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Dear Regulatory Team Members:

Enclosed please find the Final Radiological Removal Action Completion Report (RACR), Revision 2, Parcel D-2 Hunters Point Shipyard, San Francisco, CA. The enclosed RACR and associated Survey Unit Project Reports (SUPRs) have been revised at the request of the California Department of Public Health (CDPH). In August 2010 the Navy and CDPH agreed upon a "prototype" format for SUPR reports. The enclosed reports have been revised to be consistent with the agreed upon format. The revisions include a change to the presentation of survey data and residual dose and risk modeling. The results and conclusions remain unchanged from the previous version of this report.

The Navy has previously received concurrence letters on the Parcel D-2 Radiological RACR from the Department of Toxic Substance Control on August 9, 2010 and the Environmental Protection Agency on May 14, 2010.

The Navy requests a letter of concurrence on the enclosed Final RACR Revision 2 from the CDPH **no later than January 13, 2012.** If you have any questions regarding the enclosed document, please contact Mr. Chris Yantos at (619) 532-0912, or Mr. Keith Forman at (619) 532-0913 at your earliest convenience.

Sincerely,

KEITH FORMAN
BRAC Environmental Coordinator
By direction of the Director

Enclosures: 1. Final Removal Action Completion Report, Revision 2, Parcel D-2 Hunters Point Shipyard, San Francisco, CA

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CONTRACT NO. N62473-07-D-3211
CTO NO. 0018

FINAL

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT Revision 2

December 16, 2011

DCN: ECSD-3211-0018-0181.R2
Revision 2 to ECSD-5713-0072-0017.R1

PARCEL D-2
HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-07-D-3211
CTO NO. 0018

FINAL

RADIOLOGICAL

REMOVAL ACTION COMPLETION REPORT

Revision 2

December 16, 2011

PARCEL D-2
HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

DCN: ECSD-3211-0018-0181.R2
Revision 2 to ECSD-5713-0072-0017.R1

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Date

EXECUTIVE SUMMARY

The U.S. Department of the Navy (DON) directed Tetra Tech EC, Inc., to prepare this revised Radiological Removal Action Completion Report (RACR) for Parcel D-2 at Hunters Point Naval Shipyard (HPNS). This RACR describes and summarizes the Parcel D-2 Building 813 Final Status Survey (FSS) and storm drain and sanitary sewer radiological removal actions to facilitate the preparation of a no further action Record of Decision (ROD) and support the future Proposed Plan. The FSS and removal action activities were performed under multiple contracts and task orders and were conducted in accordance with regulatory requirements. The purpose of this RACR was to summarize the results of the radiological work activities performed for Parcel D-2 to protect the public health, welfare, and the environment from actual or potential releases of radiological contaminants. Except in relation to reuse or disposal of excavated soil derived from removal of the Parcel D-2 storm drain and sanitary sewers, this revised RACR does not address chemical contamination and does not include or affect any other designated HPNS parcels.

The HPNS site lies entirely within the corporate boundaries of the City and County of San Francisco, California. The HPNS site encompasses approximately 848 acres, including about 416 acres on land situated on a 2-mile-long promontory projecting southeastward into San Francisco Bay. The remaining 432 acres constitute the adjacent offshore areas. The property associated with Parcel D-2 originally was associated with Parcel B, and the related storm drain and sanitary sewer removal action activities were performed prior to the DON's designation of Work Area 12 as Parcel D-2. Approximately 5.32 acres in area, Parcel D-2 is located north of Parcel G along Spear Avenue at HPNS and encompasses Building 813, its associated asphalt parking areas, and two open-front sheds.

Based on the radiological operational history described in the final Historical Radiological Assessment, Volume II (HRA) prepared by the Naval Sea Systems Command in 2004 (NAVSEA 2004) and site-specific investigative data, the DON determined that radioactive contamination in soils and debris at HPNS required a response action. This decision is documented in the final Base-wide Radiological Removal Action, Action Memorandum (DON 2006). The storm drain and sanitary sewer removal actions were performed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan.

The present-day configuration of the HPNS storm drain and sanitary sewer systems is the result of an evolutionary process. The combined systems grew in sections and then underwent a series of separation projects to provide for installation of dedicated sanitary sewer piping and pump stations that would discharge effluent off-site. Complete separation of the combined systems was never achieved, and inspections have revealed that cross-connections may still exist. Due to

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the evolutionary nature of the separation process, radiological contamination from the same sources may have impacted the HPNS storm drain and sanitary sewer systems piping and other components.

Building 813 and the storm drain and sanitary sewer systems were identified in the HRA (NAVSEA 2004) as radiologically impacted. The HRA listed the radionuclides of concern as cesium-137, radium-226, and strontium-90.

Building 813 is a 262-square-foot by 262-square-foot, four-story, reinforced-concrete, flat-roofed warehouse. Asphalt parking areas surround Building 813 on three sides. Two open-front sheds are located on the west side of Building 813. Currently, Building 813 is vacant.

Radiological surveys were performed for Building 813 in 2006. The Building 813 drain lines and ventilation system were radiologically surveyed. No contamination was found during these survey activities. In addition, radiological surveys were performed on the interior of Building 813. The collected data were reviewed to determine whether investigative levels had been exceeded. No sample measurement for alpha or beta exceeded the release criteria. Small areas of elevated gamma activity were noted during the survey activities. Additional investigation did not locate any discrete source of radioactive materials. Because the instruments used for the gamma measurements may indicate photons from many directions and not exclusively from the surface of the materials being surveyed, the elevated gamma measurements likely can be attributed to construction materials and the geometry of the specific survey unit or room. Based on the analysis of the collected field data and since there was no residual radioactivity greater than background concentrations, Building 813 was recommended for unconditional unrestricted release. Confirmation radiological surveys performed by the California Department of Public Health (CDPH) in Building 813 supported this recommendation. The CDPH concluded that the building was acceptable for unrestricted release on April 1, 2008.

The Parcel D-2 storm drain and sanitary sewers were removed in stages beginning in November 2006. There were five sanitary sewer lines and 21 storm drain lines associated with Parcel D-2. The radiological details of the storm drain and sanitary sewer removal work completed for Parcel D-2 were provided in each of the final versions of the Survey Unit Project Reports (SUPRs) for Trench Survey Units (SU)-31, -32, -34, -35, -38, - 134, and -135. The goal of the SUPRs was to demonstrate that identified residual radioactivity levels inside the excavated trenches and within the backfill material meet the established release criteria. The CDPH requested that the DON modify Revision 1 to the final Parcel D-2 RACR to reflect changes to the individual SUPR contents and dose and risk modeling parameters required by the regulatory agencies. These changes were agreed to by the DON after the individual SUPRs and the Parcel D-2 RACR were finalized and revised. The information, conclusions, and recommendation presented in this RACR reflect these SUPR revisions and dose modeling results.

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The seven excavated trench survey units designated within Parcel D-2 primarily consisted of shallow storm drain lines located between 2 and 12 feet below ground surface and only five shallow sanitary sewer lines. Approximately 1,434 cubic yards of soil was excavated from the Parcel D-2 trenches, including about 45 cubic yards of soil removed from one trench segment in SU-35 and one trench segment in SU-135 that was disposed of as low-level radioactive waste (LLRW), but was not contaminated. Only 3 of the 1,027 linear feet of pipe excavated was disposed of as LLRW due to elevated static measurements. The remaining manholes and pipe removed from SU-31, -32, -34, - 35, and -38 were disposed of by the DON's nonradiological waste contractor. With the concurrence of the DON, radiological survey activities were not performed on pipe or manholes excavated from SU-134 or SU-135 due to the limited quantity removed and to expedite the work activities. The 440 linear feet of pipe and four manholes removed from SU-134 and SU-135 were placed directly into LLRW bins for off-site disposal.

Relatively short segments of the storm drain lines remain at Parcel D-2 because: 1) their removal would adversely affect the integrity of Building 813; 2) they could not be removed due to worker safety issues; or 3) they were within 10 feet of the building face or other obstructions (stairways, loading docks, adjacent property retaining walls, or overhangs). Based on the radiological history of Building 813, there is no potential for radiological contamination to have been transferred from the building to the roof drains and from there to the storm drain sewers. Therefore, the DON determined that roof drain pipes are nonimpacted and may be left in place within the 10-foot safety buffer. Storm drain and sanitary sewer piping laterals were removed to within the 10-foot safety buffer surrounding the structure or other associated obstructions. If no radiological contamination was present, then the exposed ends of the lateral were capped or plugged and the remaining portions left in place.

Storm drain trench lines located on the north side of Building 813 were not excavated because of their proximity to the San Francisco Redevelopment Agency (SFRA) retaining wall that separates Parcel D-2 from the adjacent SFRA property (formerly Parcel A, which was released for unrestricted use) and to prevent undermining the Building 813 loading dock. These storm drain trench lines are associated with either the building stormwater roof drains or the storm drain lines emanating from the nonimpacted adjacent SFRA property. In addition, relatively short segments of storm drain line piping were not excavated on the south, east, and west sides of Building 813 during these removal actions. These residual storm drain segments are located within the 10-foot buffer zone and could not be removed without affecting the integrity of the structure. The results of the radiological surveys performed on segments of the storm drain lines that were excavated during the removal action support the DON's contention that no radiological contamination is present in the storm drain pipe segments remaining in place.

Only five sanitary sewer trench lines are associated with Parcel D-2 and only 30 linear feet remain in place following the removal actions. Sanitary sewer line 06-D12-00-1O emanates

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from the eastern side of Building 813, and 06-D12-00-8D extends toward the southeast from Building 813 toward SU-135 and Manhole MH207. Approximately 210 linear feet of these sanitary sewer trench lines was removed, and about 30 linear feet remains in place following the removal action. Approximately 10 linear feet of sanitary sewer line 06-D12-00-1O remains in place at Parcel D-2 because of its proximity to the building; however, 180 linear feet of this line was removed, radiologically surveyed and released for off-site disposal or recycling, and disposed of off-site as nonradiological waste. Based on the radiological survey results, the DON concluded that the segment of sanitary sewer line 06-D12-00-1O remaining in place was nonimpacted. Although about 20 linear feet of sanitary sewer line 06-D12-00-8D remains in place on Parcel D-2 following the removal action, the pipe runs at a diagonal within 10 feet of the building face and cannot be removed safely or without damaging the structure. About 30 linear feet of this sanitary sewer line was removed and radiologically surveyed. The Radiation Safety Officer released these pipe pieces based on the survey results as nonimpacted wastes.

Revised dose modeling was performed for each of the seven trench survey units using the default residential farmer scenario to calculate their net residual dose. The results of the revised modeling efforts indicate that the potential upper-bound annual dose or lifetime cancer risk to workers or members of the public as a result of exposures to residual radioactive material in soil is 4.347 millirems per year with an increased potential cancer risk of 7.559×10^{-5}.

In addition to dose and risk modeling efforts, the environmental as low as reasonably achievable (ALARA) process was implemented for each of the seven trench survey units associated with Parcel D-2. The ALARA process supported the results of the dose modeling efforts and recommendations for unrestricted release of the trench survey units associated with Parcel D-2.

Based on the results of the storm drain and sanitary sewer removal action, residual dose and risk modeling efforts, and the implementation of the ALARA process presented in the SUPRs, and based on the results of the Building 813 FSS and concurrence by the CDPH for its unrestricted release, the DON has met its stated removal action objectives to protect public health and welfare and the environment and to preclude potential exposure to future residents or workers. The revised SUPRs demonstrate that identified residual radioactivity levels inside the excavated trenches and within the overburden or excavated soils and/or imported fill used as backfill meet the established release criteria.

The DON has met its stated radiological goals and objectives for Parcel D-2. The information provided in this RACR, the seven SUPRs, and the Building 813 FSS results support the DON's conclusion that Parcel D-2 is ready for unconditional, unrestricted radiological free release. The conclusions presented in this RACR support the preparation of a no further action ROD and the future Proposed Plan.

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Appendix B Building 813 Regulatory Concurrence (provided on CD only)

Appendix C Final Survey Unit Project Reports Abstract, Revision 3 (provided on CD only)

Appendix D Survey Units 31, 32, 34, 35, 38, 134, and 135 Project Reports (provided on CD only)

- Final Survey Unit 31 Project Report, Revision 3
  DCN: ECSD-3211-0018-0183.R3, Revision 3 to ECSD-2201-0006-0080.R2
- Final Survey Unit 32 Project Report, Revision 3
  DCN: ECSD-3211-0018-0184.R3, Revision 3 to ECSD-2201-0006-0081.R2
- Final Survey Unit 34 Project Report, Revision 3
  DCN: ECSD-3211-0018-0185.R3, Revision 3 to ECSD-2201-0006-0082.R2
- Final Survey Unit 35 Project Report, Revision 3
  DCN: ECSD-3211-0018-0186.R3, Revision 3 to ECSD-2201-0006-0083.R2
- Final Survey Unit 38 Project Report, Revision 3
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- Final Survey Unit 134 Project Report, Revision 1
  DCN: ECSD-3211-0018-0188.R1, Revision 1 to EMAC-8823-0002-0009
- Final Survey Unit 135 Project Report, Revision 1
  DCN: ECSD-3211-0018-0189.R1, Revision 1 to EMAC-8823-0002-0010

Appendix E Backfill Soil Review and Acceptance Procedure and Analytical Results (provided on CD only)

Appendix F Radiological Surveys and Sample Analytical Results (provided on CD only)

Appendix G Response to Comments

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ABBREVIATIONS AND ACRONYMS

µCi	microcurie
ALARA	as low as reasonably achievable
AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
CDPH	California Department of Public Health, Environmental Management Branch
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
^{137}Cs	cesium-137
CTO	Contract Task Order
DON	Department of the Navy
DTSC	(California) Department of Toxic Substances Control
EP	extraneous pipe
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
HPNS	Hunters Point Naval Shipyard
HRA	Historical Radiological Assessment
LLRW	low-level radioactive waste
m^2	square meter
MDL	method detection limit
mrem/y	millirems per year
NAVSEA	Naval Sea Systems Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
pCi/g	picocuries per gram
^{226}Ra	radium-226
RACR	Removal Action Completion Report
RASO	Radiological Affairs Support Office
ROC	radionuclide of concern
ROD	Record of Decision
RSO	Radiation Safety Officer
RSY	Radiological Screening Yard
SFRA	San Francisco Redevelopment Agency

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ABBREVIATIONS AND ACRONYMS
(Continued)

^{90}Sr	strontium-90
SU	Trench Survey Unit
SUPR	Survey Unit Project Report
SUPRA	Survey Unit Project Report Abstract
TtEC	Tetra Tech EC, Inc.
UC	Utility Corridor
VCP	vitreous clay pipe

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1.0 INTRODUCTION

The U.S. Department of the Navy (DON) directed Tetra Tech EC, Inc. (TtEC) to prepare this Radiological Removal Action Completion Report (RACR) for Parcel D-2 at Hunters Point Naval Shipyard (HPNS) in San Francisco, California. This RACR describes and summarizes the Parcel D-2 Building 813 Final Status Survey (FSS) and storm drain and sanitary sewer radiological removal actions to facilitate the preparation of a no further action Record of Decision (ROD) and support the future Proposed Plan. The removal action activities were directed by the DON, Naval Facilities Engineering Command Southwest, and the Radiological Affairs Support Office (RASO) under Contract No. N62473-06-D-2201 and Contract Task Order (CTO) No. 0006 for Trench Survey Units 31, 32, 34, 35, and 38. The RACR previously was submitted to the DON and the regulatory agencies as a final document on January 9, 2009. Based on comments received from the California Department of Toxic Substances Control (DTSC) dated February 24, 2009, the final RACR was revised to include the excavation of additional storm drain and sanitary sewer lines (Survey Units 134 and 135) removed from Parcel D-2 under Contract No. N62473-08-D-8823 and the CTO No. 0002 Utility Corridor (UC) 1 and 2 removal action. The final RACR and the first revision were prepared under Contract No. N68711-98-D-5713 and CTO No. 0072. The regulatory agency comments on the RACR and the DON's responses are provided in Appendix G.

The DTSC and California Department of Public Health (CDPH) requested that the DON modify Revision 1 to the final Parcel D-2 RACR to reflect changes to the individual Survey Unit Project Report (SUPR) contents and dose and risk modeling parameters required by the regulatory agencies. These changes were agreed to by the DON after the individual SUPRs and the Parcel D-2 RACR were finalized and revised. The revised SUPRs for the trench survey units associated with Parcel D-2 were prepared under Contract No. N62473-07-D-3211 and CTO No. 0019. This second revision to the final RACR was prepared under Contract No. N62473-07-D-3211 and CTO No. 0018. Except in relation to reuse or disposal of excavated soil derived from removal of the Parcel D-2 storm drain and sanitary sewers, this revised RACR does not address chemical contamination and does not include or affect any other designated HPNS parcels.

The storm drain and sanitary sewer removal actions were performed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Because these removal actions were performed in compliance with CERCLA, Section 121(e), no permits were necessary.

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1.1 HUNTERS POINT NAVAL SHIPYARD LOCATION AND DESCRIPTION

The HPNS site lies entirely within the corporate boundaries of the City and County of San Francisco, California. The HPNS site encompasses approximately 848 acres, including about 416 acres on land situated on a 2-mile-long promontory projecting southeastward into San Francisco Bay within the southeast corner of the City of San Francisco. The remaining 432 acres constitute the adjacent offshore areas (Figure 1-1).

In 1992, the DON divided HPNS into five contiguous parcels (A through E) to expedite remedial action activities and land reuse. Parcel F was designated in 1996 and encompasses the offshore areas. The DON designated the landfill area in Parcel E as Parcel E-2 in September 2004. Subsequently, Parcel A was transferred to the City and County of San Francisco. In July 2008, the DON redivided HPNS into eight parcels (B, C, D-1, D-2, E, E-2, G, and F) and three UCs identified as UC1, UC2, and UC3 (Figure 1-2). Parcels B, C, D-1, D-2, E, E-2, and G encompass the onshore areas, and the offshore areas continue to be designated as Parcel F.

Based on the HPNS radiological operational history described in the final Historical Radiological Assessment, Volume II (HRA) prepared by the Naval Sea Systems Command (NAVSEA) in 2004 (NAVSEA 2004) and site-specific investigative data, the DON determined that radioactive contamination in soils and debris at HPNS required a response action. This decision is documented in the final Base-wide Radiological Removal Action, Action Memorandum (AM) (DON 2006).

1.2 PARCEL D-2 SITE DESCRIPTION

Parcel D-2 is approximately 5.32 acres in area and is located north of Parcels G and UC1 (Spear Avenue) within HPNS (Figure 1-2). The boundaries of Parcel D-2 were designated by the DON on July 7, 2008. It is bounded on the north, west, and east by property being developed by the San Francisco Redevelopment Agency (SFRA) for the City and County of San Francisco (formerly Parcel A) and on the south by Spear Avenue and Parcel UC1. The property does not include Building 819 located adjacent to the southwest corner of Parcel D-2, but does include Building 813 and its associated asphalt parking areas. Figure 1-3 illustrates the location of Building 813 within the Parcel D-2 boundaries and the associated storm drain and sanitary sewer lines. Located along Spear Avenue, Building 813 is a four-story concrete-reinforced structure that is further described in Section 2.0. There are no Installation Restoration Program sites associated with Parcel D-2.

The DON initiated the characterization survey for Building 813 based on its operational history described in the HRA (NAVSEA 2004). The DON directed the removal of the storm drain and sanitary sewer systems at HPNS to eliminate the potential threat posed by migration and/or off-site release of radioactive materials present at the site to the surrounding environment. The HRA

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listed cesium-137 (^{137}Cs), radium-226 (^{226}Ra), and strontium-90 (^{90}Sr) as the radionuclides of concern (ROCs) associated with the HPNS storm drain and sanitary sewer systems (NAVSEA 2004). A history of the HPNS storm drain and sanitary sewer systems is provided in the AM (DON 2006) and the HRA (NAVSEA 2004). To achieve the DON's objectives, the following documents were prepared and subsequently revised to direct the radiological work performed at HPNS in accordance with the AM:

- Final Parcel B Design Plan, Storm Drain and Sanitary Sewer Removal – Parcel B (TtEC 2006a)
- Final Task-specific Plan for the Building 813 Characterization Survey (TtFW 2005)
- Final Design Plan, Storm Drain and Sanitary Sewer Removal, Parcels C and D (TtEC 2008b)
- Final Execution Plan, Fisher and Spear Avenues, Storm Drain and Sanitary Sewer Removal (TtEC 2008d)
- Survey Unit Project Report Abstract (SUPRA), Revision 3, provided in Appendix C
- Base-wide Radiological Work Plan, Revision 1 (Radiological Work Plan) (TtEC 2008c)
- Base-wide Storm Drain and Sanitary Sewer Removal Project Work Plan (TtEC 2006b)
  - Base-wide Storm Drain and Sanitary Sewer Removal Project Work Plan, Revision 1 (TtEC 2007)
  - Base-wide Storm Drain and Sanitary Sewer Removal Project Work Plan, Revision 2 (TtEC 2008a)
  - Base-wide Storm Drain and Sanitary Sewer Removal Project Work Plan, Revision 3 (TtEC 2008e)

The Parcel D-2 sewer removal and building survey activities were performed in accordance with these documents and subsequent revisions, as appropriate.

The Parcel D-2 storm drain and sanitary sewers were removed in stages beginning in November 2006. The property associated with Parcel D-2 originally was associated with Parcel B, and the related storm drain and sanitary removal action activities were performed prior to the DON's designation of Work Area 12 as Parcel D-2. Piping under the footprint of Building 813 and outdoor areas were evaluated as part of the FSS (Appendix A). There were five sanitary sewer lines (06-D12-00-1O, 06-D12-00-8D, 02-D26-00-3J, 02-D26-00-3D, and 02-D26-00-3C) and 21 storm drain lines associated with Parcel D-2. Storm drain lines located on the north side of Building 813 were not excavated because of their proximity to the retaining wall that separates Parcel D-2 from the adjacent SFRA property and to prevent undermining the Building 813

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loading dock. These lines either drain stormwater from the roof of Building 813 or are associated with upgradient storm drain lines emanating from the non-radiologically impacted SFRA property (formerly Parcel A, which was released for unrestricted use). Figures 1-3, 1-4, and 1-5 show the locations of the storm drain and sanitary sewer lines (both excavated and those remaining in place). The excavated storm drain and sanitary sewer trenches were backfilled to grade and covered with road base material. Section 2.0 summarizes the Building 813 radiological survey results. Section 3.0 summarizes the storm drain and sanitary sewer removal actions and details related to piping remaining in place following the removal actions.

1.2.1 Current and Future Land Use

Currently, Building 813 is vacant. Based on the HPNS Redevelopment Plan (SFRA 1997), the planned future use of Parcel D-2 is "mixed use" that may include residential areas.

1.3 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this RACR is to describe and summarize the Parcel D-2 Building 813 FSS and the storm drain and sanitary sewer removal actions, and to facilitate the preparation of a no further action ROD to support the Proposed Plan. This Parcel D-2 RACR is organized as follows:

- **Section 1.0, Introduction** – Section 1.0 provides project background information and the Parcel D-2 site description.
- **Section 2.0, Building 813 Summary of Survey Results** – Section 2.0 provides a description and history of the structure, summarizes the FSS results, and discusses regulatory concurrence for free release of Building 813.
- **Section 3.0, Storm Drain and Sanitary Sewer Removal Actions** – Section 3.0 summarizes the final revised SUPRA and each of the seven SUPRs.
- **Section 4.0, Conclusions and Recommendation** – Section 4.0 presents the conclusions and recommendation for free release of Parcel D-2 in support of a no further action ROD.
- **Section 5.0, References** – Section 5.0 presents the references cited in this RACR.
- **Appendices A through G** – The appendices present the technical information and data that support the conclusions of this RACR as well as the responses to comments.

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2.0 BUILDING 813 SUMMARY OF SURVEY RESULTS

The following sections describe Building 813, provide an abbreviated history, summarize the FSS results, and discuss regulatory concurrence for unrestricted, free release of the structure. The location of Building 813 is shown on Figures 1-3 through 1-5. The FSS Report is included in Appendix A, and the regulatory concurrence for unrestricted release is provided in Appendix B.

2.1 DESCRIPTION

Building 813 is a 262-square-foot by 262-square-foot, four-story, reinforced-concrete, flat-roofed warehouse that includes banks of industrial steel sash in horizontal bands across all four stories, except at the front of the first floor on the south end of the building. This front has a bank of steel rollup industrial doors extending the length of the concrete loading dock area sheltered by a concrete canopy. Asphalt parking areas surround Building 813 on three sides with a narrow asphalt area that abuts the SFRA retaining wall on the north side. Two open-front sheds are located on the west side of Building 813. One shed is an approximately 20-foot by 20-foot wood structure, and the other shed is a 20-foot by 40-foot wood and corrugated metal structure. Several bollards are embedded into the asphalt at the northeast corner of Parcel D-2 that appear to have been installed to protect two former aboveground storage tanks.

2.2 HISTORY

The HRA, Volume II (NAVSEA 2004) specifies that Building 813 previously was used as 1) a general warehouse and offices, 2) a supply storehouse, and 3) the Disaster Control Center. Historically, a leaking 300-microcurie (μCi) ^{90}Sr check source was found listed in the disaster control inventory for the Disaster Control Center. Because a cabinet of unknown origin was found bearing a radioactive materials placard and since there was no indication of what types of radioactive materials were stored in the cabinet, ^{226}Ra and ^{137}Cs as well as ^{90}Sr were included as ROCs for the scoping survey performed in Building 813 beginning in 2006. The details of the scoping survey were provided in the FSS Report (Appendix A). The scoping survey concluded that the residual radioactivity at Building 813 met the release criteria and that Building 813 was ready for unconditional unrestricted use.

2.3 FINAL STATUS SURVEY SUMMARY

TtEC and New World Technology, Inc., mobilized to perform scoping surveys for Building 813 in 2006. The Multi-Agency Radiation Survey and Site Investigation Manual (NUREG-1575) (DoD et al. 2000), NUREG-1505 (NRC 1998), and NUREG/CR-1507 (NRC 1997) guided in the survey design and implementation. Materials such as desks, filing cabinets, tables, other

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miscellaneous office furniture and asbestos tile located in Building 813 were surveyed and released using Regulatory Guide 1.86 limits (AEC 1974) specified for ^{226}Ra, ^{137}Cs, and ^{90}Sr. In addition, the drain lines and ventilation system were surveyed. No contamination was found on any of the items surveyed, and the asbestos tile was disposed of under the appropriate landfill waste classification. The details of these surveys are presented in Appendix A.

The first floor of Building 813 was divided into 18 Class 1 survey units, 2 Class 2 survey units, and 1 Class 3 survey unit for the scoping surveys. Class 1 survey units consisted of floor areas less than 100 square meters (m^2), and Class 2 survey units encompassed floor areas less than 1,000 m^2. The Class 3 survey unit included the remaining portions of the first floor. Visual Sample Plan software, in conjunction with computer-assisted draft drawings, was used to determine the survey unit grid parameters and specific data collection locations. Class 1 survey units received 100 percent scan coverage for alpha/beta and gamma emitters, while both Class 2 and Class 3 survey units received 50 percent scan coverage. Static measurements were logged at systematic locations in each of the survey units, and a swipe sample was collected at each of these systematic locations. The purpose of the swipe samples was to evaluate the presence of loose alpha and beta-gamma surface activity.

The collected data were reviewed to determine whether investigative levels had been exceeded. No sample measurement for alpha or beta exceeded the release criteria. Small areas of elevated gamma activity were noted during the survey activities. Additional investigation did not locate any discrete source of radioactive materials. Because the instruments used for the gamma measurements may indicate photons from many directions and not exclusively from the surface of the materials being surveyed, the elevated gamma measurements likely can be attributed to construction materials and the geometry of the specific survey unit or room.

Currently, there are no established release criteria for building interior surfaces based on gamma exposure rates. The guidance document NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, specifies that the average of exposure rates that are measured 1 meter above the surface of a survey unit should not exceed twice the background measurements (NRC 1992). Because the gamma survey results did not exceed twice the background, Building 813 was considered acceptable for unconditional release.

Survey results were statistically analyzed using the Wilcoxon Rank-Sum test to determine if residual radioactivity was present and to ascertain whether conditions within the survey units met the release criteria for unrestricted use. The survey and sample results show that Building 813 meets the release criteria and the building can be released for unrestricted use.

Because the mean concentrations for both alpha and beta emitters were less than background, there was no residual radioactivity to model, and each survey unit in Building 813 was assigned

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an administrative dose of 0.00 millirem per year (mrem/y). No further dose modeling was determined to be necessary.

Based on the analysis of the collected field data and since there was no residual radioactivity greater than background concentrations, Building 813 was recommended for unconditional, unrestricted release.

2.4 REGULATORY CONCURRENCE

The CDPH, at the request of the DTSC, reviewed documents associated with radiological issues and performed confirmation radiological surveys in Building 813. The CDPH concluded that the building was acceptable for unrestricted release on April 1, 2008 (CDPH 2008). A copy of the CDPH memorandum is provided in Appendix B.

A regulatory concurrence letter for the unrestricted release of Building 813 has not been provided to the DON by the U.S. Environmental Protection Agency (EPA) as of the date of this RACR.

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3.0 STORM DRAIN AND SANITARY SEWER REMOVAL ACTIONS

This section summarizes and describes the storm drain and sanitary sewer system removal actions completed at Parcel D-2. The purpose of these removal actions was to meet the currently specified removal action objectives and achieve the unrestricted radiological release of the storm drain and sanitary sewer system. The removal action objectives were developed to protect public health and welfare and the environment and to preclude potential exposure to future residents or workers by physically removing the existing storm drain and sanitary sewer lines and disposing of the associated radioactive contaminants that exceed the radiological remedial objectives. Meeting these removal action objectives substantially eliminated the potential migration of contaminated material within or outside of the systems. In accordance with the NCP requirements, the applicable or relevant and appropriate requirements (ARARs) for this removal action are presented in the AM (DON 2006).

3.1 FINAL SURVEY UNIT PROJECT REPORTS ABSTRACT

The SUPRA (Appendix C) was prepared to document work performed under the Base-wide Storm Drain and Sanitary Sewer Removal Work Plan (TtEC 2006b) (Sewer Work Plan) at HPNS and its subsequent revisions. This SUPRA is applicable to the storm drain and sanitary sewer removal actions performed at HPNS prior to December 31, 2010. Because there are numerous trench survey units at HPNS and each trench survey unit has its own SUPR, an overarching abstract was developed to provide information and details common to each of the individual trench survey units and to reduce those elements that typically would be redundant to each SUPR. The SUPRA is revised as state-of-the-art laboratory methodologies and quality assurance procedures are refined. This document is applicable to all storm drain and sanitary sewer SUPRs and data sets prepared for regulatory review.

The SUPRA provides a history of the storm drain and sanitary sewer system at HPNS and documentation of the site's operational history. The SUPRA also presents discussions and common information related to storm drain and sanitary sewer system removal actions at HPNS including:

- Release limits
- As low as reasonably achievable (ALARA) and the environmental ALARA process
- ROCs and the associated release criteria
- Investigation level for gamma scan surveys
- FSS objectives, design, and methodology

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- Radiological Screening Yard (RSY) processing of peripheral material, overburden, and excavated soil
- Imported fill sources, screening, and results
- Reference areas
- Sample collection and preparation methodologies, and laboratory analyses including gamma spectroscopy analysis and data flags
- Quality assurance, quality control, and comparative laboratory sample results
- Selection of the off-site laboratory
- On-site and off-site laboratory comparisons
- ^{90}Sr analysis methodology
- Counting uncertainty analysis
- Data assessment (verification, validation, and evaluation)
- Statistical tests, including decision errors
- Dose and risk modeling
- Final unrestricted radiological release criteria

A copy of Revision 3 to the final SUPRA is provided in Appendix C.

3.2 SURVEY UNIT PROJECT REPORTS

The radiological details of the storm drain and sanitary sewer removal work completed for Parcel D-2 are provided in the revised final versions of the SUPRs for Survey Units 31, 32, 34, 35, 38, 134, and 135. The DON directed TtEC to revise the seven Parcel D-2 SUPRs following numerous discussions with the DTSC and CDPH and apply the larger of the method detection limit (MDL) or reported activity parameters to the dose modeling efforts. Survey Units 31, 32, 34, 35, and 38 were excavated during the CTO No. 0006 storm drain and sanitary sewer removal action, prior to the designation of the Parcel D-2 boundaries, while Trench Survey Units 134 and 135 were excavated during the CTO No. 0002 UC1 and UC2 removal action performed after the designation of the Parcel D-2 boundaries. The objective of the SUPRs was to demonstrate that identified residual radioactivity levels inside the excavated trench and within the overburden soils and/or import fill soils used as backfill material met the release criteria. Fieldwork and construction activities were briefly summarized in each revised SUPR; however, detailed information related to the fieldwork performed is provided in this RACR. A copy of each of the revised SUPRs is provided in Appendix D.

The seven individual SUPRs prepared for Survey Units 31, 32, 34, 35, 38, 134, and 135 presented the radiological details related to the storm drain and sanitary sewer lines associated

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with Parcel D-2 and summarized the scope, approach, and survey results from the associated removal actions. The SUPRs also presented discussions and information related to the storm drain and sanitary sewer system removal actions at Parcel D-2 including:

- FSS activities performed for the trench survey unit and selected backfill materials
- Laboratory analytical results and comparison of on-site and off-site analytical results
- Dose modeling with input parameters using reported activities
- Dose modeling with input parameters using the larger of the MDL or reported activity
- Dose and risk modeling results
- Derived concentration guidelines, levels, and modeling
- ALARA and the environmental ALARA process including identification and review of potential radiological impacts as well as discussions related to the performance of qualitative and quantitative ALARA analyses
- Recommendation for final unrestricted radiological release

Figure 1-4 depicts the seven trench survey units and their respective locations within Parcel D-2. Table 3-1 summarizes relevant details provided in the revised SUPRs, including the results of the dose modeling efforts.

The trench survey units associated with Parcel D-2 primarily consisted of shallow storm drain lines that were located at depths between 2 and 10 feet below ground surface. The maximum depths of the excavated trenches ranged between 3 and 12 feet below ground surface, and the total area of the exposed trench surface was 25,306 square feet. Approximately 1,434 cubic yards of soil was excavated from the Parcel D-2 trenches including an estimated 45 cubic yards of soil removed from two trench segments (06-D12-00-1S and 02-D26-00-3C) that was disposed of as low-level radioactive waste (LLRW). The trench segment remediation activities are discussed in the Survey Unit 35 and Survey Unit 135 SUPRs provided in Appendix D and in Section 3.6.1 and Section 3.9.1, respectively, of this RACR. In total, 1,988 linear feet of trench (inclusive of overburden soil, peripheral material, excavated soil, and pipe/manholes) was excavated during the removal actions, and 641 samples (including soil, sediment, solid, and swipe samples) were collected from Parcel D-2 and analyzed by the on-site laboratory.

Twenty-one storm drain lines (06-D12-00-1A, -1B, -1C, -1D, -1H, - 1I, -1J, -1L, -1M, -1N, -1P, -1R, -1S, -8A, -8B, and -8C and 02-D26-00-1C, -1D, -3G, -3H, and -5A) and five sanitary sewer lines (06-D12-00-1O and -8D and 02-D26-00-3C, -3D, and -3J) were associated with Parcel D-2. Based on the radiological history of Building 813, there is no potential for radiological contamination to have been transferred from the building to the roof storm drains and from there

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to the storm drain sewers. Therefore, the DON has determined that roof drain pipes are nonimpacted and may be left in place within the 10-foot safety buffer.

Generally, storm drain and sanitary sewer laterals were removed to within the first 10 feet of their union with a main trunk line. If no radiological contamination was present in this segment of the line, then the exposed ends of the lateral were capped or plugged, and the remaining portions were left in place. If evidence of radiological contamination was encountered, the remaining lateral was removed in 10-linear-foot sections until the line had been determined to be free of radioactive contamination or to be as close to the face of Building 813 or other obstructions (stairways or loading docks) as practicable, whichever came first. Details relating to the excavated storm drain and sanitary sewer lines as well as those portions remaining in place following the removal actions are presented in this RACR under the individual trench survey unit discussions.

During the removal actions for Survey Units 31, 32, 34, 35, and 38, a total of 1,027 linear feet of pipe and seven manholes were excavated and segregated pending radiological survey activities. The majority of the pipe and manholes were concrete, corrugated metal, or clay-encased within concrete. Although two of the manholes were disposed of as LLRW, only the sediment sample collected from Manhole MH208 showed ^{137}Cs activity above the release limit at 0.23231 picocuries per gram (pCi/g). The second manhole (MH200) that was disposed of as LLRW did not show radioactivity above the release limits. These manholes are further discussed in Section 3.6.1 of this RACR. Only 3 linear feet of pipe was disposed of as LLRW due to elevated radiological survey results. Five excavated manholes and approximately 1,024 linear feet of pipe were transferred off the HPNS site by the DON's nonradiological waste contractor for disposal in an appropriate landfill.

In general, the pipe and manholes removed from Trench Survey Units 134 and 135 were either concrete or cast iron. With the concurrence of the DON, radiological survey activities were not performed on pipe or manholes excavated from these two trench survey units due to the limited quantity removed and to expedite the work activities. Approximately 440 linear feet of pipe and the four manholes removed from these two trench survey units were placed directly in LLRW bins for off-site disposal. Broken and crushed pieces of pipe were included in the excavated soil transferred to the radiological screening yard for processing.

Revised dose modeling was performed for each of the seven trench survey units using the default residential farmer scenario provided in the most current version of RESRAD at the time of the modeling exercise. The results of the revised modeling efforts indicate that the net potential dose or lifetime cancer risk to workers or members of the public as a result of exposures to residual radioactive material in soil is 4.347 mrem/y and indicates an excess lifetime cancer risk of 7.559×10^{-5}.

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In addition to the dose modeling efforts, the environmental ALARA process was implemented and is presented in Appendix C. This process included the identification and review of potential radiological impacts, and the performance of qualitative and quantitative ALARA analyses. Nine different methods were used in reviewing the potential radiological impacts and are discussed in the individual SUPRs provided in Appendix D. Quantitative and qualitative ALARA analyses were performed for each of the seven Parcel D-2 survey units. Following the completion of each trench excavation, the qualitative radiological impacts from operations were evaluated by performing a dose and risk assessment. Based on the qualitative ALARA analyses, the excavation projects that could cause the potential dose to the public to exceed 1 millirem (individual) or 10 person-rem (collective) were subjected to quantitative ALARA analyses. To date, no operations at HPNS have resulted in an individual dose to the public greater than 1 millirem or a collective dose greater than 10 person-rem.

A complete discussion of the ALARA process for each of the Parcel D-2 trench survey units is provided in Section 7.4 of each SUPR (Appendix D).

3.2.1 Imported Fill Material

The storm drain and sanitary sewer removal action necessitated the importation of appropriate soil for use as backfill material: 1) when insufficient radiologically released overburden material or excavated soil was available for these activities, and 2) to account for the void created by the removed piping. The DON developed the Hunters Point Shipyard Project Backfill Review and Acceptance Procedure HPO-Tt-0270 to describe the procedural requirements necessary to ensure that imported fill materials were adequately reviewed and accepted prior to being brought to HPNS. A copy of this procedure is provided in Appendix E. In addition, soil being screened for potential backfill material was sampled in accordance with specific instructions identified in the Sampling and Analysis Plan, Appendix A of the Sewer Work Plan (TtEC 2006b).

In June 2006, six in situ soil samples were collected from a construction project identified as the "Pancake House" located in Millbrae, California, to ascertain whether the soil was acceptable as backfill material at HPNS. In addition, a total of eight in situ soil samples were collected from the Mills Peninsula Hospital construction site in Burlingame, California, to determine whether the soil was acceptable as backfill material at HPNS; four of the soil samples were collected in September 2006 and four in October 2006. The soil samples were submitted to the appropriate laboratories for both radiological and chemical analysis. Based on the chemical and radiological analytical results, both the Pancake House and the Mills Peninsula Hospital soil was accepted and approved for use as backfill material at HPNS. This imported material was used exclusively along with appropriate radiologically released overburden or excavated soil to backfill trench survey units in Parcel D-2. The analytical results and the executed backfill review and acceptance forms are included in Appendix E.

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3.3 TRENCH SURVEY UNIT 31

Trench Survey Unit 31 (SU-31) is located within Parcel D-2 near the northeast corner of Building 813 and comprises trench segments 06-D12-00-8A, -1D, and -1H (Figure 1-4). The footprint of SU-31 is 95.03 feet by 34.51 feet and the total surface area is 1,977.79 square feet. The depth of the excavated survey unit varied to a maximum of 6 feet below ground surface.

3.3.1 Removal Action

Excavation activities commenced for SU-31 on November 9, 2006, in trench segment 06-D12-00-1D and were completed for the survey unit on November 10, 2006. During the excavation of SU-31, 15 truckloads of overburden and peripheral material were transferred to the RSY for processing. Table 3-2 lists each truckload of material that was excavated, identifies the overburden and peripheral screening pad identification number assigned by the RSY for tracking purposes, and provides the date the material was excavated. In accordance with the Sewer Work Plan (TtEC 2006b), each truckload of peripheral material (defined as 1 foot of soil surrounding each pipe/manhole) was placed on a 14-cubic-yard screening pad and was allowed to dewater, as necessary. The material placed on each peripheral pad was radiologically scanned using a Ludlum 2350-1 equipped with a 44-10 probe, and two soil samples were collected and analyzed by gamma spectroscopy at the on-site laboratory. In addition, 10 percent of the peripheral material samples were analyzed at the on-site laboratory for ^{90}Sr. The analytical results for the SU-31 peripheral soil did not indicate the presence of activity above the release limits. Following concurrence by the RASO, the released peripheral material stockpiles were consolidated onto appropriate overburden pads for additional survey activities.

Approximately 64 linear feet of pipe and two manholes were removed from SU-31 and were staged pending survey activities. In addition, a previously unidentified 6-inch-diameter vitreous clay pipe (VCP) was found extending from Manhole MH203 toward the north during the SU-31 excavation activities. This trench segment was assigned identification number 06-D12-00-8A, and the entire 12 linear feet of this storm drain line was removed. Storm drain trench segment 06-D12-00-8A likely emanated from the upgradient non-radiologically impacted SFRA property to the north (former Parcel A that was released for unrestricted use). The majority of the SU-31 pipe excavated was concrete or VCP that disintegrated as it was removed. These small pipe pieces were transferred, along with the peripheral material soil surrounding the pipe, to the RSY for screening. Table 3-3 lists and describes each piece of excavated pipe and manhole removed from SU-31.

Radiological surveys were performed on the SU-31 pipe and Manholes MH203 and MH204. The piping excavated from SU-31 was either concrete or VCP, while the manholes were brick (MH203) or concrete (MH204). Table 3-3 lists each excavated SU-31 pipe segment and

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manhole, identifies the date surveyed, and provides the associated survey unit report identification number. The radiological survey activities consisted of a 100 percent surface scan on each pipe/manhole. In addition, two static measurements were recorded, and two swipe samples were collected and submitted to the on-site laboratory for analysis. These radiological survey reports are provided in Appendix F. Based on the survey results, the Radiation Safety Officer (RSO) concurred that the 64 linear feet of pipe and the two manholes could be released for off-site disposal or recycling. The released pipe and manholes were transferred to the DON's nonradiological waste contractor for disposal or recycling.

In accordance with the Sewer Work Plan (TtEC 2006b), sediment samples were collected from pipe and sewer system components when sufficient material was available for analysis. Only Manhole MH203 had sufficient sediment available, and a sample (6PBMH68A-203-092-01) was collected on November 9, 2006, and was submitted to the on-site laboratory for analysis by gamma spectroscopy. A solid sample of MH203 (6PDMH128A-203-318-01) also was collected and submitted to the on-site laboratory for ^{90}Sr analysis in conformance with the Work Instruction for Final Surveys of Potentially Contaminated Piping Systems During Sanitary Sewer & Storm Drain Removal Activities (Work Instruction). The analytical results did not indicate the presence of activity above the release limits, and the RSO released MH203 for nonradiological disposal on November 13, 2006.

3.3.2 SU-31 Piping Remaining In Place

Portions of two storm drain lines (06-D12-00-1H and 06-D12-00-1D) located on the north side of Building 813 were not excavated during the removal action because of their proximity to the SFRA retaining wall that separates Parcel D-2 from the adjacent former Parcel A property and to prevent undermining and potentially damaging the Building 813 loading dock. Approximately 242 linear feet of trench segment 06-D12-00-1H and about 150 linear feet of trench segment 06-D12-00-1D lie within the 10-foot buffer zone and remain in place on Parcel D-2. Table 3-4 identifies the piping remaining in place following the Parcel D-2 removal actions along with the associated linear feet of piping that was removed.

Trench segment 06-D12-00-1H is a 12-inch-diameter concrete storm drain line. Based on historical drawings, approximately 242 linear feet of this drain line remains on Parcel D-2 following the removal action. About 26 linear feet of trench segment 06-D12-00-1H were excavated and five pieces of the line were staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on results of the radiological surveys, the five pieces of trench segment 06-D12-00-1H were released for either disposal off-site or recycling as nonimpacted waste.

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Trench segment 06-D12-00-1D was a 6-inch-diameter VCP storm drain line. Trench segment 06-D12-00-8A connected the two sections of trench segment 06-D12-00-1D that remain in place after the removal action. It was found extending from Manhole MH203 toward the north, and two pieces of intact 06-D12-00-8A (about 10.5 linear feet) were removed and staged pending radiological survey activities. In addition, approximately 58 linear feet of trench segment 06-D12-00-1D was excavated, and nine pieces of this drain line were staged pending survey activities. The survey activities were performed on February 21, 2007. Based on the survey activities and the laboratory analytical results for the swipe samples, the RSO released the two pieces of trench segment 06-D12-00-8A pipe and the nine pieces of trench segment 06-D12-00-1D pipe for off-site disposal or recycling as nonimpacted waste.

Based on analytical results for the sediment sample collected from Manhole MH203 and results of the radiological survey activities, the DON concluded that the storm drain piping remaining in place on Parcel D-2 following the removal action was not radiologically impacted.

3.3.3 SU-31 Final Status Survey Summary

The radiological work performed for SU-31 (inclusive of the trench and the associated import fill material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-31 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-31 SUPR is provided in Appendix D.

Revised dose modeling for SU-31 was performed using the most current version of the RESRAD model. The imported fill material and SU-31 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 1.478 mrem/y with an increased cancer risk of 2.820×10^{-5} for the imported fill material and 1.996 mrem/y with an increased cancer risk of 3.797×10^{-5} for the trench unit. No further dose modeling was determined to be reasonable or prudent based on these results. The revised input parameters and dose model are included in the SU-31 SUPR provided in Appendix D.

Based on a net potential dose of 1.996 mrem/y with an increased cancer risk of 3.797×10^{-5}, SU-31 was recommended for free release.

3.3.4 Backfill Activities

The RASO concurred with backfilling SU-31 on December 8, 2006, and backfill activities were completed on January 8, 2007. Imported fill material was used for backfill since sample results for overburden soil were not readily available and an expedited turnaround was needed to ensure that Lennar could continue its work near the SU-31 trench unit. A portion of the fill material

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was rock and gravel due to the shallow groundwater encountered and the saturated condition of the trench. Approximately 169 cubic yards of imported fill material was used to bring SU-31 to grade, and road base was placed over the backfill material. Detailed discussions related to the imported material used as backfill are provided in the final SUPRA (Appendix C) and the revised final SU-31 SUPR (Appendix D). The radiological analytical results for the imported fill are provided in the final SUPRA (Appendix C), and the chemical analytical results are provided in Appendix E.

3.4 TRENCH SURVEY UNIT 32

Trench Survey Unit 32 (SU-32) is located adjacent to the east side of Building 813 and extends from just south of former Manhole MH204 where it ties into SU-31 to the boundary of Trench Survey Unit 135 and former Manhole MH207 (Figure 1-4). SU-32 comprises storm drain trench segments 06-D12-00-1I, -1J, -1L, -1M, -1N, -1P, and -8B and sanitary sewer trench segment 06-D12-00-1O. Trench segment 06-D12-00-1M storm drain piping was not found during the removal activities, although several attempts were made to locate this segment. Manholes MH205 and MH206 were excavated from SU-32 during this removal action.

The footprint of SU-32 is 258.14 feet by 125.63 feet and the total surface area is 6,009.45 square feet. The depth of the excavated survey unit varied to a maximum of 5 feet below ground surface, and groundwater was encountered at a depth of approximately 2.5 feet in the northern portion of the survey unit.

3.4.1 Removal Action

Excavation activities commenced for SU-32 on November 15, 2006, in sanitary sewer trench segment 06-D12-00-1O and were completed on January 10, 2007. During SU-32 excavation, 39 truckloads of peripheral material were transferred to the RSY for processing. Table 3-2 lists each truckload of SU-32 material removed, identifies the peripheral screening pad identification number assigned by the RSY for tracking purposes, provides the date the material was excavated, and lists the overburden stockpile where the peripheral material was transferred after receiving RASO concurrence that the material was ready for consolidation and additional survey activities.

Each load of peripheral material (1 foot of soil surrounding each pipe/manhole) was placed on a 14-cubic-yard screening pad and was allowed to dewater, as necessary. The material placed on each peripheral pad was radiologically scanned using a Ludlum 2350-1 equipped with a 44-10 probe, and two soil samples were collected and analyzed by gamma spectroscopy at the on-site laboratory. The analytical results for the SU-32 peripheral material did not indicate the presence of activity above the release limits. Following concurrence by the RASO, the released peripheral material stockpiles were consolidated onto overburden pads for additional survey activities.

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During the excavation activities, a previously unidentified 6-inch-diameter corrugated metal storm drain pipe was found extending from Manhole MH206 toward the south on the eastern boundary of Parcel D-2. This trench segment was assigned identification number 06-D12-00-8B and was about 60 feet long.

Approximately 330 linear feet of pipe and one manhole (MH206) were removed from SU-32 and staged pending survey activities. The majority of the pipe excavated was concrete, concrete-encased VCP, VCP, or corrugated metal. The VCP excavated from SU-32 tended to disintegrate upon removal. These small VCP pieces were transferred along with the peripheral material surrounding the pipe to the RSY for screening. Table 3-3 lists and describes each piece of excavated pipe and Manhole MH206 removed from SU-32. Manhole MH205 was not radiologically surveyed because it was crushed upon removal and was surveyed along with the associated peripheral material in the RSY.

In accordance with the Sewer Work Plan (TtEC 2006b), sediment samples were collected from pipe and sewer system components when sufficient material was available for analysis. Only Manhole MH206 contained sufficient sediment, and a sample was collected and submitted to the on-site laboratory for analysis by gamma spectroscopy (6PDMH1N-206-097-01). In addition, a solid sample of storm drain pipe segment 06-D12-00-1I-5 was collected and submitted to the on-site laboratory for ^{90}Sr analysis (6PDPI121I-005-311-05) in conformance with the Work Instruction. Neither the sediment nor the solid sample analytical results showed activity above the release limits, and the RSO released Manhole MH206 and pipe segment 06-D12-00-1I-5 for off-site disposal or recycling in August 2007.

Radiological survey activities were performed on the SU-32 storm drain and sanitary sewer piping as well as Manhole MH206. Table 3-3 lists each excavated SU-32 pipe segment and manhole, identifies the date it was surveyed, and provides the associated radiological survey report identification number. A 100 percent surface scan was performed on each pipe/manhole. In addition, two static measurements were recorded, and two swipe samples were collected and submitted to the on-site laboratory for analysis. The radiological survey report results are provided in Appendix F. Two 12-inch-diameter concrete storm drain pipes (06-D12-00-1I-6 and -1J-20) and two 6-inch-diameter concrete-encased VCP sanitary sewer pipes (06-D12-00-1O-2 and -7) were resurveyed by collecting additional static measurements because the original surveys (HPS-061607-126) indicated elevated readings. The resurvey results (HPS-062607-136) did not show elevated readings, and the RSO released these pipe segments for off-site disposal.

Based on the radiological survey results, the RSO concurred that the 330 linear feet of pipe and Manhole MH206 could be released for disposal or recycling. The pipe and MH206 were transferred off-site by the DON's nonradiological waste contractor.

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3.4.2 SU-32 Piping Remaining In Place

Excavation activities were halted within 10 feet of the building or within 10 feet of other obstructions (stairways, loading docks, or overhangs) for worker safety and to avoid undermining the integrity of the structure. Portions of two storm drain lines (06-D12-00-1L and 06-D12-00-1P) and a part of sanitary sewer line 06-D12-00-1O were not excavated during the removal action due to their proximity to the building face or stairway (Figure 1-4). Approximately 10 linear feet of storm drain trench segment 06-D12-00-1L and sanitary sewer line 06-D12-00-1O, and about 31 linear feet of storm drain trench segment 06-D12-00-1P were not excavated and remain in place on Parcel D-2 following the removal action. Table 3-4 identifies the piping remaining in place along with the associated linear feet of piping that was removed.

Trench segment 06-D12-00-1L is a 4-inch-diameter VCP storm drain line. Approximately 20 linear feet of this trench segment was excavated and four pieces of the line were staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on the results of the radiological surveys, the four pieces of storm drain line 06-D12-00-1L were released for off-site disposal or recycling as nonimpacted waste.

Trench segment 06-D12-00-1O is a 6-inch-diameter concrete-encased VCP sanitary sewer line. Approximately 180 linear feet of this trench segment was excavated and 27 pieces of the line were staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on the results of the radiological surveys, the 27 pieces of sanitary sewer line 06-D12-00-1O were released by the RSO for off-site disposal or recycling as nonimpacted waste.

Trench segment 06-D12-00-1P is a VCP storm drain line that extends beneath an exterior stairway on the east side of Building 813. Approximately 2 linear feet of this trench segment was excavated; however, no survey activities could be performed because the pipe disintegrated upon removal. Trench segment 06-D12-00-1P connected to the 12-inch-diameter 06-D12-00-1J concrete storm drain line that was excavated in November 2006. A total of 29 pieces of trench segment 06-D12-00-1J were radiologically surveyed in January 2007. The results of the survey activities are provided in Appendix F. Based on the results of the radiological surveys, the 29 pieces of this storm drain line were released by the RSO for off-site disposal or recycling as nonimpacted waste.

Based on results of the radiological survey activities performed on storm drain and sanitary sewer trench segments, the DON concluded that the piping remaining in place on Parcel D-2 following the removal action was not radiologically impacted.

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3.4.3 SU-32 Final Status Survey Summary

The radiological work performed for SU-32 (inclusive of the trench and the associated import fill and overburden material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-32 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-32 SUPR is provided in Appendix D.

Revised dose modeling for SU-32 was performed using the most current version of the RESRAD model. The backfill material (including Overburden Unit 141 and imported fill) and SU-32 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 3.256 mrem/y with an increased cancer risk of 5.514×10^{-5} for the backfill material and 4.178 mrem/y with an increased cancer risk of 7.088×10^{-5} for the trench unit. No further dose modeling was determined to be reasonable or prudent based on these results. The revised input parameters and dose model are included in the SU-32 SUPR provided in Appendix D.

Based on a net potential dose of 4.178 mrem/y with an increased cancer risk of 7.088×10^{-5}, SU-32 was recommended for free release.

3.4.4 Backfill Activities

The RASO concurred with backfilling SU-32 on February 5, 2007, and backfill activities were completed on March 5, 2007. Overburden Unit 141 and approximately 280 cubic yards of imported fill material were used to backfill SU-32 to grade, and road base material was placed over the backfilled trench. Detailed discussions related to the imported and overburden materials used as backfill in SU-32 are provided in the final SUPR (Appendix D). The radiological analytical results for the imported fill material are provided in the final SUPRA (Appendix C) and the chemical analytical results are provided in Appendix E.

3.5 TRENCH SURVEY UNIT 34

Trench Survey Unit 34 (SU-34) is located at the northwest corner of Parcel D-2 and extends west from the Building 813 attached shed through M anhole MH202, then south along the western parcel boundary where it ties into Trench Survey Unit 35, and then turns east through Manhole MH201 toward the building (Figure 1-4). SU-34 comprises storm drain trench segments 06-D12-00-1B, -1C, and approximately 126 linear feet of -1A (the remainder of trench segment 06-D12-00-1A is associated with SU-35). The footprint of SU-34 is 198.64 feet by 170.46 feet, and the total surface area is 5,969.01 square feet. The depth of the excavated survey unit varied to a maximum of 5 feet below ground surface.

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3.5.1 Removal Action

Excavation activities commenced for SU-34 on November 27, 2006, in storm drain trench segment 06-D12-00-1C and were completed for the survey unit on January 3, 2007. While excavating SU-34, 17 truckloads of overburden soil and 17 truckloads of peripheral material were transferred to the RSY for processing. Table 3-2 lists each truckload of SU-34 material excavated, identifies the assigned peripheral screening pad identification number used for tracking purposes, indicates the overburden screening pad identification number for both excavated overburden soil and peripheral material that was consolidated onto overburden pads for additional survey activities, and provides the date the material was excavated.

Each load of peripheral material (1 foot of soil surrounding each pipe/manhole) was placed on a 14-cubic-yard screening pad and was allowed to dewater, as necessary. The material placed on each peripheral pad was radiologically scanned using a Ludlum 2350-1 instrument equipped with a 44-10 probe. Two soil samples were collected and analyzed by gamma spectroscopy at the on-site laboratory. The analytical results for the SU-34 peripheral material did not indicate the presence of activity above the release limits. Following concurrence by the RASO, the released peripheral material stockpiles were consolidated onto overburden pads for additional survey activities.

Approximately 211 linear feet of storm drain piping and two manholes (Manholes MH201 and MH202) were removed from SU-34 and were staged pending survey activities. The majority of the pipe excavated was concrete or corrugated metal. Both Manholes MH201 and MH202 were constructed of concrete. Table 3-3 lists and describes each piece of excavated pipe and manholes removed from SU-34.

During the pipe/manhole excavation activities for SU-34, there was insufficient sediment available for analysis, and no samples were submitted to the on-site laboratory. A solid sample of concrete (6PDMH121B-202-320-01) was collected from Manhole MH202 and was submitted to the on-site laboratory for ^{90}Sr analysis in conformance with the Work Instruction. The ^{90}Sr analytical results did not show activity above the release limit. The RSO concurred that Manhole MH202 could be released for off-site disposal as nonradiological waste on August 16, 2007.

Radiological surveys were performed on the SU-34 pipe and Manholes MH201 and MH202. Table 3-3 lists each excavated SU-34 pipe segment and manhole, identifies the date it was surveyed, and provides the associated radiological survey report number. A 100 percent surface scan was performed on each pipe/manhole. In addition, two static measurements were recorded, and two swipe samples were collected and submitted to the on-site laboratory for analysis. The radiological survey reports are provided in Appendix F.

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Based on the survey results, the RSO concurred that the 211 linear feet of pipe and Manholes MH201 and MH202 could be released for nonradiological disposal or recycling. The pipe and manholes were transferred off-site by the DON's nonradiological waste contractor.

3.5.2 SU-34 Piping Remaining In Place

Excavation activities were halted within 10 feet of Building 813 or within 10 feet of other obstructions (stairways, loading docks, retaining walls, or overhangs) to protect the safety of workers and to avoid undermining the integrity of the structure. Portions of storm sewer trench segment 06-D12-00-1B and -1C were not excavated during the removal action due to their proximity to the building or the retaining wall on the adjacent SFRA (formerly Parcel A) property (Figure 1-4). Approximately 97 linear feet of storm drain trench segment 06-D12-00-1B and about 10 linear feet of storm drain trench segment 06-D12-00-1C were not excavated and remain in place on Parcel D-2 following the removal action. The estimated 97 linear feet of storm drain trench segment 06-D12-00-1B is based on data provided in historical drawings, and the majority appears to continue beneath the Building 813 extension. Table 3-4 identifies the piping remaining in place along with the associated linear feet of piping that was removed.

Trench segment 06-D12-00-1B is an 8-inch-diameter corrugated metal storm drain line that extends from the western Building 813 attached shed through Manhole MH202 and appears to continue beneath the SFRA retaining wall based on historical drawings. Approximately 152 linear feet of this trench segment was excavated, and 14 pieces of the line were staged pending radiological survey activities. Results of the survey activities are provided in Appendix F. Based on results of the radiological surveys, the 14 pieces of this storm drain line were released by the RSO for off-site disposal or recycling as nonimpacted waste.

Trench segment 06-D12-00-1C is a 6-inch-diameter corrugated metal storm drain line that extends beneath the canopy attached to the west side of Building 813. About 154 linear feet of this trench segment was excavated (including overburden soil, peripheral material, and piping), and approximately 58 linear feet of pipe was staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on the results of the radiological surveys, the piping associated with storm drain trench segment 06-D12-00-1C was released by the RSO for off-site disposal or recycling as nonimpacted waste.

Based on the results of the radiological survey activities performed on the storm drain trench segments and Manholes MH201 and MH202, the DON concluded that the piping remaining in place on Parcel D-2 following the removal action was not radiologically impacted.

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3.5.3 SU-34 Final Status Survey Summary

The radiological work performed for SU-34 (inclusive of the trench and the associated overburden material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-34 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-34 SUPR is provided in Appendix D.

Revised dose modeling for SU-34 was performed using the most current version of the RESRAD model. The backfill material (including Overburden Units 136, 137, and 144) and SU-34 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 3.959 mrem/y with an increased cancer risk of 6.690×10^{-5} for the backfill material and 3.473 mrem/y with an increased cancer risk of 5.882×10^{-5} for the trench unit. No further dose modeling was determined to be reasonable or prudent based on these results. The revised input parameters and dose model are included in the SU-34 SUPR provided in Appendix D.

Based on a net potential dose of 3.959 mrem/y with an increased cancer risk of 6.690×10^{-5}, SU-34 was recommended for free release.

3.5.4 Backfill Activities

The RASO concurred with backfilling SU-34 on February 1, 2007, and backfill activities were completed on February 16, 2007. Overburden Units 136, 137, and 144 were used to backfill SU-34 to grade, and road base material was placed over the backfill trench. A detailed discussion of the overburden material used as backfill in SU-34 was provided in the final SUPR (Appendix D).

3.6 TRENCH SURVEY UNIT 35

Trench Survey Unit 35 (SU-35) is located south of Building 813 and extends from Manhole MH208 through Manhole MH200 at the southwest corner of the Parcel D-2 property boundary and then turns north until it ties into SU-34. SU-35 comprises storm drain trench segment 06-D12-00-1S and approximately 156 linear feet of storm drain trench segment 06-D12-00-1A (the remainder of trench segment 06-D12-00-1A is associated with SU-34).

The footprint of SU-35 is 156.9 feet by 284.5 feet with a total surface area of 5,000.6 square feet. The depth of the excavated survey unit varied to a maximum of 5 feet below ground surface.

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3.6.1 Removal Action

Excavation activities commenced on November 29, 2006, in storm drain trench segment 06-D-12-00-1A and were completed for SU-35 on March 9, 2007. Nine truckloads of overburden soil and 24 truckloads of peripheral material were transferred to the RSY for processing during the SU-35 excavation activities. Table 3-2 lists each truckload of SU-35 material removed, identifies the peripheral and overburden stockpile identification number assigned by the RSY for tracking purposes, provides the date the material was excavated, and lists the overburden stockpile where the peripheral material was transferred after receiving RASO concurrence that the material was ready for consolidation and additional survey activities.

Each load of peripheral material (1 foot of soil surrounding each pipe or manhole) was placed on a 14-cubic-yard screening pad and was allowed to dewater, as necessary. The material placed on each peripheral pad was radiologically scanned using a Ludlum 2350-1 instrument equipped with a 44-10 probe. Two soil samples were collected and analyzed by gamma spectroscopy at the on-site laboratory. The analytical results for the SU-35 peripheral material did not indicate the presence of activity above the release limits. Following concurrence by the RASO, the released peripheral material stockpiles were consolidated onto overburden pads for additional survey activities or were transferred to the stockpile area pending off-site disposal because there were no appropriate overburden pads available to receive the peripheral material.

Approximately 198 linear feet of pipe and Manholes MH200 and MH208 were removed from SU-35 and were staged pending radiological survey activities. The majority of the pipe excavated was 15-inch-diameter concrete. Table 3-3 lists and describes each piece of excavated pipe and the two manholes removed from SU-35.

During the excavation activities, insufficient sediment was found in the SU-35 pipes to submit to the on-site laboratory for analysis; however, sediment samples were collected from Manholes MH200 and MH208 and were submitted to the on-site laboratory for analysis by gamma spectroscopy. The analytical results indicated the presence of 0.23231 pCi/g ^{137}Cs in Manhole MH-208 (6PDMH121S-208-104-01). Although no elevated activity was identified in the sediment sample collected from MH200, it was placed in radiological waste bin GFLU001115G1 due to a communication error. Manhole MH208 was placed in radiological waste bin BKRU026303D at the direction of the RSO based on the elevated ^{137}Cs activity.

In accordance with the Sewer Work Plan (TtEC 2006b), a total of 81 investigative samples were collected along the trench bottom due to the elevated ^{137}Cs activity in the sediment sample collected from Manhole MH208. This information is presented in the final SUPR provided in Appendix D. The results of the investigative samples analyzed identified ^{226}Ra contamination at nine sample points ranging from 1.5705 to 3.1843 pCi/g. No elevated ^{137}Cs activity was identified in the trench unit. Remediation of 21.5 cubic yards of soil was

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performed, and an additional 25 characterization samples were collected. The analytical results indicated that remediation was required around two sample points due to elevated ^{226}Ra activity identified at 1.6098 and 1.9478 pCi/g. Four postremediation samples were collected, and the analytical results showed elevated ^{226}Ra activity at 2.6695 pCi/g. Additional remediation of the contaminated soil was performed, and four postremediation soil samples were collected. The analytical results indicated the presence of ^{226}Ra at 1.8968 pCi/g. Following further remediation, four additional postremediation samples were collected. The analytical results indicated the presence of elevated ^{226}Ra activity in three of the four samples at 1.6713, 1.7142, and 3.1948 pCi/g. Following remediation, three postremediation samples were collected, and the analytical results did not indicate the presence of elevated activity. The FSS sample locations were plotted and soil samples were collected. The analytical results did not indicate the presence of elevated activity, and no further remedial actions were necessary. Figure 1-5 shows the elevated activity sample locations in SU-35 prior to being remediated.

Radiological surveys were performed on the SU-35 pipe. Pipe segment 06-D12-00-1S-41 showed elevated static measurements during the survey activities. A solid piece of this pipe segment was collected and submitted to the on-site laboratory for ^{90}Sr analysis (6PDPI121S-041-324-01) in conformance with the Work Instruction. Based on the results, pipe segment 06-D12-00-1S-41 was released for nonradiological waste disposal at the direction of the RSO.

Table 3-3 lists each excavated SU-35 pipe segment, identifies the date it was surveyed, and provides the associated radiological survey report identification number. A 100 percent surface scan was performed on each pipe segment. In addition, two static measurements were recorded, and two swipe samples were collected and submitted to the on-site laboratory for analysis. The survey results are provided in Appendix F.

Based on the survey results, the RSO concurred that the 198 linear feet of pipe could be released for nonradiological disposal. The pipe was transferred off-site by the DON's nonradiological waste contractor.

3.6.2 SU-35 Piping Remaining in Place

There is no known storm drain or sanitary sewer pipe associated with SU-35 remaining in Parcel D-2.

3.6.3 SU-35 Final Status Survey Summary

The radiological work performed for SU-35 (inclusive of the trench and backfill material comprised of overburden soil, and imported fill material) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise

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the SU-35 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-35 SUPR is provided in Appendix D.

Revised dose modeling for SU-35 was performed using the most current version of the RESRAD model. The backfill material (including Overburden Units 144 and 172 and imported fill) and SU-35 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 4.347 mrem/y with an increased cancer risk of 7.559×10^{-5} for the backfill material and 3.88 mrem/y with an increased cancer risk of 6.769×10^{-5} for the trench unit. No further dose modeling was determined to be reasonable or prudent based on these results. The revised input parameters and dose model are included in the SU-35 SUPR provided in Appendix D.

Based on a net potential dose of 4.347 mrem/y with an increased cancer risk of 7.559×10^{-5}, SU-35 was recommended for free release.

3.6.4 Backfill Activities

The RASO concurred with backfilling SU-35 on June 11, 2007, and backfill activities were completed on June 12, 2007. Overburden Units 144 and 172 and about 232 cubic yards of imported fill were used to backfill SU-35 to grade, and road base material was placed over the backfilled trench. Detailed discussions related to the imported and overburden materials used as backfill in SU-35 are provided in the final SUPR (Appendix D). The radiological analytical results for the imported fill material are provided in the final SUPRA (Appendix C) and the chemical analytical results are provided in Appendix E.

The presence of ^{137}Cs in Manhole MH208 sediment is consistent with the conceptual site model for the radiologically impacted storm drain and sanitary sewers. Based on the history of the HPNS sewer system, there is potential for elevated radioactivity in piping sediment because the storm drain and sanitary sewers were a combined system. In general, the identification of elevated activity in pipes or manholes is not necessarily dependent on the historical use or storage of radioactive material at the nearest radiologically impacted area at HPNS as the storm drain and sanitary sewer systems have been modified and repaired throughout the years, and flow patterns may have changed.

3.7 TRENCH SURVEY UNIT 38

Trench Survey Unit 38 (SU-38) is located adjacent to the south side of Building 813 and runs parallel to the southern Parcel D-2 property boundary. It extends from the southeast corner of Building 813 where it connects to SU-32 and Trench Survey Unit 135 westward to Manhole MH208 where it connects to SU-35 (Figure 1-4). SU-38 comprises storm drain trench segments 06-D12-00-1R and -8C, and sanitary sewer trench segment 06-D12-00-8D. Neither storm drain

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trench segment 06-D12-00-8C nor sanitary sewer segment 06-D12-00-8D were identified on historical drawings.

The footprint of SU-38 is 67.6 feet by 214.96 feet with a total surface area of 2,194.34 square feet. The depth of the excavated survey unit varied to a maximum of 4 feet below ground surface. Groundwater was encountered at a depth of approximately 2.5 feet below ground surface in SU-38.

3.7.1 Removal Action

Excavation activities commenced on November 9, 2006, in storm drain trench segment 06-D12-00-1R and were completed for SU-38 on January 4, 2007. Five truckloads of overburden soil and six truckloads of peripheral material were transferred to the RSY for processing during the SU-38 excavation activities. Table 3-2 lists each truckload of SU-38 material removed, identifies the peripheral and overburden stockpile identification number assigned by the RSY for tracking purposes, provides the date the material was excavated, and lists the overburden stockpile where the peripheral material was transferred after receiving RASO concurrence that the material was ready for consolidation and additional survey activities.

Each load of peripheral material (1 foot of soil surrounding each pipe or manhole) was placed on a 14-cubic-yard screening pad and was allowed to dewater, as necessary. The material placed on each peripheral pad was radiologically scanned using a Ludlum 2350-1 instrument equipped with a 44-10 probe. T wo soil samples were collected and analyzed by gamma spectroscopy at the on-site laboratory. The analytical results for the SU-38 peripheral material did not indicate the presence of activity above the release limits. Following concurrence by the RASO, the released peripheral material stockpiles were consolidated onto overburden pads for additional survey activities.

Approximately 224 linear feet of storm drain pipe was removed from SU-35 and was staged pending radiological survey activities. The majority of the excavated storm drain pipe was 12-inch-diameter concrete. In addition, about 30 linear feet of 4-inch-diameter steel sanitary sewer pipe was excavated and staged pending survey activities. This sanitary sewer line extends from Building 813 through Manhole MH207 and a portion remains in place following the removal action (see Section 3.7.2 below). Table 3-3 lists and describes each piece of excavated pipe removed from SU-38.

An unidentified 2- inch-diameter metal pipe and an unidentified 3- inch-diameter metal pipe were found during the excavation activities at the southeast corner of Parcel D-2. These non-stormwater/non-sanitary sewer pipelines had the potential to be liquid-bearing and were assigned extraneous pipe (EP) identification numbers EP-33 and EP-34. These two EPs were not breached and were left intact during the excavation activities. On March 3, 2007, EP-33 and

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EP-34 were "hot tapped" to identify any potential liquid or gas in the pipelines in accordance with the Sewer Work Plan (TtEC 2006b). No liquids or gasses were observed, and swipe samples were collected from the interior of the piping and submitted to the on-site laboratory for analysis. No elevated activity was identified in either of the EPs, and the remaining segments were backfilled along with SU-38. Figure 1-4 identifies these EP segments that remain in Parcel D-2.

During the survey activities, one 3-foot section of 12-inch-diameter concrete pipe identified as 06-D12-00-1R-11 was found to have elevated activity based on static measurements. At the direction of the RSO, a solid sample (6PDPI121R-011-325-01) was collected from this pipe segment and was submitted to the on-site laboratory for ^{90}Sr analysis in conformance with the Work Instruction. Although the ^{90}Sr results were below the release limits, the RSO elected to dispose of pipe segment 06-D12-00-1R-11 as LLRW. This pipe segment was placed in LLRW bin GFLU001179G2 on August 24, 2007, and the bin was transferred to the DON's radiological disposal contractor.

During the excavation activities, insufficient sediment was found in the SU-38 excavated pipes to submit to the on-site laboratory for analysis.

Radiological survey activities were performed on the SU-38 storm drain and sanitary sewer piping. Table 3-3 lists each excavated SU-38 pipe segment (including the extraneous pipe), identifies the date it was surveyed, and provides the associated radiological survey report identification number. A 100 percent surface scan was performed on each pipe segment. In addition, two static measurements were recorded, and two swipe samples were collected and submitted to the on-site laboratory for analysis. The survey reports are provided in Appendix F.

Based on survey results, the RSO concurred that the storm drain and sanitary sewer pipe could be released for nonradiological disposal or recycling. As discussed above, pipe segment 06-D12-00-1R-11 was disposed of as LLRW at the direction of the RSO on August 24, 2007. The non-LLRW pipe was transferred off-site by the DON's nonradiological waste contractor.

3.7.2 SU-38 Piping Remaining In Place

Excavation activities were halted within 10 feet of the building or within 10 feet of other obstructions (stairways, loading docks, or overhangs) for worker safety and to avoid undermining the integrity of the structure. Small portions of trench segments 06-D12-00-8C and -8D were not removed during the Parcel D-2 removal action because of their proximity to the loading dock or because they were located within the 10-foot buffer zone. Approximately 16 linear feet of storm drain trench segment 06-D12-00-8C remains in place on Parcel D-2 following the removal action because it runs at a diagonal beneath the loading dock. About 20 linear feet of sanitary sewer trench segment 06-D12-00-8D remains in place on Parcel D-2 following the

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removal action because it runs at a diagonal to within 10 feet of the building face toward Manhole MH207 (removed during Trench Unit 135 excavation activities). Table 3-4 identifies the piping remaining in place along with the associated linear feet of piping that was removed from SU-38.

Trench segment 06-D12-00-8C is a 4-inch-diameter concrete storm drain line extending toward Building 813 beneath the loading dock. Approximately 8 linear feet of this trench segment was excavated and about 1.58 linear feet of pipe was recovered and staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on the results of the radiological survey, this storm drain pipe was released for either off-site disposal or for recycling as nonimpacted waste.

Trench segment 06-D12-00-8D is a 4-inch-diameter steel sanitary sewer line. Approximately 30 linear feet of this sanitary sewer trench segment was excavated and four pieces of the line were staged pending radiological survey activities. The results of the survey activities are provided in Appendix F. Based on results of the radiological surveys, the four pieces of sanitary sewer line 06-D12-00-8D were released by the RSO for either off-site disposal or recycling as nonimpacted waste.

Based on results of the radiological survey activities performed on the storm drain and sanitary sewer trench segments, the DON concluded that the piping remaining in place on Parcel D-2 following the removal action was not radiologically impacted.

3.7.3 SU-38 Final Status Survey Summary

The radiological work performed for SU-38 (inclusive of the trench and the associated overburden material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-38 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-38 SUPR is provided in Appendix D.

Revised dose modeling for SU-38 was performed using the most current version of the RESRAD model. The Overburden Unit 172 backfill material and SU-38 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 2.981 mrem/y with an increased cancer risk of 5.679×10^{-5} for the overburden material and 1.809 mrem/y with an increased cancer risk of 3.420×10^{-5} for the trench unit. No further dose modeling was determined to be reasonable or prudent based on these results. The revised input parameters and dose model are included in the SU-38 SUPR provided in Appendix D.

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Based on a net potential dose of 2.981 mrem/y with an increased cancer risk of 5.679×10^{-5}, SU-38 was recommended for free release.

3.7.4 Backfill Activities

The RASO concurred with backfilling SU-38 on March 6, 2007, and backfill activities were completed on March 8, 2007. Approximately 106 cubic yards of Overburden Unit 141 was used to backfill SU-38 to grade, and road base material was placed over the backfilled trench. A detailed discussion of the overburden soil used to backfill SU-38 was provided in the final SUPR (Appendix D).

3.8 TRENCH SURVEY UNIT 134

Trench Survey Unit 134 (SU-134) is located at the southwest corner of Parcel D-2 and extends from Manhole MH200 and SU-35 south and east through Manhole MH277 and terminates just south of the southern Parcel D-2 boundary just beyond Manhole MH276 (Figure 1-4). SU-134 comprises storm drain segments 02-D26-00-3H, -3G, and -5A (Figure 1-4). The footprint of SU-134 is 67.14 feet by 38.43 feet with a total surface area of 1,083.03 square feet. The depth of the excavated survey unit varied to a maximum of 12 feet below ground surface, and groundwater was encountered at approximately 3 feet below ground surface.

3.8.1 Removal Action

The excavation activities for SU-134 commenced in trench segment 02-D26-00-3H on April 2, 2007. During the excavation activities, a total of 14 truckloads (approximately 162 cubic yards) of excavated soil were transferred to RSY2 for processing. Table 3-2 lists each truckload of SU-134 soil removed, identifies the excavated soil stockpile number assigned by the RSY2 staff for tracking purposes, and provides the date the material was excavated. Because work activities associated with SU-134 were completed under a different DON contract (Contract No. N62473-08-D-8823) and CTO No. 0002, with a new final Execution Plan (TtEC 2008d), and in accordance with the revised Sewer Work Plan (TtEC 2008e), excavated soils were not segregated into peripheral and overburden material as was done for SU-31, -32, -34, - 35, and -38; instead they were excavated and transferred directly to RSY2 for radiological screening.

Sediment samples were collected from Manholes MH276 and MH277 and submitted to the on-site laboratory for analysis. No activity above the release limits was identified in the sediment sample from Manhole MH276 (02-PDMH276-002-01); however, ^{137}Cs activity at 0.11465 pCi/g was identified in the sediment sample from Manhole MH277 (02-PDMH277-001-01). Based on this elevated activity, three investigative soil samples were collected from the survey unit trench bottom and analyzed by the on-site laboratory. No activity above the release limits was identified in any of the three investigative samples.

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Approximately 141 linear feet of pipe, in addition to Manholes MH276 and MH277, was removed from SU-134. Insufficient sediment was found in the excavated pipe to collect a sample for analysis. About 7 linear feet of 15-inch-diameter VCP was crushed during the excavation activities and was transferred to RSY2 for screening along with the excavated soil; the remaining 134 linear feet of pipe was placed into LLRW bins for disposal. With the concurrence of the DON, radiological survey activities were not performed on either pipe or manholes excavated from SU-134 because of the limited quantity removed and to expedite the work activities. The storm drain pipe excavated from SU-134 was 15-inch-diameter concrete; no sanitary sewer pipe was associated with this survey unit. Table 3-3 lists and describes the excavated piping and two manholes removed from SU-135 as well as the associated LLRW bin used for disposal.

Based on a random start point and a triangular grid, 18 systematic sample locations were plotted in SU-134. The 18 systematic samples were collected on April 21, 2009, and were submitted to the on-site laboratory for analysis. No activity above the release limits was identified.

3.8.2 SU-134 Piping Remaining In Place

There is no known piping associated with SU-134 remaining in place on Parcel D-2 following the removal action.

3.8.3 SU-134 Final Status Survey Summary

The radiological work performed for SU-134 (inclusive of the trench and the associated imported material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-134 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-134 SUPR is provided in Appendix D.

Revised dose modeling for SU-134 was performed using the most current version of the RESRAD model. The imported fill material and SU-134 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 2.513 mrem/y with an increased cancer risk of 5.035×10^{-5} for the backfill material and 0.9035 mrem/y with an increased cancer risk of 1.777×10^{-5} for the trench unit. Based on these results, no further dose modeling was determined to be reasonable or prudent. The revised input parameters and dose model are included in the SU-134 SUPR provided in Appendix D.

Based on a net potential dose of 2.513 mrem/y with an increased cancer risk of 5.035×10^{-5}, SU-134 was recommended for free release.

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3.8.4 Backfill Activities

The RASO concurred with backfilling SU-134 on May 13, 2009. Backfilling activities commenced and were completed on May 18, 2009. Approximately 216 cubic yards of imported fill were used to backfill SU-134 to grade, and road base material was placed over the backfilled trench. Detailed discussions related to the imported material used as backfill are provided in the final SUPRA (Appendix C) and the revised final SU-134 SUPR (Appendix D). The radiological analytical results for the imported fill are provided in the final SUPRA (Appendix C) and the chemical analytical results are provided in Appendix E.

The presence of ^{137}Cs activity in Manhole MH277 sediment is consistent with the conceptual site model for the radiologically impacted storm drain and sanitary sewers. Based on the history of the HPNS sewer system, there is potential for elevated radioactivity in piping/manhole sediment because the storm drain and sanitary sewers were a combined system at one time. In general, the identification of elevated activity in piping or manholes is not necessarily dependent on the historical use or storage of radioactive material at the nearest radiologically impacted area at HPNS because the storm drain and sanitary sewer systems have been modified and repaired throughout the years, and flow patterns may have changed. Neither the sediment sample collected from MH276 to the south of MH277 nor the sediment sample collected from MH200 (SU-35) to the north of MH277 showed elevated activity above the release criteria (Figure 1-4).

3.9 TRENCH SURVEY UNIT 135

Trench Survey Unit 135 (SU-135) is located in the southeast corner of Parcel D-2. It extends southward along the eastern boundary of Parcel D-2 through Manhole MH267 then continues south of the parcel boundary fence line toward the west where it connects to Manhole MH207 and ends at the convergence of SU-32 and SU-38 (Figure 1-4). SU-135 comprises storm drain segments 02-D26-00-1C and - 1D, and sanitary sewer segments 02-D26-00-3C, - 3D, and -3J (Figures 1-3 through 1-5). A shallow connector trench was excavated between the storm drain and sanitary sewer segments to join the two sections into one survey unit. This connector trench is located just south of the Parcel D-2 boundary within Spear Avenue. The 10 linear feet of sanitary sewer trench segment 02-D26-00-3J is the only portion of SU-135 not identified on historical drawings.

The footprint of SU-135 is 351.45 feet by 18.86 feet with a total surface area of 3,104.15 square feet. The depth of the excavated survey unit varied to a maximum of 8 feet below ground surface.

3.9.1 Removal Action

Excavation activities commenced in storm drain trench segment 02-D26-00-1C on April 1, 2009, and were completed for SU-135 on April 3, 2009. A total of 14 truckloads

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(approximately 99 cubic yards) of excavated soil were transferred to the RSY2 for processing during the SU-135 excavation activities. Table 3-2 lists each truckload of SU-135 material removed, identifies the excavated soil stockpile number assigned by the RSY2 staff for tracking purposes, and provides the date the material was excavated. Because work activities associated with SU-135 were completed under a different DON contract (Contract No. N62473-08-D-8823) and CTO No. 0002, with a new final Execution Plan (TtEC 2008d), and in accordance with the revised Sewer Work Plan (TtEC 2008e), excavated soils were not segregated into peripheral and overburden material as was done for SU-31, -32, -34, -35, and -38; instead they were excavated and transferred directly to RSY2 for radiological screening.

Approximately 299 linear feet of pipe in addition to Manholes MH207 and MH267 were removed from SU-135. About 38 linear feet of pipe was crushed upon excavation and transferred to RSY2 for processing along with the excavated soil. The remaining 261 linear feet of pipe was placed into LLRW bins for disposal. With the concurrence of the DON, radiological survey activities were not performed on pipe or manholes excavated from SU-135 due to the limited quantity removed and to expedite the work activities. The storm drain pipe excavated from SU-135 was 6-inch-diameter corrugated metal and 8-inch-diameter cast iron, while the sanitary sewer pipe was a mixture of 6-inch-diameter VCP and 8-inch-diameter cast iron. No pipe was removed from the shallow connector trench that joined the storm drain and sanitary sewer trench segments. Table 3-3 lists and describes the excavated pipe and two manholes removed from SU-135 and identifies the associated LLRW bin used for disposal.

Insufficient sediment was found during the excavation activities in either the piping or manholes to submit to the on-site laboratory for analysis.

Following the removal of SU-135 pipe, manholes, and soil, 18 soil samples were collected and submitted to the on-site laboratory for analysis by gamma spectroscopy. The analytical results showed the presence of ^{226}Ra activity above the release criteria at three sample collection points in the vicinity of the excavated sanitary sewer pipe ranging from 1.7867 to 1.9498 pCi/g. Approximately 7 cubic yards of soil was remediated from trench segment 02-D26-00-3C and placed in an LLRW bin on April 29, 2009, for disposal, and six postremediation samples were collected and submitted to the on-site laboratory for analysis. Because no elevated activity was identified in the postremediation samples, 18 additional soil samples were collected and analyzed. The analytical results indicated the presence of elevated ^{226}Ra activity at Sample Point 30 (1.7048 pCi/g), Point 31 (1.4899 pCi/g), Point 35 (1.7227 pCi/g), and Point 36 (1.6334 pCi/g). Based on the analytical results, approximately 4.5 cubic yards of soil was excavated from trench segment 02-D26-00-3C and placed in an LLRW bin for disposal. Following remediation, a total of eight postremediation samples were collected and analyzed by gamma spectroscopy. Only Sample Point 45 showed ^{226}Ra activity above the release criteria at 1.6287 pCi/g. About 3.5 cubic yards of soil was

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remediated from the same trench segment and placed in an LLRW bin for disposal, and three postremediation samples were collected and analyzed. No activity above the release criteria was identified in the postremediation samples. A total of 18 systematic soil sample locations were plotted, and the samples were collected and submitted to the on-site laboratory on May 29, 2009. The analytical results for the systematic samples did not indicate any further presence of elevated ^{226}Ra activity in SU-135. Figure 1-5 shows the locations of the elevated activity sample points remediated from SU-135.

3.9.2 SU-135 Piping Remaining In Place

There is no known piping associated with SU-135 remaining in place on Parcel D-2 following the removal action.

3.9.3 SU-135 Final Status Survey Summary

The radiological work performed for SU-135 (inclusive of the trench and the associated import fill material used as backfill) was documented in the final SUPR. Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the SU-135 SUPR and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. The revised SU-135 SUPR is provided in Appendix D.

Revised dose modeling for SU-135 was performed using the most current version of the RESRAD model. The imported fill material and SU-135 were modeled separately with input parameters using the larger of the MDL or reported activity concentrations. Revised RESRAD modeling resulted in a net residual dose of 3.517 mrem/y with an increased cancer risk of 6.461×10^{-5} for the backfill material and 1.544 mrem/y with an increased cancer risk of 2.647×10^{-5} for the trench unit. Based on these results, no further dose modeling was determined to be reasonable or prudent. The revised input parameters and dose model are included in the SU-135 SUPR provided in Appendix D.

Based on a net potential dose of 3.517 mrem/y with a net increase in cancer of 6.461×10^{-5}, SU-135 was recommended for free release.

3.9.4 Backfill Activities

The RASO concurred with backfilling SU-135 on July 15, 2009, and backfilling activities were commenced and completed on the same day. Approximately 143 cubic yards of imported fill was used to backfill SU-135 to grade, and road base material was placed over the backfilled trench. Detailed discussions related to the imported material used as backfill are provided in the final SUPRA (Appendix C) and the revised final SU-135 SUPR (Appendix D). The radiological analytical results for the imported fill are provided in the final SUPRA (Appendix C) and the chemical analytical results are provided in Appendix E.

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The presence of ^{226}Ra activity in soil remediated from SU-135 is consistent with the conceptual site model for the radiologically impacted storm drain and sanitary sewers. Based on the age and condition of the sewer system, radioactive contamination may have been released into the surrounding soil through degraded or broken pipelines. However, the identification of elevated activity associated with pipes or manholes is not necessarily dependent on the historical use or storage of radioactive material at the nearest radiologically impacted area at HPNS because the storm drain and sanitary sewer systems have been modified and repaired throughout the years, and flow patterns may have changed. Although no sediment samples were obtained from the potentially upgradient section of sanitary sewer trench segment 06-D12-00-8D (discussed as part of SU-38), trench segment 02-D26-00-3D or Manhole MH207, approximately 30 linear feet of sanitary sewer trench segment 06-D12-00-8D was excavated and four pieces of the line were radiologically surveyed. Based on results of the radiological surveys, the four pieces of sanitary sewer line 06-D12-00-8D were released by the RSO for either off-site disposal or recycling as nonimpacted waste. The results of the survey activities are provided in Appendix F.

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4.0 CONCLUSIONS AND RECOMMENDATION

This RACR was prepared at the direction of the DON to summarize and describe the Parcel D-2 Building 813 FSS and the two storm drain and sanitary sewer radiological removal actions, and to facilitate the preparation of a no further action ROD and support the future Proposed Plan. The DON determined, based on the HPNS radiological operational history, that radioactive contamination in soils and debris at HPNS required a response action. This decision is documented in the AM (DON 2006).

Parcel D-2 is approximately 5.32 acres in area and is located north of Parcel G along Spear Avenue. This parcel encompasses Building 813, its associated asphalt parking areas, and two open-front sheds. Building 813 is a four-story, concrete-reinforced structure with steel rollup industrial doors and a concrete loading dock. The building is separated from the adjoining SFRA property by a retaining wall and a narrow asphalt area. Historically, Building 813 was used as a general warehouse and offices, a supply storehouse, and the Disaster Control Center. Because a leaking 300 μCi ^{90}Sr check source was listed on the disaster control inventory for the Disaster Control Center and a cabinet of unknown origin was identified in the structure bearing a radioactive materials placard, a scoping survey was performed for Building 813 in 2007. To be conservative, the scoping survey included ^{226}Ra and ^{137}Cs as well as ^{90}Sr as the ROCs since there was no indication of what types of radioactive materials historically were stored in the cabinet.

The scoping survey for Building 813 was performed in 2006. The details of the scoping survey were provided in the FSS Report (Appendix A). During the scoping survey, materials such as desks, filing cabinets, tables, other miscellaneous office furniture, and asbestos tile were radiologically surveyed and released using Regulatory Guide 1.86 limits (AEC 1974) specified for the ROCs. In addition, the drain lines and ventilation system for the building were surveyed. No contamination was found on any of the items surveyed, and the asbestos tile was disposed of under the appropriate landfill waste classification.

The design of the radiological scoping survey divided the first floor of Building 813 into 18 Class 1 survey units, 2 Class 2 survey units, and 1 Class 3 survey unit. Class 1 survey units received 100 percent scan coverage for alpha/beta and gamma emitters, while both the Class 2 and Class 3 survey units received 50 percent scan coverage. Static measurements were logged and swipe samples were collected at systematic locations within the designated survey units. The results of the scoping survey showed no alpha or beta activity above the release criteria. Small areas of elevated gamma activity were noted during the survey activities; however, additional investigation did not locate any discrete source. Because the instruments used for the gamma measurements can indicate photons from many directions and not exclusively from the

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surface of the material being surveyed, the elevated gamma measurements were attributed to the Building 813 construction materials and the geometry of the specific survey unit or room.

There are no established release criteria for building interior surfaces based on gamma exposure rates. As specified in the guidance document NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, the average of exposure rates that are measured 1 meter above the surface of a survey unit should not exceed twice the background measurements (NRC 1992). The gamma results for the Building 813 scoping survey did not exceed twice the background measurements.

The survey results were statistically analyzed to determine whether residual radioactivity was present and to ascertain whether the results met the release criteria for unrestricted use. Because the mean concentrations for both alpha and beta emitters were less than background, there was no residual radioactivity to model.

Based on the analysis of the collected field data and the statistical analysis and because there was no residual radioactivity greater than background levels in the structure, Building 813 was recommended for unconditional, unrestricted release. The CDPH concurred with the unrestricted release of Building 813 in a memorandum dated April 1, 2008 (CDPH 2008). The EPA has not provided concurrence for the unrestricted release of Building 813 as of the date of this RACR.

The two storm drain and sanitary sewer system removal actions were completed to meet the specified removal action objectives and to achieve the unrestricted radiological release of SU-31, -32, -34, -35, -38, - 134, and -135 within Parcel D-2. The removal action objectives were developed to protect public health and welfare and the environment and to prevent potential exposures to future residents or workers. By meeting these removal action objectives and the ARARs requirements associated with this removal action, the migration of radiologically contaminated material within or outside the storm drain and sanitary sewer system was eliminated.

The radiological details of the storm drain and sanitary sewer removal work completed for Parcel D-2 were provided in each of the revised final versions of the SUPRs for SU-31, -32, -34, -35, -38, - 134, and -135 (Appendix D). The goal of the SUPRs was to demonstrate that identified residual radioactivity levels inside the excavated trenches and within the overburden or excavated soils and/or imported fill used as backfill material meet the established radiological release criteria.

The revised SUPRs included in Appendix D discussed the scope, approach, and radiological survey results from the removal of the sanitary sewer and storm drains located in Parcel D-2. The

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SUPRs also presented dose modeling results with input parameters using the larger of the MDL or reported activity, the environmental ALARA process including identification and review of potential radiological impacts and quantitative/qualitative ALARA analyses, as well as recommendations for final unrestricted radiological release of each of the trench survey units.

The seven excavated trench survey units designated within Parcel D-2 primarily consisted of shallow storm drain lines that were between 2 and 12 feet below ground surface and only five shallow sanitary sewer lines. Approximately 1,434 cubic yards of soil was excavated from the Parcel D-2 trenches, including about 45 cubic yards of soil removed from one trench segment in SU-35 and one trench segment in SU-135 that was disposed of as LLRW. The remediation of SU-35 and SU-135 is discussed in Sections 3.6.1 and 3.9.1, respectively, and in the final SUPRs (Appendix D). A total of 1,988 linear feet of trench (including overburden soil, peripheral material, excavated soil, and pipe/manholes) was excavated during the removal actions. The on-site laboratory analyzed 641 samples associated with the trenches and piping (not including air monitoring or quality assurance sample analyses).

A total of 1,027 linear feet of pipe and seven manholes were removed from SU-31, -32, -34, -35, and -38 a nd segregated pending radiological survey activities. One of the seven manholes (MH208) was disposed of as LLRW due to the presence of ^{137}Cs activity above the release limits in its sediment sample, and one manhole (MH200) was disposed of as LLRW, but was not contaminated. Only 3 of the 1,027 linear feet of pipe excavated was disposed of as LLRW due to elevated static measurements. The remaining manholes and pipe removed from SU-31, -32, -34, -35, and -38 were disposed of by the DON's nonradiological waste contractor.

With the concurrence of the DON, radiological survey activities were not performed on pipe or manholes excavated from SU-134 or SU-135 due to the limited quantity removed and to expedite the work activities. The 440 linear feet of pipe and four manholes removed from these trench survey units were placed directly into LLRW bins for off-site disposal.

In general, the identification of elevated activity in piping or manholes is not necessarily dependent on the historical use or storage of radioactive material at the nearest radiologically impacted area at HPNS because the storm drain and sanitary sewer systems have been modified and repaired throughout the years, and flow patterns may have changed. Based on the history of the HPNS sewer system, there is potential for elevated radioactivity in piping sediment because the storm drain and sanitary sewers were a combined system. The identification of ^{137}Cs in Manholes MH208 and MH277 sediments is consistent with the conceptual site model for the radiologically impacted storm drain and sanitary sewers at HPNS.

Relatively short segments of the storm drain lines remain at Parcel D-2 because: 1) their removal would adversely affect the integrity of Building 813; 2) they could not be removed due

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to worker safety issues; or 3) they were within 10 feet of the building face or other obstructions (stairways, loading docks, adjacent property retaining walls, or overhangs). Based on the radiological history of Building 813, there is no potential for radiological contamination to have been transferred from the building to the roof drains and from there to the storm drain sewers. Therefore, the DON determined that roof drain pipes are nonimpacted and may be left in place within the 10-foot safety buffer. Storm drain and sanitary sewer piping laterals were removed to within the 10-foot safety buffer surrounding the structure or other associated obstructions. If no radiological contamination was present, then the exposed ends of the lateral were capped or plugged and the remaining portions left in place.

Storm drain trench lines located on the north side of Building 813 were not excavated because of their proximity to the SFRA retaining wall that separates Parcel D-2 from the adjacent SFRA property (formerly Parcel A, which was released for unrestricted use) and to prevent undermining the Building 813 loading dock. These storm drain trench lines are associated with either the building stormwater roof drains or the storm drain lines emanating from the nonimpacted adjacent SFRA property. In addition, relatively short segments of storm drain line piping were not excavated on the south, east, and west sides of Building 813 during these removal actions. These residual storm drain segments are located within the 10-foot buffer zone and could not be removed without affecting the integrity of the structure. The results of the radiological surveys performed on segments of the storm drain lines that were excavated during the removal action support the DON's contention that no radiological contamination is present in the storm drain segments remaining in place.

Only five sanitary sewer trench lines are associated with Parcel D-2 and only 30 linear feet remains in place following the removal actions: 10 linear feet identified as 06-D12-00-1O and 20 linear feet identified as 06-D12-00-8D. Sanitary sewer line 06-D12-00-1O emanates from the eastern side of Building 813, and 06-D12-00-8D extends toward the southeast from Building 813 toward SU-135 and Manhole MH207. Approximately 210 linear feet of these sanitary sewer trench lines was removed , and about 30 linear feet remains in place following the removal action. Approximately 10 linear feet of sanitary sewer line 06-D12-00-1O remains in place at Parcel D-2 because of its proximity to the building; however, 180 linear feet of this line was removed, radiologically surveyed, released by the RSO for off-site disposal or recycling, and disposed of off-site as nonradiological waste. Based on the radiological survey results, the DON concluded that the segment of sanitary sewer line 06-D12-00-1O remaining in place was nonimpacted. Although about 20 linear feet of sanitary sewer line 06-D12-00-8D remains in place on Parcel D-2 following the removal action, the pipe runs at a diagonal within 10 feet of the building face and cannot be removed safely or without damaging the structure. About 30 linear feet of this sanitary sewer line was removed and radiologically surveyed. The RSO released these pipe pieces based on the survey results as nonimpacted wastes.

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Following numerous discussions with the DTSC and CDPH, the DON directed TtEC to revise the seven SUPRs and apply the larger of the MDL or reported activity parameters to the RESRAD modeling efforts. Revised dose modeling was performed for each of the seven trench survey units using the default residential farmer scenario to calculate their net residual dose. The results of the revised modeling efforts indicate that the potential upper-bound annual dose or lifetime cancer risk to workers or members of the public as a result of exposures to residual radioactive material in soil is 4.347 mrem/y and an increased potential cancer risk of 7.559×10^{-5}.

In addition to dose and risk modeling efforts, the environmental ALARA process was implemented for each of the seven trench survey units associated with Parcel D-2. The ALARA process supported the results of the dose modeling efforts and the recommendations for unrestricted release of the trench survey units associated with Parcel D-2.

Based on the results of the storm drain and sanitary sewer removal action, residual dose and risk modeling efforts, and the implementation of the ALARA process presented in the SUPRs, and based on the results of the Building 813 FSS and concurrence by the CDPH for its unrestricted release, the DON has met its stated removal action objectives to protect public health and welfare and the environment and to preclude potential exposure to future residents or workers. The revised SUPRs demonstrate that identified residual radioactivity levels inside the excavated trenches and within the overburden or excavated soils and/or imported fill used as backfill meet the established release criteria.

The DON has met its stated radiological goals and objectives for Parcel D-2. The information provided in this RACR, the seven SUPRs, and the Building 813 FSS results support the DON's conclusion that Parcel D-2 is ready for unconditional, unrestricted radiological free release. The conclusions presented in this RACR support the preparation of a no further action ROD and the future Proposed Plan.

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TABLES

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TABLE 3-1

PARCEL D-2 STORM DRAIN AND SANITARY SEWER REMOVAL TRENCH SUMMARY

Survey Unit ID #	Associated Trench Segments	Surface Area ($meters^2$)	Linear Feet	Hand Surveyed	Soil Samples			Impacted Material		Contaminated Soil Highest Activity (pCi/g)		Survey Unit Backfill Data		Date Backfilled	Comments	Net Residual Dose	Recommendation
					Date Collected	No. of Samples	Total Samples	Removed (yds^3)	LLRW Bin #	^{226}Ra	^{137}Cs	Soil Used as Backfill	RASO Concurrence				
31	06-D12-00-8A 06-D12-00-1D 06-D12-00-1H	184	88	30-Nov-06	30-Nov-06	18	18	NA	NA	NA	NA	About 169 cy of Pancake House imported backfill and pea/gravel to bridge groundwater table	8-Dec-06	8-Jan-07	Some backfill material was rock/gravel due to saturated trench conditions	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 1.478 mrem/y with an increased cancer risk of 2.820×10^{-5} for the backfill material and 1.996 mrem/y with an increased cancer risk of 3.797×10^{-5} for the trench unit.	Based on a net potential dose of 1.996 mrem/y with an increased cancer risk of 3.797×10^{-5}, SU-31 is recommended for free release.
32	06-D12-00-1I 06-D12-00-1L 06-D12-00-1M 06-D12-00-1J 06-D12-00-1N 06-D12-00-8B 06-D12-00-1P 06-D12-00-1O	558	414	11-Jan-07	11-Jan-07	18	18	NA	NA	NA	NA	About 280 cy of Pancake House imported backfill with some pea gravel to bridge the groundwater table, and OB #141 - 180 cy	5-Feb-07	5-Mar-07	Some backfill material was rock/gravel due to saturated trench conditions	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 3.256 mrem/y with an increased cancer risk of 5.514×10^{-5} for the backfill material and 4.178 mrem/y with an increased cancer risk of 7.088×10^{-5} for the trench unit.	Based on a net potential dose of 4.178 mrem/y with an increased cancer risk of 7.088×10^{-5}, SU-32 is recommended for free release.
34	06-D12-00-1A 06-D12-00-1B 06-D12-00-1C	555	432	19-Dec-06	19-Dec-06	18	18	NA	NA	NA	NA	OB #136 - 150 cy OB #137 - 192 cy OB #144 - 90 cy Total = 432 cy	1-Feb-07	16-Feb-07	No imported backfill soil placed in trench unit	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 3.959 mrem/y with an increased cancer risk of 6.690×10^{-5} for the backfill material and 3.473 mrem/y with an increased cancer risk of 5.882×10^{-5} for the trench unit.	Based on a net potential dose of 3.959 mrem/y with an increased cancer risk of 6.690×10^{-5}, SU-34 is recommended for free release.

TABLE 3-1

PARCEL D-2 STORM DRAIN AND SANITARY SEWER REMOVAL TRENCH SUMMARY

Survey Unit ID #	Associated Trench Segments	Surface Area ($meters^2$)	Linear Feet	Hand Surveyed	Soil Samples			Impacted Material		Contaminated Soil Highest Activity (pCi/g)		Survey Unit Backfill Data		Date Backfilled	Comments	Net Residual Dose	Recommendation
					Date Collected	No. of Samples	Total Samples	Removed (yds^3)	LLRW Bin #	^{226}Ra	^{137}Cs	Soil Used as Backfill	RASO Concurrence				
35	06-D12-00-1A 06-D12-00-1S	465	394	24-May-07	15-Mar-06 16-Mar-06 19-Mar-06 03-Apr-07 11-Apr-07 30-Apr-07 07-May-07 16-May-07 24-May-07	20 20 41 25 4 5 3 3 18	138	3 5.5 13 1 3.25 3 1	CVGU001110D GFLU001125D GFLU001038D GFLU001120D GFLU001011G1 GFLU001011G1 GFLU001011G1	NA	NA	About 232 cy of Mills Peninsula Hospital imported soil plus OB #144 - 30 cy OB #172 - 25 cy Total = 55 cy	11-Jun-07	12-Jun-07	81 investigative samples collected due to ^{137}Cs identified in one manhole at 0.23231 pCi/g (MH208); ^{226}Ra contamination found at 9 sample points ranging from 1.5705 pCi/g to 3.1843 pCi/g; remediated 21.5 cy on 04/02/07; collected 25 characterization samples on 04/03/07; remediation required around Points 104 (1.6098 pCi/g) and 105 (1.9478 pCi/g) due to ^{226}Ra contamination; remediated 1 cy on 04/10/07 and collected 4 postremediation samples; additional remediation required around Point 107 due to ^{226}Ra at 2.6695 pCi/g; remediated 3.25 cy of contaminated soil on 04/27/07 and collected 4 postremediation samples on 04/30/07; ^{226}Ra identified at Point 111 at 1.8968 pCi/g; issued drawing for remediation and postremediation sample locations 115-117 on 05/05/07; remediated 3 cy and collected 3 samples on 05/07/07; Point 115 (1.6713 pCi/g), Point 116 (1.7142 pCi/g), and Point 117 (3.1948 pCi/g) contaminated due to ^{226}Ra activity; remediated 1 cy and collected 3 post-remediation samples on 05/16/07; no contamination identified; collected 18 systematic samples on 05/24/07; no further contamination.	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 4.347 mrem/y with an increased cancer risk of 7.559×10^{-5} for the backfill material and 3.88 mrem/y with an increased cancer risk of 6.769×10^{-5} for the trench unit.	Based on a net potential dose of 4.347 mrem/y with an increased cancer risk of 7.559×10^{-5}, SU-35 is recommended for free release.
38	06-D12-00-8C 06-D12-00-1R 06-D12-00-8D	200	215	11-Jan-07	11-Jan-07	18	18	NA	NA	NA	NA	OB #172 - 106 cy	6-Mar-07	8-Mar-07	Approximately 16 linear feet of 06-D12-00-8C and about 20 linear feet of 06-D12-00-8D remain in place adjacent Building 813	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 2.981 mrem/y with an increased cancer risk of 5.679×10^{-5} for the backfill material and 1.809 mrem/y with an increased cancer risk of 3.420×10^{-5} for the trench unit.	Based on a net potential dose of 2.981 mrem/y with an increased cancer risk of 5.679×10^{-5}, SU-38 is recommended for free release.

TABLE 3-1

PARCEL D-2 STORM DRAIN AND SANITARY SEWER REMOVAL TRENCH SUMMARY

Survey Unit ID #	Associated Trench Segments	Surface Area ($meters^2$)	Linear Feet	Hand Surveyed	Soil Samples			Impacted Material		Contaminated Soil Highest Activity (pCi/g)		Survey Unit Backfill Data		Date Backfilled	Comments	Net Residual Dose	Recommendation
					Date Collected	No. of Samples	Total Samples	Removed (yds^3)	LLRW Bin #	^{226}Ra	^{137}Cs	Soil Used as Backfill	RASO Concurrence				
134	02-D26-00-3G 02-D26-00-3H 02-D26-00-5A	101	67	21-Apr-09	15-Apr-09 21-Apr-09	3 18	21	NA	NA	NA	NA	About 216 cy of imported Mills Peninsula Hospital soil	13-May-09	18-May-09	Issued drawing on 04/14/09 to identify locations for 3 investigative samples (1-3) due to ^{137}Cs activity at 0.11465 pCi/g in Manhole MH277 sediment; collected 3 investigative samples on 4/21/09; no activity above the release limits identified; issued drawing for systematic samples (4/21/09) and collected soil samples on 4/21/09; no activity above the release limits identified.	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 2.513 mrem/y with an increased cancer risk of 5.035×10^{-5} for the backfill material and 0.9035 mrem/y with an increased cancer risk of 1.777×10^{-5} for the trench unit.	Based on a net potential dose of 2.513 mrem/y with an increased cancer risk of 5.035×10^{-5}, SU-134 is recommended for free release.
135	02-D26-00-1C 02-D26-00-1D 02-D26-00-3C 02-D26-00-3D 02-D26-00-3J	288	378	22-Apr-09	23-Apr-09 29-Apr-09 05-May-09 11-May-09 19-May-09 29-May-09	18 6 18 8 3 18	71	7 4.5 3.5	MHFU001304G10 GFLU001037G8 GFLU001037G8	1.9498	NA	About 143 cy of imported Mills Peninsula Hospital soil	15-Jul-09	15-Jul-09	Issued drawing for systematic sample collection (1-18) on 4/22/09 and collected the samples on 4/23/09; ^{226}Ra activity identified at Point 4 (1.9498 pCi/g), Point 7 (1.7867 pCi/g), and Point 10 (1.8458 pCi/g); remediated about 7 cy and collected 6 postremediation samples (19-24) on 4/29/09; no elevated activity identified in postremediation samples; collected 18 systematic samples (25-42) on 5/8/09; ^{226}Ra activity identified at Point 30 (1.7048 pCi/g), Point 31 (1.4899 pCi/g), Point 35 (1.7227 pCi/g), and Point 36 (1.6334 pCi/g); remediated about 4.5 cy aand collected 8 postremediation samples (43-50) on 5/11/09; ^{226}Ra activity identified at Point 45 (1.6287 pCi/g); remediated about 3.5 cy and collected 3 postremediation samples (51-53) on 5/19/09; no activity above the release criteria identified in the postremediation samples; collected 18 systematic samples (54-71) on 5/29/09; no further activity above the release limits identified.	Revised modeling using the larger of the MDL or reported activity resulted in a net residual dose of 3.517 mrem/y with an increased cancer risk of 6.461×10^{-5} for the backfill material and 1.544 mrem/y with an increased cancer risk of 2.647×10^{-5} for the trench unit.	Based on a net potential dose of 3.517 mrem/y with a net increase in cancer of 6.461×10^{-5}, SU-135 is recommended for free release.

Abbreviations and Acronyms:

^{137}Cs – cesium-137
cy – cubic yard
LLRW – low-level radioactive waste
MDL – method detection limit
$meters^2$ – square meter
mrem/y – millirems per ear
NA – not applicable
OB – overburden stockpile
pCi/g – picocuries per gram
^{226}Ra – radium-226
RASO – Radiological Affairs Support Office
SU – Trench Survey Unit
yd^3 – cubic yard

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TABLE 3-2

PARCEL D-2 EXCAVATED SOIL AND ASSIGNED STOCKPILE NUMBERS

Survey Unit No.	Material Type	Material ID		Assigned Stockpile No.			Date Excavated
		Trench No.	Load No.	Peripheral Material	Overburden Soil	Excavated Soil[a]	
31	Overburden	06-D12-00-1D	1	--	140	NA	09-Nov-06
31	Peripheral	06-D12-00-1D	1	1345	128	NA	10-Nov-06
31	Peripheral	06-D12-00-1D	2	1341	134	NA	10-Nov-06
31	Peripheral	06-D12-00-1D	3	1352	128	NA	10-Nov-06
31	Peripheral	06-D12-00-1D	4	1349	134	NA	10-Nov-06
31	Peripheral	06-D12-00-1D	5	1350	134	NA	10-Nov-06
31	Overburden	06-D12-00-1H	1	--	140	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	1	1348	134	NA	09-Nov-06
31	Peripheral	06-D12-00-1H	2	1347	129	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	3	1346	128	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	4	1344	128	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	5	1343	134	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	6	1342	128	NA	10-Nov-06
31	Peripheral	06-D12-00-1H	7	1351	134	NA	10-Nov-06
31	Peripheral	06-D12-00-8A	1	1337	128	NA	09-Nov-06
32	Peripheral	06-D12-00-1I	1	1370	134	NA	17-Nov-06
32	Peripheral	06-D12-00-1I	2	1545	172	NA	09-Jan-07
32	Peripheral	06-D12-00-1J	1	1372	134	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	2	1373	138	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	3	1374	134	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	4	1376	136	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	5	1377	136	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	6	1380	136	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	7	1378	138	NA	17-Nov-06
32	Peripheral	06-D12-00-1J	8	1394	136	NA	18-Nov-06
32	Peripheral	06-D12-00-1J	9	1408	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	10	1410	138	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	11	1411	138	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	12	1412	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	13	1413	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	14	1414	138	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	15	1415	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	16	1416	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	17	1418	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	18	1419	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	19	1420	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	20	1409	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	21	1405	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	22	1406	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	23	1407	140	NA	28-Nov-06
32	Peripheral	06-D12-00-1J	24	1542	172	NA	08-Jan-07
32	Peripheral	06-D12-00-1J	25	1549	172	NA	10-Jan-07
32	Peripheral	06-D12-00-1L	1	1382	136	NA	17-Nov-06
32	Peripheral	06-D12-00-1N	1	1384	136	NA	20-Nov-06
32	Peripheral	06-D12-00-1N	2	1386	136	NA	20-Nov-06
32	Peripheral	06-D12-00-1N	3	1385	140	NA	20-Nov-06
32	Peripheral	06-D12-00-1N	4	1387	136	NA	20-Nov-06
32	Peripheral	06-D12-00-1N	5	1398	144	NA	20-Nov-06
32	Peripheral	06-D12-00-1O	1	1359	134	NA	15-Nov-06

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TABLE 3-2

PARCEL D-2 EXCAVATED SOIL AND ASSIGNED STOCKPILE NUMBERS

Survey Unit No.	Material Type	Material ID		Assigned Stockpile No.			Date Excavated
		Trench No.	Load No.	Peripheral Material	Overburden Soil	Excavated Soil[a]	
32	Peripheral	06-D12-00-1O	2	1360	134	NA	15-Nov-06
32	Peripheral	06-D12-00-1O	3	1361	134	NA	15-Nov-06
32	Peripheral	06-D12-00-1O	4	1422	138	NA	29-Nov-06
32	Peripheral	06-D12-00-8B	1	1396	136	NA	20-Nov-06
32	Peripheral	06-D12-00-8B	2	1421	138	NA	29-Nov-06
34	Overburden	06-D12-00-1A	1	--	136	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	1	1425	138	NA	29-Nov-06
34	Overburden	06-D12-00-1A	2	--	133	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	2	1426	138	NA	29-Nov-06
34	Overburden	06-D12-00-1A	3	--	133	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	3	1432	138	NA	01-Dec-06
34	Overburden	06-D12-00-1A	4	--	133	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	4	1433	172	NA	01-Dec-06
34	Overburden	06-D12-00-1A	5	--	133	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	5	1429	138	NA	01-Dec-06
34	Overburden	06-D12-00-1A	6	--	133	NA	29-Nov-06
34	Peripheral	06-D12-00-1A	6	1436	140	NA	01-Dec-06
34	Overburden	06-D12-00-1A	7	--	133	NA	29-Nov-06
34	Overburden	06-D12-00-1A	8	--	133	NA	29-Nov-06
34	Overburden	06-D12-00-1A	9	--	133	NA	29-Nov-06
34	Overburden	06-D12-00-1A	10	--	133	NA	29-Nov-06
34	Overburden	06-D12-00-1A	11	--	133	NA	29-Nov-06
34	Overburden	06-D12-00-1B	1	--	137	NA	30-Nov-06
34	Peripheral	06-D12-00-1B	1	1451	144	NA	02-Dec-06
34	Overburden	06-D12-00-1B	2	--	137	NA	30-Nov-06
34	Peripheral	06-D12-00-1B	2	1452	144	NA	02-Dec-06
34	Overburden	06-D12-00-1B	3	--	140	NA	30-Nov-06
34	Peripheral	06-D12-00-1B	3	1456	144	NA	02-Dec-06
34	Overburden	06-D12-00-1C	1	--	136	NA	27-Nov-06
34	Peripheral	06-D12-00-1C	1	1402	140	NA	27-Nov-06
34	Overburden	06-D12-00-1C	2	--	136	NA	27-Nov-06
34	Peripheral	06-D12-00-1C	2	1403	140	NA	27-Nov-06
34	Overburden	06-D12-00-1C	3	--	140	NA	04-Dec-06
34	Peripheral	06-D12-00-1C	3	1455	144	NA	02-Dec-06
34	Peripheral	06-D12-00-1C	4	1454	144	NA	02-Dec-06
34	Peripheral	06-D12-00-1C	5	1460	144	NA	04-Dec-06
34	Peripheral	06-D12-00-1C	6	1458	144	NA	04-Dec-06
34	Peripheral	06-D12-00-1C	7	1462	144	NA	04-Dec-06
34	Peripheral	06-D12-00-1C	8	1463	144	NA	04-Dec-06
34	Peripheral	06-D12-00-1C	9	1461	144	NA	04-Dec-06
35	Peripheral	06-D12-00-1A	7	1437	138	NA	01-Dec-06
35	Peripheral	06-D12-00-1A	8	1438	172	NA	01-Dec-06
35	Peripheral	06-D12-00-1A	9	1439	138	NA	01-Dec-06
35	Peripheral	06-D12-00-1A	10	1442	140	NA	01-Dec-06
35	Peripheral	06-D12-00-1A	11	1444	146	NA	01-Dec-06
35	Overburden	06-D12-00-1A	12	--	133	NA	29-Nov-06
35	Peripheral	06-D12-00-1A	12	1445	140	NA	01-Dec-06
35	Overburden	06-D12-00-1A	13	--	137	NA	29-Nov-06
35	Peripheral	06-D12-00-1A	13	1448	172	NA	02-Dec-06

TABLE 3-2

PARCEL D-2 EXCAVATED SOIL AND ASSIGNED STOCKPILE NUMBERS

Survey Unit No.	Material Type	Material ID		Assigned Stockpile No.			Date Excavated
		Trench No.	Load No.	Peripheral Material	Overburden Soil	Excavated Soil[a]	
35	Overburden	06-D12-00-1A	14	--	137	NA	29-Nov-06
35	Peripheral	06-D12-00-1A	14	1465	144	NA	04-Dec-06
35	Overburden	06-D12-00-1A	15	--	137	NA	29-Nov-06
35	Overburden	06-D12-00-1A	16	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	17	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	18	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	19	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	20	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	21	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	22	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	23	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1A	24	--	137	NA	30-Nov-06
35	Overburden	06-D12-00-1S	1	--	137	NA	30-Nov-06
35	Peripheral	06-D12-00-1S	1	1466	144	NA	04-Dec-06
35	Overburden	06-D12-00-1S	2	--	140	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	2	1467	144	NA	04-Dec-06
35	Overburden	06-D12-00-1S	3	--	140	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	3	1480	144	NA	06-Dec-06
35	Overburden	06-D12-00-1S	4	--	140	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	4	1473	144	NA	06-Dec-06
35	Overburden	06-D12-00-1S	5	--	140	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	5	1477	144	NA	06-Dec-06
35	Overburden	06-D12-00-1S	6	--	144	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	6	1478	[b]	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	7	1475	144	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	8	1483	144	NA	06-Dec-06
35	Peripheral	06-D12-00-1S	9	1783	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	10	1788	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	11	1786	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	12	1790	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	13	1792	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	14	1797	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	15	1793	[b]	NA	09-Mar-07
35	Peripheral	06-D12-00-1S	16	1795	[b]	NA	09-Mar-07
38	Overburden	06-D12-00-1R	1	--	172	NA	03-Jan-07
38	Peripheral	06-D12-00-1R	1	1521	172	NA	03-Jan-07
38	Overburden	06-D12-00-1R	2	--	172	NA	03-Jan-07
38	Peripheral	06-D12-00-1R	2	1522	172	NA	03-Jan-07
38	Peripheral	06-D12-00-1R	3	--	172	NA	03-Jan-07
38	Peripheral	06-D12-00-1R	3	1523	[b]	NA	03-Jan-07
38	Overburden	06-D12-00-1R	4	--	172	NA	03-Jan-07
38	Peripheral	06-D12-00-1R	4	1524	172	NA	03-Jan-07
38	Overburden	06-D12-00-1R	5	--	172	NA	04-Jan-07
38	Peripheral	06-D12-00-1R	5	1525	172	NA	04-Jan-07
38	Peripheral	06-D12-00-1R	6	1526	172	NA	04-Jan-07
134	Soil/debris	02-D26-00-3H	1	--	--	180	02-Apr-09

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TABLE 3-2

PARCEL D-2 EXCAVATED SOIL AND ASSIGNED STOCKPILE NUMBERS

Survey Unit No.	Material Type	Material ID		Assigned Stockpile No.			Date Excavated
		Trench No.	Load No.	Peripheral Material	Overburden Soil	Excavated Soil[a]	
134	Soil/debris	02-D26-00-3H	2	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	3	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	4	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	5	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	6	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	7	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	8	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	9	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	10	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	11	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-3H	12	--	--	180	02-Apr-09
134	Soil/debris	02-D26-00-5A	1	--	--	182	06-Apr-09
134	Soil/debris	02-D26-00-5A	2	--	--	182	06-Apr-09
135	Soil/debris	02-D26-00-1C	1	--	--	180	01-Apr-09
135	Soil/debris	02-D26-00-1C	2	--	--	180	01-Apr-09
135	Soil/debris	02-D26-00-1C	3	--	--	180	01-Apr-09
135	Soil/debris	02-D26-00-1D	1	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-1D	2	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-3C	1	--	--	181	02-Apr-09
135	Soil/debris	02-D26-00-3C	2	--	--	181	02-Apr-09
135	Soil/debris	02-D26-00-3C	3	--	--	181	02-Apr-09
135	Soil/debris	02-D26-00-3C	4	--	--	181	02-Apr-09
135	Soil/debris	02-D26-00-3C	5	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-3C	6	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-3C	7	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-3C	8	--	--	181	03-Apr-09
135	Soil/debris	02-D26-00-3C	9	--	--	181	03-Apr-09

Notes:

[a] Excavated soil includes both overburden and peripheral material as defined in the Sewer Work Plan (TtEC 2008e).

[b] Transferred directly to the stockpile area following radiological release for disposal because no appropriate overburden pads were available.

Abbreviations and Acronyms:

NA – not applicable

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
31	06-D12-00-1D	1	9-Nov-06	5	10	VCP	21-Feb-07	2	36309	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	2	10-Nov-06	5	6	VCP	21-Feb-07	2	36309	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	3	10-Nov-06	2	6	VCP	21-Feb-07	2	36308	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	4	10-Nov-06	2	6	VCP	21-Feb-07	2	36309	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	5	10-Nov-06	6	6	VCP	21-Feb-07	2	36309	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	6	10-Nov-06	1	6	VCP	21-Feb-07	2	36308	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	7	10-Nov-06	7	6	VCP	21-Feb-07	2	36308	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	8	10-Nov-06	6.5	6	VCP	21-Feb-07	2	36308	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	9	10-Nov-06	4.5	6	VCP	21-Feb-07	2	36308	HPS-022107-090	--	--	--	--
31	06-D12-00-1D	MH204	10-Nov-06	--	--	Concrete	16-Jun-07	2	39797	HPS-061607-126	--	--	--	--
31	06-D12-00-1H	1	10-Nov-06	3	12	Concrete	21-Feb-07	2	36310	HPS-022107-090	--	--	--	--
31	06-D12-00-1H	2	10-Nov-06	2.16	12	Concrete	16-Jan-07	2	23482	HPS-011607-075	--	--	--	--
31	06-D12-00-1H	3	10-Nov-06	3	12	Concrete	16-Jan-07	2	23481	HPS-011607-075	--	--	--	--
31	06-D12-00-1H	4	10-Nov-06	3	12	Concrete	16-Jan-07	2	23479	HPS-011607-075	--	--	--	--
31	06-D12-00-1H	5	10-Nov-06	3	12	Concrete	16-Jan-07	2	23483	HPS-011607-075	--	--	--	--
31	06-D12-00-8A	1	9-Nov-06	8	6	VCP	21-Feb-07	2	36310	HPS-022107-090	--	--	--	--
31	06-D12-00-8A	2	9-Nov-06	2.5	6	VCP	21-Feb-07	2	36309	HPS-022107-090	--	--	--	--
31	06-D12-00-8A	MH203	9-Nov-06	--	--	Brick	16-Jun-07	2	39875	HPS-061607-126	--	--	--	--
32	06-D12-00-1I	1	17-Nov-06	3	12	Concrete	23-Jan-07	2	23558	HPS-012307-077	--	--	--	--
32	06-D12-00-1I	2	17-Nov-06	3	12	Concrete	16-Jan-07	2	23482	HPS-011607-075	--	--	--	--
32	06-D12-00-1I	3	17-Nov-06	3	12	Concrete	23-Jan-07	2	23558	HPS-012307-077	--	--	--	--
32	06-D12-00-1I	4	17-Nov-06	3	12	Concrete	23-Jan-07	2	23558	HPS-012307-077	--	--	--	--
32	06-D12-00-1I	5	9-Jan-07	2.66	12	Concrete	16-Jun-07	2	39796	HPS-061607-126	--	--	--	--
32	06-D12-00-1I	6	9-Jan-07	3	12	Concrete	16-Jun-07	2	39796	HPS-061607-126	26-Jun-07	HPS-062607-136	--	--
32	06-D12-00-1I	7	9-Jan-07	3	12	Concrete	16-Jun-07	2	39796	HPS-061607-126	--	--	--	--
32	06-D12-00-1I	8	9-Jan-07	2.42	12	Concrete	16-Jan-07	2	23479	HPS-011607-075	--	--	--	--
32	06-D12-00-1I	9	9-Jan-07	3	12	Concrete	16-Jan-07	2	23489	HPS-011607-076	--	--	--	--
32	06-D12-00-1I	10	9-Jan-07	3	12	Concrete	16-Jan-07	2	23486	HPS-011607-076	--	--	--	--
32	06-D12-00-1I	MH205	17-Nov-06	--	--	Brick	[a]	[a]	[a]	[a]	--	--	--	--
32	06-D12-00-1J	1	16-Nov-06	3	12	Concrete	16-Jan-07	2	23481	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	2	16-Nov-06	3	12	Concrete	16-Jan-07	2	23481	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	3	16-Nov-06	3	12	Concrete	16-Jun-07	2	39796	HPS-061607-126	--	--	--	--
32	06-D12-00-1J	4	16-Nov-06	3	12	Concrete	16-Jan-07	2	23482	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	5	17-Nov-06	6	12	Concrete	16-Jan-07	2	23482	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	6	17-Nov-06	3.16	12	Concrete	23-Jan-07	2	23505	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	7	17-Nov-06	6	12	Concrete	23-Jan-07	2	23560	HPS-012307-077	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
32	06-D12-00-1J	8	17-Nov-06	6	12	Concrete	23-Jan-07	2	23560	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	9	17-Nov-06	5.25	12	Concrete	23-Jan-07	2	23560	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	10	17-Nov-06	2.16	12	Concrete	16-Jan-07	2	23481	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	11	17-Nov-06	3	12	Concrete	16-Jan-07	2	23487	HPS-011607-076	--	--	--	--
32	06-D12-00-1J	12	17-Nov-06	3	12	Concrete	23-Jan-07	2	23560	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	13	17-Nov-06	3	12	Concrete	16-Jan-07	2	23489	HPS-011607-076	--	--	--	--
32	06-D12-00-1J	14	17-Nov-06	3	12	Concrete	16-Jan-07	2	23489	HPS-011607-076	--	--	--	--
32	06-D12-00-1J	15	17-Nov-06	3	12	Concrete	16-Jan-07	2	23482	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	16	17-Nov-06	2	12	Concrete	16-Jun-07	2	39880	HPS-061607-128	--	--	--	--
32	06-D12-00-1J	17	17-Nov-06	2.5	12	Concrete	16-Jun-07	2	39880	HPS-061607-128	--	--	--	--
32	06-D12-00-1J	18	17-Nov-06	2	12	Concrete	23-Jan-07	2	23505	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	19	28-Nov-06	3	12	Concrete	16-Jun-07	2	39880	HPS-061607-128	--	--	--	--
32	06-D12-00-1J	20	28-Nov-06	2.25	12	Concrete	16-Jun-07	2	39796	HPS-061607-126	26-Jun-07	HPS-062607-136	--	--
32	06-D12-00-1J	21	28-Nov-06	3	12	Concrete	23-Jan-07	2	23505	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	22	28-Nov-06	3	12	Concrete	23-Jan-07	2	23559	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	23	28-Nov-06	6	12	Concrete	23-Jan-07	2	23558	HPS-012307-077	--	--	--	--
32	06-D12-00-1J	24	28-Nov-06	6	12	Concrete	16-Jun-07	2	39875	HPS-061607-126	--	--	--	--
32	06-D12-00-1J	25	28-Nov-06	3	12	Concrete	16-Jan-07	2	23483	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	26	28-Nov-06	6	12	Concrete	16-Jan-07	2	23487	HPS-011607-076	--	--	--	--
32	06-D12-00-1J	27	9-Jan-07	3	12	Concrete	16-Jan-07	2	23477	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	28	9-Jan-07	3.25	12	Concrete	16-Jan-07	2	23477	HPS-011607-075	--	--	--	--
32	06-D12-00-1J	29	9-Jan-07	3	12	Concrete	16-Jan-07	2	23477	HPS-011607-075	--	--	--	--
32	06-D12-00-1L	1	17-Nov-06	6.25	4	VCP	16-Jan-07	2	23486	HPS-011607-076	--	--	--	--
32	06-D12-00-1L	2	17-Nov-06	3.25	4	VCP	16-Jan-07	2	23486	HPS-011607-076	--	--	--	--
32	06-D12-00-1L	3	17-Nov-06	3	4	VCP	23-Jan-07	2	23510	HPS-012307-078	--	--	--	--
32	06-D12-00-1L	4	17-Nov-06	4	4	VCP	16-Jun-07	2	39880	HPS-061607-128	--	--	--	--
32	06-D12-00-1N	1	20-Nov-06	2.5	12	Concrete	16-Jan-07	2	23483	HPS-011607-075	--	--	--	--
32	06-D12-00-1N	2	20-Nov-06	3	12	Concrete	16-Jan-07	2	23483	HPS-011607-075	--	--	--	--
32	06-D12-00-1N	3	20-Nov-06	2.25	12	Concrete	23-Jan-07	2	23505	HPS-012307-077	--	--	--	--
32	06-D12-00-1N	4	20-Nov-06	3	12	Concrete	23-Jan-07	2	23505	HPS-012307-077	--	--	--	--
32	06-D12-00-1N	5	20-Nov-06	3	12	Concrete	16-Jan-07	2	23483	HPS-011607-075	--	--	--	--
32	06-D12-00-1N	MH206	20-Nov-06	--	--	Concrete	16-Jun-07	2	39880	HPS-061607-128	--	--	--	--
32	06-D12-00-1O	1	15-Nov-06	6	6	Concrete/VCP	16-Jan-07	2	23477	HPS-011607-075	--	--	--	--
32	06-D12-00-1O	2	15-Nov-06	2.83	6	Concrete/VCP	16-Jun-07	2	39875	HPS-061607-126	26-Jun-07	HPS-062607-136	--	--
32	06-D12-00-1O	3	15-Nov-06	3.33	6	Concrete/VCP	16-Jan-07	2	23479	HPS-011607-075	--	--	--	--
32	06-D12-00-1O	4	15-Nov-06	4.5	6	Concrete/VCP	16-Jan-07	2	23479	HPS-011607-075	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
32	06-D12-00-1O	5	15-Nov-06	2.5	6	Concrete/VCP	16-Jan-07	2	23481	HPS-011607-075	--	--	--	--
32	06-D12-00-1O	6	15-Nov-06	2.25	6	Concrete/VCP	16-Jan-07	2	23479	HPS-011607-075	--	--	--	--
32	06-D12-00-1O	7	15-Nov-06	2.66	6	Concrete/VCP	16-Jun-07	2	39875	HPS-061607-126	--	--	--	--
32	06-D12-00-1O	8	15-Nov-06	3	6	Concrete/VCP	16-Jan-07	2	23477	HPS-011607-075	26-Jun-07	HPS-062607-136	--	--
32	06-D12-00-1O	9	16-Nov-06	7.5	6	Concrete/VCP	23-Jan-07	2	23560	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	10	16-Nov-06	4.5	6	Concrete/VCP	16-Jan-07	2	23486	HPS-011607-076	--	--	--	--
32	06-D12-00-1O	11	28-Nov-06	6.33	6	Concrete/VCP	16-Jun-07	2	39875	HPS-061607-126	--	--	--	--
32	06-D12-00-1O	12	28-Nov-06	3.66	6	Concrete/VCP	16-Jan-07	2	23486	HPS-011607-076	--	--	--	--
32	06-D12-00-1O	13	28-Nov-06	3	6	Concrete/VCP	16-Jan-07	2	23489	HPS-011607-076	--	--	--	--
32	06-D12-00-1O	14	28-Nov-06	6	6	Concrete/VCP	16-Jan-07	2	23487	HPS-011607-076	--	--	--	--
32	06-D12-00-1O	15	28-Nov-06	3	6	Concrete/VCP	23-Jan-07	2	23507	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	16	28-Nov-06	1.5	6	Concrete/VCP	23-Jan-07	2	23507	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	17	28-Nov-06	8	6	Concrete/VCP	23-Jan-07	2	23559	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	18	28-Nov-06	3	6	Concrete/VCP	23-Jan-07	2	23510	HPS-012307-078	--	--	--	--
32	06-D12-00-1O	19	28-Nov-06	4.5	6	Concrete/VCP	23-Jan-07	2	23559	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	20	28-Nov-06	6	6	Concrete/VCP	23-Jan-07	2	23559	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	21	28-Nov-06	7.83	6	Concrete/VCP	16-Jun-07	2	39882	HPS-061607-128	--	--	--	--
32	06-D12-00-1O	22	28-Nov-06	7.75	6	Concrete/VCP	16-Jun-07	2	39882	HPS-061607-128	--	--	--	--
32	06-D12-00-1O	23	28-Nov-06	7	6	Concrete/VCP	23-Jan-07	2	23507	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	24	28-Nov-06	3	6	Concrete/VCP	23-Jan-07	2	23559	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	25	28-Nov-06	6	6	Concrete/VCP	23-Jan-07	2	23507	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	26	28-Nov-06	3	6	Concrete/VCP	23-Jan-07	2	23507	HPS-012307-077	--	--	--	--
32	06-D12-00-1O	27	28-Nov-06	2.33	6	Concrete/VCP	16-Jan-07	2	23489	HPS-011607-076	--	--	--	--
32	06-D12-00-8B	1	20-Nov-06	7.75	6	Corrugated Metal	16-Jun-07	2	39797	HPS-061607-126	--	--	--	--
32	06-D12-00-8B	2	20-Nov-06	4.33	6	Corrugated Metal	21-Feb-07	2	36310	HPS-022107-090	--	--	--	--
32	06-D12-00-8B	3	20-Nov-06	1.25	6	Corrugated Metal	21-Feb-07	2	36310	HPS-022107-090	--	--	--	--
32	06-D12-00-8B	4	20-Nov-06	5.75	6	Corrugated Metal	16-Jun-07	2	39797	HPS-061607-126	--	--	--	--
32	06-D12-00-8B	5	29-Nov-06	12	6	Corrugated Metal	16-Jun-07	2	39797	HPS-061607-126	--	--	--	--
32	06-D12-00-8B	6	29-Nov-06	7	6	Corrugated Metal	21-Feb-07	2	36310	HPS-022107-090	--	--	--	--
32	06-D12-00-8B	7	29-Nov-06	8	6	Corrugated Metal	16-Jun-07	2	39797	HPS-061607-126	--	--	--	--
34	06-D12-00-1A	1	1-Dec-06	3	15	Concrete	15-Jan-07	2	23459	HPS-011507-071	--	--	--	--
34	06-D12-00-1A	2	1-Dec-06	3	15	Concrete	10-Jan-07	2	23412	HPS-011207-069	--	--	--	--
34	06-D12-00-1A	3	1-Dec-06	3	15	Concrete	10-Jan-07	2	23412	HPS-011207-069	--	--	--	--
34	06-D12-00-1A	4	1-Dec-06	3	15	Concrete	10-Jan-07	2	23408	HPS-011207-069	--	--	--	--
34	06-D12-00-1A	5	1-Dec-06	3	15	Concrete	10-Jan-07	2	23412	HPS-011207-069	--	--	--	--
34	06-D12-00-1A	6	1-Dec-06	3	15	Concrete	10-Jan-07	2	23412	HPS-011207-069	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
34	06-D12-00-1A	7	1-Dec-06	3	15	Concrete	10-Jan-07	2	23412	HPS-011207-069	--	--	--	--
34	06-D12-00-1A	8	1-Dec-06	3	15	Concrete	15-Jan-07	2	23474	HPS-011507-074	--	--	--	--
34	06-D12-00-1A	9	1-Dec-06	3	15	Concrete	15-Jan-07	2	23472	HPS-011507-073	--	--	--	--
34	06-D12-00-1A	10	1-Dec-06	3	15	Concrete	15-Jan-07	2	23472	HPS-011507-073	--	--	--	--
34	06-D12-00-1A	11	1-Dec-06	3	15	Concrete	15-Jan-07	2	23471	HPS-011507-073	--	--	--	--
34	06-D12-00-1A	12	1-Dec-06	3	15	Concrete	18-Jun-07	2	39896	HPS-061807-130	--	--	--	--
34	06-D12-00-1B	1	2-Dec-06	14	8	Corrugated Metal	26-Feb-07	2	36574	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	2	2-Dec-06	12	8	Corrugated Metal	26-Feb-07	2	36574	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	3	2-Dec-06	6	8	Corrugated Metal	26-Feb-07	2	36574	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	4	2-Dec-06	12	8	Corrugated Metal	23-Jan-07	2	23510	HPS-012307-078	--	--	--	--
34	06-D12-00-1B	5	2-Dec-06	5	8	Corrugated Metal	26-Feb-07	2	36574	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	6	2-Dec-06	10	8	Corrugated Metal	26-Feb-07	2	36575	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	7	2-Dec-06	6	8	Corrugated Metal	23-Jan-07	2	23510	HPS-012307-078	--	--	--	--
34	06-D12-00-1B	8	2-Dec-06	20	8	Corrugated Metal	23-Jan-07	2	23510	HPS-012307-078	--	--	--	--
34	06-D12-00-1B	9	2-Dec-06	13	8	Corrugated Metal	26-Feb-07	2	36576	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	10	2-Dec-06	3	8	Corrugated Metal	26-Feb-07	2	36576	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	11	2-Dec-06	6	8	Corrugated Metal	26-Feb-07	2	36576	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	12	2-Dec-06	5	8	Corrugated Metal	26-Feb-07	2	36576	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	13	2-Dec-06	4	8	Corrugated Metal	26-Feb-07	2	36576	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	14	2-Dec-06	1	8	Corrugated Metal	26-Feb-07	2	36577	HPS-022607-092	--	--	--	--
34	06-D12-00-1B	MH202	2-Dec-06	--	--	Concrete	18-Jun-07	2	39892	HPS-061807-130	--	--	--	--
34	06-D12-00-1C	1	4-Dec-06	18	6	Corrugated Metal	26-Feb-07	2	36577	HPS-022607-092	--	--	--	--
34	06-D12-00-1C	2	4-Dec-06	25	6	Corrugated Metal	26-Feb-07	2	36577	HPS-022607-092	--	--	--	--
34	06-D12-00-1C	3	4-Dec-06	15	6	Corrugated Metal	26-Feb-07	2	36577	HPS-022607-092	--	--	--	--
34	06-D12-00-1C	MH201	2-Dec-06	--	--	Concrete	18-Jun-07	2	39892	HPS-061807-130	--	--	--	--
35	06-D12-00-1A	13	1-Dec-06	3	15	Concrete	15-Jan-07	2	23459	HPS-011507-071	--	--	--	--
35	06-D12-00-1A	14	1-Dec-06	3	15	Concrete	23-Jan-07	2	23558	HPS-012307-077	--	--	--	--
35	06-D12-00-1A	15	1-Dec-06	3	15	Concrete	15-Jan-07	2	23459	HPS-011507-071	--	--	--	--
35	06-D12-00-1A	16	1-Dec-06	3	15	Concrete	15-Jan-07	2	23459	HPS-011507-071	--	--	--	--
35	06-D12-00-1A	17	1-Dec-06	3	15	Concrete	15-Jan-07	2	23472	HPS-011507-073	--	--	--	--
35	06-D12-00-1A	18	1-Dec-06	3	15	Concrete	18-Jun-07	2	39896	HPS-061807-130	--	--	--	--
35	06-D12-00-1A	19	1-Dec-06	3	15	Concrete	15-Jan-07	2	23472	HPS-011507-073	--	--	--	--
35	06-D12-00-1A	20	1-Dec-06	3	15	Concrete	18-Jun-07	2	39896	HPS-061807-130	--	--	--	--
35	06-D12-00-1A	21	1-Dec-06	3	15	Concrete	18-Jun-07	2	39896	HPS-061807-130	--	--	--	--
35	06-D12-00-1A	22	1-Dec-06	3	15	Concrete	18-Jun-07	2	39896	HPS-061807-130	--	--	--	--
35	06-D12-00-1A	23	1-Dec-06	3	15	Concrete	15-Jan-07	2	23472	HPS-011507-073	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
35	06-D12-00-1A	24	1-Dec-06	3	15	Concrete	10-Jan-07	2	23408	HPS-011207-069	--	--	--	--
35	06-D12-00-1A	25	1-Dec-06	3	15	Concrete	10-Jan-07	2	23408	HPS-011207-069	--	--	--	--
35	06-D12-00-1A	26	1-Dec-06	3	15	Concrete	10-Jan-07	2	23408	HPS-011207-069	--	--	--	--
35	06-D12-00-1A	27	2-Dec-06	3	15	Concrete	15-Jan-07	2	23474	HPS-011507-074	--	--	--	--
35	06-D12-00-1A	MH200[b]	1-Dec-06	--	--	Concrete	--	--	--	[c]	--	--	5-Jun-07	GFLU001115G1
35	06-D12-00-1S	1	4-Dec-06	3	15	Concrete	15-Jan-07	2	23457	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	2	4-Dec-06	3	15	Concrete	15-Jan-07	2	23462	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	3	4-Dec-06	3	15	Concrete	15-Jan-07	2	23462	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	4	4-Dec-06	3	15	Concrete	15-Jan-07	2	23462	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	5	4-Dec-06	3	15	Concrete	15-Jan-07	2	23457	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	6	4-Dec-06	3	15	Concrete	15-Jan-07	2	23457	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	7	4-Dec-06	3	15	Concrete	15-Jan-07	2	23462	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	8	4-Dec-06	3	15	Concrete	15-Jan-07	2	23457	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	9	4-Dec-06	3	15	Concrete	15-Jan-07	2	23457	HPS-011507-071	--	--	--	--
35	06-D12-00-1S	10	4-Dec-06	3	15	Concrete	15-Jan-07	2	23474	HPS-011507-074	--	--	--	--
35	06-D12-00-1S	11	4-Dec-06	3	15	Concrete	15-Jan-07	2	23474	HPS-011507-074	--	--	--	--
35	06-D12-00-1S	12	6-Dec-06	3	15	Concrete	10-Jan-07	2	23408	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	13	6-Dec-06	3	15	Concrete	10-Jan-07	2	23409	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	14	6-Dec-06	3	15	Concrete	10-Jan-07	2	23409	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	15	6-Dec-06	3	15	Concrete	10-Jan-07	2	23409	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	16	6-Dec-06	3	15	Concrete	10-Jan-07	2	23409	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	17	6-Dec-06	3	15	Concrete	10-Jan-07	2	23413	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	18	6-Dec-06	3	15	Concrete	10-Jan-07	2	23413	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	19	6-Dec-06	3	15	Concrete	10-Jan-07	2	23413	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	20	6-Dec-06	3	15	Concrete	10-Jan-07	2	23410	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	21	6-Dec-06	3	15	Concrete	10-Jan-07	2	23409	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	22	6-Dec-06	3	15	Concrete	10-Jan-07	2	23414	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	23	6-Dec-06	3	15	Concrete	10-Jan-07	2	23410	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	24	6-Dec-06	3	15	Concrete	10-Jan-07	2	23413	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	25	6-Dec-06	3	15	Concrete	10-Jan-07	2	23413	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	26	6-Dec-06	3	15	Concrete	10-Jan-07	2	23410	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	27	6-Dec-06	3	15	Concrete	15-Jan-07	2	23471	HPS-011507-073	--	--	--	--
35	06-D12-00-1S	28	6-Dec-06	3	15	Concrete	10-Jan-07	2	23410	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	29	6-Dec-06	3	15	Concrete	15-Jan-07	2	23471	HPS-011507-073	--	--	--	--
35	06-D12-00-1S	30	6-Dec-06	3	15	Concrete	10-Jan-07	2	23410	HPS-011207-069	--	--	--	--
35	06-D12-00-1S	31	9-Mar-07	3	15	Concrete	16-Jun-07	2	39882	HPS-061607-128	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

				Description			Radiological Surveys				Resurveys		Radiological Waste	
Survey Unit	Trench Segment ID	Component No.	Date Excavated	Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
35	06-D12-00-1S	32	9-Mar-07	3	15	Concrete	16-Jun-07	2	39876	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	33	9-Mar-07	3	15	Concrete	16-Jun-07	2	39878	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	34	9-Mar-07	3	15	Concrete	18-Jun-07	2	39892	HPS-061807-130	--	--	--	--
35	06-D12-00-1S	35	9-Mar-07	3	15	Concrete	16-Jun-07	2	39876	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	36	9-Mar-07	3	15	Concrete	16-Jun-07	2	39878	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	37	9-Mar-07	3	15	Concrete	16-Jun-07	2	39879	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	38	9-Mar-07	3	15	Concrete	16-Jun-07	2	39879	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	39	9-Mar-07	3	15	Concrete	16-Jun-07	2	39878	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	40	9-Mar-07	3	15	Concrete	16-Jun-07	2	39876	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	41	9-Mar-07	3	15	Concrete	16-Jun-07	2	39879	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	42	9-Mar-07	3	15	Concrete	16-Jun-07	2	39876	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	43	9-Mar-07	3	15	Concrete	16-Jun-07	2	39878	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	44	9-Mar-07	3	15	Concrete	16-Jun-07	2	39882	HPS-061607-128	--	--	--	--
35	06-D12-00-1S	45	9-Mar-07	3	15	Concrete	16-Jun-07	2	39879	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	46	9-Mar-07	3	15	Concrete	16-Jun-07	2	39878	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	47	9-Mar-07	3	15	Concrete	16-Jun-07	2	39876	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	48	9-Mar-07	3	15	Concrete	16-Jun-07	2	39882	HPS-061607-128	--	--	--	--
35	06-D12-00-1S	49	9-Mar-07	3	15	Concrete	18-Jun-07	2	39892	HPS-061807-130	--	--	--	--
35	06-D12-00-1S	50	9-Mar-07	3	15	Concrete	16-Jun-07	2	39879	HPS-061607-127	--	--	--	--
35	06-D12-00-1S	51	9-Mar-07	3	15	Concrete	18-Jun-07	2	39892	HPS-061807-130	--	--	--	--
35	06-D12-00-1S	MH208	9-Mar-07	--	--	Concrete	--	--	--	[c]	--	--	30-Mar-07	BKRU026303D
38	06-D12-00-1R	1	7-Dec-06	4.42	12	Concrete	15-Jan-07	2	23470	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	2	7-Dec-06	3.25	12	Concrete	15-Jan-07	2	23470	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	3	7-Dec-06	3.33	12	Concrete	15-Jan-07	2	23470	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	4	7-Dec-06	3	12	Concrete	15-Jan-07	2	23468	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	5	3-Jan-07	2.75	12	Concrete	15-Jan-07	2	23469	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	6	3-Jan-07	3	12	Concrete	15-Jan-07	2	23469	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	7	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23464	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	8	3-Jan-07	3	12	Concrete	15-Jan-07	2	23464	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	9	3-Jan-07	2.75	12	Concrete	15-Jan-07	2	23464	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	10	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23469	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	11	3-Jan-07	3.08	12	Concrete	16-Jun-07	2	39886	HPS-061607-129	--	--	24-Aug-07	GFLU001179G2
38	06-D12-00-1R	12	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23469	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	13	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23468	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	14	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23470	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	15	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23468	HPS-011507-073	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
38	06-D12-00-1R	16	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23468	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	17	3-Jan-07	3.25	12	Concrete	16-Jun-07	2	39886	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	18	3-Jan-07	3	12	Concrete	15-Jan-07	2	23468	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	19	3-Jan-07	3	12	Concrete	16-Jun-07	2	39886	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	20	3-Jan-07	3	12	Concrete	15-Jan-07	2	23466	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	21	3-Jan-07	3	12	Concrete	15-Jan-07	2	23467	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	22	3-Jan-07	3	12	Concrete	26-Feb-07	2	36577	HPS-022607-092	--	--	--	--
38	06-D12-00-1R	23	3-Jan-07	3	12	Concrete	15-Jan-07	2	23465	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	24	3-Jan-07	3	12	Concrete	15-Jan-07	2	23466	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	25	3-Jan-07	3	12	Concrete	15-Jan-07	2	23466	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	26	3-Jan-07	3	12	Concrete	15-Jan-07	2	23465	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	27	3-Jan-07	3.25	12	Concrete	15-Jan-07	2	23465	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	28	3-Jan-07	2.25	12	Concrete	15-Jan-07	2	23465	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	29	3-Jan-07	3	12	Concrete	15-Jan-07	2	23464	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	30	3-Jan-07	3	12	Concrete	15-Jan-07	2	23464	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	31	3-Jan-07	3	12	Concrete	15-Jan-07	2	23466	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	32	3-Jan-07	3	12	Concrete	15-Jan-07	2	23459	HPS-011507-071	--	--	--	--
38	06-D12-00-1R	33	3-Jan-07	3	12	Concrete	15-Jan-07	2	23467	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	34	3-Jan-07	3	12	Concrete	15-Jan-07	2	23467	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	35	3-Jan-07	3	12	Concrete	15-Jan-07	2	23467	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	36	3-Jan-07	3	12	Concrete	15-Jan-07	2	23466	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	37	3-Jan-07	3	12	Concrete	15-Jan-07	2	23467	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	38	3-Jan-07	2.42	12	Concrete	16-Jun-07	2	39886	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	39	3-Jan-07	3	12	Concrete	15-Jan-07	2	23463	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	40	3-Jan-07	3	12	Concrete	15-Jan-07	2	23465	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	41	3-Jan-07	3	12	Concrete	15-Jan-07	2	23470	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	42	3-Jan-07	3	12	Concrete	15-Jan-07	2	23469	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	43	3-Jan-07	3	12	Concrete	16-Jun-07	2	39886	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	44	3-Jan-07	3	12	Concrete	6-Mar-07	2	36349	HPS-030607-094	--	--	--	--
38	06-D12-00-1R	45	3-Jan-07	3	12	Concrete	6-Mar-07	2	36349	HPS-030607-094	--	--	--	--
38	06-D12-00-1R	46	3-Jan-07	3	12	Concrete	6-Mar-07	2	36349	HPS-030607-094	--	--	--	--
38	06-D12-00-1R	47	3-Jan-07	3	12	Concrete	15-Jan-07	2	23471	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	48	3-Jan-07	3	12	Concrete	15-Jan-07	2	23471	HPS-011507-073	--	--	--	--
38	06-D12-00-1R	49	4-Jan-07	3	12	Concrete	13-Jan-07	2	23443	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	50	4-Jan-07	3	12	Concrete	15-Jan-07	2	23463	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	51	4-Jan-07	3	12	Concrete	15-Jan-07	2	23463	HPS-011507-072	--	--	--	--

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Survey Unit	Trench Segment ID	Component No.	Date Excavated	Description			Radiological Surveys				Resurveys		Radiological Waste	
				Length (linear feet)	Diameter (inches)	Material Type	Date Surveyed	Swipe Samples	COC #	Survey Report No.	Date Resurveyed	Resurvey Report No.	Date Disposed	LLRW Bin No.
38	06-D12-00-1R	52	4-Jan-07	3	12	Concrete	15-Jan-07	2	23463	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	53	4-Jan-07	3	12	Concrete	15-Jan-07	2	23463	HPS-011507-072	--	--	--	--
38	06-D12-00-1R	54	4-Jan-07	3	12	Concrete	16-Jun-07	2	39887	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	55	4-Jan-07	3	12	Concrete	13-Jan-07	2	23441	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	56	4-Jan-07	3	12	Concrete	13-Jan-07	2	23443	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	57	4-Jan-07	3	12	Concrete	13-Jan-07	2	23441	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	58	4-Jan-07	3	12	Concrete	13-Jan-07	2	23441	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	59	4-Jan-07	3	12	Concrete	13-Jan-07	2	23441	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	60	4-Jan-07	3	12	Concrete	13-Jan-07	2	23442	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	61	4-Jan-07	3	12	Concrete	13-Jan-07	2	23441	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	62	4-Jan-07	3	12	Concrete	16-Jun-07	2	39887	HPS-061607-129	--	--	--	--
38	06-D12-00-1R	63	4-Jan-07	3	12	Concrete	13-Jan-07	2	23443	HPS-011307-070	--	--	--	--
38	06-D12-00-1R	64	4-Jan-07	3	12	Concrete	13-Jan-07	2	23443	HPS-011307-070	--	--	--	--
38	06-D12-00-8C	1	7-Dec-06	1.58	4	Concrete	26-Feb-07	2	36574	HPS-022607-092	--	--	--	--
38	06-D12-00-8D	1	4-Jan-07	13.75	4	Steel	6-Mar-07	2	36353	HPS-030607-094	--	--	--	--
38	06-D12-00-8D	2	4-Jan-07	8.83	4	Steel	6-Mar-07	2	36353	HPS-030607-094	--	--	--	--
38	06-D12-00-8D	3	4-Jan-07	4.33	4	Steel	6-Mar-07	2	36353	HPS-030607-094	--	--	--	--
38	06-D12-00-8D	4	4-Jan-07	1.42	4	Steel	6-Mar-07	2	36349	HPS-030607-094	--	--	--	--
38	06-D12-00-1R	EP-33	4-Jan-07	[d]	2	Metal	6-Mar-07	2	36349	HPS-030607-094	--	--	--	--
38	06-D12-00-1R	EP-34	4-Jan-07	[d]	3	Metal	7-Mar-07	2	38575	HPS-030707-095	--	--	--	--
134	02-D26-00-3G	1	7-Apr-09	7	15	VCP	--	--	--	--	--	--	--	[e]
134	02-D26-00-3H	1	2-Apr-09	50	15	Concrete	--	--	--	--	--	--	6-Apr-09	GFLU001186G9
134	02-D26-00-3H	MH277	2-Apr-09	--	--	Concrete	--	--	--	--	--	--	15-Apr-09	GFLU001130G7
134	02-D26-00-5A	1	6-Apr-09	84	15	Concrete	--	--	--	--	--	--	13-Apr-09	GFLU001073G3
134	02-D26-00-5A	MH276	6-Apr-09	--	--	Concrete	--	--	--	--	--	--	15-Apr-09	GFLU001011G9
135	02-D26-00-1C	1	1-Apr-09	107	6	Corrugated Metal	--	--	--	--	--	--	4/6/2009	GFLU001186G9
135	02-D26-00-1D	1	23-Apr-09	20	8	Cast Iron	--	--	--	--	--	--	--	[e]
135	02-D26-00-1D	2	4-May-09	8	8	Cast Iron	--	--	--	--	--	--	5/5/2009	GFLU001172G11
135	02-D26-00-1D	MH267	3-Apr-09	--	--	Concrete	--	--	--	--	--	--	4/6/2009	GFLU001186G9
135	02-D26-00-3C	1	2-Apr-09	75	8	Cast Iron	--	--	--	--	--	--	4/21/2009	BKRU026177G9
135	02-D26-00-3C	2	3-Apr-09	60	8	Cast Iron	--	--	--	--	--	--	4/29/2009	GFLU001221G2
135	02-D26-00-3C	3	16-Apr-09	11	8	Cast Iron	--	--	--	--	--	--	4/29/2009	GFLU001221G2
135	02-D26-00-3C	MH207	3-Apr-09	--	--	Concrete	--	--	--	--	--	--	4/7/2009	GFLU001194G8 GFLU001209G9
135	02-D26-00-3D	1	7-Apr-09	8	6	VCP	--	--	--	--	--	--	--	[e]
135	02-D26-00-3J	1	7-Apr-09	10	8	VCP	--	--	--	--	--	--	--	[e]

TABLE 3-3

PARCEL D-2 EXCAVATED PIPE/MANHOLES

Notes:
Blue text indicates a link that is active only in the PDF file on the enclosed CD.
[a] No survey performed because manhole was crushed upon removal and included in peripheral soil.
[b] MH200 sediment had no elevated radioactivity; it was placed in an LLRW bin inadvertently.
[c] No survey performed due to contaminated sediment.
[d] No linear footage provided; EP pipe was not removed.
[e] Pipe crushed during excavation and radiologically surveyed with excavated soil.

Abbreviations and Acronyms:
COC – chain of custody
EP – extraneous pipe
LLRW – low-level radioactive waste
MH – manhole
VCP – vitreous clay pipe

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TABLE 3-4

PARCEL D-2 STORM DRAIN AND SANITARY SEWER PIPING REMAINING IN PLACE

Survey Unit	Trench Segment Remaining in Place	Type	Linear Feet of Pipe	
			Remaining In Place	Removed
SU-31	06-D12-00-1D	Storm Drain	150[a]	58
	06-D12-00-1H	Storm Drain	242[a]	26
SU-32	06-D12-00-1L	Storm Drain	10	20
	06-D12-00-1O	Sanitary Sewer	10	180
	06-D12-00-1P	Storm Drain	31	2
SU-34	06-D12-00-1B	Storm Drain	97[a]	152
	06-D12-00-1C	Storm Drain	10	154
SU-38	06-D12-00-8C	Storm Drain	16	8
	06-D12-00-8D	Sanitary Sewer	20	30

Notes:

[a] Linear feet are estimated based on historical drawings.

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FIGURES

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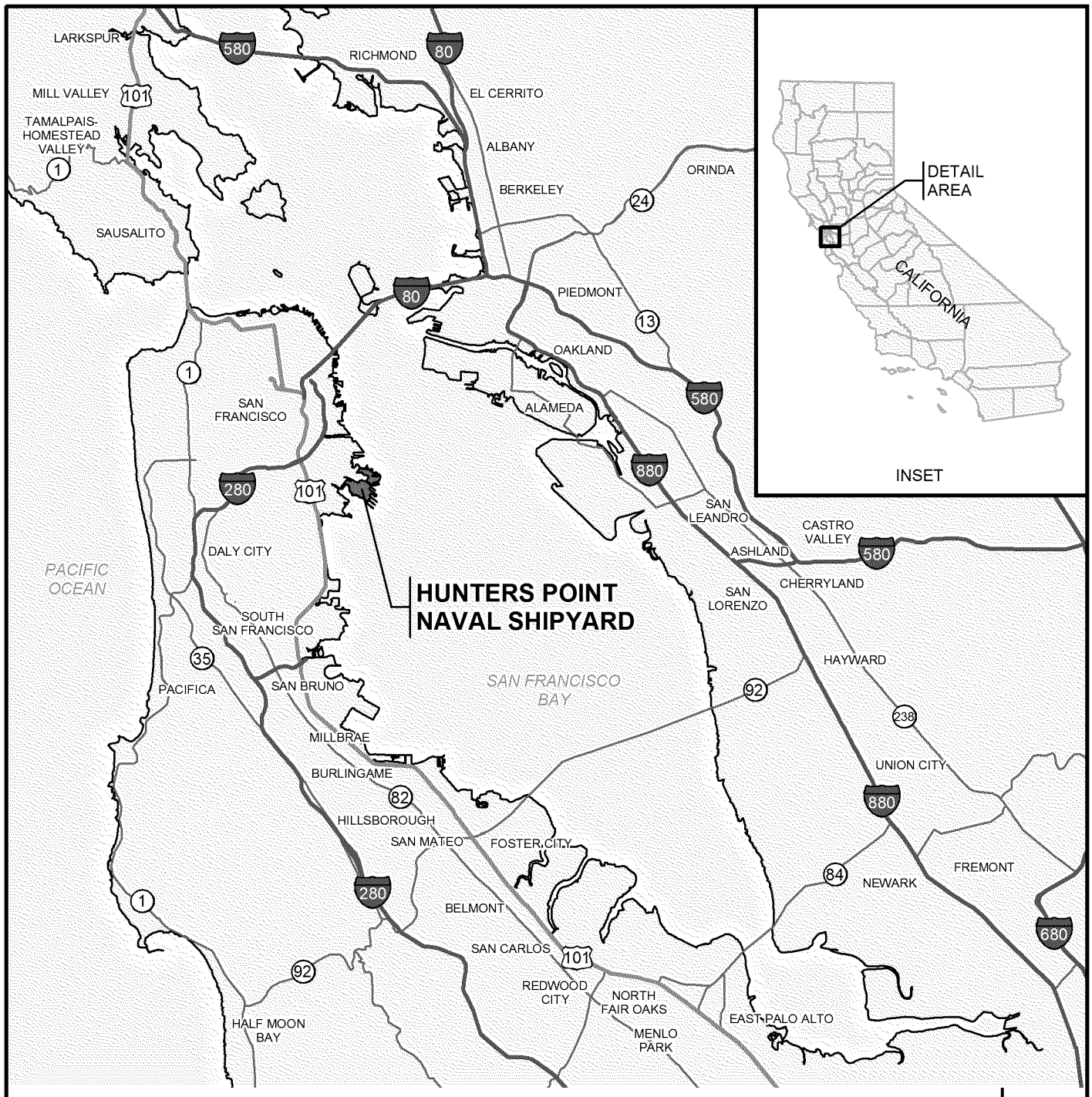


LEGEND

- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- HUNTERS POINT NAVAL SHIPYARD
- WATER

2.5 0 2.5 5 Miles

Scale: 1" = 5 Miles

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT
PARCEL D-2

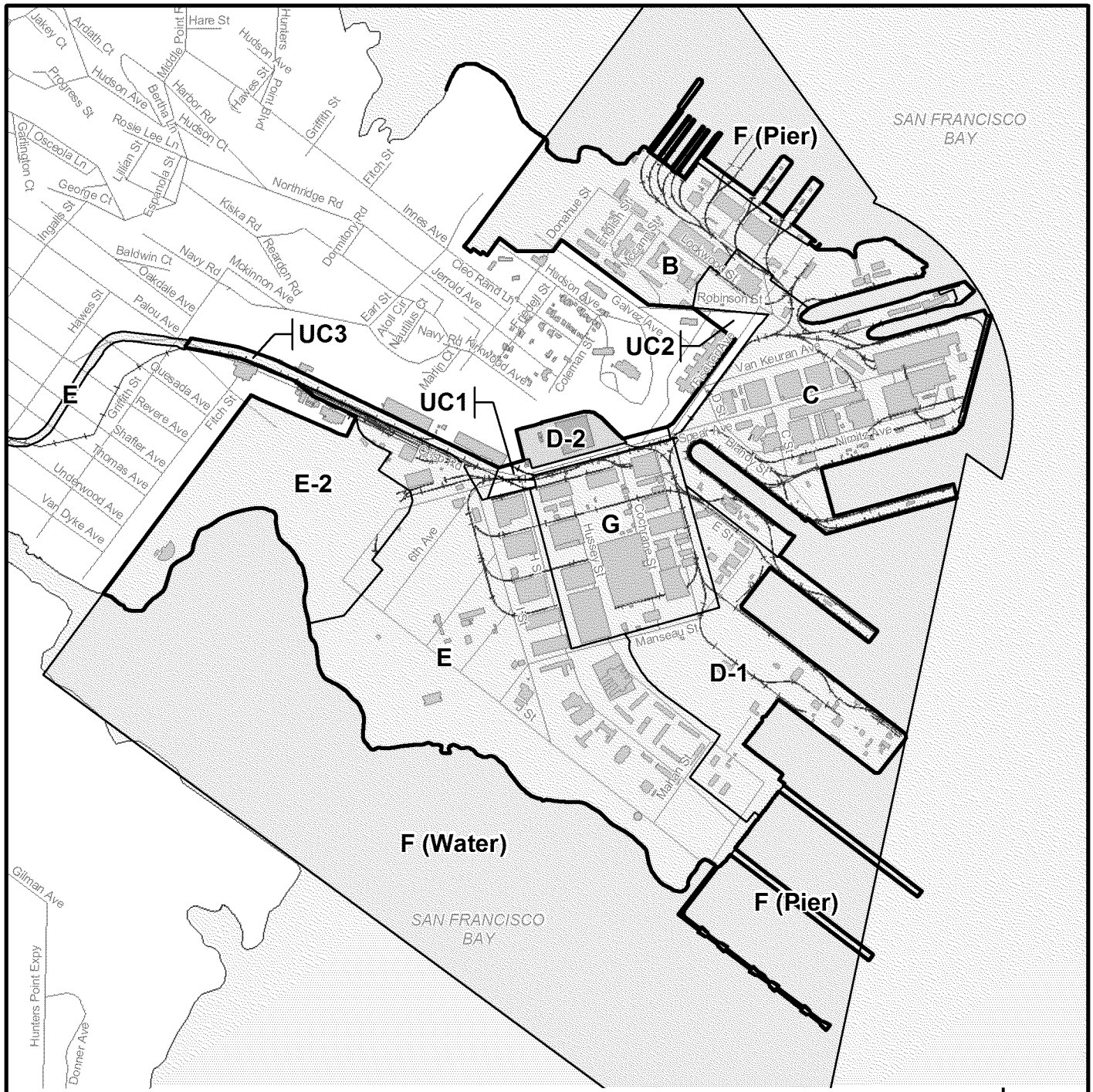
FIGURE 1-1

REGIONAL LOCATION MAP

HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

REVIEW: 0
AUTHOR: MS
DCN: ECSD-3211-0018-0181.R2
FILE NUMBER: 120064R7358.mxd

TETRA TECH EC, INC.



LEGEND

- ROAD
- RAILROAD
- BUILDING
- PARCEL D-2
- PARCEL
- HUNTERS POINT NAVAL SHIPYARD BOUNDARY
- WATER

600 0 600 1,200 Feet

Scale: 1" = 1200'

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT, PARCEL D-2

FIGURE 1-2

HUNTERS POINT NAVAL SHIPYARD PARCEL MAP

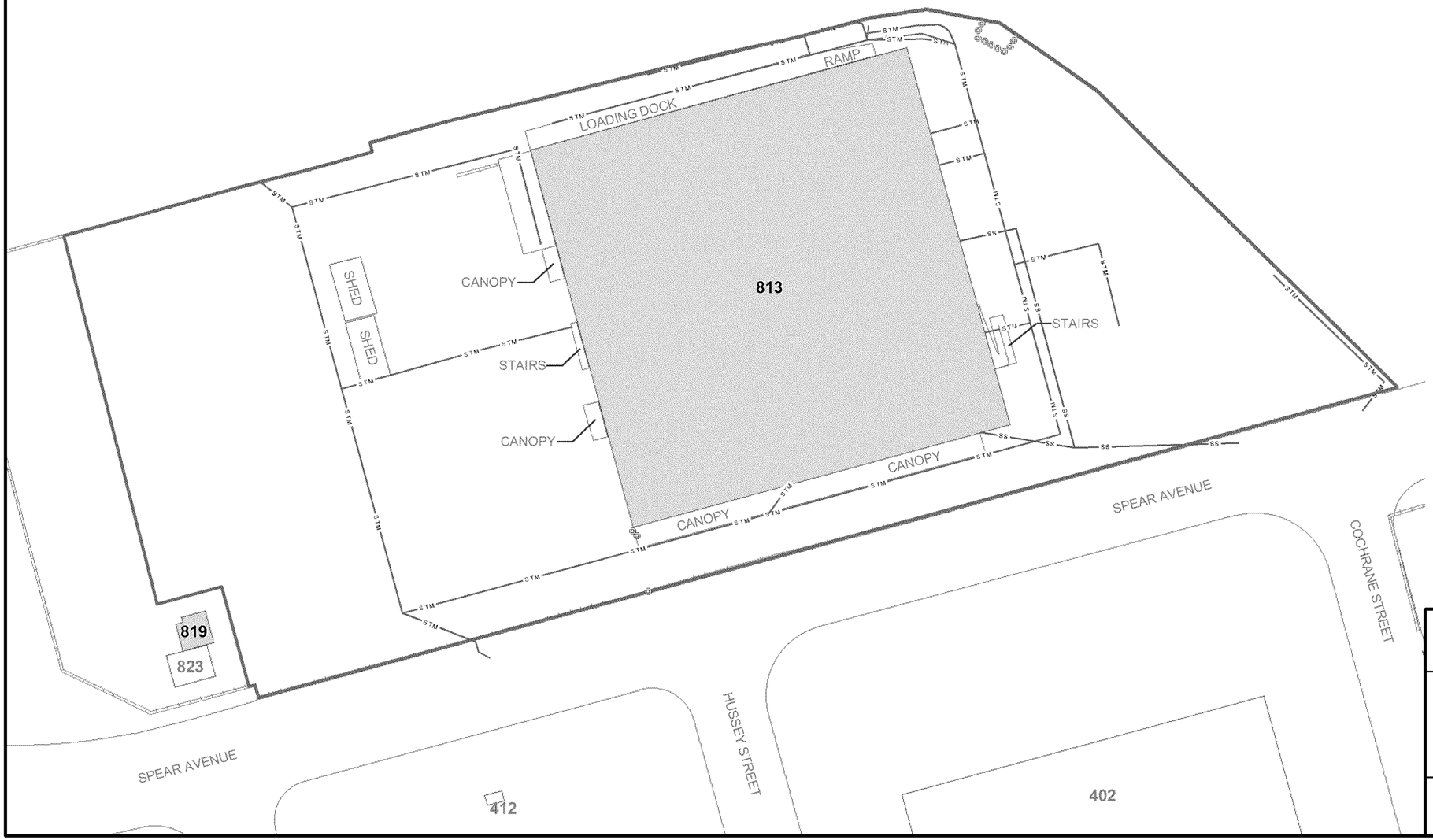
HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

REVIEW: A
AUTHOR: MS
DCN: ECSD-3211-0018-0181.R2
FILE NUMBER: 120064S7359.mxd

TETRATECH EC, INC.

LEGEND

- BOLLARD
- SS — SANITARY SEWER LINE
- STM — STORM DRAIN LINE
- FENCE
- ROAD
- PARCEL D-2
- 402 — NON-IMPACTED BUILDING AND BUILDING NUMBER
- 813 — IMPACTED BUILDING THAT HAS OBTAINED REGULATORY RELEASE



N

40 0 40 80

Feet

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT
PARCEL D-2

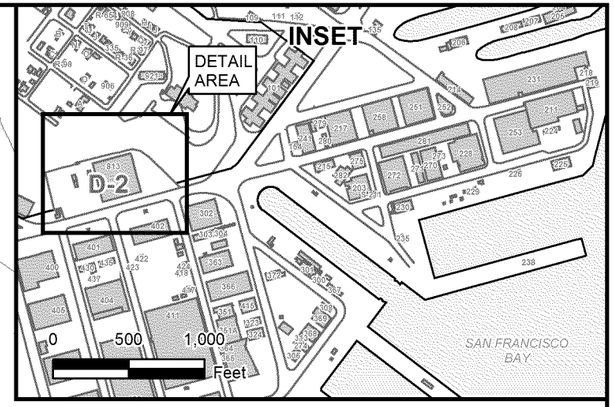
FIGURE 1-3

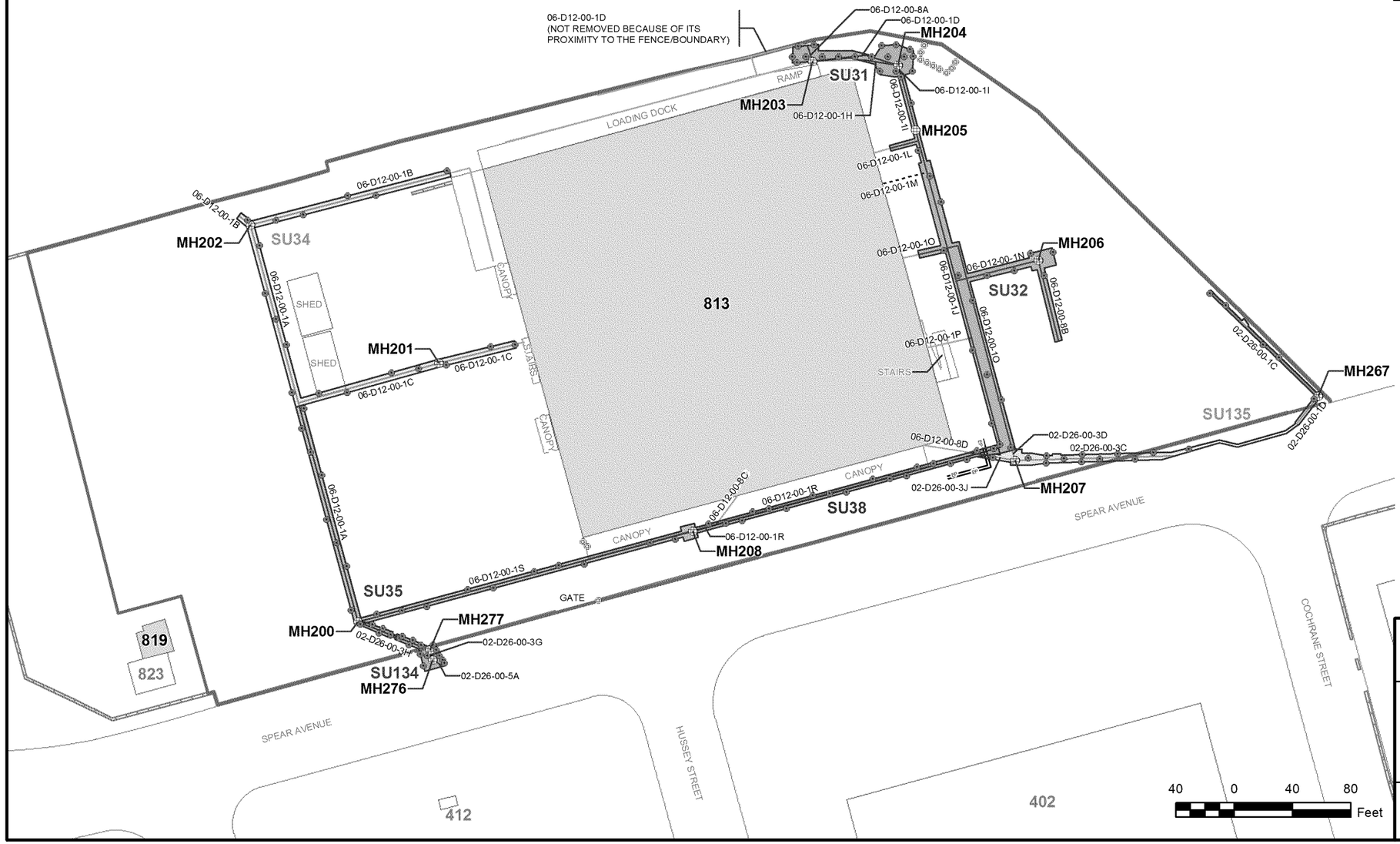
PARCEL D-2 SITE MAP

HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

REVIEW: D
AUTHOR: MS
DCN: ECSD-3211-0018-0181.R2
FILE NUMBER: 120064L7360.mxd

TETRA TECH EC, INC.





LEGEND

- FINAL STATUS SURVEY LOCATIONS
- MH200 — MANHOLE
- BOLLARD
- PIPE NOT FOUND
- PIPE PORTION NOT REMOVED (WITHIN 10 FEET OF BUILDING OR OBSTRUCTION)
- EP — EXTRANEOUS PIPE
- FENCE
- ROAD
- PARCEL D-2
- 402 — NON-IMPACTED BUILDING AND BUILDING NUMBER
- 813 — IMPACTED BUILDING THAT HAS OBTAINED REGULATORY RELEASE
- HUNTERS POINT NAVAL SHIPYARD BOUNDARY
- SU — TRENCH SURVEY UNIT
- WATER

TRENCH ID

XX-XXX-XX-XX

- SEGMENT NUMBER
- IR SITE ID, 00 IF NON-IR SITE
- WORK/BUILDING AREA
- CTO OR TO NUMBER

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT
PARCEL D-2

FIGURE 1-4

PARCEL D-2 STORM DRAIN AND SANITARY SEWER SYSTEMS
HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

REVIEW: A
AUTHOR: MS
DCN: ECSD-3211-0018-0181.R2
FILE NUMBER: 120064L7361.mxd

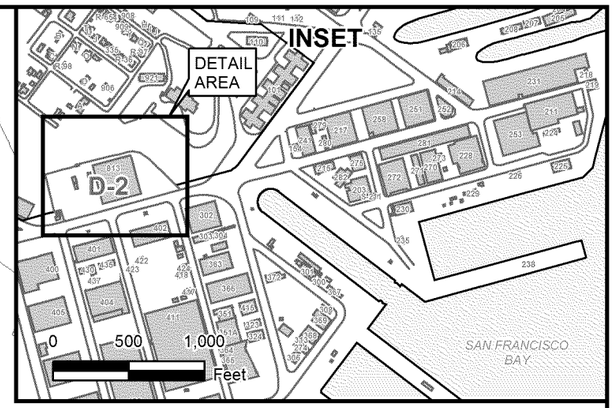
TETRA TECH EC, INC.

TRENCH ID

XX-XXX-XX-XX

- SEGMENT NUMBER
- IR SITE ID, 00 IF NON-IR SITE
- WORK/BUILDING AREA
- CTO OR TO NUMBER

SAMPLE ID → **6PBFS-035-25**
RESULT → Ra-226 = 1.9603 pCi/g



06-D12-00-1D
(NOT REMOVED BECAUSE OF ITS PROXIMITY TO THE FENCE/BOUNDARY)

06-D12-00-8A
06-D12-00-1D
MH204
SU31
RAMP
LOADING DOCK
MH203
06-D12-00-1H
06-D12-00-1I
MH205
06-D12-00-1L
06-D12-00-1M
06-D12-00-1O
MH206
SU32
06-D12-00-1N
06-D12-00-1J
06-D12-00-1P
06-D12-00-8B
06-D12-00-1Q
02-D26-00-1C
MH267
SU135
02-D26-00-1D
SPEAR AVENUE
MH207
02-D26-00-3C
02-D26-00-3D
02-D26-00-3J
06-D12-00-8D
06-D12-00-8C
06-D12-00-1R
CANOPY
SU38
MH208
06-D12-00-1B
MH202
SU34
06-D12-00-1A
SHED
SHED
CANOPY
MH201
06-D12-00-1C
STAIRS
813
SU35
06-D12-00-1S
GATE
MH200
MH277
02-D26-00-3H
02-D26-00-3G
02-D26-00-5A
SU134
MH276
819
823
SPEAR AVENUE
HUSSEY STREET
COCHRANE STREET
402

6PBFS-035-31
Ra-226 = 2.3613 pCi/g

6PBFS-035-27
Ra-226 = 1.9287 pCi/g

6PBFS-035-25
Ra-226 = 1.9603 pCi/g

6PBFS-035-19
Ra-226 = 2.6939 pCi/g

6PBFS-035-104
Ra-226 = 1.6098/1.613 pCi/g

6PBFS-035-105
Ra-226 = 1.9478/2.3629 pCi/g

6PBFS-035-09
Ra-226 = 1.7825 pCi/g

6PBFS-035-36
Ra-226 = 3.1843 pCi/g

6PBFS-035-38
Ra-226 = 2.2601 pCi/g

6PBFS-035-46
Ra-226 = 1.5705 pCi/g

6PBFS-035-115
Ra-226 = 1.6713 pCi/g

6PBFS-035-116
Ra-226 = 1.7142 pCi/g

6PBFS-035-111
Ra-226 = 1.8968 pCi/g

6PBFS-035-107
Ra-226 = 2.6695 pCi/g

6PBFS-035-12
Ra-226 = 1.9664 pCi/g

6PBFS-035-117
Ra-226 = 3.1948 pCi/g

02-UCT-135-04
Ra-226 = 1.9498 pCi/g

02-UCT-135-30DUP
Ra-226 = 1.9264 pCi/g

02-UCT-135-30
Ra-226 = 1.7048 pCi/g

02-UCT-135-36
Ra-226 = 1.6334 pCi/g

02-UCT-135-10
Ra-226 = 1.8458 pCi/g

02-UCT-135-35
Ra-226 = 1.7227 pCi/g

02-UCT-135-07
Ra-226 = 1.7867 pCi/g

02-UCT-135-31
Ra-226 = 1.4899 pCi/g

02-UCT-135-45
Ra-226 = 1.6287 pCi/g

LEGEND

- ELEVATED ACTIVITY SAMPLE LOCATIONS PRIOR TO REMEDIATION
- MH200 — MANHOLE
- BOLLARD
- PIPE NOT FOUND
- PIPE PORTION NOT REMOVED (WITHIN 10 FEET OF BUILDING OR OBSTRUCTION)
- EP — EXTRANEOUS PIPE
- FENCE
- ROAD
- PARCEL D-2
- 402 — NON-IMPACTED BUILDING AND BUILDING NUMBER
- 813 — IMPACTED BUILDING THAT HAS OBTAINED REGULATORY RELEASE
- HUNTERS POINT NAVAL SHIPYARD BOUNDARY
- SU — TRENCH SURVEY UNIT
- WATER

NOTES:
pCi/g - picocuries per gram
Ra-226 - radium-226

40 0 40 80 Feet

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL REMOVAL ACTION COMPLETION REPORT
PARCEL D-2

FIGURE 1-5

PARCEL D-2 ELEVATED ACTIVITY SAMPLE LOCATIONS PRIOR TO REMEDIATION

HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

REVIEW: B
AUTHOR: GFG
DCN: ECSD-3211-0018-0181.R2
FILE NUMBER: 120064A7362.mxd

TETRA TECH EC, INC.

APPENDIX A

BUILDING 813 FINAL STATUS SURVEY

(Provided on CD only)

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DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
1455 FRAZEE RD, SUITE 900
SAN DIEGO, CA 92108-4310

5090
Ser BPMOW.dcj/0341
MAR 19 2008

Mr. Mark Ripperda (SFD 8-1)
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Ms. Vandana Kohli
California Department of Public Health
601 N. 7th St., MS 396
PO Box 942732
Sacramento, CA 94234-7320

Dear BCT Members:

Enclosed please find Final, Final Status Survey Building 813, Revision 1, Hunters Point Shipyard, San Francisco, California. This revision was prepared in response to comments received from California Department Toxics Substance Control and California Department of Public Health (CDPH), dated February 8, 2008. The main text of this document has been revised and printed for distribution based on conversations and correspondence with CDPH. Appendix C has also been updated to reflect these clarification points. All appendices are included on CD.

The Navy respectfully requests that the California Department of Public Health provide approval for unrestricted/free release of Building 813 **no later than Monday, April 7, 2008**, or provide written justification for not doing so.

If you have questions regarding this request and the enclosed documents, please contact Mr. Dane Jensen at (619) 532-0789, or Mr. Keith Forman at (619) 532-0913.

Sincerely,

for KEITH FORMAN
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Final, Final Status Survey Results Building 813 Site, Revision 1, Hunters Point Shipyard, San Francisco, California, March 2008.

5090
Ser BPMOW.dcj/0341
MAR 19 2008

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Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0006

FINAL

FINAL STATUS SURVEY RESULTS

Revision 1

March 21, 2008

DCN: ECSD-2201-0006-0017.R1

BUILDING 813
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

ED_000855_00003297-00092

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0006

FINAL

FINAL STATUS SURVEY RESULTS
March 21, 2008

BUILDING 813
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

DCN: ECSD-2201-0006-0017.R1

Prepared by:

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Brian Henderson
Technical Lead

Bill Dougherty
Project Manager

Daryl DeLong
Radiation Safety Officer

Laurie Lowman
Radiological Affairs Support Office

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EXECUTIVE SUMMARY

Building 813 is a vacant four-story building at Hunters Point Shipyard located in San Francisco, California. The building was used as general warehouse and offices by the Supply Department. Additionally, the building housed the Disaster Control Center. Radioactive material in the form of check sources for the Center's radiation survey equipment was used and stored on the first floor of the building. Historical documents indicate that a leaking sealed radioactive check source was discovered by Center personnel. Therefore, a scoping survey of the first floor was conducted to determine the radiological status of Building 813 and to support the release of the building for unrestricted use.

Building 813 is a large, 262-by-262-foot, four-story reinforced concrete, flat-roofed supply warehouse with banks of industrial steel sash in horizontal bands across all four stories, except at the front of the first floor on the south end of the building. The front has a bank of steel roll-up industrial doors extending the length of a concrete loading dock area sheltered by a concrete canopy.

Historical documents indicate the leaking source was 300 microcuries of strontium-90, which was discovered to be leaking during routine swipes of the check sources. The historical documentation does not indicate if the leaking source contaminated the DCC work spaces. The leaking source was turned into the waste disposal facility, Building 146. Additionally, during a walkthrough of Building 813, a cabinet with a radioactive materials placard was found on the first floor. There was no indication of what types of radioactive materials may have been stored in the cabinet. No other physical indications of the presence of radioactive materials were found in any location in Building 813.

Not only the identification of strontium-90, but also cesium-137 and radium-226 were included as radionuclides of concern for the scoping survey of Building 813. These radionuclides of concern were chosen as they were commonly used throughout Hunters Point Shipyard, and with strontium-90, will cover alpha, beta, and gamma radiation.

After reviewing the applicable plans of Building 813, Building 258 was selected as the appropriate reference area. Building 258 is listed as non-impacted in the Historical Radiological Assessment, is made of similar building materials, and was constructed in the same era as Building 813.

In summer 2006, New World Technology, Inc., a radiological services subcontractor to Tetra Tech EC, Inc., performed a scoping survey to determine if contamination exists on the first floor of Building 813. While not initially designated as a Final Status Survey, the scoping survey was designed so it could be used as a Final Status Survey, in accordance with the *Multi-Agency*

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Radiation Survey and Site Investigation Manual (NUREG-1575; Department of Defense et al., 2000), if no contamination was found. To perform the survey, Building 813 was divided into 18 Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. The floors and walls less than or equal to two meters above the respective floor areas around the previous location of the Disaster Control Center were divided into Class 1 survey units. Areas that surrounded the Class 1 survey units were divided into Class 2 survey units. The Class 3 survey unit encompassed the remaining portions of the first floor outward of the Class 2 survey units.

Survey methods included fixed static (direct) and scan surface contamination surveys for alpha and beta radiation. Static and scan measurements were performed for gamma radiation. Exposure rate measurements were performed at static reading locations. Additionally, swipe samples were obtained to evaluate the presence of loose alpha and beta-gamma radiation.

Radionuclide-specific release criteria, referred to as derived concentration guideline limits (DCGLs), were obtained using the Atomic Energy Commission Regulatory Guide 1.86 or RESRAD-Build 3.3 based on the 25-millirem-per-year total effective dose equivalent whichever was more conservative. DCGLs for Hunters Point Shipyard have been developed and are documented in the *Final Basewide Radiological Removal Action, Action Memorandum - Revision 2006* (AM [TtEC, 2006a]).

Survey results were statistically analyzed using the Wilcoxon Rank-Sum test to determine if residual radioactivity was present and to determine if conditions within the survey units met the release criteria for unrestricted use. All survey and sample results indicate that Building 819 meets the release criteria and the building can be released to unrestricted use. Dose modeling was not performed since both alpha and beta radiation net mean activity of each survey unit was less than or equal to zero. The residual dose for Building 813 is therefore assigned an administrative dose of 0.00 millirem per year.

This report details the procedures and results of the surveys performed to facilitate unrestricted release of Building 813. Appendices A and B provide survey instrumentation data and instrument calibration documentation. Appendix C presents the WRS statistics based on the Unity Rule. Appendix D presents the "Static" Gamma Measurement Statistics. Appendix E shows the survey results, including swipe analysis, and Appendix H provides the Project Work Plan that Building 813 survey work was performed under. Appendix J presents the regulatory comments, and Navy responses to the *Draft, Final Status Survey Plan and Results, Building 813* (TtEC, 2006b) received as of July 1st, 2007.

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ABBREVIATIONS AND ACRONYMS

μCi	microcurie
α	alpha
β	beta
γ	gamma
AEC	Atomic Energy Commission
ALARA	as low as reasonably achievable
AM	Action Memorandum
cm	centimeter
cm^2	square centimeter
cm/s	centimeter per second
cpm	count per minute
^{137}Cs	cesium-137
DCC	Disaster Control Center
DCGL	derived concentration guideline level
DoD	Department of Defense
DON	Department of the Navy
dpm	disintegration per minute
DQO	data quality objective
FSS	Final Status Survey
G-RAM	general radioactive material
HPS	Hunters Point Shipyard
HRA	Historical Radiological Assessment
ISO	International Organization for Standardization
keV	kilo-electron volt
LBGR	lower boundary of the gray region
m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
MeV	mega-electron volt

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ABBREVIATIONS AND ACRONYMS
(Continued)

min	minute
mrem/y	millirem per year
NaI	sodium iodide
NAVSEA	Naval Sea Systems Command
NIST	National Institute of Standards and Technology
NWT	New World Technology, Inc.
NRC	Nuclear Regulatory Commission
^{226}Ra	radium-226
ROC	radionuclide of concern
SFRA	San Francisco Redevelopment Agency
^{90}Sr	strontium-90
TEDE	total effective dose equivalent
TtEC	Tetra Tech EC, Inc.
TtEMI	Tetra Tech EM, Inc.
TtFW	Tetra Tech FW, Inc.
WRS	Wilcoxon Rank-Sum

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1.0 SITE DESCRIPTION

1.1 SITE LOCATION AND DESCRIPTION

Building 813 is a 262-by-262-foot, four-story reinforced concrete, flat-roofed warehouse that includes banks of industrial steel sash in horizontal bands across all four stories, except at the front of the first floor on the south end of the building. The front has a bank of steel roll-up industrial doors extending the length of the concrete loading dock area sheltered by a concrete canopy.

Figure 1-1 provides a map of the site location.

1.2 PRIOR HISTORICAL USE

The Historical Radiological Assessment (HRA), Volume II (Naval Sea Systems Command [NAVSEA], 2004), states that Building 813 was previously used for the following purposes:

- General warehouse and offices
- Supply storehouse
- Disaster Control Center (DCC)

Historically, a leaking 300 microcurie (μCi) strontium-90 (^{90}Sr) check source was found in the disaster control inventory, and the DCC was located inside of Building 813. While conducting a walkthrough of the building, a cabinet was identified bearing a radioactive materials placard. Since the origin of the cabinet is unknown, additional radioisotopes may be present in the building. The most prevalent isotopes that have been encountered at HPS have been cesium-137 (^{137}Cs) and radium-226 (^{226}Ra).

1.3 CURRENT AND FUTURE BUILDING OR LAND USE

Building 813 is currently vacant and unoccupied. The planned future use identified in the San Francisco Redevelopment Agency (SFRA) Reuse Plan (SFRA, 1997) is as a "mixed use" area, which may include residential areas.

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FIGURE 1-1

BUILDING 813 AND REFERENCE AREA LOCATIONS

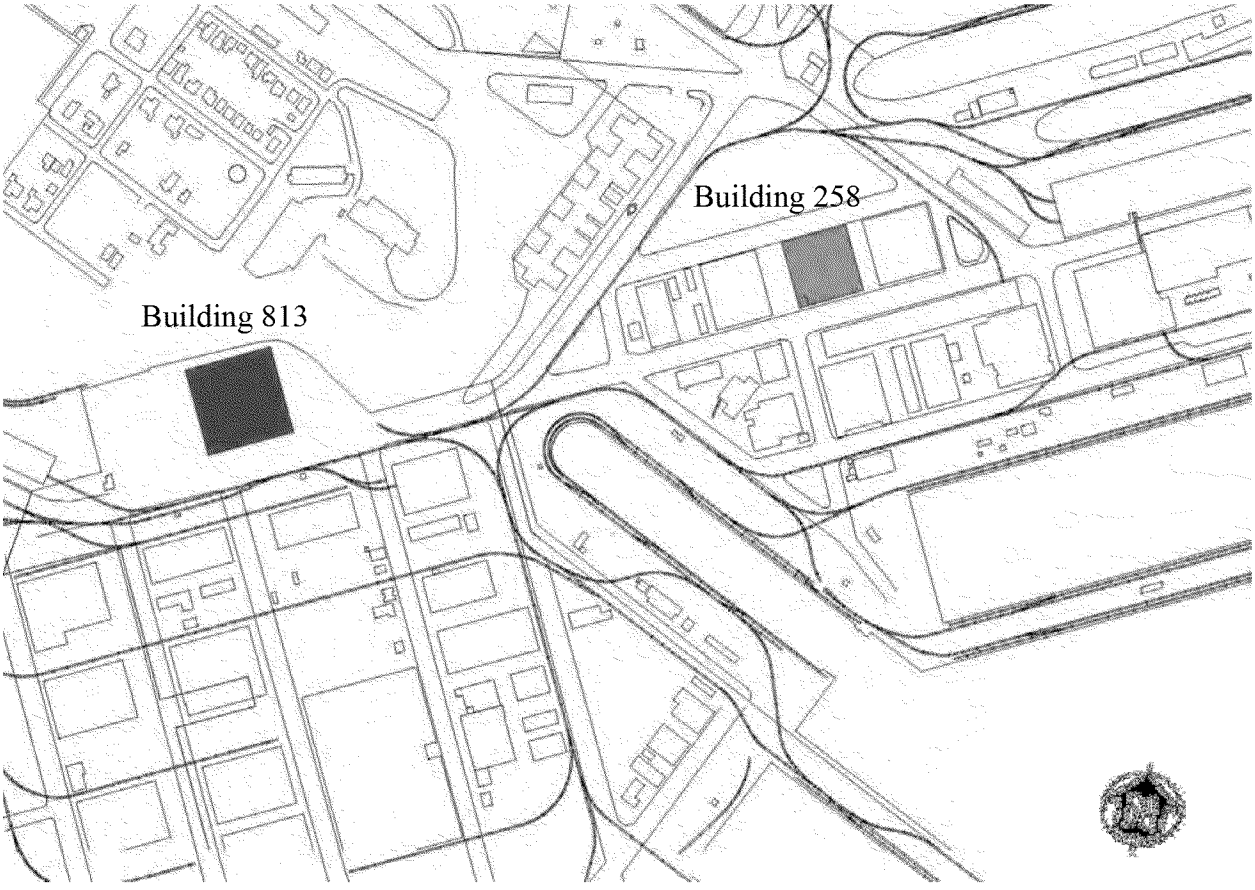

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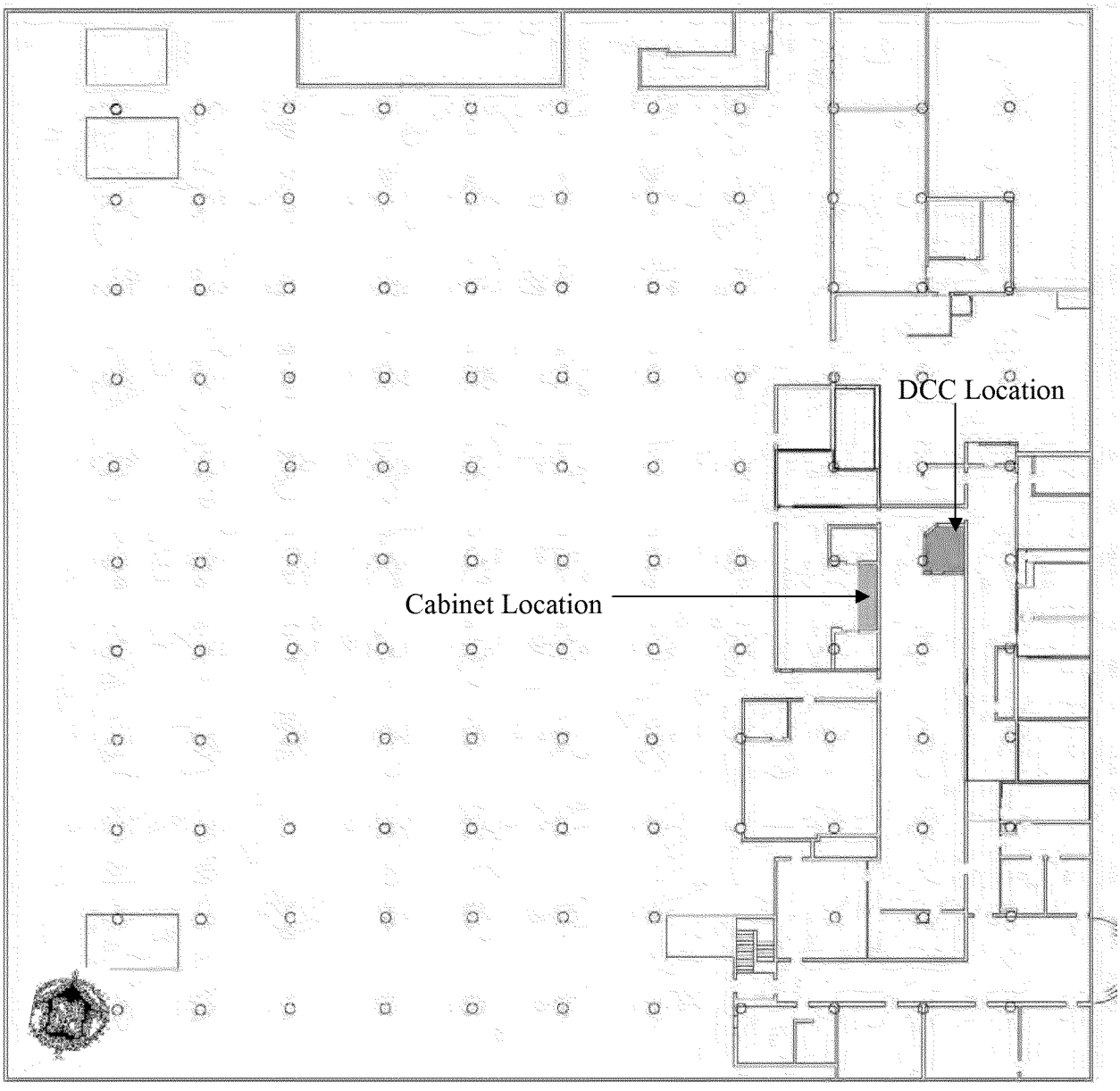
FIGURE 1-2

BUILDING 813 FIRST-FLOOR PLAN



1.4 REPORT OBJECTIVES

This report details the procedures and results of scoping surveys performed in Building 813. These survey results will show that the residual dose to the critical group is less than the required 25 millirems per year, thereby substantiating the recommended radiological release of Building 813 for unrestricted use. Appendices A and B provide survey instrumentation data and

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instrument calibration documentation. Appendices C through F present field measurement and swipe data. Appendix F contains the *Final, Task-specific Plan for the Building 813 Characterization Survey* (Tetra Tech FW, Inc. [TtFW], 2005a) along with all approved Field Change Requests, and Appendix G presents the Navy's Response to Comments from the Draft Final version of this report.

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2.0 HISTORICAL SITE ASSESSMENT

2.1 OPERATING HISTORY

References from the HRA indicate that the shipyard performed a survey of the building during closure in 1974 and found no contamination. However, these references from the HRA (NAVSEA, 2004) indicated that the potential for radioactive contamination was present in Building 813 due to a leaking check source associated with the DCC located on the first floor.

2.2 MARSSIM CLASSIFICATION

Scoping surveys were conducted as directed by the HRA (using guidance regarding the performance of scoping surveys presented in Multi-Agency Radiation Survey and Site Investigation Manual [MARSSIM]) and consisted of judgment measurements based on the HRA data and professional experience. Sufficient information was collected to identify situations that would have required immediate radiological attention or to support development of other project activities.

The primary objectives of scoping surveys were to:

- Perform a preliminary contamination assessment
- Assess general levels and extent of radionuclide contamination, if found
- Evaluate whether the survey can be optimized for use as a characterization survey or final status survey (FSS)

To perform the scoping survey in a manner optimized for use as a possible FSS, the first floor of Building 813 was divided into 18 Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. The floors and walls less than or equal to two meters above the respective floor areas around the previous location of the DCC were divided into Class 1 survey units. Areas that surrounded the Class 1 survey units were divided into Class 2 survey units. The Class 3 survey unit encompassed the remaining portions of the first floor outward of the Class 2 survey units. The total surface area of the Class 1 survey units (including walls) is approximately 472.01 square meters (m^2). The total surface area of the Class 2 survey units (including walls) is approximately 1,101.59 m^2, and the total area of the Class 3 survey unit is 4,716.45 m^2.

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2.3 RADIONUCLIDES OF CONCERN AND RADIATION CHARACTERISTICS

As identified in the HRA (NAVSEA, 2004), the isotope of concern at Building 813 is ^{90}Sr. Additionally, during a walkthrough of Building 813, a cabinet with a radioactive materials placard was found on the first floor. There was no indication of what types of radioactive materials may have been stored in the cabinet. No other physical indications of the presence of radioactive materials were found in any location in Building 813. Because of this cabinet, additional isotopes were added by the Department of the Navy (DON), typical of other radiologically-impacted buildings and areas at HPS. These additional radioisotopes are to be ^{137}Cs and ^{226}Ra. Table 2-1 lists those radionuclides of concern with the half-lives and principle types of radiation (alpha, beta, and gamma).

TABLE 2-1

RADIONUCLIDES OF CONCERN

Radioisotope	Half-life	Radiations
Radium-226	1,600 years	Alpha (α)/gamma (γ)
Strontium-90	28.6 years	Beta (β^-)
Cesium-137	30 years	Beta/gamma (β^-,γ)

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3.0 RELEASE CRITERIA

3.1 UNRESTRICTED RELEASE CRITERIA

The Nuclear Regulatory Commission release limit for unrestricted use was applied in assessing the results of the survey of Building 813. Results were analyzed to determine if the residual radioactivity, distinguishable from background radiation, resulted in a total effective dose equivalent (TEDE) to an average member of the critical (screening) group exceeding 25 millirem per year (mrem/y), and if the residual radioactivity has been reduced to levels that were as low as reasonably achievable (ALARA). This radiological release process assures that residual radioactivity will not result in individuals being exposed to unacceptable levels of radiation or radioactive materials.

Dose levels for the critical group were derived by analyzing residual levels of radioactive materials using default decontamination and decommissioning scenarios in RESRAD Build Version 3.3 software which analyzes the various pathways and scenarios (direct radiation, inhalation, ingestion, etc.) through which exposures could occur. The results of this analysis are provided in Section 10.

The dose model for the critical group was based on default decontamination and decommissioning scenario "Building Occupancy" designed by RESRAD Build Version 3.3 software. The default "Building Occupancy" scenario includes external, ingestion, and inhalation exposure pathways. For all contaminants, a non-distributed total effective dose equivalent scenario was selected for the most conservative approach. For all parameters, the most conservative scenarios were selected and it assumes that persons living in the building will be exposed without building-use restrictions.

3.2 DERIVED CONCENTRATION GUIDELINES

The radionuclide-specific release criteria, referred to as DCGLs, used for the FSS are equivalent to the ROC release criteria established in the *Final Basewide Radiological Removal Action, Action Memorandum* (*AM*) - *Revision 2006* (Tetra Tech EM, Inc. [TtEMI], 2006). The DCGLs are presented in terms of surface or mass activity concentrations and refer to average levels of radiation or radioactivity above background levels. The DCGLs applicable to Building 813 and equipment surfaces are expressed in disintegration per minute (dpm) per 100 square centimeters (cm^2).

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3.2.1 DCGL Modeling

Radionuclide-specific release criteria, referred to as DCGLs, were obtained from the AM and were then modeled using RESRAD-Build Version 3.3 based on the 25 mrem/y TEDE or were otherwise risk-based; the final doses on risk-based release criterion for HPS are all less than this 25mrem/y release criterion. The model for the critical group was based on default RESRAD-Build Version 3.3 building occupancy parameters. The default scenario includes the following exposure pathways: external, inhalation, deposition, immersion, and ingestion. This model shows that with all the DCGLs combined, the dose to the average member of the critical group would be 18.497 mrem/y. However, since direct measurement of ^{137}Cs was not performed, using the lower total limit for ^{90}Sr, this maximum possible dose is only 1.297 mrem/y.

3.2.2 $DCGL_W$

The $DCGL_W$ for each radionuclide of concern is presented in Table 3-1.

TABLE 3-1

RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN

Radioisotope	Structures Total Surface Activity (dpm/100 cm^2)	Structures Removable Surface Activity (dpm/100 cm^2)
Radium-226	100	20
Strontium-90	1,000	200
Cesium-137	5,000	1,000

Notes:

cm^2 – square centimeter
dpm – disintegration per minute

3.3 ALARA ANALYSIS

Based on the model described in Section 3.2.1, modeling the release criteria for each ROC results in a net dose of 0.612, 0.685, and 1.72 mrem/y for ^{226}Ra ^{90}Sr, and ^{137}Cs, which is considered ALARA.

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3.4 DIRECT APPLICATION OF DCGLS

In the simplest case, the DCGLs may be applied directly to survey data to demonstrate compliance. This involves assessing the surface activity levels and comparing measured values to the appropriate DCGL.

3.5 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a quality control check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may indicate that the survey unit was improperly classified or may indicate a failing instrument.

When determiningan investigationlevel using a statistical-based parameter (e.g., standard deviation), the following may be considered: survey objectives, underlying radionuclide distributions (e.g., normal, log normal, non-parametric), data population descriptors (e.g., standard deviation, mean, median), and prior survey and historical information.

If an investigation level was exceeded, the measurement would have been confirmed to ensure that the initial measurement/sample actually exceeded the particular investigation level. This would have involved taking further measurements to confirm the initial result, and as appropriate, to quantify the area of elevated residual radioactivity.

3.5.1 Investigation Levels for Alpha and Beta Radiation Surveys

For alpha and beta surveys, the investigation levels were 100 dpm/100 cm^2 and 1,000 dpm/100 cm^2, respectively. These levels are set at the same values as their DCGL.

The alpha and beta loose surface investigation levels were 20 percent of the values for total activity. These levels are set at the same values as their DCGL.

3.5.2 Investigation Levels for Gamma Radiation Surveys

For gamma surveys, the investigation level was established at the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area. It should be noted that there are currently no established release criteria for building interior surfaces based on gamma radiation readings alone (since ^{137}Cs is also detectable by beta emission). Gamma surveys of building interior surfaces were performed as an added measure to help detect any anomalies, such as gamma-emitting sources that may not emit alpha or beta radiation.

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4.0 SURVEY DESIGN

4.1 OBJECTIVE OF SURVEYS

MARSSIM (NUREG-1575; Department of Defense [DoD] et al., 2000), NUREG-1505 (NRC, 1998), and NUREG/CR-1507 (NRC, 1997) were used as guidance in designing and conducting the surveys referenced in this report. The survey was also performed consistently with the requirements outlined in the *Final Base-Wide Radiological Work Plan* (Base-Wide Plan) [Tetra Tech FW, Inc. (TtFW), 2005].

The objective of the surveys contained in this report is to demonstrate that residual radioactivity levels are less than the predetermined release criteria for the radionuclides of concern. In demonstrating that the objective has been met, the null hypothesis (H_o) is tested for residual contamination exceeding the release criterion. The alternative hypothesis (H_a) is then tested for residual contamination that meets the release criterion.

4.2 SURVEY UNITS

The first floor of Building 813 was divided into 18 Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. Class 1 survey units consisted of floor areas less than 100 m^2, while Class 2 survey units had floor areas less than 1,000 m^2. The Class 3 survey unit encompassed the remaining portions of the first floor. Walls above two meters and the ceiling were not included in the survey units. Using a different random start point in each survey unit, systematic data collection locations (N) were laid out in a square grid pattern within each survey units. Visual Sample Plan software, in conjunction with computer-assisted draft drawings, was used to determine the survey unit grid parameters and specific data collection locations. In some cases, the number of data collection locations differed from N; however, the minimum number of samples required was always taken in each survey unit; primarily because the value of N was not always divisible by the exact number of columns and rows associated with the square grid pattern for a given survey unit. This was particularly true when N was a prime number or not divisible by three and four.

Figure 4-1 shows the locations of Class 1 survey units only. Figure 4-2 shows the locations on the first floor of Building 813 Class 2 and Class 3 survey units; the area that is not shaded in Figure 4-2 is the location of the Class 1 survey units. SU18 was modified to change it into SU21 (a hallway) and SU22 (a closet) since different construction materials were used. The SU18 nomenclature was not reused to prevent any possible confusion during analysis of field data. Circles on each figure indicate the approximate locations of columns inside the building. Visual Sample Plan (VSP) software was used to obtain the systematic sampling locations for each survey unit. Since the random start location was not determined from a table of values and hand-

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calculated when using the random seed generation function in VSP, the random start location is not shown. Asterisks on each map indicate the systematic sampling locations. The locations of wall survey locations can be seen in Appendix E.

FIGURE 4-1

FIRST-FLOOR OFFICES, FLOORS, AND LOWER WALLS – CLASS 1

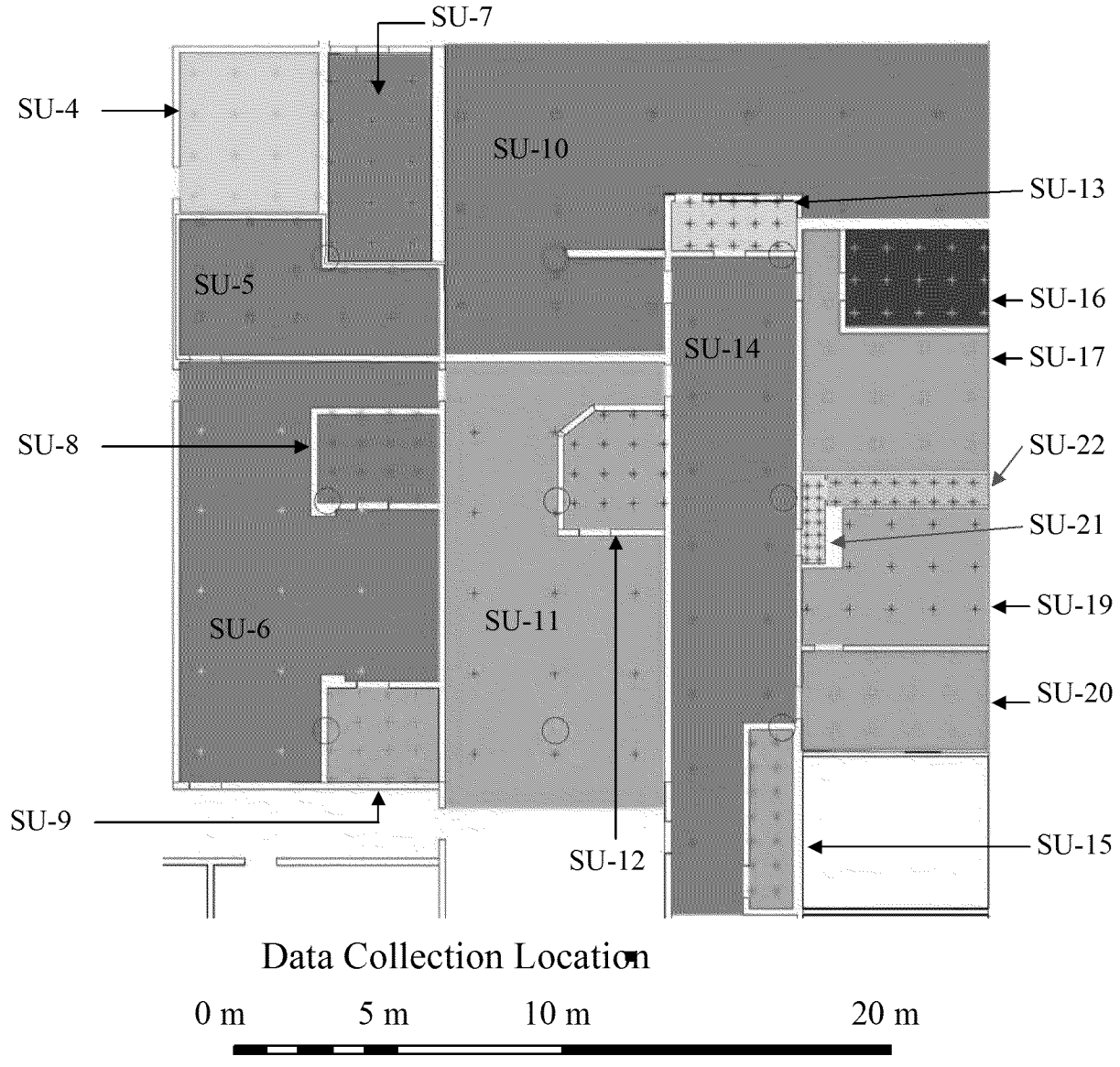

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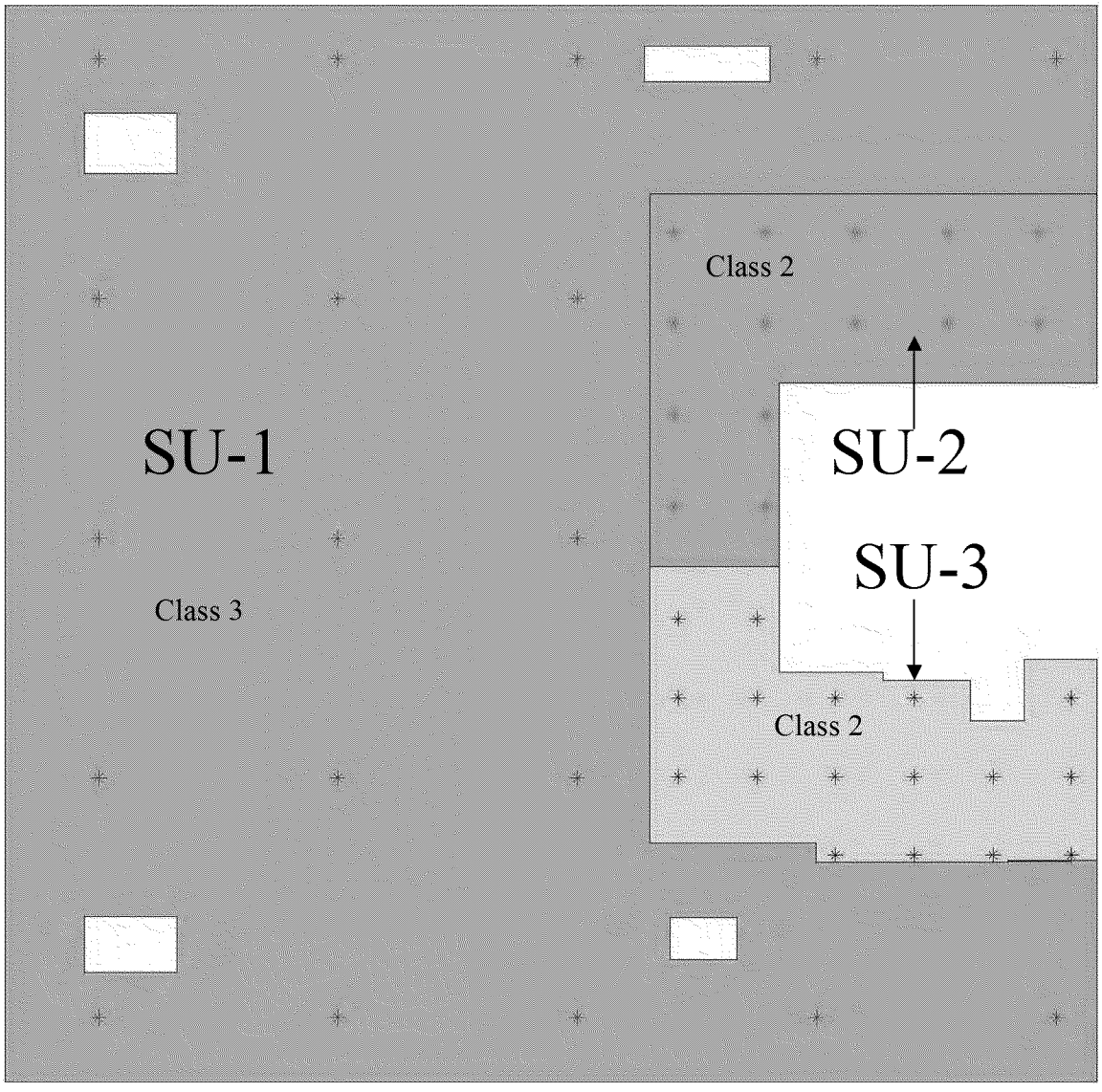
FIGURE 4-2

FIRST-FLOOR WAREHOUSE BAY – CLASS 2 AND CLASS 3



4.3 REFERENCE AREAS

Building 258 was used as the reference area because its surroundings, material composition, and overall characteristics are similar to those present at Building 813 and it has no radiological history during its use as a pipefitter shop. Building 258 is located in Parcel C.

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4.4 STATISTICAL TESTS

MARSSIM (NUREG-1575; DoD et al., 2000) recommends use, in part, of the Wilcoxon Rank-Sum (WRS) test to conservatively evaluate field results. The WRS test is a two-sample, non-parametric procedure that can be used to evaluate compliance when contamination is present in background. The WRS test can be used to compare means between samples (contamination concentration measured in reference background materials vs. the same parameter measured in site investigative materials) when either or both sampling distributions deviate significantly from normal.

During the collection of associated data, a verification and validation process was incorporated to evaluate whether the data met the objectives of the survey and whether the data were sufficient to determine compliance. Data collected from each survey unit were independently subjected to the following reviews:

1) Collected data were compared with the prescribed activities documented according to the applicable Standard Operating Procedures for HPS.
2) Collected data were compared to the data quality objectives (DQOs) documented in the *Final, Task-specific Plan for the Building 813 Characterization Survey, Hunters Point Shipyard, San Francisco, California* (TtFW, 2005a) as seen in Appendix G.
3) A supervisor, not directly involved in the data collection process, independently conducted an independent technical review of the information at the end of each surveillance step.

This process ensured the validity of collected data, the measurement techniques used, and consistency in surveillance data collection.

4.5 DETERMINING THE NUMBER OF MEASUREMENTS AND/OR SAMPLES

Since radionuclide-specific measurements were not performed, N was calculated in the manner specified for the WRS test (Equation 5-1, Base-Wide Plan).

Equation 5-1 from the Base-Wide Plan

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

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Where:

$Z_{1-\alpha}$	=	Type I decision error level as determined from MARSSIM
$Z_{1-\beta}$	=	Type II decision error level as determined from MARSSIM
P_r	=	Random measurement probability, which is based on relative shift discussed in Section 4.5.1
1.2	=	factor for over-sampling to account for missing or unusable data

The second term in the equation increases the number of data points by 20 percent. The value of 20 percent was selected to account for a reasonable amount of uncertainty in the parameters used to calculate *N* and still allow flexibility to account for some lost or unusable data. While this 20 percent factor assists in meeting all Data Quality Objectives, it is not required during the Data Quality Assessment to demonstrate compliance with the stated objectives of the statistical tests.

P_r in Equation 1 above is based on the relative shift. The relative shift is equal to Δ/σ, where Δ is equal to [DCGL-lower boundary of the gray region (LBGR)] and σ is an estimate of the standard deviation of the measured values in a survey unit.

4.5.1 LBGR Determination

The LBGR is the net median concentration of the contaminant in the survey unit. Since this value is unknown, MARSSIM (NUREG-1575; DoD et al., 2000) suggests using a value for the LBGR of ½ DCGL during planning purposes. However, once the median concentration activity in the survey unit was established (as expressed in a gross alpha and gross beta measurement) this value was used as a ratio to the lowest DCGL for the decay method to determine the LBGR. Equation 4-1, taken from MARSSIM, gives the method used to determine the LBGR:

Equation 4-1

$$weighted - sum = \frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \frac{C_2}{DCGL_2} + \ldots + \frac{C_i}{DCGL_i}$$

Where:

C_i	=	*Concentration of Radionuclide "i"*
$DCGL_i$	=	*DCGL of Radionuclide "i"*

In the case of Survey Unit 4 the net median concentration of both the alpha and beta was less than zero, thereby setting the LBGR at zero.

4.5.2 Standard Deviation

Likewise, there is no estimate of the standard deviation of the contaminant in the survey unit, especially if no contaminant is initially expected. Therefore, σ is assigned the value of the

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standard deviation of the adjusted measurement values in the survey unit as shown in Equation 4-2 from Section 6.2.3 of *Decommissioning Health Physics* [Abelquist (2001)], whichever is higher; these data are provided in the corresponding WRS test data.

Equation 4-2

$$\sigma = \sqrt{\left(\frac{\sigma_{C1}}{DCGL_1}\right)^2 + \left(\frac{\sigma_{C2}}{DCGL_2}\right)^2 + \ldots + \left(\frac{\sigma_{Ci}}{DCGL_i}\right)^2}$$

Where:

σ_{Ci} = *Standard Deviation from Radionuclide "i"*

$DCGL_i$ = *DCGL of Radionuclide "i"*

As an example, from Survey Unit 4, the alpha measurement standard deviation observed was 7.8 dpm/100cm^2, while the beta measurement standard deviation observed was 406.05 dpm/100cm^2. When using the DCGLs specified in Table 3-1 for ^{226}Ra and ^{90}Sr (the most restrictive DCGL for a beta-emitting radionuclide), the standard deviation of the survey unit can be determined as shown below:

$$\sigma = \sqrt{\left(\frac{7.8 dpm/100cm^2}{100 dpm/100cm^2}\right)^2 + \left(\frac{225.2 dpm/100cm^2}{1{,}000 dpm/100cm^2}\right)^2} = 0.238325$$

4.5.3 Relative Shift

The relative shift is equal to Δ/σ, where Δ is equal to [DCGL-LBGR] and σ is an estimate of the standard deviation of the measured values in a survey unit.

The relative shift from Survey Unit 4 can be calculated as shown below in Equation 4-3:

Equation 4-3

$$\frac{\Delta}{\sigma} = \frac{DCGL_W - LBGR}{\sigma} = \frac{1-0}{0.238325} = 4.19$$

Using this Δ/σ value of 2.42, P_r was determined to be 0.944167.

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4.5.4 Unity Rule

As stated in Section 4.3.3 and Appendix I.11 of MARSSIM, the unity rule was used since multiple radionuclides (with different decay methods) were present. As stated in Appendix I.11.1, the DCGL is set at 1.0 (the total fraction of all radionuclides might exceed the 25 mrem/y as stated in the AM).

Therefore *N* is calculated using Equation 5-1 from the Base-Wide Plan as follows:

Where:

Type I decision error level: 1.645
Type II decision error level: 1.645
Random measurement probability: 0.944167

$$15 = \frac{(1.645 + 1.645)^2}{3(0.997658 - 0.5)^2}$$

N for surveys is calculated as a minimum of 18 total data collection locations. This would equate to 9 from each survey unit and 9 from the reference area, for a total of 18.

For the surveys of Building 813, *N* was estimated using preliminary survey data to be a minimum of 32 total data collection locations, 16 from each survey unit and 16 from the reference area. The change in *N* is due to the use of the actual standard deviation from the survey unit. In some instances, the number of samples actually collected exceeded the number of samples required. Further, due to specific survey unit dimensions, additional samples were collected. These additional systematic samples only help to further increase the power of the statistical tests.

While not initially designated as an FSS, the survey was designed so that if no radioactive contamination was found above established DCGLs, this survey could be used as an FSS, in accordance with MARSSIM (NUREG-1575; DoD et al., 2000). To maintain the potential for FSS, data were continuously analyzed to determine the relationship between each survey unit and the reference area.

4.5.5 Determining Areas of Elevated Activity

According to MARSSIM (NUREG-1575, 2000), systematic measurements and sampling, in conjunction with surface scanning, are used to obtain adequate assurance that small areas of elevated radioactivity will still satisfy the release criterion for small areas.

The $DCGL_W$ is the average concentration across the site that is equivalent to the release criteria, based on dose or risk. The general assumption is that the concentrations of the radionuclides in

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the source are homogenous. The degree to which any single localized area can be elevated above the average, assuming the average is at the $DCGL_W$, and not invalidate the homogenous assumption is characterized by the small area criteria ($DCGL_{EMC}$).

Values for the $DCGL_{EMC}$ are obtained by modifying the $DCGL_W$ using an area factor that accounts for the difference in area and the resulting change in dose or risk. The area factor is the magnitude by which the concentration within the small area of elevated activity can exceed the $DCGL_W$ while maintaining compliance with the release criterion. The area factor takes into consideration how a smaller area would affect the dose or risk.

The first step in the process is to asses the scan minimum detectable concentration (MDC). This process is described in Section 7.3. The next step is to determine the 'required' scan MDC. The 'required' scan MDC is the product of the $DCGL_W$ and the area factor (also known as the $DCGL_{EMC}$). This can be calculated using Equation 4-4:

Equation 4-4

$$\textit{'required' Scan MDC} = DCGL_{EMC} = (DCGL_W) \times (\textit{Area Factor})$$

The area factor is obtained from dose modeling using RESRAD or RESRAD-BUILD and is determined based on the size of the area bounded by the sample size in the survey unit. This bounded area (*a'*) is simply the survey unit area (in m^2) divided by the number of samples determined in Section 4.5.3. Equation 4-5 is used to derive at the size of the area:

Equation 4-5

$$a' = \textit{Survey Unit Area (in } m^2\textit{) / number of samples}$$

The 'actual' scan MDC is then compared to the 'required' scan MDC. If the 'actual' scan MDC is less than the 'required' scan MDC, then no additional samples are required. However, if the 'actual' scan MDC is greater than the 'required' scan MDC, an increase in the number of samples taken may be required. To determine if there is an increased sample size, the area factor is determined using Equation 4-6:

Equation 4-6

$$\textit{Area Factor} = (\textit{'actual' Scan MDC}) / (DCGL_W)$$

A table of possible area factors was determined by taking the ratio of doses established by using the most current version of RESRAD-BUILD for structures. For each radionuclide of concern, all exposure pathways were calculated assuming a concentration of radioactive contamination at the release criteria. The area of contamination in RESRAD-BUILD defaults to 36 m^2. The other areas that were compared to this value are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 16, 20, and 25 m^2.

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Removable surface contamination is assumed to be 50 percent. No other changes to exposure pathways are to be made between iterations when calculating a table of values.

The values for both alpha and beta emitters can be seen in Table 4-2:

TABLE 4-2

AREA FACTORS FOR BUILDING 813

Radium-226			Strontium-90			Cesium-137			Cesium-137 plus strontium-90		
Area (m^2)	Area Factor	Dose (mRem/yr)	Area (m^2)	Area Factor	Dose (mRem/yr)	Area (m^2)	Area Factor	Dose (mRem/yr)	Area (m^2)	Area Factor	Dose (mRem/yr)
1	26.15	0.023	1	35.49	0.019	1	11.17	0.154	1	2.70	0.893
2	13.63	0.045	2	17.84	0.038	2	6.21	0.277	2	3.20	0.753
3	9.37	0.065	3	11.89	0.058	3	4.51	0.381	3	3.16	0.762
4	7.22	0.085	4	8.93	0.077	4	3.66	0.470	4	3.11	0.775
5	5.88	0.104	5	7.15	0.096	5	3.13	0.549	5	3.26	0.740
6	5.02	0.122	6	5.96	0.115	6	2.77	0.621	6	3.04	0.793
7	4.37	0.140	7	5.11	0.134	7	2.51	0.686	7	2.87	0.839
8	3.87	0.158	8	4.48	0.153	8	2.31	0.746	8	2.74	0.880
9	3.50	0.175	9	3.98	0.172	9	2.14	0.802	9	2.63	0.917
10	3.17	0.193	10	3.59	0.191	10	2.01	0.855	10	0.25	9.510
16	2.09	0.293	16	2.25	0.305	16	1.54	1.120	16	2.01	1.200
20	1.70	0.359	20	1.80	0.381	20	1.37	1.260	20	1.83	1.320
25	1.39	0.439	25	1.44	0.476	25	1.21	1.420	25	1.65	1.460
36	1.00	0.612	36	1.00	0.685	36	1.00	1.720	36	1.00	2.410

If necessary, these area factors were then used to determine the new area bounded by 4 sample points, *a'* by logarithmically interpolating from these generated tables of possible area factors using Equation 4-7 below, and solving for *a'*:

Equation 4-7

$$\ln(a') = \frac{\ln(\frac{y}{z})\square\ln(\frac{AF_x}{AF_z})}{\ln(\frac{AF_y}{AF_z})} + \ln(z)$$

Where:

y	=	Size of Area with lower area factor than area factor determined
z	=	Size of area with higher area factor than area factor determined
AF_x	=	Area factor determined
AF_y	=	Area factor of area y
AF_z	=	Area factor of area z
a'	=	Area bounded by four sample points

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In all instances however, when performing the analysis to determine the $DCGL_{EMC}$, the number of samples taken in each survey unit satisfied the requirements (with the given scan MDC in each survey unit). Further, there were more than an adequate number of samples taken in each survey unit to ensure that any area of elevated activity would have been identified, and that the residual dose from these areas would not be greater than 25 mrem/y.

4.5.6 Example Calculation of $DCGL_{EMC}$

Using the methods described in Section 4.5.3 with data obtained from the gross alpha measurements collected for the Survey Unit 10, the following example calculations are shown for illustrative purposes.

Calculating the actual area bounded by four sample points using Equation 4-4, this area can be calculated:

$$a' = \textit{Survey Unit Area (in } m^2\textit{) / number of samples} = 98.58\ m^2/14 = 7.04143\ m^2$$

To determine the maximum "required" scan MDC, it will be necessary to use Equation 4-7 and Table 4-2, substituting 7.04143 for *a'* and solving for AF_x:

$$\ln(7.04143) = \frac{\ln(\frac{8}{7}) \square \ln(\frac{AF_x}{4.37})}{\ln(\frac{3.87}{4.37})} + \ln(7)$$

After solving, AFx was determined to be 4.3466. Using Equation 4-4, the 'required' scan MDC can be calculated:

$$\textit{'required' Scan MDC} = (100\ \text{dpm} / 100\ \text{cm}^2) \times 4.3466 = 434.66\ \text{dpm} / 100\ \text{cm}^2$$

Since the 'required' scan MDC is greater than the 'actual' Scan MDC of 73 dpm / 100 cm^2, there are no further samples required. However, for illustrative purposes, we will continue to determine under the supposition that this was not the case and the 'actual' scan MDC was at 103 dpm / 100 cm^2.

Using the "actual scan MDC" of 103 dpm / 100 cm^2 for the gross alpha emitters, the area factor needed can be determined using Equation 4-6:

$$\textit{Area Factor} = (103\ \text{dpm} / 100\ \text{cm}^2) / (100\ \text{dpm} / 100\ \text{cm}^2) = 1.03$$

Determining the appropriate area factor from this value of 1.03 using Equation 4-7 and Table 4-2 with areas of 36 meters (AF=1.0) and 25 meters (AF=1.39), solving for *a'*:

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$$\ln(a') = \frac{\ln(\frac{36}{25}) \square \ln(\frac{1.03}{1.39})}{\ln(\frac{1.0}{1.39})} + \ln(25) = \ln(3.555079)$$

Solving this natural log gives a result of 34.8408 m^2.

Basically, the maximum area that needs to be bounded by four sample points is 34.8408 m^2 for elevated measurement comparison, and the largest area that was actually bound by four sample points was 7.04143 m^2. Therefore, no additional samples are required.

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5.0 FIELD ACTIVITIES

In summer 2006, Tetra Tech EC, Inc. (TtEC) and New World Technology, Inc. (NWT) mobilized to perform activities associated with Building 813 scoping surveys, which led to the final data for the FSS. This section describes surveys that were ancilliary to the scoping survey of Building 813. The scoping survey is discussed in other sections of this report.

5.1 MOBILIZATION

Mobilization to perform scoping survey work of Building 813 began in late April 2006. The *Final, Task-specific Plan for the Building 813 Scoping Survey* (TtFW, 2005a), as seen in Appendix G, was reviewed by TtEC and NWT staff involved in the scoping survey and instrumentation and supplies were procured. Equipment used in Building 813 was surveyed upon arrival at Hunters Point Shipyard (HPS), but prior to use in Building 813 until the equipment was verified to be less than the *Regulatory Guide 1.86* limits (AEC, 1974) specified for ^{137}Cs, ^{90}Sr, and ^{226}Ra.

5.2 GRIDDING ACTIVITIES

The first floor of Building 813 was divided into 18 Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. The building was subdivided such that floor areas around the historical location of the DCC and areas less than or equal to 2 meters above the respective floor were considered Class 1 survey units. The area that surrounded the Class 1 survey units was divided into two Class 2 survey units. The Class 3 Survey Unit encompassed the remaining portions of the supply warehouse bay on the first floor.

5.3 EQUIPMENT AND MATERIAL SURVEYS

Building 813 contained floor tiles on all floor surface areas in Class 1 survey units, and over approximately 60 percent of Class 2 survey units. These tiles are discussed further in Section 5.4.

Other materials such as desks, filing cabinets, tables, and other miscellaneous office furniture in Building 813 were surveyed and released using *Regulatory Guide 1.86* limits (AEC, 1974) specified for ^{137}Cs, ^{90}Sr, and ^{226}Ra; no contamination was discovered on any of the materials surveyed.

5.4 FLOOR / GROUND SURFACES

The original flooring material consisted of asbestos tile covering approximately 60 percent of the total first-floor surface area found in Building 813 to enable the performance of the scoping survey on the original flooring materials. The tiles were removed and scanned to *Regulatory Guide 1.86* limits (AEC, 1974) specified for ^{137}Cs, ^{90}Sr, and ^{226}Ra. No contamination was found

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and the tiles were disposed of as landfill waste. No solid samples were collected from materials involved since investigation levels were not exceeded.

5.5 DRAINAGE SYSTEMS

Drain lines in Building 813 were surveyed independently of the Class 1 and Class 2 survey units. The release limits for these drainage systems are consistent with the other release criteria for surfaces in Building 813. Static gamma measurements were not available inside drain lines in Building 813 since the lines were too small for the probe to enter the line. Accessible exterior surfaces of drain lines with inaccessible internals (sink drains, capped drains, etc.) were surveyed. Scan measurements were also collected along the accessible exterior surfaces of drain lines. Swipe sample measurements were taken inside accessible portions of drain lines, and results are documented in Appendix E. No contamination was found. Materials were not present in quantities high enough to perform gamma spectroscopy analysis.

5.6 VENTILATION SYSTEMS

One hundred percent of accessible exterior surfaces of ventilation ducts received scan surveys for alpha and beta contamination. Additionally, access covers to ventilation ducts were removed and 100 percent of the interior surfaces that could be reached from the access opening received scan surveys for alpha and beta contamination. While performing the ventilation system surveys, particular emphasis was placed on collecting survey data from likely accumulation points and areas that produce elevated scan measurement results.

No contamination exceeding *Regulatory Guide 1.86* limits (AEC, 1974) was discovered. Solid samples were not collected as there was not enough material available.

5.7 SAMPLING

Swipe samples were collected from each of the specified systematic and biased locations in the survey units, from equipment and materials, and from within the ventilation systems and drainage systems. Since investigation levels were not exceeded on flooring materials, and other drainage and ventilation systems did not exceed any investigation level, additional analyses—including gamma spectroscopy—were not performed.

5.8 DEMOBILIZATION

Demobilization occurred in late August 2006. All equipment used during the survey was verified to be less than the *Regulatory Guide 1.86* (AEC, 1974) limits specified for ^{137}Cs, ^{90}Sr, and ^{226}Ra. The equipment (which included instrumentation, tools, floor tile removal equipment, and scaffolding) was then unconditionally released back to the applicable vendor for unrestricted use.

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6.0 SURVEY INSTRUMENTATION

6.1 INSTRUMENTATION SELECTION

Instruments selected were deemed suitable for the physical and environmental site conditions as detailed in the *Final Task-specific Plan for the Building 813 Scoping Survey* (TtFW, 2005a) as seen in Appendix G. The instruments and selected measurement methods used were able to detect the radionuclides of concern or radiation type of interest, and were, in relation to the survey or analytical technique, capable of measuring levels equal to or less than the DCGL.

Appendix A provides a detailed description of all survey instruments used.

6.2 INSTRUMENT CALIBRATION AND QUALITY ASSURANCE PROCEDURES

Prior to the start of and throughout the project, survey and laboratory instruments were maintained within calibration-based parameters using National Institute of Standards and Technology (NIST)-traceable standards. Survey instruments were source-checked daily, prior to and after each surveillance activity. Appendix B provides calibration certificates specific to field instrumentation used for data collection purposes and source certificates for radioactive sources used to perform instrument response checks and analysis.

6.3 INSTRUMENT OPERATIONAL CHECKS

Radiation detection instrumentation used in the scoping survey were maintained and calibrated to operate within manufacturer specifications so that the required sensitivity and precision were maintained. Specific calibration and maintenance were conducted by personnel familiar with the equipment or by manufacturers' technical representatives.

Procedures were developed for all field instrumentation to verify that the instruments were operating properly and that the data were valid with instrument calibrations that were NIST traceable (as performed by the instrument vendor). These procedures included functional operational checks, routine maintenance, calibration procedures, and operational instructions.

All of the instruments were within +/-20 percent criteria established when setting up their baseline information. Had the instrument not met the criteria, it would have been removed from service and returned to the manufacturer for maintenance.

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6.4 INSTRUMENTS FOR THE MEASUREMENT OF ALPHA AND BETA SURFACE ACTIVITY

6.4.1 Instruments for the Static Measurement of Alpha and Beta Surface Activity

Surveys for alpha and beta particulate radiation were performed using a Ludlum Model 2360 data logger, equipped with a Ludlum Model 43-68, 126-cm^2 gas-flow proportional detector. This instrument measures alpha and beta radiation levels and can record data in scaler (time-integrated count) or ratemeter (instantaneous count rate) mode. The data logger, operated in the scaler mode, recorded static measurements for alpha and beta particulate radiation by positioning the detector assembly approximately ¼ inch from the designated surveillance surface and completing a stationary 3-minute count cycle.

6.4.2 Instruments for the Scan Measurement of Alpha and Beta Surface Activity

Scan surveys for alpha and beta (particulate) radiation were performed using a Ludlum Model 2360 data logger equipped with a Ludlum Model 43-37 582-cm^2 gas-flow proportional detector. The instrument measures alpha and beta radiation levels and can record data in scaler (time-integrated count) or ratemeter (instantaneous count rate) mode. The detector position was adjusted so that the detector window was approximately ¼ inch from the surveillance surface. The surveyor moved the detector at a scan speed of approximately one centimeter per second (cm/s) for alpha and beta scans while maintaining audio and visual observation of the instrument response.

6.4.3 Determination of Instrument Efficiency for Alpha and Beta Surface Activity Measurements

Instrument efficiency (ε_i), defined as the ratio between the net count rate (in counts per minute [cpm]) of the instrument and the surface emission rate of the calibration source for a specified geometry, was determined during calibration by the instrument vendor. The surface emission rate is the 2π particle fluence that is affected by both the attenuation and backscatter of the radiation emitted from the calibration source. Equation 7-1 from the Base-Wide Radiological Work Plan (TtFW, 2005b) was used to determine alpha/beta instrument efficiencies for surveillance activities described within this report.

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Equation 7-1 from the Base-Wide Plan

$$\varepsilon_i = \frac{R_{S+B} - R_B}{q_{2\pi}\left[W_A / S_A\right]}$$

Where:

R_{S+B} = the gross count rate of the calibration measurement (cpm)
R_B = the background count rate in cpm
$q_{2\pi}$ = surface emission rate of the calibration source (NIST-traceable)
W_A = Active area of the detector window (cm^2)
S_A = Area of the source (cm^2)

Note: This equation assumes that the dimensions of the calibration source are sufficient to cover the window of the instrument detector. If the dimensions of the calibration source are smaller than the detector's window, W_A is set equal to the dimensions of the calibration source (the quotient of W_A and S_A is set equal to 1).

Instrument efficiency was determined during calibration by obtaining static counts from an attached detector. The detector was positioned over a calibration source that features a NIST-traceable surface emission rate. The 2π particle fluence rate was corrected for decay. The surface emission rate of the source was then corrected for the area subtended by the probe. Additional considerations, supportive of reliable instrument efficiencies, include the following:

- Calibration Sources: Selected calibration sources feature alpha and beta emitter energies similar to those expected from contaminants in the field (similar to radionuclides of concern).
- Source Geometry Factors: Geometry dimensions are derived, based on a calibration source equal to or greater than the area of the probe.
- Source-to-detector Distances: Calibration is performed at a "source-to-detector" distance identical to the "detector-to-surface" distance used in the field.
- Window Density Thickness: Calibration is performed using a detector window density thickness identical to that used in the field.
- Detector-related Factors: The instrument user constantly monitored proper detector response. The user also accounted for extremes in ambient conditions (variations in temperature, pressure, and/or humidity) known during calibration and compared to those present in the field).

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6.5 INSTRUMENT FOR THE MEASUREMENT OF GAMMA SURFACE ACTIVITY

Static surveys for gamma (photon) radiation were performed using a Ludlum Model 2350-1 data logger and a Ludlum Model 44-10 scintillation detector assembly that featured a 2-inch by 2-inch sodium iodide (NaI) crystal. Capable of detecting gamma photon energies ranging from 60 kilo-electron volts (keV) to 3 mega-electron volts (MeV), the instrument was programmed to respond to the full spectrum of gamma photon energies. Static photon measurements required positioning the detector assembly 4 inches (10 centimeters [cm]) above the designated surveillance surface and recording a stationary 60-second integrated count. NaI scintillation detectors are very sensitive to photon gamma radiation and are ideal for locating elevated radiation levels above background when performing gamma scans and static measurements.

6.6 INSTRUMENT FOR THE MEASUREMENT OF EXPOSURE RATES

Exposure rate measurements were obtained approximately one meter from the area surfaces using a Ludlum Model 2350-1 data logger and a Ludlum Model 44-10 scintillation detector.

6.7 INSTRUMENT FOR SWIPE SAMPLES

Swipe samples were collected for the analysis of removable contaminants. Swipe samples, also referred to as smear samples, were obtained at the discrete surveillance points in the survey units. All samples were processed using a Protean Instrument Corporation IPC9025 gas-flow proportional counter that features a low-background counting chamber. A microprocessor allows for data processing, and the unit provides a full range of simultaneous alpha and beta analysis at levels required for environmental release surveillance. Data is reported in units of dpm/100 cm^2.

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7.0 DETECTION SENSITIVITY – STATIC AND SCAN MINIMUM DETECTABLE CONCENTRATIONS

7.1 STATIC MDC

The static MDC represents the smallest level of radioactivity, on a surface, that is statistically detectable by the measurement process. The conventional equation, Equation 7-7 from the Base-Wide Plan (TtFW, 2005b), is used to calculate instrument MDC in units of dpm/100 cm^2 for alpha and beta radiation. Equation 7-13 from the Base-Wide Plan is used to calculate the MDC for gamma radiation.

Equation 7-7 from the Base-Wide Plan

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

R_B = background count rate (cpm)
T_B = background counting time (minute [min])
ε_i = instrument efficiency (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = active area of the detector window (cm^2)

Equation 7-13 from the Base-Wide Plan

$$MDC_\gamma = \frac{3 + 3.29\sqrt{R_B T_B}}{T_B}$$

Where:

R_B = background count rate (cpm)
T_B = background counting time (min)

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7.1.1 Calculation of Static MDC for Alpha Surveys (126-cm^2 Probe)

The following calculation of the MDC in dpm/100 cm^2 α is for the gas-proportional instrument with a 126-cm^2 probe area that was used for the direct measurement surveys of alpha radiation in Building 813 during the scoping survey. For this calculation, the observed average background count rate of 3.03 cpm was used (from Survey Unit 1), and measurement and background counting times were each 3 minutes:

Where:

Instrument Efficiency: 19.41 %
Surface Efficiency Factor: 25 %
Background Count Rate: 3.03 cpm
Sample Count Time: 3 min
Probe Area Size: 126 cm^2

The MDC is calculated using Equation 7-7 from the Base-Wide Plan (TtFW, 2005b):

$$MDC = \frac{3 + 4.65\sqrt{3.03 \times 3}}{0.1941 \times 0.25 \times \frac{126}{100} \times 3} = 93\, dpm/100 cm^2 \alpha$$

7.1.2 Calculation of Static MDC for Beta Surveys (126-cm^2 Probe)

The following calculation of the MDC in dpm/100 cm^2 β is for the gas-proportional instrument with a 126-cm^2 probe area that was used for the direct measurement surveys of beta radiation in Building 813 during the scoping survey. For this calculation, the observed average background count rate from Survey Unit 1 of 259.733 cpm was used, and measurement and background counting times were each 3 minutes:

Where:

Instrument Efficiency: 17.62 %
Surface Efficiency Factor: 25 %
Background Count Rate: 259.733 cpm
Sample Count Time: 3 min
Probe Area Size: 126 cm^2

The MDC is calculated using Equation 7-7 from the Base-Wide Plan (TtFW, 2005b):

$$MDC = \frac{3 + 4.65\sqrt{259.733 \times 3}}{0.1762 \times 0.25 \times \frac{126}{100} \times 3} = 797.55\ dpm/100 cm^2$$

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7.1.3 Calculation of Static MDC for Gamma Surveys

The following calculation of the MDC in cpm γ is for the NaI instrument with a 2-inch by 2-inch probe that was used for the direct measurement surveys of gamma radiation in Building 813 during the scoping survey. For this calculation, the observed average background count rate of 5,461 cpm from Survey Unit 1 was used, and the measurement and background counting times were each 1 minute.

Where:

Background Count Rate: 5,461 cpm
Background Count Time: 1 min

The MDC is calculated using Equation 7-13 from the Base-Wide Plan (TtFW, 2005b):

$$MDC_{\gamma} = \frac{3 + 3.29\sqrt{5{,}461 \times 1}}{1} = 246.1\,cpm$$

7.2 SCANNING MINIMUM DETECTABLE COUNT RATE

The minimum detectable number of net source counts in the scan interval, for an ideal observer, can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in d') as shown in Equation 7-5 from the Base-Wide Plan (TtFW, 2005b).

Equation 7-5 from the Base-Wide Plan

$$MDCR = d'\sqrt{b_i}\left(\frac{60}{i}\right)$$

Where:

d' = index of sensitivity (α and β error)
b_i = number of background counts in scan time interval (count)
i = scan or observation interval(s)

7.2.1 Determination of MDCR and Use of Surveyor Efficiency (Beta, 582-cm^2 Probe)

The minimum detectable number of net source counts in the interval is given by S_i. Therefore, for an ideal observer, the number of source counts required for a specified level of performance can be arrived at by multiplying the square root of the number of background counts by the detectability value associated with the desired performance (as reflected in d'), as shown in Equation 7-1 below.

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Equation 7-1

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

The following is the calculation of the minimum detectable count rate (MDCR) in dpm/100 cm^2 β for the gas-proportional instrument with a 582-cm^2 probe area that was used for the scan surveys performed in Building 813 from Survey Unit 1 during the scoping survey. For this calculation, the observed average background count rate of 755.65 cpm was used. It was noted that a typical source remained under the probe for 16 seconds during the scan; therefore, the average number of background counts in the observation interval was 201.507 [$b_i = 755.65 \times (16/60)$]. The required rate of true positives was 95 percent, and the false positives were 5 percent.

From Table 6.5 of MARSSIM (NUREG-1575; DoD et al., 2000), the value of d', representing this performance goal, is 3.28.

The minimum detectable number of net source counts, S_i, needed was calculated by multiplying 14.1953 (the square root of 201.507) by 3.28 (the d' value); so, S_i equals 46.5606

The MDCR, in cpm, was then calculated by:

$$MDCR = S_i \left(60 / i\right)$$

$$MDCR = 46\ 5606 \left(60/16\right) = 174.602 cpm$$

The $MDCR_{Surveyor}$ was calculated assuming a surveyor efficiency (p) of 0.5 and the MDCR of 174.602 cpm as follows:

$$MDCR_{SURVEYOR} = \frac{MDCR}{\sqrt{P}} = \frac{174.602}{\sqrt{0.5}} = 246.925 cpm$$

7.2.2 Determination of MDCR and Use of Surveyor Efficiency, Gamma

The following is the calculation of the MDCR in cpm γ for the NaI instrument with a 2-inch by 2-inch NaI probe that was used for the scan surveys performed in Building 813 Survey Unit 1 during the scoping survey. For this calculation, the observed average background count rate of 5,461 cpm was used. It was noted that a typical source remained under the probe for 1 second during the scan; therefore, the average number of background counts in the observation interval was 91.02 [$b_i = 5{,}461 \times (1/60)$]. The required rate of true positives was 95 percent, and the false positives were 5 percent.

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From Table 6.5 of MARSSIM (NUREG-1575; DoD et al., 2000), the value of d', representing this performance goal, is 3.28.

The minimum detectable number of net source counts, S_i, needed was calculated by multiplying 9.54 (the square root of 91.02) by 3.28 (the d' value); so, S_i equals 31.29.

The MDCR, in cpm, was then calculated by:

$$MDCR = S_i \left(60 / i\right)$$

$$MDCR = 31\ 29 \left(60 / 1\right) = 1{,}877.52$$

The $MDCR_{Surveyor}$ was calculated assuming a surveyor efficiency (p) of 0.5 and the MDCR of 1,877.52 cpm as follows:

$$MDCR_{SURVEYOR} = \frac{MDCR}{\sqrt{P}} = \frac{1877.52}{\sqrt{0.5}} = 2655.22\,cpm$$

7.3 SCAN MDC FOR BETA

The scan MDC is derived from the MDCR by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. The MDCR accounts for the background level, performance criteria (d'), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity.

For alpha and beta radiation, the scan MDC for surfaces is calculated using Equation 7-6 from the Base-Wide Plan (TtFW, 2005b).

Equation 7-6 from the Base-Wide Plan

$$ScanMDC = \frac{MDCR}{\sqrt{P} \times \varepsilon_i \times \varepsilon_s \frac{W_A}{100\,cm^2}}$$

Where:

MDCR	=	as discussed in Section 7.2.1
ε_i	=	the instrument efficiency (count per particle)
ε_s	=	the contaminated surface efficiency (particles per disintegration)
W_A	=	the area of the detector window (cm^2)
P	=	surveyor efficiency

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The scan MDC (in dpm/100 cm^2) for ^{90}Sr on the concrete surfaces of Survey Unit 1 in Building 813 was determined for a background level of 755.65 cpm and a 16-second observation interval using a gas-proportional detector (582-cm^2 probe area). For the specified level of performance, a 95 percent true positive rate and 5 percent false positive rate was required.

In Table 6.5 of MARSSIM (NUREG-1575; DoD et al., 2000), d' equals 3.28 and the MDCR is 174.602 cpm. Using a surveyor efficiency of 0.5 and assuming instrument and surface efficiencies of 0.1951 and 0.25, respectively, the scan MDC was calculated using Equation 7-6 from the Base-Wide Plan (TtFW, 2005b):

$$Scan\,MDC = \frac{174.602}{\sqrt{0.5} \times 0.3296 \times 0.25 \times {}^{582}/_{100}} = 514.889\,dpm/100\,cm^2\ \beta\gamma$$

7.4 SCAN MDC FOR ALPHA

Scanning for alpha emitters differs significantly from scanning for beta and gamma emitters in that the expected background response of most alpha detectors is very close to zero. The following covers scanning for alpha emitters. Assumptions are made that the surface being surveyed is similar in nature to the material on which the detector was calibrated. In this respect, the approach is purely theoretical. Surveying surfaces that are dirty, non-planar, or weathered can significantly affect the detection efficiency and therefore bias the expected MDC for the scan.

The Model 43-37 proportional counter has a background count rate on the order of 5 to 10 cpm, and a single count should not cause a surveyor to investigate further. A counting period long enough to establish that a single count indicates that an elevated contamination level would be prohibitively inefficient. For this specific instance, the surveyor usually will need to get at least two counts while passing over the source area before stopping for further investigation. Assuming this to be true, the probability of detecting given levels of alpha surface contamination can be calculated by use of Poisson summation statistics. Since the background count rate in Building 258 falls into this criteria, the use of Equation 7-4 from the Base-Wide Plan (TtFW, 2005b) to calculate scan MDC for alpha is justified.

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Equation 7-4 from the Base-Wide Plan

$$P(n \geq 2) = 1 - \left[1 + \frac{(GE + B)t}{60}\right] e^{\frac{-(GE+B)}{60}}$$

Where:

$P(n \geq 2)$	=	probability of getting two or more counts during the time interval t (%)
t	=	time interval (s)
G	=	contamination activity (dpm)
E	=	detector efficiency (4π)
B	=	background count rate (cpm)

The following calculation of the probability for the gas-proportional instrument with a 582-cm^2 probe area was used for the scan surveys performed in Building 813 (with the values used from Survey Unit 1) during the scoping survey:

$$P(n \geq 2) = 1 - \left[1 + \frac{(100 \times 0.1915 + 3.45)16}{60}\right] e^{\frac{-(100 \times 0.1915 + 3.45)16}{60}} = 98\ 304\%$$

Where:

t	=	16 seconds
G	=	100 dpm
E	=	19.15 %
B	=	3.45 cpm

Using Equation 7-4 from the Base-Wide Plan (TtFW, 2005b), the probability of detecting 100 dpm/100 cm^2 alpha was 98.304 percent at a scan speed of 1 cm/s.

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8.0 SURVEY PROCEDURES AND MEASUREMENT DATA INTERPRETATION

8.1 SURVEY PROCEDURES

The survey procedures described in this section were performed in accordance with Standard Operating Procedures (SOPs) approved for use at HPS and were consistent with the Base-Wide Plan (TtFW, 2005). Class 1 survey units received 100 percent scan coverage, while both Class 2 and Class 3 survey units received 50 percent scan coverage. Figures 4-1 and 4-2 identify the approximate surveillance points where measurements and swipe samples were collected.

8.1.1 Static Alpha, Beta, and Gamma Measurement Technique

Static contamination surveys were used to determine contamination levels on surface areas. These surveys were performed by holding a detection device over a surface for a specified time at a set distance.

A systematic measurement pattern was used for both the reference area and the survey units.

8.1.2 Direct MicroR Exposure Rate Measurements

These surveys are performed to measure ambient gamma radiation levels. Exposure rate measurements were obtained by holding the detection device approximately one meter from the surface being surveyed. Instrumentation was allowed to stabilize before taking the measurement.

Measurements were obtained in reference areas and compared with survey units to evaluate external exposure rates from gamma radiation.

8.1.3 Swipe Sample Technique

Swipe sampling was performed to assess the presence of radioactive contamination that is readily removed from a surface. Swipe samples were taken to evaluate the presence of alpha and beta surface activity. Swipe samples were obtained from all survey points of the building interior.

8.1.4 Scan Measurement Technique

Scan surveys are an integral part of survey programs conducted to determine contamination levels. The surveys are an evaluation technique performed by moving a detection device over a surface at a specified speed and distance above the surface to detect radiation. It will be used to identify areas that may require additional survey measurements.

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The alpha, beta, and gamma scans were conducted on 100 percent of the accessible surfaces in the Class 1 survey units and 50 percent of those in the Class 2 and Class 3 survey units with special emphasis on air handling units, ventilation systems, and other upper horizontal surfaces). Scan measurements for alpha, beta, and gamma radiation were comparable to background levels, and no additional biased static measurements were collected based on scan data results. Scan ranges for each survey unit are identified on the individual survey reports provided in Appendix E.

8.2 DATA INTERPRETATION

The first level check for validating data integrity during collection and reporting was verification of numerical work. After collection of survey data each day, the results were reviewed by the Radiological Control Technician to verify their completeness. The purpose of the first level check was to ascertain that the data presented were free of numerical or transcription errors and that established procedures and methodology had been properly followed.

DQOs are qualitative and quantitative statements developed to define the purpose of the data collection effort, clarify what the data should represent to satisfy this purpose, and specify the performance requirements for the quality of information to be obtained from the data. These outputs are used to develop a data collection design that meets all performance criteria and other design requirements and constraints. The U.S. Environmental Protection Agency has developed a seven-step process to develop DQOs. During this process, it is important to note that the intent of the investigation is to define the extent of contamination or provide for a comprehensive risk assessment.

8.2.1 Step One – Define the Problem

It must be determined if the scoping survey can recommend the building for FSS or if remediation is warranted. Therefore, the decision to be made can be stated as, "Do the results of the survey meet the alpha release limits of 100 dpm/100 cm^2 for ^{226}Ra? Do they meet the beta/gamma release limits of 1,000 dpm/100 cm^2 for ^{90}Sr?"

8.2.2 Step Two – Identify the Decision

What is the extent of residual radioactive material in surface building materials due to historical site operations? Determine whether surface and near-surface radionuclide concentrations in building materials exceed the release criteria.

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8.2.3 Step Three – Identify Inputs to the Decision

Radionuclide surface activities in excess of the release criteria are the necessary inputs to the decision. Thus, the surface activities from the impacted areas and non-impacted reference areas were measured.

8.2.4 Step Four – Define the Study Boundaries

The spatial boundaries for this survey effort were confined to the first-floor interior surfaces of Building 813.

8.2.5 Step Five – Develop a Decision Rule

The intent of data validation of this survey data was to identify all of the impacted areas and to determine the extent and magnitude of contamination in Building 813. The decision rule for the radionuclides of concern was that any measurement above the release criteria is considered as impacted.

8.2.6 Step Six – Specify Limits on Decision Error

The TtEC team established acceptable decision errors for this project to enable testing of data relative to guidelines. Surveys were conducted on 100 percent of the Class 1 survey units and 50 percent of the Class 2 and Class 3 survey units as a conservative measure, to ensure that all statistical testing criteria would be met.

8.2.7 Step Seven – Optimize the Design for Obtaining Data

To the extent practical, the design for collecting data presented in this report was optimized to achieve the stated DQOs. The scope of work and data collection process was designed to provide near real-time data during implementation of field activities. These data were used to modify and expand the scope of field activities, as needed, to verify that the DQOs were met.

8.3 SURFACE ACTIVITY MEASUREMENTS

Surveillance measurements were used to quantify surface activity levels mainly on remaining concrete surfaces. ISO 7503-1 (International Organization for Standardization [ISO], 1988), NUREG/CR-1507 (NRC, 1997), and Selection and Use of Portable Radiological Survey Instruments for Performing In Situ Radiological Assessments in Support of Decommissioning (American Society for Testing and Materials [ASTM], 1998) were used as technical guidance to ensure accuracy in the measurement of surface activity.

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Equation 8-1 is used to calculate the surface activity in units of dpm per 100 cm^2.

Equation 8-1

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_s \frac{W_A}{100\,cm^2}}$$

Where:

A_S	=	total surface activity (dpm/100 cm^2)
R_{S+B}	=	the gross count rate of the measurement in cpm
R_B	=	the background count rate in cpm
ε_i	=	the instrument efficiency
ε_s	=	the contaminated surface efficiency
W_A	=	the area of the detector window (cm^2)

This equation has two efficiency terms discussed in Section 6.4.3.

8.3.1 Probe Area Correction Factor for Surface Activity Measurements

In Equation 8-1 W_A is the size of the detector window active area. If the detector window area (cm^2) is not equal to 100 cm^2, it is necessary to convert the detector response to units of dpm per 100 cm^2. This conversion allows for direct comparison to the reference area readings. The area of the probe window is 126 cm^2 for the Model 43-68 probe.

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9.0 ANALYSIS AND RESULTS

Interpreting a survey's results is most straightforward when measurement data are entirely higher or lower than the $DCGL_W$. In such cases, the decision that a survey unit meets or exceeds the release criterion requires little in terms of data analysis. However, formal statistical tests provide a valuable tool when a survey unit's measurements are neither clearly above nor entirely below the $DCGL_W$. Nevertheless, the survey design always makes use of the statistical tests in helping to assure that the number of sampling points and the measurement sensitivity are adequate, but not excessive, for the decision made.

Radiological survey data were obtained in units of cpm and activity that had no intrinsic meaning to the release limits. Data were converted to units of dpm/100 cm^2 to compare results with the release limits and to help identify which statistical tests, if any, would prove to be the best in interpreting data.

9.1 STATISTICAL TESTS

Once the survey data has been determined to be below the release criteria, two statistical tests are performed on the survey data: paired t-test, and WRS test. Many statistical tests are based on the assumption that observations of the sample data follow a known distribution, such as the normal distribution. Such tests are known as parametric tests. Provided the distributional assumptions can be met, the observations can be measured on a continuous scale.

In comparison, statistical tests that make few or no assumptions about the distribution of the observations are known as distribution-free or non-parametric tests. Non-parametric tests are useful when the requirements of the parametric test cannot be met. For example, if observations can only be measured on a categorical scale, the sample size may be too small, or other distributional assumptions do not hold. In many situations a non-parametric test is the only option, since many do not have parametric equivalents.

9.2 DECISION ERRORS

There are two types of decision errors that can be made when performing any statistical test. The first type of decision error, called a Type I error, occurs when the null hypothesis is rejected when it is actually true. This type of error is sometimes called a "false positive." The probability of a Type I error is denoted by an α. The Type I error is often referred to as the significance level or size of the test.

The second type of decision error, called a Type II error, occurs when the null hypothesis is not rejected when it is actually false. This type of error is sometimes called a "false negative." The probability of a Type II error is denoted by a β. The power of a statistical test is defined as the

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probability of rejecting the null hypothesis when it is actually false. It is numerically equal to 1-β, where β is the Type II error rate.

The Building 813 survey was designed to limit Type I and Type II errors to a maximum probability of 5 percent. It is important to minimize the chances of concluding that a survey unit meets the release criteria (reject the null hypothesis) when it actually exceeds the limits (Type I error), and concluding that a survey unit exceeds the release criteria (accept the null hypothesis) when it actually meets the limits (Type II error).

9.3 PAIRED T-TEST

For the paired t-test, the data sets are dependent with a one-to-one correspondence between the values in the two samples (between the survey unit and the reference area); for example, the same radiation source measured in the survey unit and a non-impacted area, or the same radiation source measured at different times. The main assumption is that the differences should be normally distributed. The paired t-test is used to determine whether there is a significant difference between the expected average values of the same type of measurement made under two different conditions. Both measurements are made on each unit in a sample, and the test is based on the paired differences between these two values. The null hypothesis then tests that the difference in the mean expected values between the paired data is different by a probability of less than 0.05 (at the Type I error rate); this null hypothesis tests that the difference between the means of the paired data actually differs from zero. Conversely, the alternate hypothesis is stated that the difference between the paired data is greater than 0.05 (Type I error rate), meaning that this difference is approaching zero. Explicitly stated:

$H_O : P<0.05$
$H_a : P \geq 0.05$

Even in the event that the null hypothesis is accepted for this test, further evaluation of the data is made to determine the nature of the difference before any conclusions can be made.

9.4 WILCOXON RANK-SUM TEST

The WRS test is designed to test a hypothesis about the location of a population distribution. It is most often used to test the hypothesis about a population median and often involves the use of matched pairs. For example, reference area and survey unit data are tested for a median difference of zero. This test is also a non-parametric test that may be used when it is only necessary, or possible, to know if observed differences between two conditions are significant. The WRS test is structured to denote change in magnitude, as opposed to any attempt at the quantitative measurement. This effect is further amplified when used with the "Unity Rule" presented in MARSSIM.

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The null hypothesis is specifically stated for the WRS test that the residual contamination remaining in the survey unit exceeds the background level by more than the DCGL. Conversely, the alternate hypothesis is stated that the residual contamination remaining in the survey unit is less than the background level plus the DCGL. Explicitly stated:

H_O=Residual activity of the survey unit is greater than or equal to the background plus the DCGL

H_a=Residual activity of the survey unit is less than the background plus the DCGL

9.5 STATIC ALPHA MEASUREMENT ANALYSIS AND RESULTS

A comprehensive radiological survey was implemented using MARSSIM (NUREG-1575; DoD et al., 2000) guidance, and complete sets of alpha measurements were obtained in the reference area and corresponding survey units. Basic statistical quantities were calculated for the data in an effort to identify patterns, relationships, and anomalies. Collected data were reviewed by the area supervisor and then examined by the TtEC Radiation Safety Officer (RSO) to determine whether investigative levels had been exceeded. Scan readings in each survey unit were comparable with background levels.

Alpha survey data were converted to units of dpm per 100 cm^2. The measurements were compared directly to background measurements after conversion of the background data. In all instances, no sample measurement exceeded the release criteria and the null hypothesis was rejected in all cases.

Table 9-1 provides a summary of corresponding alpha measurements and WRS data for each Survey Unit.

As identified in Table 9-1 below, the required number of measurements for Survey 19 was 20. Survey unit 19 has a total surface area of 19.1 square meters. Thirteen alpha measurements were collected from the survey unit. All measurements were below the average background reference area measurement. With the net mean alpha activity for Survey Unit 19 being 4 dpm/100cm^2 and the highest net alpha activity measurement at 38 dm/100cm^2.

Considering the size of the survey unit and the fact that no scan measurement or individual static reading exceeded the release criteria, no additional readings were deemed necessary for Survey Unit 19.

The WRS Unity Rule test for each Survey Unit indicates that the null hypothesis is rejected and the respective survey units meet the release criteria. Detailed survey results are available in Appendix C.

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TABLE 9-1

BUILDING 813 ALPHA MEASUREMENTS SUMMARY

Alpha Measurement Summary - Building 813 - Final Status						
Survey Unit	Survey Unit Area (m^2)	N Required	N Taken	Net Mean (dpm/100cm^2)	Net Maximum Reading (dpm/100cm^2)	Null Hypothesis
1	4,716.5	7	19	-13	21	Rejected
2	593.3	7	14	-16	10	Rejected
3	508.3	7	17	-13	10	Rejected
4	18.3	7	16	-33	-17	Rejected
5	24.5	7	13	-19	10	Rejected
6	69.4	7	13	-20	-1	Rejected
7	17.5	7	15	-13	16	Rejected
8	8.8	8	16	-9	14	Rejected
9	8.6	7	16	-14	7	Rejected
10	98.6	8	14	-14	1	Rejected
11	69.8	7	13	-9	7	Rejected
12	9.5	7	15	-12	5	Rejected
13	5.2	7	15	-8	26	Rejected
14	59.6	8	14	-1	20	Rejected
15	6.5	7	14	-3	18	Rejected
16	11.4	7	15	-15	11	Rejected
17	24.4	12	14	10	32	Rejected
19	19.1	10	13	4	38	Rejected
20	15.3	7	15	-14	5	Rejected
21	1.6	7	14	-7	4	Rejected
22	4.1	7	10	2	25	Rejected

Notes:

dpm – disintegration per minute
m^2 – square meter
See Section 9.4 for Hypothesis

9.6 STATIC BETA MEASUREMENT ANALYSIS AND RESULTS

A comprehensive radiological survey was implemented using MARSSIM (NUREG-1575; DoD et al., 2000) guidance, and complete sets of beta measurements were obtained in the associated reference areas and corresponding survey units. Collected data were reviewed by the area supervisor and then examined by the TtEC RSO to determine whether investigative levels had been exceeded. Readings in all survey units were comparable with background levels.

Since ^{90}Sr was the primary beta emitting isotope of concern for the building, the ^{90}Sr efficiencies were used for those instruments that were provided with ^{90}Sr efficiencies.

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Beta survey data were converted to units of dpm per 100 cm^2. The measurements were compared directly to background measurements. In all instances, no sample measurement exceeded the release criteria and the null hypothesis was rejected in all cases.

Table 9-2 provides a summary or corresponding beta measurements and WRS data. Table 9-2 normalizes the maximum reading in each survey unit.

TABLE 9-2

BUILDING 813 BETA MEASUREMENTS SUMMARY

Beta Measurement Summary - Building 813 - Final Status						
Survey Unit	Survey Unit Area (m^2)	N Required	N Taken	Net Mean (dpm/100cm^2)	Net Maximum Reading (dpm/100cm^2)	Null Hypothesis
1	4,716.450	7	19	-204	258	Rejected
2	593.340	7	14	-106	268	Rejected
3	508.250	7	17	-192	162	Rejected
4	18.300	7	16	-600	-11	Rejected
5	24.480	7	13	-199	-34	Rejected
6	69.360	7	13	-271	-41	Rejected
7	17.510	7	15	81	358	Rejected
8	8.760	8	16	-1,126	-630	Rejected
9	8.620	7	16	-1,181	-1002	Rejected
10	98.580	8	14	-1,330	-1045	Rejected
11	69.750	7	13	-1,497	-1102	Rejected
12	9.450	7	15	-525	-263	Rejected
13	5.230	7	15	-1,417	-859	Rejected
14	59.610	8	14	-1,249	-1009	Rejected
15	6.510	7	14	-450	-292	Rejected
16	11.370	7	15	-258	-27	Rejected
17	24.350	12	14	-181	385	Rejected
19	19.110	10	13	-1,129	-445	Rejected
20	15.270	7	15	-363	-144	Rejected
21	1.630	7	14	-311	-161	Rejected
22	4.120	7	10	-123	125	Rejected

Notes:

dpm – disintegration per minute
m^2 – square meter
See Section 9.4 for Hypothesis

During review of the data, it was noticed that one of the instruments used during the survey was only provided with efficiency for technetium-99 (^{99}Tc). In an effort to make the calculations of the data consistent in each survey unit, the ^{99}Tc efficiency for each instrument was used to evaluate the data for all survey units instead of using a mix and match of both ^{90}Sr and ^{99}Tc efficiencies.

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In changing from ^{90}Sr efficiencies to ^{99}Tc efficiencies, the calculation using the new efficiency changed the number of samples necessary for each survey unit. The number of samples calculated for the WRS test per MARSSIM (NUREG-1575; DoD et al., 2000) was below the number of samples taken prior to changing from ^{90}Sr efficiencies to ^{99}Tc efficiencies. Using the ^{99}Tc efficiencies in the calculations resulted in the number of required samples for the WRS test required to be greater than the number of samples taken.

As identified in Table 9-2 above, the required number of measurements for Survey Unit 19 was 20. Survey unit 19 has a total surface area of 19.1 square meters. Thirteen beta measurements were collected from the survey unit. All measurements were below the average background reference area measurement. With the net mean beta activity for Survey Unit 19 being -2,038 dpm/100 cm^2 and the highest net beta activity measurement at -802 dpm/100 cm^2.

Considering the size of the survey unit and the fact that no scan measurement or individual static reading exceeded the release criteria, no additional readings were deemed necessary for Survey Unit 19.

The WRS Unity Rule test for each Survey Unit indicates that the null hypothesis is rejected and the respective survey units meet the release criteria. Detailed survey results are available in Appendix C.

9.7 STATIC GAMMA MEASUREMENT ANALYSIS AND RESULTS

A comprehensive radiological survey was implemented using MARSSIM (NUREG-1575; DoD et al., 2000) guidance, and complete sets of gamma measurements were obtained in the associated reference areas and Building 813 survey units. Basic statistical quantities were calculated for the data in an effort to identify patterns, relationships, and any type of anomaly. The paired t-test was used to evaluate if the residual radioactivity levels in the survey units met the release criteria and to test the null hypothesis (H_o) or alternative hypothesis (H_a). Results show that the null hypothesis should be accepted for all survey units. Gamma activity results are presented with summary in Appendix D as are field surveillance data reports. Gamma exposure rate results are listed in Appendix E.

After determining if data results were normally distributed, the t-test was selected to determine whether activity within each survey unit did or did not exceed the activity of the corresponding reference area. Individual measurements from each survey unit were also compared to the reference area's mean level, plus two standard deviations for evidence of small areas of elevated activity.

A summary of the paired t-test data is presented in Table 9-3.

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TABLE 9-3

BUILDING 813 GAMMA MEASUREMENTS SUMMARY

Gamma Measurement Summary - Building 813 - Final Status						
Survey Unit	N Taken	Background cpm	Mean cpm	Net Cpm	2-Tailed p value	Null Hypothesis
1	19	5,461	6,768	1,307	<0.0001	Accepted
2	14	5,627	7,246	1,619	<0.0001	Accepted
3	17	5,461	6,618	1,157	<0.0001	Accepted
4	16	6,317	7,410	1,093	<0.0001	Accepted
5	13	5,824	7,594	1,770	<0.0001	Accepted
6	13	5,824	7,213	1,389	<0.0001	Accepted
7	15	5,627	8,904	3,277	<0.0001	Accepted
8	16	5,627	6,816	1,189	<0.0001	Accepted
9	16	5,627	6,557	930	<0.0001	Accepted
10	14	5,824	7,022	1,198	<0.0001	Accepted
11	13	5,627	6,531	904	<0.0001	Accepted
12	15	5,461	6,206	745	<0.0001	Accepted
13	15	5,627	6,474	847	<0.0001	Accepted
14	14	5,627	6,700	1,073	<0.0001	Accepted
15	14	5,824	6,429	605	<0.0001	Accepted
16	15	5,824	7,365	1,541	<0.0001	Accepted
17	14	5,627	7,819	2,192	<0.0001	Accepted
19	13	8,652	8,067	-585	<0.0001	Accepted
20	15	5,824	6,540	716	<0.0001	Accepted
21	14	5,824	6,623	799	<0.0001	Accepted
22	10	5,627	7,056	1,429	<0.0001	Accepted

Notes:

cpm – count per minute
See Section 9.3 for Hypothesis

In the instances where the H_o was accepted, and where the mean survey unit in cpm was greater than the mean background cpm, additional investigation did not locate any discrete sources of radioactive materials. Since gamma measurements with a NaI detector indicate photons from directions not exclusively from the surface of the materials, elevated gamma measurements may be attributed to construction materials, and the geometry of the specific survey unit or room.

As previously stated in Section 3.5.2, there are currently no established release criteria for building interior surfaces based on gamma exposure rates. However, guidance document NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination*, specifies that the average of exposure rates, which were measured one meter above the surveillance surface of a survey unit, should not exceed twice the background. If this criterion were applied to the gamma radiation levels at Building 813, then Building 813 would be considered acceptable for unconditional release.

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10.0 DOSE MODELING

The intent of the Building 813 survey is to achieve unrestricted release for the building. To accomplish this goal, it is necessary to provide a means for calculating residual dose to the critical group; the residential scenario in RESRAD-BUILD was selected. However, since the mean concentrations for both alpha and beta emitters were less than zero, each survey unit (and thusly the entirety of Building 813) is assigned an administrative dose of 0.00 millirem per year. No further dose modeling was determined to be reasonable or prudent.

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11.0 CONCLUSION

Building 813 is a large, 262-by-262-foot, four-story reinforced concrete, flat-roofed supply warehouse with banks of industrial steel sash in horizontal bands across all four stories, except at the front of the first floor on the south end of the building. The front has a bank of steel roll-up industrial doors extending the length of a concrete loading dock area sheltered by a concrete canopy.

Historical documents indicate that a leaking check source of 300 μCi of ^{90}Sr was discovered during routine swipes of the check sources. The historical documentation does not indicate if the leaking source contaminated the DCC work spaces. Additionally, during a walkthrough of Building 813, a cabinet with a radioactive materials placard was found on the first floor. There was no indication of what types of radioactive materials may have been stored in the cabinet. No other physical indications of the presence of radioactive materials were found in any location in Building 813.

In addition to identifying ^{90}Sr as a radionuclide of concern (ROC), ^{137}Cs and ^{226}Ra were included as ROCs for the scoping survey of Building 813. These ROCs were chosen as they were commonly used throughout HPS, and with ^{90}Sr, will cover alpha, beta, and gamma radiation.

After reviewing the applicable plans of Building 813, Building 258 was selected as the appropriate reference area. Building 258 has no radiological history, is made of similar building materials, and was constructed in the same era as Building 813.

In summer 2006, NWT, a radiological services subcontractor to TtEC, performed a scoping survey to determine if contamination exists on the first floor of Building 813. While not initially designated as an FSS, the scoping survey was designed so it could be used as an FSS, in accordance with the MARSSIM (NUREG-1575; Department of Defense et al., 2000), if no contamination was found. To perform the survey, the first floor of Building 813 was divided into 18 Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. The floors and walls less than or equal to two meters above the respective floor areas around the previous location of the DCC were divided into Class 1 survey units. Areas that surrounded the Class 1 survey units were divided into Class 2 survey units. The Class 3 survey unit encompassed the remaining portions of the first floor outward of the Class 2 survey units.

Survey methods included fixed static (direct) and scan surface contamination surveys for alpha and beta radiation, and static and scan measurements were performed for gamma radiation. Exposure rate measurements were performed at static reading locations. Additionally, swipe samples were obtained to evaluate the presence of loose alpha and beta-gamma radiation at static reading locations.

ED_000855_00003297-00148

The analysis of collected field data shows that the residual radioactivity at Building 813 meets the stated release criteria and that Building 813 is ready for unconditional unrestricted use.

Since the mean concentrations for both alpha and beta emitters were less than zero, each survey unit (and thusly the entirety of Building 819) is assigned an administrative dose of 0.00 millirem per year. No further dose modeling was determined to be necessary.

ED_000855_00003297-00149

12.0 REFERENCES

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ED_000855_00003297-00150

APPENDIX A

SURVEY INSTRUMENTATION
(Available on CD only)

ED_000855_00003297-00151

MODEL 2350-1 Data Logger

- *Data Logger*
- *16 Independent Detector Setups*
- *Microprocessor Based Electronics*
- *RS-232 Output*
- *Optional Keypad for Setup*
- *LCD Display with backlight*
- *Scaler*
- *Ratemeter*
- *Integrated Dose*
- *5 decade Logarithmic Trend Indicator*
- *Bar Code Reader*

PART NUMBER:48-2751

INDICATED USE: Field analysis and data logging
COMPATIBLE DETECTORS: G-M, proportional, scintillation
CONNECTOR: Series "C" (*others available on request*)
DISPLAY: 8 line LCD display with 15 characters per line
BACKLIGHT: A two position toggle switch to turn backlight ON or OFF
SCALER: 6 digit display
TIMER: Used in conjunction with scaler. Count time can be set from 1 - 65,535 seconds in 1 second intervals
RATEMETER: Digital ratemeter, corrected for dead time and calibration constant
TREND INDICATOR: 5 decade logarithmic bar graph
LINEARITY: Reading within plus or minus 10% of true value with detector connected
SCALE: Can display in rem/hr, Sv/hr, R/hr, cpm, cps, dpm, dps, rad(r), Gray(G), C/kg, Ci/cm squared, or Bq/cm squared
INTEGRATED DOSE: Counter provided to give total accumulated dose for up to 45 days (*Will display in same units as ratemeter*)
AUDIO: Built in unimorph speaker with volume control (*greater than 60 dB at 2 feet, full volume*)
AUDIO DIVIDE: Operator selected divisions of 1, 10, or 100 events-per-click
ALARM: Separate alarms for digital ratemeter, scaler, and integrated dose can be set at any point (*audible and visual indicators*)
ACK/SCROLL: Push-button to silence audio after alarm has been indicated and/or scroll through the various displays
DATA LOGGER: Capable of logging up to 1000 individual data points with the following identifiers for each point

```
8 Location codes (5 character ) Time of day

Month, Day, and Year                    Count rate/scaler count/integrated dose

Count time                                    Detector number

Logging mode                               Sample number
```

DETECTOR PARAMETERS: Capable of storing the following parameters for 16 different detectors

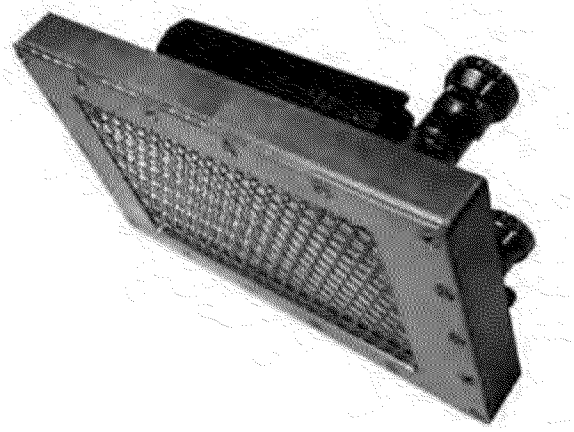
Model number	Serial number
Calibration constant	Dead time correction
High voltage	Threshold
Window	Display range multiplier
Display time base	Display units
Overload current	Ratemeter alarm setting
Scaler alarm setting	Low ratemeter alarm setting
Integrated dose alarm setting	Scaler count time

RS-232 PORT: A full duplex communication port that allows for instrument setup by optional keypad or PC. Also allows for data to be transferred to a PC file.
BAR CODE READER (optional): Allows for setup of instrument by computer generated bar codes
HIGH VOLTAGE: Adjustable from 200 - 2500 volts
THRESHOLD: Adjustable from 100 - 1000
WINDOW: Adjustable from 0 - 1000 above threshold
GAIN: Adjustable from 2 - 350 mV at threshold setting of 100
DEAD TIME: Adjustable to compensate for dead time of detector and electronics
RESPONSE:
Fixed - Adjustable from 1 - 127 seconds in 1 second intervals
Variable - Will vary according to number of counts present.
Typical times FAST: 4 - 25 seconds, SLOW: 4 - 60 seconds from 10% to 90% of final reading
POWER: 4 each "D" cell batteries (*housed in sealed compartment that is accessible from back of instrument*)
BATTERY LIFE: Greater than 75 hours (*low battery condition is automatically indicated*)
CONSTRUCTION: Milled and drawn aluminum with beige polyurethane enamel paint
TEMPERATURE RANGE: 32° F(0° C) to 122° F(50° C) (*LCD limits temperature range*)
SIZE: 6"(15cm)H X 4.3"(11cm)W X 8.8"(22cm)L
WEIGHT: 5 lbs (2.3kg) including batteries

MODEL 43-68 Gas Proportional Detector

PART NUMBER:47-2005

The Model 43-68 is a large area gas proportional detector for use in simultaneous alpha/beta surveys as well as alpha or beta surveys

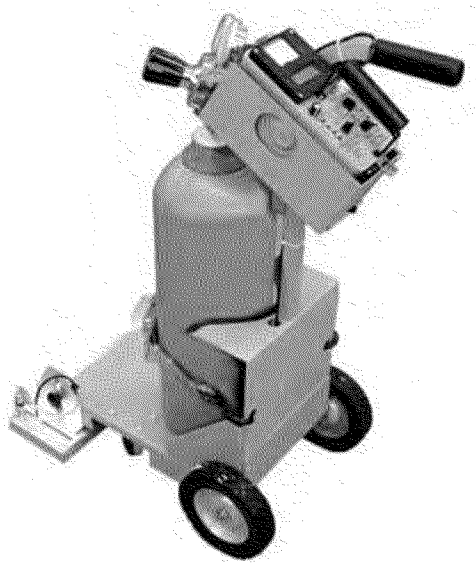


INDICATED USE: Alpha-beta survey
RECOMMENDED COUNTING GAS: P-10 (*10% methane, 90% argon*)
GAS RECHARGE: Will operate on a static charge for over 15 hours with a 39" cable
WINDOW: Typically 0.8 mg/cm² aluminized mylar (*other thickness available*)
WINDOW AREA:
Active - 126 cm²
Open - 100 cm²
EFFICIENCY (4pi geometry): Typically 20% - Pu-239; 30% - Tc-99; 15% - C-14; less than 1% - gamma
BACKGROUND:
Alpha - Less than 5 cpm (*when operating on the alpha only plateau region*)
Beta - Typically 400 cpm or less (*10 microR/hr field*)
COMPATIBLE INSTRUMENTS: Model 12, 16, 18, 2000, 2200, 2221, 2224, 2225, 2241, 2350-1
OPERATING VOLTAGE:
Alpha - Typically 1000 - 1500 volts
Beta-gamma - Typically 1600 - 1800 volts
COUNTER THRESHOLD SETTING: Typically 2 - 5 mV
GAS CONNECTORS: Double end quick disconnect
CONNECTOR: Series "C" (*others available*)
CONSTRUCTION: Anodized aluminum housing
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified for operation from -40° F(-40° C) to 150° F(65° C)
SIZE: 3.9"(10cm)H X 4.6"(11.7cm)W X 7.8"(19.8cm)L
WEIGHT: 2 lbs (0.9kg)

MODEL 239-1F Floor Monitor

PART NUMBERS

Model 239-1F w/Model 12 - 48-1702
Model 239-1F w/ Model 2221 - 48-2085
Model 239-1F w/Model 2350-1 - 48-2594
Model 239-1F w/Model 2224 - 48-2650
Model 239-1F w/Model 2360 - 48-2922



LINKS TO SURVEY METERS

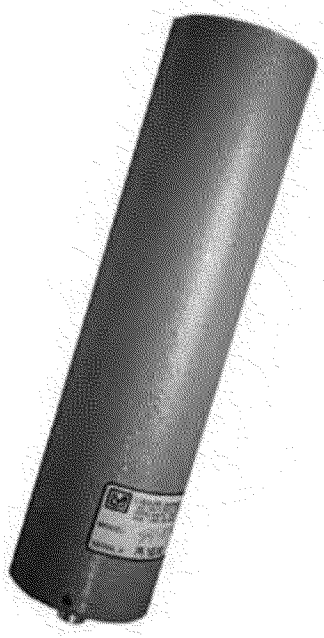
Model 12 - **Ratemeter**
Model 2221 - **Portable Scaler Ratemeter**
Model 2350-1 - **Data Logger**
Model 2224 - **Alpha/Beta Scaler/Ratemeter**
Model 2360 - **Alpha/Beta Data Logger**

INDICATED USE: Floor monitoring for alpha, and beta-gamma
DETECTOR: Gas proportional
RECOMMENDED COUNTING GAS: P-10 (*10% methane; 90% argon*)
BOTTLE SIZE: Typically used with Matheson size 2 or Linde Q bottles (*provided by customer*)
DETECTOR WINDOW: 0.8 mg/square cm aluminized mylar (*window thickness of 0.4, 1.2, 3.9, or 7.9 mg/square cm available*)
WINDOW AREA:
ACTIVE - Approximately 582 square cm
OPEN - Approximately 425 square cm
EFFICIENCY(4pi geometry): Approximately 25% - Sr-90/Y-90; 17% - Pu-239; gamma - less than 1%
GAS RECHARGE: Will operate on static charge for over 2 hours
COMPATIBLE INSTRUMENTS: Typically used with Model 12, 2221, 2224, or 2350-1
DETECTOR HEIGHT: Adjustable from 0.125"(0.32cm) - 3"(7.6cm) from surface
DETECTOR OPERATING VOLTAGE:
ALPHA - Typically 1000 - 1200 volts
BETA-GAMMA: Typically 1600 - 1800 volts
THRESHOLD: Typically 2 - 4 mV
FLOW METER:
IN - Adjustable from 0 - 100 cc/min
OUT - Flow indicator from 0 - 100 cc/min
GAS CONNECTORS: Double end quick disconnect for 0.25"(0.6cm) OD tubing
GAS CONSUMPTION: Typically 50 cc/min
CONSTRUCTION:
DETECTOR - Anodized aluminum housing with stainless steel hex protective screen (*79% open*)
CART - 1" square tubular steel and aluminum with beige polyurethane enamel paint, 7.5"(19.1cm) diameter rear wheels, and 4"(10.2cm) diameter swivel casters
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified for operation from -40° F(-40° C) to 150° F(65° C)
SIZE:
DETECTOR - 0.8"(2cm)H X 6.3"(16cm)W X 18.3"(46.5cm)L
CART - 42"(106.7cm)H X 16"(40.6cm)W X 27.5"(69.9cm)L (*excluding detector*)
WEIGHT: 25 lbs (11.4kg) (*excluding gas bottle and counting instrument*)

MODEL 44-10 Gamma Scintillator

PART NUMBER:47-1540

The Model 44-10 is a 2" X 2" NaI(Tl) Gamma Scintillator that can be used with several different instruments including survey meters, scalers, ratemeters, and alarm ratemeters



INDICATED USE: High energy gamma detection
SCINTILLATOR: 2" (5.1 cm) diameter X 2" (5.1 cm) thick sodium iodide (NaI)Tl scintillator
SENSITIVITY: Typically 900 cpm/microR/hr (*Cs-137*)
ENERGY RESPONSE: Energy dependent
COMPATIBLE INSTRUMENTS: General purpose survey meters, ratemeters, and scalers
TUBE: 2"(5.1cm) diameter magnetically shielded photomultiplier
OPERATING VOLTAGE: Typically 500 - 1200 volts
DYNODE STRING RESISTANCE: 60 megohm
CONNECTOR: Series "C" (*others available*)
CONSTRUCTION: Aluminum housing with beige polyurethane enamel paint
TEMPERATURE RANGE: -4° F(-20° C) to 122° F(50° C)
May be certified to operate from -40° F(-40° C) to 150° F(65° C)
SIZE: 2.6" (6.6 cm) diameter X 11" (27.9 cm)L
WEIGHT: 2.3 lb (1.1kg)

APPENDIX B

INSTRUMENT CALIBRATION DOCUMENTATION

(Available on CD only)

ED_000855_00003297-00157

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

5/4/2006

Calibration Certificate

Calibration Certificate for 2350-1,Serial # 221013, Bar Code # ,Property # SEC-6121

SECTION 1: GENERAL INFORMATION

Date: 05/02/06 Date Last Cal. Expires: Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 209797 CAL. DUE: 06/13/06

MODEL: SERIAL #: CAL DUE:

SECTION 2: AS FOUND DATA

Condition: SAT AF Mechanical Zero: AL Mechanical Zero:

☐ New Batteries? Battery Check: SAT

HV (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	502	AF
1000 V:	1001	AF
1500 V:	1494	AF

AF THRESHOLD: 10.1 AL THRESHOLD: 10.5 AFHVReading: 0 ALHVReading: 1000

SECTION 3: REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 (x1000)	25 (x1000)	25 (x1000)
x100 or x1000 Scale:	250 (x1000)	250 (x1000)	250 (x1000)

☐ Are the Individual Counts Within 10% of the Average?

☐ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT

SECTION 4: DIGITAL SCALER

AF 250:	250	% ERR:	0.00%	AL 250:	AF	% ERR:	0.00%
AF 2500:	2500	% ERR:	0.00%	AL 2500:	AF	% ERR:	0.00%
AF 25K:	25.00 K	% ERR:	0.00%	AL 25K:	AF K	% ERR:	0.00%
AF 250K:	250.0 K	% ERR:	0.00%	AL 250K:	AF K	% ERR:	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

SECTION 5: FINAL ACCEPTANCE

Push Buttons: SAT Lamp: SAT Audio/Divide: SAT

Comments: Married as a set with: PR155599 Model: 44-10

☑ Does Instrument Meet Final Acceptance Criteria?

☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 5.2.6

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 44-10,Serial # PR155599, Bar Code # ,Property # SEC-6100

Date: 05/02/06 Date Last Cal. Expires: 01/23/07 Technician: David Moyer

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 221013 CAL DUE: 05/02/07

MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
99CS250-0288	Cs-137	7.5 uCi		3/18/1999

AS FOUND DATA

AF Instrument Condition: SAT AL Instrument Condition: SAT

Efficiency from Last Cal.: 0.68 % HV From Last Calibration: 950 V Calibration Threshold: 10 mV

	HV	Center Count	Background Count	Probe Efficiency	
AS FOUND:	950 V	117773	4162	Cs-137	0.68%
AS LEFT:	AF V			Cs-137	

☑ Is the As Found Efficiency Within 20% of the efficiency from the last cal.?

Reproducibility: Isotope: Cs-137 118409 117924 117819 Average: 118051

☑ Are the individual counts within 10% of the average?

* If As Found Efficiency (even after repair) is within 10% of the last calibration and uniformity is <10%, the technician may N/A the Plateau Data and proceed to Comments. Geometry = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified.

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background	HV	CENTER	Background	Efficiency
N/A			V			Cs-137

Comments:

Married as a set with: Model: 2350-1 Serial #: 221013

Calibration short cycled for use at different site.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Reviewed by: Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: Date: 5.2.6

SAFETY AND ECOLOGY
CALIBRATION DATA SHEET

FORM 99-6
REV. 1

CUSTOMER NAME	: Safety and Ecology	INST. MANUFACTURER	: Ludlum Measurements	
PLANT NAME	:	TYPE	: NaI	
ADDRESS	: 10512 Lexington Drive	MODEL NO.	: 2350-1	44-10
	Knoxville	SERIAL NO.	: 221013	PR155599
	TN			
CONTACT PERSON	: J DeGroodt			

SOURCES USED

CAL SOURCE USED: CESIUM-137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE: 09/10/2006

CALIBRATION DATA

Dead Time : 17.8 u Sec **Calibration Constant 6.364980 E10**

DIGITAL READINGS	EXPOSURE RATE uR/HR	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
	150	0	150	-100.00	0.00
	500	0	497	-100.00	-0.60
	1500	0	1450	-100.00	-3.33
	5000	0	4950	-100.00	-1.00

PRECISION

DIGITAL READINGS	EXPOSURE RATE	AS FOUND	MEAN VALUE	% DEV.
	1500 uR/HR	1450		0.00
		1450	1450.00	0.00
		1450		0.00

COMMENTS/REMARKS: Initial calibration of 44-10 in uR/Hr as detector #1 on the 2350-1

ALL CALIBRATION DONE WITH CALIBRATED TEST EQUIPMENT.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL INPUT RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 99.

CALIBRATED BY : WM REVIEWED BY : [signature]

DATE CALIBRATED : 5-2-6 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5-2-7

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

5/4/2006

Calibration Certificate

Calibration Certificate for 2350-1,Serial # 221016, Bar Code # ,Property # SEC-6123

SECTION 1: GENERAL INFORMATION

Date: 05/02/06 Date Last Cal. Expires: Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 209797 CAL. DUE: 06/13/06

MODEL: SERIAL #: CAL DUE:

SECTION 2: AS FOUND DATA

Condition: SAT AF Mechanical Zero: AL Mechanical Zero:

☐ New Batteries? Battery Check: SAT

HV (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	503	AF
1000 V:	1001	AF
1500 V:	1496	AF

AF THRESHOLD: 9.8 AL THRESHOLD: 10.3 AFHVReading: 0 ALHVReading: 1000

SECTION 3: REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 (x1000)	25 (x1000)	25 (x1000)
x100 or x1000 Scale:	250 (x1000)	250 (x1000)	250 (x1000)

☑ Are the Individual Counts Within 10% of the Average?

☑ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT

SECTION 4: DIGITAL SCALER

AF 250:	250	% ERR: 0.00%	AL 250:	AF	% ERR: 0.00%
AF 2500:	2503	% ERR: 0.12%	AL 2500:	AF	% ERR: 0.12%
AF 25K:	24.97 K	% ERR: 0.12%	AL 25K:	AF K	% ERR: 0.12%
AF 250K:	249.7 K	% ERR: 0.12%	AL 250K:	AF K	% ERR: 0.12%

☑ Is the As Found Data Within 20% of the Set Point?

SECTION 5: FINAL ACCEPTANCE

Push Buttons: SAT Lamp: SAT Audio/Divide: SAT

Comments: Married as a set with: PR150640 Model: 44-10

☑ Does Instrument Meet Final Acceptance Criteria?

☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 5.2.6

SAFETY AND ECOLOGY
CALIBRATION DATA SHEET

FORM 99-6
REV. 1

CUSTOMER NAME	: Safety and Ecology	INST. MANUFACTURER	: Ludlum Measurements	
PLANT NAME	:	TYPE	: NaI	
ADDRESS	: 10512 Lexington Drive Knoxville TN.	MODEL NO.	: 2350-1	44-10
		SERIAL NO.	: 221016	PR150640
CONTACT PERSON	: J DeGroodt			

SOURCES USED

CAL SOURCE USED: CESIUM-137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE: 09/10/2006

CALIBRATION DATA

Dead Time : 19.3 uSec **Calibration Constant : 6.453363E10**

DIGITAL READINGS	EXPOSURE RATE uR/HR	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
	150	0	150	-100.00	0.00
	500	0	489	-100.00	-2.20
	1500	0	1500	-100.00	0.00
	5000	0	5020	-100.00	0.40

PRECISION

DIGITAL READINGS	EXPOSURE RATE	AS FOUND	MEAN VALUE	% DEV.
	1500 uR/HR	1500		0.00
		1500	1500.00	0.00
		1500		0.00

COMMENTS/REMARKS: Initial calibration of 44-10 in uR/Hr as detector #1 on the 2350-1

ALL CALIBRATION DONE WITH CALIBRATED TEST EQUIPMENT.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL INPUT RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 99.

CALIBRATED BY : [signature] REVIEWED BY : [signature]

DATE CALIBRATED : 5.2.6 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5.2.7

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 44-10,Serial # PR150640, Bar Code # ,Property # SEC-5178

Date: 05/02/06 Date Last Cal. Expires: 01/23/07 Technician: David Moyer

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 221016 CAL DUE: 05/02/07

MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
99CS250-0288	Cs-137	7.5 uCi		3/18/1999

AS FOUND DATA

AF Instrument Condition: SAT AL Instrument Condition: SAT

Efficiency from Last Cal.: 0.63 % HV From Last Calibration: 1000 V Calibration Threshold: 10 mV

	HV	Center Count	Background Count	Probe Efficiency
AS FOUND:	1000 V	109828	4270	Cs-137 0.63%
AS LEFT:	AF V			Cs-137

☑ Is the As Found Efficiency Within 20% of the efficiency from the last cal.?

Reproducibility: Isotope: Cs-137 108919 109863 109741 Average: 109508

☑ Are the individual counts within 10% of the average?

* If As Found Efficiency (even after repair) is within 10% of the last calibration and uniformity is <10%, the technician may N/A the Plateau Data and proceed to Comments. Geometry = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified.

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background
N/A		

HV V CENTER Background Efficiency

Cs-137

Comments:

Married as a set with: Model: 2350-1 Serial #: 221016

Calibration short cycled for use at a different site.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Reviewed by: Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: WM Date: 5.2.6

Safety and Ecology Corporation

2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 2350-1,Serial # 221019, Bar Code # ,Property # SEC-6120

SECTION 1: GENERAL INFORMATION

Date: 05/02/06 Date Last Cal. Expires: Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 209797 CAL. DUE: 06/13/06

MODEL: SERIAL #: CAL DUE:

SECTION 2: AS FOUND DATA

Condition: SAT AF Mechanical Zero: AL Mechanical Zero:

☐ New Batteries? Battery Check: SAT

HV (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	501	AF
1000 V:	1000	AF
1500 V:	1494	AF

AF THRESHOLD: 9.8 AL THRESHOLD: 10.2 AFHVReading: 0 ALHVReading: 1000

SECTION 3: REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 (x1000)	25 (x1000)	25 (x1000)
x100 or x1000 Scale:	250 (x1000)	250 (x1000)	250 (x1000)

☑ Are the Individual Counts Within 10% of the Average?

☑ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT

SECTION 4: DIGITAL SCALER

AF 250:	250	% ERR: 0.00%	AL 250:	AF	% ERR: 0.00%
AF 2500:	2502	% ERR: 0.08%	AL 2500:	AF	% ERR: 0.08%
AF 25K:	25.02 K	% ERR: 0.08%	AL 25K:	AF K	% ERR: 0.08%
AF 250K:	250.1 K	% ERR: 0.04%	AL 250K:	AF K	% ERR: 0.04%

☑ Is the As Found Data Within 20% of the Set Point?

SECTION 5: FINAL ACCEPTANCE

Push Buttons: SAT Lamp: SAT Audio/Divide: SAT

Comments: Married as a set with: PR150641 Model: 44-10

☑ Does Instrument Meet Final Acceptance Criteria?

☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 5.2.6

SAFETY AND ECOLOGY
CALIBRATION DATA SHEET

FORM 99-6
REV. 1

CUSTOMER NAME	: Safety and Ecology	INST. MANUFACTURER	: Ludlum Measurements	
PLANT NAME	:	TYPE	: NaI	
ADDRESS	: 10512 Lexington Drive	MODEL NO.	: 2350-1	44-10
	Knoxville	SERIAL NO.	: 221019	PR150641
	TN.			
CONTACT PERSON	: J DeGroodt			

SOURCES USED

CAL SOURCE USED: CESIUM-137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE: 09/10/2006

CALIBRATION DATA

Dead Time : **18.4 u Sec** **Calibration Constant 6.31182 E10**

DIGITAL READINGS	EXPOSURE RATE uR/HR	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
	150	0	150	-100.00	0.00
	500	0	497	-100.00	-0.60
	1500	0	1490	-100.00	-0.67
	5000	0	4920	-100.00	-1.60

PRECISION

DIGITAL READINGS	EXPOSURE RATE	AS FOUND	MEAN VALUE	% DEV.
	1500 uR/HR	1490		0.00
		1490	1490.00	0.00
		1490		0.00

COMMENTS/REMARKS: Initial calibration of 44-10 in uR/Hr as detector #1 on the 2350-1

ALL CALIBRATION DONE WITH CALIBRATED TEST EQUIPMENT.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL INPUT RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 99.

CALIBRATED BY : [signature] REVIEWED BY : [signature]

DATE CALIBRATED : 5·2·6 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5·2·7

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 44-10,Serial # PR150641, Bar Code # ,Property # SEC-6099

Date: 05/02/06 Date Last Cal. Expires: 01/23/07 Technician: David Moyer

Location: 9999 Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 221019 CAL DUE: 05/02/07

MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
99CS250-0288	Cs-137	7.5 uCi		3/18/1999

AS FOUND DATA

AF Instrument Condition: SAT AL Instrument Condition: SAT

Efficiency from Last Cal.: 0.66 % HV From Last Calibration: 900 V Calibration Threshold: 10 mV

	HV	Center Count	Background Count	Probe Efficiency	
AS FOUND:	900 V	112083	4308	Cs-137	0.65%
AS LEFT:	AF V			Cs-137	

☑ Is the As Found Efficiency Within 20% of the efficiency from the last cal.?

Reproducibility: Isotope: Cs-137 112821 112817 112222 Average: 112620

☑ Are the individual counts within 10% of the average?

* If As Found Efficiency (even after repair) is within 10% of the last calibration and uniformity is <10%, the technician may N/A the Plateau Data and proceed to Comments. Geometry = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified.

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background	HV	CENTER	Background	Efficiency
N/A			V			Cs-137

Comments: Married as a set with: Model: 2350-1 Serial #: 221019

Calibration short cycled for use at different Site.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 5.2.6

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

5/4/2006

Calibration Certificate

Calibration Certificate for 2350-1,Serial # 228683, Bar Code # ,Property # SEC-6122

SECTION 1: GENERAL INFORMATION

Date: 05/02/06 Date Last Cal. Expires: Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL:	500-2	SERIAL #:	209797	CAL. DUE:	06/13/06
MODEL:		SERIAL #:		CAL DUE:	

SECTION 2: AS FOUND DATA

Condition: SAT AF Mechanical Zero: AL Mechanical Zero:

☐ New Batteries? Battery Check: SAT

HV (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	502	AF
1000 V:	1001	AF
1500 V:	1495	AF

AF THRESHOLD: 9.9 AL THRESHOLD: 10.4 AFHVReading: 0 ALHVReading: 1000

SECTION 3: REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 (x1000)	25 (x1000)	25 (x1000)
x100 or x1000 Scale:	250 (x1000)	250 (x1000)	250 (x1000)

☑ Are the Individual Counts Within 10% of the Average?

☑ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT

SECTION 4: DIGITAL SCALER

AF 250:	250	% ERR: 0.00%	AL 250:	AF	% ERR: 0.00%
AF 2500:	2498	% ERR: 0.08%	AL 2500:	AF	% ERR: 0.08%
AF 25K:	24.98 K	% ERR: 0.08%	AL 25K:	AF K	% ERR: 0.08%
AF 250K:	249.8 K	% ERR: 0.08%	AL 250K:	AF K	% ERR: 0.08%

☑ Is the As Found Data Within 20% of the Set Point?

SECTION 5: FINAL ACCEPTANCE

Push Buttons: SAT Lamp: SAT Audio/Divide: SAT

Comments: Married as a set with: PR150870 Model: 44-10

☑ Does Instrument Meet Final Acceptance Criteria?

☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 5-2-6

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 44-10,Serial # PR150870, Bar Code # ,Property # SEC-5037

Date: 05/02/06 Date Last Cal. Expires: 01/23/07 Technician: David Moyer

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 228683 CAL DUE: 05/02/07

MODEL: SERIAL #: CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
99CS250-0288	Cs-137	7.5 uCi		3/18/1999

AS FOUND DATA

AF Instrument Condition: SAT AL Instrument Condition: SAT

Efficiency from Last Cal.: 0.61 % HV From Last Calibration: 1100 V Calibration Threshold: 10 mV

	HV	Center Count	Background Count	Probe Efficiency	
AS FOUND:	1100 V	107608	4073	Cs-137	0.62%
AS LEFT:	AF V			Cs-137	

☑ Is the As Found Efficiency Within 20% of the efficiency from the last cal.?

Reproducibility: Isotope: Cs-137 108205 107418 107842 Average: 107822

☑ Are the individual counts within 10% of the average?

* If As Found Efficiency (even after repair) is within 10% of the last calibration and uniformity is <10%, the technician may N/A the Plateau Data and proceed to Comments. Geometry = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless otherwise specified.

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background
N/A		

HV V CENTER Background Efficiency

Cs-137

Comments:

Married as a set with: Model: 2350-1 Serial #: 228683

Calibration short cycled for use at a different site.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Reviewed by: Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: Date: 5.2.6

SAFETY AND ECOLOGY
CALIBRATION DATA SHEET

FORM 99-6
REV. 1

CUSTOMER NAME	: Safety and Ecology	INST. MANUFACTURER	: Ludlum Measurements	
PLANT NAME	:	TYPE	: NaI	
ADDRESS	: 10512 Lexington Drive	MODEL NO.	: 2350-1	44-10
	Knoxville	SERIAL NO.	: 228683	PR150870
	TN.			
CONTACT PERSON	: J DeGroodt			

SOURCES USED

CAL SOURCE USED: CESIUM-137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE: 09/10/2006

CALIBRATION DATA

Dead Time : 17.9 u Sec **Calibration Constant 6.08191 E10**

DIGITAL READINGS	EXPOSURE RATE uR/HR	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
	150	0	151	-100.00	0.67
	500	0	503	-100.00	0.60
	1500	0	1470	-100.00	-2.00
	5000	0	5040	-100.00	0.80

PRECISION

DIGITAL READINGS	EXPOSURE RATE	AS FOUND	MEAN VALUE	% DEV.
	1500 uR/HR	1470		0.00
		1470	1470.00	0.00
		1470		0.00

COMMENTS/REMARKS: Initial calibration of 44-10 in uR/Hr as detector #1 on the 2350-1

ALL CALIBRATION DONE WITH CALIBRATED TEST EQUIPMENT.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL INPUT RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 99.

CALIBRATED BY : [signature] REVIEWED BY : [signature]

DATE CALIBRATED : 5-2-6 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5-2-7

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Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931
Calibration Certificate

SEC PROCEDURE #

5/2/2006

Calibration Certificate for 2360,Serial # 227427, Bar Code # ,Property # SEC-6125

Date: 05/02/06 Date Last Cal. Expires: Technician: Thomas Thompson

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 190580 CAL DUE: 08/13/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

☑ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	510 V	500 V
1000 V:	1009 V	1000 V
1500 V:	1505 V	1500 V
AF HV Setting:	808 V	
AL HV Setting:		1650 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	3.3 mV	4 mV
BW (40 mV +/- 4 mV):	29.5 mV	40 mV
AT (120 mV +/- 10 mV):	120 mV	AF mV

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250:	251	% ERR:	0.40%	AL 250:	AF	% ERR:	0.40%
AF 2500:	2510	% ERR:	0.40%	AL 2500:	AF	% ERR:	0.40%
AF 25K:	25.10 K	% ERR:	0.40%	AL 25K:	AF K	% ERR:	0.40%
AF 250K:	250.9 K	% ERR:	0.36%	AL 250K:	AF K	% ERR:	0.36%

☑ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-68 Serial #: PR160700 Bar Code #:

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ Date: 5/2/06

Calibration Certificate

Calibration Certificate for 43-68,Serial # PR160700, Bar Code # ,Property # SEC-5869

Date: 05/02/06 Date Last Cal. Expires: 10/14/05 Technician: Thomas Thompson

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 2360 SERIAL #: 227427 CAL DUE 05/02/07

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40300 dpm	20,500 cpm	2/11/2003
	4072-02	Tc-99	28100 dpm	17,600 cpm	2/6/2003
	4076-02	Sr-90	14600 dpm	10,200 cpm	2/1/2003
	4079-02	Pu-239	29300 dpm	14,900 cpm	2/11/2003

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : 1300 V

Threshold Beta: ~~40~~ 4 - 40.0 mV Alpha: 130 mV

Efficiencies from last calibration	
Pu:	24.70 %
Tc:	27.95 %
Th:	27.34 %
Sr:	39.56 %

	Alpha		Beta		
Background:		CPM		CPM	A-B XTLK
Pu-239:		CPM		CPM	0.0%
Tc-99:		CPM		CPM	B-A XTLK
Th-230:		CPM	N/A		<1%
Sr-90:	N/A			CPM	

AS FOUND Efficiencies: Pu-239: Tc-99: Th-230: Sr-90:

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

	Alpha		Beta		
Background:		CPM		CPM	A-B XTLK
Pu-239:		CPM		CPM	
Tc-99:		CPM		CPM	B-A XTLK
Th-230:		CPM	N/A		<1%
Sr-90:	N/A			CPM	

AS LEFT Efficiencies: Pu-239: Tc-99: Th-230: Sr-90:

☐ Is the As Found Data Within 20% of the efficiency from the last cal.?

Reproducibility : Isotope: Sr-90 4760 4848 4860 Average: 4822.7 ☑ Are the individual counts within 10% of the average?

If the As Found data (even after repair) 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 Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

Source 1: Sr-90 Source 2: Pu-239

HV / Vernier:	Response (CPM) A ch.	B ch.	Net Eff.	Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%	B to A Xtalk: <1%
1450	23	1004	6.73%	3052	321	10.41%	1	21	8.95%	<1%
1500	29	1864	12.22%	4300	346	14.68%	0	80	5.83%	<1%
1550	30	3367	22.31%	5232	427	17.85%	3	110	5.71%	<1%
1600	42	4313	28.71%	5921	492	20.21%	0	122	5.88%	<1%
1650	72	4792	31.64%	6181	461	21.09%	1	172	4.47%	<1%
1700	298	4019	26.64%	6434	446	21.93%	8	130	4.68%	<1%

	Alpha	Beta	HV / Vernier	Pu-239	Tc-99	Th-230	Sr-90
Background:	1	135	1650	6032 CPM	5085 CPM	7822 CPM	4784 CPM
AL Efficiencies:				20.58%	17.62%	19.41%	31.84%

Comments: Married as a set with: Model: 2360 Serial #: 227427 Bar Code #:

Married with new meter. Replaced mylar.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Reviewed by: Date: 5/4/06

Printed Name: Thomas Thompson

Entered in Computer Inventory By: Date: 5/2/06

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

5/4/2006

Calibration Certificate for 2360,Serial # 225246, Bar Code # ,Property # SEC-6108

Date: 04/21/06 Date Last Cal. Expires: Technician: David Moyer

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 209797 CAL DUE: 06/13/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

☐ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	510 V	AF V
1000 V:	1000 V	AF V
1500 V:	1500 V	AF V
AF HV Setting:	895 V	AL HV Setting: 1750 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	3.3 mV	4 mV
BW (40 mV +/- 4 mV):	29.1 mV	40 mV
AT (120 mV +/- 10 mV):	116 mV	120 mV

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250:	251	% ERR:	0.40%	AL 250:	AF	% ERR:	0.40%
AF 2500:	2500	% ERR:	0.00%	AL 2500:	AF	% ERR:	0.00%
AF 25K:	24.99 K	% ERR:	0.04%	AL 25K:	AF K	% ERR:	0.04%
AF 250K:	249.9 K	% ERR:	0.04%	AL 250K:	AF K	% ERR:	0.04%

☑ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-37 Serial #: PR146720 Bar Code #:

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 04/21/07

Performed by: Reviewed by: Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: Date: 4.21.6

Safety and Ecology Corporation
2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 43-37, Serial # PR146720, Bar Code # , Property # BNFL0000161

Date: 04/21/06 Date Last Cal. Expires: Technician: David Moyer

Location: 1193, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 225246 CAL DUE 04/21/07

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4049-02	Th-230	30300 dpm	15,400 cpm	9/26/2002
	4050-02	Tc-99	36600 dpm	22,900 cpm	9/25/2002
	4052-02	Sr-90	22400 dpm	15,700 cpm	9/25/2002
	4053-02	Pu-239	27500 dpm	14,000 cpm	9/26/2002

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : V

Threshold Beta: 4 - 40 mV Alpha : 120mV

Efficiencies from last calibration	
Pu:	%
Tc:	%
Th:	%
Sr:	%

Back ground:	Alpha		Beta		
		CPM		CPM	A-B XTLK
Pu-239:		CPM		CPM	0.0%
Tc-99:		CPM		CPM	B-A XTLK
Th-230:		CPM	N/A		<1%
Sr-90:	N/A			CPM	

AS FOUND Efficiencies: Pu-239: Tc-99: Th-230: Sr-90:

☐ Is the As Found Data Within 20% of the efficiency from the last cal.?

AS LEFT DATA

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

Back ground:	Alpha		Beta		
		CPM		CPM	A-B XTLK
Pu-239:		CPM		CPM	
Tc-99:		CPM		CPM	B-A XTLK
Th-230:		CPM	N/A		<1%
Sr-90:	N/A			CPM	

AS LEFT Efficiencies: Pu-239: Tc-99: Th-230: Sr-90:

Reproducibility : Isotope: Sr-90 7684 7641 7558 Average: 7627.7 ☑ Are the individual counts within 10% of the average?

If the As Found data (even after repair) 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 Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

Source 1: Sr-90 Source 2: Pu-239

HV / Vernier:	Response (CPM) A ch.	B ch.	Net Eff.	Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%	B to A Xtalk: <1%
1650	32	4735	19.58%	5276	613	19.17%	5	349	4.77%	<1%
1700	40	6103	25.12%	5314	811	19.32%	2	476	5.93%	<1%
1750	19	7703	31.47%	5590	1025	20.31%	4	654	6.22%	<1%
1800	151	7595	31.04%	6061	1231	22.00%	10	642	8.86%	<1%

	Alpha	Beta	HV / Vernier	Pu-239	Tc-99	Th-230	Sr-90
Background:	6.8	663.4	1775	5906 CPM	7803 CPM	5808 CPM	8046 CPM
AL Efficiencies:				21.45%	19.51%	19.15%	32.96%

Comments: Married as a set with: Model: 2360 Serial #: 225246 Bar Code #:

Alpha threshold = 120mV Beta = 4 - 40mV.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 04/21/07

Performed by: Date: 5/4/06

Printed Name: David Moyer

Entered in Computer Inventory By: Date: 4-21-06

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

SEC PROCEDURE #

Calibration Certificate

Page 1 of 1

4/21/2006

Calibration Certificate for 2360,Serial # 164693, Bar Code # ,Property # SEC-5430

Date: 04/21/06 Date Last Cal. Expires: 03/07/07 Technician: David Moyer

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 209797 CAL DUE: 06/13/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

☐ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	510 V	AF V
1000 V:	1000 V	AF V
1500 V:	1500 V	AF V
AF HV Setting:	698 V	AL HV Setting: 1750 V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	3.9 mV	4 mV
BW (40 mV +/- 4 mV):	40 mV	AF mV
AT (120 mV +/- 10 mV):	120 mV	AF mV

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250:	251	% ERR: 0.40%	AL 250:	AF	% ERR: 0.40%
AF 2500:	2502	% ERR: 0.08%	AL 2500:	AF	% ERR: 0.08%
AF 25K:	25.01 K	% ERR: 0.04%	AL 25K:	AF K	% ERR: 0.04%
AF 250K:	250.1 K	% ERR: 0.04%	AL 250K:	AF K	% ERR: 0.04%

☑ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-37 Serial #: PR190328 Bar Code #:

Married to new probe.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 04/21/07

Performed by: _____ Reviewed by: _____ Date: _____

Printed Name: David Moyer

Entered in Computer Inventory By: _____ Date: 4.21.6

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

4/21/2006

Calibration Certificate for 43-37,Serial # PR190328, Bar Code # ,Property # SEC-6112

Date: 04/21/06 Date Last Cal. Expires: Technician: David Moyer

Location: 8888, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 164693 CAL DUE 04/21/07

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4049-02	Th-230	30300 dpm	15,400 cpm	9/26/2002
	4050-02	Tc-99	36600 dpm	22,900 cpm	9/25/2002
	4052-02	Sr-90	22400 dpm	15,700 cpm	9/25/2002
	4053-02	Pu-239	27500 dpm	14,000 cpm	9/26/2002

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : V

Threshold Beta: - mV

Efficiencies from last calibration	
Pu:	%
Tc:	%
Th:	%
SrY:	%

	Alpha	Beta		
Back ground:		CPM	CPM	A-B XTLK
Pu-239:		CPM	CPM	0.0%
Tc-99:		CPM	CPM	
Th-230:		CPM	N/A	
SrY-90:	N/A		CPM	

AS FOUND Efficiencies: Pu-239: Tc-99: Th-230: SrY-90:

☐ Is the As Found Data Within 20% of the efficiency from the last cal.?

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

	Alpha	Beta		
Back ground:		CPM	CPM	A-B XTLK
Pu-239:		CPM	CPM	
Tc-99:		CPM	CPM	
Th-230:		CPM	N/A	
SrY-90:	N/A		CPM	

AS LEFT Efficiencies: Pu-239: Tc-99: Th-230: SrY-90:

Reproducibility : Isotope: Sr-90 8043 7979 8001 Average: 8007.7 ☑ Are the individual counts within 10% of the average?

If the As Found data (even after repair) is within 10% of the last calibration and the A-B Xtalk is <10%, then the technician may N/A the Plateau Data and go directly to Comments. When calibrating the probe to a new set of sources not all efficiencies need to fall within 10%. Geometry = NaI probes are 4 1/2" from source. All other probes are in contact with surface unless

PLATEAU DATA

Source 1: Sr-90 Source 2: Pu-239

HV / Vernier:	Response (CPM) A ch.	B ch.	Net Eff.	Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%
1700	27	7267	29.90%	5079	920	18.46%	3	569	6.46%
1750	46	8070	32.21%	5761	1077	20.92%	8	854	3.73%
1800	275	7338	29.09%	5948	1101	21.60%	9	822	4.48%

	Alpha	Beta	HV / Vernier	Pu-239	Tc-99	Th-230	SrY-90
Background:	7	846	1750	5730 CPM	7757 CPM	5382 CPM	7984 CPM
AL Efficiencies:				20.81%	18.88%	17.74%	31.87%

Comments: Married as a set with: Model: 2360 Serial #: 164693 Bar Code #:

Alpha Threshold = 120mV Beta = 4 - 40mV

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 04/21/07

Performed by: Reviewed by: Date:

Printed Name: David Moyer

Entered in Computer Inventory By: Date: 4.21.6

SAFETY AND ECOLOGY CORP.
CALIBRATION DATA SHEET

FORM 73-1
REV. 0

CUSTOMER NAME	: SAFETY AND ECOLOGY	INST. MANUFACTURER	: LUDLUM INST.
PLANT NAME	: SEC LAB	TYPE	: SCINTILLATION
ADDRESS	: 10512 Lexington Dr.	MODEL NO.	: 19
	KNOXVILLE	SERIAL NO.	: 137849
	TN		
CONTACT PERSON	: JERRY DEGROODT		

AQ03

SOURCE USED

CAL. SOURCE USED : CESIUM -137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE : 09/10/2006

M&TE

MINIPULSER S/N	: 314	CALIBRATION DUE DATE :	01/27/2007
DVM S/N	: 82730524	CALIBRATION DUE DATE :	02/10/2007
H.V. PROBE S/N	: 82630102	CALIBRATION DUE DATE :	02/10/2007

CALIBRATION DATA

		AS FOUND	AS LEFT	
HIGH VOLTAGE	:	800	800	VOLTS
INPUT SENSITIVITY	:	38	38	MILLIVOLTS

SCALE	EXPOSURE RATE uR/HR	EXPOSURE RATE (MR/HR)	INSTRUMENT READING AS FOUND	INSTRUMENT READING AS LEFT	PER CENT ERROR AS FOUND	PER CENT ERROR AS LEFT
25	5	(PULSED = TO)	5.00	5.00	0.00	0.00
	12	(PULSED = TO)	12.00	12.00	0.00	0.00
	20	(PULSED = TO)	20.00	20.00	0.00	0.00
50	10	(PULSED = TO)	10.0	10.0	0.00	0.00
	25	(PULSED = TO)	25.0	25.0	0.00	0.00
	40	(PULSED = TO)	40.0	40.0	0.00	0.00
250	50	(PULSED = TO)	50.0	50.0	0.00	0.00
	120	(PULSED = TO)	120.0	120.0	0.00	0.00
	200	(PULSED = TO)	200.0	200.0	0.00	0.00
500	200	(0.2)	200	200	0.00	0.00
	250	(0.25)	250	250	0.00	0.00
	400	(0.4)	390	390	-2.50	-2.50
5000	1000	(1.0)	1050	1050	5.00	5.00
	2500	(2.5)	2500	2500	0.00	0.00
	4000	(4.0)	3800	3800	-5.00	-5.00

PRECISION

SCALE	EXPOSURE RATE		AS FOUND	MEAN VALUE	% DEV.
5000	2500	(2.5)	2500		0.00
			2500	2500	0.00
			2500		0.00

COMMENTS/REMARKS:

DOSE RATE CALIBRATION DONE WITH N.I.S.T. TRACEABLE SOURCES AND CALIBRATED TEST EQUIPMENT.
PULSE RATE CALIBRATION DONE AS REQUIRED DUE TO BACKGROUND RADIATION AND CORRELATED TO DOSE RATE CALIBRATION ON HIGHER SCALES.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL EXPOSURE RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 73.

CALIBRATED BY : _____ REVIEWED BY : _____

DATE CALIBRATED : 5.4.06 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5.4.07

SAFETY AND ECOLOGY CORP.
CALIBRATION DATA SHEET

FORM 73-1
REV. 0

CUSTOMER NAME	: SAFETY AND ECOLOGY	INST. MANUFACTURER	: LUDLUM INST.
PLANT NAME	: SEC LAB	TYPE	: SCINTILLATION
ADDRESS	: 10512 Lexington Dr.	MODEL NO.	: 19
	KNOXVILLE	SERIAL NO.	: 148206
	TN		
CONTACT PERSON	: JERRY DEGROODT		

SOURCE USED

CAL. SOURCE USED : CESIUM -137 400 CURIE/130 MILLICURIE S/N 9115 CAL DUE : 09/10/2006

M&TE

MINIPULSER S/N	: 314	CALIBRATION DUE DATE :	01/27/2007
DVM S/N	: 82730524	CALIBRATION DUE DATE :	02/10/2007
H.V. PROBE S/N	: 82630102	CALIBRATION DUE DATE :	02/10/2007

CALIBRATION DATA

		AS FOUND	AS LEFT	
HIGH VOLTAGE	:	950	950	VOLTS
INPUT SENSITIVITY	:	40	40	MILLIVOLTS

SCALE	EXPOSURE RATE uR/HR	(MR/HR)	INSTRUMENT READING AS FOUND	AS LEFT	PER CENT ERROR AS FOUND	AS LEFT
25	5	(PULSED = TO)	4.80	4.80	-4.00	-4.00
	12	(PULSED = TO)	12.00	12.00	0.00	0.00
	20	(PULSED = TO)	20.00	20.00	0.00	0.00
50	10	(PULSED = TO)	10.0	10.0	0.00	0.00
	25	(PULSED = TO)	25.0	25.0	0.00	0.00
	40	(PULSED = TO)	40.0	40.0	0.00	0.00
250	50	(PULSED = TO)	50.0	50.0	0.00	0.00
	120	(PULSED = TO)	120.0	120.0	0.00	0.00
	200	(PULSED = TO)	200.0	200.0	0.00	0.00
500	200	(0.2)	200	200	0.00	0.00
	250	(0.25)	250	250	0.00	0.00
	400	(0.4)	390	390	-2.50	-2.50
5000	1000	(1.0)	1000	1000	0.00	0.00
	2500	(2.5)	2500	2500	0.00	0.00
	4000	(4.0)	3800	3800	-5.00	-5.00

PRECISION

SCALE	EXPOSURE RATE		AS FOUND	MEAN VALUE	% DEV.
5000	2500	(2.5)	2500		0.00
			2500	2500	0.00
			2500		0.00

COMMENTS/REMARKS:

DOSE RATE CALIBRATION DONE WITH N.I.S.T. TRACEABLE SOURCES AND CALIBRATED TEST EQUIPMENT.
PULSE RATE CALIBRATION DONE AS REQUIRED DUE TO BACKGROUND RADIATION AND CORRELATED TO DOSE RATE CALIBRATION ON HIGHER SCALES.
CALIBRATION POINTS ACCEPTANCE CRITERIA +/-10% OF ACTUAL EXPOSURE RATE.
OUT OF TOLERANCE VALUES ARE CIRCLED AND CUSTOMER CONTACT NOTIFIED VERBALLY OF CONDITION.
CALIBRATION PERFORMED PER ICAL PROCEDURE NUMBER 73.

CALIBRATED BY : _____ REVIEWED BY : _____

DATE CALIBRATED : 5-4-06 DATE REVIEWED : 5/4/06

CALIBRATION DUE DATE : 5-4-07

Safety and Ecology Corporation
2800 Solway Road
Knoxville, TN 37931

Calibration Certificate

SEC PROCEDURE #

5/4/2006

Calibration Certificate for 2360,Serial # 227415, Bar Code # ,Property # SEC-6124

Date: 05/04/06 Date Last Cal. Expires: 05/02/07 Technician: Thomas Thompson

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 190580 CAL DUE: 08/13/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

☐ New Batteries? Battery Check: SAT AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	500 V	AF V
1000 V:	1000 V	AF V
1500 V:	1500 V	AF V
AF HV Setting:	1660 V	AL HV Setting: V

WINDOW SETTINGS	AS FOUND	AS LEFT
BT (4 mV +/- .4 mV):	4.3 mV	4 mV
BW (40 mV +/- 4 mV):	40.4 mV	40 mV
AT (120 mV +/- 10 mV):	132 mV	120 mV

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250: 251 % ERR: 0.40% AL 250: AF % ERR: 0.40%

AF 2500: 2507 % ERR: 0.28% AL 2500: AF % ERR: 0.28%

AF 25K: 25.07 K % ERR: 0.28% AL 25K: AF K % ERR: 0.28%

AF 250K: 250.6 K % ERR: 0.24% AL 250K: AF K % ERR: 0.24%

☑ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

Audio Response: SAT

Overload Light: SAT

Low Battery (2.2V): SAT

Comments: Married as a set with: Model: 43-68 Serial #: PR116722 Bar Code #:

Calibrated with 15' cable.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/04/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ Date: 5/4/06

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

5/4/2006

Calibration Certificate for 43-68,Serial # PR116722, Bar Code # ,Property # SEC0000651

Date: 05/04/06 Date Last Cal. Expires: 05/02/07 Technician: Thomas Thompson

Location: 9999, Reason For Calibration: Other (See Comments)

EQUIPMENT USED DURING CALIBRATION MODEL: 2360 SERIAL #: 227415 CAL DUE 05/04/07

MODEL: SERIAL #: CAL DUE

NIST TRACEABLE SOURCES USED	SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
	4071-02	Th-230	40300 dpm	20,500 cpm	2/11/2003
	4072-02	Tc-99	28100 dpm	17,600 cpm	2/6/2003
	4076-02	Sr-90	14600 dpm	10,200 cpm	2/1/2003
	4079-02	Pu-239	29300 dpm	14,900 cpm	2/11/2003

AS FOUND DATA

AS FOUND Instrument Condition: SAT

Calibration Setpoints

HV : 1650 V

Threshold Beta: ~~120~~ 4-40.0 mV Alpha: 120mV

Efficiencies from last calibration	
Pu:	22.16 %
Tc:	18.52 %
Th:	20.72 %
Sr:	33.05 %

	Alpha		Beta		
Back ground:	0	CPM	170	CPM	A-B XTLK
Pu-239:	4008	CPM	547	CPM	8.6%
Tc-99:	0	CPM	6437	CPM	B-A XTLK
Th-230:	4531	CPM	N/A		<1%
Sr-90:	N/A		4008	CPM	

AS FOUND Efficiencies: Pu-239: 13.68% Tc-99: 22.30% Th-230: 11.24% Sr-90: 26.29%

AS LEFT Instrument Condition: SAT

AS LEFT DATA after repair or HV adjust

HV : V

	Alpha		Beta		
Back ground:		CPM		CPM	A-B XTLK
Pu-239:		CPM		CPM	
Tc-99:		CPM		CPM	B-A XTLK
Th-230:		CPM	N/A		<1%
Sr-90:	N/A			CPM	

AS LEFT Efficiencies: Pu-239: Tc-99: Th-230: Sr-90:

☐ Is the As Found Data Within 20% of the efficiency from the last cal.?

Reproducibility : Isotope: Sr-90 4668 4660 4668 Average: 4665.3 ☑ Are the individual counts within 10% of the average?

If the As Found data (even after repair) 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 Data and go directly to Comments. Geometry of source = flush to surface, except gas proportional probes = 1/8" from surface unless otherwise specified.

PLATEAU DATA

Source 1: Sr-90 Source 2: Pu-239

HV / Vernier:	Response (CPM) A ch.	B ch.	Net Eff.	Response (CPM) A ch.	B ch.	Net Eff.	Background (CPM) A ch.	B ch.	Net A to B Xtalk: <10%	B to A Xtalk: <1%
1600	20	2620	17.49%	2735	664	9.33%	0	67	17.92%	<1%
1650	25	4125	27.40%	3711	572	12.66%	2	124	10.77%	<1%
1700	39	4697	31.02%	4555	584	15.54%	1	168	8.37%	<1%
1750	226	3669	23.62%	5143	551	17.52%	11	221	6.03%	<1%
										<1%
										<1%

	Alpha	Beta	HV / Vernier	Pu-239	Tc-99	Th-230	Sr-90
Background:	1	186	1700	4589 CPM	5421 CPM	5559 CPM	4780 CPM
AL Efficiencies:				15.66%	18.63%	13.79%	31.47%

Comments: Married as a set with: Model: 2360 Serial #: 227415 Bar Code #:

Calibrated with 15' cable.

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/04/07

Performed by: _____ Reviewed by: _____ Date: 5/4/06

Printed Name: Thomas Thompson

Entered in Computer Inventory By: _____ Date: 5/4/06

COPY

Duratek

CALIBRATION CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum	
Address: 628 Gallaher Road, Kingston, TN 37763		Model: 2360	Serial Number: 185766
Contact Name: Thomas F. Scott		Probe: 43-68	Serial Number: 099186
Customer Purchase Order Number: N/A	Work Order Number: 2006-03546	Calibration Method: Electronic	

INSTRUMENT CALIBRATION INFORMATION

Instrument Range	Calibration Standard Value	Ratemeter Response		Calibration Standard Value CPM	Time Base (minutes)	Tolerances (cpm) ± 10%	Scaler Response	
		As Found	As Left				As Found	As Left
X 1	100	100	100	1,000 CPM	.1	90 – 110	100	100
X 1	200	200	200	1,000 CPM	.5	450 – 550	500	500
X 1	400	400	400	1,000 CPM	1	900 – 1,100	1,000	1,000
X 10	1,000	1,000	1,000	1,000 CPM	2	1.8K–2.2K	2,000	2,000
X 10	2,000	2,000	2,000	1,000 CPM	5	4.5K-5.5K	5,000	5,000
X 10	4,000	4,000	4,000	1,000 CPM	10	9.9K-11K	10,000	10,000
X 100	10,000	10,000	10,000					
X 100	20,000	20,000	20,000					
X 100	40,000	40,000	40,000					
X 1000	100,000	100,000	100,000					
X 1000	200,000	200,000	200,000					
X 1000	400,000	400,000	400,000					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated By: M. Paul	Reviewed By: Robert Rowden Date: 2/14/06
Calibration Date: 02/14/06	Calibration Due: 02/14/07

Model: 2360 Serial Number: 185766

M&TE				Environmental Conditions		
Volt Meter	ID# TW12663	Cal Due:	03/30/06	Barometer	ID# 2816	Cal Due: 04/19/06
Pulser	ID# 683	Cal Due:	03/16/06	Thermometer	ID# 2816	Cal Due: 04/19/06
Humidtiy	ID# 958670	Cal Due:	03/22/06	Temp: 23.9°C	Pressure: 745 mmHg	Humidity: 14%

Special Test

Geotropism	Sat (√) Unsat ( )	As Found	As Left
Audio Check	Sat (√) Unsat ( )	Alpha Sensitivity = 145 mv	Alpha Sensitivity = 120 mv
Mechanical Zero	Sat (√) Unsat ( )	Beta Sensitivity = 4 mv	Beta Sensitivity = 3.5 mv
Reset	Sat (√) Unsat ( )	Beta Window = 40 mv	Beta Window = 30 mv
HV Analog Display	Sat (√) Unsat ( )	See detector certificate for High Voltage setting	

High Voltage Calibration

Voltage	Tolerance	As Found	As Left	Overload Not Set		Overload Not Set	
				H.V. Set With Detector Not Connected			
500	450-550	492	492				
1000	900-1100	982	982				
1500	1350-1650	1,499	1,499				

COMMENTS

Calibrated with 5ft. Cable

Instrument Calibrated By: M. Pani	Reviewed By: [signature] Date: 2/14/06
Calibration Date: 02/14/06	Calibration Due: 02/14/07

Duratek

DETECTOR CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-68A
Contact Name: Thomas Scott		Serial Number: 099186
Customer Purchase Order Number: N/A	Work Order Number: 2006-03546	Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION

1) Source Nuclide: Th^{230}	Serial Number: 119709	Activity (dpm): 2,442	Certification Date: 10/14/97

Parameter	As Found	As Left	Precision Test	CPM (Source #1)
Count 1	412	412	Count 1(Heel)	386
Count 2	415	415	Count 2(Center)	424
Count 3	416	416	Count 3(Toe)	422
Average	414	414	Average	411
Background (cpm)	1.2	1.2	Tolerance	All counts within ±10% of Average
Net Counts	413	413	Pass/Fail	PASS
Efficiency	16.9%	16.9%		

Low Sample Activity: Source #: N/A	High Sample Activity: Source #: N/A	Dead Time (DT): N/A	Calibration Constant (CC): N/A

SCALER INFORMATION		DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2360	185766	02/14/07	1.2	1650V	120mV

Detector Setup Report YES NO √	Barcode Report YES NO √	Voltage Plateau YES √ NO

COMMENTS

Calibrated with 5Ft. Cable

10 minute background* Efficiency determined w/43-68 source jig*

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By: M. Pani	Reviewed By: [signature]	Date: 2/14/06
Certification Date: 02/14/06		Certification Due: 02/14/07

Duratek

DETECTOR CERTIFICATE

Duratek Instrument Services
628 Gallaher Road
Kingston, TN 37763
Phone: (865) 376-8337
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		DETECTOR INFORMATION
Customer Name: Duratek Instrument Services		Manufacturer: Ludlum
Address: 628 Gallaher Rd Kingston, TN 37763		Detector Model: 43-68B
Contact Name: Thomas Scott		Serial Number: 099186
Customer Purchase Order Number: N/A	Work Order Number: 2006-03546	Evaluation Method: Source

DETECTOR EFFICIENCY/RESPONSE/PRECISION INFORMATION

1) Source Nuclide: Tc99	Serial Number: 119713	Activity (dpm): 2,616	Certification Date: 10/14/97

Parameter	As Found	As Left	Precision Test	CPM (Source #1)
Count 1	595	595	Count 1(Heel)	584
Count 2	574	574	Count 2(Center)	615
Count 3	544	544	Count 3(Toe)	593
Average	571	571	Average	597
Background (cpm)	183.6	183.6	Tolerance	All counts within ±10% of Average
Net Counts	387.4	387.4	Pass/Fail	PASS
Efficiency	14.8%	14.8%		

Low Sample Activity: Source #: N/A	High Sample Activity: Source #: N/A	Dead Time (DT): N/A	Calibration Constant (CC): N/A

SCALER INFORMATION		DETECTOR INFORMATION			
Model	Serial Number	Due Date	Background	Operating Voltage	Threshold
2360	185766	02/14/07	183.6	1650V	3.5-30 mV

Detector Setup Report YES NO √	Barcode Report YES NO √	Voltage Plateau YES √ NO

COMMENTS

Calibrated with 5Ft. Cable

10 minute background* Efficiency determined w/43-68 source jig*

STATEMENT OF CERTIFICATION

We Certify that the detector listed above was evaluated for proper operation prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this detector).

Detector Certified By: M. Paul	Reviewed By: [signature]	Date: 2/14/06
Certification Date: 02/14/06		Certification Due: 02/14/07

Detector 43-68 #099186 Raw Data (Counts)										
	Background		Th-230		Tc-99		N/A		N/A	
Voltage	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
1600	0	115	400	217	1	571				
1625	1	151	423	246	1	658				
1650	**1**	**206**	**419**	**262**	**1**	**596**				
1675	1	198	422	264	5	495				
1700	2	187	444	245	21	429				
1725	9	176	481	192	61	371				
1750										

Source Info

Nuclide	**Th-230**	**Tc-99**	**N/A**	**N/A**
ID	119709	119713		
Initial DPM	2442	2616		
Certification Date	10/14/1997	10/14/1997		
Today's Date	2/14/2006	2/14/2006	2/14/2006	2/14/2006
Source Age (Years)	8.34	8.34	106.12	106.12
Half-Life (Years)	7.70E+04	2.13E+05		
Corrected Activity	2442	2616	#DIV/0!	#DIV/0!

Net CPM													
	MDA/Cross-Talk			Beta Eff.	Alpha Eff.	Th-230		Tc-99		N/A		N/A	
Voltage	Beta MDA	Alpha MDA	Beta-Alpha	(%)	(%)	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
1600	301.8	16.5	0.2%	17.43%	16.4%	400	102	1	456	0	-115	0	-115
1625	309.0	42.6	0.2%	19.38%	17.3%	422	95	0	507	-1	-151	-1	-151
1650	**466.1**	**43.0**	**0.2%**	**14.91%**	**17.1%**	**418**	**56**	**0**	**390**	-1	-206	-1	-206
1675	600.5	42.7	1.0%	11.35%	17.2%	421	66	4	297	-1	-198	-1	-198
1700	717.1	51.3	4.7%	9.25%	18.1%	442	58	19	242	-2	-187	-2	-187
1725	864.4	86.2	14.1%	7.45%	19.3%	472	16	52	195	-9	-176	-9	-176
1750	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0	0
	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0	0
	#DIV/0!	#DIV/0!	#DIV/0!	0.00%	0.0%	0	0	0	0	0	0	0	0

Performed By: Mike Paul Date: 2/14/06

Reveiwed By: Robert Woodhull Date: 2/14/06

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

Calibration Certificate for 3,Serial # 111535, Bar Code # ,Property # SEC0000207

Date: 05/02/06 Date Last Cal. Expires: 01/16/07 Technician: Blake Huettel

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 153622 CAL DUE: 08/24/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	500	AF
1000 V:	1000	AF
1500 V:	1500	AF

HV Range 400-1500V: N/A

☐ New Batteries? Battery Check: SAT Alarm: N/A

AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

AS FOUND THRESHOLD: 32.7 mV AS LEFT THRESHOLD: 32.7 mV

AS FOUND HV Reading: 900 V AS LEFT HV Reading: 900 V

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250:	N/A	% ERR:	0.00%	AL 250:	N/A	% ERR:	0.00%
AF 2500:	N/A	% ERR:	0.00%	AL 2500:	N/A	% ERR:	0.00%
AF 25K:	N/A K	% ERR:	0.00%	AL 25K:	N/A K	% ERR:	0.00%
AF 250K:	N/A K	% ERR:	0.00%	AL 250K:	N/A K	% ERR:	0.00%

☐ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

☑ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT Audio Divide: N/A

Push Buttons: SAT Lamp: SAT

Scaler/Digital: SAT

Comments: Married as a set with: Model: 44-9 Serial #: PR193576 Bar Code #:

☑ Does Instrument Meet Final Acceptance Criteria? ✓ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Blake Huettel Reviewed by: [signature] Date: 5/4/06

Printed Name: Blake Huettel

Entered in Computer Inventory By: BH Date: 5-2-06

Safety and Ecology Corporation

2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

Calibration Certificate for 44-9,Serial # PR193576, Bar Code # ,Property # SEC-5211

Date: 05/02/06 Date Last Cal. Expires: 07/20/06 Technician: Blake Huettel

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 3 SERIAL # 111535 CAL DUE: 05/05/07

MODEL: SERIAL # CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
4073-02	Tc-99	30100 dpm	18,800 cpm	2/6/2003
4065-02	Sr-90	21500 dpm	15,100 cpm	12/12/2002

Geometry = in contact with surface unless otherwise specified.

PREVIOUS Tc-99 EFFICIENCY: % Calibration Voltage: 900 V Calibration Threshold: 32.7 mV

AS FOUND Instrument Condition: SAT

AS FOUND DATA

1 MINUTE COUNTS (CPM)

				AVERAGE
AF Background:	44			
Tc-99 Count:	3800	3800	3800	3800.0
Sr-90 Count:	5000			

Efficiencies

Tc-99 EFF: 12.48% Sr-90 EFF: 23.05%

AS LEFT Instrument Condition: SAT

AS LEFT DATA

1 MINUTE COUNTS (CPM)

				AVERAGE
AL Background:	AF			
Tc-99 Count:	AF	AF	AF	
Sr-90 Count:	AF			

Efficiencies

Tc-99 EFF: Sr-90 EFF:

- [x] Is the AS FOUND efficiency within 20% of efficiency from last calibration?
- [x] Reproducibility: Are the individual counts within 10% of the average?
- [x] Does the probe meet final acceptance criteria?
- [x] Calibration sticker attached?

Comments: Married as a set with: Model: 3 Serial #: 111535 Bar Code #:

Date Instrument is Due For Next Calibration: 05/02/07

Performed by: Blake Huettel Reviewed by: Date: 5/4/06

Printed Name: Blake Huettel

Entered in Computer Inventory By: BH Date: 5-2-06

Safety and Ecology Corporation
2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

Calibration Certificate for 3,Serial # 187586, Bar Code # ,Property # SEC-5641

Date: 05/01/06 Date Last Cal. Expires: 01/16/07 Technician: Blake Huettel

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 500-2 SERIAL #: 153622 CAL DUE: 08/24/06

MODEL: SERIAL #: CAL DUE:

AS FOUND DATA

Geotropism: SAT AS FOUND Instrument Condition: SAT AS LEFT Instrument Condition: SAT

HIGH VOLTAGE (+/- 10% tolerance)	AS FOUND HV	AS LEFT HV
500 V:	500	AF
1000 V:	1000	AF
1500 V:	1500	AF

HV Range 400-1500V: N/A

☐ New Batteries? Battery Check: SAT Alarm: N/A

AS FOUND Mechanical Zero: 0 AS LEFT Mechanical Zero: 0

AS FOUND THRESHOLD: 38.9 mV AS LEFT THRESHOLD: 38.9 mV

AS FOUND HV Reading: 894 V AS LEFT HV Reading: 900 V

RATE METER

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.00%	AF	0.00%
	250	250	0.00%	AF	0.00%
	400	400	0.00%	AF	0.00%
x1 or x10	1000	1000	0.00%	AF	0.00%
	2500	2500	0.00%	AF	0.00%
	4000	4000	0.00%	AF	0.00%
x10 or x100	10K	10	0.00%	AF	0.00%
	25K	25	0.00%	AF	0.00%
	40K	40	0.00%	AF	0.00%
x100 or x1000	100K	100	0.00%	AF	0.00%
	250K	250	0.00%	AF	0.00%
	400K	400	0.00%	AF	0.00%

☑ Is the As Found Data Within 20% of the Set Point?

DIGITAL SCALER

AF 250: 250 % ERR: 0.00% AL 250: AF % ERR: 0.00%

AF 2500: 2498 % ERR: 0.08% AL 2500: AF % ERR: 0.08%

AF 25K: 24.98 K % ERR: 0.08% AL 25K: AF K % ERR: 0.08%

AF ~~250K~~ 100K: 100 K % ERR: ~~60.00~~ 0 AL ~~250K~~ 100K: AF K % ERR: ~~60.00%~~ 0 BK

☑ Is the As Found Data Within 20% of the Set Point?

REPRODUCIBILITY

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25 K	25 K	25 K
x100 or x1000 Scale:	250 K	250 K	250 K

☑ Are the Individual Counts Within 10% of the Average?

☑ Fast / Slow Response Switch Functions Properly?

Audio Response: SAT Audio Divide: N/A

Push Buttons: SAT Lamp: SAT

Scaler/Digital: SAT

Comments: Married as a set with: Model: 44-9 Serial #: PR193570 Bar Code #:

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: 05/01/07

Performed by: Blake Huettel Reviewed by: [signature] Date: 5/4/06

Printed Name: Blake Huettel

Entered in Computer Inventory By: BH Date: 5-1-06

Safety and Ecology Corporation
2800 Solway Road, Knoxville, TN 37931

Calibration Certificate

5/1/2006

Calibration Certificate for 44-9,Serial # PR193570, Bar Code # ,Property # SEC-5120

Date: 05/01/06 Date Last Cal. Expires: Technician: Blake Huettel

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 3 SERIAL # 187586 CAL DUE: 05/01/07

MODEL: SERIAL # CAL DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2π	ASSAY DATE
4073-02	Tc-99	30100 dpm	18,800 cpm	2/6/2003
4065-02	Sr-90	21500 dpm	15,100 cpm	12/12/2002

Geometry = in contact with surface unless otherwise specified.

PREVIOUS Tc-99 EFFICIENCY: % Calibration Voltage: 900 V Calibration Threshold: 38.9 mV

AS FOUND Instrument Condition: SAT

AS FOUND DATA

1 MINUTE COUNTS (CPM)

				AVERAGE
AF Background:	39			
Tc-99 Count:	4642	4748	4608	4666.0
Sr-90 Count:	6128			

Efficiencies

Tc-99 EFF: 15.37% Sr-90 EFF: 28.32%

AS LEFT Instrument Condition: SAT

AS LEFT DATA

1 MINUTE COUNTS (CPM)

				AVERAGE
AL Background:	AF			
Tc-99 Count:	AF	AF	AF	
Sr-90 Count:	AF			

Efficiencies

Tc-99 EFF: Sr-90 EFF:

- [x] Is the AS FOUND efficiency within 20% of efficiency from last calibration?
- [x] Reproducibility: Are the individual counts within 10% of the average?
- [x] Does the probe meet final acceptance criteria?
- [x] Calibration sticker attached?

Comments: Married as a set with: Model: 3 Serial #: 187586 Bar Code #:

Calibrated with a 4' Cable. BH 5/1/06

Date Instrument is Due For Next Calibration: 05/01/07

Performed by: Blake Huettel Reviewed by: Date: 5/4/06

Printed Name: Blake Huettel

Entered in Computer Inventory By: BHuettel Date: 5-1-06

APPENDIX C

"STATIC" ALPHA AND BETA MEASUREMENT DATA SHEETS

(Available on CD only)

Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	1.80	17	8	20	8	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	60	870	1						

Building 813 Survey Unit 1
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 3 Survey Unit 1 Design

Plan

Classification:	Class 3	
Survey Unit Size (sq meters):	4716.45	
DCGL Criterion:		
Dose:	25	mrem/y TEDE
Model:	RESRAD-Build	Building Occupancy - Default Parameters

Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	1.70	1.80	
$DCGL_{(EMC)}$:	170.47	1797.90	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	6.9	1511.3	counts
Enter Sigma:	2.7	109.3	cpm
Calculated Sigma:	2.6	38.9	cpm
Detector Efficiency (ε_i):	19%	20%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.79%	4.88%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		<----------

False Positive	True Positive
0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**	50% of $DCGL_{(W)}$:	60%	87%
$MDCR_{Surveyor}$:	**17**	**247**	cpm		
Scan MDC:	**60**	**870**	dpm 100 cm^{-2}	35%	48%
Minimum Area Factor Needed:	**0.60**	**0.87**	50% of $DCGL_{(EMC)}$:		

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.7	717.8	Counts
Enter Sigma:	3.2	28.0	counts	2.8	54.1	Counts
Calculated Sigma:	3.0	27.9	counts	2.6	26.8	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	93%	80%
			50% of $DCGL_{(W)}$:		

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	2.79			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.974067			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 3 Alpha Measurements - Building 813 Survey Unit 1

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/23/06	10:30	6	3	2.0	0.0485	33	-17
2	5/23/06	10:34	8	3	2.7	0.0485	44	-6
3	5/23/06	10:38	8	3	2.7	0.0485	44	-6
4	5/23/06	10:42	6	3	2.0	0.0485	33	-17
5	5/23/06	10:46	5	3	1.7	0.0485	27	-22
6	5/23/06	10:50	5	3	1.7	0.0485	27	-22
7	5/23/06	10:54	6	3	2.0	0.0485	33	-17
8	5/23/06	10:58	6	3	2.0	0.0485	33	-17
9	5/23/06	11:02	7	3	2.3	0.0485	38	-12
10	5/23/06	11:06	9	3	3.0	0.0485	49	-1
11	5/23/06	11:10	6	3	2.0	0.0485	33	-17
12	5/23/06	11:14	5	3	1.7	0.0485	27	-22
13	5/23/06	11:18	7	3	2.3	0.0485	38	-12
14	5/23/06	11:22	8	3	2.7	0.0485	44	-6
15	5/23/06	11:26	13	3	4.3	0.0485	71	21
16	5/23/06	11:30	4	3	1.3	0.0485	22	-28
17	5/23/06	11:34	1	3	0.3	0.0485	5	-44
18	5/23/06	11:38	13	3	4.3	0.0485	71	21
19	5/23/06	11:42	5	3	1.7	0.0485	27	-22
20	5/23/06	11:46	5	3	1.7	0.0485	27	-22
		mean	**7**	**mean**	**2**	**mean**	**36**	**-13**
		std dev	**2.8**	**std dev**	**0.9**	**std dev**	**15.1**	**15.1**
		median	**6**	**median**	**2**	**median**	**33**	**-17**

Counts greater than 100 dpm / 100 cm^2 are colored "red."

Class 3 Beta Measurements - Building 813 Survey Unit 1

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/23/06	10:30	857	3	285.7	0.0441	5141	467
2	5/23/06	10:34	692	3	230.7	0.0441	4151	-523
3	5/23/06	10:38	708	3	236.0	0.0441	4247	-427
4	5/23/06	10:42	610	3	203.3	0.0441	3659	-1015
5	5/23/06	10:46	701	3	233.7	0.0441	4205	-469
6	5/23/06	10:50	641	3	213.7	0.0441	3845	-829
7	5/23/06	10:54	635	3	211.7	0.0441	3809	-865
8	5/23/06	10:58	740	3	246.7	0.0441	4439	-235
9	5/23/06	11:02	724	3	241.3	0.0441	4343	-331
10	5/23/06	11:06	715	3	238.3	0.0441	4289	-385
11	5/23/06	11:10	739	3	246.3	0.0441	4433	-241
12	5/23/06	11:14	741	3	247.0	0.0441	4445	-229
13	5/23/06	11:18	695	3	231.7	0.0441	4169	-505
14	5/23/06	11:22	762	3	254.0	0.0441	4571	-103
15	5/23/06	11:26	699	3	233.0	0.0441	4193	-481
16	5/23/06	11:30	708	3	236.0	0.0441	4247	-427
17	5/23/06	11:34	758	3	252.7	0.0441	4547	-127
18	5/23/06	11:38	701	3	233.7	0.0441	4205	-469
19	5/23/06	11:42	760	3	253.3	0.0441	4559	-115
20	5/23/06	11:46	770	3	256.7	0.0441	4619	-55
		mean	**718**	**mean**	**239**	**mean**	**4306**	**-369**
		std dev	**54.1**	**std dev**	**18.0**	**std dev**	**324.7**	**324.7**
		median	**712**	**median**	**237**	**median**	**4268**	**-406**

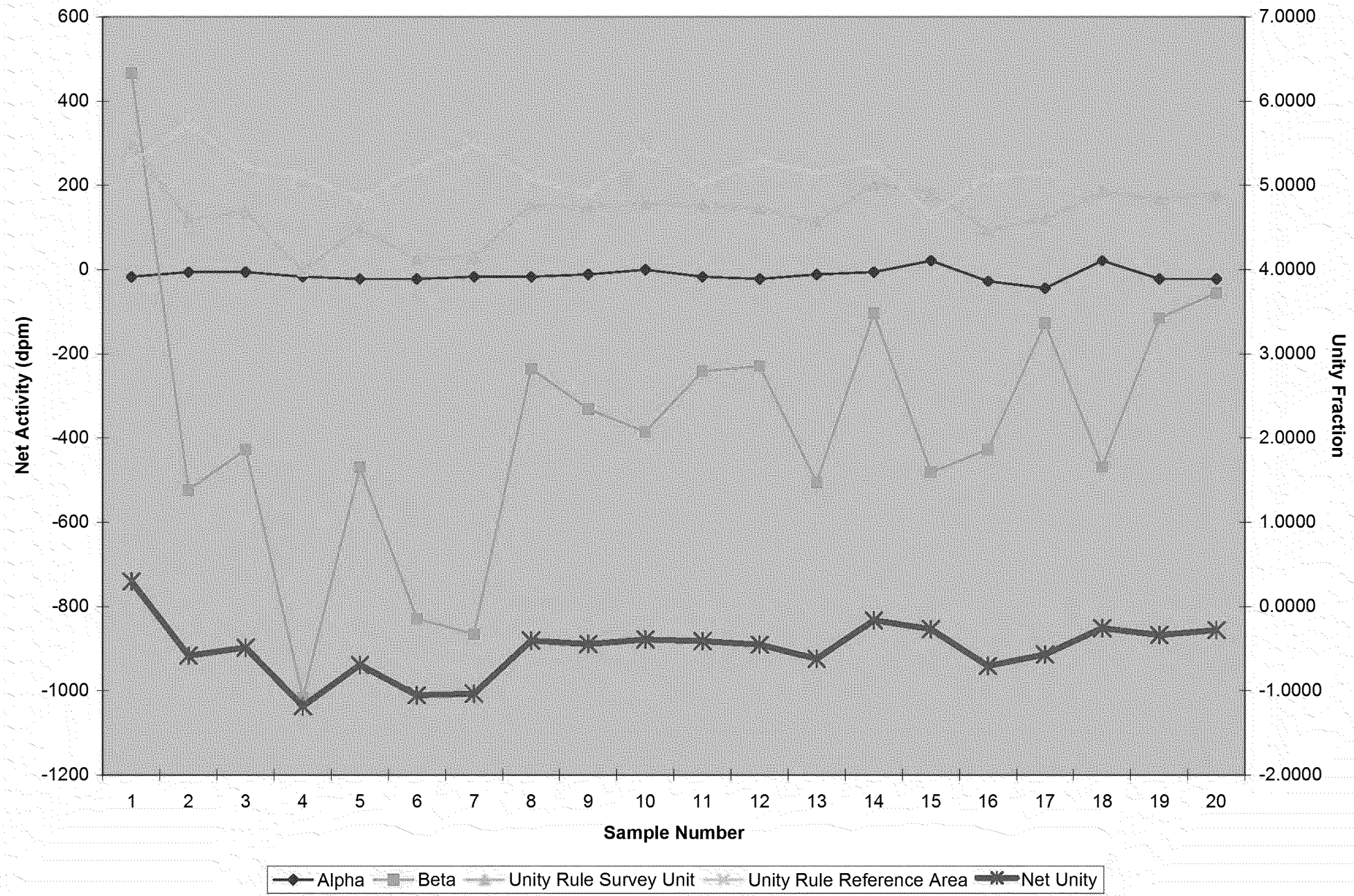
Counts greater than 1,000 dpm / 100 cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 1

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	32	32
2	87	4853.1	R	6.7258	37	37
3	27	4949.1	R	6.2218	31	31
4	49	4619.1	R	6.1100	26.5	27
5	38	4463.2	R	5.8450	22	22
6	76	4433.2	R	6.1968	30	30
7	60	4883.1	R	6.4831	36	36
8	33	4757.1	R	6.0844	25	25
9	27	4631.1	R	5.9039	23	23
10	55	4883.1	R	6.4285	35	35
11	38	4637.1	R	6.0190	24	24
12	55	4745.1	R	6.2906	33	33
13	65	4481.2	R	6.1357	28	28
14	60	4691.1	R	6.2911	34	34
15	27	4379.2	R	5.6519	21	21
16	49	4619.1	R	6.1100	26.5	27
17	38	4769.1	R	6.1509	29	29
1	33	5141.0	S	5.4683	20	0
2	44	4151.2	S	4.5876	7	0
3	44	4247.2	S	4.6836	9	0
4	33	3659.3	S	3.9866	1	0
5	27	4205.2	S	4.4779	5	0
6	27	3845.3	S	4.1180	2	0
7	33	3809.3	S	4.1366	3	0
8	33	4439.2	S	4.7664	13	0
9	38	4343.2	S	4.7250	11	0
10	49	4289.2	S	4.7801	14	0
11	33	4433.2	S	4.7604	12	0
12	27	4445.2	S	4.7179	10	0
13	38	4169.2	S	4.5510	6	0
14	44	4571.1	S	5.0075	19	0
15	71	4193.2	S	4.9023	17	0
16	22	4247.2	S	4.4654	4	0
17	5	4547.1	S	4.6017	8	0
18	71	4205.2	S	4.9143	18	0
19	27	4559.1	S	4.8319	15	0
20	27	4619.1	S	4.8919	16	0
				SUM =	**703**	
					W_r =	**493**
					Critical Value =	**377**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 1 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	5.11	17	8	14	8	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 2
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 2 Survey Unit 2 Design

Plan

Classification:	Class 2	
Survey Unit Size (sq meters):	593.34	
DCGL Criterion:		
Dose:	25	mrem/y TEDE
Model:	RESRAD-Build	Building Occupancy - Default Parameters

Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	4.37	5.11	
$DCGL_{(EMC)}$:	437.14	5111.94	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	8.7	1693.6	counts
Enter Sigma:	2.1	35.8	cpm
Calculated Sigma:	3.0	41.2	cpm
Detector Efficiency (ε_i):	18%	18%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.44%	4.44%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		<----------

	False Positive	True Positive
	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**	50% of $DCGL_{(w)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm		
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	23%	28%
Minimum Area Factor Needed:	**1.03**	**1.43**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.1	747.3	Counts
Enter Sigma:	3.2	28.0	counts	2.1	52.4	Counts
Calculated Sigma:	3.0	27.9	counts	2.5	27.3	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2} 50% of $DCGL_{(w)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	2.99			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.974067			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 2 Alpha Measurements - Building 813 Survey Unit 2

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	9:30	4	3	1.3	0.0485	22	-28
2	6/6/06	9:34	3	3	1.0	0.0485	16	-33
3	6/6/06	9:38	6	3	2.0	0.0485	33	-17
4	6/6/06	9:42	6	3	2.0	0.0485	33	-17
5	6/6/06	9:46	6	3	2.0	0.0485	33	-17
6	6/6/06	9:50	11	3	3.7	0.0485	60	10
7	6/6/06	9:54	6	3	2.0	0.0485	33	-17
8	6/6/06	9:58	8	3	2.7	0.0485	44	-6
9	6/6/06	10:02	7	3	2.3	0.0485	38	-12
10	6/6/06	10:06	9	3	3.0	0.0485	49	-1
11	6/6/06	10:10	5	3	1.7	0.0485	27	-22
12	6/6/06	10:14	4	3	1.3	0.0485	22	-28
13	6/6/06	10:18	5	3	1.7	0.0485	27	-22
14	6/6/06	10:22	6	3	2.0	0.0485	33	-17
		mean	**6**	**mean**	**2**	**mean**	**34**	**-16**
		std dev	**2.1**	**std dev**	**0.7**	**std dev**	**11.5**	**11.5**
		median	**6**	**median**	**2**	**median**	**33**	**-17**

Greater than 100 dpm^{net}/100cm^2 sigma are colored "red."

Class 2 Beta Measurements - Building 813 Survey Unit 2

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	9:30	775	3	258.3	0.0441	4649	-25
2	6/6/06	9:34	684	3	228.0	0.0441	4103	-571
3	6/6/06	9:38	773	3	257.7	0.0441	4637	-37
4	6/6/06	9:42	860	3	286.7	0.0441	5159	484
5	6/6/06	9:46	774	3	258.0	0.0441	4643	-31
6	6/6/06	9:50	752	3	250.7	0.0441	4511	-163
7	6/6/06	9:54	706	3	235.3	0.0441	4235	-439
8	6/6/06	9:58	661	3	220.3	0.0441	3965	-709
9	6/6/06	10:02	722	3	240.7	0.0441	4331	-343
10	6/6/06	10:06	781	3	260.3	0.0441	4685	11
11	6/6/06	10:10	741	3	247.0	0.0441	4445	-229
12	6/6/06	10:14	685	3	228.3	0.0441	4109	-565
13	6/6/06	10:18	790	3	263.3	0.0441	4739	65
14	6/6/06	10:22	758	3	252.7	0.0441	4547	-127
		mean	**747**	**mean**	**249**	**mean**	**4483**	**-192**
		std dev	**52.4**	**std dev**	**17.5**	**std dev**	**314.2**	**314.2**
		median	**755**	**median**	**252**	**median**	**4529**	**-145**

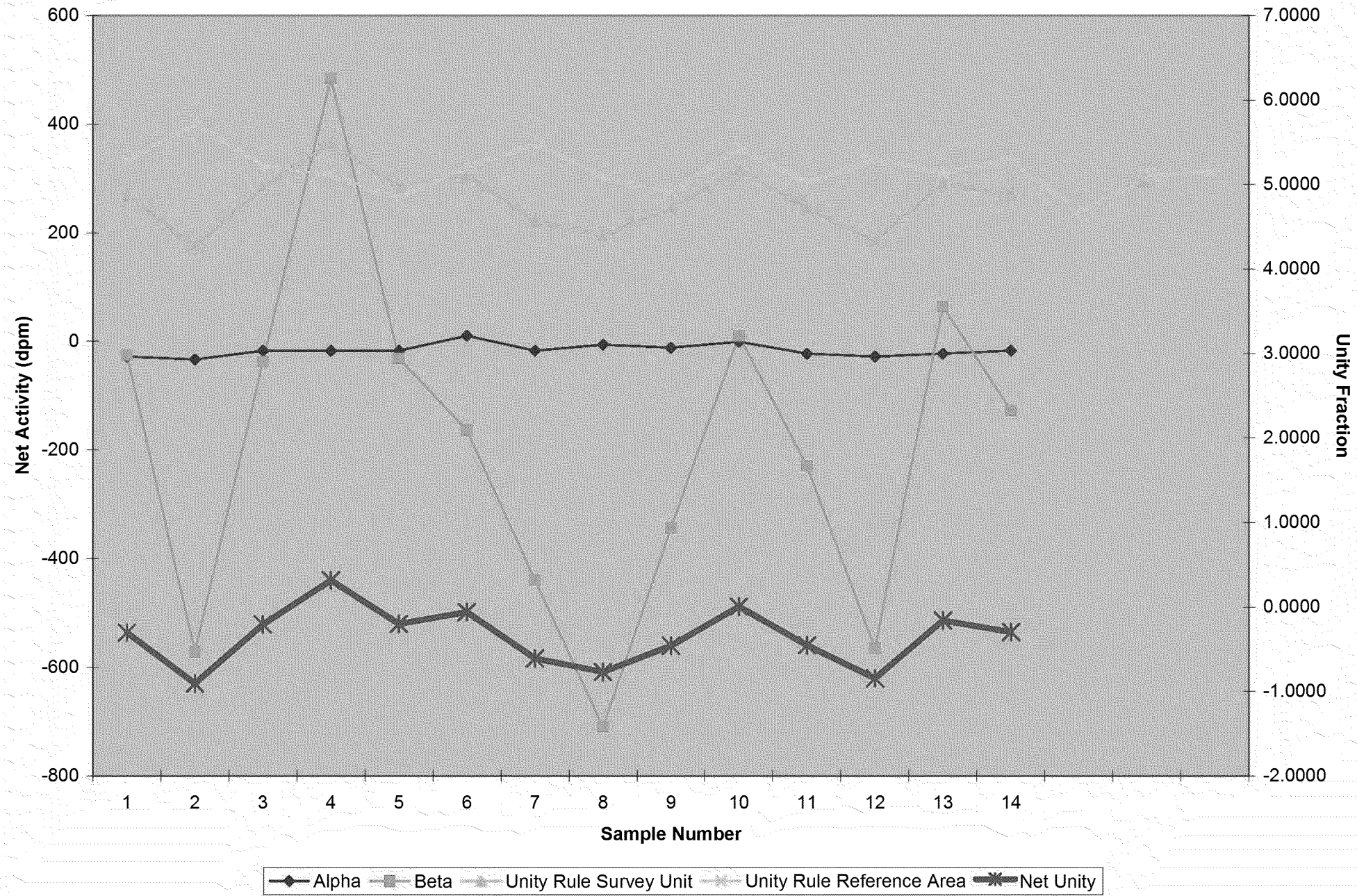
Greater than 1,000 dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 2

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	26	26
2	87	4853.1	R	6.7258	31	31
3	27	4949.1	R	6.2218	25	25
4	49	4619.1	R	6.1100	20.5	21
5	38	4463.2	R	5.8450	16	16
6	76	4433.2	R	6.1968	24	24
7	60	4883.1	R	6.4831	30	30
8	33	4757.1	R	6.0844	19	19
9	27	4631.1	R	5.9039	17	17
10	55	4883.1	R	6.4285	29	29
11	38	4637.1	R	6.0190	18	18
12	55	4745.1	R	6.2906	27	27
13	65	4481.2	R	6.1357	22	22
14	60	4691.1	R	6.2911	28	28
15	27	4379.2	R	5.6519	15	15
16	49	4619.1	R	6.1100	20.5	21
17	38	4769.1	R	6.1509	23	23
1	22	4649.1	S	4.8673	7	0
2	16	4103.2	S	4.2669	1	0
3	33	4637.1	S	4.9644	9	0
4	33	5159.0	S	5.4863	14	0
5	33	4643.1	S	4.9704	10	0
6	60	4511.2	S	5.1112	12	0
7	33	4235.2	S	4.5625	4	0
8	44	3965.3	S	4.4016	3	0
9	38	4331.2	S	4.7130	5	0
10	49	4685.1	S	5.1760	13	0
11	27	4445.2	S	4.7179	6	0
12	22	4109.2	S	4.3274	2	0
13	27	4739.1	S	5.0118	11	0
14	33	4547.1	S	4.8744	8	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 2 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	5.11	17	8	17	8	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 3
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 2 Survey Unit 3 Design

Plan

Classification:	Class 2		
Survey Unit Size (sq meters):	508.25		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	4.37	5.11	
$DCGL_{(EMC)}$:	437.14	5111.94	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background					
	Alpha	Beta				
Counting Time:	2		min			
Bkgd. Measurement:	8.7	1693.6	counts			
Enter Sigma:	2.1	35.8	cpm			
Calculated Sigma:	3.0	41.2	cpm			
Detector Efficiency (ε_i):	18%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.44%	4.44%				
Surveyor Factor (p):	50.0%					
Probe Area (Active):	582		cm^2			
Scan Interval:	16		s	False Positive	True Positive	
d':	3.28		<----------	0.05	0.95	

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**		50% of $DCGL_{(W)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm			
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	23%	28%
Minimum Area Factor Needed:	**1.03**	**1.43**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.7	721.4	Counts
Enter Sigma:	3.2	28.0	counts	2.6	49.1	Counts
Calculated Sigma:	3.0	27.9	counts	2.6	26.9	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.05			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.983039			
N:	**8**	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 2 Alpha Measurements - Building 813 Survey Unit 3

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/5/06	12:45	10	3	3.3	0.0485	55	5
2	6/5/06	12:49	5	3	1.7	0.0485	27	-22
3	6/5/06	12:53	10	3	3.3	0.0485	55	5
4	6/5/06	12:57	5	3	1.7	0.0485	27	-22
5	6/5/06	13:01	5	3	1.7	0.0485	27	-22
6	6/5/06	13:05	3	3	1.0	0.0485	16	-33
7	6/5/06	13:09	8	3	2.7	0.0485	44	-6
8	6/5/06	13:13	5	3	1.7	0.0485	27	-22
9	6/5/06	13:17	2	3	0.7	0.0485	11	-39
10	6/5/06	13:21	11	3	3.7	0.0485	60	10
11	6/5/06	13:25	8	3	2.7	0.0485	44	-6
12	6/5/06	13:29	5	3	1.7	0.0485	27	-22
13	6/5/06	13:33	6	3	2.0	0.0485	33	-17
14	6/5/06	13:37	10	3	3.3	0.0485	55	5
15	6/5/06	13:41	8	3	2.7	0.0485	44	-6
16	6/5/06	13:45	5	3	1.7	0.0485	27	-22
17	6/5/06	13:49	8	3	2.7	0.0485	44	-6
		mean	**7**	**mean**	**2**	**mean**	**37**	**-13**
		std dev	**2.6**	**std dev**	**0.9**	**std dev**	**14.4**	**14.4**
		median	**6**	**median**	**2**	**median**	**33**	**-17**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 2 Beta Measurements - Building 813 Survey Unit 3

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/5/06	12:45	747	3	249.0	0.0441	4481	-193
2	6/5/06	12:49	697	3	232.3	0.0441	4181	-493
3	6/5/06	12:53	629	3	209.7	0.0441	3773	-901
4	6/5/06	12:57	653	3	217.7	0.0441	3917	-757
5	6/5/06	13:01	751	3	250.3	0.0441	4505	-169
6	6/5/06	13:05	755	3	251.7	0.0441	4529	-145
7	6/5/06	13:09	771	3	257.0	0.0441	4625	-49
8	6/5/06	13:13	694	3	231.3	0.0441	4163	-511
9	6/5/06	13:17	699	3	233.0	0.0441	4193	-481
10	6/5/06	13:21	711	3	237.0	0.0441	4265	-409
11	6/5/06	13:25	687	3	229.0	0.0441	4121	-553
12	6/5/06	13:29	718	3	239.3	0.0441	4307	-367
13	6/5/06	13:33	765	3	255.0	0.0441	4589	-85
14	6/5/06	13:37	721	3	240.3	0.0441	4325	-349
15	6/5/06	13:41	675	3	225.0	0.0441	4049	-625
16	6/5/06	13:45	828	3	276.0	0.0441	4967	293
17	6/5/06	13:49	763	3	254.3	0.0441	4577	-97
		mean	**721**	**mean**	**240**	**mean**	**4328**	**-347**
		std dev	**49.1**	**std dev**	**16.4**	**std dev**	**294.8**	**294.8**
		median	**718**	**median**	**239**	**median**	**4307**	**-367**

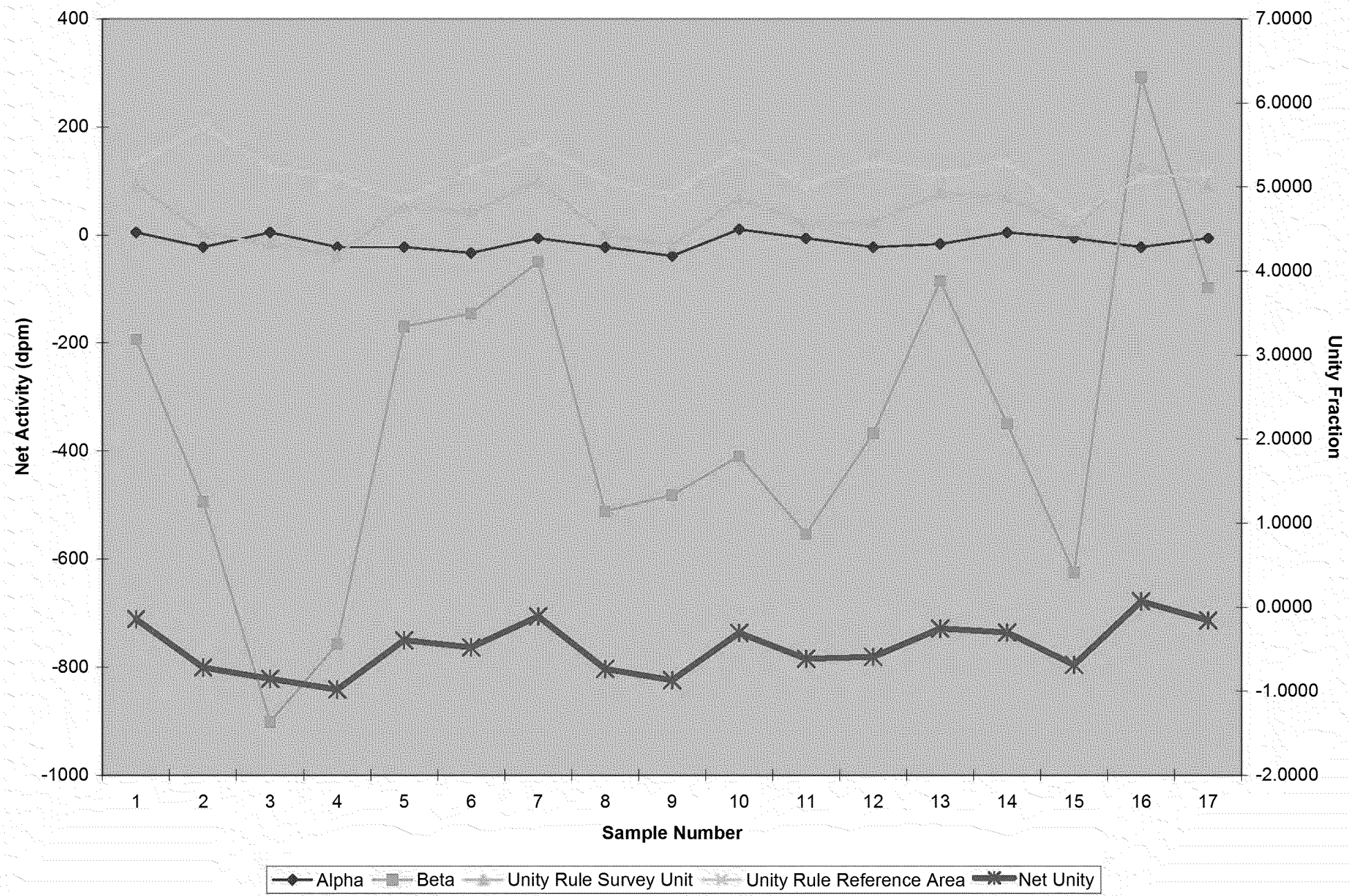
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 3

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	29	29
2	87	4853.1	R	6.7258	34	34
3	27	4949.1	R	6.2218	28	28
4	49	4619.1	R	6.1100	23.5	24
5	38	4463.2	R	5.8450	19	19
6	76	4433.2	R	6.1968	27	27
7	60	4883.1	R	6.4831	33	33
8	33	4757.1	R	6.0844	22	22
9	27	4631.1	R	5.9039	20	20
10	55	4883.1	R	6.4285	32	32
11	38	4637.1	R	6.0190	21	21
12	55	4745.1	R	6.2906	30	30
13	65	4481.2	R	6.1357	25	25
14	60	4691.1	R	6.2911	31	31
15	27	4379.2	R	5.6519	18	18
16	49	4619.1	R	6.1100	23.5	24
17	38	4769.1	R	6.1509	26	26
1	55	4481.2	S	5.0266	15	0
2	27	4181.2	S	4.4539	5	0
3	55	3773.3	S	4.3188	3	0
4	27	3917.3	S	4.1900	1	0
5	27	4505.2	S	4.7779	10	0
6	16	4529.1	S	4.6928	9	0
7	44	4625.1	S	5.0615	16	0
8	27	4163.2	S	4.4359	4	0
9	11	4193.2	S	4.3023	2	0
10	60	4265.2	S	4.8652	11	0
11	44	4121.2	S	4.5576	7	0
12	27	4307.2	S	4.5799	8	0
13	33	4589.1	S	4.9164	13	0
14	55	4325.2	S	4.8707	12	0
15	44	4049.2	S	4.4856	6	0
16	27	4967.1	S	5.2398	17	0
17	44	4577.1	S	5.0135	14	0
				SUM =	**595**	
					W_r =	**442**
					Critical Value =	**345**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 3 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	35.49	17	9	16	9	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 4
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 4 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	18.3		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		50% of $DCGL_{(W)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm			
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	3.1	598.7	Counts
Enter Sigma:	3.2	28.0	counts	1.4	67.8	Counts
Calculated Sigma:	3.0	27.9	counts	1.8	24.5	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	2.42			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.944167			
N:	**9**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**9**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 4

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	10:00	3	3	1.0	0.0485	16	-33
2	6/2/06	10:04	2	3	0.7	0.0485	11	-39
3	6/2/06	10:08	2	3	0.7	0.0485	11	-39
4	6/2/06	10:12	5	3	1.7	0.0485	27	-22
5	6/2/06	10:16	2	3	0.7	0.0485	11	-39
6	6/2/06	10:20	3	3	1.0	0.0485	16	-33
7	6/2/06	10:24	6	3	2.0	0.0485	33	-17
8	6/2/06	10:28	4	3	1.3	0.0485	22	-28
9	6/2/06	10:32	2	3	0.7	0.0485	11	-39
10	6/2/06	10:36	3	3	1.0	0.0485	16	-33
11	6/2/06	10:40	3	3	1.0	0.0485	16	-33
12	6/2/06	10:44	5	3	1.7	0.0485	27	-22
13	6/2/06	10:48	1	3	0.3	0.0485	5	-44
14	6/2/06	10:52	3	3	1.0	0.0485	16	-33
15	6/2/06	10:56	1	3	0.3	0.0485	5	-44
16	6/2/06	11:00	4	3	1.3	0.0485	22	-28
		mean	**3**	**mean**	**1**	**mean**	**17**	**-33**
		std dev	**1.4**	**std dev**	**0.5**	**std dev**	**7.8**	**7.8**
		median	**3**	**median**	**1**	**median**	**16**	**-33**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 4

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	10:00	776	3	258.7	0.0441	4655	-19
2	6/1/06	10:04	650	3	216.7	0.0441	3899	-775
3	6/1/06	10:08	618	3	206.0	0.0441	3707	-967
4	6/1/06	10:12	624	3	208.0	0.0441	3743	-931
5	6/1/06	10:16	597	3	199.0	0.0441	3581	-1093
6	6/1/06	10:20	557	3	185.7	0.0441	3341	-1333
7	6/1/06	10:24	640	3	213.3	0.0441	3839	-835
8	6/1/06	10:28	597	3	199.0	0.0441	3581	-1093
9	6/1/06	10:32	585	3	195.0	0.0441	3509	-1165
10	6/1/06	10:36	576	3	192.0	0.0441	3455	-1219
11	6/1/06	10:40	668	3	222.7	0.0441	4007	-667
12	6/1/06	10:44	602	3	200.7	0.0441	3611	-1063
13	6/1/06	10:48	514	3	171.3	0.0441	3083	-1591
14	6/1/06	10:52	532	3	177.3	0.0441	3191	-1483
15	6/1/06	10:56	547	3	182.3	0.0441	3281	-1393
16	6/1/06	11:00	496	3	165.3	0.0441	2975	-1699
		mean	**599**	**mean**	**200**	**mean**	**3591**	**-1083**
		std dev	**67.8**	**std dev**	**22.6**	**std dev**	**406.5**	**406.5**
		median	**597**	**median**	**199**	**median**	**3581**	**-1093**

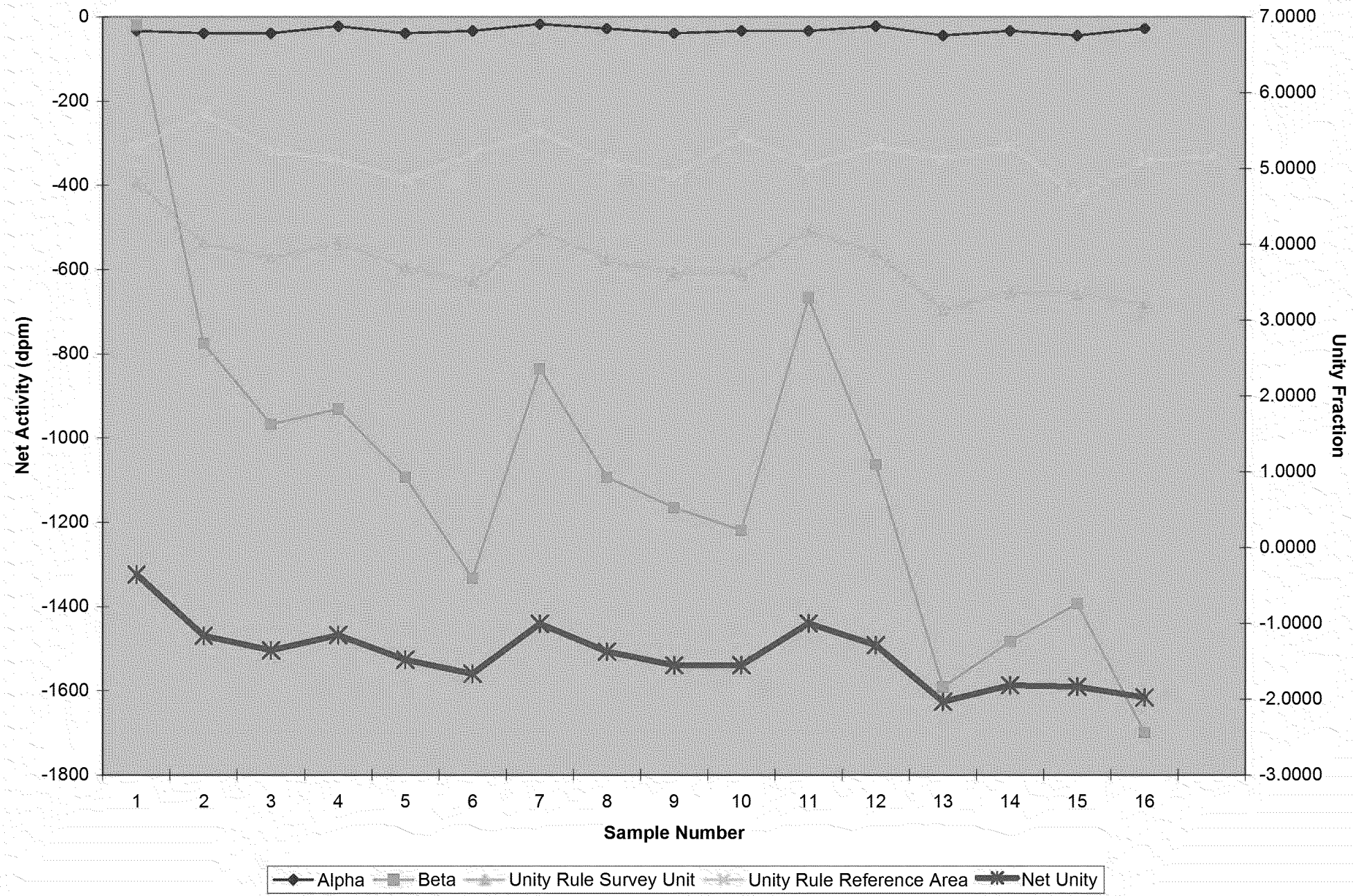
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 4

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	28	28
2	87	4853.1	R	6.7258	33	33
3	27	4949.1	R	6.2218	27	27
4	49	4619.1	R	6.1100	22.5	23
5	38	4463.2	R	5.8450	18	18
6	76	4433.2	R	6.1968	26	26
7	60	4883.1	R	6.4831	32	32
8	33	4757.1	R	6.0844	21	21
9	27	4631.1	R	5.9039	19	19
10	55	4883.1	R	6.4285	31	31
11	38	4637.1	R	6.0190	20	20
12	55	4745.1	R	6.2906	29	29
13	65	4481.2	R	6.1357	24	24
14	60	4691.1	R	6.2911	30	30
15	27	4379.2	R	5.6519	17	17
16	49	4619.1	R	6.1100	22.5	23
17	38	4769.1	R	6.1509	25	25
1	16	4655.1	S	4.8188	16	0
2	11	3899.3	S	4.0084	12	0
3	11	3707.3	S	3.8164	10	0
4	27	3743.3	S	4.0160	13	0
5	11	3581.3	S	3.6904	8	0
6	16	3341.4	S	3.5050	5	0
7	33	3839.3	S	4.1666	14	0
8	22	3581.3	S	3.7995	9	0
9	11	3509.3	S	3.6184	6	0
10	16	3455.4	S	3.6190	7	0
11	16	4007.2	S	4.1709	15	0
12	27	3611.3	S	3.8841	11	0
13	5	3083.4	S	3.1380	1	0
14	16	3191.4	S	3.3550	4	0
15	5	3281.4	S	3.3359	3	0
16	22	2975.4	S	3.1936	2	0
				SUM =	**561**	
					$W_{r=}$	**425**
					Critical Value =	**335**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 4 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	17.84	17	8	13	8	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 5
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 5 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	24.48		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	13.63	17.84	
$DCGL_{(EMC)}$:	1363.03	17838.54	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		50% of $DCGL_{(W)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm			
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	6%	7%
Minimum Area Factor Needed:	**0.85**	**1.23**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	5.6	719.2	Counts
Enter Sigma:	3.2	28.0	counts	2.8	37.7	Counts
Calculated Sigma:	3.0	27.9	counts	2.4	26.8	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.66			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 5

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	9:45	7	3	2.3	0.0485	38	-12
2	6/1/06	9:49	7	3	2.3	0.0485	38	-12
3	6/1/06	9:53	3	3	1.0	0.0485	16	-33
4	6/1/06	9:57	4	3	1.3	0.0485	22	-28
5	6/1/06	10:01	9	3	3.0	0.0485	49	-1
6	6/1/06	10:05	2	3	0.7	0.0485	11	-39
7	6/1/06	10:09	8	3	2.7	0.0485	44	-6
8	6/1/06	10:13	5	3	1.7	0.0485	27	-22
9	6/1/06	10:17	11	3	3.7	0.0485	60	10
10	6/1/06	10:21	3	3	1.0	0.0485	16	-33
11	6/1/06	10:25	2	3	0.7	0.0485	11	-39
12	6/1/06	10:29	5	3	1.7	0.0485	27	-22
13	6/1/06	10:33	7	3	2.3	0.0485	38	-12
		mean	**6**	**mean**	**2**	**mean**	**31**	**-19**
		std dev	**2.8**	**std dev**	**0.9**	**std dev**	**15.4**	**15.4**
		median	**5**	**median**	**2**	**median**	**27**	**-22**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 5

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	9:45	656	3	218.7	0.0441	3935	-739
2	6/1/06	9:49	730	3	243.3	0.0441	4379	-295
3	6/1/06	9:53	769	3	256.3	0.0441	4613	-61
4	6/1/06	9:57	707	3	235.7	0.0441	4241	-433
5	6/1/06	10:01	734	3	244.7	0.0441	4403	-271
6	6/1/06	10:05	725	3	241.7	0.0441	4349	-325
7	6/1/06	10:09	673	3	224.3	0.0441	4037	-637
8	6/1/06	10:13	665	3	221.7	0.0441	3989	-685
9	6/1/06	10:17	732	3	244.0	0.0441	4391	-283
10	6/1/06	10:21	745	3	248.3	0.0441	4469	-205
11	6/1/06	10:25	765	3	255.0	0.0441	4589	-85
12	6/1/06	10:29	756	3	252.0	0.0441	4535	-139
13	6/1/06	10:33	693	3	231.0	0.0441	4157	-517
		mean	**719**	**mean**	**240**	**mean**	**4315**	**-360**
		std dev	**37.7**	**std dev**	**12.6**	**std dev**	**226.0**	**226.0**
		median	**730**	**median**	**243**	**median**	**4379**	**-295**

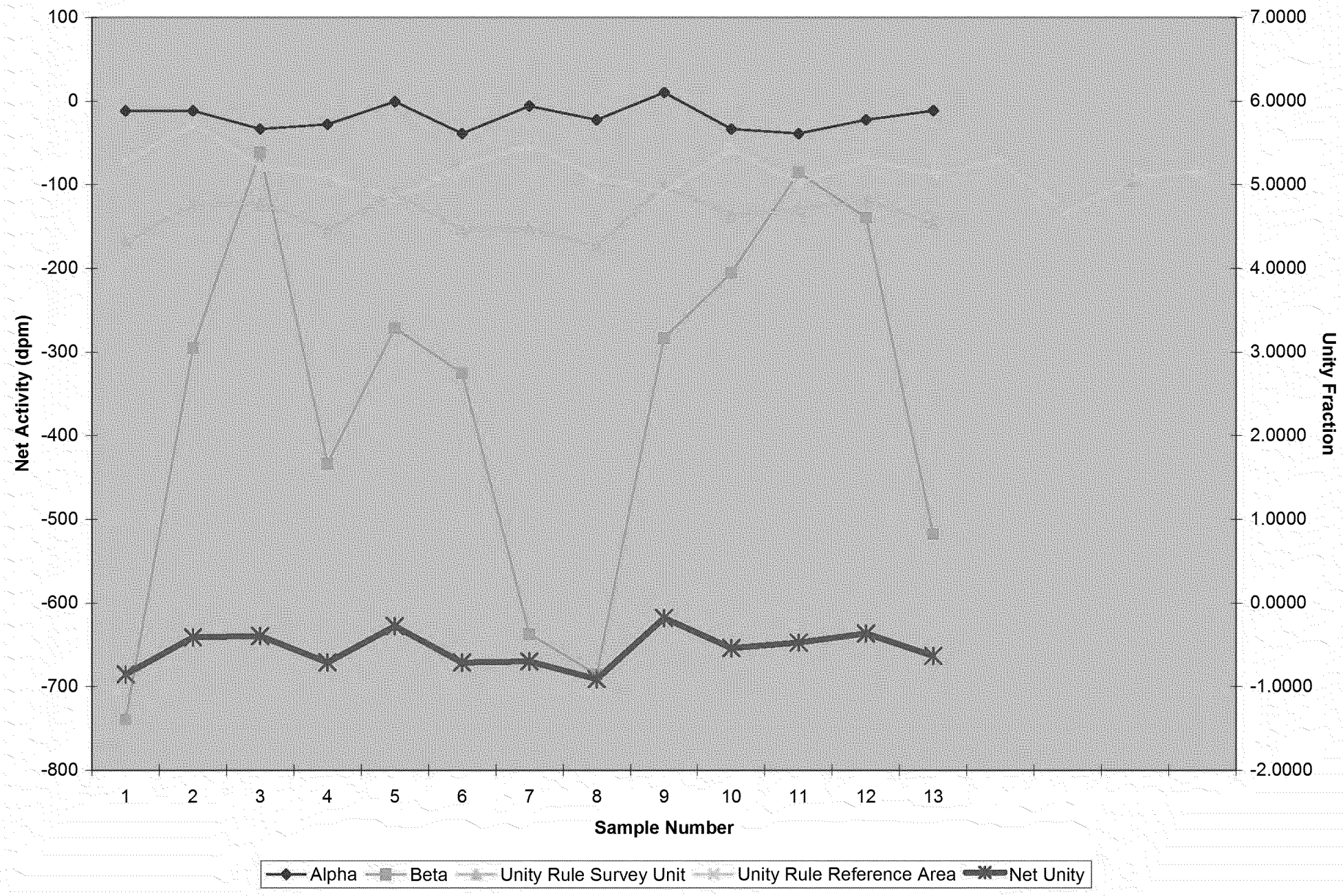
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 5

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	25	25
2	87	4853.1	R	6.7258	30	30
3	27	4949.1	R	6.2218	24	24
4	49	4619.1	R	6.1100	19.5	20
5	38	4463.2	R	5.8450	15	15
6	76	4433.2	R	6.1968	23	23
7	60	4883.1	R	6.4831	29	29
8	33	4757.1	R	6.0844	18	18
9	27	4631.1	R	5.9039	16	16
10	55	4883.1	R	6.4285	28	28
11	38	4637.1	R	6.0190	17	17
12	55	4745.1	R	6.2906	26	26
13	65	4481.2	R	6.1357	21	21
14	60	4691.1	R	6.2911	27	27
15	27	4379.2	R	5.6519	14	14
16	49	4619.1	R	6.1100	19.5	20
17	38	4769.1	R	6.1509	22	22
1	38	3935.3	S	4.3171	2	0
2	38	4379.2	S	4.7610	9	0
3	16	4613.1	S	4.7768	10	0
4	22	4241.2	S	4.4594	4	0
5	49	4403.2	S	4.8941	12	0
6	11	4349.2	S	4.4583	3	0
7	44	4037.2	S	4.4736	5	0
8	27	3989.3	S	4.2620	1	0
9	60	4391.2	S	4.9912	13	0
10	16	4469.2	S	4.6328	7	0
11	11	4589.1	S	4.6982	8	0
12	27	4535.1	S	4.8079	11	0
13	38	4157.2	S	4.5390	6	0
				SUM =	**465**	
					W_r =	**374**
					Critical Value =	**303**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 5 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	11.89	17	7	13	7	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 6
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 6 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	69.36		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	9.37	11.89	
$DCGL_{(EMC)}$:	937.21	11892.36	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background					
	Alpha	Beta				
Counting Time:	2		min			
Bkgd. Measurement:	6.9	1511.3	counts			
Enter Sigma:	2.7	109.3	cpm			
Calculated Sigma:	2.6	38.9	cpm			
Detector Efficiency (ε_i):	19%	20%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.79%	4.88%				
Surveyor Factor (p):	50.0%					
Probe Area (Active):	582		cm^2			
Scan Interval:	16		s	False Positive	True Positive	
d':	3.28		<----------	0.05	0.95	

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**	50% of $DCGL_{(w)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	9%	10%
Minimum Area Factor Needed:	**0.85**	**1.23**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	5.5	697.8	Counts
Enter Sigma:	3.2	28.0	counts	1.7	35.1	Counts
Calculated Sigma:	3.0	27.9	counts	2.4	26.4	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2} 50% of $DCGL_{(w)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	4.34			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.997658			
N:	7	Number of Measurements Required from the Reference Area		
N+N_{EA}:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 6

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	13:00	4	3	1.3	0.0485	22	-28
2	6/1/06	13:04	5	3	1.7	0.0485	27	-22
3	6/1/06	13:08	5	3	1.7	0.0485	27	-22
4	6/1/06	13:12	5	3	1.7	0.0485	27	-22
5	6/1/06	13:16	8	3	2.7	0.0485	44	-6
6	6/1/06	13:20	5	3	1.7	0.0485	27	-22
7	6/1/06	13:24	9	3	3.0	0.0485	49	-1
8	6/1/06	13:28	7	3	2.3	0.0485	38	-12
9	6/1/06	13:32	5	3	1.7	0.0485	27	-22
10	6/1/06	13:36	4	3	1.3	0.0485	22	-28
11	6/1/06	13:40	3	3	1.0	0.0485	16	-33
12	6/1/06	13:44	5	3	1.7	0.0485	27	-22
13	6/1/06	13:48	7	3	2.3	0.0485	38	-12
		mean	**6**	**mean**	**2**	**mean**	**30**	**-20**
		std dev	**1.7**	**std dev**	**0.6**	**std dev**	**9.3**	**9.3**
		median	**5**	**median**	**2**	**median**	**27**	**-22**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 6

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	13:00	698	3	232.7	0.0441	4187	-487
2	6/1/06	13:04	767	3	255.7	0.0441	4601	-73
3	6/1/06	13:08	652	3	217.3	0.0441	3911	-763
4	6/1/06	13:12	693	3	231.0	0.0441	4157	-517
5	6/1/06	13:16	665	3	221.7	0.0441	3989	-685
6	6/1/06	13:20	693	3	231.0	0.0441	4157	-517
7	6/1/06	13:24	717	3	239.0	0.0441	4301	-373
8	6/1/06	13:28	703	3	234.3	0.0441	4217	-457
9	6/1/06	13:32	671	3	223.7	0.0441	4025	-649
10	6/1/06	13:36	667	3	222.3	0.0441	4001	-673
11	6/1/06	13:40	761	3	253.7	0.0441	4565	-109
12	6/1/06	13:44	674	3	224.7	0.0441	4043	-631
13	6/1/06	13:48	710	3	236.7	0.0441	4259	-415
		mean	**698**	**mean**	**233**	**mean**	**4186**	**-489**
		std dev	**35.1**	**std dev**	**11.7**	**std dev**	**210.5**	**210.5**
		median	**693**	**median**	**231**	**median**	**4157**	**-517**

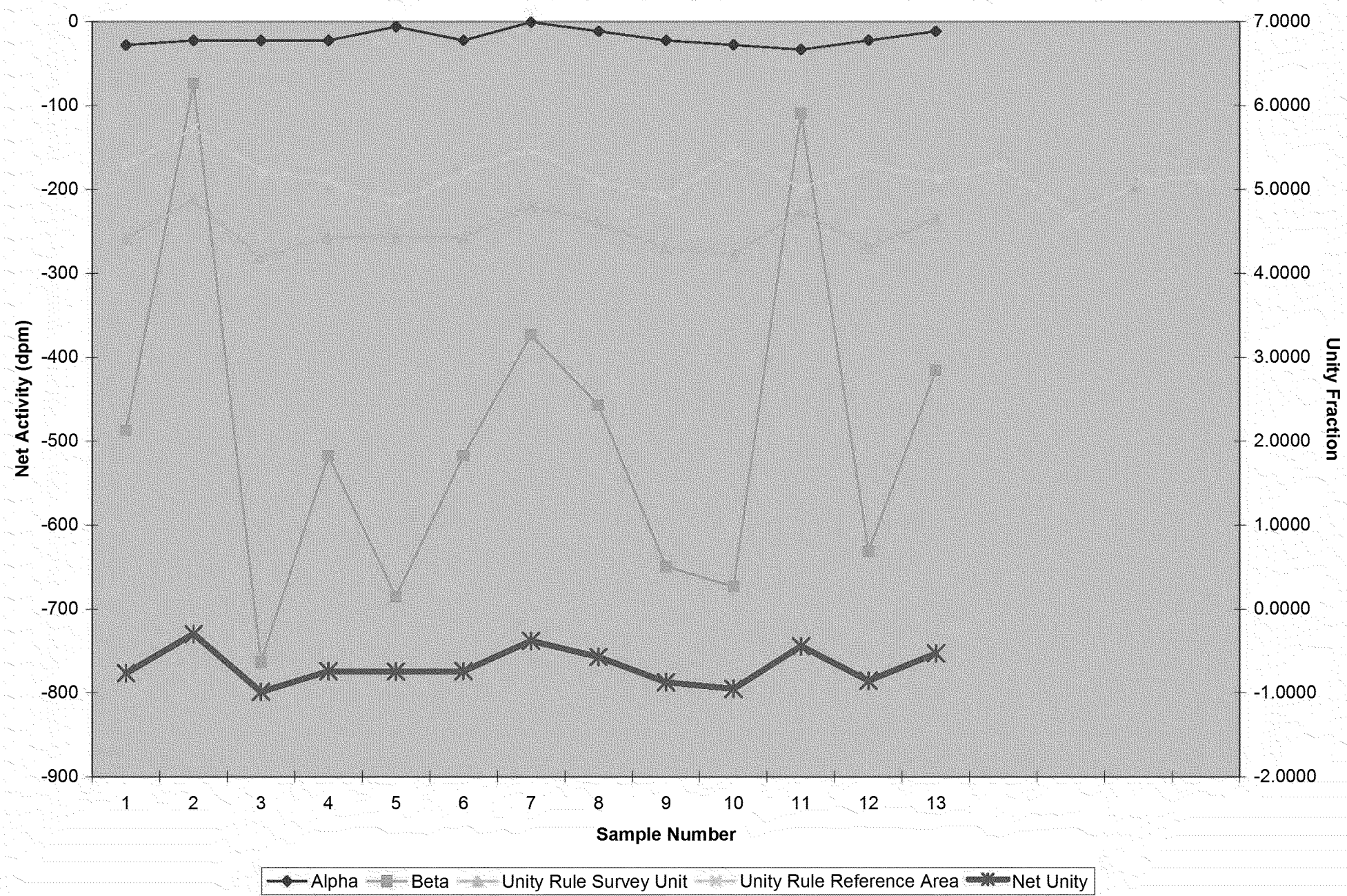
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 6

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	25	25
2	87	4853.1	R	6.7258	30	30
3	27	4949.1	R	6.2218	24	24
4	49	4619.1	R	6.1100	19.5	20
5	38	4463.2	R	5.8450	15	15
6	76	4433.2	R	6.1968	23	23
7	60	4883.1	R	6.4831	29	29
8	33	4757.1	R	6.0844	18	18
9	27	4631.1	R	5.9039	16	16
10	55	4883.1	R	6.4285	28	28
11	38	4637.1	R	6.0190	17	17
12	55	4745.1	R	6.2906	26	26
13	65	4481.2	R	6.1357	21	21
14	60	4691.1	R	6.2911	27	27
15	27	4379.2	R	5.6519	14	14
16	49	4619.1	R	6.1100	19.5	20
17	38	4769.1	R	6.1509	22	22
1	22	4187.2	S	4.4054	5	0
2	27	4601.1	S	4.8739	13	0
3	27	3911.3	S	4.1840	1	0
4	27	4157.2	S	4.4300	7.5	0
5	44	3989.3	S	4.4256	6	0
6	27	4157.2	S	4.4300	7.5	0
7	49	4301.2	S	4.7921	12	0
8	38	4217.2	S	4.5990	9	0
9	27	4025.2	S	4.2980	3	0
10	22	4001.2	S	4.2194	2	0
11	16	4565.1	S	4.7288	11	0
12	27	4043.2	S	4.3160	4	0
13	38	4259.2	S	4.6410	10	0
				SUM =	**465**	
					W_r =	**374**
					Critical Value =	**303**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 6 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	35.49	17	8	15	8	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 7
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 7 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	17.51		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	8.7	1693.6	counts
Enter Sigma:	2.1	35.8	cpm
Calculated Sigma:	3.0	41.2	cpm
Detector Efficiency (ε_i):	18%	18%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.44%	4.44%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		

	False Positive	True Positive
<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**	50% of $DCGL_{(w)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm		
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	4%	4%
Minimum Area Factor Needed:	**1.03**	**1.43**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.7	803.7	Counts
Enter Sigma:	3.2	28.0	counts	2.5	40.0	Counts
Calculated Sigma:	3.0	27.9	counts	2.6	28.4	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2} 50% of $DCGL_{(w)}$:	93%	80%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	0.8754	cpm	LBGR	0.1246
Delta/Sigma:	3.16			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.983039			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 7

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	13:00	6	3	2.0	0.0485	33	-17
2	6/6/06	13:04	4	3	1.3	0.0485	22	-28
3	6/6/06	13:08	4	3	1.3	0.0485	22	-28
4	6/6/06	13:12	9	3	3.0	0.0485	49	-1
5	6/6/06	13:16	11	3	3.7	0.0485	60	10
6	6/6/06	13:20	12	3	4.0	0.0485	65	16
7	6/6/06	13:24	4	3	1.3	0.0485	22	-28
8	6/6/06	13:28	6	3	2.0	0.0485	33	-17
9	6/6/06	13:32	7	3	2.3	0.0485	38	-12
10	6/6/06	13:36	9	3	3.0	0.0485	49	-1
11	6/6/06	13:40	4	3	1.3	0.0485	22	-28
12	6/6/06	13:44	6	3	2.0	0.0485	33	-17
13	6/6/06	13:48	6	3	2.0	0.0485	33	-17
14	6/6/06	13:52	6	3	2.0	0.0485	33	-17
15	6/6/06	13:56	6	3	2.0	0.0485	33	-17
		mean	**7**	**mean**	**2**	**mean**	**36**	**-13**
		std dev	**2.5**	**std dev**	**0.8**	**std dev**	**13.8**	**13.8**
		median	**6**	**median**	**2**	**median**	**33**	**-17**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 7

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	13:00	731	3	243.7	0.0441	4385	-289
2	6/6/06	13:04	796	3	265.3	0.0441	4775	101
3	6/6/06	13:08	763	3	254.3	0.0441	4577	-97
4	6/6/06	13:12	800	3	266.7	0.0441	4799	125
5	6/6/06	13:16	801	3	267.0	0.0441	4805	131
6	6/6/06	13:20	764	3	254.7	0.0441	4583	-91
7	6/6/06	13:24	790	3	263.3	0.0441	4739	65
8	6/6/06	13:28	869	3	289.7	0.0441	5213	538
9	6/6/06	13:32	800	3	266.7	0.0441	4799	125
10	6/6/06	13:36	887	3	295.7	0.0441	5321	646
11	6/6/06	13:40	779	3	259.7	0.0441	4673	-1
12	6/6/06	13:44	837	3	279.0	0.0441	5021	347
13	6/6/06	13:48	800	3	266.7	0.0441	4799	125
14	6/6/06	13:52	809	3	269.7	0.0441	4853	179
15	6/6/06	13:56	830	3	276.7	0.0441	4979	305
		mean	**804**	**mean**	**268**	**mean**	**4821**	**147**
		std dev	**40.0**	**std dev**	**13.3**	**std dev**	**240.2**	**240.2**
		median	**800**	**median**	**267**	**median**	**4799**	**125**

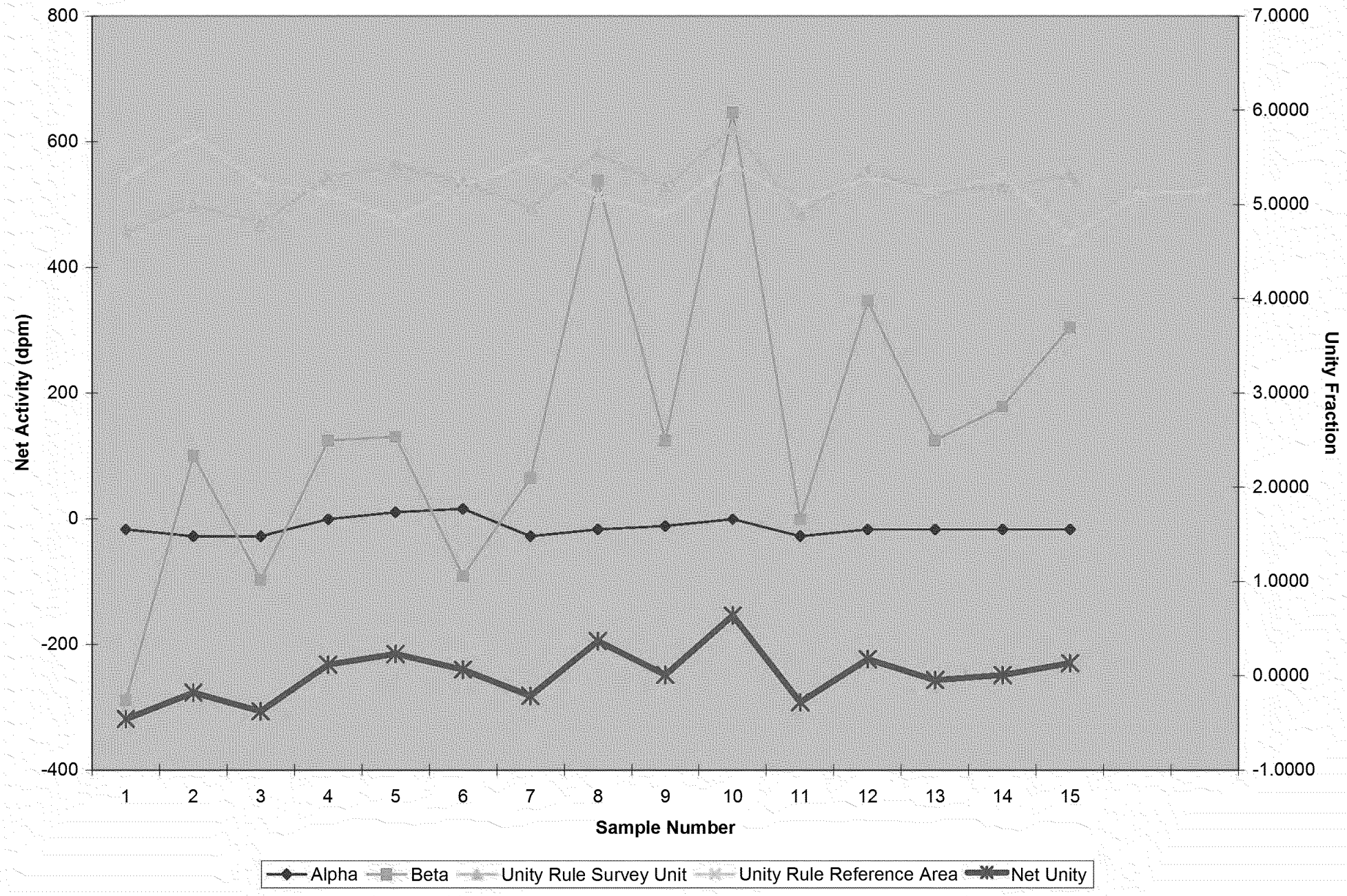
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 7

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	27	27
2	87	4853.1	R	6.7258	32	32
3	27	4949.1	R	6.2218	26	26
4	49	4619.1	R	6.1100	21.5	22
5	38	4463.2	R	5.8450	17	17
6	76	4433.2	R	6.1968	25	25
7	60	4883.1	R	6.4831	31	31
8	33	4757.1	R	6.0844	20	20
9	27	4631.1	R	5.9039	18	18
10	55	4883.1	R	6.4285	30	30
11	38	4637.1	R	6.0190	19	19
12	55	4745.1	R	6.2906	28	28
13	65	4481.2	R	6.1357	23	23
14	60	4691.1	R	6.2911	29	29
15	27	4379.2	R	5.6519	15	15
16	49	4619.1	R	6.1100	21.5	22
17	38	4769.1	R	6.1509	24	24
1	33	4385.2	S	4.7125	1	0
2	22	4775.1	S	4.9933	5	0
3	22	4577.1	S	4.7953	2	0
4	49	4799.1	S	5.2900	10	0
5	60	4805.1	S	5.4051	13	0
6	65	4583.1	S	5.2377	9	0
7	22	4739.1	S	4.9573	4	0
8	33	5213.0	S	5.5403	14	0
9	38	4799.1	S	5.1809	8	0
10	49	5321.0	S	5.8119	16	0
11	22	4673.1	S	4.8913	3	0
12	33	5021.1	S	5.3483	12	0
13	33	4799.1	S	5.1264	6	0
14	33	4853.1	S	5.1804	7	0
15	33	4979.1	S	5.3063	11	0
				SUM =	**528**	
					W_r =	**407**
					Critical Value =	**324**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 7 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	35.49	17	8	16	8	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 8
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 8 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	8.76		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		50% of $DCGL_{(w)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm			
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	4.4	546.7	Counts
Enter Sigma:	2.0	20.9	counts	1.9	34.4	Counts
Calculated Sigma:	2.4	26.5	counts	2.1	23.4	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2}	50% of $DCGL_{(w)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.70			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 8

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	14:00	2	3	0.7	0.0423	13	-24
2	6/1/06	14:04	4	3	1.3	0.0423	25	-11
3	6/1/06	14:08	1	3	0.3	0.0423	6	-30
4	6/1/06	14:12	7	3	2.3	0.0423	44	7
5	6/1/06	14:16	4	3	1.3	0.0423	25	-11
6	6/1/06	14:20	5	3	1.7	0.0423	31	-5
7	6/1/06	14:24	3	3	1.0	0.0423	19	-18
8	6/1/06	14:28	6	3	2.0	0.0423	38	1
9	6/1/06	14:32	4	3	1.3	0.0423	25	-11
10	6/1/06	14:36	6	3	2.0	0.0423	38	1
11	6/1/06	14:40	8	3	2.7	0.0423	50	14
12	6/1/06	14:44	4	3	1.3	0.0423	25	-11
13	6/1/06	14:48	5	3	1.7	0.0423	31	-5
14	6/1/06	14:52	5	3	1.7	0.0423	31	-5
15	6/1/06	14:56	4	3	1.3	0.0423	25	-11
16	6/1/06	15:00	2	3	0.7	0.0423	13	-24
		mean	**4**	**mean**	**1**	**mean**	**27**	**-9**
		std dev	**1.9**	**std dev**	**0.6**	**std dev**	**11.6**	**11.6**
		median	**4**	**median**	**1**	**median**	**25**	**-11**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 8

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/1/06	14:00	610	3	203.3	0.0373	4326	-668
2	6/1/06	14:04	616	3	205.3	0.0373	4369	-625
3	6/1/06	14:08	521	3	173.7	0.0373	3695	-1299
4	6/1/06	14:12	547	3	182.3	0.0373	3880	-1114
5	6/1/06	14:16	539	3	179.7	0.0373	3823	-1171
6	6/1/06	14:20	521	3	173.7	0.0373	3695	-1299
7	6/1/06	14:24	581	3	193.7	0.0373	4121	-873
8	6/1/06	14:28	561	3	187.0	0.0373	3979	-1015
9	6/1/06	14:32	542	3	180.7	0.0373	3844	-1150
10	6/1/06	14:36	543	3	181.0	0.0373	3851	-1143
11	6/1/06	14:40	529	3	176.3	0.0373	3752	-1242
12	6/1/06	14:44	561	3	187.0	0.0373	3979	-1015
13	6/1/06	14:48	489	3	163.0	0.0373	3468	-1526
14	6/1/06	14:52	499	3	166.3	0.0373	3539	-1455
15	6/1/06	14:56	541	3	180.3	0.0373	3837	-1157
16	6/1/06	15:00	547	3	182.3	0.0373	3880	-1114
		mean	**547**	**mean**	**182**	**mean**	**3877**	**-1117**
		std dev	**34.4**	**std dev**	**11.5**	**std dev**	**244.1**	**244.1**
		median	**543**	**median**	**181**	**median**	**3848**	**-1146**

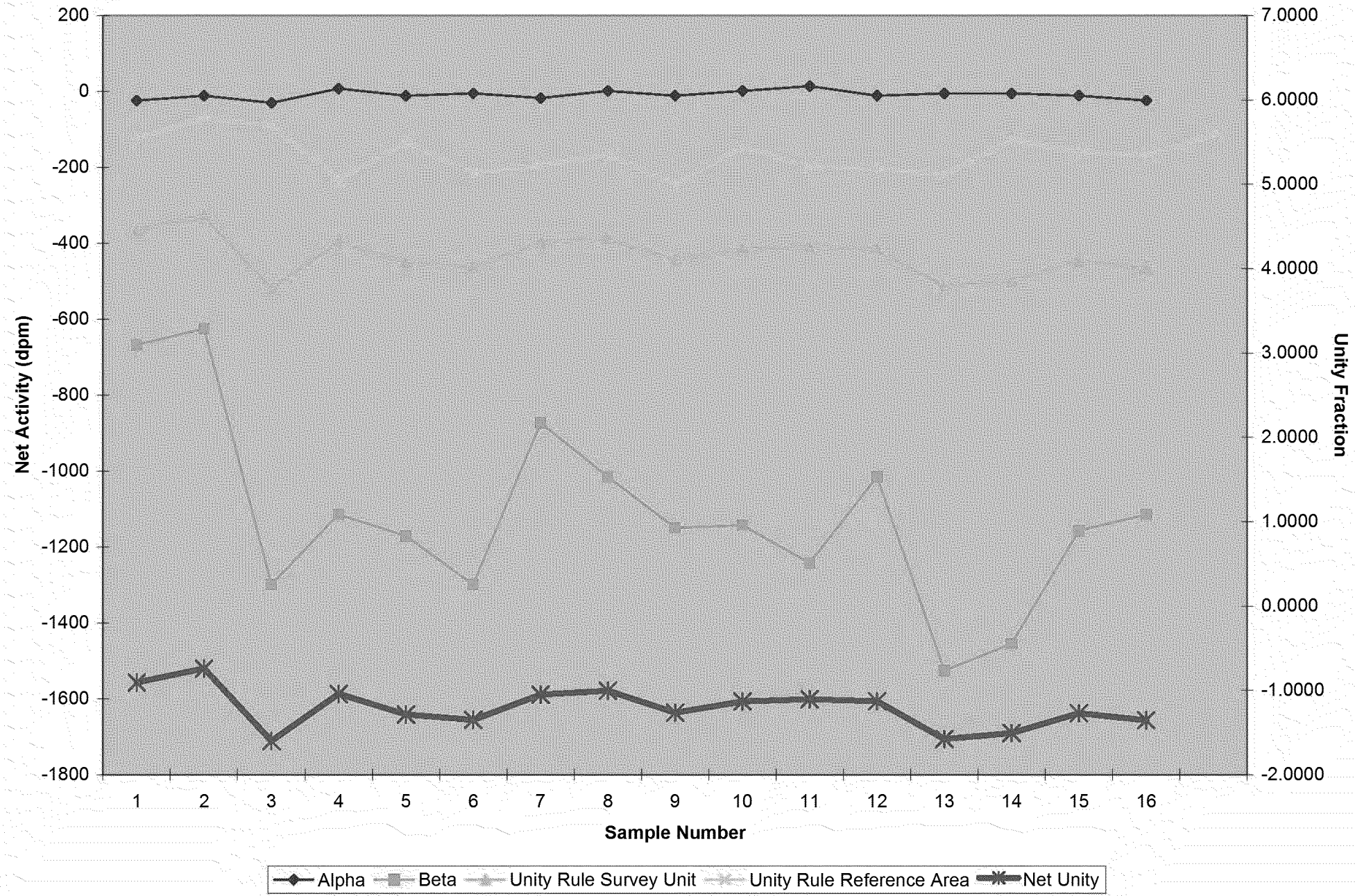
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 8

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	30	30
2	50	5283.9	R	6.7842	33	33
3	44	5262.6	R	6.7004	32	32
4	19	4865.5	R	6.0531	18	18
5	38	5120.8	R	6.4960	28	28
6	19	4943.5	R	6.1311	20	20
7	31	4915.1	R	6.2278	23	23
8	56	4787.4	R	6.3503	25	25
9	13	4886.7	R	6.0118	17	17
10	38	5071.1	R	6.4464	27	27
11	31	4893.8	R	6.2065	22	22
12	31	4872.5	R	6.1853	21	21
13	25	4858.4	R	6.1085	19	19
14	50	5028.6	R	6.5289	29	29
15	44	4943.5	R	6.3813	26	26
16	44	4900.9	R	6.3387	24	24
17	44	5156.2	R	6.5940	31	31
1	13	4326.4	S	4.4515	15	0
2	25	4369.0	S	4.6191	16	0
3	6	3695.2	S	3.7577	1	0
4	44	3879.6	S	4.3174	13	0
5	25	3822.9	S	4.0730	6	0
6	31	3695.2	S	4.0079	5	0
7	19	4120.7	S	4.3084	12	0
8	38	3978.9	S	4.3541	14	0
9	25	3844.1	S	4.0943	8	0
10	38	3851.2	S	4.2265	9	0
11	50	3751.9	S	4.2523	11	0
12	25	3978.9	S	4.2291	10	0
13	31	3468.2	S	3.7809	2	0
14	31	3539.2	S	3.8519	3	0
15	25	3837.0	S	4.0872	7	0
16	13	3879.6	S	4.0047	4	0
				SUM =	**561**	
					W_r =	**425**
					Critical Value =	**335**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 8 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	35.49	17	7	16	7	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 9
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 9 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	8.62		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**			

50% of $DCGL_{(W)}$:

50% of $DCGL_{(EMC)}$:

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	3.6	538.9	Counts
Enter Sigma:	2.0	20.9	counts	1.6	19.5	Counts
Calculated Sigma:	2.4	26.5	counts	1.9	23.2	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

Static MDC:	**89**	**897**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	5.87			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	1			
N:	7	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 9

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	8:15	4	3	1.3	0.0423	25	-11
2	6/2/06	8:19	3	3	1.0	0.0423	19	-18
3	6/2/06	8:23	3	3	1.0	0.0423	19	-18
4	6/2/06	8:27	6	3	2.0	0.0423	38	1
5	6/2/06	8:31	3	3	1.0	0.0423	19	-18
6	6/2/06	8:35	2	3	0.7	0.0423	13	-24
7	6/2/06	8:39	1	3	0.3	0.0423	6	-30
8	6/2/06	8:43	2	3	0.7	0.0423	13	-24
9	6/2/06	8:47	2	3	0.7	0.0423	13	-24
10	6/2/06	8:51	7	3	2.3	0.0423	44	7
11	6/2/06	8:55	4	3	1.3	0.0423	25	-11
12	6/2/06	8:59	5	3	1.7	0.0423	31	-5
13	6/2/06	9:03	3	3	1.0	0.0423	19	-18
14	6/2/06	9:07	3	3	1.0	0.0423	19	-18
15	6/2/06	9:11	4	3	1.3	0.0423	25	-11
16	6/2/06	9:15	5	3	1.7	0.0423	31	-5
		mean	**4**	**mean**	**1**	**mean**	**22**	**-14**
		std dev	**1.6**	**std dev**	**0.5**	**std dev**	**9.9**	**9.9**
		median	**3**	**median**	**1**	**median**	**19**	**-18**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 9

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	8:15	547	3	182.3	0.0373	3880	-1114
2	6/2/06	8:19	564	3	188.0	0.0373	4000	-994
3	6/2/06	8:23	561	3	187.0	0.0373	3979	-1015
4	6/2/06	8:27	533	3	177.7	0.0373	3780	-1214
5	6/2/06	8:31	535	3	178.3	0.0373	3794	-1199
6	6/2/06	8:35	554	3	184.7	0.0373	3929	-1065
7	6/2/06	8:39	549	3	183.0	0.0373	3894	-1100
8	6/2/06	8:43	548	3	182.7	0.0373	3887	-1107
9	6/2/06	8:47	527	3	175.7	0.0373	3738	-1256
10	6/2/06	8:51	525	3	175.0	0.0373	3724	-1270
11	6/2/06	8:55	557	3	185.7	0.0373	3951	-1043
12	6/2/06	8:59	557	3	185.7	0.0373	3951	-1043
13	6/2/06	9:03	517	3	172.3	0.0373	3667	-1327
14	6/2/06	9:07	540	3	180.0	0.0373	3830	-1164
15	6/2/06	9:11	515	3	171.7	0.0373	3653	-1341
16	6/2/06	9:15	494	3	164.7	0.0373	3504	-1490
		mean	**539**	**mean**	**180**	**mean**	**3822**	**-1172**
		std dev	**19.5**	**std dev**	**6.5**	**std dev**	**138.3**	**138.3**
		median	**544**	**median**	**181**	**median**	**3855**	**-1139**

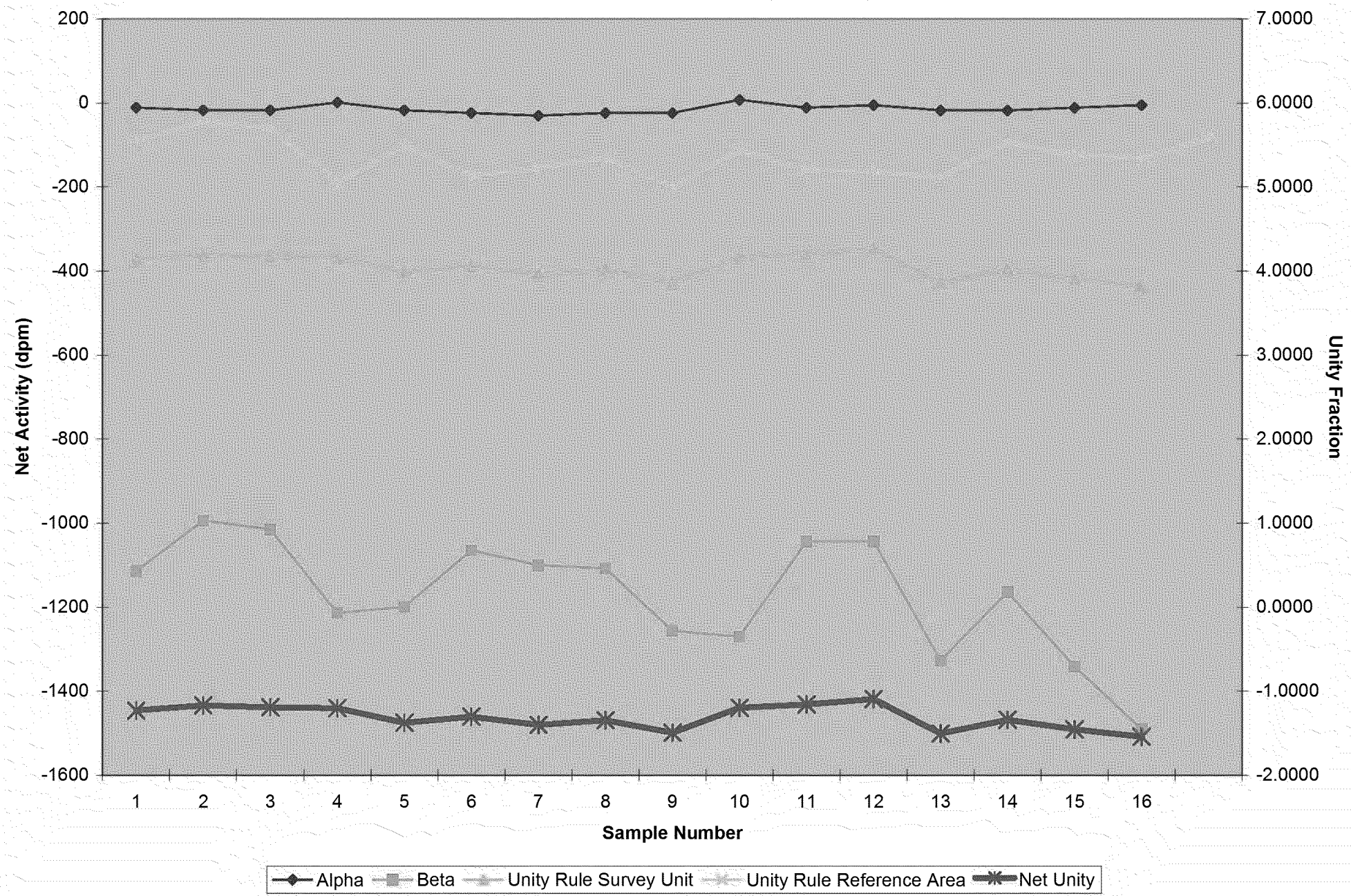
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 9

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	30	30
2	50	5283.9	R	6.7842	33	33
3	44	5262.6	R	6.7004	32	32
4	19	4865.5	R	6.0531	18	18
5	38	5120.8	R	6.4960	28	28
6	19	4943.5	R	6.1311	20	20
7	31	4915.1	R	6.2278	23	23
8	56	4787.4	R	6.3503	25	25
9	13	4886.7	R	6.0118	17	17
10	38	5071.1	R	6.4464	27	27
11	31	4893.8	R	6.2065	22	22
12	31	4872.5	R	6.1853	21	21
13	25	4858.4	R	6.1085	19	19
14	50	5028.6	R	6.5289	29	29
15	44	4943.5	R	6.3813	26	26
16	44	4900.9	R	6.3387	24	24
17	44	5156.2	R	6.5940	31	31
1	25	3879.6	S	4.1298	10	0
2	19	4000.2	S	4.1878	14	0
3	19	3978.9	S	4.1665	13	0
4	38	3780.3	S	4.1556	11	0
5	19	3794.5	S	3.9821	6	0
6	13	3929.2	S	4.0543	9	0
7	6	3893.8	S	3.9563	5	0
8	13	3886.7	S	4.0118	7	0
9	13	3737.7	S	3.8628	3	0
10	44	3723.6	S	4.1614	12	0
11	25	3950.5	S	4.2007	15	0
12	31	3950.5	S	4.2632	16	0
13	19	3666.8	S	3.8544	2	0
14	19	3830.0	S	4.0176	8	0
15	25	3652.6	S	3.9028	4	0
16	31	3503.7	S	3.8164	1	0
				SUM =	**561**	
					W_r =	**425**
					Critical Value =	**335**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 9 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	11.89	17	8	14	8	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	73	1013	1						

Building 813 Survey Unit 10
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 10 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	98.58		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	9.37	11.89	
$DCGL_{(EMC)}$:	937.21	11892.36	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background					
	Alpha	Beta				
Counting Time:	2		min			
Bkgd. Measurement:	8.7	1693.6	counts			
Enter Sigma:	2.1	35.8	cpm			
Calculated Sigma:	3.0	41.2	cpm			
Detector Efficiency (ε_i):	18%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.44%	4.44%				
Surveyor Factor (p):	50.0%					
Probe Area (Active):	582		cm^2			
Scan Interval:	16		s	False Positive	True Positive	
d':	3.28		<----------	0.05	0.95	

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**		50% of $DCGL_{(W)}$:	73%	101%
$MDCR_{Surveyor}$:	**19**	**261**	cpm			
Scan MDC:	**73**	**1013**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	8%	9%
Minimum Area Factor Needed:	**0.73**	**1.01**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	3.6	518.1	Counts
Enter Sigma:	2.0	20.9	counts	1.9	31.4	Counts
Calculated Sigma:	2.4	26.5	counts	1.9	22.8	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.94			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 10

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	9:30	5	3	1.7	0.0423	31	-5
2	6/6/06	9:34	0	3	0.0	0.0423	0	-36
3	6/6/06	9:38	4	3	1.3	0.0423	25	-11
4	6/6/06	9:42	6	3	2.0	0.0423	38	1
5	6/6/06	9:46	1	3	0.3	0.0423	6	-30
6	6/6/06	9:50	4	3	1.3	0.0423	25	-11
7	6/6/06	9:54	5	3	1.7	0.0423	31	-5
8	6/6/06	9:58	2	3	0.7	0.0423	13	-24
9	6/6/06	10:02	6	3	2.0	0.0423	38	1
10	6/6/06	10:06	3	3	1.0	0.0423	19	-18
11	6/6/06	10:10	5	3	1.7	0.0423	31	-5
12	6/6/06	10:14	5	3	1.7	0.0423	31	-5
13	6/6/06	10:18	1	3	0.3	0.0423	6	-30
14	6/6/06	10:22	3	3	1.0	0.0423	19	-18
		mean	**4**	**mean**	**1**	**mean**	**22**	**-14**
		std dev	**1.9**	**std dev**	**0.6**	**std dev**	**12.2**	**12.2**
		median	**4**	**median**	**1**	**median**	**25**	**-11**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 10

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/6/06	9:30	481	3	160.3	0.0373	3411	-1582
2	6/6/06	9:34	553	3	184.3	0.0373	3922	-1072
3	6/6/06	9:38	465	3	155.0	0.0373	3298	-1696
4	6/6/06	9:42	495	3	165.0	0.0373	3511	-1483
5	6/6/06	9:46	537	3	179.0	0.0373	3809	-1185
6	6/6/06	9:50	462	3	154.0	0.0373	3277	-1717
7	6/6/06	9:54	522	3	174.0	0.0373	3702	-1292
8	6/6/06	9:58	519	3	173.0	0.0373	3681	-1313
9	6/6/06	10:02	558	3	186.0	0.0373	3958	-1036
10	6/6/06	10:06	521	3	173.7	0.0373	3695	-1299
11	6/6/06	10:10	536	3	178.7	0.0373	3802	-1192
12	6/6/06	10:14	547	3	182.3	0.0373	3880	-1114
13	6/6/06	10:18	515	3	171.7	0.0373	3653	-1341
14	6/6/06	10:22	542	3	180.7	0.0373	3844	-1150
		mean	**518**	**mean**	**173**	**mean**	**3674**	**-1320**
		std dev	**31.4**	**std dev**	**10.5**	**std dev**	**222.6**	**222.6**
		median	**522**	**median**	**174**	**median**	**3699**	**-1295**

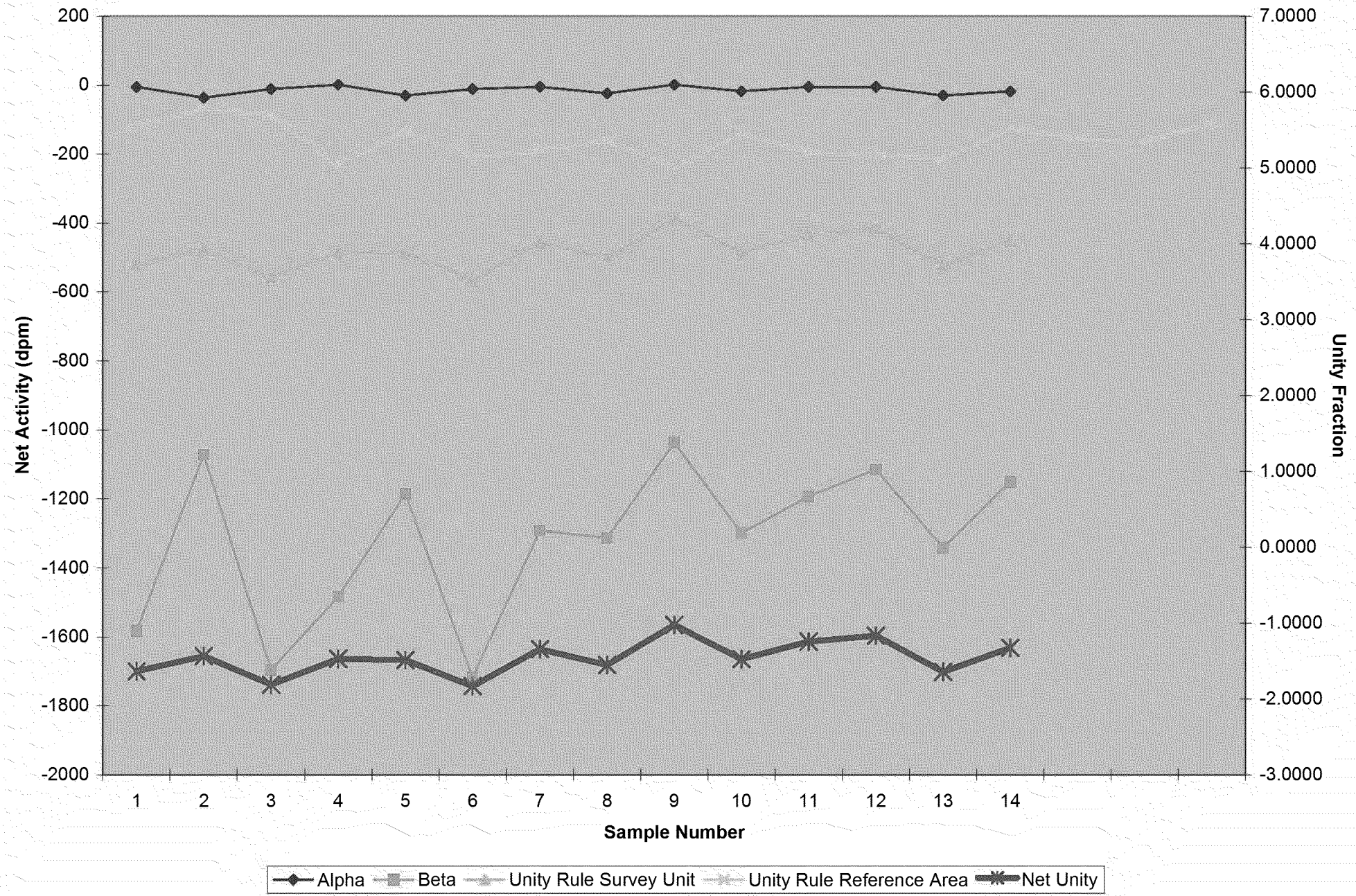
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 10

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	28	28
2	50	5283.9	R	6.7842	31	31
3	44	5262.6	R	6.7004	30	30
4	19	4865.5	R	6.0531	16	16
5	38	5120.8	R	6.4960	26	26
6	19	4943.5	R	6.1311	18	18
7	31	4915.1	R	6.2278	21	21
8	56	4787.4	R	6.3503	23	23
9	13	4886.7	R	6.0118	15	15
10	38	5071.1	R	6.4464	25	25
11	31	4893.8	R	6.2065	20	20
12	31	4872.5	R	6.1853	19	19
13	25	4858.4	R	6.1085	17	17
14	50	5028.6	R	6.5289	27	27
15	44	4943.5	R	6.3813	24	24
16	44	4900.9	R	6.3387	22	22
17	44	5156.2	R	6.5940	29	29
1	31	3411.5	S	3.7242	4	0
2	0	3922.2	S	3.9222	9	0
3	25	3298.0	S	3.5482	2	0
4	38	3510.8	S	3.8860	8	0
5	6	3808.7	S	3.8712	6	0
6	25	3276.7	S	3.5269	1	0
7	31	3702.3	S	4.0150	10	0
8	13	3681.0	S	3.8061	5	0
9	38	3957.6	S	4.3329	14	0
10	19	3695.2	S	3.8828	7	0
11	31	3801.6	S	4.1143	12	0
12	31	3879.6	S	4.1923	13	0
13	6	3652.6	S	3.7152	3	0
14	19	3844.1	S	4.0318	11	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 10 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	11.89	17	7	13	7	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 11
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 11 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	69.75		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	9.37	11.89	
$DCGL_{(EMC)}$:	937.21	11892.36	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background					
	Alpha	Beta				
Counting Time:	2		min			
Bkgd. Measurement:	6.9	1511.3	counts			
Enter Sigma:	2.7	109.3	cpm			
Calculated Sigma:	2.6	38.9	cpm			
Detector Efficiency (ε_i):	19%	20%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.79%	4.88%				
Surveyor Factor (p):	50.0%					
Probe Area (Active):	582		cm^2			
Scan Interval:	16		s	False Positive	True Positive	
d':	3.28		<----------	0.05	0.95	

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		50% of $DCGL_{(w)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm			
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	9%	10%
Minimum Area Factor Needed:	**0.85**	**1.23**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	4.4	494.8	Counts
Enter Sigma:	2.0	20.9	counts	1.9	29.5	Counts
Calculated Sigma:	2.4	26.5	counts	2.1	22.2	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2}	50% of $DCGL_{(w)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	4.19			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.997658			
N:	7	Number of Measurements Required from the Reference Area		
N+N_{EA}:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 11

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	11:30	3	3	1.0	0.0423	19	-18
2	6/2/06	11:34	5	3	1.7	0.0423	31	-5
3	6/2/06	11:38	3	3	1.0	0.0423	19	-18
4	6/2/06	11:42	6	3	2.0	0.0423	38	1
5	6/2/06	11:46	2	3	0.7	0.0423	13	-24
6	6/2/06	11:50	6	3	2.0	0.0423	38	1
7	6/2/06	11:54	5	3	1.7	0.0423	31	-5
8	6/2/06	11:58	1	3	0.3	0.0423	6	-30
9	6/2/06	12:02	3	3	1.0	0.0423	19	-18
10	6/2/06	12:06	6	3	2.0	0.0423	38	1
11	6/2/06	12:10	4	3	1.3	0.0423	25	-11
12	6/2/06	12:14	7	3	2.3	0.0423	44	7
13	6/2/06	12:18	6	3	2.0	0.0423	38	1
		mean	**4**	**mean**	**1**	**mean**	**27**	**-9**
		std dev	**1.9**	**std dev**	**0.6**	**std dev**	**11.6**	**11.6**
		median	**5**	**median**	**2**	**median**	**31**	**-5**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 11

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	11:30	550	3	183.3	0.0373	3901	-1093
2	6/2/06	11:34	476	3	158.7	0.0373	3376	-1618
3	6/2/06	11:38	497	3	165.7	0.0373	3525	-1469
4	6/2/06	11:42	448	3	149.3	0.0373	3177	-1817
5	6/2/06	11:46	503	3	167.7	0.0373	3568	-1426
6	6/2/06	11:50	525	3	175.0	0.0373	3724	-1270
7	6/2/06	11:54	535	3	178.3	0.0373	3794	-1199
8	6/2/06	11:58	467	3	155.7	0.0373	3312	-1682
9	6/2/06	12:02	512	3	170.7	0.0373	3631	-1363
10	6/2/06	12:06	493	3	164.3	0.0373	3497	-1497
11	6/2/06	12:10	477	3	159.0	0.0373	3383	-1611
12	6/2/06	12:14	472	3	157.3	0.0373	3348	-1646
13	6/2/06	12:18	477	3	159.0	0.0373	3383	-1611
		mean	**495**	**mean**	**165**	**mean**	**3509**	**-1485**
		std dev	**29.5**	**std dev**	**9.8**	**std dev**	**209.0**	**209.0**
		median	**493**	**median**	**164**	**median**	**3497**	**-1497**

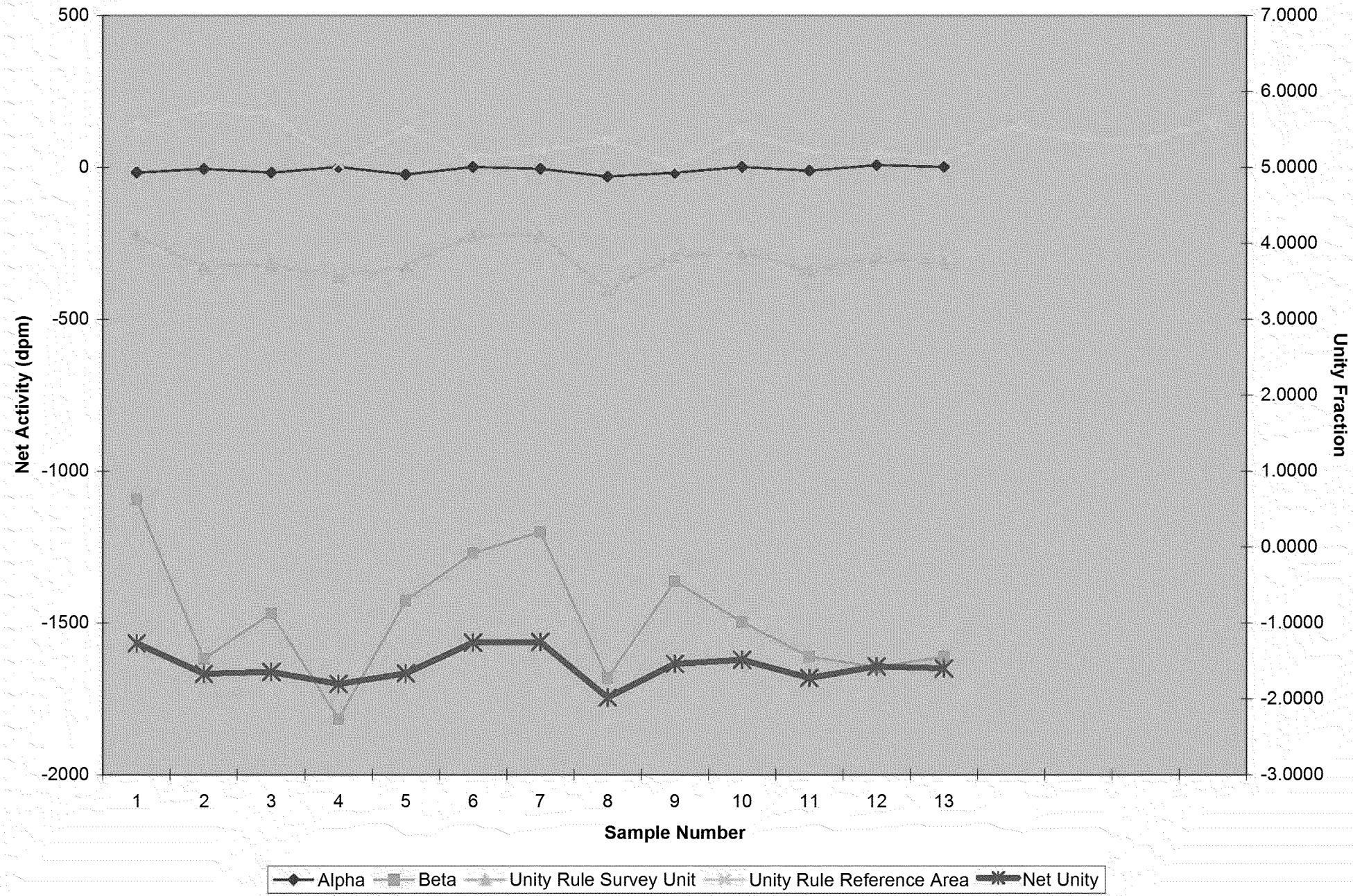
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 11

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	27	27
2	50	5283.9	R	6.7842	30	30
3	44	5262.6	R	6.7004	29	29
4	19	4865.5	R	6.0531	15	15
5	38	5120.8	R	6.4960	25	25
6	19	4943.5	R	6.1311	17	17
7	31	4915.1	R	6.2278	20	20
8	56	4787.4	R	6.3503	22	22
9	13	4886.7	R	6.0118	14	14
10	38	5071.1	R	6.4464	24	24
11	31	4893.8	R	6.2065	19	19
12	31	4872.5	R	6.1853	18	18
13	25	4858.4	R	6.1085	16	16
14	50	5028.6	R	6.5289	26	26
15	44	4943.5	R	6.3813	23	23
16	44	4900.9	R	6.3387	21	21
17	44	5156.2	R	6.5940	28	28
1	19	3900.9	S	4.0885	11	0
2	31	3376.0	S	3.6887	4	0
3	19	3525.0	S	3.7126	6	0
4	38	3177.4	S	3.5527	2	0
5	13	3567.5	S	3.6926	5	0
6	38	3723.6	S	4.0988	12	0
7	31	3794.5	S	4.1072	13	0
8	6	3312.2	S	3.3747	1	0
9	19	3631.4	S	3.8190	9	0
10	38	3496.6	S	3.8719	10	0
11	25	3383.1	S	3.6333	3	0
12	44	3347.7	S	3.7855	8	0
13	38	3383.1	S	3.7584	7	0
				SUM =	**465**	
					W_r =	**374**
					Critical Value =	**303**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 11 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	35.49	17	8	15	8	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 12
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 12 Design

Plan

Classification:	Class 1	
Survey Unit Size (sq meters):	9.45	
DCGL Criterion:		
Dose:	25	mrem/y TEDE
Model:	RESRAD-Build	Building Occupancy - Default Parameters

Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	6.9	1511.3	counts
Enter Sigma:	2.7	109.3	cpm
Calculated Sigma:	2.6	38.9	cpm
Detector Efficiency (ε_i):	19%	20%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.79%	4.88%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		<----------

False Positive	True Positive
0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**	50% of $DCGL_{(w)}$:	85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**	50% of $DCGL_{(EMC)}$:		

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.9	621.2	Counts
Enter Sigma:	3.2	28.0	counts	2.1	43.2	Counts
Calculated Sigma:	3.0	27.9	counts	2.6	24.9	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	93%	80%
			50% of $DCGL_{(w)}$:		

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.53			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α	dpm β
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 12

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	10:00	4	3	1.3	0.0485	22	-28
2	6/2/06	10:04	3	3	1.0	0.0485	16	-33
3	6/2/06	10:08	6	3	2.0	0.0485	33	-17
4	6/2/06	10:12	9	3	3.0	0.0485	49	-1
5	6/2/06	10:16	9	3	3.0	0.0485	49	-1
6	6/2/06	10:20	5	3	1.7	0.0485	27	-22
7	6/2/06	10:24	9	3	3.0	0.0485	49	-1
8	6/2/06	10:28	10	3	3.3	0.0485	55	5
9	6/2/06	10:32	7	3	2.3	0.0485	38	-12
10	6/2/06	10:36	6	3	2.0	0.0485	33	-17
11	6/2/06	10:40	7	3	2.3	0.0485	38	-12
12	6/2/06	10:44	6	3	2.0	0.0485	33	-17
13	6/2/06	10:48	9	3	3.0	0.0485	49	-1
14	6/2/06	10:52	8	3	2.7	0.0485	44	-6
15	6/2/06	10:56	5	3	1.7	0.0485	27	-22
		mean	**7**	**mean**	**2**	**mean**	**37**	**-12**
		std dev	**2.1**	**std dev**	**0.7**	**std dev**	**11.5**	**11.5**
		median	**7**	**median**	**2**	**median**	**38**	**-12**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 12

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	10:00	563	3	187.7	0.0441	3377	-1297
2	6/2/06	10:04	607	3	202.3	0.0441	3641	-1033
3	6/2/06	10:08	671	3	223.7	0.0441	4025	-649
4	6/2/06	10:12	575	3	191.7	0.0441	3449	-1225
5	6/2/06	10:16	586	3	195.3	0.0441	3515	-1159
6	6/2/06	10:20	580	3	193.3	0.0441	3479	-1195
7	6/2/06	10:24	686	3	228.7	0.0441	4115	-559
8	6/2/06	10:28	587	3	195.7	0.0441	3521	-1153
9	6/2/06	10:32	629	3	209.7	0.0441	3773	-901
10	6/2/06	10:36	631	3	210.3	0.0441	3785	-889
11	6/2/06	10:40	612	3	204.0	0.0441	3671	-1003
12	6/2/06	10:44	700	3	233.3	0.0441	4199	-475
13	6/2/06	10:48	646	3	215.3	0.0441	3875	-799
14	6/2/06	10:52	658	3	219.3	0.0441	3947	-727
15	6/2/06	10:56	587	3	195.7	0.0441	3521	-1153
		mean	**621**	**mean**	**207**	**mean**	**3726**	**-948**
		std dev	**43.2**	**std dev**	**14.4**	**std dev**	**259.0**	**259.0**
		median	**612**	**median**	**204**	**median**	**3671**	**-1003**

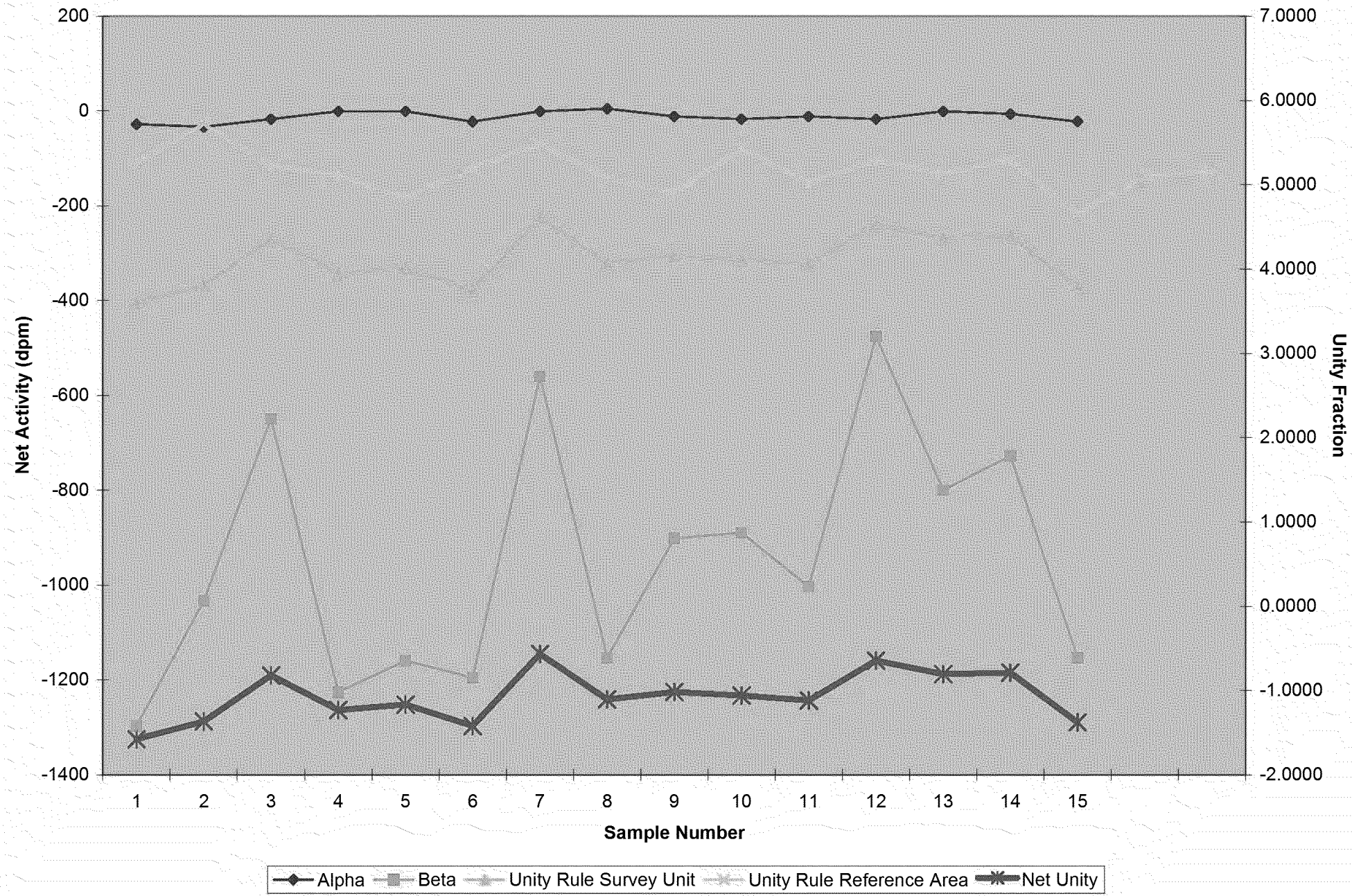
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 12

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	27	27
2	87	4853.1	R	6.7258	32	32
3	27	4949.1	R	6.2218	26	26
4	49	4619.1	R	6.1100	21.5	22
5	38	4463.2	R	5.8450	17	17
6	76	4433.2	R	6.1968	25	25
7	60	4883.1	R	6.4831	31	31
8	33	4757.1	R	6.0844	20	20
9	27	4631.1	R	5.9039	18	18
10	55	4883.1	R	6.4285	30	30
11	38	4637.1	R	6.0190	19	19
12	55	4745.1	R	6.2906	28	28
13	65	4481.2	R	6.1357	23	23
14	60	4691.1	R	6.2911	29	29
15	27	4379.2	R	5.6519	16	16
16	49	4619.1	R	6.1100	21.5	22
17	38	4769.1	R	6.1509	24	24
1	22	3377.4	S	3.5956	1	0
2	16	3641.3	S	3.8050	4	0
3	33	4025.2	S	4.3525	11	0
4	49	3449.4	S	3.9403	5	0
5	49	3515.3	S	4.0063	6	0
6	27	3479.3	S	3.7521	2	0
7	49	4115.2	S	4.6061	15	0
8	55	3521.3	S	4.0668	8	0
9	38	3773.3	S	4.1551	10	0
10	33	3785.3	S	4.1126	9	0
11	38	3671.3	S	4.0531	7	0
12	33	4199.2	S	4.5265	14	0
13	49	3875.3	S	4.3662	12	0
14	44	3947.3	S	4.3836	13	0
15	27	3521.3	S	3.7941	3	0
				SUM =	**528**	
					W_r =	**408**
					Critical Value =	**324**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 12 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	35.49	17	7	15	7	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 13
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 13 Design

Plan

Classification:	Class 1	
Survey Unit Size (sq meters):	5.23	
DCGL Criterion:		
Dose:	25	mrem/y TEDE
Model:	RESRAD-Build	Building Occupancy - Default Parameters

Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	8.7	1693.6	counts
Enter Sigma:	2.1	35.8	cpm
Calculated Sigma:	3.0	41.2	cpm
Detector Efficiency (ε_i):	18%	18%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.44%	4.44%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		<----------

	False Positive	True Positive
	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**	50% of $DCGL_{(W)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm		
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	4%	4%
Minimum Area Factor Needed:	**1.03**	**1.43**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	4.5	506.0	Counts
Enter Sigma:	2.0	20.9	counts	2.5	25.2	Counts
Calculated Sigma:	2.4	26.5	counts	2.1	22.5	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2} 50% of $DCGL_{(W)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	4.23			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.997658			
N:	7	Number of Measurements Required from the Reference Area		
N+N_{EA}:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 13

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	11:30	10	3	3.3	0.0423	63	26
2	6/2/06	11:34	2	3	0.7	0.0423	13	-24
3	6/2/06	11:38	3	3	1.0	0.0423	19	-18
4	6/2/06	11:42	1	3	0.3	0.0423	6	-30
5	6/2/06	11:46	5	3	1.7	0.0423	31	-5
6	6/2/06	11:50	4	3	1.3	0.0423	25	-11
7	6/2/06	11:54	8	3	2.7	0.0423	50	14
8	6/2/06	11:58	4	3	1.3	0.0423	25	-11
9	6/2/06	12:02	4	3	1.3	0.0423	25	-11
10	6/2/06	12:06	4	3	1.3	0.0423	25	-11
11	6/2/06	12:10	1	3	0.3	0.0423	6	-30
12	6/2/06	12:14	7	3	2.3	0.0423	44	7
13	6/2/06	12:18	6	3	2.0	0.0423	38	1
14	6/2/06	12:22	4	3	1.3	0.0423	25	-11
15	6/2/06	12:26	4	3	1.3	0.0423	25	-11
		mean	**4**	**mean**	**1**	**mean**	**28**	**-8**
		std dev	**2.5**	**std dev**	**0.8**	**std dev**	**15.5**	**15.5**
		median	**4**	**median**	**1**	**median**	**25**	**-11**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 13

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/5/06	10:00	518	3	172.7	0.0373	3674	-1320
2	6/5/06	10:04	508	3	169.3	0.0373	3603	-1391
3	6/5/06	10:08	584	3	194.7	0.0373	4142	-852
4	6/5/06	10:12	495	3	165.0	0.0373	3511	-1483
5	6/5/06	10:16	483	3	161.0	0.0373	3426	-1568
6	6/5/06	10:20	521	3	173.7	0.0373	3695	-1299
7	6/5/06	10:24	483	3	161.0	0.0373	3426	-1568
8	6/5/06	10:28	524	3	174.7	0.0373	3716	-1277
9	6/5/06	10:32	496	3	165.3	0.0373	3518	-1476
10	6/5/06	10:36	494	3	164.7	0.0373	3504	-1490
11	6/5/06	10:40	491	3	163.7	0.0373	3482	-1512
12	6/5/06	10:44	493	3	164.3	0.0373	3497	-1497
13	6/5/06	10:48	498	3	166.0	0.0373	3532	-1462
14	6/5/06	10:52	510	3	170.0	0.0373	3617	-1377
15	6/5/06	10:56	492	3	164.0	0.0373	3490	-1504
		mean	**506**	**mean**	**169**	**mean**	**3589**	**-1405**
		std dev	**25.2**	**std dev**	**8.4**	**std dev**	**178.6**	**178.6**
		median	**496**	**median**	**165**	**median**	**3518**	**-1476**

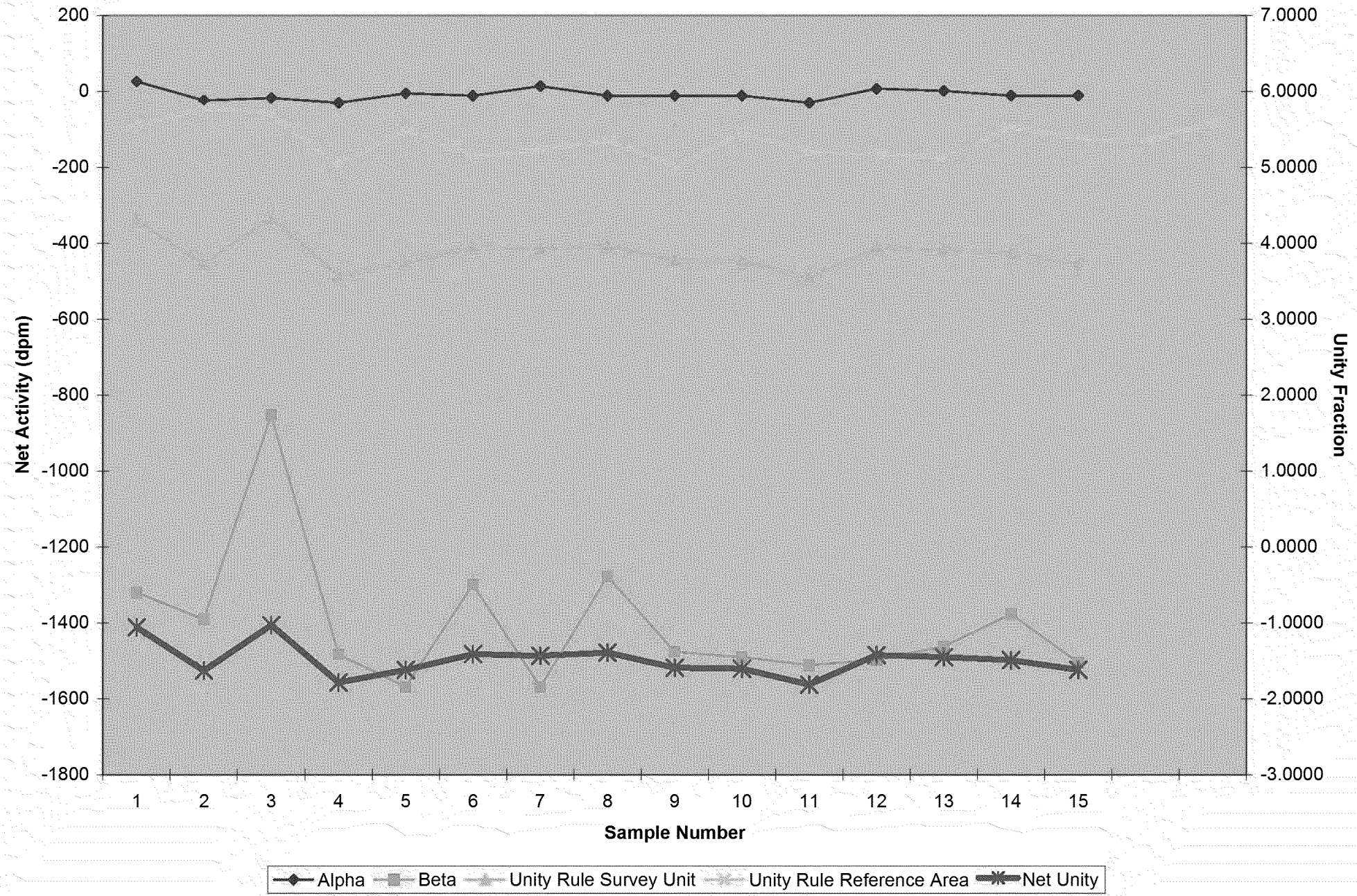
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 13

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	29	29
2	50	5283.9	R	6.7842	32	32
3	44	5262.6	R	6.7004	31	31
4	19	4865.5	R	6.0531	17	17
5	38	5120.8	R	6.4960	27	27
6	19	4943.5	R	6.1311	19	19
7	31	4915.1	R	6.2278	22	22
8	56	4787.4	R	6.3503	24	24
9	13	4886.7	R	6.0118	16	16
10	38	5071.1	R	6.4464	26	26
11	31	4893.8	R	6.2065	21	21
12	31	4872.5	R	6.1853	20	20
13	25	4858.4	R	6.1085	18	18
14	50	5028.6	R	6.5289	28	28
15	44	4943.5	R	6.3813	25	25
16	44	4900.9	R	6.3387	23	23
17	44	5156.2	R	6.5940	30	30
1	63	3673.9	S	4.2993	14	0
2	13	3603.0	S	3.7281	3	0
3	19	4142.0	S	4.3296	15	0
4	6	3510.8	S	3.5733	2	0
5	31	3425.7	S	3.7384	4	0
6	25	3695.2	S	3.9454	12	0
7	50	3425.7	S	3.9260	10	0
8	25	3716.5	S	3.9666	13	0
9	25	3517.9	S	3.7680	7	0
10	25	3503.7	S	3.7539	6	0
11	6	3482.4	S	3.5450	1	0
12	44	3496.6	S	3.9344	11	0
13	38	3532.1	S	3.9073	9	0
14	25	3617.2	S	3.8673	8	0
15	25	3489.5	S	3.7397	5	0
				SUM =	**528**	
					W_r =	**408**
					Critical Value =	**324**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 13 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	17.84	17	8	14	8	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 14
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 14 Design

Plan

Classification:	Class 1	
Survey Unit Size (sq meters):	59.61	
DCGL Criterion:		
Dose:	25	mrem/y TEDE
Model:	RESRAD-Build	Building Occupancy - Default Parameters

Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	13.63	17.84	
$DCGL_{(EMC)}$:	1363.03	17838.54	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background		
	Alpha	Beta	
Counting Time:	2		min
Bkgd. Measurement:	8.7	1693.6	counts
Enter Sigma:	2.1	35.8	cpm
Calculated Sigma:	3.0	41.2	cpm
Detector Efficiency (ε_i):	18%	18%	
Surface Efficiency (ε_s):	25%	25%	
Total Efficiency (ε_T):	4.44%	4.44%	
Surveyor Factor (p):	50.0%		
Probe Area (Active):	582		cm^2
Scan Interval:	16		s
d':	3.28		<----------

False Positive	True Positive
0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**	50% of $DCGL_{(W)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm		
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	8%	8%
Minimum Area Factor Needed:	**1.03**	**1.43**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	5.7	529.5	Counts
Enter Sigma:	2.0	20.9	counts	2.3	29.1	Counts
Calculated Sigma:	2.4	26.5	counts	2.4	23.0	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2} 50% of $DCGL_{(W)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	0.9577	cpm	LBGR	0.0423
Delta/Sigma:	3.81			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_A:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 14

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/5/06	10:00	3	3	1.0	0.0423	19	-18
2	6/5/06	10:04	6	3	2.0	0.0423	38	1
3	6/5/06	10:08	7	3	2.3	0.0423	44	7
4	6/5/06	10:12	8	3	2.7	0.0423	50	14
5	6/5/06	10:16	4	3	1.3	0.0423	25	-11
6	6/5/06	10:20	3	3	1.0	0.0423	19	-18
7	6/5/06	10:24	7	3	2.3	0.0423	44	7
8	6/5/06	10:28	9	3	3.0	0.0423	56	20
9	6/5/06	10:32	4	3	1.3	0.0423	25	-11
10	6/5/06	10:36	8	3	2.7	0.0423	50	14
11	6/5/06	10:40	2	3	0.7	0.0423	13	-24
12	6/5/06	10:44	4	3	1.3	0.0423	25	-11
13	6/5/06	10:48	8	3	2.7	0.0423	50	14
14	6/5/06	10:52	7	3	2.3	0.0423	44	7
		mean	**6**	**mean**	**2**	**mean**	**36**	**-1**
		std dev	**2.3**	**std dev**	**0.8**	**std dev**	**14.4**	**14.4**
		median	**7**	**median**	**2**	**median**	**41**	**4**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 14

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/5/06	10:00	472	3	157.3	0.0373	3348	-1646
2	6/5/06	10:04	544	3	181.3	0.0373	3858	-1136
3	6/5/06	10:08	499	3	166.3	0.0373	3539	-1455
4	6/5/06	10:12	482	3	160.7	0.0373	3419	-1575
5	6/5/06	10:16	539	3	179.7	0.0373	3823	-1171
6	6/5/06	10:20	563	3	187.7	0.0373	3993	-1001
7	6/5/06	10:24	534	3	178.0	0.0373	3787	-1207
8	6/5/06	10:28	516	3	172.0	0.0373	3660	-1334
9	6/5/06	10:32	552	3	184.0	0.0373	3915	-1079
10	6/5/06	10:36	513	3	171.0	0.0373	3638	-1356
11	6/5/06	10:40	534	3	178.0	0.0373	3787	-1207
12	6/5/06	10:44	547	3	182.3	0.0373	3880	-1114
13	6/5/06	10:48	562	3	187.3	0.0373	3986	-1008
14	6/5/06	10:52	556	3	185.3	0.0373	3943	-1051
		mean	**530**	**mean**	**177**	**mean**	**3755**	**-1238**
		std dev	**29.1**	**std dev**	**9.7**	**std dev**	**206.1**	**206.1**
		median	**537**	**median**	**179**	**median**	**3805**	**-1189**

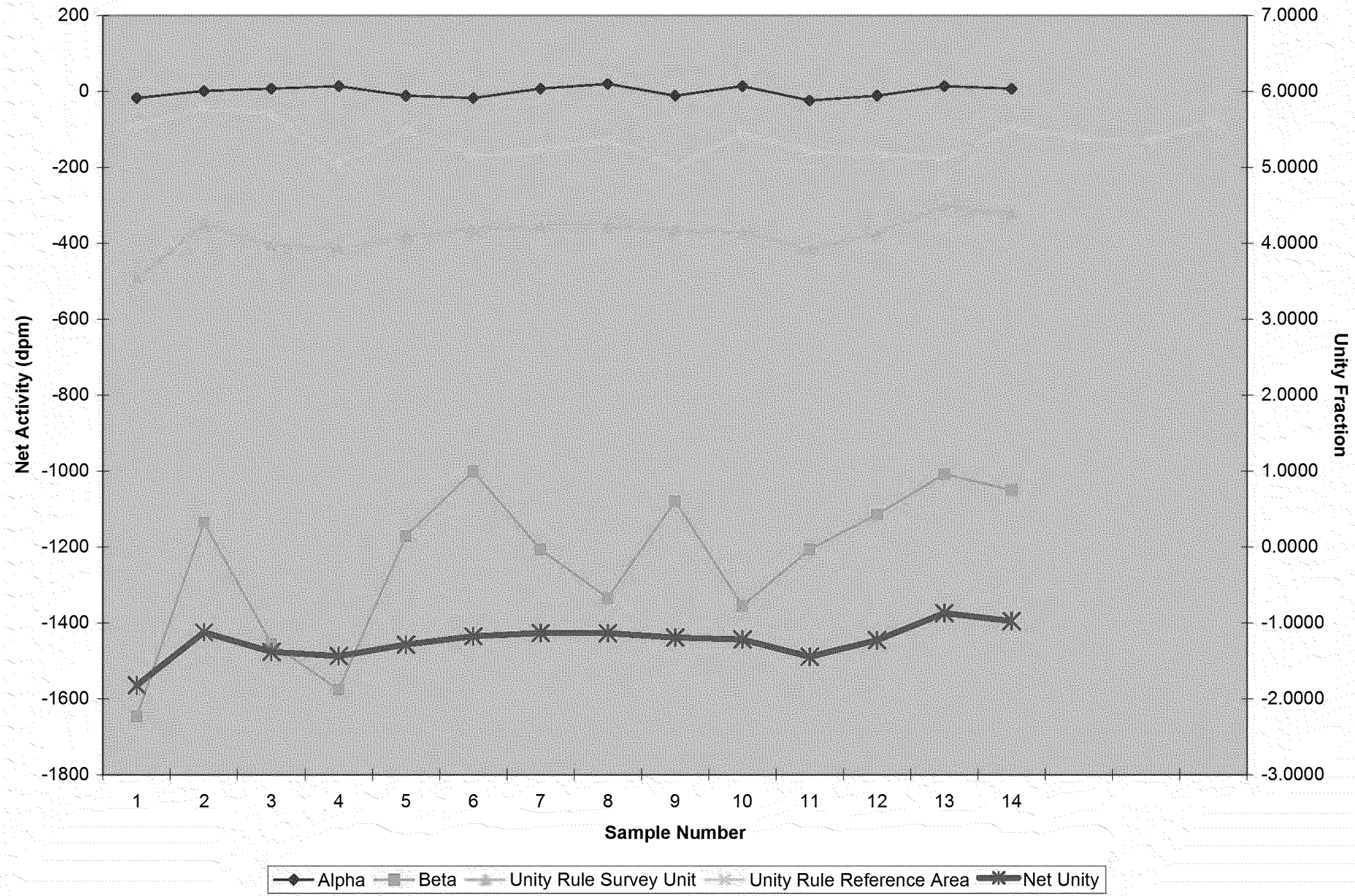
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 14

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	28	28
2	50	5283.9	R	6.7842	31	31
3	44	5262.6	R	6.7004	30	30
4	19	4865.5	R	6.0531	16	16
5	38	5120.8	R	6.4960	26	26
6	19	4943.5	R	6.1311	18	18
7	31	4915.1	R	6.2278	21	21
8	56	4787.4	R	6.3503	23	23
9	13	4886.7	R	6.0118	15	15
10	38	5071.1	R	6.4464	25	25
11	31	4893.8	R	6.2065	20	20
12	31	4872.5	R	6.1853	19	19
13	25	4858.4	R	6.1085	17	17
14	50	5028.6	R	6.5289	27	27
15	44	4943.5	R	6.3813	24	24
16	44	4900.9	R	6.3387	22	22
17	44	5156.2	R	6.5940	29	29
1	19	3347.7	S	3.5353	1	0
2	38	3858.3	S	4.2336	12	0
3	44	3539.2	S	3.9769	4	0
4	50	3418.6	S	3.9189	3	0
5	25	3822.9	S	4.0730	5	0
6	19	3993.1	S	4.1807	9	0
7	44	3787.4	S	4.2252	11	0
8	56	3659.7	S	4.2226	10	0
9	25	3915.1	S	4.1652	8	0
10	50	3638.5	S	4.1388	7	0
11	13	3787.4	S	3.9125	2	0
12	25	3879.6	S	4.1298	6	0
13	50	3986.0	S	4.4863	14	0
14	44	3943.4	S	4.3812	13	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 14 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227415	Ludlum 43-68	PR116722	0.138	0.186	0.25	0.25	0.0345	0.0466	Ra-226, Sr-90, Cs-137*	99	762	*	*	1	35.49	17	7	14	7	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 15
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 15 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	6.51		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**			

50% of $DCGL_{(W)}$:

50% of $DCGL_{(EMC)}$:

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	4-May-07	Serial No.:	227415
Detector:	Ludlum 43-68		Cal. Date:	4-May-07	Serial No.:	PR116722

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	4.6	794.9	counts	4.2	668.1	Counts
Enter Sigma:	1.5	21.5	counts	2.1	26.5	Counts
Calculated Sigma:	2.1	28.2	counts	2.1	25.8	
Detector Efficiency (ε_i):	14%	19%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	3.45%	4.66%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**99**	**762**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	99%	76%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	4.56			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	1			
N:	7	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227415 / PR116722

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	794	2.33	264.7	0.0345	0.0466	54	4508
2	05/12/06	8:35	3	6	809	2.00	269.7	0.0345	0.0466	46	4593
3	05/12/06	8:40	3	4	787	1.33	262.3	0.0345	0.0466	31	4468
4	05/12/06	8:45	3	4	798	1.33	266.0	0.0345	0.0466	31	4530
5	05/12/06	8:50	3	5	770	1.67	256.7	0.0345	0.0466	38	4371
6	05/12/06	8:55	3	7	791	2.33	263.7	0.0345	0.0466	54	4491
7	05/12/06	9:00	3	3	834	1.00	278.0	0.0345	0.0466	23	4735
8	05/12/06	9:05	3	5	753	1.67	251.0	0.0345	0.0466	38	4275
9	05/12/06	9:10	3	4	766	1.33	255.3	0.0345	0.0466	31	4349
10	05/12/06	9:15	3	5	808	1.67	269.3	0.0345	0.0466	38	4587
11	05/12/06	9:20	3	2	773	0.67	257.7	0.0345	0.0466	15	4388
12	05/12/06	9:25	3	5	812	1.67	270.7	0.0345	0.0466	38	4610
13	05/12/06	9:30	3	3	808	1.00	269.3	0.0345	0.0466	23	4587
14	05/12/06	9:35	3	6	802	2.00	267.3	0.0345	0.0466	46	4553
15	05/12/06	9:40	3	6	800	2.00	266.7	0.0345	0.0466	46	4542
16	05/12/06	9:45	3	3	827	1.00	275.7	0.0345	0.0466	23	4695
17	05/12/06	9:50	3	3	782	1.00	260.7	0.0345	0.0466	23	4439
			mean	**4.59**	**794.94**	**1.53**	**264.98**			**35.18**	**4512.92**
			std dev	**1.50**	**21.53**	**0.50**	**7.18**			**11.52**	**122.21**
			median	**5.00**	**798.00**	**1.67**	**266.00**			**38.34**	**4530.28**

Class 1 Alpha Measurements - Building 813 Survey Unit 15

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	15:00	3	3	1.0	0.0345	23	-12
2	5/31/06	15:04	6	3	2.0	0.0345	46	11
3	5/31/06	15:08	5	3	1.7	0.0345	38	3
4	5/31/06	15:12	2	3	0.7	0.0345	15	-20
5	5/31/06	15:16	7	3	2.3	0.0345	54	18
6	5/31/06	15:20	4	3	1.3	0.0345	31	-5
7	5/31/06	15:24	7	3	2.3	0.0345	54	18
8	5/31/06	15:28	3	3	1.0	0.0345	23	-12
9	5/31/06	15:32	5	3	1.7	0.0345	38	3
10	5/31/06	15:36	3	3	1.0	0.0345	23	-12
11	5/31/06	15:40	0	3	0.0	0.0345	0	-35
12	5/31/06	15:44	4	3	1.3	0.0345	31	-5
13	5/31/06	15:48	3	3	1.0	0.0345	23	-12
14	5/31/06	15:52	7	3	2.3	0.0345	54	18
		mean	**4**	**mean**	**1**	**mean**	**32**	**-3**
		std dev	**2.1**	**std dev**	**0.7**	**std dev**	**16.0**	**16.0**
		median	**4**	**median**	**1**	**median**	**31**	**-5**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 15

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	15:00	661	3	220.3	0.0466	3753	-760
2	5/31/06	15:04	707	3	235.7	0.0466	4014	-499
3	5/31/06	15:08	708	3	236.0	0.0466	4019	-494
4	5/31/06	15:12	680	3	226.7	0.0466	3860	-653
5	5/31/06	15:16	618	3	206.0	0.0466	3508	-1005
6	5/31/06	15:20	675	3	225.0	0.0466	3832	-681
7	5/31/06	15:24	644	3	214.7	0.0466	3656	-857
8	5/31/06	15:28	657	3	219.0	0.0466	3730	-783
9	5/31/06	15:32	693	3	231.0	0.0466	3934	-579
10	5/31/06	15:36	681	3	227.0	0.0466	3866	-647
11	5/31/06	15:40	646	3	215.3	0.0466	3667	-846
12	5/31/06	15:44	636	3	212.0	0.0466	3611	-902
13	5/31/06	15:48	664	3	221.3	0.0466	3770	-743
14	5/31/06	15:52	683	3	227.7	0.0466	3877	-635
		mean	**668**	**mean**	**223**	**mean**	**3793**	**-720**
		std dev	**26.5**	**std dev**	**8.8**	**std dev**	**150.2**	**150.2**
		median	**670**	**median**	**223**	**median**	**3801**	**-712**

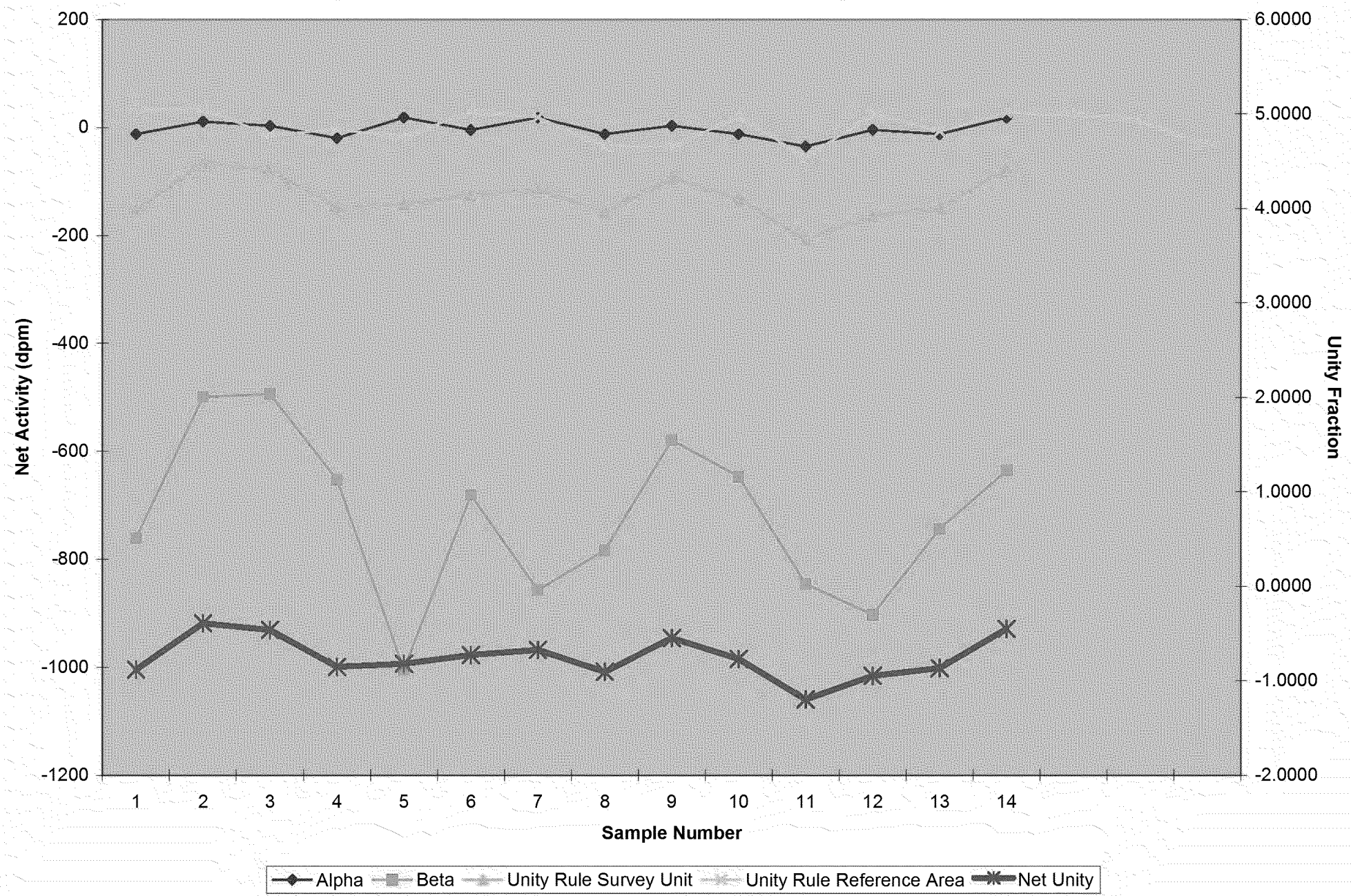
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 15

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	54	4507.6	R	6.0443	30	30
2	46	4592.7	R	6.0528	31	31
3	31	4467.8	R	5.7746	20	20
4	31	4530.3	R	5.8370	22	22
5	38	4371.3	R	5.7547	19	19
6	54	4490.5	R	6.0273	29	29
7	23	4734.7	R	5.9647	24	24
8	38	4274.8	R	5.6582	17	17
9	31	4348.6	R	5.6553	16	16
10	38	4587.1	R	5.9705	25	25
11	15	4388.4	R	5.5417	15	15
12	38	4609.8	R	5.9932	26	26
13	23	4587.1	R	5.8171	21	21
14	46	4553.0	R	6.0131	28	28
15	46	4541.6	R	6.0017	27	27
16	23	4694.9	R	5.9250	23	23
17	23	4439.4	R	5.6695	18	18
1	23	3752.5	S	3.9826	4	0
2	46	4013.7	S	4.4738	14	0
3	38	4019.3	S	4.4028	12	0
4	15	3860.4	S	4.0138	6	0
5	54	3508.4	S	4.0452	7	0
6	31	3832.0	S	4.1387	9	0
7	54	3656.0	S	4.1928	10	0
8	23	3729.8	S	3.9599	3	0
9	38	3934.2	S	4.3176	11	0
10	23	3866.1	S	4.0961	8	0
11	0	3667.4	S	3.6674	1	0
12	31	3610.6	S	3.9173	2	0
13	23	3769.6	S	3.9996	5	0
14	54	3877.4	S	4.4142	13	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 15 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227415	Ludlum 43-68	PR116722	0.138	0.186	0.25	0.25	0.0345	0.0466	Ra-226, Sr-90, Cs-137*	99	762	*	*	1	35.49	17	7	15	7	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 16
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 16 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	11.37		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**			

50% of $DCGL_{(W)}$:

50% of $DCGL_{(EMC)}$:

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	4-May-07	Serial No.:	227415
Detector:	Ludlum 43-68		Cal. Date:	4-May-07	Serial No.:	PR116722

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	4.6	794.9	counts	2.6	718.1	Counts
Enter Sigma:	1.5	21.5	counts	1.5	34.3	Counts
Calculated Sigma:	2.1	28.2	counts	1.6	26.8	
Detector Efficiency (ε_i):	14%	19%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	3.45%	4.66%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**99**	**762**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	99%	76%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	4.42			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.997658			
N:	7	Number of Measurements Required from the Reference Area		
N+N_{EA}:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227415 / PR116722

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	794	2.33	264.7	0.0345	0.0466	54	4508
2	05/12/06	8:35	3	6	809	2.00	269.7	0.0345	0.0466	46	4593
3	05/12/06	8:40	3	4	787	1.33	262.3	0.0345	0.0466	31	4468
4	05/12/06	8:45	3	4	798	1.33	266.0	0.0345	0.0466	31	4530
5	05/12/06	8:50	3	5	770	1.67	256.7	0.0345	0.0466	38	4371
6	05/12/06	8:55	3	7	791	2.33	263.7	0.0345	0.0466	54	4491
7	05/12/06	9:00	3	3	834	1.00	278.0	0.0345	0.0466	23	4735
8	05/12/06	9:05	3	5	753	1.67	251.0	0.0345	0.0466	38	4275
9	05/12/06	9:10	3	4	766	1.33	255.3	0.0345	0.0466	31	4349
10	05/12/06	9:15	3	5	808	1.67	269.3	0.0345	0.0466	38	4587
11	05/12/06	9:20	3	2	773	0.67	257.7	0.0345	0.0466	15	4388
12	05/12/06	9:25	3	5	812	1.67	270.7	0.0345	0.0466	38	4610
13	05/12/06	9:30	3	3	808	1.00	269.3	0.0345	0.0466	23	4587
14	05/12/06	9:35	3	6	802	2.00	267.3	0.0345	0.0466	46	4553
15	05/12/06	9:40	3	6	800	2.00	266.7	0.0345	0.0466	46	4542
16	05/12/06	9:45	3	3	827	1.00	275.7	0.0345	0.0466	23	4695
17	05/12/06	9:50	3	3	782	1.00	260.7	0.0345	0.0466	23	4439
			mean	**4.59**	**794.94**	**1.53**	**264.98**			**35.18**	**4512.92**
			std dev	**1.50**	**21.53**	**0.50**	**7.18**			**11.52**	**122.21**
			median	**5.00**	**798.00**	**1.67**	**266.00**			**38.34**	**4530.28**

Class 1 Alpha Measurements - Building 813 Survey Unit 16

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	15:00	3	3	1.0	0.0345	23	-12
2	5/31/06	15:04	2	3	0.7	0.0345	15	-20
3	5/31/06	15:08	3	3	1.0	0.0345	23	-12
4	5/31/06	15:12	2	3	0.7	0.0345	15	-20
5	5/31/06	15:16	1	3	0.3	0.0345	8	-28
6	5/31/06	15:20	3	3	1.0	0.0345	23	-12
7	5/31/06	15:24	1	3	0.3	0.0345	8	-28
8	5/31/06	15:28	1	3	0.3	0.0345	8	-28
9	5/31/06	15:32	4	3	1.3	0.0345	31	-5
10	5/31/06	15:36	1	3	0.3	0.0345	8	-28
11	5/31/06	15:40	6	3	2.0	0.0345	46	11
12	5/31/06	15:44	1	3	0.3	0.0345	8	-28
13	5/31/06	15:48	4	3	1.3	0.0345	31	-5
14	5/31/06	15:52	4	3	1.3	0.0345	31	-5
15	5/31/06	15:56	3	3	1.0	0.0345	23	-12
		mean	**3**	**mean**	**1**	**mean**	**20**	**-15**
		std dev	**1.5**	**std dev**	**0.5**	**std dev**	**11.5**	**11.5**
		median	**3**	**median**	**1**	**median**	**23**	**-12**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 16

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	15:00	732	3	244.0	0.0466	4156	-357
2	5/31/06	15:04	714	3	238.0	0.0466	4053	-460
3	5/31/06	15:08	744	3	248.0	0.0466	4224	-289
4	5/31/06	15:12	684	3	228.0	0.0466	3883	-630
5	5/31/06	15:16	671	3	223.7	0.0466	3809	-704
6	5/31/06	15:20	748	3	249.3	0.0466	4246	-266
7	5/31/06	15:24	742	3	247.3	0.0466	4212	-301
8	5/31/06	15:28	787	3	262.3	0.0466	4468	-45
9	5/31/06	15:32	731	3	243.7	0.0466	4150	-363
10	5/31/06	15:36	671	3	223.7	0.0466	3809	-704
11	5/31/06	15:40	676	3	225.3	0.0466	3838	-675
12	5/31/06	15:44	718	3	239.3	0.0466	4076	-437
13	5/31/06	15:48	686	3	228.7	0.0466	3894	-618
14	5/31/06	15:52	746	3	248.7	0.0466	4235	-278
15	5/31/06	15:56	721	3	240.3	0.0466	4093	-420
		mean	**718**	**mean**	**239**	**mean**	**4076**	**-436**
		std dev	**34.3**	**std dev**	**11.4**	**std dev**	**194.6**	**194.6**
		median	**721**	**median**	**240**	**median**	**4093**	**-420**

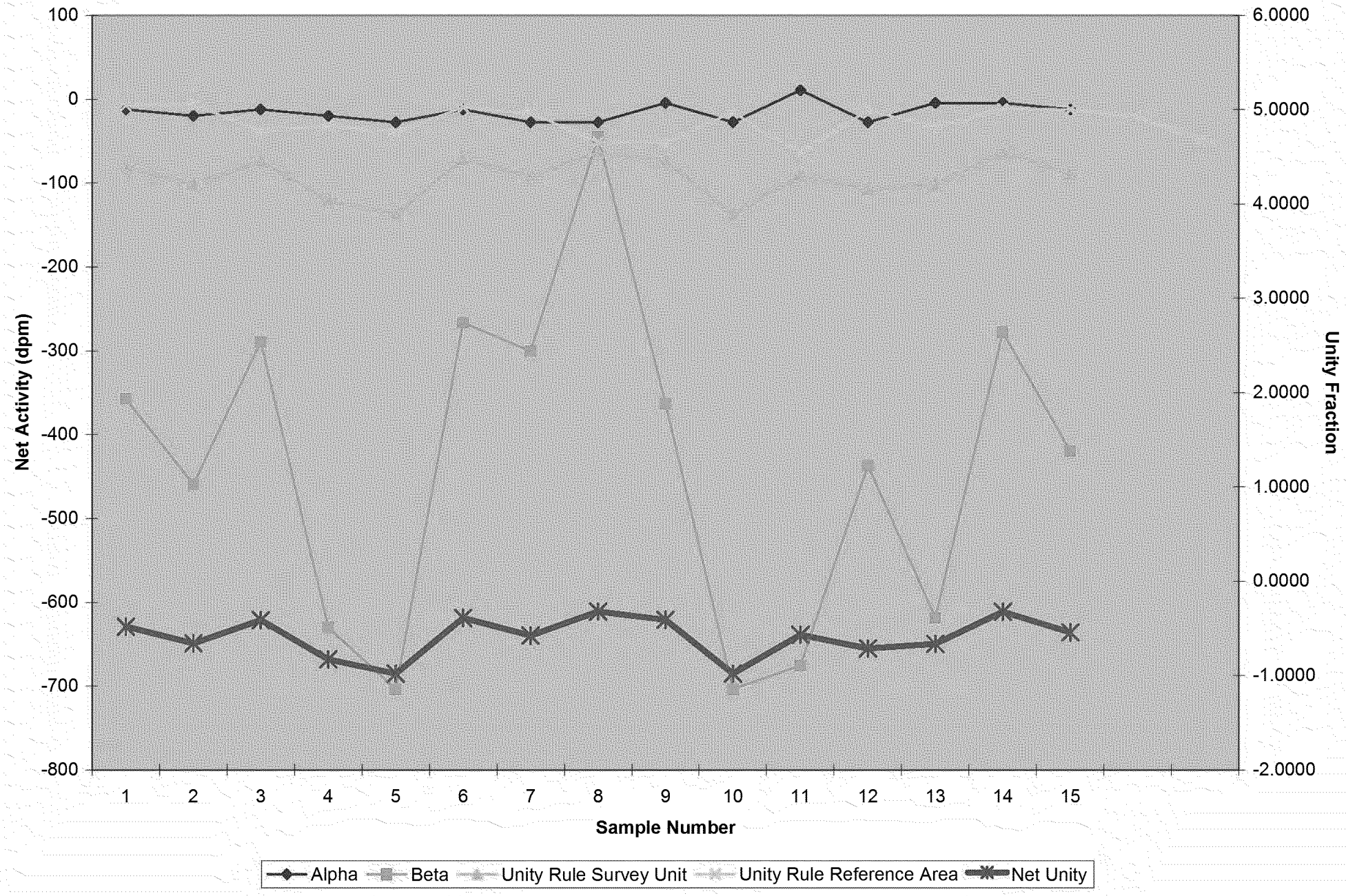
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 16

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	54	4507.6	R	6.0443	31	31
2	46	4592.7	R	6.0528	32	32
3	31	4467.8	R	5.7746	21	21
4	31	4530.3	R	5.8370	23	23
5	38	4371.3	R	5.7547	20	20
6	54	4490.5	R	6.0273	30	30
7	23	4734.7	R	5.9647	25	25
8	38	4274.8	R	5.6582	18	18
9	31	4348.6	R	5.6553	17	17
10	38	4587.1	R	5.9705	26	26
11	15	4388.4	R	5.5417	16	16
12	38	4609.8	R	5.9932	27	27
13	23	4587.1	R	5.8171	22	22
14	46	4553.0	R	6.0131	29	29
15	46	4541.6	R	6.0017	28	28
16	23	4694.9	R	5.9250	24	24
17	23	4439.4	R	5.6695	19	19
1	23	4155.6	S	4.3856	10	0
2	15	4053.4	S	4.2068	6	0
3	23	4223.7	S	4.4538	11	0
4	15	3883.1	S	4.0365	3	0
5	8	3809.3	S	3.8860	1.5	0
6	23	4246.4	S	4.4765	13	0
7	8	4212.4	S	4.2890	7	0
8	8	4467.8	S	4.5445	15	0
9	31	4149.9	S	4.4566	12	0
10	8	3809.3	S	3.8860	1.5	0
11	46	3837.7	S	4.2978	8	0
12	8	4076.1	S	4.1528	4	0
13	31	3894.5	S	4.2012	5	0
14	31	4235.1	S	4.5418	14	0
15	23	4093.1	S	4.3232	9	0
				SUM =	**528**	
					W_r =	**408**
					Critical Value =	**324**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 16 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	185766	Ludlum 43-68	PR99186	0.169	0.149	0.25	0.25	0.0423	0.0373	Ra-226, Sr-90, Cs-137*	89	897	*	*	1	35.49	17	12	14	12	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 17
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 17 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	24.35		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background					
	Alpha	Beta				
Counting Time:	2		min			
Bkgd. Measurement:	8.7	1693.6	counts			
Enter Sigma:	2.1	35.8	cpm			
Calculated Sigma:	3.0	41.2	cpm			
Detector Efficiency (ε_i):	18%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.44%	4.44%				
Surveyor Factor (p):	50.0%					
Probe Area (Active):	582		cm^2			
Scan Interval:	16		s	False Positive	True Positive	
d':	3.28		<----------	0.05	0.95	

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**	50% of $DCGL_{(W)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm		
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	4%	4%
Minimum Area Factor Needed:	**1.03**	**1.43**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	14-Feb-07	Serial No.:	185766
Detector:	Ludlum 43-68		Cal. Date:	14-Feb-07	Serial No.:	PR99186

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.8	704.1	counts	7.4	678.9	Counts
Enter Sigma:	2.0	20.9	counts	1.9	73.1	Counts
Calculated Sigma:	2.4	26.5	counts	2.7	26.1	
Detector Efficiency (ε_i):	17%	15%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.23%	3.73%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**89**	**897**	dpm 100 cm^{-2} 50% of $DCGL_{(W)}$:	89%	90%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	0.9264	cpm	LBGR	0.0736
Delta/Sigma:	1.74			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.885299			
N:	**12**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**12**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 185766 / PR99186

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	7	720	2.33	240.0	0.0423	0.0373	44	5107
2	05/12/06	8:35	3	8	745	2.67	248.3	0.0423	0.0373	50	5284
3	05/12/06	8:40	3	7	742	2.33	247.3	0.0423	0.0373	44	5263
4	05/12/06	8:45	3	3	686	1.00	228.7	0.0423	0.0373	19	4865
5	05/12/06	8:50	3	6	722	2.00	240.7	0.0423	0.0373	38	5121
6	05/12/06	8:55	3	3	697	1.00	232.3	0.0423	0.0373	19	4943
7	05/12/06	9:00	3	5	693	1.67	231.0	0.0423	0.0373	31	4915
8	05/12/06	9:05	3	9	675	3.00	225.0	0.0423	0.0373	56	4787
9	05/12/06	9:10	3	2	689	0.67	229.7	0.0423	0.0373	13	4887
10	05/12/06	9:15	3	6	715	2.00	238.3	0.0423	0.0373	38	5071
11	05/12/06	9:20	3	5	690	1.67	230.0	0.0423	0.0373	31	4894
12	05/12/06	9:25	3	5	687	1.67	229.0	0.0423	0.0373	31	4873
13	05/12/06	9:30	3	4	685	1.33	228.3	0.0423	0.0373	25	4858
14	05/12/06	9:35	3	8	709	2.67	236.3	0.0423	0.0373	50	5029
15	05/12/06	9:40	3	7	697	2.33	232.3	0.0423	0.0373	44	4943
16	05/12/06	9:45	3	7	691	2.33	230.3	0.0423	0.0373	44	4901
17	05/12/06	9:50	3	7	727	2.33	242.3	0.0423	0.0373	44	5156
			mean	**5.82**	**704.12**	**1.94**	**234.71**			**36.42**	**4993.95**
			std dev	**1.98**	**20.92**	**0.66**	**6.97**			**12.36**	**148.39**
			median	**6.00**	**697.00**	**2.00**	**232.33**			**37.52**	**4943.47**

Class 1 Alpha Measurements - Building 813 Survey Unit 17

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/12/06	13:20	6	3	2.0	0.0423	38	1
2	6/12/06	13:24	8	3	2.7	0.0423	50	14
3	6/12/06	13:28	9	3	3.0	0.0423	56	20
4	6/12/06	13:32	8	3	2.7	0.0423	50	14
5	6/12/06	13:36	7	3	2.3	0.0423	44	7
6	6/12/06	13:40	11	3	3.7	0.0423	69	32
7	6/12/06	13:44	6	3	2.0	0.0423	38	1
8	6/12/06	13:48	6	3	2.0	0.0423	38	1
9	6/12/06	13:52	7	3	2.3	0.0423	44	7
10	6/12/06	13:56	11	3	3.7	0.0423	69	32
11	6/12/06	14:00	7	3	2.3	0.0423	44	7
12	6/12/06	14:04	5	3	1.7	0.0423	31	-5
13	6/12/06	14:08	6	3	2.0	0.0423	38	1
14	6/12/06	14:12	6	3	2.0	0.0423	38	1
		mean	**7**	**mean**	**2**	**mean**	**46**	**10**
		std dev	**1.9**	**std dev**	**0.6**	**std dev**	**11.7**	**11.7**
		median	**7**	**median**	**2**	**median**	**44**	**7**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 17

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/12/06	13:20	758	3	252.7	0.0373	5376	382
2	6/12/06	13:24	664	3	221.3	0.0373	4709	-285
3	6/12/06	13:28	703	3	234.3	0.0373	4986	-8
4	6/12/06	13:32	717	3	239.0	0.0373	5085	91
5	6/12/06	13:36	687	3	229.0	0.0373	4873	-121
6	6/12/06	13:40	645	3	215.0	0.0373	4575	-419
7	6/12/06	13:44	653	3	217.7	0.0373	4631	-363
8	6/12/06	13:48	755	3	251.7	0.0373	5355	361
9	6/12/06	13:52	706	3	235.3	0.0373	5007	13
10	6/12/06	13:56	691	3	230.3	0.0373	4901	-93
11	6/12/06	14:00	745	3	248.3	0.0373	5284	290
12	6/12/06	14:04	725	3	241.7	0.0373	5142	148
13	6/12/06	14:08	521	3	173.7	0.0373	3695	-1299
14	6/12/06	14:12	534	3	178.0	0.0373	3787	-1207
		mean	**679**	**mean**	**226**	**mean**	**4815**	**-179**
		std dev	**73.1**	**std dev**	**24.4**	**std dev**	**518.6**	**518.6**
		median	**697**	**median**	**232**	**median**	**4943**	**-50**

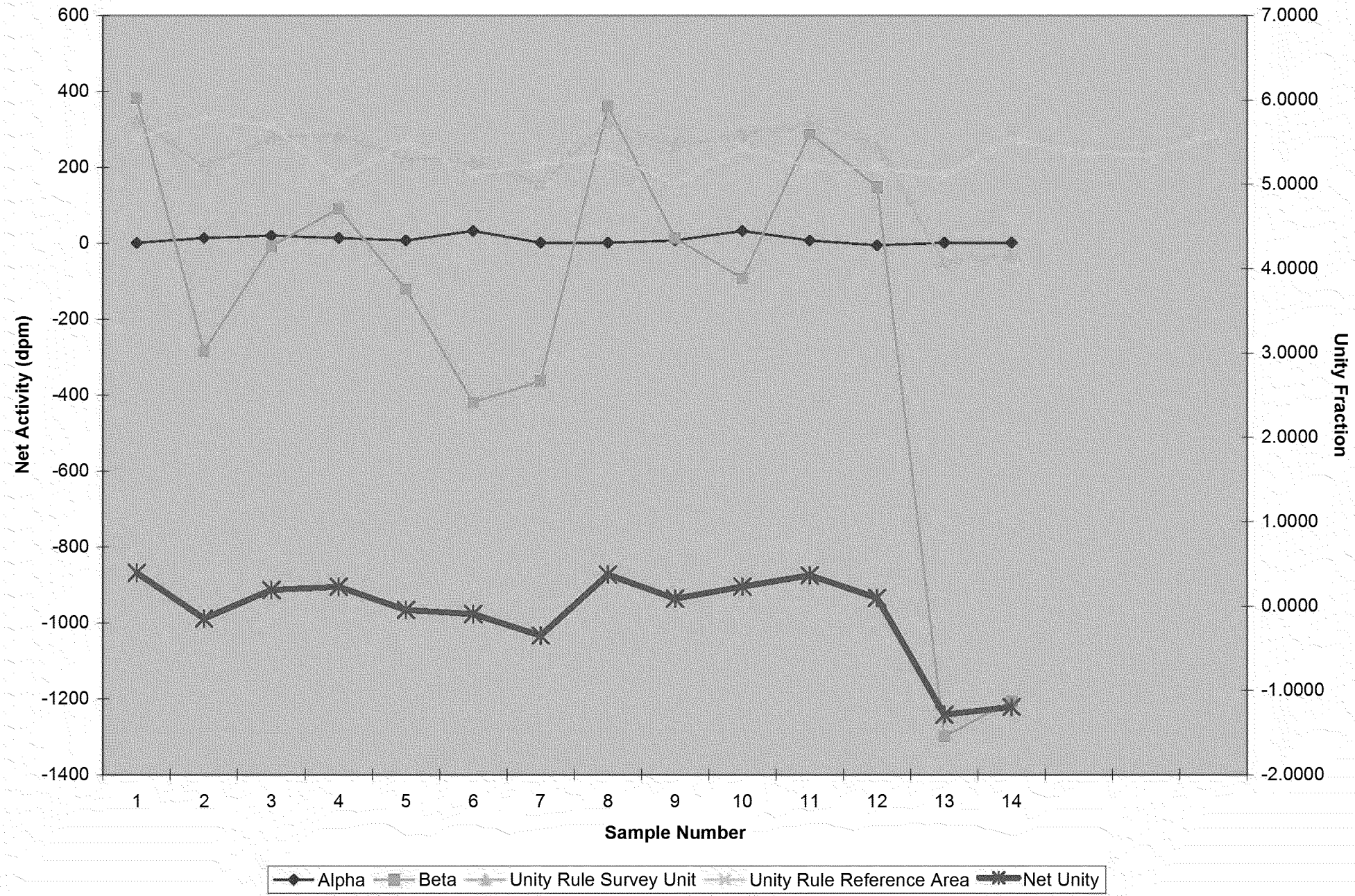
Greater than 1,000dpm^{net}/100cm^2 are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 17

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	44	5106.6	R	6.5444	28	28
2	50	5283.9	R	6.7842	31	31
3	44	5262.6	R	6.7004	30	30
4	19	4865.5	R	6.0531	16	16
5	38	5120.8	R	6.4960	26	26
6	19	4943.5	R	6.1311	18	18
7	31	4915.1	R	6.2278	21	21
8	56	4787.4	R	6.3503	23	23
9	13	4886.7	R	6.0118	15	15
10	38	5071.1	R	6.4464	25	25
11	31	4893.8	R	6.2065	20	20
12	31	4872.5	R	6.1853	19	19
13	25	4858.4	R	6.1085	17	17
14	50	5028.6	R	6.5289	27	27
15	44	4943.5	R	6.3813	24	24
16	44	4900.9	R	6.3387	22	22
17	44	5156.2	R	6.5940	29	29
1	38	5376.1	S	5.7514	14	0
2	50	4709.4	S	5.2098	4	0
3	56	4986.0	S	5.5489	9	0
4	50	5085.3	S	5.5857	10	0
5	44	4872.5	S	5.3103	6	0
6	69	4574.7	S	5.2626	5	0
7	38	4631.4	S	5.0067	3	0
8	38	5354.8	S	5.7301	13	0
9	44	5007.3	S	5.4451	7	0
10	69	4900.9	S	5.5889	11	0
11	44	5283.9	S	5.7217	12	0
12	31	5142.1	S	5.4548	8	0
13	38	3695.2	S	4.0704	1	0
14	38	3787.4	S	4.1626	2	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 17 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	1035	*	*	1	35.49	17	20	13	20	WRS
Ludlum 2360	164693	Ludlum 43-37	PR190328	0.177	0.177	0.25	0.25	0.0444	0.0444	Ra-226, Sr-90, Cs-137*	32	377	103	1432	1						

Building 813 Survey Unit 19
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 19 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	19.11		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	164693
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR190328

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	8.7	1693.6	counts		
Enter Sigma:	2.1	35.8	cpm		
Calculated Sigma:	3.0	41.2	cpm		
Detector Efficiency (ε_i):	18%	18%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.44%	4.44%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**32**	**377**		50% of $DCGL_{(W)}$:	103%	143%
$MDCR_{Surveyor}$:	**27**	**370**	cpm			
Scan MDC:	**103**	**1432**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	4%	4%
Minimum Area Factor Needed:	**1.03**	**1.43**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	1326.8	counts	9.8	987.0	Counts
Enter Sigma:	3.2	38.5	counts	3.4	118.8	Counts
Calculated Sigma:	3.0	36.4	counts	3.1	31.4	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**1035**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	93%	104%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	0.9519	cpm	LBGR	0.0481
Delta/Sigma:	1.29			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.801892			
N:	**20**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**20**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 164693 / PR190328

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	10	1620	5.00	810.0	0.0444	0.0444	19	3135
2	05/15/06	14:02	2	10	1692	5.00	846.0	0.0444	0.0444	19	3274
3	05/15/06	14:05	2	10	1751	5.00	875.5	0.0444	0.0444	19	3388
4	05/15/06	14:08	2	11	1664	5.50	832.0	0.0444	0.0444	21	3220
5	05/15/06	14:11	2	6	1713	3.00	856.5	0.0444	0.0444	12	3315
6	05/15/06	14:14	2	7	1686	3.50	843.0	0.0444	0.0444	14	3262
7	05/15/06	14:16	2	8	1671	4.00	835.5	0.0444	0.0444	15	3233
8	05/15/06	14:19	2	6	1640	3.00	820.0	0.0444	0.0444	12	3173
9	05/15/06	14:21	2	12	1683	6.00	841.5	0.0444	0.0444	23	3256
10	05/15/06	14:24	2	10	1695	5.00	847.5	0.0444	0.0444	19	3280
11	05/15/06	14:27	2	5	1747	2.50	873.5	0.0444	0.0444	10	3380
12	05/15/06	14:30	2	10	1700	5.00	850.0	0.0444	0.0444	19	3289
13	05/15/06	14:32	2	9	1726	4.50	863.0	0.0444	0.0444	17	3340
14	05/15/06	14:35	2	9	1738	4.50	869.0	0.0444	0.0444	17	3363
15	05/15/06	14:38	2	11	1697	5.50	848.5	0.0444	0.0444	21	3284
16	05/15/06	14:41	2	8	1663	4.00	831.5	0.0444	0.0444	15	3218
17	05/15/06	14:44	2	6	1706	3.00	853.0	0.0444	0.0444	12	3301
			mean	**8.71**	**1693.65**	**4.35**	**846.82**			**16.85**	**3277.08**
			std dev	**2.08**	**35.83**	**1.04**	**17.91**			**4.03**	**69.32**
			median	**9.00**	**1695.00**	**4.50**	**847.50**			**17.41**	**3279.70**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	10:00	3	11	1305	3.67	435.0	0.0485	0.0441	60	7829
2	05/12/06	10:04	3	16	1295	5.33	431.7	0.0485	0.0441	87	7769
3	05/12/06	10:08	3	5	1325	1.67	441.7	0.0485	0.0441	27	7949
4	05/12/06	10:12	3	9	1258	3.00	419.3	0.0485	0.0441	49	7547
5	05/12/06	10:16	3	7	1310	2.33	436.7	0.0485	0.0441	38	7859
6	05/12/06	10:20	3	14	1300	4.67	433.3	0.0485	0.0441	76	7799
7	05/12/06	10:24	3	11	1368	3.67	456.0	0.0485	0.0441	60	8206
8	05/12/06	10:28	3	6	1300	2.00	433.3	0.0485	0.0441	33	7799
9	05/12/06	10:32	3	5	1331	1.67	443.7	0.0485	0.0441	27	7984
10	05/12/06	10:36	3	10	1311	3.33	437.0	0.0485	0.0441	55	7865
11	05/12/06	10:40	3	7	1319	2.33	439.7	0.0485	0.0441	38	7913
12	05/12/06	10:44	3	10	1392	3.33	464.0	0.0485	0.0441	55	8350
13	05/12/06	10:48	3	12	1408	4.00	469.3	0.0485	0.0441	65	8446
14	05/12/06	10:52	3	11	1311	3.67	437.0	0.0485	0.0441	60	7865
15	05/12/06	10:56	3	5	1304	1.67	434.7	0.0485	0.0441	27	7823
16	05/12/06	11:00	3	9	1357	3.00	452.3	0.0485	0.0441	49	8140
17	05/12/06	11:04	3	7	1361	2.33	453.7	0.0485	0.0441	38	8164
			mean	**9.12**	**1326.76**	**3.04**	**442.25**			**49.73**	**7959.09**
			std dev	**3.22**	**38.46**	**1.07**	**12.82**			**17.56**	**230.70**
			median	**9.00**	**1311.00**	**3.00**	**437.00**			**49.09**	**7864.52**

Class 1 Alpha Measurements - Building 813 Survey Unit 19

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	10:00	10	3	3.3	0.0485	55	5
2	6/2/06	10:04	10	3	3.3	0.0485	55	5
3	6/2/06	10:08	10	3	3.3	0.0485	55	5
4	6/2/06	10:12	7	3	2.3	0.0485	38	-12
5	6/2/06	10:16	11	3	3.7	0.0485	60	10
6	6/2/06	10:20	4	3	1.3	0.0485	22	-28
7	6/2/06	10:24	5	3	1.7	0.0485	27	-22
8	6/2/06	10:28	9	3	3.0	0.0485	49	-1
9	6/2/06	10:32	15	3	5.0	0.0485	82	32
10	6/2/06	10:36	11	3	3.7	0.0485	60	10
11	6/2/06	10:40	16	3	5.3	0.0485	87	38
12	6/2/06	10:44	9	3	3.0	0.0485	49	-1
13	6/2/06	10:48	11	3	3.7	0.0485	60	10
		mean	**10**	**mean**	**3**	**mean**	**54**	**4**
		std dev	**3.4**	**std dev**	**1.1**	**std dev**	**18.3**	**18.3**
		median	**10**	**median**	**3**	**median**	**55**	**5**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 19

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	6/2/06	10:00	931	3	310.3	0.0441	5585	-2374
2	6/2/06	10:04	1006	3	335.3	0.0441	6035	-1924
3	6/2/06	10:08	1057	3	352.3	0.0441	6341	-1618
4	6/2/06	10:12	1193	3	397.7	0.0441	7157	-802
5	6/2/06	10:16	1121	3	373.7	0.0441	6725	-1234
6	6/2/06	10:20	897	3	299.0	0.0441	5381	-2578
7	6/2/06	10:24	839	3	279.7	0.0441	5033	-2926
8	6/2/06	10:28	816	3	272.0	0.0441	4895	-3064
9	6/2/06	10:32	1022	3	340.7	0.0441	6131	-1828
10	6/2/06	10:36	960	3	320.0	0.0441	5759	-2200
11	6/2/06	10:40	1158	3	386.0	0.0441	6947	-1012
12	6/2/06	10:44	917	3	305.7	0.0441	5501	-2458
13	6/2/06	10:48	914	3	304.7	0.0441	5483	-2476
		mean	**987**	**mean**	**329**	**mean**	**5921**	**-2038**
		std dev	**118.8**	**std dev**	**39.6**	**std dev**	**712.9**	**712.9**
		median	**960**	**median**	**320**	**median**	**5759**	**-2200**

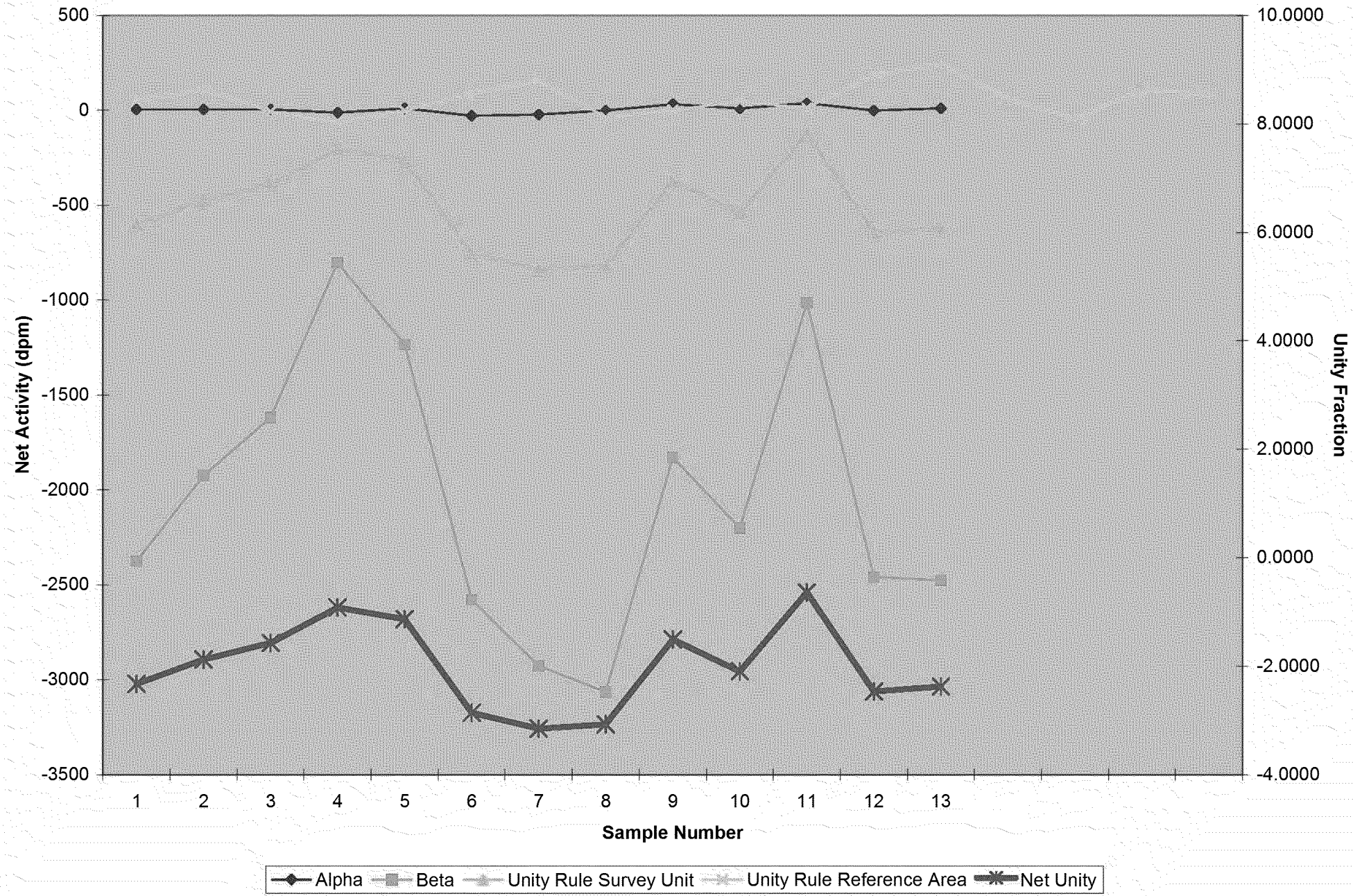
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 19

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	7828.5	R	9.4285	22	22
2	87	7768.5	R	9.6413	27	27
3	27	7948.5	R	9.2212	17	17
4	49	7546.6	R	9.0375	14	14
5	38	7858.5	R	9.2403	18	18
6	76	7798.5	R	9.5622	25	25
7	60	8206.5	R	9.8065	28	28
8	33	7798.5	R	9.1258	16	16
9	27	7984.5	R	9.2572	19	19
10	55	7864.5	R	9.4100	21	21
11	38	7912.5	R	9.2943	20	20
12	55	8350.4	R	9.8959	29	29
13	65	8446.4	R	10.1010	30	30
14	60	7864.5	R	9.4645	23	23
15	27	7822.5	R	9.0953	15	15
16	49	8140.5	R	9.6314	26	26
17	38	8164.5	R	9.5463	24	24
1	55	5585.0	S	6.1304	6	0
2	55	6034.9	S	6.5803	8	0
3	55	6340.8	S	6.8863	9	0
4	38	7156.7	S	7.5385	12	0
5	60	6724.7	S	7.3247	11	0
6	22	5381.0	S	5.5992	3	0
7	27	5033.1	S	5.3058	1	0
8	49	4895.1	S	5.3860	2	0
9	82	6130.8	S	6.9490	10	0
10	60	5758.9	S	6.3589	7	0
11	87	6946.7	S	7.8194	13	0
12	49	5501.0	S	5.9919	4	0
13	60	5483.0	S	6.0830	5	0
				SUM =	**465**	
					W_r =	**374**
					Critical Value =	**303**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 19 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	93	798	*	*	1	35.49	17	8	15	8	WRS
Ludlum 2360	225246	Ludlum 43-37	PR146720	0.192	0.195	0.25	0.25	0.0479	0.0488	Ra-226, Sr-90, Cs-137*	27	324	85	1230	1						

Building 813 Survey Unit 20
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 20 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	15.27		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.38	35492.23	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	21-Apr-07	Serial No.:	225246
Detector:	Ludlum 43-37		Cal. Date:	21-Apr-07	Serial No.:	PR146720

	Background				
	Alpha	Beta			
Counting Time:	2		min		
Bkgd. Measurement:	6.9	1511.3	counts		
Enter Sigma:	2.7	109.3	cpm		
Calculated Sigma:	2.6	38.9	cpm		
Detector Efficiency (ε_i):	19%	20%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.79%	4.88%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	582		cm^2		
Scan Interval:	16		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**27**	**324**		85%	123%
$MDCR_{Surveyor}$:	**24**	**349**	cpm		
Scan MDC:	**85**	**1230**	dpm 100 cm^{-2}	3%	3%
Minimum Area Factor Needed:	**0.85**	**1.23**			

50% of $DCGL_{(W)}$:

50% of $DCGL_{(EMC)}$:

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	9.1	779.2	counts	6.6	670.1	Counts
Enter Sigma:	3.2	28.0	counts	2.5	35.2	Counts
Calculated Sigma:	3.0	27.9	counts	2.6	25.9	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**93**	**798**	dpm 100 cm^{-2}	93%	80%

50% of $DCGL_{(W)}$:

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	3.99			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.993329			
N:	**8**	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 225246 / PR146720

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/15/06	14:00	2	3	1167	1.50	583.5	0.0479	0.0488	5	2054
2	05/15/06	14:02	2	5	1362	2.50	681.0	0.0479	0.0488	9	2398
3	05/15/06	14:05	2	6	1489	3.00	744.5	0.0479	0.0488	11	2621
4	05/15/06	14:08	2	10	1505	5.00	752.5	0.0479	0.0488	18	2649
5	05/15/06	14:11	2	11	1467	5.50	733.5	0.0479	0.0488	20	2583
6	05/15/06	14:14	2	8	1493	4.00	746.5	0.0479	0.0488	14	2628
7	05/15/06	14:16	2	7	1544	3.50	772.0	0.0479	0.0488	13	2718
8	05/15/06	14:19	2	7	1528	3.50	764.0	0.0479	0.0488	13	2690
9	05/15/06	14:21	2	8	1607	4.00	803.5	0.0479	0.0488	14	2829
10	05/15/06	14:24	2	13	1502	6.50	751.0	0.0479	0.0488	23	2644
11	05/15/06	14:27	2	5	1625	2.50	812.5	0.0479	0.0488	9	2861
12	05/15/06	14:30	2	4	1624	2.00	812.0	0.0479	0.0488	7	2859
13	05/15/06	14:32	2	4	1550	2.00	775.0	0.0479	0.0488	7	2729
14	05/15/06	14:35	2	9	1542	4.50	771.0	0.0479	0.0488	16	2715
15	05/15/06	14:38	2	5	1575	2.50	787.5	0.0479	0.0488	9	2773
16	05/15/06	14:41	2	7	1577	3.50	788.5	0.0479	0.0488	13	2776
17	05/15/06	14:44	2	5	1535	2.50	767.5	0.0479	0.0488	9	2702
			mean	**6.88**	**1511.29**	**3.44**	**755.65**			**12.34**	**2660.58**
			std dev	**2.71**	**109.33**	**1.36**	**54.67**			**4.87**	**192.48**
			median	**7.00**	**1535.00**	**3.50**	**767.50**			**12.55**	**2702.31**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	8:30	3	11	779	3.67	259.7	0.0485	0.0441	60	4673
2	05/12/06	8:35	3	16	809	5.33	269.7	0.0485	0.0441	87	4853
3	05/12/06	8:40	3	5	825	1.67	275.0	0.0485	0.0441	27	4949
4	05/12/06	8:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
5	05/12/06	8:50	3	7	744	2.33	248.0	0.0485	0.0441	38	4463
6	05/12/06	8:55	3	14	739	4.67	246.3	0.0485	0.0441	76	4433
7	05/12/06	9:00	3	11	814	3.67	271.3	0.0485	0.0441	60	4883
8	05/12/06	9:05	3	6	793	2.00	264.3	0.0485	0.0441	33	4757
9	05/12/06	9:10	3	5	772	1.67	257.3	0.0485	0.0441	27	4631
10	05/12/06	9:15	3	10	814	3.33	271.3	0.0485	0.0441	55	4883
11	05/12/06	9:20	3	7	773	2.33	257.7	0.0485	0.0441	38	4637
12	05/12/06	9:25	3	10	791	3.33	263.7	0.0485	0.0441	55	4745
13	05/12/06	9:30	3	12	747	4.00	249.0	0.0485	0.0441	65	4481
14	05/12/06	9:35	3	11	782	3.67	260.7	0.0485	0.0441	60	4691
15	05/12/06	9:40	3	5	730	1.67	243.3	0.0485	0.0441	27	4379
16	05/12/06	9:45	3	9	770	3.00	256.7	0.0485	0.0441	49	4619
17	05/12/06	9:50	3	7	795	2.33	265.0	0.0485	0.0441	38	4769
			mean	**9.12**	**779.24**	**3.04**	**259.75**			**49.73**	**4674.53**
			std dev	**3.22**	**28.03**	**1.07**	**9.34**			**17.56**	**168.12**
			median	**9.00**	**779.00**	**3.00**	**259.67**			**49.09**	**4673.12**

Class 1 Alpha Measurements - Building 813 Survey Unit 20

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	12:45	4	3	1.3	0.0485	22	-28
2	5/31/06	12:49	4	3	1.3	0.0485	22	-28
3	5/31/06	12:53	7	3	2.3	0.0485	38	-12
4	5/31/06	12:57	4	3	1.3	0.0485	22	-28
5	5/31/06	13:01	10	3	3.3	0.0485	55	5
6	5/31/06	13:05	9	3	3.0	0.0485	49	-1
7	5/31/06	13:09	6	3	2.0	0.0485	33	-17
8	5/31/06	13:13	8	3	2.7	0.0485	44	-6
9	5/31/06	13:17	9	3	3.0	0.0485	49	-1
10	5/31/06	13:21	3	3	1.0	0.0485	16	-33
11	5/31/06	13:25	10	3	3.3	0.0485	55	5
12	5/31/06	13:29	9	3	3.0	0.0485	49	-1
13	5/31/06	13:33	4	3	1.3	0.0485	22	-28
14	5/31/06	13:37	7	3	2.3	0.0485	38	-12
15	5/31/06	13:41	5	3	1.7	0.0485	27	-22
		mean	**7**	**mean**	**2**	**mean**	**36**	**-14**
		std dev	**2.5**	**std dev**	**0.8**	**std dev**	**13.5**	**13.5**
		median	**7**	**median**	**2**	**median**	**38**	**-12**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 20

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	5/31/06	12:45	668	3	222.7	0.0441	4007	-667
2	5/31/06	12:49	626	3	208.7	0.0441	3755	-919
3	5/31/06	12:53	636	3	212.0	0.0441	3815	-859
4	5/31/06	12:57	718	3	239.3	0.0441	4307	-367
5	5/31/06	13:01	698	3	232.7	0.0441	4187	-487
6	5/31/06	13:05	633	3	211.0	0.0441	3797	-877
7	5/31/06	13:09	646	3	215.3	0.0441	3875	-799
8	5/31/06	13:13	651	3	217.0	0.0441	3905	-769
9	5/31/06	13:17	651	3	217.0	0.0441	3905	-769
10	5/31/06	13:21	661	3	220.3	0.0441	3965	-709
11	5/31/06	13:25	736	3	245.3	0.0441	4415	-259
12	5/31/06	13:29	676	3	225.3	0.0441	4055	-619
13	5/31/06	13:33	705	3	235.0	0.0441	4229	-445
14	5/31/06	13:37	636	3	212.0	0.0441	3815	-859
15	5/31/06	13:41	710	3	236.7	0.0441	4259	-415
		mean	**670**	**mean**	**223**	**mean**	**4020**	**-655**
		std dev	**35.2**	**std dev**	**11.7**	**std dev**	**210.9**	**210.9**
		median	**661**	**median**	**220**	**median**	**3965**	**-709**

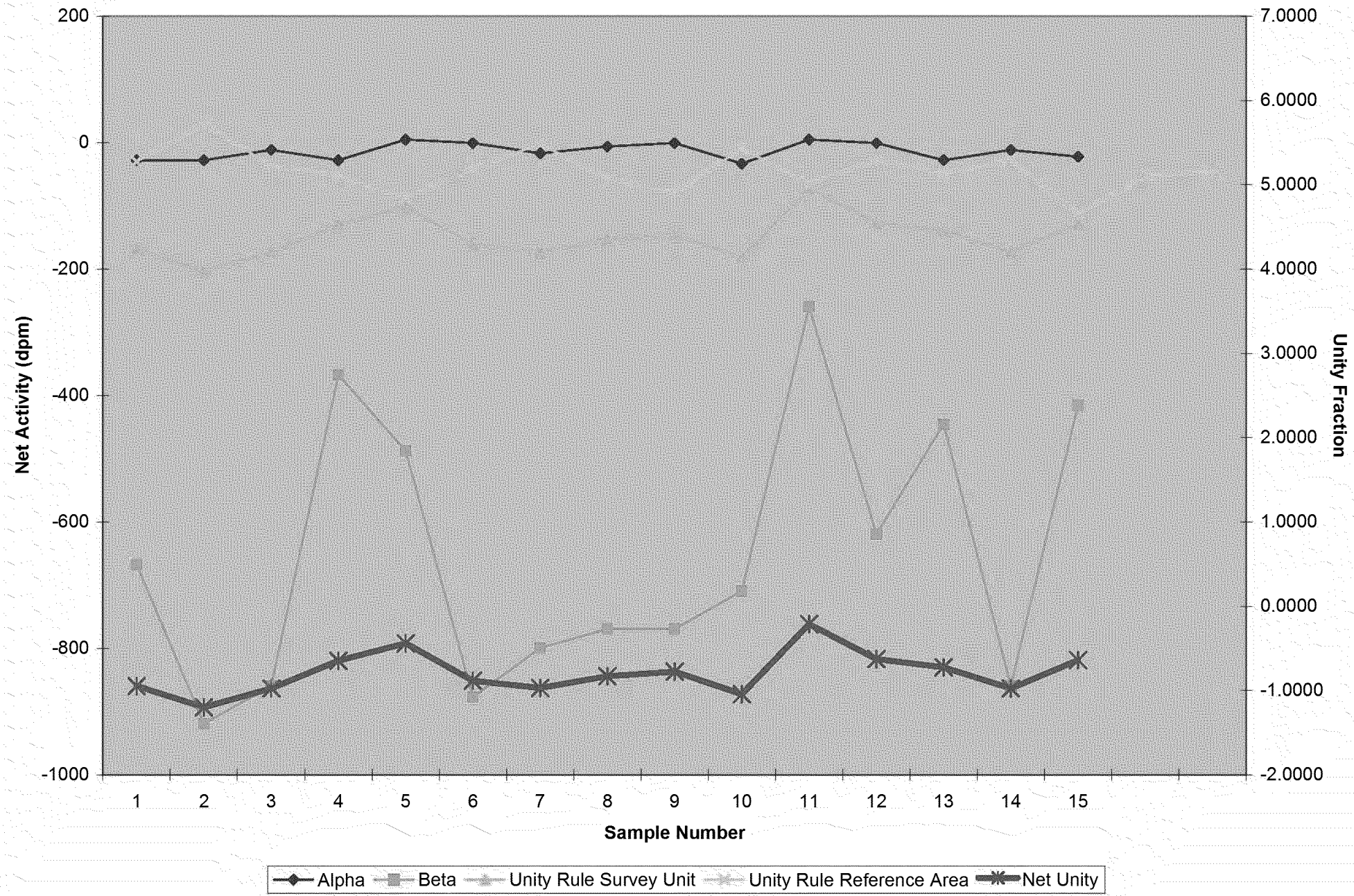
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 20

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	60	4673.1	R	6.2731	27	27
2	87	4853.1	R	6.7258	32	32
3	27	4949.1	R	6.2218	26	26
4	49	4619.1	R	6.1100	21.5	22
5	38	4463.2	R	5.8450	17	17
6	76	4433.2	R	6.1968	25	25
7	60	4883.1	R	6.4831	31	31
8	33	4757.1	R	6.0844	20	20
9	27	4631.1	R	5.9039	18	18
10	55	4883.1	R	6.4285	30	30
11	38	4637.1	R	6.0190	19	19
12	55	4745.1	R	6.2906	28	28
13	65	4481.2	R	6.1357	23	23
14	60	4691.1	R	6.2911	29	29
15	27	4379.2	R	5.6519	16	16
16	49	4619.1	R	6.1100	21.5	22
17	38	4769.1	R	6.1509	24	24
1	22	4007.2	S	4.2254	6	0
2	22	3755.3	S	3.9735	1	0
3	38	3815.3	S	4.1971	3.5	0
4	22	4307.2	S	4.5254	11	0
5	55	4187.2	S	4.7327	14	0
6	49	3797.3	S	4.2882	7	0
7	33	3875.3	S	4.2026	5	0
8	44	3905.3	S	4.3416	8	0
9	49	3905.3	S	4.3962	9	0
10	16	3965.3	S	4.1289	2	0
11	55	4415.2	S	4.9606	15	0
12	49	4055.2	S	4.5462	13	0
13	22	4229.2	S	4.4474	10	0
14	38	3815.3	S	4.1971	3.5	0
15	27	4259.2	S	4.5319	12	0
				SUM =	**528**	
					W_r =	**408**
					Critical Value =	**324**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 20 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	75	671	*	*	1	35.49	17	7	14	7	WRS
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	75	671	416	4627	1						

Building 813 Survey Unit 21
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 21 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	1.63		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.00	35490.00	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background				
	Alpha	Beta			
Counting Time:	3		min		
Bkgd. Measurement:	5.4	546.5	counts		
Enter Sigma:	2.4	18.4	cpm		
Calculated Sigma:	2.3	23.4	cpm		
Detector Efficiency (ε_i):	19%	18%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.85%	4.41%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	126		cm^2		
Scan Interval:	10.7		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**75**	**671**		50% of $DCGL_{(W)}$:	416%	463%
$MDCR_{Surveyor}$:	**25**	**257**	cpm			
Scan MDC:	**416**	**4627**	dpm 100 cm^{-2}	50% of $DCGL_{(EMC)}$:	16%	13%
Minimum Area Factor Needed:	**4.16**	**4.63**				

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.4	546.5	counts	4.0	453.0	Counts
Enter Sigma:	2.4	18.4	counts	1.3	29.3	Counts
Calculated Sigma:	2.3	23.4	counts	2.0	21.3	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

					Actual % α DCGL	Actual % β DCGL
Static MDC:	**75**	**671**	dpm 100 cm^{-2}	50% of $DCGL_{(W)}$:	75%	67%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	1.0000	cpm	LBGR	0.0000
Delta/Sigma:	5.27			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	1			
N:	7	Number of Measurements Required from the Reference Area		
$N+N_{EA}$:	7	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	12:30	3	10	541	3.33	180.3	0.0485	0.0441	55	3245
2	05/12/06	12:34	3	7	555	2.33	185.0	0.0485	0.0441	38	3329
3	05/12/06	12:38	3	3	557	1.00	185.7	0.0485	0.0441	16	3341
4	05/12/06	12:42	3	4	560	1.33	186.7	0.0485	0.0441	22	3359
5	05/12/06	12:46	3	10	502	3.33	167.3	0.0485	0.0441	55	3011
6	05/12/06	12:50	3	8	555	2.67	185.0	0.0485	0.0441	44	3329
7	05/12/06	12:54	3	2	544	0.67	181.3	0.0485	0.0441	11	3263
8	05/12/06	12:58	3	6	582	2.00	194.0	0.0485	0.0441	33	3491
9	05/12/06	13:02	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
10	05/12/06	13:06	3	5	555	1.67	185.0	0.0485	0.0441	27	3329
11	05/12/06	13:10	3	5	559	1.67	186.3	0.0485	0.0441	27	3353
12	05/12/06	13:14	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
13	05/12/06	13:18	3	6	527	2.00	175.7	0.0485	0.0441	33	3161
14	05/12/06	13:22	3	3	564	1.00	188.0	0.0485	0.0441	16	3383
15	05/12/06	13:26	3	6	522	2.00	174.0	0.0485	0.0441	33	3131
16	05/12/06	13:30	3	6	534	2.00	178.0	0.0485	0.0441	33	3203
17	05/12/06	13:34	3	2	542	0.67	180.7	0.0485	0.0441	11	3251
			mean	**5.35**	**546.53**	**1.78**	**182.18**			**29.20**	**3278.56**
			std dev	**2.42**	**18.38**	**0.81**	**6.13**			**13.21**	**110.27**
			median	**5.00**	**546.00**	**1.67**	**182.00**			**27.27**	**3275.38**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	12:30	3	10	541	3.33	180.3	0.0485	0.0441	55	3245
2	05/12/06	12:34	3	7	555	2.33	185.0	0.0485	0.0441	38	3329
3	05/12/06	12:38	3	3	557	1.00	185.7	0.0485	0.0441	16	3341
4	05/12/06	12:42	3	4	560	1.33	186.7	0.0485	0.0441	22	3359
5	05/12/06	12:46	3	10	502	3.33	167.3	0.0485	0.0441	55	3011
6	05/12/06	12:50	3	8	555	2.67	185.0	0.0485	0.0441	44	3329
7	05/12/06	12:54	3	2	544	0.67	181.3	0.0485	0.0441	11	3263
8	05/12/06	12:58	3	6	582	2.00	194.0	0.0485	0.0441	33	3491
9	05/12/06	13:02	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
10	05/12/06	13:06	3	5	555	1.67	185.0	0.0485	0.0441	27	3329
11	05/12/06	13:10	3	5	559	1.67	186.3	0.0485	0.0441	27	3353
12	05/12/06	13:14	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
13	05/12/06	13:18	3	6	527	2.00	175.7	0.0485	0.0441	33	3161
14	05/12/06	13:22	3	3	564	1.00	188.0	0.0485	0.0441	16	3383
15	05/12/06	13:26	3	6	522	2.00	174.0	0.0485	0.0441	33	3131
16	05/12/06	13:30	3	6	534	2.00	178.0	0.0485	0.0441	33	3203
17	05/12/06	13:34	3	2	542	0.67	180.7	0.0485	0.0441	11	3251
			mean	**5.35**	**546.53**	**1.78**	**182.18**			**29.20**	**3278.56**
			std dev	**2.42**	**18.38**	**0.81**	**6.13**			**13.21**	**110.27**
			median	**5.00**	**546.00**	**1.67**	**182.00**			**27.27**	**3275.38**

Class 1 Alpha Measurements - Building 813 Survey Unit 21

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	7/19/06	14:40	4	3	1.3	0.0485	22	-7
2	7/19/06	14:44	5	3	1.7	0.0485	27	-2
3	7/19/06	14:48	5	3	1.7	0.0485	27	-2
4	7/19/06	14:52	5	3	1.7	0.0485	27	-2
5	7/19/06	14:56	6	3	2.0	0.0485	33	4
6	7/19/06	15:00	3	3	1.0	0.0485	16	-13
7	7/19/06	15:04	5	3	1.7	0.0485	27	-2
8	7/19/06	15:08	3	3	1.0	0.0485	16	-13
9	7/19/06	15:12	2	3	0.7	0.0485	11	-18
10	7/19/06	15:16	5	3	1.7	0.0485	27	-2
11	7/19/06	15:20	3	3	1.0	0.0485	16	-13
12	7/19/06	15:24	3	3	1.0	0.0485	16	-13
13	7/19/06	15:28	5	3	1.7	0.0485	27	-2
14	7/19/06	15:32	2	3	0.7	0.0485	11	-18
		mean	**4**	**mean**	**1**	**mean**	**22**	**-7**
		std dev	**1.3**	**std dev**	**0.4**	**std dev**	**7.1**	**7.1**
		median	**5**	**median**	**2**	**median**	**25**	**-5**

Greater than 100dpm^{net}/100cm^2 are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 21

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	7/19/06	14:40	485	3	161.7	0.0441	2909	-369
2	7/19/06	14:44	482	3	160.7	0.0441	2891	-387
3	7/19/06	14:48	492	3	164.0	0.0441	2951	-327
4	7/19/06	14:52	488	3	162.7	0.0441	2927	-351
5	7/19/06	14:56	498	3	166.0	0.0441	2987	-291
6	7/19/06	15:00	432	3	144.0	0.0441	2592	-687
7	7/19/06	15:04	433	3	144.3	0.0441	2598	-681
8	7/19/06	15:08	427	3	142.3	0.0441	2562	-717
9	7/19/06	15:12	425	3	141.7	0.0441	2550	-729
10	7/19/06	15:16	458	3	152.7	0.0441	2747	-531
11	7/19/06	15:20	433	3	144.3	0.0441	2598	-681
12	7/19/06	15:24	427	3	142.3	0.0441	2562	-717
13	7/19/06	15:28	440	3	146.7	0.0441	2640	-639
14	7/19/06	15:32	422	3	140.7	0.0441	2532	-747
		mean	**453**	**mean**	**151**	**mean**	**2717**	**-561**
		std dev	**29.3**	**std dev**	**9.8**	**std dev**	**175.8**	**175.8**
		median	**437**	**median**	**146**	**median**	**2619**	**-660**

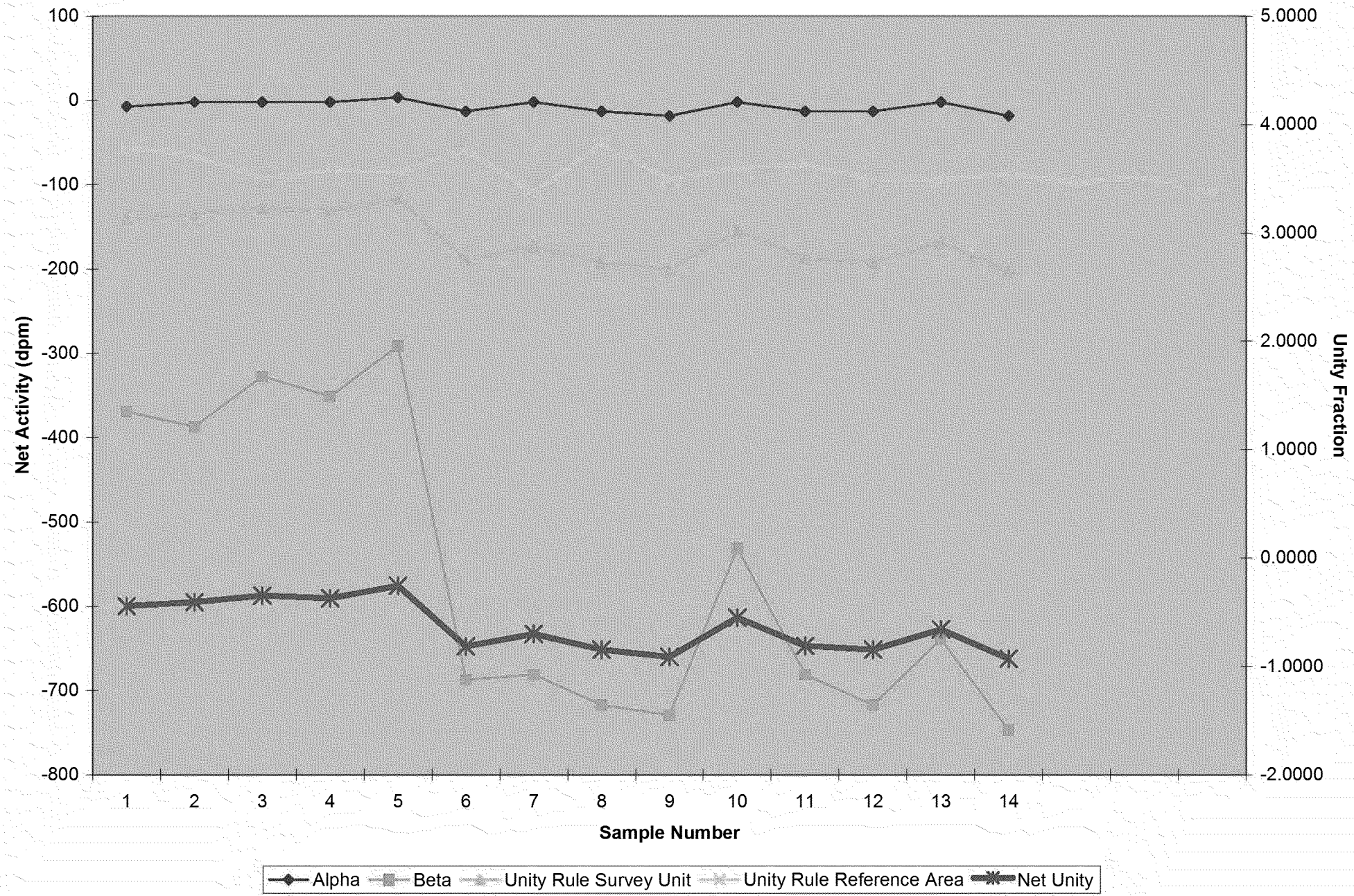
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 21

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	55	3245.4	R	4.7909	30	30
2	38	3329.4	R	4.7112	28	28
3	16	3341.4	R	4.5050	21	21
4	22	3359.4	R	4.5776	25	25
5	55	3011.4	R	4.5569	24	24
6	44	3329.4	R	4.7657	29	29
7	11	3263.4	R	4.3725	16	16
8	33	3491.3	R	4.8186	31	31
9	22	3275.4	R	4.4936	19.5	20
10	27	3329.4	R	4.6021	26	26
11	27	3353.4	R	4.6261	27	27
12	22	3275.4	R	4.4936	19.5	20
13	33	3161.4	R	4.4887	18	18
14	16	3383.4	R	4.5470	23	23
15	33	3131.4	R	4.4587	17	17
16	33	3203.4	R	4.5307	22	22
17	11	3251.4	R	4.3605	15	15
1	22	2909.5	S	3.1276	10	0
2	27	2891.5	S	3.1642	11	0
3	27	2951.4	S	3.2242	13	0
4	27	2927.4	S	3.2002	12	0
5	33	2987.4	S	3.3147	14	0
6	16	2591.5	S	2.7552	5	0
7	27	2597.5	S	2.8702	7	0
8	16	2561.5	S	2.7252	3.5	0
9	11	2549.5	S	2.6586	2	0
10	27	2747.5	S	3.0202	9	0
11	16	2597.5	S	2.7612	6	0
12	16	2561.5	S	2.7252	3.5	0
13	27	2639.5	S	2.9122	8	0
14	11	2531.5	S	2.6406	1	0
				SUM =	**496**	
					W_r =	**391**
					Critical Value =	**313**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 21 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



Summary Data

Instrument Model	Model Serial No.	Instrument Detector	Probe Serial No.	α Instrument Efficiency (ε_i)	β Instrument Efficiency (ε_i)	α Surface Efficiency (ε_s)	β Surface Efficiency (ε_s)	α Total Efficiency (ε_t)	β Total Efficiency (ε_t)	Radionuclides of Concern	α Static MDC	β Static MDC	α Scan MDC	β Scan MDC	Gross DCGL	Maximum Area Factor	Data Points Taken Reference Area	Data Points Required Reference Area	Data Points Taken Survey Unit	Data Points Required Survey Unit	Statistical Test
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	75	671	*	*	1	35.49	17	8	10	8	WRS
Ludlum 2360	227427	Ludlum 43-68	PR160700	0.194	0.176	0.25	0.25	0.0485	0.0441	Ra-226, Sr-90, Cs-137*	75	671	416	4627	1						

Building 813 Survey Unit 22
Unity Rule

*Lowest DCGL was used for Beta analysis to demonstrate compliance

Building 813 Class 1 Survey Unit 22 Design

Plan

Classification:	Class 1		
Survey Unit Size (sq meters):	4.12		
DCGL Criterion:			
Dose:	25	mrem/y TEDE	
Model:	RESRAD-Build	Building Occupancy - Default Parameters	
Radionuclides of Concern:	Alpha	Beta	
	Ra-226	**Sr-90, Cs-137***	
Fraction:	100%	100%	
$DCGL_{(w)}$:	100	1000	dpm 100 cm^{-2}
Area Factor:	26.15	35.49	
$DCGL_{(EMC)}$:	2615.00	35490.00	dpm 100 cm^{-2}

Statistics

Test: WRS

Hypothesis Testing

H_o: The survey unit mean is equal to or exceeds the $DCGL_{(w)}$

H_a: The survey unit mean is less than the $DCGL_{(w)}$ - survey unit may be released

Scanning Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background				
	Alpha	Beta			
Counting Time:	3		min		
Bkgd. Measurement:	5.4	546.5	counts		
Enter Sigma:	2.4	18.4	cpm		
Calculated Sigma:	2.3	23.4	cpm		
Detector Efficiency (ε_i):	19%	18%			
Surface Efficiency (ε_s):	25%	25%			
Total Efficiency (ε_T):	4.85%	4.41%			
Surveyor Factor (p):	50.0%				
Probe Area (Active):	126		cm^2		
Scan Interval:	10.7		s	False Positive	True Positive
d':	3.28		<----------	0.05	0.95

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**75**	**671**	50% of $DCGL_{(W)}$:	416%	463%
$MDCR_{Surveyor}$:	**25**	**257**	cpm		
Scan MDC:	**416**	**4627**	dpm 100 cm^{-2} 50% of $DCGL_{(EMC)}$:	16%	13%
Minimum Area Factor Needed:	**4.16**	**4.63**			

Static Instrumentation

Model:	Ludlum 2360		Cal. Date:	2-May-07	Serial No.:	227427
Detector:	Ludlum 43-68		Cal. Date:	2-May-07	Serial No.:	PR160700

	Background			Sample		
	Alpha	Beta		Alpha	Beta	
Counting Time:	3		min	3		counts
Bkgd. Measurement:	5.4	546.5	counts	5.8	509.4	Counts
Enter Sigma:	2.4	18.4	counts	2.4	43.9	Counts
Calculated Sigma:	2.3	23.4	counts	2.4	22.6	
Detector Efficiency (ε_i):	19%	18%				
Surface Efficiency (ε_s):	25%	25%				
Total Efficiency (ε_T):	4.85%	4.41%				
Probe Area (Active):	126		cm^2			

				Actual % α DCGL	Actual % β DCGL
Static MDC:	**75**	**671**	dpm 100 cm^{-2} 50% of $DCGL_{(W)}$:	75%	67%

Number of Measurements

Delta = $DCGL_w$ - LBGR:	0.9647	cpm	LBGR	0.0353
Delta/Sigma:	3.27			
Type I - α:	0.05	---------->	$Z_{1-\alpha}$:	1.645
Type II - β:	0.05	---------->	$Z_{1-\beta}$:	1.645
Pr	0.983039			
N:	**8**	Number of Measurements Required from the Reference Area		
N+N_{EA}:	**8**	Number of Measurements Required from each Survey Unit		

Scanning Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	12:30	3	10	541	3.33	180.3	0.0485	0.0441	55	3245
2	05/12/06	12:34	3	7	555	2.33	185.0	0.0485	0.0441	38	3329
3	05/12/06	12:38	3	3	557	1.00	185.7	0.0485	0.0441	16	3341
4	05/12/06	12:42	3	4	560	1.33	186.7	0.0485	0.0441	22	3359
5	05/12/06	12:46	3	10	502	3.33	167.3	0.0485	0.0441	55	3011
6	05/12/06	12:50	3	8	555	2.67	185.0	0.0485	0.0441	44	3329
7	05/12/06	12:54	3	2	544	0.67	181.3	0.0485	0.0441	11	3263
8	05/12/06	12:58	3	6	582	2.00	194.0	0.0485	0.0441	33	3491
9	05/12/06	13:02	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
10	05/12/06	13:06	3	5	555	1.67	185.0	0.0485	0.0441	27	3329
11	05/12/06	13:10	3	5	559	1.67	186.3	0.0485	0.0441	27	3353
12	05/12/06	13:14	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
13	05/12/06	13:18	3	6	527	2.00	175.7	0.0485	0.0441	33	3161
14	05/12/06	13:22	3	3	564	1.00	188.0	0.0485	0.0441	16	3383
15	05/12/06	13:26	3	6	522	2.00	174.0	0.0485	0.0441	33	3131
16	05/12/06	13:30	3	6	534	2.00	178.0	0.0485	0.0441	33	3203
17	05/12/06	13:34	3	2	542	0.67	180.7	0.0485	0.0441	11	3251
			mean	**5.35**	**546.53**	**1.78**	**182.18**			**29.20**	**3278.56**
			std dev	**2.42**	**18.38**	**0.81**	**6.13**			**13.21**	**110.27**
			median	**5.00**	**546.00**	**1.67**	**182.00**			**27.27**	**3275.38**

Static Reference Area Measurements - Building 258 - 227427 / PR160700

Count No.	Date	Time	Count Time T_B	Counts α C_B	Counts β C_B	cpm α	cpm β	$\varepsilon_{T\,\alpha}$	$\varepsilon_{T\,\beta}$	dpm α /100cm^2	dpm β /100cm^2
1	05/12/06	12:30	3	10	541	3.33	180.3	0.0485	0.0441	55	3245
2	05/12/06	12:34	3	7	555	2.33	185.0	0.0485	0.0441	38	3329
3	05/12/06	12:38	3	3	557	1.00	185.7	0.0485	0.0441	16	3341
4	05/12/06	12:42	3	4	560	1.33	186.7	0.0485	0.0441	22	3359
5	05/12/06	12:46	3	10	502	3.33	167.3	0.0485	0.0441	55	3011
6	05/12/06	12:50	3	8	555	2.67	185.0	0.0485	0.0441	44	3329
7	05/12/06	12:54	3	2	544	0.67	181.3	0.0485	0.0441	11	3263
8	05/12/06	12:58	3	6	582	2.00	194.0	0.0485	0.0441	33	3491
9	05/12/06	13:02	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
10	05/12/06	13:06	3	5	555	1.67	185.0	0.0485	0.0441	27	3329
11	05/12/06	13:10	3	5	559	1.67	186.3	0.0485	0.0441	27	3353
12	05/12/06	13:14	3	4	546	1.33	182.0	0.0485	0.0441	22	3275
13	05/12/06	13:18	3	6	527	2.00	175.7	0.0485	0.0441	33	3161
14	05/12/06	13:22	3	3	564	1.00	188.0	0.0485	0.0441	16	3383
15	05/12/06	13:26	3	6	522	2.00	174.0	0.0485	0.0441	33	3131
16	05/12/06	13:30	3	6	534	2.00	178.0	0.0485	0.0441	33	3203
17	05/12/06	13:34	3	2	542	0.67	180.7	0.0485	0.0441	11	3251
			mean	**5.35**	**546.53**	**1.78**	**182.18**			**29.20**	**3278.56**
			std dev	**2.42**	**18.38**	**0.81**	**6.13**			**13.21**	**110.27**
			median	**5.00**	**546.00**	**1.67**	**182.00**			**27.27**	**3275.38**

Class 1 Alpha Measurements - Building 813 Survey Unit 22

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	7/19/06	16:07	3	3	1.0	0.0485	16	-13
2	7/19/06	16:11	7	3	2.3	0.0485	38	9
3	7/19/06	16:15	8	3	2.7	0.0485	44	14
4	7/19/06	16:19	7	3	2.3	0.0485	38	9
5	7/19/06	16:23	5	3	1.7	0.0485	27	-2
6	7/19/06	16:27	10	3	3.3	0.0485	55	25
7	7/19/06	16:31	7	3	2.3	0.0485	38	9
8	7/19/06	16:35	2	3	0.7	0.0485	11	-18
9	7/19/06	16:39	5	3	1.7	0.0485	27	-2
10	7/19/06	16:43	4	3	1.3	0.0485	22	-7
		mean	**6**	**mean**	**2**	**mean**	**32**	**2**
		std dev	**2.4**	**std dev**	**0.8**	**std dev**	**13.3**	**13.3**
		median	**6**	**median**	**2**	**median**	**33**	**4**

Greater than 100dpm^{net}/100cm^{2}are colored "red."

Class 1 Beta Measurements - Building 813 Survey Unit 22

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm	ε_T	dpm/100cm^2	dpm^{net}/100cm^2
1	7/19/06	16:07	518	3	172.7	0.0441	3107	-171
2	7/19/06	16:11	533	3	177.7	0.0441	3197	-81
3	7/19/06	16:15	523	3	174.3	0.0441	3137	-141
4	7/19/06	16:19	527	3	175.7	0.0441	3161	-117
5	7/19/06	16:23	584	3	194.7	0.0441	3503	225
6	7/19/06	16:27	494	3	164.7	0.0441	2963	-315
7	7/19/06	16:31	545	3	181.7	0.0441	3269	-9
8	7/19/06	16:35	444	3	148.0	0.0441	2663	-615
9	7/19/06	16:39	480	3	160.0	0.0441	2879	-399
10	7/19/06	16:43	446	3	148.7	0.0441	2675	-603
		mean	**509**	**mean**	**170**	**mean**	**3056**	**-223**
		std dev	**43.9**	**std dev**	**14.6**	**std dev**	**263.4**	**263.4**
		median	**521**	**median**	**174**	**median**	**3122**	**-156**

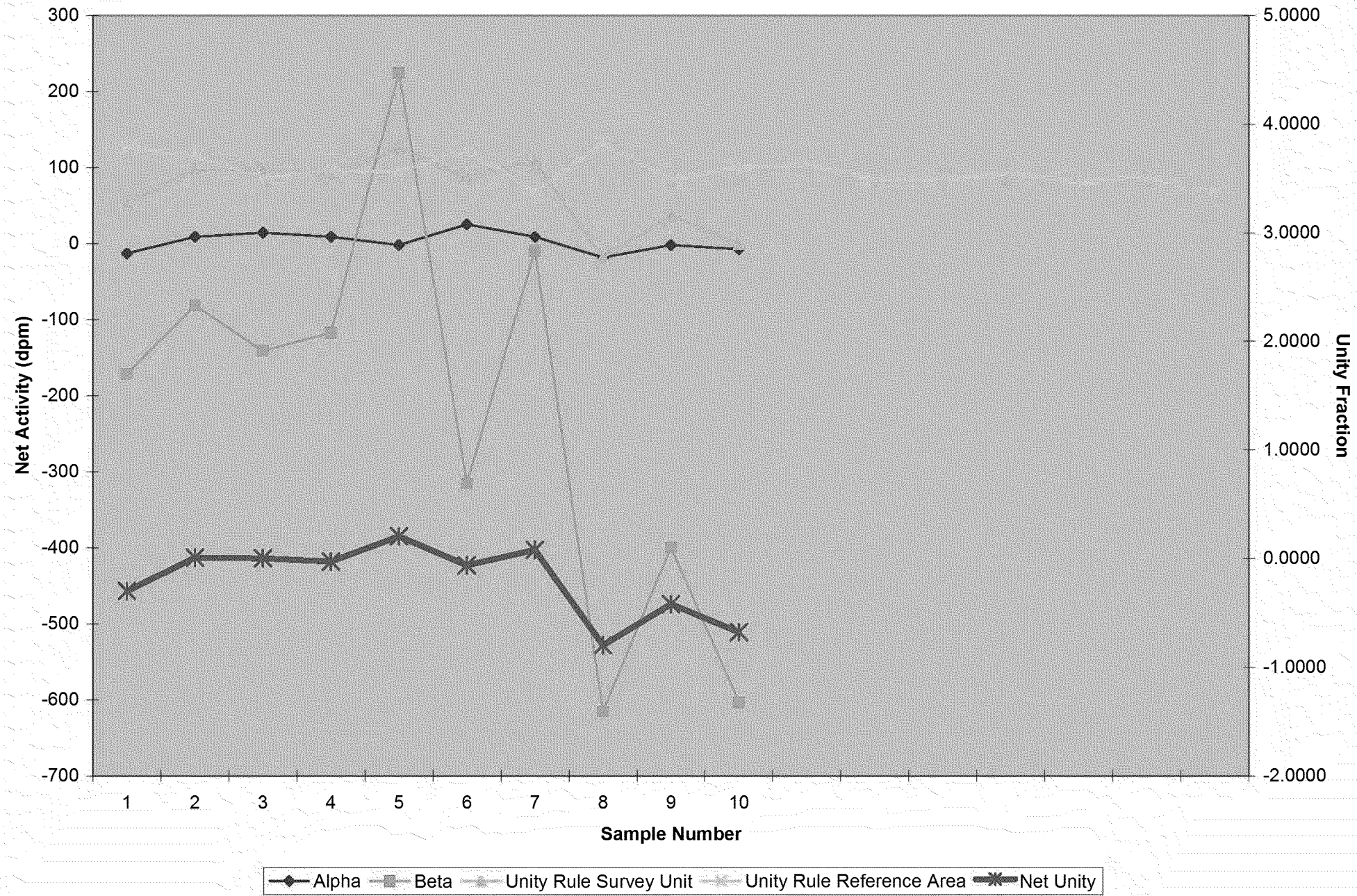
Greater than 1,000dpm^{net}/100cm^{2}are colored "red."

WRS TEST - Measurements - Building 813 Survey Unit 22

Count No.	Alpha Data dpm	Beta Data dpm	Area	Adjusted Data	Ranks	Reference Area Ranks
1	55	3245.4	R	4.7909	26	26
2	38	3329.4	R	4.7112	24	24
3	16	3341.4	R	4.5050	17	17
4	22	3359.4	R	4.5776	21	21
5	55	3011.4	R	4.5569	20	20
6	44	3329.4	R	4.7657	25	25
7	11	3263.4	R	4.3725	12	12
8	33	3491.3	R	4.8186	27	27
9	22	3275.4	R	4.4936	15.5	16
10	27	3329.4	R	4.6021	22	22
11	27	3353.4	R	4.6261	23	23
12	22	3275.4	R	4.4936	15.5	16
13	33	3161.4	R	4.4887	14	14
14	16	3383.4	R	4.5470	19	19
15	33	3131.4	R	4.4587	13	13
16	33	3203.4	R	4.5307	18	18
17	11	3251.4	R	4.3605	11	11
1	16	3107.4	S	3.2711	4	0
2	38	3197.4	S	3.5792	8	0
3	44	3137.4	S	3.5738	7	0
4	38	3161.4	S	3.5432	6	0
5	27	3503.3	S	3.7761	10	0
6	55	2963.4	S	3.5089	5	0
7	38	3269.4	S	3.6512	9	0
8	11	2663.5	S	2.7726	1	0
9	27	2879.5	S	3.1522	3	0
10	22	2675.5	S	2.8937	2	0
				SUM =	**378**	
					W_r =	**323**
					Critical Value =	**271**

Reject the null hypothesis - the survey unit meets the release criterion.

Building 813 Survey Unit 22 Comparison Graph Ra-226, Sr-90, Cs-137* and Unity Fraction



APPENDIX D

"STATIC" GAMMA MEASUREMENT DATA SHEETS

(Available on CD only)

ED_000855_00003297-00358

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 1
1	5292	7092
2	5568	7099
3	5426	6862
4	5479	6401
5	5509	6095
6	5515	6486
7	5509	6485
8	5478	6551
9	5517	7448
10	5453	7013
11	5483	6370
12	5337	7345
13	5420	7208
14	5378	7164
15	5519	6750
16	5426	6494
17	5536	6673
18		6487
19		6573

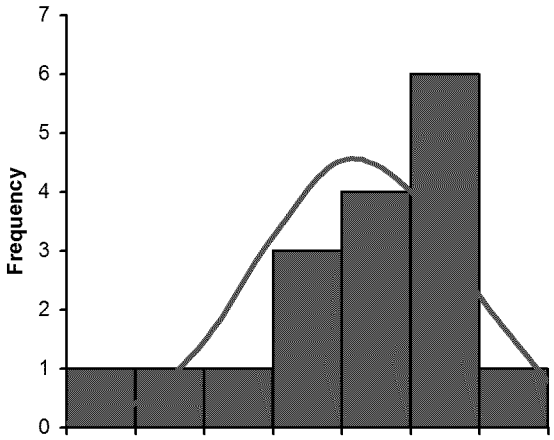
[ ] Bracketed measurements are considered outliers and were eliminated

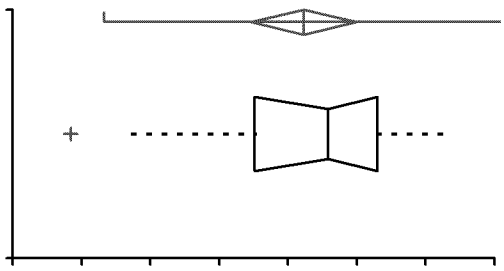
Parcel C, Building 258 , Reference Area - Gamma Measurements

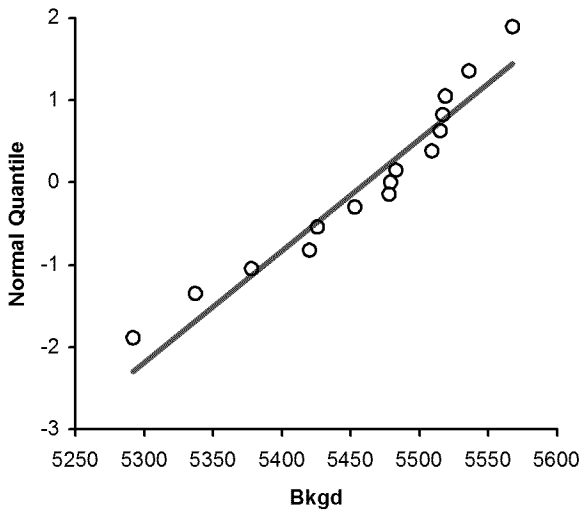
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:44	5292	1	5292
2	5/10/2006	9:48	5568	1	5568
3	5/10/2006	9:49	5426	1	5426
4	5/10/2006	9:50	5479	1	5479
5	5/10/2006	9:51	5509	1	5509
6	5/10/2006	9:53	5515	1	5515
7	5/10/2006	9:54	5509	1	5509
8	5/10/2006	9:55	5478	1	5478
9	5/10/2006	9:56	5517	1	5517
10	5/10/2006	9:57	5453	1	5453
11	5/10/2006	9:58	5483	1	5483
12	5/10/2006	9:59	5337	1	5337
13	5/10/2006	10:00	5420	1	5420
14	5/10/2006	10:02	5378	1	5378
15	5/10/2006	10:03	5519	1	5519
16	5/10/2006	10:04	5426	1	5426
17	5/10/2006	10:05	5536	1	5536
		mean	**5461**	**mean**	**5461.47**
		std dev	**73.8**	**std dev**	**73.83**
		median	**5479**	**median**	**5479.00**
				MDCR	**1329.80**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17 (cases excluded: 2 due to mis
Mean	5461.5
95% CI	5423.5 to 5499.4
Variance	5450.76
SD	73.83
SE	17.91
CV	1%

Median	5479.0
95.1% CI	5426.0 to 5515.0
Range	276
IQR	89

Percentile	
2.5th	-
25th	5426.0
50th	5479.0
75th	5515.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9272	0.1951
Skewness	-0.9093	0.0961
Kurtosis	0.3843	-

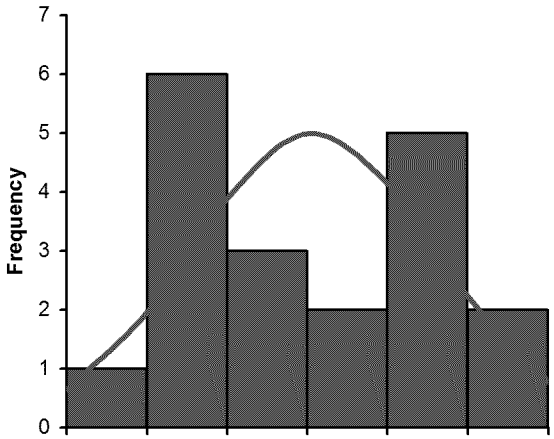
Building 813 Survey Unit 1 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/23/2006	10:30	7092	1	7092
2	5/23/2006	10:31	7099	1	7099
3	5/23/2006	10:32	6862	1	6862
4	5/23/2006	10:33	6401	1	6401
5	5/23/2006	10:34	6095	1	6095
6	5/23/2006	10:35	6486	1	6486
7	5/23/2006	10:36	6485	1	6485
8	5/23/2006	10:37	6551	1	6551
9	5/23/2006	10:38	7448	1	7448
10	5/23/2006	10:39	7013	1	7013
11	5/23/2006	10:40	6370	1	6370
12	5/23/2006	10:41	7345	1	7345
13	5/23/2006	10:42	7208	1	7208
14	5/23/2006	10:43	7164	1	7164
15	5/23/2006	10:44	6750	1	6750
16	5/23/2006	10:45	6494	1	6494
17	5/23/2006	10:46	6673	1	6673
18	5/23/2006	10:47	6487	1	6487
19	5/23/2006	10:48	6573	1	6573
		mean	**6768**	**mean**	**6768.21**
		std dev	**378.8**	**std dev**	**378.83**
		median	**6673**	**median**	**6673.00**

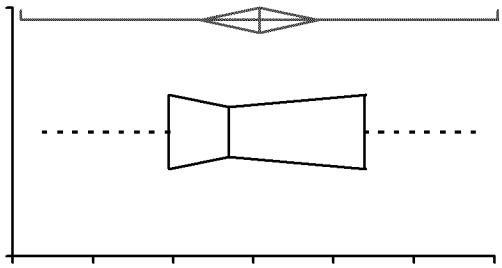
Bkgd + 3σ 5683

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 1
Performed by	B Henderson
Date	5 January 2007

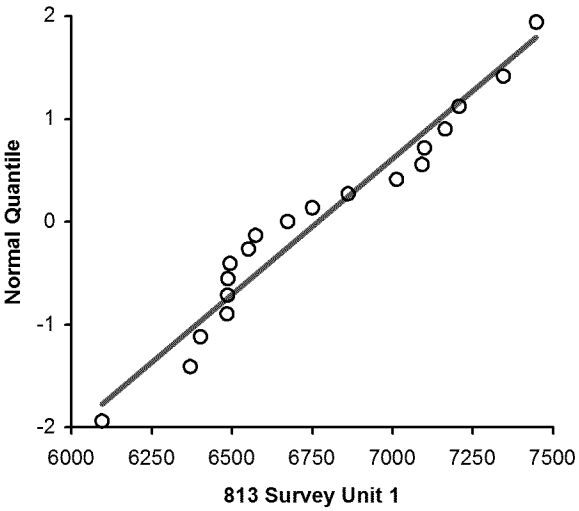


n	19
Mean	6768.2
95% CI	6585.6 to 6950.8
Variance	143515.40
SD	378.83
SE	86.91
CV	6%



Median	6673.0
98.1% CI	6486.0 to 7099.0
Range	1353
IQR	609

Percentile	
2.5th	-
25th	6486.5
50th	6673.0
75th	7095.5
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9449	0.3230
Skewness	0.2448	0.6212
Kurtosis	-0.9735	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 1
Performed by	B Henderson
Date	5 January 2007

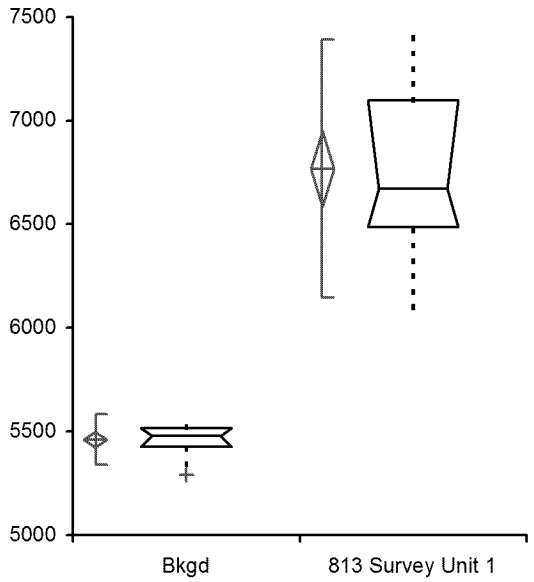
n	17 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	17	5461.5	73.8	17.91
813 Survey Unit 1	17	6796.2	391.5	94.96
Difference	17	-1334.8	426.9	103.54

Difference between means	-1334.8
95% CI	-1554.3 to -1115.3

t statistic	-12.89
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 1
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5461.5	73.83	17.91	5423.5 to 5499.4	5479.0	89.0	5426.0 to 5515.0
813 Survey Unit 1	19	6768.2	378.83	86.91	6585.6 to 6950.8	6673.0	609.0	6486.0 to 7099.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 02
1	5640	7164
2	5675	7003
3	5711	7387
4	5700	7502
5	5551	7469
6	5763	7666
7	5511	7385
8	5659	6877
9	5496	6739
10	5733	7734
11	5648	7917
12	5576	7378
13	5485	6659
14	5731	6557
15	5672	
16	5522	
17	5593	

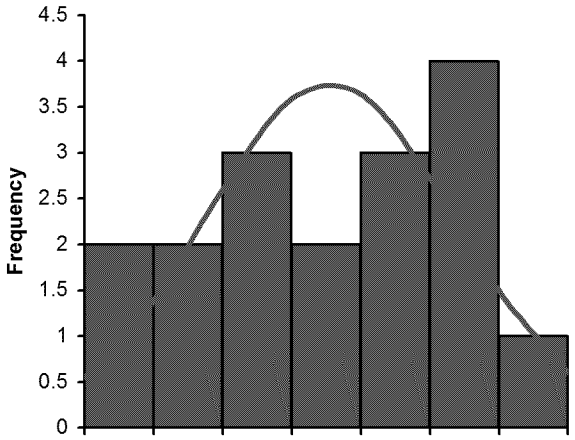
[ ] Bracketed measurements are considered outliers and were eliminated

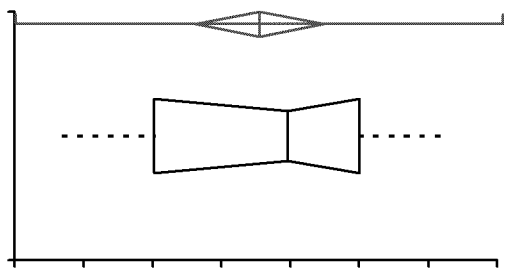
Parcel C, Building 258 , Reference Area - Gamma Measurements

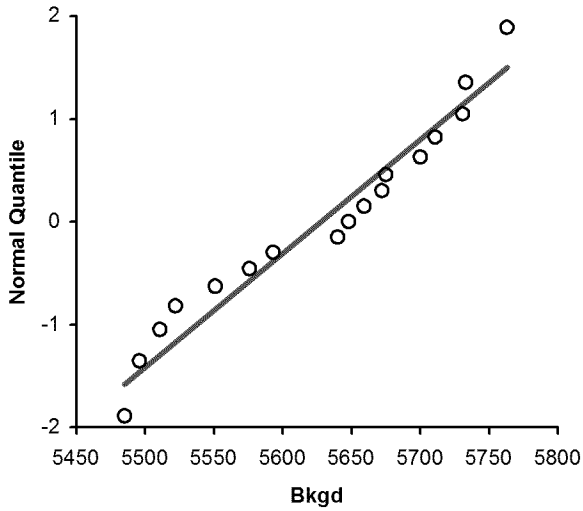
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

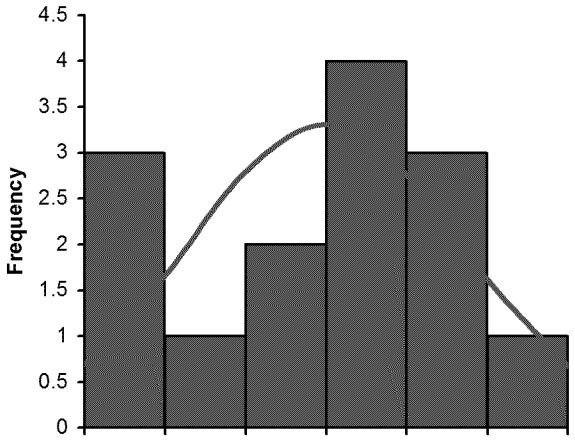
Building 813 Survey Unit 02 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/6/2006	9:30	7164	1	7164
2	6/6/2006	9:31	7003	1	7003
3	6/6/2006	9:32	7387	1	7387
4	6/6/2006	9:33	7502	1	7502
5	6/6/2006	9:34	7469	1	7469
6	6/6/2006	9:35	7666	1	7666
7	6/6/2006	9:36	7385	1	7385
8	6/6/2006	9:37	6877	1	6877
9	6/6/2006	9:38	6739	1	6739
10	6/6/2006	9:39	7734	1	7734
11	6/6/2006	9:40	7917	1	7917
12	6/6/2006	9:41	7378	1	7378
13	6/6/2006	9:42	6659	1	6659
14	6/6/2006	9:43	6557	1	6557
		mean	**7246**	**mean**	**7245.50**
		std dev	**422.0**	**std dev**	**421.99**
		median	**7382**	**median**	**7381.50**

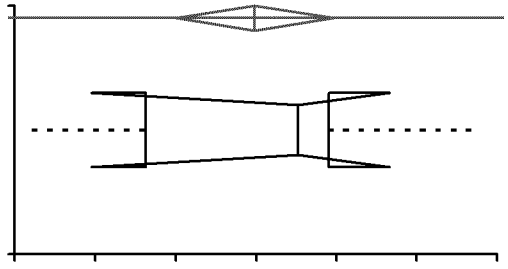
Bkgd + 3σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 02
Performed by	B Henderson
Date	5 January 2007

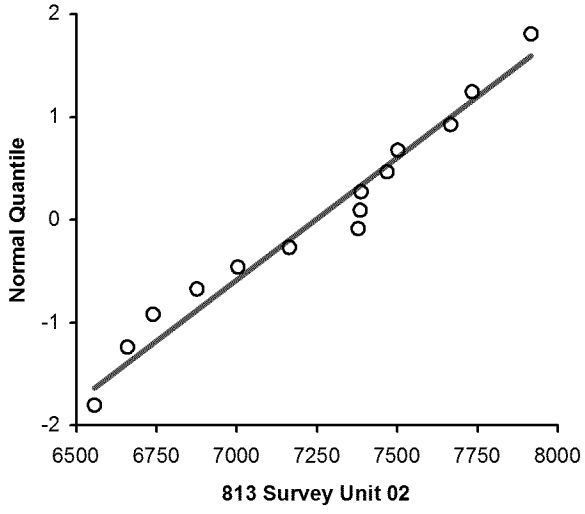


n	14 (cases excluded: 3 due to mis
Mean	7245.5
95% CI	7001.9 to 7489.1
Variance	178072.73
SD	421.99
SE	112.78
CV	6%



Median	7381.5
98.7% CI	6739.0 to 7666.0
Range	1360
IQR	569

Percentile	
2.5th	-
25th	6908.5
50th	7381.5
75th	7477.3
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9533	0.6133
Skewness	-0.2308	0.6843
Kurtosis	-1.0227	-

Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 02		
Performed by	B Henderson	**Date**	5 January 2007

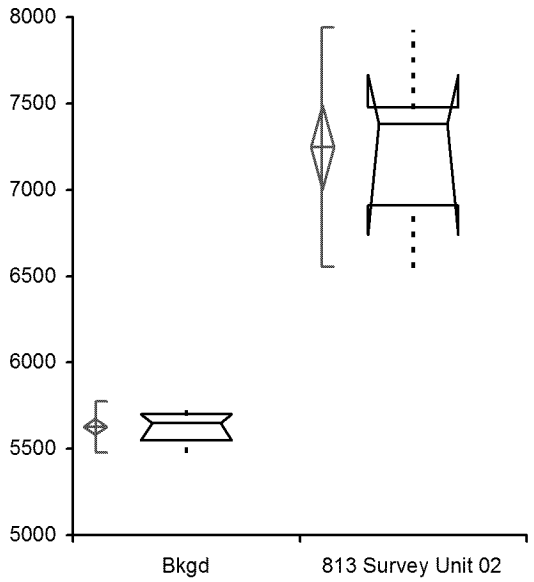
n	14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5634.2	94.2	25.17
813 Survey Unit 02	14	7245.5	422.0	112.78
Difference	14	-1611.3	401.5	107.31

Difference between means	-1611.3
95% CI	-1843.1 to -1379.5

t statistic	-15.02
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 02
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 02	14	7245.5	421.99	112.78	7001.9 to 7489.1	7381.5	568.8	6739.0 to 7666.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 3
1	5292	6837
2	5568	6472
3	5426	6390
4	5479	6447
5	5509	6897
6	5515	6710
7	5509	6849
8	5478	6521
9	5517	6479
10	5453	6358
11	5483	6711
12	5337	6310
13	5420	6771
14	5378	6490
15	5519	6324
16	5426	6862
17	5536	7075

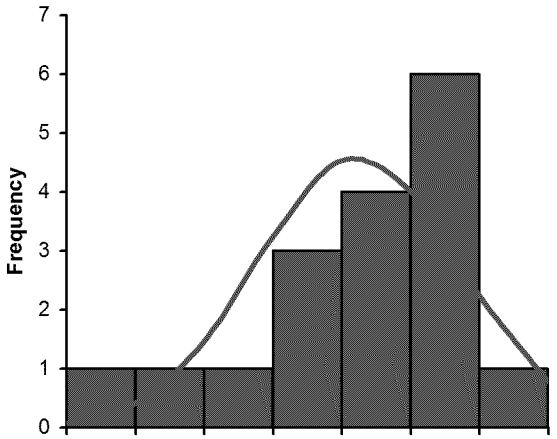
[ ] Bracketed measurements are considered outliers and were eliminated

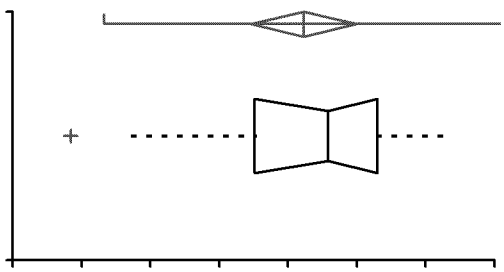
Parcel C, Building 258 , Reference Area - Gamma Measurements

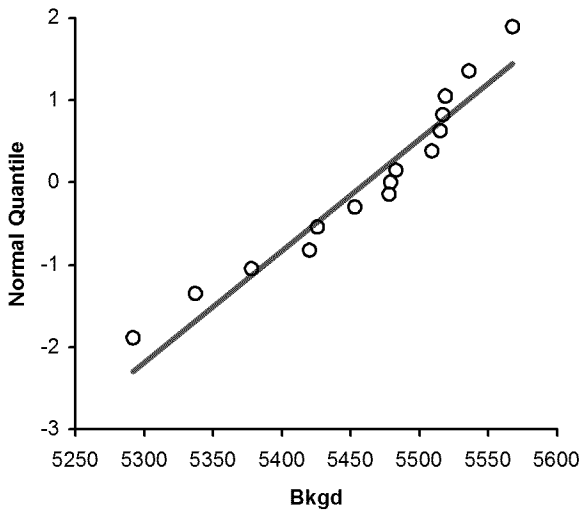
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:44	5292	1	5292
2	5/10/2006	9:48	5568	1	5568
3	5/10/2006	9:49	5426	1	5426
4	5/10/2006	9:50	5479	1	5479
5	5/10/2006	9:51	5509	1	5509
6	5/10/2006	9:53	5515	1	5515
7	5/10/2006	9:54	5509	1	5509
8	5/10/2006	9:55	5478	1	5478
9	5/10/2006	9:56	5517	1	5517
10	5/10/2006	9:57	5453	1	5453
11	5/10/2006	9:58	5483	1	5483
12	5/10/2006	9:59	5337	1	5337
13	5/10/2006	10:00	5420	1	5420
14	5/10/2006	10:02	5378	1	5378
15	5/10/2006	10:03	5519	1	5519
16	5/10/2006	10:04	5426	1	5426
17	5/10/2006	10:05	5536	1	5536
		mean	**5461**	**mean**	**5461.47**
		std dev	**73.8**	**std dev**	**73.83**
		median	**5479**	**median**	**5479.00**
				MDCR	**1329.80**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5461.5
95% CI	5423.5 to 5499.4
Variance	5450.76
SD	73.83
SE	17.91
CV	1%

Median	5479.0
95.1% CI	5426.0 to 5515.0
Range	276
IQR	89

Percentile	
2.5th	-
25th	5426.0
50th	5479.0
75th	5515.0
97.5th	-

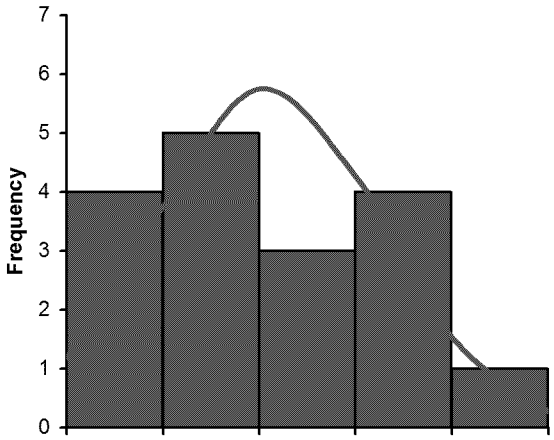
	Coefficient	**p**
Shapiro-Wilk	0.9272	0.1951
Skewness	-0.9093	0.0961
Kurtosis	0.3843	-

Building 813 Survey Unit 3 - Gamma Measurements

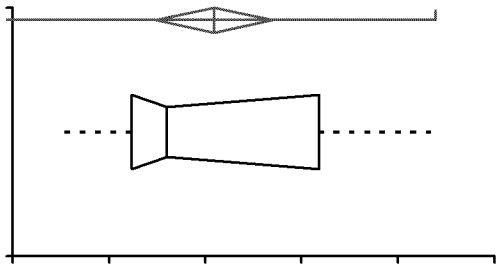
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/5/2006	12:45	6837	1	6837
2	6/5/2006	12:46	6472	1	6472
3	6/5/2006	12:47	6390	1	6390
4	6/5/2006	12:49	6447	1	6447
5	6/5/2006	12:50	6897	1	6897
6	6/5/2006	12:51	6710	1	6710
7	6/5/2006	12:53	6849	1	6849
8	6/5/2006	12:54	6521	1	6521
9	6/5/2006	12:55	6479	1	6479
10	6/5/2006	12:56	6358	1	6358
11	6/5/2006	12:57	6711	1	6711
12	6/5/2006	12:59	6310	1	6310
13	6/5/2006	13:00	6771	1	6771
14	6/5/2006	13:01	6490	1	6490
15	6/5/2006	13:02	6324	1	6324
16	6/5/2006	13:03	6862	1	6862
17	6/5/2006	13:04	7075	1	7075
		mean	**6618**	**mean**	**6617.82**
		std dev	**235.1**	**std dev**	**235.14**
		median	**6521**	**median**	**6521.00**
		Bkgd + 3σ	5683		

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 3
Performed by	B Henderson
Date	5 January 2007

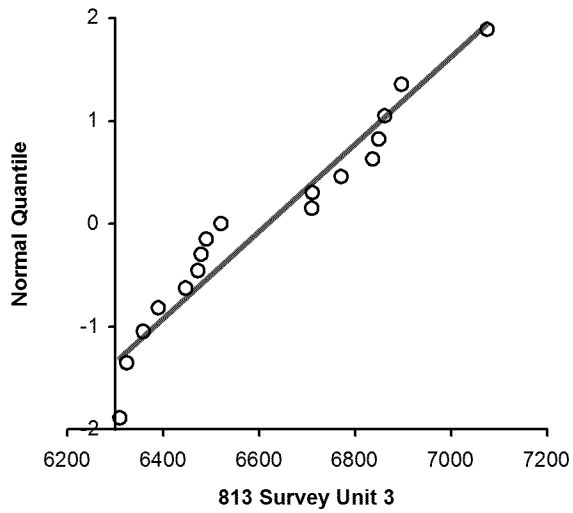


n	17
Mean	6617.8
95% CI	6496.9 to 6738.7
Variance	55289.03
SD	235.14
SE	57.03
CV	4%



Median	6521.0
95.1% CI	6447.0 to 6837.0
Range	765
IQR	390

Percentile	
2.5th	-
25th	6447.0
50th	6521.0
75th	6837.0
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9241	0.1731
Skewness	0.3394	0.5160
Kurtosis	-1.1281	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 3
Performed by	B Henderson
Date	5 January 2007

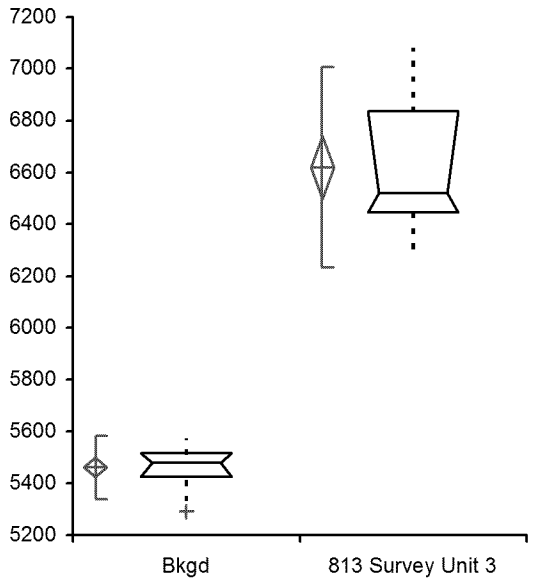
n	17

	n	Mean	SD	SE
Bkgd	17	5461.5	73.8	17.91
813 Survey Unit 3	17	6617.8	235.1	57.03
Difference	17	-1156.4	239.3	58.05

Difference between means	-1156.4
95% CI	-1279.4 to -1033.3

t statistic	-19.92
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 3
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5461.5	73.83	17.91	5423.5 to 5499.4	5479.0	89.0	5426.0 to 5515.0
813 Survey Unit 3	17	6617.8	235.14	57.03	6496.9 to 6738.7	6521.0	390.0	6447.0 to 6837.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 04
1	6374	7128
2	6182	6990
3	6205	7211
4	6457	7604
5	6320	7120
6	6397	7412
7	6403	7435
8	6277	7901
9	6260	7412
10	6213	7258
11	6308	7849
12	6446	7764
13	6349	7396
14	6340	7266
15	6330	7281
16	6343	7258
17	6179	

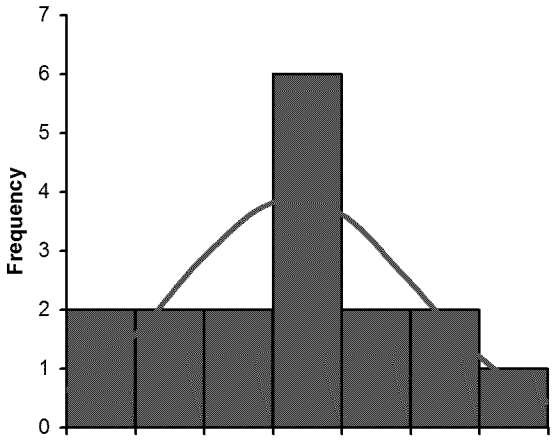
[ ] Bracketed measurements are considered outliers and were eliminated

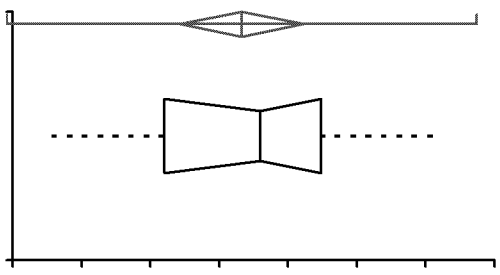
Parcel C, Building 258 , Reference Area - Gamma Measurements

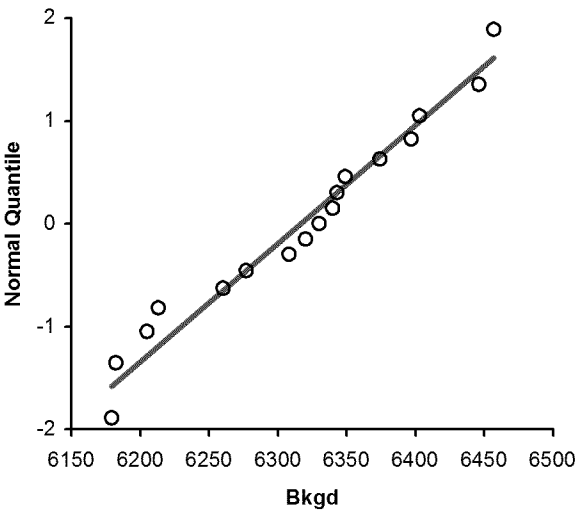
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:20	6374	1	6374
2	5/10/2006	9:21	6182	1	6182
3	5/10/2006	9:22	6205	1	6205
4	5/10/2006	9:23	6457	1	6457
5	5/10/2006	9:24	6320	1	6320
6	5/10/2006	9:25	6397	1	6397
7	5/10/2006	9:26	6403	1	6403
8	5/10/2006	9:27	6277	1	6277
9	5/10/2006	9:28	6260	1	6260
10	5/10/2006	9:29	6213	1	6213
11	5/10/2006	9:30	6308	1	6308
12	5/10/2006	9:31	6446	1	6446
13	5/10/2006	9:32	6349	1	6349
14	5/10/2006	9:33	6340	1	6340
15	5/10/2006	9:34	6330	1	6330
16	5/10/2006	9:35	6343	1	6343
17	5/10/2006	9:36	6179	1	6179
		mean	**6317**	**mean**	**6316.65**
		std dev	**87.1**	**std dev**	**87.05**
		median	**6330**	**median**	**6330.00**
				MDCR	**1429.34**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	6316.6
95% CI	6271.9 to 6361.4
Variance	7578.12
SD	87.05
SE	21.11
CV	1%
Median	6330.0
95.1% CI	6260.0 to 6374.0
Range	278
IQR	114

Percentile	
2.5th	-
25th	6260.0
50th	6330.0
75th	6374.0
97.5th	-

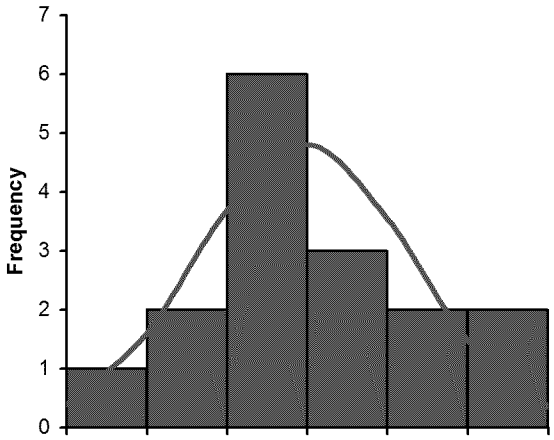
	Coefficient	**p**
Shapiro-Wilk	0.9533	0.5106
Skewness	-0.1558	0.7641
Kurtosis	-0.8831	-

Building 813 Survey Unit 04 - Gamma Measurements

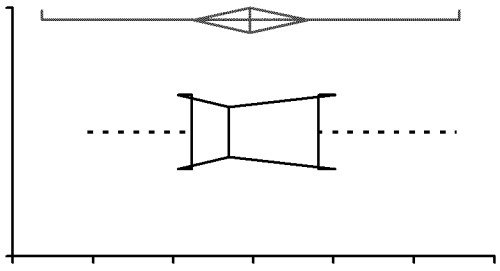
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/1/2006	9:30	7128	1	7128
2	6/1/2006	9:31	6990	1	6990
3	6/1/2006	9:32	7211	1	7211
4	6/1/2006	9:33	7604	1	7604
5	6/1/2006	9:34	7120	1	7120
6	6/1/2006	9:35	7412	1	7412
7	6/1/2006	9:36	7435	1	7435
8	6/1/2006	9:37	7901	1	7901
9	6/1/2006	9:38	7412	1	7412
10	6/1/2006	9:39	7537	1	7537
11	6/1/2006	9:40	7849	1	7849
12	6/1/2006	9:41	7764	1	7764
13	6/1/2006	9:42	7396	1	7396
14	6/1/2006	9:43	7266	1	7266
15	6/1/2006	9:44	7281	1	7281
16	6/1/2006	9:45	7258	1	7258
		mean	**7410**	**mean**	**7410.25**
		std dev	**265.1**	**std dev**	**265.06**
		median	**7404**	**median**	**7404.00**
		Bkgd + 3σ	6578		

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 04
Performed by	B Henderson
Date	5 January 2007

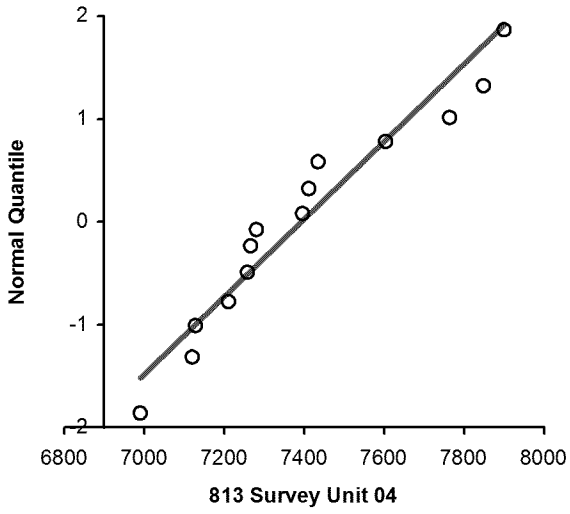


n	16	(cases excluded: 1 due to mis
Mean	7392.8	
95% CI	7251.4	to 7534.2
Variance	70404.43	
SD	265.34	
SE	66.33	
CV	4%	



Median	7338.5	
97.9% CI	7211.0	to 7604.0
Range	911	
IQR	316	

Percentile	
2.5th	-
25th	7246.3
50th	7338.5
75th	7561.8
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9261	0.2113
Skewness	0.6862	0.2109
Kurtosis	-0.2931	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 04
Performed by	B Henderson
Date	5 January 2007

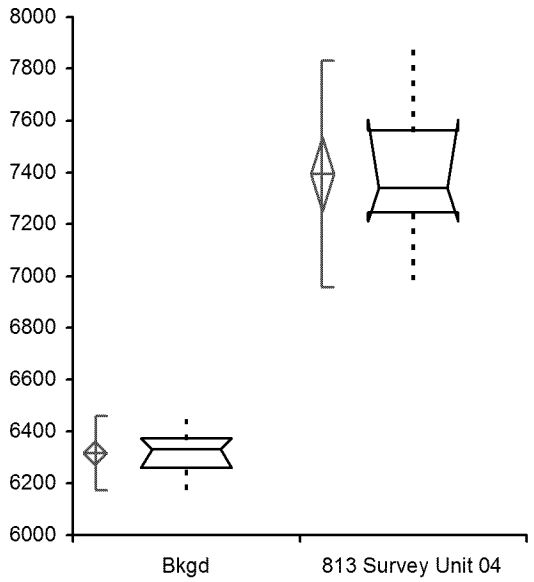
n	16 (cases excluded: 1 due to missing values)

	n	Mean	SD	SE
Bkgd	16	6325.3	82.1	20.53
813 Survey Unit 04	16	7392.8	265.3	66.33
Difference	16	-1067.6	246.7	61.67

Difference between means	-1067.6
95% CI	-1199.0 to -936.1

t statistic	-17.31
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 04
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	6316.6	87.05	21.11	6271.9 to 6361.4	6330.0	114.0	6260.0 to 6374.0
813 Survey Unit 04	16	7392.8	265.34	66.33	7251.4 to 7534.2	7338.5	315.5	7211.0 to 7604.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 05
1	5783	7392
2	5769	7408
3	5698	7526
4	5780	7491
5	5935	7587
6	5885	7210
7	5869	7429
8	5692	7212
9	5783	8117
10	5880	8200
11	5781	7395
12	5805	7711
13	6004	8040
14	5886	
15	5766	
16	5901	
17	5795	

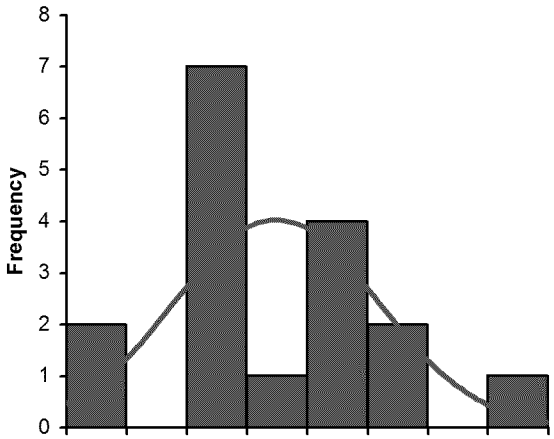
[ ] Bracketed measurements are considered outliers and were eliminated

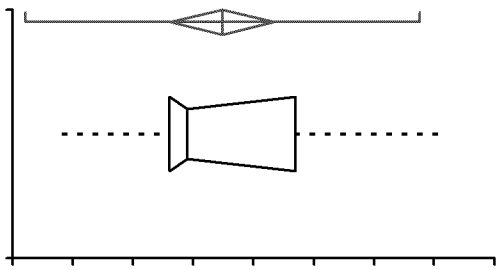
Parcel C, Building 258 , Reference Area - Gamma Measurements

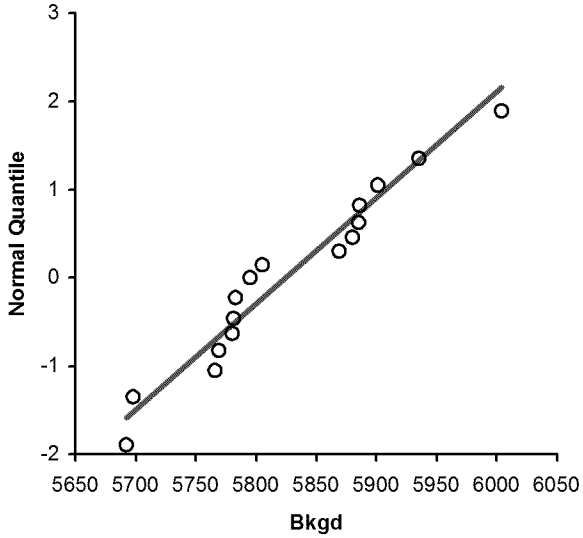
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5783	1	5783
2	5/10/2006	9:01	5769	1	5769
3	5/10/2006	9:02	5698	1	5698
4	5/10/2006	9:03	5780	1	5780
5	5/10/2006	9:04	5935	1	5935
6	5/10/2006	9:05	5885	1	5885
7	5/10/2006	9:06	5869	1	5869
8	5/10/2006	9:07	5692	1	5692
9	5/10/2006	9:08	5783	1	5783
10	5/10/2006	9:09	5880	1	5880
11	5/10/2006	9:10	5781	1	5781
12	5/10/2006	9:11	5805	1	5805
13	5/10/2006	9:12	6004	1	6004
14	5/10/2006	9:13	5886	1	5886
15	5/10/2006	9:14	5766	1	5766
16	5/10/2006	9:15	5901	1	5901
17	5/10/2006	9:16	5795	1	5795
		mean	**5824**	**mean**	**5824.24**
		std dev	**83.4**	**std dev**	**83.45**
		median	**5795**	**median**	**5795.00**
				MDCR	**1367.61**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.2
95% CI	5781.3 to 5867.1
Variance	6963.32
SD	83.45
SE	20.24
CV	1%
Median	5795.0
95.1% CI	5780.0 to 5885.0
Range	312
IQR	105

Percentile	
2.5th	-
25th	5780.0
50th	5795.0
75th	5885.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9432	0.3577
Skewness	0.4040	0.4409
Kurtosis	-0.1526	-

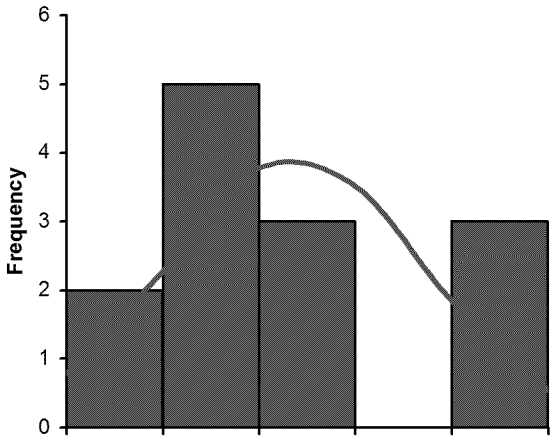
Building 813 Survey Unit 05 - Gamma Measurements

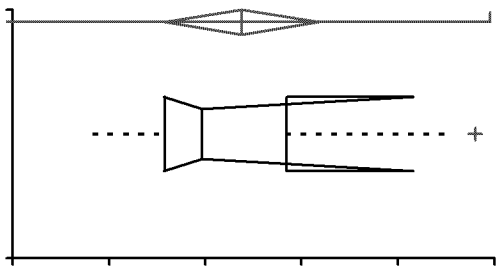
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/1/2006	9:45	7392	1	7392
2	6/1/2006	9:46	7408	1	7408
3	6/1/2006	9:47	7526	1	7526
4	6/1/2006	9:48	7491	1	7491
5	6/1/2006	9:49	7587	1	7587
6	6/1/2006	9:50	7210	1	7210
7	6/1/2006	9:51	7429	1	7429
8	6/1/2006	9:52	7212	1	7212
9	6/1/2006	9:53	8117	1	8117
10	6/1/2006	9:54	8200	1	8200
11	6/1/2006	9:55	7395	1	7395
12	6/1/2006	9:56	7711	1	7711
13	6/1/2006	9:57	8040	1	8040
		mean	**7594**	**mean**	**7593.69**
		std dev	**329.7**	**std dev**	**329.68**
		median	**7491**	**median**	**7491.00**

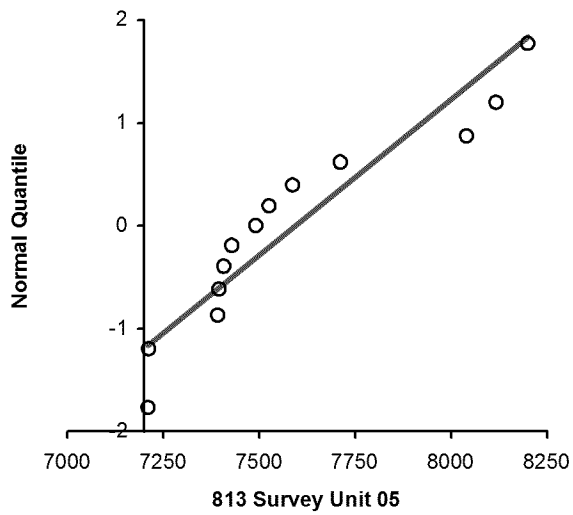
Bkgd + 3σ 6075

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 05
Performed by	B Henderson
Date	5 January 2007







n	13 (cases excluded: 4 due to mis
Mean	7593.7
95% CI	7394.5 to 7792.9
Variance	108688.06
SD	329.68
SE	91.44
CV	4%

Median	7491.0
97.8% CI	7392.0 to 8040.0
Range	990
IQR	316

Percentile	
2.5th	-
25th	7395.0
50th	7491.0
75th	7711.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.8721	0.0558
Skewness	0.8694	0.1514
Kurtosis	-0.4472	-

Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 05		
Performed by	B Henderson	**Date**	5 January 2007

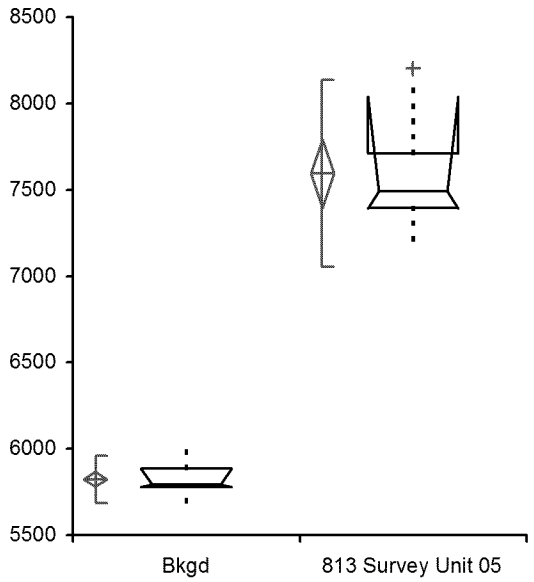
n	13 (cases excluded: 4 due to missing values)

	n	Mean	SD	SE
Bkgd	13	5820.3	90.0	24.97
813 Survey Unit 05	13	7593.7	329.7	91.44
Difference	13	-1773.4	303.1	84.07

Difference between means	-1773.4
95% CI	-1956.6 to -1590.2

t statistic	-21.09
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 05
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.2	83.45	20.24	5781.3 to 5867.1	5795.0	105.0	5780.0 to 5885.0
813 Survey Unit 05	13	7593.7	329.68	91.44	7394.5 to 7792.9	7491.0	316.0	7392.0 to 8040.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 06
1	5783	6886
2	5769	7156
3	5698	7115
4	5780	7171
5	5935	7089
6	5885	7272
7	5869	7277
8	5692	7108
9	5783	7226
10	5880	7396
11	5781	7234
12	5805	7537
13	6004	7307
14	5886	
15	5766	
16	5901	
17	5795	

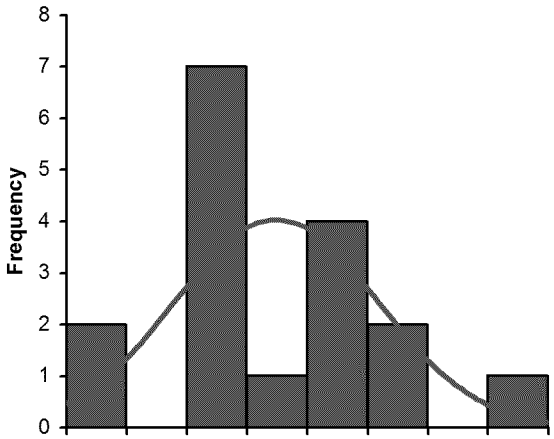
[ ] Bracketed measurements are considered outliers and were eliminated

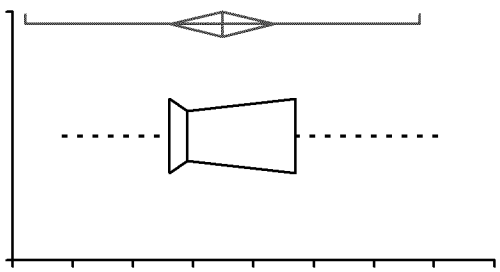
Parcel C, Building 258 , Reference Area - Gamma Measurements

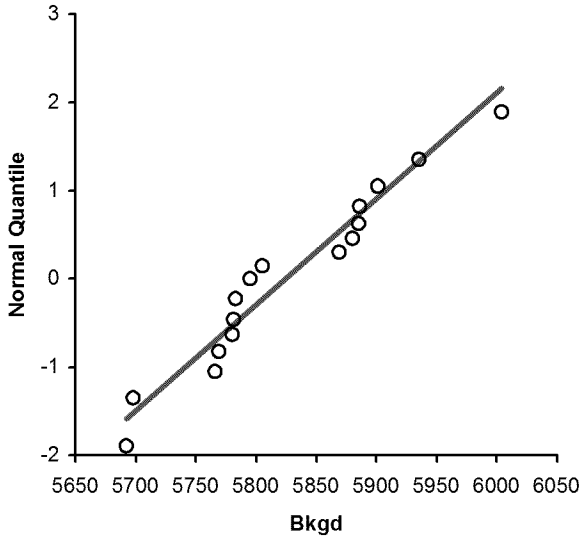
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5783	1	5783
2	5/10/2006	9:01	5769	1	5769
3	5/10/2006	9:02	5698	1	5698
4	5/10/2006	9:03	5780	1	5780
5	5/10/2006	9:04	5935	1	5935
6	5/10/2006	9:05	5885	1	5885
7	5/10/2006	9:06	5869	1	5869
8	5/10/2006	9:07	5692	1	5692
9	5/10/2006	9:08	5783	1	5783
10	5/10/2006	9:09	5880	1	5880
11	5/10/2006	9:10	5781	1	5781
12	5/10/2006	9:11	5805	1	5805
13	5/10/2006	9:12	6004	1	6004
14	5/10/2006	9:13	5886	1	5886
15	5/10/2006	9:14	5766	1	5766
16	5/10/2006	9:15	5901	1	5901
17	5/10/2006	9:16	5795	1	5795
		mean	**5824**	**mean**	**5824.24**
		std dev	**83.4**	**std dev**	**83.45**
		median	**5795**	**median**	**5795.00**
				MDCR	**1367.61**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.2
95% CI	5781.3 to 5867.1
Variance	6963.32
SD	83.45
SE	20.24
CV	1%

Median	5795.0
95.1% CI	5780.0 to 5885.0
Range	312
IQR	105

Percentile	
2.5th	-
25th	5780.0
50th	5795.0
75th	5885.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9432	0.3577
Skewness	0.4040	0.4409
Kurtosis	-0.1526	-

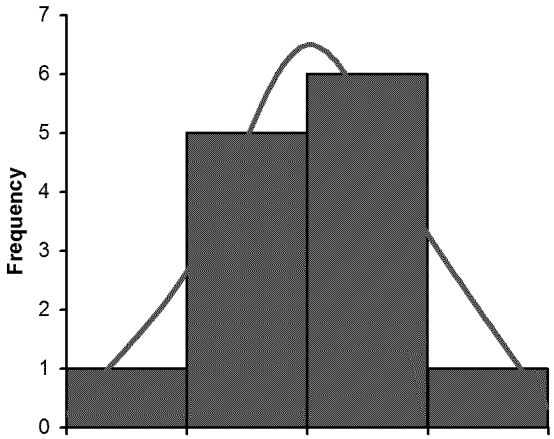
Building 813 Survey Unit 06 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/1/2006	13:00	6886	1	6886
2	6/1/2006	13:01	7156	1	7156
3	6/1/2006	13:02	7115	1	7115
4	6/1/2006	13:03	7171	1	7171
5	6/1/2006	13:04	7089	1	7089
6	6/1/2006	13:05	7272	1	7272
7	6/1/2006	13:06	7277	1	7277
8	6/1/2006	13:07	7108	1	7108
9	6/1/2006	13:08	7226	1	7226
10	6/1/2006	13:09	7396	1	7396
11	6/1/2006	13:10	7234	1	7234
12	6/1/2006	13:11	7537	1	7537
13	6/1/2006	13:12	7307	1	7307
		mean	**7213**	**mean**	**7213.38**
		std dev	**159.0**	**std dev**	**159.02**
		median	**7226**	**median**	**7226.00**

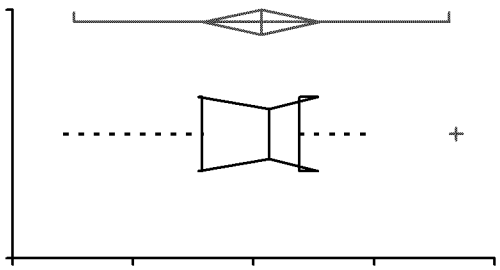
Bkgd + 3σ 6075

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 06
Performed by	B Henderson
Date	5 January 2007

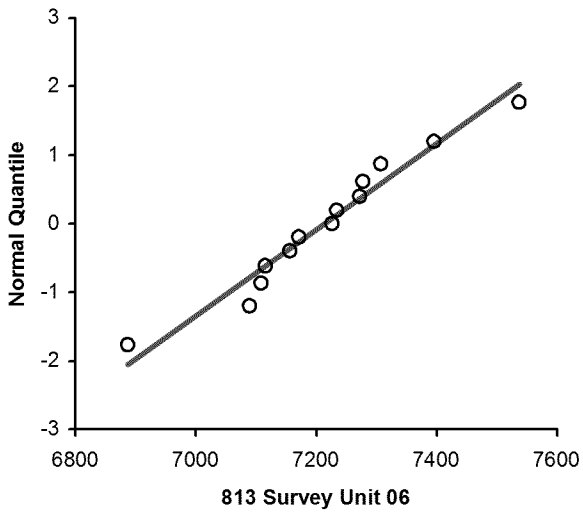


n	13 (cases excluded: 4 due to mis
Mean	7213.4
95% CI	7117.3 to 7309.5
Variance	25286.09
SD	159.02
SE	44.10
CV	2%



Median	7226.0
97.8% CI	7108.0 to 7307.0
Range	651
IQR	162

Percentile	
2.5th	-
25th	7115.0
50th	7226.0
75th	7277.0
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9707	0.9027
Skewness	0.0458	0.9377
Kurtosis	1.2790	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 06
Performed by	B Henderson
Date	5 January 2007

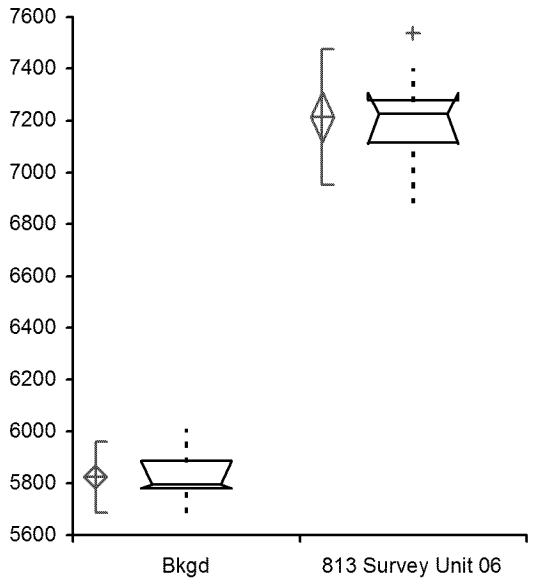
n	13 (cases excluded: 4 due to missing values)

	n	Mean	SD	SE
Bkgd	13	5820.3	90.0	24.97
813 Survey Unit 06	13	7213.4	159.0	44.10
Difference	13	-1393.1	154.6	42.88

Difference between means	-1393.1
95% CI	-1486.5 to -1299.6

t statistic	-32.49
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 06
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.2	83.45	20.24	5781.3 to 5867.1	5795.0	105.0	5780.0 to 5885.0
813 Survey Unit 06	13	7213.4	159.02	44.10	7117.3 to 7309.5	7226.0	162.0	7108.0 to 7307.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 07
1	5640	8543
2	5675	8735
3	5711	9311
4	5700	8903
5	5551	8998
6	5763	9120
7	5511	9108
8	5659	9150
9	5496	9029
10	5733	8874
11	5648	8881
12	5576	9279
13	5485	8684
14	5731	8717
15	5672	8221
16	5522	
17	5593	

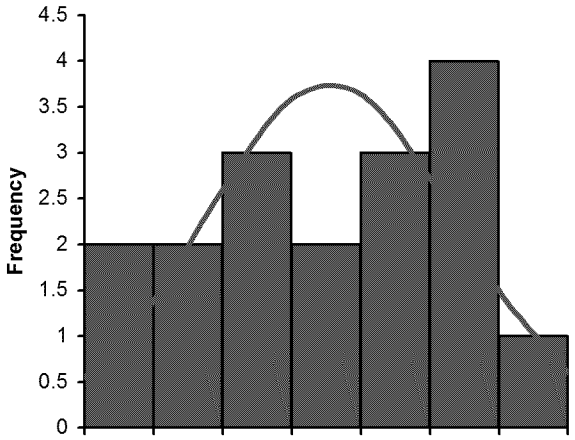
[ ] Bracketed measurements are considered outliers and were eliminated

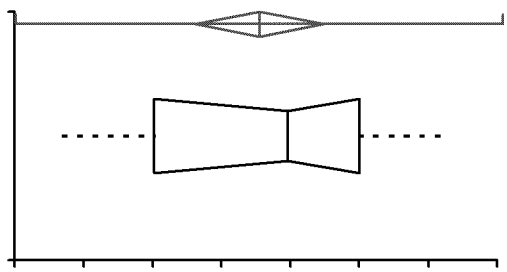
Parcel C, Building 258 , Reference Area - Gamma Measurements

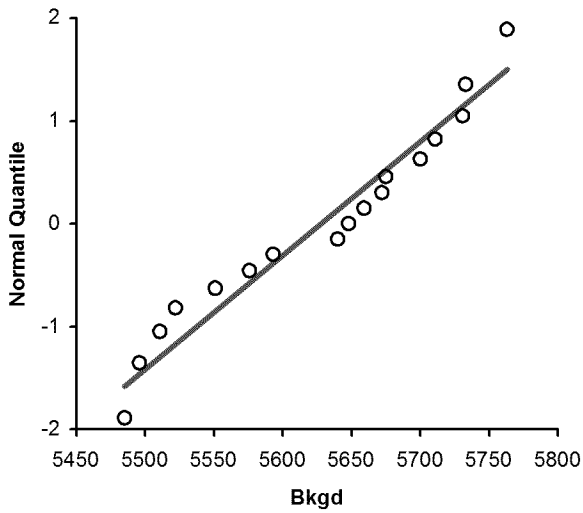
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

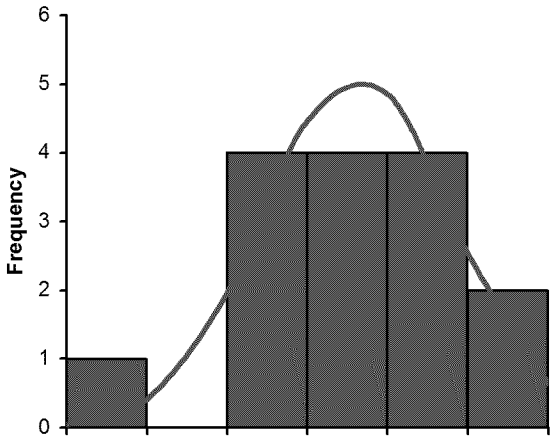
Building 813 Survey Unit 07 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/6/2006	13:00	8543	1	8543
2	6/6/2006	13:01	8735	1	8735
3	6/6/2006	13:02	9311	1	9311
4	6/6/2006	13:03	8903	1	8903
5	6/6/2006	13:04	8998	1	8998
6	6/6/2006	13:05	9120	1	9120
7	6/6/2006	13:06	9108	1	9108
8	6/6/2006	13:07	9150	1	9150
9	6/6/2006	13:08	9029	1	9029
10	6/6/2006	13:09	8874	1	8874
11	6/6/2006	13:10	8881	1	8881
12	6/6/2006	13:11	9279	1	9279
13	6/6/2006	13:12	8684	1	8684
14	6/6/2006	13:13	8717	1	8717
15	6/6/2006	13:14	8221	1	8221
		mean	**8904**	**mean**	**8903.53**
		std dev	**291.5**	**std dev**	**291.51**
		median	**8903**	**median**	**8903.00**

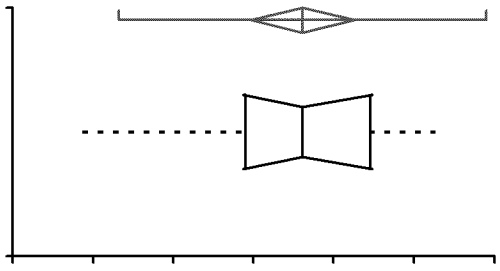
Bkgd + 3σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 07
Performed by	B Henderson
Date	5 January 2007

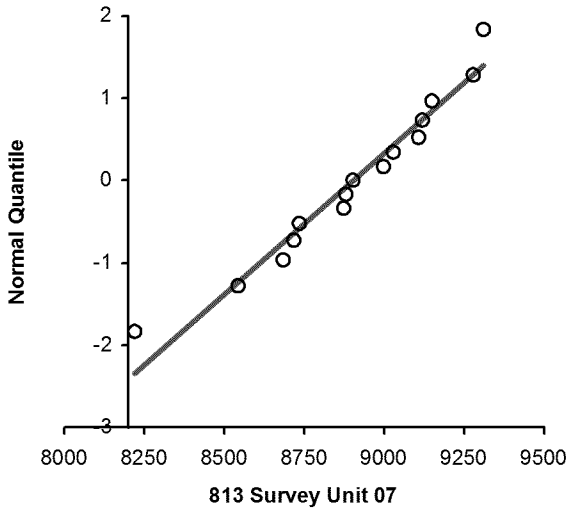


n	15 (cases excluded: 2 due to mis
Mean	8903.5
95% CI	8742.1 to 9065.0
Variance	84977.84
SD	291.51
SE	75.27
CV	3%



Median	8903.0
96.5% CI	8717.0 to 9120.0
Range	1090
IQR	388

Percentile	
2.5th	-
25th	8726.0
50th	8903.0
75th	9114.0
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9550	0.6061
Skewness	-0.7641	0.1777
Kurtosis	0.6995	-

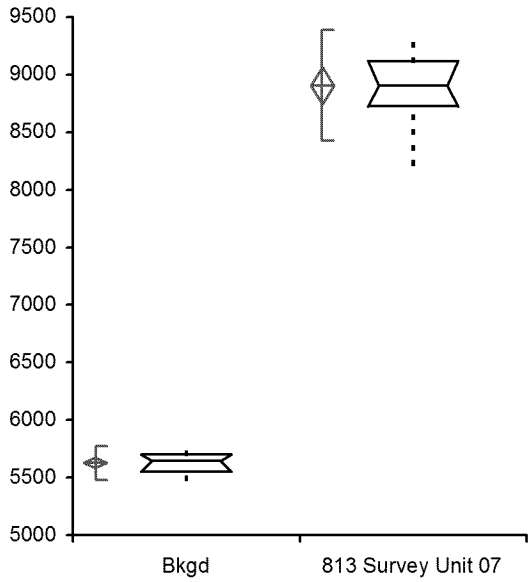
Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 07		
Performed by	B Henderson	**Date**	5 January 2007

n 15 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	15	5636.7	91.3	23.57
813 Survey Unit 07	15	8903.5	291.5	75.27
Difference	15	-3266.8	312.5	80.68

Difference between means	-3266.8
95% CI	-3439.8 to -3093.8
t statistic	-40.49
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 07
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 07	15	8903.5	291.51	75.27	8742.1 to 9065.0	8903.0	388.0	8717.0 to 9120.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 08
1	5640	6791
2	5675	6762
3	5711	6791
4	5700	6629
5	5551	6799
6	5763	6760
7	5511	6769
8	5659	6608
9	5496	6953
10	5733	6961
11	5648	6875
12	5576	6835
13	5485	6919
14	5731	6922
15	5672	6859
16	5522	6827
17	5593	

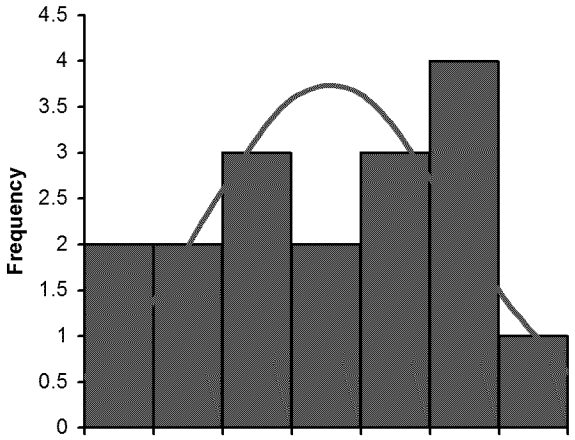
[ ] Bracketed measurements are considered outliers and were eliminated

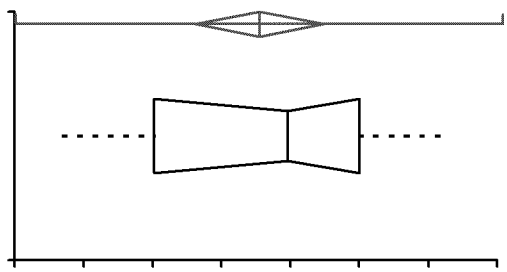
Parcel C, Building 258 , Reference Area - Gamma Measurements

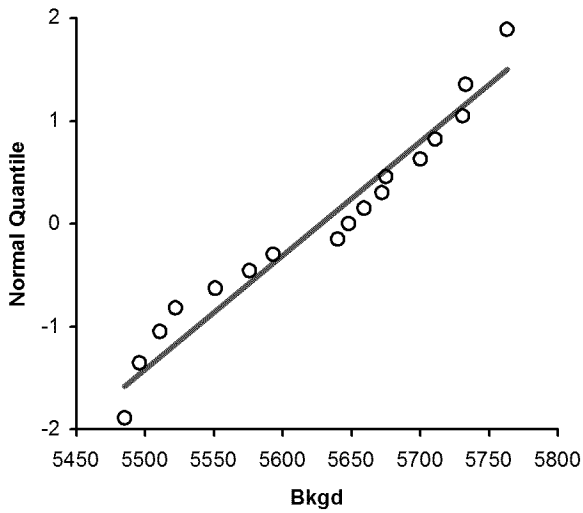
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

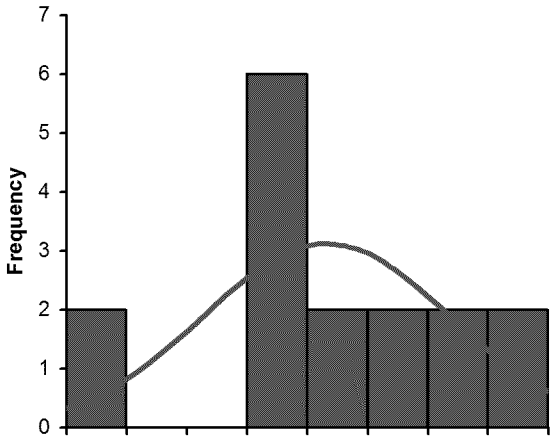
	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

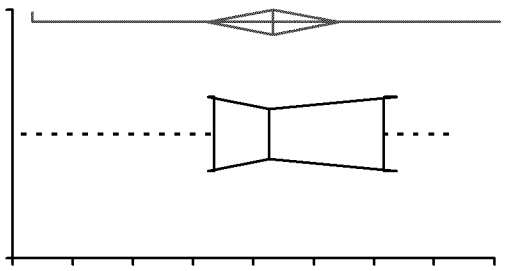
Building 813 Survey Unit 08 - Gamma Measurements

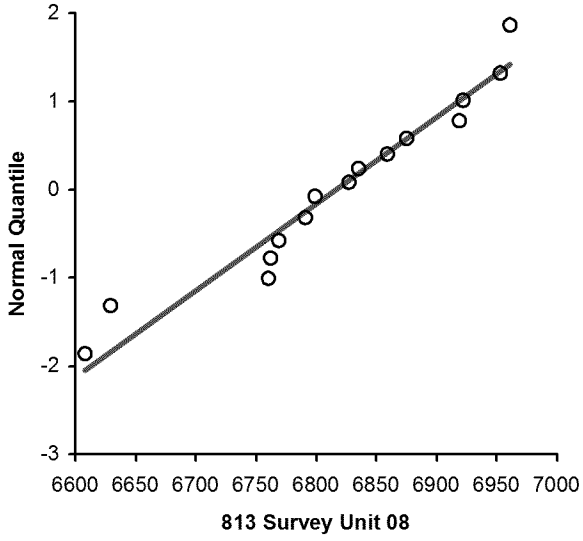
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/1/2006	14:00	6791	1	6791
2	6/1/2006	14:01	6762	1	6762
3	6/1/2006	14:02	6791	1	6791
4	6/1/2006	14:03	6629	1	6629
5	6/1/2006	14:04	6799	1	6799
6	6/1/2006	14:05	6760	1	6760
7	6/1/2006	14:06	6769	1	6769
8	6/1/2006	14:07	6608	1	6608
9	6/1/2006	14:08	6953	1	6953
10	6/1/2006	14:09	6961	1	6961
11	6/1/2006	14:10	6875	1	6875
12	6/1/2006	14:11	6835	1	6835
13	6/1/2006	14:12	6919	1	6919
14	6/1/2006	14:13	6922	1	6922
15	6/1/2006	14:14	6859	1	6859
16	6/1/2006	14:15	6827	1	6827
		mean	**6816**	**mean**	**6816.25**
		std dev	**101.8**	**std dev**	**101.81**
		median	**6813**	**median**	**6813.00**
		Bkgd + 3σ	5898		

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 08
Performed by	B Henderson
Date	5 January 2007







n	16 (cases excluded: 1 due to mis
Mean	6816.3
95% CI	6762.0 to 6870.5
Variance	10365.53
SD	101.81
SE	25.45
CV	1%

Median	6813.0
97.9% CI	6762.0 to 6919.0
Range	353
IQR	141

Percentile	
2.5th	-
25th	6767.3
50th	6813.0
75th	6908.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9373	0.3172
Skewness	-0.5726	0.2924
Kurtosis	0.1630	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 08
Performed by	B Henderson
Date	5 January 2007

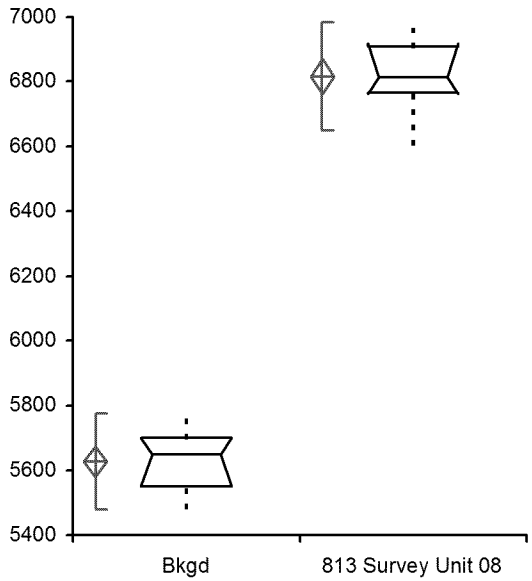
n	16 (cases excluded: 1 due to missing values)

	n	Mean	SD	SE
Bkgd	16	5629.6	92.7	23.18
813 Survey Unit 08	16	6816.3	101.8	25.45
Difference	16	-1186.7	152.1	38.03

Difference between means	-1186.7
95% CI	-1267.7 to -1105.6

t statistic	-31.20
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 08
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 08	16	6816.3	101.81	25.45	6762.0 to 6870.5	6813.0	140.8	6762.0 to 6919.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 09
1	5640	6687
2	5675	6657
3	5711	6797
4	5700	6537
5	5551	6628
6	5763	6704
7	5511	6651
8	5659	6341
9	5496	6350
10	5733	6424
11	5648	6624
12	5576	6511
13	5485	6466
14	5731	6676
15	5672	6566
16	5522	6297
17	5593	

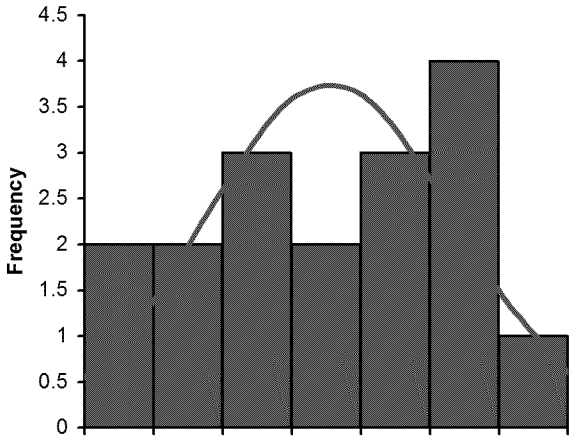
[ ] Bracketed measurements are considered outliers and were eliminated

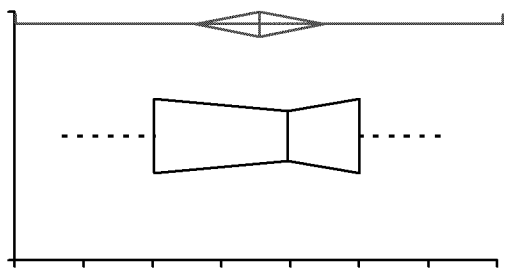
Parcel C, Building 258 , Reference Area - Gamma Measurements

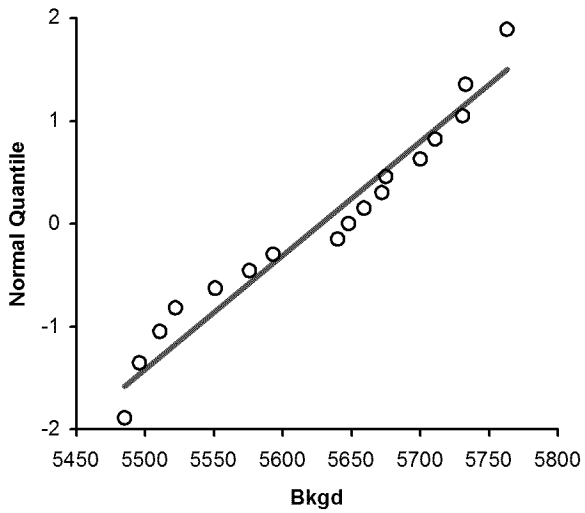
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

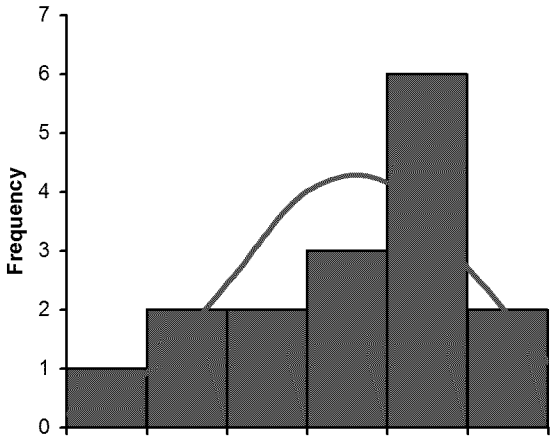
	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

Building 813 Survey Unit 09 - Gamma Measurements

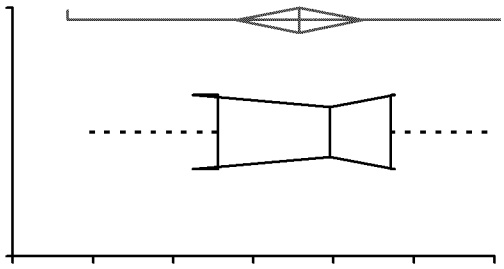
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/2/2006	8:15	6687	1	6687
2	6/2/2006	8:16	6657	1	6657
3	6/2/2006	8:17	6797	1	6797
4	6/2/2006	8:18	6537	1	6537
5	6/2/2006	8:19	6628	1	6628
6	6/2/2006	8:20	6704	1	6704
7	6/2/2006	8:21	6651	1	6651
8	6/2/2006	8:22	6341	1	6341
9	6/2/2006	8:23	6350	1	6350
10	6/2/2006	8:24	6424	1	6424
11	6/2/2006	8:25	6624	1	6624
12	6/2/2006	8:26	6511	1	6511
13	6/2/2006	8:27	6466	1	6466
14	6/2/2006	8:28	6676	1	6676
15	6/2/2006	8:29	6566	1	6566
16	6/2/2006	8:30	6297	1	6297
		mean	**6557**	**mean**	**6557.25**
		std dev	**147.0**	**std dev**	**147.04**
		median	**6595**	**median**	**6595.00**
		Bkgd + 3σ	5898		

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 09
Performed by	B Henderson
Date	5 January 2007

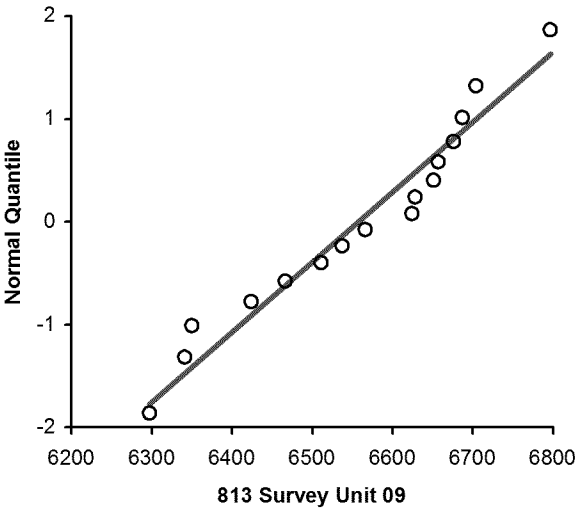


n	16 (cases excluded: 1 due to mis
Mean	6557.3
95% CI	6478.9 to 6635.6
Variance	21620.47
SD	147.04
SE	36.76
CV	2%



Median	6595.0
97.9% CI	6424.0 to 6676.0
Range	500
IQR	216

Percentile	
2.5th	-
25th	6455.5
50th	6595.0
75th	6671.3
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9473	0.4488
Skewness	-0.3980	0.4596
Kurtosis	-0.8357	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 09
Performed by	B Henderson
Date	5 January 2007

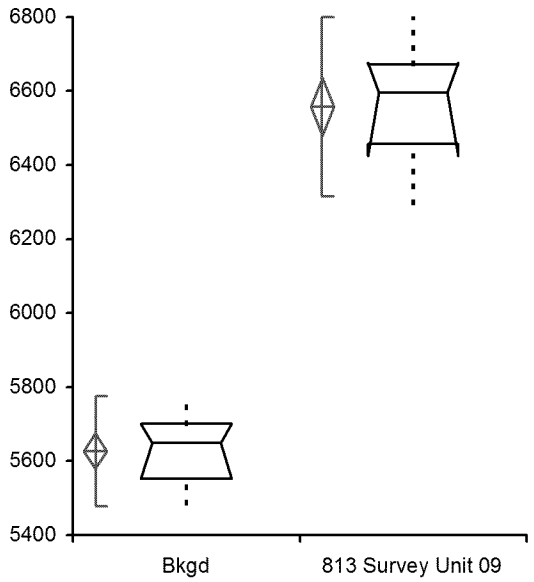
n	16 (cases excluded: 1 due to missing values)

	n	Mean	SD	SE
Bkgd	16	5629.6	92.7	23.18
813 Survey Unit 09	16	6557.3	147.0	36.76
Difference	16	-927.7	134.1	33.53

Difference between means	-927.7
95% CI	-999.2 to -856.2

t statistic	-27.67
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 09
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 09	16	6557.3	147.04	36.76	6478.9 to 6635.6	6595.0	215.8	6424.0 to 6676.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 10
1	5783	7073
2	5769	6965
3	5698	6788
4	5780	7272
5	5935	7473
6	5885	6681
7	5869	6596
8	5692	6840
9	5783	7548
10	5880	7109
11	5781	7097
12	5805	6863
13	6004	7086
14	5886	6910
15	5766	
16	5901	
17	5795	

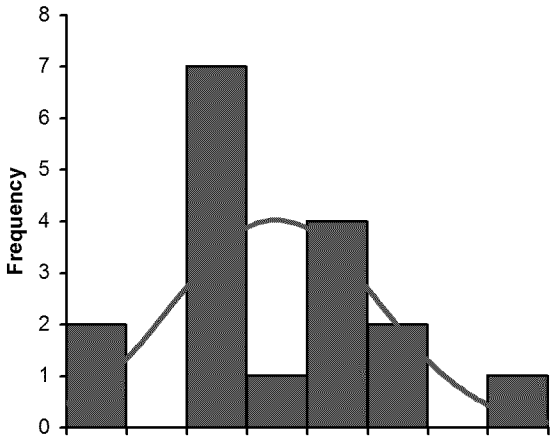
[ ] Bracketed measurements are considered outliers and were eliminated

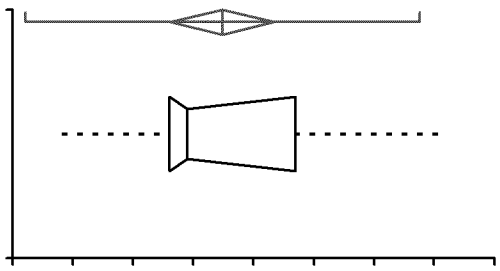
Parcel C, Building 258 , Reference Area - Gamma Measurements

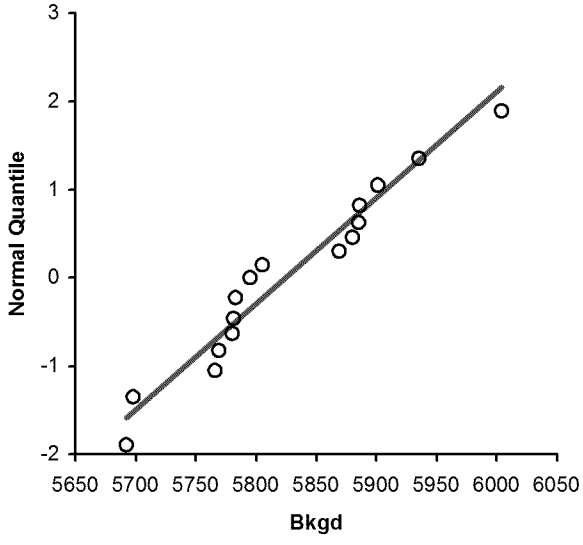
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5783	1	5783
2	5/10/2006	9:01	5769	1	5769
3	5/10/2006	9:02	5698	1	5698
4	5/10/2006	9:03	5780	1	5780
5	5/10/2006	9:04	5935	1	5935
6	5/10/2006	9:05	5885	1	5885
7	5/10/2006	9:06	5869	1	5869
8	5/10/2006	9:07	5692	1	5692
9	5/10/2006	9:08	5783	1	5783
10	5/10/2006	9:09	5880	1	5880
11	5/10/2006	9:10	5781	1	5781
12	5/10/2006	9:11	5805	1	5805
13	5/10/2006	9:12	6004	1	6004
14	5/10/2006	9:13	5886	1	5886
15	5/10/2006	9:14	5766	1	5766
16	5/10/2006	9:15	5901	1	5901
17	5/10/2006	9:16	5795	1	5795
		mean	**5824**	**mean**	**5824.24**
		std dev	**83.4**	**std dev**	**83.45**
		median	**5795**	**median**	**5795.00**
				MDCR	**1367.61**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.2
95% CI	5781.3 to 5867.1
Variance	6963.32
SD	83.45
SE	20.24
CV	1%
Median	5795.0
95.1% CI	5780.0 to 5885.0
Range	312
IQR	105

Percentile	
2.5th	-
25th	5780.0
50th	5795.0
75th	5885.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9432	0.3577
Skewness	0.4040	0.4409
Kurtosis	-0.1526	-

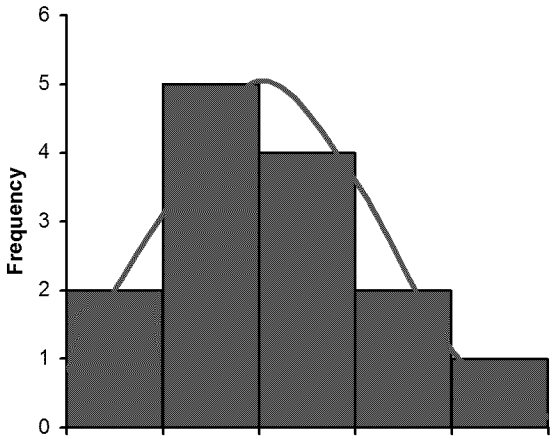
Building 813 Survey Unit 10 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/6/2006	9:30	7073	1	7073
2	6/6/2006	9:31	6965	1	6965
3	6/6/2006	9:32	6788	1	6788
4	6/6/2006	9:33	7272	1	7272
5	6/6/2006	9:34	7473	1	7473
6	6/6/2006	9:35	6681	1	6681
7	6/6/2006	9:36	6596	1	6596
8	6/6/2006	9:37	6840	1	6840
9	6/6/2006	9:38	7548	1	7548
10	6/6/2006	9:39	7109	1	7109
11	6/6/2006	9:40	7097	1	7097
12	6/6/2006	9:41	6863	1	6863
13	6/6/2006	9:42	7086	1	7086
14	6/6/2006	9:43	6910	1	6910
		mean	**7022**	**mean**	**7021.50**
		std dev	**275.8**	**std dev**	**275.84**
		median	**7019**	**median**	**7019.00**

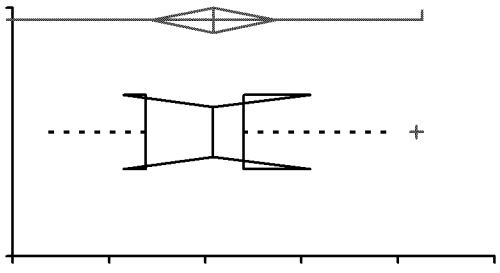
Bkgd + 3σ 6075

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 10
Performed by	B Henderson
Date	5 January 2007

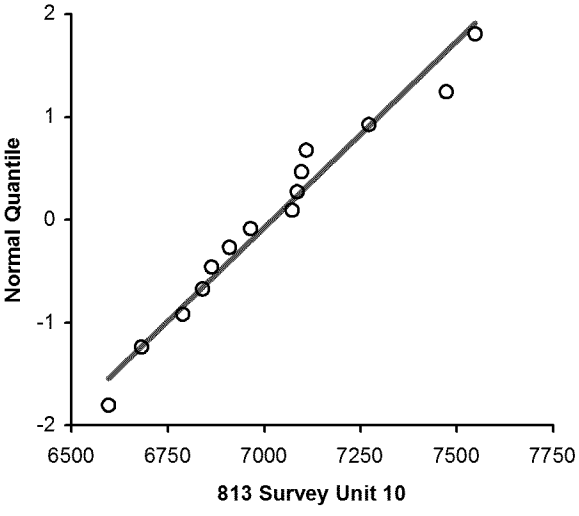


n	14	(cases excluded: 3 due to mis
Mean	7021.5	
95% CI	6862.2	to 7180.8
Variance	76090.42	
SD	275.84	
SE	73.72	
CV	4%	



Median	7019.0	
98.7% CI	6788.0	to 7272.0
Range	952	
IQR	254	

Percentile	
2.5th	-
25th	6845.8
50th	7019.0
75th	7100.0
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9603	0.7273
Skewness	0.4893	0.3934
Kurtosis	-0.1731	-

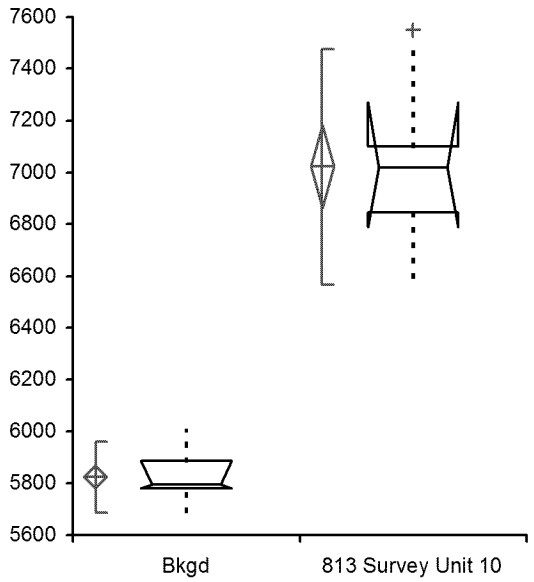
Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 10
Performed by	B Henderson
Date	5 January 2007

n 14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5825.0	88.3	23.59
813 Survey Unit 10	14	7021.5	275.8	73.72
Difference	14	-1196.5	278.4	74.41

Difference between means	-1196.5
95% CI	-1357.3 to -1035.7
t statistic	-16.08
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 10
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.2	83.45	20.24	5781.3 to 5867.1	5795.0	105.0	5780.0 to 5885.0
813 Survey Unit 10	14	7021.5	275.84	73.72	6862.2 to 7180.8	7019.0	254.3	6788.0 to 7272.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 11
1	5640	6241
2	5675	6412
3	5711	6336
4	5700	6683
5	5551	6638
6	5763	6511
7	5511	6736
8	5659	6373
9	5496	6594
10	5733	6669
11	5648	6529
12	5576	6625
13	5485	6555
14	5731	
15	5672	
16	5522	
17	5593	

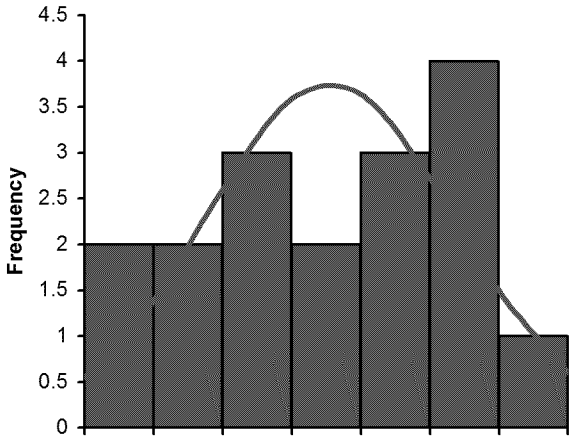
[ ] Bracketed measurements are considered outliers and were eliminated

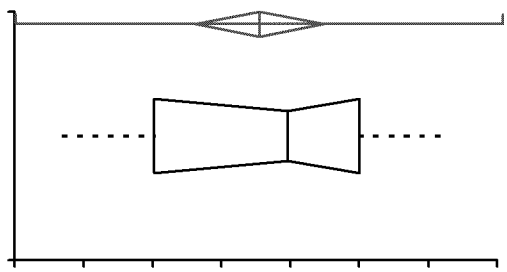
Parcel C, Building 258 , Reference Area - Gamma Measurements

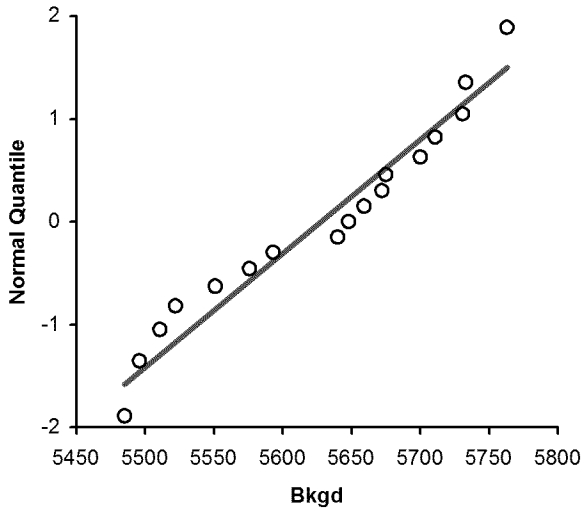
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

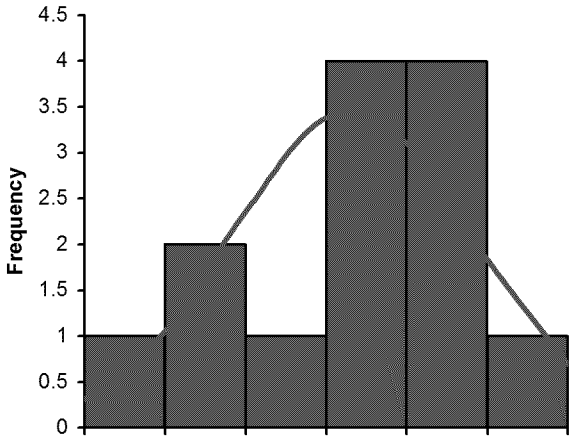
Building 813 Survey Unit 11 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/2/2006	11:30	6241	1	6241
2	6/2/2006	11:31	6412	1	6412
3	6/2/2006	11:32	6336	1	6336
4	6/2/2006	11:33	6683	1	6683
5	6/2/2006	11:34	6638	1	6638
6	6/2/2006	11:35	6511	1	6511
7	6/2/2006	11:36	6736	1	6736
8	6/2/2006	11:37	6373	1	6373
9	6/2/2006	11:38	6594	1	6594
10	6/2/2006	11:39	6669	1	6669
11	6/2/2006	11:40	6529	1	6529
12	6/2/2006	11:41	6625	1	6625
13	6/2/2006	11:42	6555	1	6555
		mean	**6531**	**mean**	**6530.92**
		std dev	**150.2**	**std dev**	**150.18**
		median	**6555**	**median**	**6555.00**

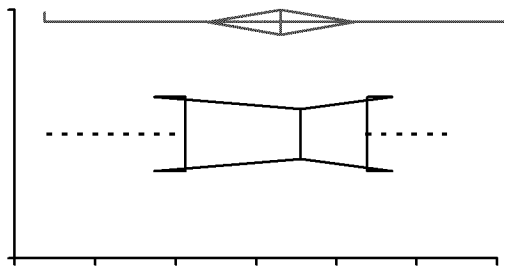
Bkgd + 3σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 11
Performed by	B Henderson
Date	5 January 2007

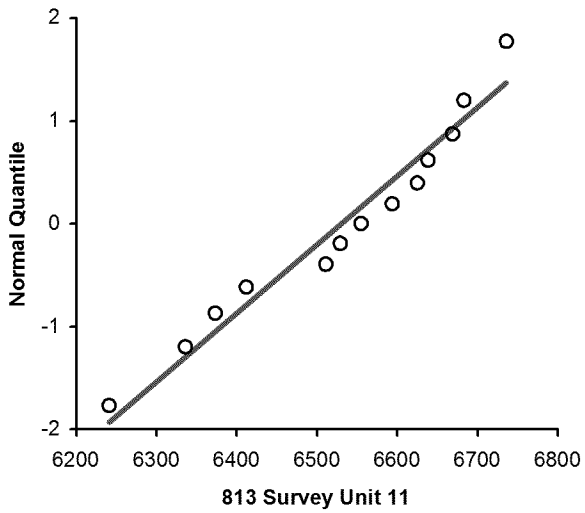


n	13 (cases excluded: 4 due to mis
Mean	6530.9
95% CI	6440.2 to 6621.7
Variance	22554.74
SD	150.18
SE	41.65
CV	2%



Median	6555.0
97.8% CI	6373.0 to 6669.0
Range	495
IQR	226

Percentile	
2.5th	-
25th	6412.0
50th	6555.0
75th	6638.0
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9483	0.5734
Skewness	-0.5903	0.3214
Kurtosis	-0.6141	-

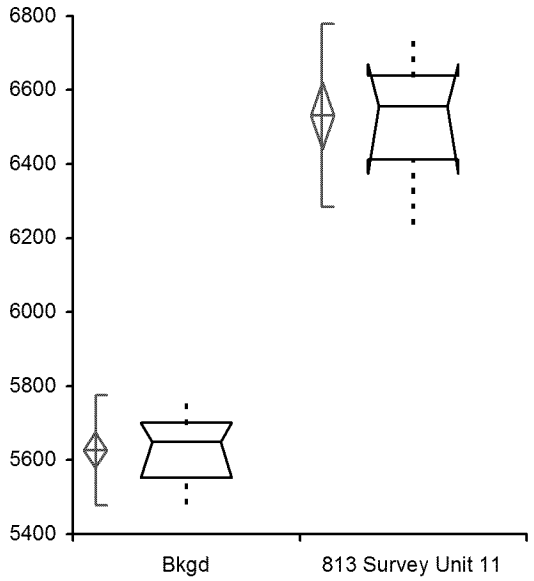
Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 11		
Performed by	B Henderson	**Date**	5 January 2007

n	13 (cases excluded: 4 due to missing values)

	n	Mean	SD	SE
Bkgd	13	5626.8	93.6	25.97
813 Survey Unit 11	13	6530.9	150.2	41.65
Difference	13	-904.2	201.8	55.96

Difference between means	-904.2
95% CI	-1026.1 to -782.2
t statistic	-16.16
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 11
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 11	13	6530.9	150.18	41.65	6440.2 to 6621.7	6555.0	226.0	6373.0 to 6669.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 12
1	5292	6041
2	5568	6190
3	5426	6316
4	5479	5958
5	5509	6068
6	5515	6195
7	5509	6316
8	5478	6091
9	5517	6204
10	5453	6091
11	5483	6320
12	5337	6096
13	5420	6348
14	5378	6615
15	5519	6248
16	5426	
17	5536	

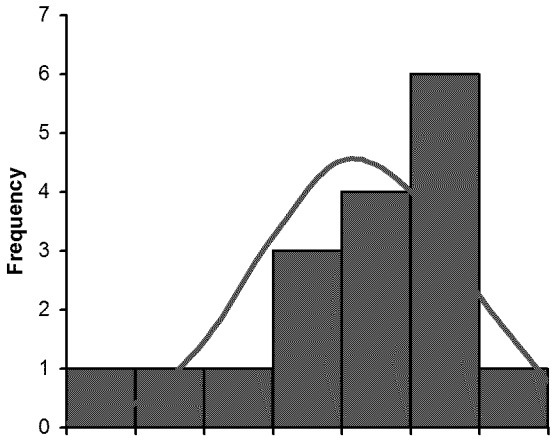
[ ] Bracketed measurements are considered outliers and were eliminated

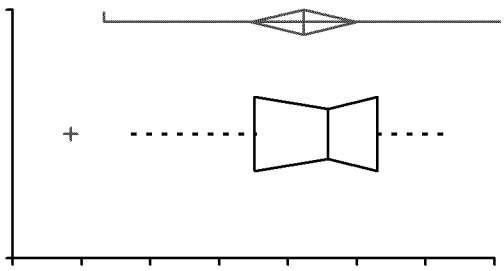
Parcel C, Building 258 , Reference Area - Gamma Measurements

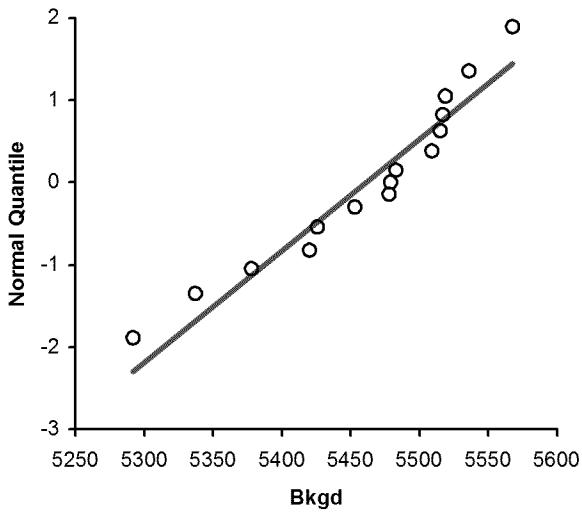
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:44	5292	1	5292
2	5/10/2006	9:48	5568	1	5568
3	5/10/2006	9:49	5426	1	5426
4	5/10/2006	9:50	5479	1	5479
5	5/10/2006	9:51	5509	1	5509
6	5/10/2006	9:53	5515	1	5515
7	5/10/2006	9:54	5509	1	5509
8	5/10/2006	9:55	5478	1	5478
9	5/10/2006	9:56	5517	1	5517
10	5/10/2006	9:57	5453	1	5453
11	5/10/2006	9:58	5483	1	5483
12	5/10/2006	9:59	5337	1	5337
13	5/10/2006	10:00	5420	1	5420
14	5/10/2006	10:02	5378	1	5378
15	5/10/2006	10:03	5519	1	5519
16	5/10/2006	10:04	5426	1	5426
17	5/10/2006	10:05	5536	1	5536
		mean	**5461**	**mean**	**5461.47**
		std dev	**73.8**	**std dev**	**73.83**
		median	**5479**	**median**	**5479.00**
				MDCR	**1329.80**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5461.5
95% CI	5423.5 to 5499.4
Variance	5450.76
SD	73.83
SE	17.91
CV	1%

Median	5479.0
95.1% CI	5426.0 to 5515.0
Range	276
IQR	89

Percentile	
2.5th	-
25th	5426.0
50th	5479.0
75th	5515.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9272	0.1951
Skewness	-0.9093	0.0961
Kurtosis	0.3843	-

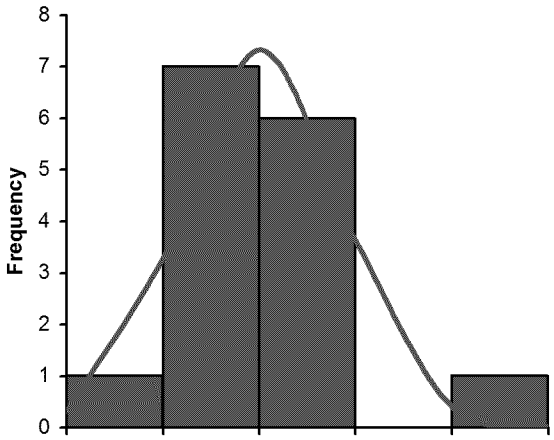
Building 813 Survey Unit 12 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/2/2006	10:00	6041	1	6041
2	6/2/2006	10:01	6190	1	6190
3	6/2/2006	10:02	6316	1	6316
4	6/2/2006	10:03	5958	1	5958
5	6/2/2006	10:04	6068	1	6068
6	6/2/2006	10:05	6195	1	6195
7	6/2/2006	10:06	6316	1	6316
8	6/2/2006	10:07	6091	1	6091
9	6/2/2006	10:08	6204	1	6204
10	6/2/2006	10:09	6091	1	6091
11	6/2/2006	10:10	6320	1	6320
12	6/2/2006	10:11	6096	1	6096
13	6/2/2006	10:12	6348	1	6348
14	6/2/2006	10:13	6615	1	6615
15	6/2/2006	10:14	6248	1	6248
		mean	**6206**	**mean**	**6206.47**
		std dev	**163.2**	**std dev**	**163.25**
		median	**6195**	**median**	**6195.00**

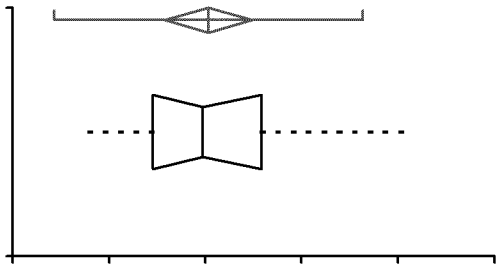
Bkgd + 3σ 5683

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 12
Performed by	B Henderson
Date	5 January 2007

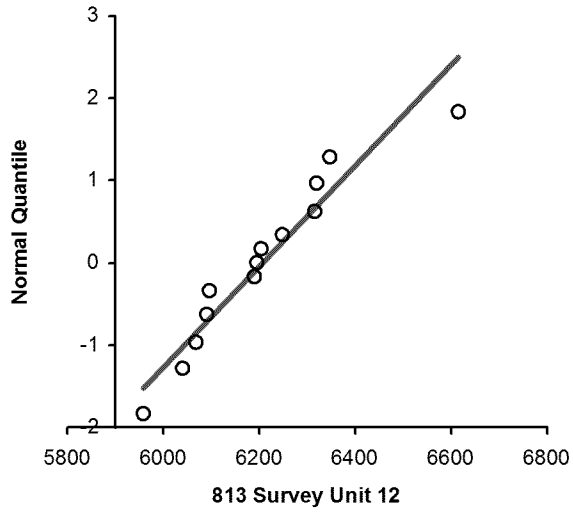


n	15 (cases excluded: 2 due to mis
Mean	6206.5
95% CI	6116.1 to 6296.9
Variance	26650.41
SD	163.25
SE	42.15
CV	3%



Median	6195.0
96.5% CI	6091.0 to 6316.0
Range	657
IQR	225

Percentile	
2.5th	-
25th	6091.0
50th	6195.0
75th	6316.0
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9312	0.2843
Skewness	0.9136	0.1117
Kurtosis	1.5140	-

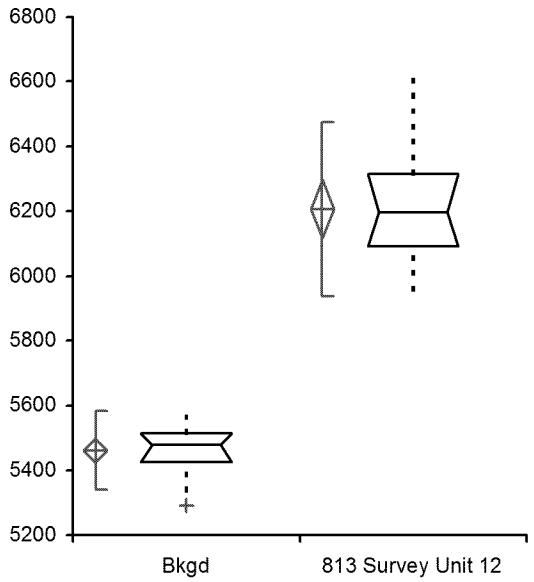
Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 12		
Performed by	B Henderson	**Date**	5 January 2007

n 15 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	15	5458.9	75.7	19.55
813 Survey Unit 12	15	6206.5	163.2	42.15
Difference	15	-747.6	182.5	47.12

Difference between means	-747.6
95% CI	-848.7 to -646.5
t statistic	-15.87
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 12
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5461.5	73.83	17.91	5423.5 to 5499.4	5479.0	89.0	5426.0 to 5515.0
813 Survey Unit 12	15	6206.5	163.25	42.15	6116.1 to 6296.9	6195.0	225.0	6091.0 to 6316.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 13
1	5640	6376
2	5675	6371
3	5711	6634
4	5700	6510
5	5551	6224
6	5763	6421
7	5511	6575
8	5659	6557
9	5496	6570
10	5733	6276
11	5648	6509
12	5576	6535
13	5485	6576
14	5731	6561
15	5672	6420
16	5522	
17	5593	

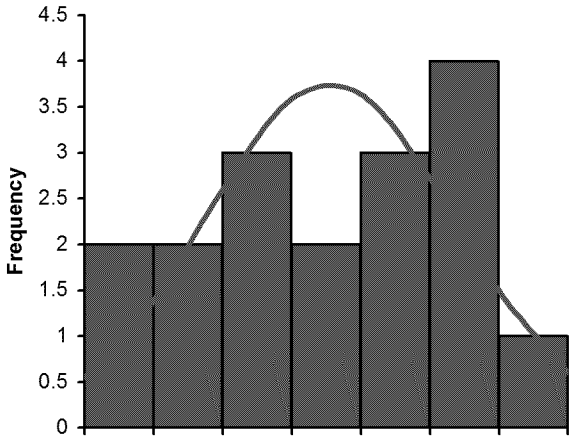
[ ] Bracketed measurements are considered outliers and were eliminated

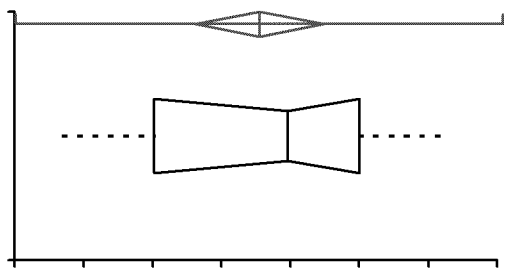
Parcel C, Building 258 , Reference Area - Gamma Measurements

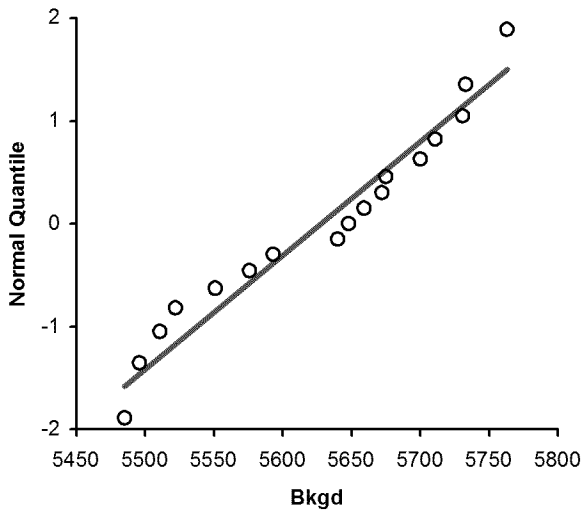
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

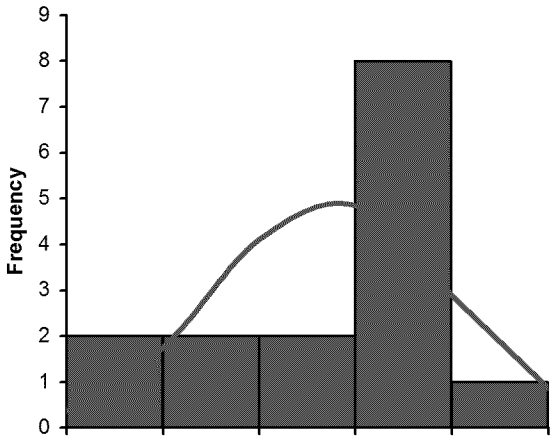
Building 813 Survey Unit 13 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/5/2006	10:00	6376	1	6376
2	6/5/2006	10:01	6371	1	6371
3	6/5/2006	10:02	6634	1	6634
4	6/5/2006	10:03	6510	1	6510
5	6/5/2006	10:04	6224	1	6224
6	6/5/2006	10:05	6421	1	6421
7	6/5/2006	10:06	6575	1	6575
8	6/5/2006	10:07	6557	1	6557
9	6/5/2006	10:08	6570	1	6570
10	6/5/2006	10:09	6276	1	6276
11	6/5/2006	10:10	6509	1	6509
12	6/5/2006	10:11	6535	1	6535
13	6/5/2006	10:12	6576	1	6576
14	6/5/2006	10:13	6561	1	6561
15	6/5/2006	10:14	6420	1	6420
		mean	**6474**	**mean**	**6474.33**
		std dev	**120.6**	**std dev**	**120.64**
		median	**6510**	**median**	**6510.00**

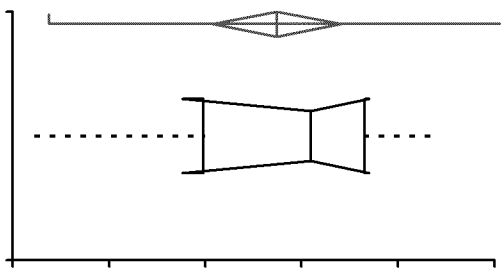
Bkgd + 3σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 13
Performed by	B Henderson
Date	5 January 2007

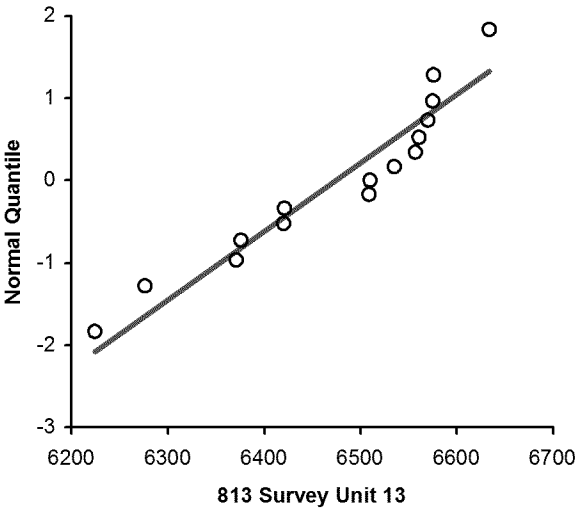


n	15	(cases excluded: 2 due to mis
Mean	6474.3	
95% CI	6407.5	to 6541.1
Variance	14554.38	
SD	120.64	
SE	31.15	
CV	2%	



Median	6510.0	
96.5% CI	6376.0	to 6570.0
Range	410	
IQR	168	

Percentile	
2.5th	-
25th	6398.0
50th	6510.0
75th	6565.5
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9069	0.1214
Skewness	-0.8126	0.1534
Kurtosis	-0.2615	-

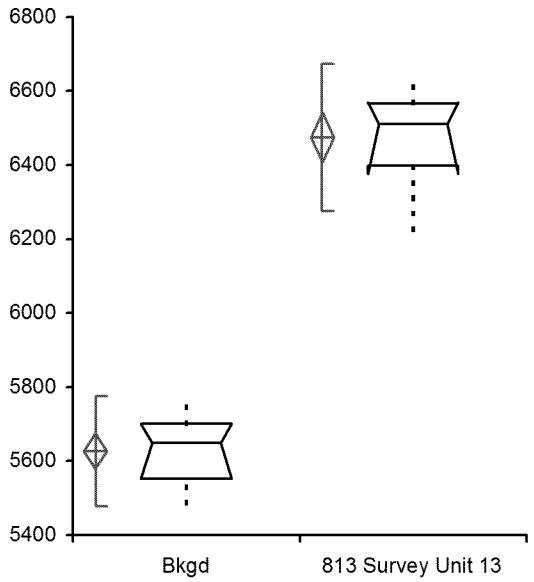
Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 13		
Performed by	B Henderson	**Date**	5 January 2007

n	15 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	15	5636.7	91.3	23.57
813 Survey Unit 13	15	6474.3	120.6	31.15
Difference	15	-837.6	165.4	42.70

Difference between means	-837.6
95% CI	-929.2 to -746.0
t statistic	-19.61
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 13
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 13	15	6474.3	120.64	31.15	6407.5 to 6541.1	6510.0	167.5	6376.0 to 6570.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 14
1	5640	6035
2	5675	6480
3	5711	6594
4	5700	6426
5	5551	6703
6	5763	6734
7	5511	6977
8	5659	6691
9	5496	6910
10	5733	6829
11	5648	6837
12	5576	7151
13	5485	6828
14	5731	6610
15	5672	
16	5522	
17	5593	

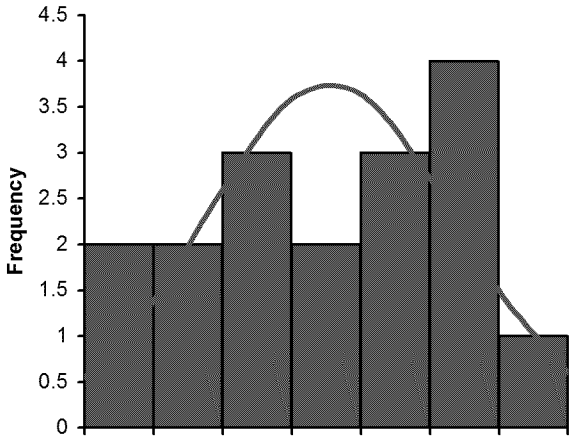
[ ] Bracketed measurements are considered outliers and were eliminated

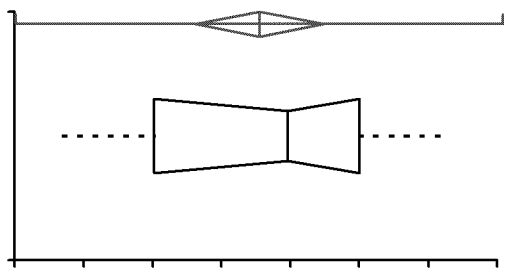
Parcel C, Building 258 , Reference Area - Gamma Measurements

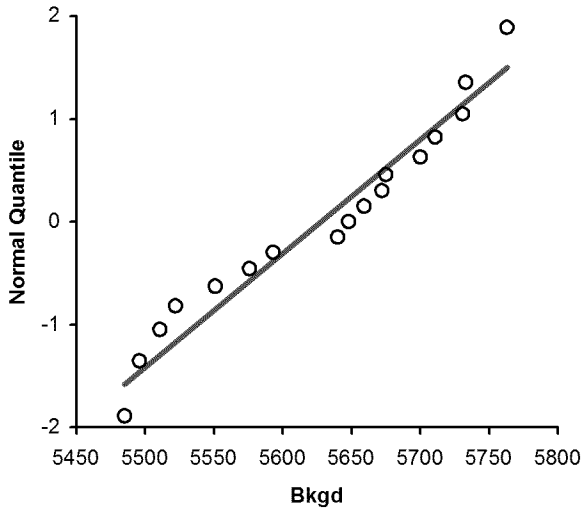
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

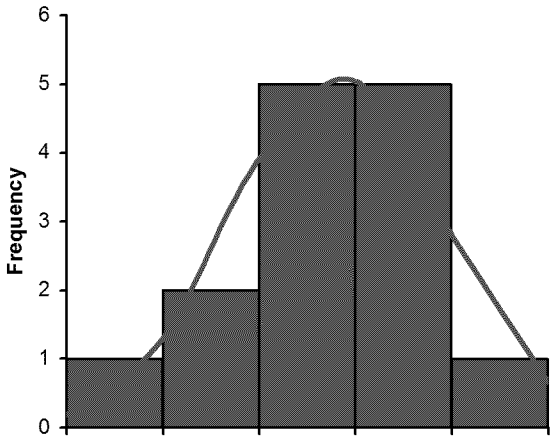
Building 813 Survey Unit 14 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/5/2006	12:50	6035	1	6035
2	6/5/2006	12:51	6480	1	6480
3	6/5/2006	12:52	6594	1	6594
4	6/5/2006	12:53	6426	1	6426
5	6/5/2006	12:54	6703	1	6703
6	6/5/2006	12:55	6734	1	6734
7	6/5/2006	12:56	6977	1	6977
8	6/5/2006	12:57	6691	1	6691
9	6/5/2006	12:58	6910	1	6910
10	6/5/2006	12:59	6829	1	6829
11	6/5/2006	13:00	6837	1	6837
12	6/5/2006	13:01	7151	1	7151
13	6/5/2006	13:02	6828	1	6828
14	6/5/2006	13:03	6610	1	6610
		mean	**6700**	**mean**	**6700.36**
		std dev	**272.1**	**std dev**	**272.07**
		median	**6719**	**median**	**6718.50**

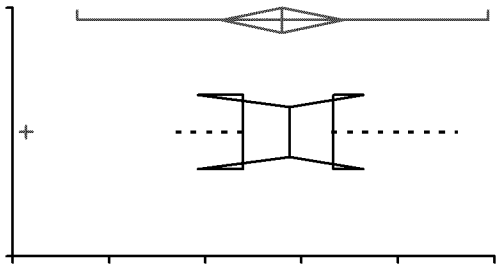
Bkgd +32σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 14
Performed by	B Henderson
Date	5 January 2007

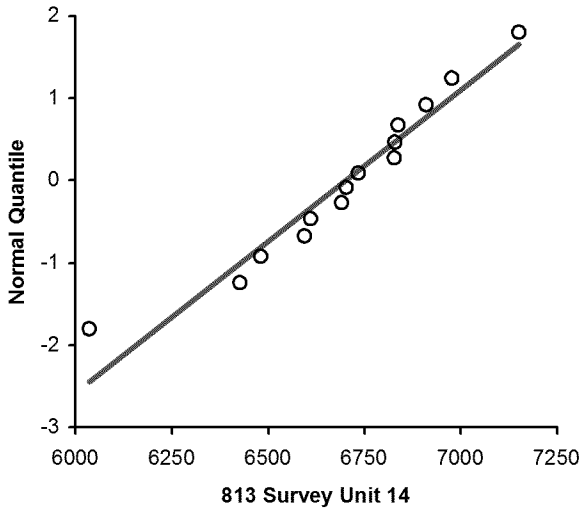


n	14 (cases excluded: 3 due to mis
Mean	6700.4
95% CI	6543.3 to 6857.4
Variance	74023.48
SD	272.07
SE	72.71
CV	4%



Median	6718.5
98.7% CI	6480.0 to 6910.0
Range	1116
IQR	233

Percentile	
2.5th	-
25th	6598.0
50th	6718.5
75th	6831.0
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9501	0.5624
Skewness	-0.8874	0.1319
Kurtosis	1.8346	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 14
Performed by	B Henderson
Date	5 January 2007

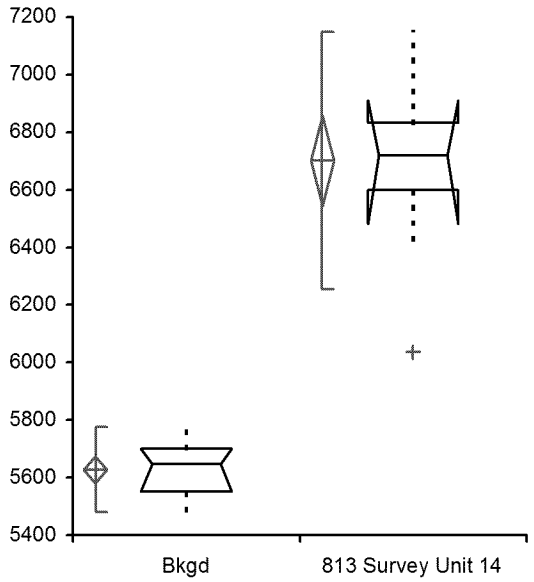
n	14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5634.2	94.2	25.17
813 Survey Unit 14	14	6700.4	272.1	72.71
Difference	14	-1066.1	322.6	86.22

Difference between means	-1066.1
95% CI	-1252.4 to -879.9

t statistic	-12.37
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 14
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 14	14	6700.4	272.07	72.71	6543.3 to 6857.4	6718.5	233.0	6480.0 to 6910.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 15
1	5783	6296
2	5769	6323
3	5698	6342
4	5780	6218
5	5935	6364
6	5885	6414
7	5869	6558
8	5692	6627
9	5783	6761
10	5880	6623
11	5781	6479
12	5805	6176
13	6004	6473
14	5886	6350
15	5766	
16	5901	
17	5795	

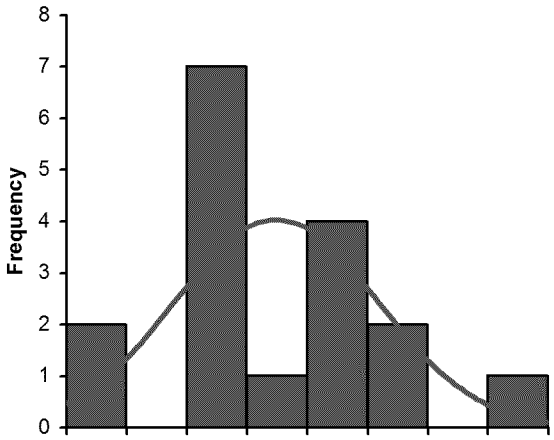
[ ] Bracketed measurements are considered outliers and were eliminated

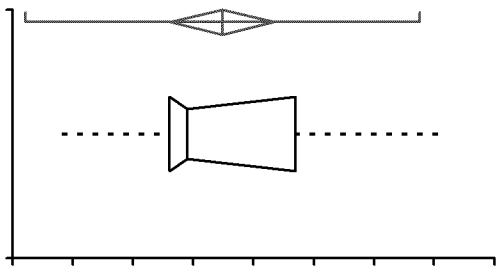
Parcel C, Building 258 , Reference Area - Gamma Measurements

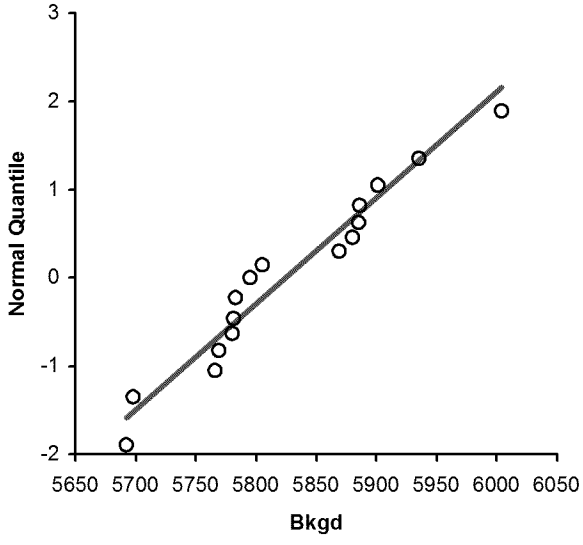
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5783	1	5783
2	5/10/2006	9:01	5769	1	5769
3	5/10/2006	9:02	5698	1	5698
4	5/10/2006	9:03	5780	1	5780
5	5/10/2006	9:04	5935	1	5935
6	5/10/2006	9:05	5885	1	5885
7	5/10/2006	9:06	5869	1	5869
8	5/10/2006	9:07	5692	1	5692
9	5/10/2006	9:08	5783	1	5783
10	5/10/2006	9:09	5880	1	5880
11	5/10/2006	9:10	5781	1	5781
12	5/10/2006	9:11	5805	1	5805
13	5/10/2006	9:12	6004	1	6004
14	5/10/2006	9:13	5886	1	5886
15	5/10/2006	9:14	5766	1	5766
16	5/10/2006	9:15	5901	1	5901
17	5/10/2006	9:16	5795	1	5795
		mean	**5824**	**mean**	**5824.24**
		std dev	**83.4**	**std dev**	**83.45**
		median	**5795**	**median**	**5795.00**
				MDCR	**1367.61**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.2
95% CI	5781.3 to 5867.1
Variance	6963.32
SD	83.45
SE	20.24
CV	1%

Median	5795.0
95.1% CI	5780.0 to 5885.0
Range	312
IQR	105

Percentile	
2.5th	-
25th	5780.0
50th	5795.0
75th	5885.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9432	0.3577
Skewness	0.4040	0.4409
Kurtosis	-0.1526	-

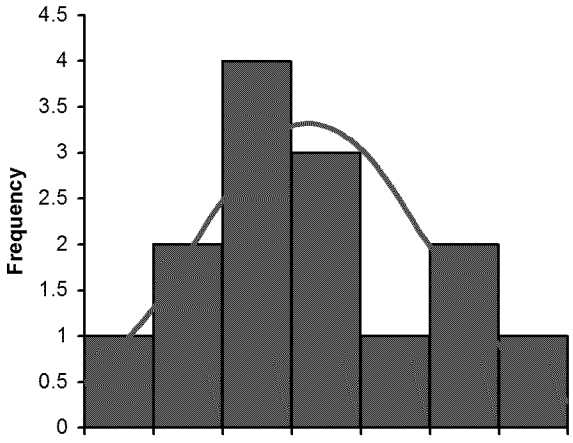
Building 813 Survey Unit 15 - Gamma Measurements

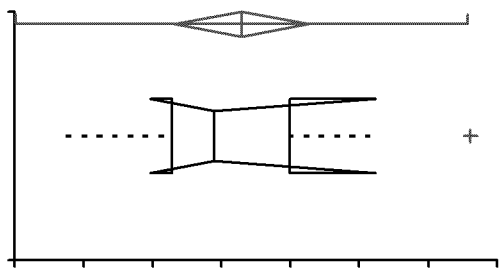
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/31/2006	15:00	6296	1	6296
2	5/31/2006	15:01	6323	1	6323
3	5/31/2006	15:02	6342	1	6342
4	5/31/2006	15:03	6218	1	6218
5	5/31/2006	15:04	6364	1	6364
6	5/31/2006	15:05	6414	1	6414
7	5/31/2006	15:06	6558	1	6558
8	5/31/2006	15:07	6627	1	6627
9	5/31/2006	15:08	6761	1	6761
10	5/31/2006	15:09	6623	1	6623
11	5/31/2006	15:10	6479	1	6479
12	5/31/2006	15:11	6176	1	6176
13	5/31/2006	15:12	6473	1	6473
14	5/31/2006	15:13	6350	1	6350
		mean	**6429**	**mean**	**6428.86**
		std dev	**167.3**	**std dev**	**167.30**
		median	**6389**	**median**	**6389.00**

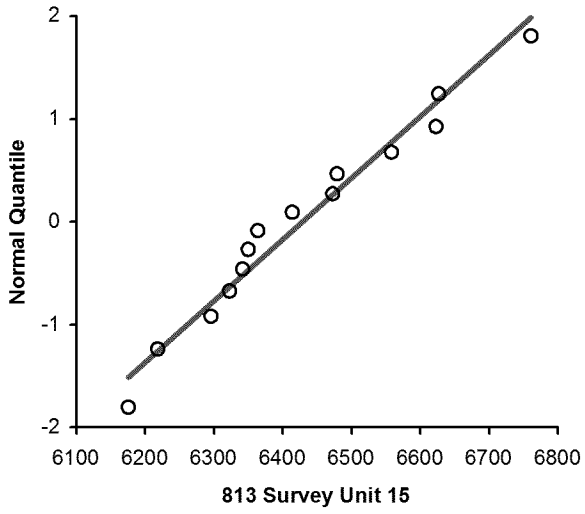
Bkgd + 3σ 6075

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 15
Performed by	B Henderson
Date	5 January 2007







n	14 (cases excluded: 3 due to mis
Mean	6428.9
95% CI	6332.3 to 6525.5
Variance	27988.90
SD	167.30
SE	44.71
CV	3%
Median	6389.0
98.7% CI	6296.0 to 6623.0
Range	585
IQR	171

Percentile	
2.5th	-
25th	6327.8
50th	6389.0
75th	6498.8
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9657	0.8150
Skewness	0.4525	0.4291
Kurtosis	-0.3985	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 15
Performed by	B Henderson
Date	5 January 2007

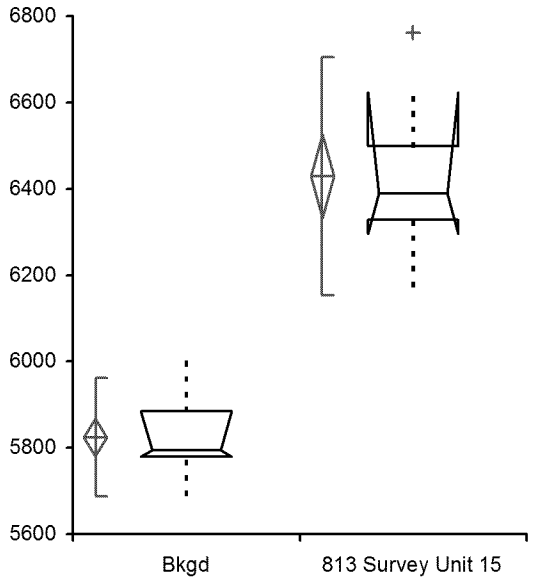
n	14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5825.0	88.3	23.59
813 Survey Unit 15	14	6428.9	167.3	44.71
Difference	14	-603.9	186.7	49.90

Difference between means	-603.9
95% CI	-711.7 to -496.1

t statistic	-12.10
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 15
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.2	83.45	20.24	5781.3 to 5867.1	5795.0	105.0	5780.0 to 5885.0
813 Survey Unit 15	14	6428.9	167.30	44.71	6332.3 to 6525.5	6389.0	171.0	6296.0 to 6623.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 16
1	5783	7384
2	5769	7493
3	5698	7612
4	5780	7808
5	5935	7506
6	5885	7261
7	5869	7255
8	5692	7485
9	5783	7445
10	5880	7248
11	5781	6924
12	5805	7221
13	6004	7355
14	5886	7301
15	5766	7180
16	5901	
17	5795	

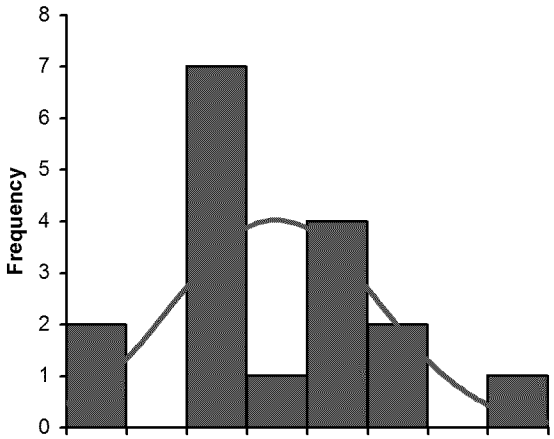
[ ] Bracketed measurements are considered outliers and were eliminated

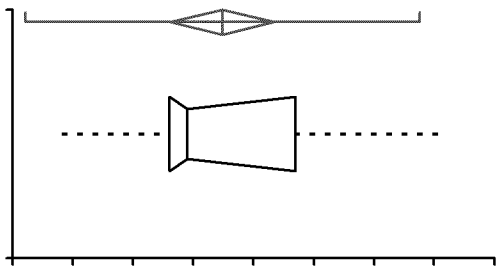
Parcel C, Building 258 , Reference Area - Gamma Measurements

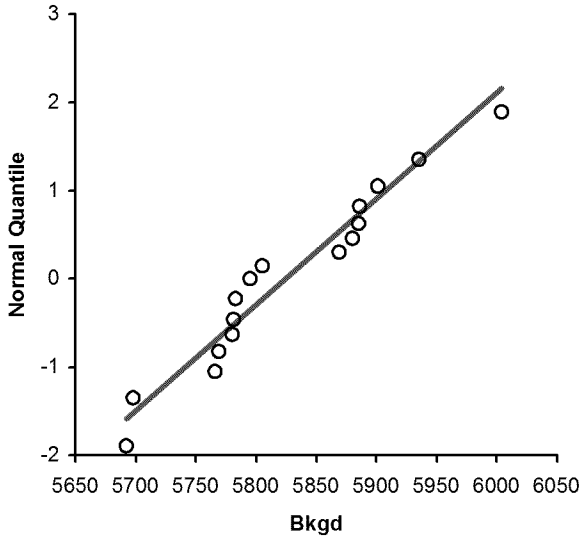
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5783	1	5783
2	5/10/2006	9:01	5769	1	5769
3	5/10/2006	9:02	5698	1	5698
4	5/10/2006	9:03	5780	1	5780
5	5/10/2006	9:04	5935	1	5935
6	5/10/2006	9:05	5885	1	5885
7	5/10/2006	9:06	5869	1	5869
8	5/10/2006	9:07	5692	1	5692
9	5/10/2006	9:08	5783	1	5783
10	5/10/2006	9:09	5880	1	5880
11	5/10/2006	9:10	5781	1	5781
12	5/10/2006	9:11	5805	1	5805
13	5/10/2006	9:12	6004	1	6004
14	5/10/2006	9:13	5886	1	5886
15	5/10/2006	9:14	5766	1	5766
16	5/10/2006	9:15	5901	1	5901
17	5/10/2006	9:16	5795	1	5795
		mean	**5824**	**mean**	**5824.24**
		std dev	**83.4**	**std dev**	**83.45**
		median	**5795**	**median**	**5795.00**
				MDCR	**1367.61**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.2
95% CI	5781.3 to 5867.1
Variance	6963.32
SD	83.45
SE	20.24
CV	1%

Median	5795.0
95.1% CI	5780.0 to 5885.0
Range	312
IQR	105

Percentile	
2.5th	-
25th	5780.0
50th	5795.0
75th	5885.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9432	0.3577
Skewness	0.4040	0.4409
Kurtosis	-0.1526	-

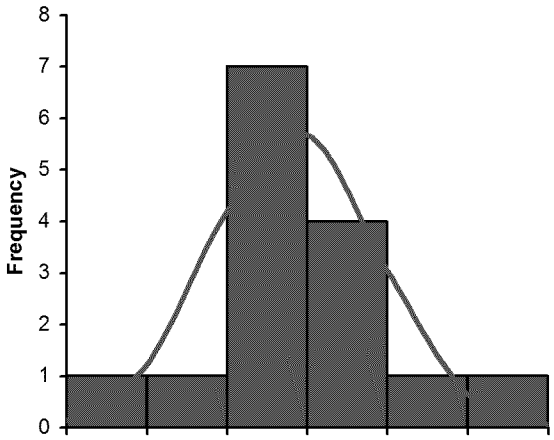
Building 813 Survey Unit 16 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/31/2006	13:00	7384	1	7384
2	5/31/2006	13:01	7493	1	7493
3	5/31/2006	13:02	7612	1	7612
4	5/31/2006	13:03	7808	1	7808
5	5/31/2006	13:04	7506	1	7506
6	5/31/2006	13:05	7261	1	7261
7	5/31/2006	13:06	7255	1	7255
8	5/31/2006	13:07	7485	1	7485
9	5/31/2006	13:08	7445	1	7445
10	5/31/2006	13:09	7248	1	7248
11	5/31/2006	13:10	6924	1	6924
12	5/31/2006	13:11	7221	1	7221
13	5/31/2006	13:12	7355	1	7355
14	5/31/2006	13:13	7301	1	7301
15	5/31/2006	13:14	7180	1	7180
		mean	**7365**	**mean**	**7365.20**
		std dev	**207.9**	**std dev**	**207.87**
		median	**7355**	**median**	**7355.00**

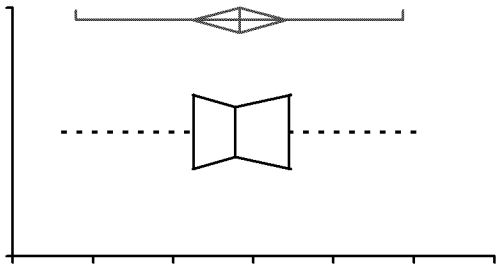
Bkgd + 3σ 6075

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 16
Performed by	B Henderson
Date	5 January 2007

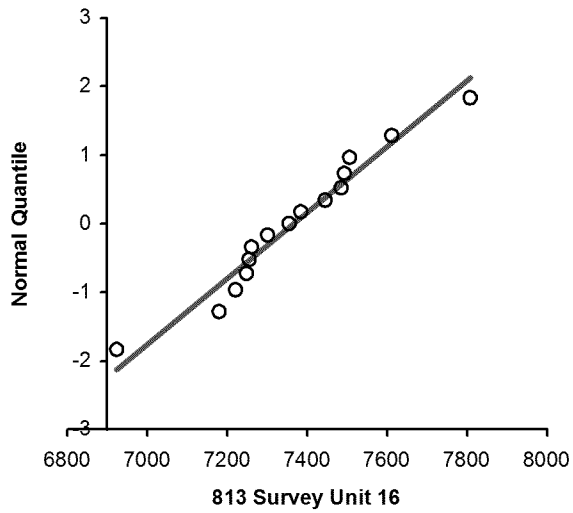


n	15 (cases excluded: 2 due to mis
Mean	7365.2
95% CI	7250.1 to 7480.3
Variance	43209.03
SD	207.87
SE	53.67
CV	3%



Median	7355.0
96.5% CI	7248.0 to 7493.0
Range	884
IQR	238

Percentile	
2.5th	-
25th	7251.5
50th	7355.0
75th	7489.0
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9704	0.8638
Skewness	0.0861	0.8752
Kurtosis	1.1179	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 16
Performed by	B Henderson
Date	5 January 2007

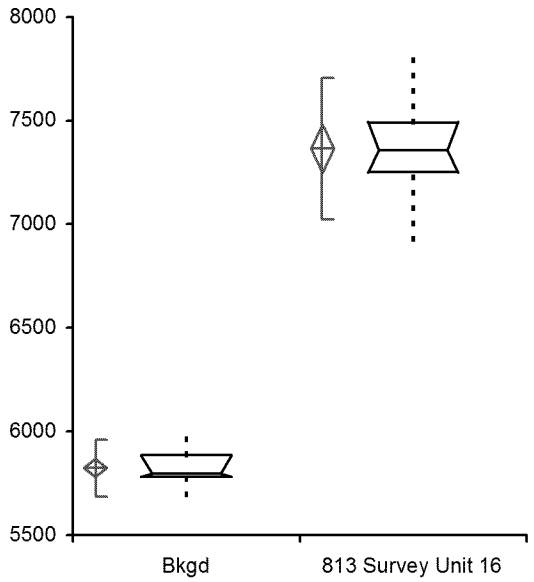
n	15 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	15	5821.1	86.4	22.31
813 Survey Unit 16	15	7365.2	207.9	53.67
Difference	15	-1544.1	241.4	62.32

Difference between means	-1544.1
95% CI	-1677.8 to -1410.5

t statistic	-24.78
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 16
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.2	83.45	20.24	5781.3 to 5867.1	5795.0	105.0	5780.0 to 5885.0
813 Survey Unit 16	15	7365.2	207.87	53.67	7250.1 to 7480.3	7355.0	237.5	7248.0 to 7493.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 17
1	5640	7829
2	5675	8061
3	5711	8299
4	5700	8133
5	5551	7649
6	5763	7881
7	5511	8441
8	5659	7752
9	5496	7536
10	5733	8047
11	5648	8175
12	5576	8123
13	5485	6998
14	5731	6537
15	5672	
16	5522	
17	5593	

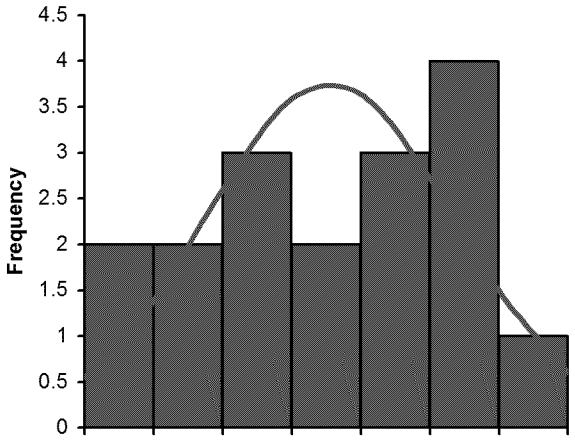
[ ] Bracketed measurements are considered outliers and were eliminated

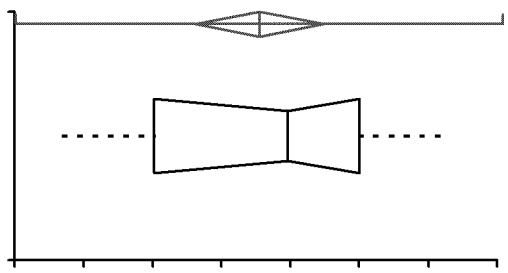
Parcel C, Building 258 , Reference Area - Gamma Measurements

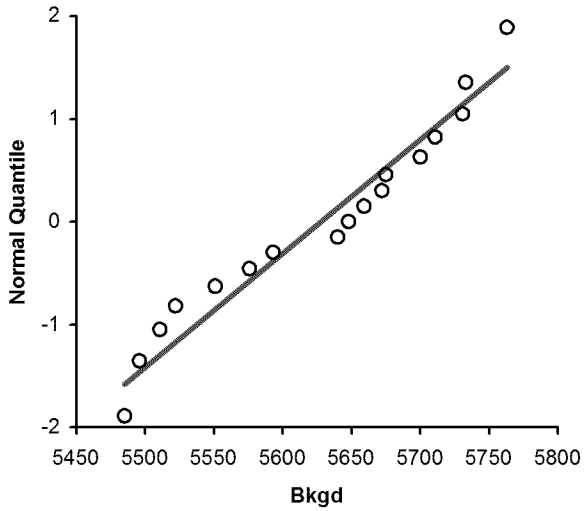
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

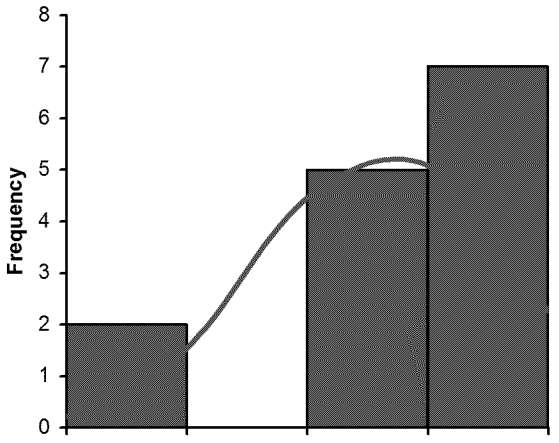
Building 813 Survey Unit 17 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/12/2006	13:20	7829	1	7829
2	6/12/2006	13:21	8061	1	8061
3	6/12/2006	13:22	8299	1	8299
4	6/12/2006	13:23	8133	1	8133
5	6/12/2006	13:24	7649	1	7649
6	6/12/2006	13:25	7881	1	7881
7	6/12/2006	13:26	8441	1	8441
8	6/12/2006	13:27	7752	1	7752
9	6/12/2006	13:28	7536	1	7536
10	6/12/2006	13:29	8047	1	8047
11	6/12/2006	13:30	8175	1	8175
12	6/12/2006	13:31	8123	1	8123
13	6/12/2006	13:32	6998	1	6998
14	6/12/2006	13:33	6537	1	6537
		mean	**7819**	**mean**	**7818.64**
		std dev	**517.4**	**std dev**	**517.43**
		median	**7964**	**median**	**7964.00**

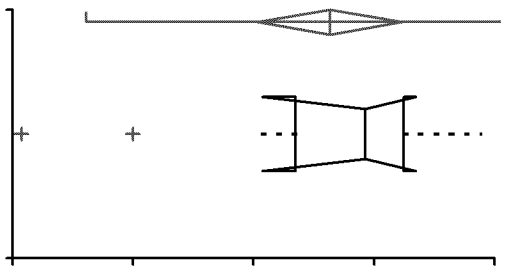
Bkgd + 3σ 5898

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 17
Performed by	B Henderson
Date	5 January 2007

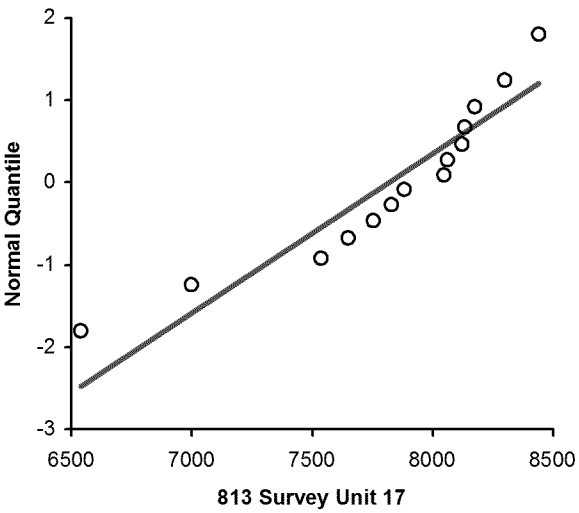


n	14	(cases excluded: 3 due to mis
Mean	7818.6	
95% CI	7519.9	to 8117.4
Variance	267735.79	
SD	517.43	
SE	138.29	
CV	7%	



Median	7964.0	
98.7% CI	7536.0	to 8175.0
Range	1904	
IQR	451	

Percentile	
2.5th	-
25th	7674.8
50th	7964.0
75th	8125.5
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.8726	0.0457
Skewness	-1.4270	0.0214
Kurtosis	1.9685	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 17
Performed by	B Henderson
Date	5 January 2007

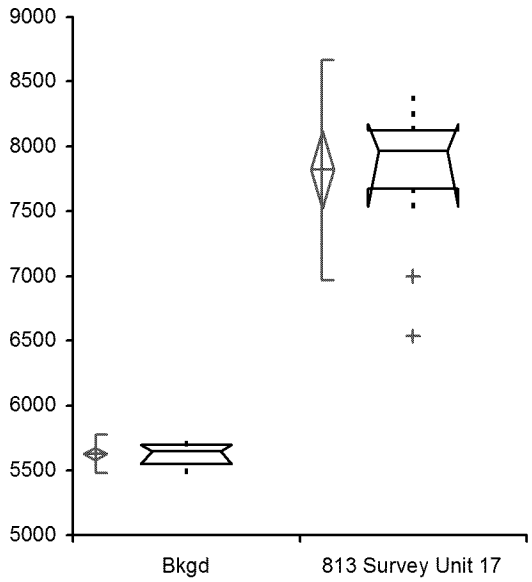
n	14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5634.2	94.2	25.17
813 Survey Unit 17	14	7818.6	517.4	138.29
Difference	14	-2184.4	517.3	138.25

Difference between means	-2184.4
95% CI	-2483.1 to -1885.7

t statistic	-15.80
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 17
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 17	14	7818.6	517.43	138.29	7519.9 to 8117.4	7964.0	450.8	7536.0 to 8175.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 19
1	8607	7642
2	8691	7519
3	8763	8162
4	8645	8200
5	8740	8361
6	8707	7686
7	8771	7865
8	8611	8004
9	8591	7912
10	8693	8601
11	8591	8314
12	8657	8689
13	8615	7912
14	8691	
15	8575	
16	8501	
17	8637	

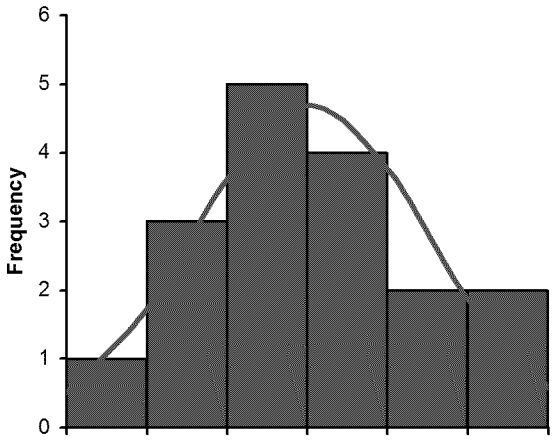
[ ] Bracketed measurements are considered outliers and were eliminated

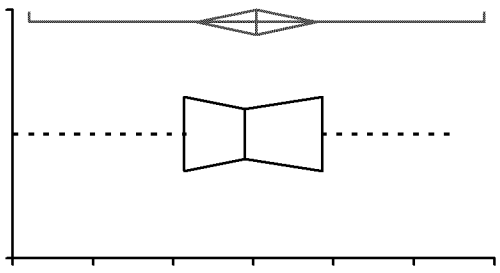
Parcel C, Building 258 , Reference Area - Gamma Measurements

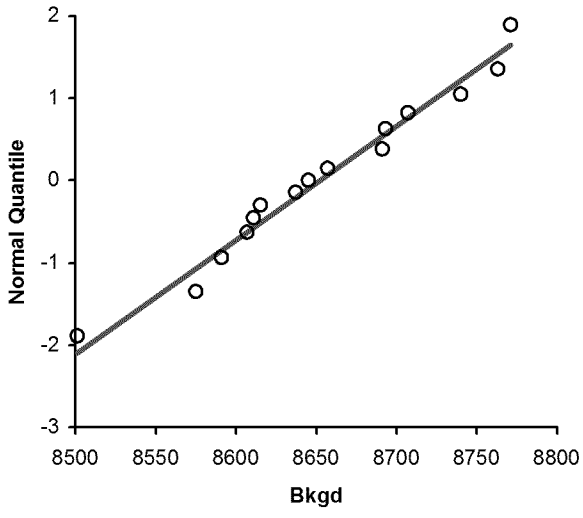
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	10:06	8607	1	8607
2	5/10/2006	10:07	8691	1	8691
3	5/10/2006	10:08	8763	1	8763
4	5/10/2006	10:09	8645	1	8645
5	5/10/2006	10:10	8740	1	8740
6	5/10/2006	10:11	8707	1	8707
7	5/10/2006	10:12	8771	1	8771
8	5/10/2006	10:13	8611	1	8611
9	5/10/2006	10:14	8591	1	8591
10	5/10/2006	10:15	8693	1	8693
11	5/10/2006	10:16	8591	1	8591
12	5/10/2006	10:17	8657	1	8657
13	5/10/2006	10:18	8615	1	8615
14	5/10/2006	10:19	8691	1	8691
15	5/10/2006	10:20	8575	1	8575
16	5/10/2006	10:21	8501	1	8501
17	5/10/2006	10:22	8637	1	8637
		mean	**8652**	**mean**	**8652.12**
		std dev	**72.2**	**std dev**	**72.25**
		median	**8645**	**median**	**8645.00**
				MDCR	**1670.39**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	8652.1
95% CI	8615.0 to 8689.3
Variance	5219.99
SD	72.25
SE	17.52
CV	1%

Median	8645.0
95.1% CI	8607.0 to 8693.0
Range	270
IQR	86

Percentile	
2.5th	-
25th	8607.0
50th	8645.0
75th	8693.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9710	0.8358
Skewness	-0.0956	0.8537
Kurtosis	-0.2456	-

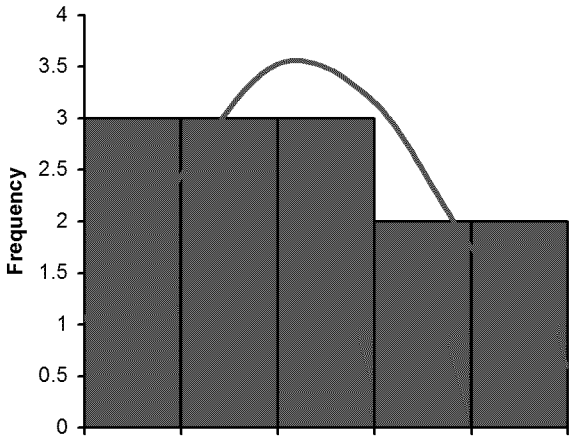
Building 813 Survey Unit 19 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/12/2006	14:00	7642	1	7642
2	6/12/2006	14:01	7519	1	7519
3	6/12/2006	14:02	8162	1	8162
4	6/12/2006	14:03	8200	1	8200
5	6/12/2006	14:04	8361	1	8361
6	6/12/2006	14:05	7686	1	7686
7	6/12/2006	14:06	7865	1	7865
8	6/12/2006	14:07	8004	1	8004
9	6/12/2006	14:08	7912	1	7912
10	6/12/2006	14:09	8601	1	8601
11	6/12/2006	14:10	8314	1	8314
12	6/12/2006	14:11	8689	1	8689
13	6/12/2006	14:12	7912	1	7912
		mean	**8067**	**mean**	**8066.69**
		std dev	**361.1**	**std dev**	**361.15**
		median	**8004**	**median**	**8004.00**

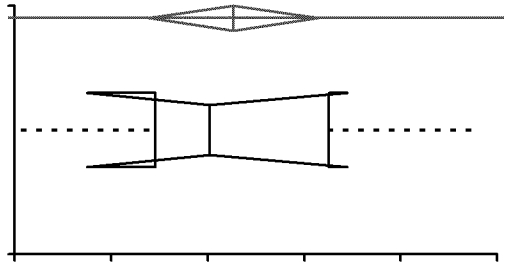
Bkgd + 3σ 8869

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 19
Performed by	B Henderson
Date	5 January 2007

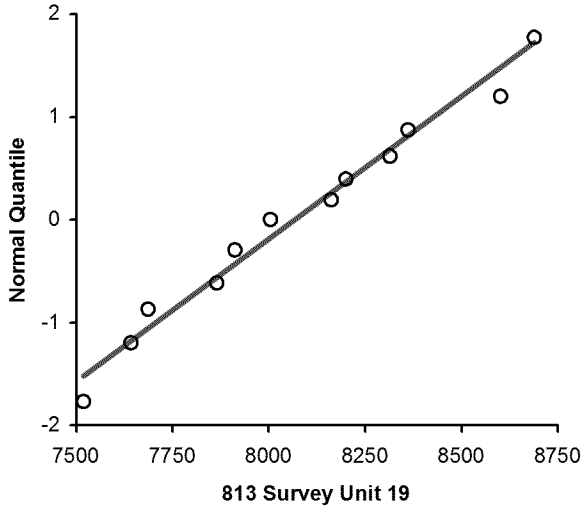


n	13 (cases excluded: 4 due to mis
Mean	8066.7
95% CI	7848.5 to 8284.9
Variance	130425.90
SD	361.15
SE	100.16
CV	4%



Median	8004.0
97.8% CI	7686.0 to 8361.0
Range	1170
IQR	449

Percentile	
2.5th	-
25th	7865.0
50th	8004.0
75th	8314.0
97.5th	-



	Coefficient	**p**
Shapiro-Wilk	0.9673	0.8603
Skewness	0.2623	0.6552
Kurtosis	-0.7707	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 19
Performed by	B Henderson
Date	5 January 2007

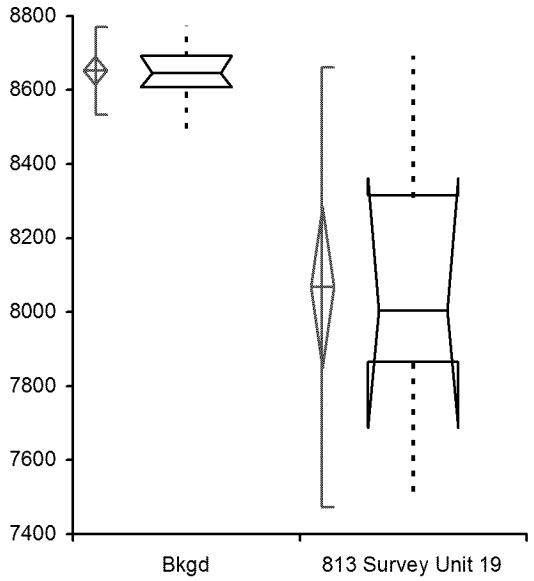
n	13 (cases excluded: 4 due to missing values)

	n	Mean	SD	SE
Bkgd	13	8667.8	64.4	17.86
813 Survey Unit 19	13	8066.7	361.1	100.16
Difference	13	601.2	363.2	100.73

Difference between means	601.2
95% CI	381.7 to 820.6

t statistic	5.97
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 19
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	8652.1	72.25	17.52	8615.0 to 8689.3	8645.0	86.0	8607.0 to 8693.0
813 Survey Unit 19	13	8066.7	361.15	100.16	7848.5 to 8284.9	8004.0	449.0	7686.0 to 8361.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 20
1	5851	5959
2	5994	6167
3	5792	6376
4	5863	6479
5	5859	6594
6	5778	6310
7	5777	6553
8	5880	6405
9	5872	6776
10	5792	6901
11	5754	6391
12	5827	6348
13	5886	6777
14	5726	6906
15	5864	7158
16	5804	
17	5696	

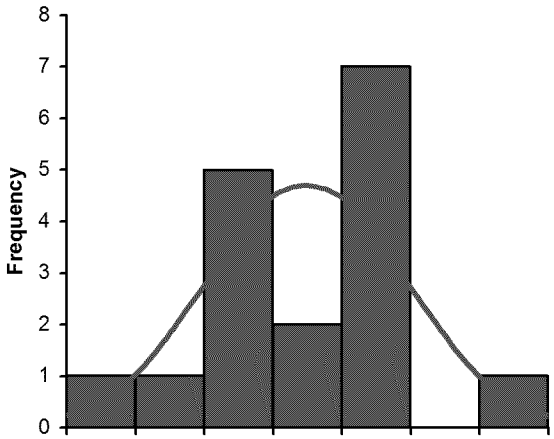
[ ] Bracketed measurements are considered outliers and were eliminated

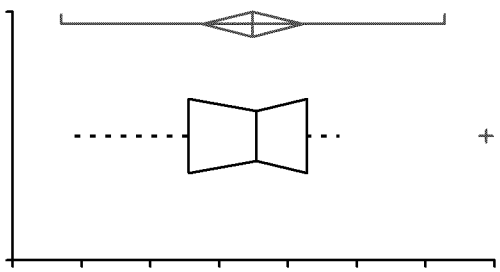
Parcel C, Building 258 , Reference Area - Gamma Measurements

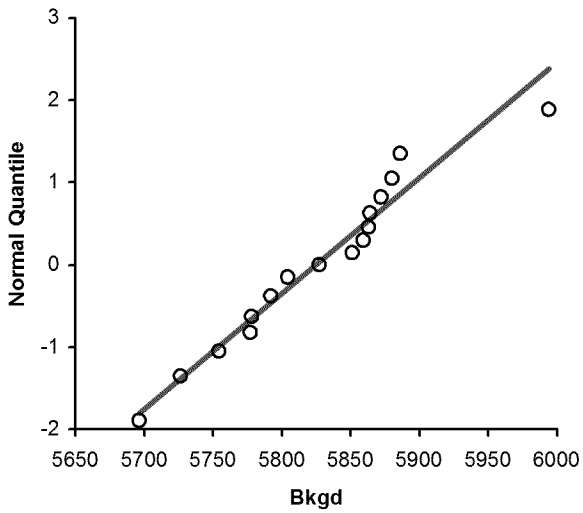
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	10:30	5851	1	5851
2	5/10/2006	10:31	5994	1	5994
3	5/10/2006	10:32	5792	1	5792
4	5/10/2006	10:33	5863	1	5863
5	5/10/2006	10:34	5859	1	5859
6	5/10/2006	10:35	5778	1	5778
7	5/10/2006	10:36	5777	1	5777
8	5/10/2006	10:37	5880	1	5880
9	5/10/2006	10:38	5872	1	5872
10	5/10/2006	10:39	5792	1	5792
11	5/10/2006	10:40	5754	1	5754
12	5/10/2006	10:41	5827	1	5827
13	5/10/2006	10:42	5886	1	5886
14	5/10/2006	10:43	5726	1	5726
15	5/10/2006	10:44	5864	1	5864
16	5/10/2006	10:45	5804	1	5804
17	5/10/2006	10:46	5696	1	5696
		mean	**5824**	**mean**	**5824.41**
		std dev	**71.1**	**std dev**	**71.12**
		median	**5827**	**median**	**5827.00**
				MDCR	**1371.38**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.4
95% CI	5787.8 to 5861.0
Variance	5057.88
SD	71.12
SE	17.25
CV	1%

Median	5827.0
95.1% CI	5778.0 to 5864.0
Range	298
IQR	86

Percentile	
2.5th	-
25th	5778.0
50th	5827.0
75th	5864.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9607	0.6447
Skewness	0.3677	0.4821
Kurtosis	0.8468	-

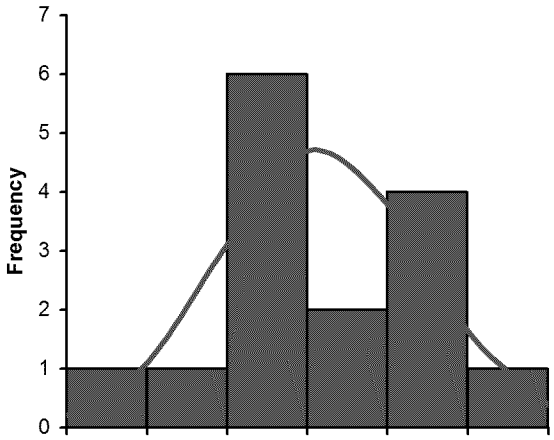
Building 813 Survey Unit 20 - Gamma Measurements

Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/31/2006	12:45	5959	1	5959
2	5/31/2006	12:46	6167	1	6167
3	5/31/2006	12:47	6376	1	6376
4	5/31/2006	12:48	6479	1	6479
5	5/31/2006	12:49	6594	1	6594
6	5/31/2006	12:50	6310	1	6310
7	5/31/2006	12:51	6553	1	6553
8	5/31/2006	12:52	6405	1	6405
9	5/31/2006	12:53	6776	1	6776
10	5/31/2006	12:54	6901	1	6901
11	5/31/2006	12:55	6391	1	6391
12	5/31/2006	12:56	6348	1	6348
13	5/31/2006	12:57	6777	1	6777
14	5/31/2006	12:58	6906	1	6906
15	5/31/2006	12:59	7158	1	7158
		mean	**6540**	**mean**	**6540.00**
		std dev	**316.1**	**std dev**	**316.08**
		median	**6479**	**median**	**6479.00**

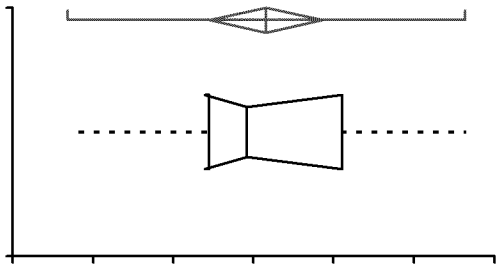
Bkgd + 3σ 6038

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 20
Performed by	B Henderson
Date	5 January 2007

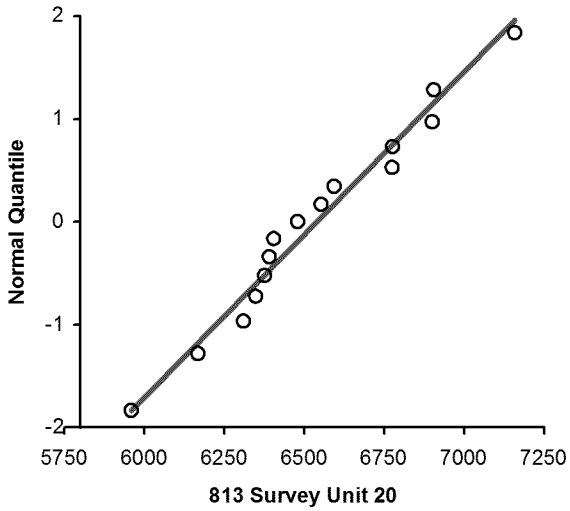


n	15 (cases excluded: 2 due to mis
Mean	6540.0
95% CI	6365.0 to 6715.0
Variance	99903.43
SD	316.08
SE	81.61
CV	5%



Median	6479.0
96.5% CI	6348.0 to 6777.0
Range	1199
IQR	415

Percentile	
2.5th	-
25th	6362.0
50th	6479.0
75th	6776.5
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.9758	0.9330
Skewness	0.2115	0.7005
Kurtosis	-0.1790	-

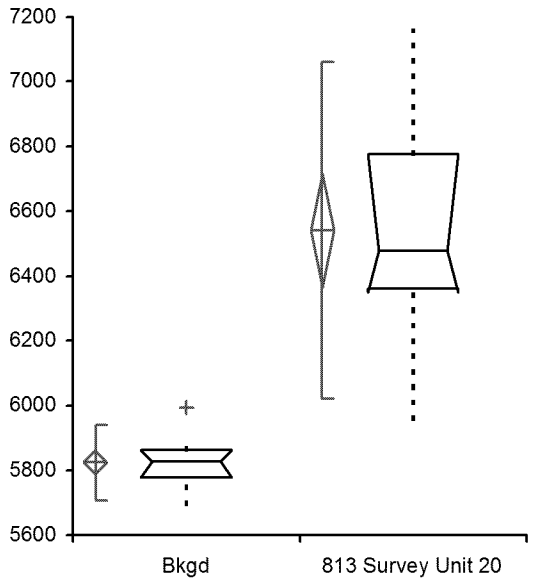
Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 20		
Performed by	B Henderson	**Date**	5 January 2007

n 15 (cases excluded: 2 due to missing values)

	n	Mean	SD	SE
Bkgd	15	5834.3	66.8	17.26
813 Survey Unit 20	15	6540.0	316.1	81.61
Difference	15	-705.7	335.8	86.70

Difference between means	-705.7
95% CI	-891.6 to -519.7
t statistic	-8.14
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 20
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.4	71.12	17.25	5787.8 to 5861.0	5827.0	86.0	5778.0 to 5864.0
813 Survey Unit 20	15	6540.0	316.08	81.61	6365.0 to 6715.0	6479.0	414.5	6348.0 to 6777.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 21
1	5851	6025
2	5994	6184
3	5792	6986
4	5863	6730
5	5859	6768
6	5778	6504
7	5777	6627
8	5880	6838
9	5872	6418
10	5792	6312
11	5754	6779
12	5827	6756
13	5886	6869
14	5726	6922
15	5864	
16	5804	
17	5696	

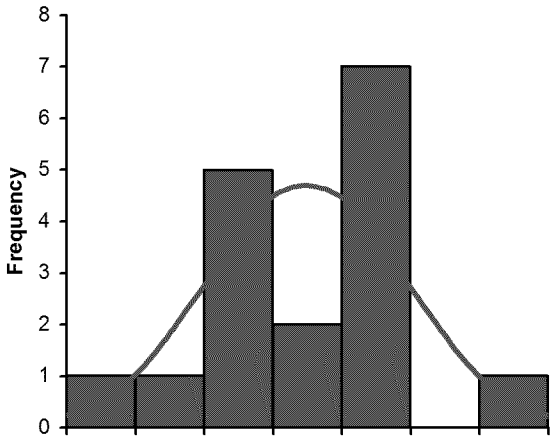
[ ] Bracketed measurements are considered outliers and were eliminated

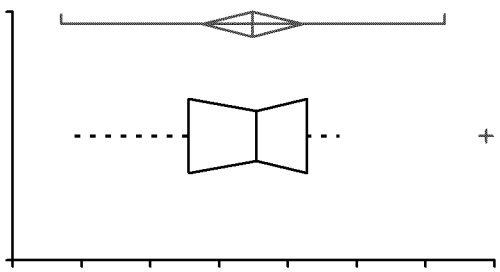
Parcel C, Building 258 , Reference Area - Gamma Measurements

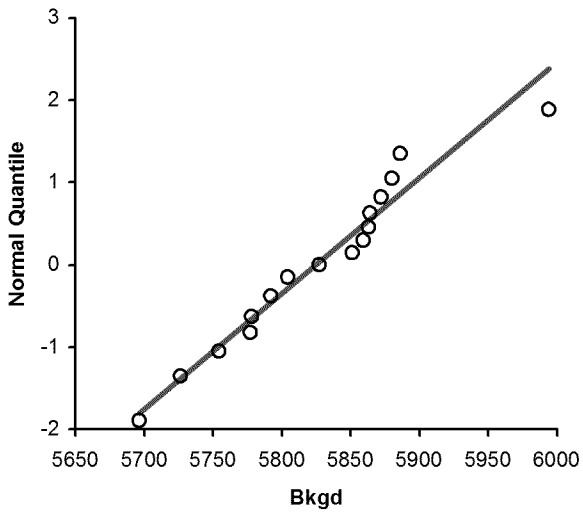
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	10:30	5851	1	5851
2	5/10/2006	10:31	5994	1	5994
3	5/10/2006	10:32	5792	1	5792
4	5/10/2006	10:33	5863	1	5863
5	5/10/2006	10:34	5859	1	5859
6	5/10/2006	10:35	5778	1	5778
7	5/10/2006	10:36	5777	1	5777
8	5/10/2006	10:37	5880	1	5880
9	5/10/2006	10:38	5872	1	5872
10	5/10/2006	10:39	5792	1	5792
11	5/10/2006	10:40	5754	1	5754
12	5/10/2006	10:41	5827	1	5827
13	5/10/2006	10:42	5886	1	5886
14	5/10/2006	10:43	5726	1	5726
15	5/10/2006	10:44	5864	1	5864
16	5/10/2006	10:45	5804	1	5804
17	5/10/2006	10:46	5696	1	5696
		mean	**5824**	**mean**	**5824.41**
		std dev	**71.1**	**std dev**	**71.12**
		median	**5827**	**median**	**5827.00**
				MDCR	**1371.38**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5824.4
95% CI	5787.8 to 5861.0
Variance	5057.88
SD	71.12
SE	17.25
CV	1%

Median	5827.0
95.1% CI	5778.0 to 5864.0
Range	298
IQR	86

Percentile	
2.5th	-
25th	5778.0
50th	5827.0
75th	5864.0
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9607	0.6447
Skewness	0.3677	0.4821
Kurtosis	0.8468	-

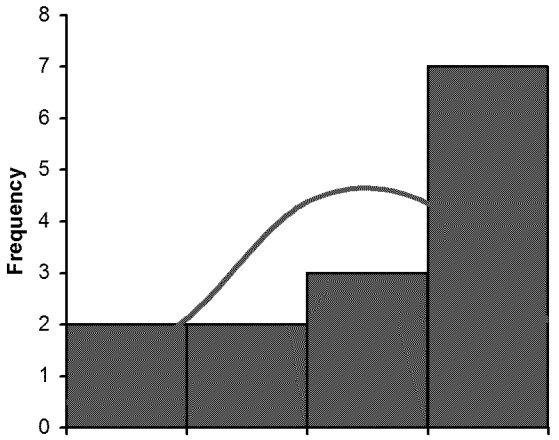
Building 813 Survey Unit 21 - Gamma Measurements

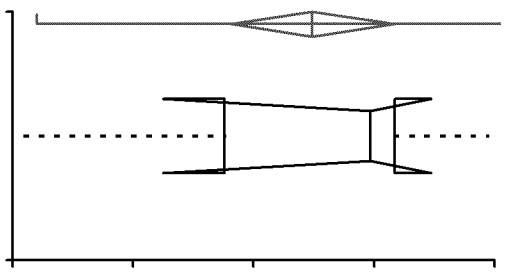
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	7/19/2006	14:40	6025	1	6025
2	7/19/2006	14:41	6184	1	6184
3	7/19/2006	14:42	6986	1	6986
4	7/19/2006	14:43	6730	1	6730
5	7/19/2006	14:44	6768	1	6768
6	7/19/2006	14:45	6504	1	6504
7	7/19/2006	14:46	6627	1	6627
8	7/19/2006	14:47	6838	1	6838
9	7/19/2006	14:48	6418	1	6418
10	7/19/2006	14:49	6312	1	6312
11	7/19/2006	14:50	6779	1	6779
12	7/19/2006	14:51	6756	1	6756
13	7/19/2006	14:52	6869	1	6869
14	7/19/2006	14:53	6922	1	6922
		mean	**6623**	**mean**	**6622.71**
		std dev	**291.6**	**std dev**	**291.63**
		median	**6743**	**median**	**6743.00**

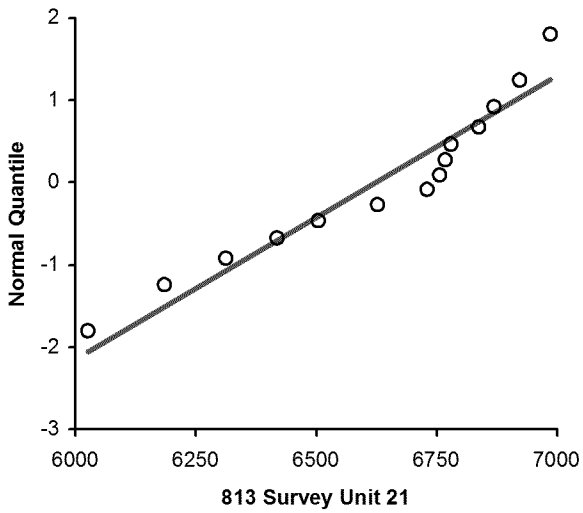
Bkgd + 3σ 6038

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 21
Performed by	B Henderson
Date	5 January 2007







n	14	(cases excluded: 3 due to mis
Mean	6622.7	
95% CI	6454.3	to 6791.1
Variance	85050.53	
SD	291.63	
SE	77.94	
CV	4%	
Median	6743.0	
98.7% CI	6312.0	to 6869.0
Range	961	
IQR	354	

Percentile	
2.5th	-
25th	6439.5
50th	6743.0
75th	6793.8
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9174	0.2016
Skewness	-0.8252	0.1591
Kurtosis	-0.3099	-

Test	**Paired samples t-test**
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 21
Performed by	B Henderson
Date	5 January 2007

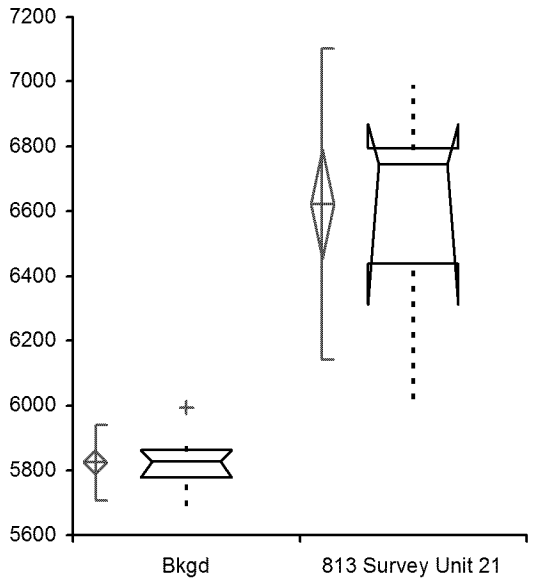
n	14 (cases excluded: 3 due to missing values)

	n	Mean	SD	SE
Bkgd	14	5832.2	68.8	18.40
813 Survey Unit 21	14	6622.7	291.6	77.94
Difference	14	-790.5	324.4	86.69

Difference between means	-790.5
95% CI	-977.8 to -603.2

t statistic	-9.12
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 21
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5824.4	71.12	17.25	5787.8 to 5861.0	5827.0	86.0	5778.0 to 5864.0
813 Survey Unit 21	14	6622.7	291.63	77.94	6454.3 to 6791.1	6743.0	354.3	6312.0 to 6869.0

Summary of Gamma Measurements

Count No.	Bkgd	813 Survey Unit 22
1	5640	6698
2	5675	7244
3	5711	7206
4	5700	7033
5	5551	7146
6	5763	6448
7	5511	7213
8	5659	7201
9	5496	7146
10	5733	7225
11	5648	
12	5576	
13	5485	
14	5731	
15	5672	
16	5522	
17	5593	

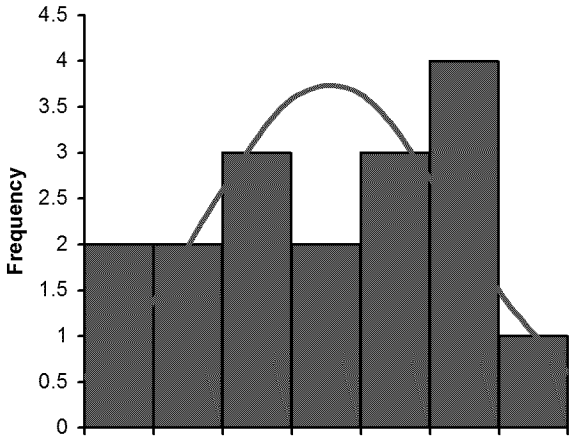
[ ] Bracketed measurements are considered outliers and were eliminated

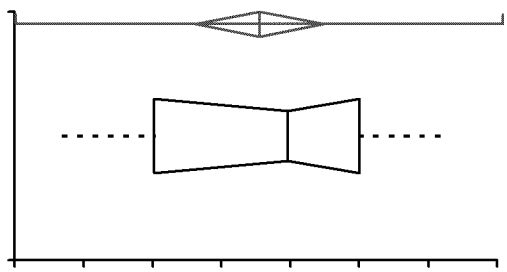
Parcel C, Building 258 , Reference Area - Gamma Measurements

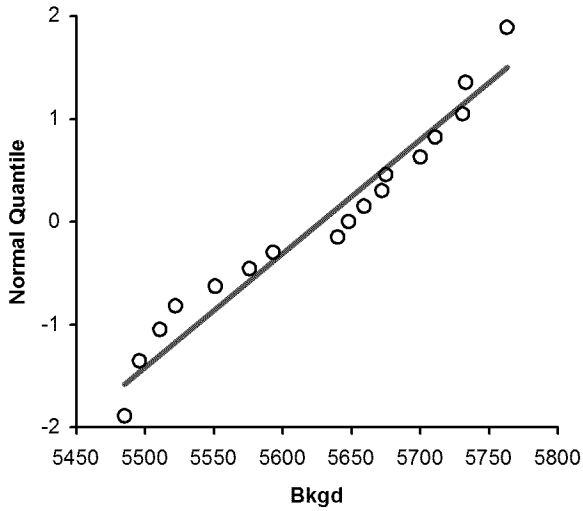
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	5/10/2006	9:00	5640	1	5640
2	5/10/2006	9:01	5675	1	5675
3	5/10/2006	9:02	5711	1	5711
4	5/10/2006	9:03	5700	1	5700
5	5/10/2006	9:04	5551	1	5551
6	5/10/2006	9:05	5763	1	5763
7	5/10/2006	9:06	5511	1	5511
8	5/10/2006	9:07	5659	1	5659
9	5/10/2006	9:08	5496	1	5496
10	5/10/2006	9:09	5733	1	5733
11	5/10/2006	9:10	5648	1	5648
12	5/10/2006	9:11	5576	1	5576
13	5/10/2006	9:12	5485	1	5485
14	5/10/2006	9:13	5731	1	5731
15	5/10/2006	9:14	5672	1	5672
16	5/10/2006	9:15	5522	1	5522
17	5/10/2006	9:16	5593	1	5593
		mean	**5627**	**mean**	**5627.41**
		std dev	**90.2**	**std dev**	**90.22**
		median	**5648**	**median**	**5648.00**
				MDCR	**1350.15**

[ ] Bracketed measurement is considered an outlier and was eliminated

Test	**Continuous summary descriptives**
Variable	Bkgd
Performed by	B Henderson
Date	5 January 2007







n	17
Mean	5627.4
95% CI	5581.0 to 5673.8
Variance	8139.51
SD	90.22
SE	21.88
CV	2%

Median	5648.0
95.1% CI	5551.0 to 5700.0
Range	278
IQR	149

Percentile	
2.5th	-
25th	5551.0
50th	5648.0
75th	5700.0
97.5th	-

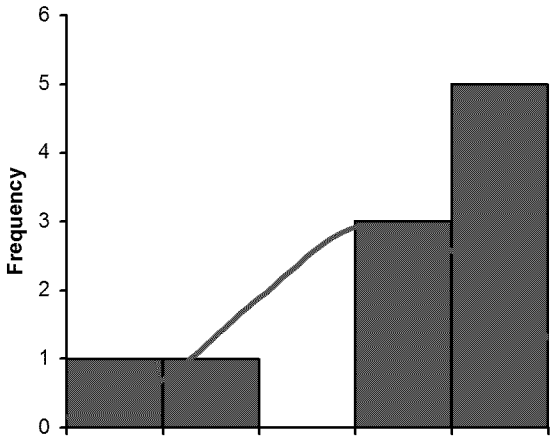
	Coefficient	**p**
Shapiro-Wilk	0.9363	0.2770
Skewness	-0.2453	0.6374
Kurtosis	-1.2881	-

Building 813 Survey Unit 22 - Gamma Measurements

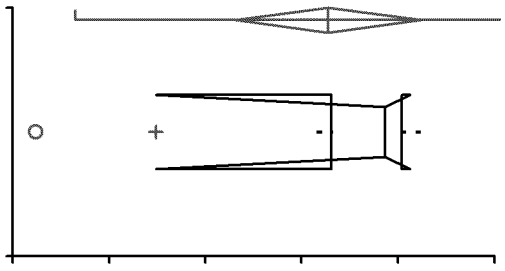
Count No.	Date	Time	Counts C_B	Count Time T_B	cpm
1	6/6/2006	9:30	6698	1	6698
2	6/6/2006	9:31	7244	1	7244
3	6/6/2006	9:32	7206	1	7206
4	6/6/2006	9:33	7033	1	7033
5	6/6/2006	9:34	7146	1	7146
6	6/6/2006	9:35	6448	1	6448
7	6/6/2006	9:36	7213	1	7213
8	6/6/2006	9:37	7201	1	7201
9	6/6/2006	9:38	7146	1	7146
10	6/6/2006	9:39	7225	1	7225
		mean	**7056**	**mean**	**7056.00**
		std dev	**268.0**	**std dev**	**268.05**
		median	**7174**	**median**	**7173.50**
		Bkgd + 3σ	5898		

Counts greater than the mean bkgd + 3 sigma are colored "red."

Test	**Continuous summary descriptives**
Variable	813 Survey Unit 22
Performed by	B Henderson
Date	5 January 2007

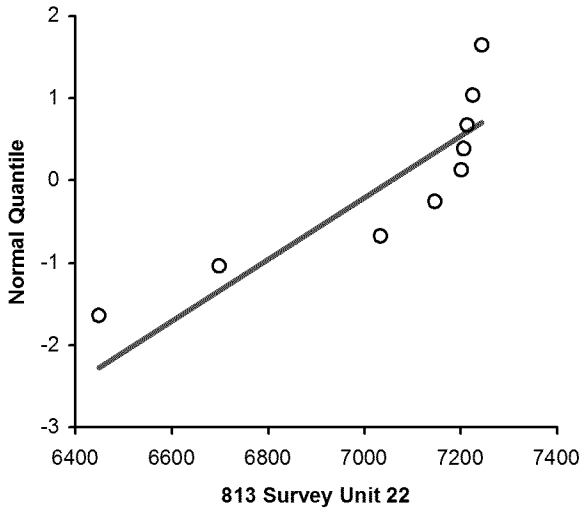


n	10 (cases excluded: 7 due to mis
Mean	7056.0
95% CI	6864.3 to 7247.7
Variance	71848.44
SD	268.05
SE	84.76
CV	4%



Median	7173.5
97.9% CI	6698.0 to 7225.0
Range	796
IQR	147

Percentile	
2.5th	-
25th	7061.3
50th	7173.5
75th	7207.8
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.7113	0.0012
Skewness	-1.7844	0.0124
Kurtosis	2.2914	-

Test	**Paired samples t-test**		
Alternative hypothesis	Bkgd ≠ 813 Survey Unit 22		
Performed by	B Henderson	**Date**	5 January 2007

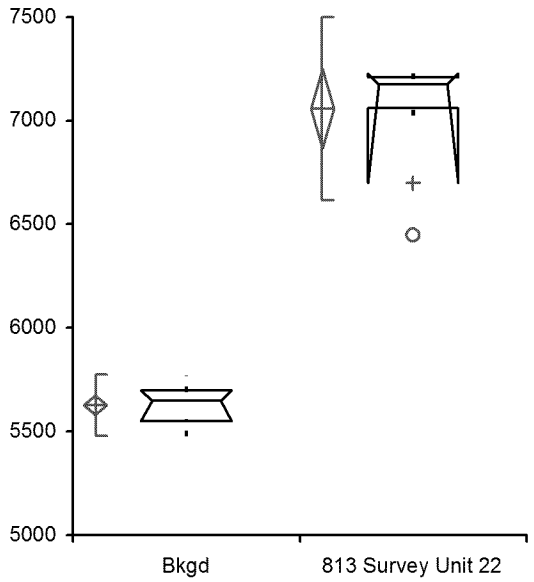
n	10 (cases excluded: 7 due to missing values)

	n	Mean	SD	SE
Bkgd	10	5643.9	93.8	29.66
813 Survey Unit 22	10	7056.0	268.0	84.76
Difference	10	-1412.1	314.3	99.40

Difference between means	-1412.1
95% CI	-1636.9 to -1187.3

t statistic	-14.21
2-tailed p	<0.0001

Test	**Comparative descriptives**
Variables	Bkgd, 813 Survey Unit 22
Performed by	B Henderson
Date	5 January 2007



	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Bkgd	17	5627.4	90.22	21.88	5581.0 to 5673.8	5648.0	149.0	5551.0 to 5700.0
813 Survey Unit 22	10	7056.0	268.05	84.76	6864.3 to 7247.7	7173.5	146.5	6698.0 to 7225.0

APPENDIX E

FIELD SURVEY DATA SHEETS

(Available on CD only)

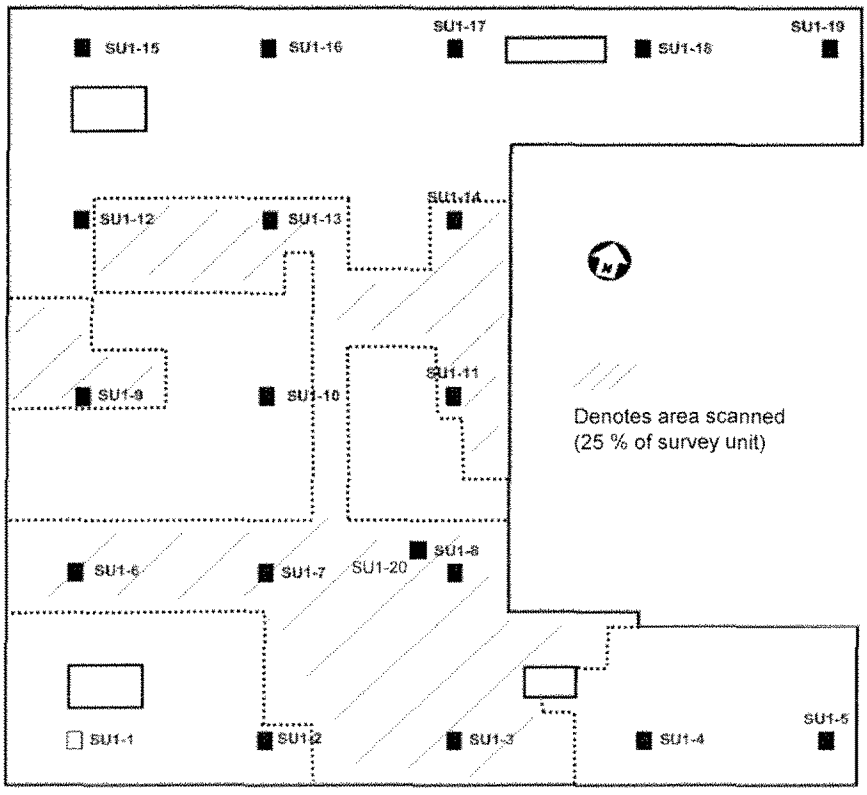
ED_000855_00003297-00506

COPY

RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
5/23/2006 10:30	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU01F01-001	2360	225246	4/21/2006	α 19.15%	α 4.79%	α 27.14	α 12.20
	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.98	α 0.22
				βγ 62.41%	βγ 15.60%	βγ 17.82	βγ 2.82
Reviewed By: N. Smith	2350-1	228683	5/2/2007				5.3 Kcpm
	44-10	150870					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs	Model 19	187849	5/4/2007				7 μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU01 Class 3



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 1-3 cpm alpha and 700-900 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 4.9-5.8 Kcpm.

Survey points 1-19 are systematic.

Survey point 20 is biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00507

RADIATION/CONTAMINATION SURVEY SUPPLEMENT Page____of____

SURVEY NUMBER: HPS-06NPD813SU01F01-001

SURVEYOR: C. Carchidi | LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1		7	1792	-16.36	255.91	-0.22	-0.68	
2		7	1799	-5.45	-292.47	-0.22	-2.82	
3		7	1562	-5.45	-239.29	2.27	3.59	
4		7	1101	-16.36	-564.99	-0.22	-0.68	
5		7	795	-21.81	-262.56	-0.22	7.86	
6		7	1186	-21.81	-461.97	-0.22	-2.82	
7		7	1185	-16.36	-481.91	2.27	-0.68	
8		7	1251	-16.36	-132.94	-0.22	-2.82	
9		8	2148	-10.90	-186.12	-0.22	12.14	
10		7	1713	0.00	-216.03	-0.22	1.45	
11		7	1070	-16.36	-136.26	-0.22	18.54	
12		7	2045	-21.81	-129.62	-0.22	7.86	
13		7	1908	-10.90	-282.50	-0.22	10.00	
14		7	1864	-5.45	-59.82	-0.22	-0.68	
15		7	1450	21.81	-269.20	-0.22	1.45	
16		7	1194	-27.26	-239.29	-0.22	-0.68	
17		6	1373	-43.61	-73.12	2.27	-2.82	
18		7	1187	21.81	-262.56	-0.22	10.00	
19		7	1273	-21.81	-66.47	-0.22	-2.82	
20		7	2014	-21.81	-33.23	-0.22	-0.68	

Reviewer

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RSO/RTM

Date:

Time:

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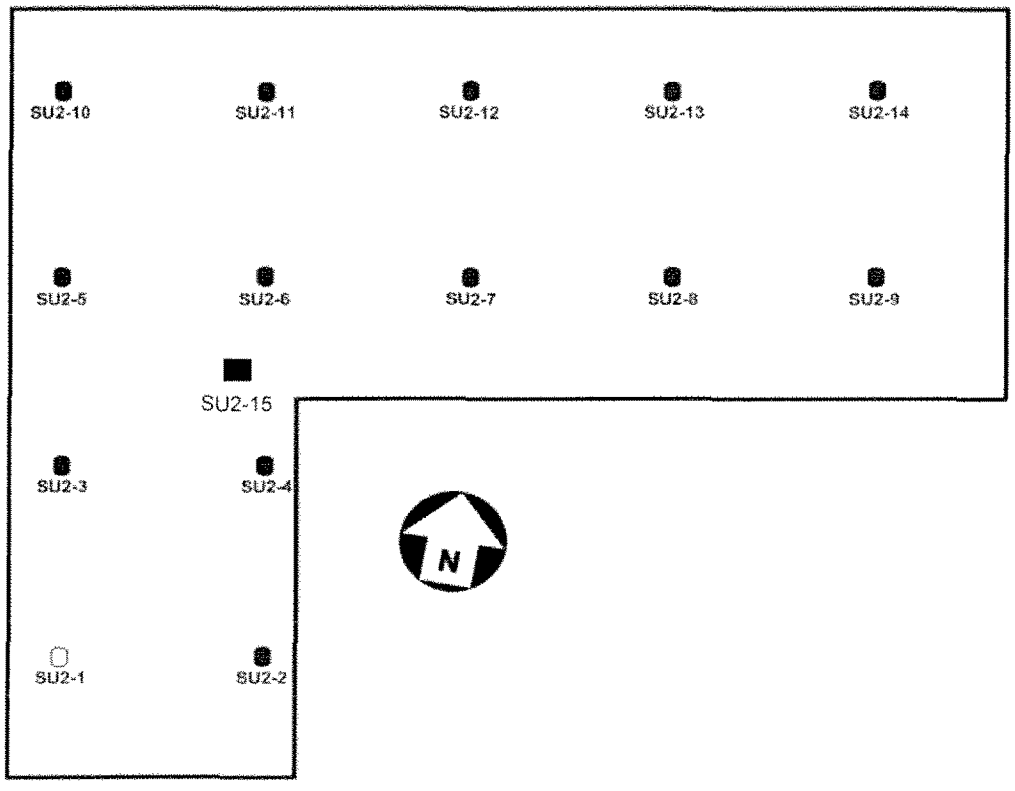
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
6/6/2006 09:30	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU02F01-001	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
				βγ 62.41%	βγ 15.60%	βγ 15.68	βγ 1.86
Reviewed By: Ken Bradley QA/QC	2350-1	221013	5/2/2007				5.62
	44-10	155599					Kcpm
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	187849	5/4/2007				6
							µR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU02 Class 2



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 2-4 cpm alpha and 700-900 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.3-7.6 Kcpm.

Survey points 1-14 are systematic.

Survey point 15 is biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU02F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1		7	1544	-27.26	-16.62	-0.15	4.55	
2		7	1383	-32.71	-319.06	-0.15	21.64	
3		7	1767	-16.36	-23.26	-0.15	0.28	
4		7	1882	-16.36	265.88	-0.15	4.55	
5		7	1849	-16.36	-19.94	-0.15	-1.86	
6		6	2046	10.90	-93.06	-0.15	2.41	
7		7	1765	-16.36	-245.94	2.35	4.55	
8		7	1257	-5.45	-395.50	-0.15	-1.86	
9		7	1119	-10.90	-192.76	-0.15	0.28	
10		6	2114	0.00	3.32	-0.15	2.41	
11		6	2297	-21.81	-129.62	-0.15	4.55	
12		6	1758	-27.26	-315.73	-0.15	2.41	
13		6	1039	-21.81	33.23	-0.15	-1.86	
14		7	937	-16.36	-73.12	-0.15	-1.86	
15		6	1431	-5.45	59.82	-0.15	-1.86	

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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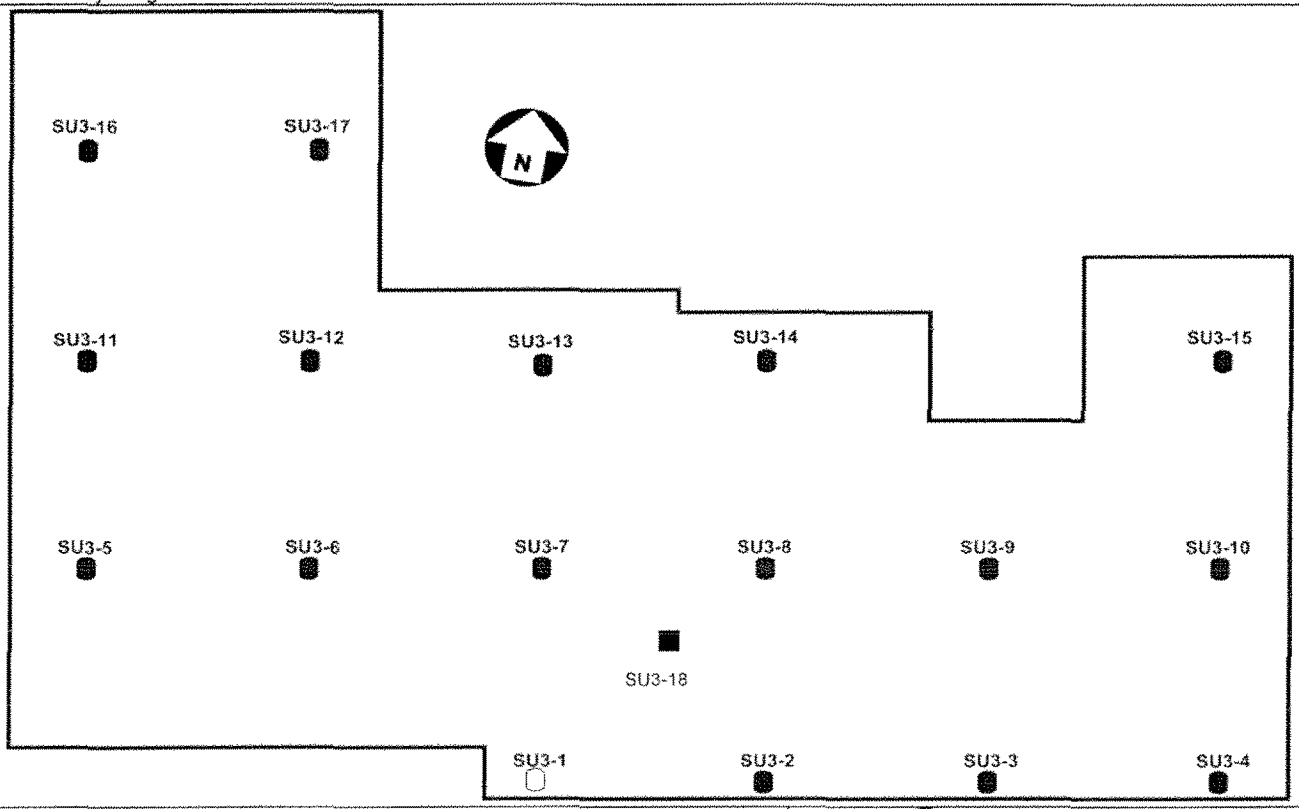
RADIATION/CONTAMINATION SURVEY FORM

Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/5/2006 12:45	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU03F01-001	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
				βγ 62.41%	βγ 15.60%	βγ 15.68	βγ 1.86
Reviewed By: Ken Bradley QA/QC	2350-1	228683	5/2/2007				5.46
	44-10	150870					Kcpm
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	187849	5/4/2007				7
							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU03 Class 2



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 1-3 cpm alpha and 650-900 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.3-7.8 Kcpm.

Survey points 1-17 are systematic.

Survey point 18 is biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU03F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1		7	1377	5.45	-109.68	-0.15	-1.86	
2		6	1012	-21.81	-275.85	2.35	0.28	
3		6	930	5.45	-501.85	2.35	10.96	
4		6	987	-21.81	-422.08	-0.15	0.28	
5		7	1437	-21.81	-96.38	-0.15	4.55	
6		7	1250	-32.71	-83.09	-0.15	6.69	
7		7	1389	-5.45	-29.91	-0.15	6.69	
8		7	1061	-21.81	-285.82	-0.15	-1.86	
9		6	1019	-38.16	-269.20	-0.15	0.28	
10		6	898	10.90	-229.32	-0.15	0.28	
11		7	1251	-5.45	-309.09	-0.15	0.28	
12		7	850	-21.81	-206.06	-0.15	0.28	
13		7	1311	-16.36	-49.85	-0.15	6.69	
14		6	1030	5.45	-196.09	-0.15	10.96	
15		6	864	-5.45	-348.97	-0.15	-1.86	
16		7	1402	-21.81	159.53	-0.15	-1.86	
17		7	1615	-5.45	-56.50	-0.15	2.41	
18		7	1365	-10.90	-285.82	-0.15	2.41	

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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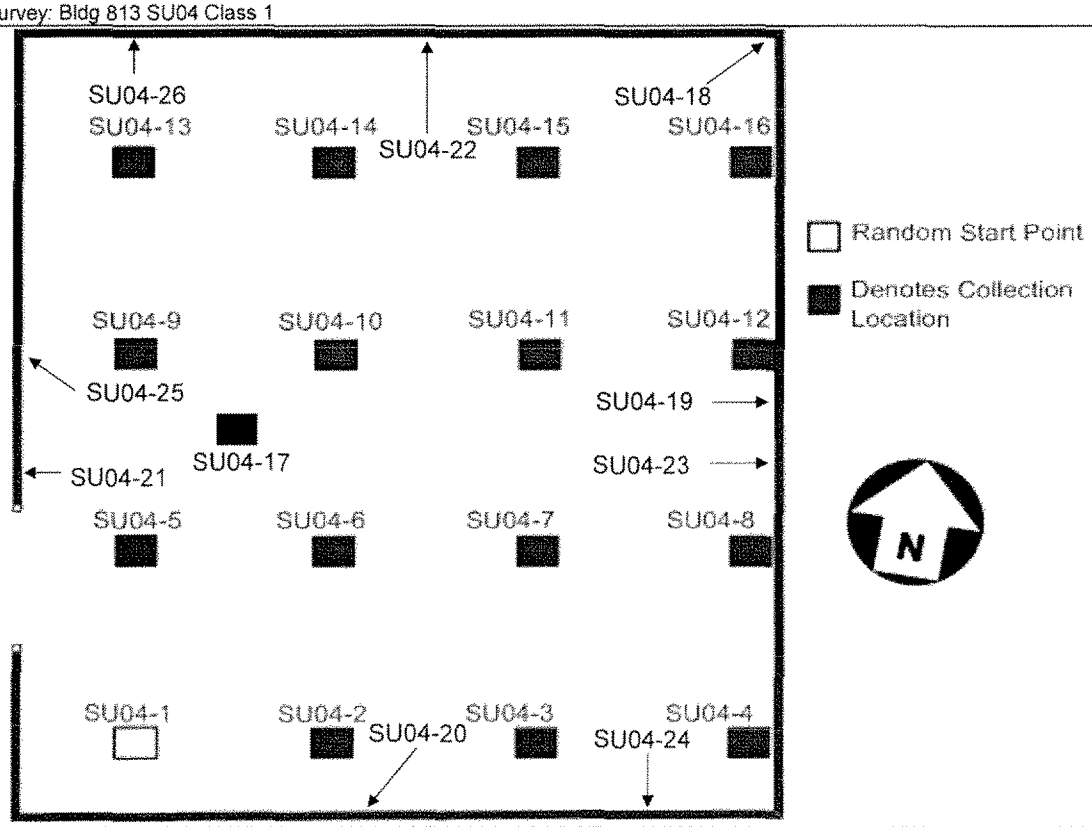
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
6/1/2006 09:30	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU04F01-001	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 76.88	α 31.08
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 420.31	βγ 2343.06
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
				βγ 62.41%	βγ 15.60%	βγ 17.56	βγ 2.69
Reviewed By: Ken Bradley QA/QC	2350-1	221013	5/2/2007	N/A	N/A	N/A	6.8 Kcpm
	44-10	155599					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	187849	5/4/2007	N/A	N/A	N/A	7 µR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU04 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 700-900 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.5-7.9 Kcpm.

Survey points 1-16 are systematic.

Survey point 17 is biased.

Survey points 18-26 taken on the walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00513

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU04F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	328.00	-14.72	235.97	-0.07	3.72	N/A
2	N/A	7	190.00	-20.17	-182.79	-0.07	-2.69	N/A
3	N/A	7	411.00	-20.17	-289.14	-0.07	12.26	N/A
4	N/A	7	804.00	-3.82	-269.20	-0.07	3.72	N/A
5	N/A	7	320.00	-20.17	-358.94	-0.07	-2.69	N/A
6	N/A	7	612.00	-14.72	-491.88	2.42	1.58	N/A
7	N/A	7	635.00	1.64	-216.03	-0.07	1.58	N/A
8	N/A	7	1101.00	-9.27	-358.94	-0.07	-0.56	N/A
9	N/A	7	612.00	-20.17	-398.82	-0.07	-2.69	N/A
10	N/A	7	737.00	-14.72	-428.73	-0.07	1.58	N/A
11	N/A	7	1049.00	-14.72	-122.97	-0.07	-0.56	N/A
12	N/A	7	964.00	-3.82	-342.32	-0.07	3.72	N/A
13	N/A	7	596.00	-25.62	-634.79	-0.07	3.72	N/A
14	N/A	7	466.00	-14.72	-574.96	-0.07	1.58	N/A
15	N/A	7	481.00	-25.62	-525.11	-0.07	-2.69	N/A
16	N/A	7	458.00	-9.27	-694.61	-0.07	-2.69	N/A
17	N/A	7	481.00	1.64	-475.26	-0.07	-2.69	N/A
18	N/A	7	239.00	7.09	-864.11	-0.07	-2.69	N/A
19	N/A	7	946.00	-3.82	-677.99	-0.07	-2.69	N/A
20	N/A	7	420.00	-9.27	-362.26	-0.07	-0.56	N/A
21	N/A	7	218.00	-20.17	-578.29	-0.07	-2.69	N/A
22	N/A	7	461.00	7.09	-774.37	-0.07	-2.69	N/A
23	N/A	7	1188.00	-3.82	-488.55	-0.07	-0.56	N/A
24	N/A	7	111.00	-3.82	-475.26	-0.07	3.72	N/A
25	N/A	7	198.00	-9.27	-727.85	-0.07	-0.56	N/A
26	N/A	7	165.00	1.64	-737.82	-0.07	-2.69	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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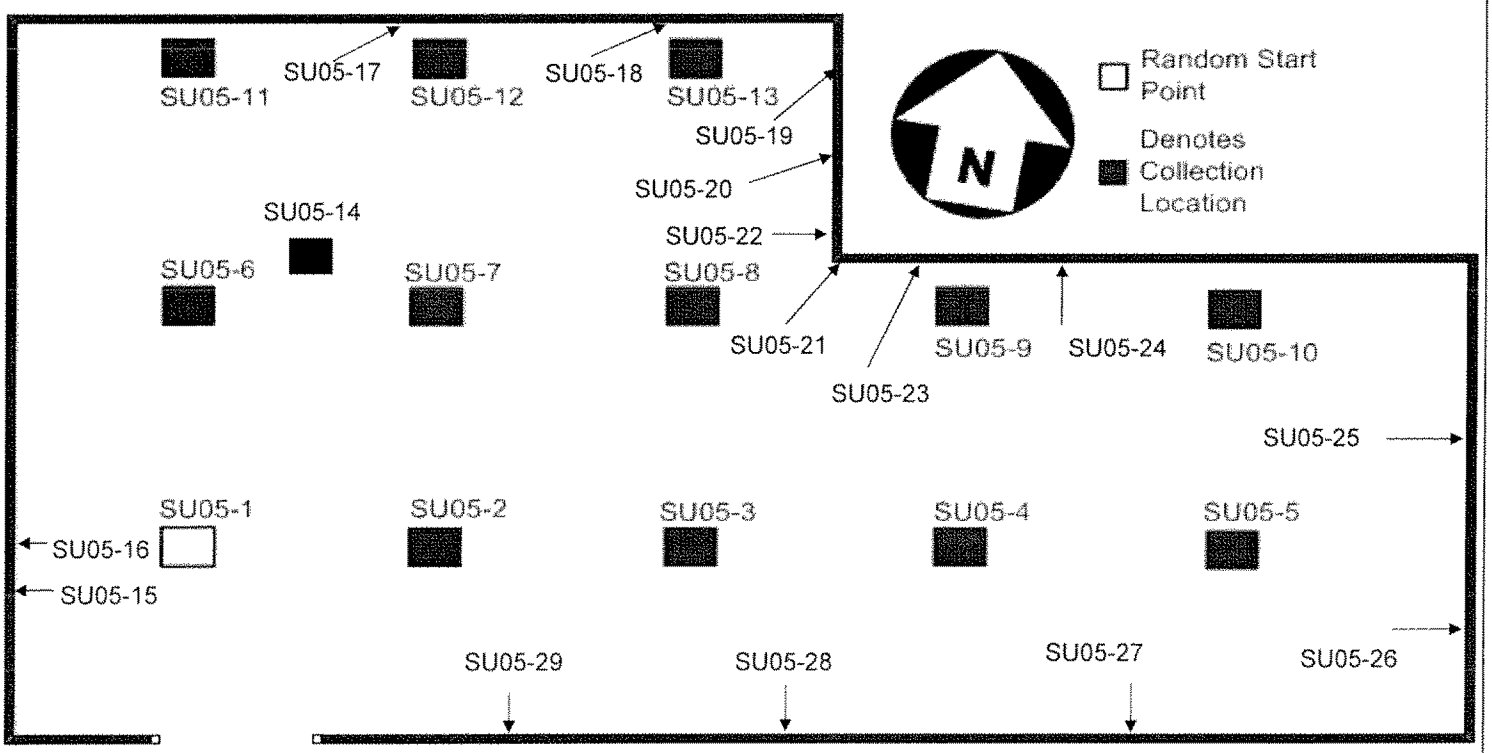
RADIATION/CONTAMINATION SURVEY FORM

Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/1/2006 09:45	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA * (dpm/100cm²)	Background * (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPDSU05F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
Location: Parcel D	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 17.56	βγ 2.69
	2350-1	221016	5/2/2007	N/A	N/A	N/A	6
Reviewed By: Ken Bradley QA/QC	44-10	150640					Kcpm
	Model 19	148206	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU13 ORIGINAL CONCRETE FLOOR



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 700-900 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.5-6.6 Kcpm.

Survey points 1-13 are systematic.

Survey point 14 is biased.

Survey points 15-29 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00515

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPDSU05F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	1392.00	-10.90	-412.11	-0.07	1.58	N/A
2	N/A	7	1408.00	-10.90	-166.17	-0.07	-2.69	N/A
3	N/A	7	1526.00	-32.71	-36.56	-0.07	3.72	N/A
4	N/A	7	1491.00	-27.26	-242.62	-0.07	-0.56	N/A
5	N/A	7	1587.00	0.00	-152.88	-0.07	-2.69	N/A
6	N/A	7	1210.00	-38.16	-182.79	-0.07	-2.69	N/A
7	N/A	7	1429.00	-5.45	-355.61	-0.07	-2.69	N/A
8	N/A	7	1212.00	-21.81	-382.20	-0.07	-0.56	N/A
9	N/A	8	2117.00	10.90	-159.53	-0.07	3.72	N/A
10	N/A	7	2200.00	-32.71	-116.32	-0.07	1.58	N/A
11	N/A	7	1395.00	-38.16	-49.85	-0.07	1.58	N/A
12	N/A	7	1711.00	-21.81	-79.76	-0.07	-0.56	N/A
13	N/A	7	2040.00	-10.90	-289.14	-0.07	5.85	N/A
14	N/A	7	1729.00	-16.36	16.62	-0.07	3.72	N/A
15	N/A	7	1255.00	-21.81	-1176.52	-0.07	-2.69	N/A
16	N/A	7	1290.00	-27.26	-1163.22	-0.07	-0.56	N/A
17	N/A	7	1386.00	10.90	-864.11	-0.07	20.81	N/A
18	N/A	8	1816.00	-10.90	232.64	-0.07	5.85	N/A
19	N/A	7	2370.00	-10.90	-122.97	-0.07	1.58	N/A
20	N/A	7	2243.00	-10.90	222.67	-0.07	-0.56	N/A
21	N/A	7	1122.00	-16.36	-794.32	-0.07	-0.56	N/A
22	N/A	7	1024.00	21.81	-621.49	-0.07	-0.56	N/A
23	N/A	7	2564.00	-32.71	245.94	-0.07	1.58	N/A
24	N/A	8	2596.00	10.90	355.61	-0.07	-2.69	N/A
25	N/A	7	1393.00	0.00	-219.35	-0.07	3.72	N/A
26	N/A	7	1244.00	5.45	-1100.08	-0.07	-2.69	N/A
27	N/A	7	1237.00	-5.45	-1269.58	-0.07	-2.69	N/A
28	N/A	7	1203.00	-21.81	-1106.72	-0.07	5.85	N/A
29	N/A	7	1356.00	10.90	-1163.22	-0.07	3.72	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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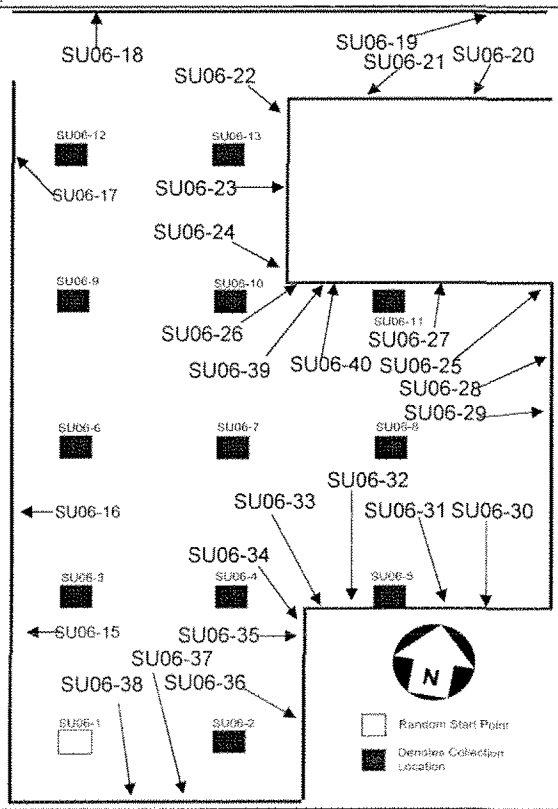
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
6/1/2006 13:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU06F01-001	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
				βγ 62.41%	βγ 15.60%	βγ 17.56	βγ 2.69
Reviewed By: Ken Bradley QA/QC	2350-1	221016	5/2/2007	N/A	N/A	N/A	5.9 Kcpm
	44-10	150640					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	148206	5/4/2007	N/A	N/A	N/A	6 µR/hr

Survey Type: Building — 2360 Static Count Time: 3 Minutes — 2350 Static Count Time: 1 Minute

Description of survey: BLDG 813 SU06 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 2-4 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.5-6.6 Kcpm.

Survey points 1-15 are systematic.

Survey points 15-40 were located on the wall

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU06F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	986.00	-27.26	-272.53	2.42	12.26	N/A
2	N/A	7	1256.00	-21.81	-43.21	-0.07	5.85	N/A
3	N/A	7	1215.00	-21.81	-425.41	-0.07	-2.69	N/A
4	N/A	7	1271.00	-21.81	-289.14	-0.07	1.58	N/A
5	N/A	7	1189.00	-5.45	-382.20	-0.07	-0.56	N/A
6	N/A	7	1372.00	-21.81	-289.14	-0.07	-0.56	N/A
7	N/A	7	1377.00	0.00	-209.38	-0.07	10.13	N/A
8	N/A	7	1208.00	-10.90	-255.91	-0.07	-2.69	N/A
9	N/A	7	1326.00	-21.81	-362.26	-0.07	-0.56	N/A
10	N/A	7	1496.00	-27.26	-375.56	-0.07	-2.69	N/A
11	N/A	7	1334.00	-32.71	-63.15	-0.07	-2.69	N/A
12	N/A	7	1637.00	-21.81	-352.29	-0.07	-2.69	N/A
13	N/A	8	1407.00	-10.90	-232.64	-0.07	1.58	N/A
14	N/A	7	1336.00	-10.90	-358.94	-0.07	7.99	N/A
15	N/A	7	882.00	16.36	-1056.87	-0.07	-0.56	N/A
16	N/A	7	1090.00	-16.36	-1093.43	-0.07	3.72	N/A
17	N/A	7	1273.00	0.00	-1053.55	-0.07	-2.69	N/A
18	N/A	7	1045.00	-16.36	-920.61	-0.07	-0.56	N/A
19	N/A	7	1358.00	-5.45	-1146.61	2.42	1.58	N/A
20	N/A	7	960.00	-5.45	-1033.61	-0.07	1.58	N/A
21	N/A	8	805.00	-16.36	-1080.14	-0.07	-2.69	N/A
22	N/A	7	889.00	27.26	-1156.58	-0.07	-0.56	N/A
23	N/A	7	901.00	-21.81	-1007.02	-0.07	1.58	N/A
24	N/A	7	730.00	-38.16	-1156.58	-0.07	27.22	N/A
25	N/A	7	976.00	-10.90	-937.23	-0.07	-0.56	N/A
26	N/A	7	1033.00	-5.45	-1053.55	2.42	1.58	N/A
27	N/A	7	754.00	-5.45	-913.96	-0.07	1.58	N/A
28	N/A	7	659.00	-10.90	-1129.99	-0.07	1.58	N/A
29	N/A	7	707.00	-5.45	-1203.11	-0.07	1.58	N/A
30	N/A	7	652.00	-5.45	-1173.19	-0.07	-0.56	N/A
31	N/A	7	540.00	0.00	-1136.64	-0.07	-0.56	N/A
32	N/A	7	698.00	10.90	-1139.96	-0.07	-2.69	N/A
33	N/A	7	662.00	-32.71	-903.99	-0.07	-2.69	N/A
34	N/A	7	1105.00	-16.36	-1173.19	-0.07	1.58	N/A
35	N/A	7	778.00	-16.36	-880.73	-0.07	-2.69	N/A

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU06F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
36	N/A	7	549.00	-21.81	-1096.75	-0.07	1.58	N/A
37	N/A	7	878.00	0.00	-920.61	-0.07	-2.69	N/A
38	N/A	7	860.00	-5.45	-1046.90	-0.07	-2.69	N/A
39	N/A	7	587.00	-10.90	-817.58	-0.07	7.99	N/A
40	N/A	7	630.00	5.45	-967.14	2.42	-0.56	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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RADIATION/CONTAMINATION SURVEY FORM

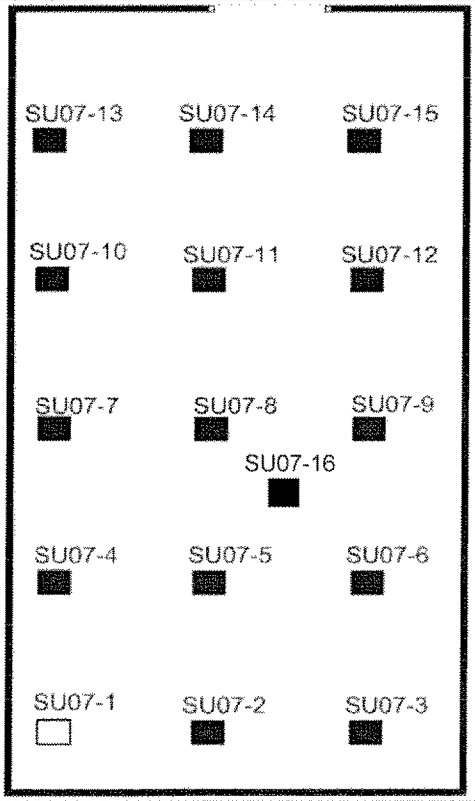
Date: Time:	INSTRUMENTATION USED						
6/6/2006 13:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
Survey Number: HPS-06NPD813SU07F01-001	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
Location: Parcel D	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 15.68	βγ 1.86
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	160700					Kcpm
	Model 19	197849	5/4/2007	N/A	N/A	N/A	8
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr

Survey Type: Building

2360 Static Count Time: 3 Minutes

2350 Static Count Time: 1 Minute

Description of survey: Bldg 813 SU07 Class 1



Comments:

All LAW's were ≤ background α β

2360 - Scan Ranges 1-3 cpm alpha and 550-750 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 8.7-9.7 Kcpm.

Survey points 1-15 are systematic.

Survey point 16 is biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00520

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU07F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	8	2913.00	-16.36	-162.85	-0.15	-1.86	N/A
2	N/A	8	3105.00	-27.26	53.18	-0.15	0.28	N/A
3	N/A	8	3681.00	-27.26	-56.50	-0.15	10.96	N/A
4	N/A	9	3273.00	0.00	66.47	-0.15	0.28	N/A
5	N/A	9	3368.00	10.90	69.79	-0.15	2.41	N/A
6	N/A	8	3490.00	16.36	-53.18	-0.15	-1.86	N/A
7	N/A	9	3478.00	-27.26	33.23	-0.15	4.55	N/A
8	N/A	9	3520.00	-16.36	295.79	-0.15	-1.86	N/A
9	N/A	9	3399.00	-10.90	66.47	-0.15	0.28	N/A
10	N/A	9	3244.00	0.00	355.61	-0.15	2.41	N/A
11	N/A	8	3251.00	-27.26	-3.32	-0.15	0.28	N/A
12	N/A	9	3649.00	-16.36	189.44	-0.15	0.28	N/A
13	N/A	9	3054.00	-16.36	66.47	-0.15	-1.86	N/A
14	N/A	8	3087.00	-16.36	96.38	-0.15	-1.86	N/A
15	N/A	9	2591.00	-16.36	166.17	-0.15	0.28	N/A
16	N/A	9	3141.00	-21.81	142.91	-0.15	0.28	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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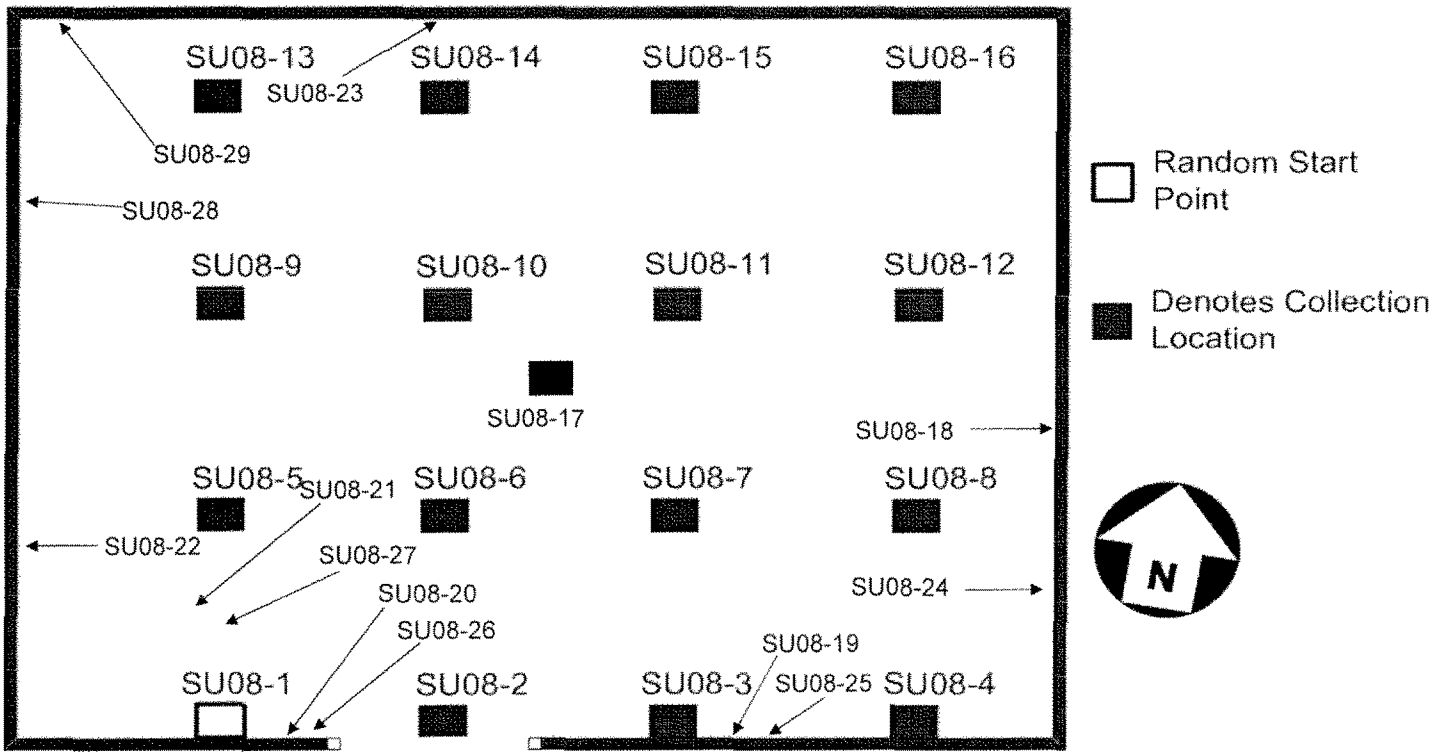
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
6/1/2006 14:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU08F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
Surveyor: C.Carchidi				βγ 62.41%	βγ 15.60%	βγ 15.35	βγ 1.73
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.82
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	187848	5/4/2007	N/A	N/A	N/A	7
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU08 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.8-7.2 Kcpm.

Survey points 1-16 are systematic.

Survey point 17 is biased.

Survey points 18-29 were taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00522

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU08F01-001

SURVEYOR: C.Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	971.00	-23.17	-679.25	-0.07	0.41	N/A
2	N/A	7	942.00	-10.64	-636.35	-0.07	6.82	N/A
3	N/A	7	971.00	-29.43	-1315.60	2.42	4.68	N/A
4	N/A	7	809.00	8.14	-1129.70	-0.07	-1.73	N/A
5	N/A	7	979.00	-10.64	-1186.90	-0.07	-1.73	N/A
6	N/A	7	940.00	-4.38	-1315.60	-0.07	-1.73	N/A
7	N/A	7	949.00	-16.91	-886.60	-0.07	0.41	N/A
8	N/A	7	788.00	1.88	-1029.60	-0.07	-1.73	N/A
9	N/A	7	1133.00	-10.64	-1165.45	-0.07	6.82	N/A
10	N/A	7	1141.00	1.88	-1158.30	-0.07	-1.73	N/A
11	N/A	7	1055.00	14.40	-1258.40	-0.07	4.68	N/A
12	N/A	7	1015.00	-10.64	-1029.60	-0.07	-1.73	N/A
13	N/A	7	1099.00	-4.38	-1544.40	-0.07	2.54	N/A
14	N/A	7	1102.00	-4.38	-1472.90	-0.07	2.54	N/A
15	N/A	7	1039.00	-10.64	-1172.60	-0.07	-1.73	N/A
16	N/A	7	1007.00	-23.17	-1129.70	-0.07	-1.73	N/A
17	N/A	7	1113.00	-29.43	-1222.65	-0.07	2.54	N/A
18	N/A	7	245.00	-16.91	-1808.95	-0.07	8.95	N/A
19	N/A	7	376.00	-10.64	-1966.25	-0.07	0.41	N/A
20	N/A	7	293.00	-16.91	-1787.50	-0.07	-1.73	N/A
21	N/A	7	503.00	1.88	-1401.40	-0.07	6.82	N/A
22	N/A	7	520.00	-23.17	-1851.85	-0.07	0.41	N/A
23	N/A	7	629.00	-29.43	-1823.25	-0.07	2.54	N/A
24	N/A	7	55.00	-4.38	-1665.95	2.42	0.41	N/A
25	N/A	7	796.00	-16.91	-1494.35	-0.07	-1.73	N/A
26	N/A	7	327.00	-16.91	-1837.55	-0.07	2.54	N/A
27	N/A	7	620.00	8.14	-950.95	-0.07	2.54	N/A
28	N/A	7	614.00	-4.38	-1808.95	-0.07	21.77	N/A
29	N/A	7	762.00	-16.91	-1365.65	-0.07	2.54	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

ED_000855_00003297-00523

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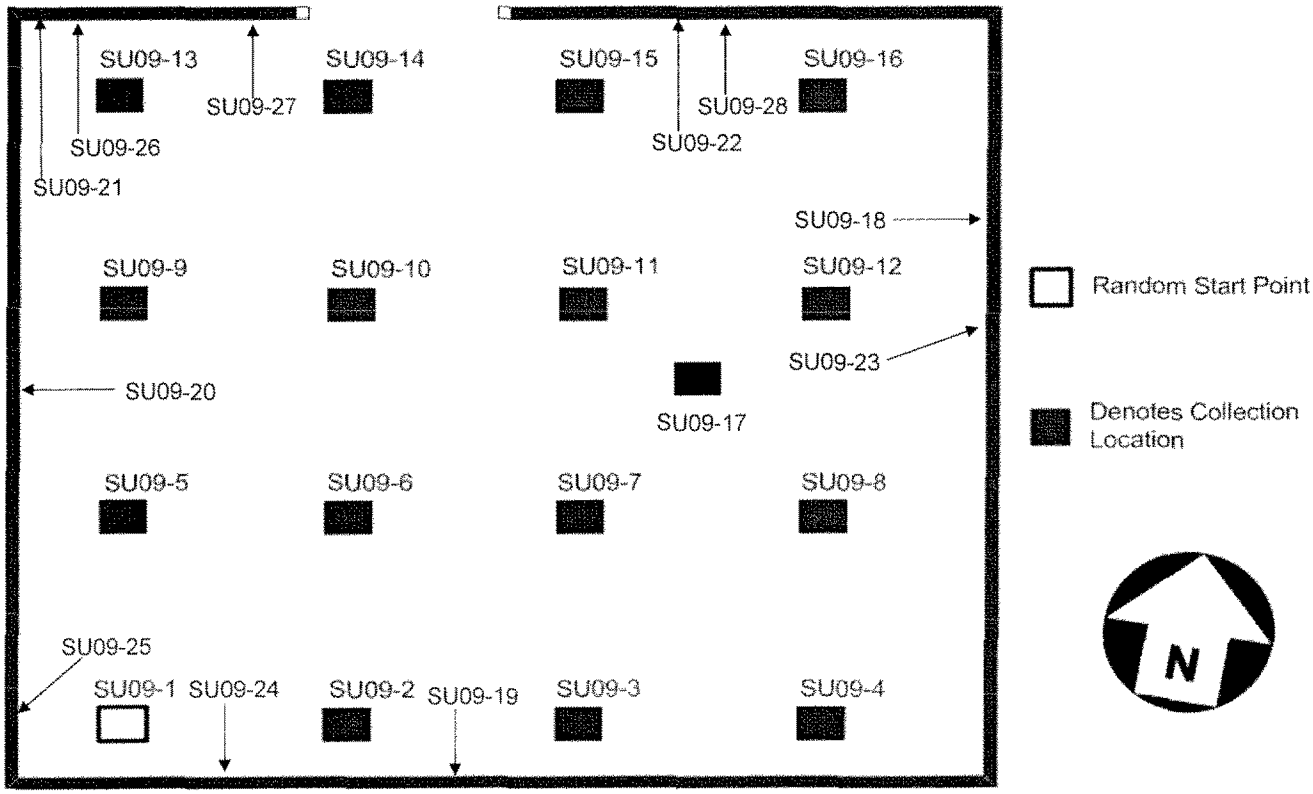
RADIATION/CONTAMINATION SURVEY FORM

Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/2/2006 08:15	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU09F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 17.56	βγ 2.69
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	148206	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU09 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.0-7.3 Kcpm.

Survey points 1-16 are systematic.

Survey point 17 is biased.

Survey points 18-28 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00524

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU09F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	1057.00	-10.64	-1129.70	-0.07	-0.56	N/A
2	N/A	6	1027.00	-16.91	-1008.15	-0.07	10.13	N/A
3	N/A	6	1167.00	-16.91	-1029.60	-0.07	1.58	N/A
4	N/A	6	907.00	1.88	-1229.80	-0.07	-2.69	N/A
5	N/A	6	998.00	-16.91	-1215.50	-0.07	3.72	N/A
6	N/A	6	1074.00	-23.17	-1079.65	-0.07	-0.56	N/A
7	N/A	6	1021.00	-29.43	-1115.40	2.42	-2.69	N/A
8	N/A	6	711.00	-23.17	-1122.55	-0.07	-0.56	N/A
9	N/A	6	720.00	-23.17	-1272.70	-0.07	5.85	N/A
10	N/A	7	794.00	8.14	-1287.00	-0.07	-2.69	N/A
11	N/A	7	994.00	-10.64	-1058.20	-0.07	-0.56	N/A
12	N/A	6	881.00	-4.38	-1058.20	-0.07	-0.56	N/A
13	N/A	6	836.00	-16.91	-1344.20	-0.07	-0.56	N/A
14	N/A	6	1046.00	-16.91	-1179.75	-0.07	1.58	N/A
15	N/A	7	936.00	-10.64	-1358.50	-0.07	-0.56	N/A
16	N/A	7	667.00	-4.38	-1508.65	2.42	-2.69	N/A
17	N/A	6	818.00	-4.38	-1959.10	-0.07	-0.56	N/A
18	N/A	6	345.00	1.88	-1701.70	-0.07	-0.56	N/A
19	N/A	6	673.00	1.88	-2123.55	-0.07	5.85	N/A
20	N/A	6	625.00	-4.38	-1022.45	-0.07	-0.56	N/A
21	N/A	6	796.00	20.66	-1136.85	-0.07	-0.56	N/A
22	N/A	6	487.00	8.14	-1658.80	2.42	1.58	N/A
23	N/A	6	529.00	1.88	-1851.85	-0.07	-0.56	N/A
24	N/A	6	820.00	-29.43	-1544.40	-0.07	3.72	N/A
25	N/A	6	746.00	1.88	-2002.00	-0.07	-2.69	N/A
26	N/A	6	473.00	-10.64	-1108.25	-0.07	1.58	N/A
27	N/A	6	282.00	20.66	-1673.10	-0.07	-0.56	N/A
28	N/A	6	344.00	-4.38	-1901.90	-0.07	1.58	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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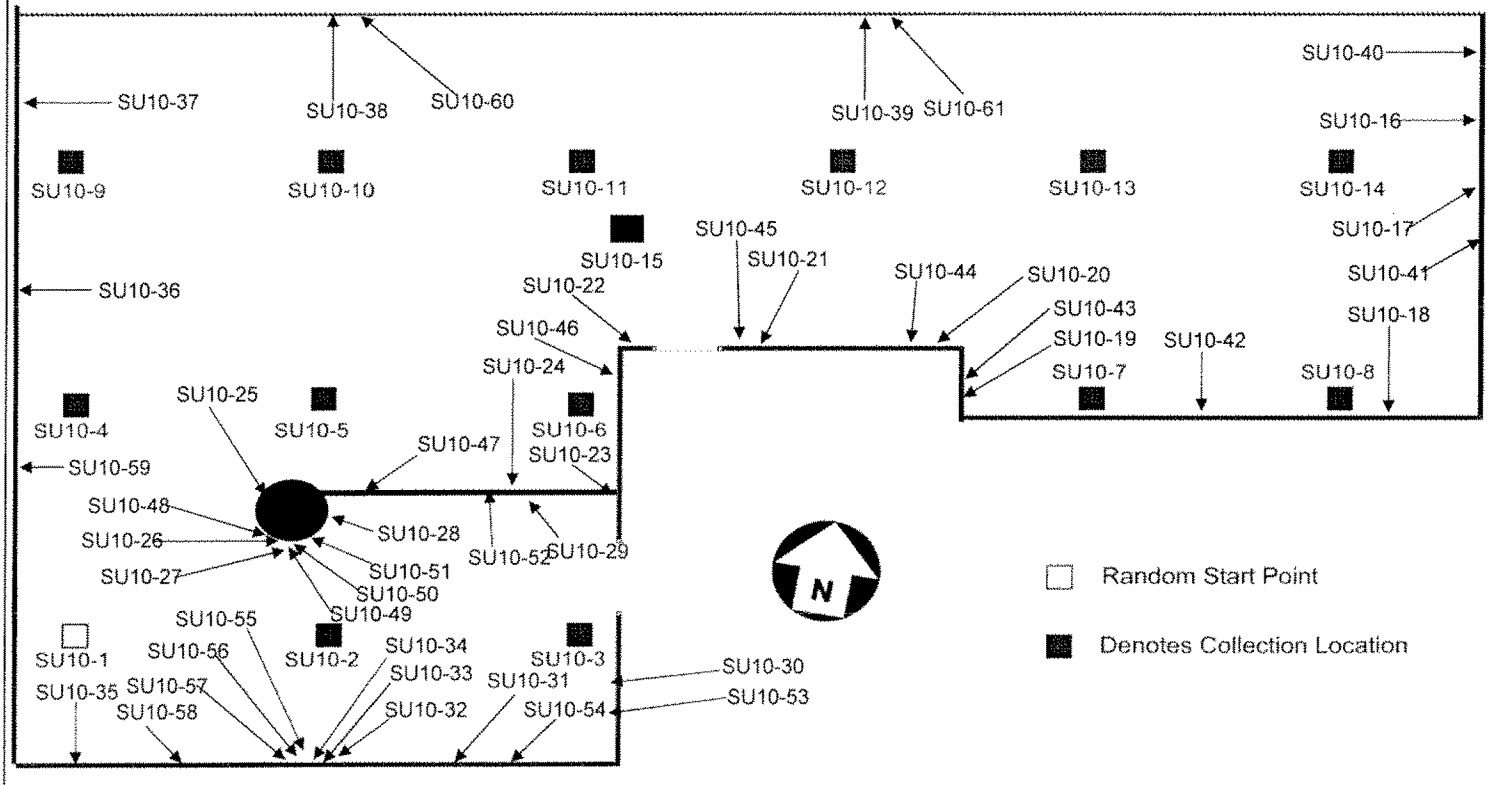
RADIATION/CONTAMINATION SURVEY FORM Page 1 of 3

Date: Time: 6/6/2006 09:30	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU10F01-001	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
Location: Parcel D	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 12.00	α 0.37
				βγ 62.41%	βγ 15.60%	βγ 16.29	βγ 2.12
Reviewed By: Ken Bradley QA/QC	2350-1	221016	5/4/2007	N/A	N/A	N/A	5.82 Kcpm
	44-10	150640					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	187849	5/4/2007	N/A	N/A	N/A	6 µR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU10 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 1-3 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.2-7.8 Kcpm.

Survey points 1-14 are systematic.

Survey point 15 is biased.

Survey points 16-61 taken on the walls

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU10F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	1253.00	-4.38	-1601.60	2.12	-2.12	N/A
2	N/A	7	1145.00	-35.69	-1086.80	-0.37	-2.12	N/A
3	N/A	6	968.00	-10.64	-1716.00	-0.37	8.57	N/A
4	N/A	7	1452.00	1.88	-1501.50	-0.37	2.16	N/A
5	N/A	6	1653.00	-29.43	-1201.20	-0.37	2.16	N/A
6	N/A	6	861.00	-10.64	-1737.45	2.12	-2.12	N/A
7	N/A	6	776.00	-4.38	-1308.45	-0.37	-2.12	N/A
8	N/A	6	1020.00	-23.17	-1329.90	-0.37	2.16	N/A
9	N/A	7	1728.00	1.88	-1051.05	-0.37	-2.12	N/A
10	N/A	6	1289.00	-16.91	-1315.60	-0.37	-2.12	N/A
11	N/A	6	1277.00	-4.38	-1208.35	-0.37	0.02	N/A
12	N/A	7	1043.00	-4.38	-1129.70	-0.37	-2.12	N/A
13	N/A	6	1266.00	-29.43	-1358.50	-0.37	0.02	N/A
14	N/A	6	1090.00	-16.91	-1165.45	-0.37	-2.12	N/A
15	N/A	7	1337.00	-10.64	-1487.20	-0.37	-2.12	N/A
16	N/A	6	638.00	-10.64	-1279.85	-0.37	0.02	N/A
17	N/A	5	12.00	14.40	-908.05	-0.37	-2.12	N/A
18	N/A	6	384.00	-23.17	-1808.95	-0.37	0.02	N/A
19	N/A	6	537.00	-16.91	-1880.45	-0.37	-2.12	N/A
20	N/A	6	883.00	58.23	-1708.85	-0.37	2.16	N/A
21	N/A	6	681.00	14.40	-1608.75	-0.37	6.43	N/A
22	N/A	6	608.00	-4.38	-1544.40	-0.37	0.02	N/A
23	N/A	6	165.00	-4.38	-1630.20	-0.37	10.70	N/A
24	N/A	6	201.00	-4.38	-2102.10	-0.37	-2.12	N/A
25	N/A	6	1095.00	-4.38	-950.95	-0.37	-2.12	N/A
26	N/A	6	785.00	20.66	-1301.30	-0.37	0.02	N/A
27	N/A	6	942.00	-16.91	-686.40	-0.37	-2.12	N/A
28	N/A	6	413.00	1.88	-1651.65	-0.37	12.84	N/A
29	N/A	6	543.00	-10.64	-2245.10	-0.37	-2.12	N/A
30	N/A	5	294.00	26.92	-2323.75	-0.37	0.02	N/A
31	N/A	6	689.00	-16.91	-1894.75	-0.37	0.02	N/A
32	N/A	6	300.00	-10.64	-1022.45	-0.37	0.02	N/A
33	N/A	6	592.00	14.40	-800.80	-0.37	8.57	N/A
34	N/A	6	616.00	-16.91	-1201.20	-0.37	0.02	N/A
35	N/A	6	767.00	1.88	-2145.00	-0.37	4.29	N/A

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU10F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
36	N/A	7	2390.00	-10.64	-1630.20	-0.37	2.16	N/A
37	N/A	7	1707.00	-4.38	-1773.20	-0.37	0.02	N/A
38	N/A	7	1295.00	14.40	-1015.30	-0.37	2.16	N/A
39	N/A	6	4037.00	-16.91	-965.25	-0.37	4.29	N/A
40	N/A	6	4675.00	-10.64	-1408.55	-0.37	4.29	N/A
41	N/A	6	1047.00	-23.17	-1072.50	-0.37	6.43	N/A
42	N/A	5	916.00	-4.38	-822.25	-0.37	-2.12	N/A
43	N/A	6	262.00	20.66	-1866.15	-0.37	-2.12	N/A
44	N/A	6	512.00	33.19	-1508.65	-0.37	0.02	N/A
45	N/A	6	614.00	-4.38	-1530.10	-0.37	2.16	N/A
46	N/A	6	375.00	1.88	-1837.55	-0.37	-2.12	N/A
47	N/A	6	618.00	-10.64	-1487.20	-0.37	6.43	N/A
48	N/A	7	986.00	-23.17	-1372.80	-0.37	-2.12	N/A
49	N/A	7	638.00	-10.64	-1029.60	-0.37	-2.12	N/A
50	N/A	6	776.00	-4.38	-908.05	-0.37	6.43	N/A
51	N/A	6	500.00	-10.64	-1179.75	-0.37	0.02	N/A
52	N/A	6	691.00	-23.17	-2109.25	-0.37	2.16	N/A
53	N/A	5	593.00	-4.38	-2252.25	-0.37	-2.12	N/A
54	N/A	5	728.00	-4.38	-1994.85	-0.37	10.70	N/A
55	N/A	5	806.00	-16.91	-929.50	-0.37	-2.12	N/A
56	N/A	6	748.00	26.92	-700.70	-0.37	0.02	N/A
57	N/A	6	469.00	-16.91	-1551.55	-0.37	0.02	N/A
58	N/A	6	1091.00	8.14	-1401.40	-0.37	0.02	N/A
59	N/A	6	622.00	-4.38	-736.45	-0.37	0.02	N/A
60	N/A	6	342.00	1.88	-800.80	-0.37	2.16	N/A
61	N/A	6	697.00	1.88	-650.65	-0.37	2.16	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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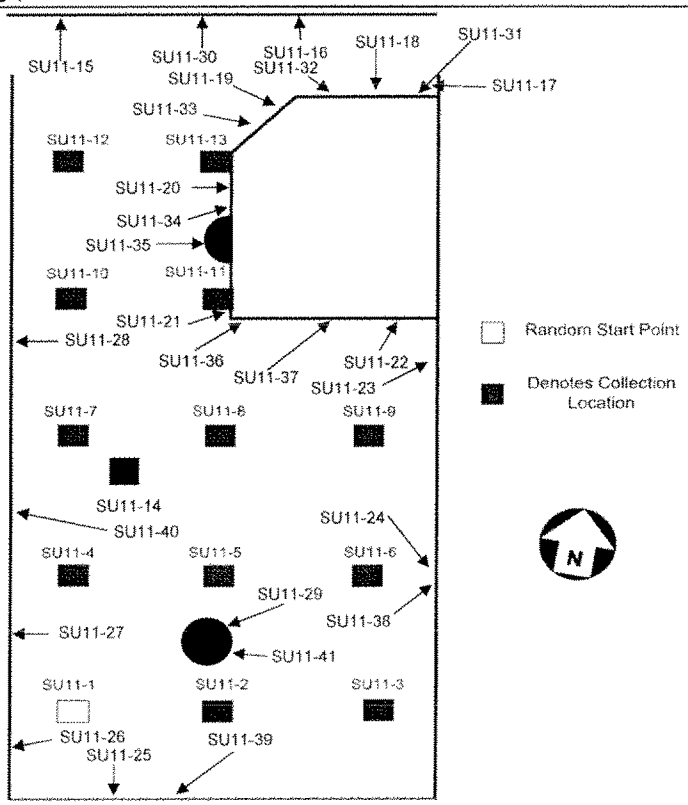
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
6/2/2006 11:30	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU11F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 15.35	βγ 1.73
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	148206	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU11 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 650-850 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.0-7.2 Kcpm.

Survey points 1-13 are systematic.

Survey point 14 is biased.

Survey points 15-41 taken on the walls

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area massfinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00529

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU11F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	611.00	-16.91	-1108.25	-0.07	0.41	N/A
2	N/A	7	782.00	-4.38	-1637.35	-0.07	4.68	N/A
3	N/A	7	706.00	-16.91	-1487.20	-0.07	-1.73	N/A
4	N/A	7	1053.00	1.88	-1837.55	-0.07	2.54	N/A
5	N/A	7	1008.00	-23.17	-1444.30	-0.07	8.95	N/A
6	N/A	7	881.00	1.88	-1287.00	-0.07	-1.73	N/A
7	N/A	7	1106.00	-4.38	-1215.50	-0.07	-1.73	N/A
8	N/A	7	743.00	-29.43	-1701.70	-0.07	-1.73	N/A
9	N/A	7	964.00	-16.91	-1379.95	-0.07	19.63	N/A
10	N/A	7	1039.00	1.88	-1515.80	-0.07	-1.73	N/A
11	N/A	7	899.00	-10.64	-1630.20	-0.07	13.22	N/A
12	N/A	7	995.00	8.14	-1665.95	-0.07	6.82	N/A
13	N/A	7	925.00	1.88	-1630.20	-0.07	4.68	N/A
14	N/A	7	941.00	-10.64	-1322.75	-0.07	0.41	N/A
15	N/A	7	760.00	1.88	-2216.50	-0.07	-1.73	N/A
16	N/A	7	766.00	-16.91	-1944.80	-0.07	0.41	N/A
17	N/A	6	771.00	14.40	-1737.45	2.42	0.41	N/A
18	N/A	6	439.00	8.14	-1694.55	-0.07	-1.73	N/A
19	N/A	6	436.00	-16.91	-1894.75	2.42	0.41	N/A
20	N/A	6	1297.00	26.92	-2230.80	2.42	0.41	N/A
21	N/A	7	1258.00	14.40	-1873.30	-0.07	4.68	N/A
22	N/A	7	480.00	-23.17	-1923.35	2.42	4.68	N/A
23	N/A	7	360.00	-4.38	-2195.05	-0.07	4.68	N/A
24	N/A	7	592.00	-29.43	-2166.45	-0.07	-1.73	N/A
25	N/A	7	-4.00	-4.38	-1851.85	-0.07	-1.73	N/A
26	N/A	7	-32.00	-4.38	-2316.60	-0.07	0.41	N/A
27	N/A	7	315.00	-10.64	-1930.50	-0.07	0.41	N/A
28	N/A	7	672.00	-4.38	-2066.35	2.42	-1.73	N/A
29	N/A	7	524.00	20.66	-1401.40	-0.07	-1.73	N/A
30	N/A	7	695.00	-23.17	-1665.95	-0.07	-1.73	N/A
31	N/A	6	595.00	8.14	-1894.75	-0.07	13.22	N/A
32	N/A	6	667.00	-29.43	-1801.80	-0.07	2.54	N/A
33	N/A	7	550.00	-4.38	-1930.50	-0.07	0.41	N/A
34	N/A	7	538.00	8.14	-1608.75	-0.07	2.54	N/A
35	N/A	7	781.00	-16.91	-1408.55	-0.07	-1.73	N/A

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU11F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
36	N/A	7	496.00	1.88	-457.60	-0.07	2.54	N/A
37	N/A	7	509.00	8.14	-1923.35	-0.07	6.82	N/A
38	N/A	7	686.00	-29.43	-1615.90	-0.07	-1.73	N/A
39	N/A	7	116.00	1.88	-2073.50	-0.07	2.54	N/A
40	N/A	7	848.00	-23.17	-1287.00	-0.07	4.68	N/A
41	N/A	7	677.00	14.40	-1480.05	-0.07	-1.73	N/A

Reviewer

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RADIATION/CONTAMINATION SURVEY FORM

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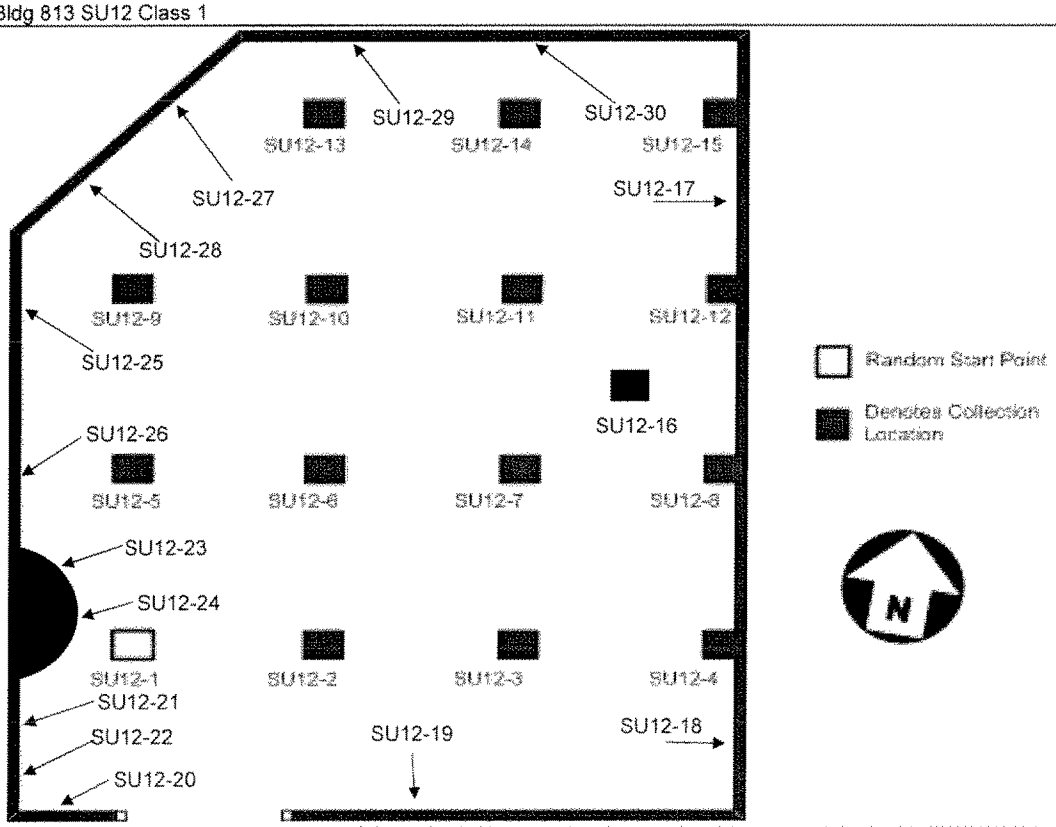
Date: Time:	INSTRUMENTATION USED						
6/2/2006 10:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA * (dpm/100cm²)	Background * (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU12F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
Location: Parcel D	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 9.51	α 0.07
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 17.56	βγ 2.69
	2350-1	228683	5/2/2007	N/A	N/A	N/A	5.46
Reviewed By: Ken Bradley QA/QC	44-10	150870					Kcpm
	Model 19	187849	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU12 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 600-800 cpm alpha and 3-5 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.7-7.2 Kcpm.

Survey points 1-15 are systematic.

Survey point 16 is biased.

Survey points 17-30 were taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

* Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU12F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	581.00	-27.26	-721.20	-0.07	3.72	N/A
2	N/A	6	730.00	-32.71	-574.96	-0.07	3.72	N/A
3	N/A	6	856.00	-16.36	-362.26	2.42	-2.69	N/A
4	N/A	6	498.00	0.00	-681.32	-0.07	-0.56	N/A
5	N/A	6	608.00	0.00	-644.76	-0.07	1.58	N/A
6	N/A	6	735.00	-21.81	-664.70	-0.07	-0.56	N/A
7	N/A	6	856.00	0.00	-312.41	-0.07	-0.56	N/A
8	N/A	6	631.00	5.45	-641.43	-0.07	-2.69	N/A
9	N/A	6	744.00	-10.90	-501.85	-0.07	-2.69	N/A
10	N/A	6	631.00	-16.36	-495.20	-0.07	-2.69	N/A
11	N/A	6	860.00	-10.90	-558.35	-0.07	3.72	N/A
12	N/A	6	636.00	-16.36	-265.88	-0.07	-2.69	N/A
13	N/A	6	888.00	0.00	-445.35	-0.07	-0.56	N/A
14	N/A	7	1155.00	-5.45	-405.47	-0.07	-2.69	N/A
15	N/A	6	788.00	-21.81	-641.43	-0.07	-2.69	N/A
16	N/A	6	964.00	-10.90	-458.64	-0.07	-2.69	N/A
17	N/A	6	722.00	-16.36	-980.43	-0.07	3.72	N/A
18	N/A	6	549.00	5.45	-1093.43	-0.07	-0.56	N/A
19	N/A	6	431.00	-10.90	-1219.72	-0.07	-0.56	N/A
20	N/A	6	773.00	0.00	-1143.28	-0.07	-2.69	N/A
21	N/A	6	658.00	-10.90	-1076.81	-0.07	5.85	N/A
22	N/A	6	634.00	-27.26	-1056.87	-0.07	1.58	N/A
23	N/A	6	557.00	-21.81	-737.82	-0.07	1.58	N/A
24	N/A	6	572.00	5.45	-525.11	-0.07	5.85	N/A
25	N/A	6	1081.00	10.90	-1093.43	-0.07	-0.56	N/A
26	N/A	6	412.00	-10.90	-1000.37	-0.07	-0.56	N/A
27	N/A	6	594.00	10.90	-1023.64	-0.07	12.26	N/A
28	N/A	6	665.00	0.00	-1186.49	-0.07	7.99	N/A
29	N/A	6	727.00	-16.36	-1076.81	-0.07	1.58	N/A
30	N/A	6	624.00	-5.45	-1183.16	-0.07	-2.69	N/A

Reviewer	Date:	RSO/RTM	Date:
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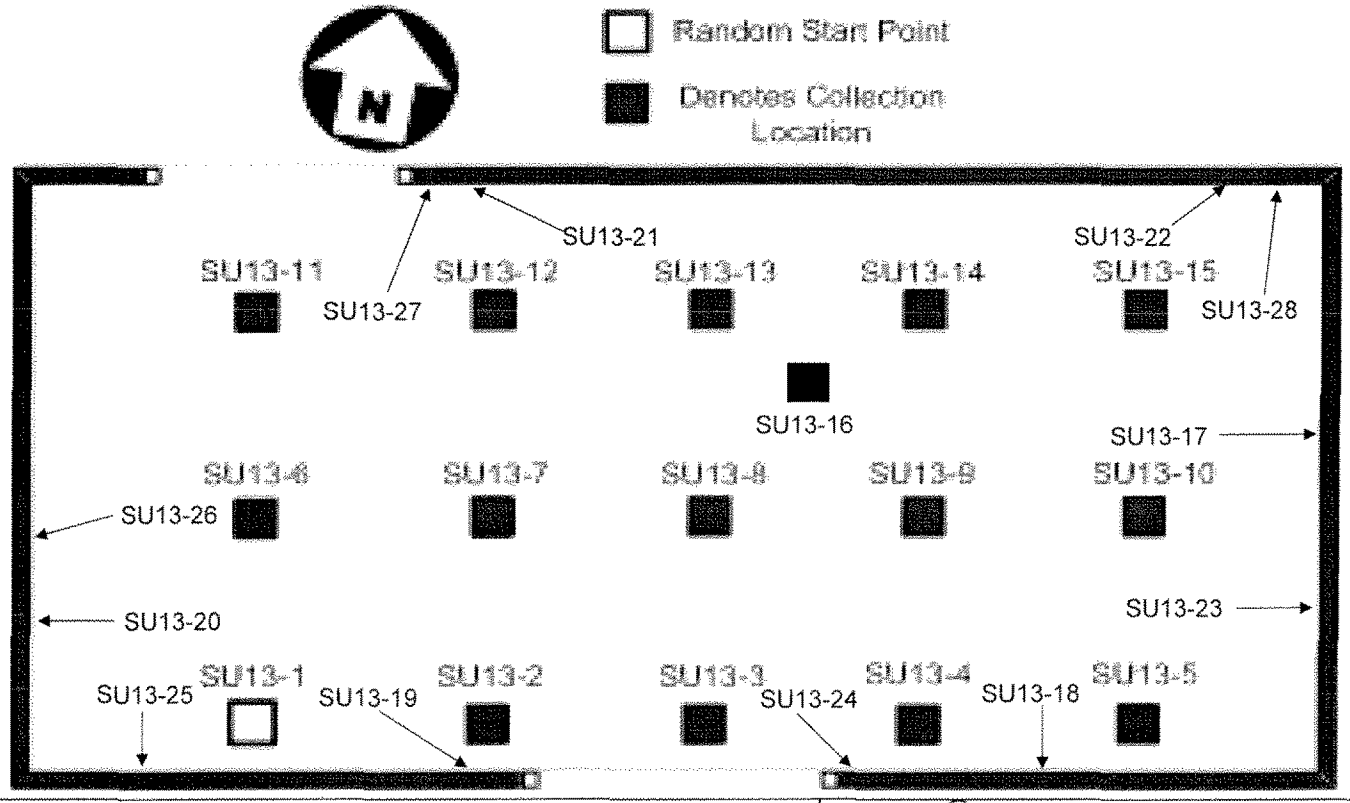
RADIATION/CONTAMINATION SURVEY FORM Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/5/2006 10:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA * (dpm/100cm²)	Background * (dpm/100cm²)
	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
Survey Number: HPS-06NPD813SU13F01-001	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 15.68	βγ 1.86
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	148206	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 Concrete Floor SU13 Class 1



Comments:

All LAW's were ≤ background α β

Floor monitor - Scan Ranges 1-3 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.9-7.2 Kcpm.

Survey points 1-15 are systematic.

Survey point 16 is biased.

Survey points 17-28 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU13F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	746.00	26.92	-1337.05	-0.15	0.28	N/A
2	N/A	6	741.00	-23.17	-1408.55	-0.15	-1.86	N/A
3	N/A	6	1004.00	-16.91	-865.15	-0.15	2.41	N/A
4	N/A	6	880.00	-29.43	-1501.50	2.35	-1.86	N/A
5	N/A	6	594.00	-4.38	-1587.30	2.35	2.41	N/A
6	N/A	6	791.00	-10.64	-1315.60	-0.15	-1.86	N/A
7	N/A	6	945.00	14.40	-1587.30	-0.15	25.92	N/A
8	N/A	6	927.00	-10.64	-1294.15	-0.15	-1.86	N/A
9	N/A	6	940.00	-10.64	-1494.35	-0.15	-1.86	N/A
10	N/A	6	646.00	-10.64	-1508.65	-0.15	2.41	N/A
11	N/A	6	879.00	-29.43	-1530.10	-0.15	0.28	N/A
12	N/A	6	905.00	8.14	-1515.80	-0.15	-1.86	N/A
13	N/A	6	946.00	1.88	-1480.05	-0.15	6.69	N/A
14	N/A	6	931.00	-10.64	-1394.25	-0.15	0.28	N/A
15	N/A	6	790.00	-10.64	-1522.95	-0.15	2.41	N/A
16	N/A	6	860.00	14.40	-1472.90	-0.15	-1.86	N/A
17	N/A	6	172.00	8.14	-1830.40	2.35	2.41	N/A
18	N/A	6	499.00	8.14	-1136.85	-0.15	2.41	N/A
19	N/A	6	584.00	20.66	-1687.40	-0.15	2.41	N/A
20	N/A	6	402.00	-10.64	-1737.45	-0.15	2.41	N/A
21	N/A	6	491.00	20.66	-1837.55	-0.15	0.28	N/A
22	N/A	6	270.00	14.40	-1573.00	-0.15	0.28	N/A
23	N/A	6	269.00	14.40	-2123.55	-0.15	0.28	N/A
24	N/A	6	357.00	-4.38	-2080.65	-0.15	-1.86	N/A
25	N/A	6	429.00	-10.64	-1758.90	-0.15	-1.86	N/A
26	N/A	6	228.00	1.88	-1680.25	-0.15	-1.86	N/A
27	N/A	6	209.00	1.88	-1887.60	-0.15	-1.86	N/A
28	N/A	6	417.00	39.45	-2338.05	-0.15	2.41	N/A

Reviewer	Date:	RSO/RTM	Date:
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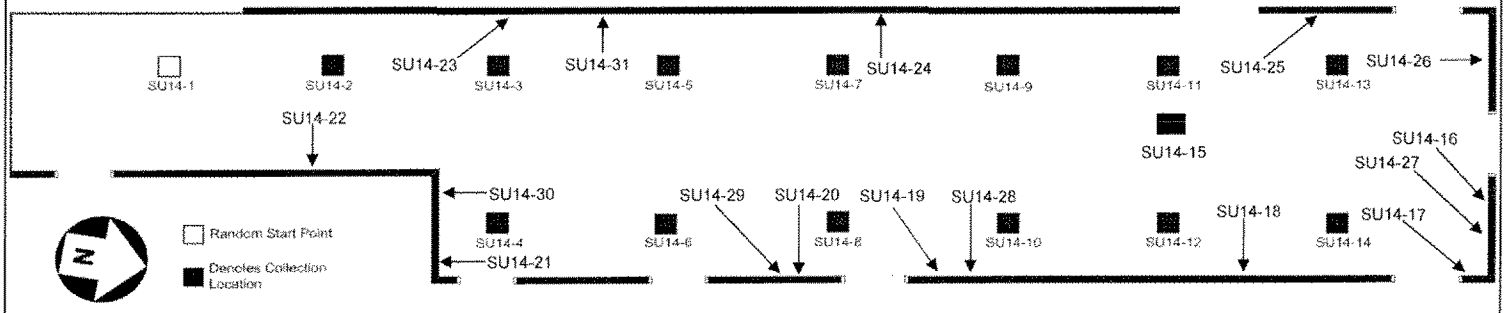
RADIATION/CONTAMINATION SURVEY FORM Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/5/2006 12:50	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
Survey Number: HPS-06NPD813SU14F01-001	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 15.68	βγ 1.86
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	148206	5/4/2007	N/A	N/A	N/A	7
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU14 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 1-3 cpm alpha and 650-850 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.6-7.9 Kcpm.

Survey points 1-14 are systematic.

Survey point 15 is biased.

Survey points 16-31 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU14F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	405.00	-16.91	-1665.95	-0.15	-1.86	N/A
2	N/A	6	850.00	1.88	-1151.15	-0.15	4.55	N/A
3	N/A	7	964.00	8.14	-1472.90	2.35	0.28	N/A
4	N/A	7	796.00	14.40	-1594.45	-0.15	-1.86	N/A
5	N/A	7	1073.00	-10.64	-1186.90	-0.15	0.28	N/A
6	N/A	7	1104.00	-16.91	-1015.30	-0.15	2.41	N/A
7	N/A	7	1347.00	8.14	-1222.65	-0.15	4.55	N/A
8	N/A	7	1061.00	20.66	-1351.35	-0.15	0.28	N/A
9	N/A	7	1280.00	-10.64	-1093.95	-0.15	0.28	N/A
10	N/A	7	1199.00	14.40	-1372.80	-0.15	0.28	N/A
11	N/A	7	1207.00	-23.17	-1222.65	-0.15	2.41	N/A
12	N/A	7	1521.00	-10.64	-1129.70	-0.15	0.28	N/A
13	N/A	7	1198.00	14.40	-1022.45	-0.15	0.28	N/A
14	N/A	7	980.00	8.14	-1065.35	-0.15	4.55	N/A
15	N/A	7	1145.00	8.14	-1179.75	-0.15	2.41	N/A
16	N/A	7	733.00	8.14	-1308.45	-0.15	-1.86	N/A
17	N/A	7	444.00	39.45	-1823.25	-0.15	-1.86	N/A
18	N/A	7	1292.00	1.88	-1601.60	4.85	0.28	N/A
19	N/A	7	1057.00	14.40	-672.10	-0.15	-1.86	N/A
20	N/A	7	1220.00	-10.64	-1158.30	2.35	-1.86	N/A
21	N/A	6	509.00	8.14	-1172.60	-0.15	-1.86	N/A
22	N/A	7	490.00	20.66	-1179.75	-0.15	0.28	N/A
23	N/A	7	575.00	-10.64	-2030.60	-0.15	-1.86	N/A
24	N/A	7	665.00	26.92	-1651.65	-0.15	-1.86	N/A
25	N/A	6	590.00	8.14	-1165.45	-0.15	2.41	N/A
26	N/A	7	633.00	-10.64	-1623.05	-0.15	2.41	N/A
27	N/A	7	748.00	-10.64	-958.10	-0.15	-1.86	N/A
28	N/A	7	1023.00	14.40	-1129.70	2.35	0.28	N/A
29	N/A	7	1201.00	-4.38	-1816.10	-0.15	0.28	N/A
30	N/A	7	330.00	-23.17	-2123.55	-0.15	0.28	N/A
31	N/A	7	861.00	20.66	-1537.25	-0.15	-1.86	N/A

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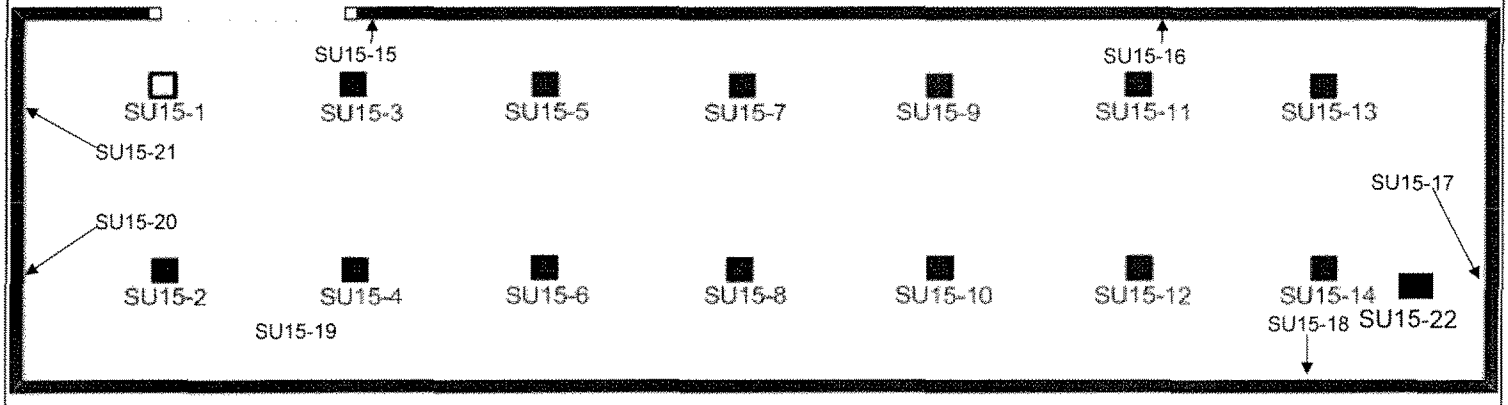
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
5/31/2006 15:00	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU15F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	227415	5/4/2007	α 13.79%	α 3.45%	α 98.72	α 34.53
Location: Parcel D	43-68	116722		βγ 31.47%	βγ 7.87%	βγ 445.09	βγ 2602.63
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.98	α 0.22
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 17.16	βγ 2.50
	2350-1	221016	5/2/2007	N/A	N/A	N/A	6.3
Reviewed By: Ken Bradley QA/QC	44-10	150640					Kcpm
	Model 19	187849	5/4/2007	N/A	N/A	N/A	6
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr

Survey Type: Building | 2360 Static Count Time: 3 Minutes | 2350 Static Count Time: 1 Minute

Description of survey: Bldg 813 SU15 Class 1



Random Start Point

Denotes Collection Location

N

Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 3-5 cpm alpha and 600-750 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.9-7.1 Kcpm.

Survey points 1-14 are systematic.

Survey points 15-21 taken on walls

Survey point 22 is biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00538

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU15F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	-4.00	-11.51	-379.97	-0.22	-0.36	N/A
2	N/A	6	23.00	11.51	-225.29	-0.22	-2.50	N/A
3	N/A	7	42.00	3.84	-221.93	-0.22	1.77	N/A
4	N/A	6	-82.00	-19.18	-316.08	-0.22	12.46	N/A
5	N/A	6	64.00	19.18	-524.56	-0.22	-0.36	N/A
6	N/A	6	114.00	-3.84	-332.89	-0.22	3.91	N/A
7	N/A	6	258.00	19.18	-437.13	-0.22	-0.36	N/A
8	N/A	6	327.00	-11.51	-393.42	-0.22	-0.36	N/A
9	N/A	6	461.00	3.84	-272.37	-0.22	-0.36	N/A
10	N/A	6	323.00	-11.51	-312.72	-0.22	-0.36	N/A
11	N/A	7	179.00	-34.53	-430.41	-0.22	-2.50	N/A
12	N/A	7	-124.00	-3.84	-464.03	-0.22	-2.50	N/A
13	N/A	7	173.00	-11.51	-369.88	-0.22	-0.36	N/A
14	N/A	6	50.00	19.18	-305.99	-0.22	-2.50	N/A
15	N/A	6	-325.00	19.18	-578.36	-0.22	6.05	N/A
16	N/A	6	-276.00	-3.84	-928.07	-0.22	-2.50	N/A
17	N/A	7	166.00	3.84	-605.26	-0.22	-0.36	N/A
18	N/A	6	-159.00	3.84	-924.71	-0.22	-0.36	N/A
19	N/A	6	-448.00	-11.51	-1008.77	-0.22	-2.50	N/A
20	N/A	6	-569.00	-3.84	-931.43	-0.22	-0.36	N/A
21	N/A	6	-466.00	11.51	-1035.67	-0.22	1.77	N/A
22	N/A	6	-175.00	26.86	-739.77	-0.22	1.77	N/A

Reviewer

ORIGINAL ON FILE

Date:

Time:

RSO/RTM

Date:

Time:

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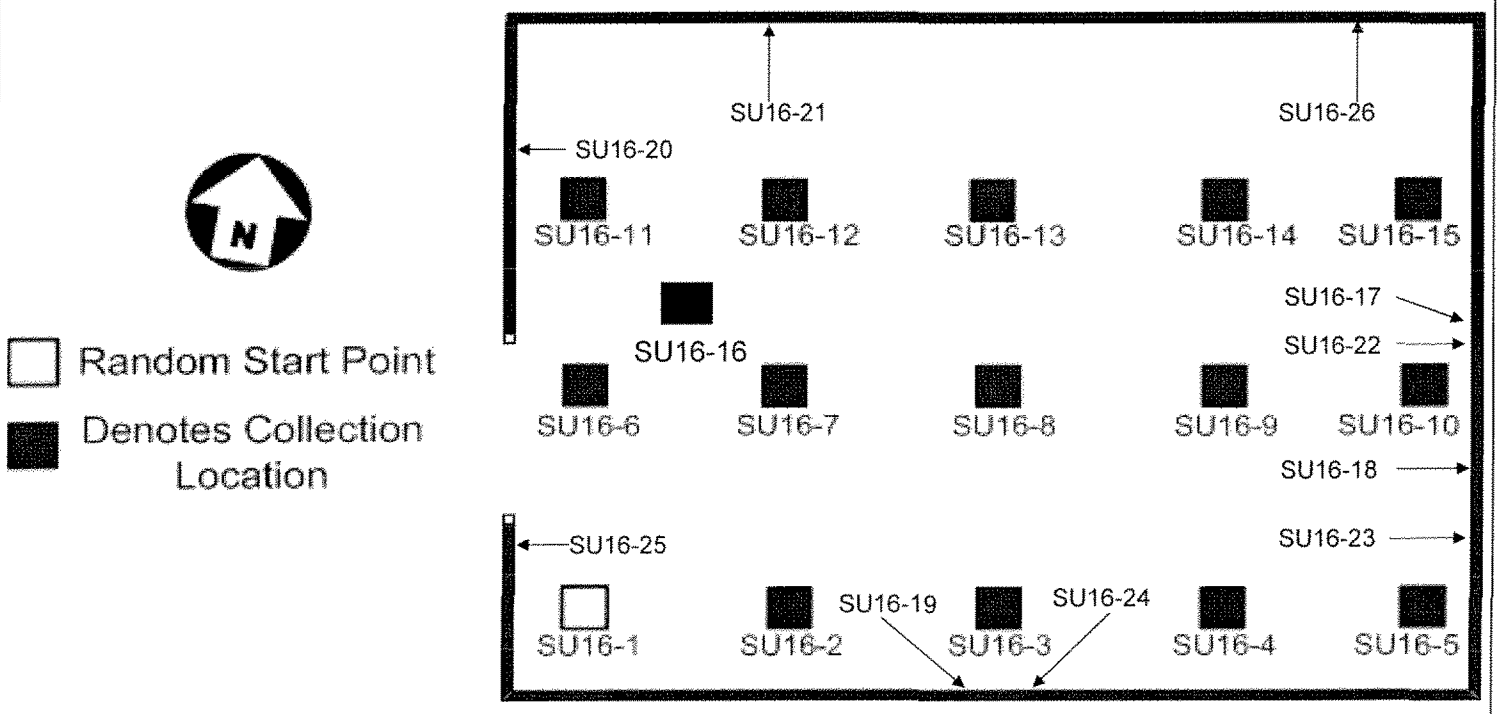
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA * (dpm/100cm²)	Background * (dpm/100cm²)
5/31/2006 13:00							
	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
Survey Number: HPS-06NPD813SU16F01-001	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
	2360	227415	5/4/2007	α 13.79%	α 3.45%	α 98.72	α 34.53
Location: Parcel D	43-68	116722		βγ 31.47%	βγ 7.87%	βγ 445.09	βγ 2602.63
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 16.73	βγ 2.31
	2350-1	221016	5/2/2007	N/A	N/A	N/A	6.4
Reviewed By: Ken Bradley QA/QC	44-10	150640					Kcpm
	Model 19	187849	5/4/2007	N/A	N/A	N/A	7
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU16 Class 1



Comments:

All LAW's were ≤ background α β

Floor Monitor - Scan Ranges 5-7 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.9-7.2 Kcpm.

Survey points 1-15 are systematic.

Survey point 16 is biased.

Survey points 17-26 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00540

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU16F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	7	984.00	-11.51	-141.23	-0.15	-0.17	N/A
2	N/A	7	1093.00	-19.18	-201.75	-0.15	-2.31	N/A
3	N/A	7	1212.00	-11.51	-100.88	-0.15	4.10	N/A
4	N/A	7	1408.00	-19.18	-302.63	-0.15	-2.31	N/A
5	N/A	7	1106.00	-26.86	-346.34	-0.15	-0.17	N/A
6	N/A	7	861.00	-11.51	-87.43	-0.15	-0.17	N/A
7	N/A	7	855.00	-26.86	-107.60	-0.15	1.97	N/A
8	N/A	7	1085.00	-26.86	43.71	-0.15	4.10	N/A
9	N/A	7	1045.00	-3.84	-144.59	-0.15	-0.17	N/A
10	N/A	7	848.00	-26.86	-346.34	-0.15	-2.31	N/A
11	N/A	7	524.00	11.51	-329.53	-0.15	-2.31	N/A
12	N/A	7	821.00	-26.86	-188.30	-0.15	4.10	N/A
13	N/A	7	955.00	-3.84	-295.91	-0.15	-0.17	N/A
14	N/A	7	901.00	-3.84	-94.15	-0.15	4.10	N/A
15	N/A	7	780.00	-11.51	-178.22	-0.15	-2.31	N/A
16	N/A	7	527.00	-3.84	-117.69	-0.15	-0.17	N/A
17	N/A	7	425.00	-11.51	-780.12	-0.15	-0.17	N/A
18	N/A	7	947.00	-3.84	-763.30	-0.15	1.97	N/A
19	N/A	7	834.00	11.51	-783.48	-0.15	-0.17	N/A
20	N/A	6	91.00	3.84	-928.07	-0.15	-0.17	N/A
21	N/A	7	236.00	3.84	-948.24	-0.15	-0.17	N/A
22	N/A	7	445.00	-26.86	-850.73	-0.15	1.97	N/A
23	N/A	7	543.00	-11.51	-1002.05	-0.15	-2.31	N/A
24	N/A	7	793.00	3.84	-679.24	-0.15	-2.31	N/A
25	N/A	6	296.00	-19.18	-938.16	2.35	-0.17	N/A
26	N/A	7	273.00	-26.86	-837.28	-0.15	10.51	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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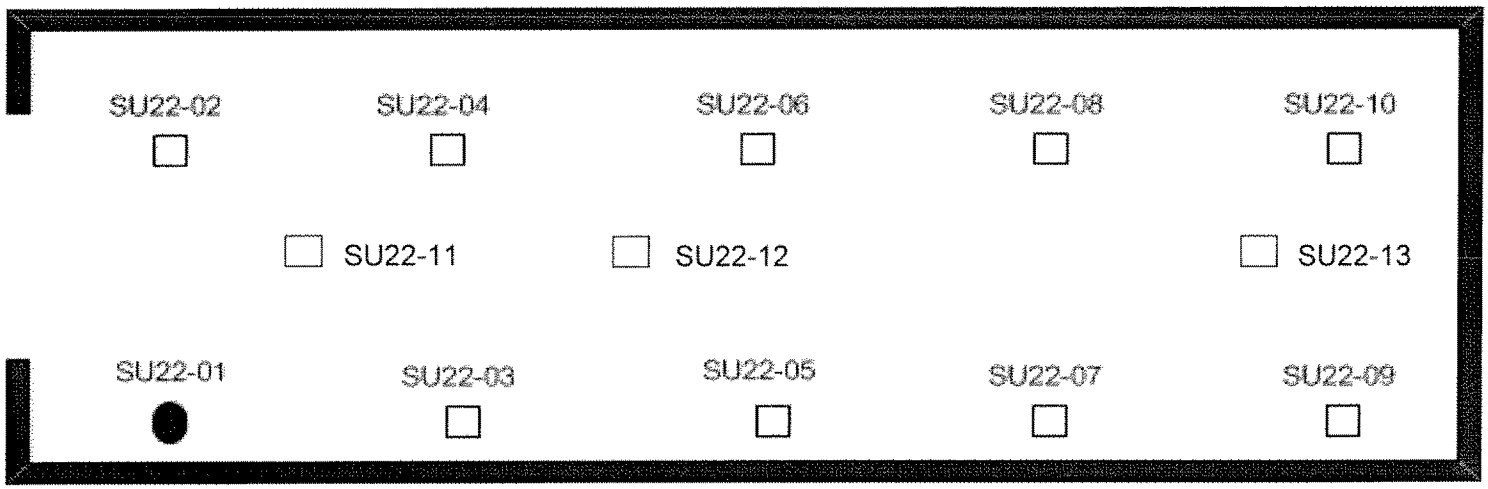
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA [+] (dpm/100cm^2)	Background [+] (dpm/100cm^2)
7/19/2006 16:07	N/A N/A	N/A N/A	N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A
Survey Number: HPS-813-SU22-F001-001	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 75.27	α 29.44
Location: Parcel D	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 371.08	βγ 1814.63
Surveyor: A. Matus	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.98	α 0.22
				βγ 62.41%	βγ 15.60%	βγ 16.73	βγ 2.31
Reviewed By: Ken Bradley QA/QC	2350-1	228683	5/2/2007				5.824
	44-10	150870					Kcpm
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	N/A	N/A	N/A				N/A N/A
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU22 Class 1



● - Denotes Starting Point

□ - Denotes Survey Point

Comments:

All LAW's were ≤ background α β

2360 - Scan Ranges 1-2 cpm alpha and 300-450 cpm beta.

2360 - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.2 - 8.5 Kcpm.

Survey points 1-10 are systematic.

Survey points 11-13 are biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

[+] Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00542

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-813-SU22-F001-001

SURVEYOR: A. Matus

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1			874	-13.08	-93.06	-0.22	6.24	
2			1420	8.72	-43.21	-0.22	4.10	
3			1382	14.17	-76.44	-0.22	4.10	
4			1209	8.72	-63.15	-0.22	10.51	
5			1322	-2.18	126.29	-0.22	-0.17	
6			624	25.08	-172.82	-0.22	1.97	
7			1389	8.72	-3.32	-0.22	-0.17	
8			1377	-18.54	-339.00	-0.22	6.24	
9			1322	-2.18	-219.35	-0.22	-2.31	
10			1401	-7.63	-332.35	2.27	-2.31	
11			1019	3.27	-335.67	-0.22	1.97	
12			1148	35.98	-176.15	-0.22	-0.17	
13			1082	8.72	-212.70	-0.22	-2.31	

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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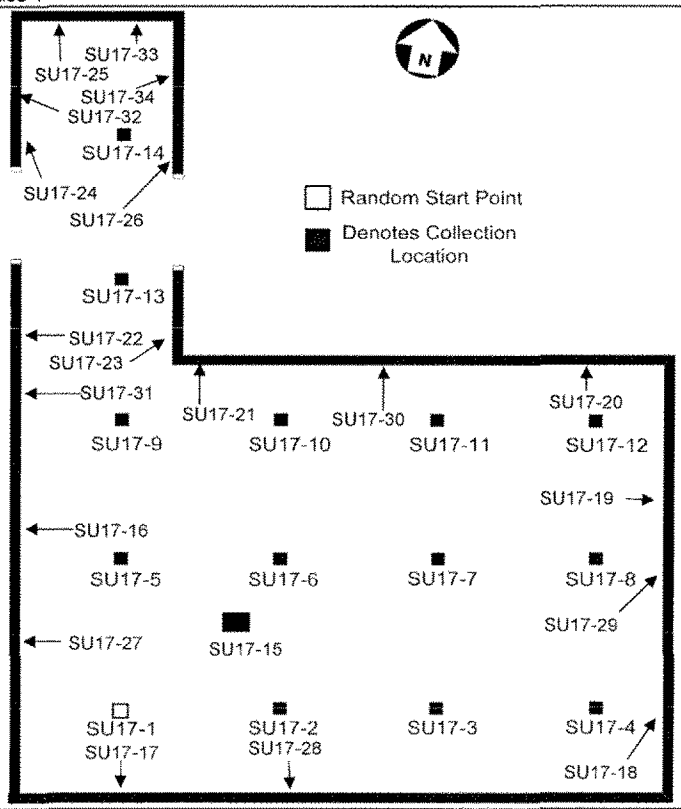
RADIATION/CONTAMINATION SURVEY FORM

Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
6/12/2006 13:20	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 32.53	α 17.05
Survey Number: HPS-06NPD813SU17F01-001	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 209.60	βγ 1826.58
	2360	185766	2/14/2007	α 16.90%	α 4.23%	α 88.30	α 35.69
Location: Parcel D	43-68	99186		βγ 14.80%	βγ 3.70%	βγ 904.23	βγ 5040.76
	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
Surveyor: C. Carchidi				βγ 62.41%	βγ 15.60%	βγ 18.94	βγ 3.40
	2350-1	221013	5/2/2007	N/A	N/A	N/A	5.63
Reviewed By: Ken Bradley QA/QC	44-10	155599					Kcpm
	Model 19	187849	5/4/2007	N/A	N/A	N/A	7
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu							μR/hr
Survey Type: Building	2360 Static Count Time: 3 Minutes				2350 Static Count Time: 1 Minute		

Description of survey: Bldg 813 SU17 Class 1



Comments:

All LAW's were ≤ background α β

Floor monitor - Scan Ranges 1-3 cpm alpha and 1000-1500 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.6-8.9 Kcpm.

Survey points 1-14 are systematic.

Survey point 15 is biased.

Survey points 16-34 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

Rev 4 05/10/2006

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU17F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm²	Beta/Gamma dpm/100cm²	Alpha dpm/100cm²	Beta/Gamma dpm/100cm²	
1	N/A	7	2199.00	1.88	378.95	-0.15	-3.40	N/A
2	N/A	7	2431.00	14.40	-293.15	-0.15	3.01	N/A
3	N/A	7	2669.00	20.66	-14.30	-0.15	-3.40	N/A
4	N/A	8	2503.00	14.40	85.80	-0.15	24.38	N/A
5	N/A	8	2019.00	8.14	-128.70	-0.15	-1.26	N/A
6	N/A	7	2251.00	39.45	-429.00	-0.15	-1.26	N/A
7	N/A	7	2811.00	1.88	-371.80	4.85	-3.40	N/A
8	N/A	8	2122.00	1.88	357.50	-0.15	-3.40	N/A
9	N/A	8	1906.00	8.14	7.15	-0.15	-1.26	N/A
10	N/A	8	2417.00	39.45	-100.10	-0.15	-3.40	N/A
11	N/A	8	2545.00	8.14	286.00	2.35	-1.26	N/A
12	N/A	8	2493.00	-4.38	858.00	-0.15	9.42	N/A
13	N/A	6	1368.00	1.88	-1315.60	-0.15	-3.40	N/A
14	N/A	6	907.00	1.88	-1222.65	-0.15	-1.26	N/A
15	N/A	8	2271.00	14.40	407.55	-0.15	0.88	N/A
16	N/A	8	2058.00	14.40	464.75	-0.15	0.88	N/A
17	N/A	7	1718.00	-29.43	993.85	2.35	-1.26	N/A
18	N/A	7	1961.00	-16.91	800.80	-0.15	5.15	N/A
19	N/A	7	2151.00	14.40	772.20	-0.15	-1.26	N/A
20	N/A	7	2160.00	51.97	686.40	-0.15	0.88	N/A
21	N/A	7	1950.00	14.40	707.85	-0.15	0.88	N/A
22	N/A	7	1005.00	-10.64	-1608.75	-0.15	-1.26	N/A
23	N/A	7	1327.00	-10.64	-2052.05	-0.15	0.88	N/A
24	N/A	7	42.00	-29.43	-2330.90	-0.15	3.01	N/A
25	N/A	7	1140.00	-29.43	-2002.00	2.35	-3.40	N/A
26	N/A	7	960.00	-23.17	-1830.40	-0.15	-3.40	N/A
27	N/A	7	2171.00	20.66	686.40	-0.15	-3.40	N/A
28	N/A	7	2207.00	14.40	936.65	-0.15	-3.40	N/A
29	N/A	7	2054.00	26.92	965.25	2.35	0.88	N/A
30	N/A	7	1990.00	8.14	336.05	-0.15	-1.26	N/A
31	N/A	7	963.00	-10.64	-1630.20	-0.15	0.88	N/A
32	N/A	7	201.00	-4.38	-1794.65	-0.15	-3.40	N/A
33	N/A	7	1209.00	-16.91	-2002.00	-0.15	13.69	N/A
34	N/A	7	1172.00	-16.91	-1973.40	2.35	-1.26	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

ED_000855_00003297-00545

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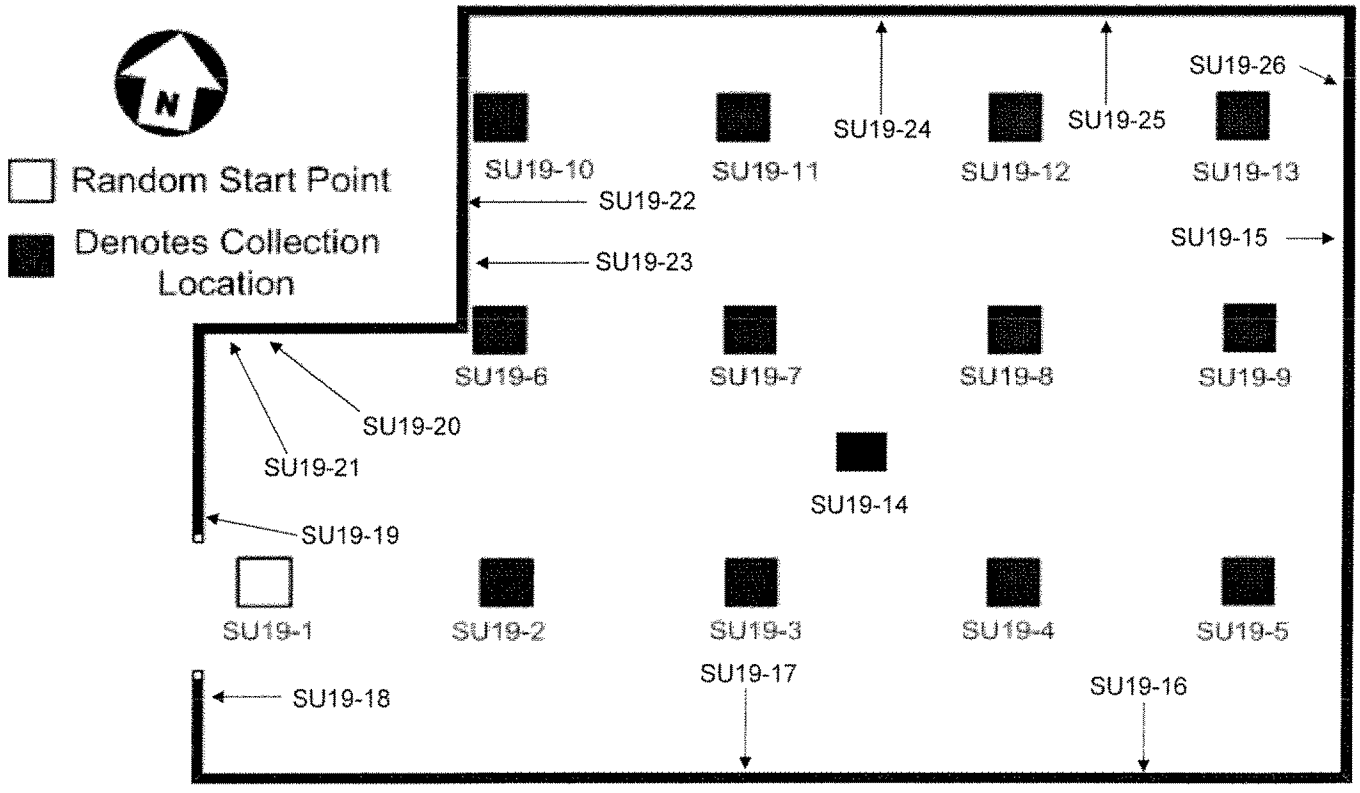
RADIATION/CONTAMINATION SURVEY FORM

Date: 6/12/2007 Time: 14:00	INSTRUMENTATION USED						
	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU19F01-001	2360	164693	4/21/2007	α 17.74%	α 4.44%	α 37.01	α 23.25
	43-37	190328		βγ 31.87%	βγ 7.97%	βγ 285.09	βγ 3407.31
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 119.33	α 89.96
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 572.73	βγ 4406.96
Surveyor: C.Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
				βγ 62.41%	βγ 15.60%	βγ 18.94	βγ 3.40
Reviewed By: Ken Bradley QA/QC	2350-1	228683	5/2/2007	N/A	N/A	N/A	8.65 Kcpm
	44-10	150870					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	148206	5/4/2007	N/A	N/A	N/A	7 μR/hr

Survey Type: Building — 2360 Static Count Time: 3 Minutes — 2350 Static Count Time: 1 Minute

Description of survey: Bldg 813 SU19 Class 1



Comments:

All LAW's were ≤ background α β

2360 - Scan Ranges 1-3 cpm alpha and 1000-1500 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.5-8.5 Kcpm.

Survey points 1-13 are systematic.

Survey point 14 is biased.

Survey points 15-26 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

+ Unless Otherwise Noted

All readings in μR/hr unless otherwise noted

K = 1000

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU19F01-001

SURVEYOR: C.Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm²	Beta/Gamma dpm/100cm²	Alpha dpm/100cm²	Beta/Gamma dpm/100cm²	
1	N/A	8	-1008.00	-35.44	-1312.78	-0.15	0.88	N/A
2	N/A	8	-1131.00	-35.44	-1063.52	-0.15	-1.26	N/A
3	N/A	8	-488.00	-35.44	-894.02	-0.15	0.88	N/A
4	N/A	8	-450.00	-51.79	-442.02	-0.15	-3.40	N/A
5	N/A	8	-289.00	-29.99	-681.32	-0.15	-1.26	N/A
6	N/A	8	-964.00	-68.15	-1425.78	2.35	11.56	N/A
7	N/A	8	-785.00	-62.70	-1618.54	-0.15	0.88	N/A
8	N/A	8	-646.00	-40.89	-1694.98	-0.15	-3.40	N/A
9	N/A	8	-738.00	-8.18	-1010.34	-0.15	-3.40	N/A
10	N/A	8	-49.00	-29.99	-1216.40	2.35	5.15	N/A
11	N/A	8	-336.00	-2.73	-558.35	-0.15	-1.26	N/A
12	N/A	8	39.00	-40.89	-1359.31	-0.15	-1.26	N/A
13	N/A	8	-738.00	-29.99	-1369.28	2.35	-3.40	N/A
14	N/A	8	-723.00	-46.34	-1611.90	-0.15	-1.26	N/A
15	N/A	7	-1075.00	-19.08	-761.08	-0.15	-1.26	N/A
16	N/A	7	-788.00	-2.73	-1355.99	-0.15	-3.40	N/A
17	N/A	7	-1001.00	-24.53	-624.82	-0.15	-1.26	N/A
18	N/A	7	-1007.00	2.73	-1276.22	-0.15	-1.26	N/A
19	N/A	7	-888.00	-13.63	-1046.90	2.35	-3.40	N/A
20	N/A	7	-956.00	-19.08	-438.70	-0.15	-1.26	N/A
21	N/A	7	-923.00	-24.53	-329.03	-0.15	-1.26	N/A
22	N/A	7	-1132.00	-19.08	-1452.37	-0.15	5.15	N/A
23	N/A	7	-1233.00	-8.18	-63.15	-0.15	-1.26	N/A
24	N/A	7	-779.00	-2.73	-1339.37	-0.15	-3.40	N/A
25	N/A	7	-935.00	2.73	-1365.96	-0.15	-3.40	N/A
26	N/A	7	-661.00	-2.73	-874.08	2.35	3.01	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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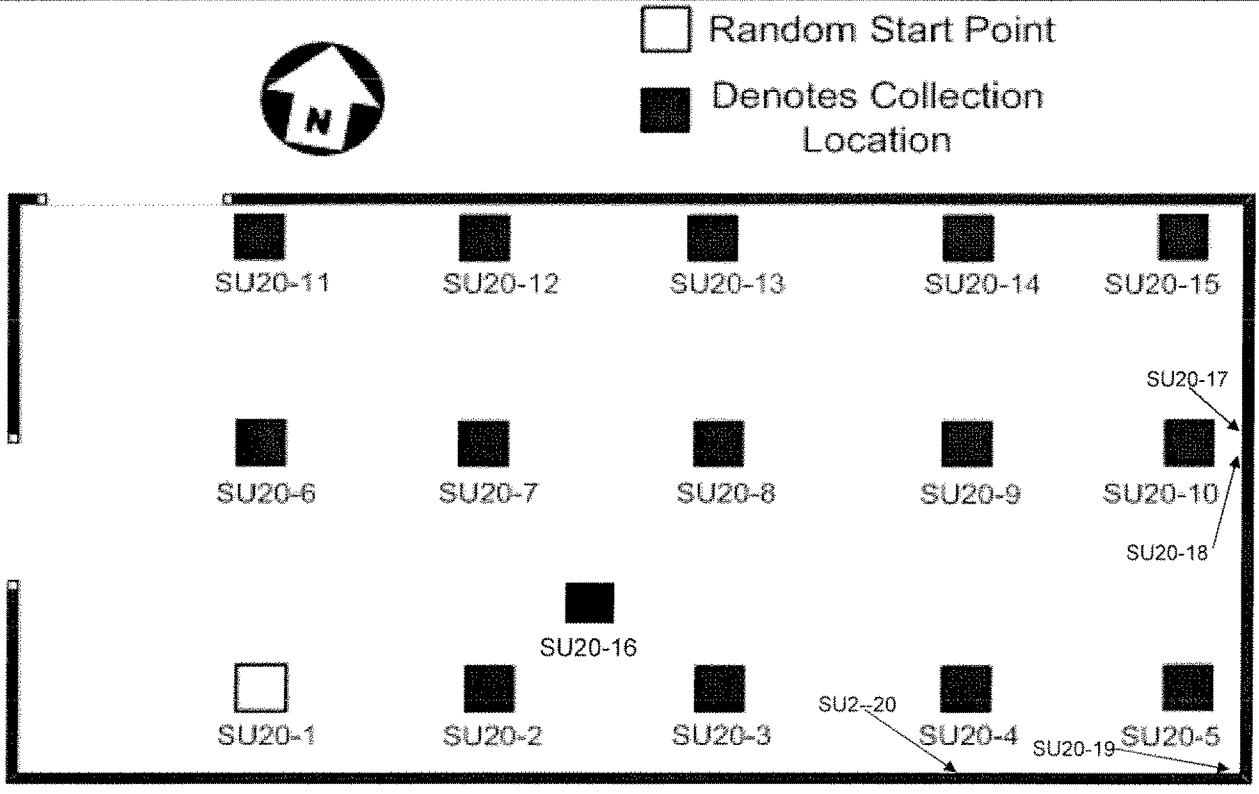
RADIATION/CONTAMINATION SURVEY FORM

Date: Time:	INSTRUMENTATION USED						
5/31/2006 12:45	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA + (dpm/100cm²)	Background + (dpm/100cm²)
Survey Number: HPS-06NPD813SU20F01-001	2360	225246	4/21/2007	α 19.15%	α 4.79%	α 27.14	α 12.20
	43-37	146720		βγ 32.96%	βγ 8.24%	βγ 191.64	βγ 1576.42
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 92.41	α 49.07
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 441.58	βγ 2592.33
Surveyor: C. Carchidi	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.34	α 0.15
				βγ 62.41%	βγ 15.60%	βγ 16.73	βγ 2.31
Reviewed By: Ken Bradley QA/QC	2350-1	228683	5/2/2007	N/A	N/A	N/A	6 Kcpm
	44-10	150870					
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	Model 19	148206	5/4/2007	N/A	N/A	N/A	6 µR/hr

Survey Type: Building | 2360 Static Count Time: 3 Minutes | 2350 Static Count Time: 1 Minute

Description of survey: Bldg 813 SU20 Class 1



Comments:

All LAW's were ≤ background α β

2360 - Scan Ranges 5-7 cpm alpha and 600-800 cpm beta.

Floor Monitor - No detectable alpha/beta activity over background was found.

2350 - Scan range 5.5-6.5 Kcpm.

Survey points 1-15 are systematic.

Survey point 16 is biased.

Survey points 17-20 taken on walls.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

\+ Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

ED_000855_00003297-00548

RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-06NPD813SU20F01-001

SURVEYOR: C. Carchidi

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1	N/A	6	-41.00	-27.26	-372.23	-0.15	-2.31	N/A
2	N/A	7	167.00	-27.26	-511.82	-0.15	14.78	N/A
3	N/A	7	376.00	-10.90	-478.58	-0.15	-2.31	N/A
4	N/A	6	479.00	-27.26	-206.06	-0.15	1.97	N/A
5	N/A	7	594.00	5.45	-272.53	-0.15	8.37	N/A
6	N/A	6	310.00	0.00	-488.55	-0.15	-0.17	N/A
7	N/A	6	553.00	-16.36	-445.35	-0.15	1.97	N/A
8	N/A	7	405.00	-5.45	-428.73	-0.15	-0.17	N/A
9	N/A	6	776.00	0.00	-428.73	-0.15	-2.31	N/A
10	N/A	6	901.00	-32.71	-395.50	-0.15	-0.17	N/A
11	N/A	6	391.00	5.45	-146.23	-0.15	1.97	N/A
12	N/A	7	348.00	0.00	-345.64	-0.15	-0.17	N/A
13	N/A	7	777.00	-27.26	-249.26	2.35	4.10	N/A
14	N/A	7	906.00	-10.90	-478.58	-0.15	1.97	N/A
15	N/A	7	1158.00	-21.81	-232.64	-0.15	-2.31	N/A
16	N/A	7	397.00	0.00	-325.70	-0.15	8.37	N/A
17	N/A	6	-76.00	-27.26	-1096.75	2.35	4.10	N/A
18	N/A	6	273.00	-27.26	-1139.96	-0.15	-0.17	N/A
19	N/A	6	576.00	-16.36	-1126.67	-0.15	1.97	N/A
20	N/A	7	948.00	-43.61	-947.20	-0.15	-2.31	N/A

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

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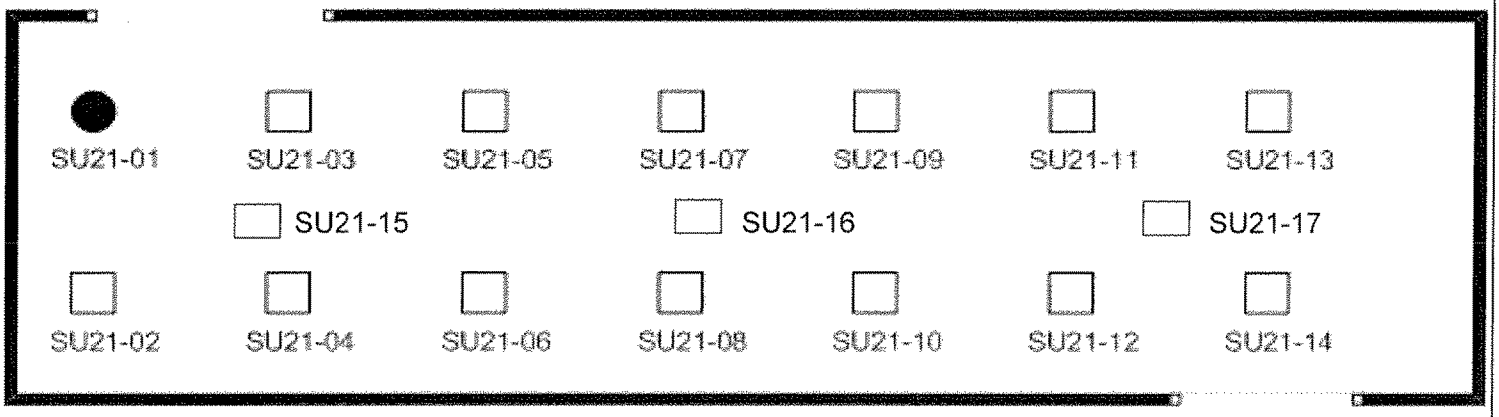
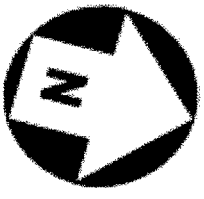
RADIATION/CONTAMINATION SURVEY FORM

Page 1 of 2

Date: Time:	INSTRUMENTATION USED						
7/19/2006 14:40	Model Inst/Det.	Serial Number	Calibration Due Date	Instrument % Efficiency	Total % Efficiency	MDC/MDA [+] (dpm/100cm^2)	Background [+] (dpm/100cm^2)
Survey Number: HPS-813-SU21-F001-001	N/A N/A	N/A N/A	N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A
Location: Parcel D	2360	227427	5/2/2007	α 19.41%	α 4.85%	α 75.27	α 29.44
	43-68	160700		βγ 31.84%	βγ 7.96%	βγ 371.08	βγ 1814.63
Surveyor: A. Matus	Protean	906057	1/4/2007	α 53.36%	α 13.34%	α 10.98	α 0.22
				βγ 62.41%	βγ 15.60%	βγ 16.73	βγ 2.31
Reviewed By: Ken Bradley QA/QC	2350-1	228683	5/2/2007				5.824
	44-10	150870					Kcpm
Isotopes of Concern: ^{226}Ra ^{90}Sr ^{137}Cs ^{239}Pu	N/A	N/A	N/A				N/A N/A
Survey Type: Building	2360 Static Count Time: 3 Minutes			2350 Static Count Time: 1 Minute			

Description of survey: Bldg 813 SU21 Class 1





- Denotes Starting Point

- Denotes Survey Point

Comments:

All LAW's were ≤ background α β

2360 - Scan Ranges 1-2 cpm alpha and 300-450 cpm beta.

2360 - No detectable alpha/beta activity over background was found.

2350 - Scan range 6.2 - 8.5 Kcpm.

Survey points 1-14 are systematic.

Survey points 15-17 are biased.

(#) denotes swipe location or fixed α/β readings

# denotes G/A radiation readings

#/# denotes contact / 1 meter radiation readings.

* denotes highest radiation reading on contact

LAW denotes large area masslinn wipe

Δ denotes static location.

[+] Unless Otherwise Noted

All readings in µR/hr unless otherwise noted

K = 1000

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RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER: HPS-813-SU21-F001-001

SURVEYOR: A. Matus

LOCATION: Parcel D

Location	Exposure Rate (µR/hr)		Fixed + Removable (NET)			Removable (NET)		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	Alpha dpm/100cm^2	Beta/Gamma dpm/100cm^2	
1			201	-7.63	-202.73	-0.22	-2.31	
2			360	-2.18	-212.70	-0.22	-0.17	
3			1162	-2.18	-179.47	-0.22	-2.31	
4			906	-2.18	-192.76	-0.22	-0.17	
5			944	3.27	-159.53	-0.22	-2.31	
6			680	-13.08	-378.88	-0.22	1.97	
7			803	-2.18	-375.56	-0.22	4.10	
8			1014	-13.08	-395.50	-0.22	-0.17	
9			594	-18.54	-402.14	-0.22	4.10	
10			488	-2.18	-292.47	-0.22	1.97	
11			955	-13.08	-375.56	2.27	6.24	
12			932	-13.08	-395.50	-0.22	1.97	
13			1045	-2.18	-1668.39	-0.22	1.97	
14			1098	-18.54	-412.11	-0.22	-2.31	
15			785	-18.54	-388.85	-0.22	6.24	
16			992	8.72	-232.64	-0.22	-0.17	
17			671	-13.08	-465.29	-0.22	1.97	

Reviewer	Date:	RSO/RTM	Date:
ORIGINAL ON FILE	Time:		Time:

APPENDIX F

FINAL TASK-SPECIFIC PLAN FOR THE BUILDING 813 CHARACTERIZATION SURVEY

(Available on CD only)

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FINAL

TASK-SPECIFIC PLAN FOR THE BUILDING 813 CHARACTERIZATION SURVEY

Prepared under the
HUNTERS POINT SHIPYARD
BASE-WIDE RADIOLOGICAL WORK PLAN

July 8, 2005
Revision 0
DCN: FWSD-RAC-05-1420

Prepared by: _____ Date: 7/8/05
Radiation Task Manager

Reviewed by: _____ Date: 7/8/2005
Radiation Safety Officer

Approved by: _____ Date: 8 July 2005
Radiological Affairs Support Office

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TASK-SPECIFIC PLAN
FOR
BUILDING 813 CHARACTERIZATION SURVEY

This Task-specific Plan (TSP) provides task-specific details for the characterization survey at Building 813 at Hunters Point Shipyard (HPS). The survey will be conducted in accordance with the general approach and methodologies that are given in the *Base-wide Radiological Work Plan* (Base-wide Plan) [Tetra Tech FW, Inc. (TtFW), 2005], and Standard Operating Procedures (SOPs). The survey activities will conform to the requirements of the Base-wide Health and Safety Plan (HSP) (TtFW, 2004) and the Building-specific Health and Safety Plan (BHASP) prepared for the site. No exceptions to the Base-wide Plan, SOPs, or HSP are noted.

1.0 SITE DESCRIPTION AND HISTORICAL SUMMARY

Building 813 is a large, 262-by-262-foot, four-story reinforced concrete, flat-roofed warehouse that includes banks of industrial steel sash in horizontal bands across all four stories, except at the front (south) of the first floor. The front has a bank of steel roll-up industrial doors extending the length of the concrete loading dock area. A concrete canopy shelters the loading dock. Figure 1-1 provides a map of the site location. A floor plan of Building 813 is shown in Figure 1-2.

The Historical Radiological Assessment (HRA), Volume II [Naval Sea Systems Command (NAVSEA), 2004], states that Building 813 was previously used for the following purposes:

- General warehouse and offices
- Supply storehouse
- Disaster control center

Building 813 is currently vacant and unoccupied. Historically, a leaking 300 microcurie (μCi) strontium-90 (^{90}Sr) check source was found in the disaster control inventory, and the disaster control center was located in Building 813. While conducting a walkthrough of the building, a cabinet was identified bearing a radioactive materials placard. Since the origin of the cabinet is unknown, additional radioisotopes may be present in the building. The most prevalent isotopes that have been encountered at HPS have been cesium-137 (^{137}Cs) and radium-226 (^{226}Ra). The planned future use identified in the San Francisco Redevelopment Agency's (SFRA's) Reuse Plan (SFRA, 1997) is as a "mixed use" area, which includes residential areas.

As identified in the HRA, the isotope of concern in Building 813 is ^{90}Sr. Additional isotopes may be encountered, including ^{137}Cs and ^{226}Ra.

2.0 SURVEY DESCRIPTION

2.1 Release Criteria

This survey is being performed to assess if residual radioactivity above the established release criteria, as defined in Table 2-1, is present in the area. The default values of 1,000 disintegrations per minute (dpm)/100 square centimeters (cm^2) beta total surface activity and 100 dpm/100 cm^2 alpha total surface activity will be used as the release criteria.

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2.2 Reference Area

Building 258 will be used as the reference area for this survey. It is similar in composition to Building 813. The location of Building 258 is shown in Figure 1-1.

2.3 Investigation Levels

The investigation levels for alpha and beta surveys will be 100 dpm/100 cm^2 alpha and 1,000 dpm/100 cm^2 beta. For gamma surveys, the investigation level will be established at the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area.

2.4 Survey Units

Building 813 has been divided into fifteen Class 1 survey units, two Class 2 survey units, and one Class 3 survey unit. Using a random start point, systematic data collection locations (*N*) have been laid out in a square grid pattern for the survey units. In some cases, the number of data collection locations may exceed *N*. This is primarily due to the fact that the value of *N* may not always be divisible by the exact number of columns and rows associated with the square grid pattern for a given survey unit. This is particularly true when *N* is a prime number or is not divisible by three and four.

2.5 Establishing the Number of Measurements

Since radionuclide-specific measurements will not be performed, *N* is calculated in the manner specified for the Wilcoxon Rank Sum test (Equation 5-1, Base-wide Plan).

Equation 5-1 from the Base-wide Plan

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

Where:

$Z_{1-\alpha}$ = 1.645 Type I decision error level
$Z_{1-\beta}$ = 1.645 Type II decision level
P_r = 1.0 for alpha and 0.921319 for beta [from Table 5.1 in MARSSIM (NUREG-1575)]
(1.2) = 20% increase in number of samples over the minimum

Variables used to calculate *N* not already specified in the Base-wide Plan are Δ and σ. The value used for Δ is ½ of the release criteria for the isotopes of concern, while the values for σ are based on preliminary survey data in Building 813. Preliminary alpha and beta static and scan measurements obtained from Buildings 813 and 258 are identified in Tables 2-2 through 2-7. Values for Δ (500 dpm/100 cm^2) and σ (237 dpm/100 cm^2) associated with ^{90}Sr and Δ (50 dpm/100 cm^2) and σ (6 dpm/100 cm^2) associated with ^{226}Ra were used to calculate the value for *N* for the isotopes of concern in Building 813 (see Tables 2-2 through 2-5 for details). Using Equation 5-1 from the Base-wide Plan, *N* for alpha is calculated as 18 total data collection locations, 9 from each survey unit and 9 from the reference area, while *N* for beta is calculated as 26 total data collection locations, 13 from each survey unit and 13 from the reference area. Therefore, a minimum of 13 measurements will be collected from each survey unit. A summary of the sampling design is provided in Table 2-8.

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In addition to the 13 systematic data collection points on the floor of each Class 1 survey unit, additional biased measurements will be collected at least once per wall section or one measurement location for every 6 linear meters of wall, whichever is the most restrictive. The biased measurement locations will be identified based on the scan survey data. This will produce a minimum of 17 measurement locations for each Class 1 survey unit. There will be a minimum of 13 measurement locations in the Class 2 and Class 3 survey units.

The data collection locations and identification numbers are shown in Figures 2-1 and 2-2.

2.6 Alpha and Beta Scan Measurements

Scan measurements are performed to identify elevated areas of radioactivity within the survey unit. Alpha and beta scans will be effective for identifying elevated concentrations of ^{90}Sr, ^{137}Cs, and ^{226}Ra. One hundred percent of the accessible surface areas in the Class 1 survey units, 50 percent of those in the Class 2 survey units, and 25 percent of those in the Class 3 survey units (paying particular attention to air handling units, ventilation systems, and other upper horizontal surfaces) will be scanned with Ludlum Model 43-37 or 43-68 gas-flow proportional detectors coupled to Ludlum Model 2350-1 data loggers.

Preliminary survey data indicates that the alpha count rate on various surfaces in Buildings 813 and 258 average less than 10 counts per minute (cpm) with a Model 43-37 detector. Alpha scan speeds for these surfaces will be determined using Equation 7-4 from the Base-wide Plan.

Equation 7-4 from the Base-wide Plan

$$P(n \geq 2) = 1 - \left[1 + \frac{(GE + B)t}{60}\right] e^{\frac{-(GE+B)}{60}}$$

Where:

$P(n \geq 2)$ = probability of getting two or more counts during the time interval t (%)

t = time interval (s) = 11.7

G = contamination activity (dpm) = 100

E = detector efficiency (4π) = 0.158

B = background count rate (cpm) = 5.1

(See Table 2-7 for preliminary alpha scan survey details)

$P(n \geq 2)$ = 91 % at a scan speed of 1.2 centimeters per second (cm/s).

The scan surveys will be performed using a Ludlum Model 43-37 detector. The detector position will be adjusted so that the detector window is approximately 1/4 inch from the surface. The surveyor will move the detector at a scan speed of 1.2 cm/s while maintaining audio and visual observation of the instrument response. If the surveyor observes two or more counts during a scan interval (approximately 12 seconds), the surveyor will pause the detector movement and take a 5-second observation. If during the 5-second observation no additional counts are observed, the surveyor can continue the scan survey. Conversely if additional counts are observed during the 5-second observation, the surveyor should mark the area for further investigation and subsequent biased measurements using a 126-cm^2 or smaller detector to locate and properly quantify any areas of elevated activity.

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For beta scans, the minimum detectable number of net source counts in the scan interval can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in *d'*) as shown in Equation 7-5 from the Base-wide Plan as follows:

Equation 7-5 from the Base-wide Plan

$$MDCR = d' \sqrt{b_i \left(\frac{60}{i}\right)}$$

Where:

d'	=	index of sensitivity (α and β errors [performance criteria])
b_i	=	number of background counts in scan time interval (count)
i	=	scan or observation interval (s)

For beta scans:

d'	=	3.28
b_i	=	24.1 counts (based on background of 464.8 cpm)
i	=	14 cm / 4.5 cm/s ~3.1 seconds

Beta scan MDCR = 310.5 cpm at a scan speed of 4.5 cm/s.

The scan minimum detectable concentration (MDC) is determined from the MDCR by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. As discussed below, the MDCR accounts for the background level, performance criteria (d′), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity. The scan MDC for structure surfaces is calculated using Equation 7-6 from the Base-wide Plan as follows:

Equation 7-6 from the Base-wide Plan

$$Scan\ MDC = \frac{MDCR}{\sqrt{p}\,\varepsilon_i \varepsilon_s \frac{W_A}{100\ cm^2}}$$

Where:

MDCR		is discussed above
p	=	surveyor efficiency factor
ε_i	=	instrument efficiency (count per particle)
ε_s	=	contaminated surface efficiency (particle per disintegration)
W_A	=	area of the detector window (cm^2)

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For beta scans:

$MDCR$ = 310.5
p = 0.50
ε_i = 0.302
ε_s = 0.25
W_A = 582
(See Table 2-4 for preliminary beta scan survey details)

Beta scan MDC = 999 dpm/100 cm^2 at a scan speed of 4.5 cm/s.

2.7 Alpha and Beta Static Measurements

Three-minute alpha and two-minute beta static measurements will be performed at the specified systematic and biased locations in each of the survey units to achieve the MDC limits necessary for the isotopes of concern. Additional measurements may be collected if elevated radiation readings are identified while performing the scan surveys. Ludlum Model 43-68 gas-flow proportional detectors coupled to Ludlum Model 2350-1 data loggers will be used to perform alpha and beta static measurements.

The MDC for alpha measurements were calculated from preliminary Building 258 measurements using Equation 7-7 from the Base-wide Plan as follows:

Equation 7-7 from the Base-wide Plan

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

3+4.65 = constant factor provided in MARSSIM
R_B = Background Count Rate = 2.2 cpm
T_B = Background Count Time = 3 minutes
ε_i = Instrument Efficiency = 0.314
ε_s = Surface Efficiency Factor = 0.25
W_A = Probe Area Size = 126 cm^2
(See Table 2-6 for preliminary alpha static survey details)

The calculated MDC (based on preliminary measurements) for alpha contamination is 50 dpm/100 cm^2 using a 3-minute static counting time.

The MDC for beta measurements were also calculated using Equation 7-7 from the Base-wide Plan as follows:

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Where:

3+4.65	=	constant factor provided in MARSSIM
R_B	=	Background Count Rate = 269 cpm
T_B	=	Background Count Time = 2 minutes
ε_i	=	Instrument Efficiency = 0.328
ε_s	=	Surface Efficiency Factor = 0.25
W_A	=	Probe Area Size = 126 cm^2

(See Table 2-3 for preliminary beta static survey details)

The calculated MDC (based on preliminary measurements) for beta contamination is 537 dpm/100 cm^2, using a 2-minute static counting time.

2.8 Gamma Scans

Gamma scans will be used to identify elevated concentrations of ^{137}Cs. One hundred percent of the Class 1 survey units, 50 percent of the Class 2 survey units, and 20 percent of those in the Class 3 survey units will be scanned with Ludlum Model 44-10 scintillation detectors coupled to Ludlum Model 2350-1 or 2221 scaler/rate meters. The gamma scans will be performed in accordance with SOP HPO-Tt-006, *Radiation and Contamination Surveys*. A single detector or an array of detectors may be used to perform gamma scans. In each case, scans will be performed at a rate of approximately one-half meter per second with the detector held approximately 10 centimeters [cm (4 inches)] from the surface area. If a single detector is used, it will be moved back and forth across the travel path while scanning, producing a serpentine scan pattern. If a detector array is used, it will be pushed or pulled in a straight line with the detector centers positioned approximately 30 cm apart.

2.9 Static Gamma Measurements

Static gamma measurements will be collected from the specified systematic and biased locations (as discussed in Section 2.5) in each of the survey units. Additional measurements may be collected if elevated areas are identified while performing the scan surveys. Ludlum Model 44-10 scintillation detectors coupled to Ludlum Model 2350-1 data loggers will be used to perform the measurements.

2.10 Exposure Rate Measurements

Exposure rate measurements will be collected from the specified systematic and biased locations in each of the survey units. Additional measurements will be collected if elevated areas are identified while performing the gamma scan surveys. Ludlum Model 44-10 scintillation detectors coupled to Ludlum Model 2350-1 data loggers will be used to perform the measurements.

2.11 Floor Surfaces

Since the original flooring material is not known, floor surfaces (e.g., tile, plywood, carpet) will be surveyed and removed to expose the original flooring material. One hundred percent scan surveys for alpha and beta radiation will be conducted on the accessible surfaces of these materials. Systematic static alpha and beta measurements will be collected from the surfaces. Additional measurements and solid samples will be collected at locations where the investigation level is exceeded. Materials identified as having contamination present above the levels specified in Table 2-1 will be packaged for subsequent storage and disposal.

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2.12 Drainage Systems

Drain systems will be surveyed independently of the Class 1 and Class 2 survey units. Static gamma measurements will be collected from inside accessible drain lines and from the accessible exterior surfaces of drain lines with inaccessible internals (such as sink drains or capped drains). Scan measurements will also be collected along the accessible exterior surfaces of drain lines.

2.13 Ventilation Systems

Portions of ventilation systems within Class 1 survey units will be surveyed as follows. One hundred percent scan surveys for alpha, beta, and gamma radiation will be conducted on the accessible exterior and interior surfaces of ventilation systems. Biased static alpha, beta, and gamma measurements will be collected from the exterior and accessible interior surfaces of the ventilation systems.

Ventilation systems that are present in the Class 2 and 3 areas will be surveyed as part of the Class 2 and Class 3 survey units. Scan surveys for alpha, beta, and gamma radiation will be conducted on the accessible exterior and interior surfaces of ventilation systems. Biased static alpha, beta, and gamma measurements will be collected from the accessible exterior and interior surfaces of the ventilation systems.

While performing the ventilation system surveys, particular emphasis will be placed on collecting survey data from likely accumulation points and areas that produce elevated scan measurement results.

2.14 Equipment and Materials

One hundred percent scan surveys for alpha and beta radiation will be conducted on the accessible surfaces of equipment and materials. Biased static alpha and beta measurements will be collected from the surfaces. A minimum of 1 static measurement will be collected at the location exhibiting the highest alpha/beta radiation measurement. Additional measurements will be collected at locations where the investigation level is exceeded. Materials identified as having contamination present above the levels specified in Table 2-1 will be packaged for subsequent decontamination or storage and disposal.

2.15 Media Samples

Swipe samples will be collected from each of the specified systematic and biased locations in the survey units, from equipment and materials, and from within the ventilation systems and drainage systems. Where sufficient material is present, media samples will also be collected from ventilation systems, drainage systems, and other low-lying spots identified in the field where contaminants might accumulate. Additional samples may also be collected based on scan survey results. Samples will be collected using SOP HPO-Tt-009, *Sampling Procedures for Radiological Surveys*.

Samples will be analyzed in the field laboratory for alpha/beta and gamma radiation. Alpha/beta radiation analyses will be performed using a low background gas-flow proportional counter. Gamma radiation analyses will be performed by gamma spectroscopy. Ten percent of the solid samples will then be forwarded to an off-site laboratory for quality assurance verification of gamma spectroscopy results. These solid samples will also be analyzed at the off-site laboratory for ^{90}Sr.

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3.0 QUALITY CONTROL

The data quality objectives for the survey are provided in Table 3-1.

Definable features of work (DFWs) establish the measures required to verify both the quality of work performed and compliance with project requirements. The DFW for this task is radiological surveys.

Descriptions of this DFW and the associated phases of quality control are presented in Table 3-2.

4.0 ENVIRONMENTAL PROTECTION

Environmental protection-driven requirements not already addressed in the Base-wide Plan will not apply.

5.0 REFERENCES

The following additional references not already in the Base-wide Plan are cited in this TSP:

Naval Sea Systems Command (NAVSEA). 2004. Historical Radiological Assessment, Volume II.

San Francisco Redevelopment Agency (SFRA). 1997. *Hunters Point Shipyard Redevelopment Plan.* July.

Tetra Tech FW, Inc. (TtFW). 2004b. *Final Base-wide Health and Safety Plan.* Hunters Point Shipyard, San Francisco, California. Revision 0. April 23.

TtFW. 2005. *Final Base-wide Radiological Work Plan.* Revision 0. February 16.

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TABLES

ED_000855_00003297-00562

TABLE 2-1

BUILDING 813
PRIMARY RADIATION PROPERTIES AND RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN

Radionuclide	Primary Radiation Properties		Release Criteria		
			Buildings and Structures		Release Criteria for Residential Reuse Solid Samples[b] (pCi/g)
	Half-life	Type	Total Surface Activity[a]	Removable Activity[a]	
^{226}Radium	1600 y	Alpha Gamma	100	20	1 > background, not to exceed 2[c]
^{90}Strontium	28.6 y	Beta	1,000	200	0.331
^{137}Cesium	30.17 y	Beta Gamma	5,000	1,000	0.13[d]

Notes:

[a] Units are disintegrations per minute (dpm) per 100 square centimeters (cm^2)
[b] U.S. Environmental Protection Agency (EPA) Preliminary Remediation Goals (PRGs) for soil (ventilation and drain line solid samples), except as noted
[c] Per agreement with EPA
[d] Decay-corrected PRG provided by EPA Region IX

pCi/g – picouries per gram
y – year

TABLE 2-2

BUILDING 813 PRELIMINARY STATIC BETA MEASUREMENT RESULTS

Bldg. 813 Concrete	Detector Area (cm^2)		126						
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency (2π)	Count Time (seconds)	Sample Gross Counts	Sample Gross (cpm)	Total Surface Activity (dpm/100cm^2)
1	1/25/2005	9:52	175854	PR160780	0.328	120	408	204	1,974
2	1/25/2005	9:55	175854	PR160780	0.328	120	477	239	2,308
3	1/25/2005	9:57	175854	PR160780	0.328	120	444	222	2,149
4	1/25/2005	10:00	175854	PR160780	0.328	120	459	230	2,221
5	1/25/2005	10:02	175854	PR160780	0.328	120	470	235	2,274
6	1/25/2005	10:05	175854	PR160780	0.328	120	426	213	2,062
7	1/25/2005	10:07	175854	PR160780	0.328	120	499	250	2,415
8	1/25/2005	10:10	175854	PR160780	0.328	120	448	224	2,168
9	1/25/2005	10:12	175854	PR160780	0.328	120	450	225	2,178
10	1/25/2005	10:14	175854	PR160780	0.328	120	462	231	2,236
11	1/25/2005	10:29	175854	PR160780	0.328	120	485	243	2,347
12	1/25/2005	10:31	175854	PR160780	0.328	120	497	249	2,405
13	1/25/2005	10:34	175854	PR160780	0.328	120	540	270	2,613
14	1/25/2005	10:36	175854	PR160780	0.328	120	499	250	2,415
15	1/25/2005	10:38	175854	PR160780	0.328	120	506	253	2,449
16	1/25/2005	10:41	175854	PR160780	0.328	120	550	275	2,662
17	1/25/2005	10:44	175854	PR160780	0.328	120	544	272	2,633
18	1/25/2005	10:46	175854	PR160780	0.328	120	578	289	2,797
19	1/25/2005	10:48	175854	PR160780	0.328	120	546	273	2,642
20	1/25/2005	10:51	175854	PR160780	0.328	120	573	287	2,773

Number of Measurements	20	20
Maximum	289	2,797
Average	247	2,386
Standard Deviation	25	237

Notes:

cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute

TABLE 2-3

REFERENCE AREA

BUILDING 258 PRELIMINARY STATIC BETA RESULTS

Bldg. 258 Concrete	Detector Area (cm^2)		126						
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency (2π)	Count Time (seconds)	Sample Gross Counts	Sample Gross (cpm)	Total Surface Activity ($dpm/100cm^2$)
1	2/9/2005	10:09	175854	PR160780	0.328	120	558	279	2,700
2	2/9/2005	10:11	175854	PR160780	0.328	120	555	278	2,686
3	2/9/2005	10:13	175854	PR160780	0.328	120	518	259	2,507
4	2/9/2005	10:15	175854	PR160780	0.328	120	548	274	2,652
5	2/9/2005	10:17	175854	PR160780	0.328	120	541	271	2,618
6	2/9/2005	10:19	175854	PR160780	0.328	120	496	248	2,400
7	2/9/2005	10:21	175854	PR160780	0.328	120	532	266	2,575
8	2/9/2005	10:23	175854	PR160780	0.328	120	542	271	2,623
9	2/9/2005	10:26	175854	PR160780	0.328	120	554	277	2,681
10	2/9/2005	10:28	175854	PR160780	0.328	120	536	268	2,594
11	2/9/2005	10:30	175854	PR160780	0.328	120	524	262	2,536
12	2/9/2005	10:32	175854	PR160780	0.328	120	572	286	2,768
13	2/9/2005	10:34	175854	PR160780	0.328	120	487	244	2,357
14	2/9/2005	10:36	175854	PR160780	0.328	120	559	280	2,705
15	2/9/2005	10:38	175854	PR160780	0.328	120	562	281	2,720
16	2/9/2005	10:40	175854	PR160780	0.328	120	522	261	2,526
17	2/9/2005	10:43	175854	PR160780	0.328	120	567	284	2,744
18	2/9/2005	10:45	175854	PR160780	0.328	120	491	246	2,376
19	2/9/2005	10:47	175854	PR160780	0.328	120	599	300	2,899
20	2/9/2005	10:49	175854	PR160780	0.328	120	501	251	2,425

Number of Measurements	20	20
Maximum	300	2,899
Average	269	2,605
Standard Deviation	15	143

Notes:

cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute

TABLE 2-4

REFERENCE AREA

BUILDING 258 PRELIMINARY BETA SCAN RESULTS

Bldg. 258 Concrete	Detector Area (cm^2)		582					
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency (2π)	Count Time (seconds)	Sample Gross Counts	Sample Gross (cpm)
1	2/9/2005	8:33	175854	PR160079	0.302	60	471	471
2	2/9/2005	8:34	175854	PR160079	0.302	60	482	482
3	2/9/2005	8:35	175854	PR160079	0.302	60	458	458
4	2/9/2005	8:36	175854	PR160079	0.302	60	447	447
5	2/9/2005	8:37	175854	PR160079	0.302	60	456	456
6	2/9/2005	8:38	175854	PR160079	0.302	60	468	468
7	2/9/2005	8:39	175854	PR160079	0.302	60	472	472
8	2/9/2005	8:40	175854	PR160079	0.302	60	475	475
9	2/9/2005	8:41	175854	PR160079	0.302	60	467	467
10	2/9/2005	8:42	175854	PR160079	0.302	60	479	479
11	2/9/2005	8:43	175854	PR160079	0.302	60	474	474
12	2/9/2005	8:44	175854	PR160079	0.302	60	456	456
13	2/9/2005	8:45	175854	PR160079	0.302	60	457	457
14	2/9/2005	8:46	175854	PR160079	0.302	60	451	451
15	2/9/2005	8:48	175854	PR160079	0.302	60	470	470
16	2/9/2005	8:49	175854	PR160079	0.302	60	464	464
17	2/9/2005	8:50	175854	PR160079	0.302	60	454	454
18	2/9/2005	8:51	175854	PR160079	0.302	60	444	444
19	2/9/2005	8:52	175854	PR160079	0.302	60	470	470
20	2/9/2005	8:53	175854	PR160079	0.302	60	481	481

Number of Measurements	20
Maximum	482.0
Average	464.8
Standard Deviation	11.3

Notes:

cm^2 – square centimeters
cpm – counts per minute

TABLE 2-5

BUILDING 813 PRELIMINARY STATIC ALPHA MEASUREMENT RESULTS

Bldg. 813 Concrete	Detector Area (cm^2)		126						
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency	Count Time (seconds)	Sample Gross Counts	Sample Gross (cpm)	Total Surface Activity (dpm/100cm^2)
1	2/14/2005	11:12	175854	PR160780	0.314	180	4	1.3	13
2	2/14/2005	11:17	175854	PR160780	0.314	180	2	0.7	7
3	2/14/2005	11:22	175854	PR160780	0.314	180	2	0.7	7
4	2/14/2005	11:27	175854	PR160780	0.314	180	5	1.7	17
5	2/14/2005	11:32	175854	PR160780	0.314	180	1	0.3	3
6	2/14/2005	11:37	175854	PR160780	0.314	180	4	1.3	13
7	2/14/2005	11:42	175854	PR160780	0.314	180	4	1.3	13
8	2/14/2005	11:47	175854	PR160780	0.314	180	1	0.3	3
9	2/14/2005	11:52	175854	PR160780	0.314	180	4	1.3	13
10	2/14/2005	11:58	175854	PR160780	0.314	180	2	0.7	7
11	2/14/2005	13:07	175854	PR160780	0.314	180	1	0.3	3
12	2/14/2005	13:12	175854	PR160780	0.314	180	5	1.7	17
13	2/14/2005	13:17	175854	PR160780	0.314	180	1	0.3	3
14	2/14/2005	13:23	175854	PR160780	0.314	180	5	1.7	17
15	2/14/2005	13:28	175854	PR160780	0.314	180	4	1.3	13
16	2/14/2005	13:34	175854	PR160780	0.314	180	5	1.7	17
17	2/14/2005	13:39	175854	PR160780	0.314	180	5	1.7	17
18	2/14/2005	13:45	175854	PR160780	0.314	180	5	1.7	17
19	2/14/2005	13:50	175854	PR160780	0.314	180	5	1.7	17
20	2/14/2005	13:56	175854	PR160780	0.314	180	6	2.0	20

Number of Measurements	20	20
Maximum	2.0	20
Average	1.2	12
Standard Deviation	0.6	6

Notes:

cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute

TABLE 2-6

REFERENCE AREA

BUILDING 258 PRELIMINARY STATIC ALPHA RESULTS

Bldg. 258 Concrete	Detector Area (cm^2)		126						
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency (2π)	Count Time (seconds)	Sample Gross Counts	Sample Gross (cpm)	Total Surface Activity (dpm/100cm^2)
1	2/8/2005	13:54	175854	PR160780	0.314	180	8	2.7	27
2	2/8/2005	13:59	175854	PR160780	0.314	180	5	1.7	17
3	2/8/2005	14:04	175854	PR160780	0.314	180	8	2.7	27
4	2/8/2005	14:10	175854	PR160780	0.314	180	7	2.3	24
5	2/8/2005	14:15	175854	PR160780	0.314	180	1	0.3	3
6	2/8/2005	14:20	175854	PR160780	0.314	180	5	1.7	17
7	2/8/2005	14:25	175854	PR160780	0.314	180	4	1.3	13
8	2/8/2005	14:30	175854	PR160780	0.314	180	6	2.0	20
9	2/8/2005	14:35	175854	PR160780	0.314	180	8	2.7	27
10	2/8/2005	14:40	175854	PR160780	0.314	180	7	2.3	24
11	2/8/2005	14:45	175854	PR160780	0.314	180	5	1.7	17
12	2/8/2005	14:50	175854	PR160780	0.314	180	6	2.0	20
13	2/8/2005	14:55	175854	PR160780	0.314	180	8	2.7	27
14	2/8/2005	15:00	175854	PR160780	0.314	180	7	2.3	24
15	2/8/2005	15:05	175854	PR160780	0.314	180	9	3.0	30
16	2/8/2005	15:11	175854	PR160780	0.314	180	8	2.7	27
17	2/8/2005	15:16	175854	PR160780	0.314	180	9	3.0	30
18	2/8/2005	15:21	175854	PR160780	0.314	180	1	0.3	3
19	2/8/2005	15:26	175854	PR160780	0.314	180	10	3.3	34
20	2/8/2005	15:31	175854	PR160780	0.314	180	8	2.7	27

Number of Measurements	20	20
Maximum	3.3	34
Average	2.2	22
Standard Deviation	0.8	8

Notes:

cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute

TABLE 2-7

REFERENCE AREA

BUILDING 258 PRELIMINARY ALPHA SCAN RESULTS

Bldg. 258 Concrete	Detector Area (cm^2)		582					
Location	Survey Date	Survey Time	Instrument Serial Number	Detector Serial Number	Detector Efficiency (2π)	Detector Efficiency (4π)	Count Time (seconds)	Sample Gross (cpm)
1	2/9/2005	8:09	175854	PR160079	0.315	0.158	60	5
2	2/9/2005	8:10	175854	PR160079	0.315	0.158	60	2
3	2/9/2005	8:12	175854	PR160079	0.315	0.158	60	6
4	2/9/2005	8:13	175854	PR160079	0.315	0.158	60	4
5	2/9/2005	8:14	175854	PR160079	0.315	0.158	60	8
6	2/9/2005	8:15	175854	PR160079	0.315	0.158	60	7
7	2/9/2005	8:16	175854	PR160079	0.315	0.158	60	6
8	2/9/2005	8:17	175854	PR160079	0.315	0.158	60	2
9	2/9/2005	8:18	175854	PR160079	0.315	0.158	60	8
10	2/9/2005	8:19	175854	PR160079	0.315	0.158	60	4
11	2/9/2005	8:20	175854	PR160079	0.315	0.158	60	6
12	2/9/2005	8:22	175854	PR160079	0.315	0.158	60	6
13	2/9/2005	8:23	175854	PR160079	0.315	0.158	60	4
14	2/9/2005	8:24	175854	PR160079	0.315	0.158	60	5
15	2/9/2005	8:25	175854	PR160079	0.315	0.158	60	3
16	2/9/2005	8:26	175854	PR160079	0.315	0.158	60	3
17	2/9/2005	8:27	175854	PR160079	0.315	0.158	60	3
18	2/9/2005	8:28	175854	PR160079	0.315	0.158	60	8
19	2/9/2005	8:29	175854	PR160079	0.315	0.158	60	8
20	2/9/2005	8:31	175854	PR160079	0.315	0.158	60	4

Number of Measurements	20
Maximum	8.0
Average	5.1
Standard Deviation	2.0

Notes:

cm^2 – square centimeters
cpm – counts per minute

TABLE 2-8

SUMMARY OF SAMPLING DESIGN

Primary objective of design	Compare a site mean or median to a reference area mean or median	
Type of sampling design	Nonparametric	
Sample placement (location in the field)	Systematic with a random start location	
Working (null) hypothesis	The difference between the medians (means) exceeds the threshold	
Formula for calculating Number of sampling locations	Wilcoxon Rank Sum Test - MARSSIM version	
Grid pattern	Square	
Survey Unit ID	1	2-18
Total number of samples for each site and reference area	13	13
Number of samples on map [a]	20	268
Number of selected sample areas [b]	1	17
Specified sampling area [c]	5056.48 m^2	1227.89 m^2
Size of grid / Area of grid cell [d]	16.76 m / 280.92 m^2	0.67 m / 0.45 m^2

Notes:

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.

[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

m – meters
m^2 – square meters
MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual

TABLE 3-1

SUMMARY OF DATA QUALITY OBJECTIVES

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Statement of Problem	**Decisions**	**Inputs to the Decisions**	**Boundaries of the Study**	**Decision Rules**	**Limits on Decision Errors**	**Optimize the Sampling Design**
Building 813 is listed as an area impacted by radiological activities. The Isotope of concern is: ^{90}Sr. It must be determined if the site-specific release criteria for these isotopes have been met or if remediation is warranted.	The primary use of the data expected to result from completion of this TSP is to support the Final Status Survey for Building 813. Therefore, the decision to be made can be stated as, "Do the results of the survey meet the release criteria?	Radiological surveys required to support the characterization survey of Building 813 will include: • 100 percent alpha, beta, and gamma scan surveys of Class 1 survey units. • 50 percent alpha, beta, and gamma scan surveys of Class 2 survey units. • 25 percent alpha, beta, and gamma scan surveys of Class 3 survey units. • A minimum of 13 systematic and 4 biased swipe samples, static alpha, beta, gamma, and exposure rate measurements will be performed in each Class 1 survey unit. • A minimum of 13 systematic swipe samples, static alpha, beta, gamma, and exposure rate measurements will be performed in each Class 2 and Class 3 survey unit. • Supplemental solid samples and biased measurements from drainage and ventilation systems will be collected.	The lateral and vertical spatial boundaries for this survey effort are confined to the interior of Building 813.	If the results of the survey meet the release criteria, then the data will be used to support a Final Status Survey. If the results of the survey exceed the release criteria, then the building will be further investigated.	Limits on decision errors are set at 5 percent as specified in the Base-wide Plan.	Operational details for the radiological survey process have been developed. The theoretical assumptions are based on guidelines contained in MARSSIM. Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this plan and the Base-wide Plan.

Notes:

MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual
^{90}Sr – strontium-90
TSP – Task-specific Plan

TABLE 3-2

DEFINABLE FEATURES OF WORK FOR RADIOLOGICAL SURVEYS

ACTIVITY	PREPARATORY (Prior to initiating survey activity)	DONE	INITIAL (At outset of survey activity)	DONE	FOLLOW-UP (Ongoing during survey activity)	DONE
Radiological surveys	• Verify that an approved TSP is in place. • Verify that the Remedial Project Manager, the Radiological Site Manager, and Caretaker Site Office are notified about mobilization. • Verify that an approved RWP is available and has been read and signed by assigned personnel. • Verify that Base-wide Plan, BHASP, TSP, and AHAs have been reviewed. • Verify that assigned personnel are trained and qualified. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimetry have completed NRC Form 4. • Verify that the relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that equipment is on site and is in working order (initial daily check).		• Verify that radiological instruments are as specified in the Base-wide Plan and TSP. • Inspect training records. • Verify that a qualified RCT and SHSS are present at active work areas. • Verify that site activities are being photographed. • Verify that the reference area measurements have been obtained using the procedure described in the Base-wide Plan, which states that the same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units. • Verify that daily checks were performed on all portable survey instruments. • Verify that radiological instrument calibrations and setup are current. • Verify that required dosimetry is being worn. • Verify that field logbooks, proper forms, and chain-of-custody documents are in use. • Verify that samples and measurements are being collected in accordance with the TSP, the Base-wide Plan, and relevant SOPs. • Verify that sample handling and analyses are in accordance with the Base-wide Plan and applicable SOPs.		• Verify that site is properly posted and secured, if necessary. • Conduct ongoing inspection of material and equipment. • Verify that a qualified RCT and SHSS are present at active work areas. • Verify that daily instrument checks and background measurements were obtained and documented. • Verify that survey and sample analysis results are documented. • Verify that personnel have read and signed revised RWP, if revision is required. • Inspect sample chain-of-custody and survey log for completeness. • Verify that survey and analytical activities conform to the TSP. • Verify that survey instruments are recalibrated after repairs or modifications. • Verify that site activities are being photographed.	

Notes:

AHA – Activity Hazard Analysis
BHASP – Building-Specific Health and Safety Plan
NRC – Nuclear Regulatory Commission
RCT – Registered Certified Technician
RWP- Radiation Work Permit
SHSS – Site Health and Safety Specialist
SOP – Standard Operating Procedure
TSP – Task-specific Plan

FIGURES

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FIGURE 1-1

BUILDING 813 AND REFERENCE AREA

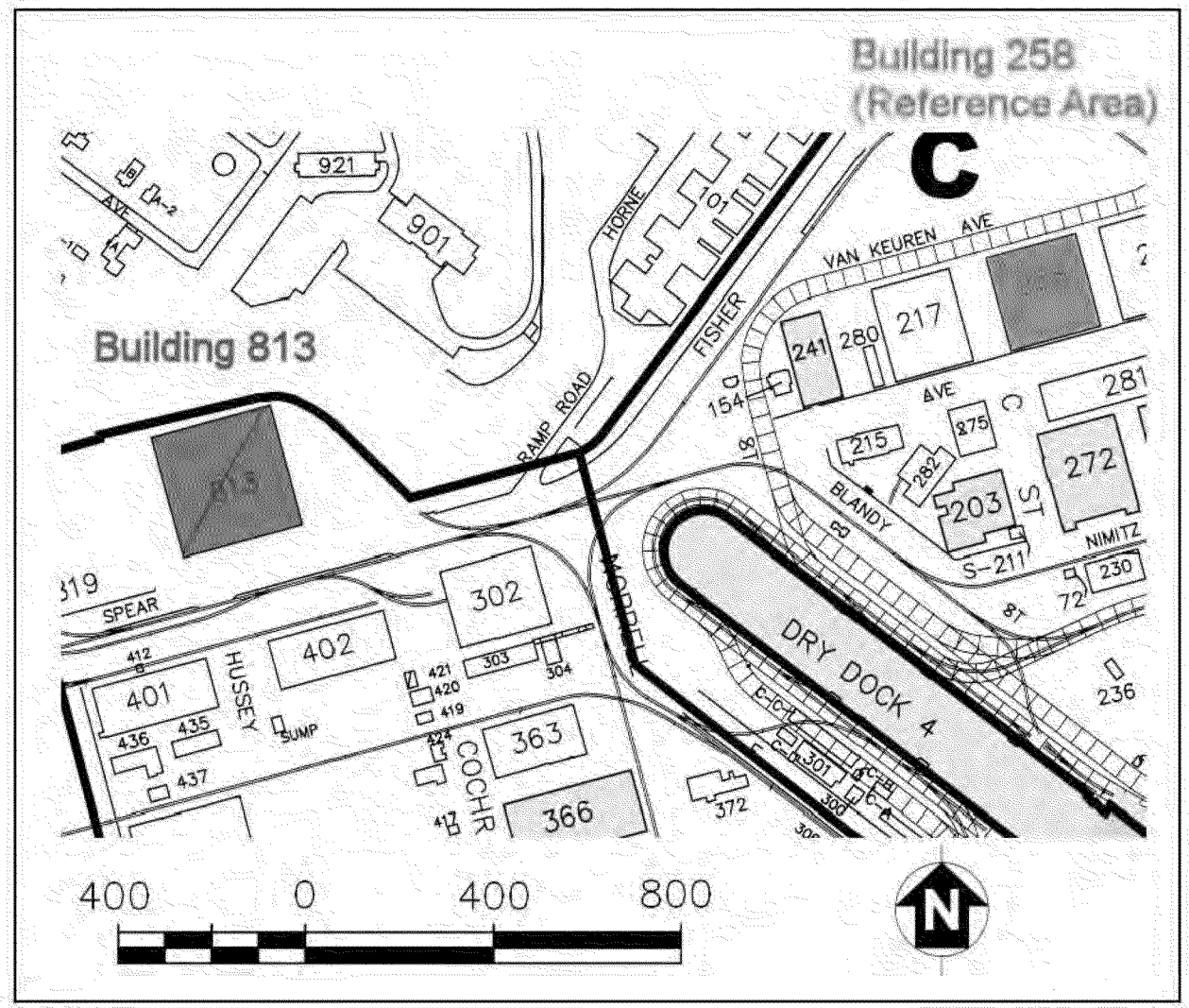


FIGURE 1-2

BUILDING 813 FLOOR PLAN

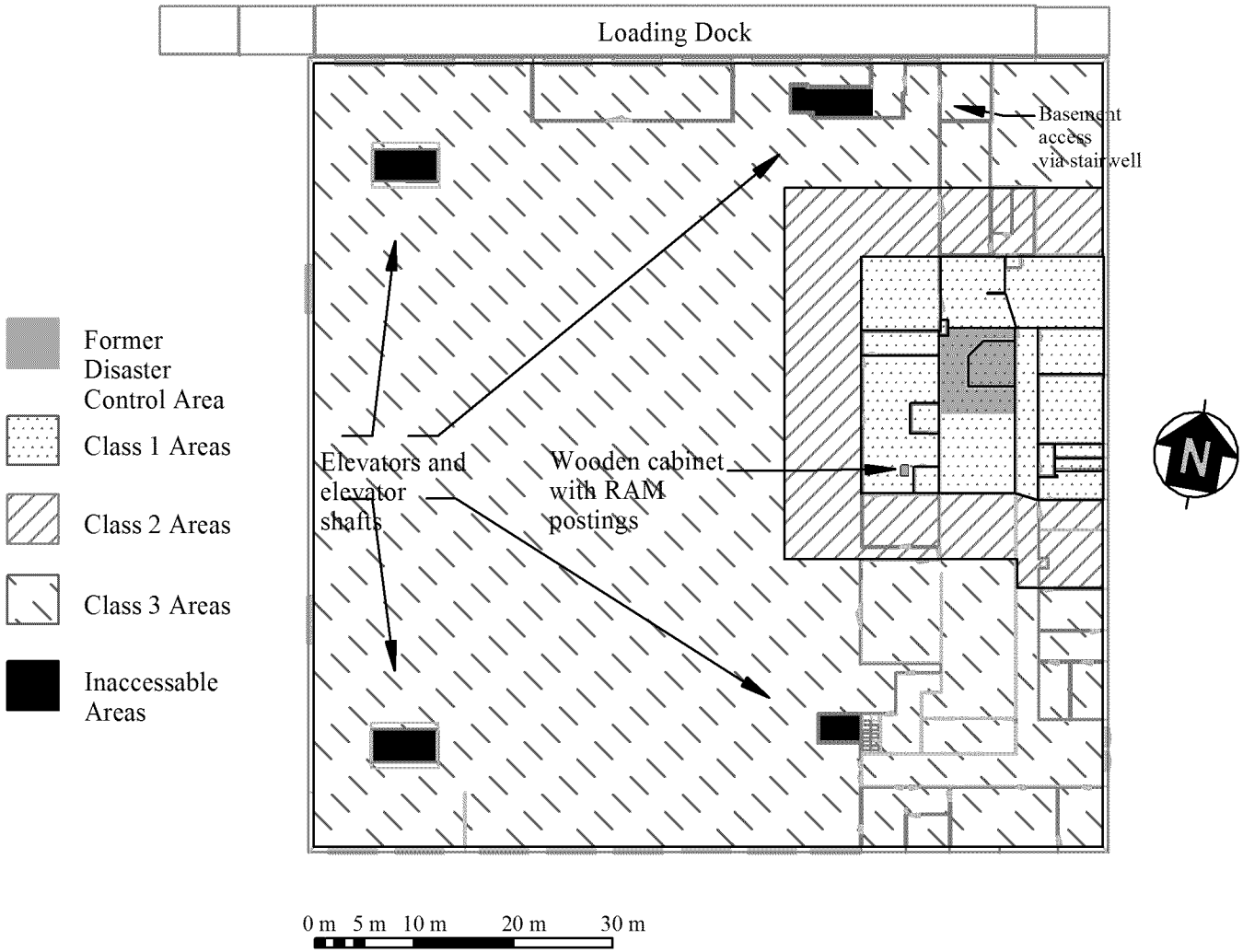
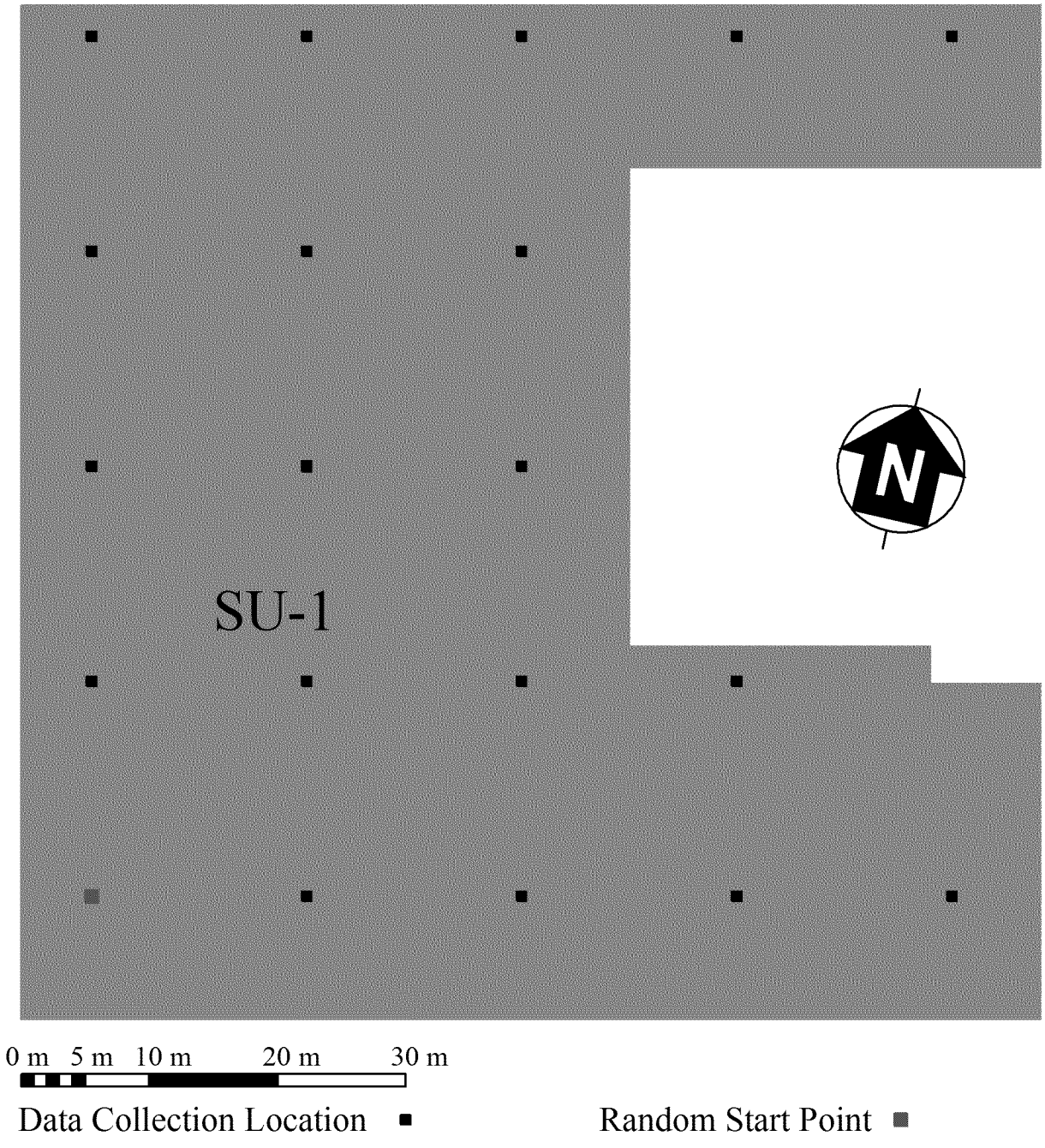


FIGURE 2-1

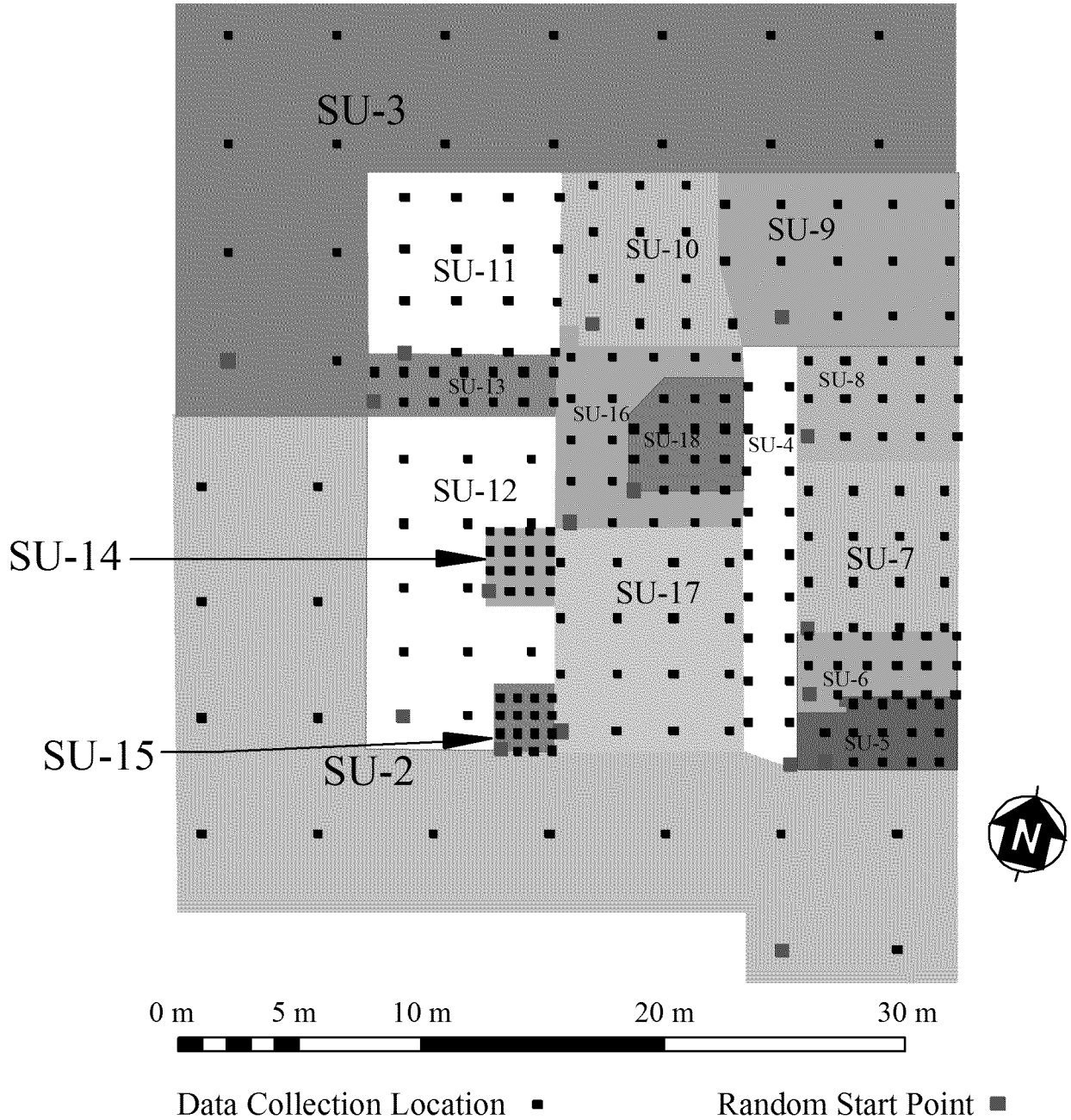
BUILDING 813 SURVEY UNITS - FIRST FLOOR OFFICES
CLASS 3 FLOORS



Survey Unit ID; **72 - M - 813 - survey unit # - 00 - consecutive sample #**

FIGURE 2-2

BUILDING 813 SURVEY UNITS - FIRST FLOOR OFFICES
CLASS 1 and 2 FLOORS



Survey Unit ID; **72 - M - 813 - survey unit # - 00 - consecutive sample**

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TETRA TECH FW, INC.

FIELD CHANGE REQUEST FORM

Contract No.	CTO No.	Field Change Request Form No.
N68711-98-D-5713	CTO-006	FCRF-CTO06-064
Location		Date
Building 813, Hunters Point Shipyard, San Francisco, CA		07/11/2006

RE: Drawing No. _____ Title _____

Specification Section _____ Title _____

Other Final, Task-specific Plan for the Building 813 Characterization Survey, DCN: FWSD-RAC-05-1420

Subject: Subdivision of SU18 into new SU21 and SU22

Description (items involved, submit sketch, if applicable)

This Field Change is submitted to subdivide SU18 into SU21 and SU22 in Building 813 at HPS.

Reason for Change

Materials that the original SU18 was constructed of are not similar in nature, and thusly cannot be used with a single background. This FCR divides SU18 into two different areas, based on materials of construction.

Recommended Disposition (submit sketch, if applicable)

1. Replace Table 2-8 with new Table 2-8(a).

2. Insert Attachment 1 of this FCR. Line out as superseded FCR-06058. Leave FCR-06058 attached in the TSP for historical reasons, to preserve the original data locations for SU18 should this data be used for later purposes.

TETRA TECH FW, INC.

FIELD CHANGE REQUEST FORM

Additional Details
N/A

N/A per Roger Margotto

Will this change result in a contract cost or time change? ☐ Yes ☐ No

of contrac

7/11/2006

Preparer (signature)			Site Superintendent (Signature)	Date
Brian Henderson	7/11/06	Associate ESQ Scientist EHS		07.11.06

Disposition

☐ Approved.

☐ Not approved (give reason).

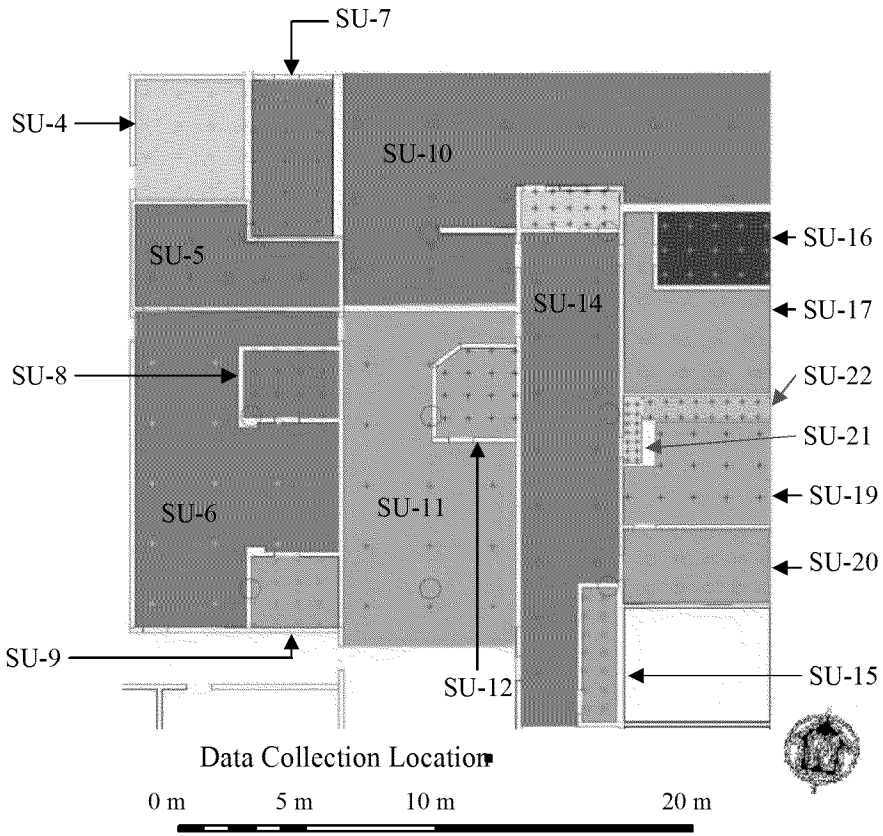
TtFW Engineer (signature) (if engineering related)	Date	TtFW Project Manager (signature)	Date
☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☐ No Comments	
TtFW PESM (signature) (if health and safety related)	Date	TtFW Scientist (signature) (if science related)	Date
☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☒ No Comments	7/11/2006
TtFW QC Program Manager (signature)	Date		
☐ Comments (attached) ☐ No Comments			

Distribution: Original to Project File, Copy to Site File,
Project Manager, DON RPM, DON ROICC, PQCM, QCM, Site Superintendent, RSO, Originator

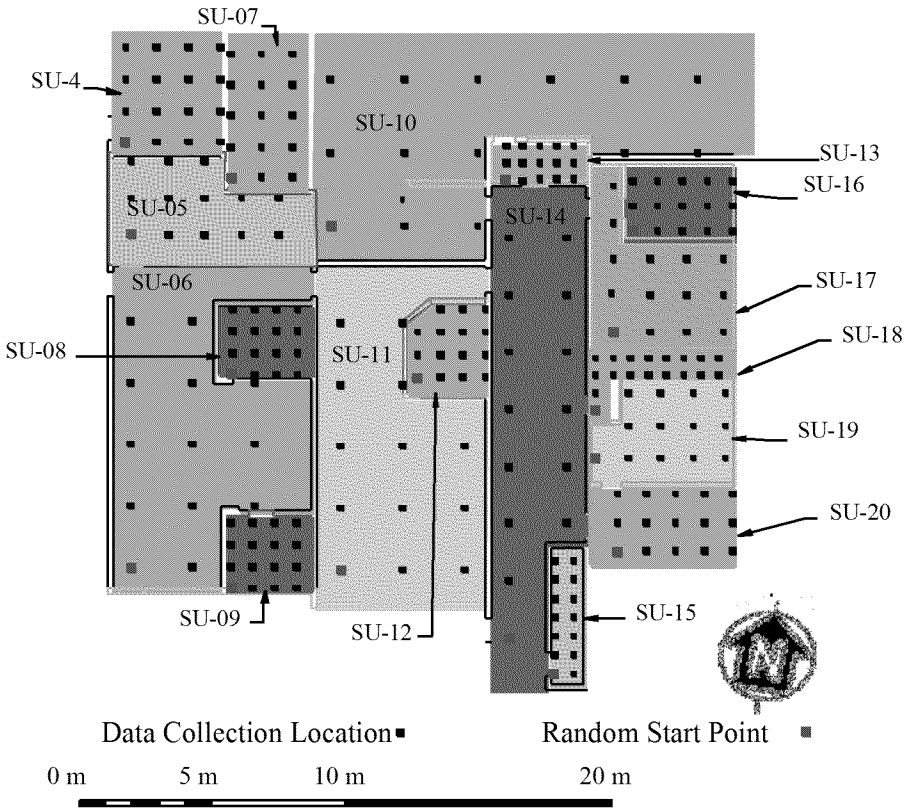
1.0 REVISED DRAWING

ORIGINAL DRAWING

Survey Units 4-17 and 19-22



Survey Units 4-20



Due to differing surface materials located in Survey Unit 18, the area will be segregated into two different survey units, SU21 and SU22, both Class 1 survey units; SU21 is the directly west of SU22. Scan surveys for alpha, beta, and gamma radionuclides may be listed as either SU18, or as SU21 or SU22. The surveillance points for all other grids have not changed. The random start point is designated as the lower right hand corner of SU21 and SU22. Static measurements will be listed taken at the new designated surveillance points, using appropriate backgrounds as discussed in the TSP. The Building 813 survey will now consist of eighteen Class 1 survey units (Survey Units (SU) 4 – 22, with out a SU18), two Class 2 survey units (SU 2, 3), and one Class 3 survey unit (SU 1). Table 2-8 should be replaced with the Table 2-8(a) on the following page.

Table 2-8 (a)

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a reference area mean or median
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The difference between the medians(means) exceeds the threshold
Formula for calculating number of sampling locations	Wilcoxon Rank Sum Test - MARSSIM version
Calculated total number of samples for each site and reference area	13
Number of samples on map [a]	261
Number of sample areas [b]	18 (SU4-17, and SU19-22)
Specified sampling area [c]	472.01 m^2
Size of grid / Area of grid cell [d]	14.7111 meters / 216.417 m^2
Grid pattern	Square

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

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APPENDIX B

BUILDING 813 REGULATORY CONCURRENCE

(Provided on CD only)

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California Department of Public Health

MEMORANDUM

DATE: April 1, 2008

TO: Mr. Rick Moss, Chief
Office of Military Facilities
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826-3200

FROM: Robin R. Hook, Chief
Environmental Management Branch
P.O. Box 997413
1616 Capitol Avenue, MS 7405
Sacramento, California 95899-7413
(916) 449-5667

SUBJECT: Recommendation for Unrestricted Release of Building 813 at former Hunters Point Naval Shipyard, San Francisco, California.

Upon the request of the Department of Toxic Substance Control (DTSC), the Environmental Management Branch (EMB), California Department of Public Health (CDPH) reviewed documents associated with radiological issues regarding Building 813 and performed confirmation surveys of this building. EMB has concluded that, with respect to radiological issues, this building is acceptable for unrestricted release.

If you need further assistance please contact Penny Leinwander of my staff at (916) 449-5921.

APPENDIX C

FINAL SURVEY UNIT PROJECT REPORTS ABSTRACT, REVISION 3

(Provided on CD only)

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DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
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SAN DIEGO, CA 92108-4310

Ser BPMOW.cny/0706
JUL 7 2011

Mr. Mark Ripperda (SFD 8-1)
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Mr. Larry Morgan
California Department of Public Health
1616 Capitol Avenue, MS 7405
P.O. Box 997377
Sacramento, CA 95899-7377

Dear Regulatory Team Members:

Enclosed please find the Final Survey Units Project Reports Abstract, Revision 3 (SUPRA), Sanitary Sewer and Storm Drain Removal Project, Hunters Point Shipyard, San Francisco, California. This revision to the SUPRA is a result of a Survey Unit Project Report (SUPR) "prototype" that was agreed upon by the California Department of Public Health in August 2010. All SUPR reports dated after August 2010 incorporate the "prototype" changes, however, the SUPRA was never updated accordingly. The SUPRA is a reference document in the SUPR reports. This document is being submitted for your records only.

If you have any questions regarding the enclosed document, please contact Mr. Chris Yantos at (619) 532-0912, or Mr. Keith Forman at (619) 532-0913 at your earliest convenience.

Sincerely,

KEITH FORMAN
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Final, Survey Units Project Reports Abstract, Revision 3 Sanitary Sewer and Storm Drain Removal, Hunters Point Shipyard, San Francisco, California, July 2011.

Ser BPMOW.cny/0706
JUL 7 2011

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CONTRACT NO. N62473-08-D-8823
CTO NO. 0003

FINAL

SURVEY UNIT PROJECT REPORTS ABSTRACT
REVISION 3

July 7, 2011

DCN: EMAC-8823-0003-0100.R3
Revision 3 to ECSD-RACIV-07-0207

SANITARY SEWER AND STORM DRAIN REMOVAL PROJECT
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

ED_000855_00003297-00589

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-08-D-8823
CTO NO. 0003

FINAL

SURVEY UNIT PROJECT REPORTS ABSTRACT

REVISION 3

July 7, 2011

SANITARY SEWER AND STORM DRAIN REMOVAL PROJECT
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

DCN: EMAC-8823-0003-0100.R3
Revision 3 to ECSD-RACIV-07-0207

Prepared by:

TETRA TECH EC, INC.
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Daryl DeLong
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Erik Abkemeier
Radiation Safety Officer

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ABBREVIATIONS AND ACRONYMS

µR/h	microroentgen per hour
ALARA	as low as reasonably achievable
AM	Action Memorandum
^{214}Bi	bismuth-214
CDPH	California Department of Public Health
COC	chain of custody
cpm	counts per minute
^{137}Cs	cesium-137
CTO	contract task order
DON	Department of the Navy
DQA	data quality assessment
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ESU	excavated soil unit
FSS	Final Status Survey
GPS	global positioning system
HPGe	high-purity germanium
HPS	Hunters Point Shipyard
HRA	Historical Radiological Assessment
IQR	interquartile range
keV	kiloelectron volt
LBGR	lower boundary of the gray region
LLRW	low-level radioactive waste
LMI	Ludlum Measurements, Inc.
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	multi-channel analyzer
MDA	minimum detectable activity
NaI	sodium iodide
NIST	National Institute of Standards and Technology

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ABBREVIATIONS AND ACRONYMS
(Continued)

NRC	Nuclear Regulatory Commission
^{214}Pb	lead-214
pCi/g	picocuries per gram
QA	quality assurance
QC	quality control
^{226}Ra	radium-226
RASO	Radiological Affairs Support Office
ROC	radionuclide of concern
RPD	relative percent difference
RSO	Radiation Safety Officer
RSY	Radiological Screening Yard
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
^{90}Sr	strontium-90
SUPR	Survey Unit Project Report
^{235}U	uranium-235
VSP	Visual Sample Plan
WRS	Wilcoxon Rank-Sum

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1.0 INTRODUCTION

1.1 PURPOSE

This Survey Unit Project Reports (SUPRs) Abstract was prepared to document work conducted under the final Base-wide Storm Drain and Sanitary Sewer Removal Work Plan (TtEC 2006) and final Base-wide Storm Drain and Sanitary Sewer Removal Work Plan – Revision 4 (TtEC 2010) (Work Plan) at Hunters Point Shipyard (HPS), San Francisco, California. This Abstract summarizes the scope, approach, and radiological surveys used during removal of the sanitary sewer and storm drains located within HPS prior to December 31, 2010. This Abstract will be applicable to all associated SUPRs and data sets prepared for regulatory review unless otherwise noted.

The previous version of this document (revision 2 to the final) was prepared under Contract No. N68711-98-D-5713, Contract Task Order (CTO) No. 0072. This document (revision 3 to the final) was prepared under Contract No. N62473-08-D-8823, CTO No. 0003.

1.2 BACKGROUND

Based on the site's operational history described in the final Historical Radiological Assessment (HRA), Volume II (NAVSEA 2004) and site-specific investigative data, the Department of the Navy (DON) determined that the HPS sanitary sewer and storm drain systems contain radioactive contamination in soils and debris requiring a response action. This decision is documented in the final Base-wide Radiological Removal Action, Action Memorandum (AM) – Revision 2006 (DON 2006), which was created to implement the recommendations of the HRA.

HPS is a site where radioactive materials have been used or stored, where known spills, discharges, or other instances involving radioactive materials have occurred, and where radioactive materials might have been disposed of or buried. The sanitary sewer and storm drain systems have a potential for general radioactive material contamination based on the site operating history or known contamination detected during previous radiation surveys.

The DON initiated this removal action for the extraction of piping systems and soil containing radioactive contaminants that may be present in or around the sanitary sewer and storm drain systems. This removal action will serve to eliminate the potential threat posed by future migration and/or off-site release of radioactive material present at the site to the surrounding environment. Currently, such a release could occur as a result of wastewater or stormwater transport, erosion, weathering, seismic events, or biological activity.

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The HRA (NAVSEA 2004) states that the present-day configuration of the sanitary sewer and storm drain systems is the result of an evolutionary process. This system was originally designed and built in the 1940s as a combined system, using the same conveyance piping and 40 separate discharge outfalls into San Francisco Bay.

This combined system grew in sections from the 1940s to its maximum size in 1958, when it underwent the first in a series of separation projects. The Building 819 pump station was constructed for conveyance of much of the sanitary sewage from HPS to the City of San Francisco treatment works, and separation of the systems took place in the industrial areas and the southwest area of HPS. Separation of the systems involved installation of dedicated sanitary sewer collection piping or diversion structures within the combined system piping that normally directed all combined flows through the Building 819 pump station. However, during storm events, stormwater flows would overwhelm Building 819, and much of the sewage and stormwater was diverted to various existing outfalls into the bay. Twenty-eight bay outfalls were converted to exclusive use for stormwater outlets, while 12 continued to serve as combined sanitary and stormwater sewer outlets.

A second segregation project, undertaken in 1973, provided some additional separation of the combined systems. The last of the separation projects performed in 1976 involved the installation of additional dedicated sanitary sewer piping. Complete separation of the combined systems was never achieved. Due to the evolutionary nature of the separation process, radiological contamination from the same source could have impacted the piping and other components of both systems.

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2.0 RELEASE CRITERIA

2.1 RELEASE LIMITS

The DON is taking steps to ensure that residual radioactivity at an area will not result in individuals being exposed to unacceptable levels of radiation or radioactive materials. Regulatory agencies establish radiation dose standards based on risk considerations and scientific data relating dose to risk. Residual levels of radioactive material that correspond to allowable radiation dose standards are derived by analysis of various pathways and scenarios such as direct exposure, inhalation, and ingestion.

These levels, known as release limits, are presented in terms of soil activity concentration. Release limits usually refer to average levels of radiation or radioactivity above appropriate background levels. Release limits applicable to soil are expressed in units of activity concentration, picocuries per gram (pCi/g). The development of release limits is often an iterative process, where the release limits selected or developed are modified as additional site-specific information is obtained. The development of final cleanup levels was based on the Nuclear Regulatory Commission's (NRC's) screening levels, the U.S. Environmental Protection Agency's (EPA's) preliminary remediation goals, or agreements between the DON and regulatory agencies as documented in the AM.

2.2 AS LOW AS REASONABLY ACHIEVABLE

As low as reasonably achievable (ALARA) is a philosophy of striving for excellence in the practice of health physics and is an important aspect of radiation-safety regulations. The National Council on Radiation Protection and Measurements has stated, "ALARA is simply the continuation of good radiation-protection programs and practices which traditionally have been effective in keeping the average and individual exposures for monitored workers well below the limits" (NCRP 1993). The application of ALARA clearly includes the consideration of economic and social factors, and thus will inherently be different for different sources or facilities.

The ALARA concept is founded in the professional judgment of radiation-safety managers and personnel and is not, therefore, able to be used as a measure as to whether or not a particular radiation-safety program is adequate in comparison with other programs. Additionally, the ALARA concept does not provide a numerical limit below which the ALARA concept is achieved.

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2.3 ENVIRONMENTAL ALARA PROCESS

This section describes the steps taken to implement the environmental ALARA policy:

1. Identification of Potential Radiological Impacts
2. Review of Radiological Impacts
3. Performance of Qualitative ALARA Analyses
4. Performance of Quantitative ALARA Analyses

2.3.1 Identification of Potential Radiological Impacts

Each new radiological operation is subjected to ALARA reviews before work begins to ensure that radiation exposures to workers, the public, and the environment meet ALARA principles. ALARA reviews are conducted for all operations, practices, and procedures that have potential for individual or collective doses to workers. Reviews culminate in changes or additions to work planning documents, standard operating procedures (SOPs), and radiological work permits.

These documents are used to identify activities that have potential for radiological environmental impacts and could require environmental ALARA analysis. If a radiological impact is identified that could impact the environment significantly, the Radiation Safety Officer (RSO) communicates the impact to the work staff and the Radiological Affairs Support Office (RASO).

2.3.2 Review of Radiological Impacts

Radiological impacts to the environment, workers, and the public from field operations are assessed for compliance with ALARA principles. Results from radiological survey activities, and air, soil, sediment, and water samples are used to assess the radiological impacts of HPS activities.

Determination of environmental radiological impacts from radiological activities is performed using nine methods: 1) air monitoring stations located around the excavation site perimeter to track radiological impacts; 2) field monitoring and sampling to identify areas requiring additional remediation; 3) remediation of contaminated areas at or above the release criteria; 4) control of radiologically impacted areas and work sites; 5) frisking of personnel and examining equipment leaving a radiologically controlled area; 6) use of release criteria that equate to dose and risk; 7) review of historical radiological operations to allow complete investigation of all areas of radiological concern; 8) complete characterization of radiologically impacted sites to ensure complete removal of radioactive material above the release criteria; and 9) dosimetry worn by personnel to measure time-averaged doses from gamma radiation.

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2.3.3 Performance of Qualitative ALARA Analyses

Laboratory analyses are performed for 19 different isotopes to ensure that any possible radioactive contamination is identified. After each excavation is completed, the qualitative radiological impacts from operations are evaluated by performing a dose and risk assessment. The results of analysis and assessments are provided to the RASO and regulatory agencies for review.

2.3.4 Performance of Quantitative ALARA Analyses

Based on qualitative ALARA analyses, excavation projects that could cause a potential dose to the public are subjected to quantitative ALARA analyses using the steps described below.

Quantitative ALARA analyses include societal, technological, economic, and public policy considerations. In addition, these ALARA analyses consider NRC guidance for performing the following environmental ALARA assessments:

- Identification of possible radiation protection systems, such as alternative operating methods or controls, that are reasonably achievable. The options should range from the most rudimentary (base case) to the most technologically sophisticated systems.
- Quantification of exposures and doses to workers and the public in the vicinity of the work through air monitoring and dosimetry.
- Quantification of the economic factors, including the costs of purchasing, installing, operating, and maintaining the radiological equipment, and the potential health effects associated with the exposure of people and any other direct or indirect cost resulting from exposures to radiation during investigations and/or remediations.
- Identification and estimation of other health and non-health detriments and benefits, such as equipment loss and accidents.
- Evaluation of process alternatives using a quantitative cost-benefit analysis, when possible. When evaluations included assumptions, judgments, and limitations that could be quantified, and potential doses were well below the dose limit, qualitative analyses were used with full documentation.
- Implementation of the ALARA principles and monitoring of the results.

The following specific factors are used in performing a quantitative ALARA analysis:

- Dose to workers, the public, and the environment before and during work processes
- Residual dose to the local population
- Applicable alternative processes (treatments, operating methods, or controls) for site investigations or remediations

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- Costs for each alternative evaluated
- Societal and environmental (positive and negative) impacts associated with alternatives

Based on recent estimates of dose to the public from HPS operations, only qualitative ALARA analyses were required. Much of the data and analysis used for environmental ALARA evaluations is developed as part of the routine work processes.

To ensure that ALARA levels are met, removal actions conducted in accordance with the AM are designed to 1) substantially reduce ionizing radiation below cleanup goals and 2) eliminate identified pathways of exposure to ionizing radiation.

2.4 RADIONUCLIDES OF CONCERN

As listed in Table 3-1 of the Work Plan (TtEC 2008), the primary radionuclides of concern (ROCs) for most survey units were cesium-137 (^{137}Cs), radium-226 (^{226}Ra), and strontium-90 (^{90}Sr). Table 2-1 lists those ROCs. The principal types of radiation (alpha, beta, and gamma) and associated half-lives are also identified for measurement purposes.

TABLE 2-1

RADIONUCLIDES OF CONCERN

Radionuclide	Half-life	Radiations
Radium-226	1,600 years	Alpha (α)/gamma (γ)
Strontium-90	28.6 years	Beta (β^-)
Cesium-137	30.17 years	Beta/gamma (β^-,γ)

Exceptions to the ROCs will be individually noted in the specific SUPR, as necessary. One hundred percent of the samples collected were analyzed by gamma spectroscopy at the HPS on-site laboratory. Ten percent of the samples were also analyzed for ^{90}Sr.

The presence of ^{90}Sr would primarily be attributed to fission products associated with OPERATIONS CROSSROADS and decontamination of ships that participated in atomic weapons testing. Since ^{137}Cs would have also been present, any sample containing activity greater than the release criteria for ^{137}Cs will also be analyzed for ^{90}Sr.

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2.5 RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN

Radionuclide-specific release criteria were obtained for each ROC using the criteria established by the NRC and EPA, as discussed in Section 2.1 above. The release criteria are shown in Table 2-2. Survey units for the sanitary sewer and storm drain removal project are considered acceptable when the radionuclide concentrations meet the soil release criteria defined in Table 2-2.

TABLE 2-2

RELEASE CRITERIA

Radionuclide	Soil			
	Outdoor Worker (pCi/g)	Residual Dose (mrem/yr)[a]	Residential (pCi/g)	Residual Dose (mrem/yr)[a]
Cesium-137	0.113	0.2142	0.113	0.2561
Radium-226	1.0[b]	6.342	1.0[b]	14.59
Strontium-90	10.8	0.1931	0.331	1.648

Notes:

[a] The resulting dose is based on modeling using RESRAD Version 6.3, with radon pathways turned off.
[b] Limit is 1 pCi/g above background, per agreement with EPA.

Abbreviations and Acronyms:

EPA – U.S. Environmental Protection Agency
mrem/yr – millirems per year
pCi/g – picocuries per gram

2.6 INVESTIGATION LEVEL FOR GAMMA SCAN SURVEYS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a quality control (QC) check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may have indicated a failing instrument.

When determining an investigation level using a statistical based parameter (for example, standard deviation), the following may be considered: survey objectives, underlying radionuclide distributions (normal, log-normal, nonparametric), data population descriptors (standard deviation, mean, median), and prior survey and historical information.

When an investigation level was exceeded, the measurement would have been confirmed to ensure that the initial measurement actually exceeds a particular investigation level.

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This involved taking further measurements to confirm the initial result and, as appropriate, to quantify the area of elevated residual radioactivity.

The investigation level for gamma surveys was established as the reference area mean + 3 σ where σ is the standard deviation of the gamma readings in the reference area.

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3.0 FINAL STATUS SURVEYS

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NUREG-1575; DoD et al. 2000), the Nonparametric Statistical Methodology for the Design and Analysis of the Final Status Decommissioning Survey Guide (NUREG-1505; NRC 1998), and the Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions Guide (NUREG-1507; NRC 1997) were used as guidance in designing and conducting the Final Status Surveys (FSSs).

3.1 OBJECTIVE OF THE FINAL STATUS SURVEYS

The objective of the FSS was to demonstrate that identified residual radioactivity levels inside the excavated trench and subsequent overburden soils to be used as backfill met the release criteria. In demonstrating that this objective was met, the null hypothesis (H_o) was tested for residual contamination that exceeds the release criteria. T he alternative hypothesis (H_a) was stated as residual contamination that meets the release criteria.

3.2 SURVEY UNITS

Sanitary sewer and storm drain systems were divided into manageable work areas, as designated in the specific design and work plans that are submitted for regulatory review. Smaller survey units were identified within each work area. There were three types of survey units: trench, overburden, and excavated soil. Trench survey units are survey units constructed by the surface area remaining as sanitary sewers and storm drain lines, as well as surrounding soil, are removed. An overburden survey unit is created by taking surrounding soil on the HPS site that is potentially used for fill material in a trench survey unit following its radiological release and placing it in 6-inch-thick "lifts" to be surveyed to verify its acceptability as fill material. Excavated soil survey units are created from the soil excavated during stormwater and sanitary sewer drain removal, so that the soil can be surveyed to determine its acceptability for use as fill material. Although the size of each survey unit may vary, each received the same scan survey and systematic sampling frequency.

3.2.1 Trench Survey Units

Scan surveys and systematic sampling were performed for each identified survey unit. Trench survey units varied in size but did not exceed 1,000 square meters in surface area. Systematically located post-excavation samples were collected after establishing a grid using Visual Sample Plan (VSP). Additional surveys may have been performed if the investigation levels were exceeded.

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Accessible surface areas of each trench unit were scanned using Ludlum Model 44-10 2-inch by 2-inch sodium iodide (NaI) scintillation detectors coupled to Ludlum Model 2350-1 data loggers. The scan surveys were performed at a rate of approximately 0.08 meter per second with the detector held approximately 10 centimeters (4 inches) above the trench sidewalls and floor as appropriate. The detector was moved back and forth across the travel path while scanning, producing a serpentine scan pattern. Areas of elevated activity identified during the scan survey were investigated further. Trench unit scan survey data are provided as an attachment to each individual SUPR.

Each trench unit was mapped using computer-aided design technologies. First, the trench centerline was plotted, and then the extent of the trench excavation was drawn, with walls splayed out flat, into a two-dimensional plane. The design was then extracted into VSP to determine the locations of systematic sample points.

A minimum of 18 systematic sample locations, based on a random start point and the triangular grid pattern, were generated using VSP and are provided in each SUPR. Sample collection points were placed in the field using approved land surveying technologies and identified with the global positioning system (GPS).

3.2.2 Overburden Survey Units

During the course of excavation of Parcel B sanitary sewer and storm drain lines, the soils from excavations not in the immediate 1-foot vicinity of sewer or storm drain piping were removed to dewatering/screening pads located in the Radiological Screening Yard (RSY). Peripheral soils, as discussed in Section 3.2.3, may have also been added to the overburden unit. The soils were then spread out in lifts not to exceed 6 inches in thickness and 1,000 square meters in total surface area. Each of these areas was then assigned an incremental number and was identified as an overburden unit.

The gamma scan data for each overburden unit used as backfill will be presented as an attachment to each SUPR, as applicable.

The entire area of each overburden unit was plotted in VSP, and 18 systematic sampling locations were determined using a random start point on a triangular grid pattern. Typical systematic sampling locations used for each overburden unit are shown on Figure 3-1.

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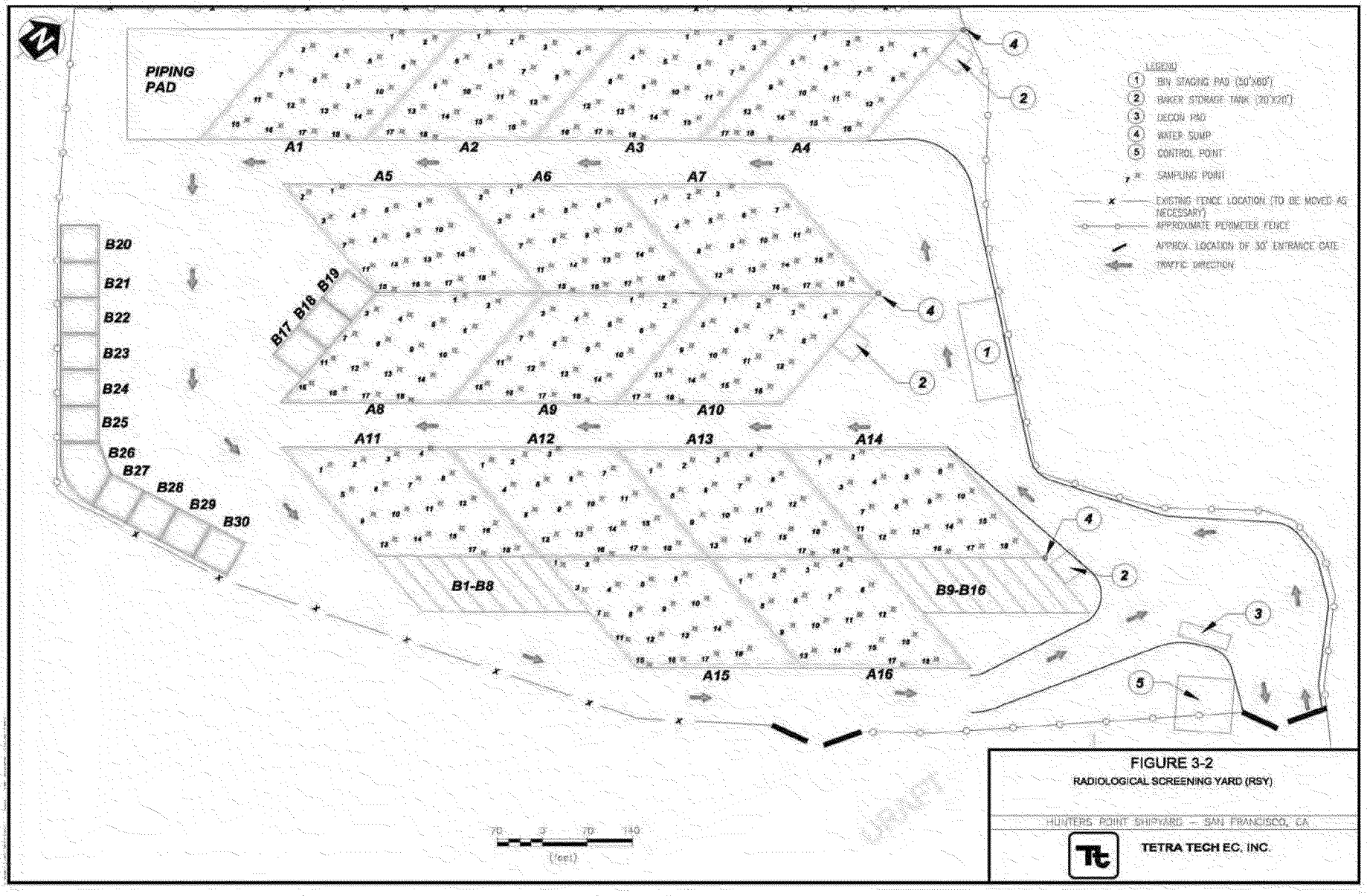
FIGURE 3-1

OVERBURDEN UNIT SAMPLING DIAGRAM



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3.2.3 Peripheral Soils

Specific to Parcel B, peripheral soils (those within the 1-foot vicinity of sewer or storm drain piping) were stockpiled separately in approximately 12-cubic-yard piles on peripheral pads. Each 12-cubic-yard stockpile was hand-surveyed after spreading into lifts not to exceed 6 inches. These surveys were performed manually for gamma radiation as detailed in Section 3.2.1.

A minimum of two samples were taken from each 6-inch lift. The samples were collected at the location exhibiting the highest gamma radiation measurement. Additional samples were collected at locations where the investigation level was exceeded.

Once surveys and sampling of peripherals were completed, with specific concurrence from the TtEC RSO and the RASO, the soils were consolidated with other overburden stockpiles and screened as described in Section 3.2.2.

If a peripheral pile was identified as low-level radioactive waste (LLRW), it was disposed of and the trench segment where the peripheral soil originated was sampled in 3-foot intervals to identify the extent of trench contamination, if any.

For radiological release, a single survey unit was the sum of the trench unit that was excavated and the overburden unit(s) soils that were reused to backfill the trench. Each individual trench unit and overburden unit was systematically sampled independently. Maps detailing the general location of trench units are provided individually with each SUPR.

3.2.4 Excavated Soil Survey Units

During the course of excavation from Parcels C, D-1, D-2, E, E-2, G, and Utility Corridor sanitary sewer and storm drain lines, the soils from these excavations were removed to dewatering/screening pads located in the RSY. The soils were then spread out in lifts not to exceed 6 inches in thickness and 1,000 square meters in total surface area. Each of these areas was then assigned an incremental number and identified as an excavated soil unit (ESU).

The gamma scan data for each ESU are presented as an attachment to each SUPR, as applicable.

The entire area of each ESU was plotted in VSP, and 18 systematic sampling locations were determined using a random start point on a triangular grid pattern. Typical systematic sampling locations used for each ESU are shown on Figure 3-2. The final sampling locations of ESUs are provided in each SUPR, as applicable.

3.2.5 Soil Scanning at the Radiological Screening Yard

Each overburden unit or ESU was scanned using a towed array system. To date, there have been three such systems in use at HPS.

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FIGURE 3-2
EXCAVATED SOIL UNIT SAMPLING DIAGRAM

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The first of such system consisted of a Ludlum Model 4612 instrument that features a single channel analyzer assembly equipped with a programmable computer that streamlines all operation parameters. Four arrays of three Ludlum Model 44-10 scintillation detectors spaced 12 inches apart were connected to the Ludlum 4612. The Ludlum 4612 was connected to a GPS receiver, which was used to correlate logged data points to specific coordinates. This instrument array was positioned behind the back of a tow vehicle so as to "follow behind" the path of the vehicle. Survey lanes were approximately 1 meter wide.

The towed array mechanism logged measurements at a 6-second integrated count time every 4 feet with each detector elevated approximately 10 centimeters (4 inches) above the ground. The data were reviewed to determine if additional biased sampling would be necessary.

The second scanning system used a RSI-700 mobile radiation detection system that featured a multi-channel analyzer (MCA) gamma ray spectrometer controller equipped with two 4- by 4- by 16-inch NaI scintillation detectors. The RSI-700 system was designed to measure and record radiation measurements from a moving platform and incorporated a GPS receiver, which was used to correlate logged data points to specific coordinates. This instrument array was positioned behind the back of a tow vehicle so as to "follow behind" the path of the vehicle. Survey lanes were approximately 1 meter wide.

The two detectors were installed in series, to function as one 4- by 4- by 32-inch detector in the system software. The towed array mechanism logged measurements at a 1-second integrated count time every 0.5 meter with the detectors elevated approximately 10 cm above the ground. The data were reviewed to determine if additional biased sampling was necessary.

The system currently in use is the Drive Over Array M251. The M251 system is constructed with a 40- by 6- by 2-inch gamma scintillation detector provided by Ludlum Measurements, Inc. (LMI), coupled to an LMI Model 2350-1 Data Logger, with positioning provided by a Trimble® ProXT GPS. The system integrates both GPS and counts from the detector using Trimble's TerraSync system (via Bluetooth® technology). The M251 is designed to measure both gamma radiation and GPS accurately.

The GPS was selected based on the ability to reliably measure position within 1 meter (and typically within 30 centimeters). The detector was chosen to provide a wide angle of scan in a rugged and reliable package. Scan speeds of the system are limited to an average of 0.3 meter per second with a detector height of 10 centimeters, which are consistent with the detector height presented in NUREG-1507, and are slow enough to provide adequate data acquisition over each pad. The system was constructed on a portable trailer, coupled to a 20-horsepower John Deere tractor.

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3.2.6 Import Fill

In June 2006, a local source of import fill material was found in the Millbrae, California, area. This soil was screened both chemically and radiologically before being delivered for use as residential fill material at HPS. This import fill material met the standards specified in Section 4.2 of the Sampling and Analysis Plan (SAP) (TtEC 2008), and approximately 12,000 cubic yards of the material was stockpiled at HPS.

In February 2007, another local source of import fill material was found in the Burlingame, California, area from the expansion of the Mills Hospital facility. This soil was screened both chemically and radiologically before being delivered for use as residential fill material at HPS. This import fill material met the standards specified in Section 4.2 of the SAP (TtEC 2008), and approximately 100,000 cubic yards of the material was stockpiled at HPS.

Eighteen random soil samples were collected from the import fill stockpile and the samples were analyzed by gamma spectroscopy. The results of the 18 random soil samples are used when performing dose modeling and statistical analysis when import fill material was used to backfill a trench. When import f ill was used, the results from statistical tests based on these soil samples are included in lieu of overburden unit statistics provided in a SUPR.

The import fill material gamma spectroscopy and ^{90}Sr results are provided in Attachment 1. Table 3-1 provides a summary of the results of the import fill from the Millbrae source, and Table 3-2 provides a summary of the results of the import fill from the Burlingame source.

3.3 REFERENCE AREA

Reference area samples for the sanitary sewer and storm drain removal project were obtained in April 2006 in an area of the Building 813 parking lot in Parcel D-2. Building 813 was identified in the HRA as being impacted, but the parking lot area was not identified as being impacted, and is considered of like material to that encountered in the soils in survey units. Eighteen samples were collected systematically from this area for reference area purposes. All 18 samples were analyzed at the on-site laboratory by gamma spectroscopy. Ten percent of samples (two samples total) were also analyzed for ^{90}Sr at the on-site laboratory. The reference area samples provided a basis for net activity concentration. Background activity for ^{226}Ra was determined to be 0.485 pCi/g, placing the release criterion at 1.485 pCi/g of ^{226}Ra.

The reference area gamma spectroscopy and ^{90}Sr results are provided in Attachment 2. A summary of the results is provided in Table 3-3.

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TABLE 3-1

Class 1 Soil Measurements - Import Fill 1

Sample No.	Date	Time	Results (pCi/g) ^{137}Cs	Flag	MDL	≥MDL	^{90}Sr	Flag	MDL	≥MDL	^{226}Ra	Flag	MDL	≥MDL
1	7/27/2006	13:00:00	0.018	A	0.036	0.036					0.094	A	0.758	0.758
2	7/27/2006	13:10:00	-0.032	#B	0.042	0.042					-0.278	#B	0.936	0.936
3	7/27/2006	13:20:00	-0.021	#B	0.048	0.048					-0.314	#B	0.816	0.816
4	7/27/2006	13:30:00	-0.025	#B	0.037	0.037					0.284	B	0.821	0.821
5	7/27/2006	13:40:00	0.033	A	0.035	0.035	0.041		0.049	0.049	0.816		0.777	0.816
6	7/27/2006	13:50:00	-0.042	#B	0.035	0.035					-0.948	#B	0.848	0.848
7	7/27/2006	14:00:00	-0.004	#B	0.039	0.039					-0.201	#B	0.814	0.814
8	7/27/2006	14:10:00	-0.039	#B	0.043	0.043					-0.224	#B	0.947	0.947
9	7/27/2006	14:20:00	0.009	A	0.044	0.044					0.683	A	0.926	0.926
10	7/27/2006	14:30:00	-0.027	#B	0.043	0.043					-1.084	#B	1.120	1.120
11	7/27/2006	14:40:00	-0.039	#B	0.043	0.043					0.634	A	0.874	0.874
12	7/27/2006	14:50:00	-0.045	#B	0.029	0.029	0.015		0.054	0.054	-0.426	#B	0.746	0.746
13	7/27/2006	15:00:00	0.006	A	0.032	0.032					0.533	A	0.561	0.561
14	7/27/2006	15:10:00	-0.028	#A	0.050	0.050					-1.297	#B	1.090	1.090
15	7/27/2006	15:20:00	-0.005	#B	0.049	0.049					0.681	A	1.050	1.050
16	7/27/2006	15:30:00	-0.035	#B	0.048	0.048					0.040	A	0.893	0.893
17	7/27/2006	15:40:00	-0.030	#A	0.047	0.047					-0.894	#B	1.060	1.060
18	7/27/2006	15:50:00	-0.008	#B	0.043	0.043					0.184	A	1.130	1.130
		mean				**0.041**				**0.052**				**0.900**
		std dev				**0.006**				**0.004**				**0.149**
		median				**0.043**				**0.052**				**0.884**

Notes:

Information concerning flags associated with the on-site laboratory data can be found in Section 4.3, and a discussion of uncertainty can be found in Section 4.8.

Abbreviations and Acronyms:

^{137}Cs – cesium-137
MDL – minimum detectable limit
pCi/g – picocuries per gram
^{226}Ra – radium-226
^{90}Sr – strontium-90
std dev – standard deviation

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TABLE 3-2

Class 1 Soil Measurements - Import Fill 2

Sample No.	Date	Time	Results (pCi/g) ^{137}Cs	Flag	MDL	≥MDL	^{90}Sr	Flag	MDL	≥MDL	^{226}Ra	Flag	MDL	≥MDL
1	2/19/2007	7:30:00	0.062		0.036	0.062					0.028	A	1.070	1.070
2	2/19/2007	7:40:00	0.089	#	0.041	0.089					0.562	#A	1.080	1.080
3	2/19/2007	7:50:00	-0.060	#B	0.054	0.054					-0.513	#B	1.140	1.140
4	2/19/2007	8:00:00	-0.009	#B	0.050	0.050					1.022	B	1.350	1.350
5	2/19/2007	8:10:00	-0.024	#B	0.051	0.051					0.291	B	1.150	1.150
6	2/19/2007	8:20:00	-0.050	#B	0.061	0.061	-0.003		0.068	0.068	-0.012	#B	1.280	1.280
7	2/19/2007	8:30:00	-0.040	#B	0.044	0.044					1.005	F	0.959	1.005
8	2/19/2007	8:40:00	-0.057	#B	0.052	0.052					0.221	B	1.100	1.100
9	2/19/2007	8:50:00	0.038		0.019	0.038					-0.408	#B	0.881	0.881
10	2/19/2007	9:00:00	0.037	#	0.034	0.037					-0.498	#B	0.932	0.932
11	2/19/2007	9:10:00	-0.056	#B	0.055	0.055					-1.169	#B	0.971	0.971
12	2/19/2007	9:20:00	0.006	B	0.043	0.043					0.587	B	1.070	1.070
13	2/19/2007	9:30:00	-0.050	#B	0.040	0.040					-0.061	#B	0.842	0.842
14	2/19/2007	9:40:00	0.025	B	0.043	0.043					1.291		1.020	1.291
15	2/19/2007	9:50:00	0.007	B	0.058	0.058					-1.372	#B	1.190	1.190
16	2/19/2007	10:00:00	-0.004	#B	0.059	0.059	0.016		0.072	0.072	0.658	B	0.996	0.996
17	2/19/2007	10:10:00	0.027	B	0.052	0.052					-0.434	#B	1.120	1.120
18	2/19/2007	10:20:00	-0.072	#B	0.059	0.059					0.126	B	1.220	1.220
		mean				**0.053**				**0.070**				**1.094**
		std dev				**0.012**				**0.003**				**0.141**
		median				**0.052**				**0.070**				**1.090**

Notes:

Information concerning flags associated with the on-site laboratory data can be found in Section 4.3, and a discussion of uncertainty can be found in Section 4.8.

Abbreviations and Acronyms:

^{137}Cs – cesium-137
MDL – minimum detectable limit
pCi/g – picocuries per gram
^{226}Ra – radium-226
^{90}Sr – strontium-90
std dev – standard deviation

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TABLE 3-3

Class 1 Soil Measurements - Background Reference Area

Sample No.	Date	Time	Results (pCi/g) ^{137}Cs	Flag	MDL	≥MDL	^{90}Sr	Flag	MDL	≥MDL	^{226}Ra	Flag	MDL	≥MDL
1	4/26/2006	12:00:00	-0.029	#B	0.038	0.038					0.202	A	0.700	0.700
2	4/26/2006	12:00:00	-0.063	#A	0.044	0.044					0.230	A	0.641	0.641
3	4/26/2006	12:00:00	-0.035	#B	0.036	0.036					0.219	A	0.633	0.633
4	4/26/2006	12:00:00	0.028	A	0.033	0.033					0.198	A	0.773	0.773
5	4/26/2006	12:00:00	-0.049	#A	0.042	0.042	-0.204		0.194	0.194	0.296	A	0.647	0.647
6	4/26/2006	12:00:00	-0.013	#B	0.036	0.036	-0.123		0.194	0.194	0.569	A	0.609	0.609
7	4/26/2006	12:00:00	0.057		0.033	0.057					0.767		0.669	0.767
8	4/26/2006	12:00:00	-0.079	#A	0.040	0.040					0.621		0.597	0.621
9	4/26/2006	12:00:00	-0.023	#B	0.039	0.039					0.233	A	0.633	0.633
10	4/26/2006	12:00:00	-0.020	#B	0.038	0.038					0.671	A	0.876	0.876
11	4/26/2006	12:00:00	-0.062	#A	0.042	0.042					1.228		0.621	1.228
12	4/26/2006	12:00:00	0.000	#B	0.041	0.041					0.548	A	0.570	0.570
13	4/26/2006	12:00:00	-0.072	#A	0.049	0.049					0.604	A	0.737	0.737
14	4/26/2006	12:00:00	0.002	A	0.040	0.040					0.400	A	0.807	0.807
15	4/26/2006	12:00:00	-0.035	#B	0.042	0.042					0.442	A	0.594	0.594
16	4/26/2006	12:00:00	-0.059	#A	0.045	0.045					0.224	A	0.777	0.777
17	4/26/2006	12:00:00	0.012	A	0.031	0.031					0.788		0.665	0.788
18	4/26/2006	12:00:00	0.021	A	0.033	0.033					0.482	A	0.580	0.580
		mean				**0.040**				**0.194**				**0.721**
		std dev				**0.006**				**0.000**				**0.155**
		median				**0.040**				**0.194**				**0.674**

Notes:

Information concerning flags associated with the on-site laboratory data can be found in Section 4.3, and a discussion of uncertainty can be found in Section 4.8.

Abbreviations and Acronyms:

^{137}Cs – cesium-137
MDL – minimum detectable limit
pCi/g – picocuries per gram
^{226}Ra – radium-226
^{90}Sr – strontium-90
std dev – standard deviation

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4.0 LABORATORY ANALYSIS

4.1 SAMPLE PREPARATION

Samples for radiological analysis were collected in the field by trained and qualified radiological technicians. When soil samples were collected in the field, they were first processed through a colander apparatus to eliminate foreign objects and large debris. If the samples were acceptable for processing, an adequate amount of the sample was then placed into the geometry used by the on-site laboratory for analysis. However, if, in the opinion of the field technician, the sample was saturated beyond 10 percent moisture content by weight (as may be indicated by a failure to pass material through the colander apparatus), then approximately four times the amount of sample needed for analysis was placed into a ZipLoc® bag for subsequent drying by laboratory personnel.

The field technician who collected the sample turned the samples over to the on-site laboratory using the chain-of-custody (COC) procedure described in the SAP (TtEC 2008). Each sample is verified to contain identical information on the sample container and the associated COC form when received at the laboratory.

Once the samples were received by the on-site laboratory, each sample was verified to contain less than 10 percent moisture content by weight when massed. Samples with moisture in excess of the 10 percent limit were dried in a laboratory oven. Once the moisture content was determined to be less than 10 percent, the sample was passed through consecutively smaller sieves, ending at a number 40, to screen for any foreign materials that may have been present. An aliquot of the remaining materials was then placed into the geometry necessary for analysis by the laboratory team.

The area where samples were received and staged for analysis is a secured area with access restricted to laboratory team members or their immediate supervisors.

4.2 GAMMA SPECTROSCOPY ANALYSIS

Gamma spectroscopy analysis was performed using EG&G ORTEC® detector systems equipped with beryllium end caps (windows), which allowed for enhanced quantification of low-energy gammas (such as ^{226}Ra). Hardware features included a high-purity germanium (HPGe) gamma photon detector supported by an MCA and analysis software. Instrument hardware was calibrated using a multi-energy National Institute of Standards and Technology (NIST)-traceable source ranging from 50 kiloelectron volts (keV) to 2.6 megaelectron volts. All results were reported in pCi/g. The Laboratory Manager reviewed all data results, including energy spectrums, for quality assurance (QA) and to verify count integration, efficiency, and

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background corrections, as well as the identification of overlapping peaks. If there was any question on the analysis results, the sample was counted for a longer interval.

Additional reviews consisted of ensuring that 100 percent of the data complies with the method- and project-specific requirements as outlined in the SAP (TtEC 2008). QA data reviews included checking for compliance with the required QC practices, SOPs, and method and project requirements.

Compilations of statistical summary tables were reviewed and checked for trends prior to presenting the data to the RASO for final concurrence. The RASO then reviewed the data prior to concurring on release of material, backfilling of trenches, or disposal as LLRW.

A summary of typical library peaks used for identification may be seen in Table 4-1.

4.3 GAMMA SPECTROSCOPY ANALYSIS FLAGS

The gamma vision software produces a report once the analysis is complete. Each report is typically eight pages long, with a summary provided on the last page. The summary reports are then presented for each sample in the individual SUPR. The summary reports also identify flags (or symbols) that may be associated with each radionuclide, if appropriate. These flags and their associated meanings are presented below and do not necessarily specify that the data are not valid:

- # – **All peaks for activity calculation had bad shape.** The peak did not have a proper Poisson shape. These peaks are suspect, and the activity was calculated using a Simpson's Rule type of approximation.
- * – **Activity omitted from total.** The total activity is the scaled sum of the decay-corrected activity, if present, or the time-of-count activity. If the total activity was reported with a * symbol, this will indicate that the activity reported for some of the nuclides was not included in the total activity of the sample. The two instances in which a sample will report a total activity with a * symbol are discussed below.
- **& – Activity omitted from total and all peaks had bad shape.** This flag is used when the nuclide was not found and the peak did not have a proper Poisson shape. In short, the & symbol is used instead of two separate flags (< and # symbols). Nuclides identified with a & symbol are not included in the total activity of the sample.
- **< – MDA value printed.** If the nuclide was not found, the minimum detectable activity (MDA) value was printed with a < symbol after the nuclide name, and no uncertainty is reported. Nuclides identified with a < symbol are not included in the total activity.
- **A – Activity printed, but activity < MDA.** The activity calculation performed on the peaks for the isotope of concern yields a lower value than the calculation for the MDA. This identifies that a calculation was performed and the peaks were found, but the resulting activity was lower than the MDA.

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TABLE 4-1

SUMMARY OF LIBRARY FOR GAMMA SPECTROSCOPY ANALYSIS AT THE ON-SITE LABORATORY

Nuclide	Energy	Percent	Half-life		Nuclide	Energy	Percent	Half-life		Nuclide	Energy	Percent	Half-life	
Ac-228	338.40	12.01%	6.13	hr	Cs-137	661.66	84.62%	30.1	y	Pb-214	77.11	10.70%	26.8	min
Ac-228	463.00	4.40%	6.13	hr	Eu-152	121.78	29.24%	12.7	y	Pb-214	87.20	3.70%	26.8	min
Ac-228	794.95	4.25%	6.13	hr	Eu-152	344.30	27.00%	12.7	y	Pb-214	241.92	7.47%	26.8	min
Ac-228	911.07	29.00%	6.13	hr	Eu-152	411.09	2.26%	12.7	y	Pb-214	295.22	19.20%	26.8	min
Ac-228	968.90	17.46%	6.13	hr	Eu-152	778.90	12.99%	12.7	y	Pb-214	351.99	37.10%	26.8	min
Am-241	26.99	2.50%	433	Y	Eu-152	964.00	14.58%	12.7	y	Pb-214	785.95	1.09%	26.8	min
Am-241	59.54	36.30%	433	Y	Eu-152	1408.08	21.21%	12.7	y	Ra-226	186.20	3.28%	1600	y
Bi-212	727.17	11.80%	60.55	min	Eu-154	123.10	40.46%	8.5	y	Th-230	67.67	0.37%	7.54E+04	y
Bi-212	785.42	2.00%	60.55	min	Eu-154	723.30	19.70%	8.5	y	Th-230	143.87	0.05%	7.54E+04	y
Bi-212	1620.56	2.75%	60.55	min	Eu-154	1274.80	35.50%	8.5	y	Th-230	253.73	0.01%	7.54E+04	y
Bi-214	609.32	46.09%	19.9	min	K-40	1460.80	10.70%	1.28E+09	y	Th-234	63.29	4.84%	578.4	hr
Bi-214	665.45	1.56%	19.9	min	Pa-234	131.28	20.00%	6.7	hr	Th-234	92.80	2.77%	578.4	hr
Bi-214	768.36	4.89%	19.9	min	Pa-234	883.24	15.00%	6.7	hr	Tl-208	583.14	86.00%	3.1	min
Bi-214	934.05	3.17%	19.9	min	Pa-234	946.00	12.00%	6.7	hr	Tl-208	860.47	12.00%	3.1	min
Bi-214	1120.28	15.04%	19.9	min	Pb-210	46.54	4.25%	22.3	y	Tl-208	2614.47	100.00%	3.1	min
Bi-214	1377.65	4.02%	19.9	min	Pb-212	74.81	9.60%	10.64	hr	U-235	143.76	10.50%	3.80E+06	y
Bi-214	1407.98	2.48%	19.9	min	Pb-212	77.11	17.50%	10.64	hr	U-235	163.35	4.70%	3.80E+06	y
Bi-214	1509.19	2.19%	19.9	min	Pb-212	87.20	6.30%	10.64	hr	U-235	185.05	54.00%	3.80E+06	y
Bi-214	1764.51	15.92%	19.9	min	Pb-212	238.63	43.10%	10.64	hr					
Co-60	1173.23	99.86%	5.272	Y	Pb-212	300.09	3.27%	10.64	hr					
Co-60	1332.51	99.98%	5.272	Y										

Abbreviations and Acronyms:

Ac-228 – actinium-228
Am-241 – americium-241
Bi-212 – bismuth-212
Bi-214 – bismuth-214
Co-60 – cobalt-60
Cs-137 – cesium-137
Eu-152 – europium-152
Eu-154 – europium-154
hr – hour
K-40 – potassium-40
min – minute
Pa-234 – proactinium-234
Pb-210 – lead-210
Pb-212 – lead-212
Pb-214 – lead 214
Ra-226 – radium-226
Th-230 – thorium-230
Th-234 – thorium-234
Tl-208 – thallium-208
U-235 – uranium-235
Y – year

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- **B – Activity < MDA and failed test.** The peak was not statistically differentiable from background, and the background value was considered valid—activities reported with these codes should only be considered as < MDA values.
- **C – Area < Critical level.** The area of the peak was determined not to be statistically significant. The peak is not statistically differentiable from background.
- **F – Failed fraction or key line test.** The most abundant peak for the particular isotope was not observed in the correct proportions relative to other peaks, either high or low. The activity was determined using the most conservative estimate relative to using either the primary peak only or the secondary peaks only.
- **H – Half-life limit exceeded.** This flag would only show up on an old sample or a laboratory calibration standard with radioisotopes that are short lived. The date the sample was collected or the calibration standard was made is input into the software program. If an isotope is identified that has exceeded 12 half-lives from the time of collection, this flag will show up for that isotope.

4.4 QUALITY ASSURANCE GAMMA SPECTROSCOPY ANALYSIS

Samples were selected for QA purposes to ensure that the data quality objectives (DQOs) established in the SAP (TtEC 2008) were being met by the on-site laboratory. As required by the SAP, a minimum of 10 percent of samples for each type of analysis were sent to the off-site laboratory for independent verification of results. QA sample selection criteria included:

- Ten percent of all samples across all projects
- Ten percent of samples used to recommend unrestricted release of a survey unit, namely samples associated with the FSS sampling event

Samples were selected based on indications of activity that are generally near the release criteria for the particular project. This objective ensured that the on-site laboratory met the DQOs specified.

Starting in July 2008, the independent cross reference QA analyses were performed by TestAmerica (formerly Severn-Trent Laboratories) in St. Louis, Missouri. TestAmerica is a National Voluntary Laboratory Accreditation Program and Utah certified laboratory.

4.5 SELECTION OF THE OFF-SITE LABORATORY

4.5.1 Detection of Radium-226 at the On-Site Laboratory

During the performance of gamma spectroscopy, ^{226}Ra activity can be quantified by two different methods. The method used by the DON was identification of the 186.2 keV energy peak, and the in-growth method is based on calculations from identification of the ^{226}Ra daughters, bismuth-214 (^{214}Bi) and lead-214 (^{214}Pb). The DON considers quantification of the

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activity using the 186.2 keV peak to be a more cost-effective method and as reliable a means of analysis as the in-growth method.

Gamma spectroscopy at the on-site laboratory was performed using HPGe detectors with beryllium end caps using Gamma Vision software. These systems were able to achieve the minimum detection limits necessary to quantify ^{226}Ra activity using the 186.2 keV peak after analysis for 2,700 seconds (45 minutes). Upon completion of data acquisition, analysis software processed spectral regions of interest around specified energy ranges, which allowed for identification and quantification of the nuclides of potential concern and their associated progeny. In addition, analysis and review of the data addressed count integration, efficiency, and background corrections, and the processing of overlapping spectral peaks.

As part of the on-going internal QC of the on-site laboratory, the DON purchased a NIST-certified standard of ^{226}Ra from Eckert & Ziegler, Inc., in March 2008. The certified quantity of ^{226}Ra was 29.959 pCi/g (the lowest activity the vendor could certify without extraordinary effort), with a relative uncertainty of 3.3 percent. The standard was delivered in a container similar to that used at HPS with a density of about 1.6 grams per milliliter (equivalent to NUREG-1507 soil). The standard was analyzed by all gamma spectroscopy systems at HPS, and the results using the on-site method of detection of ^{226}Ra were within the relative uncertainty of the standard . The relative percent difference (RPD) between the certified activity and the activity reported from each detector ranged from 0.29 to 3.06. Table 4-2 summarizes the results and associated RPD.

TABLE 4-2

COMPARISON OF ON-SITE LABORATORY AND NIST TRACEABLE RADIUM-226 STANDARD RESULTS

NIST Traceable ^{226}Ra Standard (29.959 pCi/g)								
Count	Detector	1	2	3	4	5	6	7
1st Count Feb 08	Activity (pCi/g)	30.689	30.127	30.234	30.047	30.179	30.890	30.781
	RPD	2.41	0.56	0.91	0.29	0.73	3.06	2.71

Abbreviations and Acronyms:

NIST – National Institute of Standards and Technology
pCi/g – picocuries per gram
^{226}Ra – radium-226
RPD – relative percent difference

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4.5.2 Evaluation of Eberline Services

Eberline Services used HPGe detectors with aluminum caps for performance of gamma spectroscopy activities associated with this project. The use of aluminum end caps decreases the ability of the system to differentiate the low-energy gamma rays produced by some radioisotopes. As a result, Eberline Services counted sewer project samples for 200 to 1,000 minutes in order to achieve the required reporting limits. Despite the longer count time, the equipment could not adequately differentiate between the 185.05 and 186.2 keV peaks associated with uranium-235 (^{235}U) and ^{226}Ra, respectively. Therefore, Eberline Services based ^{226}Ra activity on mathematical formulae (the alternate method), which used both ^{214}Bi and ^{214}Pb activity (assumed to be in secular equilibrium).

The DON sent the 30 pCi/g ^{226}Ra standard (discussed above) to Eberline Services as a "blind" (unknown to the laboratory) QC check. Eberline Services (using the in-growth method) reported ^{226}Ra activity at 11.7 pCi/g, about an RPD of 88 lower than certified value of the standard. Based on the low standard results and due to the questions concerning the validity of the Eberline QA analyses, the DON sent additional samples (slightly more than 10 percent) that were processed by Eberline Services to TestAmerica for follow-up QA checks to ensure the data received from Eberline Services were still valid. The selection of samples ensured that at least one sample from each trench unit where overburden material was used as backfill underwent additional QA.

Eberline Services returned the 30 pCi/g standard to the on-site laboratory. All available systems again analyzed the standard to determine the status of the standard. Again, all available gamma spectroscopy systems indicated activity within the reported tolerance of the standard. The RPD between the certified activity and the activity reported from each detector ranged from 0.34 to 2.35, with an RPD between the first and second count between 0.18 and 3.04. Table 4-3 summarizes the results and associated RPDs.

Note that the ^{226}Ra standard was not reanalyzed on the third gamma spectroscopy system because the detector was not available due to maintenance issues.

4.5.3 Initial Evaluation of TestAmerica

Gamma spectroscopy at the TestAmerica laboratory was performed using HPGe detectors with beryllium end caps using Gamma Vision software. TestAmerica based ^{226}Ra activity initially on mathematical formulae (the in-growth method), which used both ^{214}Bi and ^{214}Pb activity (assumed to be in secular equilibrium), but later switched to using the 186.2 keV peak at the request of the DON. The DON specifically chose to use TestAmerica due to the similarity of equipment, analysis engines, software, and price.

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TABLE 4-3

COMPARISON OF EBERLINE SERVICES AND NIST TRACEABLE RADIUM-226 STANDARD RESULTS

NIST Traceable ^{226}Ra Standard (29.959 pCi/g)								
Count	Detector	1	2	3	4	5	6	7
2nd Count April 08	Activity (pCi/g)	29.825	30.072	N/A	30	29.276	30.670	30.420
	RPD	0.45	0.38	N/A	0.34	2.31	2.35	1.53
RPD Between 1st and 2nd Count		2.86	0.18	N/A	0.05	3.04	0.71	1.18

Abbreviations and Acronyms:

N/A – not available
NIST – National Institute of Standards and Technology
pCi/g – picocuries per gram
^{226}Ra – radium-226
RPD – relative percent difference

After receiving the 30 pCi/g ^{226}Ra standard (as discussed in Section 4.5.2) and reanalysis by the on-site laboratory, the 30 pCi/g standard was sent to TestAmerica for analysis. Results from this analysis (using the 186.2 keV method) was 29.93 pCi/g with an RPD of the certified value at 0.1.

The results of the standard analysis and resulting RPD from all laboratories are summarized in Table 4-4. Individual gamma spectroscopy reports, including the off-site laboratory result, can be found in Attachment 3.

4.5.4 Selection of TestAmerica as the QA/QC Laboratory

Based on the similarity of gamma spectroscopy systems between TestAmerica and the on-site laboratory, and the use of the direct measurement of ^{226}Ra at the 186.20 keV energy, the DON replaced Eberline Services with TestAmerica as the primary choice for QA/QC verification of the on-site laboratory. However, TestAmerica subsequently reverted to the in-growth method, which used both ^{214}Bi and ^{214}Pb activity (assumed to be in secular equilibrium) as described in Section 4.9.6.

4.6 LABORATORY COMPARISON

Data from the on-site and off-site gamma spectroscopy analysis were compared, and the acceptance criterion of RPD for each on-site and off-site laboratory pair was established at 30 in instances where both activities were reported above the quantification or reporting limit (with no associated disqualifying flags). When off-site laboratory results are less than the on-site

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TABLE 4-4

SUMMARY OF NIST TRACEABLE RADIUM-226 STANDARD RESULTS

NIST Traceable ^{226}Ra Standard (29.959 pCi/g)								
Count	Detector	1	2	3	4	5	6	7
1st Count Feb 08	Activity (pCi/g)	30.689	30.127	30.234	30.047	30.179	30.890	30.781
	RPD	2.41	0.56	0.91	0.29	0.73	3.06	2.71
Eberline Services	Activity (pCi/g)	11.70						
	RPD	87.66						
TestAmerica Services	Activity (pCi/g)	29.93						
	RPD	0.10						
RPD On-site vs Eberline		89.59	88.11	88.40	87.90	88.25	90.12	89.83
RPD On-site vs TestAmerica		2.50	0.66	1.01	0.39	0.83	3.16	2.80

Abbreviations and Acronyms:

NIST – National Institute of Standards and Technology
pCi/g – picocuries per gram
^{226}Ra – radium-226
RPD – relative percent difference

laboratory results, an RPD greater than 30 will not be investigated since the on-site laboratory results are used for decision making and are biased high by design. Any off-site laboratory result greater than the on-site laboratory result with an RPD greater than 30 will require an investigation to resolve the discrepancy. Any subsequent actions, if necessary, are discussed in each individual SUPR.

For background measurements, different counting times and analysis processes were used, and there was not a direct correlation between the results from the on-site and off-site laboratory. However, the highest ^{226}Ra activity reported by the off-site laboratory was 0.307 pCi/g, which is well below the release criteria and well below the MDA for the same sample processed in the on-site laboratory. T he Laboratory Manager and RSO compared analysis results to determine whether or not there could be any difference that would question the validity of the on-site laboratory data. The Laboratory Manager and the RSO concluded that the results were acceptable. A summary of the on-site and off-site (Eberline Services) laboratory results for the reference area samples is provided in Table 4-5.

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TABLE 4-5

Reference Area Laboratory Results Comparison (pCi/g)

Sample ID	On-site Laboratory						Off-site Laboratory (QA)					
	^{137}Cs			^{226}Ra			^{137}Cs			^{226}Ra		
	Activity	MDA	2σ Error	Activity	MDA	2σ Error	Activity	MDA	2σ Error	Activity	MDA	2σ Error
6NPBRAO-007	0.057	0.033	0.040	0.767	0.669	0.839	U	0.045	N/A	0.307	0.086	0.100
6NPBRAO-016	-0.059	0.045	-0.124	0.224	0.777	0.901	U	0.015	N/A	0.188	0.027	0.050

Abbreviations and Acronyms:

^{137}Cs – cesium-137
MDA – minimum detectable activity
N/A – 2 sigma error not reported since the activity was less than the MDA
pCi/g – picocuries per gram
QA – quality assurance
^{226}Ra – radium-226
U – activity not reported since it was less than MDA

4.7 STRONTIUM-90 ANALYSIS

The approved subcontractor procedure describes a method for separation and isotopic measurement of ^{90}Sr in various media through the use of a specialized cation resin. The extraction system in the proprietary specialized resin is 1.0 molar 4,4'(5')-di-t-butylcyclohexano 18-crown-6 (crown ether) in 1-octanol. A 40 percent loading of this organic solution is loaded onto an inert chromatographic support. The bed density of strontium resin is approximately 0.35 gram per milliliter. The radioactive ^{90}Sr is separated using the specialized resin prior to gas proportional counting. Small amounts of ^{90}Sr tracer are used to monitor method yields and correct results to improve precision and accuracy. Note that in some cases, ^{90}Sr is analyzed for "total Sr," which includes ^{89}Sr and ^{90}Sr. If this total Sr result is less than the ^{90}Sr release criterion, this result is conservatively reported at the ^{90}Sr result. However, if the total Sr result is larger than the ^{90}Sr result, the sample will be further analyzed using the ^{90}Sr sample analysis procedure described above.

The results of ^{90}Sr analysis were reported in pCi/g and are included as an attachment to each SUPR. Any sample exhibiting ^{137}Cs activity greater than the release criteria was also analyzed for ^{90}Sr.

A minimum of 10 percent of samples were randomly chosen for ^{90}Sr analysis at the on-site or off-site laboratory.

4.8 COUNTING UNCERTAINTY

Measurement of radioactivity has some degree of inherent uncertainty. The uncertainty quoted is the standard deviation of the average, obtained from the statistical uncertainties of the individual measurements. This uncertainty results from the combination of all possible inaccuracies in the

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measurement process, including such factors as the reading of the result, peak integration interpretation, peak background determination, the calibration of the measurement device, numerical rounding errors, and the random nature of radioactivity. Individual radioactivity measurements are accompanied by a plus or minus (±) value, which is an uncertainty term known as either the two-sigma counting error or the total propagated analytical uncertainty.

An additional problem is that there is only a single low energy gamma associated with ^{226}Ra, and its comparison to the background continuum is the only method to quantify efficiency. This leads to a mathematical weakness for calculating uncertainties, and uncertainties will be calculated high when the activity is near background levels. Therefore, extra attention to background quantification and frequency is imperative.

Total propagated uncertainty includes both counting uncertainty and analytical uncertainty. Because measuring a radionuclide requires a process of counting random radioactive emissions from a sample, the counting uncertainty gives information on what the measurement might be if the same sample were counted again under identical conditions. The counting uncertainty implies that approximately 95 percent of the time, a recount of the same sample would give a value somewhere between the reported value minus the counting uncertainty and the reported value plus the counting uncertainty.

The uncertainty in the background is not as simple because the background is a calculated number. The background area uncertainty is the uncertainty in the channels used to calculate the end points of the background multiplied by the ratio of the number of channels in the peak to the number of channels used to calculate the background. For wide peaks and low counts per channel, there is high uncertainty in the calculated background.

To better understan d the effect of background uncertainty coupled with the ^{226}Ra counting uncertainty, the on-site laboratory identified a sample that had ^{226}Ra activity present above the MDA but below the release criteria and performed an empirical test. The sample was analyzed ten different times on the same detector. Results of the analysis indicated that the average ^{226}Ra activity reported was 1.353 pCi/g with an average reported counting uncertainty of 1.170 pCi/g. However, the standard deviation of the ^{226}Ra activity was 0.034, while the standard deviation of the counting uncertainty was 0.054. These data tend to show that the real uncertainty for accuracy and reproducibility associated with the reported ^{226}Ra activity is quite low in comparison to the reported uncertainty. This information is summarized in Table 4-6. Individual laboratory data are provided in Attachment 4.

Values in the tables provided in the SUPR that are less than the counting uncertainty indicate that the reported result might have come from a sample with no radioactivity. Such values are considered below detection. Also note that each radioactive measurement has the random background radioactivity of the measuring instrument subtracted, and the uncertainty of this individual background measurement is also a part of the counting uncertainty. Therefore,

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negative results and negative uncertainties are possible, especially when the sample has very little radioactivity.

TABLE 4-6

On-Site Laboratory Soil Measurements Uncertainty Estimate

Sample No.	Date	Time	^{226}Ra	MDA	Counting Uncertainty
1	7/21/2008	10:08:00	1.333	0.925	1.168
2	7/21/2008	10:08:00	1.390	1.030	1.238
3	7/21/2008	10:08:00	1.305	0.972	1.221
4	7/21/2008	10:08:00	1.416	0.945	1.133
5	7/21/2008	10:08:00	1.332	0.953	1.147
6	7/21/2008	10:08:00	1.320	1.040	1.264
7	7/21/2008	10:08:00	1.366	0.922	1.157
8	7/21/2008	10:08:00	1.339	0.886	1.104
9	7/21/2008	10:08:00	1.359	0.902	1.115
10	7/21/2008	10:08:00	1.368	0.969	1.150
		mean	**1.353**	**0.954**	**1.170**
		std dev	**0.034**	**0.051**	**0.054**
		median	**1.349**	**0.949**	**1.154**

Notes:

The unit of measure is pCi/g.

Abbreviations and Acronyms:

MDA – minimum detectable activity
pCi/g – picocuries per gram
^{226}Ra – radium-226
std dev – standard deviation

In some instances, results approach a "zero" relative to the background determined for each channel of the gamma spectroscopy system. Because of this, in a few instances, the counting statistics increase without bound as the limit approaches zero. While not desirable, with activities approaching indistinguishability from the background of the gamma spectroscopy system, the counting uncertainty approaches an unusually large activity.

4.9 DATA ASSESSMENT

Laboratory data were assessed to determine whether the objectives of the survey process were met. The assessment process consisted of four data phases: verification, validation, evaluation, and quality assessment. The assessment of HPS laboratory data ensured the objective of the survey, final unrestricted release, was met.

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4.9.1 Data Verification

Data verification ensured that the requirements were implemented as prescribed. Data verification activities included inspections of the laboratory, verifying that documented QC checks were performed on laboratory equipment in accordance with the appropriate SOP, technical reviews of data, and audits as appropriate.

4.9.2 Data Validation

As stated in the SAP (TtEC 2008), there are no standards for data validation of radiological analyses. Therefore, guidance documents and modified functional guidelines were used in validation of radiological data. Data not meeting method and/or SAP specifications were flagged as estimated or rejected.

RPD requirements for the on-site laboratory are provided in Table A.7-3 of the SAP (TtEC 2008). In addition, Section 7.2.4.1 of the SAP states that results reported greater than the MDA were to be used for the assessment of the precision requirements. The laboratory duplicate selection process was designed to be "blind" so that the process also applies to results that were less than the MDA. Specific laboratory duplicates are provided in SUPRs. Discussions concerning the on-site laboratory duplicate will only be provided if an investigation was necessary due to the accuracy of the result.

4.9.3 Data Evaluation

On-site radiochemical and laboratory data were evaluated prior to submittal to the RASO. The evaluation of data was based on method requirements and results of QC checks, the level of contamination of method blanks and method spikes (as appropriate), and the overall indication of interference due to contamination. The data qualifiers, if used, were listed at the bottom of the data report. If the data were determined to be acceptable for use, no qualifiers appear. ^{90}Sr results that did not indicate activity did not use qualifiers.

4.9.4 Data Quality Assessment

Data quality assessment (DQA) is a scientific and statistical evaluation that indicates whether the data are of the right type, quality, and quantity to support their intended use. DQA provides the assessment needed to decide if the planning objectives were met. All data presented in the SUPRs were subject to the DQA process, and the data were determined suitable for use.

During the course of work, extensive DQA was performed for the samples collected and processed at the on-site laboratory. The DON, in a response to a specific request, analyzed additional duplicate pairs of samples that have indicated ^{226}Ra above the MDA to illustrate the on-site laboratory's precision. Results for these 32 duplicate pairs of different samples that indicated activity near the ^{226}Ra action level are provided in Attachment 5, along with a summary. These duplicate pairs were analyzed across all gamma spectroscopy systems, and the

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data were previously provided to the State of California Department of Public Health (CDPH). All samples indicated ^{226}Ra RPD less than 30, with a maximum RPD of 18, indicating a very high level of precision at the on-site laboratory.

Additionally, 10 of the 32 duplicate samples were sent to the off-site laboratory (Eberline Services) for a comparison evaluation. A bias between methods or laboratories can be viable for comparison purposes, if it is a consistent bias. The typical approach is to construct a scatter plot for the results of the different methods or laboratories and fit the data to a function that can then be used for data comparison between methods or laboratories. However, in this case, some results, including some of the higher selected on-site laboratory duplicate sample results for ^{226}Ra, are below the reporting limit or are nondetect for the off-site laboratory, which has a much lower MDA. Essentially, this appears to show that the two laboratory-specific implementations of the chosen methods are not comparable, even when one attempts to take the relative bias into consideration.

Results of the sample comparison are summarized in Table 4-7. Off-site laboratory data are provided in Attachment 6.

Due to the large RPDs between the on-site laboratory and Eberline Services, the DON decided to send the 10 duplicate samples to another outside laboratory (TestAmerica) in an effort to validate the data set. TestAmerica, like Eberline Services, based ^{226}Ra activity on mathematical formulae that used ^{214}Bi activity (assumed to be in secular equilibrium). However, using the in-growth method, all results for ^{226}Ra were identified as having activity present above the MDA, and the RPD was at 86.85 or below for all samples results. This appears to show that the three laboratory-specific implementations of the chosen methods are somewhat comparable. As identified in Table 4-8, the RPD between the on-site laboratory results and results from TestAmerica after a 30-minute count time were in better agreement than the RPD between Eberline Services and the on-site laboratory results provided in Table 4-7.

To further assess the data quality, a comparison of the two off-site laboratories' methods of using the same process for estimating the ^{226}Ra activity based on the ^{214}Bi activity was performed. Results of the comparison, as identified in Table 4-9, showed that the RPD between the two off-site laboratories was from not applicable (for samples that were reported as a nondetect) to 93.02. This appears to show that the two off-site laboratory-specific implementations of the same method were less comparable than the on-site laboratory and TestAmerica results.

Results of the off-site laboratory sample comparison are summarized in Table 4-9.

Since the TestAmerica gamma spectroscopy systems were similar to the systems used at the on-site laboratory, the DON requested that TestAmerica reanalyze the duplicate samples using the 186.2 keV peak. TestAmerica was able to achieve the minimum detection limits necessary to

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TABLE 4-7

Eberline Services
Laboratory Duplicate Results Comparison (pCi/g)

Sample ID	On-site Laboratory				Eberline Services				Relative Percent Difference	
	Count Time (seconds)	^{226}Ra			Count Time (minutes)	^{226}Ra				
		Activity	MDA	2σ Error		Activity	MDA	2σ Error	Onsite Lab	Onsite vs Offsite
6PBFS-055-105	2700	2.310	0.872	1.126	815	0.645	0.026	0.100	4.28	112.69
6PBFS-055-105dup		2.213	0.905	1.168						
6PBFS-055-109	2700	3.450	1.250	1.603	276	0.632	0.053	0.110	6.89	138.08
6PBFS-055-109dup		3.221	1.150	1.504						
6PBFS-055-110	2700	3.103	1.070	1.380	216	U	0.128	N/A	3.35	N/A
6PBFS-055-110dup		3.001	1.120	1.445						
70-PD-C0080-42	2700	2.687	0.929	1.282	231	0.387	0.080	0.120	18.30	149.65
70-PD-C0080-42dup		2.237	0.843	1.164						
70-PD-C0081-26	2700	2.463	0.968	1.236	921	0.608	0.036	0.100	10.54	120.79
70-PD-C0081-26dup		2.737	1.070	1.364						
70-PDT-085-30	2700	2.875	1.240	1.551	202	0.906	0.064	0.150	2.34	104.15
70-PDT-085-30dup		2.809	1.260	1.610						
70-PDT-085-31	2700	3.599	1.090	1.487	206	U	1.800	N/A	0.94	N/A
70-PDT-085-31dup		3.565	1.030	1.400		0.875	0.091	0.160		
70-PDT-085-33	5400	2.566	0.807	1.061	1016	0.862	0.037	0.140	3.70	99.42
70-PDT-085-33dup		2.473	0.818	1.043						
70-PDT-086-33	2700	2.480	1.000	1.316	1015	U	0.058	N/A	4.56	N/A
70-PDT-086-33dup		2.370	0.929	1.253						
70-PDT-086-61	2700	2.608	1.110	1.403	1015	0.542	0.042	0.120	0.73	131.17
70-PDT-086-61dup		2.627	1.060	1.315						

Abbreviations and Acronyms:

MDA – minimum detectable activity
N/A – 2 sigma error not reported since the activity was less than MDA
pCi/g – picocuries per gram
^{226}Ra – radium-226
U – activity not reported since it was less than MDA

quantify ^{226}Ra activity using the 186.2 keV peak with an analysis time of no more than 2 hours. Results of the comparison, as identified in Table 4-10, showed that the RPD between the on-site and off-site laboratories using this method was between 0.08 and 36.64. This appears to show that the off-site laboratory-specific implementations of the same method were more comparable than the previous method discussed earlier.

Results of the sample comparison and associated RPD are summarized in Table 4-10.

TestAmerica began analysis to verify QA/QC for the on-site laboratory using the 186 keV method in the fall of 2008, with the initial results shown in Table 4-10. The second analyses confirmation package matched very well, with all but one RPD less than 30 as required by the SAP. The TestAmerica internal duplicate analyses also matched and met the RPD requirements. For all analyses where the on-site laboratory reported results less than the release criteria,

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TABLE 4-8

TestAmerica
Laboratory Duplicate Results Comparison (pCi/g)

Sample ID	On-site Laboratory				TestAmerica				Relative Percent Difference	
	Count Time (seconds)	^{226}Ra Activity	^{226}Ra MDA	^{226}Ra 2σ Error	Count Time (minutes)	^{226}Ra Activity	^{226}Ra MDA	^{226}Ra 2σ Error	Onsite Lab	Onsite vs Offsite
6PBFS-055-105	2700	2.310	0.872	1.126	30	1.050	0.140	0.200	4.28	75.00
6PBFS-055-105dup		2.213	0.905	1.168						
6PBFS-055-109	2700	3.450	1.250	1.603	30	1.640	0.120	0.250	6.89	71.13
6PBFS-055-109dup		3.221	1.150	1.504						
6PBFS-055-110	2700	3.103	1.070	1.380	30	1.540	0.160	0.280	3.35	67.32
6PBFS-055-110dup		3.001	1.120	1.445						
70-PD-C0080-42	2700	2.687	0.929	1.282	30	1.060	0.160	0.220	18.30	86.85
70-PD-C0080-42dup		2.237	0.843	1.164						
70-PD-C0081-26	2700	2.463	0.968	1.236	30	1.200	0.200	0.270	10.54	68.94
70-PD-C0081-26dup		2.737	1.070	1.364						
70-PDT-085-30	2700	2.875	1.240	1.551	30	1.710	0.110	0.250	2.34	50.82
70-PDT-085-30dup		2.809	1.260	1.610						
70-PDT-085-31	2700	3.599	1.090	1.487	30	1.620	0.210	0.310	0.94	75.84
70-PDT-085-31dup		3.565	1.030	1.400						
70-PDT-085-33	5400	2.566	0.807	1.061	30	1.880	0.160	0.300	3.70	30.86
70-PDT-085-33dup		2.473	0.818	1.043						
70-PDT-086-33	2700	2.480	1.000	1.316	30	1.470	0.120	0.250	4.56	51.15
70-PDT-086-33dup		2.370	0.929	1.253						
70-PDT-086-61	2700	2.608	1.110	1.403	30	1.340	0.140	0.240	0.73	64.23
70-PDT-086-61dup		2.627	1.060	1.315		1.110	0.180	0.200		

Abbreviations and Acronyms:

MDA – minimum detectable activity
N/A – 2 sigma error not reported since the activity was less than the MDA
pCi/g – picocuries per gram
^{226}Ra – radium-226

TestAmerica also reported results less than the release criteria, confirming that the on-site laboratory is reporting conservatively high as designed. Results of the second sample comparison and associated RPD are summarized in Table 4-11.

4.9.5 Interim Data Quality Assessment

Following the analysis of the initial two QA/QC confirmation packages, one sample from each Parcel B trench unit (62 in all) was sent to TestAmerica for analysis. Prior to receipt of those samples, TestAmerica installed a modified version of ORTEC Gammavision analysis software to further enhance their ability to analyze environmental levels of ^{226}Ra using the 186 keV method. The intent of the modification was to better identify and separate the conflicting peaks of ^{235}U at 185.7 keV and ^{226}Ra at 186.2 keV. The modified software did not produce the anticipated enhanced results. In fact, subsequent analyses following installation of the modified software showed a sporadic tendency to incorporate the natural ^{235}U contribution to the ^{226}Ra activity.

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TABLE 4-9

TestAmerica and Eberline Services
Laboratory Duplicate Results Comparison (pCi/g)

Sample ID	TestAmerica				Eberline Services				
	Count Time (minutes)	^{226}Ra			Count Time (minutes)	^{226}Ra			Relative Percent Difference
		Activity	MDA	2σ Error		Activity	MDA	2σ Error	
6PBFS-055-105	30	1.050	0.140	0.200	815	0.645	0.026	0.100	47.79
6PBFS-055-109	30	1.640	0.120	0.250	276	0.632	0.053	0.110	88.73
6PBFS-055-110	30	1.540	0.160	0.280	216	U	0.128	N/A	N/A
70-PD-C0080-42	30	1.060	0.160	0.220	231	0.387	0.080	0.120	93.02
70-PD-C0081-26	30	1.200	0.200	0.270	921	0.608	0.036	0.100	65.49
70-PDT-085-30	30	1.710	0.110	0.250	202	0.906	0.064	0.150	61.47
70-PDT-085-31	30	1.620	0.210	0.310	206	U	1.800	N/A	N/A
70-PDT-085-31dup						0.875	0.091	0.160	
70-PDT-085-33	30	1.880	0.160	0.300	1016	0.862	0.037	0.140	74.25
70-PDT-086-33	30	1.470	0.120	0.250	1015	U	0.058	N/A	N/A
70-PDT-086-61	30	1.340	0.140	0.240	1015	0.542	0.042	0.120	84.80
70-PDT-086-61dup		1.110	0.180	0.200					

Abbreviations and Acronyms:

MDA – minimum detectable activity
N/A – 2 sigma error not reported since the activity was less than the MDA
pCi/g – picocuries per gram
^{226}Ra – radium-226
U – activity not reported since it was less than MDA

This resulted in statistically significant variations from both the HPS laboratory results and with TestAmerica's in-house duplicate analysis. A summary of the sample comparison is provided in Attachment 7.

Review of data provided in Attachment 7 generally indicated that the off-site laboratory method using the 186 keV method for the ^{226}Ra gamma peak was biased high relative to and less reproducible than the on-site 186 keV method. This is likely due to interference from ^{235}U activity being less well accounted for or separated in the off-site method after recent analysis system changes at the off-site laboratory. This situation caused the DON to conduct additional investigations and to decide to use the in-growth method data from the off-site laboratory for comparison.

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TABLE 4-10

TestAmerica and On-Site Laboratory
Laboratory Duplicate Results Comparison (pCi/g)

Sample ID	On-site Laboratory				TestAmerica				Relative Percent Difference	
	Count Time (seconds)	^{226}Ra Activity	^{226}Ra MDA	^{226}Ra 2σ Error	Count Time (minutes)	^{226}Ra Activity	^{226}Ra MDA	^{226}Ra 2σ Error	Onsite Lab	Onsite vs Offsite
6PBFS-055-105	2700	2.310	0.872	1.126	60	2.500	1.600	1.200	4.28	7.90
6PBFS-055-105dup		2.213	0.905	1.168						
6PBFS-055-109	2700	3.450	1.250	1.603	60	2.500	1.800	1.200	6.89	31.94
6PBFS-055-109dup		3.221	1.150	1.504						
6PBFS-055-110	2700	3.103	1.070	1.380	60	2.500	1.400	1.000	3.35	21.51
6PBFS-055-110dup		3.001	1.120	1.445						
70-PD-C0080-42	2700	2.687	0.929	1.282	60	2.300	1.500	1.100	18.30	15.54
70-PD-C0080-42dup		2.237	0.843	1.164						
70-PD-C0081-26	2700	2.463	0.968	1.236	60	1.700	1.700	1.100	10.54	36.64
70-PD-C0081-26dup		2.737	1.070	1.364						
70-PDT-085-30	2700	2.875	1.240	1.551	60	2.400	2.100	1.400	2.34	18.01
70-PDT-085-30dup		2.809	1.260	1.610						
70-PDT-085-31	2700	3.599	1.090	1.487	60	3.100	1.900	1.400	0.94	14.89
70-PDT-085-31dup		3.565	1.030	1.400						
70-PDT-085-33	5400	2.566	0.807	1.061	60	3.000	2.200	1.500	3.70	15.59
70-PDT-085-33dup		2.473	0.818	1.043						
70-PDT-086-33	2700	2.480	1.000	1.316	120	2.120	1.100	0.800	4.56	15.67
70-PDT-086-33dup		2.370	0.929	1.253						
70-PDT-086-61	2700	2.608	1.110	1.403	120	2.610	1.300	0.980	0.73	0.08
70-PDT-086-61dup		2.627	1.060	1.315		2.300	1.200	0.870		

Abbreviations and Acronyms:

MDA – minimum detectable activity
N/A – 2 sigma error not reported since the activity was less than the MDA
pCi/g – picocuries per gram
^{226}Ra – radium-226

To ensure the in-growth method could be considered a viable comparison option, the DON requested that TestAmerica reanalyze the 30 pCi/g ^{226}Ra standard. Results from this analysis (using the in-growth method) was 25.9 pCi/g with an RPD of the certified value at 14.53. A summary of the sample comparison using the in-growth method is provided in Attachment 8. The laboratory report for the standard reanalysis is provided in Attachment 9.

Twelve of those samples were selected for further comparison and additional analyses by TestAmerica. A summary of the 12 sample results comparison is provided in Table 4-12.

All but 2 of the 12 sample results identified ^{214}Bi activity less than the ^{226}Ra activity reported by the on-site laboratory. In the case of the two off-site laboratory samples with ^{214}Bi activity greater than the on-site laboratory ^{226}Ra activity, the RPDs were well within 30.

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TABLE 4-11

TestAmerica and On-Site Laboratory
Second Sample Comparison

Sample ID	On-site Laboratory			Off-site Laboratory			RPD
	^{226}Ra			^{226}Ra			^{226}Ra
	Activity	MDA	2σ Error	Activity	MDA	2σ Error	
6PBFS-031-03	-0.276	1.150	-1.774	0.880	0.670	0.450	
6PBFS-031-14	-0.133	0.837	-1.081	0.740	0.820	0.520	
6PBFS-032-04	0.610	1.030	1.212	1.140	0.820	0.550	
6PBFS-032-12	0.311	1.150	1.304	1.250	0.730	0.520	
6PBOPA07-011-141-08	1.124	1.010	1.186	0.120	0.740	0.420	
6PBOPA07-011-141-17	0.245	1.150	1.323	0.940	0.660	0.130	
6PBFS-034-03	-1.015	0.847	-2.500	0.000	0.700	3.100	
6PBFS-034-13	-0.469	0.852	-1.638	0.760	0.570	0.380	
6PBOPA01-009-136-03	-0.437	1.120	-1.782	0.920	0.760	0.500	
6PBOPA01-009-136-10	-0.970	1.180	-3.324	1.330	0.830	0.580	
6PBOPA16-008-137-03	-0.190	1.220	-1.607	0.000	0.560	0.150	
6PBOPA16-008-137-12	-0.713	0.877	-2.147	0.020	0.700	0.410	
6PBOPA03-011-144-02	0.396	0.738	0.825	0.800	0.780	0.510	
6PBOPA03-011-144-15	-1.120	0.905	-4.710	0.360	0.540	0.330	
6PBFS-035-117	3.195	1.050	1.298	4.400	1.300	1.200	31.74
6PBFS-035-126	0.310	1.130	1.306	0.750	0.600	0.400	
6PBFS-035-129	-0.926	1.160	-3.576	0.640	0.720	0.450	
6PBOPA03-011-144-02	0.396	0.738	0.825	0.800	0.780	0.510	
6PBOPA03-011-144-15	-1.120	0.905	-4.710	0.360	0.540	0.330	
6PBOPA02-009-172-10	1.282	0.954	1.132	1.100	0.790	0.530	15.29
6PBOPA02-009-172-18	1.386	0.943	1.130	1.240	0.770	0.540	11.14
6PBFS-038-02	0.936	1.070	1.272	1.230	0.760	0.530	
6PBFS-038-17	-0.296	1.120	-1.651	1.270	0.630	0.470	
6PBOPA02-009-172-10	1.282	0.954	1.132	1.100	0.790	0.530	15.29
6PBOPA02-009-172-18	1.386	0.943	1.130	1.240	0.770	0.540	11.14
6PBAB-116-04	0.223	1.080	1.233	0.970	0.800	0.530	
6PBAB-116-16	1.401	1.240	1.485	1.440	0.720	0.540	2.72
6PB142-SU1-024	-1.165	0.846	-6.127	0.290	0.650	0.390	
6PB142-SU1-031	-0.629	1.070	-2.115	0.290	0.540	0.320	
6PB142-SU2-020	-1.081	1.260	-4.036	0.510	0.600	0.370	
6PB142-SU2-032	-1.310	1.090	-6.495	0.000	0.590	0.200	
6PB142-SU3-027	-0.252	1.070	-1.493	0.000	1.000	0.580	
6PB142-SU3-044	-0.704	1.000	-2.392	0.000	0.660	0.390	
72-M-114-RA-04	1.383	0.930	1.109	1.060	0.760	0.520	26.43
72-M-114-RA-10	0.773	0.964	1.125	1.010	0.660	0.460	
72-M-114-01-003	0.545	1.330	1.525	0.140	0.710	0.410	
72-M-114-01-008	-0.939	1.100	-2.983	1.160	0.750	0.660	
72-M-114-02-001	-0.852	0.962	-2.173	0.600	0.650	0.410	
72-M-114-02-014	1.113	1.020	1.203	1.040	0.740	0.500	6.77

Notes:

The unit of measure is in pCi/g. Values in red exceed the release criteria for that radionuclide of concern.

Abbreviations and Acronyms:

MDA – minimum detectable activity
^{226}Ra – radium-226
pCi/g – picocuries per gram
RPD – relative percent difference

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TABLE 4-12

TestAmerica and On-Site Laboratory
QA Analysis of HPS Lab Ra-226 and TA Bi-214 Results

Sample ID	On-site Laboratory				Original Container Off-site Laboratory (QA)				RPD
	Count Time (min)	^{226}Ra			Count Time (min)	^{214}Bi			
		Activity	MDA	2σ Error		Activity	MDL	2σ Error	
6PBFS-004-15	90	1.114	0.839	1.009	90	1.060	0.110	0.140	4.98
6PBFS-005-115	45	0.926	0.860	1.018	90	1.000	0.100	0.140	7.66
6PBFS-010-31	90	1.488	0.807	0.976	90	1.050	0.110	0.140	34.52
6PBFS-014-111	45	1.123	0.846	1.015	90	0.730	0.080	0.110	42.45
6PBFS-026-12	45	0.725	0.691	0.804	90	0.418	0.088	0.098	53.71
6PBFS-029-13	90	1.149	0.969	1.139	90	0.830	0.140	0.150	32.27
6PBFS-037-54	90	1.083	0.702	0.840	90	0.990	0.100	0.140	9.01
6PBFS-040-50	45	1.421	1.120	1.352	90	1.000	0.100	0.140	34.77
6PBFS-043-115	90	1.057	0.833	1.000	90	0.870	0.080	0.120	19.39
6PBFS-045-152	90	1.012	0.775	0.914	90	0.600	0.110	0.120	51.12
6PBFS-056-93	45	1.035	0.851	1.000	90	1.160	0.130	0.160	11.40
6PBFS-058-63	90	0.746	0.685	0.814	90	0.500	0.090	0.100	39.52

Notes:

The unit of measure is in pCi/g. Values in red exceed the release criteria for that radionuclide of concern.

Abbreviations and Acronyms:

^{214}Bi – bismuth-214
HPS – Hunters Point Shipyard
MDA – minimum detectable activity
MDL – method detection limit
min – minute
pCi/g – picocuries per gram
QA – quality assurance
^{226}Ra – radium-226
RPD – relative percent difference
TA – TestAmerica

4.9.6 Ongoing Data Quality Assessment

Currently, TestAmerica is performing QA/QC analysis using the in-growth method. This has resulted in significantly lower RPDs than occurred with comparison of analysis from the modified software using the 186 keV method. However, the RPDs are not as low as the original RPDs when TestAmerica was using the original software and performing the 186 keV method. These data were summarized and sent to the CDPH for review (provided in Attachments 7 and 8).

Based upon review of the in-growth method results by the CDPH, it was recommended to reanalyze a dozen samples after sealing them into the typical tuna cans used by the off-site laboratory given the difference in results seen between the on-site 186 keV results and the off-site in-growth results. This reanalysis occurred after the samples were placed in the standard off-site laboratory tuna can geometry, which were sealed according to the off-site laboratory

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procedures and held for in-growth. The same 12 samples identified in Table 4-12 were used for this test so that additional comparisons could be made.

All but 2 of the 12 sample results identified ^{214}Bi activity less than the ^{226}Ra activity reported by the on-site laboratory. In the case of the two off-site laboratory samples with ^{214}Bi activity greater than the on-site laboratory ^{226}Ra activity, the RPDs were well within 30. Results of the analysis are provided in Table 4-13.

TABLE 4-13

TestAmerica and On-Site Laboratory
QA of HPS Lab Ra-226 and TA Bi-214 Tuna Can Results

Sample ID	On-site Laboratory				Reprocessed Off-site Laboratory (Tuna Can)				RPD
	Count Time (min)	^{226}Ra			Count Time (min)	^{214}Bi			
		Activity	MDA	2σ Error		Activity	MDL	2σ Error	
6PBFS-004-15	90	1.114	0.839	1.009	60	0.870	0.090	0.220	24.61
6PBFS-005-115	45	0.926	0.860	1.018	60	0.640	0.070	0.150	36.55
6PBFS-010-31	90	1.488	0.807	0.976	60	1.200	0.070	0.200	21.44
6PBFS-014-111	45	1.123	0.846	1.015	60	0.570	0.060	0.150	65.36
6PBFS-026-12	45	0.725	0.691	0.804	60	0.380	0.060	0.120	62.44
6PBFS-029-13	90	1.149	0.969	1.139	60	1.160	0.070	0.210	0.92
6PBFS-037-54	90	1.083	0.702	0.840	60	0.910	0.060	0.170	17.40
6PBFS-040-50	45	1.421	1.120	1.352	60	0.890	0.070	0.170	45.95
6PBFS-043-115	90	1.057	0.833	1.000	60	0.630	0.080	0.190	50.60
6PBFS-045-152	90	1.012	0.775	0.914	60	0.730	0.090	0.210	32.38
6PBFS-056-93	45	1.035	0.851	1.000	60	1.240	0.070	0.200	18.03
6PBFS-058-63	90	0.746	0.685	0.814	60	0.420	0.060	0.110	55.95

Notes:

The unit of measure is pCi/g. Values in red exceed the release criteria for that radionuclide of concern.

Abbreviations and Acronyms:

^{214}Bi – bismuth-214
HPS – Hunters Point Shipyard
MDA – minimum detectable activity
MDL – method detection limit
min – minute
pCi/g – picocuries per gram
QA – quality assurance
^{226}Ra – radium-226
RPD – relative percent difference
TA – TestAmerica

A comparison of these 12 samples was made to identify how well the in-growth method could be performed using the on-site laboratory sample containers. All but three of the sample had RPDs within 30. Of the three sample results that did not have an RPD of less than or equal to 30,

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only one of the tuna can results had slightly higher ^{214}Bi activity. Results of the analysis are provided in Table 4-14.

TABLE 4-14

TestAmerica and On-Site Laboratory
QA Analysis of TA Bi-214 and Bi-214 Tuna Can Results

Sample ID		Original Off-site Laboratory (QA)				Reprocessed Off-site Laboratory (Tuna Can)			
	Count Time (min)	^{214}Bi			Count Time (min)	^{214}Bi			RPD
		Activity	MDA	2σ Error		Activity	MDL	2σ Error	
6PBFS-004-15	90	1.060	0.110	0.140	60	0.870	0.090	0.220	19.69
6PBFS-005-115	90	1.000	0.100	0.140	60	0.640	0.070	0.150	43.90
6PBFS-010-31	90	1.050	0.110	0.140	60	1.200	0.070	0.200	13.33
6PBFS-014-111	90	0.730	0.080	0.110	60	0.570	0.060	0.150	24.62
6PBFS-026-12	90	0.418	0.088	0.098	60	0.380	0.060	0.120	9.52
6PBFS-029-13	90	0.830	0.140	0.150	60	1.160	0.070	0.210	33.17
6PBFS-037-54	90	0.990	0.100	0.140	60	0.910	0.060	0.170	8.42
6PBFS-040-50	90	1.000	0.100	0.140	60	0.890	0.070	0.170	11.64
6PBFS-043-115	90	0.870	0.080	0.120	60	0.630	0.080	0.190	32.00
6PBFS-045-152	90	0.600	0.110	0.120	60	0.730	0.090	0.210	19.55
6PBFS-056-93	90	1.160	0.130	0.160	60	1.240	0.070	0.200	6.67
6PBFS-058-63	90	0.500	0.090	0.100	60	0.420	0.060	0.110	17.39

Notes:

The unit of measure is pCi/g.

Abbreviations and Acronyms:

^{214}Bi – bismuth-214
MDA – minimum detectable activity
MDL – method detection limit
min – minute
QA – quality assurance
^{226}Ra – radium-226
RPD – relative percent difference
TA – TestAmerica

The analytical comparison between counting geometries using the in-growth method has been completed. No significant high or low bias was noted when comparing TestAmerica's ^{226}Ra results using the tape-sealed plastic container versus the mechanically sealed tuna can. The RPDs were at approximately 30 percent or less with the exception of one sample with an RPD of 44, whose activity was well below the release criteria. The DON considers these results acceptable and concludes that the two counting geometries are comparable and either is valid to use for ^{226}Ra analysis using ^{214}Bi in-growth at the off-site QA laboratory.

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The on-site laboratory analysis of ^{226}Ra in soil using the 186 keV gamma is accurate but biased conservatively high. One source of the potential high bias is the inability to completely separate the ^{235}U 185.7 keV gamma ray from the ^{226}Ra 186.2 keV and over reporting the additional ^{235}U activity. The inability to separate the two gamma rays could also lead to a low bias if actual ^{226}Ra activity is attributed to the ^{235}U peak and subtracted out. The HPS on-site Laboratory Manager has made every effort to ensure that the potential low bias has been effectively eliminated by: 1) adding more channels per keV to better refine the ^{235}U and ^{226}Ra separation, 2) closely monitoring the spectra for any energy drift that could add bias, and 3) thoroughly characterizing each remediation location for the potential to contain ^{235}U activity.

Even though the potential for low bias has been minimized, the DON still chooses to make its remediation decisions based on either a Critical Level MDA calculation or the result itself, to ensure it errs to the conservative side. The decision to use the Critical Level calculation for the MDA also adds a high bias to the on-site ^{226}Ra activities. When the on-site ^{226}Ra 186 keV analysis is compared to ^{214}Bi in-growth analysis conducted by the off-site QA laboratory using either the plastic cup or the tuna can geometry, a slight high bias in activity exists for the 186 keV analysis. It should be noted that both the in-growth and the 186 keV analysis methodologies produce acceptable results when analyzing the known 30 pCi/g source. The high bias on-site when analyzing low activity samples is therefore, by design, due to conservatism and was anticipated.

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5.0 STATISTICAL TESTS

Once the sample data were determined to be below the release criteria, two statistical tests were performed on the sample data: comparative descriptives and Wilcoxon Rank-Sum (WRS) tests. Statistical tests that are based on the assumption that observations of the sample data follow a known distribution are known as parametric tests. When the distributional assumptions can be met, the observations are measured on a continuous scale.

Conversely, statistical tests that make few or no assumptions about the distribution of the observations are known as distribution-free or nonparametric tests. Nonparametric tests are useful when the requirements of the parametric test cannot be met. For example, if observations were only measured on a categorical scale, the sample size may be too small, or other distributional assumptions may not be valid. In many situations, nonparametric tests are the only option, since most nonparametric tests do not have a parametric equivalent.

Statistical tests of radioanalytical results, where greater than 40 percent of the results are less than the MDA, are not valid. Because the vast majority of sample radioanalytical results were below the MDA, and all final status survey results were below the respective radionuclide-specific release criteria, statistical tests were not included in the SUPRs. However, the following sections describe the methodology for determining the required number of sampling points necessary for statistical testing of a survey unit as exceeding a release criterion.

5.1 DECISION ERRORS

There are two types of decision errors that were used when performing the statistical tests outlined in this SUPR Abstract. The first type of decision error, called a Type I error, occurs when the null hypothesis is rejected when it is actually true. This type of error is sometimes called a "false positive." The probability of a Type I error is denoted by an α. The Type I error is often referred to as the significance level or size of the test.

The second type of decision error, called a Type II error, occurs when the null hypothesis is not rejected when it is actually false. This type of error is sometimes called a "false negative." The probability of a Type II error is denoted by a β. The power of a statistical test is defined as the probability of rejecting the null hypothesis when it is actually false. It is numerically equal to $1-\beta$, where β is the Type II error rate.

Each survey was designed to limit Type I and Type II errors to a maximum probability of 5 percent. It was important to minimize the chances of concluding that a survey unit met the release criteria (reject the null hypothesis) when it actually exceeded the limits (Type I error),

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and concluding that a survey unit exceeded the release criteria (accept the null hypothesis) when it actually met the limits (Type II error).

5.2 COMPARATIVE DESCRIPTIVES TEST

Descriptive statistics illustrate the observations of one or more samples. The test compared the central location and distribution of many samples side by side, optionally split by the categories of a factor. The test included multiple box-plots and summary statistics. Summary statistics were presented for numeric evaluation with charts for visual assessment.

Parametric and nonparametric summary statistics are presented for each variable to indicate the central tendency and the scatter/dispersion of the observations. Vertical box-plots are shown side-by-side for easy comparison of differences between the variables.

A categorical scale variable was measured so the effect or influence on other variables was assessed.

Comparative descriptives show vertical box-plots for each sample, side by side for comparison. The blue line series indicate parametric statistics with the diamond identifying the mean and the requested confidence interval around the mean, while the notched line indicate the requested parametric percentile range. The notched box and whiskers show nonparametric statistics with the notched box identifying the median, lower and upper quartiles, and the confidence interval around the median, while the dotted line connects the nearest observations within 1.5 interquartile ranges (IQR) of the lower and upper quartiles. The + and ○ symbols indicate possible outliers that were observations more than 1.5 IQR (near outliers) and more than 3.0 IQR (far outliers) from the quartiles, respectively.

5.3 WILCOXON RANK-SUM TEST

The WRS test is designed to test a hypothesis about the location of a population distribution. It is most often used to test the hypothesis about a population median and often involves the use of matched pairs. F or example, reference area and survey unit data were tested for a median difference of zero. This test is also a nonparametric test that may be used when it is only necessary, or possible, to know if observed differences between two conditions were significant. The WRS test is structured to denote change in magnitude, as opposed to any attempt at the quantitative measurement.

5.3.1 Determining the Numbers of Data Points for the WRS Test

Since the ROCs were present in background, N is calculated in the manner specified for the WRS test using Equation 5-1:

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Equation 5-1

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{3(P_r - 0.5)^2} \cdot (1.2)$$

Where:

$Z_{1-\alpha}$ = 1.645 Type I decision error level
$Z_{1-\beta}$ = 1.645 Type II decision error level
P_r = 0.997658 random measurement probability
[from Table 5.1 in MARSSIM (NUREG-1575; DoD et al. 2000)]
(1.2) = 20% increase in number of samples over the minimum

The variable used to calculate N not already specified in the Work Plan (TtEC 2008) was the random measurement probability P_r. P_r in Equation 5-1 above is based on the relative shift. The relative shift is equal to Δ/σ, where Δ was equal to the release criterion minus the lower boundary of the gray region (LBGR), and σ was an estimate of the standard deviation of the measured values in a survey unit. The LBGR was the net median concentration of the contaminant in the survey unit. When this value was unknown, half the value of the release criterion was used as the LBGR, as suggested in MARSSIM (NUREG-1575; DoD et al. 2000). Likewise, σ was assigned the value of the standard deviation of the measurement values in the reference area.

Using Equation 5-2 below, the value for Δ was derived by converting the release criterion from pCi/g to counts per minute (cpm). To perform this conversion, an arbitrary concentration of ^{226}Ra is divided by the associated exposure rate produced by this concentration of ^{226}Ra. The resulting number was then divided by the average net cpm per microentgen per hour (μR/h) for the detectors on the towed array. Once this number was derived, the release criterion of 1.0 pCi/g for ^{226}Ra was divided by this number.

Equation 5-2

$$RC\ in\ cpm = \frac{RC}{AC/ER * 1/CR}$$

Where:

RC = release criterion (pCi/g)
AC = arbitrary concentration of ^{226}Ra (pCi/g)
ER = exposure rate for 1 pCi/g ^{226}Ra calculated by Microshield®
CR = counts per minute per μR/h for the detector

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Where:

RC = 1.0
AC = 1
ER = 0.7384
CR = 900

The values used for these parameters to determine a P_r were 664 cpm for the release criterion. Taking half of this value, 332 cpm for Δ, and using 74.2 cpm for σ, N was calculated as nine samples when using Equation 5-1.

5.3.2 Determining Data Points for Small Areas of Elevated Activity

The statistical test described above evaluated whether or not the residual radioactivity in the survey unit exceeded the release criterion for contamination conditions that were approximately uniform across the survey unit. To obtain reasonable assurance that any small areas of elevated residual radioactivity were not missed during the survey, the total number of samples was increased. Equation 5-3 was used to determine the number of samples. The required number of samples n_{EA} was developed for an area of elevated activity based on a survey unit size of 1,000 square meters and a triangular grid with spacing, L, of 8 meters. Substituting these values into the following equation, n_{EA} was calculated to be 18.

Equation 5-3

$$L = \sqrt{\frac{A}{0.866\, n_{EA}}}$$

Where:

L = length of spacing (meters)
0.866 = factor presented in MARSSIM
A = surface area of the survey unit (1,000 square meters)
n_{EA} = number of samples

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6.0 DOSE MODELING

The intent of a SUPR is to achieve unrestricted release for the associated survey unit. In doing so, the most conservative approach was used to model the area using the most current version of RESRAD. The default residential farmer scenario was used with only two minor changes: the actual surface area of the trench unit was used (in square meters) and the net concentrations above background were used (survey unit mean isotopic concentration minus background mean isotopic concentration).

In addition, modeling was performed using the mean concentrations of ^{137}Cs, ^{226}Ra (with the lead-210 daughter), and ^{90}Sr using the actual activity and substituting in the MDA value if the reported activity was less than the MDA. The activity used to model each radionuclide was based on the isotopic net concentration (survey unit mean isotopic concentration minus background mean isotopic concentration). No background is subtracted from the ^{137}Cs or ^{90}Sr values, as these radionuclides are not naturally occurring or expected at drain piping depths from global fallout from nuclear weapons testing.

The default parameters included external and inhalation exposures and exposure from the following ingestion pathways: drinking water, food grown with contaminated irrigation water, food grown on contaminated soil, fish, and inadvertent ingestion of soil. Land-based foods considered were leafy vegetables, root vegetables, fruit, grain, beef, poultry, milk, and eggs. Animal feeds included fresh forage, as well as stored grain, and hay. This was the most conservative scenario as it assumed that persons living on the site can use the land for any purpose without land use restrictions.

If none of the concentrations for the ROCs for the specific survey unit were greater than zero, the net dose and increased health risk for the survey unit were expected to be negligible, and no further modeling was determined to be reasonable or prudent.

The final dose and health risk modeling summary, if needed, will be included in each SUPR. Demonstration of both a net residual dose of less than 15 millirems per year and a net increased health risk of less than 3×10^{-4} to the average member of the critical group (or member of the public) will be considered sufficient for unrestricted release of the survey unit.

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7.0 RECOMMENDATION OF FINAL UNRESTRICTED RELEASE

A SUPR will be prepared for each survey unit with recommendations for free release. Each SUPR will provide general background information about the trench unit and associated overburden unit(s) or ESU(s) that are part of the survey unit package. Any exceptions to the ROC will be addressed in each SUPR.

A discussion of the FSS will include the activities performed for the trench unit and each overburden unit, ESU, or import fill that was used for backfill. The discussion will include results of the soil samples. Gamma scan data will be provided as attachments in each SUPR.

The version of RESRAD used and the results of the dose and risk modeling will be provided as an attachment and discussed in each SUPR.

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8.0 REFERENCES

DoD (Department of Defense), Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). NUREG-1575. August.

DON (Department of the Navy). 2006. Final Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California.

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NRC (Nuclear Regulatory Commission). 1998. Nonparametric Statistical Methodology for the Design and Analysis of the Final Status Decommissioning Survey Guide (NUREG)-1505).

————. 1997. Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions Guide (NUREG-1507).

TtEC (Tetra Tech EC, Inc.). 2006. Final Base-wide Storm Drain and Sanitary Sewer Removal Work Plan, Hunters Point Shipyard, San Francisco, California.

————. 2010. Final Project Work Plan, Revision 4. Base-wide Storm Drain and Sanitary Sewer Removal, Hunters Point Shipyard, San Francisco, California. June 30.

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ATTACHMENT 1

IMPORT FILL MATERIAL
SAMPLE RESULTS

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ORTEC g v - i (3263) wan32 G53W2.03 27-JUL-2006 22:12:46 Page 1
New World Technology Spectrum name: 3N003301.An1

Sample description
Parcel B 6PBIF001-001 403g
7/27/06 13:00

Acquisition information
Start time: 27-Jul-2006 21:25:16
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity picoCi/g	Uncertainty 2 Sigma Counting picoCi/g	Total picoCi/g	MDA picoCi/g
Ac-228 #B	-6.8078E-02	-4.6390E-02	-4.6459E-02	0.202E+00
AM-241 #A	4.1666E-02	1.0775E-01	1.0776E-01	0.809E-01
Bi-212 F	4.6195E-01	3.0090E-01	3.0139E-01	0.187E+00
BI-214 F	3.2513E-01	1.6096E-01	1.6141E-01	0.105E+00
CO-60 #B	-7.1417E-03	-2.2420E-02	-2.2421E-02	0.245E-01
Cs-137 A	1.7828E-02	3.8166E-02	3.8172E-02	0.360E-01
EU-152 C	2.5108E-01	1.5638E-01	1.5666E-01	0.577E-01
EU-154 B	4.8473E-02	6.4945E-02	6.4970E-02	0.525E-01
K-40	8.5450E+00	1.4896E+00	1.5229E+00	0.102E+01
PA-234 #B	-7.8198E-02	4.5513E+02	4.5513E+02	0.127E+00
Pb-210 A	4.2247E-01	1.2874E+00	1.2875E+00	0.977E+00
PB-212	4.6587E-01	1.0497E-01	1.0638E-01	0.690E-01
PB-214	2.7873E-01	1.3471E-01	1.3511E-01	0.101E+00
RA-226 A	9.3770E-02	8.4801E-01	8.4802E-01	0.758E+00
Th-230 #B	-2.0672E+00	-1.4703E+01	-1.4704E+01	0.785E+01
TH-234 A	5.0775E-01	6.2926E-01	6.2954E-01	0.764E+00
Tl-208 B	8.6630E-02	4.2087E-02	4.2210E-02	0.113E+00
U-235 #B	-1.3852E-02	-9.9436E-02	-9.9437E-02	0.484E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.8 keV) 1.0076658E+01 picoCi/g

Laboratory: New World Technology

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ORTEC g v - i (3263) wan32 G53W2.06 27-JUL-2006 22:40:35 Page 1
New World Technology Spectrum name: 5N000389.An1

Sample description
Parcel B 6PBIF001-002 408g
7/27/06 13:10

Acquisition information
Start time: 27-Jul-2006 21:55:26
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.8030E-01	1.9816E-01	1.9827E-01	0.178E+00
AM-241	#B	-7.6393E-02	-3.4829E-01	-3.4830E-01	0.972E-01
Bi-212	#F	7.4694E-01	3.8574E-01	3.8674E-01	0.178E+00
BI-214	F	3.1694E-01	1.2507E-01	1.2562E-01	0.969E-01
CO-60	#F	6.7710E-02	3.6213E-02	3.6300E-02	0.159E-01
CS-137	#B	-3.2019E-02	-2.2011E-01	-2.2012E-01	0.418E-01
EU-152	#B	8.1405E-02	7.8862E-02	7.8920E-02	0.869E-01
EU-154	F	1.2739E-01	7.8348E-02	7.8489E-02	0.495E-01
K-40		9.0457E+00	1.5648E+00	1.6002E+00	0.997E+00
Pa-234	B	1.1695E-02	1.2635E-01	1.2635E-01	0.104E+00
Pb-210	#	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	2.9426E-01	1.0439E-01	1.0496E-01	0.833E-01
PB-214	F	5.7138E-01	1.6016E-01	1.6155E-01	0.801E-01
RA-226	#B	-2.7840E-01	-1.5801E+00	-1.5801E+00	0.936E+00
Th-230	#B	-1.0872E+01	-3.9742E+01	-3.9744E+01	0.871E+01
Th-234	F	1.2621E+00	7.0114E-01	7.0269E-01	0.911E+00
Tl-208		1.6707E-01	7.0097E-02	7.0369E-02	0.937E-01
U-235	#B	-7.7247E-01	-1.6976E+00	-1.6979E+00	0.101E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (53.5 to 3408.3 keV) 1.1210009E+01 pCi/g

Laboratory: New World Technology

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ORTEC g v - i (3263) wan32 G53W2.03 27-JUL-2006 23:01:38 Page 1
New World Technology Spectrum name: 3N003302.An1

Sample description
Parcel B 6PBIF001-003 376g
7/27/06 13:20

Acquisition information
Start time: 27-Jul-2006 22:16:33
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	F	3.2329E-01	2.1883E-01	2.1916E-01	0.183E+00
AM-241	#B	-3.0891E-02	-2.6131E-01	-2.6131E-01	0.683E-01
Bi-212	B	1.5535E-01	3.2245E-01	3.2250E-01	0.251E+00
BI-214	F	2.5105E-01	1.3101E-01	1.3134E-01	0.102E+00
CO-60	#A	1.0177E-02	2.7963E-02	2.7966E-02	0.327E-01
Cs-137	#B	-2.0701E-02	-9.9049E-02	-9.9052E-02	0.479E-01
EU-152	F	1.0210E-01	1.2910E-01	1.2916E-01	0.812E-01
EU-154	#B	-2.7170E-02	-6.7432E+00	-6.7432E+00	0.478E-01
K-40		9.0226E+00	1.5888E+00	1.6237E+00	0.110E+01
PA-234	#B	-2.1441E-02	-2.0542E-01	-2.0542E-01	0.105E+00
Pb-210	#A	9.0562E-01	1.3178E+00	1.3182E+00	0.997E+00
PB-212		3.9531E-01	1.0708E-01	1.0807E-01	0.749E-01
PB-214		3.3500E-01	1.7747E-01	1.7790E-01	0.119E+00
RA-226	#B	-3.1380E-01	-1.4668E+00	-1.4669E+00	0.816E+00
Th-230	B	3.8499E+00	3.2475E+00	3.2507E+00	0.788E+01
TH-234		8.3972E-01	9.4216E-01	9.4267E-01	0.794E+00
Tl-208	B	-4.2043E-02	-4.3580E-02	-4.3608E-02	0.111E+00
U-235	B	-1.0971E-02	-6.6520E-02	-6.6521E-02	0.432E-01

- All peaks for activity calculation had bad shape.
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& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.8 keV) 1.1166934E+01 picoCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 27-JUL-2006 23:28:49 Page 1
New World Technology Spectrum name: 5N000390.An1

Sample description
Parcel B 6PBIF001-004 465g
7/27/06 13:30

Acquisition information
Start time: 27-Jul-2006 22:43:39
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #F	1.4083E-01	1.5962E-01	1.5971E-01	0.135E+00
AM-241 #B	-2.4980E-02	-2.2663E-01	-2.2663E-01	0.106E+00
Bi-212 F	6.0429E-01	2.9775E-01	2.9859E-01	0.177E+00
BI-214 F	4.3774E-01	1.3692E-01	1.3788E-01	0.820E-01
CO-60 #B	-9.8409E-03	3.6874E+01	3.6874E+01	0.140E-01
CS-137 #B	-2.4586E-02	-1.4517E-01	-1.4518E-01	0.365E-01
EU-152 F	1.2600E-01	5.6351E-02	5.6543E-02	0.688E-01
EU-154 F	8.7192E-02	6.6075E-02	6.6154E-02	0.472E-01
K-40	8.9054E+00	1.3668E+00	1.4061E+00	0.853E+00
Pa-234 B	5.9457E-02	7.8104E-02	7.8135E-02	0.798E-01
Pb-210 #	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	3.2508E-01	9.2067E-02	9.2851E-02	0.707E-01
PB-214	4.4116E-01	1.3219E-01	1.3319E-01	0.734E-01
RA-226 B	2.8354E-01	9.4897E-01	9.4903E-01	0.821E+00
Th-230 #B	-1.3085E+01	-9.4006E+01	-9.4007E+01	0.690E+01
Th-234 F	1.5099E+00	7.6114E-01	7.6318E-01	0.767E+00
Tl-208	2.1429E-01	5.9774E-02	6.0299E-02	0.822E-01
U-235 #B	-6.9215E-01	-2.1669E+00	-2.1671E+00	0.897E-01

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (53.5 to 3408.3 keV) 1.2437845E+01 pCi/g

Laboratory: New World Technology

ED_000855_00003297-00652

ORTEC g v - i (3263) wan32 G53W2.03 27-JUL-2006 23:52:18 Page 1
New World Technology Spectrum name: 3N003303.An1

Sample description
Parcel B 6PBIF001-005 426g
7/27/06 13:40

Acquisition information
Start time: 27-Jul-2006 23:07:14
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	#B	6.6616E-03	4.9700E-03	4.9761E-03	0.191E+00
AM-241	#B	-2.3214E-02	-2.2902E-01	-2.2902E-01	0.699E-01
Bi-212	F	8.5002E-01	4.4944E-01	4.5055E-01	0.227E+00
BI-214	F	3.3161E-01	1.4604E-01	1.4656E-01	0.968E-01
CO-60	#B	-2.1580E-02	6.6864E+01	6.6864E+01	0.236E-01
Cs-137	A	3.3091E-02	3.9558E-02	3.9577E-02	0.349E-01
EU-152	B	7.0280E-02	9.2616E-02	9.2652E-02	0.716E-01
EU-154	#B	1.0847E-02	2.8850E-02	2.8853E-02	0.525E-01
K-40	#	7.9636E+00	1.4023E+00	1.4331E+00	0.969E+00
PA-234	#B	-6.9675E-02	-2.0111E+00	-2.0111E+00	0.703E-01
Pb-210	A	4.2821E-01	1.2192E+00	1.2193E+00	0.924E+00
PB-212	F	3.5761E-01	9.2803E-02	9.3745E-02	0.640E-01
PB-214		2.9047E-01	1.3174E-01	1.3218E-01	0.899E-01
RA-226		8.1575E-01	9.2570E-01	9.2619E-01	0.777E+00
Th-230	B	-9.5274E+00	-2.2097E+02	-2.2097E+02	0.464E+01
TH-234	B	1.5377E-01	3.9222E-01	3.9226E-01	0.693E+00
Tl-208	#B	2.2495E-03	1.4037E-03	1.4062E-03	0.103E+00
U-235	B	1.4113E-03	6.0006E-02	6.0006E-02	0.514E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.7 to 2660.8 keV) 1.0609038E+01 picoCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 28-JUL-2006 00:17:33 Page 1
New World Technology Spectrum name: 5N000391.An1

Sample description
Parcel B 6PBIF001-006 454g
7/27/06 13:50

Acquisition information
Start time: 27-Jul-2006 23:32:23
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	3.9500E-01	2.2549E-01	2.2596E-01	0.152E+00
AM-241 #B	-1.2094E-01	-3.3790E+00	-3.3790E+00	0.106E+00
Bi-212 F	7.9686E-01	4.6405E-01	4.6499E-01	0.259E+00
BI-214 F	3.7508E-01	1.4589E-01	1.4655E-01	0.897E-01
CO-60 #B	-2.6132E-03	-1.7950E-02	-1.7950E-02	0.143E-01
CS-137 #B	-4.2154E-02	1.0050E+02	1.0050E+02	0.354E-01
EU-152 B	4.3628E-02	6.0098E-02	6.0119E-02	0.747E-01
EU-154 B	5.4184E-02	1.1593E-01	1.1595E-01	0.550E-01
K-40	8.8646E+00	1.4414E+00	1.4784E+00	0.895E+00
Pa-234 #B	-1.8081E-02	2.1176E+02	2.1176E+02	0.914E-01
Pb-210 #	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212 F	2.9892E-01	9.5960E-02	9.6597E-02	0.734E-01
PB-214	4.0193E-01	1.1413E-01	1.1510E-01	0.672E-01
RA-226 #B	-9.4821E-01	-6.8316E+00	-6.8317E+00	0.848E+00
Th-230 #B	-1.5241E+01	2.1195E+04	2.1195E+04	0.802E+01
Th-234 F	9.4055E-01	5.6201E-01	5.6309E-01	0.847E+00
Tl-208 B	1.1917E-01	3.1815E-02	3.2119E-02	0.130E+00
U-235 #B	-6.9195E-01	-1.4934E+00	-1.4936E+00	0.910E-01

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (53.5 to 3408.3 keV) 1.1132341E+01 pCi/g

Laboratory: New World Technology

ED_000855_00003297-00654

ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 00:42:02 Page 1
New World Technology Spectrum name: 3N003304.An1

Sample description
Parcel B 6PBIF001-007 413g
7/27/06 14:00

Acquisition information
Start time: 27-Jul-2006 23:56:29
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	F	3.2041E-01	2.2898E-01	2.2929E-01	0.167E+00
AM-241	#B	-4.9522E-02	1.9578E+02	1.9578E+02	0.741E-01
Bi-212	F	5.8220E-01	3.5488E-01	3.5554E-01	0.229E+00
BI-214	#F	3.3352E-01	1.9187E-01	1.9227E-01	0.114E+00
CO-60	#B	-2.0611E-02	-9.3138E-02	-9.3142E-02	0.235E-01
Cs-137	#B	-4.2642E-03	-4.5309E-02	-4.5310E-02	0.386E-01
EU-152	F	2.5033E-01	1.9160E-01	1.9182E-01	0.732E-01
EU-154	B	3.7325E-02	4.4091E-02	4.4112E-02	0.477E-01
K-40		6.4558E+00	1.4535E+00	1.4731E+00	0.104E+01
PA-234	#B	2.4291E-02	1.3074E-01	1.3074E-01	0.118E+00
Pb-210	A	7.0538E-02	9.0815E-01	9.0815E-01	0.846E+00
PB-212		4.7626E-01	1.0714E-01	1.0859E-01	0.700E-01
PB-214		4.0290E-01	1.5332E-01	1.5404E-01	0.937E-01
RA-226	#B	-2.0133E-01	-1.2895E+00	-1.2895E+00	0.814E+00
Th-230	#B	1.1595E-01	1.1366E-01	1.1374E-01	0.858E+01
TH-234	B	3.5168E-01	4.9260E-01	4.9277E-01	0.733E+00
Tl-208	F	1.1421E-01	5.7911E-02	5.8065E-02	0.104E+00
U-235	#B	-6.9865E-03	-1.9109E-02	-1.9111E-02	0.436E-01

- All peaks for activity calculation had bad shape.
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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.7 to 2660.8 keV) 8.8214426E+00 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00655

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     ORTEC g v - i (3263) wan32  G53W2.06  28-JUL-2006 01:06:41 Page    1
 New World Technology            Spectrum name: 5N000392.An1

 Sample description
      Parcel B 6PBIF001-008 398g
      7/27/06 14:10

 Acquisition information
        Start time:                 28-Jul-2006 00:21:32
        Live time:               2700
        Real time:               2703

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total         MDA
                pCi/g         pCi/g         pCi/g         pCi/g

 ____________________________________________________________________________
 Ac-228 #     4.0464E-01   2.3813E-01    2.3861E-01  0.164E+00
 AM-241 #B   -2.8073E-02  -1.7750E-01   -1.7750E-01  0.106E+00
 Bi-212  F    5.9890E-01   4.7861E-01    4.7912E-01  0.267E+00
 BI-214  F    3.7639E-01   1.6734E-01    1.6792E-01  0.101E+00
 CO-60  #F    3.5344E-02   2.8247E-02    2.8277E-02  0.163E-01
 CS-137 #B   -3.9413E-02  -4.1589E-01   -4.1589E-01  0.426E-01
 EU-152  B   -2.7838E-02   1.8325E+02    1.8325E+02  0.693E-01
 EU-154  F    9.7722E-02   1.0456E-01    1.0462E-01  0.507E-01
 K-40         1.1139E+01   1.7101E+00    1.7592E+00  0.102E+01
 Pa-234  B    4.7658E-02   9.4391E-02    9.4407E-02  0.107E+00
 Pb-210 #     0.0000E+00   0.0000E+00    0.0000E+00  0.000E+00
 Pb-212       3.4185E-01   1.1005E-01    1.1078E-01  0.863E-01
 PB-214       4.8163E-01   1.2639E-01    1.2765E-01  0.794E-01
 RA-226 #B   -2.2388E-01  -1.4629E+00   -1.4629E+00  0.947E+00
 Th-230 #B   -7.8186E+00  -3.3259E+01   -3.3260E+01  0.112E+02
 Th-234  F    1.6285E+00   6.5312E-01    6.5589E-01  0.984E+00
 Tl-208  B   -8.3515E-02  -2.4449E-02   -2.4644E-02  0.170E+00
 U-235  #B   -8.1958E-01  -3.3078E+00   -3.3079E+00  0.104E+00

   # - All peaks for activity calculation had bad shape.
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   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   53.5 to  3408.3 keV) 1.3377280E+01  pCi/g

Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 01:36:02 Page 1
New World Technology Spectrum name: 3N003305.An1

Sample description
Parcel B 6PBIF001-009 354g
7/27/06 14:20

Acquisition information
Start time: 28-Jul-2006 00:46:03
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		5.1146E-01	3.3655E-01	3.3708E-01	0.211E+00
AM-241	A	6.9617E-02	1.2236E-01	1.2239E-01	0.100E+00
Bi-212		6.7759E-01	4.7392E-01	4.7458E-01	0.294E+00
BI-214	F	2.3907E-01	1.3173E-01	1.3203E-01	0.114E+00
CO-60	#B	2.2122E-02	3.0416E-02	3.0427E-02	0.260E-01
Cs-137	A	8.9249E-03	4.5949E-02	4.5950E-02	0.440E-01
EU-152	F	1.6794E-01	1.4083E-01	1.4097E-01	0.808E-01
EU-154	#B	-2.6231E-02	-1.1086E+00	-1.1086E+00	0.544E-01
K-40		8.8224E+00	1.7203E+00	1.7512E+00	0.119E+01
PA-234	#B	-2.2765E-02	-2.8655E-01	-2.8655E-01	0.145E+00
Pb-210	#B	-3.4354E-02	-1.5910E+00	-1.5910E+00	0.117E+01
PB-212		3.6398E-01	1.0609E-01	1.0695E-01	0.752E-01
PB-214		4.4005E-01	1.9257E-01	1.9326E-01	0.106E+00
RA-226	A	6.8310E-01	1.0837E+00	1.0840E+00	0.926E+00
Th-230	B	-9.7152E+00	-6.9824E+01	-6.9825E+01	0.630E+01
TH-234	#B	4.4553E-01	9.4486E-01	9.4500E-01	0.752E+00
Tl-208	#B	2.8951E-02	1.6777E-02	1.6811E-02	0.111E+00
U-235	#B	-2.7715E-02	-1.8120E-01	-1.8120E-01	0.636E-01

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.8 keV) 1.1222479E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00657

ORTEC g v - i (3263) wan32 G53W2.06 28-JUL-2006 01:57:33 Page 1
New World Technology Spectrum name: 5N000393.An1

Sample description
Parcel B 6PBIF001-010 360g
7/27/06 14:30

Acquisition information
Start time: 28-Jul-2006 01:12:23
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	B	1.9113E-01	2.4814E-01	2.4824E-01	0.200E+00
AM-241	#B	-7.8215E-02	-4.1755E-01	-4.1756E-01	0.118E+00
Bi-212	F	5.6558E-01	4.3161E-01	4.3212E-01	0.303E+00
BI-214	F	3.1197E-01	1.5192E-01	1.5236E-01	0.105E+00
CO-60	#B	1.0828E-02	3.3289E-02	3.3292E-02	0.262E-01
CS-137	#B	-2.6697E-02	-1.2779E-01	-1.2780E-01	0.434E-01
EU-152	F	2.8683E-01	1.7578E-01	1.7610E-01	0.913E-01
EU-154	F	1.5768E-01	1.6388E-01	1.6398E-01	0.613E-01
K-40		1.1078E+01	1.9380E+00	1.9810E+00	0.118E+01
Pa-234	#B	-2.2802E-02	2.5019E+02	2.5019E+02	0.108E+00
Pb-210	#	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	3.2653E-01	1.1837E-01	1.1899E-01	0.947E-01
PB-214		5.2691E-01	1.6961E-01	1.7073E-01	0.945E-01
RA-226	#B	-1.0844E+00	-6.7799E+00	-6.7800E+00	0.112E+01
Th-230	#B	-1.2292E+01	-5.5441E+01	-5.5443E+01	0.110E+02
Th-234	B	6.6332E-01	8.2737E-01	8.2773E-01	0.102E+01
Tl-208	F	2.5216E-01	7.5659E-02	7.6234E-02	0.106E+00
U-235	#B	-8.6173E-01	-1.5480E+00	-1.5484E+00	0.113E+00

- All peaks for activity calculation had bad shape.
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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (53.5 to 3408.3 keV) 1.3060900E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 02:26:15 Page 1
New World Technology Spectrum name: 3N003306.An1

Sample description
Parcel B 6PBIF001-011 364g
7/27/06 14:40

Acquisition information
Start time: 28-Jul-2006 01:40:44
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228 #F	3.2886E-01	2.1962E-01	2.1996E-01	0.176E+00
AM-241 #B	-1.2655E-02	-1.4695E-01	-1.4695E-01	0.807E-01
Bi-212 #F	9.6929E-01	5.4169E-01	5.4288E-01	0.245E+00
BI-214 F	3.5085E-01	1.6263E-01	1.6315E-01	0.124E+00
CO-60 #B	-6.5479E-03	-3.1804E-02	-3.1805E-02	0.253E-01
Cs-137 #B	-3.8594E-02	-1.5580E-01	-1.5581E-01	0.425E-01
EU-152 F	3.4904E-01	1.8385E-01	1.8430E-01	0.723E-01
EU-154 #B	-2.8514E-02	1.3377E+02	1.3377E+02	0.488E-01
K-40	9.7884E+00	1.6677E+00	1.7067E+00	0.113E+01
PA-234 #B	-9.9664E-02	-6.2413E-01	-6.2414E-01	0.640E-01
Pb-210 #B	-7.0857E-01	-2.0267E+00	-2.0268E+00	0.103E+01
PB-212 F	4.7194E-01	1.0806E-01	1.0947E-01	0.713E-01
PB-214	3.1433E-01	1.6342E-01	1.6383E-01	0.107E+00
RA-226 A	6.3393E-01	1.0194E+00	1.0197E+00	0.874E+00
Th-230 #B	-2.9343E+00	-2.0457E+01	-2.0457E+01	0.952E+01
TH-234 C	1.0639E+00	1.0113E+00	1.0121E+00	0.854E+00
Tl-208 #B	6.7560E-02	3.2206E-02	3.2303E-02	0.129E+00
U-235 B	-7.8216E-03	-2.8217E-02	-2.8219E-02	0.522E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.8 keV) 1.2572660E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00659

ORTEC g v - i (3263) wan32 G53W2.06 28-JUL-2006 03:30:35 Page 1
New World Technology Spectrum name: 5N000394.An1

Sample description
Parcel B 6PBIF001-012 375g
7/27/06 14:50

Acquisition information
Start time: 28-Jul-2006 02:00:21
Live time: 5400
Real time: 5406

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	2.2033E-01	1.4655E-01	1.4678E-01	0.131E+00
AM-241 #B	-1.0904E-01	-4.6209E-01	-4.6211E-01	0.761E-01
Bi-212 F	5.6924E-01	2.7359E-01	2.7440E-01	0.181E+00
BI-214 F	3.2725E-01	1.4252E-01	1.4303E-01	0.821E-01
CO-60 B	1.1349E-02	9.7482E-03	9.7572E-03	0.126E-01
CS-137 #B	-4.5399E-02	-4.4093E-01	-4.4093E-01	0.289E-01
EU-152 F	2.0598E-01	1.3231E-01	1.3253E-01	0.619E-01
EU-154 F	1.2072E-01	8.2167E-02	8.2288E-02	0.365E-01
K-40	1.1356E+01	1.2323E+00	1.3021E+00	0.757E+00
Pa-234 B	6.8154E-02	7.1031E-02	7.1076E-02	0.755E-01
Pb-210 #	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212 F	3.5626E-01	7.9255E-02	8.0347E-02	0.621E-01
PB-214	4.9612E-01	1.3318E-01	1.3444E-01	0.683E-01
RA-226 #B	-4.2570E-01	-1.4983E+00	-1.4983E+00	0.746E+00
Th-230 #B	-6.8750E+00	-2.4616E+01	-2.4618E+01	0.876E+01
Th-234 F	1.4859E+00	6.0909E-01	6.1157E-01	0.711E+00
Tl-208	3.5530E-01	1.0662E-01	1.0743E-01	0.721E-01
U-235 #B	-8.0662E-01	-7.9342E-01	-7.9398E-01	0.759E-01

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (53.5 to 3408.3 keV) 1.5166050E+01 pCi/g

Laboratory: New World Technology

ED_000855_00003297-00660

ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 06:24:38 Page 1
New World Technology Spectrum name: 3N003307.An1

Sample description
Parcel B 6PBIF001-013 418g
7/27/06 15:00

Acquisition information
Start time: 28-Jul-2006 02:29:53
Live time: 5400
Real time: 5404

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		3.3694E-01	1.7020E-01	1.7066E-01	0.125E+00
AM-241	#B	-3.5338E-02	-4.9509E-01	-4.9509E-01	0.618E-01
Bi-212	F	7.0794E-01	2.5194E-01	2.5330E-01	0.151E+00
BI-214	F	2.8362E-01	1.2178E-01	1.2224E-01	0.798E-01
CO-60	#B	-2.0975E-02	-2.1825E-01	-2.1825E-01	0.179E-01
Cs-137	A	6.0236E-03	3.5144E-02	3.5145E-02	0.320E-01
EU-152	F	7.0174E-02	8.3171E-02	8.3211E-02	0.437E-01
EU-154	B	2.1363E-03	5.4890E-03	5.4896E-03	0.319E-01
K-40		6.9537E+00	9.6253E-01	9.9646E-01	0.698E+00
PA-234	#B	-2.2262E-02	-1.6108E-01	-1.6108E-01	0.761E-01
Pb-210		7.3607E-01	8.4006E-01	8.4050E-01	0.651E+00
PB-212	F	4.1224E-01	7.1047E-02	7.2672E-02	0.484E-01
PB-214	F	3.4698E-01	9.2432E-02	9.3322E-02	0.733E-01
RA-226	A	5.3278E-01	6.5579E-01	6.5609E-01	0.561E+00
Th-230	#B	-7.9173E+00	-3.7993E+01	-3.7994E+01	0.517E+01
TH-234	C	5.3779E-01	5.5183E-01	5.5219E-01	0.524E+00
Tl-208	B	3.3234E-02	1.4529E-02	1.4581E-02	0.780E-01
U-235	#B	-3.3976E-02	-2.7389E-01	-2.7389E-01	0.372E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.7 to 2660.8 keV) 9.7774429E+00 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00661

ORTEC g v - i (3263) wan32 G53W2.06 28-JUL-2006 11:31:09 Page 1
New World Technology Spectrum name: 1N002860.An1

Sample description
Parcel B 6PBIF001-014 368g
7/27/06 15:10

Acquisition information
Start time: 28-Jul-2006 10:45:59
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/ g	Time of Count Uncertainty Counting picoCi/ g	2 Sigma Total picoCi/ g	MDA picoCi/ g
Ac-228	C	2.7246E-01	1.4919E-01	1.4953E-01	0.205E+00
AM-241	#A	-1.4846E-01	-1.1195E+00	-1.1196E+00	0.205E+00
Bi-212		5.4240E-01	3.5866E-01	3.5922E-01	0.202E+00
BI-214	F	5.2257E-01	1.7237E-01	1.7346E-01	0.239E+00
CO-60	#A	-4.1406E-02	-3.9729E-01	-3.9730E-01	0.538E-01
CS-137	#A	-2.8021E-02	1.9206E+02	1.9206E+02	0.504E-01
EU-152	A	5.0914E-02	7.6426E-02	7.6449E-02	0.879E-01
EU-154	C	5.4674E-02	6.3957E-02	6.3989E-02	0.514E-01
K-40		9.3979E+00	1.9578E+00	1.9886E+00	0.998E+00
Pa-234	#B	-3.2801E-01	-1.4203E+00	-1.4204E+00	0.117E+00
Pb-210	#	1.2842E+01	1.3853E+01	1.3861E+01	0.839E+01
Pb-212	#B	-3.9853E-02	3.2944E+02	3.2944E+02	0.958E-01
Pb-214	#	4.5446E-01	1.2446E-01	1.2559E-01	0.455E-01
RA-226	#B	-1.2974E+00	-5.0145E+00	-5.0147E+00	0.109E+01
Th-230	#B	3.6404E+00	1.4291E+01	1.4291E+01	0.118E+02
Th-234	B	-3.4013E-01	-8.4719E-01	-8.4728E-01	0.151E+01
Tl-208		2.4767E-01	9.1953E-02	9.2411E-02	0.345E-01
U-235	A	6.1088E-03	3.1005E-02	3.1006E-02	0.512E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2605.8 keV) 2.4007235E+01 picoCi/ g

Laboratory: New World Technology

ED_000855_00003297-00662

ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 11:40:10 Page 1
New World Technology Spectrum name: 2N003354.An1

Sample description
Parcel B 6PBIF001-015 370g
7/27/06 15:20

Acquisition information
Start time: 28-Jul-2006 10:55:03
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity picoCi/g	Uncertainty 2 Sigma Counting picoCi/g	Total picoCi/g	MDA picoCi/g
Ac-228	C	4.1887E-01	1.7820E-01	1.7888E-01	0.169E+00
AM-241	#A	6.8046E-02	8.5661E-01	8.5661E-01	0.666E+00
Bi-212	F	5.1152E-01	3.6043E-01	3.6093E-01	0.239E+00
BI-214	F	3.8355E-01	1.2647E-01	1.2727E-01	0.798E-01
CO-60	#B	1.5204E-02	1.3349E-02	1.3361E-02	0.284E-01
Cs-137	#B	-5.3403E-03	-5.4502E-02	-5.4502E-02	0.489E-01
EU-152	F	1.4461E-01	1.2899E-01	1.2910E-01	0.957E-01
EU-154	B	5.7095E-02	1.0584E-01	1.0586E-01	0.840E-01
K-40	#	1.1320E+01	1.5895E+00	1.6441E+00	0.604E+00
PA-234	F	2.1312E-01	1.1385E-01	1.1412E-01	0.161E+00
Pb-210	#C	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212	F	4.8009E-01	1.2433E-01	1.2560E-01	0.858E-01
PB-214		4.2776E-01	1.8888E-01	1.8955E-01	0.989E-01
RA-226	A	6.8068E-01	1.2141E+00	1.2144E+00	0.105E+01
Th-230	B	-3.1250E+01	-8.3934E+01	-8.3942E+01	0.297E+02
TH-234	#B	0.0000E+00	8.8041E+03	8.8041E+03	0.262E+01
Tl-208	F	1.8600E-01	7.7569E-02	7.7876E-02	0.188E-01
U-235	B	-3.2662E-02	-3.1477E-01	-3.1477E-01	0.620E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.8 to 2673.8 keV) 1.3308646E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00663

```
     ORTEC g v - i (3263) wan32  G53W2.03  28-JUL-2006 12:52:13 Page    1
 New World Technology            Spectrum name: 3N003312.An1

 Sample description
      Parcel B 6PBIF001-016 357g
      7/27/06  15:30

 Acquisition information
        Start time:                 28-Jul-2006 11:06:36
        Live time:               2700
        Real time:               2702

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total         MDA
               picoCi/g      picoCi/g      picoCi/g      picoCi/g

 ____________________________________________________________________________
 Ac-228       4.3043E-01   2.7319E-01    2.7366E-01  0.195E+00
 AM-241 #B   -3.2535E-02  -3.2280E-01   -3.2280E-01  0.825E-01
 Bi-212  F    5.5238E-01   3.9939E-01    3.9991E-01  0.269E+00
 BI-214  F    2.9754E-01   1.9517E-01    1.9548E-01  0.122E+00
 CO-60  #B   -6.6763E-03  -3.2428E-02   -3.2429E-02  0.258E-01
 Cs-137 #B   -3.5492E-02  -1.6049E-01   -1.6049E-01  0.480E-01
 EU-152 #B   -4.6544E-03   1.7998E+02    1.7998E+02  0.634E-01
 EU-154  B    2.1519E-02   6.6176E-02    6.6181E-02  0.462E-01
 K-40         9.4550E+00   1.6707E+00    1.7070E+00  0.116E+01
 PA-234 #B   -5.2653E-02  -4.5775E-01   -4.5775E-01  0.105E+00
 Pb-210 #B   -6.6086E-01  -2.2279E+00   -2.2280E+00  0.106E+01
 PB-212  F    3.6470E-01   1.1150E-01    1.1231E-01  0.804E-01
 PB-214       3.5855E-01   1.8446E-01    1.8494E-01  0.114E+00
 RA-226  A    3.9935E-02   1.0018E+00    1.0018E+00  0.893E+00
 Th-230 #B    2.6594E-01   5.2229E-01    5.2238E-01  0.906E+01
 TH-234 #C    7.7899E-01   8.5799E-01    8.5847E-01  0.711E+00
 Tl-208 #B    2.3564E-02   1.3255E-02    1.3283E-02  0.119E+00
 U-235  #B   -3.0973E-02  -2.5697E-01   -2.5697E-01  0.616E-01

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   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ---------------------------
 Total Activity (   41.7 to  2660.8 keV) 1.1458595E+01  picoCi/g

Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.06 28-JUL-2006 12:19:42 Page 1
New World Technology Spectrum name: 1N002861.An1

Sample description
Parcel B 6PBIF001-017 347g
7/27/06 15:40

Acquisition information
Start time: 28-Jul-2006 11:34:28
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity picoCi/ g	Uncertainty Counting picoCi/ g	2 Sigma Total picoCi/ g	MDA picoCi/ g
Ac-228 F	4.5611E-01	1.7428E-01	1.7509E-01	0.188E+00
AM-241 #A	-7.0727E-02	-5.5219E-01	-5.5220E-01	0.262E+00
Bi-212 C	2.7039E-01	3.0440E-01	3.0457E-01	0.218E+00
BI-214 #F	9.7864E-01	6.5243E-01	6.5344E-01	0.253E+00
CO-60 #A	-4.2190E-02	-1.9830E-01	-1.9831E-01	0.487E-01
CS-137 #A	-2.9716E-02	1.3348E+02	1.3348E+02	0.470E-01
EU-152 C	1.3767E-01	1.2751E-01	1.2761E-01	0.783E-01
EU-154 C	5.9582E-02	8.1695E-02	8.1724E-02	0.513E-01
K-40	7.5187E+00	1.8587E+00	1.8795E+00	0.106E+01
Pa-234 #B	-6.7438E-02	-5.4498E-02	-5.4555E-02	0.136E+00
Pb-210 #A	4.6038E+00	7.8249E+00	7.8267E+00	0.611E+01
Pb-212 F	3.7801E-01	1.1465E-01	1.1550E-01	0.691E-01
Pb-214	5.0662E-01	1.6372E-01	1.6479E-01	0.663E-01
RA-226 #B	-8.9446E-01	-2.5719E+00	-2.5721E+00	0.106E+01
Th-230 B	-5.3345E+00	-7.1337E+01	-7.1337E+01	0.860E+01
Th-234 A	1.0042E+00	8.7400E-01	8.7479E-01	0.172E+01
Tl-208 #	2.0472E-01	7.0804E-02	7.1210E-02	0.241E-01
U-235 A	4.9654E-02	5.7133E-02	5.7163E-02	0.529E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.2 to 2605.8 keV) 9.5866594E+00 picoCi/ g

Laboratory: New World Technology

ED_000855_00003297-00665

ORTEC g v - i (3263) wan32 G53W2.03 28-JUL-2006 12:39:52 Page 1
New World Technology Spectrum name: 2N003355.An1

Sample description
Parcel B 6PBIF001-018 382g
7/27/06 15:50

Acquisition information
Start time: 28-Jul-2006 11:54:45
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	C	3.3282E-01	2.0632E-01	2.0669E-01	0.173E+00
AM-241	#B	-1.1612E-01	-8.1178E-01	-8.1179E-01	0.510E+00
Bi-212	F	3.7680E-01	3.6734E-01	3.6760E-01	0.267E+00
BI-214	F	3.5128E-01	1.6627E-01	1.6678E-01	0.104E+00
CO-60	#B	-2.3356E-02	-1.0691E-01	-1.0692E-01	0.273E-01
Cs-137	#B	-7.9952E-03	-4.8698E-02	-4.8699E-02	0.434E-01
EU-152	B	7.1693E-02	7.5813E-02	7.5860E-02	0.108E+00
EU-154	B	1.3034E-02	6.2171E-02	6.2173E-02	0.765E-01
K-40		1.1061E+01	1.5456E+00	1.5992E+00	0.585E+00
PA-234	#F	2.2086E-01	2.4735E-01	2.4749E-01	0.154E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212		3.4451E-01	1.1654E-01	1.1724E-01	0.860E-01
PB-214		2.8098E-01	1.2431E-01	1.2475E-01	0.920E-01
RA-226	A	1.8358E-01	1.2922E+00	1.2923E+00	0.113E+01
Th-230	#B	-2.9182E+01	-3.9131E+01	-3.9146E+01	0.198E+02
TH-234	A	1.7623E+00	2.1728E+00	2.1738E+00	0.214E+01
Tl-208	#	2.3520E-01	8.5884E-02	8.6326E-02	0.183E-01
U-235	A	1.4012E-02	7.6850E-02	7.6852E-02	0.632E-01

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S U M M A R Y

Total Activity (41.8 to 2673.8 keV) 1.2870369E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00666

STRONTIUM-90 ANALYSIS REPORT

Count Date:	12/22/2006	Instrument ID:	Protean WPC 9550	Count Time:	30 min
Batch ID:	NWTLAB122206-095	Detector ID:	0615608	^{90}Y Eff.:	31.1%
Performed By:	P Smith	Cal Due Date:	9/27/2006	^{90}Sr Eff.:	26.9%
				^{90}Sr Added:	10 mg

Sample ID	Collected m/dd/yy hh:mm	^{90}Y in-growth m/dd/yy hh:mm	Counted m/dd/yy hh:mm	Aliquot Mass grams	Initial Mass grams	Final Mass grams	^{90}Sr Yield percent	Total CPM	Total Counts	^{90}Sr Activity pCi/g	MDC pCi/g	2 σ Uncert. pCi/g
6PBIF001-005	7/27/06 13:40	12/21/06 10:00	12/21/06 21:45	10	6.8133	6.8248	107.0%	0.833	25	0.041	0.049	0.117
6PBIF001-012	7/27/06 14:50	12/21/06 9:55	12/21/06 22:46	10	6.7914	6.8020	98.0%	0.500	15	0.015	0.054	0.075
Method Spike 3.49	12/20/06 7:00	12/21/06 9:59	12/22/06 0:47	10	6.8165	6.8271	98.0%	22.400	672	3.432	0.092	1.461
Blank	12/20/06 7:00	12/21/06 10:00	12/22/06 1:18	10	6.7656	6.7664	0.0%	0.333	10			

New World Technology Spectrum name: 1N000289.An1

Sample description
Parcel B 6PBIF002-001 304g
2/19/07 07:30

Acquisition information
Start time: 19-Feb-2007 14:41:39
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/ g	Time of Count Uncertainty Counting pCi/ g	2 Sigma Total pCi/ g	MDA pCi/ g
Ac-228	5.6771E-01	2.2570E-01	2.2669E-01	0.927E-01
AM-241 #A	-1.2544E-01	2.2151E+02	2.2151E+02	0.956E-01
Bi-212 F	6.6458E-01	4.3890E-01	4.3959E-01	0.268E+00
BI-214 F	1.6897E+00	1.0645E+00	1.0663E+00	0.672E+00
CO-60 #A	-1.7906E-02	-5.6522E-02	-5.6526E-02	0.241E-01
CS-137	6.1821E-02	5.3120E-02	5.3170E-02	0.357E-01
EU-152 C	1.2710E-01	8.6255E-02	8.6383E-02	0.841E-01
EU-154 A	4.9696E-02	5.9635E-02	5.9663E-02	0.632E-01
K-40	7.5522E+00	1.4867E+00	1.5130E+00	0.753E+00
Pa-234 #B	6.9468E-02	1.7192E-01	1.7194E-01	0.120E+00
Pb-210 A	9.1505E-01	1.2512E+00	1.2516E+00	0.990E+00
Pb-212	3.8506E-01	1.4191E-01	1.4263E-01	0.965E-01
Pb-214	4.2112E-01	1.3798E-01	1.3886E-01	0.895E-01
RA-226 A	2.8430E-02	1.1758E+00	1.1758E+00	0.107E+01
Th-230 #B	-1.8558E+00	-2.0230E+01	-2.0231E+01	0.951E+01
Th-234 B	3.9904E-01	5.4528E-01	5.4547E-01	0.788E+00
Tl-208 F	2.3446E-01	9.5640E-02	9.6037E-02	0.219E-01
U-235 A	6.2346E-02	1.1551E-01	1.1553E-01	0.632E-01

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---------- S U M M A R Y ----------

Total Activity (41.8 to 2666.6 keV) 1.1576583E+01 pCi/ g

Laboratory: New World Technology

New World Technology Spectrum name: 2N000301.An1

Sample description
Parcel B 6PBIF002-002 308g
2/19/07 07:40

Acquisition information
Start time: 19-Feb-2007 14:48:30
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	5.1838E-01	2.3297E-01	2.3377E-01	0.211E+00
AM-241 #B	-7.1121E-01	2.3168E+03	2.3168E+03	0.745E+00
Bi-212 #B	-1.2200E-01	1.5225E+03	1.5225E+03	0.367E+00
BI-214 #F	2.4491E-01	1.5251E-01	1.5278E-01	0.372E-01
CO-60 #B	1.4972E-02	1.4206E-02	1.4217E-02	0.403E-01
Cs-137 #	8.8884E-02	6.6819E-02	6.6901E-02	0.412E-01
EU-152 B	4.6686E-02	5.0124E-02	5.0154E-02	0.930E-01
EU-154 B	5.8307E-02	4.7119E-02	4.7169E-02	0.633E-01
K-40	1.1311E+01	1.6804E+00	1.7319E+00	0.243E+00
PA-234 #B	1.2198E-01	1.2167E-01	1.2176E-01	0.139E+00
Pb-210 #C	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212	3.1518E-01	1.3798E-01	1.3847E-01	0.101E+00
PB-214 F	3.5264E-01	1.9763E-01	1.9807E-01	0.123E+00
RA-226 #A	5.6223E-01	1.4252E+00	1.4253E+00	0.108E+01
Th-230 #B	-4.0966E+01	-6.0787E+01	-6.0806E+01	0.252E+02
TH-234	3.2567E+00	4.2908E+00	4.2925E+00	0.312E+01
Tl-208 #C	1.1531E-01	5.9140E-02	5.9295E-02	0.496E-01
U-235 #B	-5.9332E-02	1.4994E+02	1.4994E+02	0.567E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2634.2 keV) 1.5842535E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 3N000123.An1

Sample description
Parcel B 6PBIF002-003 324g
2/19/07 07:50

Acquisition information
Start time: 19-Feb-2007 14:53:31
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	7.2311E-01	3.4292E-01	3.4397E-01	0.218E+00
AM-241	#B	-1.3983E-02	-2.5933E-01	-2.5933E-01	0.136E+00
Bi-212	F	7.3045E-01	4.7547E-01	4.7624E-01	0.316E+00
BI-214	F	5.0497E-01	1.9729E-01	1.9817E-01	0.154E+00
CO-60	#B	-6.1476E-02	-2.8127E-01	-2.8128E-01	0.424E-01
Cs-137	#B	-5.9811E-02	-6.0821E-01	-6.0821E-01	0.540E-01
EU-152	F	1.6738E-01	1.8171E-01	1.8182E-01	0.113E+00
EU-154	A	3.1095E-02	6.3594E-02	6.3605E-02	0.777E-01
K-40		1.3177E+01	1.6803E+00	1.7500E+00	0.125E+00
PA-234	B	9.9215E-02	2.1039E-01	2.1042E-01	0.173E+00
Pb-210	#B	-3.0790E-01	-1.9313E+00	-1.9313E+00	0.135E+01
PB-212	F	3.2754E-01	1.2133E-01	1.2193E-01	0.913E-01
PB-214	F	1.8706E-01	1.4156E-01	1.4173E-01	0.132E+00
RA-226	#B	-5.1312E-01	-2.4225E+00	-2.4226E+00	0.114E+01
Th-230	#B	1.0645E+01	1.0265E+01	1.0272E+01	0.111E+02
TH-234		1.1651E+00	1.1083E+00	1.1091E+00	0.875E+00
Tl-208		1.5706E-01	8.1947E-02	8.2154E-02	0.981E-01
U-235	#B	-3.0323E-03	-8.5664E-02	-8.5664E-02	0.659E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2676.4 keV) 1.6467535E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 4N000244.An1

Sample description
Parcel B 6PBIF002-004 304g
2/19/07 08:00

Acquisition information
Start time: 19-Feb-2007 14:56:03
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	6.3898E-01	2.5222E-01	2.5333E-01	0.123E+00
AM-241	#A	-5.0412E-02	-4.4713E-01	-4.4714E-01	0.142E+00
Bi-212	B	8.1667E-02	4.6218E-01	4.6219E-01	0.471E+00
BI-214		5.7043E-01	1.7290E-01	1.7419E-01	0.817E-01
CO-60	#B	-8.8822E-03	-7.2698E-02	-7.2699E-02	0.234E-01
CS-137	#B	-8.6726E-03	-8.5716E-02	-8.5717E-02	0.500E-01
EU-152	F	2.5372E-01	1.7843E-01	1.7868E-01	0.117E+00
EU-154	B	3.3675E-02	7.6321E-02	7.6331E-02	0.928E-01
K-40		1.0362E+01	1.8706E+00	1.9096E+00	0.105E+01
Pa-234	F	2.3342E-01	1.4737E-01	1.4762E-01	0.118E+00
Pb-210	#	2.7305E+00	2.0871E+00	2.0896E+00	0.134E+01
Pb-212	F	4.7750E-01	1.4833E-01	1.4938E-01	0.103E+00
PB-214	F	5.0662E-01	1.5353E-01	1.5468E-01	0.991E-01
RA-226	B	1.0217E+00	1.5614E+00	1.5619E+00	0.135E+01
Th-230	#B	-8.5719E-02	2.6710E+04	2.6710E+04	0.115E+02
Th-234		2.1309E+00	1.4108E+00	1.4130E+00	0.130E+01
Tl-208	F	4.1367E-01	1.3889E-01	1.3974E-01	0.512E-01
U-235	#B	-1.5660E+00	-2.6955E+00	-2.6962E+00	0.165E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.8 to 3401.4 keV) 1.8084658E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 5N000273.An1

Sample description
Parcel B 6PBIF002-005 289g
2/19/07 08:10

Acquisition information
Start time: 19-Feb-2007 15:05:54
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	6.1054E-01	3.6421E-01	3.6491E-01	0.237E+00
AM-241 #B	-1.4652E-01	-1.1160E+00	-1.1160E+00	0.150E+00
Bi-212 #B	-4.0037E-02	1.2994E+03	1.2994E+03	0.407E+00
BI-214 F	4.0777E-01	1.7452E-01	1.7518E-01	0.130E+00
CO-60 #B	-1.1567E-02	-5.6949E-02	-5.6950E-02	0.226E-01
CS-137 #B	-2.3933E-02	-9.9798E-02	-9.9802E-02	0.511E-01
EU-152 F	1.2303E-01	1.2585E-01	1.2593E-01	0.112E+00
EU-154 F	8.3135E-02	8.6652E-02	8.6707E-02	0.761E-01
K-40	1.0910E+01	1.7764E+00	1.8220E+00	0.103E+01
Pa-234 F	1.2131E-01	1.1537E-01	1.1546E-01	0.119E+00
Pb-210 #	1.3210E+00	1.2933E+00	1.2942E+00	0.961E+00
Pb-212 F	2.4250E-01	1.3692E-01	1.3721E-01	0.115E+00
PB-214 F	4.8148E-01	1.8978E-01	1.9062E-01	0.984E-01
RA-226 B	2.9052E-01	1.3084E+00	1.3084E+00	0.115E+01
Th-230 #B	-1.2809E+01	-6.2655E+01	-6.2657E+01	0.105E+02
Th-234 B	8.7421E-01	4.6474E-01	4.6586E-01	0.104E+01
Tl-208 F	3.1695E-01	8.4549E-02	8.5364E-02	0.103E+00
U-235 B	-1.0768E+00	-2.5117E+00	-2.5120E+00	0.137E+00

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---------- S U M M A R Y ----------

Total Activity (41.8 to 2665.6 keV) 1.3973738E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 19-FEB-2007 14:46:03 Page 1
New World Technology Spectrum name: 7N000177.An1

Sample description
Parcel B 6PBIF002-006 300g
2/19/07 08:20

Acquisition information
Start time: 19-Feb-2007 14:00:50
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228	F	1.0124E+00	3.4681E-01	3.4884E-01	0.154E+00
AM-241	B	2.2705E-02	1.8276E-01	1.8276E-01	0.152E+00
BI-212	F	4.9399E-01	5.3336E-01	5.3368E-01	0.417E+00
BI-214	F	8.2743E-01	2.4955E-01	2.5143E-01	0.109E+00
CO-60	#B	-4.7682E-02	-1.2003E-01	-1.2004E-01	0.612E-01
CS-137	#B	-5.0483E-02	-2.8462E-01	-2.8462E-01	0.605E-01
EU-152	B	-1.5018E-01	-1.4087E+00	-1.4087E+00	0.134E+00
EU-154	F	1.8583E-01	1.8450E-01	1.8463E-01	0.675E-01
K-40		1.4475E+01	2.0355E+00	2.1053E+00	0.107E+01
PA-234	B	1.0669E-01	1.7448E-01	1.7453E-01	0.149E+00
PB-210		2.2996E+00	1.8907E+00	1.8927E+00	0.152E+01
PB-212	F	5.2269E-01	1.2882E-01	1.3028E-01	0.957E-01
PB-214		4.4652E-01	1.7869E-01	1.7946E-01	0.111E+00
RA-226	#B	-1.2247E-02	-1.4715E+00	-1.4715E+00	0.128E+01
Th-230	#B	-1.8116E+01	2.6562E+04	2.6562E+04	0.115E+02
TH-234	#B	-4.9518E-01	-2.1332E+00	-2.1333E+00	0.139E+01
TL-208	#F	1.3877E-01	6.4350E-02	6.4556E-02	0.540E-01
U-235	#B	-7.2026E-01	-1.1697E+00	-1.1700E+00	0.118E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.1 to 2687.4 keV) 1.9583656E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 6N000208.An1

Sample description
Parcel B 6PBIF002-007 323g
2/19/07 08:30

Acquisition information
Start time: 19-Feb-2007 15:05:58
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	5.5866E-01	1.7435E-01	1.7557E-01	0.236E+00
AM-241	A	8.0130E-02	1.2444E-01	1.2447E-01	0.104E+00
Bi-212	B	2.1057E-01	2.9779E-01	2.9790E-01	0.446E+00
BI-214	F	3.1201E-01	1.2240E-01	1.2294E-01	0.109E+00
CO-60	#B	-1.2302E-01	-5.0262E-01	-5.0265E-01	0.606E-01
CS-137	#B	-3.9972E-02	-1.1910E-01	-1.1911E-01	0.437E-01
EU-152	F	2.6182E-01	9.8911E-02	9.9386E-02	0.702E-01
EU-154	#F	2.5514E-01	1.2976E-01	1.3011E-01	0.690E-01
K-40		1.3132E+01	1.8892E+00	1.9509E+00	0.106E+01
Pa-234	F	4.7818E-01	4.1234E-01	4.1272E-01	0.133E+00
Pb-210	#	4.1342E+00	2.3207E+00	2.3258E+00	0.821E+00
Pb-212		4.9062E-01	9.5673E-02	9.7388E-02	0.651E-01
PB-214		1.5616E+01	4.4137E+00	4.4515E+00	0.102E+01
RA-226	F	1.0047E+00	1.1140E+00	1.1146E+00	0.959E+00
Th-230	B	6.6060E+00	1.2878E+01	1.2880E+01	0.109E+02
Th-234		2.8353E+00	1.4648E+00	1.4686E+00	0.107E+01
Tl-208	F	1.9618E-01	6.0695E-02	6.1129E-02	0.438E-01
U-235	B	-1.6586E-01	-8.2794E-02	-8.3022E-02	0.875E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.9 keV) 3.8015041E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 6N000210.An1

Sample description
Parcel B 6PBIF002-007DUP 323g
2/19/07 08:30

Acquisition information
Start time: 20-Feb-2007 12:19:21
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	9.3238E-01	1.5945E-01	1.6316E-01	0.236E+00
AM-241		1.7326E-01	1.4613E-01	1.4627E-01	0.118E+00
Bi-212	B	2.0793E-01	4.9116E-01	4.9123E-01	0.451E+00
BI-214	F	7.3222E-01	1.6017E-01	1.6246E-01	0.109E+00
CO-60	#B	-1.2302E-01	-5.0262E-01	-5.0265E-01	0.606E-01
CS-137	#B	-3.2806E-02	-9.8511E-02	-9.8518E-02	0.443E-01
EU-152	F	2.0774E-01	1.3973E-01	1.3995E-01	0.108E+00
EU-154	F	3.4921E-01	1.1763E-01	1.1834E-01	0.751E-01
K-40		1.0938E+01	1.7637E+00	1.8097E+00	0.106E+01
Pa-234	F	2.2746E-01	1.2793E-01	1.2821E-01	0.605E-01
Pb-210		3.8003E+00	2.3393E+00	2.3436E+00	0.857E+00
Pb-212		4.5746E-01	8.4589E-02	8.6273E-02	0.556E-01
PB-214		3.4507E+00	1.4934E+00	1.4989E+00	0.580E+00
RA-226	F	1.0753E+00	1.2005E+00	1.2012E+00	0.103E+01
Th-230	B	6.4256E+00	1.3725E+01	1.3727E+01	0.116E+02
Th-234		4.0457E+00	2.1551E+00	2.1603E+00	0.105E+01
Tl-208	F	2.0197E-01	6.1244E-02	6.1700E-02	0.438E-01
U-235	#B	-3.7436E-01	-4.4750E-01	-4.4771E-01	0.880E-01

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.9 keV) 2.4356661E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 7N000178.An1

Sample description
Parcel B 6PBIF002-008 321g
2/19/07 08:40

Acquisition information
Start time: 19-Feb-2007 15:06:46
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228	F	1.1398E+00	3.7263E-01	3.7502E-01	0.145E+00
AM-241	B	8.7894E-02	1.6468E-01	1.6471E-01	0.135E+00
BI-212	B	6.9759E-02	4.6428E-01	4.6429E-01	0.396E+00
BI-214	F	6.6347E-01	2.5669E-01	2.5787E-01	0.110E+00
CO-60	#B	-1.0484E-01	-3.4597E-01	-3.4599E-01	0.522E-01
CS-137	#B	-5.6767E-02	-3.9827E-01	-3.9828E-01	0.522E-01
EU-152	#B	1.0846E-01	5.5979E-02	5.6123E-02	0.125E+00
EU-154	#B	2.2562E-02	5.7384E-02	5.7391E-02	0.854E-01
K-40		1.2504E+01	1.7563E+00	1.8167E+00	0.969E+00
PA-234	F	4.4356E-01	1.6902E-01	1.6982E-01	0.141E+00
PB-210		3.6890E+00	2.4541E+00	2.4579E+00	0.151E+01
PB-212	F	5.5528E-01	1.2107E-01	1.2281E-01	0.810E-01
PB-214		4.0695E-01	1.6358E-01	1.6427E-01	0.124E+00
RA-226	B	2.2127E-01	1.2362E+00	1.2362E+00	0.110E+01
Th-230	#B	-7.4922E+00	-3.2438E+01	-3.2439E+01	0.111E+02
TH-234	#B	-1.0247E+00	-2.8646E+00	-2.8648E+00	0.128E+01
TL-208	F	3.9815E-01	1.1594E-01	1.1688E-01	0.321E-01
U-235	#B	-6.0170E-01	-7.0561E-01	-7.0597E-01	0.112E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.1 to 2687.4 keV) 1.9357141E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 1N000290.An1

Sample description
Parcel B 6PBIF002-009 359g
2/19/07 08:50

Acquisition information
Start time: 20-Feb-2007 06:09:21
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/ g	Time of Count Uncertainty Counting pCi/ g	2 Sigma Total pCi/ g	MDA pCi/ g
Ac-228	3.8444E-01	1.5905E-01	1.5969E-01	0.785E-01
AM-241 #A	-4.1150E-02	-1.9627E-01	-1.9627E-01	0.797E-01
Bi-212 F	7.4198E-01	4.4213E-01	4.4299E-01	0.239E+00
BI-214 B	4.1031E-01	2.0448E-01	2.0505E-01	0.565E+00
CO-60 #	3.1843E-02	3.0326E-02	3.0349E-02	0.194E-01
CS-137	3.8476E-02	3.1708E-02	3.1740E-02	0.189E-01
EU-152 C	1.4220E-01	1.5326E-01	1.5335E-01	0.738E-01
EU-154 C	5.2463E-02	5.3843E-02	5.3878E-02	0.424E-01
K-40	8.8568E+00	1.4421E+00	1.4792E+00	0.638E+00
Pa-234 F	3.6464E-01	1.9510E-01	1.9556E-01	0.117E+00
Pb-210 #A	5.4785E-01	1.6072E+00	1.6073E+00	0.104E+01
Pb-212	2.6556E-01	9.8697E-02	9.9189E-02	0.772E-01
Pb-214	2.5339E-01	1.3473E-01	1.3506E-01	0.772E-01
RA-226 #B	-4.0784E-01	-1.5455E+00	-1.5456E+00	0.881E+00
Th-230 #B	1.5947E+00	8.7971E+00	8.7973E+00	0.643E+01
Th-234 A	3.4532E-01	6.4213E-01	6.4226E-01	0.666E+00
Tl-208	1.6677E-01	7.4498E-02	7.4756E-02	0.185E-01
U-235 B	4.7433E-02	6.7716E-02	6.7739E-02	0.539E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.8 to 2666.6 keV) 1.0739238E+01 pCi/ g

Laboratory: New World Technology

New World Technology Spectrum name: 2N000302.An1

Sample description
Parcel B 6PBIF002-010 358g
2/19/07 09:00

Acquisition information
Start time: 20-Feb-2007 06:18:43
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.2136E-01	2.2261E-01	2.2293E-01	0.170E+00
AM-241 #B	-3.5993E-02	-7.9784E-01	-7.9784E-01	0.576E+00
Bi-212 F	4.5498E-01	2.9361E-01	2.9410E-01	0.179E+00
BI-214 #F	1.5733E-01	1.0633E-01	1.0649E-01	0.632E-01
CO-60 #B	-2.7088E-02	7.1770E+01	7.1770E+01	0.272E-01
Cs-137 #	3.6792E-02	4.5052E-02	4.5073E-02	0.344E-01
EU-152 F	1.1927E-01	7.2290E-02	7.2425E-02	0.100E+00
EU-154 B	3.6467E-02	7.5704E-02	7.5716E-02	0.596E-01
K-40	7.1274E+00	1.3050E+00	1.3315E+00	0.608E+00
PA-234 #F	1.4968E-01	8.2970E-02	8.3154E-02	0.748E-01
Pb-210 #C	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212	2.9467E-01	1.2240E-01	1.2289E-01	0.851E-01
PB-214 F	2.6939E-01	1.3361E-01	1.3398E-01	0.884E-01
RA-226 #B	-4.9788E-01	-1.8927E+00	-1.8928E+00	0.932E+00
Th-230 #B	-8.6625E+00	-9.5895E+00	-9.5949E+00	0.293E+02
TH-234	4.4038E+00	3.0077E+00	3.0121E+00	0.334E+01
Tl-208 C	8.2903E-02	4.2760E-02	4.2870E-02	0.442E-01
U-235 #B	-3.0574E-02	-2.2874E-01	-2.2874E-01	0.525E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2634.2 keV) 1.2908356E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 3N000124.An1

Sample description
Parcel B 6PBIF002-011 349g
2/19/07 09:10

Acquisition information
Start time: 20-Feb-2007 06:23:22
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228 #B	-8.0764E-01	-1.4868E+00	-1.4871E+00	0.308E+00
AM-241 #B	-4.7073E-02	-1.3703E+00	-1.3703E+00	0.100E+00
Bi-212 B	8.6940E-02	3.7727E-01	3.7729E-01	0.306E+00
BI-214 F	8.3314E-01	1.8883E-01	1.9135E-01	0.610E-01
CO-60 #B	-5.2066E-02	-2.3058E-01	-2.3059E-01	0.394E-01
Cs-137 #B	-5.6466E-02	-7.3060E-01	-7.3060E-01	0.547E-01
EU-152 F	1.3221E-01	1.0993E-01	1.1004E-01	0.106E+00
EU-154 C	8.3433E-02	5.7567E-02	5.7650E-02	0.778E-01
K-40	1.4608E+01	1.7805E+00	1.8612E+00	0.602E+00
PA-234 #F	2.5609E-01	3.5888E-01	3.5900E-01	0.192E+00
Pb-210 #A	1.2625E+00	2.0333E+00	2.0339E+00	0.126E+01
PB-212	2.4635E-01	1.1333E-01	1.1370E-01	0.849E-01
PB-214 F	2.5078E-01	1.5070E-01	1.5098E-01	0.123E+00
RA-226 #B	-1.1688E+00	-7.4601E+00	-7.4602E+00	0.971E+00
Th-230 F	1.5019E+01	9.4391E+00	9.4554E+00	0.844E+01
TH-234 A	7.1953E-01	7.6446E-01	7.6492E-01	0.860E+00
Tl-208 #B	-1.6334E-01	-5.2636E-01	-5.2640E-01	0.967E-01
U-235 C	7.0196E-02	6.5385E-02	6.5437E-02	0.575E-01

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2676.4 keV) 1.5944047E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 4N000245.An1

Sample description
Parcel B 6PBIF002-012 388g
2/19/07 09:20

Acquisition information
Start time: 20-Feb-2007 06:26:43
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	7.0639E-01	2.1352E-01	2.1512E-01	0.782E-01
AM-241	#A	-4.5996E-02	-4.8367E-01	-4.8367E-01	0.125E+00
Bi-212	B	2.0439E-01	2.0775E-01	2.0788E-01	0.382E+00
BI-214		5.6240E-01	1.5134E-01	1.5277E-01	0.664E-01
CO-60	#B	-9.0061E-03	-6.6528E-02	-6.6529E-02	0.195E-01
CS-137	B	6.0657E-03	4.9585E-02	4.9586E-02	0.431E-01
EU-152	F	1.3724E-01	9.4310E-02	9.4446E-02	0.773E-01
EU-154	#B	5.5284E-02	5.4961E-02	5.4999E-02	0.683E-01
K-40		1.0280E+01	1.4585E+00	1.5074E+00	0.771E+00
Pa-234	B	5.4950E-02	7.0549E-02	7.0578E-02	0.118E+00
Pb-210		2.0085E+00	1.2198E+00	1.2220E+00	0.944E+00
Pb-212	F	3.6174E-01	1.0537E-01	1.0622E-01	0.774E-01
PB-214	F	3.9587E-01	1.3773E-01	1.3851E-01	0.791E-01
RA-226	B	5.8679E-01	1.2338E+00	1.2340E+00	0.107E+01
Th-230	B	5.6029E+00	1.0591E+01	1.0593E+01	0.852E+01
Th-234	F	2.1711E+00	1.3446E+00	1.3470E+00	0.105E+01
Tl-208	F	1.3404E-01	6.3640E-02	6.3834E-02	0.648E-01
U-235	#B	-1.2733E+00	-4.1464E+00	-4.1467E+00	0.130E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.8 to 3401.4 keV) 1.6486198E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 5N000274.An1

Sample description
Parcel B 6PBIF002-013 392g
2/19/07 09:30

Acquisition information
Start time: 20-Feb-2007 06:39:16
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228 #B	1.1548E-01	1.8850E-01	1.8855E-01	0.168E+00
AM-241 #B	-1.3284E-01	-1.9513E+00	-1.9513E+00	0.885E-01
Bi-212 F	5.3828E-01	3.2573E-01	3.2635E-01	0.201E+00
BI-214 F	5.3509E-01	2.6071E-01	2.6147E-01	0.118E+00
CO-60 #B	-9.3395E-03	-4.4110E-02	-4.4111E-02	0.172E-01
CS-137 #B	-4.9627E-02	-2.4427E+00	-2.4427E+00	0.400E-01
EU-152 B	7.3636E-02	7.9405E-02	7.9452E-02	0.826E-01
EU-154 B	3.5921E-02	6.7078E-02	6.7092E-02	0.565E-01
K-40	8.0837E+00	1.3121E+00	1.3460E+00	0.760E+00
Pa-234 F	2.5895E-01	1.3002E-01	1.3037E-01	0.106E+00
Pb-210	1.3416E+00	1.0712E+00	1.0724E+00	0.757E+00
Pb-212 F	1.9793E-01	9.4737E-02	9.5022E-02	0.793E-01
PB-214 #F	3.4075E-01	1.4390E-01	1.4445E-01	0.772E-01
RA-226 #B	-6.0991E-02	-1.0204E+00	-1.0204E+00	0.842E+00
Th-230 #B	-1.0477E+01	-6.7230E+01	-6.7231E+01	0.905E+01
Th-234 F	1.6195E+00	4.7812E-01	4.8185E-01	0.760E+00
Tl-208	1.2075E-01	4.5630E-02	4.5850E-02	0.569E-01
U-235 #B	-8.0666E-01	-2.2714E+00	-2.2716E+00	0.991E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.8 to 2665.6 keV) 1.1417101E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 4N000246.An1

Sample description
Parcel B 6PBIF002-014 345g
2/19/07 09:40

Acquisition information
Start time: 20-Feb-2007 07:28:57
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	7.6814E-01	1.9403E-01	1.9610E-01	0.327E-01
AM-241	A	1.0344E-01	1.6022E-01	1.6026E-01	0.132E+00
Bi-212	B	1.6168E-01	3.0284E-01	3.0290E-01	0.394E+00
BI-214		5.6577E-01	1.1419E-01	1.1610E-01	0.300E-01
CO-60	#B	-1.2431E-02	6.4591E+01	6.4591E+01	0.176E-01
CS-137	B	2.4682E-02	5.0591E-02	5.0600E-02	0.427E-01
EU-152	F	1.8702E-01	9.0717E-02	9.0980E-02	0.104E+00
EU-154	F	1.7555E-01	7.6654E-02	7.6928E-02	0.580E-01
K-40		1.0083E+01	1.5547E+00	1.5990E+00	0.867E+00
Pa-234	F	3.3518E-01	1.3683E-01	1.3739E-01	0.141E+00
Pb-210		4.0421E+00	2.5975E+00	2.6018E+00	0.917E+00
Pb-212	F	4.9287E-01	1.1844E-01	1.1984E-01	0.740E-01
PB-214	F	5.5978E-01	1.3557E-01	1.3715E-01	0.456E-01
RA-226		1.2909E+00	1.1893E+00	1.1903E+00	0.102E+01
Th-230	B	4.4301E+00	1.0461E+01	1.0462E+01	0.844E+01
Th-234	F	2.4721E+00	1.3445E+00	1.3476E+00	0.112E+01
Tl-208	#F	1.9182E-01	5.2121E-02	5.2604E-02	0.451E-01
U-235	B	-1.3763E+00	-2.3038E+00	-2.3044E+00	0.146E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.8 to 3401.4 keV) 2.0466312E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 7N000179.An1

Sample description
Parcel B 6PBIF002-015 299g
2/19/07 09:50

Acquisition information
Start time: 20-Feb-2007 06:47:14
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
AC-228	F	1.3009E+00	4.1486E-01	4.1766E-01	0.146E+00
AM-241	B	1.5464E-02	1.9297E-01	1.9297E-01	0.161E+00
BI-212	#B	-2.3238E-01	1.2418E+03	1.2418E+03	0.536E+00
BI-214	F	5.6421E-01	1.5882E-01	1.6019E-01	0.944E-01
CO-60	#B	2.0558E-03	4.8213E-02	4.8213E-02	0.557E-01
CS-137	B	6.7844E-03	6.3255E-02	6.3255E-02	0.583E-01
EU-152	#F	3.1666E-01	1.0411E-01	1.0477E-01	0.133E+00
EU-154	F	9.9861E-02	9.0725E-02	9.0801E-02	0.751E-01
K-40		1.3009E+01	2.0190E+00	2.0760E+00	0.109E+01
PA-234	F	2.5643E-01	1.6890E-01	1.6917E-01	0.122E+00
PB-210		3.1902E+00	2.7951E+00	2.7976E+00	0.169E+01
PB-212	F	5.6096E-01	1.3103E-01	1.3268E-01	0.896E-01
PB-214		4.4954E-01	2.2110E-01	2.2173E-01	0.134E+00
RA-226	#B	-1.3724E+00	-5.0915E+00	-5.0917E+00	0.119E+01
Th-230	#B	-2.2251E+00	-2.3766E+01	-2.3767E+01	0.132E+02
TH-234	#B	-6.9451E-01	-2.1207E+00	-2.1209E+00	0.125E+01
TL-208	F	1.4212E-01	7.5986E-02	7.6169E-02	0.570E-01
U-235	B	-7.7959E-01	-2.0365E+00	-2.0367E+00	0.113E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.1 to 2687.4 keV) 1.9074280E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 6N000207.An1

Sample description
Parcel B 6PBIF002-016 318g
2/19/07 10:00

Acquisition information
Start time: 19-Feb-2007 14:05:19
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	7.8796E-01	2.6007E-01	2.6170E-01	0.250E+00
AM-241	A	2.3655E-02	1.7809E-01	1.7809E-01	0.149E+00
Bi-212	#B	-2.8048E-02	-2.8048E-02	-2.8067E-02	0.502E+00
BI-214	F	6.4851E-01	2.7219E-01	2.7325E-01	0.130E+00
CO-60	#B	1.3943E-02	8.1689E-02	8.1691E-02	0.678E-01
CS-137	#B	-3.5414E-03	-7.0402E-02	-7.0402E-02	0.593E-01
EU-152	B	6.9507E-02	1.1021E-01	1.1024E-01	0.122E+00
EU-154	F	1.2881E-01	1.2462E-01	1.2471E-01	0.715E-01
K-40		1.6235E+01	2.3026E+00	2.3801E+00	0.116E+01
Pa-234	F	2.4621E-01	1.6792E-01	1.6817E-01	0.126E+00
Pb-210	#	3.3914E+00	1.6404E+00	1.6452E+00	0.105E+01
Pb-212	F	4.3292E-01	1.0489E-01	1.0611E-01	0.765E-01
PB-214		2.0617E+00	1.6631E+00	1.6648E+00	0.107E+01
RA-226	B	6.5809E-01	1.1410E+00	1.1413E+00	0.996E+00
Th-230	#B	-7.9620E+00	-3.5470E+01	-3.5472E+01	0.112E+02
Th-234	B	7.8409E-01	1.3361E+00	1.3364E+00	0.116E+01
Tl-208	F	2.0573E-01	8.3036E-02	8.3386E-02	0.526E-01
U-235	#B	-3.4939E-01	-3.8442E-01	-3.8463E-01	0.918E-01

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< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.9 keV) 2.4009892E+01 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: 5N000275.An1

Sample description
Parcel B 6PBIF002-017 304g
2/19/07 10:10

Acquisition information
Start time: 20-Feb-2007 07:38:47
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	5.4375E-01	3.3763E-01	3.3823E-01	0.224E+00
AM-241 #B	-1.8823E-01	3.1265E+02	3.1265E+02	0.135E+00
Bi-212 F	8.6981E-01	4.5179E-01	4.5295E-01	0.269E+00
BI-214 F	3.3276E-01	1.8116E-01	1.8158E-01	0.132E+00
CO-60 #B	1.3116E-02	1.4620E-02	1.4628E-02	0.222E-01
CS-137 B	2.6944E-02	5.8808E-02	5.8817E-02	0.524E-01
EU-152 F	2.0165E-01	9.5059E-02	9.5351E-02	0.893E-01
EU-154 F	1.4602E-01	1.5317E-01	1.5326E-01	0.586E-01
K-40 #	9.3386E+00	1.6243E+00	1.6609E+00	0.980E+00
Pa-234 F	3.7106E-01	1.5898E-01	1.5957E-01	0.102E+00
Pb-210 #B	-1.0618E+00	-2.0421E+01	-2.0421E+01	0.119E+01
Pb-212 F	3.2413E-01	1.2505E-01	1.2563E-01	0.102E+00
PB-214 F	5.8530E-01	1.9811E-01	1.9930E-01	0.101E+00
RA-226 #B	-4.3449E-01	-2.0099E+00	-2.0100E+00	0.112E+01
Th-230 #B	-1.0253E+01	-5.3315E+01	-5.3317E+01	0.111E+02
Th-234 F	1.2898E+00	7.5325E-01	7.5476E-01	0.102E+01
Tl-208 F	2.2509E-01	6.0210E-02	6.0788E-02	0.733E-01
U-235 #B	-1.0312E+00	-2.7082E+00	-2.7085E+00	0.130E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.8 to 2665.6 keV) 1.2219432E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 20-FEB-2007 08:24:57 Page 1
New World Technology Spectrum name: 7N000180.An1

Sample description
Parcel B 6PBIF002-018 311g
2/19/07 10:20

Acquisition information
Start time: 20-Feb-2007 07:39:45
Live time: 2700
Real time: 2706

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228	F	9.5561E-01	2.6115E-01	2.6355E-01	0.122E+00
AM-241		2.2983E-01	1.8673E-01	1.8693E-01	0.149E+00
BI-212	F	4.7338E-01	5.4109E-01	5.4138E-01	0.425E+00
BI-214	#F	8.3005E-01	1.9390E-01	1.9634E-01	0.753E-01
CO-60	#B	-1.0278E-01	-6.4371E-01	-6.4372E-01	0.550E-01
CS-137	#B	-7.1788E-02	-2.8724E+00	-2.8724E+00	0.593E-01
EU-152	F	1.9897E-01	9.9161E-02	9.9436E-02	0.127E+00
EU-154	F	1.3450E-01	8.8083E-02	8.8225E-02	0.727E-01
K-40		1.5899E+01	2.0830E+00	2.1651E+00	0.104E+01
PA-234	F	1.5394E-01	2.1145E-01	2.1152E-01	0.133E+00
PB-210		2.6269E+00	2.3594E+00	2.3614E+00	0.151E+01
PB-212	F	4.3988E-01	1.2645E-01	1.2750E-01	0.919E-01
PB-214		3.0051E-01	1.5387E-01	1.5427E-01	0.121E+00
RA-226	B	1.2599E-01	1.3826E+00	1.3826E+00	0.122E+01
Th-230	#B	-1.1326E+01	-7.4271E+01	-7.4272E+01	0.138E+02
TH-234	B	4.5470E-01	1.3986E+00	1.3987E+00	0.123E+01
TL-208	F	4.2739E-01	1.2191E-01	1.2294E-01	0.332E-01
U-235	#B	-7.4452E-01	-2.1812E+00	-2.1813E+00	0.116E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.1 to 2687.4 keV) 2.1708801E+01 pCi/g

Laboratory: New World Technology

STRONTIUM-90 ANALYSIS REPORT

Count Date:	2/27/2007	Instrument ID:	Protean WPC 9550	Count Time:	30 min
Batch ID:	NWTLAB022707-014	Detector ID:	0615608	^{90}Y Eff.:	31.1%
Performed By:	P Smith	Cal Due Date:	9/27/2007	^{90}Sr Eff.:	26.9%
				^{90}Sr Added:	10 mg

Sample ID	Collected m/dd/yy hh:mm	^{90}Y in-growth m/dd/yy hh:mm	Counted m/dd/yy hh:mm	Aliquot Mass grams	Initial Mass grams	Final Mass grams	^{90}Sr Yield percent	Total CPM	Total Counts	^{90}Sr Activity pCi/g	MDC pCi/g	2 σ Uncert. pCi/g
6PBIF002-006	2/19/07 8:20	2/27/07 11:14	2/27/07 23:27	10	9.4044	9.4159	103.0%	0.533	16	-0.003	0.068	0.034
6PBIF002-016	2/19/07 10:00	2/27/07 11:14	2/27/07 23:57	10	9.4294	9.4404	98.0%	0.733	22	0.016	0.072	0.080
Method Spike 3.49	2/26/07 7:00	2/27/07 11:14	2/28/07 6:02	10	9.4284	9.4392	96.0%	22.067	662	3.532	0.121	1.524
Blank	2/26/07 7:00	2/27/07 11:15	2/28/07 6:33	10	9.3939	9.3951		0.567	17			

ATTACHMENT 2

REFERENCE AREA SAMPLE RESULTS

ED_000855_00003297-00688

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ED_000855_00003297-00689

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 13:51:39 Page 1
New World Technology Spectrum name: 2N002311.An1

Sample description
IRO7 Bkd 06NPBRAO-001 503g
04/26/2006 12:00

Acquisition information
Start time: 02-May-2006 17:16:40
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		5.3085E-01	1.7695E-01	1.7804E-01	0.119E+00
AM-241	#B	-3.2550E-01	-2.9695E+00	-2.9695E+00	0.438E+00
Bi-212	#B	-2.4844E-02	-3.1479E-01	-3.1479E-01	0.155E+00
BI-214	F	4.1896E-01	1.3743E-01	1.3831E-01	0.762E-01
CO-60	#B	-1.9533E-02	5.1754E+01	5.1754E+01	0.196E-01
Cs-137	#B	-2.8939E-03	-4.2883E-02	-4.2883E-02	0.384E-01
EU-152	F	1.1377E-01	8.0020E-02	8.0131E-02	0.664E-01
EU-154	B	-5.1125E-04	1.3019E+02	1.3019E+02	0.475E-01
K-40		1.1094E+01	1.3139E+00	1.3768E+00	0.433E+00
PA-234	#	1.5654E-01	1.0555E-01	1.0571E-01	0.122E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212	F	3.5349E-01	9.2961E-02	9.3880E-02	0.646E-01
PB-214		4.4479E-01	1.3876E-01	1.3974E-01	0.791E-01
RA-226	A	2.0198E-01	8.1257E-01	8.1261E-01	0.700E+00
Th-230	B	-8.2745E+00	-9.1643E+00	-9.1694E+00	0.215E+02
TH-234	A	2.1431E+00	3.3507E+00	3.3516E+00	0.235E+01
Tl-208	C	1.0572E-01	3.5512E-02	3.5728E-02	0.239E-01
U-235	#B	2.7607E-02	4.5695E-02	4.5707E-02	0.416E-01

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.9 to 2675.6 keV) 1.2998281E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00690

```
     ORTEC g v - i (3263) wan32  G53W2.06  04-AUG-2006 11:53:26 Page    1
 New World Technology            Spectrum name: 1N001774.An1

 Sample description
      IR07 Bkd 06NPBRAO-002 532g
      4/26/06 12:00

 Acquisition information
        Start time:                 02-May-2006 17:21:48
        Live time:               2700
        Real time:               2703

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total         MDA
                picoCi/ g     picoCi/ g     picoCi/ g     picoCi/ g

 ____________________________________________________________________________
 Ac-228       6.0566E-01   1.8261E-01    1.8399E-01  0.326E-01
 AM-241 #A   -1.4682E-01   4.3983E+02    4.3983E+02  0.166E+00
 Bi-212  A    2.1957E-01   2.9477E-01    2.9489E-01  0.220E+00
 BI-214  F    5.3893E-01   1.8584E-01    1.8691E-01  0.204E+00
 CO-60  #A   -2.4633E-02  -1.0973E-01   -1.0973E-01  0.303E-01
 CS-137 #A   -6.2824E-02  -2.6540E-01   -2.6541E-01  0.441E-01
 EU-152  C    8.8401E-02   6.6183E-02    6.6264E-02  0.594E-01
 EU-154  A   -3.0407E-03  -2.2960E-02   -2.2960E-02  0.469E-01
 K-40         6.6737E+00   1.3621E+00    1.3844E+00  0.685E+00
 Pa-234 #B    1.1698E-02   1.3292E-02    1.3299E-02  0.967E-01
 Pb-210 #     7.5060E+00   9.1825E+00    9.1867E+00  0.577E+01
 Pb-212       3.9365E-01   8.2014E-02    8.3302E-02  0.423E-01
 Pb-214       4.9218E-01   1.2268E-01    1.2403E-01  0.517E-01
 RA-226  A    2.3013E-01   7.4019E-01    7.4024E-01  0.641E+00
 Th-230 #B    1.0416E+01   1.8038E+01    1.8042E+01  0.122E+02
 Th-234  B   -1.6585E+00   3.2498E+03    3.2498E+03  0.111E+01
 Tl-208 #     1.6399E-01   5.9592E-02    5.9901E-02  0.237E-01
 U-235   C    4.2276E-02   4.8816E-02    4.8841E-02  0.408E-01

   # - All peaks for activity calculation had bad shape.
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   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   41.2 to  2606.4 keV) 1.5835150E+01  picoCi/ g

Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 12:36:09 Page 1
New World Technology Spectrum name: 3N002316.An1

Sample description
IR07 Bkd 06NPBRAO-003 509g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 17:27:21
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	F	5.8777E-01	2.0588E-01	2.0703E-01	0.129E+00
AM-241	#B	-3.9466E-02	1.7505E+02	1.7505E+02	0.662E-01
Bi-212	F	5.8549E-01	3.2906E-01	3.2977E-01	0.212E+00
BI-214	F	4.1106E-01	1.4854E-01	1.4932E-01	0.864E-01
CO-60	#B	-1.2140E-03	-5.3193E-03	-5.3195E-03	0.229E-01
Cs-137	#B	-3.4603E-02	-2.1850E-01	-2.1850E-01	0.355E-01
EU-152	B	6.2825E-02	1.3437E-01	1.3439E-01	0.639E-01
EU-154	#B	-1.3150E-02	-2.2705E-01	-2.2705E-01	0.411E-01
K-40		9.5428E+00	1.4247E+00	1.4680E+00	0.859E+00
PA-234	#B	-5.3199E-03	-9.6429E-02	-9.6430E-02	0.727E-01
Pb-210	A	4.0222E-01	1.0453E+00	1.0455E+00	0.785E+00
PB-212	F	2.7998E-01	8.1115E-02	8.1776E-02	0.580E-01
PB-214		4.0663E-01	1.2430E-01	1.2521E-01	0.892E-01
RA-226	A	2.1928E-01	7.2598E-01	7.2603E-01	0.633E+00
Th-230	#B	2.0049E+00	3.3965E+00	3.3973E+00	0.626E+01
TH-234	B	2.3801E-01	7.0143E-01	7.0148E-01	0.546E+00
Tl-208	B	4.8425E-02	2.2114E-02	2.2187E-02	0.893E-01
U-235	A	2.4919E-02	5.9418E-02	5.9425E-02	0.348E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.5 keV) 1.1813709E+01 picoCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 12:22:30 Page 1
New World Technology Spectrum name: 2N002312.An1

Sample description
IRO7 Bkd 06NPBRAO-004 524g
04/26/2006 12:00

Acquisition information
Start time: 02-May-2006 18:06:18
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity picoCi/g	Uncertainty 2 Sigma Counting picoCi/g	Total picoCi/g	MDA picoCi/g
Ac-228	3.6533E-01	1.3352E-01	1.3421E-01	0.128E+00
AM-241 #B	-3.2394E-01	-4.0538E+00	-4.0538E+00	0.505E+00
Bi-212 F	5.1371E-01	2.4124E-01	2.4199E-01	0.125E+00
BI-214 F	4.5513E-01	1.2737E-01	1.2849E-01	0.683E-01
CO-60 #B	-1.0764E-02	-4.7946E-02	-4.7948E-02	0.200E-01
Cs-137 A	2.7839E-02	3.5934E-02	3.5949E-02	0.328E-01
EU-152 F	1.1407E-01	9.2399E-02	9.2495E-02	0.688E-01
EU-154 F	7.5043E-02	6.6698E-02	6.6756E-02	0.599E-01
K-40 #	8.6566E+00	1.1476E+00	1.1916E+00	0.416E+00
PA-234 #F	1.4227E-01	1.0653E-01	1.0666E-01	0.466E-01
Pb-210 #F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212	3.6228E-01	8.6884E-02	8.7917E-02	0.584E-01
PB-214	3.1240E-01	1.2677E-01	1.2730E-01	0.693E-01
RA-226 A	1.9802E-01	8.8511E-01	8.8514E-01	0.773E+00
Th-230 #B	-1.8344E+01	-1.5402E+02	-1.5403E+02	0.237E+02
TH-234 A	5.7145E-01	2.0058E+00	2.0059E+00	0.168E+01
Tl-208 #C	9.0736E-02	3.3043E-02	3.3214E-02	0.369E-01
U-235 B	5.2203E-03	4.2264E-02	4.2264E-02	0.367E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.9 to 2675.6 keV) 1.0740554E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00693

ORTEC g v - i (3263) wan32 G53W2.06 04-AUG-2006 11:54:24 Page 1
New World Technology Spectrum name: 1N001775.An1

Sample description
IR07 Bkd 06NPBRAO-005 536g
4/26/06 12:00

Acquisition information
Start time: 02-May-2006 18:12:35
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity picoCi/ g	Time of Count Uncertainty Counting picoCi/ g	2 Sigma Total picoCi/ g	MDA picoCi/ g
Ac-228	5.1248E-01	1.9033E-01	1.9127E-01	0.324E-01
AM-241 #A	-1.0306E-01	-8.8776E-01	-8.8777E-01	0.146E+00
Bi-212 #	5.5007E-01	4.5627E-01	4.5673E-01	0.220E+00
BI-214 #F	6.7785E-01	2.1820E-01	2.1964E-01	0.165E+00
CO-60 #	3.1117E-02	3.6858E-02	3.6876E-02	0.301E-01
CS-137 #A	-4.9038E-02	-1.2360E-01	-1.2361E-01	0.419E-01
EU-152 C	1.7067E-01	9.8622E-02	9.8824E-02	0.532E-01
EU-154 #A	-2.5624E-02	9.6697E+01	9.6697E+01	0.366E-01
K-40	8.3079E+00	1.4852E+00	1.5168E+00	0.680E+00
Pa-234 #B	-9.1965E-02	-9.1965E-02	-9.2028E-02	0.777E-01
Pb-210 #A	4.0797E+00	6.5894E+00	6.5911E+00	0.471E+01
Pb-212 F	3.6176E-01	7.9025E-02	8.0155E-02	0.437E-01
Pb-214	4.1537E-01	1.2336E-01	1.2431E-01	0.509E-01
RA-226 A	2.9619E-01	7.5401E-01	7.5409E-01	0.647E+00
Th-230 #B	4.3692E+00	1.4466E+01	1.4467E+01	0.104E+02
Th-234 A	4.4079E-01	5.3839E-01	5.3864E-01	0.117E+01
Tl-208	1.9605E-01	5.9269E-02	5.9713E-02	0.186E-01
U-235 A	3.5350E-02	4.9029E-02	4.9046E-02	0.396E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2606.4 keV) 1.1052633E+01 picoCi/ g

Laboratory: New World Technology

ED_000855_00003297-00694

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 12:36:56 Page 1
New World Technology Spectrum name: 3N002317.An1

Sample description
IR07 Bkd 06NPBRAO-006 515g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 18:16:16
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	#B	9.1408E-02	6.6956E-02	6.7042E-02	0.162E+00
AM-241	#A	2.9375E-02	1.1726E-01	1.1726E-01	0.828E-01
Bi-212	F	4.7535E-01	2.8637E-01	2.8692E-01	0.182E+00
BI-214	F	2.6587E-01	1.0777E-01	1.0822E-01	0.875E-01
CO-60	#C	3.0235E-02	1.9768E-02	1.9800E-02	0.213E-01
Cs-137	#B	-1.3240E-02	-6.6242E-02	-6.6244E-02	0.361E-01
EU-152	B	2.9726E-02	7.3033E-02	7.3041E-02	0.632E-01
EU-154	B	4.0297E-02	3.9583E-02	3.9611E-02	0.468E-01
K-40		6.8823E+00	1.3707E+00	1.3943E+00	0.989E+00
PA-234	B	6.0253E-02	1.4061E-01	1.4063E-01	0.905E-01
Pb-210	#	8.8394E-01	1.0566E+00	1.0571E+00	0.769E+00
PB-212		3.3519E-01	8.0879E-02	8.1828E-02	0.550E-01
PB-214		3.2928E-01	1.3770E-01	1.3824E-01	0.849E-01
RA-226	A	5.6925E-01	7.1792E-01	7.1823E-01	0.609E+00
Th-230	B	-3.5254E+00	-6.3742E+00	-6.3755E+00	0.583E+01
TH-234		6.4779E-01	7.1868E-01	7.1908E-01	0.622E+00
Tl-208	#	1.8114E-01	8.4323E-02	8.4590E-02	0.652E-01
U-235	#B	8.7465E-03	1.3239E-02	1.3243E-02	0.359E-01

- All peaks for activity calculation had bad shape.
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A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.7 to 2660.5 keV) 1.0000830E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00695

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     ORTEC g v - i (3263) wan32  G53W2.03  04-AUG-2006 14:35:02 Page    1
New World Technology            Spectrum name: 2N002313.An1

Sample description
     IRO7 Bkd 06NPBRAO-007 513g
     04/26/2006 12:00

Acquisition information
       Start time:                 02-May-2006 18:57:00
       Live time:               2700
       Real time:               2704

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*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count   Uncertainty  2 Sigma
Nuclide    Activity        Counting     Total         MDA
              picoCi/g      picoCi/g      picoCi/g      picoCi/g

_____________________________________________________________________________
Ac-228       4.4365E-01   1.8746E-01    1.8818E-01  0.138E+00
AM-241  A    1.4677E-01   6.6710E-01    6.6712E-01  0.517E+00
Bi-212  F    4.7093E-01   2.9803E-01    2.9854E-01  0.196E+00
BI-214  F    4.2261E-01   1.3489E-01    1.3580E-01  0.705E-01
CO-60  #B   -1.7734E-02  -8.0138E-02   -8.0140E-02  0.202E-01
Cs-137       5.7073E-02   4.0049E-02    4.0105E-02  0.330E-01
EU-152  F    1.1781E-01   1.0195E-01    1.0204E-01  0.768E-01
EU-154  B    7.4141E-03   5.3970E-02    5.3970E-02  0.439E-01
K-40         1.0386E+01   1.2612E+00    1.3187E+00  0.425E+00
PA-234 #F    1.1627E-01   1.0047E-01    1.0056E-01  0.507E-01
Pb-210 #F    0.0000E+00   0.0000E+00    0.0000E+00  0.000E+00
PB-212  F    3.8071E-01   8.8816E-02    8.9931E-02  0.591E-01
PB-214       3.2301E-01   1.0194E-01    1.0264E-01  0.632E-01
RA-226       7.6702E-01   8.3893E-01    8.3942E-01  0.669E+00
Th-230  B   -2.8833E-01  -3.5260E-01   -3.5276E-01  0.222E+02
TH-234  A    7.5636E-01   7.5616E-01    7.5667E-01  0.231E+01
Tl-208 #F    8.3345E-02   2.4966E-02    2.5157E-02  0.504E-01
U-235   B    1.9884E-02   4.8965E-02    4.8971E-02  0.413E-01

  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
----------------------------   S U M M A R Y   ----------------------------
Total Activity (   41.9 to  2675.6 keV) 1.3251163E+01  picoCi/g


Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.06 04-AUG-2006 11:54:49 Page 1
New World Technology Spectrum name: 1N001776.An1

Sample description
IR07 Bkd 06NPBRAO-008 526g
4/26/06 12:00

Acquisition information
Start time: 02-May-2006 19:01:42
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity picoCi/ g	Uncertainty 2 Sigma Counting picoCi/ g	Total picoCi/ g	MDA picoCi/ g
Ac-228	6.5890E-01	2.2763E-01	2.2894E-01	0.590E-01
AM-241 #A	-1.3002E-01	-2.8486E+00	-2.8486E+00	0.175E+00
Bi-212 C	3.6901E-01	3.1549E-01	3.1579E-01	0.193E+00
BI-214 #F	1.1870E+00	9.6864E-01	9.6964E-01	0.433E+00
CO-60 #A	-3.0576E-02	8.1011E+01	8.1011E+01	0.307E-01
CS-137 #A	-7.8591E-02	-3.5509E-01	-3.5511E-01	0.404E-01
EU-152 C	6.9810E-02	7.2226E-02	7.2272E-02	0.479E-01
EU-154 A	-4.3534E-03	-1.5986E-02	-1.5987E-02	0.334E-01
K-40 #	5.3198E+00	1.2532E+00	1.2687E+00	0.693E+00
Pa-234 #B	-7.4070E-02	-9.2238E-02	-9.2279E-02	0.764E-01
Pb-210 #A	5.7841E-01	2.5583E+00	2.5584E+00	0.244E+01
Pb-212 F	4.0034E-01	7.7750E-02	7.9154E-02	0.382E-01
Pb-214	3.1431E-01	8.8359E-02	8.9124E-02	0.387E-01
RA-226	6.2066E-01	7.1466E-01	7.1503E-01	0.597E+00
Th-230 #B	1.4643E+00	1.3696E+01	1.3696E+01	0.102E+02
Th-234 B	3.6673E-02	4.6791E-02	4.6811E-02	0.128E+01
Tl-208 #	1.2339E-01	5.2188E-02	5.2388E-02	0.240E-01
U-235 A	2.1901E-02	3.1019E-02	3.1030E-02	0.439E-01

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2606.4 keV) 8.6243353E+00 picoCi/ g

Laboratory: New World Technology

ED_000855_00003297-00697

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 12:37:56 Page 1
New World Technology Spectrum name: 3N002318.An1

Sample description
IR07 Bkd 06NPBRAO-009 515g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 19:05:48
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	4.7651E-01	2.6363E-01	2.6422E-01	0.151E+00
AM-241 #B	-1.4447E-03	-8.3378E-02	-8.3378E-02	0.631E-01
Bi-212 F	7.0368E-01	3.2390E-01	3.2495E-01	0.192E+00
BI-214 F	2.9895E-01	1.2410E-01	1.2459E-01	0.829E-01
CO-60 #B	-4.4676E-03	-2.7073E-02	-2.7074E-02	0.201E-01
Cs-137 #B	-2.2651E-02	-1.1475E-01	-1.1475E-01	0.387E-01
EU-152 #B	-3.1827E-03	1.2799E+02	1.2799E+02	0.451E-01
EU-154 C	7.1672E-02	4.5094E-02	4.5172E-02	0.352E-01
K-40	8.8133E+00	1.3070E+00	1.3473E+00	0.827E+00
PA-234 #B	-1.0840E-02	-4.2571E-02	-4.2573E-02	0.834E-01
Pb-210 #A	2.6658E-01	9.8469E-01	9.8474E-01	0.768E+00
PB-212	3.2530E-01	8.5065E-02	8.5916E-02	0.572E-01
PB-214	3.9513E-01	1.3030E-01	1.3112E-01	0.834E-01
RA-226 A	2.3301E-01	7.2765E-01	7.2770E-01	0.633E+00
Th-230 B	-3.5679E+00	-6.6759E+00	-6.6772E+00	0.402E+01
TH-234 A	4.4252E-01	7.5588E-01	7.5605E-01	0.595E+00
Tl-208 #	1.0276E-01	5.2853E-02	5.2991E-02	0.652E-01
U-235 #B	2.2538E-02	2.7429E-02	2.7442E-02	0.378E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.5 keV) 1.1115637E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00698

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     ORTEC g v - i (3263) wan32  G53W2.03  04-AUG-2006 13:55:38 Page    1
New World Technology            Spectrum name: 2N002314.An1

Sample description
     IRO7 Bkd 06NPBRAO-010 412g
     04/26/2006 12:00

Acquisition information
       Start time:                 02-May-2006 19:46:42
       Live time:               2700
       Real time:               2704

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count   Uncertainty  2 Sigma
Nuclide    Activity        Counting     Total         MDA
              picoCi/g      picoCi/g      picoCi/g      picoCi/g

_____________________________________________________________________________
Ac-228       5.3322E-01   2.0168E-01    2.0265E-01  0.175E+00
AM-241 #B   -1.6534E-01  -9.8782E-01   -9.8784E-01  0.486E+00
Bi-212       3.7361E-01   2.9471E-01    2.9504E-01  0.199E+00
BI-214  F    6.1252E-01   1.6125E-01    1.6284E-01  0.826E-01
CO-60  #B   -2.1640E-02  -1.0171E-01   -1.0172E-01  0.250E-01
Cs-137 #B   -2.0453E-02  -5.5888E-02   -5.5893E-02  0.384E-01
EU-152  B    5.8091E-02   6.7335E-02    6.7369E-02  0.782E-01
EU-154  B    4.0242E-02   7.0101E-02    7.0117E-02  0.710E-01
K-40         1.0966E+01   1.4569E+00    1.5126E+00  0.529E+00
PA-234 #C    1.4667E-01   1.1291E-01    1.1304E-01  0.115E+00
Pb-210 #C    0.0000E+00   0.0000E+00    0.0000E+00  0.000E+00
PB-212       4.3119E-01   1.1414E-01    1.1526E-01  0.795E-01
PB-214       5.3304E-01   1.3127E-01    1.3275E-01  0.801E-01
RA-226  A    6.7102E-01   1.0879E+00    1.0882E+00  0.876E+00
Th-230 #B   -5.3438E+00  -5.4754E+00   -5.4789E+00  0.264E+02
TH-234 #A    1.2774E+00   1.9028E+00    1.9033E+00  0.254E+01
Tl-208       2.7268E-01   8.8468E-02    8.9044E-02  0.161E-01
U-235   B    2.4755E-02   6.4319E-02    6.4325E-02  0.541E-01

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  < - MDA value printed.
  A - Activity printed, but activity < MDA.
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  F - Failed fraction or key line test.
  H - Halflife limit exceeded
----------------------------   S U M M A R Y   ---------------------------
Total Activity (   41.9 to  2675.6 keV) 1.3722486E+01  picoCi/g


Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.06 04-AUG-2006 11:55:26 Page 1
New World Technology Spectrum name: 1N001777.An1

Sample description
IR07 Bkd 06NPBRAO-011 513g
4/26/06 12:00

Acquisition information
Start time: 02-May-2006 19:51:06
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity picoCi/ g	Uncertainty 2 Sigma Counting picoCi/ g	Total picoCi/ g	MDA picoCi/ g
Ac-228	6.2803E-01	1.7113E-01	1.7270E-01	0.605E-01
AM-241 #A	-8.5207E-02	-7.8846E-01	-7.8846E-01	0.198E+00
Bi-212	3.9393E-01	3.5895E-01	3.5924E-01	0.251E+00
BI-214 F	5.3859E-01	1.4143E-01	1.4283E-01	0.328E+00
CO-60 #A	-3.1350E-02	8.3064E+01	8.3064E+01	0.314E-01
CS-137 #A	-6.2368E-02	-1.5333E-01	-1.5335E-01	0.415E-01
EU-152 C	1.4040E-01	8.7556E-02	8.7710E-02	0.534E-01
EU-154 A	2.2165E-02	4.6608E-02	4.6615E-02	0.439E-01
K-40	8.9737E+00	1.5738E+00	1.6086E+00	0.710E+00
Pa-234 #B	1.4211E-02	1.6651E-02	1.6659E-02	0.116E+00
Pb-210 #	8.2658E+00	9.0500E+00	9.0552E+00	0.571E+01
Pb-212	5.0393E-01	9.3441E-02	9.5291E-02	0.497E-01
Pb-214	4.9550E-01	1.1632E-01	1.1777E-01	0.438E-01
RA-226	1.2284E+00	7.8781E-01	7.8912E-01	0.621E+00
Th-230 #F	1.7476E+01	1.8697E+01	1.8708E+01	0.122E+02
Th-234 B	-2.0446E-01	-3.4606E-01	-3.4614E-01	0.128E+01
Tl-208	1.7895E-01	6.1673E-02	6.2029E-02	0.246E-01
U-235 B	3.2488E-02	2.9038E-02	2.9062E-02	0.455E-01

- All peaks for activity calculation had bad shape.
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& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2606.4 keV) 3.8683277E+01 picoCi/ g

Laboratory: New World Technology

ED_000855_00003297-00700

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 13:58:51 Page 1
New World Technology Spectrum name: 3N002319.An1

Sample description
IR07 Bkd 06NPBRAO-012 522g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 19:55:15
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		3.3862E-01	1.7367E-01	1.7412E-01	0.149E+00
AM-241	#B	-2.8506E-02	-2.0585E-01	-2.0585E-01	0.371E-01
Bi-212	#	4.1502E-01	2.0982E-01	2.1039E-01	0.954E-01
BI-214	F	2.5223E-01	1.1902E-01	1.1939E-01	0.863E-01
CO-60	#F	2.6300E-02	2.0232E-02	2.0256E-02	0.184E-01
Cs-137	#B	-2.4138E-04	-4.5441E-02	-4.5441E-02	0.409E-01
EU-152	F	1.3923E-01	1.3460E-01	1.3470E-01	0.590E-01
EU-154	B	3.9110E-02	5.3786E-02	5.3805E-02	0.433E-01
K-40		8.5036E+00	1.3643E+00	1.4003E+00	0.905E+00
PA-234	#B	2.0750E-03	1.2760E-01	1.2760E-01	0.927E-01
Pb-210	#B	-4.6142E-02	-8.9763E-01	-8.9763E-01	0.715E+00
PB-212		3.4760E-01	8.4452E-02	8.5429E-02	0.580E-01
PB-214	F	3.5861E-01	1.2667E-01	1.2737E-01	0.923E-01
RA-226	A	5.4760E-01	7.0779E-01	7.0808E-01	0.570E+00
Th-230	B	-2.2896E+00	-6.9016E+00	-6.9021E+00	0.592E+01
TH-234	C	6.4211E-01	6.8454E-01	6.8495E-01	0.555E+00
Tl-208		1.2217E-01	5.0516E-02	5.0719E-02	0.643E-01
U-235	#F	4.1834E-02	4.3314E-02	4.3342E-02	0.397E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.7 to 2660.5 keV) 1.0337836E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00701

ORTEC g v - i (3263) wan32 G53W2.06 04-AUG-2006 11:55:54 Page 1
New World Technology Spectrum name: 1N001778.An1

Sample description
IR07 Bkd 06NPBRAO-013 486g
4/26/06 12:00

Acquisition information
Start time: 02-May-2006 20:46:53
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity picoCi/ g	Time of Count Uncertainty Counting picoCi/ g	2 Sigma Total picoCi/ g	MDA picoCi/ g
Ac-228	5.5441E-01	1.6681E-01	1.6807E-01	0.357E-01
AM-241 #A	-8.7358E-02	-5.0808E-01	-5.0809E-01	0.146E+00
Bi-212 B	-9.1788E-02	7.1120E+02	7.1120E+02	0.269E+00
BI-214 F	4.3822E-01	1.5332E-01	1.5418E-01	0.316E+00
CO-60 #A	-3.3092E-02	8.7679E+01	8.7679E+01	0.332E-01
CS-137 #A	-7.2050E-02	-3.7401E-01	-3.7402E-01	0.488E-01
EU-152 C	6.7663E-02	7.0021E-02	7.0066E-02	0.671E-01
EU-154 #A	-3.7234E-03	-6.0466E-02	-6.0466E-02	0.406E-01
K-40	7.1815E+00	1.4807E+00	1.5044E+00	0.750E+00
Pa-234 #B	-6.9464E-02	-6.9464E-02	-6.9511E-02	0.991E-01
Pb-210 #B	-1.5650E-01	-1.0531E+00	-1.0531E+00	0.264E+01
Pb-212	3.8615E-01	8.9900E-02	9.1032E-02	0.489E-01
Pb-214	5.0739E-01	1.2504E-01	1.2645E-01	0.434E-01
RA-226 A	6.0437E-01	8.8059E-01	8.8088E-01	0.737E+00
Th-230 #B	8.9189E+00	1.3580E+01	1.3584E+01	0.957E+01
Th-234 #B	7.3124E-02	1.1896E-01	1.1899E-01	0.125E+01
Tl-208 #	1.7095E-01	6.1875E-02	6.2199E-02	0.252E-01
U-235 F	6.1989E-02	3.4555E-02	3.4632E-02	0.465E-01

- All peaks for activity calculation had bad shape.
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& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2606.4 keV) 8.8004379E+00 picoCi/ g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 12:25:40 Page 1
New World Technology Spectrum name: 2N002315.An1

Sample description
IRO7 Bkd 06NPBRAO-014 508g
04/26/2006 12:00

Acquisition information
Start time: 02-May-2006 20:50:11
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		3.6061E-01	1.4020E-01	1.4084E-01	0.118E+00
AM-241	#B	-2.8466E-01	-1.8170E+00	-1.8170E+00	0.407E+00
Bi-212	F	4.3424E-01	3.0658E-01	3.0700E-01	0.209E+00
BI-214	F	4.7121E-01	1.3861E-01	1.3971E-01	0.745E-01
CO-60	#B	1.2894E-02	2.1490E-02	2.1495E-02	0.194E-01
Cs-137	A	1.7412E-03	4.1434E-02	4.1434E-02	0.397E-01
EU-152	F	6.8764E-02	7.5378E-02	7.5421E-02	0.664E-01
EU-154	A	2.7903E-02	3.7717E-02	3.7731E-02	0.468E-01
K-40		1.0315E+01	1.3201E+00	1.3744E+00	0.466E+00
PA-234	B	7.3089E-03	1.3186E-01	1.3186E-01	0.110E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212		3.4314E-01	8.8457E-02	8.9368E-02	0.608E-01
PB-214		4.2537E-01	1.2076E-01	1.2179E-01	0.697E-01
RA-226	A	3.9971E-01	9.3793E-01	9.3805E-01	0.807E+00
Th-230	B	-2.0742E+01	-6.7709E+01	-6.7713E+01	0.218E+02
TH-234		2.6525E+00	3.4471E+00	3.4485E+00	0.240E+01
Tl-208		2.6887E-01	7.7617E-02	7.8255E-02	0.131E-01
U-235	#B	-1.6527E-02	-1.5794E-01	-1.5794E-01	0.516E-01

- All peaks for activity calculation had bad shape.
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A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

--- S U M M A R Y ---

Total Activity (41.9 to 2675.6 keV) 1.5270709E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00703

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 14:30:15 Page 1
New World Technology Spectrum name: 3N002320.An1

Sample description
IR07 Bkd 06NPBRAO-015 487g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 20:53:08
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228	F	5.2821E-01	1.7973E-01	1.8079E-01	0.150E+00
AM-241	#B	-1.3240E-02	-1.3366E-01	-1.3366E-01	0.611E-01
Bi-212	F	6.8528E-01	3.5117E-01	3.5209E-01	0.173E+00
BI-214	F	4.5851E-01	1.6567E-01	1.6654E-01	0.902E-01
CO-60	#A	1.6717E-02	2.2985E-02	2.2993E-02	0.197E-01
Cs-137	#B	-3.5110E-02	-2.5094E-01	-2.5095E-01	0.415E-01
EU-152	F	1.4043E-01	9.1458E-02	9.1606E-02	0.493E-01
EU-154	#B	-2.1020E-02	1.0130E+02	1.0130E+02	0.369E-01
K-40		1.0541E+01	1.5231E+00	1.5725E+00	0.899E+00
PA-234	B	2.8840E-02	1.3265E-01	1.3266E-01	0.100E+00
Pb-210	A	2.9168E-01	8.5836E-01	8.5843E-01	0.771E+00
PB-212		3.8152E-01	9.0132E-02	9.1235E-02	0.597E-01
PB-214		4.4211E-01	1.3751E-01	1.3848E-01	0.923E-01
RA-226	A	4.4179E-01	7.2857E-01	7.2876E-01	0.594E+00
Th-230	#B	-7.7607E+00	1.6308E+04	1.6308E+04	0.617E+01
TH-234	#	9.4509E-01	7.5332E-01	7.5413E-01	0.658E+00
Tl-208	#B	-8.4346E-02	-6.1003E-02	-6.1083E-02	0.743E-01
U-235	#B	-3.2264E-03	-5.1053E-02	-5.1053E-02	0.379E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.7 to 2660.5 keV) 1.4122178E+01 picoCi/g

Laboratory: New World Technology

```
     ORTEC g v - i (3263) wan32  G53W2.06  04-AUG-2006 11:56:29 Page    1
 New World Technology            Spectrum name: 1N001779.An1

 Sample description
      IR07 Bkd 06NPBRAO-016 469g
      4/26/06 12:00

 Acquisition information
        Start time:                 02-May-2006 21:36:46
        Live time:               2700
        Real time:               2703

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total         MDA
                picoCi/ g     picoCi/ g     picoCi/ g     picoCi/ g

 ____________________________________________________________________________
 Ac-228       6.1960E-01   1.8824E-01    1.8964E-01  0.662E-01
 AM-241 #A   -1.8135E-02  -2.7637E-01   -2.7637E-01  0.195E+00
 Bi-212  B   -6.1238E-02  -1.0768E+00   -1.0768E+00  0.225E+00
 BI-214  F    1.6050E+00   5.9844E-01    6.0139E-01  0.189E+00
 CO-60  #A   -3.4292E-02   9.0857E+01    9.0857E+01  0.344E-01
 CS-137 #A   -5.9428E-02  -1.2423E-01   -1.2425E-01  0.453E-01
 EU-152 #A   -5.5603E-02   1.5428E+02    1.5428E+02  0.584E-01
 EU-154  A    4.5298E-03   3.0741E-02    3.0741E-02  0.338E-01
 K-40         9.1740E+00   1.6729E+00    1.7072E+00  0.777E+00
 Pa-234 #B   -4.0574E-02  -4.0574E-02   -4.0601E-02  0.993E-01
 Pb-210 #A    1.5407E+00   2.9416E+00    2.9422E+00  0.253E+01
 Pb-212       5.0049E-01   1.0075E-01    1.0244E-01  0.562E-01
 Pb-214       5.5631E-01   1.5699E-01    1.5834E-01  0.597E-01
 RA-226  A    2.2407E-01   9.0121E-01    9.0125E-01  0.777E+00
 Th-230 #B    3.4974E+00   1.8103E+01    1.8103E+01  0.126E+02
 Th-234  B    1.2311E-02   1.6932E-02    1.6938E-02  0.141E+01
 Tl-208 #     2.2585E-01   7.0434E-02    7.0930E-02  0.251E-01
 U-235   A    2.2682E-02   5.5880E-02    5.5886E-02  0.410E-01

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   41.2 to  2606.4 keV) 1.2681245E+01  picoCi/ g

Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 14:37:30 Page 1
New World Technology Spectrum name: 2N002316.An1

Sample description
IRO7 Bkd 06NPBRAO-017 529g
04/26/2006 12:00

Acquisition information
Start time: 02-May-2006 21:40:27
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		3.7070E-01	1.2479E-01	1.2555E-01	0.126E+00
AM-241	#B	-3.2349E-01	-3.5656E+00	-3.5656E+00	0.445E+00
Bi-212	F	5.0595E-01	2.8277E-01	2.8339E-01	0.176E+00
BI-214	F	4.2091E-01	1.1492E-01	1.1597E-01	0.602E-01
CO-60	#B	-1.6166E-02	-1.3346E-01	-1.3346E-01	0.207E-01
Cs-137	A	1.1673E-02	3.1675E-02	3.1678E-02	0.314E-01
EU-152	B	4.5847E-02	4.3100E-02	4.3133E-02	0.611E-01
EU-154	B	3.3573E-03	4.1153E-02	4.1154E-02	0.460E-01
K-40	#	6.8054E+00	1.0253E+00	1.0559E+00	0.412E+00
PA-234	#F	9.7789E-02	9.2506E-02	9.2577E-02	0.929E-01
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
PB-212		3.4400E-01	8.8682E-02	8.9595E-02	0.613E-01
PB-214		3.5327E-01	1.2389E-01	1.2458E-01	0.706E-01
RA-226		7.8814E-01	8.3486E-01	8.3537E-01	0.665E+00
Th-230	#B	-2.6338E+01	5.5439E+04	5.5439E+04	0.210E+02
TH-234	#	3.1246E+00	3.7171E+00	3.7189E+00	0.245E+01
Tl-208	F	7.4291E-02	4.1646E-02	4.1737E-02	0.526E-01
U-235	B	-2.7127E-03	-1.2681E-02	-1.2682E-02	0.384E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.9 to 2675.6 keV) 1.2712976E+01 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00706

ORTEC g v - i (3263) wan32 G53W2.03 04-AUG-2006 14:00:06 Page 1
New World Technology Spectrum name: 3N002321.An1

Sample description
IR07 Bkd 06NPBRAO-018 478g
4/26/2006 12:00

Acquisition information
Start time: 02-May-2006 21:45:02
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity picoCi/g	Time of Count Uncertainty Counting picoCi/g	2 Sigma Total picoCi/g	MDA picoCi/g
Ac-228		3.0073E-01	1.6662E-01	1.6699E-01	0.155E+00
AM-241	#A	1.6343E-02	9.5845E-02	9.5846E-02	0.725E-01
Bi-212		8.2722E-01	4.7085E-01	4.7184E-01	0.227E+00
BI-214		4.1628E-01	1.4274E-01	1.4357E-01	0.896E-01
CO-60	#B	5.9242E-03	1.9592E-02	1.9594E-02	0.200E-01
Cs-137	A	2.0976E-02	3.6307E-02	3.6315E-02	0.332E-01
EU-152	B	-3.4290E-03	1.5177E+02	1.5177E+02	0.518E-01
EU-154	#B	2.2875E-02	6.1051E-02	6.1057E-02	0.446E-01
K-40		7.0296E+00	1.2728E+00	1.2992E+00	0.891E+00
PA-234	F	1.3216E-01	1.2710E-01	1.2720E-01	0.104E+00
Pb-210	A	7.0545E-02	1.0627E+00	1.0627E+00	0.835E+00
PB-212		3.5561E-01	9.4438E-02	9.5354E-02	0.639E-01
PB-214		2.8243E-01	1.6214E-01	1.6248E-01	0.977E-01
RA-226	A	4.8164E-01	7.1454E-01	7.1477E-01	0.580E+00
Th-230	#B	2.9151E+00	6.2348E+00	6.2357E+00	0.761E+01
TH-234	B	-1.6297E-01	-3.8513E-01	-3.8518E-01	0.536E+00
Tl-208	B	8.4747E-03	3.9469E-03	3.9594E-03	0.895E-01
U-235	#B	-1.3597E-02	-1.0120E-01	-1.0120E-01	0.433E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.7 to 2660.5 keV) 9.2118893E+00 picoCi/g

Laboratory: New World Technology

ED_000855_00003297-00707

STRONTIUM-90 ANALYSIS REPORT

Count Date:	7/24/2006	Instrument ID:	Protean WPC 9550	Count Time:	30 min
Batch ID:	NWTLAB072406-008	Detector ID:	0615608	Y-90 Efficiency:	47.6%
Performed By:	P Smith	Cal Due Date:	5/24/2007	Sr-90 Efficiency:	39.8%
				Sr-90 Added:	10 mg

Sample ID	Date Time Collected HH:MM:SS	Y-90 Date Time Start HH:MM:SS	Date Time Count HH:MM	Aliquot Mass grams	Initial Mass grams	Final Mass grams	Sr-90 Yield percent	Total CPM	Total Counts	Sr-90 Activity pCi/g	MDC pCi/g	2 Sigma Uncertainty pCi/g
06NPBRA0-006	4/26/06 12:00	7/24/06 1:38	7/24/06 13:22	10	9.2795	9.2890	93.0%	0.433	13	-0.123	0.194	0.171
06NPBRAO-005	4/26/06 14:00	7/24/06 1:38	7/24/06 14:23	10	9.2107	9.2202	93.0%	0.367	11	-0.204	0.194	0.220
Method Spike 1.0	7/22/06 0:00	7/24/06 1:38	7/24/06 12:52	10	9.1080	9.1175	93.0%	1.367	41	1.024	0.194	0.493
Blank	7/22/06 0:00	7/24/06 1:38	7/24/06 12:21	10	9.3800	9.3802		0.533	16			

ATTACHMENT 3

RADIUM-226 STANDARD SAMPLE RESULTS

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ED_000855_00003297-00710

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

76617-589

Ra-226 400 Grams Soil in 250 mL HDPE PTI Jar

Customer: New World Technology
P.O. No.: Dougherty 1-10-08, Item 1

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

Analytics maintains traceability to the National Institute of Standards and Technology through participation in a Measurements Assurance Program as described in USNRC Reg. Guide 4.15, Revision 1, February 1979.

ISOTOPE:	Ra-226
ACTIVITY (Bq):	4.434 E2
HALF-LIFE:	1.600 E3 years
CALIBRATION DATE:	February 11, 2008 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	3.3%

Comments:

Impurities: γ-impurities <0.1%
258.0 mL of sieved griffin soil.

Source Prepared By: N. E. Kiesman
N. E. Kiesman, Radiochemist

QA Approved: D. M. Montgomery, QA Manager Date: 2-12-08

End of Certificate

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 08:26:31
New World Technology Spectrum name: An12B7.An1

Sample description
Det 1 Ra 226 Calib Chk
2/18/08 07:38

Acquisition information
Start time: 18-Feb-2008 07:39:40
Live time: 2700
Real time: 2706

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (Counting) 2 Sigma pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.2244E+00	4.8335E-01	4.8548E-01	0.220E+00
AM-241	#A	-1.5473E-01	-2.4608E+00	-2.4608E+00	0.135E+01
Bi-212	F	8.5048E-01	6.3592E-01	6.3670E-01	0.468E+00
BI-214		1.8721E+01	7.1868E-01	9.9925E-01	0.158E+00
CO-60	#B	-4.5674E-03	-5.7873E-02	-5.7873E-02	0.208E-01
CS-137		1.2591E-01	8.8554E-02	8.8677E-02	0.695E-01
EU-152	C	3.2093E-01	2.0553E-01	2.0587E-01	0.205E+00
EU-154	#A	-4.8029E-03	3.6015E+02	3.6015E+02	0.155E+00
K-40		8.2065E+00	1.6561E+00	1.6839E+00	0.731E+00
Pa-234	F	4.5045E-01	4.0258E-01	4.0292E-01	0.322E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	3.5933E-01	1.9293E-01	1.9339E-01	0.154E+00
Pb-214		1.9317E+01	6.7548E-01	9.8463E-01	0.198E+00
RA-226		3.0689E+01	3.3478E+00	3.5360E+00	0.217E+01
Th-230	#B	2.1256E+01	8.3527E+01	8.3530E+01	0.632E+02
Th-234	B	-4.1112E+00	-8.7013E+00	-8.7026E+00	0.576E+01
Tl-208		2.6016E-01	8.9196E-02	8.9717E-02	0.173E-01
U-235	#B	-1.1060E+00	-6.6924E+00	-6.6925E+00	0.221E+00

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 8.0204834E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 09:16:35
New World Technology Spectrum name: An1277.An1

Sample description
Det 2 Ra 226 Calib Chk
2/18/08 08:28

Acquisition information
Start time: 18-Feb-2008 08:29:00
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	8.9816E-01	3.2860E-01	3.3029E-01	0.231E+00
AM-241	#B	-2.0290E-03	-2.0075E-01	-2.0075E-01	0.157E+00
Bi-212	F	1.0626E+00	8.1373E-01	8.1468E-01	0.464E+00
BI-214		1.8988E+01	6.7375E-01	9.7507E-01	0.132E+00
CO-60	#B	-7.1375E-02	-2.9761E-01	-2.9763E-01	0.460E-01
CS-137		1.1577E-01	7.8852E-02	7.8969E-02	0.617E-01
EU-152	F	7.8359E-01	1.9063E-01	1.9284E-01	0.168E+00
EU-154	F	2.1243E-01	1.5409E-01	1.5429E-01	0.122E+00
K-40		4.0252E+00	1.8591E+00	1.8651E+00	0.931E+00
Pa-234	F	3.2315E-01	2.4603E-01	2.4632E-01	0.182E+00
Pb-210		2.6561E+00	1.6345E+00	1.6375E+00	0.129E+01
Pb-212	F	6.0675E-01	1.6870E-01	1.7020E-01	0.125E+00
Pb-214		1.8490E+01	6.0425E-01	9.1445E-01	0.161E+00
RA-226		3.0127E+01	2.7354E+00	2.9552E+00	0.168E+01
Th-230	#B	5.4986E+00	1.7363E+01	1.7364E+01	0.139E+02
Th-234	B	1.4707E+00	2.2615E+00	2.2621E+00	0.157E+01
Tl-208	F	1.8519E-01	1.2758E-01	1.2777E-01	0.723E-01
U-235	B	-1.0847E-02	-2.3291E-02	-2.3295E-02	0.156E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
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< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 7.6091515E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 10:06:23
New World Technology Spectrum name: An124D.An1

Sample description
Det 3 Ra 226 Calib Chk
2/18/08 09:19

Acquisition information
Start time: 18-Feb-2008 09:20:28
Live time: 2700
Real time: 2707

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	7.5461E-01	3.4548E-01	3.4661E-01	0.249E+00
AM-241	#B	-5.1847E-02	4.3491E+02	4.3491E+02	0.188E+00
Bi-212	#F	1.0879E+00	5.1651E-01	5.1809E-01	0.537E+00
BI-214		1.7623E+01	6.6453E-01	9.3225E-01	0.144E+00
CO-60	#B	-6.5762E-02	-2.9198E-01	-2.9199E-01	0.522E-01
CS-137		8.6993E-02	8.4868E-02	8.4929E-02	0.686E-01
EU-152	F	6.3519E-01	1.6594E-01	1.6761E-01	0.188E+00
EU-154	F	2.9588E-01	2.3065E-01	2.3091E-01	0.129E+00
K-40		5.1851E+00	1.5916E+00	1.6032E+00	0.781E+00
Pa-234	F	4.9680E-01	2.9744E-01	2.9801E-01	0.120E+00
Pb-210	F	1.9590E+00	2.8550E+00	2.8559E+00	0.183E+01
Pb-212	F	5.6534E-01	1.8556E-01	1.8674E-01	0.144E+00
PB-214		1.8398E+01	6.4715E-01	9.4061E-01	0.192E+00
RA-226		3.0234E+01	3.0098E+00	3.2120E+00	0.195E+01
Th-230	#B	8.8511E+00	2.2840E+01	2.2843E+01	0.159E+02
Th-234	B	7.1857E-01	1.7635E+00	1.7637E+00	0.145E+01
Tl-208	F	1.9651E-01	6.0610E-02	6.1046E-02	0.183E-01
U-235	F	2.0750E-01	2.7819E-01	2.7830E-01	0.168E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.5 to 2705.0 keV) 7.3339516E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 10:54:48
New World Technology Spectrum name: An1283.An1

Sample description
Det 4 Ra 226 Calib Chk
2/18/08 10:06

Acquisition information
Start time: 18-Feb-2008 10:06:56
Live time: 2700
Real time: 2710

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	9.3342E-01	4.6565E-01	4.6693E-01	0.241E+00
AM-241	A	1.2167E-01	2.8771E-01	2.8775E-01	0.236E+00
Bi-212	B	-1.1509E-01	-2.5586E-01	-2.5589E-01	0.572E+00
BI-214		1.8986E+01	6.6732E-01	9.6963E-01	0.143E+00
CO-60	#B	3.4532E-02	3.7423E-02	3.7445E-02	0.400E-01
CS-137		1.0709E-01	8.8520E-02	8.8609E-02	0.705E-01
EU-152	F	5.5069E-01	1.5642E-01	1.5774E-01	0.157E+00
EU-154	#F	1.8674E-01	1.8012E-01	1.8025E-01	0.141E+00
K-40		6.3025E+00	1.6018E+00	1.6188E+00	0.804E+00
Pa-234	B	1.9402E-01	2.5450E-01	2.5460E-01	0.220E+00
Pb-210	#	3.9515E+00	3.0530E+00	3.0565E+00	0.197E+01
Pb-212	F	5.3379E-01	1.9571E-01	1.9671E-01	0.151E+00
PB-214		1.8832E+01	5.8653E-01	9.1154E-01	0.175E+00
RA-226		3.0047E+01	3.0502E+00	3.2470E+00	0.200E+01
Th-230	#B	-1.4425E+01	3.8824E+04	3.8824E+04	0.168E+02
Th-234		2.4732E+00	1.7050E+00	1.7075E+00	0.191E+01
Tl-208	F	2.8580E-01	9.2194E-02	9.2800E-02	0.363E-01
U-235	#B	-7.1591E-01	-1.6873E+00	-1.6875E+00	0.196E+00

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 8.2452942E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 19-FEB-2008 09:41:20
New World Technology Spectrum name: An12A2.An1

Sample description
Det 5 Ra 226 Calib Chk
2/18/08 10:56

Acquisition information
Start time: 18-Feb-2008 10:57:30
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#F	4.2526E-01	5.1716E-01	5.1740E-01	0.300E+00
AM-241	#B	-3.5060E-02	-4.4967E-01	-4.4967E-01	0.229E+00
Bi-212	B	4.4649E-01	5.8617E-01	5.8640E-01	0.454E+00
BI-214		1.9352E+01	7.1695E-01	1.0153E+00	0.153E+00
CO-60	F	8.5463E-02	8.9779E-02	8.9835E-02	0.675E-01
CS-137		1.4524E-01	1.0066E-01	1.0081E-01	0.752E-01
EU-152	F	5.1101E-01	2.9215E-01	2.9276E-01	0.164E+00
EU-154	F	3.2323E-01	3.0177E-01	3.0201E-01	0.132E+00
K-40		6.3593E+00	1.6239E+00	1.6410E+00	0.805E+00
Pa-234	#B	-1.9362E-02	4.8470E+02	4.8470E+02	0.209E+00
Pb-210		3.0846E+00	2.0605E+00	2.0637E+00	0.166E+01
Pb-212	F	3.4737E-01	1.8695E-01	1.8739E-01	0.151E+00
PB-214		1.9341E+01	6.4170E-01	9.6330E-01	0.202E+00
RA-226		3.0179E+01	2.9180E+00	3.1260E+00	0.185E+01
Th-230	#B	-1.8802E+00	-3.2827E+01	-3.2827E+01	0.185E+02
Th-234	B	7.3716E-01	2.2187E+00	2.2189E+00	0.184E+01
Tl-208		2.4314E-01	8.6012E-02	8.6485E-02	0.706E-01
U-235	#B	-8.1788E-01	-6.9925E+00	-6.9925E+00	0.191E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 7.9562843E+01 pCi/g

Laboratory: New World Technology

ED_000855_00003297-00716

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 12:42:58
New World Technology Spectrum name: An14F.An1

Sample description
Det 6 Ra 226 Calib Chk
2/18/08 11:48

Acquisition information
Start time: 18-Feb-2008 11:48:58
Live time: 2700
Real time: 2708

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	5.4571E-01	3.3566E-01	3.3627E-01	0.284E+00
AM-241	#A	4.5395E-02	2.1711E-01	2.1711E-01	0.168E+00
Bi-212	F	6.1281E-01	2.6745E-01	2.6842E-01	0.549E+00
BI-214		1.9243E+01	7.0871E-01	1.0061E+00	0.183E+00
CO-60	F	1.4021E-01	6.8033E-02	6.8232E-02	0.466E-01
CS-137		1.0529E-01	8.5911E-02	8.6000E-02	0.683E-01
EU-152	F	2.8612E-01	2.1295E-01	2.1321E-01	0.167E+00
EU-154	F	1.3060E-01	1.9912E-01	1.9918E-01	0.113E+00
K-40		6.3859E+00	1.4728E+00	1.4918E+00	0.993E+00
Pa-234	F	2.6981E-01	3.5671E-01	3.5685E-01	0.192E+00
Pb-210		3.2602E+00	2.2707E+00	2.2739E+00	0.156E+01
Pb-212	F	5.5275E-01	1.8716E-01	1.8829E-01	0.146E+00
PB-214		2.0193E+01	6.8207E-01	1.0133E+00	0.215E+00
RA-226		3.0890E+01	2.8477E+00	3.0698E+00	0.181E+01
Th-230	#B	-1.1441E+01	-4.7694E+01	-4.7696E+01	0.195E+02
Th-234	#B	-5.2962E-01	-3.0401E+00	-3.0402E+00	0.154E+01
Tl-208	F	1.5462E-01	1.2649E-01	1.2662E-01	0.810E-01
U-235	B	-3.3070E-01	-8.3514E-01	-8.3523E-01	0.175E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2611.8 keV) 8.0783569E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 18-FEB-2008 15:35:25
New World Technology Spectrum name: An12B4.An1

Sample description
Det 7 Ra 226 Calib Chk
2/18/08 14:45

Acquisition information
Start time: 18-Feb-2008 14:46:20
Live time: 2700
Real time: 2705

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228	F	1.1792E+00	5.7853E-01	5.8018E-01	0.238E+00
AM-241		3.1789E-01	2.6226E-01	2.6252E-01	0.212E+00
BI-212	F	5.4886E-01	6.5731E-01	6.5763E-01	0.521E+00
BI-214		1.8503E+01	6.3892E-01	9.3864E-01	0.173E+00
CO-60	#F	1.2013E-01	7.7855E-02	7.7983E-02	0.389E-01
CS-137		1.5385E-01	8.0273E-02	8.0477E-02	0.565E-01
EU-152	F	5.6278E-01	1.3613E-01	1.3773E-01	0.173E+00
EU-154	F	2.0314E-01	2.6382E-01	2.6393E-01	0.122E+00
K-40		7.2637E+00	1.7782E+00	1.7986E+00	0.837E+00
PA-234	B	1.4471E-01	1.6453E-01	1.6462E-01	0.148E+00
PB-210		2.5984E+00	2.2607E+00	2.2627E+00	0.185E+01
PB-212	F	6.4204E-01	1.7076E-01	1.7242E-01	0.127E+00
PB-214		1.8922E+01	5.7987E-01	9.1145E-01	0.172E+00
RA-226		3.0781E+01	2.7977E+00	3.0225E+00	0.177E+01
Th-230	#B	9.5970E+00	2.9961E+01	2.9963E+01	0.200E+02
TH-234	#B	-8.8792E-01	-4.0304E+00	-4.0305E+00	0.169E+01
TL-208	F	2.7458E-01	9.1254E-02	9.1823E-02	0.284E-01
U-235	#B	-7.8848E-01	-1.0807E+01	-1.0807E+01	0.181E+00

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2669.1 keV) 8.0756523E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 04-APR-2008 10:01:10
New World Technology Spectrum name: An11F2.An1

Sample description
Ra 226 70-B939INV-001 400g
4/4/08 06:55

Acquisition information
Start time: 04-Apr-2008 07:55:05
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
AC-228	F	1.0891E+00	5.4303E-01	5.4453E-01	0.260E+00
AM-241	#F	2.5025E-01	3.5205E-01	3.5218E-01	0.228E+00
BI-212	B	3.2912E-01	6.2609E-01	6.2621E-01	0.532E+00
BI-214		1.9357E+01	6.3995E-01	9.6153E-01	0.125E+00
CO-60	#B	-5.4076E-03	-9.2151E-02	-9.2151E-02	0.752E-01
CS-137		1.2940E-01	9.1499E-02	9.1624E-02	0.691E-01
EU-152	B	1.6513E-01	2.0499E-01	2.0509E-01	0.167E+00
EU-154	F	4.5393E-01	2.4604E-01	2.4662E-01	0.129E+00
K-40		7.1372E+00	1.4179E+00	1.4424E+00	0.850E+00
PA-234	#F	5.7169E-01	4.1252E-01	4.1306E-01	0.145E+00
PB-210		4.4062E+00	2.2571E+00	2.2630E+00	0.179E+01
PB-212	F	5.6913E-01	1.5753E-01	1.5894E-01	0.117E+00
PB-214		1.9701E+01	5.8063E-01	9.3308E-01	0.171E+00
RA-226		3.0420E+01	2.8713E+00	3.0849E+00	0.191E+01
Th-230	#B	-1.2828E+01	-8.2828E+01	-8.2829E+01	0.141E+02
TH-234	#B	1.2549E+00	2.0150E+00	2.0156E+00	0.148E+01
TL-208	F	1.9962E-01	1.2607E-01	1.2629E-01	0.424E-01
U-235	#B	-6.7546E-01	-2.4392E+00	-2.4393E+00	0.176E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.9 to 2667.7 keV) 8.2809357E+01 pCi/g

Laboratory: New World Technology

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     ORTEC g v - i (3263) wan32  G53W2.06  04-APR-2008 09:46:20
 New World Technology            Spectrum name: An1386.An1

 Sample description
      Ra 226 70-B939INV-001 400g
      4/4/08 08:56

 Acquisition information
        Start time:                 04-Apr-2008 08:56:55
        Live time:                2700
        Real time:                2706

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 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total          MDA
               pCi/g          pCi/g        pCi/g          pCi/g

 ____________________________________________________________________________
 Ac-228   F    4.0229E-01   2.9553E-01    2.9591E-01  0.269E+00
 AM-241   A    2.0126E-01   2.5766E-01    2.5777E-01  0.210E+00
 Bi-212 #B     1.8051E-02   3.7724E-02    3.7730E-02  0.474E+00
 BI-214   F    1.9665E+01   6.8388E-01    1.0000E+00  0.158E+00
 CO-60    F    5.6954E-02   5.8464E-02    5.8502E-02  0.536E-01
 CS-137        1.8590E-01   9.3275E-02    9.3530E-02  0.679E-01
 EU-152   F    1.5509E-01   1.9180E-01    1.9189E-01  0.149E+00
 EU-154   B    1.2944E-01   1.8854E-01    1.8860E-01  0.135E+00
 K-40          6.3751E+00   1.9414E+00    1.9557E+00  0.897E+00
 Pa-234 #B     1.1926E-01   2.4398E-01    2.4402E-01  0.163E+00
 Pb-210        5.6272E+00   2.6597E+00    2.6679E+00  0.169E+01
 Pb-212        4.3438E-01   1.7609E-01    1.7682E-01  0.139E+00
 PB-214        1.9534E+01   5.7103E-01    9.2274E-01  0.175E+00
 RA-226        3.0673E+01   2.8049E+00    3.0270E+00  0.179E+01
 Th-230 #B    -2.7441E+01   3.0512E+04    3.0512E+04  0.132E+02
 Th-234   B     6.6071E-01   1.9310E+00    1.9312E+00  0.161E+01
 Tl-208   F     1.6423E-01   1.2583E-01    1.2597E-01  0.687E-01
 U-235    B    -2.8218E-01  -4.7552E-01   -4.7564E-01  0.176E+00

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   41.1 to  2612.4 keV) 8.2658691E+01  pCi/g

Laboratory:  New World Technology
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ORTEC g v - i (3263) wan32 G53W2.06 04-APR-2008 13:57:56 Page 1
New World Technology Spectrum name: An1589.An1

Sample description
Ra 226 70-B939INV-001 400g
4/4/08 12:59

Acquisition information
Start time: 04-Apr-2008 13:02:39
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.2990E+00	3.7752E-01	3.8058E-01	0.142E+00
AM-241 #	6.2493E+00	4.0000E+00	4.0066E+00	0.137E+01
Bi-212 F	1.1468E+00	6.0529E-01	6.0678E-01	0.416E+00
BI-214	1.9782E+01	7.4685E-01	1.0469E+00	0.977E-01
CO-60 #	9.2590E-02	3.7154E-02	3.7313E-02	0.479E-01
CS-137 B	6.1260E-02	8.5366E-02	8.5396E-02	0.768E-01
EU-152	3.1755E-01	2.1166E-01	2.1199E-01	0.214E+00
EU-154	4.0940E-01	1.8271E-01	1.8333E-01	0.160E+00
K-40 #	6.8334E+00	1.1535E+00	1.1810E+00	0.464E+00
Pa-234 #	8.0991E-01	2.4994E-01	2.5173E-01	0.234E+00
Pb-210 #	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	5.2881E-01	1.8598E-01	1.8701E-01	0.143E+00
Pb-214	2.0776E+01	7.7445E-01	1.0924E+00	0.212E+00
RA-226	2.9825E+01	3.2678E+00	3.4499E+00	0.208E+01
Th-230 #F	1.4347E+02	1.7529E+02	1.7537E+02	0.661E+02
Th-234 #	3.0581E+01	2.1790E+01	2.1819E+01	0.760E+01
Tl-208 #	1.6353E-01	7.1295E-02	7.1552E-02	0.173E-01
U-235 #B	-5.8710E-01	-5.1093E-01	-5.1139E-01	0.216E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 1.1256525E+02 pCi/g

Laboratory: New World Technology

New World Technology Spectrum name: An159B.An1

Sample description
Ra 226 70-B939INV-001 400g
4/4/08 14:01

Acquisition information
Start time: 04-Apr-2008 14:01:45
Live time: 2700
Real time: 2707

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	6.3215E-01	3.0097E-01	3.0188E-01	0.198E+00
AM-241	#B	-6.5796E-02	5.8250E+02	5.8250E+02	0.156E+00
Bi-212	F	4.3675E-01	4.2101E-01	4.2133E-01	0.391E+00
BI-214	F	1.9598E+01	7.1122E-01	1.0174E+00	0.150E+00
CO-60	F	2.1663E-01	1.3811E-01	1.3834E-01	0.599E-01
CS-137	#B	-2.8668E-02	-1.1556E-01	-1.1556E-01	0.875E-01
EU-152	B	1.5809E-01	1.8728E-01	1.8737E-01	0.171E+00
EU-154	F	2.5956E-01	1.9617E-01	1.9641E-01	0.105E+00
K-40		6.2313E+00	1.5081E+00	1.5257E+00	0.552E+00
Pa-234	B	-8.0007E-03	5.1097E+02	5.1097E+02	0.134E+00
Pb-210	#	3.4037E+00	2.4345E+00	2.4378E+00	0.159E+01
Pb-212	F	5.0998E-01	1.6349E-01	1.6458E-01	0.122E+00
Pb-214		1.7202E+01	6.1318E-01	8.8528E-01	0.262E+00
RA-226		3.0072E+01	2.6527E+00	2.8780E+00	0.156E+01
Th-230	#B	4.7937E+00	1.9663E+01	1.9664E+01	0.152E+02
Th-234	F	1.4963E+00	1.3021E+00	1.3033E+00	0.128E+01
Tl-208	F	1.8827E-01	1.2077E-01	1.2098E-01	0.699E-01
U-235	#B	2.5362E-02	3.5062E-02	3.5075E-02	0.159E+00

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 7.8053627E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (2239) wan32 G53W2.06 04-APR-2008 12:06:25
New World Technology Spectrum name: An15A1.An1

Sample description
Ra 226 70-B939INV-001 400g
4/4/08 11:15

Acquisition information
Start time: 04-Apr-2008 11:15:54
Live time: 2700
Real time: 2707

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#	1.2867E+00	7.2705E-01	7.2862E-01	0.333E+00
AM-241	B	5.4771E-02	2.8340E-01	2.8341E-01	0.235E+00
Bi-212	F	9.7719E-01	6.4761E-01	6.4862E-01	0.475E+00
BI-214		1.9319E+01	7.3096E-01	1.0239E+00	0.162E+00
CO-60	#F	2.0630E-01	1.1265E-01	1.1291E-01	0.513E-01
CS-137		2.5433E-01	9.5704E-02	9.6169E-02	0.648E-01
EU-152	F	4.1941E-01	2.1191E-01	2.1248E-01	0.193E+00
EU-154	F	5.0183E-01	2.7665E-01	2.7727E-01	0.123E+00
K-40		7.5455E+00	1.9708E+00	1.9906E+00	0.872E+00
Pa-234	F	2.6938E-01	2.5719E-01	2.5738E-01	0.222E+00
Pb-210		6.8864E+00	2.6936E+00	2.7056E+00	0.163E+01
Pb-212		3.6512E-01	1.7435E-01	1.7487E-01	0.140E+00
PB-214		1.7635E+01	6.7027E-01	9.3683E-01	0.210E+00
RA-226		2.9276E+01	2.7822E+00	2.9869E+00	0.177E+01
Th-230	#B	8.0377E+00	2.7669E+01	2.7671E+01	0.185E+02
Th-234	B	5.8392E-01	1.5302E+00	1.5304E+00	0.175E+01
Tl-208	F	2.9527E-01	8.9947E-02	9.0612E-02	0.839E-01
U-235	#B	-5.4179E-01	-7.9445E-01	-7.9471E-01	0.182E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.2 to 2632.4 keV) 8.3751785E+01 pCi/g

Laboratory: New World Technology

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     ORTEC g v - i (3263) wan32  G53W2.06  04-APR-2008 11:13:11
 New World Technology            Spectrum name: An15BD.An1

 Sample description
     Ra 226 70-B939INV-001 400g
     4/4/08 10:06

 Acquisition information
       Start time:                 04-Apr-2008 10:09:54
       Live time:               2700
       Real time:               2710

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 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count   Uncertainty  2 Sigma
 Nuclide    Activity        Counting     Total         MDA
               pCi/g         pCi/g         pCi/g         pCi/g

 ____________________________________________________________________________
 Ac-228  F    9.4798E-01   4.3214E-01    4.3358E-01  0.256E+00
 AM-241  A    8.0848E-02   2.9828E-01    2.9829E-01  0.246E+00
 Bi-212  B    2.6593E-01   6.4338E-01    6.4346E-01  0.584E+00
 BI-214       1.9148E+01   6.8686E-01    9.8914E-01  0.171E+00
 CO-60  #F    6.6763E-02   9.6228E-02    9.6260E-02  0.577E-01
 CS-137       1.3320E-01   9.3256E-02    9.3388E-02  0.700E-01
 EU-152  F    6.8549E-01   1.7912E-01    1.8091E-01  0.199E+00
 EU-154  B    1.3668E-01   1.6704E-01    1.6711E-01  0.139E+00
 K-40         6.7544E+00   1.5491E+00    1.5693E+00  0.820E+00
 Pa-234  B    1.7377E-01   1.9917E-01    1.9927E-01  0.209E+00
 Pb-210 #     4.8998E+00   3.1091E+00    3.1144E+00  0.200E+01
 Pb-212  F    4.2560E-01   1.8705E-01    1.8772E-01  0.147E+00
 PB-214       1.8051E+01   6.3706E-01    9.2523E-01  0.200E+00
 RA-226       3.0062E+01   2.9383E+00    3.1436E+00  0.192E+01
 Th-230 #B   -1.0055E+01  -1.1636E+02   -1.1636E+02  0.159E+02
 Th-234  B    1.8518E+00   2.2910E+00    2.2920E+00  0.189E+01
 Tl-208  F    2.6918E-01   8.2686E-02    8.3289E-02  0.313E-01
 U-235  #B   -6.0562E-01  -7.1791E-01   -7.1826E-01  0.182E+00

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   42.7 to  3401.5 keV) 8.0690788E+01  pCi/g

Laboratory:  New World Technology
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ATTACHMENT 4

ON-SITE LABORATORY RESULTS FROM UNCERTAINTY ESTIMATE TEST

ED_000855_00003297-00725

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ED_000855_00003297-00726

ORTEC g v - i (3263) wan32 G53W2.06 08-AUG-2008 13:04:26
New World Technology Spectrum name: 6D000001.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 08-Aug-2008 10:54:26
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	5.6680E-01	2.1315E-01	2.1418E-01	0.207E+00
AM-241	#A	-1.0124E-01	2.7718E+02	2.7718E+02	0.120E+00
Bi-212	B	7.3625E-02	1.6463E-01	1.6465E-01	0.347E+00
BI-214	F	6.2205E-01	1.6006E-01	1.6172E-01	0.630E-01
CO-60	#B	-9.8814E-03	-1.0538E-02	-1.0544E-02	0.466E-01
CS-137		7.6686E-02	4.1140E-02	4.1238E-02	0.231E-01
EU-152	B	6.0337E-02	7.8166E-02	7.8198E-02	0.940E-01
EU-154	F	1.9195E-01	1.1856E-01	1.1878E-01	0.611E-01
K-40		8.6428E+00	1.4229E+00	1.4585E+00	0.698E+00
Pa-234	#B	-4.6741E-03	-2.0709E-02	-2.0709E-02	0.919E-01
Pb-210		1.7066E+00	1.2868E+00	1.2884E+00	0.104E+01
Pb-212	F	2.7890E-01	1.1286E-01	1.1333E-01	0.901E-01
PB-214		4.4217E-01	1.2348E-01	1.2457E-01	0.776E-01
RA-226		1.3328E+00	1.1676E+00	1.1686E+00	0.925E+00
Th-230	#B	-2.9024E+01	-7.7196E+01	-7.7203E+01	0.113E+02
Th-234	F	1.3944E+00	1.1459E+00	1.1471E+00	0.979E+00
Tl-208	F	2.2733E-01	6.7966E-02	6.8486E-02	0.475E-01
U-235	#B	-4.4655E-01	-6.2466E-01	-6.2488E-01	0.955E-01

- All peaks for activity calculation had bad shape.
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A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.6 keV) 1.5290545E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-AUG-2008 13:08:45
New World Technology Spectrum name: 6D000002.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 08-Aug-2008 11:48:04
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	4.9947E-01	2.0206E-01	2.0291E-01	0.198E+00
AM-241	#A	-3.5892E-02	-2.5632E-01	-2.5633E-01	0.100E+00
Bi-212	#B	-4.0325E-01	-9.0170E-01	-9.0183E-01	0.417E+00
BI-214	F	5.9005E-01	1.7786E-01	1.7920E-01	0.708E-01
CO-60	#B	-8.5224E-02	-2.8123E-01	-2.8125E-01	0.424E-01
CS-137	#	9.4278E-02	6.6313E-02	6.6405E-02	0.291E-01
EU-152	B	1.0339E-02	7.4125E-02	7.4126E-02	0.901E-01
EU-154	#F	8.7918E-02	9.6768E-02	9.6823E-02	0.684E-01
K-40		7.9809E+00	1.6782E+00	1.7041E+00	0.988E+00
Pa-234	#B	3.4216E-02	1.1032E-01	1.1033E-01	0.108E+00
Pb-210	#F	1.4655E+00	1.5036E+00	1.5046E+00	0.103E+01
Pb-212		3.1639E-01	1.1102E-01	1.1164E-01	0.870E-01
PB-214		5.7068E-01	1.8578E-01	1.8698E-01	0.981E-01
RA-226		1.3901E+00	1.2382E+00	1.2393E+00	0.103E+01
Th-230	#B	-3.8565E+01	3.9547E+04	3.9547E+04	0.113E+02
Th-234	#B	-2.0061E-01	-1.4138E+00	-1.4138E+00	0.989E+00
Tl-208	#F	1.5306E-01	8.2978E-02	8.3172E-02	0.535E-01
U-235	#B	-5.2081E-01	-1.0260E+00	-1.0262E+00	0.947E-01

- All peaks for activity calculation had bad shape.
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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.1 to 2612.6 keV) 1.1594908E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-AUG-2008 13:31:22
New World Technology Spectrum name: 6D000003.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 08-Aug-2008 12:43:14
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	4.1694E-01	1.6474E-01	1.6546E-01	0.215E+00
AM-241	#A	-1.8414E-02	-1.9994E-01	-1.9994E-01	0.118E+00
Bi-212	#F	4.9934E-01	2.2911E-01	2.2986E-01	0.424E+00
BI-214	F	5.0849E-01	1.6680E-01	1.6786E-01	0.907E-01
CO-60	#B	-5.5369E-02	-1.6326E-01	-1.6327E-01	0.473E-01
CS-137	#B	3.8871E-04	5.3915E-03	5.3915E-03	0.137E-01
EU-152	#B	-4.0063E-03	-3.0080E-02	-3.0080E-02	0.775E-01
EU-154	#B	5.5144E-02	5.7478E-02	5.7514E-02	0.660E-01
K-40		9.1657E+00	1.4552E+00	1.4943E+00	0.732E+00
Pa-234	#F	1.3229E-01	1.0142E-01	1.0154E-01	0.101E+00
Pb-210	#	1.7475E+00	1.3890E+00	1.3905E+00	0.978E+00
Pb-212		3.3913E-01	1.1577E-01	1.1645E-01	0.901E-01
PB-214		5.6688E-01	1.5428E-01	1.5571E-01	0.102E+00
RA-226		1.3049E+00	1.2211E+00	1.2220E+00	0.972E+00
Th-230	#B	-3.7719E+01	-8.7460E+02	-8.7460E+02	0.108E+02
Th-234	B	1.4859E-01	5.1936E-01	5.1939E-01	0.101E+01
Tl-208	#F	1.6894E-01	1.2303E-01	1.2319E-01	0.626E-01
U-235	#B	-5.4550E-01	-1.5489E+00	-1.5490E+00	0.951E-01

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.1 to 2612.6 keV) 1.3801565E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-AUG-2008 14:20:25
New World Technology Spectrum name: 6D000004.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 08-Aug-2008 13:33:25
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	5.5004E-01	2.1662E-01	2.1757E-01	0.204E+00
AM-241	#A	-1.8212E-02	-1.9179E-01	-1.9179E-01	0.114E+00
Bi-212	#B	1.7005E-01	1.5209E-01	1.5223E-01	0.405E+00
BI-214	F	5.2080E-01	1.6500E-01	1.6613E-01	0.704E-01
CO-60	#B	-6.4988E-02	-1.6335E-01	-1.6337E-01	0.432E-01
CS-137		4.4424E-02	4.1807E-02	4.1840E-02	0.288E-01
EU-152	#F	1.4296E-01	7.4576E-02	7.4764E-02	0.771E-01
EU-154	F	1.2351E-01	8.3049E-02	8.3175E-02	0.678E-01
K-40		8.1415E+00	1.4043E+00	1.4363E+00	0.875E+00
Pa-234	B	7.4516E-02	1.4843E-01	1.4846E-01	0.968E-01
Pb-210	#F	1.1595E+00	1.4721E+00	1.4727E+00	0.105E+01
Pb-212	F	4.4051E-01	1.2025E-01	1.2136E-01	0.899E-01
PB-214		6.8848E-01	1.7296E-01	1.7483E-01	0.865E-01
RA-226		1.4160E+00	1.1330E+00	1.1343E+00	0.945E+00
Th-230	#B	-3.8565E+01	2.5370E+04	2.5370E+04	0.109E+02
Th-234	B	1.2637E-02	8.8427E-02	8.8428E-02	0.106E+01
Tl-208	F	2.4554E-01	1.0159E-01	1.0199E-01	0.558E-01
U-235	#B	-4.9951E-01	-1.3147E+00	-1.3149E+00	0.962E-01

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.6 keV) 1.2047337E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-AUG-2008 15:08:42
New World Technology Spectrum name: 6D000005.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 08-Aug-2008 14:21:54
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	4.6098E-01	1.5749E-01	1.5842E-01	0.234E+00
AM-241	#A	-1.4450E-02	-1.8791E-01	-1.8791E-01	0.120E+00
Bi-212	F	4.2812E-01	3.4956E-01	3.4992E-01	0.380E+00
BI-214	F	4.0632E-01	1.3561E-01	1.3644E-01	0.616E-01
CO-60	#B	-8.5613E-03	-6.0900E-02	-6.0900E-02	0.473E-01
CS-137	B	1.1717E-02	4.3046E-02	4.3048E-02	0.342E-01
EU-152	F	2.3858E-01	1.6154E-01	1.6178E-01	0.819E-01
EU-154	#F	8.3918E-02	8.4136E-02	8.4194E-02	0.575E-01
K-40		7.8520E+00	1.4658E+00	1.4944E+00	0.782E+00
Pa-234	#B	8.4552E-02	1.0627E-01	1.0631E-01	0.114E+00
Pb-210		2.1015E+00	1.9426E+00	1.9442E+00	0.120E+01
Pb-212		4.8345E-01	1.3325E-01	1.3445E-01	0.930E-01
PB-214		3.4812E-01	1.1819E-01	1.1890E-01	0.103E+00
RA-226		1.3322E+00	1.1468E+00	1.1479E+00	0.953E+00
Th-230	#B	-3.2061E+01	-1.2543E+02	-1.2543E+02	0.118E+02
Th-234	B	1.7927E-01	9.0363E-01	9.0365E-01	0.105E+01
Tl-208	#F	2.3729E-01	1.0746E-01	1.0781E-01	0.567E-01
U-235	#B	-5.4264E-01	-1.4456E+00	-1.4458E+00	0.946E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.6 keV) 1.2999438E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-AUG-2008 09:54:02
New World Technology Spectrum name: 6D000006.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 11-Aug-2008 08:55:25
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	4.2509E-01	2.2748E-01	2.2802E-01	0.208E+00
AM-241	#A	8.0864E-03	1.5054E-01	1.5054E-01	0.111E+00
Bi-212	B	9.4671E-02	2.1169E-01	2.1172E-01	0.359E+00
BI-214	F	6.7437E-01	1.3231E-01	1.3465E-01	0.452E-01
CO-60	#B	-4.9033E-02	-1.3553E-01	-1.3554E-01	0.459E-01
CS-137	B	1.2939E-02	4.2033E-02	4.2036E-02	0.332E-01
EU-152	F	9.9977E-02	1.8711E-01	1.8714E-01	0.962E-01
EU-154	F	7.1988E-02	9.5652E-02	9.5689E-02	0.629E-01
K-40		9.0922E+00	1.3909E+00	1.4312E+00	0.702E+00
Pa-234	#B	2.3923E-02	7.2379E-02	7.2384E-02	0.936E-01
Pb-210	#	2.5155E+00	1.4952E+00	1.4981E+00	0.100E+01
Pb-212	F	4.5877E-01	1.1891E-01	1.2012E-01	0.879E-01
PB-214		4.4216E-01	1.9920E-01	1.9987E-01	0.101E+00
RA-226		1.3198E+00	1.2636E+00	1.2646E+00	0.104E+01
Th-230	#B	-3.3085E+01	-1.2267E+02	-1.2267E+02	0.103E+02
Th-234	#B	-3.8872E-02	-1.5028E+00	-1.5028E+00	0.108E+01
Tl-208	#F	2.4405E-01	1.0587E-01	1.0626E-01	0.571E-01
U-235	#B	-4.9758E-01	-8.3322E-01	-8.3342E-01	0.971E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.1 to 2612.6 keV) 1.4746874E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-AUG-2008 10:47:37
New World Technology Spectrum name: 6D000007.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 11-Aug-2008 09:55:55
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	6.4058E-01	2.2034E-01	2.2162E-01	0.221E+00
AM-241		1.2144E-01	1.7459E-01	1.7465E-01	0.118E+00
Bi-212	B	1.8548E-01	1.6590E-01	1.6604E-01	0.446E+00
BI-214	F	5.2969E-01	1.3501E-01	1.3643E-01	0.705E-01
CO-60	#B	-7.7052E-02	-4.9220E-01	-4.9220E-01	0.452E-01
CS-137	B	2.2742E-02	3.5943E-02	3.5953E-02	0.264E-01
EU-152	#F	1.7598E-01	9.8031E-02	9.8248E-02	0.884E-01
EU-154	B	-4.3626E-03	-1.5801E-02	-1.5802E-02	0.665E-01
K-40	#	8.3749E+00	1.3748E+00	1.4094E+00	0.571E+00
Pa-234	F	1.7875E-01	1.8622E-01	1.8634E-01	0.102E+00
Pb-210		1.4569E+00	1.2590E+00	1.2601E+00	0.103E+01
Pb-212	F	3.7906E-01	1.2303E-01	1.2383E-01	0.949E-01
PB-214		4.3088E-01	1.4946E-01	1.5031E-01	0.100E+00
RA-226		1.3655E+00	1.1568E+00	1.1579E+00	0.922E+00
Th-230	#B	-3.2676E+01	-1.3993E+02	-1.3993E+02	0.112E+02
Th-234	B	5.3184E-01	1.0461E+00	1.0463E+00	0.108E+01
Tl-208	F	1.6777E-01	1.0194E-01	1.0213E-01	0.543E-01
U-235	#B	-5.1225E-01	-9.5860E-01	-9.5878E-01	0.962E-01

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B - Activity < MDA and failed test.
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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.6 keV) 1.3345233E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-AUG-2008 11:36:31
New World Technology Spectrum name: 6D000008.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 11-Aug-2008 10:49:01
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	3.8192E-01	2.2901E-01	2.2945E-01	0.229E+00
AM-241	#A	-4.9209E-02	-4.2607E-01	-4.2608E-01	0.113E+00
Bi-212	#B	3.1484E-01	5.5621E-01	5.5633E-01	0.380E+00
BI-214	F	4.4348E-01	1.5376E-01	1.5464E-01	0.712E-01
CO-60	#B	3.2366E-02	1.1926E-02	1.1986E-02	0.446E-01
CS-137		8.1903E-02	4.4083E-02	4.4187E-02	0.257E-01
EU-152	F	1.0291E-01	1.1608E-01	1.1614E-01	0.688E-01
EU-154	#B	1.8779E-02	2.7175E-02	2.7184E-02	0.528E-01
K-40		8.7595E+00	1.4720E+00	1.5074E+00	0.775E+00
Pa-234	#B	7.4904E-02	6.5076E-02	6.5135E-02	0.100E+00
Pb-210		2.2155E+00	1.4904E+00	1.4926E+00	0.101E+01
Pb-212	F	3.4025E-01	1.2378E-01	1.2442E-01	0.945E-01
PB-214		3.7185E-01	1.1404E-01	1.1487E-01	0.940E-01
RA-226		1.3385E+00	1.1044E+00	1.1055E+00	0.886E+00
Th-230	#B	-3.9052E+01	-5.7697E+02	-5.7697E+02	0.817E+01
Th-234	F	1.0956E+00	1.5038E+00	1.5043E+00	0.107E+01
Tl-208	#F	1.8892E-01	7.6305E-02	7.6626E-02	0.504E-01
U-235	#B	-5.5455E-01	-1.9318E+00	-1.9319E+00	0.959E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.1 to 2612.6 keV) 1.4121861E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-AUG-2008 12:25:18
New World Technology Spectrum name: 6D000009.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 11-Aug-2008 11:37:44
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	6.8544E-01	2.3593E-01	2.3729E-01	0.201E+00
AM-241	#A	-1.5144E-03	-1.6794E-01	-1.6794E-01	0.118E+00
Bi-212	B	3.8660E-01	2.5774E-01	2.5813E-01	0.390E+00
BI-214	F	5.3280E-01	1.5580E-01	1.5705E-01	0.666E-01
CO-60	#F	6.7712E-02	4.8605E-02	4.8670E-02	0.421E-01
CS-137	B	1.1243E-02	3.9655E-02	3.9657E-02	0.313E-01
EU-152	B	6.5326E-02	8.8311E-02	8.8344E-02	0.860E-01
EU-154	#F	1.0781E-01	6.8380E-02	6.8496E-02	0.694E-01
K-40		8.7681E+00	1.4997E+00	1.5345E+00	0.843E+00
Pa-234	#B	1.1964E-02	1.5693E-02	1.5700E-02	0.743E-01
Pb-210		2.3055E+00	1.5084E+00	1.5108E+00	0.102E+01
Pb-212	F	4.3166E-01	1.1238E-01	1.1351E-01	0.839E-01
PB-214		4.6261E-01	1.6499E-01	1.6588E-01	0.945E-01
RA-226		1.3586E+00	1.1148E+00	1.1159E+00	0.902E+00
Th-230	#B	-3.7669E+01	-4.5844E+02	-4.5844E+02	0.889E+01
Th-234	B	9.2911E-01	1.5028E+00	1.5032E+00	0.117E+01
Tl-208	F	2.0765E-01	8.0125E-02	8.0493E-02	0.500E-01
U-235	B	-5.1418E-01	-1.0208E+00	-1.0210E+00	0.977E-01

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S U M M A R Y

Total Activity (41.1 to 2612.6 keV) 1.4820153E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-AUG-2008 14:04:07
New World Technology Spectrum name: 6D000010.An1

Sample description
Parcel D 70-PDB-G001237G5-01 342g
7/21/08 10:08

Acquisition information
Start time: 11-Aug-2008 12:28:00
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	3.4328E-01	2.0679E-01	2.0718E-01	0.198E+00
AM-241	#A	-8.0799E-02	-7.4770E-01	-7.4770E-01	0.826E-01
Bi-212	B	3.4964E-01	2.4723E-01	2.4757E-01	0.368E+00
BI-214	F	5.6481E-01	1.5839E-01	1.5976E-01	0.658E-01
CO-60	#B	-1.7512E-02	-9.1764E-02	-9.1766E-02	0.509E-01
CS-137	B	5.7572E-03	5.1376E-02	5.1376E-02	0.418E-01
EU-152	F	1.0757E-01	1.4504E-01	1.4509E-01	0.855E-01
EU-154	F	1.1559E-01	7.7368E-02	7.7487E-02	0.739E-01
K-40		8.6428E+00	1.5259E+00	1.5592E+00	0.705E+00
Pa-234	B	2.3050E-02	9.6724E-02	9.6728E-02	0.121E+00
Pb-210		1.9755E+00	1.5309E+00	1.5326E+00	0.104E+01
Pb-212	F	4.7101E-01	1.2111E-01	1.2236E-01	0.894E-01
PB-214		4.8732E-01	1.5776E-01	1.5879E-01	0.931E-01
RA-226		1.3675E+00	1.1503E+00	1.1514E+00	0.969E+00
Th-230	#B	-2.3585E+01	-7.2338E+01	-7.2343E+01	0.131E+02
Th-234	#B	-2.2664E-01	-6.9639E-01	-6.9644E-01	0.100E+01
Tl-208	F	1.2111E-01	7.1511E-02	7.1652E-02	0.584E-01
U-235	#B	-4.5362E-01	-1.4678E+00	-1.4679E+00	0.999E-01

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---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.6 keV) 1.3630018E+01 pCi/g

Laboratory: New World Technology

ATTACHMENT 5

LABORATORY DUPLICATE SAMPLE RESULTS

ED_000855_00003297-00737

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ED_000855_00003297-00738

Laboratory Duplicate Results Comparison (pCi/g)

Sample ID	On-site Laboratory						
	Count Time (seconds)	^{226}Ra				Relative Percent Difference	
		Activity	MDA	2σ Error	Total Activity	^{226}Ra	Total Activity
6PBBB026470G3-001	2700	1.626	0.843	1.053	20.605	4.30	7.46
6PBBB026470G3-001dup	2700	1.697	0.901	1.121	19.124		
6PBFS-051A-04	5400	1.712	0.874	1.078	21.163	10.25	7.99
6PBFS-051A-04dup	5400	1.897	0.890	1.105	22.923		
6PBFS-051A-12	2700	1.979	1.080	1.353	24.845	3.73	1.67
6PBFS-051A-12dup	2700	1.907	1.080	1.342	25.264		
6PBFS-055-104	2700	1.995	1.130	1.466	19.221	2.15	4.96
6PBFS-055-104dup	2700	2.038	1.230	1.575	20.198		
6PBFS-055-105	2700	2.310	0.872	1.126	19.863	4.28	0.68
6PBFS-055-105dup	2700	2.213	0.905	1.168	19.999		
6PBFS-055-108	2700	2.127	0.822	1.123	19.222	3.13	3.90
6PBFS-055-108dup	2700	2.062	0.819	1.125	18.487		
6PBFS-055-109	2700	3.450	1.250	1.603	28.025	6.89	1.08
6PBFS-055-109dup	2700	3.221	1.150	1.504	27.723		
6PBFS-055-110	2700	3.103	1.070	1.380	23.840	3.35	3.15
6PBFS-055-110dup	2700	3.001	1.120	1.445	23.101		
6PBFS-055-111	2700	2.436	1.350	1.644	28.273	1.86	4.69
6PBFS-055-111dup	2700	2.391	1.260	1.568	26.977		
6PBFS-055-113	2700	1.795	1.190	1.445	23.364	0.10	4.90
6PBFS-055-113dup	2700	1.797	1.030	1.326	22.247		
6PBFS-055-116	2700	1.811	1.110	1.337	22.042	0.10	7.20
6PBFS-055-116dup	2700	1.813	0.979	1.217	20.509		
70-PDB-B000163G4-01	2700	2.099	1.160	1.427	22.007	4.08	7.21
70-PDB-B000163G4-01dup	2700	2.015	1.160	1.454	23.653		
70-PDB-B000377G4-01	2700	1.779	1.100	1.377	22.035	0.35	1.75
70-PDB-B000377G4-01dup	2700	1.773	1.310	1.548	21.652		
70-PDB-B025997G3-01	2700	3.272	1.010	1.393	23.438	5.25	1.51
70-PDB-B025997G3-01dup	2700	3.105	1.070	1.447	23.796		
70-PDB-G001226G3-01	2700	1.783	0.961	1.223	21.125	2.15	0.01
70-PDB-G001226G3-01dup	2700	1.745	0.982	1.258	21.126		
70-PD-C0048-13	2700	1.920	1.050	1.342	19.449	0.68	13.75
70-PD-C0048-13dup	2700	1.907	1.110	1.425	16.946		
70-PD-C0048-26	5400	2.081	0.901	1.118	21.362	1.74	4.80
70-PD-C0048-26dup	5400	2.045	0.882	1.087	22.412		
70-PD-C0076-10	2700	1.666	0.819	1.083	15.926	4.60	4.80
70-PD-C0076-10dup	2700	1.744	0.736	0.996	15.179		
70-PD-C0080-42	2700	2.687	0.929	1.282	17.232	18.30	5.69
70-PD-C0080-42dup	2700	2.237	0.843	1.164	16.279		
70-PD-C0081-05	5400	1.669	0.560	0.735	17.051	0.86	12.98
70-PD-C0081-05dup	5400	1.683	0.615	0.788	14.973		
70-PD-C0081-23	2700	1.957	0.712	0.938	17.821	0.86	4.34
70-PD-C0081-23dup	2700	1.974	0.830	1.114	17.063		
70-PD-C0081-26	2700	2.463	0.968	1.236	21.374	10.54	1.09
70-PD-C0081-26dup	2700	2.737	1.070	1.364	21.608		
70-PDT-068-130	2700	2.001	1.020	1.272	22.185	3.33	6.39
70-PDT-068-130dup	2700	1.936	0.986	1.260	23.648		
70-PDT-077-99	2700	1.710	1.010	1.315	16.708	0.58	1.20
70-PDT-077-99dup	2700	1.720	0.787	1.081	16.508		
70-PDT-078-33	2700	1.690	0.919	1.128	20.673	2.86	2.62
70-PDT-078-33dup	2700	1.642	0.868	1.109	21.223		
70-PDT-084-22	2700	1.814	1.180	1.450	22.552	0.62	7.58
70-PDT-084-22dup	2700	1.803	1.030	1.337	24.328		
70-PDT-085-30	2700	2.875	1.240	1.551	24.347	2.34	4.60
70-PDT-085-30dup	2700	2.809	1.260	1.610	25.493		
70-PDT-085-31	2700	3.599	1.090	1.487	26.541	0.94	3.34
70-PDT-085-31dup	2700	3.565	1.030	1.400	27.443		
70-PDT-085-33	5400	2.566	0.807	1.061	25.231	3.70	9.82
70-PDT-085-33dup	5400	2.473	0.818	1.043	27.837		
70-PDT-086-33	2700	2.480	1.000	1.316	23.888	4.56	1.13
70-PDT-086-33dup	2700	2.370	0.929	1.253	23.619		
70-PDT-086-61	2700	2.608	1.110	1.403	25.488	0.73	0.24
70-PDT-086-61dup	2700	2.627	1.060	1.315	25.550		
70-PDT-086-62	2700	1.727	0.957	1.210	22.899	5.32	14.51
70-PDT-086-621dup	2700	1.821	1.060	1.337	26.480		

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 10:15:29
New World Technology Spectrum name: 2N000278.An1

Sample description
Parcel B 6PBBB026470G3-001 373g
2/28/08 13:30

Acquisition information
Start time: 29-Feb-2008 09:30:20
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	1.5512E+00	2.4865E-01	2.5523E-01	0.957E-01
AM-241 #B	1.7096E-02	1.0217E-01	1.0217E-01	0.805E-01
Bi-212 #F	1.3512E+00	5.0233E-01	5.0482E-01	0.209E+00
BI-214 F	1.0358E+00	1.9614E-01	1.9987E-01	0.713E-01
CO-60 #B	5.5863E-04	2.6406E-03	2.6406E-03	0.953E-02
CS-137 #B	-1.1851E-02	-7.0791E-02	-7.0793E-02	0.486E-01
EU-152 #F	2.0576E-01	1.0125E-01	1.0154E-01	0.638E-01
EU-154 B	-4.0941E-02	1.4296E+02	1.4296E+02	0.504E-01
K-40	7.4568E+00	1.2332E+00	1.2639E+00	0.489E+00
Pa-234 #B	-8.5799E-03	2.4525E+02	2.4525E+02	0.106E+00
Pb-210	1.2974E+00	1.1386E+00	1.1396E+00	0.784E+00
Pb-212 F	1.3447E+00	1.4244E-01	1.5093E-01	0.664E-01
Pb-214	1.0882E+00	1.9295E-01	1.9713E-01	0.805E-01
RA-226	1.6258E+00	1.0512E+00	1.0529E+00	0.843E+00
Th-230 #B	-2.7719E+00	1.9999E+04	1.9999E+04	0.863E+01
Th-234 #	3.4165E+00	1.1348E+00	1.1418E+00	0.829E+00
Tl-208 F	4.3775E-01	8.8963E-02	9.0435E-02	0.407E-01
U-235 #B	-9.0051E-02	-2.5979E-01	-2.5981E-01	0.682E-01

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< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (40.2 to 2567.0 keV) 2.0605330E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 12:48:19
New World Technology Spectrum name: 2N000280.An1

Sample description
Parcel B 6PBBB026470G3-001DUP 373g
2/28/08 13:30

Acquisition information
Start time: 29-Feb-2008 11:51:57
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.4138E+00	2.4566E-01	2.5120E-01	0.125E+00
AM-241	#B	-4.4861E-03	-1.0991E-01	-1.0991E-01	0.836E-01
Bi-212	F	1.0298E+00	4.6245E-01	4.6403E-01	0.293E+00
BI-214	F	8.1541E-01	1.5823E-01	1.6110E-01	0.591E-01
CO-60	#F	2.1156E-02	1.5482E-02	1.5502E-02	0.103E-01
CS-137	#B	-1.7013E-02	-9.2447E-02	-9.2449E-02	0.530E-01
EU-152	F	9.0053E-02	8.1491E-02	8.1559E-02	0.872E-01
EU-154	F	6.1988E-02	5.4668E-02	5.4716E-02	0.570E-01
K-40		7.9212E+00	1.3214E+00	1.3537E+00	0.529E+00
Pa-234	#F	1.5597E-01	1.6146E-01	1.6156E-01	0.857E-01
Pb-210		1.0762E+00	9.8259E-01	9.8340E-01	0.794E+00
Pb-212		1.2714E+00	1.4113E-01	1.4882E-01	0.674E-01
Pb-214		8.5043E-01	1.5203E-01	1.5527E-01	0.814E-01
RA-226		1.6972E+00	1.1188E+00	1.1206E+00	0.901E+00
Th-230	#B	5.6951E+00	1.1296E+01	1.1298E+01	0.784E+01
Th-234	#	2.5671E+00	8.8664E-01	8.9175E-01	0.813E+00
Tl-208		4.8139E-01	1.0078E-01	1.0236E-01	0.434E-01
U-235	#B	-7.5716E-02	-2.0775E-01	-2.0777E-01	0.677E-01

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A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (40.2 to 2567.0 keV) 1.9123878E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 12:53:55
New World Technology Spectrum name: 1N000294.An1

Sample description
Parcel B 6PBFS-051A-04 364g
3/06/08 14:22

Acquisition information
Start time: 08-Mar-2008 11:23:41
Live time: 5400
Real time: 5407

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228		1.8819E+00	2.6146E-01	2.7061E-01	0.917E-01
AM-241	#A	-8.6818E-01	-6.8083E+00	-6.8083E+00	0.645E+00
Bi-212	F	8.2028E-01	4.0279E-01	4.0394E-01	0.301E+00
BI-214	F	1.0406E+00	1.6970E-01	1.7404E-01	0.718E-01
CO-60	F	4.6908E-02	4.9695E-02	4.9725E-02	0.244E-01
CS-137		4.8601E-02	2.9809E-02	2.9863E-02	0.194E-01
EU-152	A	-4.2619E-02	4.2380E+02	4.2380E+02	0.914E-01
EU-154	C	8.0598E-02	8.8796E-02	8.8846E-02	0.635E-01
K-40		1.2241E+01	1.1703E+00	1.2552E+00	0.460E+00
Pa-234	#B	4.4980E-03	9.7168E-03	9.7182E-03	0.115E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	1.5596E+00	1.3679E-01	1.4852E-01	0.773E-01
Pb-214		1.2177E+00	1.9717E-01	2.0228E-01	0.920E-01
RA-226		1.7115E+00	1.0764E+00	1.0783E+00	0.874E+00
Th-230	#B	-1.2242E+01	-7.0281E+01	-7.0283E+01	0.260E+02
Th-234	B	-6.3099E+00	-1.8244E+01	-1.8245E+01	0.328E+01
Tl-208		6.4120E-01	1.0300E-01	1.0571E-01	0.135E-01
U-235	B	-1.2666E+00	-5.2272E+00	-5.2275E+00	0.108E+00

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A - Activity printed, but activity < MDA.
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C - Area < Critical level.
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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 2.1162849E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:33:35
New World Technology Spectrum name: 1N000296.An1

Sample description
Parcel B 6PBFS-051A-04DUP 364g
3/06/08 14:22

Acquisition information
Start time: 08-Mar-2008 14:03:22
Live time: 5400
Real time: 5407

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228		1.7559E+00	2.7989E-01	2.8736E-01	0.101E+00
AM-241	#A	-4.7506E-01	-1.7631E+00	-1.7632E+00	0.614E+00
Bi-212	F	1.1153E+00	3.5266E-01	3.5508E-01	0.210E+00
BI-214	F	1.1874E+00	1.4174E-01	1.4843E-01	0.659E-01
CO-60	#B	1.3773E-02	2.2849E-02	2.2855E-02	0.157E-01
CS-137	F	3.9377E-02	4.1841E-02	4.1866E-02	0.317E-01
EU-152	C	8.9470E-02	9.3266E-02	9.3324E-02	0.740E-01
EU-154	A	2.3987E-02	8.2144E-02	8.2148E-02	0.679E-01
K-40		1.3586E+01	1.2464E+00	1.3444E+00	0.422E+00
Pa-234	#F	1.8049E-01	1.6511E-01	1.6525E-01	0.133E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	1.5544E+00	1.3499E-01	1.4678E-01	0.770E-01
Pb-214		1.1388E+00	1.2981E-01	1.3651E-01	0.789E-01
RA-226		1.8965E+00	1.1031E+00	1.1053E+00	0.890E+00
Th-230	B	-1.9778E+01	-1.4143E+02	-1.4143E+02	0.284E+02
Th-234	#B	-7.6615E+00	-3.6213E+01	-3.6214E+01	0.359E+01
Tl-208		6.8855E-01	1.0753E-01	1.1052E-01	0.135E-01
U-235	#B	-1.2802E+00	-7.9870E+00	-7.9872E+00	0.106E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 2.2923214E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 07:05:30
New World Technology Spectrum name: An120E.An1

Sample description
Parcel B 6PBFS-051A-12 326g
3/07/08 07:44

Acquisition information
Start time: 10-Mar-2008 16:22:48
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	5.1493E-01	2.1245E-01	2.1330E-01	0.238E+00
AM-241	#A	-7.3778E-02	-8.1008E-01	-8.1009E-01	0.139E+00
Bi-212	#F	4.2843E-01	2.5835E-01	2.5884E-01	0.410E+00
BI-214	F	6.3857E-01	1.8176E-01	1.8329E-01	0.803E-01
CO-60	#B	-9.0966E-03	-2.3271E-02	-2.3273E-02	0.147E-01
CS-137	F	4.1124E-02	4.4416E-02	4.4442E-02	0.317E-01
EU-152	F	9.4771E-02	8.9797E-02	8.9866E-02	0.878E-01
EU-154	F	1.1534E-01	1.4545E-01	1.4552E-01	0.776E-01
K-40		1.7345E+01	2.0955E+00	2.1921E+00	0.799E+00
Pa-234	F	2.2612E-01	2.0260E-01	2.0278E-01	0.133E+00
Pb-210		3.0311E+00	1.4386E+00	1.4430E+00	0.108E+01
Pb-212		5.3752E-01	1.1851E-01	1.2018E-01	0.842E-01
PB-214		5.5757E-01	1.4659E-01	1.4804E-01	0.945E-01
RA-226		1.9794E+00	1.3513E+00	1.3533E+00	0.108E+01
Th-230	#B	-3.2224E+01	-1.8866E+02	-1.8866E+02	0.117E+02
Th-234	F	1.1117E+00	1.1783E+00	1.1790E+00	0.108E+01
Tl-208	#F	2.4041E-01	9.9613E-02	1.0001E-01	0.554E-01
U-235	B	-5.4152E-01	-1.2330E+00	-1.2331E+00	0.107E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.1 to 2612.4 keV) 2.4844769E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 06:56:36
New World Technology Spectrum name: An121A.An1

Sample description
Parcel B 6PBFS-051A-12DUP 326g
3/07/08 07:44

Acquisition information
Start time: 10-Mar-2008 21:16:48
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	8.0080E-01	2.3719E-01	2.3905E-01	0.224E+00
AM-241	#A	-3.7548E-02	-2.4793E-01	-2.4793E-01	0.107E+00
Bi-212	#B	1.3909E-01	1.9447E-01	1.9454E-01	0.350E+00
BI-214	F	7.2199E-01	2.1121E-01	2.1290E-01	0.882E-01
CO-60	#B	-5.1467E-03	-1.8253E-02	-1.8254E-02	0.111E-01
CS-137	B	2.6641E-03	4.1543E-02	4.1543E-02	0.339E-01
EU-152	F	2.5042E-01	1.1925E-01	1.1961E-01	0.111E+00
EU-154	B	6.5604E-02	6.6954E-02	6.6999E-02	0.837E-01
K-40		1.7717E+01	2.3540E+00	2.4441E+00	0.952E+00
Pa-234	B	1.0217E-01	1.3901E-01	1.3907E-01	0.120E+00
Pb-210		2.7733E+00	1.5552E+00	1.5586E+00	0.119E+01
Pb-212	F	5.9275E-01	1.2618E-01	1.2808E-01	0.872E-01
PB-214		5.1625E-01	1.1932E-01	1.2085E-01	0.102E+00
RA-226		1.9070E+00	1.3400E+00	1.3419E+00	0.108E+01
Th-230	#B	-2.5944E+01	-8.1801E+01	-8.1807E+01	0.116E+02
Th-234	B	9.7266E-01	1.2438E+00	1.2443E+00	0.107E+01
Tl-208	F	2.3495E-01	9.8080E-02	9.8466E-02	0.551E-01
U-235	#B	-5.8354E-01	-2.5197E+00	-2.5198E+00	0.107E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.5264385E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 10:11:13
New World Technology Spectrum name: An13CE.An1

Sample description
Parcel B 6PBFS-055-104 370g
2/22/08 08:40

Acquisition information
Start time: 05-Mar-2008 08:34:01
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.6169E+00	2.5034E-01	2.5742E-01	0.121E+00
AM-241	#A	-4.3367E-01	-2.4191E+00	-2.4192E+00	0.804E+00
Bi-212	B	0.0000E+00	1.0660E+03	1.0660E+03	0.460E+00
BI-214	F	1.4661E+00	2.2298E-01	2.2952E-01	0.640E-01
CO-60	#F	6.6174E-02	5.9606E-02	5.9657E-02	0.271E-01
CS-137		7.6124E-02	4.4057E-02	4.4148E-02	0.249E-01
EU-152	A	1.2477E-01	1.2534E-01	1.2542E-01	0.129E+00
EU-154		1.2966E-01	1.0776E-01	1.0787E-01	0.824E-01
K-40		1.0817E+01	1.5920E+00	1.6418E+00	0.588E+00
Pa-234	F	2.0618E-01	1.3638E-01	1.3659E-01	0.171E+00
Pb-210	F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	1.3222E+00	1.6851E-01	1.7550E-01	0.100E+00
Pb-214		1.1136E+00	2.5990E-01	2.6316E-01	0.121E+00
RA-226		1.9946E+00	1.4639E+00	1.4657E+00	0.113E+01
Th-230	B	-3.1008E+01	9.4280E+04	9.4280E+04	0.312E+02
Th-234	#B	-4.8796E+00	-1.7532E+01	-1.7533E+01	0.460E+01
Tl-208		6.1875E-01	1.4194E-01	1.4378E-01	0.187E-01
U-235	#B	-1.1759E+00	-2.1614E+00	-2.1619E+00	0.147E+00

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A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 1.9221100E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 10:06:44
New World Technology Spectrum name: An13D2.An1

Sample description
Parcel B 6PBFS-055-104DUP 370g
2/22/08 08:40

Acquisition information
Start time: 05-Mar-2008 10:30:19
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.6006E+00	2.9688E-01	3.0275E-01	0.122E+00
AM-241	#A	-5.9165E-01	-3.1855E+00	-3.1856E+00	0.781E+00
Bi-212	F	9.6443E-01	5.5710E-01	5.5824E-01	0.355E+00
BI-214	F	1.4101E+00	2.0535E-01	2.1191E-01	0.640E-01
CO-60	#B	5.5985E-03	8.8160E-03	8.8184E-03	0.120E-01
CS-137		1.0599E-01	4.9360E-02	4.9517E-02	0.260E-01
EU-152	C	2.1696E-01	1.1927E-01	1.1954E-01	0.131E+00
EU-154	A	3.1505E-02	1.0580E-01	1.0581E-01	0.941E-01
K-40		1.0956E+01	1.4888E+00	1.5433E+00	0.502E+00
Pa-234	#B	1.2420E-01	1.3144E-01	1.3152E-01	0.126E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	1.3901E+00	1.7557E-01	1.8298E-01	0.101E+00
Pb-214		1.1085E+00	1.7792E-01	1.8261E-01	0.109E+00
RA-226		2.0379E+00	1.5731E+00	1.5749E+00	0.123E+01
Th-230	B	-1.1757E+01	-2.0587E+01	-2.0592E+01	0.261E+02
Th-234	B	-3.7444E+00	-3.5091E+00	-3.5118E+00	0.424E+01
Tl-208		6.2477E-01	1.4147E-01	1.4336E-01	0.187E-01
U-235	B	-1.1873E+00	-2.4398E+00	-2.4402E+00	0.147E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.2 to 2630.1 keV) 2.0198463E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 28-FEB-2008 23:34:57
New World Technology Spectrum name: 2N000277.An1

Sample description
Parcel B 6PBFS-055-105 383g
2/28/08 11:46

Acquisition information
Start time: 28-Feb-2008 22:49:48
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.5064E+00	2.5213E-01	2.5826E-01	0.114E+00
AM-241	#B	9.0815E-04	9.5229E-02	9.5229E-02	0.788E-01
Bi-212	F	1.2764E+00	4.3633E-01	4.3890E-01	0.236E+00
BI-214	F	1.0213E+00	1.6658E-01	1.7084E-01	0.518E-01
CO-60	#B	7.6341E-04	3.1549E-03	3.1550E-03	0.929E-02
CS-137	#B	-1.6561E-02	-6.8217E-02	-6.8220E-02	0.427E-01
EU-152	F	8.5154E-02	6.0078E-02	6.0161E-02	0.699E-01
EU-154	B	4.3941E-02	3.0656E-02	3.0700E-02	0.542E-01
K-40		9.5455E+00	1.3578E+00	1.4032E+00	0.476E+00
Pa-234	B	6.1810E-02	1.0071E-01	1.0074E-01	0.937E-01
Pb-210	#	1.3156E+00	1.2983E+00	1.2993E+00	0.878E+00
Pb-212	F	1.3607E+00	1.4065E-01	1.4944E-01	0.653E-01
Pb-214		1.0688E+00	1.8573E-01	1.8992E-01	0.103E+00
RA-226		2.3099E+00	1.1231E+00	1.1264E+00	0.872E+00
Th-230	#B	-2.6996E+00	2.0735E+04	2.0735E+04	0.707E+01
Th-234	F	1.3894E+00	1.3990E+00	1.4000E+00	0.905E+00
Tl-208	F	4.5857E-01	9.1695E-02	9.3262E-02	0.407E-01
U-235	B	-2.6165E-02	-3.1317E-02	-3.1332E-02	0.679E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 1.9863091E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 11:38:21
New World Technology Spectrum name: 2N000279.An1

Sample description
Parcel B 6PBFS-055-105DUP 383g
2/28/08 11:46

Acquisition information
Start time: 29-Feb-2008 10:41:23
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.4045E+00	2.6842E-01	2.7343E-01	0.936E-01
AM-241 #B	-6.8717E-02	3.0983E+02	3.0983E+02	0.846E-01
Bi-212	1.2514E+00	4.7593E-01	4.7820E-01	0.255E+00
BI-214 F	8.4859E-01	1.5812E-01	1.6122E-01	0.746E-01
CO-60 #B	7.2514E-04	1.9677E-03	1.9679E-03	0.124E-01
CS-137 #B	-1.5716E-02	-8.5335E-02	-8.5337E-02	0.506E-01
EU-152 #B	-3.4318E-03	1.5226E+02	1.5226E+02	0.657E-01
EU-154 F	9.6670E-02	5.9732E-02	5.9840E-02	0.632E-01
K-40 #	9.5455E+00	1.3578E+00	1.4032E+00	0.476E+00
Pa-234 B	8.5557E-02	9.7777E-02	9.7828E-02	0.102E+00
Pb-210	1.9213E+00	1.2024E+00	1.2046E+00	0.784E+00
Pb-212	1.3560E+00	1.4161E-01	1.5029E-01	0.659E-01
Pb-214	9.5789E-01	1.6705E-01	1.7080E-01	0.723E-01
RA-226	2.2131E+00	1.1647E+00	1.1676E+00	0.905E+00
Th-230 #B	-2.7486E+00	-8.4880E+01	-8.4880E+01	0.421E+01
Th-234 F	2.2441E+00	8.4582E-01	8.4992E-01	0.904E+00
Tl-208 F	5.0038E-01	1.0225E-01	1.0392E-01	0.447E-01
U-235 #B	-1.1578E-01	-5.8901E-01	-5.8903E-01	0.728E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (40.2 to 2567.0 keV) 1.9998617E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 12:54:49
New World Technology Spectrum name: An13CD.An1

Sample description
Parcel B 6PBFS-055-108 356g
2/28/08 11:23

Acquisition information
Start time: 07-Mar-2008 15:31:04
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.4392E+00	2.6751E-01	2.7279E-01	0.638E-01
AM-241	B	2.1426E-02	1.1161E-01	1.1161E-01	0.936E-01
Bi-212	B	-2.9156E-01	2.0493E+03	2.0493E+03	0.460E+00
BI-214	F	1.0329E+00	2.1252E-01	2.1594E-01	0.767E-01
CO-60	#F	4.4122E-02	3.1066E-02	3.1109E-02	0.154E-01
CS-137	B	2.5034E-02	4.9125E-02	4.9134E-02	0.376E-01
EU-152	F	1.5532E-01	8.9674E-02	8.9859E-02	0.954E-01
EU-154	F	2.4968E-01	1.2484E-01	1.2518E-01	0.652E-01
K-40	#	1.0056E+01	1.5452E+00	1.5896E+00	0.389E+00
Pa-234	#B	-4.8508E-02	4.5393E+02	4.5393E+02	0.108E+00
Pb-210		1.9344E+00	1.5546E+00	1.5562E+00	0.935E+00
Pb-212		1.1997E+00	1.4804E-01	1.5459E-01	0.838E-01
PB-214	F	7.1995E-01	1.6969E-01	1.7178E-01	0.951E-01
RA-226		2.1273E+00	1.1201E+00	1.1229E+00	0.822E+00
Th-230	#B	-5.6221E+00	-1.6072E+02	-1.6072E+02	0.562E+01
Th-234	F	1.0086E+00	8.1938E-01	8.2023E-01	0.754E+00
Tl-208	F	4.1851E-01	8.4165E-02	8.5585E-02	0.633E-01
U-235	F	5.5790E-02	8.3121E-02	8.3146E-02	0.528E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (42.5 to 2705.0 keV) 1.9221844E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 11:23:42
New World Technology Spectrum name: An13D1.An1

Sample description
Parcel B 6PBFS-055-108DUP 356g
2/28/08 11:23

Acquisition information
Start time: 07-Mar-2008 17:33:33
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.4222E+00	2.3118E-01	2.3713E-01	0.108E+00
AM-241	B	4.8358E-02	1.1380E-01	1.1382E-01	0.942E-01
Bi-212	F	1.0159E+00	4.6056E-01	4.6210E-01	0.305E+00
BI-214	F	1.0556E+00	2.0053E-01	2.0432E-01	0.509E-01
CO-60	#F	2.6204E-02	2.5382E-02	2.5401E-02	0.154E-01
CS-137	B	5.6612E-03	4.0147E-02	4.0148E-02	0.323E-01
EU-152	B	6.9683E-02	5.6896E-02	5.6954E-02	0.877E-01
EU-154	F	1.5222E-01	1.2495E-01	1.2508E-01	0.590E-01
K-40		9.4132E+00	1.3738E+00	1.4175E+00	0.122E+00
Pa-234	F	2.7354E-01	1.9934E-01	1.9960E-01	0.109E+00
Pb-210	#B	-1.5385E+00	-7.1009E+00	-7.1011E+00	0.952E+00
Pb-212		1.2092E+00	1.5096E-01	1.5749E-01	0.821E-01
PB-214		7.1051E-01	1.3652E-01	1.3905E-01	0.891E-01
RA-226		2.0618E+00	1.1223E+00	1.1249E+00	0.819E+00
Th-230	F	1.0453E+01	1.4028E+01	1.4033E+01	0.776E+01
Th-234	F	9.3843E-01	9.3485E-01	9.3550E-01	0.765E+00
Tl-208	F	3.6037E-01	5.9363E-02	6.0850E-02	0.489E-01
U-235	F	1.5405E-01	1.1877E-01	1.1891E-01	0.573E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.5 to 2705.0 keV) 1.8486923E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 13:57:29
New World Technology Spectrum name: An13EB.An1

Sample description
Parcel B 6PBFS-055-109 372g
2/28/08 11:09

Acquisition information
Start time: 07-Mar-2008 12:56:28
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.6918E+00	3.8515E-01	3.9022E-01	0.172E+00
AM-241	A	1.0670E-01	1.7640E-01	1.7644E-01	0.145E+00
Bi-212		9.9910E-01	4.6136E-01	4.6284E-01	0.421E+00
BI-214		1.3190E+00	2.4189E-01	2.4677E-01	0.103E+00
CO-60	#B	-8.6988E-02	-7.9797E-01	-7.9798E-01	0.445E-01
CS-137	#F	6.1044E-02	6.5687E-02	6.5726E-02	0.378E-01
EU-152	F	2.2367E-01	1.8796E-01	1.8814E-01	0.900E-01
EU-154	F	9.1123E-02	1.1024E-01	1.1029E-01	0.803E-01
K-40		1.1039E+01	1.4806E+00	1.5360E+00	0.681E+00
Pa-234	B	1.2830E-01	1.1511E-01	1.1521E-01	0.152E+00
Pb-210		2.8785E+00	1.4108E+00	1.4148E+00	0.110E+01
Pb-212	F	1.7175E+00	1.8106E-01	1.9191E-01	0.970E-01
PB-214		1.2015E+00	2.5186E-01	2.5576E-01	0.121E+00
RA-226		3.4504E+00	1.5976E+00	1.6027E+00	0.125E+01
Th-230	B	5.3141E+00	1.4856E+01	1.4857E+01	0.125E+02
Th-234		3.1421E+00	1.1158E+00	1.1218E+00	0.115E+01
Tl-208	#F	5.8576E-01	1.2386E-01	1.2574E-01	0.390E-01
U-235	B	-9.2712E-01	-1.9046E+00	-1.9049E+00	0.128E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.8024893E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 13:49:47
New World Technology Spectrum name: An13F0.An1

Sample description
Parcel B 6PBFS-055-109DUP 372g
2/28/08 11:09

Acquisition information
Start time: 07-Mar-2008 15:23:04
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.7586E+00	3.6871E-01	3.7443E-01	0.133E+00
AM-241	A	3.9455E-02	1.8016E-01	1.8016E-01	0.150E+00
Bi-212	F	8.2129E-01	5.1209E-01	5.1299E-01	0.411E+00
BI-214		1.4040E+00	2.3111E-01	2.3689E-01	0.902E-01
CO-60	#B	4.4021E-03	1.7538E-02	1.7538E-02	0.539E-01
CS-137	B	1.6590E-02	6.1193E-02	6.1196E-02	0.490E-01
EU-152	F	2.1856E-01	9.2456E-02	9.2808E-02	0.105E+00
EU-154	F	1.2940E-01	1.3418E-01	1.3427E-01	0.774E-01
K-40		1.0088E+01	1.6254E+00	1.6678E+00	0.777E+00
Pa-234	F	2.2463E-01	1.5298E-01	1.5320E-01	0.156E+00
Pb-210		3.0742E+00	2.0946E+00	2.0977E+00	0.130E+01
Pb-212		1.7395E+00	1.7653E-01	1.8792E-01	0.915E-01
PB-214		1.4088E+00	1.8761E-01	1.9474E-01	0.895E-01
RA-226		3.2205E+00	1.4995E+00	1.5042E+00	0.115E+01
Th-230	#B	-1.0533E+01	-7.6525E+01	-7.6526E+01	0.127E+02
Th-234		3.6074E+00	1.3956E+00	1.4019E+00	0.117E+01
Tl-208	F	6.0065E-01	1.1385E-01	1.1601E-01	0.390E-01
U-235	#B	-9.4140E-01	-2.2915E+00	-2.2918E+00	0.130E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (42.7 to 3401.5 keV) 2.7722847E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 10:31:33
New World Technology Spectrum name: 6N000226.An1

Sample description
Parcel B 6PBFS-055-110 367g
2/28/08 11:03

Acquisition information
Start time: 29-Feb-2008 09:19:44
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.3258E+00	2.6501E-01	2.6955E-01	0.209E+00
AM-241	#A	-8.8456E-03	-1.6510E-01	-1.6510E-01	0.116E+00
Bi-212	B	2.9922E-01	4.3907E-01	4.3921E-01	0.386E+00
BI-214	F	1.2396E+00	2.1033E-01	2.1532E-01	0.757E-01
CO-60	#B	5.1978E-03	9.4512E-03	9.4532E-03	0.107E-01
CS-137	B	3.9179E-02	5.2346E-02	5.2366E-02	0.396E-01
EU-152	B	9.0321E-02	9.1670E-02	9.1732E-02	0.984E-01
EU-154	F	8.3571E-02	9.3056E-02	9.3107E-02	0.800E-01
K-40		1.1922E+01	1.8227E+00	1.8758E+00	0.827E+00
Pa-234	#B	8.0600E-02	1.3588E-01	1.3592E-01	0.111E+00
Pb-210		3.2955E+00	1.4512E+00	1.4564E+00	0.112E+01
Pb-212	F	1.4797E+00	1.5889E-01	1.6813E-01	0.891E-01
PB-214		1.0576E+00	2.2628E-01	2.2967E-01	0.113E+00
RA-226		3.1027E+00	1.3753E+00	1.3801E+00	0.107E+01
Th-230	#B	-1.8619E+01	-5.6592E+01	-5.6596E+01	0.124E+02
Th-234	F	1.2132E+00	9.2000E-01	9.2110E-01	0.110E+01
Tl-208	F	4.1732E-01	9.7907E-02	9.9127E-02	0.663E-01
U-235	#B	-5.1380E-01	-1.4952E+00	-1.4953E+00	0.101E+00

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A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.3840204E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 12:39:32
New World Technology Spectrum name: 6N000228.An1

Sample description
Parcel B 6PBFS-055-110DUP 367g
2/28/08 11:03

Acquisition information
Start time: 29-Feb-2008 11:49:12
Live time: 2700
Real time: 2706

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.4384E+00	2.6542E-01	2.7075E-01	0.205E+00
AM-241	A	9.4765E-02	1.5465E-01	1.5469E-01	0.127E+00
Bi-212	B	3.2901E-01	4.5285E-01	4.5301E-01	0.400E+00
BI-214	F	9.9892E-01	2.2498E-01	2.2803E-01	0.922E-01
CO-60	#B	7.1655E-03	1.7040E-02	1.7042E-02	0.174E-01
CS-137	B	1.7174E-02	5.4070E-02	5.4074E-02	0.431E-01
EU-152	#B	8.9682E-02	7.3415E-02	7.3491E-02	0.103E+00
EU-154	F	2.8834E-01	1.4322E-01	1.4362E-01	0.630E-01
K-40		1.2018E+01	1.6642E+00	1.7231E+00	0.753E+00
Pa-234	B	-7.6280E-02	2.9615E+02	2.9615E+02	0.128E+00
Pb-210		2.7904E+00	1.3522E+00	1.3562E+00	0.106E+01
Pb-212		1.5271E+00	1.6232E-01	1.7195E-01	0.914E-01
PB-214		1.0236E+00	1.4910E-01	1.5387E-01	0.979E-01
RA-226		3.0005E+00	1.4404E+00	1.4448E+00	0.112E+01
Th-230	#B	-2.5902E+01	-8.6951E+01	-8.6957E+01	0.105E+02
Th-234	B	1.5975E-01	1.2718E+00	1.2718E+00	0.111E+01
Tl-208	F	3.0369E-01	9.0983E-02	9.1680E-02	0.654E-01
U-235	#B	-4.7192E-01	-1.4643E+00	-1.4644E+00	0.107E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.1 to 2612.4 keV) 2.3100990E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 13:23:47
New World Technology Spectrum name: 4N000218.An1

Sample description
Parcel B 6PBFS-055-111 395g
2/28/08 13:20

Acquisition information
Start time: 29-Feb-2008 09:35:16
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	2.2376E+00	3.5937E-01	3.6881E-01	0.117E+00
AM-241	#A	-2.3917E-02	-3.2952E-01	-3.2952E-01	0.152E+00
Bi-212		1.0666E+00	5.0534E-01	5.0689E-01	0.448E+00
BI-214		1.7224E+00	2.4397E-01	2.5218E-01	0.869E-01
CO-60	#B	7.1416E-03	2.0476E-02	2.0478E-02	0.169E-01
CS-137	B	9.2511E-04	6.1214E-02	6.1214E-02	0.504E-01
EU-152	B	7.6218E-02	1.2680E-01	1.2683E-01	0.117E+00
EU-154	F	9.7955E-02	1.9278E-01	1.9282E-01	0.857E-01
K-40		1.0523E+01	1.5639E+00	1.6117E+00	0.726E+00
Pa-234	F	1.5238E-01	1.6816E-01	1.6825E-01	0.146E+00
Pb-210		3.0173E+00	1.9236E+00	1.9269E+00	0.122E+01
Pb-212		1.8770E+00	1.7955E-01	1.9255E-01	0.977E-01
PB-214		1.5650E+00	2.6242E-01	2.6875E-01	0.116E+00
RA-226		2.4361E+00	1.6414E+00	1.6439E+00	0.135E+01
Th-230	#B	-5.6126E+00	-3.4220E+01	-3.4221E+01	0.130E+02
Th-234		3.1057E+00	1.1258E+00	1.1317E+00	0.124E+01
Tl-208	F	7.2249E-01	9.2402E-02	9.6201E-02	0.367E-01
U-235	#B	-8.1712E-01	-1.1657E+00	-1.1661E+00	0.123E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.8272892E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 13:29:26
New World Technology Spectrum name: 4N000220.An1

Sample description
Parcel B 6PBFS-055-111DUP 395g
2/28/08 13:20

Acquisition information
Start time: 29-Feb-2008 11:41:24
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	2.1154E+00	3.5515E-01	3.6370E-01	0.117E+00
AM-241	#A	-4.4103E-02	-4.6507E-01	-4.6507E-01	0.120E+00
Bi-212		1.0377E+00	4.8748E-01	4.8900E-01	0.416E+00
BI-214		1.3670E+00	2.2688E-01	2.3246E-01	0.963E-01
CO-60	#B	4.5580E-03	1.2409E-02	1.2410E-02	0.212E-01
CS-137	B	4.7140E-03	4.5420E-02	4.5420E-02	0.370E-01
EU-152	B	1.1600E-01	9.7377E-02	9.7472E-02	0.118E+00
EU-154	B	2.7333E-02	6.7817E-02	6.7825E-02	0.914E-01
K-40		1.1249E+01	1.5151E+00	1.5714E+00	0.688E+00
Pa-234	B	3.2010E-02	5.6580E-02	5.6593E-02	0.114E+00
Pb-210	#	2.1444E+00	1.7984E+00	1.8001E+00	0.119E+01
Pb-212	F	1.6642E+00	1.7466E-01	1.8522E-01	0.993E-01
PB-214		1.3109E+00	1.9884E-01	2.0468E-01	0.118E+00
RA-226		2.3913E+00	1.5650E+00	1.5675E+00	0.126E+01
Th-230	#B	-1.2145E+01	-1.2152E+02	-1.2152E+02	0.101E+02
Th-234		3.0674E+00	1.2339E+00	1.2391E+00	0.112E+01
Tl-208	F	6.2982E-01	8.7212E-02	9.0280E-02	0.367E-01
U-235	#B	-8.4601E-01	-1.4822E+00	-1.4825E+00	0.124E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.6976948E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:52:10
New World Technology Spectrum name: An13F9.An1

Sample description
Parcel B 6PBFS-055-113 362g
2/28/08 13:40

Acquisition information
Start time: 07-Mar-2008 17:55:45
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.4132E+00	3.5132E-01	3.5522E-01	0.196E+00
AM-241	#B	-5.8076E-02	-3.3707E-01	-3.3707E-01	0.137E+00
Bi-212	F	6.4464E-01	5.4007E-01	5.4060E-01	0.393E+00
BI-214	#F	1.5352E+00	2.6147E-01	2.6761E-01	0.928E-01
CO-60	#B	9.7701E-03	2.1906E-02	2.1909E-02	0.170E-01
CS-137	B	1.5073E-02	6.1263E-02	6.1266E-02	0.491E-01
EU-152	F	3.5220E-01	2.1024E-01	2.1064E-01	0.885E-01
EU-154	#F	1.5559E-01	1.0303E-01	1.0319E-01	0.628E-01
K-40		1.2210E+01	1.6213E+00	1.6836E+00	0.634E+00
Pa-234	F	1.7773E-01	1.3554E-01	1.3570E-01	0.123E+00
Pb-210		3.0999E+00	1.3002E+00	1.3052E+00	0.979E+00
Pb-212		1.4168E+00	1.7049E-01	1.7843E-01	0.102E+00
PB-214		1.2491E+00	2.1644E-01	2.2136E-01	0.106E+00
RA-226		1.7952E+00	1.4436E+00	1.4452E+00	0.119E+01
Th-230	B	3.0116E+00	1.7524E+01	1.7524E+01	0.120E+02
Th-234	F	1.4955E+00	7.0778E-01	7.0994E-01	0.114E+01
Tl-208	F	1.6868E-01	4.1155E-02	4.1629E-02	0.135E+00
U-235	#B	-9.0513E-01	-3.1364E+00	-3.1366E+00	0.124E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 2.3364002E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:47:49
New World Technology Spectrum name: An1400.An1

Sample description
Parcel B 6PBFS-055-113DUP 362g
2/28/08 13:40

Acquisition information
Start time: 07-Mar-2008 20:16:25
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.0212E+00	3.0430E-01	3.0666E-01	0.191E+00
AM-241 #B	-8.4968E-02	-5.7983E-01	-5.7984E-01	0.154E+00
Bi-212 #F	1.3141E+00	5.5709E-01	5.5923E-01	0.249E+00
BI-214 F	1.6771E+00	2.6680E-01	2.7398E-01	0.856E-01
CO-60 #B	1.0751E-03	4.2108E-03	4.2110E-03	0.102E-01
CS-137 B	2.8630E-02	5.1193E-02	5.1204E-02	0.390E-01
EU-152 F	2.7259E-01	1.4486E-01	1.4521E-01	0.103E+00
EU-154 F	8.2086E-02	9.0423E-02	9.0474E-02	0.697E-01
K-40	1.1637E+01	1.5872E+00	1.6450E+00	0.634E+00
Pa-234 F	1.7387E-01	1.4936E-01	1.4950E-01	0.121E+00
Pb-210 #	2.0648E+00	1.5972E+00	1.5990E+00	0.105E+01
Pb-212	1.4566E+00	1.7921E-01	1.8720E-01	0.111E+00
PB-214	1.2796E+00	2.3046E-01	2.3531E-01	0.104E+00
RA-226	1.7970E+00	1.3246E+00	1.3263E+00	0.103E+01
Th-230 #B	-7.1668E+00	-2.6022E+01	-2.6024E+01	0.952E+01
Th-234 F	1.8925E+00	7.2875E-01	7.3210E-01	0.116E+01
Tl-208 #F	3.2061E-01	6.9861E-02	7.0869E-02	0.125E+00
U-235 #B	-9.2712E-01	-4.7665E+00	-4.7666E+00	0.120E+00

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.2 to 2632.4 keV) 2.2247017E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:30:20
New World Technology Spectrum name: An11C6.An1

Sample description
Parcel B 6PBFS-055-116 366g
2/28/08 14:11

Acquisition information
Start time: 07-Mar-2008 16:07:57
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	9.8018E-01	3.0737E-01	3.0951E-01	0.217E+00
AM-241	#A	-5.9612E-02	-6.3662E-01	-6.3663E-01	0.134E+00
Bi-212	F	6.0741E-01	5.2205E-01	5.2254E-01	0.384E+00
BI-214	F	1.1713E+00	2.3671E-01	2.4066E-01	0.869E-01
CO-60	#B	-4.9483E-02	-1.1443E-01	-1.1445E-01	0.512E-01
CS-137	B	3.2557E-02	4.5763E-02	4.5779E-02	0.345E-01
EU-152	B	-1.4294E-02	-2.6612E-01	-2.6612E-01	0.810E-01
EU-154	F	1.4316E-01	1.1392E-01	1.1405E-01	0.729E-01
K-40	#	1.2393E+01	2.0741E+00	2.1245E+00	0.108E+01
Pa-234	#B	1.1309E-01	2.0104E-01	2.0108E-01	0.115E+00
Pb-210	#	3.0864E+00	1.8003E+00	1.8039E+00	0.112E+01
Pb-212	F	8.9676E-01	1.2763E-01	1.3189E-01	0.798E-01
PB-214		7.9022E-01	1.4412E-01	1.4707E-01	0.101E+00
RA-226		1.8107E+00	1.3353E+00	1.3370E+00	0.111E+01
Th-230	#B	-1.9444E+01	-5.4870E+01	-5.4875E+01	0.110E+02
Th-234	F	1.0548E+00	9.6518E-01	9.6597E-01	0.103E+01
Tl-208	#F	3.0581E-01	1.1845E-01	1.1899E-01	0.581E-01
U-235	B	-4.4010E-01	-8.6018E-01	-8.6034E-01	0.102E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.2042217E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 18:37:15
New World Technology Spectrum name: An11C9.An1

Sample description
Parcel B 6PBFS-055-116DUP 366g
2/28/08 14:11

Acquisition information
Start time: 07-Mar-2008 17:51:59
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	9.2370E-01	2.7388E-01	2.7602E-01	0.216E+00
AM-241	A	1.1832E-01	1.4640E-01	1.4646E-01	0.120E+00
Bi-212	F	6.0144E-01	3.8038E-01	3.8104E-01	0.344E+00
BI-214	F	1.1333E+00	2.0602E-01	2.1027E-01	0.754E-01
CO-60	#B	-1.0494E-01	-4.5938E-01	-4.5939E-01	0.480E-01
CS-137	F	3.7937E-02	4.8692E-02	4.8712E-02	0.366E-01
EU-152	#B	-8.5992E-03	-2.2985E-01	-2.2985E-01	0.107E+00
EU-154	F	1.2166E-01	1.1272E-01	1.1281E-01	0.795E-01
K-40		1.2706E+01	1.8757E+00	1.9340E+00	0.826E+00
Pa-234	F	1.6337E-01	1.7074E-01	1.7084E-01	0.119E+00
Pb-210		1.7353E+00	1.3604E+00	1.3619E+00	0.110E+01
Pb-212	F	9.2072E-01	1.2727E-01	1.3178E-01	0.784E-01
PB-214		9.4928E-01	1.5812E-01	1.6200E-01	0.878E-01
RA-226		1.8125E+00	1.2151E+00	1.2169E+00	0.979E+00
Th-230	#B	-1.7091E+01	-3.7413E+01	-3.7419E+01	0.110E+02
Th-234	B	8.7907E-01	1.1228E+00	1.1233E+00	0.978E+00
Tl-208	F	3.2862E-01	8.8430E-02	8.9267E-02	0.478E-01
U-235	#B	-3.9978E-01	-4.9894E-01	-4.9916E-01	0.986E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.0509447E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 14:21:59
New World Technology Spectrum name: 4N000219.An1

Sample description
Parcel D 70-PDB-B000163G4-01 392g
2/28/08 14:10

Acquisition information
Start time: 29-Feb-2008 10:41:01
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.3064E+00	3.3236E-01	3.3587E-01	0.138E+00
AM-241	A	7.2968E-02	1.3748E-01	1.3751E-01	0.114E+00
Bi-212		9.1031E-01	4.7984E-01	4.8103E-01	0.419E+00
BI-214		9.3233E-01	1.8282E-01	1.8606E-01	0.806E-01
CO-60	#F	2.3430E-02	1.8777E-02	1.8797E-02	0.143E-01
CS-137	B	1.1715E-02	4.1263E-02	4.1265E-02	0.327E-01
EU-152	F	1.9359E-01	1.4193E-01	1.4211E-01	0.985E-01
EU-154	#F	1.1317E-01	1.0181E-01	1.0189E-01	0.781E-01
K-40		1.0138E+01	1.4411E+00	1.4893E+00	0.675E+00
Pa-234	B	7.5790E-02	1.5504E-01	1.5507E-01	0.141E+00
Pb-210		1.5651E+00	1.3054E+00	1.3066E+00	0.106E+01
Pb-212		1.1156E+00	1.5154E-01	1.5708E-01	0.926E-01
PB-214		9.1749E-01	1.9597E-01	1.9889E-01	0.940E-01
RA-226		2.0989E+00	1.4244E+00	1.4265E+00	0.116E+01
Th-230	B	3.7051E+00	1.3437E+01	1.3438E+01	0.114E+02
Th-234		2.5234E+00	1.0330E+00	1.0372E+00	0.108E+01
Tl-208	F	4.9933E-01	1.2006E-01	1.2147E-01	0.370E-01
U-235	#B	-9.0320E-01	-2.3564E+00	-2.3567E+00	0.121E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.2006790E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 29-FEB-2008 14:15:21
New World Technology Spectrum name: 4N000221.An1

Sample description
Parcel D 70-PDB-B000163G4-01DUP 392g
2/28/08 14:10

Acquisition information
Start time: 29-Feb-2008 13:11:51
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.4316E+00	3.5269E-01	3.5666E-01	0.137E+00
AM-241	A	3.1427E-02	1.5580E-01	1.5580E-01	0.130E+00
Bi-212	F	6.5333E-01	4.1670E-01	4.1741E-01	0.394E+00
BI-214		9.9877E-01	2.0447E-01	2.0780E-01	0.913E-01
CO-60	#B	2.8961E-03	4.8063E-03	4.8075E-03	0.941E-02
CS-137	B	2.0684E-02	5.5823E-02	5.5829E-02	0.443E-01
EU-152	F	1.3824E-01	9.2160E-02	9.2302E-02	0.108E+00
EU-154	F	1.1793E-01	7.9982E-02	8.0100E-02	0.725E-01
K-40		1.0838E+01	1.5092E+00	1.5617E+00	0.784E+00
Pa-234	B	-1.3624E-01	3.3767E+02	3.3767E+02	0.146E+00
Pb-210		2.4442E+00	1.7057E+00	1.7081E+00	0.111E+01
Pb-212		1.2990E+00	1.6244E-01	1.6942E-01	0.917E-01
PB-214		1.0996E+00	2.2424E-01	2.2791E-01	0.113E+00
RA-226		2.0149E+00	1.4521E+00	1.4540E+00	0.116E+01
Th-230	#B	-1.3958E+01	-3.8746E+02	-3.8746E+02	0.946E+01
Th-234	F	2.2196E+00	1.3097E+00	1.3123E+00	0.107E+01
Tl-208	F	6.5369E-01	1.3623E-01	1.3836E-01	0.370E-01
U-235	#B	-8.7999E-01	-1.7398E+00	-1.7401E+00	0.120E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.3652508E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:20:36
New World Technology Spectrum name: An11C0.An1

Sample description
Parcel D 70-PDB-B000377G4-01 331g
2/20/08 12:45

Acquisition information
Start time: 07-Mar-2008 12:48:38
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	9.4516E-01	2.5081E-01	2.5325E-01	0.252E+00
AM-241	#A	-3.3025E-03	-1.3699E-01	-1.3699E-01	0.111E+00
Bi-212	#F	7.0348E-01	5.1175E-01	5.1241E-01	0.352E+00
BI-214	F	8.9572E-01	1.8496E-01	1.8792E-01	0.752E-01
CO-60	#B	-1.2122E-01	-8.4697E-01	-8.4698E-01	0.543E-01
CS-137	B	6.2301E-04	3.5699E-02	3.5699E-02	0.294E-01
EU-152	F	8.0755E-02	6.6891E-02	6.6958E-02	0.614E-01
EU-154	#B	-4.7996E-02	1.9799E+02	1.9799E+02	0.655E-01
K-40		1.0861E+01	1.8315E+00	1.8753E+00	0.108E+01
Pa-234	B	7.4179E-02	1.2888E-01	1.2891E-01	0.138E+00
Pb-210		4.5964E+00	1.9275E+00	1.9351E+00	0.117E+01
Pb-212	F	1.1646E+00	1.4795E-01	1.5413E-01	0.887E-01
PB-214		8.0145E-01	1.6528E-01	1.6793E-01	0.100E+00
RA-226		1.7790E+00	1.3757E+00	1.3773E+00	0.110E+01
Th-230	#B	-2.5504E+01	-6.0281E+01	-6.0289E+01	0.102E+02
Th-234	B	8.0056E-01	1.0581E+00	1.0586E+00	0.110E+01
Tl-208	F	2.8794E-01	8.3215E-02	8.3898E-02	0.587E-01
U-235	B	-5.3906E-01	-1.3766E+00	-1.3767E+00	0.108E+00

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& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.2034649E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:25:16
New World Technology Spectrum name: An11C4.An1

Sample description
Parcel D 70-PDB-B000377G4-01DUP 331g
2/20/08 12:45

Acquisition information
Start time: 07-Mar-2008 15:14:37
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	6.3541E-01	3.2229E-01	3.2315E-01	0.266E+00
AM-241	#A	-1.0892E-01	3.5746E+02	3.5746E+02	0.154E+00
Bi-212	F	4.2797E-01	4.8872E-01	4.8897E-01	0.419E+00
BI-214	F	1.0823E+00	1.8209E-01	1.8646E-01	0.927E-01
CO-60	#B	-9.7901E-02	-4.1640E-01	-4.1641E-01	0.575E-01
CS-137	B	1.8738E-02	3.2608E-02	3.2615E-02	0.241E-01
EU-152	#F	1.3447E-01	1.0505E-01	1.0517E-01	0.114E+00
EU-154	#B	6.3527E-02	4.4478E-02	4.4540E-02	0.885E-01
K-40	#	1.2197E+01	1.9903E+00	2.0411E+00	0.111E+01
Pa-234	#F	1.9629E-01	2.3911E-01	2.3922E-01	0.146E+00
Pb-210		3.5391E+00	1.9234E+00	1.9278E+00	0.119E+01
Pb-212		1.0487E+00	1.5290E-01	1.5778E-01	0.986E-01
PB-214		9.9771E-01	1.6910E-01	1.7310E-01	0.100E+00
RA-226		1.7727E+00	1.5467E+00	1.5481E+00	0.131E+01
Th-230	#B	-2.7278E+01	-8.5870E+01	-8.5876E+01	0.116E+02
Th-234	B	2.0297E-01	1.3284E+00	1.3284E+00	0.115E+01
Tl-208	F	3.7865E-01	8.6981E-02	8.8108E-02	0.570E-01
U-235	#B	-5.1457E-01	-1.1167E+00	-1.1169E+00	0.112E+00

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< - MDA value printed.
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B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.1651861E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:13:52
New World Technology Spectrum name: An13ED.An1

Sample description
Parcel D 70-PDB-B025997G3-01 362g
2/26/08 11:00

Acquisition information
Start time: 07-Mar-2008 13:59:49
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.2547E+00	2.6537E-01	2.6941E-01	0.981E-01
AM-241	#A	-5.4583E-02	-6.8155E-01	-6.8156E-01	0.142E+00
Bi-212	F	1.0968E+00	4.8080E-01	4.8252E-01	0.420E+00
BI-214		8.8733E-01	1.9255E-01	1.9534E-01	0.840E-01
CO-60	B	4.9415E-03	1.6667E-02	1.6668E-02	0.391E-01
CS-137	B	2.3101E-02	5.5585E-02	5.5592E-02	0.437E-01
EU-152	F	1.4360E-01	1.4224E-01	1.4234E-01	0.828E-01
EU-154	#F	1.2254E-01	1.3559E-01	1.3566E-01	0.652E-01
K-40		1.0612E+01	1.4794E+00	1.5308E+00	0.700E+00
Pa-234	F	2.2980E-01	1.3597E-01	1.3623E-01	0.135E+00
Pb-210		1.8246E+00	1.5776E+00	1.5790E+00	0.110E+01
Pb-212	F	1.1331E+00	1.5991E-01	1.6533E-01	0.912E-01
PB-214		8.4444E-01	1.6496E-01	1.6790E-01	0.948E-01
RA-226		3.2721E+00	1.3872E+00	1.3925E+00	0.101E+01
Th-230	#B	-1.4871E+01	-3.2116E+02	-3.2116E+02	0.102E+02
Th-234		2.1302E+00	1.0496E+00	1.0526E+00	0.111E+01
Tl-208	F	3.8295E-01	7.9113E-02	8.0375E-02	0.401E-01
U-235	#B	-1.0282E+00	-7.2732E+00	-7.2733E+00	0.130E+00

- All peaks for activity calculation had bad shape.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (42.7 to 3401.5 keV) 2.3438217E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:11:49
New World Technology Spectrum name: An13F3.An1

Sample description
Parcel D 70-PDB-B025997G3-01DUP 362g
2/26/08 11:00

Acquisition information
Start time: 07-Mar-2008 17:09:48
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.1086E+00	2.6353E-01	2.6671E-01	0.991E-01
AM-241	A	7.0786E-03	1.6140E-01	1.6140E-01	0.136E+00
Bi-212	F	9.7578E-01	4.9064E-01	4.9197E-01	0.425E+00
BI-214		1.1396E+00	1.9954E-01	2.0396E-01	0.784E-01
CO-60	#B	-4.3083E-02	-2.8857E-01	-2.8858E-01	0.331E-01
CS-137	B	1.6087E-02	4.4967E-02	4.4971E-02	0.353E-01
EU-152	#B	-9.6749E-03	3.8343E+02	3.8343E+02	0.112E+00
EU-154	F	1.8876E-01	1.3097E-01	1.3116E-01	0.810E-01
K-40		9.8970E+00	1.4793E+00	1.5241E+00	0.725E+00
Pa-234	F	3.2923E-01	2.6975E-01	2.7002E-01	0.147E+00
Pb-210		1.8999E+00	1.6225E+00	1.6241E+00	0.113E+01
Pb-212	F	1.0894E+00	1.4920E-01	1.5456E-01	0.877E-01
PB-214		9.3665E-01	2.3038E-01	2.3298E-01	0.108E+00
RA-226		3.1046E+00	1.4419E+00	1.4465E+00	0.107E+01
Th-230	#B	-1.2274E+01	-8.6441E+01	-8.6442E+01	0.102E+02
Th-234		3.1107E+00	1.2594E+00	1.2647E+00	0.111E+01
Tl-208	F	5.3344E-01	1.2919E-01	1.3069E-01	0.401E-01
U-235	#B	-9.6940E-01	-2.0938E+00	-2.0942E+00	0.127E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.3795698E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:40:57
New World Technology Spectrum name: An112A.An1

Sample description
Parcel D 70-PDB-G001226G3-01 331g
2/20/08 14:00

Acquisition information
Start time: 07-Mar-2008 11:45:36
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228		1.2862E+00	3.3405E-01	3.3744E-01	0.122E+00
AM-241	#B	-7.2245E-02	-3.8487E+00	-3.8487E+00	0.105E+00
BI-212	F	8.3553E-01	4.4406E-01	4.4514E-01	0.322E+00
BI-214	F	1.0059E+00	1.8437E-01	1.8810E-01	0.636E-01
CO-60	#F	1.6589E-01	5.4209E-02	5.4556E-02	0.102E-01
CS-137	B	1.7605E-02	5.2271E-02	5.2275E-02	0.413E-01
EU-152	B	9.3388E-02	4.9888E-02	5.0008E-02	0.117E+00
EU-154	F	2.5837E-01	1.2074E-01	1.2112E-01	0.677E-01
K-40		1.1034E+01	1.5752E+00	1.6274E+00	0.652E+00
PA-234	F	3.0115E-01	1.3468E-01	1.3514E-01	0.123E+00
PB-210		2.3687E+00	1.4847E+00	1.4873E+00	0.118E+01
PB-212	F	1.3094E+00	1.5685E-01	1.6419E-01	0.852E-01
PB-214		5.9902E-01	1.6407E-01	1.6556E-01	0.988E-01
RA-226		1.7833E+00	1.2213E+00	1.2231E+00	0.961E+00
Th-230	#B	-4.7393E+00	-2.2927E+01	-2.2927E+01	0.114E+02
TH-234	#B	-2.6035E-01	-1.8620E+00	-1.8620E+00	0.115E+01
TL-208	#F	7.3664E-01	1.6565E-01	1.6788E-01	0.363E-01
U-235	#B	-9.1408E-01	-3.7698E+00	-3.7700E+00	0.120E+00

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2667.7 keV) 2.1124662E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:37:01
New World Technology Spectrum name: An1139.An1

Sample description
Parcel D 70-PDB-G001226G3-01DUP 331g
2/20/08 14:00

Acquisition information
Start time: 07-Mar-2008 13:51:03
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228	1.6704E+00	3.3453E-01	3.4022E-01	0.103E+00
AM-241 #B	8.3580E-02	1.7617E-01	1.7619E-01	0.124E+00
BI-212	7.9132E-01	4.5972E-01	4.6065E-01	0.343E+00
BI-214 F	1.1667E+00	1.9452E-01	1.9927E-01	0.677E-01
CO-60 #B	1.4510E-03	1.6551E-02	1.6551E-02	0.221E-01
CS-137	4.4604E-02	3.6891E-02	3.6928E-02	0.232E-01
EU-152 #B	-1.7689E-01	2.6181E+02	2.6181E+02	0.955E-01
EU-154 #F	1.7339E-01	8.1736E-02	8.1988E-02	0.526E-01
K-40	1.0788E+01	1.5598E+00	1.6102E+00	0.652E+00
PA-234 #F	2.2328E-01	1.7881E-01	1.7900E-01	0.988E-01
PB-210	2.3669E+00	1.4055E+00	1.4082E+00	0.111E+01
PB-212 F	1.2105E+00	1.4553E-01	1.5229E-01	0.814E-01
PB-214	7.6274E-01	2.0514E-01	2.0708E-01	0.113E+00
RA-226	1.7453E+00	1.2565E+00	1.2581E+00	0.982E+00
Th-230 #B	-5.7445E+00	-2.3716E+01	-2.3717E+01	0.110E+02
TH-234 #B	-1.2869E+00	-3.0470E+00	-3.0474E+00	0.102E+01
TL-208 F	5.7886E-01	1.4807E-01	1.4962E-01	0.363E-01
U-235 #B	-8.8729E-01	-1.9734E+00	-1.9736E+00	0.115E+00

- All peaks for activity calculation had bad shape.
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& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.9 to 2667.7 keV) 2.1125792E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:05:11
New World Technology Spectrum name: An13F5.An1

Sample description
Parcel D 70-PD-C0048-13 366g
2/22/08 08:25

Acquisition information
Start time: 07-Mar-2008 18:03:34
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	8.7367E-01	2.7453E-01	2.7643E-01	0.118E+00
AM-241	A	4.8905E-02	1.3086E-01	1.3087E-01	0.109E+00
Bi-212	B	2.8465E-01	2.0332E-01	2.0360E-01	0.404E+00
BI-214		6.9709E-01	2.0988E-01	2.1146E-01	0.957E-01
CO-60	#B	-3.4834E-02	-3.6521E-02	-3.6544E-02	0.492E-01
CS-137	B	1.8076E-02	3.9866E-02	3.9871E-02	0.305E-01
EU-152	#F	1.4752E-01	1.1205E-01	1.1218E-01	0.834E-01
EU-154	B	-5.3213E-02	1.7143E+02	1.7143E+02	0.649E-01
K-40		1.0070E+01	1.4382E+00	1.4859E+00	0.692E+00
Pa-234	B	8.7175E-02	1.1335E-01	1.1340E-01	0.120E+00
Pb-210		2.3200E+00	1.3400E+00	1.3428E+00	0.106E+01
Pb-212	F	6.0530E-01	1.4366E-01	1.4540E-01	0.927E-01
PB-214	F	6.2010E-01	1.9661E-01	1.9795E-01	0.108E+00
RA-226		1.9197E+00	1.3396E+00	1.3415E+00	0.105E+01
Th-230	#B	-1.5693E+01	-5.1134E+03	-5.1134E+03	0.106E+02
Th-234		2.0609E+00	9.9535E-01	9.9826E-01	0.108E+01
Tl-208	F	2.8239E-01	9.6585E-02	9.7151E-02	0.396E-01
U-235	#B	-9.4558E-01	-1.7204E+00	-1.7208E+00	0.124E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (42.7 to 3401.5 keV) 1.9449150E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:02:26
New World Technology Spectrum name: An13FC.An1

Sample description
Parcel D 70-PD-C0048-13DUP 366g
2/22/08 08:25

Acquisition information
Start time: 07-Mar-2008 20:31:06
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.0728E+00	3.2815E-01	3.3055E-01	0.122E+00
AM-241	#A	-8.8927E-02	3.0069E+02	3.0069E+02	0.130E+00
Bi-212	B	1.5502E-01	1.0430E-01	1.0446E-01	0.402E+00
BI-214		5.9682E-01	1.3824E-01	1.3999E-01	0.650E-01
CO-60	#B	-5.8676E-02	-1.4998E-01	-1.4999E-01	0.524E-01
CS-137	B	1.5562E-02	4.4694E-02	4.4697E-02	0.350E-01
EU-152	F	1.2935E-01	1.0812E-01	1.0823E-01	0.107E+00
EU-154	F	8.5487E-02	1.0365E-01	1.0370E-01	0.805E-01
K-40		1.0283E+01	1.4508E+00	1.5000E+00	0.692E+00
Pa-234	B	5.6656E-02	1.0200E-01	1.0203E-01	0.139E+00
Pb-210	F	1.3084E+00	1.3220E+00	1.3228E+00	0.108E+01
Pb-212	F	5.9084E-01	1.3259E-01	1.3438E-01	0.921E-01
PB-214		6.5034E-01	1.5420E-01	1.5607E-01	0.765E-01
RA-226		1.9066E+00	1.4229E+00	1.4246E+00	0.111E+01
Th-230	#B	-9.6075E+00	-5.6093E+01	-5.6094E+01	0.119E+02
Th-234	F	1.5340E+00	1.0254E+00	1.0269E+00	0.107E+01
Tl-208	F	3.1197E-01	1.0063E-01	1.0130E-01	0.396E-01
U-235	B	-8.5391E-01	-8.4317E-01	-8.4376E-01	0.121E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 1.6946295E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:21:31
New World Technology Spectrum name: An13FA.An1

Sample description
Parcel D 70-PD-C0048-26 351g
2/22/08 08:35

Acquisition information
Start time: 07-Mar-2008 18:58:58
Live time: 5400
Real time: 5408

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.2208E+00	1.9723E-01	2.0235E-01	0.884E-01
AM-241	#A	-5.2764E-02	-3.8072E-01	-3.8072E-01	0.898E-01
Bi-212	B	2.1612E-01	3.8003E-01	3.8012E-01	0.330E+00
BI-214		1.1277E+00	1.9781E-01	2.0217E-01	0.832E-01
CO-60	#B	-9.4834E-02	-3.5104E-01	-3.5106E-01	0.390E-01
CS-137	B	3.8702E-03	4.3517E-02	4.3517E-02	0.357E-01
EU-152	F	1.2919E-01	1.1190E-01	1.1200E-01	0.830E-01
EU-154	#B	2.9914E-02	4.5527E-02	4.5540E-02	0.609E-01
K-40		9.9362E+00	1.1643E+00	1.2212E+00	0.575E+00
Pa-234	B	9.7427E-02	1.0841E-01	1.0847E-01	0.101E+00
Pb-210	#	2.1535E+00	1.2649E+00	1.2674E+00	0.854E+00
Pb-212	F	1.1338E+00	1.1293E-01	1.2049E-01	0.688E-01
PB-214		1.0046E+00	1.3067E-01	1.3587E-01	0.717E-01
RA-226		2.0808E+00	1.1151E+00	1.1178E+00	0.901E+00
Th-230	#B	-1.6025E+01	-6.8199E+02	-6.8199E+02	0.790E+01
Th-234		2.1249E+00	8.1805E-01	8.2181E-01	0.842E+00
Tl-208	F	5.7992E-01	9.7207E-02	9.9553E-02	0.292E-01
U-235	#B	-9.9349E-01	-1.5031E+00	-1.5036E+00	0.940E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.1362257E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 22:52:17
New World Technology Spectrum name: An13FE.An1

Sample description
Parcel D 70-PD-C0048-26DUP 351g
2/22/08 08:35

Acquisition information
Start time: 07-Mar-2008 21:19:03
Live time: 5400
Real time: 5407

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	1.5226E+00	3.1862E-01	3.2357E-01	0.128E+00
AM-241	#A	-2.4746E-02	-2.1106E-01	-2.1107E-01	0.103E+00
Bi-212	F	4.6163E-01	2.9876E-01	2.9925E-01	0.313E+00
BI-214		9.6355E-01	1.7914E-01	1.8267E-01	0.812E-01
CO-60	#B	-4.3247E-02	-9.9913E-02	-9.9925E-02	0.366E-01
CS-137		6.1175E-02	4.2465E-02	4.2526E-02	0.309E-01
EU-152	B	4.3921E-02	5.5400E-02	5.5423E-02	0.597E-01
EU-154	B	3.1791E-02	4.1788E-02	4.1804E-02	0.461E-01
K-40		1.0607E+01	1.1462E+00	1.2117E+00	0.553E+00
Pa-234	B	3.8760E-02	7.9336E-02	7.9348E-02	0.114E+00
Pb-210		1.6460E+00	1.2803E+00	1.2818E+00	0.872E+00
Pb-212		1.1806E+00	1.1663E-01	1.2456E-01	0.706E-01
PB-214		1.0067E+00	1.2675E-01	1.3212E-01	0.689E-01
RA-226		2.0449E+00	1.0842E+00	1.0868E+00	0.882E+00
Th-230	#B	-6.7375E+00	-2.2379E+01	-2.2380E+01	0.822E+01
Th-234		2.4432E+00	9.0544E-01	9.0993E-01	0.846E+00
Tl-208	F	4.7521E-01	8.8051E-02	8.9794E-02	0.292E-01
U-235	B	-1.0350E+00	-2.7984E+00	-2.7987E+00	0.953E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.7 to 3401.5 keV) 2.2412436E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 10:48:18
New World Technology Spectrum name: An1398.An1

Sample description
Parcel D 70-PD-C0076-10 358g
2/19/08 13:45

Acquisition information
Start time: 05-Mar-2008 08:28:47
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		9.2428E-01	1.9131E-01	1.9437E-01	0.850E-01
AM-241	#B	-2.8499E-02	-1.9578E-01	-1.9579E-01	0.758E-01
Bi-212	F	6.8801E-01	3.5308E-01	3.5401E-01	0.216E+00
BI-214	F	8.4121E-01	1.6820E-01	1.7107E-01	0.552E-01
CO-60	#B	5.5502E-04	3.7102E-03	3.7103E-03	0.995E-02
CS-137	B	3.3543E-03	4.0582E-02	4.0582E-02	0.414E-01
EU-152	F	1.4428E-01	7.4504E-02	7.4696E-02	0.819E-01
EU-154	F	1.5030E-01	1.2271E-01	1.2284E-01	0.593E-01
K-40		8.8027E+00	1.3584E+00	1.3971E+00	0.509E+00
Pa-234	#F	2.2294E-01	1.0922E-01	1.0953E-01	0.699E-01
Pb-210		1.2322E+00	8.6073E-01	8.6195E-01	0.684E+00
Pb-212	F	7.5055E-01	1.1674E-01	1.2002E-01	0.623E-01
Pb-214		7.7322E-01	1.9745E-01	1.9952E-01	0.872E-01
RA-226		1.6657E+00	1.0813E+00	1.0830E+00	0.819E+00
Th-230	B	5.0550E+00	8.5923E+00	8.5943E+00	0.697E+01
Th-234	F	1.0649E+00	8.1265E-01	8.1361E-01	0.725E+00
Tl-208	F	2.4783E-01	9.0750E-02	9.1215E-02	0.472E-01
U-235	#B	-5.7623E-02	-8.8825E-02	-8.8850E-02	0.619E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 1.5925756E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 10:46:21
New World Technology Spectrum name: An139C.An1

Sample description
Parcel D 70-PD-C0076-10DUP 358g
2/19/08 13:45

Acquisition information
Start time: 05-Mar-2008 10:26:39
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228		9.9790E-01	2.3657E-01	2.3945E-01	0.108E+00
AM-241	B	1.1516E-01	1.7183E-01	1.7188E-01	0.140E+00
Bi-212	F	5.5448E-01	3.1267E-01	3.1334E-01	0.193E+00
BI-214	F	7.2098E-01	1.4639E-01	1.4882E-01	0.517E-01
CO-60	#F	2.4464E-02	2.0916E-02	2.0935E-02	0.995E-02
CS-137	#B	-5.4853E-02	-3.3999E-01	-3.3999E-01	0.489E-01
EU-152	F	8.3665E-02	6.8519E-02	6.8589E-02	0.763E-01
EU-154	F	9.7499E-02	7.8169E-02	7.8253E-02	0.643E-01
K-40		8.1450E+00	1.3121E+00	1.3465E+00	0.509E+00
Pa-234	F	1.9723E-01	1.0857E-01	1.0882E-01	0.907E-01
Pb-210		1.2327E+00	9.2810E-01	9.2923E-01	0.741E+00
Pb-212		7.3101E-01	1.1702E-01	1.2013E-01	0.651E-01
Pb-214		7.3095E-01	1.4737E-01	1.4985E-01	0.822E-01
RA-226		1.7442E+00	9.9363E-01	9.9574E-01	0.736E+00
Th-230	#B	1.2865E+00	6.0760E+00	6.0762E+00	0.523E+01
Th-234	B	3.9723E-02	9.6484E-02	9.6495E-02	0.799E+00
Tl-208	F	2.9710E-01	8.2564E-02	8.3297E-02	0.385E-01
U-235	B	-9.9886E-02	-3.5185E-01	-3.5187E-01	0.646E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 1.5178783E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 13:40:58
New World Technology Spectrum name: An13CB.An1

Sample description
Parcel D 70-PD-C0080-42 349g
2/21/08 14:14

Acquisition information
Start time: 07-Mar-2008 14:10:53
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	1.5123E+00	3.4878E-01	3.5327E-01	0.127E+00
AM-241 #B	-5.9424E-02	5.0291E+02	5.0291E+02	0.125E+00
Bi-212	1.3837E+00	7.0957E-01	7.1142E-01	0.362E+00
BI-214 F	1.2406E+00	2.1797E-01	2.2278E-01	0.629E-01
CO-60 #F	2.6730E-02	2.5891E-02	2.5910E-02	0.157E-01
CS-137	6.3711E-02	4.2372E-02	4.2438E-02	0.251E-01
EU-152 #B	-1.6092E-02	1.8439E+02	1.8439E+02	0.698E-01
EU-154 #B	0.0000E+00	9.0980E+01	9.0980E+01	0.285E-01
K-40	6.0845E+00	1.1899E+00	1.2111E+00	0.493E+00
Pa-234 F	9.7713E-02	6.7876E-02	6.7973E-02	0.762E-01
Pb-210	1.2493E+00	1.0302E+00	1.0312E+00	0.802E+00
Pb-212	1.5356E+00	1.7767E-01	1.8658E-01	0.102E+00
PB-214 F	9.2136E-01	2.2540E-01	2.2798E-01	0.117E+00
RA-226	2.6874E+00	1.2779E+00	1.2818E+00	0.929E+00
Th-230 #B	-1.6375E+02	-2.5917E+02	-2.5924E+02	0.194E+02
Th-234 B	-6.3358E+00	-6.5980E+00	-6.6022E+00	0.167E+01
Tl-208	5.2708E-01	8.7908E-02	9.0057E-02	0.210E-01
U-235 F	8.2681E-02	9.4605E-02	9.4655E-02	0.670E-01

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (42.5 to 2705.0 keV) 1.7232302E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 08:46:52
New World Technology Spectrum name: An13CF.An1

Sample description
Parcel D 70-PD-C0080-42DUP 349g
2/21/08 14:14

Acquisition information
Start time: 07-Mar-2008 16:36:01
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.7621E+00	2.6585E-01	2.7377E-01	0.651E-01
AM-241	B	2.9592E-02	1.3964E-01	1.3965E-01	0.116E+00
Bi-212	F	9.4406E-01	4.2474E-01	4.2619E-01	0.276E+00
BI-214	F	1.1719E+00	1.8847E-01	1.9342E-01	0.710E-01
CO-60	#B	6.0548E-03	1.0588E-02	1.0591E-02	0.157E-01
CS-137		9.0499E-02	5.9787E-02	5.9881E-02	0.399E-01
EU-152	F	1.1469E-01	4.3351E-02	4.3559E-02	0.675E-01
EU-154	F	2.4868E-01	9.3544E-02	9.3998E-02	0.496E-01
K-40		5.6067E+00	1.1724E+00	1.1907E+00	0.564E+00
Pa-234	#F	2.5904E-01	1.3670E-01	1.3704E-01	0.605E-01
Pb-210	#B	-6.6832E+00	-1.5844E+01	-1.5846E+01	0.142E+01
Pb-212		1.6534E+00	1.7597E-01	1.8636E-01	0.971E-01
PB-214		1.4755E+00	1.7681E-01	1.8509E-01	0.687E-01
RA-226		2.2369E+00	1.1607E+00	1.1637E+00	0.843E+00
Th-230	#B	-1.1468E+02	-1.7197E+02	-1.7202E+02	0.150E+02
Th-234	B	6.1086E-01	8.8910E-01	8.8939E-01	0.871E+00
Tl-208	F	5.9056E-01	7.9704E-02	8.2661E-02	0.210E-01
U-235	F	1.2508E-01	8.0737E-02	8.0870E-02	0.571E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (42.5 to 2705.0 keV) 1.6279131E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:27:10
New World Technology Spectrum name: An13D3.An1

Sample description
Parcel D 70-PD-C0081-05 363g
2/22/08 13:55

Acquisition information
Start time: 07-Mar-2008 13:49:01
Live time: 5400
Real time: 5403

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.1727E+00	1.7638E-01	1.8167E-01	0.593E-01
AM-241	#B	-4.9854E-03	-8.1779E-02	-8.1779E-02	0.615E-01
Bi-212	F	8.9502E-01	2.9231E-01	2.9419E-01	0.179E+00
BI-214	F	6.9437E-01	1.1167E-01	1.1461E-01	0.534E-01
CO-60	#F	6.8025E-03	6.1035E-03	6.1087E-03	0.491E-02
CS-137	#B	-1.8548E-02	-4.6036E-02	-4.6041E-02	0.295E-01
EU-152	F	6.7821E-02	3.4434E-02	3.4526E-02	0.546E-01
EU-154	F	8.5736E-02	4.4249E-02	4.4363E-02	0.378E-01
K-40		4.6564E+00	7.3987E-01	7.5980E-01	0.397E+00
Pa-234	F	3.2719E-01	1.0188E-01	1.0260E-01	0.661E-01
Pb-210	#	2.6980E+00	1.3302E+00	1.3340E+00	0.510E+00
Pb-212		1.1303E+00	9.2109E-02	1.0122E-01	0.420E-01
Pb-214		2.4268E-01	1.1979E-01	1.2012E-01	0.934E-01
RA-226		1.6686E+00	7.3270E-01	7.3532E-01	0.560E+00
Th-230	#F	9.6324E+00	1.1695E+01	1.1701E+01	0.491E+01
Th-234	#	3.0141E+00	1.1414E+00	1.1469E+00	0.491E+00
Tl-208		4.8327E-01	5.5041E-02	5.7891E-02	0.194E-01
U-235	B	-1.0226E-01	-2.4210E-01	-2.4213E-01	0.427E-01

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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 1.7050602E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:23:45
New World Technology Spectrum name: An13DB.An1

Sample description
Parcel D 70-PD-C0081-05DUP 363g
2/22/08 13:55

Acquisition information
Start time: 07-Mar-2008 17:59:46
Live time: 5400
Real time: 5404

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.0845E+00	1.4496E-01	1.5045E-01	0.593E-01
AM-241	#B	-2.0907E-02	-1.3308E-01	-1.3309E-01	0.638E-01
Bi-212	F	1.0005E+00	2.7667E-01	2.7915E-01	0.150E+00
BI-214	F	1.0270E+00	1.0785E-01	1.1439E-01	0.211E-01
CO-60	#F	8.6961E-03	6.6540E-03	6.6618E-03	0.491E-02
CS-137	#B	-2.0582E-02	-5.7217E-02	-5.7223E-02	0.325E-01
EU-152	F	7.3044E-02	4.2195E-02	4.2282E-02	0.552E-01
EU-154	F	9.0280E-02	6.0142E-02	6.0236E-02	0.361E-01
K-40		5.5599E+00	7.9444E-01	8.2081E-01	0.397E+00
Pa-234	F	1.1059E-01	7.3770E-02	7.3884E-02	0.624E-01
Pb-210		1.1351E+00	6.4279E-01	6.4417E-01	0.519E+00
Pb-212		1.0920E+00	9.2147E-02	1.0067E-01	0.437E-01
Pb-214		6.6567E-01	1.0353E-01	1.0644E-01	0.614E-01
RA-226		1.6830E+00	7.8569E-01	7.8817E-01	0.615E+00
Th-230	#F	1.3387E+01	1.6218E+01	1.6226E+01	0.575E+01
Th-234		1.1179E+00	6.3374E-01	6.3510E-01	0.519E+00
Tl-208	F	4.2350E-01	5.1858E-02	5.4189E-02	0.194E-01
U-235	#B	2.2621E-02	2.4769E-02	2.4784E-02	0.443E-01

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (40.2 to 2567.0 keV) 1.4972703E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:34:03
New World Technology Spectrum name: An1E2.An1

Sample description
Parcel D 70-PD-C0081-23 369g
2/22/08 14:08

Acquisition information
Start time: 06-Mar-2008 11:16:47
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228		8.2278E-01	1.9444E-01	1.9682E-01	0.542E-01
AM-241	F	1.2163E-01	1.8163E-01	1.8169E-01	0.793E-01
BI-212	F	5.4313E-01	3.2547E-01	3.2609E-01	0.224E+00
BI-214	F	9.4159E-01	1.3907E-01	1.4339E-01	0.271E-01
CO-60	#F	1.4722E-02	1.5787E-02	1.5797E-02	0.920E-02
CS-137	F	2.8348E-02	2.8659E-02	2.8678E-02	0.184E-01
EU-152	B	2.3131E-02	9.7732E-02	9.7735E-02	0.869E-01
EU-154	F	9.1817E-02	7.3354E-02	7.3433E-02	0.561E-01
K-40		7.9028E+00	1.2833E+00	1.3163E+00	0.587E+00
PA-234	F	2.0090E-01	7.8005E-02	7.8360E-02	0.537E-01
PB-210	#	3.4378E+00	1.9857E+00	1.9898E+00	0.787E+00
PB-212	F	8.2175E-01	1.1606E-01	1.1999E-01	0.643E-01
PB-214		6.4715E-01	1.7819E-01	1.7980E-01	0.725E-01
RA-226		1.9569E+00	9.3546E-01	9.3827E-01	0.712E+00
Th-230	#B	-4.0452E+00	-1.5949E+01	-1.5950E+01	0.965E+01
TH-234	#B	-7.2620E+00	-1.0184E+01	-1.0188E+01	0.146E+01
TL-208	#F	4.5395E-01	1.2338E-01	1.2452E-01	0.325E-01
U-235	#B	-5.3737E-01	-3.7152E-01	-3.7205E-01	0.106E+00

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2667.7 keV) 1.7820557E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:30:45
New World Technology Spectrum name: An1E5.An1

Sample description
Parcel D 70-PD-C0081-23DUP 369g
2/22/08 14:08

Acquisition information
Start time: 06-Mar-2008 13:19:18
Live time: 2700
Real time: 2702

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
AC-228		8.6944E-01	2.2666E-01	2.2894E-01	0.891E-01
AM-241	B	3.0824E-02	1.4269E-01	1.4270E-01	0.119E+00
BI-212	F	3.3880E-01	4.0687E-01	4.0707E-01	0.321E+00
BI-214	F	9.5988E-01	1.8261E-01	1.8604E-01	0.638E-01
CO-60	#F	9.7605E-02	3.9468E-02	3.9634E-02	0.920E-02
CS-137		6.0729E-02	4.1730E-02	4.1791E-02	0.266E-01
EU-152	#B	-1.0693E-01	-5.1269E-01	-5.1270E-01	0.942E-01
EU-154	B	4.7230E-02	6.5588E-02	6.5612E-02	0.736E-01
K-40		1.0018E+01	1.4212E+00	1.4689E+00	0.587E+00
PA-234	F	2.2416E-01	1.6437E-01	1.6458E-01	0.117E+00
PB-210		1.4909E+00	1.4897E+00	1.4908E+00	0.101E+01
PB-212	F	8.2419E-01	1.2296E-01	1.2670E-01	0.701E-01
PB-214		7.6874E-01	1.6659E-01	1.6901E-01	0.881E-01
RA-226		1.9738E+00	1.1112E+00	1.1136E+00	0.830E+00
Th-230	#B	-1.3551E+01	-5.1630E+01	-5.1632E+01	0.998E+01
TH-234	#B	-3.6748E-01	-1.4371E+00	-1.4372E+00	0.984E+00
TL-208	F	1.4879E-01	6.7645E-02	6.7870E-02	0.534E-01
U-235	#B	-7.1104E-01	-1.0485E+00	-1.0488E+00	0.103E+00

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B - Activity < MDA and failed test.
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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2667.7 keV) 1.7063337E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 06-MAR-2008 12:47:10
New World Technology Spectrum name: An11A9.An1

Sample description
Parcel D 70-PD-C0081-26 364g
2/22/08 14:00

Acquisition information
Start time: 06-Mar-2008 11:46:29
Live time: 2700
Real time: 2705

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.4443E+00	2.7481E-01	2.7999E-01	0.225E+00
AM-241	#A	-9.4450E-02	-6.3248E+00	-6.3248E+00	0.130E+00
Bi-212	#B	-5.8230E-01	1.8146E+03	1.8146E+03	0.452E+00
BI-214	F	9.0116E-01	1.5464E-01	1.5821E-01	0.767E-01
CO-60	#B	-5.2897E-02	-1.4346E-01	-1.4347E-01	0.537E-01
CS-137	B	5.5381E-03	3.8086E-02	3.8087E-02	0.308E-01
EU-152	B	8.7721E-02	1.1654E-01	1.1658E-01	0.111E+00
EU-154	B	1.2656E-03	9.6604E-03	9.6606E-03	0.717E-01
K-40		1.0195E+01	1.7066E+00	1.7480E+00	0.816E+00
Pa-234	#B	-1.6047E-02	-9.3590E-02	-9.3592E-02	0.614E-01
Pb-210		3.1956E+00	1.8516E+00	1.8554E+00	0.116E+01
Pb-212		1.5281E+00	1.5303E-01	1.6320E-01	0.837E-01
PB-214		1.1514E+00	1.8667E-01	1.9149E-01	0.994E-01
RA-226		2.4625E+00	1.2329E+00	1.2363E+00	0.968E+00
Th-230	#B	-3.0662E+01	-3.2749E+02	-3.2749E+02	0.104E+02
Th-234	B	3.7112E-01	1.2888E+00	1.2889E+00	0.112E+01
Tl-208	F	4.9587E-01	1.1272E-01	1.1421E-01	0.535E-01
U-235	#B	-4.8428E-01	-1.2172E+00	-1.2173E+00	0.101E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.1374310E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 06-MAR-2008 14:45:43
New World Technology Spectrum name: An11AC.An1

Sample description
Parcel D 70-PD-C0081-26DUP 364g
2/22/08 14:00

Acquisition information
Start time: 06-Mar-2008 13:48:48
Live time: 2700
Real time: 2705

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	1.2234E+00	3.1552E-01	3.1877E-01	0.216E+00
AM-241	#A	-5.6493E-02	-5.9680E-01	-5.9680E-01	0.139E+00
Bi-212	F	7.6138E-01	4.9281E-01	4.9362E-01	0.400E+00
BI-214	F	9.8147E-01	1.6042E-01	1.6450E-01	0.758E-01
CO-60	#B	-9.6094E-02	-5.2085E-01	-5.2087E-01	0.513E-01
CS-137	B	1.6881E-02	4.0140E-02	4.0145E-02	0.313E-01
EU-152	#B	8.9838E-02	8.7158E-02	8.7221E-02	0.114E+00
EU-154	B	3.5507E-02	6.4676E-02	6.4689E-02	0.829E-01
K-40		1.1448E+01	1.9475E+00	1.9933E+00	0.847E+00
Pa-234	#F	2.1454E-01	2.1820E-01	2.1834E-01	0.126E+00
Pb-210	#	1.4905E+00	1.3334E+00	1.3345E+00	0.101E+01
Pb-212	F	1.4650E+00	1.5162E-01	1.6107E-01	0.845E-01
PB-214		1.0759E+00	2.0310E-01	2.0699E-01	0.958E-01
RA-226		2.7366E+00	1.3598E+00	1.3636E+00	0.107E+01
Th-230	#B	-2.1198E+01	-6.2938E+01	-6.2943E+01	0.111E+02
Th-234	F	1.4369E+00	1.1736E+00	1.1748E+00	0.107E+01
Tl-208	F	4.2597E-01	1.0306E-01	1.0426E-01	0.565E-01
U-235	B	-4.3398E-01	-8.9005E-01	-8.9020E-01	0.102E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.1608295E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 13:47:29
New World Technology Spectrum name: An1128.An1

Sample description
Parcel D 70-PDT-068-130 382g
2/25/08 13:40

Acquisition information
Start time: 07-Mar-2008 10:51:49
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228		1.6534E+00	2.7486E-01	2.8161E-01	0.149E+00
AM-241	B	7.7629E-03	1.5261E-01	1.5261E-01	0.127E+00
BI-212		8.1788E-01	4.3578E-01	4.3684E-01	0.347E+00
BI-214	F	1.1225E+00	1.8330E-01	1.8796E-01	0.916E-01
CO-60	#B	-5.0557E-02	-1.3602E-01	-1.3603E-01	0.512E-01
CS-137	B	2.3588E-02	3.6291E-02	3.6302E-02	0.268E-01
EU-152	B	-1.2000E-02	-1.5290E-02	-1.5296E-02	0.113E+00
EU-154	F	8.3227E-02	1.2018E-01	1.2022E-01	0.624E-01
K-40		9.5396E+00	1.4875E+00	1.5289E+00	0.619E+00
PA-234	F	3.8719E-01	2.0584E-01	2.0634E-01	0.116E+00
PB-210		3.3491E+00	1.5228E+00	1.5278E+00	0.994E+00
PB-212	F	1.4636E+00	1.5425E-01	1.6351E-01	0.839E-01
PB-214		1.0723E+00	1.6675E-01	1.7142E-01	0.110E+00
RA-226		2.0011E+00	1.2700E+00	1.2721E+00	0.102E+01
Th-230	#B	-1.0204E+01	-3.9046E+01	-3.9048E+01	0.101E+02
TH-234	#B	4.2107E-01	6.5333E-01	6.5352E-01	0.111E+01
TL-208	F	7.7841E-01	1.5800E-01	1.6061E-01	0.314E-01
U-235	#B	-7.4710E-01	-1.5687E+00	-1.5689E+00	0.107E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2667.7 keV) 2.2184977E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 13:43:29
New World Technology Spectrum name: An112D.An1

Sample description
Parcel D 70-PDT-068-130DUP 382g
2/25/08 13:40

Acquisition information
Start time: 07-Mar-2008 12:46:11
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228		2.1048E+00	3.6525E-01	3.7350E-01	0.110E+00
AM-241	#B	-6.6636E-02	3.5682E+02	3.5682E+02	0.974E-01
BI-212	F	1.0885E+00	4.3302E-01	4.3490E-01	0.271E+00
BI-214	F	1.3628E+00	2.1558E-01	2.2142E-01	0.768E-01
CO-60	#B	-1.0237E-01	-4.4813E-01	-4.4814E-01	0.469E-01
CS-137		3.6420E-02	3.6050E-02	3.6075E-02	0.247E-01
EU-152	#B	-1.5328E-01	2.3327E+02	2.3327E+02	0.101E+00
EU-154	F	2.1785E-01	1.8953E-01	1.8971E-01	0.689E-01
K-40		1.0753E+01	1.4373E+00	1.4915E+00	0.565E+00
PA-234	#F	3.2816E-01	2.0509E-01	2.0545E-01	0.108E+00
PB-210		2.6713E+00	1.5354E+00	1.5386E+00	0.103E+01
PB-212	F	1.5001E+00	1.5041E-01	1.6036E-01	0.775E-01
PB-214		1.1207E+00	2.1810E-01	2.2202E-01	0.109E+00
RA-226		1.9356E+00	1.2574E+00	1.2595E+00	0.986E+00
Th-230	#B	-1.1394E+01	-4.6154E+01	-4.6156E+01	0.113E+02
TH-234	#B	-4.0634E-02	-7.9438E-02	-7.9452E-02	0.103E+01
TL-208	F	7.4713E-01	1.5405E-01	1.5652E-01	0.314E-01
U-235	#B	-7.6727E-01	-1.9486E+00	-1.9488E+00	0.104E+00

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H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.9 to 2667.7 keV) 2.3648245E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 08:59:09
New World Technology Spectrum name: An13D8.An1

Sample description
Parcel D 70-PDT-077-99 365g
2/26/08 15:33

Acquisition information
Start time: 05-Mar-2008 12:46:59
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	F	6.4011E-01	2.5580E-01	2.5690E-01	0.259E+00
AM-241	#A	-8.9180E-01	-9.0133E+00	-9.0134E+00	0.772E+00
Bi-212	F	1.0583E+00	4.2339E-01	4.2521E-01	0.213E+00
BI-214	F	1.0341E+00	1.8401E-01	1.8796E-01	0.571E-01
CO-60	#F	1.4037E-02	1.3597E-02	1.3607E-02	0.101E-01
CS-137		6.7946E-02	4.7161E-02	4.7229E-02	0.296E-01
EU-152	A	7.7948E-02	1.0525E-01	1.0529E-01	0.114E+00
EU-154	A	3.9837E-02	1.0378E-01	1.0379E-01	0.819E-01
K-40		1.0073E+01	1.4435E+00	1.4910E+00	0.509E+00
Pa-234	#B	4.8704E-02	5.7374E-02	5.7403E-02	0.105E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	8.4184E-01	1.5010E-01	1.5332E-01	0.939E-01
Pb-214		8.2658E-01	1.6267E-01	1.6553E-01	0.961E-01
RA-226		1.7100E+00	1.3130E+00	1.3145E+00	0.101E+01
Th-230	#B	-4.3501E+00	-4.1931E+01	-4.1931E+01	0.281E+02
Th-234	#B	-6.6057E+00	-2.1390E+01	-2.1391E+01	0.388E+01
Tl-208		4.5616E-01	1.2300E-01	1.2416E-01	0.190E-01
U-235	B	-1.2417E+00	-3.3140E+00	-3.3143E+00	0.142E+00

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A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 1.6707666E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 09:08:36
New World Technology Spectrum name: An13DC.An1

Sample description
Parcel D 70-PDT-077-99DUP 365g
2/26/08 15:33

Acquisition information
Start time: 05-Mar-2008 14:22:07
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.1642E+00	2.5661E-01	2.6021E-01	0.101E+00
AM-241	#	1.0498E+00	1.7767E+00	1.7772E+00	0.924E+00
Bi-212	#B	0.0000E+00	1.9314E+03	1.9314E+03	0.379E+00
BI-214	F	9.0033E-01	1.8840E-01	1.9134E-01	0.633E-01
CO-60	#F	1.4672E-02	2.2491E-02	2.2497E-02	0.127E-01
CS-137		4.9741E-02	4.8791E-02	4.8826E-02	0.340E-01
EU-152	C	1.7146E-01	1.2298E-01	1.2314E-01	0.104E+00
EU-154	A	4.0627E-02	9.6465E-02	9.6476E-02	0.774E-01
K-40		1.0636E+01	1.4797E+00	1.5314E+00	0.509E+00
Pa-234	#B	2.0402E-02	7.0673E-02	7.0677E-02	0.101E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	9.0676E-01	1.4718E-01	1.5097E-01	0.899E-01
Pb-214		7.5616E-01	1.6422E-01	1.6660E-01	0.942E-01
RA-226		1.7200E+00	1.0795E+00	1.0814E+00	0.787E+00
Th-230	F	5.1300E+01	6.1108E+01	6.1138E+01	0.341E+02
Th-234	#B	-5.5724E-01	-2.1028E+00	-2.1029E+00	0.435E+01
Tl-208	#F	3.7471E-01	1.1169E-01	1.1255E-01	0.190E-01
U-235	#B	-1.2688E+00	-7.0215E+00	-7.0217E+00	0.145E+00

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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (41.2 to 2630.1 keV) 1.6508223E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 10-MAR-2008 10:16:54
New World Technology Spectrum name: 2N000319.An1

Sample description
Parcel D 70-PDT-078-33 357g
3/07/08 12:57

Acquisition information
Start time: 10-Mar-2008 07:22:14
Live time: 2700
Real time: 2705

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.1527E+00	3.0948E-01	3.1242E-01	0.126E+00
AM-241	#B	-7.3721E-02	2.7152E+02	2.7152E+02	0.117E+00
Bi-212	F	1.1752E+00	6.8062E-01	6.8202E-01	0.323E+00
BI-214	F	8.1535E-01	1.8373E-01	1.8621E-01	0.763E-01
CO-60	#F	5.5393E-02	4.8043E-02	4.8087E-02	0.201E-01
CS-137	#B	-3.1408E-03	-5.1804E-02	-5.1804E-02	0.467E-01
EU-152	#F	6.6710E-02	6.7659E-02	6.7705E-02	0.586E-01
EU-154	#B	-4.2776E-02	1.6016E+02	1.6016E+02	0.489E-01
K-40		9.9762E+00	1.3816E+00	1.4303E+00	0.198E+00
Pa-234	F	3.1804E-01	1.3400E-01	1.3452E-01	0.906E-01
Pb-210		2.2200E+00	1.1175E+00	1.1205E+00	0.723E+00
Pb-212	F	1.1537E+00	1.3460E-01	1.4125E-01	0.632E-01
Pb-214	F	8.4897E-01	1.5097E-01	1.5423E-01	0.730E-01
RA-226		1.6896E+00	1.1262E+00	1.1280E+00	0.919E+00
Th-230	#B	-1.6888E+01	-5.2806E+01	-5.2810E+01	0.943E+01
Th-234	F	1.1171E+00	8.7034E-01	8.7133E-01	0.713E+00
Tl-208	F	4.6894E-01	8.8009E-02	8.9714E-02	0.369E-01
U-235	B	-1.2561E-01	-7.4141E-01	-7.4142E-01	0.729E-01

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 2.0673151E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 10-MAR-2008 10:10:58
New World Technology Spectrum name: 2N000321.An1

Sample description
Parcel D 70-PDT-078-33DUP 357g
3/07/08 12:57

Acquisition information
Start time: 10-Mar-2008 09:19:37
Live time: 2700
Real time: 2705

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.2677E+00	2.6786E-01	2.7196E-01	0.996E-01
AM-241	#B	-2.6955E-02	-2.5423E-01	-2.5423E-01	0.909E-01
Bi-212		1.2320E+00	4.4446E-01	4.4680E-01	0.231E+00
BI-214	F	9.3154E-01	1.6667E-01	1.7022E-01	0.515E-01
CO-60	#B	1.5123E-02	2.9829E-02	2.9834E-02	0.186E-01
CS-137	#B	-3.0979E-02	-1.4196E-01	-1.4197E-01	0.549E-01
EU-152	#B	-3.6817E-03	2.0324E+02	2.0324E+02	0.877E-01
EU-154	#F	1.0450E-01	5.7500E-02	5.7631E-02	0.595E-01
K-40		9.7453E+00	1.4258E+00	1.4710E+00	0.517E+00
Pa-234	F	1.1946E-01	7.2404E-02	7.2539E-02	0.982E-01
Pb-210	#	2.4258E+00	1.4080E+00	1.4109E+00	0.865E+00
Pb-212	F	1.2003E+00	1.3730E-01	1.4435E-01	0.655E-01
Pb-214		9.1075E-01	1.9243E-01	1.9537E-01	0.817E-01
RA-226		1.6419E+00	1.1074E+00	1.1091E+00	0.868E+00
Th-230	#B	-2.2924E+01	-2.6046E+02	-2.6046E+02	0.812E+01
Th-234	F	1.5437E+00	8.2312E-01	8.2512E-01	0.765E+00
Tl-208		3.2354E-01	9.2425E-02	9.3202E-02	0.453E-01
U-235	B	-9.7461E-02	-3.2349E-01	-3.2351E-01	0.643E-01

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B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (40.2 to 2567.0 keV) 2.1222536E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:33:11
New World Technology Spectrum name: An13F1.An1

Sample description
Parcel D 70-PDT-084-22 358g
2/22/08 10:05

Acquisition information
Start time: 07-Mar-2008 12:52:25
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	8.3382E-01	3.0809E-01	3.0965E-01	0.226E+00
AM-241 #B	-1.3176E-01	-1.2218E+00	-1.2218E+00	0.115E+00
Bi-212	9.4735E-01	5.7404E-01	5.7512E-01	0.397E+00
BI-214 F	1.3592E+00	2.7783E-01	2.8238E-01	0.100E+00
CO-60 #F	4.5791E-02	3.8399E-02	3.8437E-02	0.169E-01
CS-137 #B	3.5815E-03	1.5252E-02	1.5253E-02	0.140E-01
EU-152 F	1.1714E-01	7.1226E-02	7.1357E-02	0.818E-01
EU-154 F	1.9647E-01	1.1847E-01	1.1870E-01	0.564E-01
K-40	1.2762E+01	1.7291E+00	1.7929E+00	0.683E+00
Pa-234 F	3.1319E-01	1.7862E-01	1.7899E-01	0.121E+00
Pb-210	1.7647E+00	1.2756E+00	1.2772E+00	0.104E+01
Pb-212	1.1727E+00	1.7514E-01	1.8048E-01	0.116E+00
PB-214	1.3107E+00	2.7377E-01	2.7807E-01	0.120E+00
RA-226	1.8140E+00	1.4480E+00	1.4496E+00	0.118E+01
Th-230 #B	-4.0209E+00	-3.0217E+01	-3.0218E+01	0.127E+02
Th-234 F	1.4473E+00	7.3169E-01	7.3364E-01	0.108E+01
Tl-208	5.4212E-01	9.5192E-02	9.7299E-02	0.789E-01
U-235 #B	-8.9260E-01	-2.1737E+00	-2.1740E+00	0.125E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.2 to 2632.4 keV) 2.2552048E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 10-MAR-2008 08:27:41
New World Technology Spectrum name: An13F55.An1

Sample description
Parcel D 70-PDT-084-22DUP 358g
2/22/08 10:05

Acquisition information
Start time: 07-Mar-2008 15:18:52
Live time: 2700
Real time: 2703

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.0838E+00	3.2420E-01	3.2669E-01	0.200E+00
AM-241 #B	-8.8799E-02	-5.4583E-01	-5.4584E-01	0.139E+00
Bi-212 F	7.1772E-01	4.6265E-01	4.6342E-01	0.324E+00
BI-214 F	1.4735E+00	2.7226E-01	2.7771E-01	0.110E+00
CO-60 #F	2.8993E-02	2.6658E-02	2.6680E-02	0.201E-01
CS-137	5.7216E-02	4.8753E-02	4.8800E-02	0.329E-01
EU-152 #F	2.1542E-01	1.2361E-01	1.2386E-01	0.897E-01
EU-154 F	2.2370E-01	1.4751E-01	1.4774E-01	0.725E-01
K-40	1.3824E+01	1.6366E+00	1.7153E+00	0.113E+00
Pa-234 F	1.3087E-01	1.4124E-01	1.4132E-01	0.124E+00
Pb-210	2.7048E+00	1.3422E+00	1.3459E+00	0.104E+01
Pb-212	1.1977E+00	1.7449E-01	1.8007E-01	0.114E+00
PB-214	1.4671E+00	2.8759E-01	2.9270E-01	0.131E+00
RA-226	1.8027E+00	1.3350E+00	1.3366E+00	0.103E+01
Th-230 #B	-1.1285E+01	-6.8795E+01	-6.8796E+01	0.122E+02
Th-234 F	1.8414E+00	6.5830E-01	6.6181E-01	0.106E+01
Tl-208 B	-1.3971E-01	4.2363E+02	4.2363E+02	0.118E+00
U-235 #B	-8.6942E-01	-1.6469E+00	-1.6472E+00	0.124E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 2.4328342E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 07-MAR-2008 10:40:11
New World Technology Spectrum name: An13D0.An1

Sample description
Parcel D 70-PDT-085-30 385g
2/20/08 09:46

Acquisition information
Start time: 05-Mar-2008 09:40:12
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		2.4277E+00	4.1249E-01	4.2220E-01	0.126E+00
AM-241	#A	-5.5074E-01	-3.0769E+00	-3.0770E+00	0.783E+00
Bi-212		1.8766E+00	6.4848E-01	6.5220E-01	0.376E+00
BI-214	F	1.6853E+00	2.5155E-01	2.5920E-01	0.929E-01
CO-60	#B	2.9894E-03	1.2950E-02	1.2950E-02	0.108E-01
CS-137	B	4.2142E-02	5.9865E-02	5.9886E-02	0.454E-01
EU-152	C	3.2827E-01	1.5829E-01	1.5875E-01	0.991E-01
EU-154	A	4.1263E-02	9.8837E-02	9.8848E-02	0.820E-01
K-40	#	1.0480E+01	1.5661E+00	1.6136E+00	0.593E+00
Pa-234	#B	1.2555E-01	2.2823E-01	2.2828E-01	0.169E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	2.2505E+00	2.0831E-01	2.2441E-01	0.107E+00
Pb-214		1.8080E+00	2.8295E-01	2.9078E-01	0.118E+00
RA-226		2.8750E+00	1.5471E+00	1.5508E+00	0.124E+01
Th-230	#B	-2.5809E+01	-2.0407E+02	-2.0407E+02	0.204E+02
Th-234	B	2.8498E+00	3.3156E+00	3.3173E+00	0.519E+01
Tl-208		9.4331E-01	1.1394E-01	1.1919E-01	0.180E-01
U-235	B	-9.1610E-01	-7.4877E-01	-7.4954E-01	0.148E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 2.4346727E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 05-MAR-2008 12:38:09
New World Technology Spectrum name: An13D4.An1

Sample description
Parcel D 70-PDT-085-30DUP 385g
2/20/08 09:46

Acquisition information
Start time: 05-Mar-2008 11:31:54
Live time: 2700
Real time: 2704

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	F	2.3972E+00	3.5836E-01	3.6922E-01	0.119E+00
AM-241	#A	-3.1853E-01	-1.6998E+00	-1.6998E+00	0.759E+00
Bi-212	F	1.6402E+00	5.8333E-01	5.8649E-01	0.345E+00
BI-214	F	1.8111E+00	2.4946E-01	2.5834E-01	0.855E-01
CO-60	#B	8.3129E-03	2.2325E-02	2.2327E-02	0.164E-01
CS-137	B	3.2697E-02	5.7234E-02	5.7247E-02	0.440E-01
EU-152	C	2.5270E-01	1.3156E-01	1.3189E-01	0.106E+00
EU-154	A	5.2328E-02	5.0753E-02	5.0790E-02	0.955E-01
K-40		1.1776E+01	1.5065E+00	1.5685E+00	0.482E+00
Pa-234	#F	2.8778E-01	1.6829E-01	1.6863E-01	0.120E+00
Pb-210	#F	0.0000E+00	0.0000E+00	0.0000E+00	0.000E+00
Pb-212	F	2.3718E+00	2.1250E-01	2.2999E-01	0.107E+00
Pb-214		1.7403E+00	2.8427E-01	2.9150E-01	0.117E+00
RA-226		2.8086E+00	1.6069E+00	1.6102E+00	0.126E+01
Th-230	B	-1.8959E+00	-5.6300E+01	-5.6301E+01	0.422E+02
Th-234	B	-3.1060E+00	-2.3073E+00	-2.3102E+00	0.477E+01
Tl-208		9.4768E-01	1.1041E-01	1.1587E-01	0.180E-01
U-235	#B	-1.1517E+00	-3.1385E+00	-3.1387E+00	0.148E+00

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C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2630.1 keV) 2.5493275E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 08:39:50
New World Technology Spectrum name: An13D33.An1

Sample description
Parcel D 70-PDT-085-31 344g
2/20/08 09:50

Acquisition information
Start time: 07-Mar-2008 18:24:46
Live time: 2700
Real time: 2706

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (2 Sigma) Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228		2.5046E+00	3.5021E-01	3.6233E-01	0.661E-01
AM-241		1.3891E-01	1.1879E-01	1.1890E-01	0.943E-01
Bi-212	F	1.6875E+00	5.8987E-01	5.9318E-01	0.368E+00
BI-214	F	1.8605E+00	2.0965E-01	2.2072E-01	0.138E-01
CO-60	#B	4.0686E-03	6.6519E-03	6.6537E-03	0.159E-01
CS-137		7.6007E-02	4.2484E-02	4.2577E-02	0.227E-01
EU-152	F	3.1965E-01	1.3102E-01	1.3155E-01	0.104E+00
EU-154	F	1.8047E-01	8.7800E-02	8.8055E-02	0.711E-01
K-40	#	8.2151E+00	1.3914E+00	1.4244E+00	0.572E+00
Pa-234	F	2.9576E-01	1.0778E-01	1.0833E-01	0.119E+00
Pb-210	#B	-4.7536E+00	-4.8744E+00	-4.8776E+00	0.140E+01
Pb-212		2.4847E+00	2.0555E-01	2.2528E-01	0.101E+00
PB-214		1.4542E+00	2.4288E-01	2.4880E-01	0.880E-01
RA-226		3.5989E+00	1.4807E+00	1.4867E+00	0.109E+01
Th-230	#B	-7.3365E+01	-1.2805E+02	-1.2808E+02	0.164E+02
Th-234	F	2.8935E+00	1.1446E+00	1.1496E+00	0.876E+00
Tl-208	F	6.4771E-01	1.5374E-01	1.5560E-01	0.213E-01
U-235	F	1.8386E-01	9.5134E-02	9.5378E-02	0.679E-01

- All peaks for activity calculation had bad shape.
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< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (42.5 to 2705.0 keV) 2.6541424E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 11-MAR-2008 08:33:05
New World Technology Spectrum name: An13DA.An1

Sample description
Parcel D 70-PDT-085-31DUP 344g
2/20/08 09:50

Acquisition information
Start time: 07-Mar-2008 20:03:08
Live time: 2700
Real time: 2705

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***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		2.4545E+00	3.4938E-01	3.6106E-01	0.661E-01
AM-241		1.6047E-01	1.4236E-01	1.4248E-01	0.114E+00
Bi-212	F	1.6523E+00	5.3738E-01	5.4086E-01	0.313E+00
BI-214	F	1.5952E+00	1.9562E-01	2.0438E-01	0.138E-01
CO-60	#B	6.8806E-03	7.3786E-03	7.3831E-03	0.159E-01
CS-137		5.9037E-02	3.9540E-02	3.9601E-02	0.225E-01
EU-152	F	2.8532E-01	1.1451E-01	1.1500E-01	0.109E+00
EU-154	F	2.4919E-01	7.5172E-02	7.5738E-02	0.683E-01
K-40	#	1.1516E+01	1.6177E+00	1.6731E+00	0.572E+00
Pa-234	F	5.3048E-01	2.7067E-01	2.7138E-01	0.896E-01
Pb-210	#B	-3.5156E+00	-5.5945E+00	-5.5960E+00	0.133E+01
Pb-212		2.4595E+00	2.0604E-01	2.2534E-01	0.103E+00
PB-214		1.8963E+00	1.9623E-01	2.0846E-01	0.697E-01
RA-226		3.5654E+00	1.3940E+00	1.4002E+00	0.103E+01
Th-230	#B	-1.0014E+02	-1.7710E+02	-1.7714E+02	0.152E+02
Th-234	B	-9.2357E+00	-7.5400E+00	-7.5478E+00	0.146E+01
Tl-208		8.8451E-01	9.9108E-02	1.0440E-01	0.213E-01
U-235	F	1.3496E-01	9.4532E-02	9.4665E-02	0.728E-01

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---------- S U M M A R Y ----------

Total Activity (42.5 to 2705.0 keV) 2.7442698E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 14:41:31
New World Technology Spectrum name: An13F7.An1

Sample description
Parcel D 70-PDT-085-33 373g
2/20/08 09:58

Acquisition information
Start time: 07-Mar-2008 16:12:54
Live time: 5400
Real time: 5407

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
Ac-228	#	1.6679E+00	2.8867E-01	2.9525E-01	0.153E+00
AM-241	#B	-9.2825E-02	-4.7702E-01	-4.7704E-01	0.104E+00
Bi-212		1.6058E+00	4.5248E-01	4.5639E-01	0.279E+00
BI-214	F	1.7682E+00	1.8393E-01	1.9531E-01	0.657E-01
CO-60	#F	4.4058E-02	3.0780E-02	3.0824E-02	0.197E-01
CS-137	B	1.8792E-02	3.3407E-02	3.3414E-02	0.260E-01
EU-152	B	-2.9249E-02	3.7039E+02	3.7039E+02	0.799E-01
EU-154	F	1.4533E-01	1.3879E-01	1.3889E-01	0.569E-01
K-40		1.1847E+01	1.2572E+00	1.3320E+00	0.526E+00
Pa-234	F	1.0310E-01	1.0792E-01	1.0799E-01	0.954E-01
Pb-210		2.0297E+00	9.9696E-01	9.9978E-01	0.805E+00
Pb-212		2.0238E+00	1.3991E-01	1.5882E-01	0.797E-01
PB-214		1.6781E+00	1.8872E-01	1.9875E-01	0.891E-01
RA-226		2.5660E+00	1.0564E+00	1.0607E+00	0.807E+00
Th-230	#B	-9.4127E+00	-3.6906E+01	-3.6907E+01	0.787E+01
Th-234	F	2.2972E+00	5.4857E-01	5.5510E-01	0.829E+00
Tl-208	F	6.0402E-01	6.9144E-02	7.2694E-02	0.120E+00
U-235	#B	-8.7566E-01	-1.9808E+00	-1.9811E+00	0.844E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 2.5230949E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:17:19
New World Technology Spectrum name: An13FE5.An1

Sample description
Parcel D 70-PDT-085-33DUP 373g
2/20/08 09:58

Acquisition information
Start time: 07-Mar-2008 18:43:12
Live time: 5400
Real time: 5407

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.8170E+00	3.4265E-01	3.4923E-01	0.172E+00
AM-241	#B	-5.3316E-02	-2.4552E-01	-2.4553E-01	0.103E+00
Bi-212		1.6361E+00	4.2772E-01	4.3202E-01	0.261E+00
BI-214	F	1.6537E+00	2.0130E-01	2.1046E-01	0.777E-01
CO-60	#B	1.0635E-03	4.7186E-03	4.7188E-03	0.121E-01
CS-137	B	2.2523E-02	4.9440E-02	4.9447E-02	0.395E-01
EU-152	#B	-2.9249E-02	3.6125E+02	3.6125E+02	0.779E-01
EU-154	F	7.3325E-02	5.9748E-02	5.9810E-02	0.554E-01
K-40		1.2684E+01	1.2120E+00	1.3004E+00	0.470E+00
Pa-234	B	-2.0764E-02	3.4468E+02	3.4468E+02	0.744E-01
Pb-210		3.2833E+00	1.1915E+00	1.1976E+00	0.735E+00
Pb-212		1.9292E+00	1.4105E-01	1.5821E-01	0.837E-01
PB-214		1.5232E+00	1.4235E-01	1.5318E-01	0.825E-01
RA-226		2.4727E+00	1.0387E+00	1.0428E+00	0.818E+00
Th-230	#B	-9.7813E+00	-4.4296E+01	-4.4297E+01	0.841E+01
Th-234	F	2.4739E+00	6.3452E-01	6.4107E-01	0.816E+00
Tl-208		8.3806E-01	8.4299E-02	8.9864E-02	0.536E-01
U-235	B	-8.8244E-01	-2.5853E+00	-2.5855E+00	0.886E-01

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H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.2 to 2632.4 keV) 2.7837461E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 10-MAR-2008 08:10:02
New World Technology Spectrum name: An13EF5.An1

Sample description
Parcel D 70-PDT-086-33 387g
2/15/08 10:10

Acquisition information
Start time: 07-Mar-2008 11:40:09
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Uncertainty (Counting) 2 Sigma pCi/g	Total pCi/g	MDA pCi/g
Ac-228		1.1400E+00	2.9355E-01	2.9659E-01	0.188E+00
AM-241	#B	-5.8460E-02	-2.9900E-01	-2.9901E-01	0.115E+00
Bi-212		1.5363E+00	5.2938E-01	5.3245E-01	0.302E+00
BI-214	F	1.3502E+00	2.0154E-01	2.0769E-01	0.612E-01
CO-60	#F	1.1125E-01	5.9796E-02	5.9939E-02	0.211E-01
CS-137	F	4.0007E-02	5.1919E-02	5.1940E-02	0.386E-01
EU-152	B	6.8920E-02	1.3236E-01	1.3239E-01	0.960E-01
EU-154	F	1.4792E-01	6.7870E-02	6.8090E-02	0.725E-01
K-40		1.0840E+01	1.4662E+00	1.5204E+00	0.242E+00
Pa-234	B	6.2286E-02	1.1037E-01	1.1039E-01	0.119E+00
Pb-210		3.7422E+00	1.7269E+00	1.7324E+00	0.134E+01
Pb-212		1.5324E+00	1.7384E-01	1.8292E-01	0.104E+00
PB-214		1.1556E+00	1.7641E-01	1.8156E-01	0.107E+00
RA-226		2.4804E+00	1.3123E+00	1.3155E+00	0.100E+01
Th-230	#B	-5.2354E+00	-2.8246E+01	-2.8247E+01	0.107E+02
Th-234	F	1.1097E+00	1.0147E+00	1.0156E+00	0.106E+01
Tl-208	F	4.6721E-01	8.4409E-02	8.6175E-02	0.117E+00
U-235	#B	-8.3393E-01	-2.0422E+00	-2.0424E+00	0.111E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 2.3888010E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 10-MAR-2008 08:15:12
New World Technology Spectrum name: An13F35.An1

Sample description
Parcel D 70-PDT-086-33DUP 387g
2/15/08 10:10

Acquisition information
Start time: 07-Mar-2008 13:56:24
Live time: 2700
Real time: 2703

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.0836E+00	3.2843E-01	3.3089E-01	0.228E+00
AM-241	#B	-1.3436E-01	-1.9671E+00	-1.9671E+00	0.101E+00
Bi-212	F	1.4908E+00	4.8062E-01	4.8380E-01	0.243E+00
BI-214	F	1.3350E+00	2.3045E-01	2.3573E-01	0.881E-01
CO-60	#F	2.5112E-02	2.6562E-02	2.6578E-02	0.188E-01
CS-137	B	2.7879E-02	4.7680E-02	4.7691E-02	0.362E-01
EU-152	F	2.4429E-01	1.2788E-01	1.2820E-01	0.102E+00
EU-154	F	2.0553E-01	1.3247E-01	1.3269E-01	0.708E-01
K-40		1.1045E+01	1.4073E+00	1.4659E+00	0.104E+00
Pa-234	B	3.8838E-02	1.2545E-01	1.2546E-01	0.119E+00
Pb-210		2.8486E+00	1.2755E+00	1.2799E+00	0.953E+00
Pb-212		1.4155E+00	1.7327E-01	1.8107E-01	0.106E+00
PB-214		1.4060E+00	2.3593E-01	2.4164E-01	0.102E+00
RA-226		2.3699E+00	1.2498E+00	1.2529E+00	0.929E+00
Th-230	#B	-1.0593E+01	-6.5246E+01	-6.5247E+01	0.112E+02
Th-234	F	1.4389E+00	6.6510E-01	6.6722E-01	0.103E+01
Tl-208		6.2407E-01	9.1923E-02	9.4802E-02	0.730E-01
U-235	#B	-8.6716E-01	-4.0909E+00	-4.0910E+00	0.109E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.2 to 2632.4 keV) 2.3618746E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:05:56
New World Technology Spectrum name: An11BE.An1

Sample description
Parcel D 70-PDT-086-61 374g
2/26/08 10:40

Acquisition information
Start time: 07-Mar-2008 11:43:30
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.4825E+00	3.4048E-01	3.4489E-01	0.203E+00
AM-241 #A	-2.6131E-02	-2.8430E-01	-2.8430E-01	0.138E+00
Bi-212 F	8.0489E-01	5.4994E-01	5.5075E-01	0.426E+00
BI-214 F	1.2276E+00	2.0750E-01	2.1244E-01	0.755E-01
CO-60 #B	-1.0270E-01	-4.4955E-01	-4.4957E-01	0.470E-01
CS-137 B	1.9636E-02	4.5935E-02	4.5941E-02	0.360E-01
EU-152 #B	5.1149E-02	6.7422E-02	6.7449E-02	0.117E+00
EU-154 #B	1.6002E-02	2.2264E-02	2.2272E-02	0.682E-01
K-40	1.0045E+01	1.9325E+00	1.9681E+00	0.114E+01
Pa-234 F	2.8461E-01	1.9028E-01	1.9057E-01	0.132E+00
Pb-210 #	3.4235E+00	1.2982E+00	1.3044E+00	0.858E+00
Pb-212	1.3652E+00	1.4890E-01	1.5728E-01	0.861E-01
PB-214	1.0372E+00	1.6207E-01	1.6657E-01	0.952E-01
RA-226	2.6079E+00	1.3992E+00	1.4026E+00	0.111E+01
Th-230 #B	-2.9671E+01	-2.7783E+02	-2.7783E+02	0.981E+01
Th-234 F	2.6705E+00	1.1920E+00	1.1961E+00	0.921E+00
Tl-208 F	5.3931E-01	9.7283E-02	9.9320E-02	0.467E-01
U-235 #B	-3.4684E-01	-4.2742E-01	-4.2761E-01	0.101E+00

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S U M M A R Y

Total Activity (41.1 to 2612.4 keV) 2.5487976E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:15:23
New World Technology Spectrum name: An11C2.An1

Sample description
Parcel D 70-PDT-086-61DUP 374g
2/26/08 10:40

Acquisition information
Start time: 07-Mar-2008 13:53:02
Live time: 2700
Real time: 2704

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228		1.1839E+00	3.5846E-01	3.6114E-01	0.212E+00
AM-241	#A	-1.8140E-02	-2.4192E-01	-2.4192E-01	0.139E+00
Bi-212	F	4.7420E-01	4.8775E-01	4.8807E-01	0.408E+00
BI-214	F	1.0580E+00	1.7373E-01	1.7811E-01	0.619E-01
CO-60	#B	-9.6582E-02	-9.9395E-01	-9.9395E-01	0.536E-01
CS-137	B	1.7325E-02	3.8259E-02	3.8265E-02	0.296E-01
EU-152	F	1.1289E-01	1.1553E-01	1.1561E-01	0.107E+00
EU-154	F	1.0055E-01	9.4294E-02	9.4368E-02	0.787E-01
K-40		1.2996E+01	1.9102E+00	1.9701E+00	0.101E+01
Pa-234	#B	9.6059E-02	1.5018E-01	1.5022E-01	0.113E+00
Pb-210	#	3.2323E+00	1.8204E+00	1.8244E+00	0.112E+01
Pb-212		1.5672E+00	1.5239E-01	1.6311E-01	0.827E-01
PB-214		9.6415E-01	1.6272E-01	1.6661E-01	0.976E-01
RA-226		2.6271E+00	1.3115E+00	1.3152E+00	0.106E+01
Th-230	#B	-2.0905E+01	-5.5843E+01	-5.5849E+01	0.102E+02
Th-234	F	1.4867E+00	1.2075E+00	1.2088E+00	0.101E+01
Tl-208	F	4.3528E-01	8.5955E-02	8.7459E-02	0.531E-01
U-235	#B	-3.1938E-01	-2.8114E-01	-2.8138E-01	0.103E+00

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H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.1 to 2612.4 keV) 2.5550447E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:49:20
New World Technology Spectrum name: An113D.An1

Sample description
Parcel D 70-PDT-086-62 364g
2/26/08 10:44

Acquisition information
Start time: 07-Mar-2008 15:10:42
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Uncertainty 2 Sigma Counting pCi/g	Total pCi/g	MDA pCi/g
AC-228		1.7901E+00	3.6183E-01	3.6786E-01	0.133E+00
AM-241	B	3.1071E-02	1.5552E-01	1.5553E-01	0.129E+00
BI-212	F	8.3294E-01	5.0166E-01	5.0261E-01	0.353E+00
BI-214	F	1.2407E+00	2.3196E-01	2.3648E-01	0.907E-01
CO-60	#F	4.5732E-02	4.0716E-02	4.0752E-02	0.176E-01
CS-137	B	1.3346E-02	4.0727E-02	4.0730E-02	0.320E-01
EU-152	B	-9.8435E-02	-5.4183E-01	-5.4184E-01	0.117E+00
EU-154	F	8.2661E-02	1.0488E-01	1.0492E-01	0.734E-01
K-40	#	1.2631E+01	1.5031E+00	1.5743E+00	0.104E+00
PA-234	F	2.1064E-01	1.1953E-01	1.1979E-01	0.111E+00
PB-210	#	1.8255E+00	1.3515E+00	1.3532E+00	0.101E+01
PB-212	F	1.6450E+00	1.5823E-01	1.6958E-01	0.816E-01
PB-214		1.1614E+00	1.6705E-01	1.7251E-01	0.102E+00
RA-226		1.7270E+00	1.2082E+00	1.2099E+00	0.957E+00
Th-230	#B	-1.4766E+01	-9.5064E+01	-9.5065E+01	0.121E+02
TH-234	B	6.1893E-01	8.8588E-01	8.8618E-01	0.105E+01
TL-208	F	2.4643E-01	5.6764E-02	5.7494E-02	0.124E+00
U-235	#B	-5.8479E-01	-4.6977E-01	-4.7027E-01	0.109E+00

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F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (41.9 to 2667.7 keV) 2.2898989E+01 pCi/g

Laboratory: New World Technology

ORTEC g v - i (3263) wan32 G53W2.06 08-MAR-2008 15:51:19
New World Technology Spectrum name: An1142.An1

Sample description
Parcel D 70-PDT-086-62DUP 364g
2/26/08 10:44

Acquisition information
Start time: 07-Mar-2008 16:57:56
Live time: 2700
Real time: 2702

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity pCi/g	Time of Count Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AC-228		1.7976E+00	4.0131E-01	4.0681E-01	0.148E+00
AM-241	#B	3.4472E-02	1.2668E-01	1.2669E-01	0.101E+00
BI-212	F	1.7121E+00	6.2163E-01	6.2486E-01	0.286E+00
BI-214	F	1.3733E+00	2.0199E-01	2.0831E-01	0.676E-01
CO-60	#B	1.7324E-02	3.9818E-02	3.9823E-02	0.274E-01
CS-137	B	2.7001E-02	5.3211E-02	5.3221E-02	0.414E-01
EU-152	B	-3.1124E-02	-3.9278E-02	-3.9295E-02	0.116E+00
EU-154	F	2.4006E-01	1.2741E-01	1.2772E-01	0.741E-01
K-40		1.2943E+01	1.5215E+00	1.5954E+00	0.104E+00
PA-234	F	2.2354E-01	1.2043E-01	1.2072E-01	0.134E+00
PB-210		3.4554E+00	1.6156E+00	1.6206E+00	0.106E+01
PB-212	F	1.6455E+00	1.5736E-01	1.6878E-01	0.789E-01
PB-214		1.3086E+00	1.9005E-01	1.9615E-01	0.108E+00
RA-226		1.8214E+00	1.3349E+00	1.3366E+00	0.106E+01
Th-230	#B	-7.3864E+00	-3.5839E+01	-3.5840E+01	0.122E+02
TH-234	#B	-2.4723E-01	-4.5070E-01	-4.5079E-01	0.105E+01
TL-208	F	4.2293E-01	8.6178E-02	8.7593E-02	0.103E+00
U-235	#B	-7.6399E-01	-1.2213E+00	-1.2217E+00	0.109E+00

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------
Total Activity (41.9 to 2667.7 keV) 2.6480227E+01 pCi/g

Laboratory: New World Technology

ATTACHMENT 6

OFF-SITE LABORATORY SAMPLE RESULTS

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EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8836

8836-001 06NPBRA0-007

DATA SHEET

SDG	8836	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	59371
Lab sample id	R611056-01	Client sample id	06NPBRA0-007
Dept sample id	8836-001	Location/Matrix	HPS, IR-07 SOIL
Received	11/09/06	Collected/Weight	04/26/06 12:00 457 g
		Custody/Proj. No.	22140 CTO_6

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	7.31	1.5	0.646			GAM
Cobalt-60	10198-40-0	U		0.059	0.036	U	GAM
Cesium-137	10045-97-3	U		0.045	0.113	U	GAM
Europium-152	14683-23-9	U		0.429	0.130	U	GAM
Europium-154	15585-10-1	U		0.181	0.230	U	GAM
Thallium-208	14913-50-9	0.095	0.042	0.042			GAM
Lead-210	14255-04-0	0.480	0.32	0.403			GAM
Bismuth-212	14913-49-6	U		0.608		U	GAM
Lead-212	15092-94-1	0.166	0.038	0.032			GAM
Bismuth-214	14733-03-0	0.316	0.10	0.088			GAM
Lead-214	15067-28-4	0.184	0.059	0.057			GAM
Radium-226	13982-63-3	0.307	0.10	0.086	1.00		GAM
Actinium-228	14331-83-0	U		0.255		U	GAM
Thorium-230	14269-63-7	U		2.68		U	GAM
Thorium-232	7440-29-1	0.512	0.24	0.217	1.69		GAM
Protactinium-234m	378783-76-7	U		8.91		U	GAM
Thorium-234	15065-10-8	U		0.013		U	GAM
Uranium-235	15117-96-1	U		0.076	0.195	U	GAM
Americium-241	14596-10-2	U		0.040		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id	EBERL
Protocol	TTFW-CTO6
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/13/06

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EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8836

8836-002 06NPBRA0-016

DATA SHEET

SDG	8836	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	59371
Lab sample id	R611056-02	Client sample id	06NPBRA0-016
Dept sample id	8836-002	Location/Matrix	HPS, IR-07 SOIL
Received	11/09/06	Collected/Weight	04/26/06 12:00 458 g
		Custody/Proj. No.	22140 CTO_6

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	6.31	0.96	0.117			GAM
Cobalt-60	10198-40-0	U		0.018	0.036	U	GAM
Cesium-137	10045-97-3	U		0.015	0.113	U	GAM
Europium-152	14683-23-9	U		0.151	0.130	U	GAM
Europium-154	15585-10-1	U		0.057	0.230	U	GAM
Thallium-208	14913-50-9	0.077	0.021	0.014			GAM
Lead-210	14255-04-0	1.06	0.69	0.971			GAM
Bismuth-212	14913-49-6	0.370	0.20	0.184			GAM
Lead-212	15092-94-1	0.305	0.057	0.023			GAM
Bismuth-214	14733-03-0	0.194	0.051	0.028			GAM
Lead-214	15067-28-4	0.197	0.048	0.027			GAM
Radium-226	13982-63-3	0.188	0.050	0.027	1.00		GAM
Actinium-228	14331-83-0	U		0.082		U	GAM
Thorium-230	14269-63-7	U		3.05		U	GAM
Thorium-232	7440-29-1	0.287	0.089	0.073	1.69		GAM
Protactinium-234m	378783-76-7	U		2.74		U	GAM
Thorium-234	15065-10-8	U		0.011		U	GAM
Uranium-235	15117-96-1	U		0.062	0.195	U	GAM
Americium-241	14596-10-2	U		0.064		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id	EBERL
Protocol	TTFW-CTO6
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	11/13/06

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EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8855

8855-014 70-B9391NV-001

DATA SHEET

SDG 8855 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1023426

Lab sample id R803072-14 Client sample id 70-B9391NV-001
Dept sample id 8855-014 Location/Matrix SOIL
Received 03/13/08 Collected/Weight 03/13/08 10:00 401 g
Custody/Proj. No. 39274 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		1.23		U	GAM
Cobalt-60	10198-40-0	U		0.069	0.036	U	GAM
Cesium-137	10045-97-3	U		0.078	0.113	U	GAM
Europium-152	14683-23-9	U		0.538	0.130	U	GAM
Europium-154	15585-10-1	U		0.232	0.230	U	GAM
Thallium-208	14913-50-9	0.126	0.073	0.076			GAM
Lead-210	14255-04-0	1.48	0.75	1.05			GAM
Bismuth-212	14913-49-6	U		0.880		U	GAM
Lead-212	15092-94-1	0.379	0.11	0.111			GAM
Bismuth-214	14733-03-0	12.0	1.8	0.146			GAM
Lead-214	15067-28-4	13.2	2.0	0.187			GAM
Radium-226	13982-63-3	11.6	1.8	0.142	1.00		GAM
Actinium-228	14331-83-0	U		0.314		U	GAM
Thorium-230	14269-63-7	U		5.97		U	GAM
Thorium-232	7440-29-1	0.372	0.26	0.271	1.69		GAM
Protactinium-234m	378783-76-7	U		11.1		U	GAM
Thorium-234	15065-10-8	U		0.031		U	GAM
Uranium-235	15117-96-1	U		0.306	0.195	U	GAM
Americium-241	14596-10-2	U		0.089		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 03/27/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8861

8861-015 6PBFS-055-105

DATA SHEET

SDG 8861 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1018288

Lab sample id R804077-15 Client sample id 6PBFS-055-105
Dept sample id 8861-015 Location/Matrix HPS - IR07 SOIL
Received 04/10/08 Collected/Weight 02/28/08 11:46 383 g
Custody/Proj. No. 34918 CTO_6

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	6.08	0.94	0.128			GAM
Cobalt-60	10198-40-0	U		0.013	0.036	U	GAM
Cesium-137	10045-97-3	U		0.011	0.113	U	GAM
Europium-152	14683-23-9	U		0.118	0.130	U	GAM
Europium-154	15585-10-1	U		0.033	0.230	U	GAM
Thallium-208	14913-50-9	0.285	0.046	0.015			GAM
Lead-210	14255-04-0	U		0.700		U	GAM
Bismuth-212	14913-49-6	1.04	0.23	0.192			GAM
Lead-212	15092-94-1	0.883	0.13	0.020			GAM
Bismuth-214	14733-03-0	0.664	0.10	0.027			GAM
Lead-214	15067-28-4	0.757	0.12	0.033			GAM
Radium-226	13982-63-3	0.645	0.10	0.026	1.00		GAM
Actinium-228	14331-83-0	U		0.107		U	GAM
Thorium-230	14269-63-7	U		7.50		U	GAM
Thorium-232	7440-29-1	0.932	0.15	0.057	1.69		GAM
Protactinium-234m	378783-76-7	U		1.95		U	GAM
Thorium-234	15065-10-8	U		0.012		U	GAM
Uranium-235	15117-96-1	U		0.097	0.195	U	GAM
Americium-241	14596-10-2	U		0.042		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-CTO6
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 04/30/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8861

8861-013 6PBFS-055-109

DATA SHEET

SDG 8861 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1018288

Lab sample id R804077-13 Client sample id 6PBFS-055-109
Dept sample id 8861-013 Location/Matrix HPS - IR07 SOIL
Received 04/10/08 Collected/Weight 02/28/08 11:09 372 g
Custody/Proj. No. 34918 CTO_6

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	5.68	0.94	0.203			GAM
Cobalt-60	10198-40-0	U		0.021	0.036	U	GAM
Cesium-137	10045-97-3	U		0.022	0.113	U	GAM
Europium-152	14683-23-9	U		0.212	0.130	U	GAM
Europium-154	15585-10-1	U		0.065	0.230	U	GAM
Thallium-208	14913-50-9	0.316	0.056	0.028			GAM
Lead-210	14255-04-0	U		1.29		U	GAM
Bismuth-212	14913-49-6	1.23	0.35	0.336			GAM
Lead-212	15092-94-1	0.989	0.15	0.035			GAM
Bismuth-214	14733-03-0	0.650	0.11	0.054			GAM
Lead-214	15067-28-4	0.766	0.13	0.061			GAM
Radium-226	13982-63-3	0.632	0.11	0.053	1.00		GAM
Actinium-228	14331-83-0	U		0.197		U	GAM
Thorium-230	14269-63-7	U		4.22		U	GAM
Thorium-232	7440-29-1	1.12	0.21	0.098	1.69		GAM
Protactinium-234m	378783-76-7	U		3.48		U	GAM
Thorium-234	15065-10-8	U		0.021		U	GAM
Uranium-235	15117-96-1	U		0.125	0.195	U	GAM
Americium-241	14596-10-2	U		0.078		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-CTO6
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 04/30/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8861

8861-011 6BFS-055-110

DATA SHEET

SDG 8861 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1018288

Lab sample id R804077-11 Client sample id 6BFS-055-110
Dept sample id 8861-011 Location/Matrix HPS - IR07 SOIL
Received 04/10/08 Collected/Weight 02/28/08 11:03 367 g
Custody/Proj. No. 34918 CTO_6

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	6.32	1.1	0.378			GAM
Cobalt-60	10198-40-0	U		0.064	0.036	U	GAM
Cesium-137	10045-97-3	U		0.038	0.113	U	GAM
Europium-152	14683-23-9	U		0.370	0.130	U	GAM
Europium-154	15585-10-1	U		0.151	0.230	U	GAM
Thallium-208	14913-50-9	0.363	0.068	0.037			GAM
Lead-210	14255-04-0	0.972	0.57	0.724			GAM
Bismuth-212	14913-49-6	1.05	0.44	0.496			GAM
Lead-212	15092-94-1	1.04	0.16	0.051			GAM
Bismuth-214	14733-03-0	U		0.131		U	GAM
Lead-214	15067-28-4	U		0.129		U	GAM
Radium-226	13982-63-3	U		0.128	1.00	U	GAM
Actinium-228	14331-83-0	U		0.268		U	GAM
Thorium-230	14269-63-7	U		4.00		U	GAM
Thorium-232	7440-29-1	1.12	0.23	0.141	1.69		GAM
Protactinium-234m	378783-76-7	U		5.28		U	GAM
Thorium-234	15065-10-8	U		0.026		U	GAM
Uranium-235	15117-96-1	U		0.174	0.195	U	GAM
Americium-241	14596-10-2	U		0.057		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-CTO6
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 04/30/08

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-013 **70-PD-C0080-42**

DATA SHEET

SDG 8863 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1023426

Lab sample id R804079-13 Client sample id 70-PD-C0080-42
Dept sample id 8863-013 Location/Matrix HPS - TO70 SOIL
Received 04/10/08 Collected/Weight 02/21/08 14:14 349 g
Custody/Proj. No. 34916 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	U		1.16		U	GAM
Cobalt-60	10198-40-0	U		0.043	0.036	U	GAM
Cesium-137	10045-97-3	U		0.045	0.113	U	GAM
Europium-152	14683-23-9	U		0.402	0.130	U	GAM
Europium-154	15585-10-1	U		0.129	0.230	U	GAM
Thallium-208	14913-50-9	0.269	0.066	0.044			GAM
Lead-210	14255-04-0	0.812	0.40	0.538			GAM
Bismuth-212	14913-49-6	1.26	0.53	0.528			GAM
Lead-212	15092-94-1	0.919	0.16	0.062			GAM
Bismuth-214	14733-03-0	0.399	0.13	0.083			GAM
Lead-214	15067-28-4	0.570	0.14	0.100			GAM
Radium-226	13982-63-3	0.387	0.12	0.080	1.00		GAM
Actinium-228	14331-83-0	U		0.286		U	GAM
Thorium-230	14269-63-7	U		3.02		U	GAM
Thorium-232	7440-29-1	0.965	0.25	0.166	1.69		GAM
Protactinium-234m	378783-76-7	U		6.97		U	GAM
Thorium-234	15065-10-8	U		0.021		U	GAM
Uranium-235	15117-96-1	U		0.175	0.195	U	GAM
Americium-241	14596-10-2	U		0.045		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 05/07/08

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-014 **70-PD-C0081-26**

DATA SHEET

SDG 8863 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1023426

Lab sample id R804079-14 Client sample id 70-PD-C0081-26
Dept sample id 8863-014 Location/Matrix HPS - TO70 SOIL
Received 04/10/08 Collected/Weight 02/22/08 14:00 364 g
Custody/Proj. No. 34916 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	3.63	1.6	0.183			GAM
Cobalt-60	10198-40-0	U		0.016	0.036	U	GAM
Cesium-137	10045-97-3	U		0.018	0.113	U	GAM
Europium-152	14683-23-9	U		0.156	0.130	U	GAM
Europium-154	15585-10-1	U		0.049	0.230	U	GAM
Thallium-208	14913-50-9	0.341	0.060	0.022			GAM
Lead-210	14255-04-0	U		2.49		U	GAM
Bismuth-212	14913-49-6	1.10	0.29	0.258			GAM
Lead-212	15092-94-1	0.964	0.15	0.026			GAM
Bismuth-214	14733-03-0	0.626	0.11	0.037			GAM
Lead-214	15067-28-4	0.684	0.12	0.042			GAM
Radium-226	13982-63-3	0.608	0.10	0.036	1.00		GAM
Actinium-228	14331-83-0	U		0.120		U	GAM
Thorium-230	14269-63-7	U		3.38		U	GAM
Thorium-232	7440-29-1	1.02	0.19	0.081	1.69		GAM
Protactinium-234m	378783-76-7	U		2.68		U	GAM
Thorium-234	15065-10-8	U		0.015		U	GAM
Uranium-235	15117-96-1	U		0.080	0.195	U	GAM
Americium-241	14596-10-2	U		0.077		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 05/07/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-007 **70-PDT-085-30**

DATA SHEET

SDG	8863	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1023426
Lab sample id	R804079-07	Client sample id	70-PDT-085-30
Dept sample id	8863-007	Location/Matrix	HPS - TO70 SOIL
Received	04/10/08	Collected/Weight	02/20/08 09:46 385 g
		Custody/Proj. No.	33911 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	5.98	1.0	0.292			GAM
Cobalt-60	10198-40-0	U		0.028	0.036	U	GAM
Cesium-137	10045-97-3	U		0.029	0.113	U	GAM
Europium-152	14683-23-9	U		0.291	0.130	U	GAM
Europium-154	15585-10-1	U		0.079	0.230	U	GAM
Thallium-208	14913-50-9	0.491	0.082	0.033			GAM
Lead-210	14255-04-0	U		1.68		U	GAM
Bismuth-212	14913-49-6	1.66	0.45	0.418			GAM
Lead-212	15092-94-1	1.96	0.30	0.073			GAM
Bismuth-214	14733-03-0	0.932	0.16	0.065			GAM
Lead-214	15067-28-4	1.02	0.17	0.078			GAM
Radium-226	13982-63-3	0.906	0.15	0.064	1.00		GAM
Actinium-228	14331-83-0	U		0.268		U	GAM
Thorium-230	14269-63-7	U		4.89		U	GAM
Thorium-232	7440-29-1	1.57	0.28	0.148	1.69		GAM
Protactinium-234m	378783-76-7	U		5.76		U	GAM
Thorium-234	15065-10-8	U		0.027		U	GAM
Uranium-235	15117-96-1	U		0.164	0.195	U	GAM
Americium-241	14596-10-2	U		0.104		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id	EBERL
Protocol	TTFW-TO70
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	05/07/08

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-006 **70-PDT-085-31**

DATA SHEET

SDG	8863	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1023426
Lab sample id	R804079-06	Client sample id	70-PDT-085-31
Dept sample id	8863-006	Location/Matrix	HPS - TO70 SOIL
Received	04/10/08	Collected/Weight	02/20/08 09:50 344 g
		Custody/Proj. No.	33911 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	7.48	1.3	0.412			GAM
Cobalt-60	10198-40-0	U		0.042	0.036	U	GAM
Cesium-137	10045-97-3	U		0.038	0.113	U	GAM
Europium-152	14683-23-9	U		0.370	0.130	U	GAM
Europium-154	15585-10-1	U		0.129	0.230	U	GAM
Thallium-208	14913-50-9	0.552	0.095	0.041			GAM
Lead-210	14255-04-0	0.757	0.45	0.668			GAM
Bismuth-212	14913-49-6	1.88	0.66	0.658			GAM
Lead-212	15092-94-1	2.18	0.34	0.094			GAM
Bismuth-214	14733-03-0	U		1.85		U	GAM
Lead-214	15067-28-4	U		1.73		U	GAM
Radium-226	13982-63-3	U		1.80	1.00	U	GAM
Actinium-228	14331-83-0	U		0.340		U	GAM
Thorium-230	14269-63-7	U		4.73		U	GAM
Thorium-232	7440-29-1	1.70	0.31	0.145	1.69		GAM
Protactinium-234m	378783-76-7	U		5.80		U	GAM
Thorium-234	15065-10-8	U		0.031		U	GAM
Uranium-235	15117-96-1	U		0.208	0.195	U	GAM
Americium-241	14596-10-2	U		0.070		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id	EBERL
Protocol	TTFW-TO70
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	05/07/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-017 70-PDT-085-31

DUPLICATE

SDG 8863 Client Tetra Tech EC, Inc.

Contact Melissa C. Mannion Contract 1023426

DUPLICATE		ORIGINAL	
Lab sample id	R804079-17	Lab sample id	R804079-06
Dept sample id	8863-017	Dept sample id	8863-006
		Received	04/10/08

Client sample id 70-PDT-085-31

Location/Matrix HPS - TO70 SOIL

Collected/Weight 02/20/08 09:50 344 g

Custody/Proj. No. 33911 TO 70

ANALYTE	DUPLICATE pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST	ORIGINAL pCi/g	2σ ERR (TOTAL)	MDA pCi/g	QUALI-FIERS	RPD %	2σ TOT	DER σ
Potassium-40	5.37	1.0	0.458			GAM	7.48	1.3	0.412		33	26	2.6
Cobalt-60	U		0.044	0.036	U	GAM	U		0.042	U	-		0.1
Cesium-137	U		0.041	0.113	U	GAM	U		0.038	U	-		0.1
Europium-152	U		0.402	0.130	U	GAM	U		0.370	U	-		0.1
Europium-154	U		0.123	0.230	U	GAM	U		0.129	U	-		0.1
Thallium-208	0.490	0.088	0.046			GAM	0.552	0.095	0.041		12	25	1.0
Lead-210	U		5.31		U	GAM	0.757	0.45	0.668		150	178	1.7
Bismuth-212	2.02	0.66	0.656			GAM	1.88	0.66	0.658		7	48	0.3
Lead-212	1.87	0.30	0.091			GAM	2.18	0.34	0.094		15	22	1.4
Bismuth-214	0.901	0.17	0.093			GAM	U		1.85	U	69	136	1.0
Lead-214	1.05	0.19	0.109			GAM	U		1.73	U	49	127	0.8
Radium-226	0.875	0.16	0.091	1.00		GAM	U		1.80	U	69	137	1.0
Actinium-228	U		0.357		U	GAM	U		0.340	U	-		0.1
Thorium-230	U		8.47		U	GAM	U		4.73	U	-		0.8
Thorium-232	1.62	0.31	0.181	1.69		GAM	1.70	0.31	0.145		5	26	0.4
Protactinium-234m	U		7.12		U	GAM	U		5.80	U	-		0.3
Thorium-234	U		0.032		U	GAM	U		0.031	U	-		0
Uranium-235	U		0.188	0.195	U	GAM	U		0.208	U	-		0.1
Americium-241	U		0.211		U	GAM	U		0.070	U	-		1.3

QC-DUP#6 65363

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DUP
Version 3.06
Report date 05/07/08

ED_000855_00003297-00816

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-005 70-PDT-085-33

DATA SHEET

SDG 8863 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1023426

Lab sample id R804079-05 Client sample id 70-PDT-085-33
Dept sample id 8863-005 Location/Matrix HPS - TO70 SOIL
Received 04/10/08 Collected/Weight 02/20/08 09:58 373 g
Custody/Proj. No. 33911 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	6.14	1.7	0.176			GAM
Cobalt-60	10198-40-0	U		0.017	0.036	U	GAM
Cesium-137	10045-97-3	U		0.018	0.113	U	GAM
Europium-152	14683-23-9	U		0.161	0.130	U	GAM
Europium-154	15585-10-1	U		0.052	0.230	U	GAM
Thallium-208	14913-50-9	0.433	0.072	0.021			GAM
Lead-210	14255-04-0	U		2.05		U	GAM
Bismuth-212	14913-49-6	1.44	0.32	0.258			GAM
Lead-212	15092-94-1	1.28	0.20	0.027			GAM
Bismuth-214	14733-03-0	0.888	0.14	0.038			GAM
Lead-214	15067-28-4	0.997	0.16	0.044			GAM
Radium-226	13982-63-3	0.862	0.14	0.037	1.00		GAM
Actinium-228	14331-83-0	U		0.130		U	GAM
Thorium-230	14269-63-7	U		3.94		U	GAM
Thorium-232	7440-29-1	1.43	0.24	0.071	1.69		GAM
Protactinium-234m	378783-76-7	U		3.87		U	GAM
Thorium-234	15065-10-8	U		0.015		U	GAM
Uranium-235	15117-96-1	U		0.101	0.195	U	GAM
Americium-241	14596-10-2	U		0.091		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 05/07/08

EBERLINE SERVICES / RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-004 **70-PDT-086-33**

DATA SHEET

SDG 8863 Client Tetra Tech EC, Inc.
Contact Melissa C. Mannion Contract 1023426

Lab sample id R804079-04 Client sample id 70-PDT-086-33
Dept sample id 8863-004 Location/Matrix HPS - TO70 SOIL
Received 04/10/08 Collected/Weight 02/15/08 10:10 387 g
Custody/Proj. No. 33911 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	5.54	0.87	0.165			GAM
Cobalt-60	10198-40-0	U		0.015	0.036	U	GAM
Cesium-137	10045-97-3	U		0.014	0.113	U	GAM
Europium-152	14683-23-9	U		0.131	0.130	U	GAM
Europium-154	15585-10-1	U		0.043	0.230	U	GAM
Thallium-208	14913-50-9	0.352	0.055	0.012			GAM
Lead-210	14255-04-0	0.505	0.23	0.306			GAM
Bismuth-212	14913-49-6	1.28	0.28	0.227			GAM
Lead-212	15092-94-1	1.10	0.17	0.021			GAM
Bismuth-214	14733-03-0	U		0.060		U	GAM
Lead-214	15067-28-4	U		1.34		U	GAM
Radium-226	13982-63-3	U		0.058	1.00	U	GAM
Actinium-228	14331-83-0	U		0.120		U	GAM
Thorium-230	14269-63-7	U		11.0		U	GAM
Thorium-232	7440-29-1	1.19	0.19	0.056	1.69		GAM
Protactinium-234m	378783-76-7	U		2.32		U	GAM
Thorium-234	15065-10-8	U		0.012		U	GAM
Uranium-235	15117-96-1	U		0.079	0.195	U	GAM
Americium-241	14596-10-2	U		0.026		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id EBERL
Protocol TTFW-TO70
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 05/07/08

EBERLINE SERVICES/RICHMOND

SAMPLE DELIVERY GROUP 8863

8863-003 **70-PDT-086-61**

DATA SHEET

SDG	8863	Client	Tetra Tech EC, Inc.
Contact	Melissa C. Mannion	Contract	1023426
Lab sample id	R804079-03	Client sample id	70-PDT-086-61
Dept sample id	8863-003	Location/Matrix	HPS - TO70 SOIL
Received	04/10/08	Collected/Weight	02/26/08 10:40 374 g
		Custody/Proj. No.	33911 TO_70

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (TOTAL)	MDA pCi/g	RDL pCi/g	QUALI-FIERS	TEST
Potassium-40	13966-00-2	4.22	1.8	0.232			GAM
Cobalt-60	10198-40-0	U		0.020	0.036	U	GAM
Cesium-137	10045-97-3	U		0.020	0.113	U	GAM
Europium-152	14683-23-9	U		0.202	0.130	U	GAM
Europium-154	15585-10-1	U		0.066	0.230	U	GAM
Thallium-208	14913-50-9	0.325	0.059	0.022			GAM
Lead-210	14255-04-0	0.768	0.22	0.267			GAM
Bismuth-212	14913-49-6	1.05	0.29	0.260			GAM
Lead-212	15092-94-1	0.970	0.16	0.029			GAM
Bismuth-214	14733-03-0	0.559	0.12	0.044			GAM
Lead-214	15067-28-4	0.676	0.12	0.047			GAM
Radium-226	13982-63-3	0.542	0.12	0.042	1.00		GAM
Actinium-228	14331-83-0	U		0.131		U	GAM
Thorium-230	14269-63-7	U		1.45		U	GAM
Thorium-232	7440-29-1	0.993	0.19	0.084	1.69		GAM
Protactinium-234m	378783-76-7	U		3.26		U	GAM
Thorium-234	15065-10-8	U		0.011		U	GAM
Uranium-235	15117-96-1	U		0.084	0.195	U	GAM
Americium-241	14596-10-2	U		0.022		U	GAM

Gamma Spec. Method - EPA 901.1

Lab id	EBERL
Protocol	TTFW-TO70
Version	Ver 1.0
Form	DVD-DS
Version	3.06
Report date	05/07/08

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-086-61

Radiochemistry

Lab Sample ID: F8G010127-001
Work Order: KOWLH
Matrix: SOLID

Date Collected: 02/26/08 1040
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.20**		**0.28**		**0.35**	**07/03/08**	**07/24/08**
Americium 241	0.03	U	0.15		0.25	07/03/08	07/24/08
Bismuth 212	0.37	U	0.49		0.80	07/03/08	07/24/08
Bismuth 214	**1.34**		**0.24**		**0.14**	**07/03/08**	**07/24/08**
Cesium 137	-0.007	U	0.062	0.200	0.11	07/03/08	07/24/08
Cobalt 60	-0.003	U	0.067		0.13	07/03/08	07/24/08
Europium 152	-0.08	U	0.19		0.33	07/03/08	07/24/08
Europium 154	-0.06	U	0.48		0.89	07/03/08	07/24/08
Lead 210	1.2	U	1.7	3.0	2.9	07/03/08	07/24/08
Lead 212	**1.43**		**0.22**		**0.18**	**07/03/08**	**07/24/08**
Lead 214	**1.54**		**0.24**		**0.16**	**07/03/08**	**07/24/08**
Potassium 40	**7.9**		**1.7**		**0.9**	**07/03/08**	**07/24/08**
Protactinium 234	-0.02	U	0.23		0.40	07/03/08	07/24/08
Radium (226)	**1.34**		**0.24**	1.00	**0.14**	**07/03/08**	**07/24/08**
Thallium 208	**0.72**		**0.12**		**0.04**	**07/03/08**	**07/24/08**
Thorium 232	**1.20**		**0.28**		**0.35**	**07/03/08**	**07/24/08**
Thorium 234	1	U	1.5		2.5	07/03/08	07/24/08
Uranium 235	0.18	U	0.36		0.61	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-086-61 DUP

Radiochemistry

Lab Sample ID: F8G010127-001X
Work Order: KOWLH
Matrix: SOLID

Date Collected: 02/26/08 1040
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD				**pCi/g**	**Batch # 8185283**		**Yld %**
Actinium 228	**1.20**		**0.23**		**0.30**	**07/03/08**	**07/24/08**
Americium 241	-0.04	U	0.11		0.19	07/03/08	07/24/08
Bismuth 212	**1.44**		**0.53**		**0.45**	**07/03/08**	**07/24/08**
Bismuth 214	**1.11**		**0.20**		**0.18**	**07/03/08**	**07/24/08**
Cesium 137	0.026	U	0.046	0.200	0.079	07/03/08	07/24/08
Cobalt 60	0.005	U	0.043		0.082	07/03/08	07/24/08
Europium 152	0.05	U	0.13		0.23	07/03/08	07/24/08
Europium 154	-0.01	U	0.36		0.66	07/03/08	07/24/08
Lead 210	1.4	U	1.4	3.0	2.2	07/03/08	07/24/08
Lead 212	**1.45**		**0.20**		**0.17**	**07/03/08**	**07/24/08**
Lead 214	**1.20**		**0.17**		**0.16**	**07/03/08**	**07/24/08**
Potassium 40	**10.1**		**1.5**		**1.0**	**07/03/08**	**07/24/08**
Protactinium 234	0.004	U	0.21		0.37	07/03/08	07/24/08
Radium (226)	**1.11**		**0.20**	1.00	**0.18**	**07/03/08**	**07/24/08**
Thallium 208	**0.50**		**0.12**		**0.10**	**07/03/08**	**07/24/08**
Thorium 232	**1.20**		**0.23**		**0.30**	**07/03/08**	**07/24/08**
Thorium 234	**2.04**		**0.81**		**2.0**	**07/03/08**	**07/24/08**
Uranium 235	0.15	U	0.32		0.54	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-086-33

Radiochemistry

Lab Sample ID: F8G010127-002
Work Order: KOWLN
Matrix: SOLID

Date Collected: 02/15/08 1010
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			pCi/g		Batch # 8185283		Yld %
Actinium 228	**1.18**		**0.29**		**0.41**	**07/03/08**	**07/24/08**
Americium 241	0.0003	U	0.13		0.22	07/03/08	07/24/08
Bismuth 212	0.63	U	0.51		0.78	07/03/08	07/24/08
Bismuth 214	**1.47**		**0.25**		**0.12**	**07/03/08**	**07/24/08**
Cesium 137	-0.02	U	0.15	0.20	0.12	07/03/08	07/24/08
Cobalt 60	0.003	U	0.065		0.13	07/03/08	07/24/08
Europium 152	0.03	U	0.11		0.20	07/03/08	07/24/08
Europium 154	0.0	U	0.42		0.80	07/03/08	07/24/08
Lead 210	1.1	U	1.4	3.0	2.5	07/03/08	07/24/08
Lead 212	**1.68**		**0.21**		**0.14**	**07/03/08**	**07/24/08**
Lead 214	**1.22**		**0.20**		**0.18**	**07/03/08**	**07/24/08**
Potassium 40	**7.1**		**1.5**		**0.5**	**07/03/08**	**07/24/08**
Protactinium 234	0.03	U	0.20		0.35	07/03/08	07/24/08
Radium (226)	**1.47**		**0.25**	1.00	**0.12**	**07/03/08**	**07/24/08**
Thallium 208	**0.63**		**0.12**		**0.07**	**07/03/08**	**07/24/08**
Thorium 232	**1.18**		**0.29**		**0.41**	**07/03/08**	**07/24/08**
Thorium 234	1	U	1.3		2.2	07/03/08	07/24/08
Uranium 235	0.19	U	0.32		0.53	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-085-33

Radiochemistry

Lab Sample ID: F8G010127-003
Work Order: KOWLP
Matrix: SOLID

Date Collected: 02/20/08 0958
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.68**		**0.28**		**0.30**	**07/03/08**	**07/24/08**
Americium 241	-0.08	U	0.17		0.28	07/03/08	07/24/08
Bismuth 212	**1.05**		**0.57**		**0.81**	**07/03/08**	**07/24/08**
Bismuth 214	**1.88**		**0.30**		**0.16**	**07/03/08**	**07/24/08**
Cesium 137	0.008	U	0.064	0.200	0.11	07/03/08	07/24/08
Cobalt 60	0.026	U	0.051		0.089	07/03/08	07/24/08
Europium 152	-0.05	U	0.17		0.30	07/03/08	07/24/08
Europium 154	0.004	U	0.45		0.83	07/03/08	07/24/08
Lead 210	1.7	U	1.8	3.0	2.9	07/03/08	07/24/08
Lead 212	**2.04**		**0.23**		**0.20**	**07/03/08**	**07/24/08**
Lead 214	**1.70**		**0.22**		**0.18**	**07/03/08**	**07/24/08**
Potassium 40	**8.5**		**1.6**		**1.3**	**07/03/08**	**07/24/08**
Protactinium 234	0.09	U	0.18		0.30	07/03/08	07/24/08
Radium (226)	**1.88**		**0.30**	1.00	**0.16**	**07/03/08**	**07/24/08**
Thallium 208	**0.89**		**0.15**		**0.1**	**07/03/08**	**07/24/08**
Thorium 232	**1.68**		**0.28**		**0.30**	**07/03/08**	**07/24/08**
Thorium 234	2.03	U	0.95		2.7	07/03/08	07/24/08
Uranium 235	0.22	U	0.38		0.63	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-085-30

Radiochemistry

Lab Sample ID: F8G010127-004
Work Order: KOWLQ
Matrix: SOLID

Date Collected: 02/20/08 0946
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.85**		**0.38**		**0.27**	**07/03/08**	**07/24/08**
Americium 241	0.05	U	0.17		0.29	07/03/08	07/24/08
Bismuth 212	**1.63**		**0.60**		**0.72**	**07/03/08**	**07/24/08**
Bismuth 214	**1.71**		**0.25**		**0.11**	**07/03/08**	**07/24/08**
Cesium 137	-0.031	U	0.073	0.200	0.13	07/03/08	07/24/08
Cobalt 60	0.013	U	0.059		0.11	07/03/08	07/24/08
Europium 152	-0.10	U	0.19		0.32	07/03/08	07/24/08
Europium 154	-0.04	U	0.46		0.84	07/03/08	07/24/08
Lead 210	0.7	U	1.8	3.0	3.0	07/03/08	07/24/08
Lead 212	**2.53**		**0.29**		**0.16**	**07/03/08**	**07/24/08**
Lead 214	**1.88**		**0.29**		**0.21**	**07/03/08**	**07/24/08**
Potassium 40	**11.2**		**1.8**		**0.5**	**07/03/08**	**07/24/08**
Protactinium 234	-0.15	U	0.26		0.43	07/03/08	07/24/08
Radium (226)	**1.71**		**0.25**	1.00	**0.11**	**07/03/08**	**07/24/08**
Thallium 208	**0.84**		**0.14**		**0.09**	**07/03/08**	**07/24/08**
Thorium 232	**1.85**		**0.38**		**0.27**	**07/03/08**	**07/24/08**
Thorium 234	**3.0**		**1.1**		**2.5**	**07/03/08**	**07/24/08**
Uranium 235	0.17	U	0.39		0.67	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PD-C0080-42

Radiochemistry

Lab Sample ID: F8G010127-005
Work Order: KOWLR
Matrix: SOLID

Date Collected: 02/21/08 1414
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.20**		**0.27**		**0.32**	**07/03/08**	**07/24/08**
Americium 241	-0.04	U	0.13		0.23	07/03/08	07/24/08
Bismuth 212	0.75	U	0.53		0.79	07/03/08	07/24/08
Bismuth 214	**1.06**		**0.22**		**0.16**	**07/03/08**	**07/24/08**
Cesium 137	0.0	U	0.047	0.200	0.089	07/03/08	07/24/08
Cobalt 60	-0.007	U	0.062		0.12	07/03/08	07/24/08
Europium 152	0.0	U	0.15		0.26	07/03/08	07/24/08
Europium 154	0.04	U	0.39		0.74	07/03/08	07/24/08
Lead 210	2.0	U	1.9	3.0	2.8	07/03/08	07/24/08
Lead 212	**1.62**		**0.20**		**0.15**	**07/03/08**	**07/24/08**
Lead 214	**1.21**		**0.21**		**0.21**	**07/03/08**	**07/24/08**
Potassium 40	**6.3**		**1.4**		**0.5**	**07/03/08**	**07/24/08**
Protactinium 234	-0.09	U	0.21		0.36	07/03/08	07/24/08
Radium (226)	**1.06**		**0.22**	1.00	**0.16**	**07/03/08**	**07/24/08**
Thallium 208	**0.55**		**0.12**		**0.09**	**07/03/08**	**07/24/08**
Thorium 232	**1.20**		**0.27**		**0.32**	**07/03/08**	**07/24/08**
Thorium 234	0.4	U	1.3		2.3	07/03/08	07/24/08
Uranium 235	0.24	U	0.28		0.46	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PD-C0081-26

Radiochemistry

Lab Sample ID: F8G010127-006
Work Order: KOWLV
Matrix: SOLID

Date Collected: 02/22/08 1400
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD				**pCi/g**	**Batch # 8185283**		**Yld %**
Actinium 228	**1.57**		**0.33**		**0.40**	**07/03/08**	**07/24/08**
Americium 241	0.05	U	0.13		0.22	07/03/08	07/24/08
Bismuth 212	**1.11**		**0.63**		**0.86**	**07/03/08**	**07/24/08**
Bismuth 214	**1.20**		**0.27**		**0.20**	**07/03/08**	**07/24/08**
Cesium 137	0.002	U	0.071	0.200	0.13	07/03/08	07/24/08
Cobalt 60	0.014	U	0.073		0.14	07/03/08	07/24/08
Europium 152	-0.02	U	0.14		0.25	07/03/08	07/24/08
Europium 154	0.04	U	0.43		0.81	07/03/08	07/24/08
Lead 210	0.8	U	1.7	3.0	3.0	07/03/08	07/24/08
Lead 212	**1.58**		**0.24**		**0.19**	**07/03/08**	**07/24/08**
Lead 214	**1.20**		**0.21**		**0.18**	**07/03/08**	**07/24/08**
Potassium 40	**5.4**		**1.4**		**1.2**	**07/03/08**	**07/24/08**
Protactinium 234	-0.05	U	0.23		0.40	07/03/08	07/24/08
Radium (226)	**1.20**		**0.27**	1.00	**0.20**	**07/03/08**	**07/24/08**
Thallium 208	**0.60**		**0.13**		**0.09**	**07/03/08**	**07/24/08**
Thorium 232	**1.57**		**0.33**		**0.40**	**07/03/08**	**07/24/08**
Thorium 234	1.1	U	1.5		2.6	07/03/08	07/24/08
Uranium 235	0.30	U	0.37		0.60	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 6PBFS-055-110

Radiochemistry

Lab Sample ID: F8G010127-007
Work Order: KOWLW
Matrix: SOLID

Date Collected: 02/28/08 1103
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD				**pCi/g**	**Batch # 8185283**		**Yld %**
Actinium 228	**1.40**		**0.31**		**0.34**	**07/03/08**	**07/24/08**
Americium 241	0.03	U	0.13		0.23	07/03/08	07/24/08
Bismuth 212	0.50	U	0.52		0.82	07/03/08	07/24/08
Bismuth 214	**1.54**		**0.28**		**0.16**	**07/03/08**	**07/24/08**
Cesium 137	-0.006	U	0.087	0.200	0.13	07/03/08	07/24/08
Cobalt 60	-0.012	U	0.072		0.14	07/03/08	07/24/08
Europium 152	0.003	U	0.15		0.27	07/03/08	07/24/08
Europium 154	-0.08	U	0.52		0.95	07/03/08	07/24/08
Lead 210	0.8	U	1.6	3.0	2.8	07/03/08	07/24/08
Lead 212	**1.46**		**0.22**		**0.18**	**07/03/08**	**07/24/08**
Lead 214	**1.51**		**0.22**		**0.14**	**07/03/08**	**07/24/08**
Potassium 40	**6.0**		**1.6**		**1.3**	**07/03/08**	**07/24/08**
Protactinium 234	0.0	U	0.24		0.41	07/03/08	07/24/08
Radium (226)	**1.54**		**0.28**	1.00	**0.16**	**07/03/08**	**07/24/08**
Thallium 208	**0.64**		**0.14**		**0.1**	**07/03/08**	**07/24/08**
Thorium 232	**1.40**		**0.31**		**0.34**	**07/03/08**	**07/24/08**
Thorium 234	0.6	U	1.4		2.3	07/03/08	07/24/08
Uranium 235	0.01	U	0.33		0.57	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 6PBFS-055-109

Radiochemistry

Lab Sample ID: F8G010127-008
Work Order: KOWL0
Matrix: SOLID

Date Collected: 02/28/08 1109
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.56**		**0.30**		**0.35**	**07/03/08**	**07/24/08**
Americium 241	-0.03	U	0.14		0.24	07/03/08	07/24/08
Bismuth 212	**1.72**		**0.54**		**0.36**	**07/03/08**	**07/24/08**
Bismuth 214	**1.64**		**0.25**		**0.12**	**07/03/08**	**07/24/08**
Cesium 137	0.036	U	0.058	0.200	0.098	07/03/08	07/24/08
Cobalt 60	0.022	U	0.052		0.093	07/03/08	07/24/08
Europium 152	-0.03	U	0.15		0.25	07/03/08	07/24/08
Europium 154	0.0	U	0.28		0.55	07/03/08	07/24/08
Lead 210	**2.4**	**J**	**1.7**	3.0	**2.2**	**07/03/08**	**07/24/08**
Lead 212	**1.73**		**0.20**		**0.13**	**07/03/08**	**07/24/08**
Lead 214	**1.34**		**0.19**		**0.18**	**07/03/08**	**07/24/08**
Potassium 40	**6.5**		**1.5**		**1.5**	**07/03/08**	**07/24/08**
Protactinium 234	-0.08	U	0.21		0.36	07/03/08	07/24/08
Radium (226)	**1.64**		**0.25**	1.00	**0.12**	**07/03/08**	**07/24/08**
Thallium 208	**0.71**		**0.11**		**0.06**	**07/03/08**	**07/24/08**
Thorium 232	**1.56**		**0.30**		**0.35**	**07/03/08**	**07/24/08**
Thorium 234	1.50	U	0.80		2.3	07/03/08	07/24/08
Uranium 235	0.21	U	0.32		0.53	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

J Result is greater than sample detection limit but less than stated reporting limit.
U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 6PBFS-055-105

Radiochemistry

Lab Sample ID: F8G010127-009
Work Order: KOWL5
Matrix: SOLID

Date Collected: 02/28/08 1146
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.18**		**0.23**		**0.24**	**07/03/08**	**07/24/08**
Americium 241	0.05	U	0.13		0.22	07/03/08	07/24/08
Bismuth 212	-0.29	U	0.53		0.90	07/03/08	07/24/08
Bismuth 214	**1.05**		**0.20**		**0.14**	**07/03/08**	**07/24/08**
Cesium 137	-0.019	U	0.063	0.200	0.11	07/03/08	07/24/08
Cobalt 60	0.021	U	0.057		0.10	07/03/08	07/24/08
Europium 152	-0.05	U	0.15		0.26	07/03/08	07/24/08
Europium 154	-0.09	U	0.50		0.90	07/03/08	07/24/08
Lead 210	1.6	U	1.4	3.0	2.0	07/03/08	07/24/08
Lead 212	**1.14**		**0.18**		**0.20**	**07/03/08**	**07/24/08**
Lead 214	**1.19**		**0.16**		**0.15**	**07/03/08**	**07/24/08**
Potassium 40	**10.1**		**1.7**		**0.8**	**07/03/08**	**07/24/08**
Protactinium 234	-0.09	U	0.21		0.35	07/03/08	07/24/08
Radium (226)	**1.05**		**0.20**	1.00	**0.14**	**07/03/08**	**07/24/08**
Thallium 208	**0.53**		**0.11**		**0.07**	**07/03/08**	**07/24/08**
Thorium 232	**1.18**		**0.23**		**0.24**	**07/03/08**	**07/24/08**
Thorium 234	**1.5**		**1.0**		**1.4**	**07/03/08**	**07/24/08**
Uranium 235	0.09	U	0.32		0.55	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

Tetra Tech EC, Inc.

Client Sample ID: 70-PDT-085-31

Radiochemistry

Lab Sample ID: F8G010127-010
Work Order: KQWMA
Matrix: SOLID

Date Collected: 02/20/08 0950
Date Received: 07/01/08 1100

Parameter	Result	Qual	Total Uncert. (2 σ+/-)	RL	MDC	Prep Date	Analysis Date
Gamma Ra-226 & hits by EPA 901.1 MOD			**pCi/g**		**Batch # 8185283**		**Yld %**
Actinium 228	**1.57**		**0.38**		**0.37**	**07/03/08**	**07/24/08**
Americium 241	0.002	U	0.17		0.28	07/03/08	07/24/08
Bismuth 212	**1.32**		**0.71**		**1.0**	**07/03/08**	**07/24/08**
Bismuth 214	**1.62**		**0.31**		**0.21**	**07/03/08**	**07/24/08**
Cesium 137	-0.002	U	0.081	0.200	0.15	07/03/08	07/24/08
Cobalt 60	0.014	U	0.073		0.13	07/03/08	07/24/08
Europium 152	0.03	U	0.18		0.32	07/03/08	07/24/08
Europium 154	0.06	U	0.44		0.82	07/03/08	07/24/08
Lead 210	1.2	U	1.9	3.0	3.2	07/03/08	07/24/08
Lead 212	**2.43**		**0.30**		**0.19**	**07/03/08**	**07/24/08**
Lead 214	**1.95**		**0.27**		**0.24**	**07/03/08**	**07/24/08**
Potassium 40	**11.7**		**1.9**		**0.5**	**07/03/08**	**07/24/08**
Protactinium 234	-0.22	U	0.29		0.48	07/03/08	07/24/08
Radium (226)	**1.62**		**0.31**	1.00	**0.21**	**07/03/08**	**07/24/08**
Thallium 208	**0.79**		**0.15**		**0.11**	**07/03/08**	**07/24/08**
Thorium 232	**1.57**		**0.38**		**0.37**	**07/03/08**	**07/24/08**
Thorium 234	1.62	U	0.80		3.3	07/03/08	07/24/08
Uranium 235	-0.04	U	1.6		0.7	07/03/08	07/24/08

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

ATTACHMENT 7

ADDITIONAL LABORATORY COMPARISON RESULTS

(Values in red exceed the release criterion for that radionuclide of concern.)

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ED_000855_00003297-00832

QA Analysis of Cs-137 and Ra-226 Results from HPS Laboratory and TA

Sample ID	On-site Laboratory						Off-site Laboratory (QA)					
	Count Time (min)	^{137}Cs			^{226}Ra			Count Time (min)	^{137}Cs			^{226}Ra		
		Activity	MDA	2σ Error	Activity	MDA	2σ Error		Activity	MDL	2σ Error	Activity	MDL	2σ Error
6PBFS-001-13	45	-0.069	0.045	-0.260	0.857	0.694	0.843	90	-0.004	0.017	0.021	0.488	0.367	0.458
6PBFS-002-59	45	-0.042	0.035	-1.609	0.960	0.744	0.891	90	-0.003	0.021	0.049	1.150	0.350	0.530
6PBFS-003-01	45	0.012	0.045	0.061	0.732	1.220	1.425	90	-0.022	0.035	0.097	1.411	0.551	0.827
6PBFS-004-15	90	0.005	0.036	0.038	1.114	0.839	1.009	90	-0.012	0.034	0.070	1.869	0.619	0.948
6PBFS-005-115	45	0.000	0.035	0.041	0.926	0.860	1.018	90	0.012	0.025	0.031	2.040	0.510	0.790
6PBFS-005-96	90	0.001	0.020	0.023	2.116	0.696	0.878	90	-0.010	0.029	0.063	2.160	0.650	0.840
6PBFS-006-10	45	0.031	0.046	0.053	1.217	0.915	1.094	90	0.028	0.022	0.030	1.880	0.520	0.740
6PBFS-007-17	90	-0.036	0.032	-0.281	1.028	0.849	0.985	90	-0.010	0.030	0.170	1.950	0.490	0.790
6PBFS-008-02	45	-0.012	0.050	-0.075	0.501	1.030	1.200	90	-0.025	0.034	0.118	1.539	0.573	1.000
6PBFS-009-12	45	0.035	0.046	0.053	1.286	1.120	1.285	90	0.004	0.023	0.028	0.340	0.540	0.680
6PBFS-010-31	90	0.005	0.043	0.049	1.488	0.807	0.976	90	-0.009	0.027	0.060	2.130	0.630	0.820
6PBFS-010-31_Dup								90	0.018	0.035	0.041	2.943	0.671	1.179
6PBFS-010-247	90	0.054	0.035	0.046	1.463	0.698	0.871	90	-0.020	0.030	0.140	2.480	0.530	0.800
6PBFS-011-04	45	-0.024	0.049	-0.151	1.242	0.861	1.040	90	-0.019	0.029	0.064	0.210	0.520	0.590
6PBFS-012-12	45	0.005	0.019	0.023	0.523	0.667	0.753	90	-0.030	0.030	0.260	0.630	0.424	0.572
6PBFS-013-29	45	-0.066	0.056	-0.117	1.370	1.020	1.229	90	-0.009	0.030	0.130	2.160	0.450	0.670
6PBFS-014-111	45	-0.005	0.034	-0.060	1.123	0.846	1.015	90	0.000	0.020	0.059	1.920	0.360	0.630
6PBFS-015-03	90	0.004	0.024	0.029	2.177	0.657	0.827	90	-0.007	0.035	0.053	0.440	0.669	0.811
6PBFS-015-124	45	-0.011	0.046	-0.090	0.710	1.380	1.600	90	0.001	0.026	0.031	3.830	0.577	0.979
6PBFS-016-07	45	-0.024	0.051	-0.109	1.479	0.928	1.126	90	0.000	0.027	0.032	2.350	0.540	0.800
6PBFS-017-77	45	-0.008	0.039	-0.057	0.836	1.360	1.574	90	-0.041	0.041	0.354	1.312	0.588	0.826
6PBFS-018-50	90	-0.001	0.022	-0.033	0.840	0.729	0.864	90	0.001	0.024	0.029	4.060	0.632	1.038
6PBFS-018-04	90	0.008	0.021	0.025	2.587	0.648	0.835	90	-0.007	0.026	0.032	2.119	0.647	0.867
6PBFS-019-27	45	0.010	0.018	0.022	0.177	0.654	0.710	90	0.024	0.023	0.032	2.537	0.562	0.996
6PBFS-020-41	45	-0.066	0.054	-0.590	-0.176	1.220	-1.558	90	-0.012	0.020	0.026	0.103	0.323	0.405
6PBFS-021-01	45	-0.049	0.036	-0.375	0.945	0.749	0.898	90	0.002	0.014	0.031	0.670	0.430	0.520
6PBFS-022-34	45	-0.031	0.028	-0.173	-0.526	1.120	-1.972	90	0.008	0.018	0.023	1.423	0.367	0.622
6PBFS-023-187	90	-0.045	0.034	-0.211	1.382	0.760	0.899	90	0.023	0.024	0.032	2.917	0.563	1.041
6PBFS-024-100	45	-0.061	0.044	-9.597	-0.004	0.935	-1.032	90	-0.003	0.019	0.023	1.190	0.370	0.560
6PBFS-025-14	45	0.036	0.032	0.043	0.229	0.908	0.997	90	-0.003	0.019	0.023	2.113	0.370	0.560
6PBFS-026-12	45	0.018	0.022	0.028	0.725	0.691	0.804	90	0.011	0.023	0.053	-0.050	0.400	2.300

QA Analysis of Cs-137 and Ra-226 Results from HPS Laboratory and TA

Sample ID	On-site Laboratory						Off-site Laboratory (QA)					
	Count Time (min)	^{137}Cs			^{226}Ra			Count Time (min)	^{137}Cs			^{226}Ra		
		Activity	MDA	2σ Error	Activity	MDA	2σ Error		Activity	MDL	2σ Error	Activity	MDL	2σ Error
6PBFS-027-16	45	-0.074	0.059	-0.526	-0.409	1.050	-1.780	90	0.001	0.028	0.034	1.760	0.400	0.712
6PBFS-028-12	45	-0.035	0.056	-0.162	0.503	1.000	1.138	90	-0.008	0.032	0.040	1.844	0.509	0.833
6PBFS-029-13	90	-0.015	0.042	-0.101	1.149	0.969	1.139	90	-0.030	0.040	0.140	2.780	0.620	0.920
6PBFS-030-17	45	-0.041	0.056	-0.185	-0.256	1.250	-1.720	90	-0.046	0.037	0.505	1.428	0.546	0.848
6PBFS-033-05	45	-0.020	0.056	-0.109	-1.092	1.120	-3.698	90	0.016	0.020	0.027	1.322	0.379	0.658
6PBFS-036-09	45	0.020	0.026	0.034	0.952	0.798	0.920	90	-0.001	0.017	0.021	1.680	0.416	0.664
6PBFS-036-09_Dup								90	0.000	0.027	0.032	0.270	0.476	0.597
6PBFS-037-54	90	-0.0363	0.032	149.140	1.083	0.702	0.840	90	0.000	0.027	0.033	1.609	0.631	0.833
6PBFS-037-54_Dup								90	-0.016	0.034	0.043	1.193	0.620	0.813
6PBFS-039-10	45	0.016	0.040	0.042	1.299	0.951	1.141	90	0.042	0.022	0.038	0.760	0.540	0.640
6PBFS-040-50	45	0.020	0.029	0.038	1.421	1.120	1.352	90	0.023	0.026	0.061	2.280	0.560	0.880
6PBFS-041-13	45	0.019	0.040	0.042	0.417	0.979	1.117	90	0.002	0.020	0.024	2.937	0.387	0.712
6PBFS-042-119	45	0.056	0.049	0.064	1.262	1.030	1.245	90	-0.008	0.017	0.038	0.930	0.600	0.720
6PBFS-043-115	90	0.018	0.035	0.042	1.057	0.833	1.000	90	-0.004	0.024	0.029	2.713	0.528	0.844
6PBFS-044-17	45	-0.048	0.044	-0.393	1.247	0.979	1.150	90	-0.002	0.027	0.032	0.657	0.584	0.736
6PBFS-045-152	90	0.000	0.021	0.025	1.012	0.775	0.914	90	-0.006	0.026	0.032	2.091	0.491	0.854
6PBFS-046-04	45	-0.028	0.029	-0.123	-0.073	0.957	-1.176	90	-0.001	0.027	0.033	1.708	0.395	0.668
6PBFS-047-74	45	-0.030	0.043	-0.337	1.080	0.756	0.996	90	-0.010	0.030	0.200	1.100	0.500	0.670
6PBFS-048-06	90	0.003	0.030	0.033	0.783	0.948	1.102	90	-0.005	0.026	0.032	1.445	0.582	0.788
6PBFS-049-310	45	0.007	0.043	0.044	1.217	0.823	0.987	90	-0.020	0.036	0.093	1.322	0.537	0.779
6PBFS-051-336	90	0.003	0.032	0.039	1.294	0.805	0.978	90	-0.028	0.034	0.167	1.658	0.564	0.849
6PBFS-052-60	45	-0.012	0.045	-0.103	1.334	1.100	1.293	90	-0.007	0.030	0.360	1.960	0.550	0.880
6PBFS-053-117	90	0.009	0.031	0.036	1.199	0.749	0.886	90	-0.017	0.031	0.081	0.531	0.569	0.698
6PBFS-054-162	45	-0.021	0.042	-0.104	1.243	1.010	1.189	90	0.002	0.023	0.029	1.829	0.400	0.733
6PBFS-054-162_Dup								90	0.013	0.019	0.025	1.725	0.501	0.789
6PBFS-056-93	45	0.008	0.023	0.028	1.035	0.851	1.000	90	0.021	0.033	0.042	4.871	0.618	1.132
6PBFS-057-139	45	0.041	0.046	0.056	1.330	1.070	1.268	90	-0.044	0.032	1.751	1.011	0.512	0.717
6PBFS-058-63	90	0.053	0.025	0.035	0.746	0.685	0.814	90	-0.002	0.022	0.027	1.169	0.426	0.659
6PBFS-059-48	45	-0.010	0.038	-0.076	1.175	0.987	1.174	90	0.025	0.028	0.036	2.315	0.556	0.905
6PBFS-060-92	45	0.021	0.041	0.044	0.925	0.751	0.921	90	-0.008	0.024	0.030	2.521	0.421	0.703
6PBFS-061-28	45	0.067	0.038	0.054	-0.160	1.100	-1.576	90	0.010	0.017	0.023	0.522	0.414	0.510

QA Analysis of Cs-137 and Ra-226 Results from HPS Laboratory and TA

Sample ID		On-site Laboratory						Off-site Laboratory (QA)					
	Count Time (min)	^{137}Cs			^{226}Ra			Count Time (min)	^{137}Cs			^{226}Ra		
		Activity	MDA	2σ Error	Activity	MDA	2σ Error		Activity	MDL	2σ Error	Activity	MDL	2σ Error
6PBFS-062-07	45	-0.043	0.049	-0.241	0.747	1.070	1.224	90	0.008	0.027	0.034	1.403	0.475	0.723
6PBFS-063-34	45	-0.061	0.046	-0.648	-0.352	1.310	-2.047	90	0.006	0.020	0.025	1.159	0.407	0.613
6PBFS-064-69	45	-0.068	0.035	-0.297	0.280	1.140	1.289	90	0.008	0.026	0.033	1.473	0.449	0.696
6PBFS-065-01	45	0.015	0.052	0.061	0.516	1.250	1.415	90	0.022	0.025	0.032	2.370	0.548	0.856

ATTACHMENT 8

RADIUM-226 AND BISMUTH-214 QA COMPARISON
(Values in red exceed the release criterion for that radionuclide of concern.)

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QA Analysis of HPS Lab Ra-226 and TA Bi-214 Results

Sample ID	On-site Laboratory				Off-site Laboratory (QA)			
	Count Time (min)	^{226}Ra			Count Time (min)	^{214}Bi		
		Activity	MDA	2σ Error		Activity	MDL	2σ Error
6PBFS-001-13	45	0.857	0.694	0.843	90	0.339	0.052	0.069
6PBFS-002-59	45	0.960	0.744	0.891	90	0.539	0.077	0.095
6PBFS-003-01	45	0.732	1.220	1.425	90	0.580	0.130	0.120
6PBFS-004-15	90	1.114	0.839	1.009	90	1.060	0.110	0.140
6PBFS-005-115	45	0.926	0.860	1.018	90	1.000	0.100	0.140
6PBFS-005-115					60	0.640	0.070	0.150
6PBFS-005-96	90	2.116	0.696	0.878	90	1.230	0.120	0.160
6PBFS-006-10	45	1.217	0.915	1.094	90	0.620	0.130	0.140
6PBFS-007-17	90	1.028	0.849	0.985	90	0.490	0.170	0.130
6PBFS-008-02	45	0.501	1.030	1.200	90	0.600	0.120	0.130
6PBFS-009-12	45	1.286	1.120	1.285	90	0.610	0.100	0.130
6PBFS-010-31	90	1.488	0.807	0.976	90	1.050	0.110	0.140
6PBFS-010-31_Dup					90	1.090	0.150	0.170
6PBFS-010-31					60	1.200	0.070	0.200
6PBFS-010-247	90	1.463	0.698	0.871	90	0.700	0.130	0.140
6PBFS-011-04	45	1.242	0.861	1.040	90	0.314	0.100	0.082
6PBFS-012-12	45	0.523	0.667	0.753	90	0.399	0.100	0.089
6PBFS-013-29	45	1.370	1.020	1.229	90	0.463	0.110	0.098
6PBFS-014-111	45	1.123	0.846	1.015	90	0.730	0.080	0.110
6PBFS-014-111					60	0.570	0.060	0.150
6PBFS-015-03	90	2.177	0.657	0.827	90	1.080	0.150	0.170
6PBFS-015-124	45	0.710	1.380	1.600	90	1.000	0.110	0.140
6PBFS-016-07	45	1.479	0.928	1.126	90	0.570	0.120	0.110
6PBFS-017-77	45	0.836	1.360	1.574	90	0.740	0.140	0.140
6PBFS-018-50	90	0.840	0.729	0.864	90	1.440	0.110	0.160
6PBFS-018-04	90	2.587	0.648	0.835	90	1.420	0.100	0.160
6PBFS-019-27	45	0.177	0.654	0.710	90	0.400	0.120	0.120
6PBFS-020-41	45	-0.176	1.220	-1.558	90	0.205	0.067	0.068
6PBFS-021-01	45	0.945	0.749	0.898	90	0.423	0.080	0.074
6PBFS-022-34	45	-0.526	1.120	-1.972	90	0.349	0.074	0.087
6PBFS-023-187	90	1.382	0.760	0.899	90	0.620	0.210	0.150
6PBFS-024-100	45	-0.004	0.935	-1.032	90	0.294	0.061	0.067
6PBFS-025-14	45	0.229	0.908	0.997	90	0.440	0.110	0.110
6PBFS-026-12	45	0.725	0.691	0.804	90	0.418	0.088	0.098
6PBFS-027-16	45	-0.409	1.050	-1.780	90	0.225	0.120	0.081
6PBFS-028-12	45	0.503	1.000	1.138	90	0.340	0.120	0.110
6PBFS-029-13	90	1.149	0.969	1.139	90	0.830	0.140	0.150
6PBFS-029-13					60	1.160	0.070	0.210
6PBFS-030-17	45	-0.256	1.250	-1.720	90	0.190	0.150	0.110
6PBFS-033-05	45	-1.092	1.120	-3.698	90	0.166	0.099	0.079
6PBFS-036-09	45	0.952	0.798	0.920	90	0.324	0.120	0.093
6PBFS-036-09_Dup					90	0.209	0.110	0.090
6PBFS-037-54	90	1.083	0.702	0.840	90	0.990	0.100	0.140
6PBFS-037-54_Dup					90	0.850	0.110	0.140
6PBFS-039-10	45	1.299	0.951	1.141	90	0.540	0.120	0.110

QA Analysis of HPS Lab Ra-226 and TA Bi-214 Results

Sample ID	On-site Laboratory				Off-site Laboratory (QA)			
	Count Time (min)	^{226}Ra			Count Time (min)	^{214}Bi		
		Activity	MDA	2σ Error		Activity	MDL	2σ Error
6PBFS-040-50	45	1.421	1.120	1.352	90	1.000	0.100	0.140
6PBFS-041-13	45	0.417	0.979	1.117	90	0.558	0.086	0.099
6PBFS-042-119	45	1.262	1.030	1.245	90	0.700	0.130	0.130
6PBFS-043-115	90	1.057	0.833	1.000	90	0.870	0.080	0.120
6PBFS-044-17	45	1.247	0.979	1.150	90	0.540	0.150	0.110
6PBFS-045-152	90	1.012	0.775	0.914	90	0.600	0.110	0.120
6PBFS-046-04	45	-0.073	0.957	-1.176	90	0.192	0.110	0.085
6PBFS-047-74	45	1.080	0.756	0.996	90	0.270	0.140	0.110
6PBFS-048-06	90	0.783	0.948	1.102	90	0.540	0.110	0.120
6PBFS-049-310	45	1.217	0.823	0.987	90	0.580	0.120	0.120
6PBFS-051-336	90	1.294	0.805	0.978	90	0.690	0.140	0.140
6PBFS-052-60	45	1.334	1.100	1.293	90	0.470	0.110	0.100
6PBFS-053-117	90	1.199	0.749	0.886	90	0.600	0.110	0.110
6PBFS-054-162	45	1.243	1.010	1.189	90	0.570	0.100	0.110
6PBFS-054-162_Dup					90	0.480	0.130	0.140
6PBFS-056-93	45	1.035	0.851	1.000	90	1.160	0.130	0.160
6PBFS-057-139	45	1.330	1.070	1.268	90	0.490	0.120	0.110
6PBFS-058-63	90	0.746	0.685	0.814	90	0.500	0.090	0.100
6PBFS-059-48	45	1.175	0.987	1.174	90	0.490	0.130	0.120
6PBFS-060-92	45	0.925	0.751	0.921	90	0.518	0.084	0.095
6PBFS-061-28	45	-0.160	1.100	-1.576	90	0.427	0.073	0.091
6PBFS-062-07	45	0.747	1.070	1.224	90	0.500	0.130	0.130
6PBFS-063-34	45	-0.352	1.310	-2.047	90	0.418	0.074	0.092
6PBFS-064-69	45	0.280	1.140	1.289	90	0.560	0.100	0.120
6PBFS-065-01	45	0.516	1.250	1.415	90	0.770	0.100	0.120

ATTACHMENT 9

OFF-SITE LABORATORY STANDARD SAMPLE RESULT USING BISMUTH-214

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gamma Spectroscopy

Batch: M091273 **Operator:** 403293

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDateTime	CountDuration
LCS_Ra226	NA	394.30g	2.00	GammaVision	GV07	3 / 24 / 09 22:37	90

Analyte	Cmpnd#	Activity		TotalUnc	CountUnc	MDA	MLCC	Act/MDA
BI-214	1505	2.590E+001	pCi/g	1.646E+000	5.462E-001	2.262E-001	1.098E-001	114.50
PB-214	1541	2.790E+001	pCi/g	2.194E+000	5.160E-001	2.685E-001	1.317E-001	103.89
RA-226	578	2.590E+001	pCi/g	1.646E+000	5.462E-001	2.262E-001	1.098E-001	114.50

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag

Bi-214 $\Rightarrow \frac{25.90}{30} = 86.3\%$

Pb-214 $\Rightarrow \frac{27.9}{30} = 93\%$

APPENDIX D

SURVEY UNITS 31, 32, 34, 35, 38, 134, AND 135 PROJECT REPORTS

SURVEY UNIT 31 (DCN: ECSD-3211-0018-0183.R3 REVISION 3 TO ECSD-2201-0006-0080.R2)

SURVEY UNIT 32 (DCN: ECSD-3211-0018-0184.R3 REVISION 3 TO ECSD-2201-0006-0081.R2)

SURVEY UNIT 34 (DCN: ECSD-3211-0018-0185.R3 REVISION 3 TO ECSD-2201-0006-0082.R2)

SURVEY UNIT 35 (DCN: ECSD-3211-0018-0186.R3 REVISION 3 TO ECSD-2201-0006-0083.R2)

SURVEY UNIT 38 (DCN: ECSD-3211-0018-0187.R3 REVISION 3 TO ECSD-2201-0006-0084.R2)

SURVEY UNIT 134 (DCN: ECSD-3211-0018-0188.R1 REVISION 1 TO EMAC-8823-0002-0009)

SURVEY UNIT 135 (DCN: ECSD-3211-0018-0189.R1 REVISION 1 TO EMAC-8823-0002-0010)

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Final Survey Unit 31 Project Report, Revision 3
December 14, 2011

DCN: ECSD-3211-0018-0183.R3
Revision 3 to ECSD-2201-0006-0080.R2

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TETRA TECH EC, INC.

December 14, 2011
ECSD-3211-0018-0183.R3
ECSD-3211-0018-0184.R3
ECSD-3211-0018-0185.R3
ECSD-3211-0018-0186.R3
ECSD-3211-0018-0187.R3
ECSD-3211-0018-0188.R1
ECSD-3211-0018-0189.R1

Base Realignment and Closure
Program Management Office West
Attn: Christopher Yantos
1455 Frazee Road, Suite 900
San Diego, California 92108

SUBJECT: PARCEL D-2 WORK PACKAGE 3 (SURVEY UNIT 31, 32, 34, 35, 38, 134, AND 135 PROJECT REPORTS), HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CALIFORNIA

Dear Mr. Yantos:

Enclosed are the Parcel D-2 Survey Unit Project Reports, Hunters Point Naval Shipyard, San Francisco, California, dated December 14, 2011, which have been revised per your request.

If you have any questions or require additional information, please do not hesitate to contact me at (415) 216-2731.

Sincerely,

Bill Dougherty
Project Manager

Enclosures: Survey Unit 31 Project Report, Revision 3
Survey Unit 32 Project Report, Revision 3
Survey Unit 34 Project Report, Revision 3
Survey Unit 35 Project Report, Revision 3
Survey Unit 38 Project Report, Revision 3
Survey Unit 134 Project Report, Revision 1
Survey Unit 135 Project Report, Revision 1

1230 Columbia Street, Suite 750, San Diego, California 92101
Tel. 619.234.8696 Fax. 619.234.8591
www.tteci.com

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-07-D-3211
CTO NO. 0018

FINAL

SURVEY UNIT 31 PROJECT REPORT REVISION 3

December 14, 2011

DCN: ECSD-3211-0018-0183.R3
Revision 3 to ECSD-2201-0006-0080.R2

PARCEL D-2 SANITARY SEWER
AND STORM DRAIN REMOVAL PROJECT
HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

ED_000855_00003297-00848

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-07-D-3211
CTO NO. 0018

FINAL

SURVEY UNIT 31 PROJECT REPORT
REVISION 3
December 14, 2011

PARCEL D-2 SANITARY SEWER AND STORM DRAIN REMOVAL PROJECT HUNTERS POINT NAVAL SHIPYARD SAN FRANCISCO, CALIFORNIA

DCN: ECSD-3211-0018-0183.R3
Revision 3 to ECSD-2201-0006-0080.R2

Prepared by:

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