Appendix H:
Data Summary Report for Storm and Sanitary Drain Systems

SP-012

Attachment 8

Data
Summary Report

1. Introduction

Samples were collected from Ford Nuclear Reactor (FNR) storm drain and sanitary sewer lines during 2007 as part of the Decommissioning Phase Characterization. These samples were collected from drain traps and cleanouts of both systems. This report describes the samples and presents the results. It also provides background information on the storm drains and their present configuration following Decommissioning dismantlement activities.

2. System Description

The FNR storm sewer (storm drains) received water from FNR roof drains and from several drains originating inside the FNR. Storm sewer piping exits the FNR at three locations on the Beam Port Floor. These connect to a storm sewer line that runs around the perimeter of the building below grade and connects to a campus main N-S line located just west of the FNR. During FNR operation, the Cold Sump in the Basement received water from floor drains and overflow from the Hot Sump. The FNR process flow diagram shows a connection from the Cold Sump to the storm sewer [Smith 1955].

There are four roof drains that enter the FNR storm sewer system. Two drains on the main roof connect to a line on the Pool Floor ceiling (Room 3101A) which drops to the Beam Port Floor. This line exits the FNR to the external sanitary sewer at the SW corner of the Beam Port Floor. A single drain originates on the FNR Roof above the Third Floor, north of the Cooling Tower. It drops to the ceiling of Room 3104, then to the North Vertical Pipe Chase. This vertical line joins the Cooling Tower Sump Overflow drain inside the pipe chase and then exits the FNR to the external storm sewer at the north side of the building just above the Beam Port Floor elevation. A single drain originates on the FNR Roof above the third floor east of the Cooling Tower. It enters the FNR building in the ceiling of Room 3102 and then drops to the Beam Port Floor through the East Vertical Pipe Chase and exits the FNR to the external storm sewer at the SE corner. A former Secondary System emergency blowdown drain connected to the storm sewer through a 10 inch drain connection located on the east side of the Beam Port Floor. This connection is currently capped with a blank flange. A schematic of the FNR storm sewer connections is shown in Exhibit 1.

There were two paths for FNR waste water to the Ann Arbor sanitary sewer system:

a. During FNR operation, waste water from the Reactor Pool and floor drains (via the Hot Sump) was routed to three retention tanks in the PML. The water from the PML Retention Tanks was filtered and processed through ion exchange columns and released to the sanitary sewer piping in the PML Basement Piping Tunnel. This waste water was monitored and then released to an Ann Arbor sanitary sewer system main south of the PML.

b. The sanitary sewer that directly serviced the FNR received waste water from janitor sinks, toilets, showers and lavatories in the FNR. These connect to a sewer line which exits the building near the SE corner of the Beam Port Floor. The line then runs north and west outside the building (below grade) and connects to the N-S sewer trunk line at a man-hole located just west of the FNR.

The sanitary sewer release path from the FNR through the PML (Path a., described above) was investigated in the 2003 FNR Characterization Survey and found to be not impacted by FNR licensed radioactive materials [Ch2 2004]. The PML sanitary sewer was removed from the scope of the FNR Decommissioning. All the remaining connections to the FNR sanitary sewer (Path b.) originated in the 2nd Floor Restrooms and Janitor's Closet. Drains from lavatories, toilets and a urinal (a total of six) connected to a horizontal header in the East Pipe Chase which transitioned to a vertical line which dropped to the sanitary sewer connection on the east wall next to the Beam Port Floor Janitor closet. All the drain piping that connected the 2nd floor restroom lavatories, urinals and commodes to the sanitary sewer has been removed in 2007. The floor, shower and 2nd floor Janitor's closet drains remain.

Two floor drains and one capped drain from Room 2111 drained to a common 4 in. line located in the Beam Port Floor overhead just south of the North Stairwell. This line connects to the vertical drain from the FNR roof in the North Pipe Tunnel. The Room 2111 floor drain piping was removed during decommissioning and no characterization was performed.

Most piping for roof drains and sanitary drains within the FNR is carbon steel. Both the roof drain and sanitary drains transition to cast iron sewer piping (4 and 6 in.) prior to exiting the FNR.

3. System History and Previous Characterization

From the start of operations in 1957 until 1991, liquid effluents from the FNR were routinely released through the PML sanitary sewer via the retention tanks in the PML.[1] During the 2003 FNR Characterization survey, the sanitary sewer system was investigated. Samples were collected from five locations in the sanitary sewer. They were:

- drain line at exit from the PML
- Manhole outside PML where sewer joins main campus trunk line
- Manhole midway between campus and municipal treatment facility
- Manhole near municipal treatment facility
- Manhole upstream of PML sewer outlet connection

The 2004 Characterization Survey Report stated that "none of the sanitary system samples contained positive concentrations of radionuclides; this indicates that the system is not impacted by licensed operations". The storm drain system and the sanitary sewer system within the FNR were not investigated.

The Historical Site Assessment (HSA) report did not address the sanitary sewer or storm sewer systems inside the FNR or the respective sewer lines immediately downstream of the FNR.

[1] University of Michigan, *Ford Nuclear Reactor Decommissioning Plan*, Rev 1, 2006. § 2.1.2.3 describes the historical operation of the retention tanks in the PML and the PML sanitary sewer as the liquid effluent release path from FNR operations.

4. Sampling Basis

Selection of sampling locations considers potential contamination sources and waste water travel paths in the FNR storm and sanitary drain piping. Sources and potential pathways are:

Storm Sewer System: Potential sources for release of contaminated waste water from FNR operations to the storm sewer system were:

- Basement and Beam Port Floor flood events involving reactor pool water
- overflow from the Hot Sump to the Cold Sump
- waste water from floor drains in the HVAC equipment room (Rm 2111).

Other sources of water from the FNR to the storm drain system are the roof drains; Cooling Tower Sump overflow and secondary system blowdown, but these water sources have a low contamination probability.

Sanitary Sewer System: Potential sources of contaminated waste water to the FNR sanitary sewer system include the 2nd floor janitor closet drain, restroom floor and shower drains, lavatories and toilets in the FNR.

The approach to characterization of FNR storm and sanitary systems is to collect samples of material; sediment and corrosion-scale from clean-outs where storm and sanitary sewer lines exit the FNR. Non-destructive means are used to gain access – the goal is to maintain the roof drains and the main sanitary lines functional.

5. Description of Samples

Six sample locations for the storm drains and five sample locations for sanitary drains were identified and samples were collected from all but one location. The proposed sample location at the North Pipe Chase exit to the storm sewer, the pipe cleanout was "frozen" (corroded) in place, so this location was not sampled. Table 1 lists the samples that were collected. As seen in the table. Most sampling locations yielded only a small amount of material – this limits the analytical sensitivity or minimum detectable activity concentrations that can be achieved.

The samples were shipped to a vendor laboratory for analysis. The analyses requested were: tritium, C-14 and gamma spectroscopy.

Table 1, Storm Drain and Sanitary Sewer Characterization Samples

Sample Location -Description	Sample Date	FNRDP Sample ID	Sample Description	Eberline Work Order
Storm Drain - Main FNR Roof Drain clean-out where line exits the FNR at the SW corner of Beam Port Floor (STM DRN-01A)	10/10/07	CH-2007-10-10-01	Sludge in 20 ml vial	07-10110
Storm Drain - Emergency drain connection, E side of Beam Port Floor (STM DRN-03A)	10/10/07	CH-2007-10-10-03	Dry scale and rust in 20 ml vial	07-10110
Storm Drain - East Roof Drain line clean-out, Beam Port Floor SE corner where line exits FNR to Storm Drain (adjacent to Janitor's Closet (STM DRN-04A)	11/06/07	CH-2007-11-06-01	Dry residue-scrapings in 20 ml vial	07-11061
Storm Drain – Manhole west of FNR just west of Storage Ports (STM DRN-05A)	10/16/07	CH-2007-10-16-01	Sludge in 20 ml vial	07-10110
Storm Drain – Manhole west of FNR just west of Storage Ports (STM DRN-05B)	10/16/07	CH-2007-10-16-02	Sludge in 20 ml vial	07-10110
Sanitary Drain - Sanitary drain line clean-out, Beam Port Floor SE corner where the line exits the FNR to the Sanitary Sewer (adjacent to Janitor's Closet) (SAN DRN-01A)	11/6/07	CH-2007-11-06-02	Dry dark brown scale-scrapings in 20 ml vial	07-11061
Sanitary Drain - Second Floor Janitor's closet Floor Drain trap in ceiling on Beam Port Floor. (SAN DRN-02A)	10/11/07	CH-2007-10-10-06	Sludge-scrapings ~ 10 ml in 20 ml vial	07-10110
Sanitary Drain - Women's 2nd Floor Restroom shower drain trap on Beam Port Floor Janitor's Closet ceiling (SAN DRN-03A)	10/10/07	CH-2007-10-10-05	Dry scale-rust in 20 ml vial	07-10110
Sanitary Drain - Men's 2nd Floor Restroom shower drain trap on Beam Port Floor ceiling (SAN DRN-04A)	10/10/07	CH-2007-10-10-07	Water and sediment in 20 ml vial	07-10110
Sanitary Drain - Manhole west of FNR just west of Storage Ports (SAN DRN-05A)	10/17/07	CH-2007-10-17-05	~ ½ gallon of clear liquid (water) in 1 gal. container	07-10112

6. Sample Results

The vendor laboratory reported radionuclide concentrations below MDA for all radionuclides in six of the ten samples. Results above MDA were reported in three storm drain samples and in two sanitary sewer samples. Tables 2 and 3 identify the samples and radionuclides reported as "detected" in the storm drain and sanitary sewer samples, respectively. Each sample result reported as > MDA is discussed below.

Table 2, Storm Drain Sample Screening - Results > MDA

Sample Location	Sample ID	Sample Date	Analyte	pCi/g		
				Result	CSU [1]	MDA [2]
Main Roof Drain Cleanout SW BP Floor Bldg Exit [3]	CH-2007-10-10-01	10/10/2007	Uranium-235	4.14E+00	2.06E+00	2.14E+00
Emergency Storm Drain Connection BP Floor, E Side [4]	CH-2007-10-10-03	10/10/2007	Cobalt-60	2.15E+00	3.40E-01	1.06E+00
East Roof Drain Cleanout SE BP Floor Bldg Exit [5]	CH-2007-11-06-01A	11/6/2007	Carbon-14	1.42E+00	3.82E-01	1.23E+00
East Roof Drain Cleanout SE BP Floor Bldg Exit [5]	CH-2007-11-06-01A	11/6/2007	Cesium-137	6.83E+00	1.59E+00	2.60E+00
East Roof Drain Cleanout SE BP Floor Bldg Exit [5]	CH-2007-11-06-01A	11/6/2007	Tritium	6.22E+00	1.34E+00	4.23E+00

Table 2 Notes:

1. CSU is combined standard uncertainty, at the one-sigma level.
2. MDA is minimum detectable activity concentration.
3. The vendor laboratory report interpreted that sample CH-2007-10-10-01 demonstrated slightly positive results for U-235 (by gamma spectroscopy) [Eberline Work Order Report 07-10110, 11/6/07].
4. The vendor laboratory report interpreted that sample CH-2007-10-10-03 demonstrated slightly positive results for Co-60 [Eberline Work Order Report 07-10110, 11/6/07].
5. The vendor laboratory report interpreted that sample CH-2007-11-06-01A demonstrated slightly positive results for C-14, Cs-137 and tritium [Eberline Work Order Report 07-11061, 11/30/07].

The sample from the main roof drain connection to the storm sewer (CH-2007-10-10-01) reported a U-235 concentration of 4.14 pCi/g. This sample also reported 0.5 pCi/g for the "duplicate" analysis; within the two-sigma error band of 4.14 ± 4 pCi/g. This sample result was obtained by gamma spectroscopy, which has relatively poor detection sensitivity for U-235 at environmental levels.[2] Further, a sample upstream in the roof drain catch basin did not show detectable U-235 (see Characterization Package SP-017). It is concluded that this result is not a true "detect".

[2] Personal communication, Mike McDougal, Laboratory Manager, Eberline Services, Oak Ridge, TN., 11/12/07.

The reported value for C-14 (1.42 ± 0.8 pCi/g) in the East Roof Drain cleanout sample is considered to be a non-detect. It is only slightly > MDA and the MDA is well within the two-sigma uncertainty band. The tritium result from this sample (6.22 ± 2.7 pCi/g) is also judged to be a non-detect – the MDA value is within the sample result uncertainty band. The result reported for Co-60 (2.15 ± 0.7 pCi/g) in the emergency storm drain sample from the connection to the storm sewer (Sample No. CH-2007-10-10-03) is considered to be a true detect. Similarly, the reported result for Cs-137 in the East Roof Drain cleanout at the storm drain exit (6.83 ±3.2 pCi/g) is considered to be a true detect.

Table 3, Sanitary Sewer Sample Screening - Results > MDA

Sample Location	Sample ID	Sample Date	Analyte	pCi/g		
				Result	CSU [1]	MDA [2]
Women's 2nd Floor Rest Room Shower Drain Trap [3]	CH-2007-10-10-05	10/10/2007	Cobalt-60	2.08E+00	3.63E-01	1.03E+00
Sanitary Drain Cleanout SE BP Floor Bldg Exit [4]	CH-2007-11-06-02A	11/6/2007	Carbon-14	9.02E+00	3.64E-01	9.37E-01
Sanitary Drain Cleanout SE BP Floor Bldg Exit [4]	CH-2007-11-06-02A	11/6/2007	Tritium	7.73E+00	1.28E+00	3.94E+00

Table 3 Notes:

1. CSU is combined standard uncertainty, at the one-sigma level.
2. MDA is minimum detectable activity concentration.
3. The vendor laboratory report interpreted that sample CH-2007-10-10-05 demonstrated slightly positive results for Co-60 [Eberline Work Order Report 07-10110, 11/6/07].
4. The vendor laboratory report interpreted that sample CH-2007-11-06-02A demonstrated slightly positive results for C-14 and tritium [Eberline Work Order Report 07-11061 11/30/07].

The sanitary sewer sample results reported to be > MDA are considered to be true detects. The lower limits of the error bands are above the MDA for all thee results. No DCGLs have been established for licensed radioactive material in FNR storm and sanitary drains. For reference, the NRC default screening level DCGLs for surface soil are shown in Table 4. It is seen that all the sample positive results are below the soil DCGLs. It is noted that no FNR licensed radionuclides were detected in samples collected from the storm and sanitary sewer mains immediately downstream of the FNR.

Table 4, NRC Screening Level DCGLs for Surface Soil

Radionuclide	DCGL (pCi/g)
C-14	12
tritium	110
Co-60	3.8
Cs-137	11

7. References

Eberline Services/Oak Ridge Laboratory, University of Michigan FNR D&D, Standard Level IV Report of Analysis, Work Order No. 07-10112-R, October 31, 2007

Eberline Services/Oak Ridge Laboratory, University of Michigan FNR D&D, Standard Level IV Report of Analysis, Work Order No. 07-10110-R, November 6, 2007

Eberline Services/Oak Ridge Laboratory, University of Michigan FNR D&D, Standard Level IV Report of Analysis, Work Order No. 07-11061-R, November 30, 2007

Smith, Hinchmann and Grylls, Inc. University of Michigan Reactor Building, Process Flow Diagram, Drawing M-1, 1/24/1955.

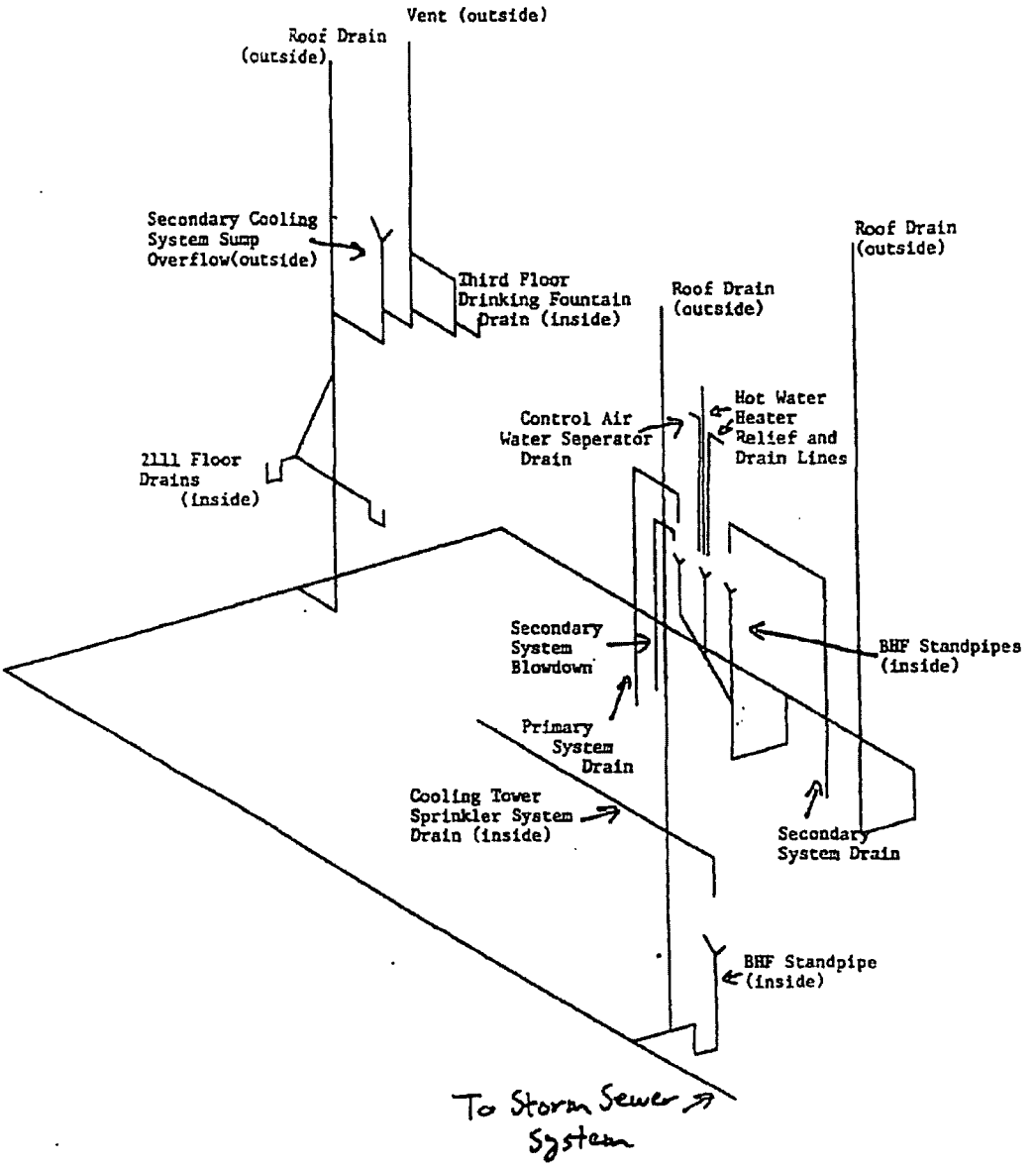
University of Michigan, *Historical Site Assessment for the Ford Nuclear Reactor* [CH2MHill, January 2003],

University of Michigan, Ford Nuclear Reactor, Report of the 2003 FNR Characterization Survey [CH2MHill, June 2004].

University of Michigan, *Ford Nuclear Reactor Decommissioning Plan,* Rev 1, 2006.

Exhibit 1

FNR STORM SEWER CONNECTIONS AS OF 12/9/97



Appendix I:
Final Disposition of the Storage Ports

Ford Nuclear Reactor Facility

Final Disposition of the Storage Ports

February 24, 2012

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Executive Summary

Fifty storage ports extended through the west wall of the first floor of the reactor and were designed for and used to store beam port plugs, collimators or other equipment from the beam ports. The storage ports were also used to store items with elevated dose readings. The storage ports consisted of forty-two 6" and eight 8" schedule 40 carbon steel pipes that extended 8'-10" into the soil; terminating into an 8" thick concrete wall providing structural support for the pipes ends. The storage ports were arranged in three levels.

Of specific interest was Storage Port No. 1 that was used to store two large $Pu^{238}Be$ sources from approximately November 1971 to February 2003 when they were relocated to another U-M facility in preparation for decommissioning the reactor facility. These $Pu^{238}Be$ sources were capable of producing approximately 1.7E+8 neutrons sec^{-1} which would be spread in all directions. The other ports were used for storing materials that would not produce a neutron flux capable of activating surrounding soil materials. Therefor the primary areas of concern during the remediation efforts were from:

- Contaminated surfaces and debris inside the storage ports from reactor equipment
- Activated soils surrounding Storage Port No. 1
- Concrete surfaces that may have been within the radius of influence from the $Pu^{238}Be$ sources in Storage Port No. 1 and become partially activated

During November/December 2008 excavation activity was undertaken to expose the storage ports to facilitate their removal. Activities involved:

- Installation of sheet piling to establish the northern, western and southern limits of the approximately 10' by 52' excavation.
- Excavation from the ground surface down to the bottom of the east/west running storage port pipes at a depth of approximately 13'. All excavated soil from storage ports 4 through 50 was stockpiled for re-use in backfilling the excavation zone. Soil from around storage ports 1 through 3 was removed for disposal.
- The seventeen one inch vent lines and 50 six and eight inch storage ports were cut and removed in a controlled manner.
- The concrete support wall around Storage Port Nos. 1 through 3 was cut and removed from the excavation for disposal.

With the excavation completed and the storage ports all removed, the project moved into a final status survey mode to confirm the ability to backfill and close the site. This involved radiological surveys of the excavation zone where the $Pu^{238}Be$ sources had been stored in Storage Port No. 1, confirmation soil samples of the area under the former Storage Port No. 1 and to the west of the area where the concrete support wall had been removed, and confirmation of the remaining concrete support wall. In addition, all of the storage port ends remaining in the wall into the FNR facility were surveyed for free release to allow them to remain in place.

The surveys and analytical work performed on remaining soil and the concrete support wall have not identified contamination remaining in the excavation associated with the operation of the storage ports, in particular Storage Port No. 1 that had been used to house high level neutron sources in the form of $Pu^{238}Be$. The final status survey supports the conclusion that all remedial

activity has been adequately completed to comply with the Default Screening Values of Table 6.91 in NUREG 5512.

On Monday, March 25, 2009 the NRC visited the FNR facility to conduct confirmatory sampling of the storage port soil and concrete for their independent analysis. The NRC radiological analyses of the soil concurred with the analyses conducted by the FNR staff and Eberline Analytical. The excavation was subsequently backfilled.

Description of the Storage Ports Construction and Use

Fifty storage ports extended through the west wall of the first floor of the reactor and were designed for and used to store beam port plugs, collimators or other equipment from the beam ports. The storage ports were also used to store items with elevated dose readings. The storage ports consisted of forty-two 6" and eight 8" schedule 40 (1/4" wall thickness) carbon steel pipes that extended 8'-10" into the soil; terminating into an 8" thick, 10'-9" tall concrete wall providing structural support for the pipes ends. The storage ports were arranged in three levels with the top and bottom levels aligned vertically and the middle level staggered horizontally between adjacent pairs. The configuration resulted in 17 storage ports in the top row, 17 storage ports in the middle row, and 16 storage ports in the bottom row. The storage ports are numbered one through fifty going from south to north and top to bottom (see Figure 1).

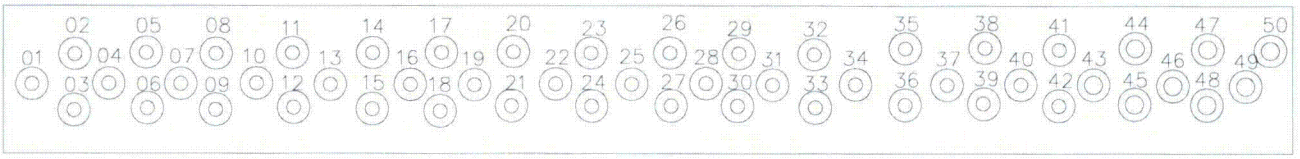


Figure 1, Storage Ports numbering system starting with no. 1 to the south and ending with no. 50 to the north

Each storage port had a ½" vent line attached near the end of the pipe to provide for air passage into or out of the storage port as the tight fitting beam port plugs, collimators or other equipment were inserted or withdrawn. With the exception of the storage ports at the north and south ends, the vents lines from three storage ports (one each from the top, middle, and bottom rows) were connected to a common vent line using "Y" fittings, and increasing from ½ inch pipe at the lowest storage port to 1 inch pipe at the upper storage port (see Figures 2 and 3). The common vent line then turned horizontal and ran parallel to and 3'-6" above the upper storage port to return through the west wall of the reactor building for connection to the Stack 2 exhaust system. The north and south end upper and lower storage ports were connected to common vent lines and run into the west wall of the facility in a similar manner.

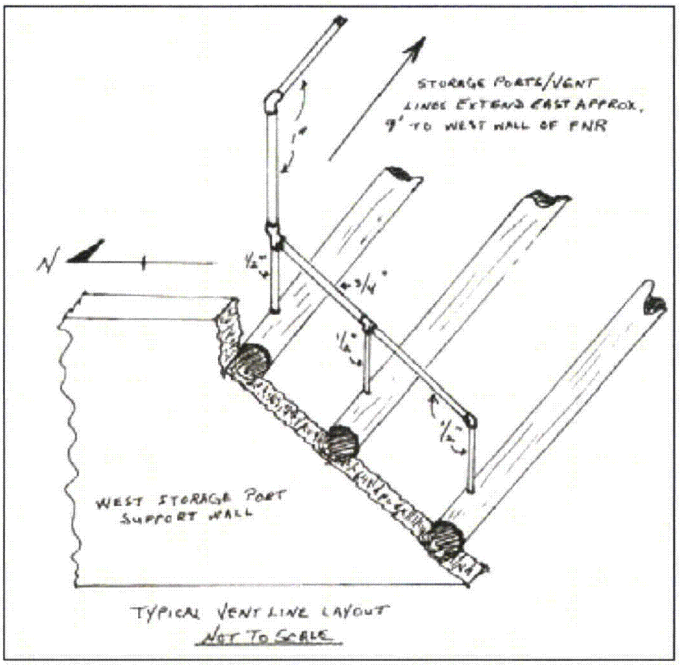


Figure 2, Typical Vent Line Layout for the Storage Ports

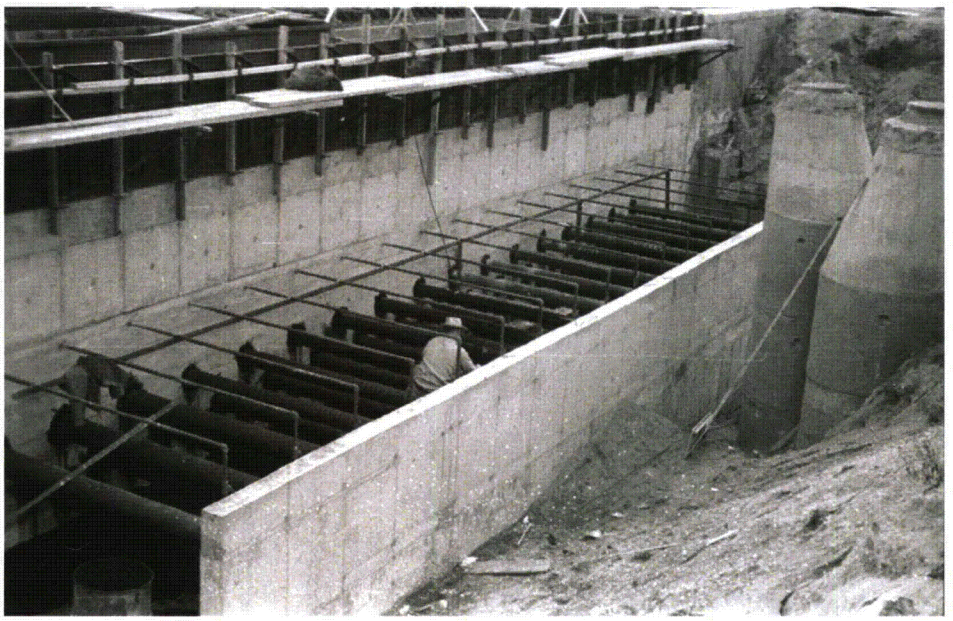


Figure 3, Storage Ports under Construction – view from NW looking toward SE

The entire installation of storage ports was buried along the west wall of the reactor building, running south to north 48'. The vent lines were located approximately 7'-10" below ground surface, the top row of storage ports were located approximately 10'-2" below ground surface, and the bottom row of storage ports were located approximately 12'-10" below ground surface. (See Figures 4 through 7)

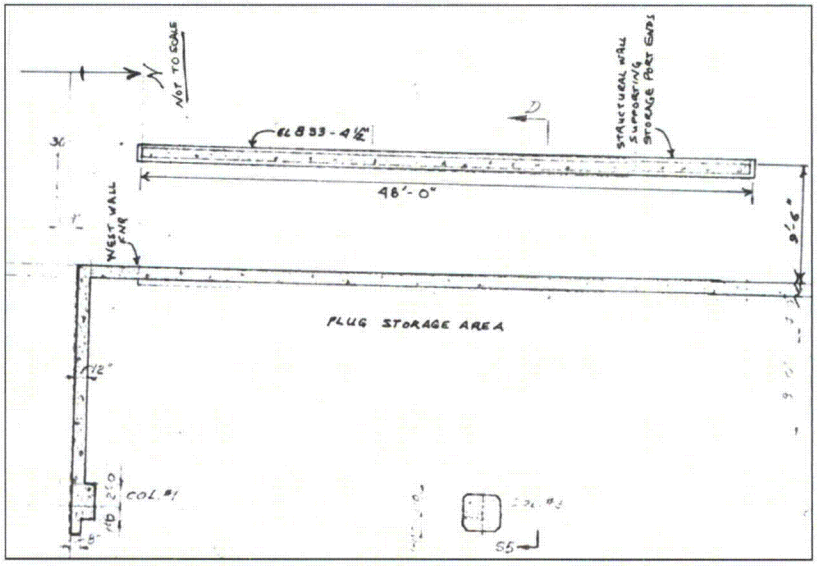


Figure 4, Plan view of Storage Port design (January 1958)

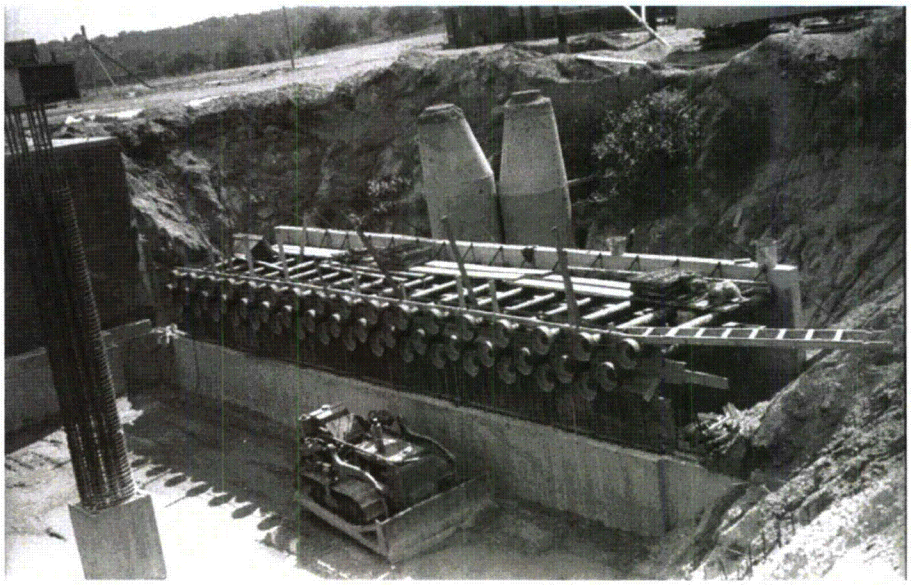


Figure 5, Storage Ports under Construction – view from NE corner looking toward SW and showing location of Storage Port No. 1

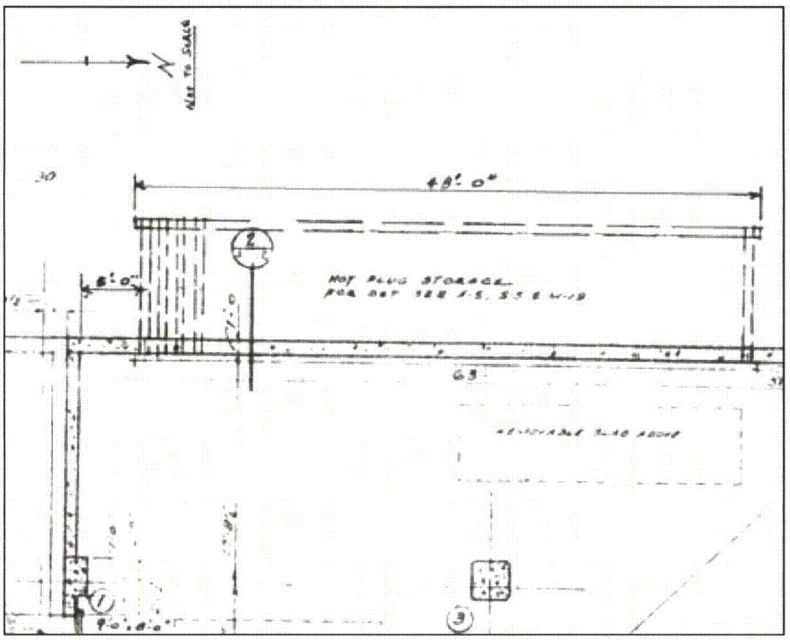


Figure 6, Plan view of Storage Port design (January 1958)

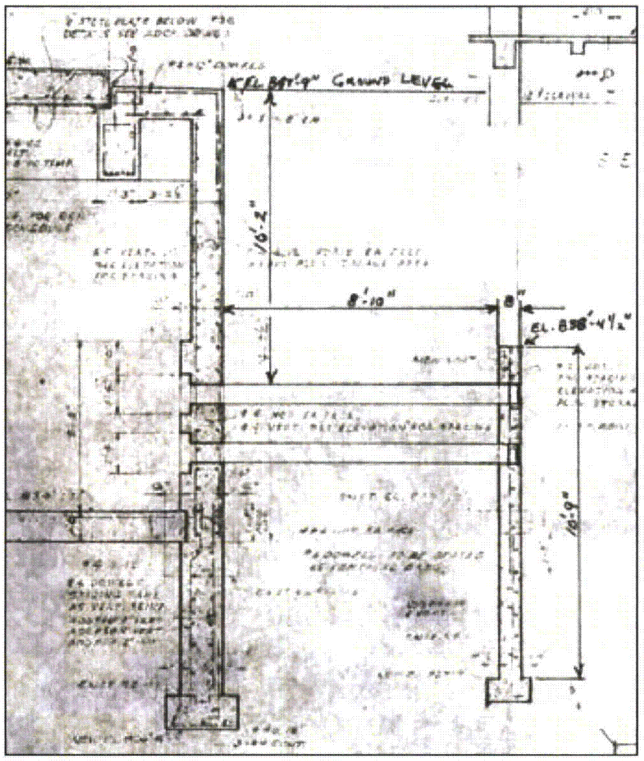


Figure 7, Section view of Storage Port design looking from north to south (January 1958)

Characterization of the Storage Ports

The 50 storage ports were designed for and used to store beam port plugs, collimators or other equipment from the beam ports as well as items with elevated dose readings. Of specific interest

was Storage Port No. 1 that was used to store two large $Pu^{238}Be$ sources from approximately November 1971 to February 2003 when they were relocated to another U-M facility in preparation for decommissioning the reactor facility. These $Pu^{238}Be$ sources were capable of producing approximately 1.7E+8 neutrons sec^{-1} (from the paper work provided by Monsanto with the sources) which would be spread 4π from the source in all directions such that at 8 cm from the source, neutron flux in air would be approximately 6E+5 neutrons cm^2 sec^{-1}. The other ports were used for storing materials that would not produce a neutron flux capable of activating surrounding soil materials. Therefor the primary areas of concern during the remediation efforts were from:

- Contaminated surfaces and debris inside the storage ports from reactor equipment
- Activated soils surrounding Storage Port No. 1
- Concrete surfaces that may have been within the radius of influence from the $Pu^{238}Be$ sources in Storage Port No. 1 and become partially activated

Characterization of Storage Port Internal Contamination

To determine internal contamination of the ports, survey work was performed using one minute static gamma measurements at approximately 9" intervals from the entrance to the back of each of the storage ports using a Ludlum 44-10 2" by 2" NaI detector (serial no. 24815). The detector was placed in a 6" or 8" cradle specifically constructed to center the NaI detector in each 6" or 8" storage port. The detector was then connected using a 20' R-59 cable to a Ludlum 2221 Scaler Ratemeter (serial no. 218602). The gross count measurements for each storage port are summarized in Table 1 below with additional data and plots of gross gamma counts as a function of position for each storage port provided in Appendix A (separate binder).

From these measurements, the following observations were made:

- Storage Port No. 1: The activation of the carbon steel wall of by the $Pu^{238}Be$ sources yielded a peak activity approximately 2' in from the end of the storage port. This agreed with operational knowledge that the $Pu^{238}Be$ sources were stored approximately one to two feet from the end of the storage port. Removable activity was found at one survey point.
- Storage Port No. 10: The high gamma measurement at the end indicated that there was a piece of activated metal stored at the very end of the storage port and that piece of metal potentially had a high specific activity. Subsequent visual inspection by camera did not identify a source of the elevated measurements. Removable activity was found at three survey points.
- Storage Port No. 48: The high gamma measurement 1' from the end indicated that there may be a piece of activated metal that required removal. Subsequent visual inspection by camera did not identify a source of the elevated measurements. Removable activity was found at three survey points.
- Storage Port No. 12, 13, 26, 29-49: Removable activity was found at various survey points.

Table 1, Storage Port pre-removal survey results summary

Port Number	Highest Gross CPM During Scan		Highest Smear in dpm/100cm²	Port Number	Highest Gross CPM During Scan		Highest Smear in dpm/100cm²
Port 1	2400@ 8 ft		121	Port 26	1200 @ 7 ft		45
Port 2	600 @ 10 ft		<MDA	Port 27	300-350		<MDA
Port 3	300-350		<MDA	Port 28	300-350		<MDA
Port 4	300-350		<MDA	Port 29	1000 @ 6.5 ft		33
Port 5	586 @ 5 ft		<MDA	Port 30	300-350		1220
Port 6	800 @ 5.5 ft		<MDA	Port 31	300-350		37
Port 7	300-350		<MDA	Port 32	1300 @ 10 ft		205
Port 8	300-350		<MDA	Port 33	1400 @ 5 ft		71
Port 9	300-350		<MDA	Port 34	300-350		5.80 α only
Port 10	52,000 @ 9 ft		96	Port 35	3000 @ 8 ft		83
Port 11	300-350		<MDA	Port 36	3000@ 8 ft		343
Port 12	400-450		73	Port 37	300-350		31
Port 13	1000 @ 5 ft		1078	Port 38	600 @ 7 ft		60
Port 14	300-350		<MDA	Port 39	300-350		140
Port 15	300-350		<MDA	Port 40	370 @ 10 ft		31
Port 16	300-350		<MDA	Port 41	1700 @ 6 ft, 600 @ 9 ft		79
Port 17	400-450		<MDA	Port 42	500-600 all		92
Port 18	300-350		<MDA	Port 43	4300 @ 6ft		73
Port 19	300-350		<MDA	Port 44	300-350		22
Port 20	1000 4-10 ft		<MDA	Port 45	1100 @ 9 ft		690
Port 21	300-350		<MDA	Port 46	300-500 all		119
Port 22	300-350		<MDA	Port 47	300-350		25
Port 23	300-350		<MDA	Port 48	1300-9200 @ 10 ft		217
Port 24	300-350		<MDA	Port 49	5000 @ 10 ft		58
Port 25	300-350		<MDA	Port 50	400-700 all		<MDA

No feasible method could be identified that would allow characterization of the small diameter vent lines in order to leave them in place. Based on the need to remove the vent lines and the three storage ports with elevated measurements, it was determined the most expeditious route was to remove all storage ports for disposal

Determination of DCGLs for the Neutron Activated Soil around Storage Port 1

Soil samples were collected north of the storage port area in November 2008 to determine a background concentration for the isotopes of concern in the soil near Storage Port No. 1 that may have become activated due to proximity to the $Pu^{238}Be$ sources. Using a 2 inch diameter dual tube direct push soil sampler, three samples were collected from a depth of 8 feet to 12 feet below the surface (the approximate depth of the storage ports) at a point north of Storage Port No. 50. The soil samples were collected in acetate liners and processed following ASTM (2005) C 999, *Soil Sample Preparation for the Determination of Radionuclides.* The material from the three acetate tubes was dried for two days at 110 degrees C until reaching a constant weight. The sample material from the three samples was combined into one sample, UM2008-11-06-01. The sample was split then into two portions using an ELLE sample splitter and 186 grams of sample material from the first split was sent to Oregon State University for determination of the content of the soil using Instrumental Neutron Activation Analysis (INAA) (refer to the

following site for information:
http://serc.carleton.edu/research_education/geochemsheets/techniques/INAA.html).

The purpose of the Oregon State University analyses was two-fold: first to determine the elemental composition of the soil, and second to give an indication of what radio-isotopes might stand out given exposure to a higher neutron flux rate. In addition it was suspected that certain other elements of possible concern may be present in the soil at levels not detected by the Oregon State University analyses; in particular, tin, molybdenum, and certain of the rare earth elements (REE). Gerhard Erdtmann, Neutron Activation Tables, 1976 was consulted based on the Oregon State University results and the suspect elements to determine what additional radioisotopes might have been produced by neutron activation of the soil. Only those radio-isotopes with a half-life greater than 100 days and absorption cross section of milli-barns or larger were considered in the analysis as others would be present at levels approximately 10E-9 pCi/g or lower.

It was necessary to make reasonable assumptions about the suspect elements concentrations in the soil in order to calculate an estimated activity for their neutron activation products. Since it is known that the REE elements, with the exceptions of europium and cerium, behave geochemically in a predictable way[1], their behavior can be used to estimate the concentration of REEs of interest based on those that were detected in the Oregon State University analyses and the commonly accepted REE pattern in the upper continental crust (UCC) as reported by Taylor and McLennan[2].

Based on this analysis, the elemental concentration of metal with activation potential and the subsequent significant activation radionuclides and their estimated concentrations are listed in Table 2.

Table 2, Metals in soil with activation potential from Storage Port 1 Activity

Natural Element	Concentration	Activation Radionuclide	Target isotope % abundance	Activation Cross Section (barn)	Half Life (d-days, a-years)
Activation by Thermal Neutrons					
Iron	15325 µg/g	Fe-55	5.8	2.25	2.7 a
Europium	0.60 µg/g	Eu-152 Eu-154	47.8 52.2	5900 390	12.4 a 8.5 a
Cobalt	5.0µg/g	Co-60	100	37.2	5.272 a
Cesium	0.92 µg/g	Cs-134	100	29	2.06 a
Barium	292 µg/g	Ba-133	0.095	8.5	10.4 a
Cerium	26 µg/g	La-137 Ce-139	0.193 0.26	7.25 1.1	60,000 a 137.5 d
Chromium	5.0 µg/g	None[2]	-	-	-
Antimony	0.53 µg/g	None[2]	-	-	-
Hafnium	0.0044 µg/g	None[2]	-	-	-

[1] Cornell University, Geol. 655 Isotope Geochemistry,Lecture 7, Spring 2003, GEOCHRONOLOGY III,THE SM-ND SYSTEM

[2] Taylor and McLennan, The Continental Crust: its Composition and Evolution, Blackwell Scientific Publications, 1985, Table 2.15 Chemical composition of the upper continental crust, p.46

Natural Element	Concentration	Activation Radionuclide	Target isotope % abundance	Activation Cross Section (barn)	Half Life (d-days, a-years)
Neodymium	13 µg/g	Sm-151	5.62	1.2	93 a
Nickel	12 µg/g	Ni-59 Ni-63	67.88 3.66	4.6 14.2	75,000 a 100 a
Rubidium	42 µg/g	None[2]	-	-	-
Scandium	4.7 µg/g	None[2]	-	-	-
Strontium	202 µg/g	None[2]	-	-	-
Tantalum	310 µg/g	Ta-182	99.998	21	115 d
Terbium	349 µg/g	None[2]	-	-	-
Zinc	48 µg/g	Zn-65	48.9	0.78	243.7 d
Zirconium	160 µg/g	Zr-93	17.11	260×10^{-3}	1.5×10^{6} a
Tin	5.5 µg/g	Sn-113 Sn-119m Sn-121m Sn-123	0.96 24.03 32.85 4.72	1.15 16×10^{-3} 1×10^{-3} 180×10^{-3}	115.1 d 245 d 50 a 129.2 d
Samarium	4.5 µg/g	Sm-145 Sm-151 Eu-155	3.1 7.4 22.8	0.7 102 5.5	340 d 93 a 4.96 a
Gadolinium	3.8 µg/g	Gd-153	0.2	1100	241.5 d
Lutetium	0.32 µg/g	Lu-177m	2.6	7	161 d
Activation by Fast Neutrons					
Iron	15325 µg/g	Mn-54	5.8	82.5×10^{-3}	312.5 d
Barium	292 µg/g	Cs-134	2.42		
Hafnium	0.0044 µg/g	La-137	0.17	2.2×10^{-3}	1.37 a
Nickel	12 µg/g	Co-60		4.4×10^{-3}	5.272 a
Terbium	349 µg/g	Tb-158	100	3.2×10^{-3}	150 a
Molybdenum	1.5 µg/g	Tc-99	23.78	130×10^{-3}	2.15×10^{5} a
Tin	5.5 µg/g	Sb-125	5.8	134×10^{-3}	2.77 a

[2] No activation product with a half-life of greater than 100 day or an absorption cross section smaller than millibarn.

The concentration of activity formed in the soil from a given element by activation of the neutrons from the $Pu^{238}Be$ source is described by the activation equation:

$$C_{pCi/g} = C_{\mu g/g} * \frac{0.6023 * a_{\%}}{1x10^{6} * MW_{g/mole}} (\phi * \sigma_{a-barns}) * \left(1 - 2^{-\frac{t_{irradiation}}{T_{1/2}}}\right)_{Buildup} * \left(2^{-\frac{t_{decay}}{T_{1/2}}}\right)_{Decay}$$

Where:

- $C_{\mu g/g}$ is the concentration of the element in the soil surrounding the storage port
- $a_{\%}$ is the abundance of the isotope of the radionuclide to be measured
- MW is the atomic weight of the element
- ϕ is the neutron flux from the $Pu^{238}Be$ source
- σ_a is the cross section for the corresponding reaction
- $i_{irradiation}$ is the length of time the soil was exposed to neutrons from the $Pu^{238}Be$ source
- t_{decay} is the length of time after the irradiation the soil decayed before being excavated
- $T_{1/2}$ is the half-life of the activation product

1,000 grams of sample material from the first split was placed into a 500 ml wide mouth Nalgene bottle and analyzed using the U-M high purity germanium (HPGe) detector. The HPGe was calibrated using a 2.09 g cm^{-3} epoxy, 500 ml Nalgene, multi-nuclide standard (Am-241 – 60 keV through Y-99 1836 keV). This sample analysis allows a determination of the isotopic concentration of the above nuclides to less than 25% of the concentration (pCi g^{-1}) that is equivalent to 25 mrem yr^{-1} for various radio nuclides listed in Table 6.91 of NUREG 5512 Vol 3 (1999), *Residual Radioactive Contamination from Decommissioning – Parameter Analysis*. This sample serves as background for the analyses of the soil around Storage Port No. 1; results are shown in Tables 3 and 4. Analytical reports are available in Appendix B (separate binder).

Table 3, Nuclides of Concern in soil surrounding Storage Port No. 1

	Concentration (pCi g^{-1}) equivalent to 25 mrem yr^{-1}	EPA Consultation Trigger (pCi g^{-1}) for Residual Soil Contamination	Typical MDA (pCi g^{-1}) for 50,000 second analysis
Mn-54	13.9	69	3×10^{-2}
Fe-55	9,350	269,000	N/A
Co-60	3.68	4	3×10^{-2}
Ba-133			5×10^{-2}
Cs-134	5.36	16	3×10^{-2}
Eu-152	8.66	4	5×10^{-2}
Eu-154	8.0	5	5×10^{-2}

Table 4, Background soil analysis (sample no. UM2008-11-06-01) for Storage Port Area

Identified Radionuclide	Measured Concentration (pCi g^{-1})	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values (pCi/ g^{-1})
Mn-54	Not Identified	1.77×10^{-2}	13.9
Fe-55	Not Identified	Not Detectable	9,350
Co-60	Not Identified	1.76×10^{-2}	3.68
Ba-133	Not Identified	2.73×10^{-2}	
Cs-134	Not Identified	1.90×10^{-2}	5.36
Eu-152	Not Identified	2.88×10^{-2}	8.66
Eu-154	Not Identified	2.05×10^{-2}	8.0

Characterization of Neutron Activated Soil around Storage Port 1

In September 2008 three soil samples were collected along Storage Port No. 1, approximately 1.5' from the end of the pipe where the $Pu^{238}Be$ sources had been stored. The purpose of these samples was to compare them to the radio-isotopes of concern identified in Tables 3 and 4 to determine if the soil had activation products that exceeded the Default Screening Values, requiring removal.

Using a 2 inch diameter dual tube direct push soil sampler, three sample tubes were collected at the two locations along Storage Port No. 1 from a depth of 8 feet to 12 feet below the surface. The soil from the third set of tubes (the approximate depth of the storage ports) was collected for analysis. The sample material from the two geo-probes was identified as sample numbers UM2008-11-20-01 and UM2008-11-20-02. In addition, a 6" hole was hand dug directly over and down to Storage Port No. 1 where sample number UM2008-12-18-01 was collected. All samples were processed following ASTM (2005) C 999, *Soil Sample Preparation for the*

Determination of Radionuclides. The material was dried for two days at 110 degrees C until reaching a constant weight. 1,000 grams of sample material from each was placed into 500 ml wide mouth Nalgene bottles and analyzed using the U-M high purity germanium (HPGe) detector calibrated using a 2.09 g cm^{-3} epoxy, 500 ml Nalgene, multi-nuclide standard (Am-241 – 60 keV through Y-99 1836 keV). Results shown in Table 5 indicate soil activation products from the $Pu^{238}Be$ source material that had been stored in the Storage Port No. 1. Analytical reports are in Appendix C (separate binder).

Table 5, Pre-excavation soil samples collected at Storage Port No. 1

Identified Radionuclide	Measured Concentration (pCi g^{-1})[3]	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UM2008-11-20-02: Dual Tube sample 1.5' from end of Storage Port No. 1, along south side of port, depth at 8' to -11' [calculated unity factor of 0.03]			
Mn-54	1.31×10^{-2}	1.30×10^{-2}	13.9
Fe-55	1.6	-	9,350
Co-60	2.52×10^{-2}	2.34×10^{-2}	3.68
Ba-133	Not Identified	3.06×10^{-2}	
Cs-134	Not Identified	2.14×10^{-2}	5.36
Eu-152	0.257	4.08×10^{-2}	8.66
Eu-154	Not Identified	2.63×10^{-2}	8.0
Sample No. UM2008-11-20-01: Dual Tube sample 1.5' from end of Storage Port No. 1, along center line of port, depth at 8' to -12' [calculated unity factor of 0.04]			
Mn-54	Not Identified	1.96×10^{-2}	13.9
Fe-55	1.6	-	9,350
Co-60	2.42×10^{-2}	2.05×10^{-2}	3.68
Ba-133	Not Identified	3.02×10^{-2}	
Cs-134	Not Identified	2.11×10^{-2}	5.36
Eu-152	0.194	3.78×10^{-2}	8.66
Eu-154	Not Identified	2.53×10^{-2}	8.0
Sample No. UM2008-12-18-01: Hand dug soil from within 6 inches of Storage Port No. 1 – [calculated unity factor of 0.37]			
Mn-54	<MDA	2.2×10^{-2}	13.9
Fe-55	2.9	-	9,350
Co-60	0.462	2.61×10^{-2}	3.68
Ba-133	Not Identified	3.19×10^{-2}	
Cs-134	2.77×10^{-2}	1.59×10^{-2}	5.36
Eu-152	2.08	6.37×10^{-2}	8.66
Eu-154	< MDA	5.35×10^{-2}	8.00

Because the radionuclides are in a mixture, a sum-of-fractions calculation was performed on the samples to determine if the 25 mrem/yr equivalent had been exceeded in the soil. As shown in Table 5, the calculated unity factors ranged from 0.03 to 0.37. The samples indicate some activation of soil particles surrounding Storage Port No. 1 but not to the extent the soil exceeds the Default Screening Values of Table 6.91 in NUREG 5512.

Because the default screening values are based on an assumption that there is at least a 1 meter separation between the activated soil and groundwater, a determination was made that the separation does exist. Based on data collected from a monitoring well located approximately

[3] Fe-55 Estimated by activation calculation bases upon measured Cu-152 and Co-60 concentrations

200' south of the storage port location, the groundwater zone was 25' (7.7 m) below the depth of Storage Port No. 1.

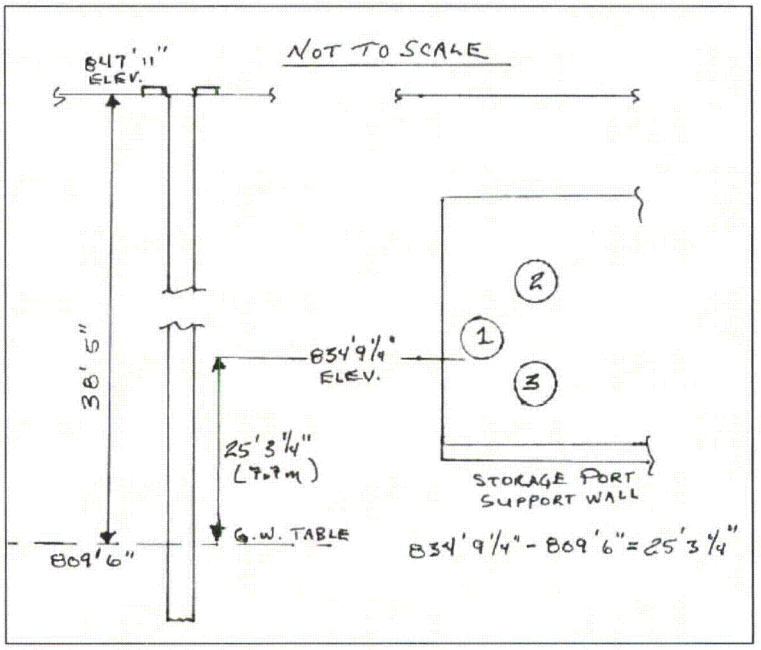


Figure 8, Depth to Groundwater Determination

Characterization of Neutron Activated Concrete around Storage Port No. 1

Samples of the concrete from the wall supporting the west end of Storage Port No. 1 were collected to analyze for isotopes that may have been activated by the storage of the $Pu^{238}Be$ sources approximately 1.5' from the end of the storage port. Two samples from the wall were collected after the storage port had been removed. The first was a circular pattern 12" diameter from the centerline of the storage port (UM2009-02-26-01) and the second was a circular pattern 18" diameter from the centerline (UM2009-03-04091). In each sample collection, a clean, 1" rotor-hammer bit was used to drill a series of holes approximately 7" deep in a circular pattern around the centerline of the storage port (see Figure 9).

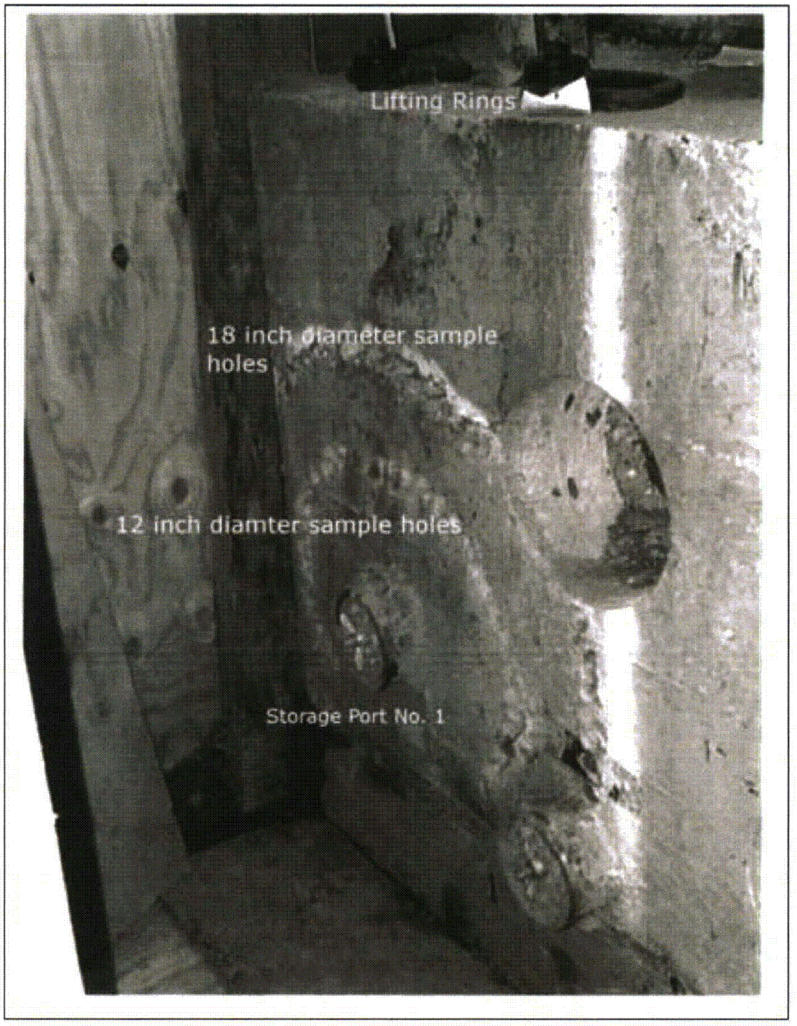


Figure 9, Concrete sampling around Storage Port 1 to check for activation products

Fines from the drilling operation were collected in a clean "Minute Man Vacuum" purchased specifically for the project. The fines were collected in a paper filter bag from which they were removed for analysis. A total of approximately 1.5 gallons of material were collected for each set of sample drill holes. The samples were submitted to Eberline Analytical for characterization and the results are shown in Table 6. Analytical data sheets are in Attachment D.

Table 6, Characterization of concrete around Storage Port No. 1 end cap (Analysis performed by Eberline)

Identified Radionuclide	Measured Concentration (pCi g^{-1})	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UM2009-02-26-01: Concrete wall 12" from centerline of Storage Port No. 1 [calculated unity factor of 0.37]			
Mn-54	<MDA	1.74×10^{-1}	13.9
Fe-55	1.48	11.4	9,350
Co-60	2.75×10^{-1}	9.66×10^{-2}	3.68
Ag-108m	1.32×10^{-2}	9.07×10^{-2}	

Identified Radionuclide	Measured Concentration ($pCi\ g^{-1}$)	Minimum Detectable Activity ($pCi\ g^{-1}$)	Default Screening Values – Table 3 ($pCi/\ g^{-1}$)
Ba-133	6.89×10^{-2}	1.02×10^{-1}	
Cs-134	9.35×10^{-3}	1.05×10^{-1}	5.36
Eu-152	1.73	3.94×10^{-1}	8.66
Eu-154	7.48×10^{-2}	2.88×10^{-1}	8.0
Eu-155	3.23×10^{-1}	2.09×10^{-1}	282
Sample No. UM2009-03-04-01: Concrete wall 18" from centerline of Storage Port No. 1 [calculated unity factor of 0.1]			
Mn-54	2.33×10^{-2}	1.43×10^{-1}	13.9
Fe-55	<MDA	10.5	9,350
Co-60	8.9×10^{-2}	8.18×10^{-2}	3.68
Ag-108m	1.28×10^{-2}	6.94×10^{-2}	
Ba-133	<MDA	7.56×10^{-2}	
Cs-134	3.59×10^{-2}	8.61×10^{-2}	5.36
Eu-152	4.94×10^{-1}	6.03×10^{-1}	8.66
Eu-154	4.89×10^{-2}	2.18×10^{-1}	8.0
Eu-155	8.28×10^{-2}	1.76×10^{-1}	282

Results of the analysis indicate some activation of the concrete from the $Pu^{238}Be$ neutron source but at levels below the Default Screening Values. Because the radionuclides are in a mixture, a sum-of-fractions calculation was performed on the samples to determine if the 25 mrem/yr equivalent had been exceeded in the concrete. Calculated sample unity factors were 0.37 and 0.1. The samples indicate some activation of concrete particles surrounding Storage Port No. 1 but not to the extent the concrete exceeds the Default Screening Values of Table 6.91 in NUREG 5512. A decision was made to cut the concrete section of the wall from around Storage Port No. 1 for disposal.

Storage Port and Contaminated Soil Removal Activity

During November/December 2008 excavation activity was undertaken to expose the storage ports to facilitate their removal. Activities involved:

- Installation of sheet piling to establish the northern, western and southern limits of the approximately 10' by 52' excavation (the eastern limit of the excavation was established by the western wall of the building) as shown on figure 10.
- Excavation from the ground surface down to the bottom of the east/west running storage port pipes at a depth of approximately 13'. All excavated soil from storage ports 4 through 50 was stockpiled for re-use in backfilling the excavation zone. Soil from around storage ports 1 through 3 was removed for disposal.
- The seventeen one inch vent lines and 50 six and eight inch storage ports were cut and removed in a controlled manner.
- The concrete support wall around Storage Port Nos. 1 through 3 was cut and removed from the excavation for disposal.

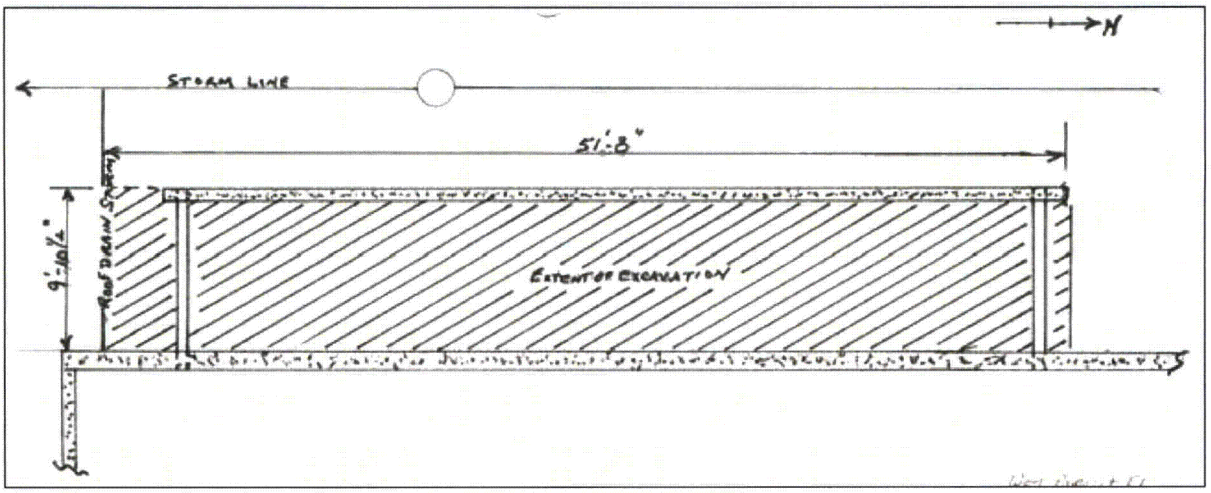


Figure 10, Storage Port excavation zone

Removal of Storage Port Vent Lines

Seventeen 1" vent lines running from the west ends of the storage ports, in an easterly direction back to and through the wall of the FNR facility were removed on December 10, 2008 using a band saw. A cardboard tray was placed under each cut line to contain pipe shavings from the band saw operation. The shavings were placed in a radioactive materials slurry/piping drum for proper disposal.

Following the cutting operation the pipes were wipe sampled at each end, and then taped to seal the openings. The pipes were then placed in the FNR radioactive material area inside FNR and eventually sent for proper disposal. All wipe samples measured below L_c levels. The cardboard tray was checked using a frisker probe Model 44-142, serial no. PR249243, and wipe samples collected and analyzed on a Tenelec Series 5, serial no. 2161, measured below L_c levels. Refer to Appendix E for the survey data sheet.

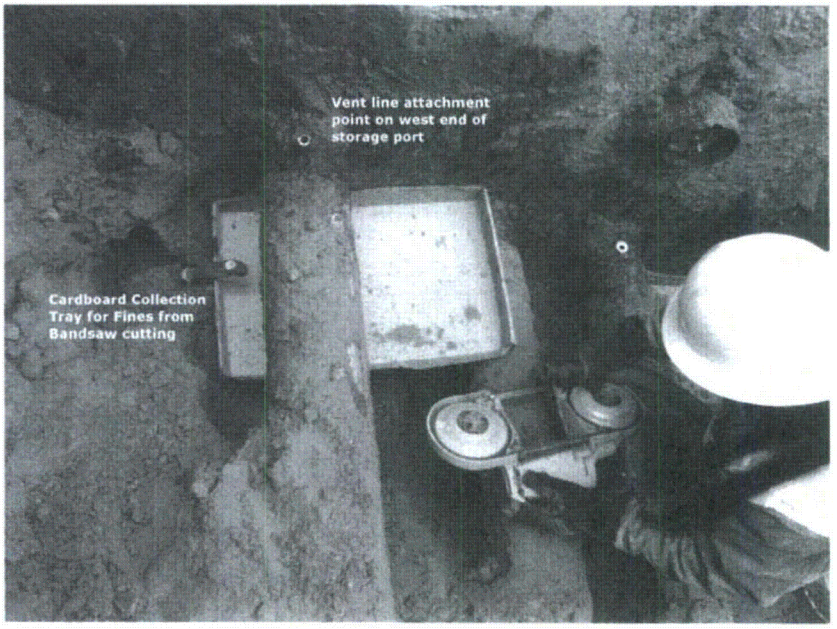


Figure 11, Cutting vent lines from the storage ports

Removal of Storage Ports and Concrete Support Wall

In December 2008 all 50 storage ports were uncovered, cut, and removed from the excavation zone. The storage ports were moved inside the FNR building for processing and ultimately disposed as low level radioactive waste in a controlled manner. As anticipated from the preliminary soil sampling activities, the soil immediately surrounding Storage Port No. 1 exhibited low-level soil activation from the $Pu^{238}Be$ sources that had been stored in the storage port. The soil and concrete in a cube approximately 40-inches on a side or approximately 37 cubic feet was removed in a controlled manner and disposed as radioactive waste.

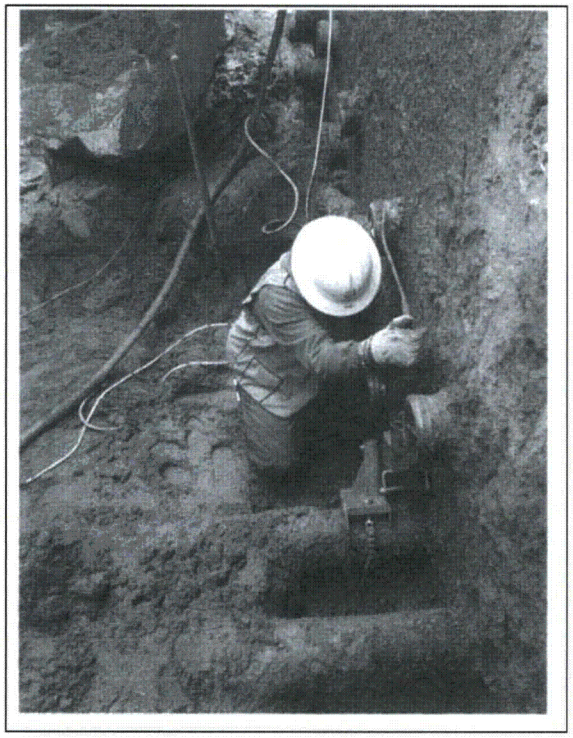


Figure 11, Cutting Storage Ports wall section removed

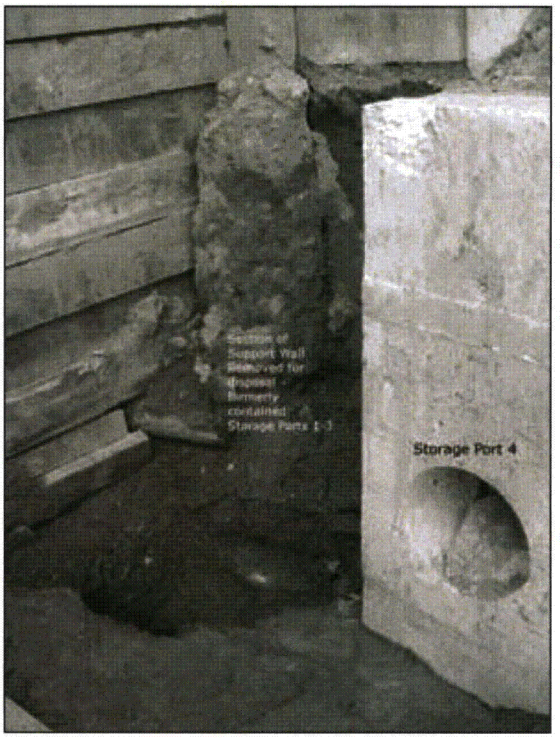


Figure 12, Concrete support

Final Status Confirmation Surveys

With the excavation completed and the storage ports all removed, the project moved into a final status survey mode to confirm the ability to backfill and close the site. This involved radiological surveys of the excavation zone where the $Pu^{238}Be$ sources had been stored in Storage Port No. 1, confirmation soil samples of the area under the former Storage Port No. 1 and to the west of the area where the concrete support wall had been removed, and confirmation of the remaining concrete support wall. In addition, all of the storage port ends remaining in the wall into the FNR facility were surveyed for free release to allow them to remain in place. The NRC then made a site visit and collected samples of the soil and concrete to confirm the analysis in order to allow backfilling of the excavation. Figure 13 identifies the sample locations.

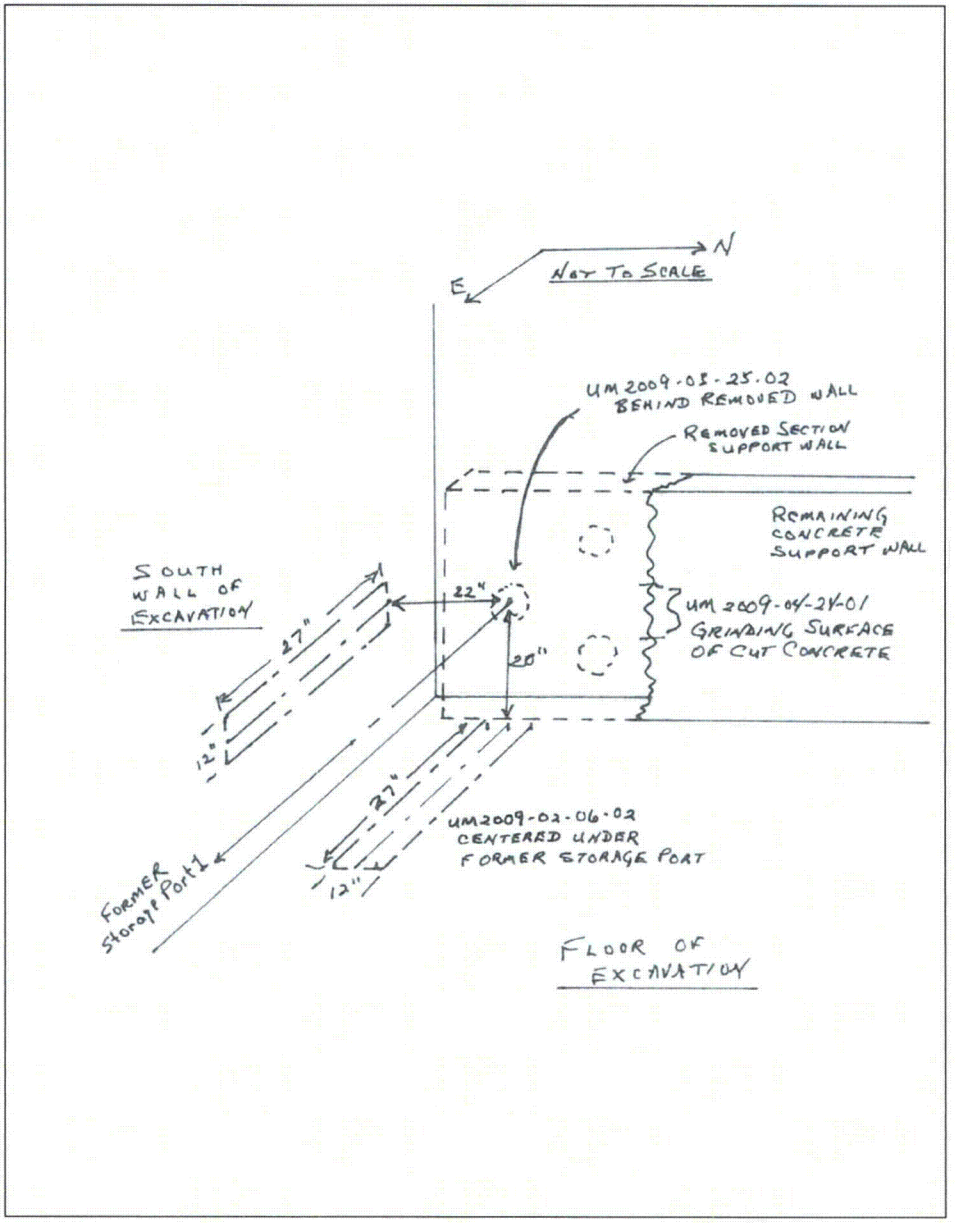


Figure 13, Final Status Survey sample locations for Storage Port No. 1

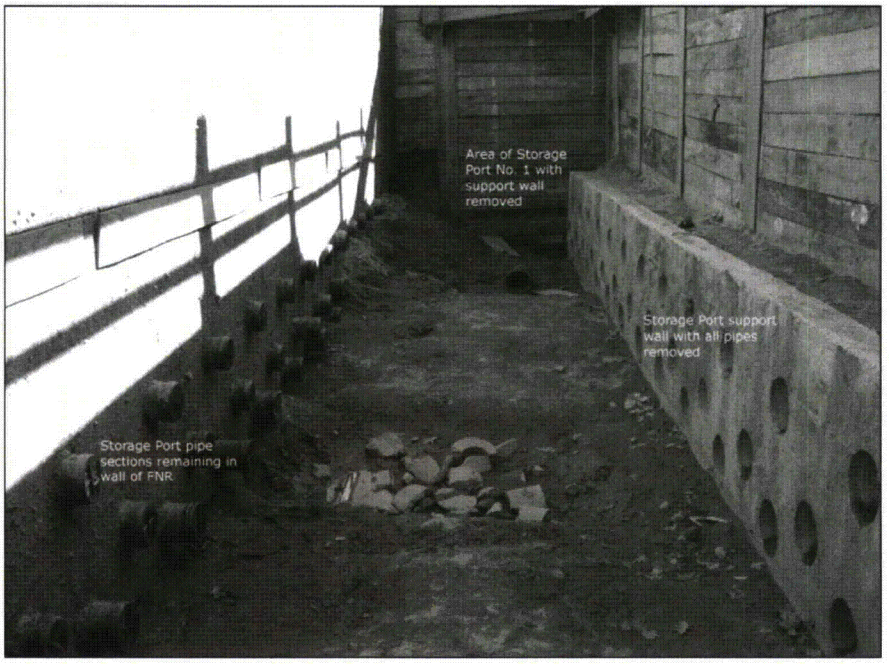


Figure 14, Storage port excavation ready for final survey work

Free Release Survey of Sections of Storage Ports Remaining in the FNR Wall

To determine the ability to free-release and leave in the wall the remaining sections of storage ports that could not be removed, survey work was performed using one minute static gamma measurements at two locations on each pipe end. The survey was performed using a Ludlum 44-1 NaI detector, serial no. PR249243, on January 9, 2009. Swipe samples were also collected and analyzed for alpha and beta using a Tenelec S5-XLB, serial no. 2161. The measurements for each storage port are summarized in Table 7 below with survey data sheets provided in Appendix F (separate binder).

The survey results indicate the pipe ends can all be free-released and left in the wall of the FNR. The ends were plugged and capped to prevent soil infiltration to the FNR facility during backfill of the excavation.

Table 7, Final Status Survey of Storage Port pipe-ends remaining in FNR wall

Port Number	Highest Gross CPM During Scan		Highest Smear in dpm/100cm²	Port Number	Highest Gross CPM During Scan		Highest Smear in dpm/100cm²
Port 1	<MDA		<MDA	Port 26	<MDA		<MDA
Port 2	<MDA		<MDA	Port 27	<MDA		<MDA
Port 3	<MDA		<MDA	Port 28	<MDA		<MDA
Port 4	<MDA		<MDA	Port 29	<MDA		<MDA
Port 5	<MDA		<MDA	Port 30	<MDA		<MDA
Port 6	<MDA		<MDA	Port 31	<MDA		<MDA
Port 7	<MDA		<MDA	Port 32	<MDA		<MDA
Port 8	<MDA		<MDA	Port 33	<MDA		<MDA
Port 9	<MDA		<MDA	Port 34	<MDA		<MDA
Port 10	<MDA		<MDA	Port 35	<MDA		<MDA
Port 11	<MDA		<MDA	Port 36	<MDA		<MDA
Port 12	<MDA		<MDA	Port 37	<MDA		<MDA
Port 13	<MDA		<MDA	Port 38	<MDA		<MDA
Port 14	<MDA		<MDA	Port 39	<MDA		<MDA
Port 15	<MDA		<MDA	Port 40	<MDA		<MDA
Port 16	<MDA		<MDA	Port 41	<MDA		<MDA
Port 17	<MDA		<MDA	Port 42	<MDA		<MDA
Port 18	<MDA		<MDA	Port 43	<MDA		<MDA
Port 19	<MDA		<MDA	Port 44	<MDA		<MDA
Port 20	<MDA		<MDA	Port 45	<MDA		<MDA
Port 21	<MDA		<MDA	Port 46	<MDA		<MDA
Port 22	<MDA		<MDA	Port 47	<MDA		<MDA
Port 23	<MDA		<MDA	Port 48	<MDA		<MDA
Port 24	<MDA		<MDA	Port 49	<MDA		<MDA
Port 25	<MDA		<MDA	Port 50	<MDA		<MDA

Soil and Concrete Survey and Analysis around Storage Port No. 1

On April 13, 2009 a survey of the soil and concrete support wall around the former location of Storage Port No. 1 was conducted using a Ludlum Model 19 MicroR Meter, serial no. 101763. All measurements were at or below the background levels as determined through measurements at the north end of the excavation zone. Appendix G (separate binder) is the Radiological Survey Report for this effort.

Following removal of the section of concrete support wall from the south end, up through Storage Port No. 3 including the concrete around Storage Port No. 1, a sample of the cut edge of the remaining concrete was collected and analyzed to determine residual activation products. The sample was collected using a diamond grinder with a new diamond wheel to grind the concrete surface. Dust from the grinding was collected in a clean Minuteman vacuum designated specifically for sample collection. The sample was processed and analyzed using the U-M high purity germanium (HPGe) detector calibrated using a 2.09 g cm^{-3} epoxy, 500 ml Nalgene, multi-nuclide standard (Am-241 – 60 keV through Y-99 1836 keV). The samples are compared to the activation products identified in the concrete prior to removal. Table 8 below provides results of that analysis and the analytical data is in Appendix H (separate binder).

Table 8, Final Status Survey Characterization of concrete support wall remaining in the excavation zone

Identified Radionuclide	Pre-Removal Measured Concentration (pCi g^{-1})	Post-Removal Measured Concentration (pCig^{-1})	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UM2009-04-24-01: Edge of remaining concrete wall at centerline of removed Storage Port No. 1				
Mn-54	<MDA	<MDA	3.72×10^{-1}	13.9
Fe-55	1.48	<MDA	11.4	9,350
Co-60	2.75×10^{-1}	<MDA	5.84×10^{-2}	3.68
Ag-108m	1.32×10^{-2}	<MDA	2.9×10^{-2}	
Ba-133	6.89×10^{-2}	<MDA	7.88×10^{-1}	
Cs-134	9.35×10^{-3}	<MDA	1.05×10^{-1}	5.36
Eu-152	1.73	8.58×10^{-2}	7.26×10^{-2}	8.66
Eu-154	7.48×10^{-2}	<MDA	5.83×10^{-2}	8.0
Eu-155	3.23×10^{-1}	ND	ND	282

Following removal of the support wall section for Storage Port No. 1 the soil behind the wall was analyzed to determine if the soil was impacted by the neutron flux from the former $Pu^{238}Be$ sources stored in the vicinity. The soil sample was collected using a clean flat scoop using ASTM D5633 (2004) methodology. The sample was processed following ASTM (2005) C 999, *Soil Sample Preparation for the Determination of Radionuclides.* The material was dried for two days at 110 degrees C until reaching a constant weight. 1,000 grams of sample material from each was placed into 500 ml wide mouth Nalgene bottles and analyzed using the U-M high purity germanium (HPGe) detector calibrated using a 2.09 g cm^{-3} epoxy, 500 ml Nalgene, multi-nuclide standard (Am-241 – 60 keV through Y-99 1836 keV). Table 9 below provides results of that analysis and the analytical data is in Appendix I (separate binder).

Table 9, Final Status Survey soil sample from behind support wall for Storage Port No. 1

Identified Radionuclide	Measured Concentration (pCi g^{-1})[4]	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UM2009-03-25-02: Soil from behind support wall for Storage Port No. 1			
Mn-54	<MDA	2.4×10^{-1}	13.9
Fe-55	<MDA	-	9,350
Co-60	<MDA	3.7×10^{-2}	3.68
Ba-133	<MDA	5.36×10^{-2}	
Cs-134	<MDA	5.23×10^{-2}	5.36
Eu-152	<MDA	5.29×10^{-2}	8.66
Eu-154	<MDA	4.4×10^{-2}	8.0

The only original soil remaining from around Storage Port No. 1 was the bottom of the excavation, approximately 20" below the former storage port, and the south wall of the excavation approximately 22" from the former storage port. The soil from the top, north, and east sides was removed. Soil samples were collected from these locations using a clean flat scoop. The samples were processed and sent to Eberline Analytical for final status survey determination of final closure of the excavation. Figure 13 above shows the sample locations and orientation with the former storage port. Table 10 below provides results of that analysis and the analytical data is in Appendix J (separate binder).

[4] Fe-55 Estimated by activation calculation bases upon measured Cu-152 and Co-60 concentrations

Table 10, Final Status Survey Soil samples from around the former Storage Port No. 1 (Eberline Analytical)

Identified Radionuclide	Measured Concentration (pCi g^{-1})[5]	Minimum Detectable Activity (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UM2009-02-06-02: Soil on floor of excavation directly under former $Pu^{238}Be$ source in Storage Port No. 1 [calculated unity factor of 0.08]			
Mn-54	<MDA	5.36×10^{-2}	13.9
Fe-55	<MDA	3.87	9,350
Co-60	7.64×10^{-2}	6.51×10^{-2}	3.68
Ba-133	Not Identified	Not Identified	
Cs-134	<MDA	5.38×10^{-2}	5.36
Eu-152	5.1×10^{-1}	3.58×10^{-1}	8.66
Eu-154	<MDA	1.77×10^{-1}	8.0
Sample No. UM2009-02-06-04: Soil on south wall of excavation directly adjacent to former $Pu^{238}Be$ source in Storage Port No. 1			
Mn-54	<MDA	1.11×10^{-1}	13.9
Fe-55	<MDA	4.16	9,350
Co-60	<MDA	1.58×10^{-1}	3.68
Ba-133	Not Identified	Not Identified	
Cs-134	<MDA	1.00×10^{-1}	5.36
Eu-152	<MDA	1.00	8.66
Eu-154	<MDA	2.99×10^{-1}	8.0

Because the radionuclides are in a mixture, a sum-of-fractions calculation was performed on the samples to determine if the 25 mrem/yr equivalent had been exceeded in the soil. As shown in Table 10, the calculated unity factor for the soil under the former $Pu^{238}Be$ sources was 0.08, indicating the remaining soils in the excavation do not exceed the Default Screening Values of Table 6.91 in NUREG 5512.

Final Status Survey Conclusion

The surveys and analytical work performed on remaining soil and the concrete support wall have not identified contamination remaining in the excavation associated with the operation of the storage ports, in particular Storage Port No. 1 that had been used to house high level neutron sources in the form of $Pu^{238}Be$. The final status survey supports the conclusion that all remedial activity has been adequately completed to comply with the Default Screening Values of Table 6.91 in NUREG 5512.

NRC Confirmation Surveys

On December 11, 2008, the decommissioning branch of the NRC conducted an inspection of activities at the FNR facility. The NRC inspection team consisted of Senior Health Physicist Bill Snell and staff Health Physicist Jeremy Tapp. The purpose of the inspection was to determine whether the decommissioning activities were conducted safely and in accordance with NRC requirements. Specifically, the two inspectors evaluated decommissioning activities and radioactive waste management. The primary activity observed during the inspection was the removal of the underground storage ports and associated vent lines. The inspectors determined that the University of Michigan was effectively completing decontamination and dismantlement

[5] Fe-55 Estimated by activation calculation bases upon measured Cu-152 and Co-60 concentrations

activities along with adequate calibration of survey equipment and completion of associated documentation. In an NRC inspection report dated December 23, 2008, the NRC noted that no radiological concerns were identified during facility tours and observations of work in progress.

On Monday, March 25, 2009 the NRC visited the FNR facility to conduct confirmatory sampling of the storage port soil and concrete for their independent analysis. The NRC radiological analyses of the soil concurred with the analyses conducted by the FNR staff and Eberline Analytical. The excavation was subsequently backfilled. Table 11 below provides results of the NRC confirmation sampling and the data sheets are provided in Appendix K (separate binder).

Table 11, NRC confirmation sampling/analytical through ORISE

Identified Radionuclide	Measured Concentration (pCi g^{-1})[6]	Minimum Detectable Concentration (pCi g^{-1})	Default Screening Values – Table 3 (pCi/ g^{-1})
Sample No. UOM-09-1-01: Soil sample from area of former Storage Port No. 1			
Fe-55	0.03	2.4	9,350
Co-60	0.03	0.03	3.68
Eu-152	0.02	0.03	8.66
Sample No. UOM-09-1-02: Soil sample from area of former Storage Port No. 1			
Fe-55	0.07	2.4	9,350
Co-60	0.01	0.03	3.68
Eu-152	0.06	0.04	8.66
Sample No. UOM-09-1-03: Concrete support wall sample			
Fe-55	0.07	2.3	9,350
Co-60	0.04	0.05	3.68
Eu-152	0.08	0.06	8.66

[6] Fe-55 Estimated by activation calculation bases upon measured Cu-152 and Co-60 concentrations

Appendices

A	Pre-Removal Internal Characterization of the Storage Ports
B	Analytical Data for Activated Soil Characterization around Storage Port No. 1
C	Pre-Excavation Soil Analysis around Storage Port No. 1
D	Analysis of Concrete Support Wall around Storage Port No. 1 Eberline Analytical
E	Storage Port Vent Lines Survey Data Sheet
F	Radiological Survey and Swipe Analysis for Storage Port Ends Remaining in FNR Wall
G	Radiological Survey Report of Excavation Zone Former Storage Port No. 1 Location
H	Analytical Data for Final Status Survey of Soil Located Behind the Section of Support Wall Removed
I	Analytical Data for Final Status Survey of Soil Located Behind the Section of Support Wall Removed
J	Analytical Results from Eberline Analytical for Final Status Survey of the Soil under the Former Storage Port No. 1
K	ORISE Confirmation Samples Collected by NRC

Appendix A

Pre-Removal Internal Characterization of the Storage Ports

Ford Nuclear Reactor Decommissioning Project
Storage Port Characterization Surveys

The following surveys were performed using a Ludlum 2221 meter (Serial No. 218602) and a 2" x 2" NaI probe (Ludlum 4410; Serial No. 242815) Removable activity surveys (disc smears) were also performed at each point whenever practical. Removable activity smears were counted on a L-2929 counter.

Survey Method: The NaI probe was placed onto a circular jig (see attafched photos). The jig ensured the probe remained centered within the storage port. The jig was attached to a string. The jig/probe was inserted into the storage port and measurements were taken at one foot (1-ft.) increments.

Survey point #1 represents the first measurement as the probe breaks the plane of the storage point. The August, 2006 measurements have elevated counts at the first port due to high exposure rates from staged radioactive materials on the Beam Port Floor (BPF).

Since exposure rates were elevated by radioactive materials in the areas surrounding the Storage Ports, corresponding graphs do not plot Pt. #1 for the August, 2006 characterization surveys. Although the May, 2007 survey data show less elevated exposure rates for Pt. #1, statistics also exclude Pt. #1 to be consistent with the August, 2006 survey statistics.

Gross Gamma (cpm) vs Depth into Storage Port

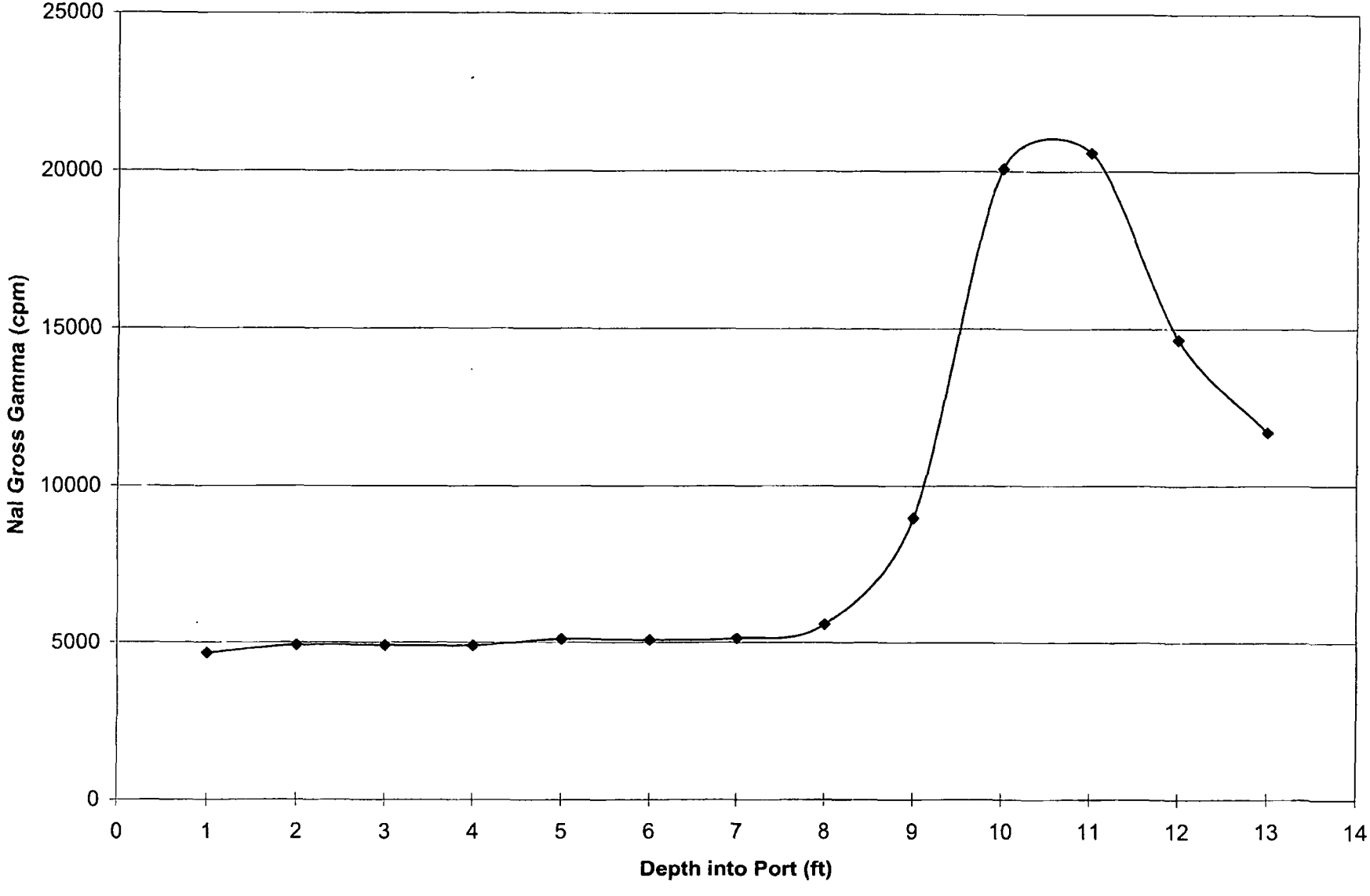
	Position (feet into port)																	
Port	1	2	3	4	5	6	7	8	9	10	11	12	13	Average. (excluding Pt. #1)	Stand. Dev. (excluding Pt. #1)	Survey Date	Survey Log No.	Removable Activity Detected?
1	4649	4904	4897	4886	5098	5064	5130	5578	8986	20081	20581	14651	11696	9296	6053	5/17/2007	2007-0997	Y
2	5249	4754	4847	4785	4708	4761	4463	4666	4977	5377	5702	5549	5027	4968	381	5/17/2007	2007-0998	N
3	20700	6768	5732	5219	5209	5004	5131	5311	5953	7366	8065	6968	6348	6090	1010	8/21/2006	2006-0383	N
4	21232	5890	5433	5251	5113	5040	4985	5015	5273	5386	5711	5335	5172	5300	277	8/21/2006	2006-0384	N
5	17429	5261	5204	5126	5116	5247	5292	5030	5342	5147	5013	5027	5042	5154	114	8/30/2006	2006-0470	N
6	16368	6776	5596	5248	5273	4920	5057	5081	5241	5471	5535	5332	5124	5388	481	8/29/2006	2006-0467	not surveyed
7	21008	6206	5550	5353	5169	5250	5156	5081	5323	5287	5359	5488	5121	5362	302	8/29/2006	2006-0468	not surveyed
8	19735	5734	5510	5317	5106	5017	5175	5321	5267	5451	5850	5350	5041	5345	259	8/29/2006	2006-0469	not surveyed
9	21066	6005	5901	5728	5350	5532	5517	5623	5879	6255	6368	6103	5512	5814	324	8/30/2006	2006-0471	not surveyed
10	6868	5706	8363	5822	5272	5303	5244	5688	6783	10533	15106	23606	71422	14071	18877	5/17/2007	2007-0999	Y
11	21228	5926	5541	5553	5298	5070	5234	5221	5336	5866	5662	5599	5206	5459	274	8/30/2006	2006-0473	not surveyed
12	20019	5935	5814	5579	5722	5766	5827	6013	6331	6913	7324	7434	7991	6387	814	8/30/2006	2006-0472	not surveyed
13	22436	7342	6583	5894	6130	6616	6540	6414	6017	5719	5729	5825	5382	6183	537	8/30/2006	2006-0474	not surveyed
14	24569	5605	5567	5311	5203	5137	5557	5354	5354	5369	5427	5281	5002	5347	180	8/30/2006	2006-0475	not surveyed
15	16088	5469	5376	5439	5384	5129	5150	4984	5238	5027	5064	5032	5264	5213	173	8/30/2006	2006-0476	not surveyed
16	27251	5631	5241	5199	5288	5328	5252	5131	5202	5126	5213	5108	5352	5256	141	8/30/2006	2006-0477	not surveyed
17	27156	5722	5599	5461	5635	5359	5597	5569	6064	6361	6056	5883	6507	5818	361	8/30/2006	2006-0478	not surveyed
18	27724	5711	5410	5075	5125	5149	5068	5014	5047	5168	5156	5236	5281	5203	194	8/30/2006	2006-0479	not surveyed
19	32823	5451	5040	5152	5208	5039	5114	5118	5198	5107	5126	5110	5090	5146	109	8/31/2006	2006-0492	not surveyed
20	35160	5613	5039	4942	5290	5594	5732	5677	5559	5670	5710	5802	5795	5535	288	8/31/2006	2006-0493	not surveyed
21	33633	5609	4980	5094	5078	4869	5140	5089	5056	5159	5207	5263	5069	5134	181	8/31/2006	2006-0494	not surveyed
22	42950	5855	4988	4777	4817	4866	4981	5039	5047	5051	5067	5125	5182	5066	276	8/31/2006	2006-0495	not surveyed
23	43985	5299	4628	4557	4923	4677	4794	4834	4931	5041	5219	5258	5202	4947	258	8/31/2006	2006-0496	not surveyed
24	42749	7809	5631	5108	5058	5062	4958	4979	5076	5152	5112	5181	5057	5349	794	8/31/2006	2006-0497	not surveyed
25	6050	5636	4482	4547	4649	4395	4617	4555	4689	4759	4813	4923	4822	4741	321	5/17/2007	2007-1000	N
26	4879	4485	4486	4623	4830	5097	5378	5218	5730	6219	5809	5395	5399	5222	547	5/17/2007	2007-1001	N
27	5198	4708	4758	4636	4599	4539	4617	4818	4881	4844	4897	4960	4983	4770	149	5/17/2007	2007-1002	N

Ford Nuclear Reactor Decommissioning Project
Storage Port Characterization Surveys

Gross Gamma (cpm) vs Depth into Storage Port

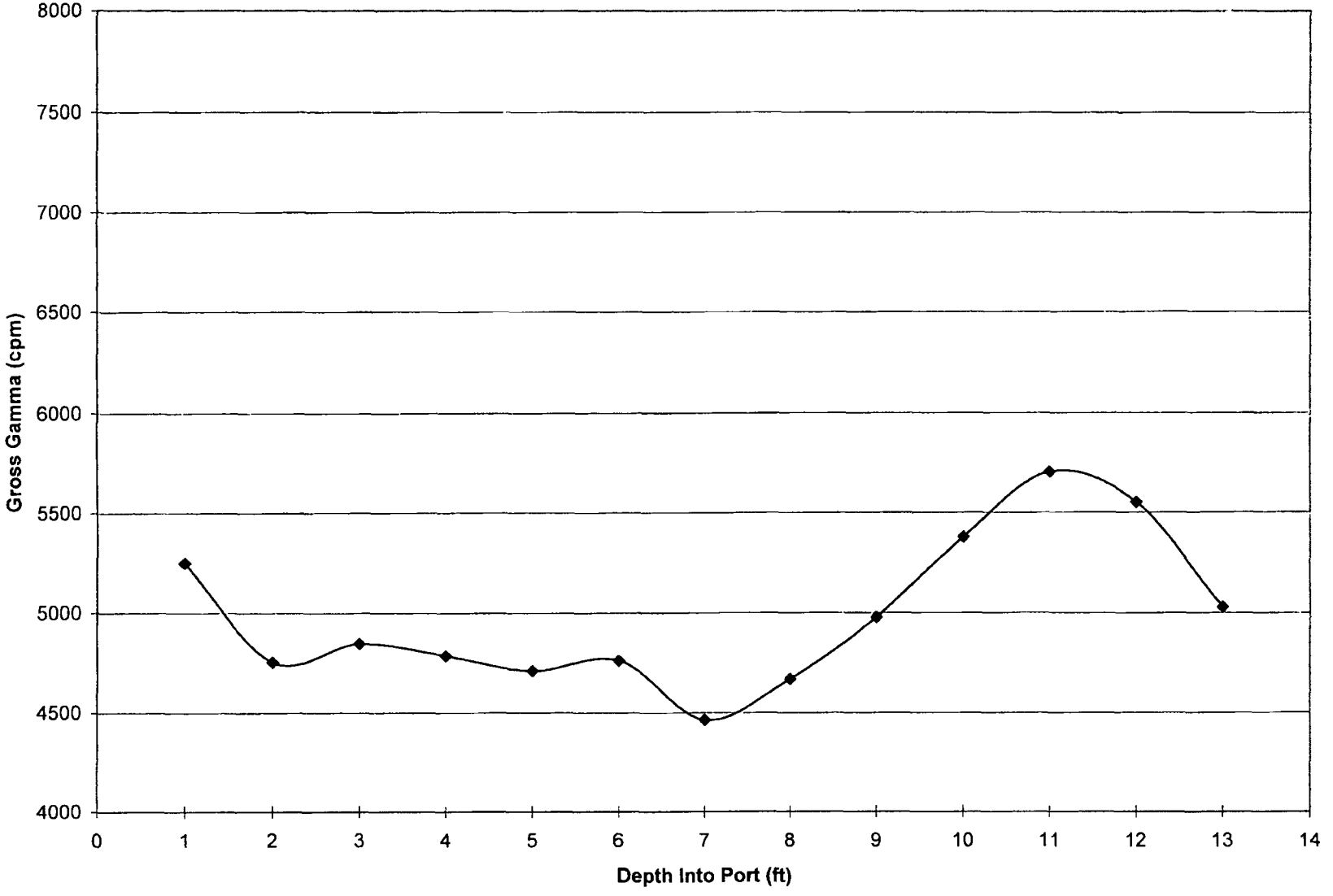
	Position (feet into port)																
Port	1	2	3	4	5	6	7	8	9	10	11	12	13	Average (excluding Pt. #1)	Stand. Dev. (excluding Pt. #1)	Survey Date	Survey Log No.	Removable Activity Detected?
28	5634	4848	4729	4488	4667	4536	4668	4960	4792	4768	4737	4790	4717	4725	128	5/17/2007	2007-1003	N
29	5702	4769	4720	4909	4794	4843	4998	4923	5057	5099	5209	5239	5466	5002	222	5/17/2007	2007-1004	N
30	5235	4747	4888	4738	4542	4627	4758	4763	4735	4902	5000	4891	4819	4784	126	5/17/2007	2007-1005	N
31	5383	5146	5213	4957	5011	5294	5526	5205	5246	5516	5476	5295	5240	5260	180	5/17/2007	2007-1006	N
32	5100	4644	4894	5101	4879	5142	5072	5426	5814	6372	6237	5689	5298	5381	545	5/17/2007	2007-1007	N
33	5524	4912	4794	4850	5129	5867	5327	5174	5221	5037	4984	4780	4654	5061	324	5/17/2007	2007-1008	N
34	6153	5020	4815	4905	4995	5004	5179	5275	5418	5500	5140	5088	4760	5092	226	5/17/2007	2007-1009	N
35	6332	5654	6958	6524	6566	7129	6802	6271	6426	6068	5468	5610	5141	6218	633	5/17/2007	2007-1010	N
36	6538	4834	4702	5125	5401	5247	5654	5398	5583	5773	5783	5248	5091	5320	348	5/17/2007	2007-1011	Y
37	6381	4722	4712	4640	4808	4798	5006	4981	5220	5224	5321	5316	5121	4989	249	5/18/2007	2007-1025	N
38	7396	4902	4813	4693	5036	5248	5362	5425	5450	5497	5443	5508	5308	5224	288	5/18/2007	2007-1024	N
39	6253	5825	5247	5254	5135	5262	5271	5291	5259	5540	5413	5339	4924	5313	218	5/18/2007	2007-1023	N
40	7462	4784	4955	4999	4969	4977	5708	5549	5525	5328	5186	5005	4949	5161	296	5/18/2007	2007-1022	N
41	8923	5190	5170	5034	5439	5390	5625	5525	5708	5536	5525	5252	5093	5374	221	5/18/2007	2007-1021	N
42	8539	5476	5303	5134	5092	5280	5355	5326	5208	5365	5365	5103	4941	5246	152	5/18/2007	2007-1020	N
43	7128	5153	5044	4921	4934	5049	5015	5038	4954	4981	5344	4984	4708	5010	149	5/21/2007	2007-1037	Y
44	8479	5381	4910	4585	4730	4725	4736	4791	5023	4890	4927	4917	4621	4853	212	5/21/2007	2007-1038	N
45	7727	5420	5466	5179	5024	5031	5162	5249	4938	5212	5027	5012	4729	5121	205	5/21/2007	2007-1039	Y
46	11016	7470	6062	5392	5233	5319	5390	5451	4949	5092	5071	4936	4716	5423	729	5/21/2007	2007-1040	Y
47	8747	4933	4404	4731	4707	4824	4947	5091	4973	5031	4965	5102	4764	4873	199	5/21/2007	2007-1041	Y
48	7889	5782	5474	5893	6407	5874	5759	5942	6312	6553	6945	9954	7384	6523	1211	5/21/2007	2007-1042	Y
49	11190	5707	5309	5186	5274	5072	5199	5479	6491	6490	6109	7789	5993	5842	793	5/21/2007	2007-1043	Y
50	7208	5017	4607	4605	4616	4550	4742	4786	4883	4985	5000	5034	4848	4806	181	5/21/2007	2007-1044	Y

FNR Storage Port #1: NaI Gross Gamma vs Depth



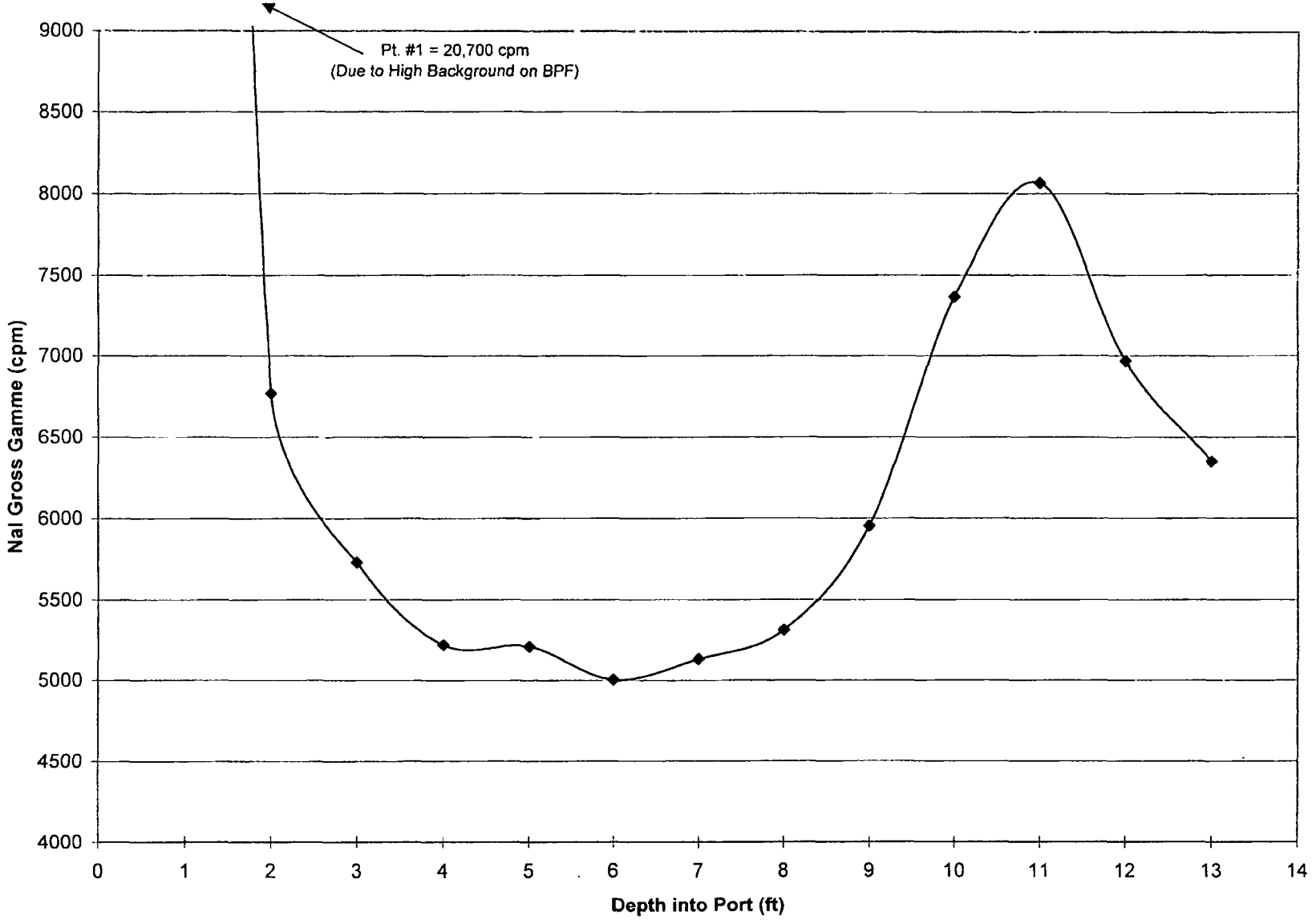
Surveyed: 5-17-2007

FNR Storage Port #2: NaI Gross Gamma vs Depth



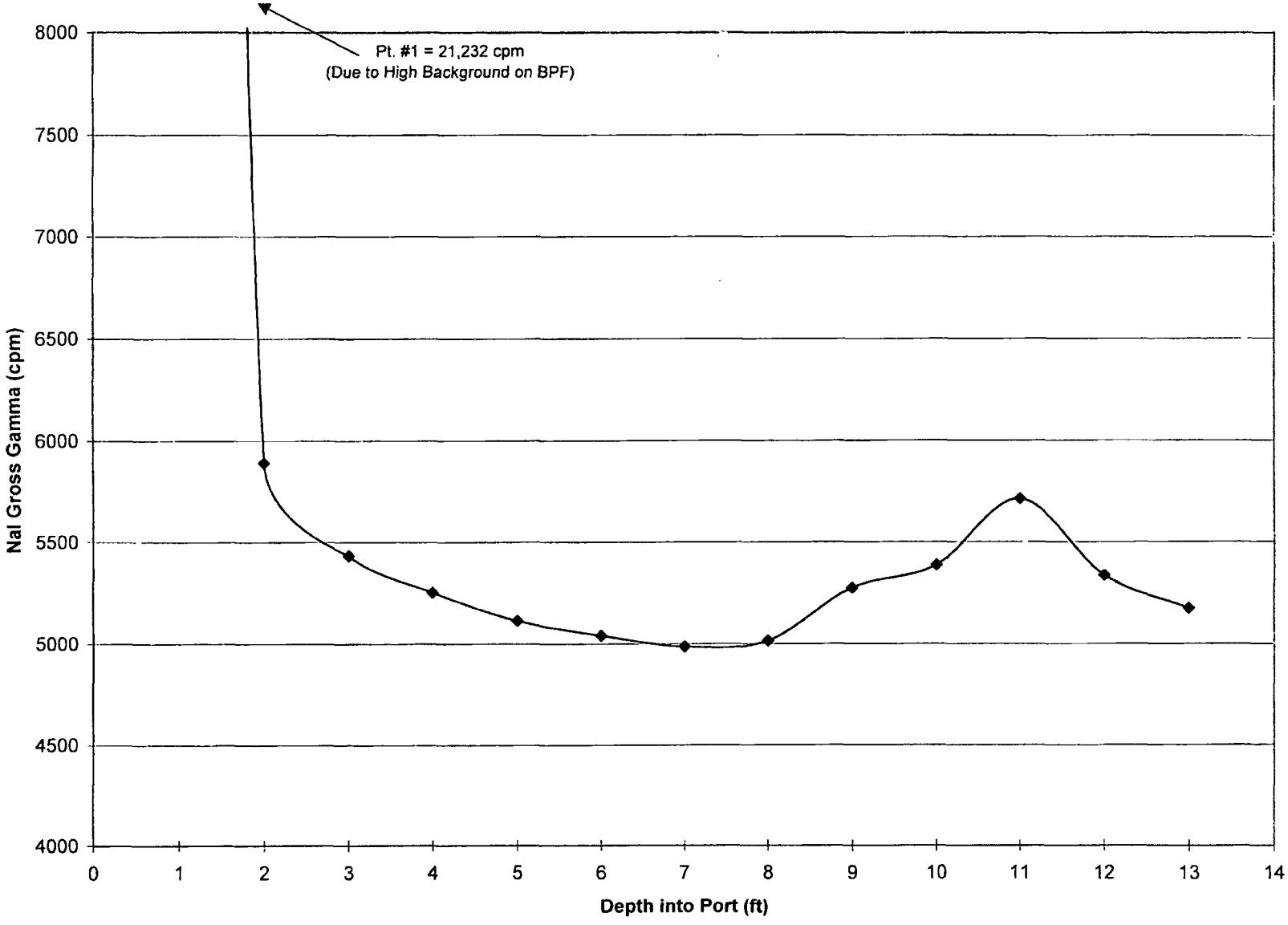
Surveyed: 5-17-2007

FNR Storage Port #3: NaI Gross Gamma vs Depth



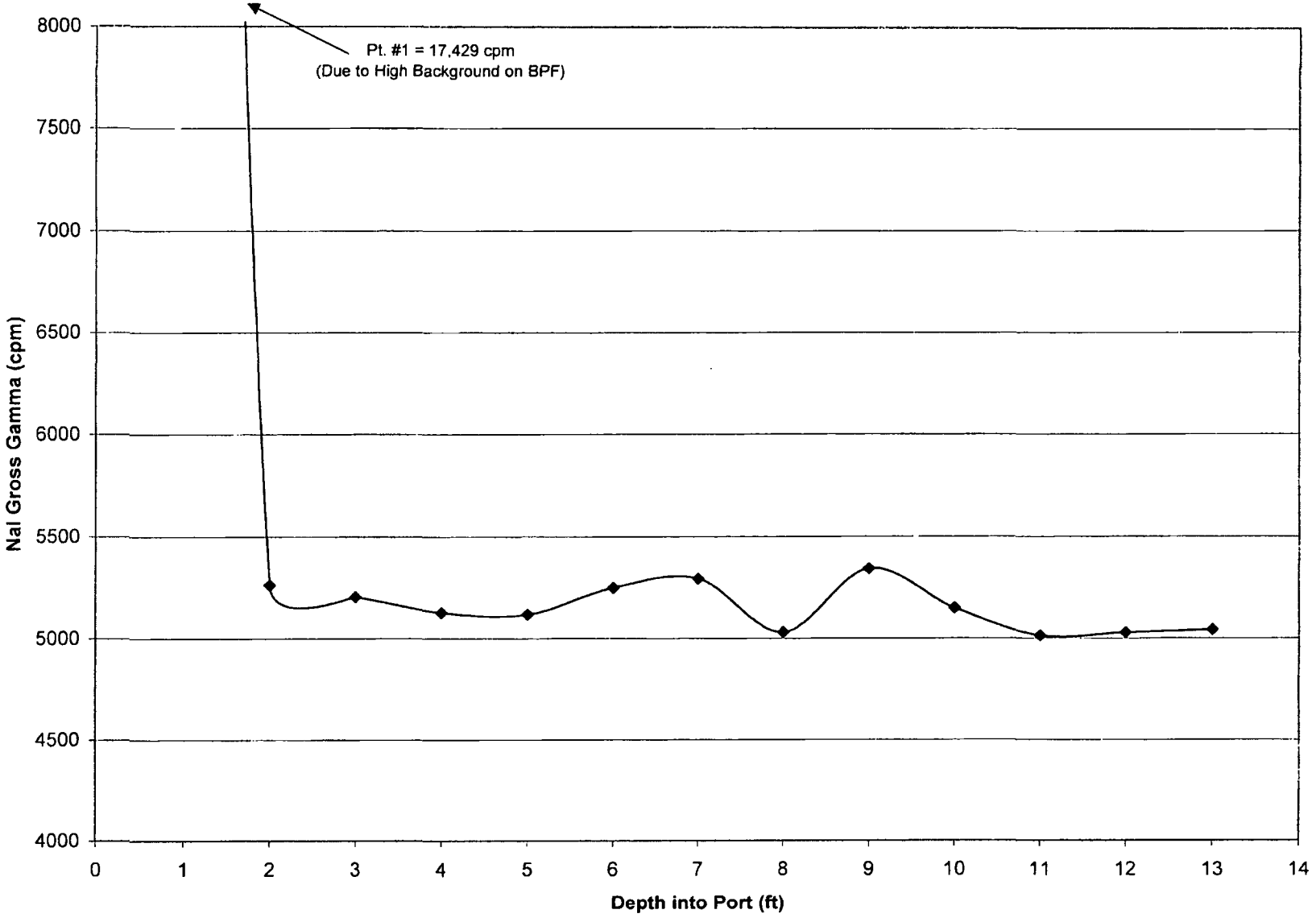
Surveyed: 8-21-2006

FNR Storage Port #4: Nal Gross Gamma vs Depth



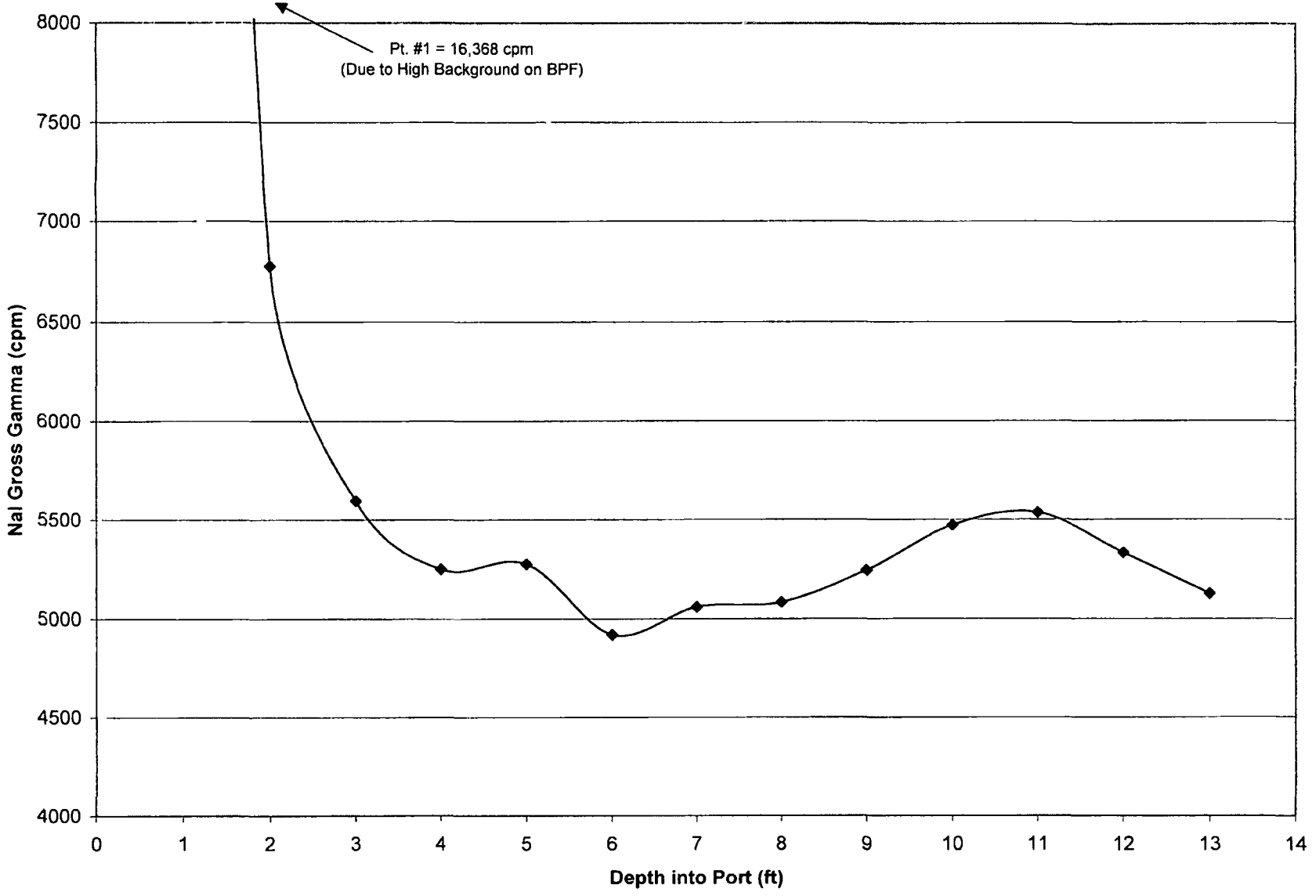
Surveyed: 8-21-2006

FNR Storage Port #5: NaI Gross Gamma vs Depth



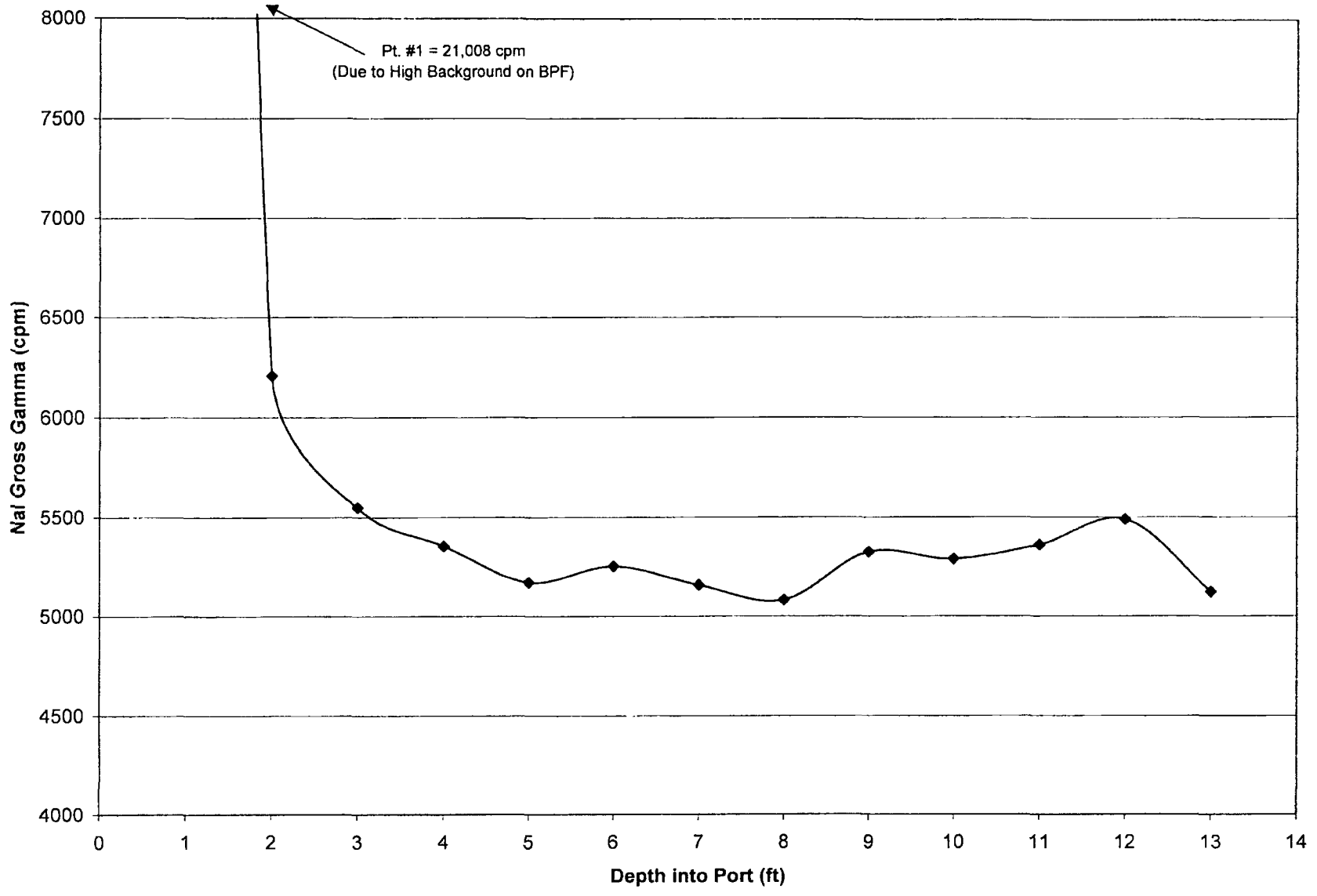
Surveyed: 8-30-2006

FNR Storage Port #6: Nal Gross Gamma vs Depth



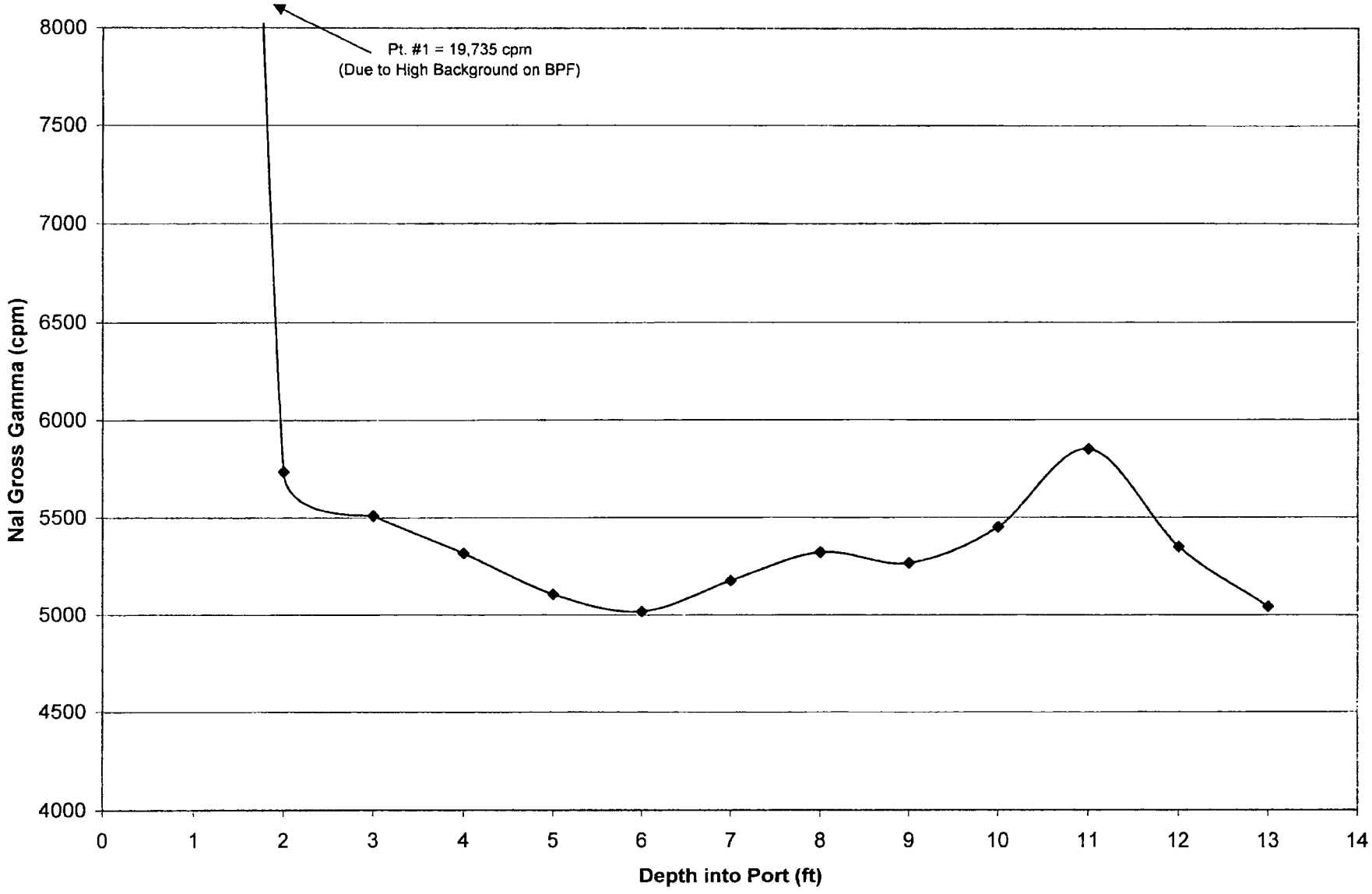
Surveyed: 08-29-2006

FNR Storage Port #7: NaI Gross Gamma vs Depth



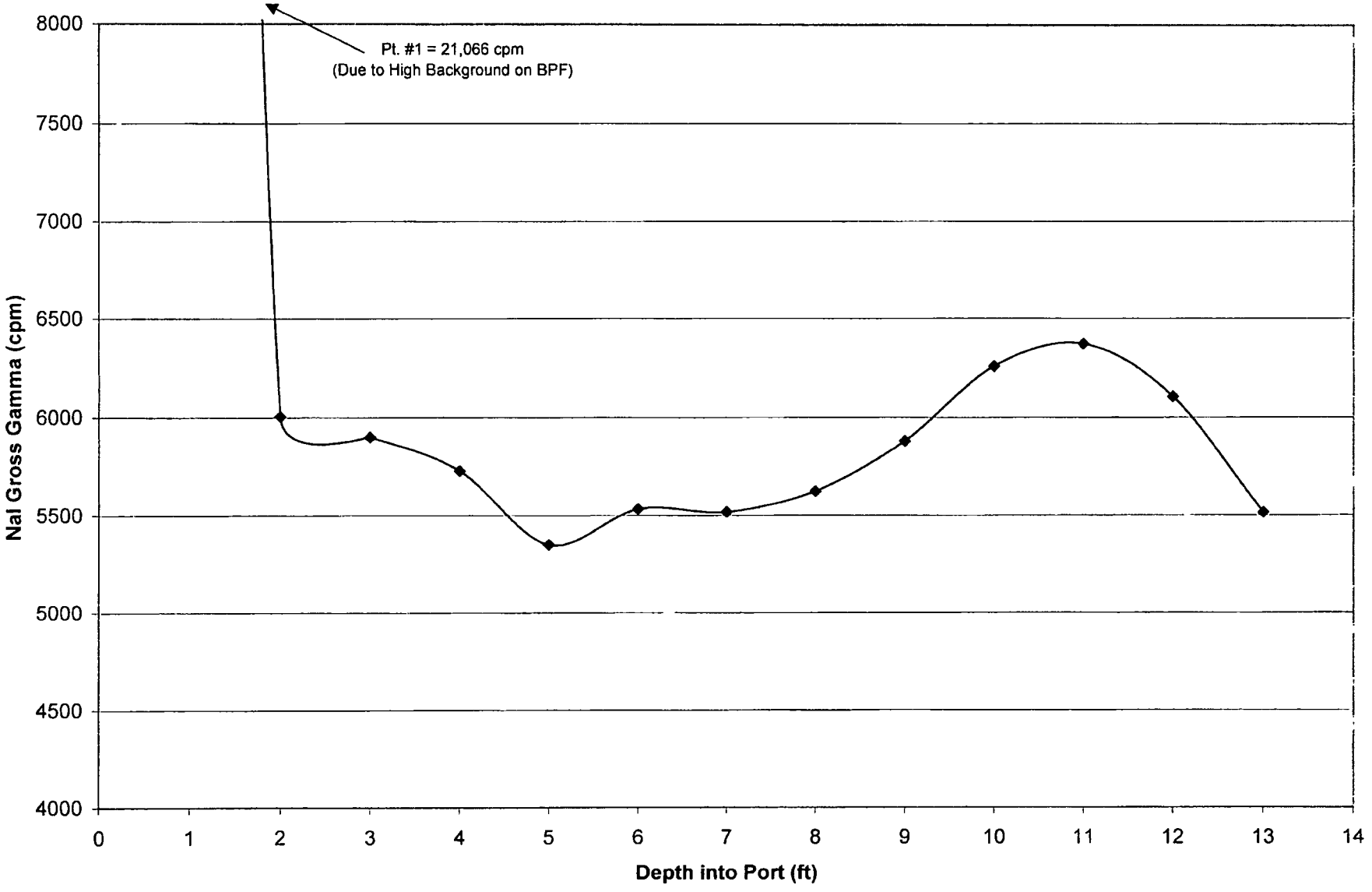
Surveyed: 08-29-2006

FNR Storage Port #8: NaI Gross Gamma vs Depth



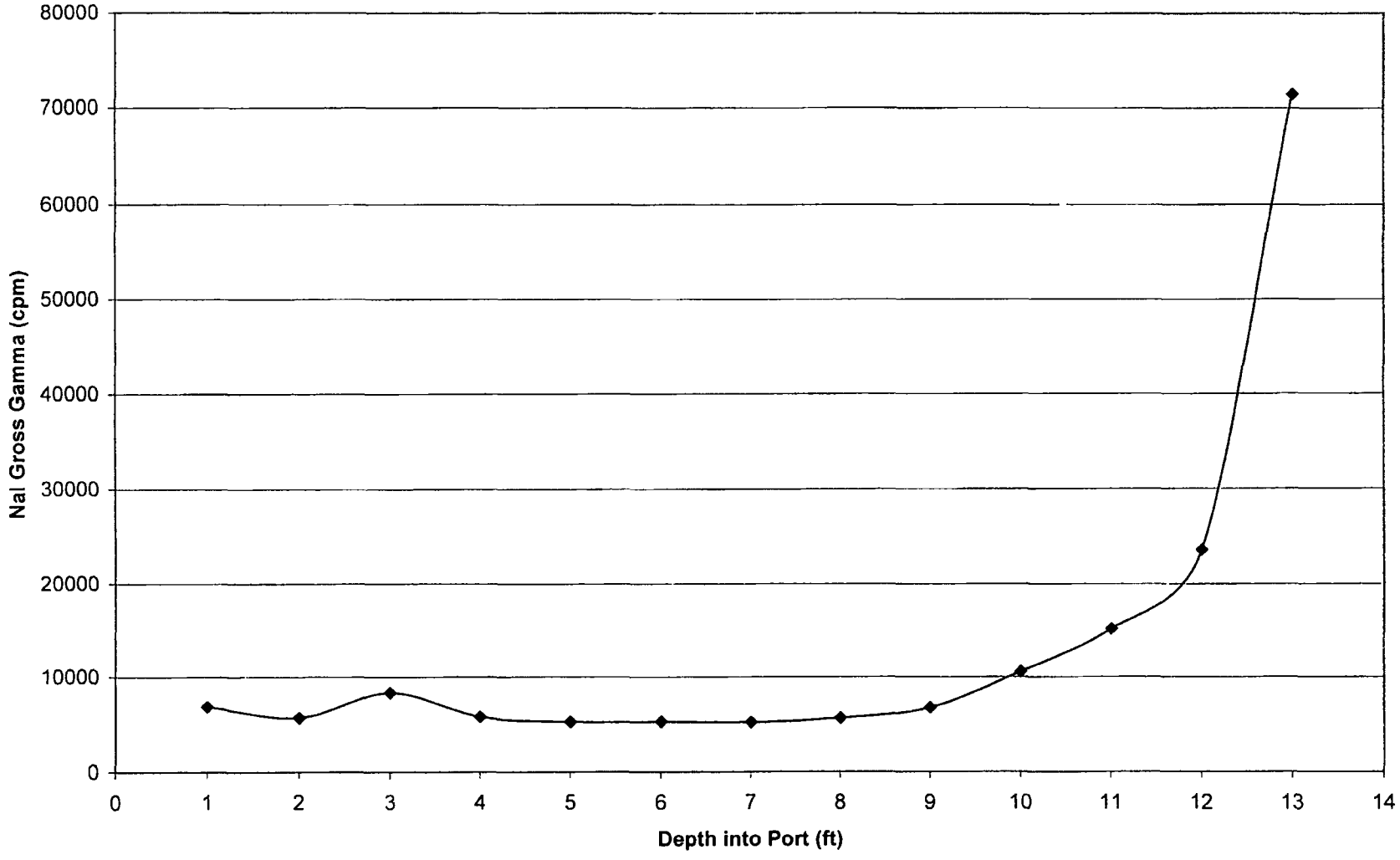
Surveyed: 08-29-2006

FNR Storage Port #9: NaI Gross Gamma vs Depth



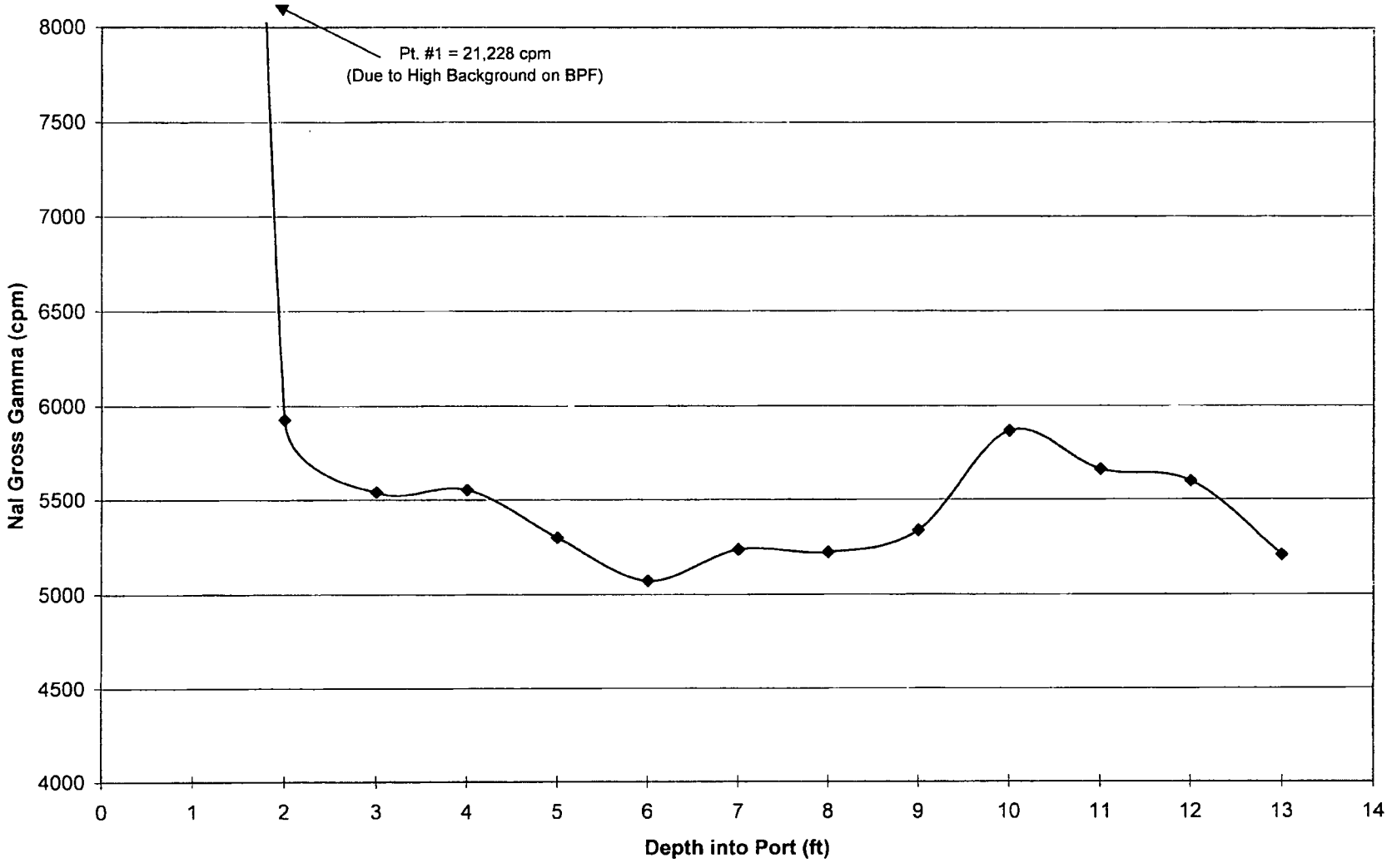
Surveyed: 08-30-2006

FNR Storage Port #10: NaI Gross Gamma vs Depth



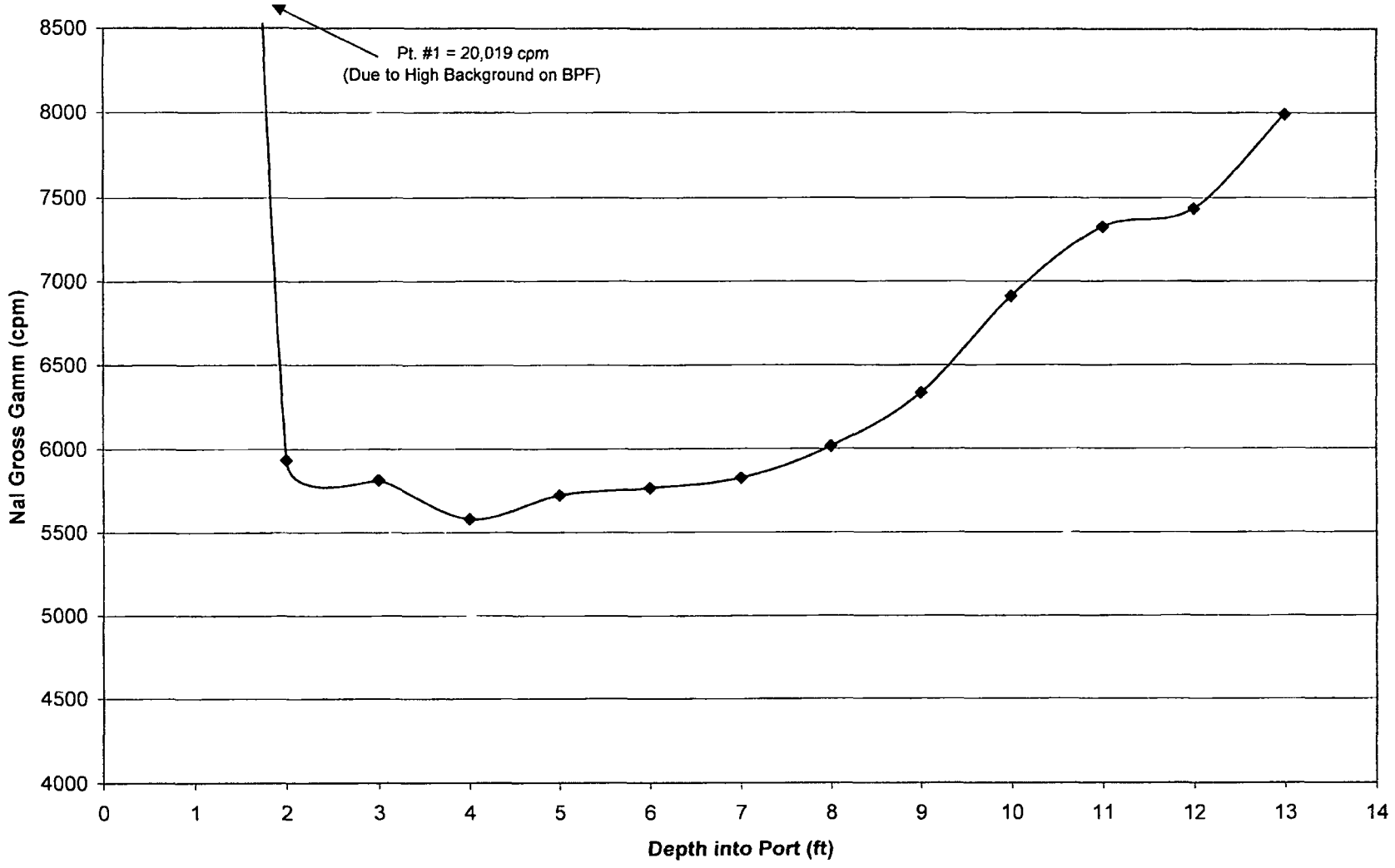
Surveyed: 05-17-2007

FNR Storage Port #11: NaI Gross Gamma vs Depth



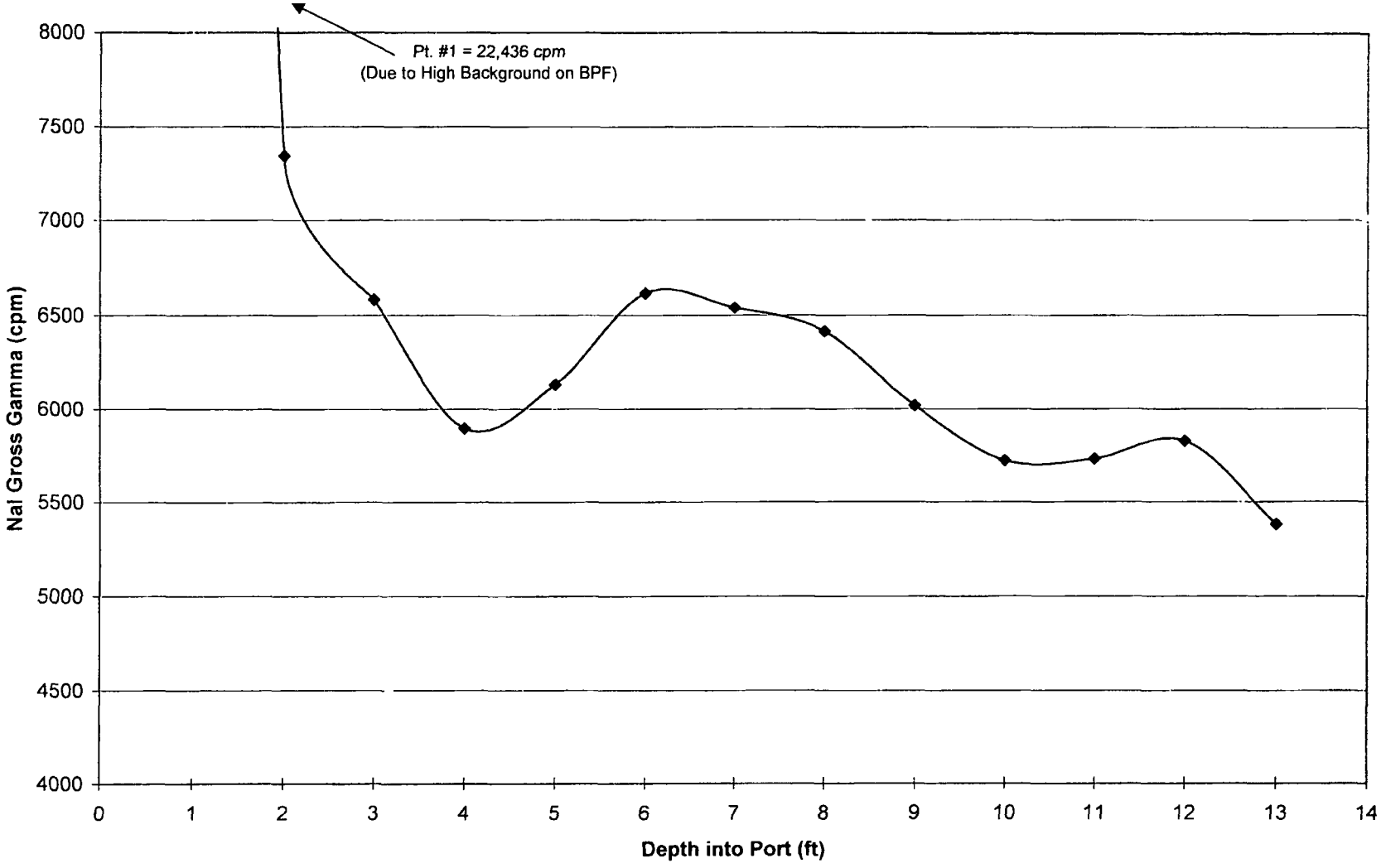
Surveyed: 08-30-2006

FNR Storage Port #12: NaI Gross Gamma vs Depth



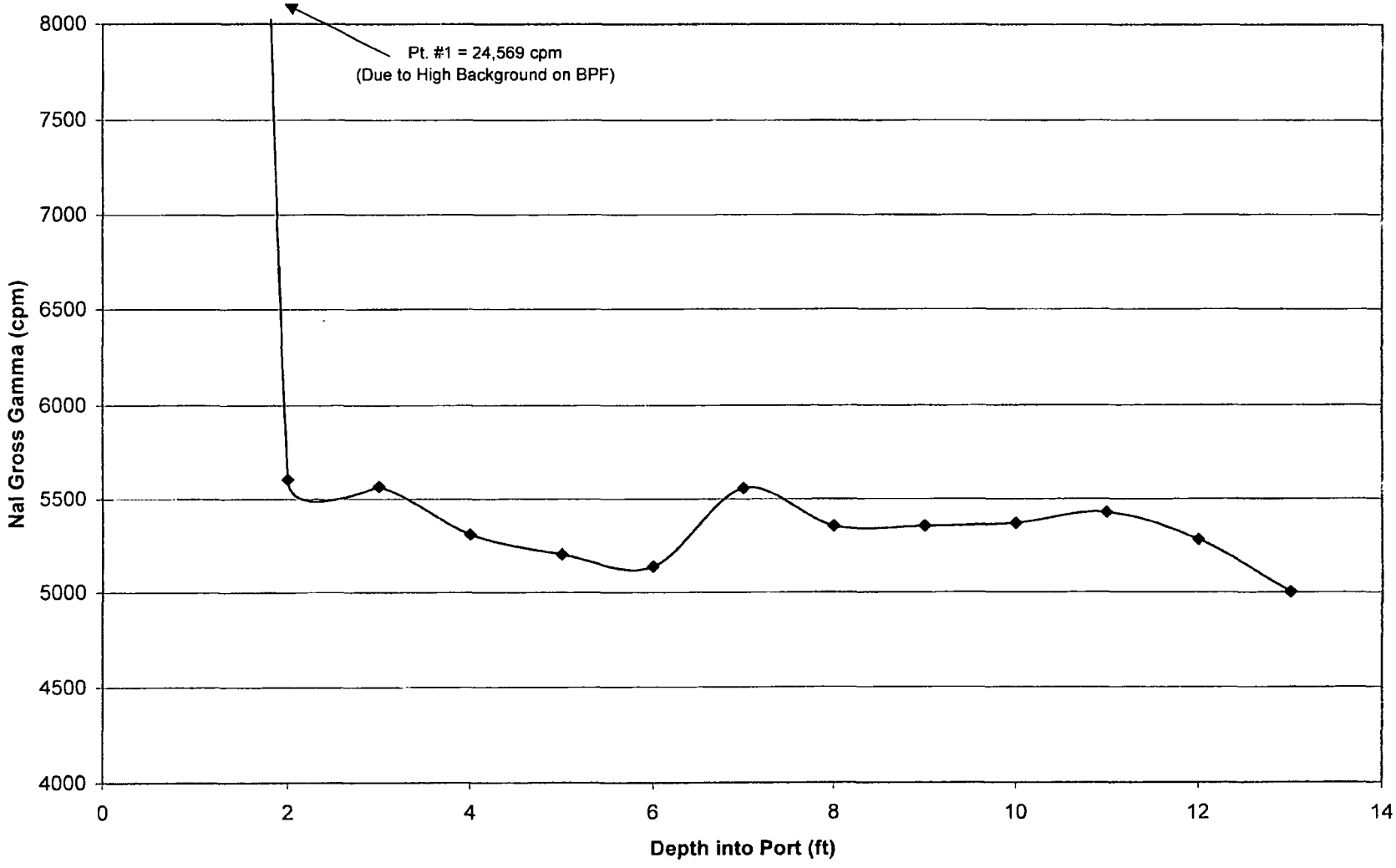
Surveyed: 08-30-2006

FNR Storage Port #13: NaI Gross Gamma vs Depth



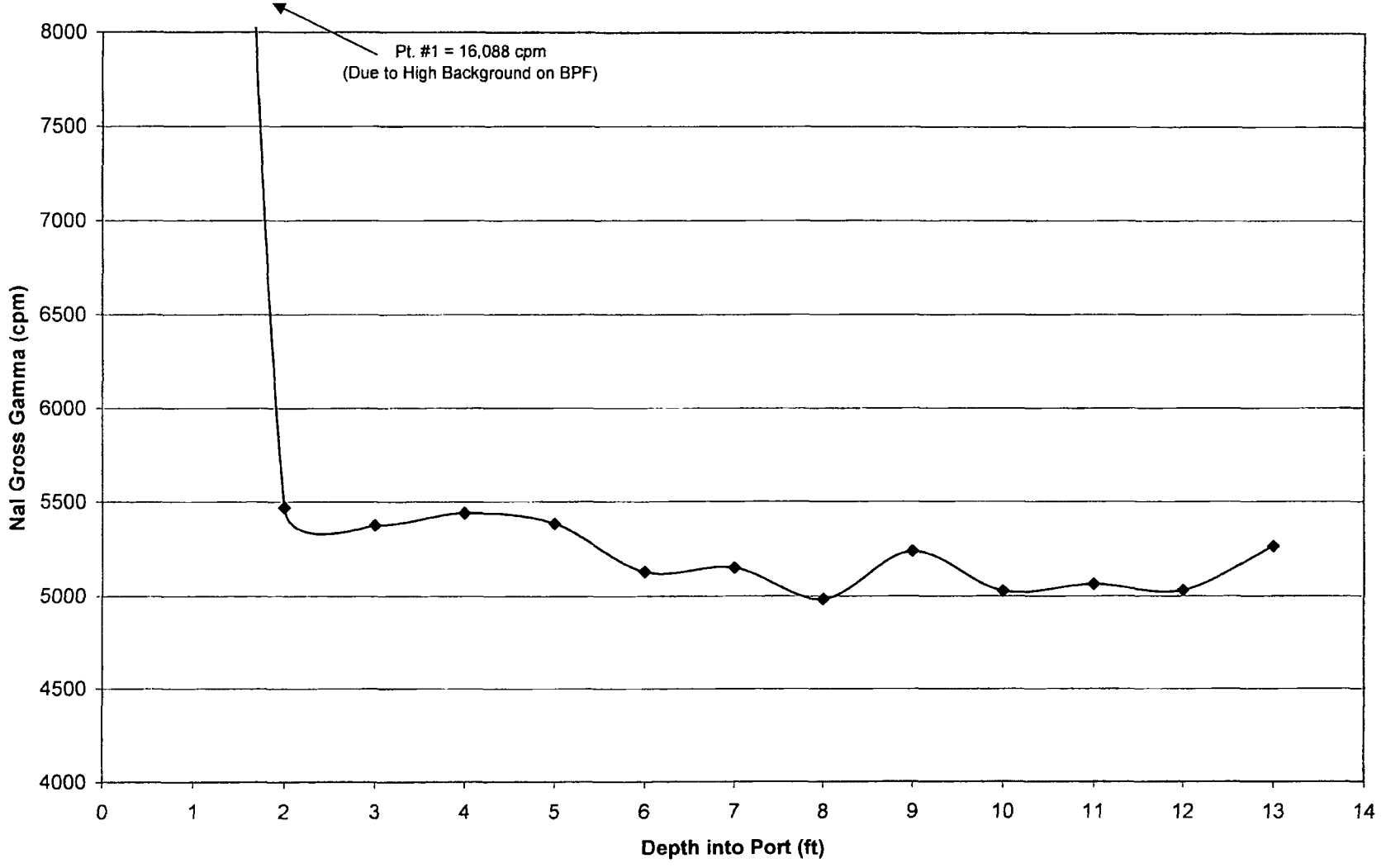
Surveyed: 08-30-2006

FNR Storage Port #14: NaI Gross Gamma vs Depth



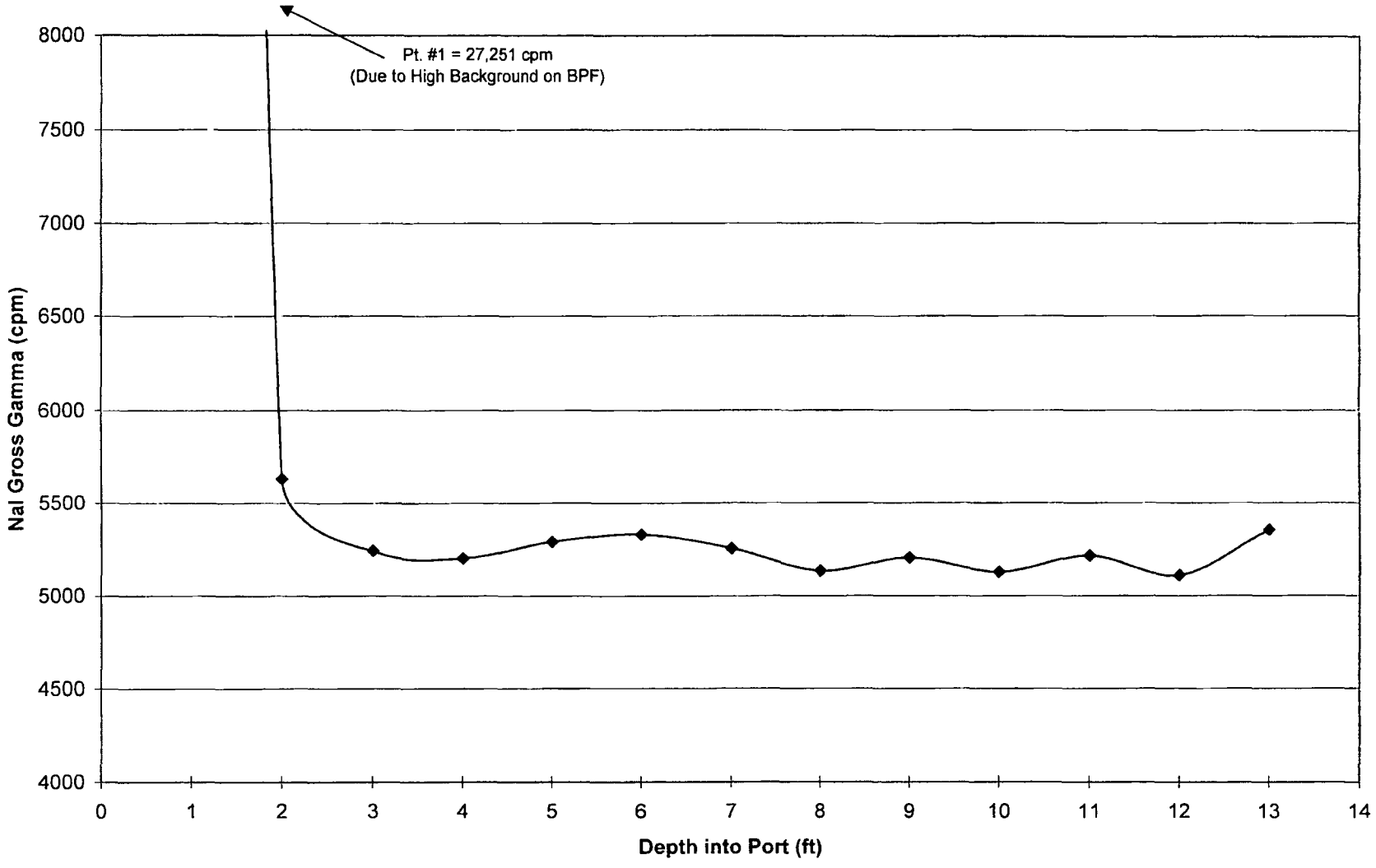
Surveyed: 08-30-2006

FNR Storage Port #15: NaI Gross Gamma vs Depth



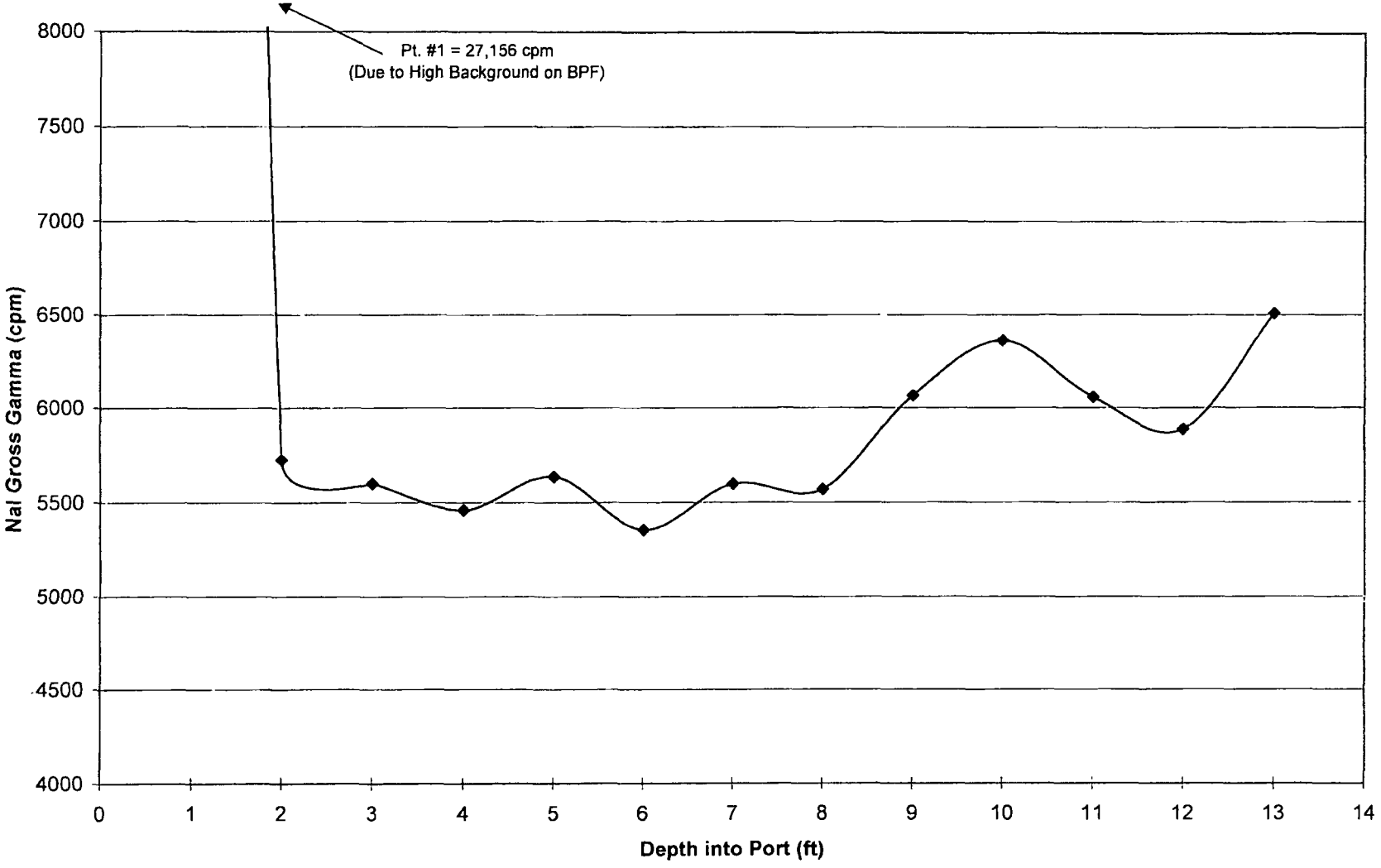
Surveyed: 08-30-2006

FNR Storage Port #16: NaI Gross Gamma vs Depth



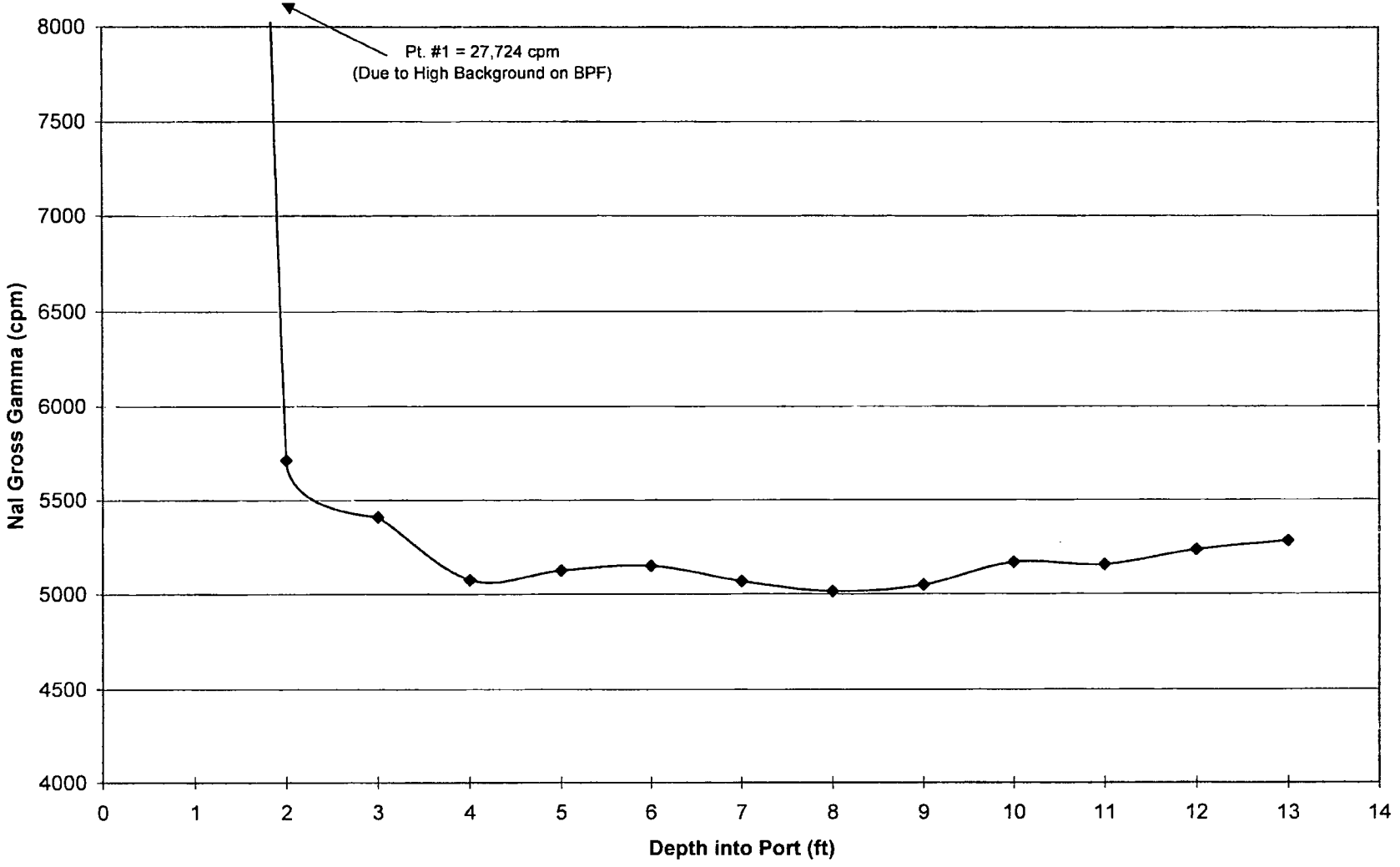
Surveyed: 08-30-2006

FNR Storage Port #17: Nal Gross Gamma vs Depth



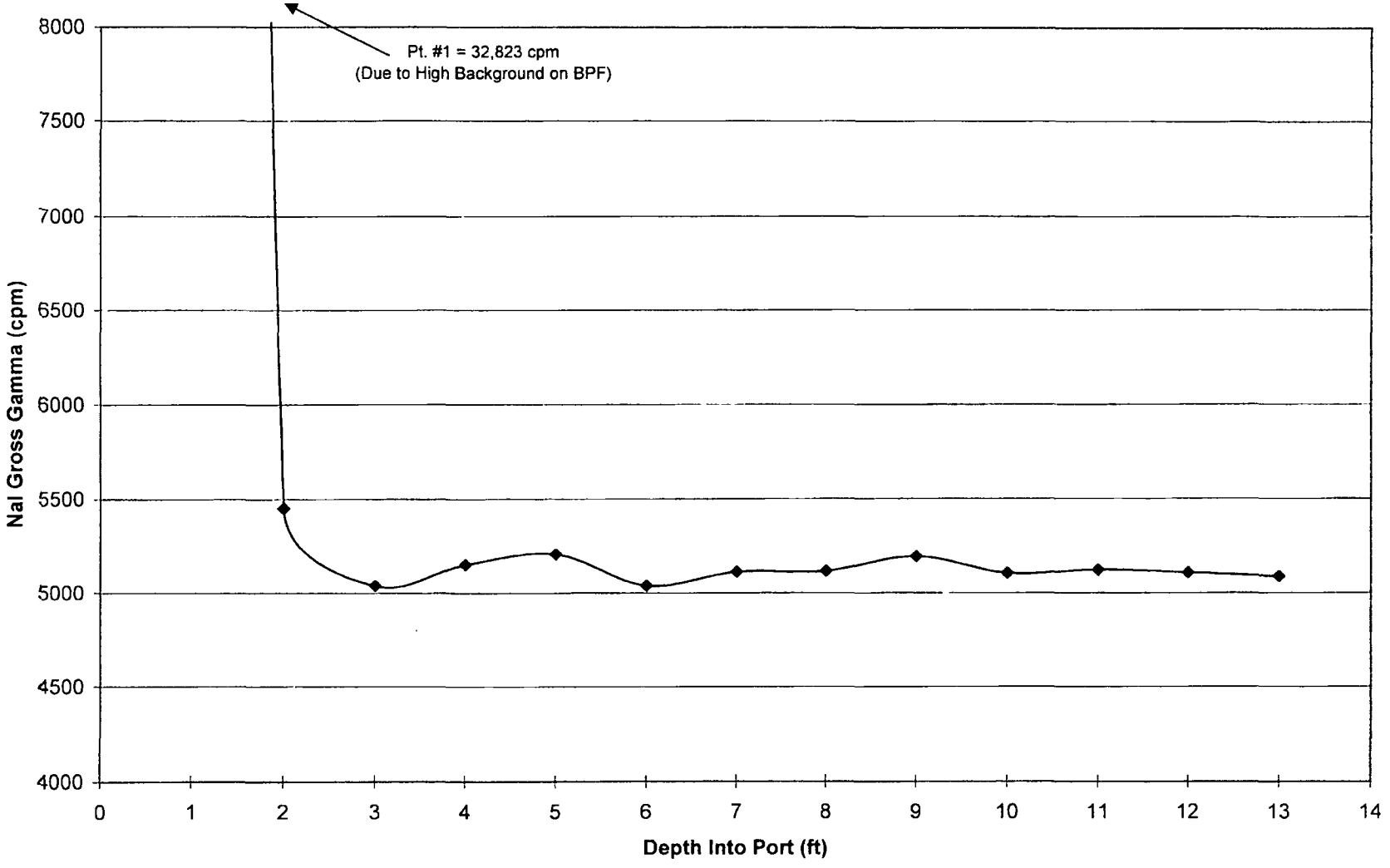
Surveyed: 08-30-2006

FNR Storage Port #18: NaI Gross Gamma vs Depth



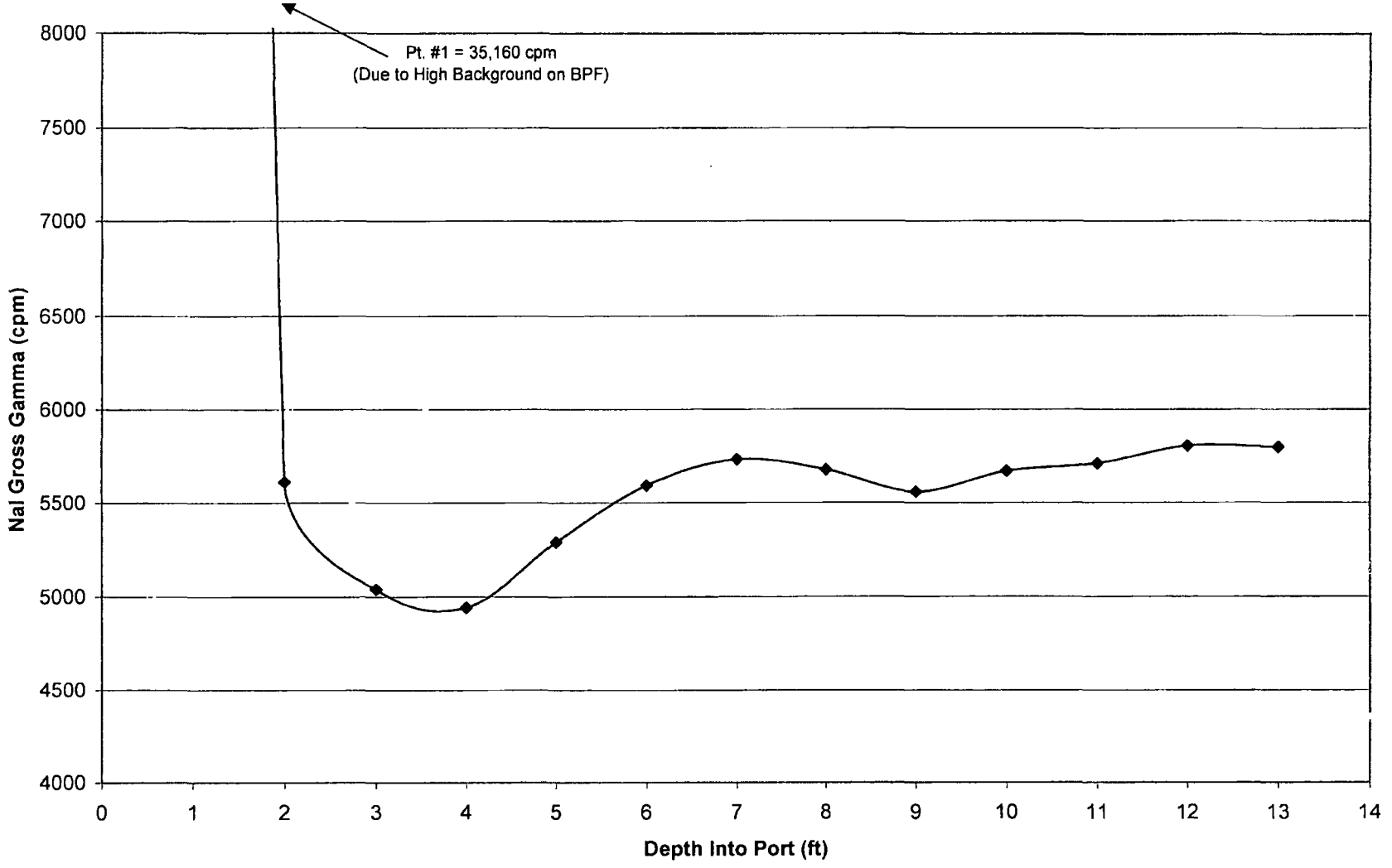
Surveyed: 08-30-2006

FNR Storage Port #19: NaI Gross Gamma vs Depth



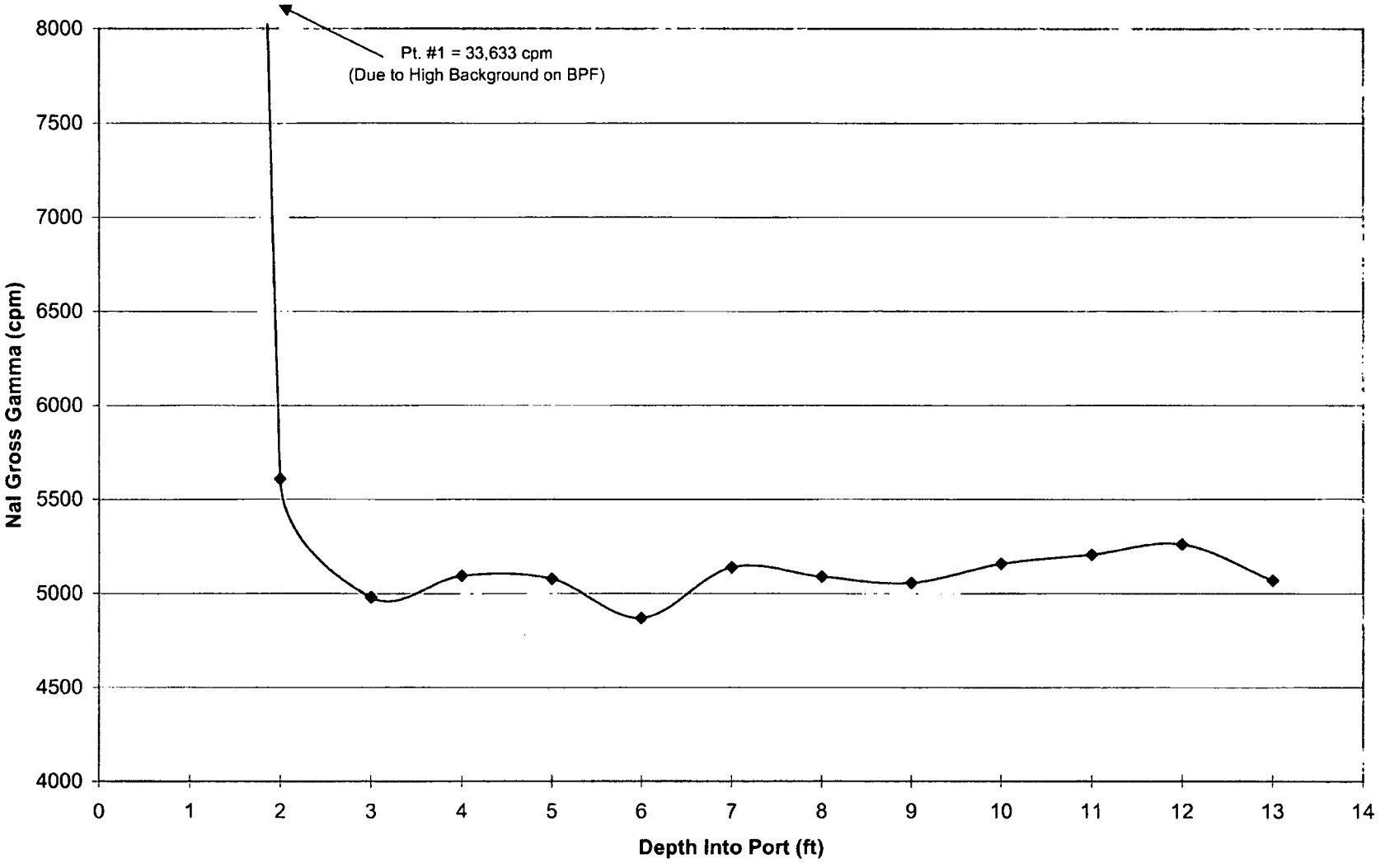
Surveyed: 08-31-2006

FNR Storage Port #20: NaI Gross Gamma vs Depth



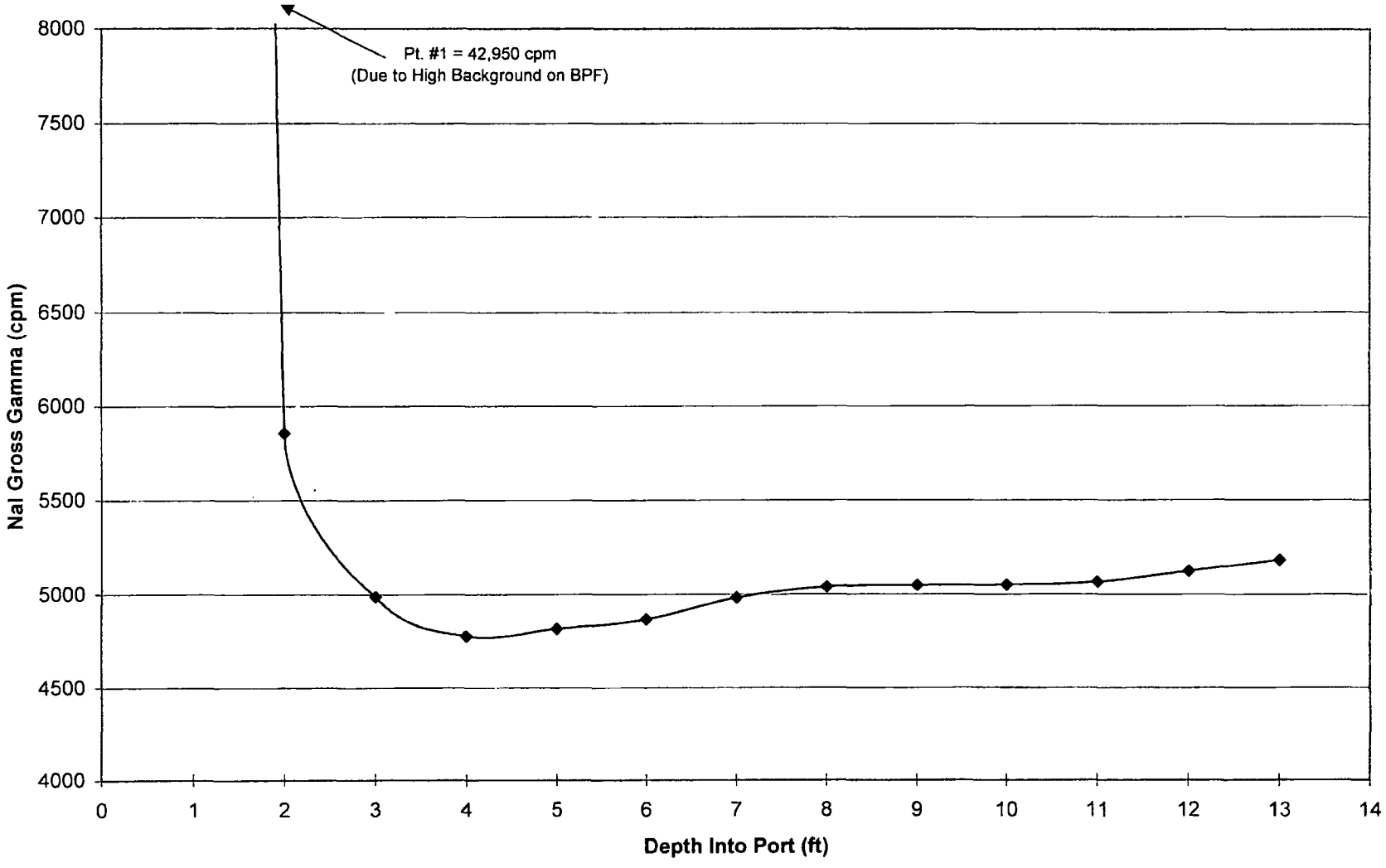
Surveyed: 08-31-2006

FNR Storage Port #21: NaI Gross Gamma vs Depth



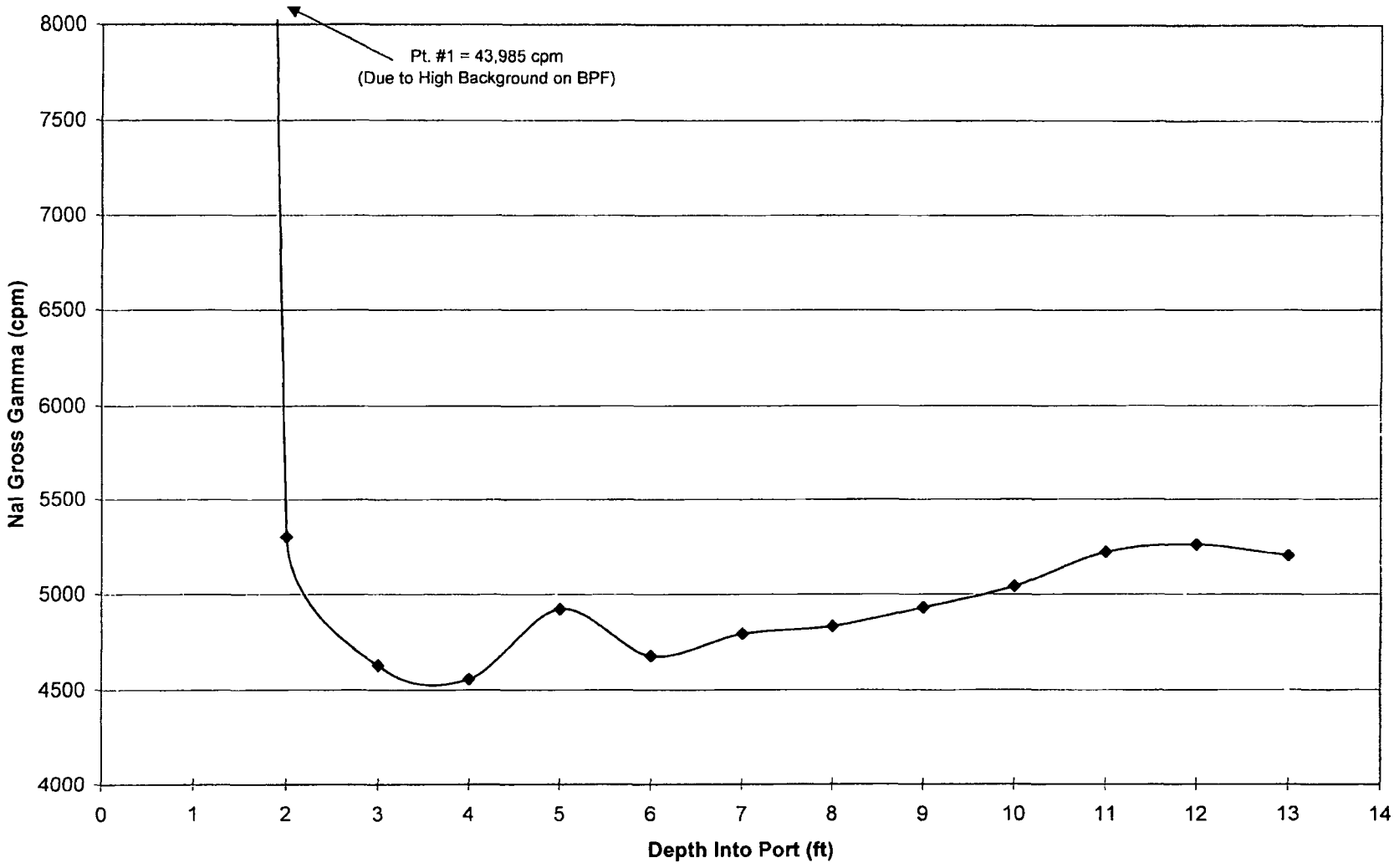
Surveyed: 08-31-2006

FNR Storage Port #22: NaI Gross Gamma vs Depth



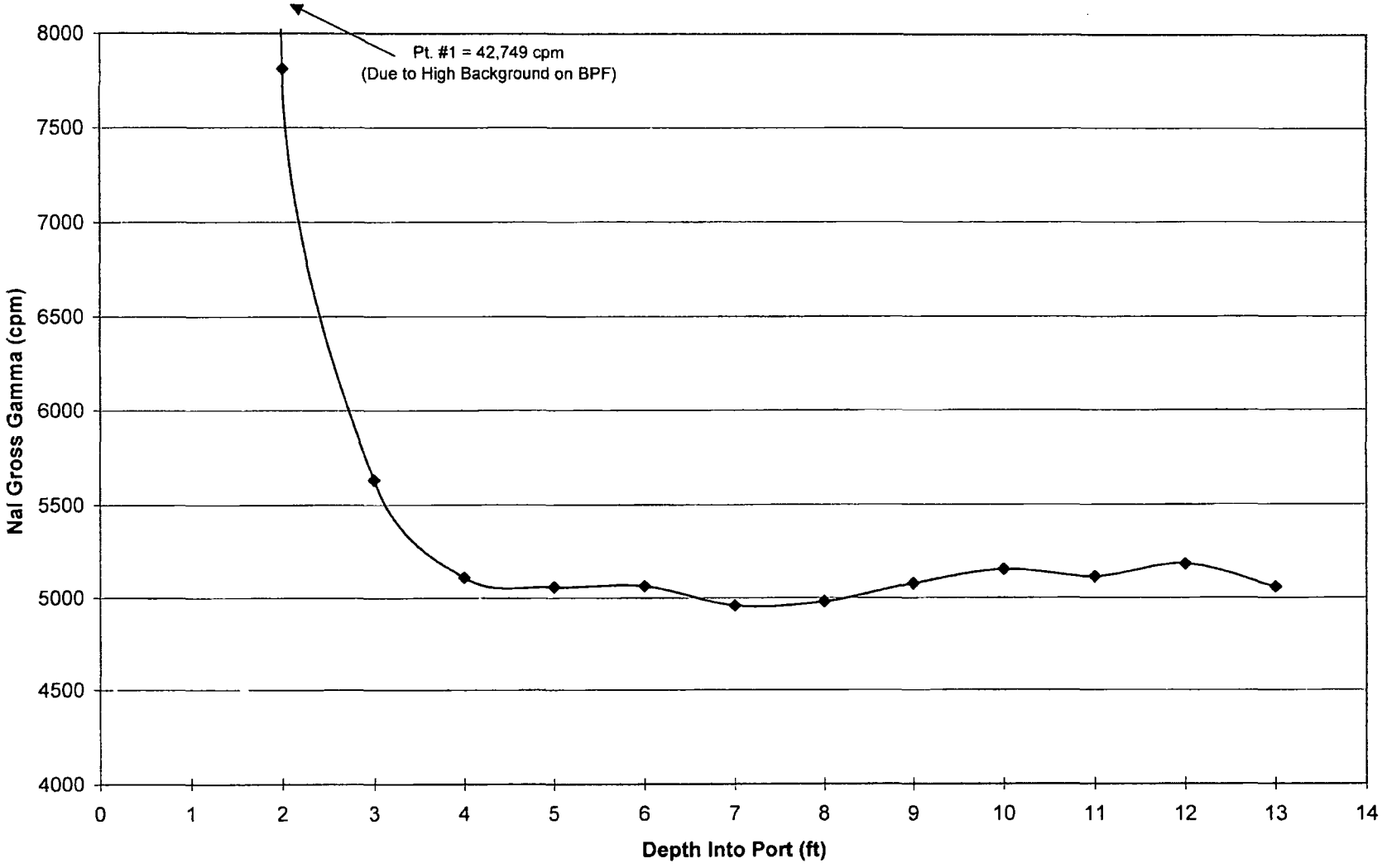
Surveyed: 08-31-2006

FNR Storage Port #23: NaI Gross Gamma vs Depth



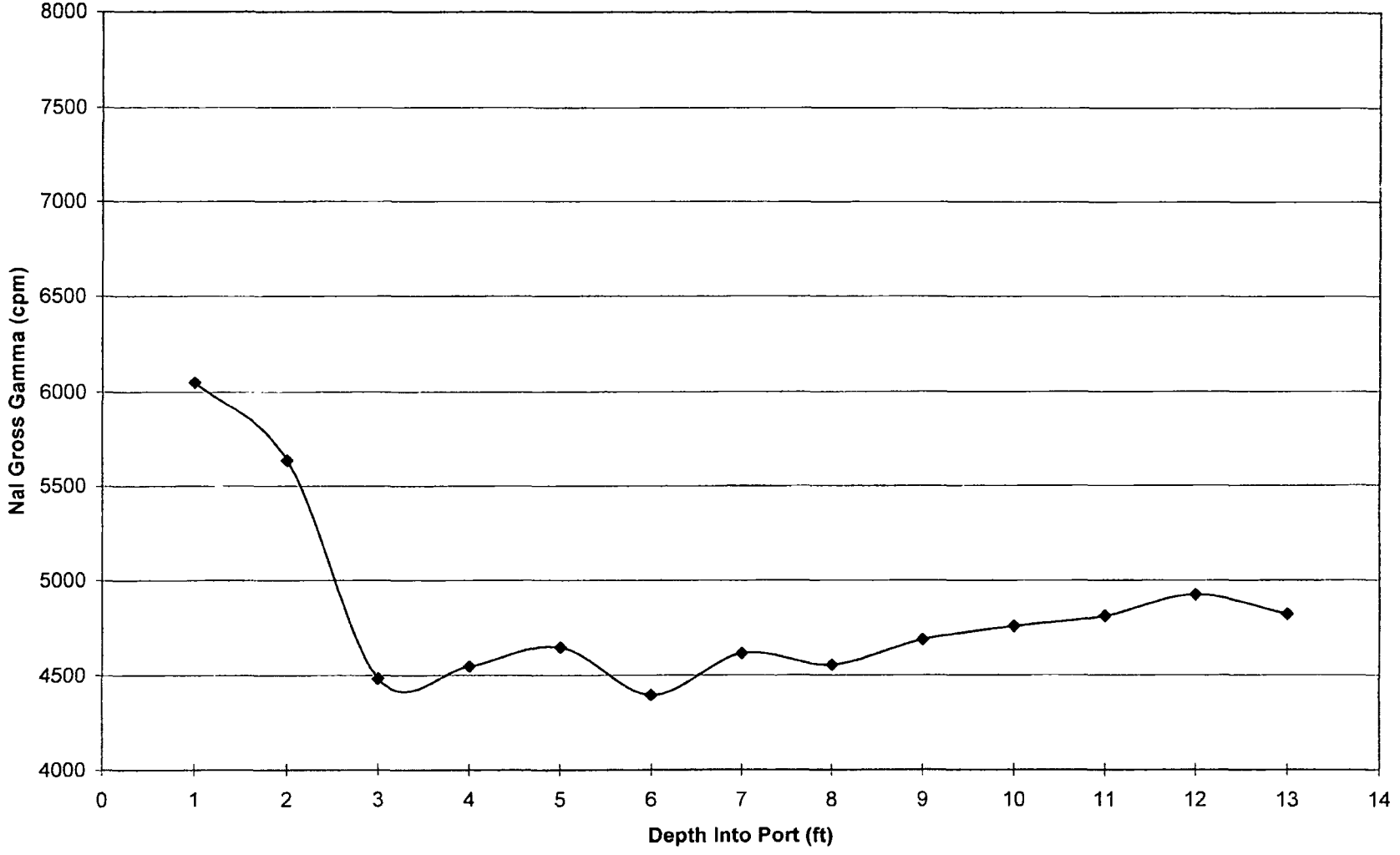
Surveyed: 08-31-2006

FNR Storage Port #24: NaI Gross Gamma vs Depth



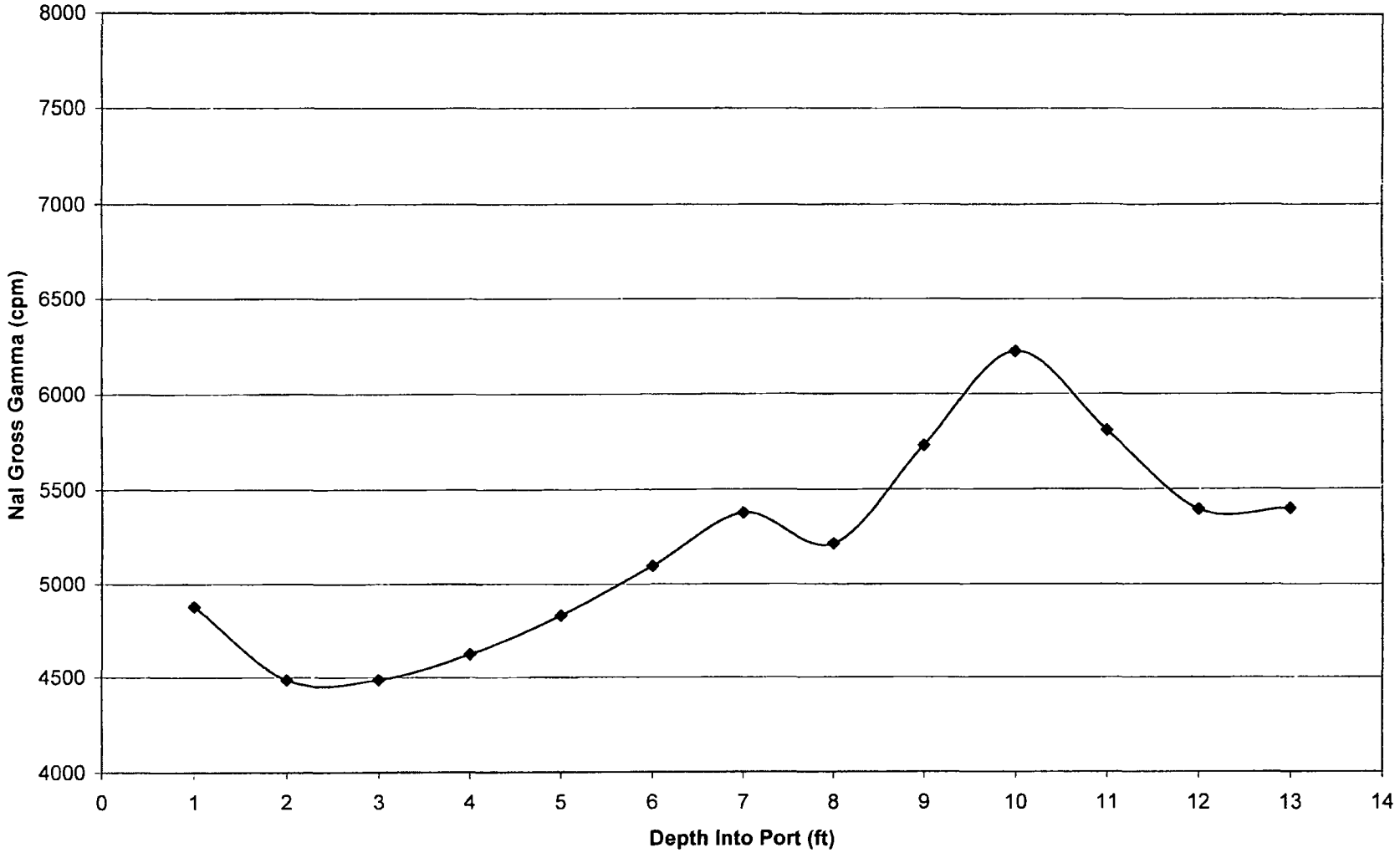
Surveyed: 08-31-2006

FNR Storage Port #25: NaI Gross Gamma vs Depth



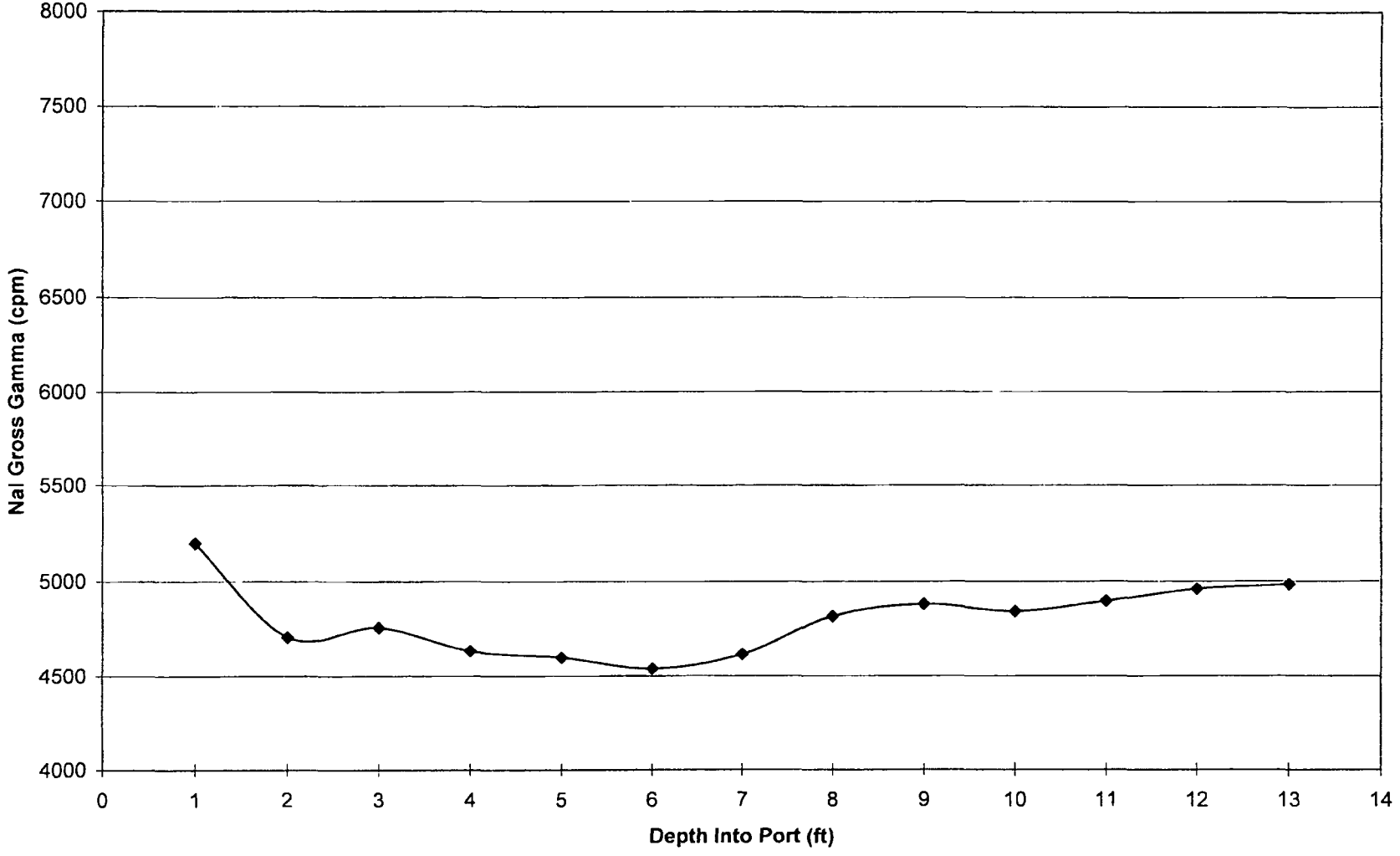
Surveyed: 05-17-2007

FNR Storage Port #26: NaI Gross Gamma vs Depth



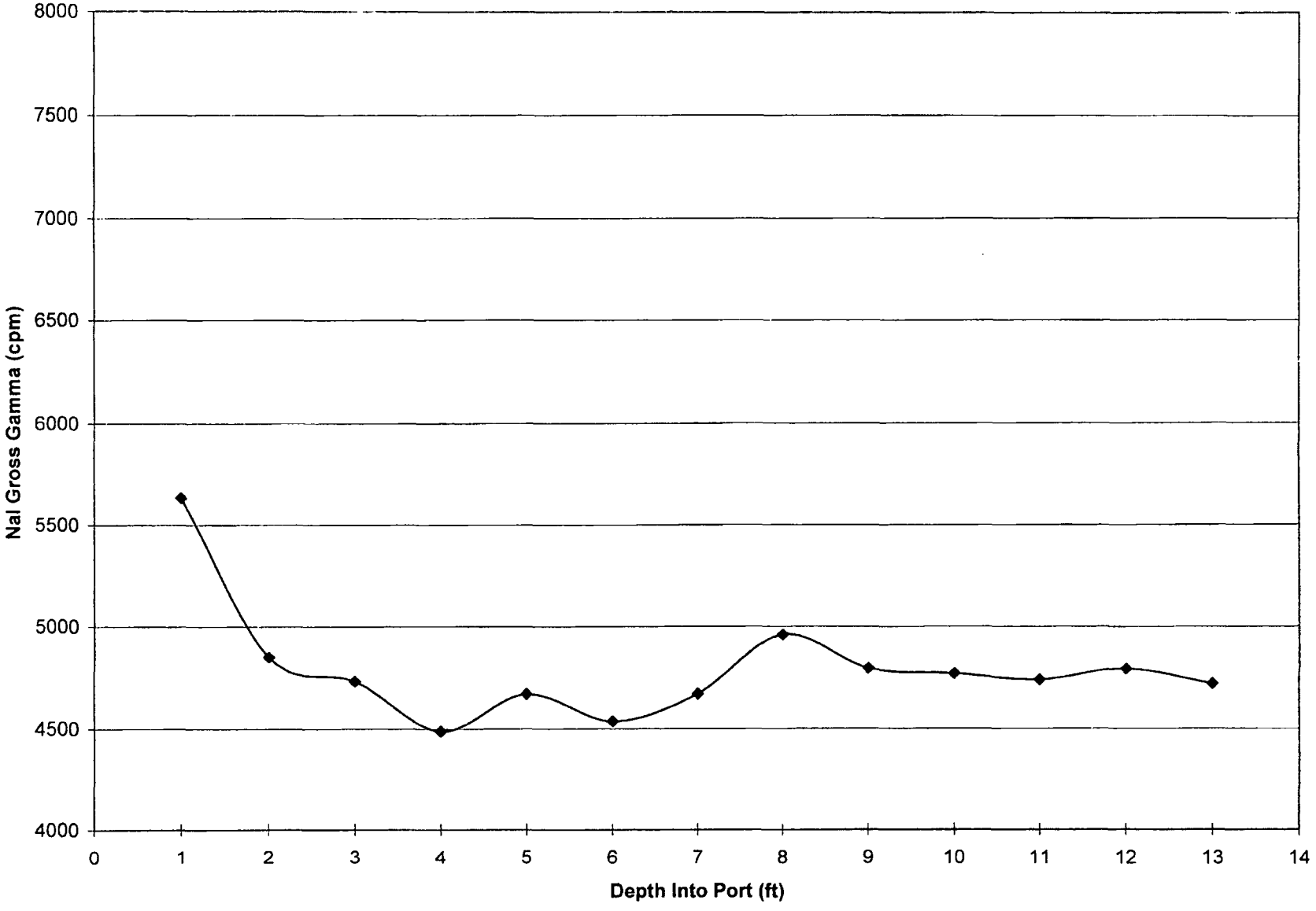
Surveyed: 05-17-2007

FNR Storage Port #27: NaI Gross Gamma vs Depth



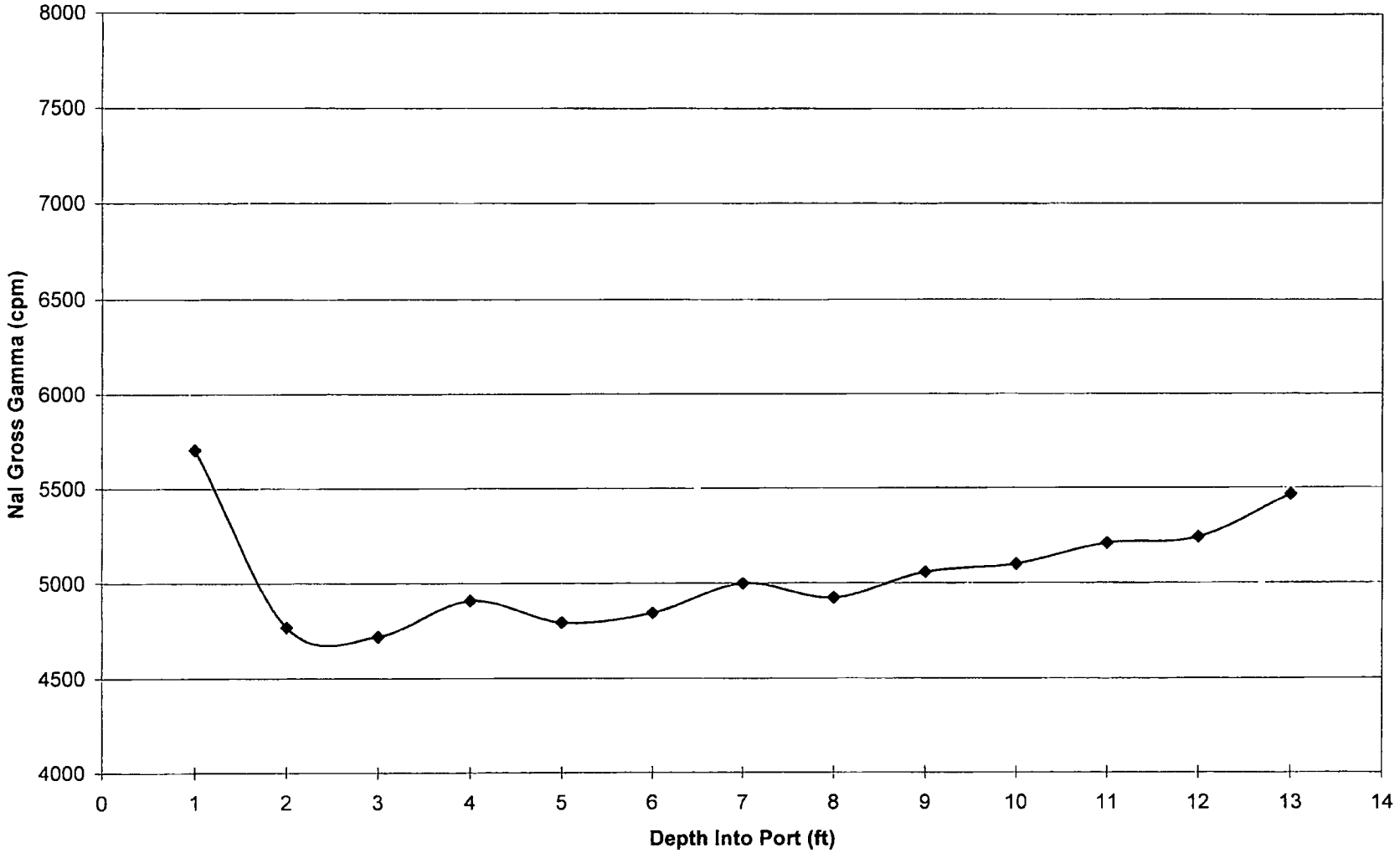
Surveyed: 05-17-2007

FNR Storage Port #28: NaI Gross Gamma vs Depth



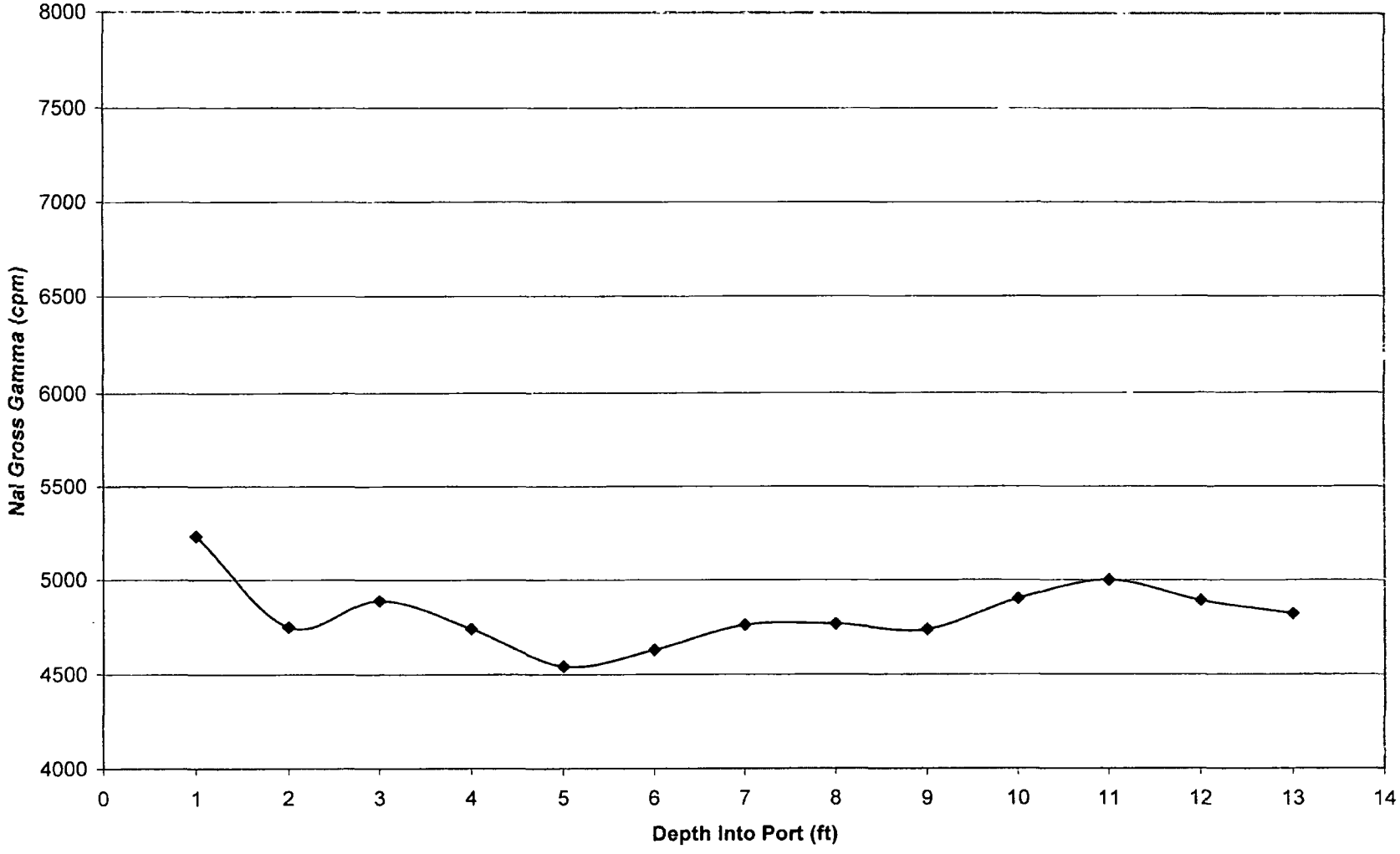
Surveyed: 05-17-2007

FNR Storage Port #29: NaI Gross Gamma vs Depth



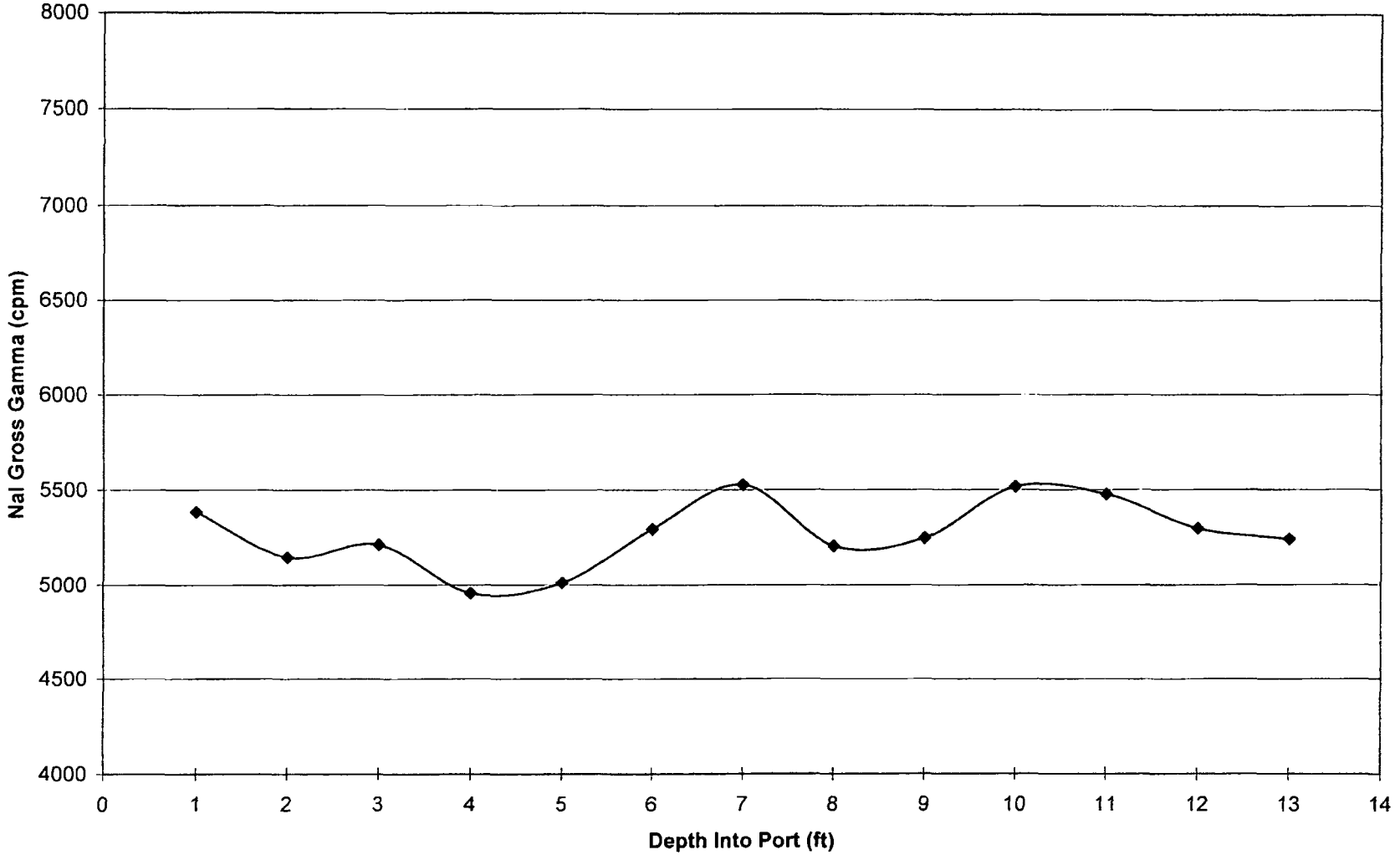
Surveyed: 05-17-2007

FNR Storage Port #30: NaI Gross Gamma vs Depth



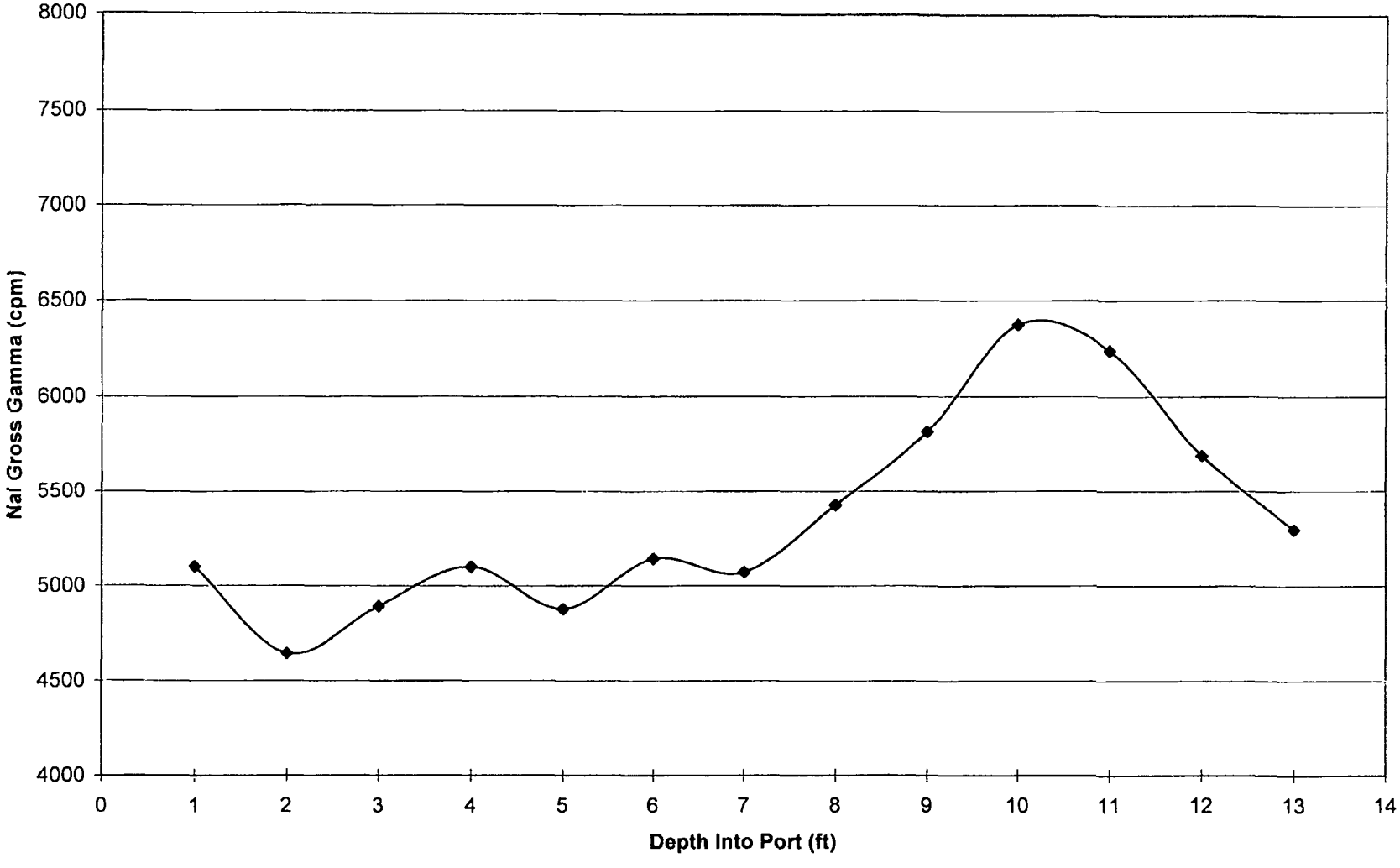
Surveyed: 05-17-2007

FNR Storage Port #31: NaI Gross Gamma vs Depth



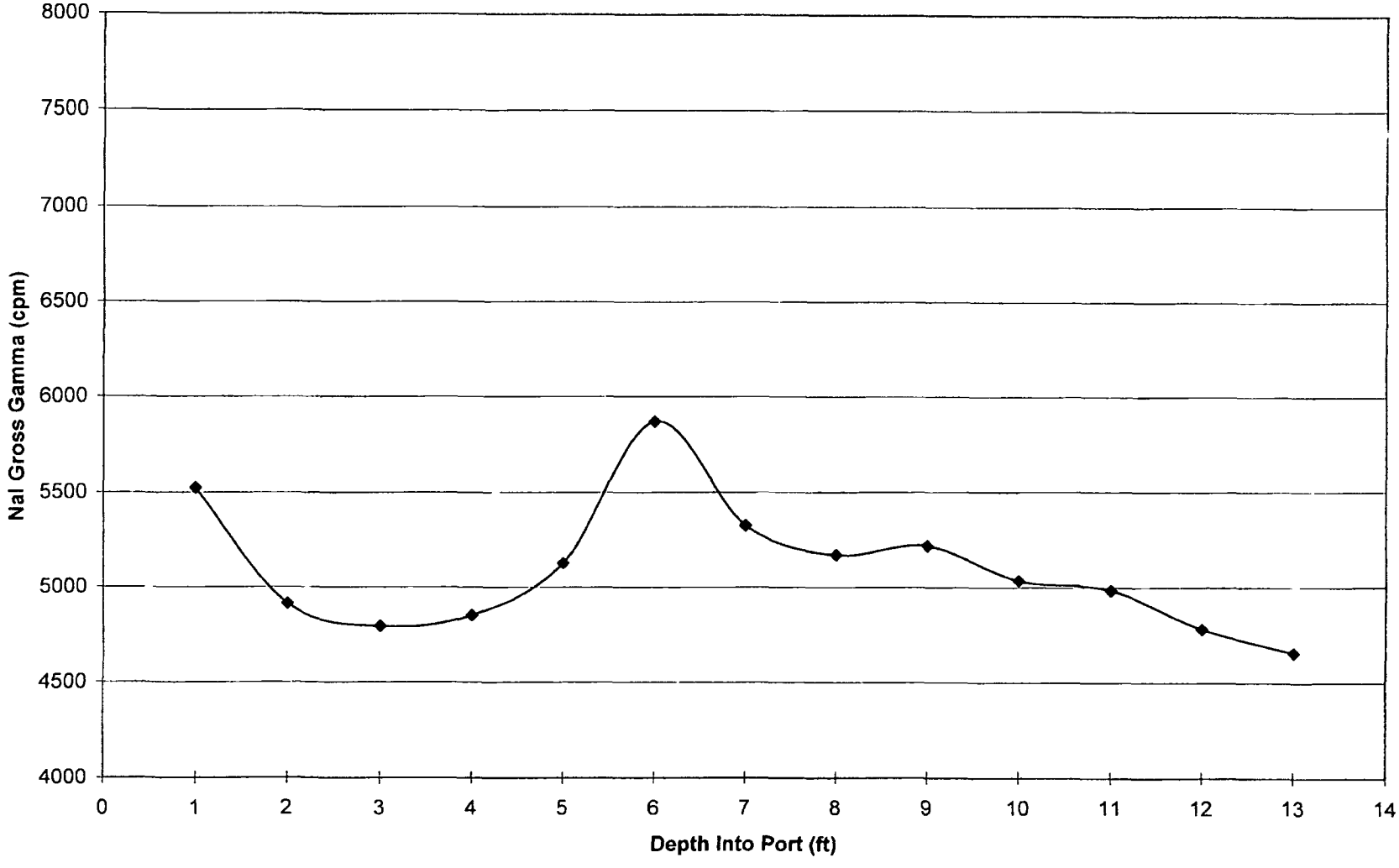
Surveyed: 05-17-2007

FNR Storage Port #32: NaI Gross Gamma vs Depth



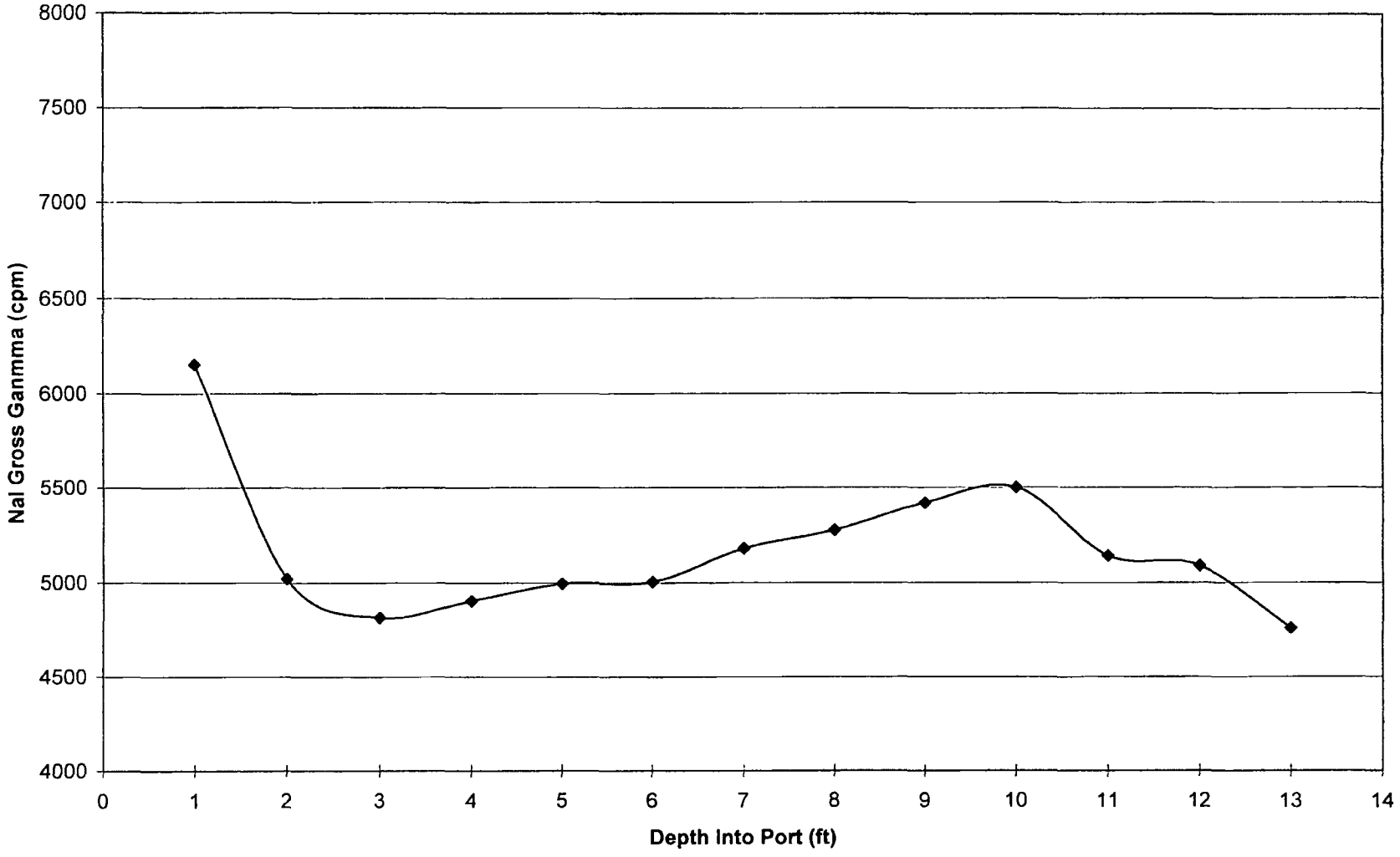
Surveyed: 05-17-2007

FNR Storage Port #33: NaI Gross Gamma vs Depth



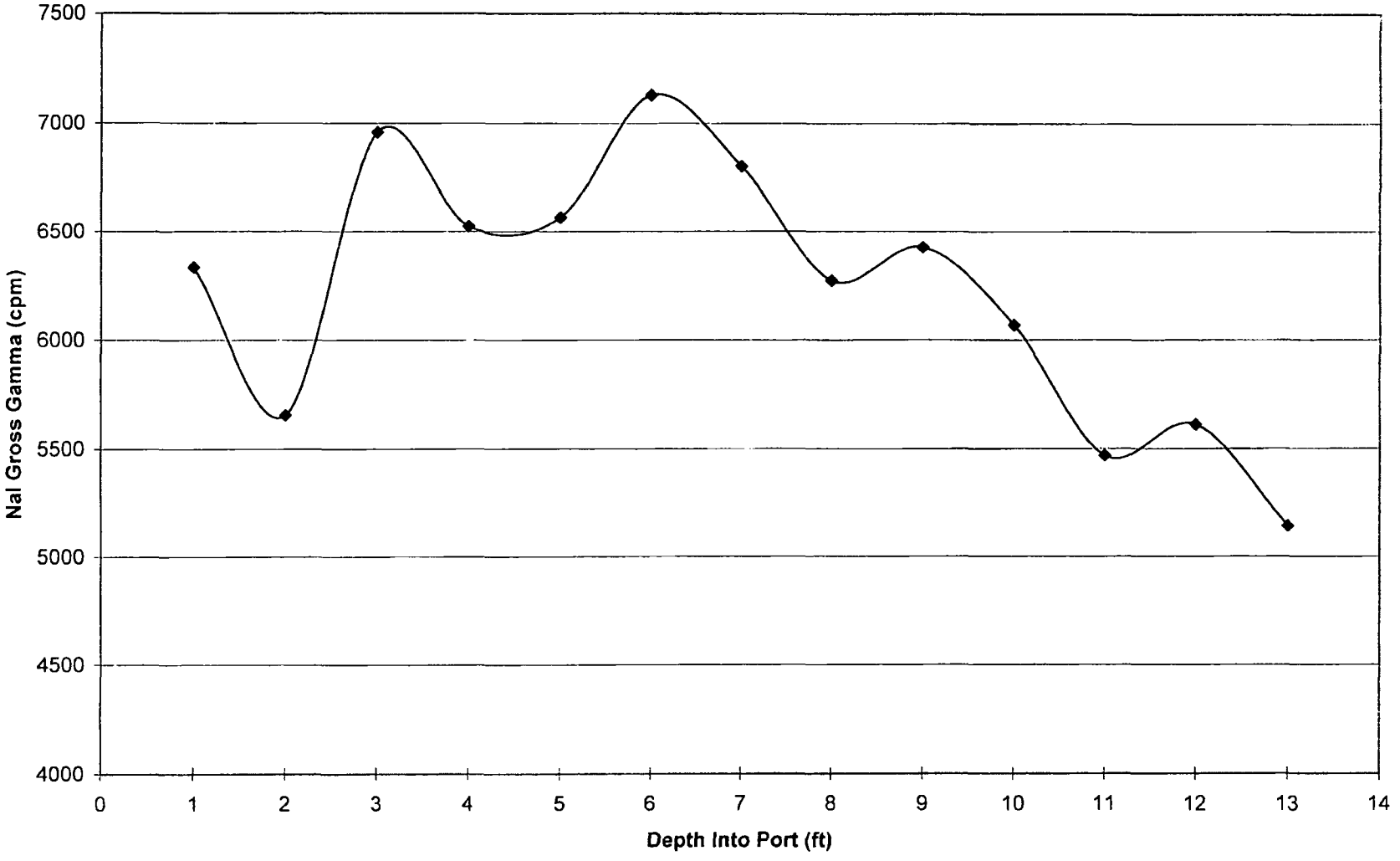
Surveyed: 05-17-2007

FNR Storage Port #34: NaI Gross Gamma vs Depth



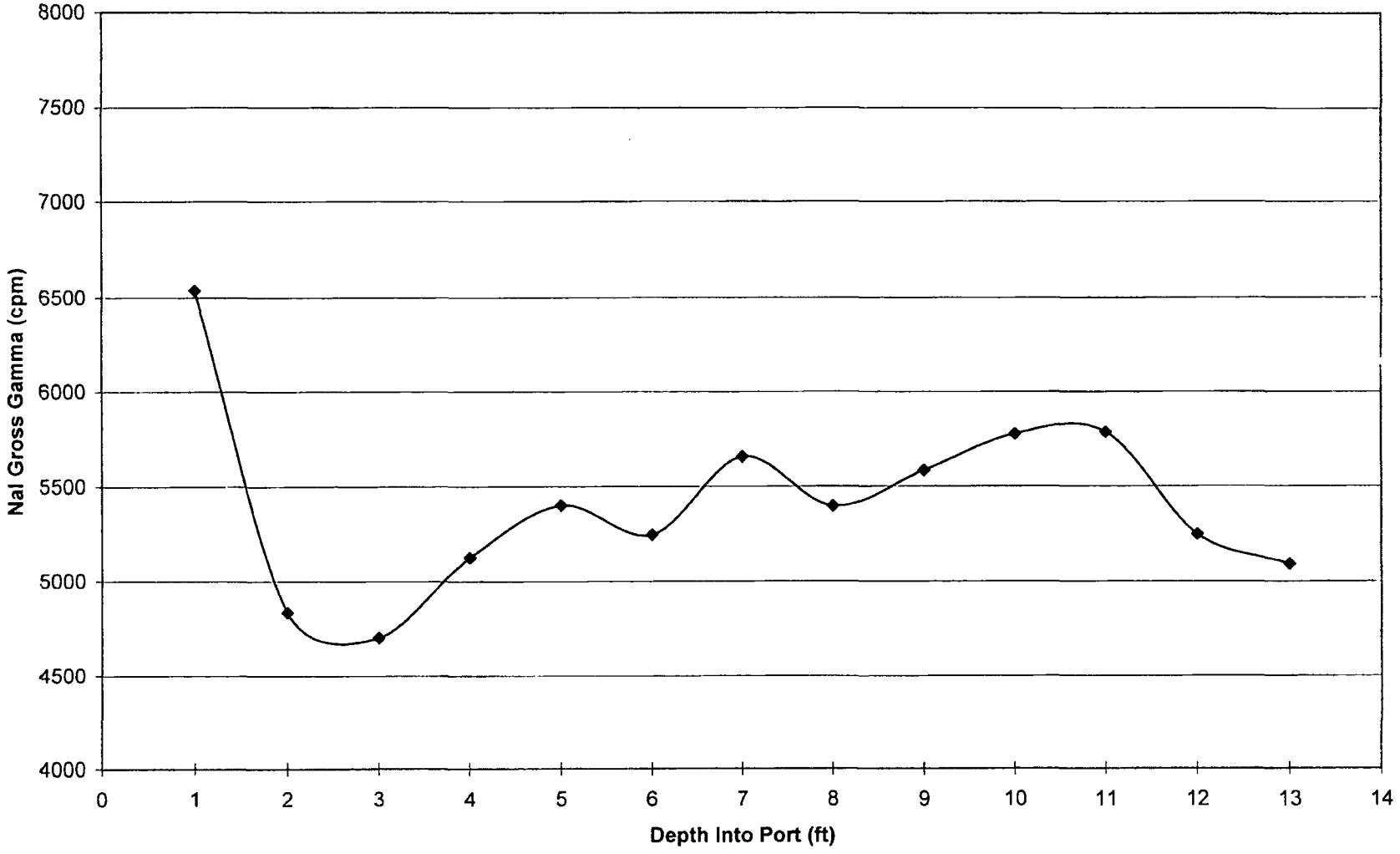
Surveyed: 05-17-2007

FNR Storage Port #35: NaI Gross Gamma vs Depth



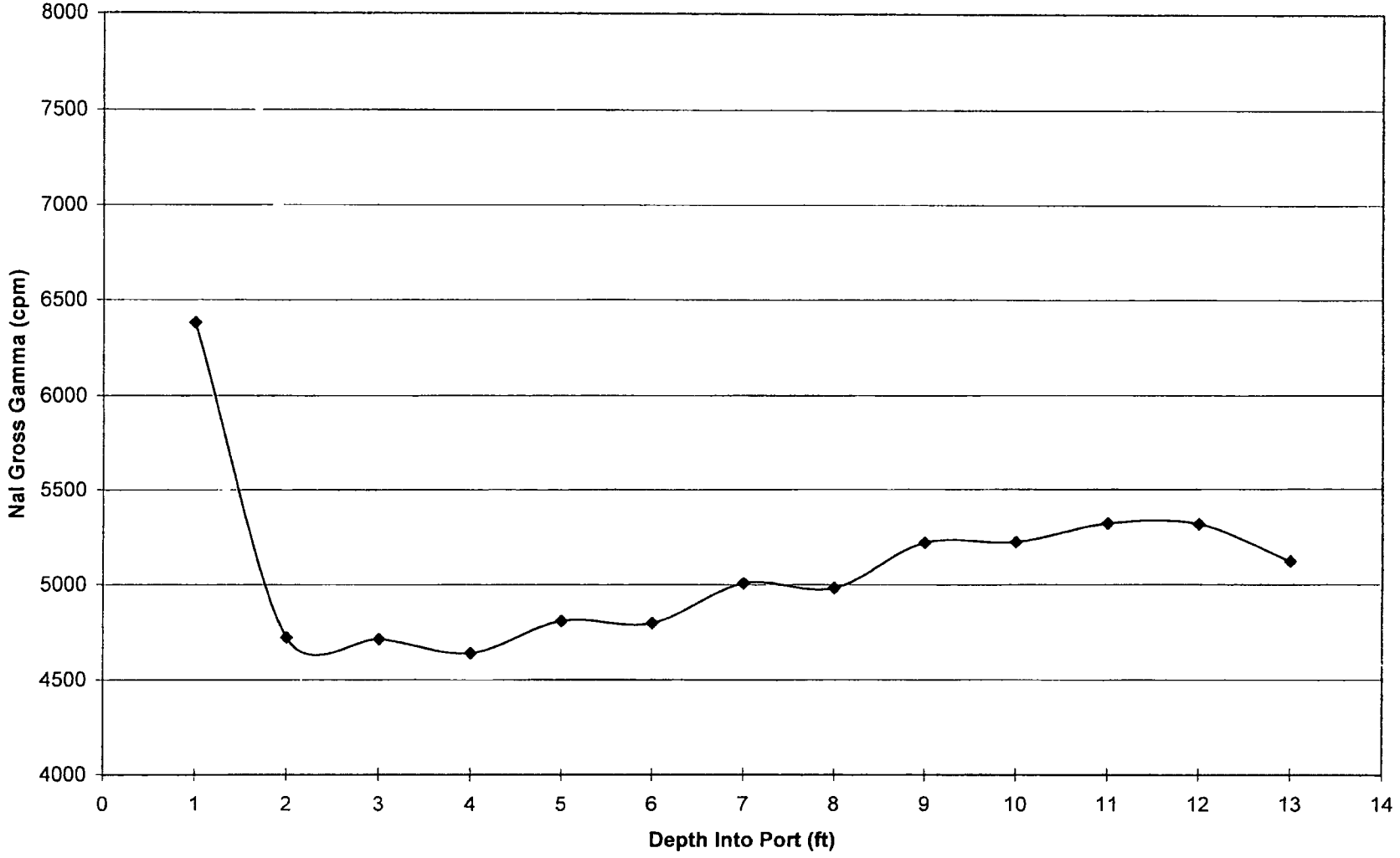
Surveyed: 05-17-2007

FNR Storage Port #36: NaI Gross Gamma vs Depth



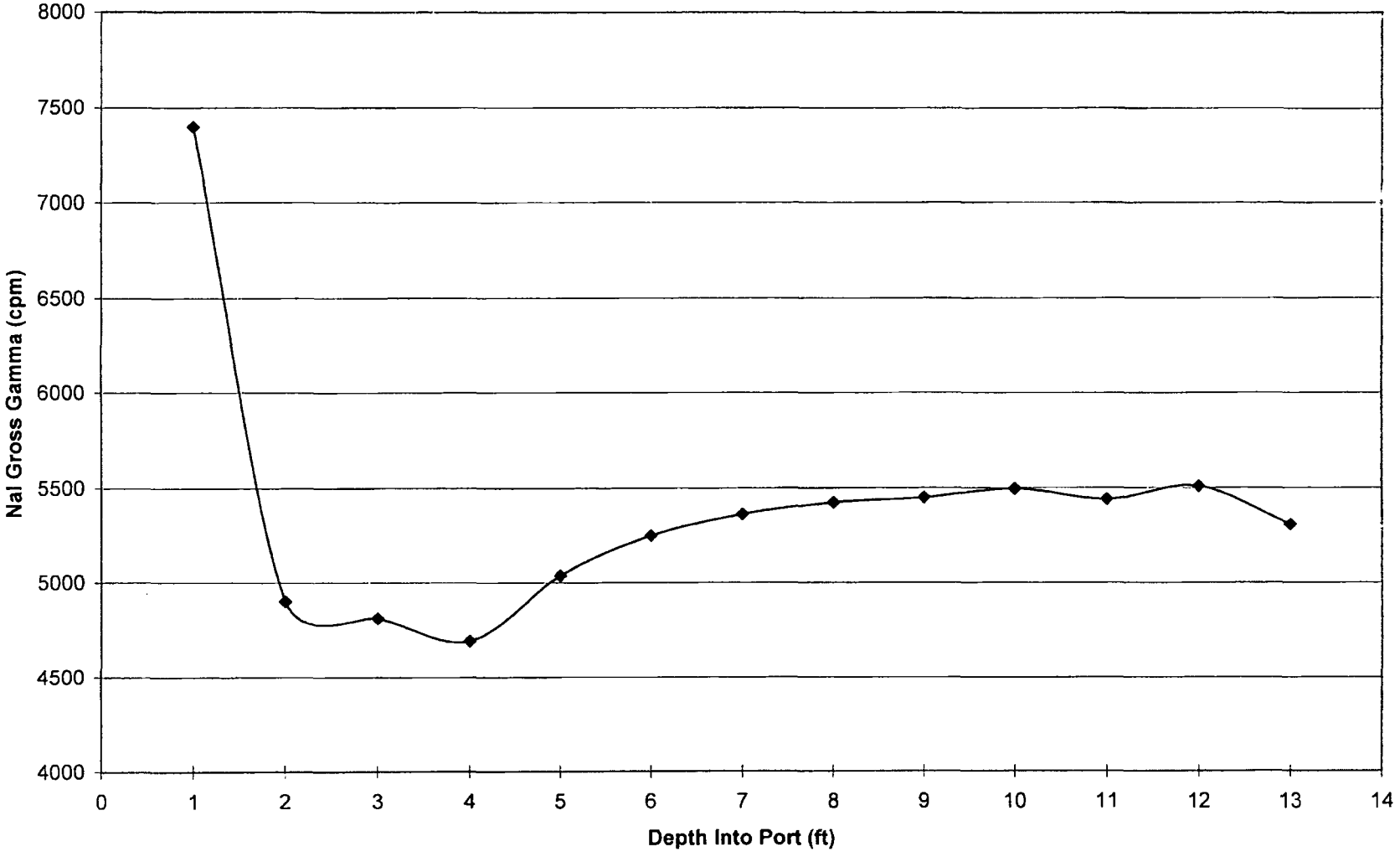
Surveyed: 05-17-2007

FNR Storage Port #37: NaI Gross Gamma vs Depth



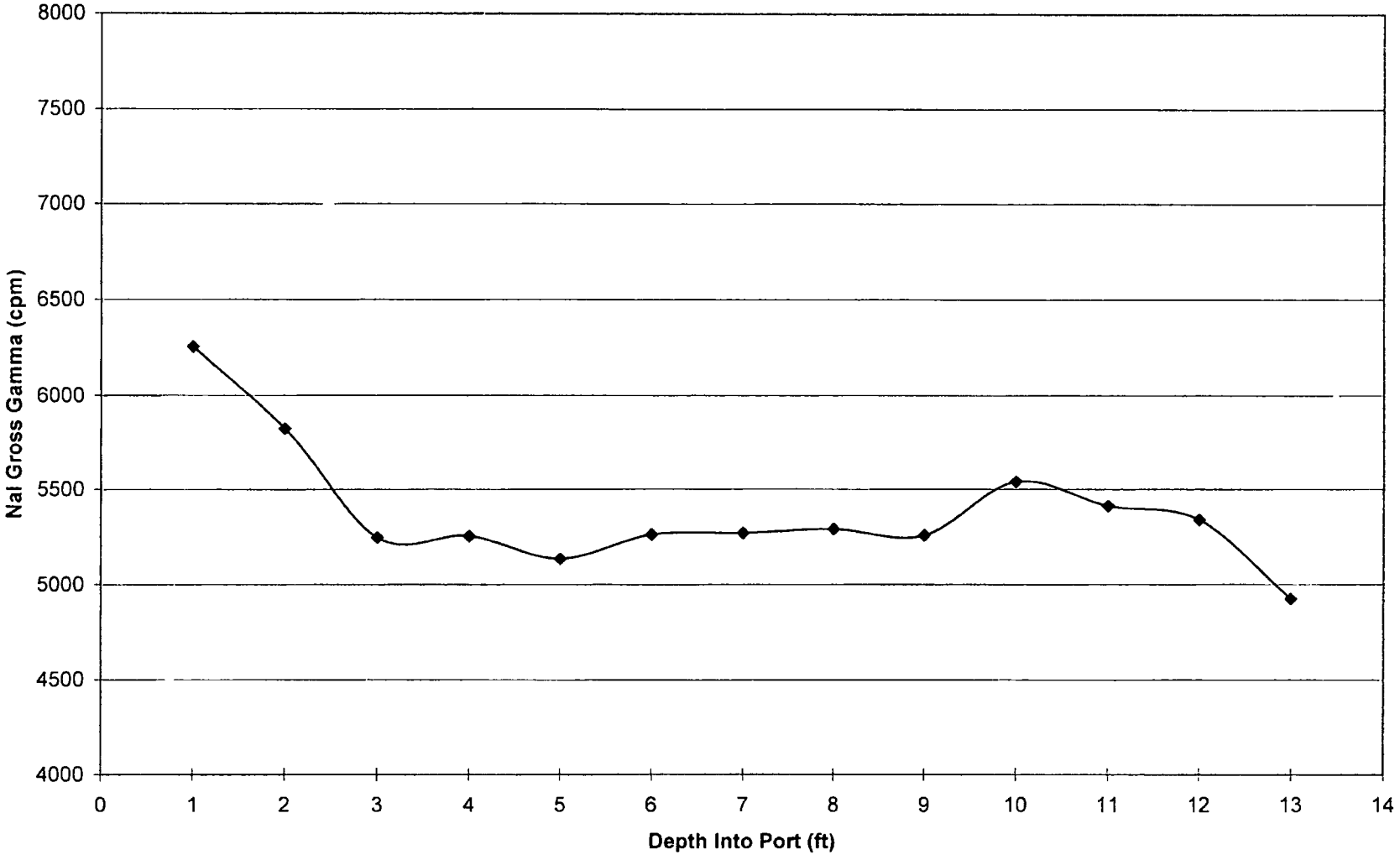
Surveyed: 05-18-2007

FNR Storage Port #38: NaI Gross Gamma vs Depth



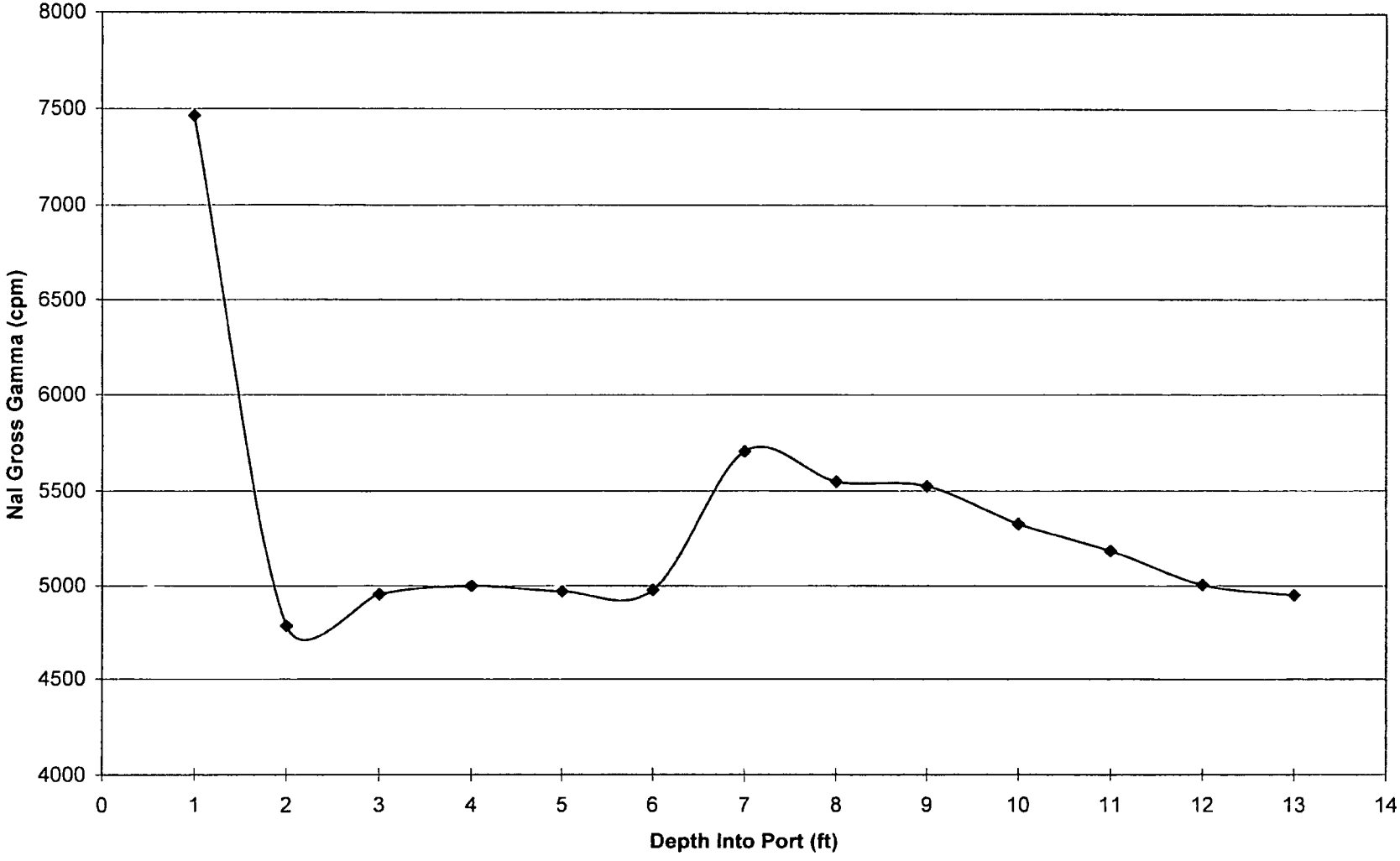
Surveyed: 05-17-2007

FNR Storage Port #39: NaI Gross Gamma vs Depth



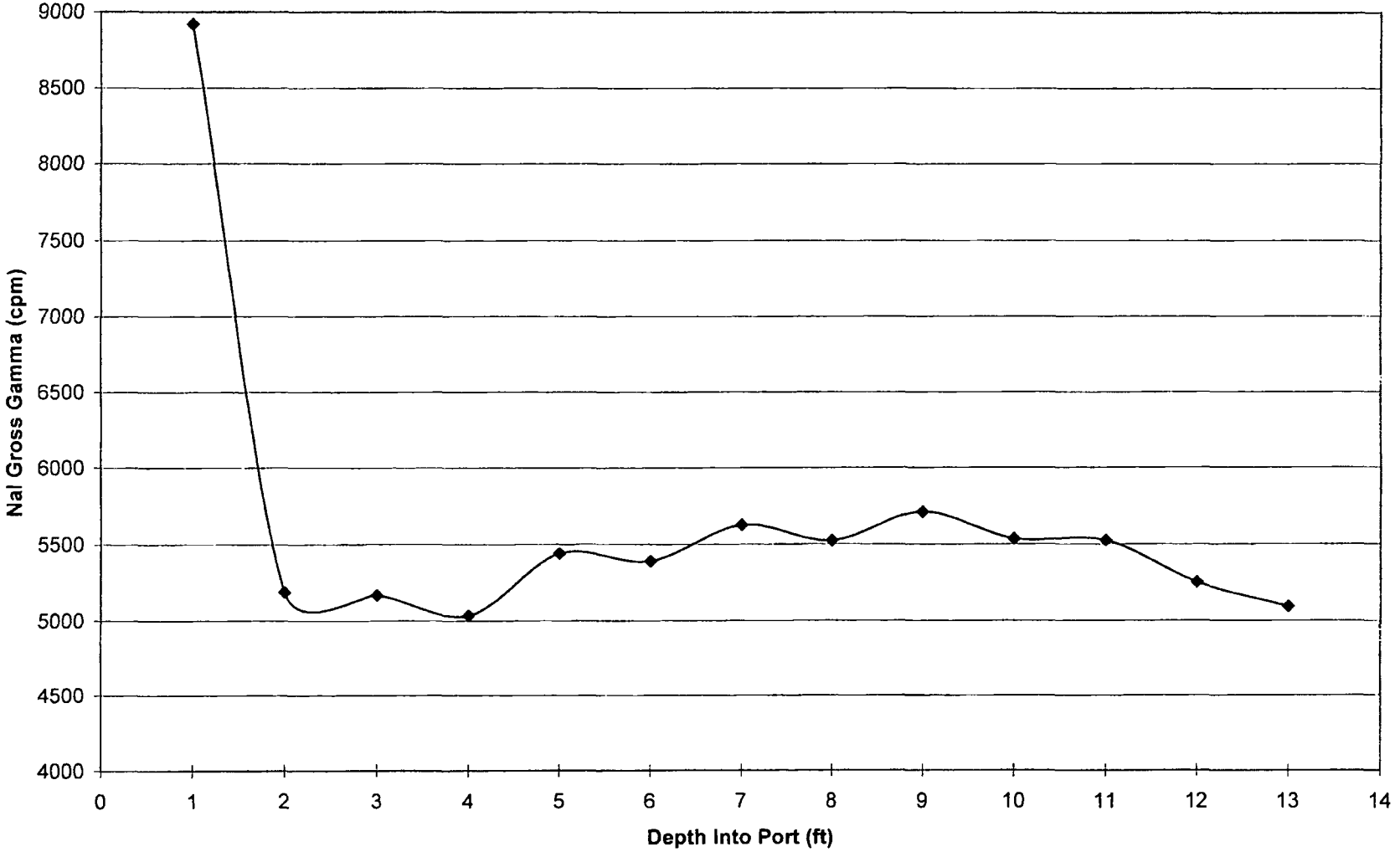
Surveyed: 05-18-2007

FNR Storage Port #40: NaI Gross Gamma vs Depth



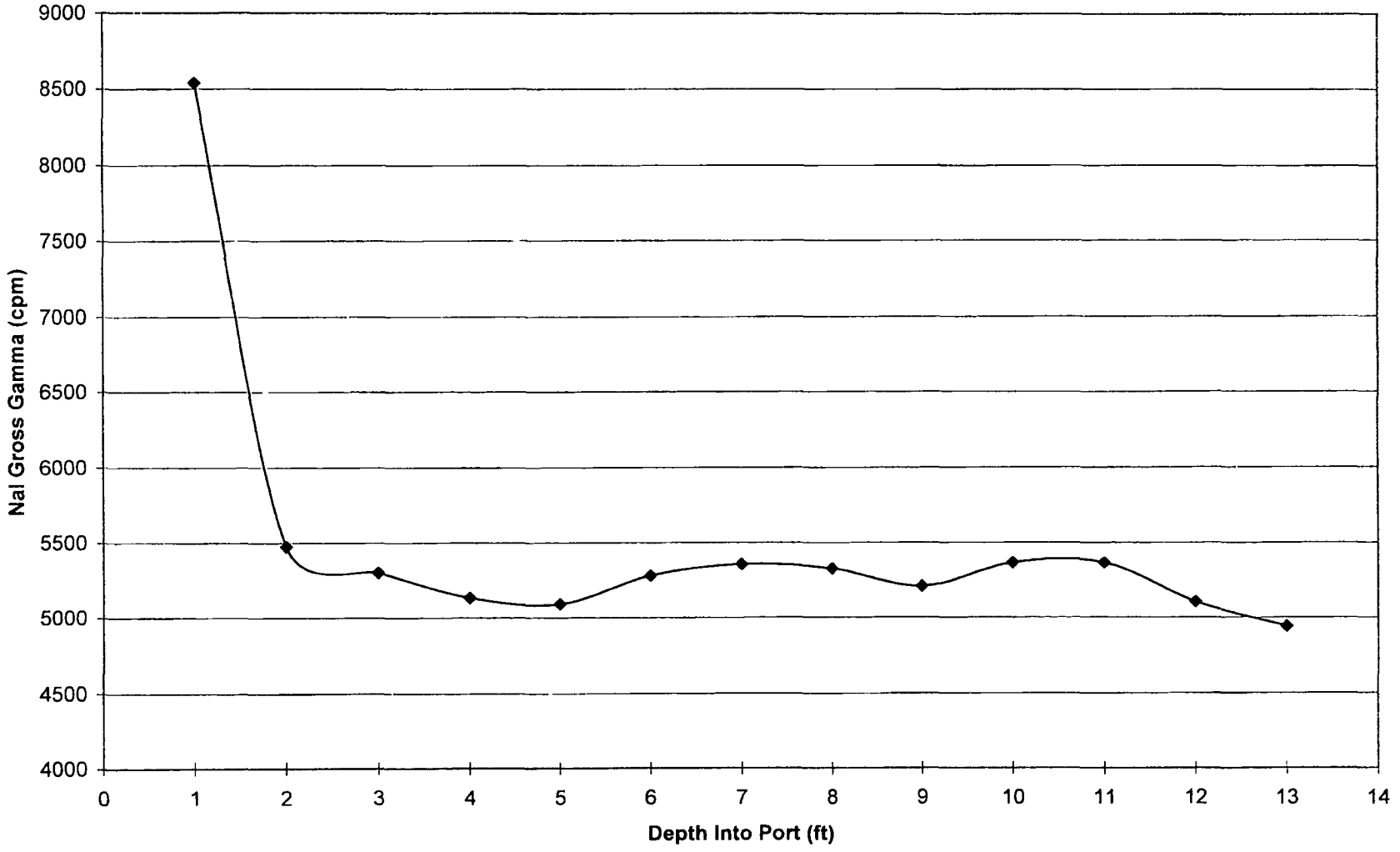
Surveyed: 05-18-2007

FNR Storage Port #41: NaI Gross Gamma vs Depth



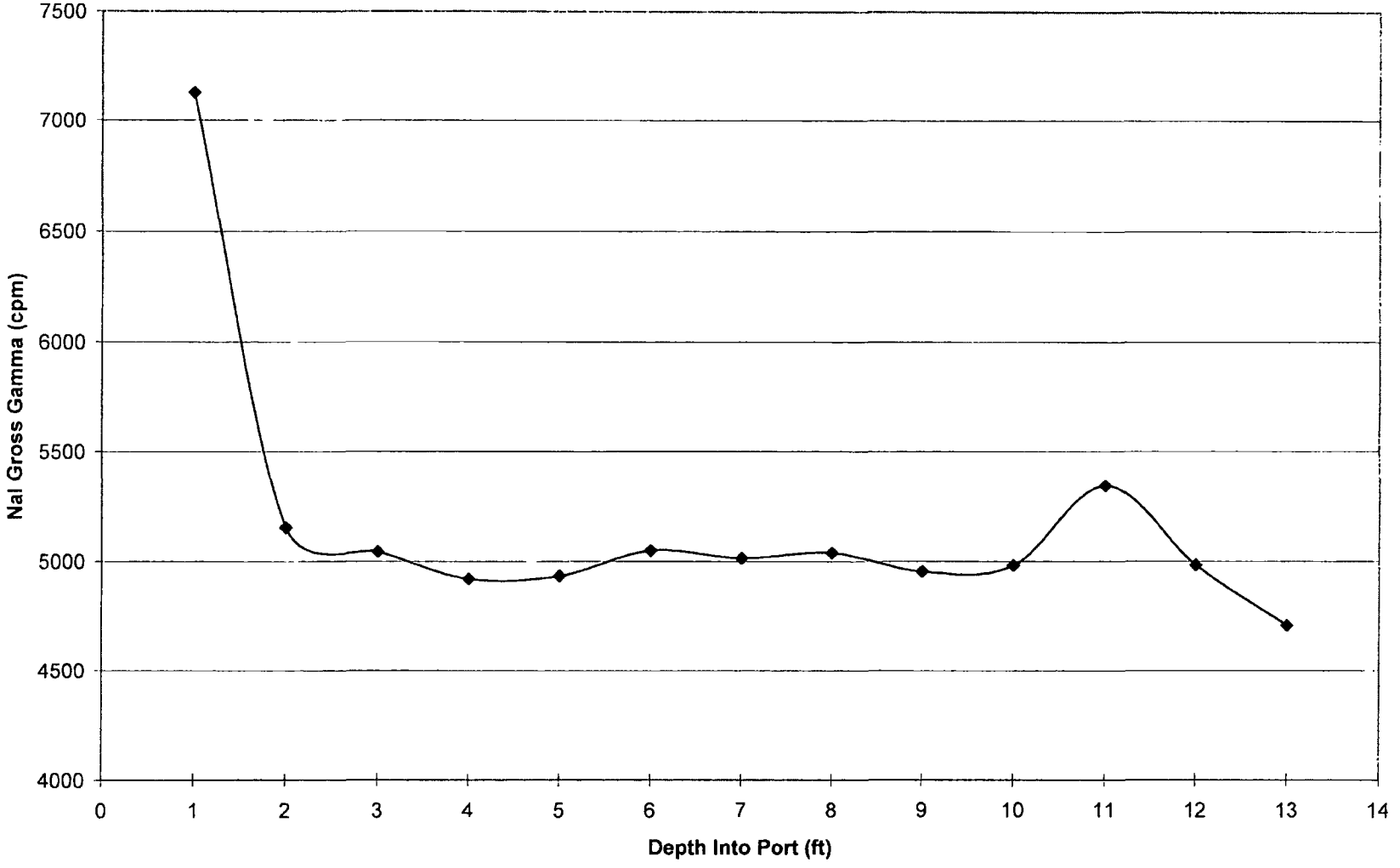
Surveyed: 05-18-2007

FNR Storage Port #42: NaI Gross Gamma vs Depth



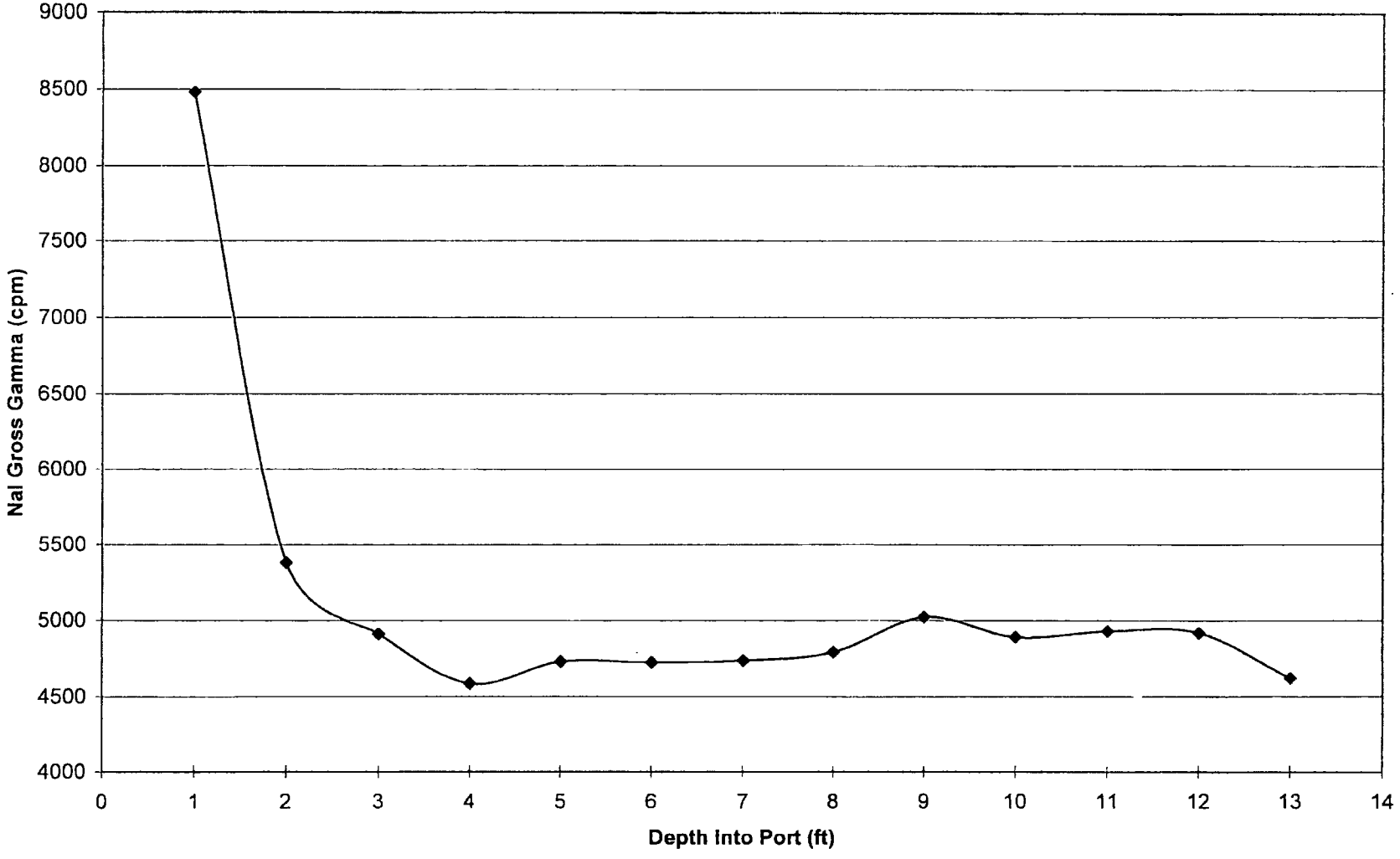
Surveyed: 05-18-2007

FNR Storage Port #43: NaI Gross Gamma vs Depth



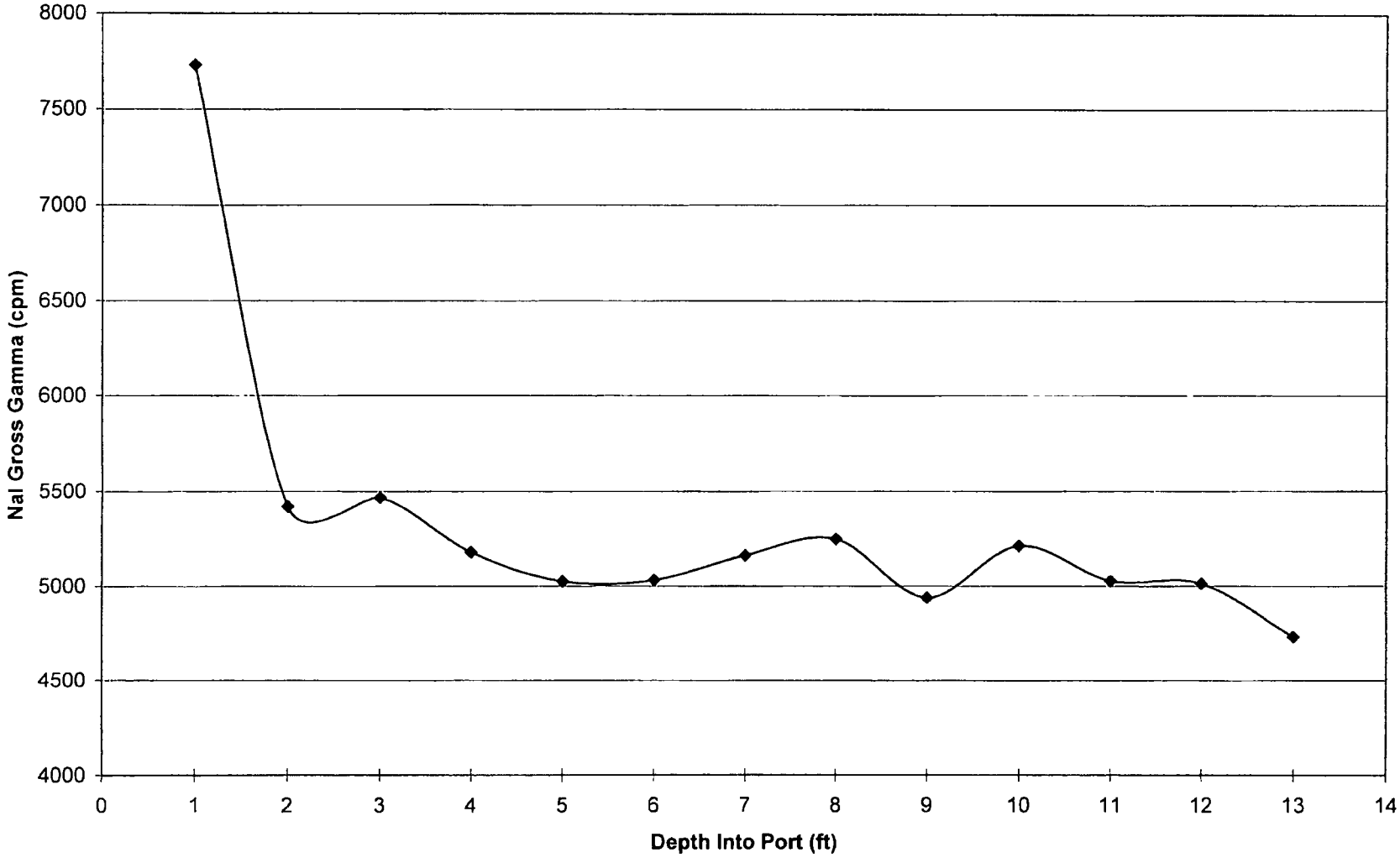
Surveyed: 05-21-2007

FNR Storage Port #44: NaI Gross Gamma vs Depth



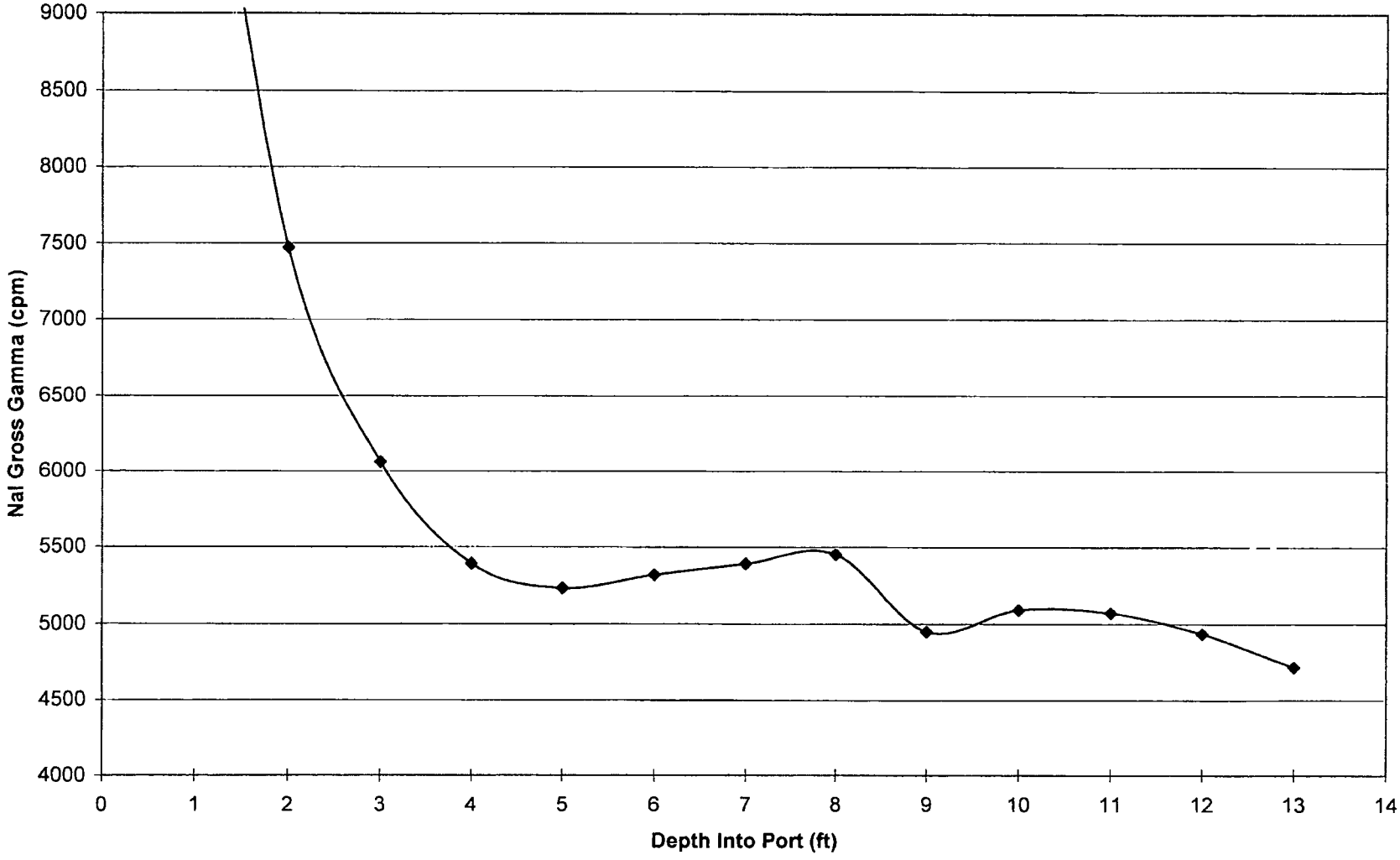
Surveyed: 05-21-2007

FNR Storage Port #45: NaI Gross Gamma vs Depth



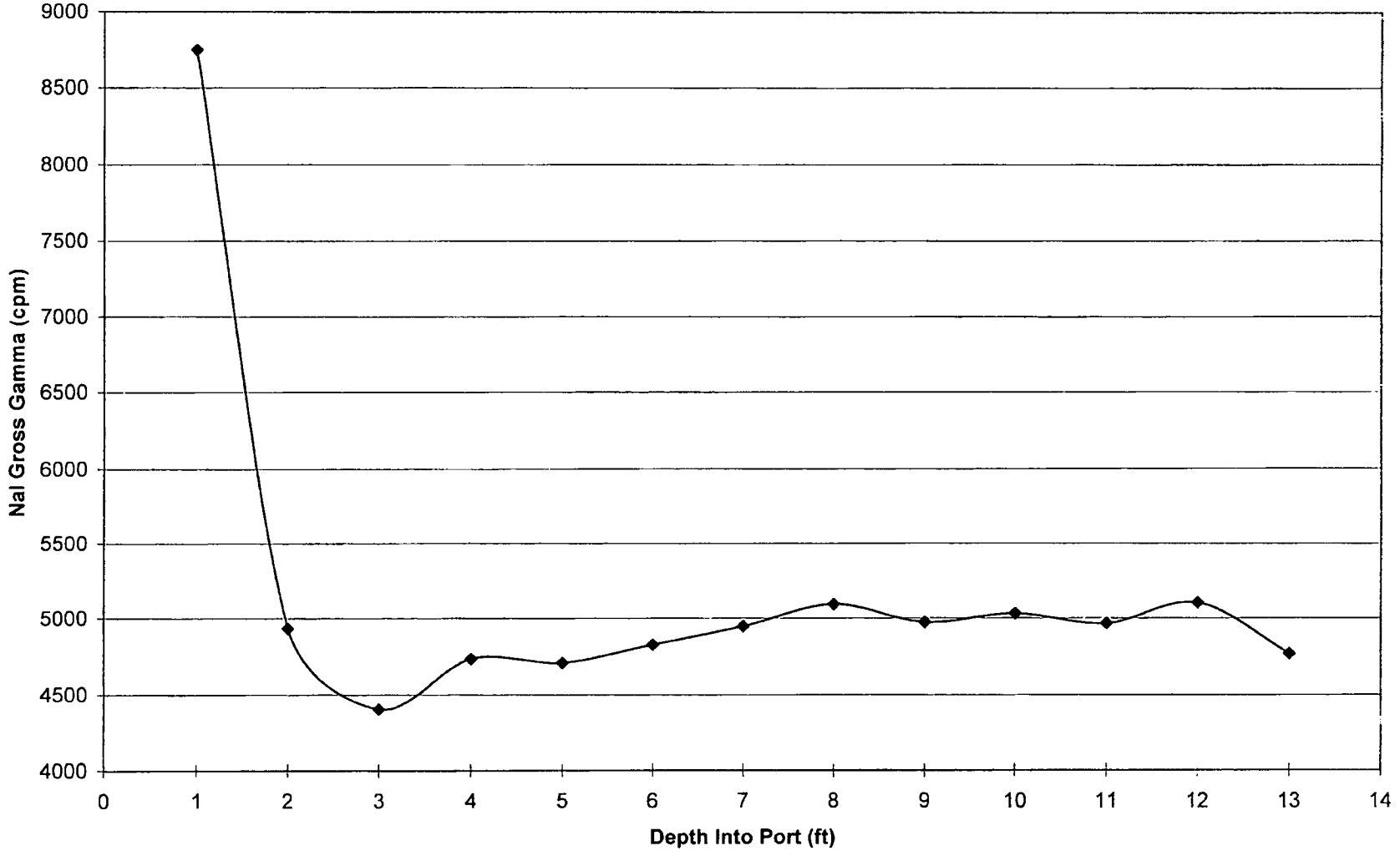
Surveyed: 05-21-2007

FNR Storage Port #46: NaI Gross Gamma vs Depth



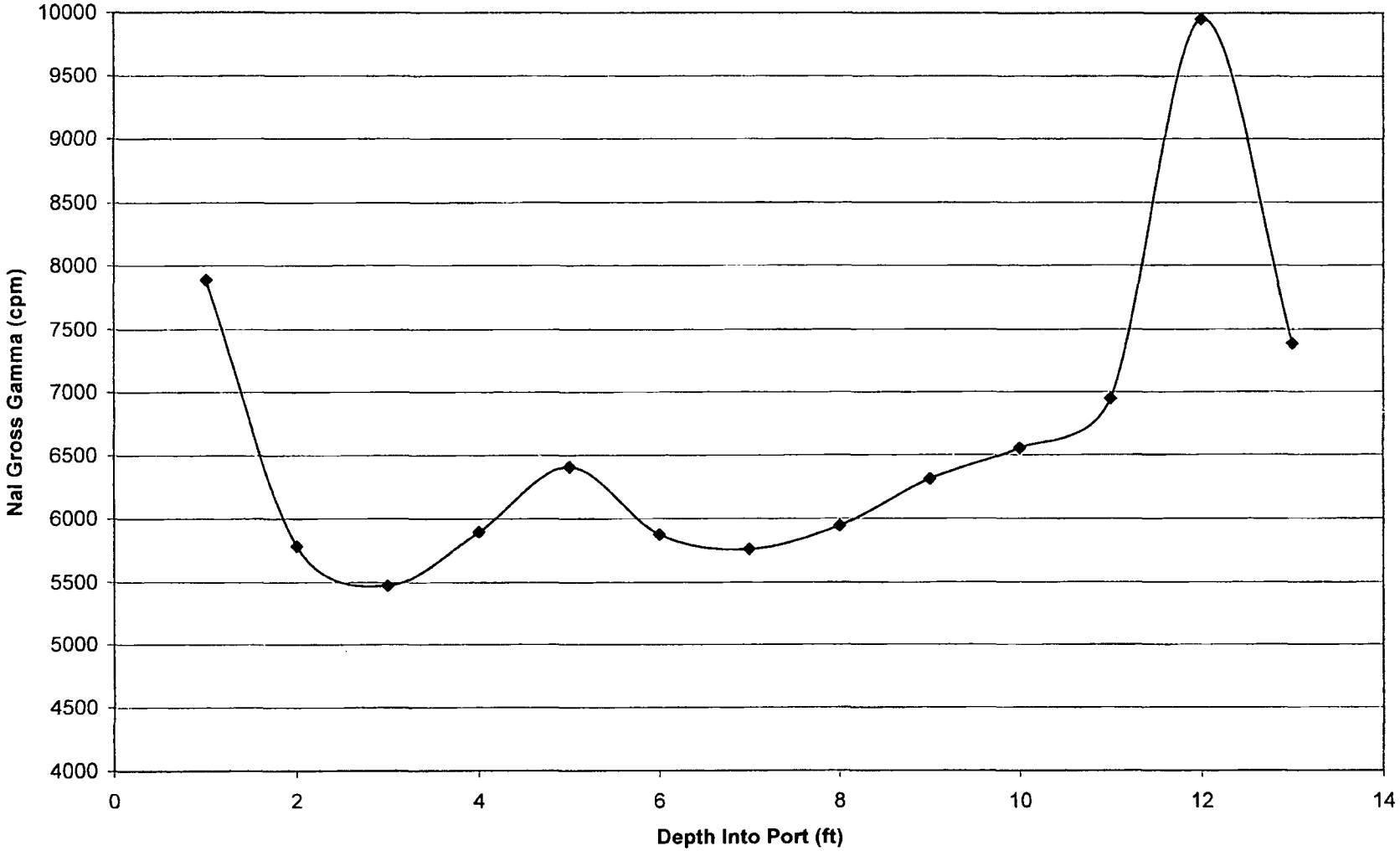
Surveyed: 05-21-2007

FNR Storage Port #47: NaI Gross Gamma vs Depth



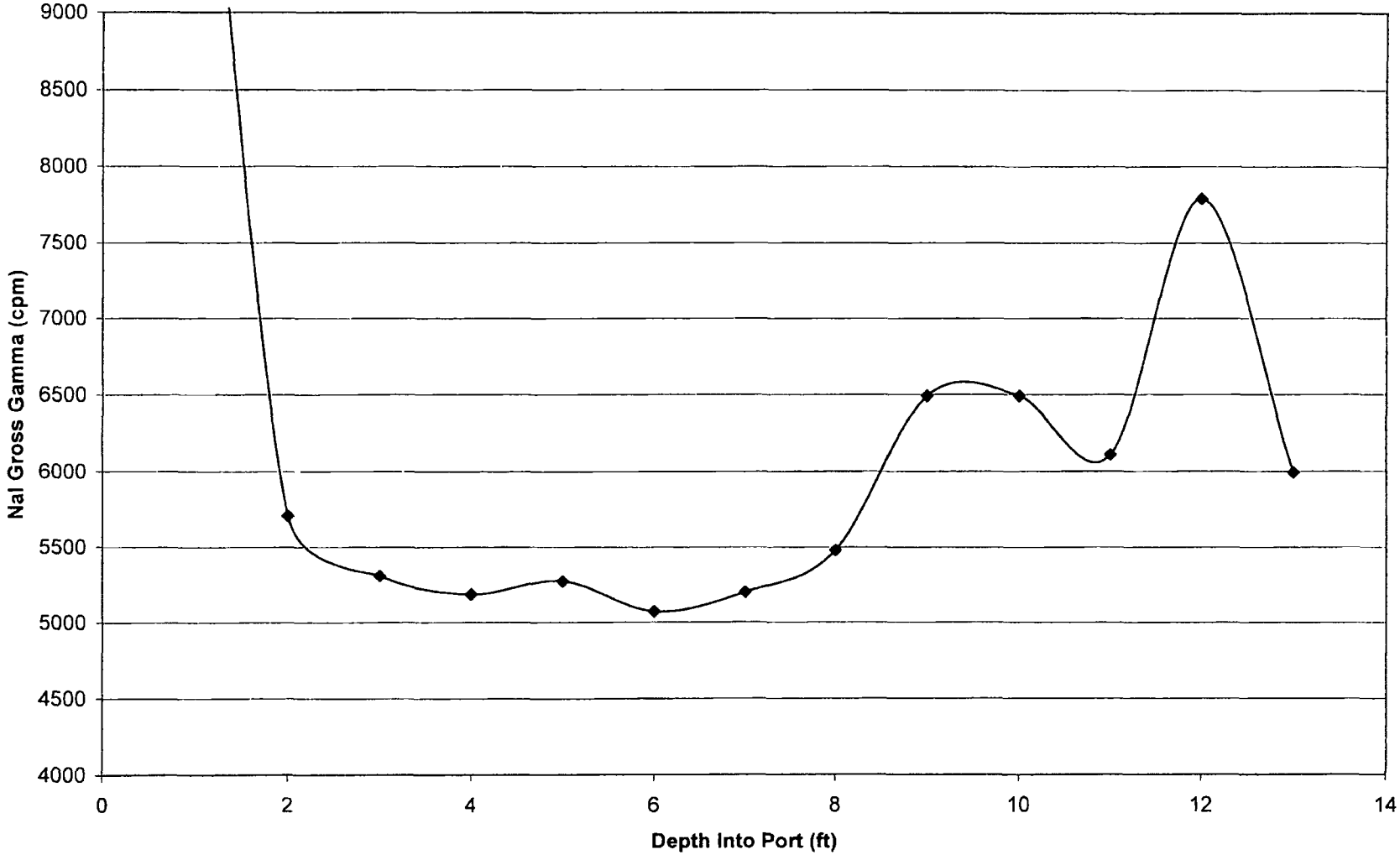
Surveyed: 05-21-2007

FNR Storage Port #48: NaI Gross Gamma vs Depth



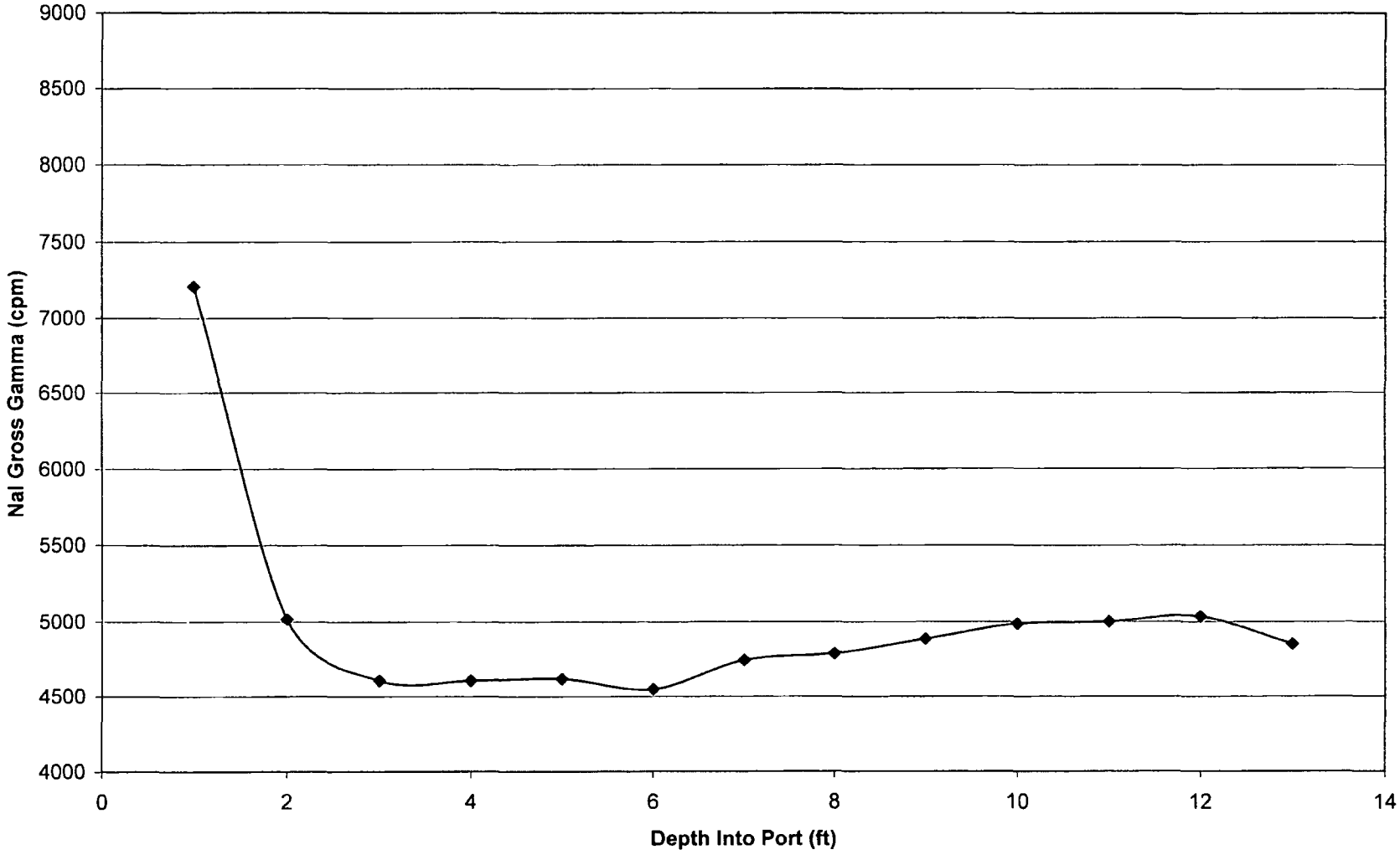
Surveyed: 05-21-2007

FNR Storage Port #49: NaI Gross Gamma vs Depth



Surveyed: 05-21-2007

FNR Storage Port #50: NaI Gross Gamma vs Depth



Surveyed: 05-21-2007

Appendix B

Analytical Data for Activated Soil Characterization around Storage Port No. 1

****
***** G A M M A S E C T R U M A N A L Y S *****
****

Filename: C:\Soil\2008-11-06-01\2008-11-06-01N_100000_2008Nov10.CNF

Report Generated On	:	12/17/2008 6:07:55 PM
Sample Title	:	Soil Background - Storage Port Fill
Sample Description	:	500 ml nalgene
Sample Identification	:	UM-2008-11-06-01
Sample Type	:	soil
Sample Geometry	:	500 ml Nalgene
Peak Locate Threshold	:	3.00
Peak Locate Range (in channels)	:	1 - 8192
Peak Area Range (in channels)	:	5 - 8192
Identification Energy Tolerance	:	1.000 keV
Sample Size	:	1.000E+003 g
Sample Taken On	:	9/1/2008 11:45:00 PM
Acquisition Started	:	11/10/2008 9:07:01 AM
Live Time	:	100000.0 seconds
Real Time	:	100100.3 seconds
Dead Time	:	0.10 %

Energy Calibration Used Done On : 12/17/2008

****
**** NUCLIDE MDA REPORT *****
****

Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: Soil Background - Storage Port Fill
Nuclide Library Used: C:\GENIE2K\CAMFILES\LIbraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	Pb x-ray	72.80	61.00	1.7312E-008	1.73E-008	-6.8954E-009
		75.00*	100.00	1.8854E-008		4.9930E-008
		84.90*	36.00	2.1462E-008		1.8456E-008
		87.60*	10.00	9.0358E-008		2.1696E-007
	BE-7	477.59	10.42	2.8147E-007	2.81E-007	2.8645E-008
+	K-40	1460.75*	10.67	2.0949E-007	2.09E-007	8.9679E-006
	MN-54	834.83	99.98	1.7669E-008	1.77E-008	-4.3999E-009
	CO-60	1173.24	99.90	2.0256E-008	1.76E-008	8.3258E-009
		1332.50	99.98	1.7643E-008		1.5454E-008
	ZN-65	511.00	2.83	7.5535E-007	5.71E-008	-7.9533E-008
		1115.55	50.70	5.7140E-008		-4.0718E-009
	NB-94x	702.62	97.90	1.4098E-008	1.41E-008	3.1511E-009
		871.09	99.90	1.4750E-008		5.3043E-009
	AG-108m	79.13	6.60	1.6780E-007	1.30E-008	1.6613E-008
		433.94	90.50	1.3046E-008		8.7054E-009
		614.28	89.80	2.5348E-008		2.2054E-010
		722.94	90.80	1.6153E-008		4.0493E-009
+	CD-109	88.03*	3.61	2.7407E-007	2.74E-007	6.5808E-007
	AG-110m	446.81	3.75	3.6686E-007	1.64E-008	1.5427E-007
		620.36	2.81	5.4534E-007		-1.1882E-007
		657.76	94.60	1.6445E-008		6.0295E-010
		677.62	10.35	1.4631E-007		-6.8294E-008
		687.02	6.44	2.4955E-007		4.0062E-008
		706.68	16.44	1.0337E-007		8.7489E-008
		744.28	4.73	3.6893E-007		1.4310E-007
		763.94	22.29	8.8737E-008		1.8806E-008
		818.03	7.34	2.3929E-007		6.7159E-009
		884.68	72.70	2.4825E-008		-2.5776E-010
		937.49	34.36	5.7360E-008		-8.6489E-009
		1384.30	24.28	8.1767E-008		4.3171E-008
		1475.79	3.99	3.6941E-007		1.1523E-007
		1505.04	13.04	1.3429E-007		-8.3139E-008
		1562.30	1.03	1.4606E-006		4.8391E-007
	SB-125	176.33	6.79	1.5043E-007	4.02E-008	-7.9700E-008
		380.43	1.52	7.5359E-007		3.8838E-008
		427.89	29.40	4.0236E-008		-1.7034E-008
		463.38	10.45	1.2215E-007		1.6248E-007
		600.56	17.78	7.5604E-008		6.5278E-008
		606.64	5.02	5.0997E-007		-5.8991E-008
		635.90	11.32	1.1386E-007		2.8665E-010
		671.41	1.80	7.5226E-007		-1.3293E-007
	BA-133	53.16	2.20	3.7734E-007	2.73E-008	1.7622E-007

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
BA-133	79.62	2.62	4.2479E-007	2.73E-008	-1.9400E-009
	81.00	34.10	2.7340E-008		-1.1400E-008
	160.61	0.64	1.4401E-006		7.0942E-007
	223.23	0.45	2.2985E-006		7.5210E-007
	276.40	7.16	1.4778E-007		3.9165E-008
	302.85	18.33	5.7083E-008		3.8433E-010
	356.02	62.05	2.8064E-008		-2.7673E-008
	383.85	8.94	1.2801E-007		6.5646E-008
CS-134	475.35	1.46	8.5311E-007	1.90E-008	-2.8470E-007
	563.23	8.38	1.5525E-007		-7.4280E-011
	569.32	15.43	8.5974E-008		8.6071E-009
	604.70	97.60	2.0763E-008		-3.0739E-009
	795.84	85.40	1.9032E-008		2.3069E-008
	801.93	8.73	1.7546E-007		-7.2547E-008
	1038.57	1.00	1.8112E-006		-4.1042E-007
	1167.94	1.80	1.1535E-006		1.0394E-006
	1365.15	3.04	4.9918E-007		3.8692E-007
CS-137	661.66	85.21	1.6079E-008	1.61E-008	7.4697E-009
EU-152x	121.78	28.40	2.8786E-008	2.88E-008	1.0174E-009
	244.70	7.49	1.5999E-007		2.0757E-009
	344.28	26.60	4.1085E-008		-6.0935E-009
	411.11	2.23	5.2242E-007		-1.2062E-007
	443.98	2.78	4.1100E-007		-1.3841E-007
	778.90	12.96	1.1246E-007		-8.9233E-009
	867.39	4.15	3.6246E-007		5.2208E-008
	964.13	14.34	1.3505E-007		-3.9789E-008
	1085.91	9.92	1.7523E-007		-9.4027E-009
	1089.70	1.71	1.0295E-006		3.0797E-007
	1112.12	13.55	1.3612E-007		1.8966E-008
	1212.95	1.40	1.5750E-006		-7.2865E-007
	1299.12	1.63	1.0407E-006		1.3197E-007
	1408.01	20.87	7.8480E-008		1.0402E-007
EU-154	123.07	40.40	2.0536E-008	2.05E-008	1.1116E-009
	188.25	0.23	4.9960E-006		-9.2005E-007
	247.93	6.83	1.4678E-007		-9.6790E-009
	401.30	0.19	6.0017E-006		-9.1079E-007
	444.39	0.55	2.0762E-006		-1.0161E-006
	478.26	0.21	5.7388E-006		9.3377E-007
	557.56	0.25	4.7266E-006		-2.3068E-006
	582.00	0.89	1.9537E-006		1.0025E-005
	591.76	4.91	2.4453E-007		-2.3015E-007
	625.22	0.32	3.9055E-006		-1.6843E-006
	676.59	0.14	9.2642E-006		-4.9429E-006
	692.42	1.78	7.6497E-007		-5.9129E-008
	715.76	0.17	7.7322E-006		-5.2589E-006
	722.30	20.00	7.0082E-008		-2.3892E-008
	756.86	4.50	3.2676E-007		-7.5369E-009
	815.55	0.50	2.8984E-006		-1.7062E-006
	845.39	0.58	2.5718E-006		-1.4378E-006
	850.64	0.23	6.3928E-006		-2.7820E-006
	873.20	12.09	1.2349E-007		2.7098E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	3.0741E-006	2.05E-008	-1.2778E-007
		904.05	0.85	1.8100E-006		1.5800E-007
		996.30	10.34	1.5704E-007		-1.1905E-008
		1004.76	17.90	9.7292E-008		1.2028E-007
		1128.40	0.29	6.3588E-006		-3.5137E-006
		1140.90	0.22	8.5255E-006		-6.8257E-007
		1241.60	0.13	1.9085E-005		-9.0839E-006
		1246.60	0.80	2.5117E-006		-3.5308E-006
		1274.51	34.40	5.2824E-008		-6.9981E-008
		1494.08	0.71	1.8543E-006		-7.9253E-007
		1596.45	1.80	7.7621E-007		-7.5055E-008
+	TL-208B	72.80	2.02	5.2279E-007	1.79E-008	-2.0823E-007
		74.97*	3.41	5.5290E-007		1.4642E-006
		84.90*	1.51	5.1168E-007		4.4002E-007
		277.36*	6.31	1.2898E-007		7.9916E-008
		510.77*	22.60	1.1666E-007		1.3365E-007
		583.19*	84.50	1.8279E-008		7.9848E-008
		763.13	1.81	8.7109E-007		-5.9783E-008
		860.56*	12.42	1.5089E-007		1.1443E-007
		2614.53*	99.16	1.7922E-008		9.1687E-008
+	Pb-210	46.52*	4.05	2.3910E-007	2.39E-007	3.8653E-007
+	PB-212B	74.81*	10.50	1.7956E-007	4.76E-008	4.7552E-007
		77.11*	17.60	1.0722E-007		4.5689E-007
		87.30*	7.90	1.1438E-007		2.7463E-007
		238.63*	43.60	4.7555E-008		2.6027E-007
		300.09*	3.34	3.1207E-007		1.3451E-007
+	BI-214B	609.31*	44.80	4.8603E-008	4.86E-008	3.8037E-007
		665.45*	1.29	9.2101E-007		6.6909E-007
		768.36*	4.80	4.0987E-007		4.5556E-007
		806.17*	1.12	1.5595E-006		8.4699E-007
		934.06*	3.03	7.4092E-007		1.6421E-007
		1120.29*	14.80	1.9382E-007		4.3643E-007
		1155.19	1.64	1.2132E-006		1.3175E-006
		1238.11*	5.86	4.2833E-007		5.5968E-007
		1280.96	1.44	1.3007E-006		1.7046E-006
		1377.67*	3.92	4.2373E-007		3.7318E-007
		1401.50*	1.55	9.1760E-007		4.8399E-007
		1407.98*	2.80	5.3286E-007		3.7594E-007
		1509.23*	2.12	7.7084E-007		5.5296E-007
		1661.28	1.14	1.0383E-006		-3.6302E-007
		1729.59*	2.88	6.1080E-007		3.8151E-007
		1764.49*	15.36	1.4213E-007		3.7158E-007
		1847.42*	2.04	9.1315E-007		8.0059E-007
		2118.55	1.14	1.1561E-006		-2.1082E-007
		2204.21*	4.86	2.8591E-007		7.3993E-007
		2447.86*	1.50	1.2947E-006		4.2322E-007
+	PB-214B	53.23*	1.11	7.0559E-007	4.57E-008	3.5720E-007
		74.81*	5.90	3.1956E-007		8.4626E-007
		77.11*	9.90	1.9061E-007		8.1226E-007
		87.30*	4.41	2.0489E-007		4.9197E-007
		241.98*	7.50	2.8262E-007		4.6078E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	7.9660E-008	4.57E-008	4.0375E-007
		351.92*	35.80	4.5726E-008		3.9887E-007
+	RA-226	186.10*	3.50	3.6333E-007	3.63E-007	6.8903E-007
+	AC-228B	12.95	15.10	1.6557E-006	7.09E-008	-1.1996E-005
		16.15	20.00	4.4331E-007		-2.6600E-006
		19.11	4.60	9.2538E-007		-1.5923E-006
		89.96*	3.40	3.9161E-007		3.8590E-007
		93.35*	5.60	2.5957E-007		4.6363E-007
		99.55*	1.30	5.4002E-007		4.6691E-007
		105.36	2.00	4.0651E-007		4.7495E-008
		129.03*	2.90	2.6337E-007		1.4655E-007
		209.39*	4.10	2.1806E-007		2.7152E-007
		270.26*	3.80	3.4606E-007		2.4428E-007
		328.07*	3.50	2.7746E-007		2.2795E-007
		338.42*	12.40	8.4379E-008		2.9111E-007
		409.62*	2.20	6.2330E-007		2.0545E-007
		463.10*	4.60	2.6564E-007		3.5236E-007
		562.65	1.01	1.2141E-006		-2.1701E-007
		755.28	1.32	1.1028E-006		9.0669E-008
		772.28	1.09	1.5442E-006		6.3911E-008
		794.79*	4.60	2.8188E-007		2.2660E-007
		835.60	1.71	8.9855E-007		-1.2797E-007
		911.16*	29.00	7.0879E-008		2.2971E-007
		964.64*	5.80	2.4653E-007		1.9612E-007
		968.97*	17.40	8.4908E-008		2.6778E-007
		1459.19	1.06	5.6817E-006		9.3381E-005
		1496.00	1.05	1.2553E-006		4.6106E-007
		1588.23	3.60	4.3444E-007		-7.8049E-008
		1630.47	1.95	6.5277E-007		4.6825E-007
	PA-234B	63.00	3.20	2.8589E-007	3.50E-008	-8.4035E-008
		94.67	14.30	6.6056E-008		-1.1601E-008
		98.44	23.00	3.4991E-008		3.4064E-009
		99.70	4.80	1.6839E-007		3.4916E-008
		111.00	10.80	7.6730E-008		3.6766E-008
		125.40	1.00	8.4102E-007		-4.4674E-007
		131.20	20.00	4.3648E-008		5.8143E-009
		152.70	6.70	1.3965E-007		-3.4542E-008
		186.00	2.00	5.8159E-007		2.3512E-006
		200.90	1.00	1.0212E-006		1.5893E-007
		202.90	1.20	8.5387E-007		8.1785E-008
		226.40	5.90	1.7491E-007		-1.0841E-007
		227.20	5.50	1.8848E-007		-8.1392E-008
		248.90	2.80	3.5761E-007		-6.9412E-008
		272.10	1.00	1.1039E-006		-3.5589E-007
		293.70	3.90	3.6928E-007		-1.2072E-007
		369.80	2.90	3.8494E-007		1.9626E-007
		372.40	1.30	8.4695E-007		-1.2731E-007
		458.80	1.50	7.9411E-007		-2.9967E-008
		506.80	1.60	1.0030E-006		-2.6117E-007
		513.70	1.30	1.3535E-006		5.0962E-008
		565.90	1.40	9.0435E-007		5.7709E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	3.8179E-007	3.50E-008	-2.5676E-008
		569.50	10.00	1.2613E-007		1.2628E-008
		574.00	2.00	6.2872E-007		-2.1914E-007
		664.80	1.30	1.0724E-006		1.3361E-006
		666.70	1.60	8.6195E-007		3.0313E-007
		669.90	1.40	9.4827E-007		-1.6473E-007
		692.70	1.50	9.0478E-007		-4.1787E-008
		699.00	4.60	2.9748E-007		-2.1391E-007
		706.10	3.10	4.5650E-007		5.3844E-007
		733.00	9.00	1.6937E-007		2.1644E-009
		738.00	1.00	1.4768E-006		-2.6685E-007
		742.81	2.40	6.0690E-007		9.7801E-008
		755.60	1.40	1.0416E-006		-6.7296E-009
		780.70	1.10	1.3520E-006		-4.6143E-008
		786.27	1.40	1.0551E-006		-8.3617E-007
		793.60	1.50	1.0392E-006		1.5215E-006
		796.30	3.80	4.0829E-007		6.5897E-007
		805.80	3.30	4.4124E-007		2.9526E-007
		819.60	2.60	5.6820E-007		4.5623E-008
		826.30	4.00	3.8135E-007		3.2153E-007
		831.60	5.50	2.7817E-007		1.3670E-007
		876.40	4.00	3.6869E-007		-4.3722E-008
		880.50	4.00	3.6424E-007		-3.0321E-007
		880.51	9.00	1.6188E-007		-1.3476E-007
		883.24	15.00	9.9918E-008		3.3205E-008
		899.00	4.10	3.7150E-007		-5.0801E-009
		925.00	2.90	5.2849E-007		7.4763E-008
		926.00	11.00	1.3835E-007		-3.0267E-008
		927.10	11.00	1.3780E-007		-9.0792E-008
		946.00	12.00	1.3229E-007		7.5176E-008
		949.00	8.00	1.9753E-007		1.6926E-007
		978.80	1.40	1.0857E-006		-1.3248E-007
		980.50	2.00	7.6961E-007		2.4922E-007
		980.50	3.00	5.1307E-007		1.6615E-007
		984.00	1.90	8.2918E-007		6.9079E-008
		1353.30	1.70	8.8483E-007		-2.4300E-007
		1394.10	3.00	4.5838E-007		2.5716E-008
		1452.70	1.00	1.8093E-006		-2.5344E-007
		1668.50	1.20	9.4669E-007		-7.4170E-007
		1694.60	1.20	1.0156E-006		-4.8341E-007
+	TH-234	63.29*	4.50	1.7585E-006	1.76E-006	9.6449E-007
		92.38	2.60	2.8420E-006		1.5332E-005
		92.80*	2.60	4.1278E-006		7.3727E-006
+	U-235	72.70	0.11	9.4758E-006	2.21E-008	-3.7742E-006
		89.95*	2.80	4.6931E-007		4.6246E-007
		93.35*	4.50	3.1880E-007		5.6941E-007
		94.00	0.40	2.3388E-006		-3.4545E-007
		105.00	2.10	3.8144E-007		7.7268E-008
		109.16	1.50	5.3782E-007		-3.4139E-007
		140.76	0.22	4.1492E-006		-7.6042E-007
		143.76*	10.90	8.9113E-008		3.5441E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	1.8444E-007	2.21E-008	6.4852E-009
		182.61	0.40	2.6956E-006		-4.0257E-006
		185.71*	57.50	2.2114E-008		4.1937E-008
		194.94	0.59	1.6992E-006		3.3220E-008
		202.11	1.00	1.0055E-006		-5.1415E-007
		205.31	5.00	2.0423E-007		-1.1028E-008
		279.50	0.27	3.7867E-006		3.2493E-006

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

Appendix C

Pre-Excavation Soil Analysis around Storage Port No. 1

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**********************************************************************
*****        G A M M A   S   E C T R U M   A N A L Y   I S        *****
**********************************************************************

Filename: C:\Soil\2008-12-18-01\2008-12-18-01N_100000_2009Jan2.CNF

Report Generated On                : 1/5/2009    3:47:54 PM

Sample Title                       : Soil Immediately in vicinity of Storage
Sample Description                 : 500 ml Nalgene
Sample Identification              : 2008-12-18-01N
Sample Type                        : Soil 2.0 g/cc
Sample Geometry                    : 500 ml Nalgene

Peak Locate Threshold              :  3.00
Peak Locate Range (in channels)    :     8 -  8192
Peak Area Range (in channels)      :     8 -  8192
Identification Energy Tolerance    :    1.000 keV

Sample Size                        :  1.000E+003 g

Sample Taken On                    : 12/18/2008 11:55:00 AM
Acquisition Started                : 1/2/2009   10:37:40 PM

Live Time                          :   100000.0 seconds
Real Time                          :   100007.8 seconds

Dead Time                          :   0.01 %

          Energy Calibration Used Done On       : 12/18/2008
          Efficiency Calibration Used Done On   : 12/17/2008
          Efficiency ID                         :
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****
*** NUCLIDE MDA REPORT *****
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Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: Soil Immediately in vicinity of Storage
Nuclide Library Used: C:\GENIE2K\CAMFILES\LIbraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	Pb x-ray	72.80	61.00	2.2790E-008	1.99E-008	-7.3552E-009
		75.00*	100.00	1.9939E-008		6.2027E-008
		84.90*	36.00	9.9714E-008		7.8783E-008
		87.60*	10.00	3.5953E-007		4.7002E-007
	BE-7	477.59	10.42	1.9989E-007	2.00E-007	9.2997E-008
+	K-40	1460.75*	10.67	2.1220E-007	2.12E-007	1.1019E-005
+	MN-54	834.83*	99.98	2.2026E-008	2.20E-008	1.5932E-008
+	CO-60	1173.24*	99.90	4.0304E-008	2.61E-008	4.6182E-007
		1332.50*	99.98	2.6145E-008		4.4833E-007
	ZN-65	511.00	2.83	8.2718E-007	8.26E-008	4.6003E-006
		1115.55	50.70	8.2641E-008		6.7304E-007
	NB-94x	702.62	97.90	2.0800E-008	2.08E-008	1.3779E-008
		871.09	99.90	2.8204E-008		1.4854E-008
	AG-108m	79.13	6.60	2.1680E-007	1.77E-008	-3.3509E-007
		433.94	90.50	1.7691E-008		-1.0709E-008
		614.28	89.80	2.8847E-008		-2.9331E-008
		722.94	90.80	2.5222E-008		1.1850E-008
+	CD-109	88.03*	3.61	1.0163E-006	1.02E-006	1.3286E-006
	AG-110m	446.81	3.75	5.1169E-007	2.15E-008	-1.0785E-007
		620.36	2.81	7.0796E-007		-3.5764E-007
		657.76	94.60	2.1492E-008		-2.0575E-008
		677.62	10.35	2.0031E-007		1.2930E-007
		687.02	6.44	3.3201E-007		1.1237E-007
		706.68	16.44	1.2912E-007		-3.6883E-008
		744.28	4.73	4.8487E-007		1.3469E-007
		763.94	22.29	1.1253E-007		-6.3800E-008
		818.03	7.34	3.2259E-007		-2.2853E-008
		884.68	72.70	3.4213E-008		7.6985E-009
		937.49	34.36	7.4316E-008		-7.5817E-009
		1384.30	24.28	7.4132E-008		-4.2231E-008
		1475.79	3.99	3.4329E-007		-1.9457E-007
		1505.04	13.04	1.1881E-007		-1.5693E-008
		1562.30	1.03	1.2901E-006		-6.2532E-007
	SB-125	176.33	6.79	2.1164E-007	5.53E-008	-3.4249E-008
		380.43	1.52	1.0219E-006		-7.0704E-007
		427.89	29.40	5.5274E-008		-1.8866E-008
		463.38	10.45	1.6231E-007		5.8298E-008
		600.56	17.78	1.1099E-007		4.1788E-010
		606.64	5.02	5.7244E-007		-2.3331E-008
		635.90	11.32	1.6916E-007		3.2118E-008
		671.41	1.80	1.1021E-006		-1.0918E-006
	BA-133	53.16	2.20	4.9756E-007	3.19E-008	1.0735E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BA-133	79.62	2.62	5.4466E-007	3.19E-008	-8.4640E-007
		81.00	34.10	3.8162E-008		-1.6450E-007
		160.61	0.64	2.1384E-006		2.8297E-006
		223.23	0.45	3.3399E-006		1.1284E-006
		276.40	7.16	2.0579E-007		5.2598E-008
		302.85	18.33	8.0133E-008		-1.6931E-008
		356.02	62.05	3.1866E-008		-1.0333E-007
		383.85	8.94	1.7541E-007		-4.4408E-009
+	CS-134	475.35	1.46	1.1640E-006	1.59E-008	2.7777E-008
		563.23*	8.38	1.5977E-007		5.5290E-008
		569.32	15.43	1.2439E-007		-3.5171E-008
		604.70*	97.60	1.5930E-008		1.9392E-008
		795.84*	85.40	2.0223E-008		2.7770E-008
		801.93	8.73	2.5819E-007		-2.2145E-007
		1038.57	1.00	2.3764E-006		-2.9657E-006
		1167.94	1.80	2.3336E-006		4.2343E-007
		1365.15	3.04	5.3262E-007		2.1101E-007
	CS-137	661.66	85.21	2.3295E-008	2.33E-008	6.7507E-009
+	EU-152x	121.78*	28.40	6.3672E-008	6.37E-008	1.9663E-006
		244.70*	7.49	4.6185E-007		1.9143E-006
		344.28*	26.60	7.0919E-008		1.8879E-006
		411.11*	2.23	7.8608E-007		2.1749E-006
		443.98*	2.78	7.1092E-007		2.2104E-006
		778.90*	12.96	1.7189E-007		2.0531E-006
		867.39*	4.15	6.1539E-007		1.8145E-006
		964.13*	14.34	2.9108E-007		2.0566E-006
		1085.91*	9.92	4.6298E-007		2.0919E-006
		1089.70*	1.71	2.7021E-006		2.6391E-006
		1112.12*	13.55	2.4919E-007		2.0369E-006
		1212.95*	1.40	1.7558E-006		2.2261E-006
		1299.12*	1.63	1.1766E-006		1.9564E-006
		1408.01*	20.87	9.5893E-008		2.0823E-006
	EU-154	123.07	40.40	5.3508E-008	5.35E-008	-4.5774E-009
		188.25	0.23	6.7518E-006		-3.6636E-006
		247.93	6.83	2.6435E-007		1.4184E-006
		401.30	0.19	8.3321E-006		3.1884E-006
		444.39	0.55	3.3662E-006		1.1169E-005
		478.26	0.21	8.1163E-006		5.2896E-006
		557.56	0.25	7.2431E-006		-5.1831E-006
		582.00	0.89	2.6094E-006		9.6606E-006
		591.76	4.91	3.8831E-007		-2.7262E-007
		625.22	0.32	5.9727E-006		-2.9648E-008
		676.59	0.14	1.4582E-005		-2.2096E-006
		692.42	1.78	1.1787E-006		-5.1231E-008
		715.76	0.17	1.2112E-005		2.6098E-006
		722.30	20.00	1.1154E-007		4.5687E-008
		756.86	4.50	5.1234E-007		2.6612E-007
		815.55	0.50	4.5640E-006		3.6749E-007
		845.39	0.58	4.0517E-006		2.2147E-006
		850.64	0.23	9.9898E-006		-5.8306E-006
		873.20	12.09	2.2458E-007		-2.9083E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	4.8349E-006	5.35E-008	1.8677E-006
		904.05	0.85	2.8602E-006		-4.8653E-007
		996.30	10.34	2.3656E-007		2.5683E-008
		1004.76	17.90	1.4756E-007		2.3828E-007
		1128.40	0.29	8.5146E-006		-9.5004E-006
		1140.90	0.22	1.1294E-005		-7.9772E-006
		1241.60	0.13	2.0896E-005		-1.4188E-005
		1246.60	0.80	2.9608E-006		-1.9684E-006
		1274.51	34.40	7.0414E-008		1.3229E-007
		1494.08	0.71	1.9605E-006		-3.3617E-007
		1596.45	1.80	8.8063E-007		-4.5685E-008
+	TL-208B	72.80	2.02	6.8822E-007	2.61E-008	-2.2211E-007
		74.97*	3.41	5.8472E-007		1.8190E-006
		84.90*	1.51	2.3773E-006		1.8783E-006
		277.36*	6.31	1.6686E-007		7.3518E-008
		510.77*	22.60	1.3009E-007		9.1441E-008
		583.19*	84.50	2.6114E-008		9.9847E-008
		763.13	1.81	1.3183E-006		-8.4216E-007
		860.56*	12.42	1.4468E-007		1.3066E-007
		2614.53	99.16	2.8487E-008		1.2778E-007
+	Pb-210	46.52*	4.05	3.8975E-007	3.90E-007	1.4607E-006
+	PB-212B	74.81*	10.50	1.8989E-007	7.93E-008	5.9073E-007
		77.11*	17.60	1.1208E-007		5.2798E-007
		87.30*	7.90	4.5511E-007		5.9496E-007
		238.63*	43.60	7.9280E-008		3.4815E-007
		300.09*	3.34	4.0858E-007		4.0355E-007
+	BI-214B	609.31*	44.80	4.6571E-008	4.66E-008	5.4444E-007
		665.45	1.29	1.5492E-006		8.1125E-007
		768.36*	4.80	3.8640E-007		6.2775E-007
		806.17	1.12	2.0246E-006		6.5388E-007
		934.06*	3.03	8.5674E-007		5.0205E-007
		1120.29*	14.80	1.9604E-007		5.6662E-007
		1155.19*	1.64	1.2889E-006		1.3812E-006
		1238.11*	5.86	3.8957E-007		7.3543E-007
		1280.96	1.44	1.6059E-006		1.1556E-006
		1377.67*	3.92	4.0913E-007		7.3397E-007
		1401.50*	1.55	1.0090E-006		5.2258E-007
		1407.98*	2.80	7.1529E-007		1.5532E-005
		1509.23*	2.12	8.4472E-007		1.0995E-006
		1661.28*	1.14	1.2716E-006		6.1785E-007
		1729.59*	2.88	3.5610E-007		6.0672E-007
		1764.49*	15.36	9.8206E-008		5.9582E-007
		1847.42*	2.04	6.6568E-007		5.6918E-007
		2118.55	1.14	1.2111E-006		-9.1058E-009
		2204.21*	4.86	4.7675E-007		6.7652E-007
		2447.86*	1.50	5.3151E-007		5.2608E-007
+	PB-214B	53.23*	1.11	7.3322E-007	5.09E-008	5.4642E-007
		74.81*	5.90	3.3795E-007		1.0513E-006
		77.11*	9.90	1.9926E-007		9.3863E-007
		87.30*	4.41	8.1527E-007		1.0658E-006
		241.98*	7.50	4.5906E-007		7.3976E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	8.8721E-008	5.09E-008	6.4590E-007
		351.92*	35.80	5.0880E-008		5.8294E-007
+	RA-226	186.10*	3.50	4.6241E-007	4.62E-007	9.7896E-007
+	AC-228B	12.95	15.10	1.0284E-006	9.54E-008	-9.3529E-009
		16.15	20.00	4.1228E-007		7.2653E-008
		19.11	4.60	1.0510E-006		-3.8324E-007
		89.96*	3.40	1.0702E-006		7.7066E-007
		93.35*	5.60	6.5366E-007		4.2049E-007
		99.55	1.30	9.7011E-007		6.8496E-007
		105.36	2.00	6.2999E-007		6.9668E-008
		129.03*	2.90	3.6627E-007		2.8412E-007
		209.39*	4.10	2.8160E-007		2.0020E-007
		270.26*	3.80	4.8039E-007		6.3653E-007
		328.07*	3.50	4.6898E-007		4.9838E-007
		338.42*	12.40	1.2720E-007		2.2411E-007
		409.62	2.20	8.1479E-007		2.1817E-006
		463.10*	4.60	2.7360E-007		3.9123E-007
		562.65*	1.01	1.3107E-006		4.5359E-007
		755.28	1.32	1.7386E-006		9.1203E-007
		772.28	1.09	2.2972E-006		-1.9324E-007
		794.79*	4.60	3.7124E-007		5.0978E-007
		835.60*	1.71	1.2464E-006		9.0152E-007
		911.16*	29.00	9.5369E-008		3.3640E-007
		964.64*	5.80	7.2023E-007		5.0887E-006
		968.97*	17.40	2.4479E-007		4.0219E-007
		1459.19	1.06	6.2056E-006		1.1293E-004
		1496.00	1.05	1.3325E-006		6.5624E-007
		1588.23	3.60	4.6012E-007		3.2593E-007
		1630.47	1.95	6.6862E-007		-4.2890E-007
	PA-234B	63.00	3.20	3.6937E-007	5.48E-008	8.1753E-007
		94.67	14.30	9.4719E-008		-6.7474E-008
		98.44	23.00	5.4760E-008		-1.8959E-008
		99.70	4.80	2.6241E-007		1.5368E-007
		111.00	10.80	1.1953E-007		3.4364E-008
		125.40	1.00	1.5861E-006		-1.8845E-006
		131.20	20.00	6.0649E-008		-1.0088E-008
		152.70	6.70	2.0276E-007		2.6111E-007
		186.00	2.00	7.8496E-007		2.8385E-006
		200.90	1.00	1.4599E-006		-8.8002E-007
		202.90	1.20	1.2187E-006		-7.0006E-007
		226.40	5.90	2.5304E-007		2.9514E-008
		227.20	5.50	2.6979E-007		-1.4786E-007
		248.90	2.80	5.8582E-007		-2.4409E-006
		272.10	1.00	1.4953E-006		-8.5579E-007
		293.70	3.90	4.5665E-007		-2.2556E-007
		369.80	2.90	5.5821E-007		6.8400E-007
		372.40	1.30	1.2208E-006		-5.9671E-007
		458.80	1.50	1.1212E-006		-1.5552E-006
		506.80	1.60	1.3293E-006		-9.2358E-008
		513.70	1.30	1.7102E-006		-1.0790E-006
		565.90	1.40	1.3769E-006		2.9473E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	5.8083E-007	5.48E-008	-2.0564E-007
		569.50	10.00	1.8983E-007		-5.3675E-008
		574.00	2.00	9.5072E-007		-1.8218E-007
		664.80	1.30	1.5363E-006		6.3837E-007
		666.70	1.60	1.2578E-006		7.7283E-007
		669.90	1.40	1.4171E-006		-6.3550E-007
		692.70	1.50	1.3933E-006		1.2949E-007
		699.00	4.60	4.4232E-007		-6.6417E-008
		706.10	3.10	6.5587E-007		-2.3926E-007
		733.00	9.00	2.5459E-007		1.2239E-007
		738.00	1.00	2.1906E-006		-6.3777E-007
		742.81	2.40	9.1527E-007		-1.8839E-007
		755.60	1.40	1.6382E-006		4.1169E-007
		780.70	1.10	2.9876E-006		2.2651E-005
		786.27	1.40	1.6805E-006		-5.5459E-006
		793.60	1.50	1.5487E-006		2.6658E-006
		796.30	3.80	6.0802E-007		3.9786E-007
		805.80	3.30	6.8495E-007		1.4754E-007
		819.60	2.60	8.6663E-007		-3.1580E-007
		826.30	4.00	5.7048E-007		2.9071E-007
		831.60	5.50	4.2067E-007		7.3590E-008
		876.40	4.00	6.1878E-007		1.5853E-007
		880.50	4.00	5.9431E-007		-1.8105E-007
		880.51	9.00	2.6414E-007		-8.0469E-008
		883.24	15.00	1.5919E-007		9.3824E-008
		899.00	4.10	5.8677E-007		-1.8587E-007
		925.00	2.90	8.3614E-007		2.6960E-007
		926.00	11.00	2.1969E-007		-5.9510E-008
		927.10	11.00	2.1890E-007		6.8320E-009
		946.00	12.00	1.9941E-007		1.3339E-007
		949.00	8.00	2.9850E-007		-9.1904E-008
		978.80	1.40	1.6283E-006		-1.1024E-007
		980.50	2.00	1.1374E-006		-2.4057E-007
		980.50	3.00	7.5825E-007		-1.6038E-007
		984.00	1.90	1.1918E-006		-7.6146E-007
		1353.30	1.70	9.5839E-007		-5.1743E-007
		1394.10	3.00	5.1917E-007		-2.5184E-008
		1452.70	1.00	2.3612E-006		-1.5479E-006
		1668.50	1.20	1.0105E-006		3.1367E-007
		1694.60	1.20	9.6053E-007		-2.6350E-007
+	TH-234	63.29*	4.50	4.5348E-007	4.53E-007	5.4959E-007
		92.38	2.60	8.4581E-007		2.8175E-006
		92.80*	2.60	2.2256E-006		1.4317E-006
+	U-235	72.70	0.11	1.2603E-005	2.81E-008	-4.0673E-006
		89.95*	2.80	1.2957E-006		9.3307E-007
		93.35*	4.50	8.1106E-007		5.2175E-007
		94.00	0.40	3.3771E-006		-1.7096E-006
		105.00	2.10	5.9784E-007		1.6501E-007
		109.16	1.50	8.4920E-007		-7.0172E-007
		140.76	0.22	5.8894E-006		-2.5483E-006
		143.76*	10.90	1.1233E-007		2.4408E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	2.7595E-007	2.81E-008	3.0782E-007
		182.61	0.40	3.7883E-006		-3.1668E-006
		185.71*	57.50	2.8146E-008		5.9587E-008
		194.94	0.59	2.4691E-006		1.3618E-006
		202.11	1.00	1.4597E-006		-6.4174E-007
		205.31	5.00	2.9598E-007		-1.5979E-007
		279.50	0.27	5.4954E-006		1.3447E-006

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

***** GAMMA SPECTRUM ANALYSIS *****

Filename: C:\Soil\2008-11-20-01\2008-11-20-01N_100000_2008November28.CN

Report Generated On	:	12/17/2008 8:02:02 PM
Sample Title	:	2008-11-20-01-Nalgene
Sample Description	:	500 ml Nalgene
Sample Identification	:	208-11-20-01
Sample Type	:	500 ml Nalgene
Sample Geometry	:	500 ml Nalgene
Peak Locate Threshold	:	3.00
Peak Locate Range (in channels)	:	1 - 8192
Peak Area Range (in channels)	:	14 - 8192
Identification Energy Tolerance	:	1.000 keV
Sample Size	:	1.000E+003 g
Sample Taken On	:	9/19/2008 8:45:00 AM
Acquisition Started	:	11/28/2008 9:26:59 AM
Live Time	:	100000.0 seconds
Real Time	:	100005.3 seconds
Dead Time	:	0.01 %

Energy Calibration Used Done On	:	12/17/2008
Efficiency Calibration Used Done On	:	12/17/2008
Efficiency ID	:	

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***** NUCLIDE MDA REPORT *****
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Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: 2008-11-20-01-Nalgene
Nuclide Library Used: C:\GENIE2K\CAMFILES\LIbraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	Pb x-ray	72.80	61.00	1.9507E-008	1.95E-008	-1.1788E-008
		75.00*	100.00	2.5030E-008		5.8326E-008
		84.90*	36.00	2.1262E-008		4.2712E-008
		87.60*	10.00	9.6304E-008		2.8112E-007
	BE-7	477.59	10.42	2.9187E-007	2.92E-007	-5.3608E-008
+	K-40	1460.75*	10.67	2.1724E-007	2.17E-007	1.0665E-005
	MN-54	834.83	99.98	1.9611E-008	1.96E-008	1.1128E-008
+	CO-60	1173.24*	99.90	2.7008E-008	2.05E-008	1.9877E-008
		1332.50*	99.98	2.0547E-008		2.4214E-008
	ZN-65	511.00	2.83	8.0625E-007	6.39E-008	5.0777E-006
		1115.55	50.70	6.3872E-008		2.4557E-007
	NB-94x	702.62	97.90	1.5116E-008	1.51E-008	5.1081E-009
		871.09	99.90	1.6684E-008		1.3197E-008
	AG-108m	79.13	6.60	1.8470E-007	1.39E-008	3.2637E-007
		433.94	90.50	1.3925E-008		8.7007E-009
		614.28	89.80	2.7449E-008		-1.5479E-008
		722.94	90.80	1.7939E-008		3.8441E-009
+	CD-109	88.03*	3.61	2.9235E-007	2.92E-007	8.5340E-007
	AG-110m	446.81	3.75	3.9862E-007	1.79E-008	1.1423E-007
		620.36	2.81	6.0346E-007		-3.2289E-008
		657.76	94.60	1.7878E-008		-2.0951E-009
		677.62	10.35	1.6847E-007		-6.2273E-008
		687.02	6.44	2.6959E-007		-3.0201E-008
		706.68	16.44	1.0788E-007		5.4925E-008
		744.28	4.73	3.9769E-007		2.0204E-007
		763.94	22.29	9.8240E-008		-8.1510E-008
		818.03	7.34	2.6493E-007		1.0330E-007
		884.68	72.70	2.6939E-008		8.0247E-009
		937.49	34.36	6.3323E-008		2.2241E-008
		1384.30	24.28	9.1513E-008		-2.1218E-008
		1475.79	3.99	3.7431E-007		-2.4713E-007
		1505.04	13.04	1.4862E-007		5.4234E-009
		1562.30	1.03	1.5068E-006		1.2057E-006
	SB-125	176.33	6.79	1.6836E-007	4.44E-008	-3.6817E-008
		380.43	1.52	8.3286E-007		6.4043E-009
		427.89	29.40	4.4422E-008		-8.8267E-009
		463.38	10.45	1.3023E-007		1.3505E-007
		600.56	17.78	8.2433E-008		1.4410E-008
		606.64	5.02	5.5368E-007		-1.3854E-007
		635.90	11.32	1.2411E-007		-6.6792E-008
		671.41	1.80	8.3897E-007		1.6433E-007
	BA-133	53.16	2.20	4.1784E-007	3.02E-008	4.6551E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BA-133	79.62	2.62	4.6780E-007	3.02E-008	1.1162E-006
		81.00	34.10	3.0161E-008		-4.2266E-007
		160.61	0.64	1.6256E-006		2.8150E-007
		223.23	0.45	2.5148E-006		-1.9541E-006
		276.40	7.16	1.6088E-007		-2.6087E-008
		302.85	18.33	6.3475E-008		-1.3120E-008
		356.02	62.05	3.0221E-008		-2.1460E-008
		383.85	8.94	1.3845E-007		-3.6701E-008
	CS-134	475.35	1.46	8.8912E-007	2.11E-008	1.4056E-007
		563.23	8.38	1.7097E-007		-8.6160E-008
		569.32	15.43	9.3636E-008		-7.3711E-009
		604.70	97.60	2.2582E-008		-7.9836E-009
		795.84	85.40	2.1078E-008		1.7273E-008
		801.93	8.73	1.9847E-007		-1.1229E-007
		1038.57	1.00	1.9187E-006		-1.0387E-006
		1167.94	1.80	1.3183E-006		3.3212E-007
		1365.15	3.04	5.5730E-007		5.1356E-008
	CS-137	661.66	85.21	1.6851E-008	1.69E-008	-8.8619E-009
+	EU-152x	121.78*	28.40	3.7810E-008	3.78E-008	1.1047E-007
		244.70*	7.49	1.1806E-007		4.9216E-008
		344.28*	26.60	4.2745E-008		9.9522E-008
		411.11	2.23	5.8722E-007		3.2492E-007
		443.98	2.78	4.4942E-007		6.5840E-008
		778.90*	12.96	1.0771E-007		1.0168E-007
		867.39	4.15	4.0912E-007		-1.0085E-007
		964.13*	14.34	2.0822E-007		2.5714E-007
		1085.91	9.92	2.0233E-007		9.2358E-008
		1089.70	1.71	1.1737E-006		2.9125E-007
		1112.12*	13.55	2.1184E-007		1.2403E-007
		1212.95	1.40	1.6550E-006		4.2269E-007
		1299.12	1.63	1.1314E-006		2.6851E-007
		1408.01*	20.87	6.5551E-008		1.9388E-007
	EU-154	123.07	40.40	2.5252E-008	2.53E-008	-1.4260E-009
		188.25	0.23	5.5681E-006		-1.5640E-005
		247.93	6.83	1.6584E-007		5.0769E-008
		401.30	0.19	6.6345E-006		2.3022E-006
		444.39	0.55	2.2641E-006		1.5647E-007
		478.26	0.21	5.9116E-006		-5.7596E-007
		557.56	0.25	5.3097E-006		-3.0550E-006
		582.00	0.89	2.2019E-006		1.3428E-005
		591.76	4.91	2.8125E-007		-1.0302E-007
		625.22	0.32	4.3906E-006		-4.5490E-006
		676.59	0.14	1.0620E-005		-7.7876E-006
		692.42	1.78	8.3313E-007		4.6020E-008
		715.76	0.17	8.7511E-006		4.0263E-006
		722.30	20.00	7.8827E-008		2.5177E-008
		756.86	4.50	3.5812E-007		2.9098E-009
		815.55	0.50	3.1869E-006		-3.3612E-007
		845.39	0.58	2.8545E-006		-3.7930E-007
		850.64	0.23	6.9718E-006		-9.2890E-006
		873.20	12.09	1.3957E-007		1.6585E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	3.2917E-006	2.53E-008	-9.0941E-007
		904.05	0.85	2.0472E-006		5.2964E-007
		996.30	10.34	1.7569E-007		-3.8026E-008
		1004.76	17.90	1.0729E-007		-1.3880E-008
		1128.40	0.29	6.9146E-006		-1.8266E-006
		1140.90	0.22	9.2528E-006		-1.7067E-006
		1241.60	0.13	2.0273E-005		4.0159E-005
		1246.60	0.80	2.7411E-006		-2.2812E-006
		1274.51	34.40	5.8399E-008		1.0686E-008
		1494.08	0.71	1.9753E-006		-6.5782E-007
		1596.45	1.80	8.4962E-007		-2.8908E-007
+	TL-208B	72.80	2.02	5.8907E-007	1.99E-008	-3.5598E-007
		74.97*	3.41	7.3401E-007		1.7104E-006
		84.90*	1.51	5.0692E-007		1.0183E-006
		277.36*	6.31	1.6163E-007		2.0963E-007
		510.77*	22.60	1.2084E-007		1.4063E-007
		583.19*	84.50	2.0727E-008		1.2109E-007
		763.13	1.81	9.7589E-007		-8.3550E-007
		860.56*	12.42	1.3708E-007		1.5753E-007
		2614.53*	99.16	1.9892E-008		1.0345E-007
+	Pb-210	46.52*	4.05	3.0358E-007	3.04E-007	6.3411E-007
+	PB-212B	74.81*	10.50	2.3838E-007	4.62E-008	5.5548E-007
		77.11*	17.60	1.4218E-007		5.3836E-007
		87.30*	7.90	1.2190E-007		3.5585E-007
		238.63*	43.60	4.6238E-008		3.3362E-007
		300.09*	3.34	2.8958E-007		3.8694E-007
+	BI-214B	609.31*	44.80	4.2857E-008	4.29E-008	5.9788E-007
		665.45*	1.29	9.8018E-007		6.9112E-007
		768.36*	4.80	3.1441E-007		5.8983E-007
		806.17	1.12	1.4330E-006		-1.7565E-007
		934.06*	3.03	5.8323E-007		7.9035E-007
		1120.29*	14.80	1.5241E-007		6.6197E-007
		1155.19*	1.64	1.1806E-006		8.1112E-007
		1238.11*	5.86	3.6751E-007		7.0365E-007
		1280.96*	1.44	1.6815E-006		8.0497E-007
		1377.67*	3.92	7.8218E-007		1.0423E-006
		1401.50	1.55	1.1505E-006		-7.3310E-007
		1407.98*	2.80	4.9029E-007		1.4501E-006
		1509.23*	2.12	1.0308E-006		1.6538E-007
		1661.28*	1.14	1.2923E-006		1.1331E-006
		1729.59*	2.88	3.7642E-007		7.2990E-007
		1764.49*	15.36	1.2965E-007		6.8308E-007
		1847.42*	2.04	4.8305E-007		1.3387E-006
		2118.55*	1.14	1.3079E-006		4.8343E-007
		2204.21*	4.86	3.2401E-007		9.9062E-007
		2447.86*	1.50	7.2595E-007		1.4171E-006
+	PB-214B	53.23*	1.11	6.9333E-007	4.47E-008	6.0276E-007
		74.81*	5.90	4.2423E-007		9.8857E-007
		77.11*	9.90	2.5276E-007		9.5708E-007
		87.30*	4.41	2.1838E-007		6.3746E-007
		241.98*	7.50	2.6946E-007		7.3934E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	7.7561E-008	4.47E-008	6.1113E-007
		351.92*	35.80	4.4676E-008		6.0289E-007
+	RA-226	186.10*	3.50	3.6694E-007	3.67E-007	1.2533E-006
+	AC-228B	12.95*	15.10	8.0507E-007	7.67E-008	4.3442E-007
		16.15	20.00	3.4020E-007		-6.2293E-008
		19.11	4.60	8.6488E-007		1.3943E-007
		89.96*	3.40	1.9819E-007		5.1562E-007
		93.35*	5.60	2.1872E-007		4.6177E-007
		99.55*	1.30	6.5781E-007		3.9880E-007
		105.36*	2.00	3.1788E-007		2.0236E-007
		129.03*	2.90	3.2153E-007		2.9308E-007
		209.39*	4.10	2.3730E-007		4.2225E-007
		270.26*	3.80	3.2268E-007		5.7734E-007
		328.07*	3.50	3.0666E-007		2.7969E-007
		338.42*	12.40	1.0797E-007		2.8263E-007
		409.62*	2.20	5.1529E-007		2.6377E-007
		463.10*	4.60	2.6449E-007		4.1318E-007
		562.65	1.01	1.3577E-006		1.3747E-007
		755.28*	1.32	1.3977E-006		7.0994E-007
		772.28	1.09	1.6902E-006		-1.5779E-007
		794.79*	4.60	3.1624E-007		3.4805E-007
		835.60	1.71	9.9980E-007		1.0275E-006
		911.16*	29.00	7.6685E-008		3.2727E-007
		964.64*	5.80	5.1660E-007		6.3796E-007
		968.97*	17.40	1.8138E-007		3.4843E-007
		1459.19	1.06	6.1602E-006		1.0870E-004
		1496.00	1.05	1.3443E-006		-5.2200E-007
		1588.23*	3.60	3.0148E-007		4.0019E-007
		1630.47*	1.95	6.5202E-007		1.3895E-007
	PA-234B	63.00	3.20	3.1476E-007	3.99E-008	-1.3943E-007
		94.67	14.30	7.2975E-008		-9.3142E-009
		98.44	23.00	3.9881E-008		2.1110E-008
		99.70	4.80	1.9088E-007		1.9327E-007
		111.00	10.80	8.5952E-008		2.9189E-008
		125.40	1.00	9.6376E-007		-5.7600E-007
		131.20	20.00	4.8884E-008		-1.8954E-008
		152.70	6.70	1.5819E-007		2.8734E-008
		186.00	2.00	6.4333E-007		2.8236E-006
		200.90	1.00	1.1440E-006		-5.0799E-007
		202.90	1.20	9.5428E-007		5.8837E-008
		226.40	5.90	1.9453E-007		-2.2644E-008
		227.20	5.50	2.0971E-007		6.4071E-008
		248.90	2.80	4.0017E-007		1.6924E-007
		272.10	1.00	1.2014E-006		-1.8479E-007
		293.70	3.90	3.9988E-007		4.7164E-008
		369.80	2.90	4.0940E-007		-6.1541E-008
		372.40	1.30	9.2200E-007		2.4178E-007
		458.80	1.50	8.4807E-007		-1.8687E-007
		506.80	1.60	1.0870E-006		6.4392E-008
		513.70	1.30	1.4540E-006		-1.2781E-007
		565.90	1.40	9.8645E-007		2.1464E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	4.1447E-007	3.99E-008	-3.0886E-007
		569.50	10.00	1.3731E-007		-1.0809E-008
		574.00	2.00	6.8905E-007		-4.1730E-007
		664.80	1.30	1.1409E-006		6.2704E-007
		666.70	1.60	9.2665E-007		1.2331E-007
		669.90	1.40	1.0651E-006		1.3819E-007
		692.70	1.50	9.8682E-007		1.0637E-007
		699.00	4.60	3.2873E-007		1.7670E-007
		706.10	3.10	4.7590E-007		2.0801E-007
		733.00	9.00	1.8609E-007		-1.7127E-007
		738.00	1.00	1.5698E-006		4.5560E-007
		742.81	2.40	6.5164E-007		-1.2292E-007
		755.60	1.40	1.1407E-006		-8.5827E-008
		780.70	1.10	1.5705E-006		1.1282E-006
		786.27	1.40	1.2091E-006		9.3691E-007
		793.60	1.50	1.1518E-006		8.5026E-007
		796.30	3.80	4.4993E-007		2.6752E-007
		805.80	3.30	4.8573E-007		-1.3166E-007
		819.60	2.60	6.2647E-007		1.4057E-008
		826.30	4.00	4.0474E-007		2.1854E-008
		831.60	5.50	3.0061E-007		3.2026E-009
		876.40	4.00	4.1302E-007		-2.6478E-009
		880.50	4.00	4.0555E-007		-9.4975E-008
		880.51	9.00	1.8025E-007		-4.2211E-008
		883.24	15.00	1.0787E-007		5.2396E-008
		899.00	4.10	4.2108E-007		2.6449E-007
		925.00	2.90	5.8504E-007		-2.4454E-008
		926.00	11.00	1.5346E-007		-4.0452E-008
		927.10	11.00	1.5337E-007		-4.0489E-008
		946.00	12.00	1.4576E-007		-1.9021E-008
		949.00	8.00	2.2334E-007		5.1564E-008
		978.80	1.40	1.2359E-006		2.5749E-007
		980.50	2.00	8.6001E-007		-1.0936E-007
		980.50	3.00	5.7334E-007		-7.2908E-008
		984.00	1.90	9.0444E-007		-1.8261E-007
		1353.30	1.70	9.4914E-007		-3.5773E-007
		1394.10	3.00	5.0216E-007		-6.7873E-007
		1452.70	1.00	1.8495E-006		-1.8362E-007
		1668.50	1.20	1.0676E-006		2.1472E-007
		1694.60	1.20	1.0206E-006		-2.4406E-007
+	TH-234	63.29*	4.50	1.8596E-006	1.86E-006	1.9361E-006
		92.38	2.60	3.1727E-006		1.5315E-005
		92.80*	2.60	3.5422E-006		7.4782E-006
+	U-235	72.70	0.11	1.0676E-005	2.23E-008	-6.4515E-006
		89.95*	2.80	2.3748E-007		6.1785E-007
		93.35*	4.50	2.6860E-007		5.6706E-007
		94.00*	0.40	2.7204E-006		9.7656E-007
		105.00	2.10	4.2494E-007		-1.7311E-007
		109.16	1.50	6.0659E-007		-1.1882E-008
		140.76	0.22	4.6037E-006		-1.0799E-006
		143.76*	10.90	8.8770E-008		2.5756E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	2.0827E-007	2.23E-008	1.1497E-007
		182.61	0.40	2.9829E-006		-1.8655E-006
		185.71*	57.50	2.2334E-008		7.6280E-008
		194.94	0.59	1.9023E-006		4.9723E-007
		202.11	1.00	1.1279E-006		-6.2595E-007
		205.31	5.00	2.2681E-007		-1.4373E-007
		279.50	0.27	4.1731E-006		5.8468E-007

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

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***** G A M M A S E C T R U M A N A L Y S *****
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Filename: HPGE

Report Generated On	:	12/18/2008 9:37:24 AM
Sample Title	:	2008-11-20-02N_2008Dec16
Sample Description	:	500 ml Nalgene
Sample Identification	:	2008-11-20-02
Sample Type	:	500 ml Nalgene
Sample Geometry	:	500 ml Nalgene
Peak Locate Threshold	:	3.00
Peak Locate Range (in channels)	:	8 - 8192
Peak Area Range (in channels)	:	8 - 8192
Identification Energy Tolerance	:	1.000 keV
Sample Size	:	1.000E+003 g
Sample Taken On	:	9/19/2008 9:45:00 AM
Acquisition Started	:	12/16/2008 7:47:05 PM
Live Time	:	100000.0 seconds
Real Time	:	100005.5 seconds
Dead Time	:	0.01 %

****
** NUCLIDE MDA REPORT *****
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Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: 2008-11-20-02N_2008Dec16
Nuclide Library Used: C:\GENIE2K\CAMFILES\LIbraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	Pb x-ray	72.80	61.00	1.9771E-008	1.70E-008	-8.6747E-009
		75.00*	100.00	1.7035E-008		5.9513E-008
		84.90*	36.00	7.6710E-008		3.7817E-008
		87.60*	10.00	2.7870E-007		3.0898E-007
	BE-7	477.59	10.42	3.8459E-007	3.85E-007	6.1627E-008
+	K-40	1460.75*	10.67	2.0511E-007	2.05E-007	1.0819E-005
+	MN-54	834.83*	99.98	1.3015E-008	1.30E-008	1.3105E-008
+	CO-60	1173.24*	99.90	2.5642E-008	2.34E-008	2.5243E-008
		1332.50*	99.98	2.3358E-008		3.8339E-008
	ZN-65	511.00	2.83	8.5220E-007	6.76E-008	5.2298E-006
		1115.55	50.70	6.7579E-008		4.7919E-008
	NB-94x	702.62	97.90	1.5128E-008	1.51E-008	-5.2693E-009
		871.09	99.90	1.7004E-008		2.0479E-008
	AG-108m	79.13	6.60	1.8821E-007	1.41E-008	-2.1692E-007
		433.94	90.50	1.4120E-008		-3.2291E-009
		614.28	89.80	2.7175E-008		-3.4055E-009
		722.94	90.80	1.8051E-008		5.5084E-011
+	CD-109	88.03*	3.61	8.6664E-007	8.67E-007	9.6082E-007
	AG-110m	446.81	3.75	4.2884E-007	1.94E-008	2.4598E-007
		620.36	2.81	6.1394E-007		-3.2693E-007
		657.76	94.60	1.9351E-008		-6.3456E-009
		677.62	10.35	1.7154E-007		1.5469E-008
		687.02	6.44	2.8142E-007		-2.5619E-008
		706.68	16.44	1.1544E-007		5.1336E-008
		744.28	4.73	4.3196E-007		3.2756E-007
		763.94	22.29	1.0525E-007		-6.7215E-008
		818.03	7.34	2.8249E-007		-7.4947E-008
		884.68	72.70	2.9505E-008		3.4660E-008
		937.49	34.36	6.8598E-008		6.5659E-008
		1384.30	24.28	9.5936E-008		-1.3727E-008
		1475.79	3.99	4.1688E-007		-1.1341E-007
		1505.04	13.04	1.5747E-007		-3.8006E-009
		1562.30	1.03	1.5491E-006		-4.7912E-008
	SB-125	176.33	6.79	1.7348E-007	4.47E-008	-4.1221E-008
		380.43	1.52	8.6771E-007		4.5805E-007
		427.89	29.40	4.4716E-008		-1.3415E-008
		463.38	10.45	1.3349E-007		7.2608E-008
		600.56	17.78	8.2960E-008		1.8588E-008
		606.64	5.02	5.6297E-007		-3.1577E-008
		635.90	11.32	1.2756E-007		-6.6065E-008
		671.41	1.80	8.4704E-007		-8.4606E-007
	BA-133	53.16	2.20	4.1852E-007	3.06E-008	7.5555E-009

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BA-133	79.62	2.62	4.7747E-007	3.06E-008	-8.0979E-007
		81.00	34.10	3.1095E-008		-6.2254E-008
		160.61	0.64	1.6661E-006		4.0547E-007
		223.23	0.45	2.6022E-006		-5.3629E-008
		276.40	7.16	1.6340E-007		6.7523E-008
		302.85	18.33	6.4449E-008		-2.6511E-008
		356.02	62.05	3.0553E-008		-3.2892E-009
		383.85	8.94	1.4087E-007		-7.9324E-008
	CS-134	475.35	1.46	9.3177E-007	2.14E-008	-5.0733E-007
		563.23	8.38	1.7768E-007		1.0518E-007
		569.32	15.43	9.7569E-008		5.3462E-008
		604.70	97.60	2.3175E-008		-1.6525E-009
		795.84	85.40	2.1356E-008		2.0855E-008
		801.93	8.73	2.0733E-007		-2.6268E-008
		1038.57	1.00	2.0034E-006		1.4765E-007
		1167.94	1.80	1.3827E-006		4.2514E-007
		1365.15	3.04	5.3616E-007		7.3781E-008
	CS-137	661.66	85.21	1.7767E-008	1.78E-008	1.4619E-008
+	EU-152x	121.78*	28.40	4.6101E-008	4.08E-008	1.4464E-007
		244.70*	7.49	1.0767E-007		8.3944E-008
		344.28*	26.60	4.0780E-008		1.2562E-007
		411.11*	2.23	5.2569E-007		2.5166E-007
		443.98	2.78	4.5722E-007		-2.5908E-007
		778.90*	12.96	9.8501E-008		1.3014E-007
		867.39	4.15	4.0891E-007		8.9574E-008
		964.13*	14.34	2.3266E-007		2.9035E-007
		1085.91*	9.92	1.4649E-007		1.8209E-007
		1089.70	1.71	1.1904E-006		8.3829E-007
		1112.12*	13.55	1.2694E-007		1.3322E-007
		1212.95	1.40	1.6795E-006		-4.2966E-007
		1299.12	1.63	1.1335E-006		3.2769E-007
		1408.01*	20.87	7.7087E-008		2.5664E-007
	EU-154	123.07	40.40	2.6289E-008	2.63E-008	-8.4530E-009
		188.25	0.23	5.6072E-006		-2.2803E-006
		247.93	6.83	1.6781E-007		-3.5039E-008
		401.30	0.19	6.7091E-006		9.8740E-007
		444.39	0.55	2.3206E-006		-1.6490E-006
		478.26	0.21	6.1364E-006		2.3715E-006
		557.56	0.25	5.3843E-006		-5.9162E-006
		582.00	0.89	2.2155E-006		1.2670E-005
		591.76	4.91	2.8105E-007		-1.7564E-007
		625.22	0.32	4.3548E-006		8.2460E-007
		676.59	0.14	1.0440E-005		-9.4933E-008
		692.42	1.78	8.4264E-007		5.2719E-007
		715.76	0.17	8.7491E-006		-3.9570E-006
		722.30	20.00	7.9877E-008		-1.5282E-009
		756.86	4.50	3.5858E-007		-2.1530E-007
		815.55	0.50	3.3010E-006		-7.1129E-007
		845.39	0.58	2.8982E-006		-2.2735E-006
		850.64	0.23	7.2629E-006		-1.9087E-006
		873.20	12.09	1.4097E-007		-9.2267E-010

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	3.4459E-006	2.63E-008	-9.0880E-007
		904.05	0.85	2.1205E-006		-5.4565E-007
		996.30	10.34	1.7581E-007		9.2446E-008
		1004.76	17.90	1.0626E-007		9.7160E-009
		1128.40	0.29	6.9690E-006		2.4773E-006
		1140.90	0.22	9.3566E-006		-5.5021E-006
		1241.60	0.13	2.0231E-005		-7.4913E-006
		1246.60	0.80	2.7278E-006		-1.0292E-006
		1274.51	34.40	5.6790E-008		-4.8507E-008
		1494.08	0.71	1.9773E-006		-4.5929E-007
		1596.45	1.80	8.3011E-007		-7.6348E-007
+	TL-208B	72.80	2.02	5.9703E-007	1.94E-008	-2.6196E-007
		74.97*	3.41	4.9956E-007		1.7453E-006
		84.90*	1.51	1.8288E-006		9.0161E-007
		277.36	6.31	1.8668E-007		8.6203E-008
		510.77*	22.60	1.2357E-007		2.0574E-007
		583.19*	84.50	2.2918E-008		1.0971E-007
		763.13	1.81	1.0010E-006		-8.0631E-007
		860.56*	12.42	1.4830E-007		1.1172E-007
		2614.53*	99.16	1.9417E-008		1.0530E-007
+	Pb-210	46.52*	4.05	3.1938E-007	3.19E-007	5.6445E-007
+	PB-212B	74.81*	10.50	1.6224E-007	4.68E-008	5.6679E-007
		77.11*	17.60	9.6064E-008		5.4901E-007
		87.30*	7.90	3.5278E-007		3.9112E-007
		238.63*	43.60	4.6835E-008		3.5217E-007
		300.09*	3.34	2.5827E-007		4.3141E-007
+	BI-214B	609.31*	44.80	4.8205E-008	4.82E-008	6.0001E-007
		665.45	1.29	1.1884E-006		9.1470E-007
		768.36*	4.80	4.4949E-007		4.8782E-007
		806.17*	1.12	1.2558E-006		7.6897E-007
		934.06*	3.03	5.4109E-007		6.6708E-007
		1120.29*	14.80	2.3865E-007		6.9791E-007
		1155.19	1.64	1.3133E-006		-6.4333E-007
		1238.11*	5.86	4.4230E-007		5.7377E-007
		1280.96	1.44	1.4246E-006		7.5732E-007
		1377.67*	3.92	4.5776E-007		7.7039E-007
		1401.50*	1.55	8.3668E-007		8.7994E-007
		1407.98*	2.80	5.7710E-007		1.9213E-006
		1509.23*	2.12	1.0154E-006		1.2189E-006
		1661.28	1.14	1.1431E-006		2.9841E-008
		1729.59*	2.88	6.1631E-007		9.5715E-007
		1764.49*	15.36	1.7542E-007		6.8580E-007
		1847.42*	2.04	5.7644E-007		9.2342E-007
		2118.55	1.14	1.1962E-006		7.0094E-007
		2204.21*	4.86	2.7413E-007		6.8161E-007
		2447.86	1.50	9.2179E-007		2.9824E-007
+	PB-214B	53.23*	1.11	7.8030E-007	5.00E-008	5.1161E-007
		74.81*	5.90	2.8873E-007		1.0087E-006
		77.11*	9.90	1.7078E-007		9.7603E-007
		87.30*	4.41	6.3197E-007		7.0065E-007
		241.98*	7.50	2.7650E-007		7.5057E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	8.2709E-008	5.00E-008	6.2956E-007
		351.92*	35.80	5.0034E-008		6.4621E-007
+	RA-226	186.10*	3.50	4.2818E-007	4.28E-007	8.3083E-007
+	AC-228B	12.95	15.10	1.0109E-006	6.09E-008	-2.0875E-006
		16.15	20.00	3.7554E-007		3.9494E-008
		19.11	4.60	9.0977E-007		-2.0883E-007
		89.96*	3.40	8.0925E-007		5.2632E-007
		93.35*	5.60	5.0886E-007		3.8076E-007
		99.55	1.30	7.1038E-007		-1.6147E-007
		105.36*	2.00	4.4940E-007		2.6570E-007
		129.03*	2.90	2.9300E-007		3.0412E-007
		209.39*	4.10	2.4257E-007		4.2862E-007
		270.26*	3.80	3.4880E-007		6.3227E-007
		328.07*	3.50	3.7750E-007		5.3944E-007
		338.42*	12.40	1.2303E-007		3.6875E-007
		409.62*	2.20	5.4166E-007		4.9087E-007
		463.10*	4.60	3.3399E-007		5.3332E-007
		562.65*	1.01	1.0648E-006		2.8323E-007
		755.28	1.32	1.2170E-006		5.2264E-007
		772.28	1.09	1.7317E-006		-8.5947E-007
		794.79*	4.60	4.8564E-007		4.1544E-007
		835.60*	1.71	6.3503E-007		6.3941E-007
		911.16*	29.00	6.0947E-008		3.2663E-007
		964.64*	5.80	5.7777E-007		7.2103E-007
		968.97*	17.40	1.9729E-007		3.6263E-007
		1459.19	1.06	6.2360E-006		1.1114E-004
		1496.00	1.05	1.3450E-006		3.8894E-009
		1588.23*	3.60	3.1427E-007		3.1969E-007
		1630.47	1.95	6.6328E-007		-6.5222E-007
	PA-234B	63.00	3.20	3.1930E-007	4.03E-008	8.2375E-007
		94.67	14.30	7.4421E-008		-5.9071E-008
		98.44	23.00	4.0335E-008		-3.3875E-008
		99.70	4.80	1.9264E-007		-2.0025E-008
		111.00	10.80	8.7144E-008		1.3006E-008
		125.40	1.00	9.9209E-007		-1.1251E-006
		131.20	20.00	4.9283E-008		3.1355E-009
		152.70	6.70	1.6122E-007		9.9171E-008
		186.00	2.00	6.5039E-007		3.0795E-006
		200.90	1.00	1.1711E-006		-5.7985E-007
		202.90	1.20	9.7608E-007		4.1131E-007
		226.40	5.90	1.9900E-007		-3.8803E-008
		227.20	5.50	2.1435E-007		-2.0708E-008
		248.90	2.80	4.0345E-007		-1.9161E-007
		272.10	1.00	1.2216E-006		-2.4644E-007
		293.70	3.90	4.1064E-007		-3.6712E-008
		369.80	2.90	4.2418E-007		6.6356E-008
		372.40	1.30	9.4794E-007		-2.2619E-007
		458.80	1.50	8.9522E-007		1.1678E-007
		506.80	1.60	1.0811E-006		-2.5258E-008
		513.70	1.30	1.4649E-006		-9.4003E-008
		565.90	1.40	1.0159E-006		2.9432E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	4.2519E-007	4.03E-008	2.0013E-007
		569.50	10.00	1.4117E-007		7.7352E-008
		574.00	2.00	7.0874E-007		-7.7288E-009
		664.80	1.30	1.1788E-006		9.3773E-007
		666.70	1.60	9.6063E-007		1.0111E-006
		669.90	1.40	1.0680E-006		2.0256E-007
		692.70	1.50	1.0047E-006		8.5147E-007
		699.00	4.60	3.3092E-007		2.0942E-008
		706.10	3.10	4.8836E-007		2.0943E-007
		733.00	9.00	1.9137E-007		-1.0508E-007
		738.00	1.00	1.6096E-006		-6.8019E-007
		742.81	2.40	6.7675E-007		1.0238E-007
		755.60	1.40	1.1497E-006		5.0565E-007
		780.70	1.10	1.6728E-006		1.5689E-006
		786.27	1.40	1.2676E-006		9.1301E-007
		793.60	1.50	1.1498E-006		-3.5347E-007
		796.30	3.80	4.4995E-007		3.1342E-007
		805.80	3.30	5.1877E-007		3.5842E-007
		819.60	2.60	6.3198E-007		-1.9968E-007
		826.30	4.00	4.0872E-007		-1.5979E-007
		831.60	5.50	3.0206E-007		-5.2989E-008
		876.40	4.00	4.2382E-007		-1.3958E-007
		880.50	4.00	4.2285E-007		6.0178E-008
		880.51	9.00	1.8793E-007		2.6746E-008
		883.24	15.00	1.1120E-007		-8.6320E-008
		899.00	4.10	4.3127E-007		8.7464E-008
		925.00	2.90	5.9652E-007		-3.8424E-008
		926.00	11.00	1.5680E-007		-4.1726E-008
		927.10	11.00	1.5482E-007		-1.1219E-007
		946.00	12.00	1.4904E-007		-2.9778E-008
		949.00	8.00	2.2381E-007		-7.4685E-008
		978.80	1.40	1.2364E-006		6.9376E-007
		980.50	2.00	8.7779E-007		7.7073E-007
		980.50	3.00	5.8519E-007		5.1382E-007
		984.00	1.90	9.1474E-007		-7.1859E-007
		1353.30	1.70	9.3560E-007		-1.6114E-007
		1394.10	3.00	4.9737E-007		-4.4321E-007
		1452.70	1.00	2.0321E-006		-4.9964E-007
		1668.50	1.20	1.0436E-006		-1.7203E-009
		1694.60	1.20	1.0459E-006		1.0262E-007
+	TH-234	63.29*	4.50	3.0689E-006	3.07E-006	3.0594E-006
		92.38	2.60	5.4557E-006		2.7366E-005
		92.80*	2.60	1.3936E-005		1.0428E-005
+	U-235	72.70	0.11	1.0782E-005	2.61E-008	-4.7310E-006
		89.95*	2.80	9.6631E-007		6.2847E-007
		93.35*	4.50	6.2271E-007		4.6594E-007
		94.00	0.40	2.6213E-006		-1.3384E-006
		105.00*	2.10	4.2087E-007		2.4884E-007
		109.16	1.50	6.1658E-007		1.8173E-008
		140.76	0.22	4.6861E-006		-4.9986E-007
		143.76	10.90	9.5719E-008		2.1991E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	2.1145E-007	2.61E-008	1.7451E-007
		182.61	0.40	3.0207E-006		-1.4635E-006
		185.71*	57.50	2.6060E-008		5.0567E-008
		194.94	0.59	1.9468E-006		2.0713E-006
		202.11	1.00	1.1528E-006		-6.5152E-008
		205.31	5.00	2.3340E-007		-6.6598E-008
		279.50	0.27	4.2900E-006		6.4679E-007

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

Appendix D

Analysis of Concrete Support Wall around Storage Port No. 1

Eberline Analytical

UNIVERSITY OF MICHIGAN

Concrete Material

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #10-02134-OR

April 19, 2010

EBERLINE ANALYTICAL/OAK RIDGE LABORATORY
OAK RIDGE, TN

Eberline Analytical
Final Report of Analysis

Report To.
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.45E+03	4.05E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.44E+03	1.42E+01	1.44E+01	5.66E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	4.03E+00	3.30E+00	3.30E+00	5.51E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	4.10E-01	6.64E-01	6.64E-01	1.12E+00	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	5.95E-01	5.95E-01	1.02E+00	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	6.46E-01	6.46E-01	1.10E+00	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	3.97E-01	6.43E-01	6.43E-01	1.09E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.67E+00	6.99E-01	6.99E-01	1.14E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	3.56E+00	7.01E-01	7.01E-01	1.08E+00	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	5.31E+00	7.52E-01	7.52E-01	1.12E+00	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	6.25E-01	6.25E-01	1.07E+00	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	3.91E+02	8.60E+00			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	3.90E+02	6.29E+00	6.29E+00	6.54E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.81E-01	8.54E-02	8.54E-02	1.18E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	4.32E-02	6.35E-02	6.35E-02	1.08E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-6.86E-03	5.80E-02	5.80E-02	1.05E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-3.25E-02	6.24E-02	6.24E-02	1.16E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.82E-02	5.25E-02	5.25E-02	9.11E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-2.81E-02	5.98E-02	5.98E-02	1.11E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.67E-02	5.58E-02	5.58E-02	9.71E-02	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.40E-02	5.92E-02	5.92E-02	1.03E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-2.00E-02	6.38E-02	6.38E-02	1.17E-01	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	3.50E+02	1.26E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	3.24E+02	4.24E+00	3.62E+01	2.06E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.58E+00	1.24E+00	1.25E+00	2.06E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.68E+00	1.31E+00	1.32E+00	2.18E+00	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.65E+00	1.29E+00	1.30E+00	2.14E+00	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.64E+00	1.28E+00	1.29E+00	2.13E+00	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.57E+00	1.23E+00	1.24E+00	2.04E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.67E+00	1.30E+00	1.32E+00	2.17E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.67E+00	1.31E+00	1.32E+00	2.17E+00	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.70E+00	1.33E+00	1.34E+00	2.21E+00	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	0.00E+00	1.23E+00	1.23E+00	2.11E+00	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To:
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Americium-241	LANL ER-130 Modified	3.66E+03	1.14E+02			pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Cobalt-57	LANL ER-130 Modified	1.14E+03	3.42E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Americium-241	LANL ER-130 Modified	3.59E+03	3.03E+02	3.03E+02	5.09E+00	pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Cobalt-57	LANL ER-130 Modified	1.23E+03	1.98E+02	1.98E+02	4.11E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-1.45E+00	6.43E+00	6.43E+00	1.07E+01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.74E+00	1.10E+01	1.10E+01	1.11E+01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	1.48E+00	6.62E+00	6.62E+00	1.14E+01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.82E+00	1.12E+01	1.12E+01	1.05E+01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	2.27E+00	5.08E+00	5.08E+00	7.72E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	2.74E+00	5.64E+00	5.64E+00	8.17E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-5.07E+00	9.54E+00	9.54E+00	1.17E+01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	4.61E+00	8.08E+00	8.08E+00	1.04E+01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.66E+00	1.02E+01	1.02E+01	9.03E+00	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	1.34E+02	3.81E+00			pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	8.08E+01	2.26E+00			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	1.39E+02	1.08E+01	1.08E+01	7.52E-01	pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	8.50E+01	8.03E+00	8.03E+00	6.77E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	-9.39E-03	1.46E-02	1.46E-02	2.28E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	9.54E-03	1.60E-02	1.60E-02	3.25E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	1.05E-02	1.81E-02	1.81E-02	3.58E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	3.08E-03	1.34E-02	1.34E-02	2.86E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-2.25E-03	1.54E-02	1.54E-02	2.53E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-3.45E-03	1.77E-02	1.77E-02	3.26E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	8.88E-02	9.91E-02	9.91E-02	2.46E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	4.03E-02	4.83E-02	4.83E-02	1.06E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.43E-02	2.80E-02	2.80E-02	4.92E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	1.75E-03	1.32E-02	1.32E-02	2.63E-02	pCi/g

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Eberline Analytical
Final Report of Analysis

Report To:
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	2.81E-04	4.70E-02	4.70E-02	8.39E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	7.75E-02	1.15E-01	1.15E-01	2.19E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	2.46E-02	5.98E-02	5.98E-02	9.94E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	3.00E-01	7.99E-02	7.99E-02	1.18E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-7.18E-03	6.34E-02	6.34E-02	9.98E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	2.71E-02	4.74E-02	4.74E-02	8.95E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	1.49E+00	6.15E-01	6.15E-01	1.13E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	1.12E-01	1.42E-01	1.42E-01	2.84E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	2.71E-01	1.37E-01	1.37E-01	2.08E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-1.94E-03	9.94E-02	9.94E-02	1.77E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.32E-02	5.55E-02	5.55E-02	9.07E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.77E-02	1.13E-01	1.13E-01	1.96E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	6.89E-02	5.83E-02	5.83E-02	1.02E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	2.75E-01	6.71E-02	6.71E-02	9.66E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	9.35E-03	6.48E-02	6.48E-02	1.05E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-6.31E-03	4.54E-02	4.54E-02	8.07E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	1.73E+00	3.41E-01	3.41E-01	3.94E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	7.48E-02	1.51E-01	1.51E-01	2.88E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	3.23E-01	1.38E-01	1.38E-01	2.09E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-6.45E-02	1.05E-01	1.05E-01	1.74E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.28E-02	4.08E-02	4.08E-02	6.94E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-1.76E-02	7.96E-02	7.96E-02	1.44E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	-3.55E-02	5.39E-02	5.39E-02	7.56E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	8.90E-02	4.67E-02	4.67E-02	8.18E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	3.59E-02	3.36E-02	3.36E-02	8.61E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-1.53E-02	3.55E-02	3.55E-02	6.30E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	4.94E-01	3.76E-01	3.76E-01	6.03E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	4.89E-02	1.12E-01	1.12E-01	2.18E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	8.28E-02	1.25E-01	1.25E-01	1.76E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	2.33E-02	7.58E-02	7.58E-02	1.43E-01	pCi/g

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Final Report of Analysis

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SDG: 10-02134
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Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.17E-02	2.33E-02	2.33E-02	4.64E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.76E-02	4.23E-02	4.23E-02	6.80E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	5.82E-02	3.06E-02	3.06E-02	6.01E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.05E-02	2.22E-02	2.22E-02	5.00E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-4.30E-04	3.24E-02	3.24E-02	5.28E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	5.68E-03	2.21E-02	2.21E-02	4.24E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	2.49E-02	1.58E-01	1.58E-01	3.16E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	1.31E-02	4.70E-02	4.70E-02	1.04E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	-2.76E-02	4.57E-02	4.57E-02	6.55E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	6.45E-03	3.73E-02	3.73E-02	7.17E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	3.04E-01	4.45E-02	4.45E-02	7.69E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	1.76E-03	6.67E-02	6.67E-02	1.24E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	6.06E-01	1.07E-01	1.07E-01	8.59E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	5.51E-01	8.02E-02	8.02E-02	5.98E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	7.58E-03	4.75E-02	4.75E-02	7.97E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-2.32E-02	3.75E-02	3.75E-02	6.53E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	2.24E-01	2.83E-01	2.83E-01	5.49E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	-6.17E-02	1.16E-01	1.16E-01	1.96E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.26E-01	1.07E-01	1.07E-01	1.44E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-3.33E-02	7.11E-02	7.11E-02	1.23E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.35E-01	5.13E-02	5.13E-02	1.12E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	3.74E-02	1.15E-01	1.15E-01	1.94E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	4.79E-02	7.47E-02	7.47E-02	1.27E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.31E-01	1.04E-01	1.04E-01	1.40E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-3.52E-02	8.00E-02	8.00E-02	1.21E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	2.41E-01	1.17E-01	1.17E-01	1.07E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	7.59E-01	4.04E-01	4.04E-01	9.14E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	2.27E-01	2.67E-01	2.67E-01	3.55E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.05E-01	1.59E-01	1.59E-01	2.45E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	3.67E-02	1.04E-01	1.04E-01	1.92E-01	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To.
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Silver-108m	LANL ER-130 Modified	3.58E-01	6.57E-02	6.57E-02	1.32E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Silver-110m	LANL ER-130 Modified	2.02E-01	1.52E-01	1.52E-01	2.67E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Barium-133	LANL ER-130 Modified	1.83E-02	9.37E-02	9.37E-02	1.43E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.21E+00	3.62E-01	3.62E-01	1.31E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cesium-134	LANL ER-130 Modified	7.26E-02	4.03E-02	4.03E-02	1.31E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cesium-137	LANL ER-130 Modified	1.77E+00	3.08E-01	3.08E-01	1.17E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-152	LANL ER-130 Modified	3.52E-01	3.64E-01	3.64E-01	7.19E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-154	LANL ER-130 Modified	6.88E-02	1.84E-01	1.84E-01	3.45E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-155	LANL ER-130 Modified	1.80E-01	1.76E-01	1.76E-01	2.87E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Manganese-54	LANL ER-130 Modified	3.65E-03	1.35E-01	1.35E-01	2.38E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Silver-108m	LANL ER-130 Modified	-1.49E-02	4.39E-02	4.39E-02	7.69E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.03E-02	3.89E-02	3.89E-02	6.49E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Barium-133	LANL ER-130 Modified	-6.26E-03	5.88E-02	5.88E-02	9.42E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cobalt-60	LANL ER-130 Modified	-2.42E-02	4.78E-02	4.78E-02	8.14E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cesium-134	LANL ER-130 Modified	-3.16E-02	4.67E-02	4.67E-02	6.92E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cesium-137	LANL ER-130 Modified	-5.83E-03	4.03E-02	4.03E-02	7.27E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-152	LANL ER-130 Modified	1.80E-01	2.59E-01	2.59E-01	5.37E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-154	LANL ER-130 Modified	-1.98E-02	1.23E-01	1.23E-01	2.22E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-155	LANL ER-130 Modified	4.15E-02	1.48E-01	1.48E-01	1.81E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Manganese-54	LANL ER-130 Modified	-1.18E-02	4.69E-02	4.69E-02	8.26E-02	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

UNIVERSITY OF MICHIGAN

Concrete Material

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #10-02134-OR

April 19, 2010

EBERLINE ANALYTICAL/OAK RIDGE LABORATORY
OAK RIDGE, TN

Eberline Analytical
Final Report of Analysis

Report To
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.45E+03	4.05E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.44E+03	1.42E+01	1.44E+01	5.66E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	4.03E+00	3.30E+00	3.30E+00	5.51E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	4.10E-01	6.64E-01	6.64E-01	1.12E+00	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	5.95E-01	5.95E-01	1.02E+00	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	6.46E-01	6.46E-01	1.10E+00	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	3.97E-01	6.43E-01	6.43E-01	1.09E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	1.67E+00	5.99E-01	6.99E-01	1.14E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	3.56E+00	7.01E-01	7.01E-01	1.08E+00	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	5.31E+00	7.52E-01	7.52E-01	1.12E+00	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/18/2010	10-02134	Carbon-14	EPA 520.0 Modified	0.00E+00	6.25E-01	6.25E-01	1.07E+00	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	3.91E+02	8.60E+00			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	3.90E+02	6.29E+00	6.29E+00	6.54E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.81E-01	8.54E-02	8.54E-02	1.18E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	4.32E-02	6.35E-02	6.35E-02	1.08E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-6.86E-03	5.80E-02	5.80E-02	1.05E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-3.25E-02	6.24E-02	6.24E-02	1.16E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.82E-02	5.25E-02	5.25E-02	9.11E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-2.81E-02	5.98E-02	5.98E-02	1.11E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.67E-02	5.58E-02	5.58E-02	9.71E-02	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	2.40E-02	5.92E-02	5.92E-02	1.03E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/4/2010	10-02134	Chlorine-36	4500-Cl-B Modified	-2.00E-02	6.38E-02	6.38E-02	1.17E-01	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	3.50E+02	1.26E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	3.24E+02	4.24E+00	3.62E+01	2.06E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.58E+00	1.24E+00	1.25E+00	2.06E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.68E+00	1.31E+00	1.32E+00	2.18E+00	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.65E+00	1.29E+00	1.30E+00	2.14E+00	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.64E+00	1.28E+00	1.29E+00	2.13E+00	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.57E+00	1.23E+00	1.24E+00	2.04E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.67E+00	1.30E+00	1.32E+00	2.17E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.67E+00	1.31E+00	1.32E+00	2.17E+00	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	1.70E+00	1.33E+00	1.34E+00	2.21E+00	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/19/2010	10-02134	Tritium	LANL ER-210 Modified	0.00E+00	1.23E+00	1.23E+00	2.11E+00	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To:
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Americium-241	LANL ER-130 Modified	3.66E+03	1.14E+02			pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Cobalt-57	LANL ER-130 Modified	1.14E+03	3.42E+01			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Americium-241	LANL ER-130 Modified	3.59E+03	3.03E+02	3.03E+02	5.09E+00	pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Cobalt-57	LANL ER-130 Modified	1.23E+03	1.98E+02	1.98E+02	4.11E+00	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-1.45E+00	6.43E+00	6.43E+00	1.07E+01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.74E+00	1.10E+01	1.10E+01	1.11E+01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	1.48E+00	6.62E+00	6.62E+00	1.14E+01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.82E+00	1.12E+01	1.12E+01	1.05E+01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	2.27E+00	5.08E+00	5.08E+00	7.72E+00	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	2.74E+00	5.64E+00	5.64E+00	8.17E+00	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-5.07E+00	9.54E+00	9.54E+00	1.17E+01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	4.61E+00	8.08E+00	8.08E+00	1.04E+01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/15/2010	10-02134	Iron-55	LANL ER-130 Modified	-6.66E+00	1.02E+01	1.02E+01	9.03E+00	pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	1.34E+02	3.81E+00			pCi/g
10-02134-01	LCS	KNOWN	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	8.08E+01	2.26E+00			pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	1.39E+02	1.08E+01	1.08E+01	7.52E-01	pCi/g
10-02134-01	LCS	SPIKE	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	8.50E+01	8.03E+00	8.03E+00	6.77E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	-9.39E-03	1.46E-02	1.46E-02	2.28E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	9.54E-03	1.60E-02	1.60E-02	3.25E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	1.05E-02	1.81E-02	1.81E-02	3.58E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	3.08E-03	1.34E-02	1.34E-02	2.86E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-2.25E-03	1.54E-02	1.54E-02	2.53E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-3.45E-03	1.77E-02	1.77E-02	3.26E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	8.88E-02	9.91E-02	9.91E-02	2.46E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	4.03E-02	4.83E-02	4.83E-02	1.06E-01	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.43E-02	2.80E-02	2.80E-02	4.92E-02	pCi/g
10-02134-02	MBL	BLANK	02/24/10 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	1.75E-03	1.32E-02	1.32E-02	2.63E-02	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To:
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	2.81E-04	4.70E-02	4.70E-02	8.39E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	7.75E-02	1.15E-01	1.15E-01	2.19E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	2.46E-02	5.98E-02	5.98E-02	9.94E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	3.00E-01	7.99E-02	7.99E-02	1.18E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-7.18E-03	6.34E-02	6.34E-02	9.98E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	2.71E-02	4.74E-02	4.74E-02	8.95E-02	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	1.49E+00	6.15E-01	6.15E-01	1.13E+00	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	1.12E-01	1.42E-01	1.42E-01	2.84E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	2.71E-01	1.37E-01	1.37E-01	2.08E-01	pCi/g
10-02134-03	DUP	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-1.94E-03	9.94E-02	9.94E-02	1.77E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.32E-02	5.55E-02	5.55E-02	9.07E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.77E-02	1.13E-01	1.13E-01	1.96E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	6.89E-02	5.83E-02	5.83E-02	1.02E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	2.75E-01	6.71E-02	6.71E-02	9.66E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	9.35E-03	6.48E-02	6.48E-02	1.05E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-6.31E-03	4.54E-02	4.54E-02	8.07E-02	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	1.73E+00	3.41E-01	3.41E-01	3.94E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	7.48E-02	1.51E-01	1.51E-01	2.88E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	3.23E-01	1.38E-01	1.38E-01	2.09E-01	pCi/g
10-02134-04	DO	UM-2009-02-26-01	02/26/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-6.45E-02	1.05E-01	1.05E-01	1.74E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.28E-02	4.08E-02	4.08E-02	6.94E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-1.76E-02	7.96E-02	7.96E-02	1.44E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	-3.55E-02	5.39E-02	5.39E-02	7.56E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	6.90E-02	4.67E-02	4.67E-02	8.18E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	3.59E-02	3.36E-02	3.36E-02	8.61E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-1.53E-02	3.55E-02	3.55E-02	6.30E-02	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	4.94E-01	3.76E-01	3.76E-01	6.03E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	4.89E-02	1.12E-01	1.12E-01	2.18E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	8.28E-02	1.25E-01	1.25E-01	1.76E-01	pCi/g
10-02134-05	TRG	UM-2009-03-04-01	03/06/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	2.33E-02	7.58E-02	7.58E-02	1.43E-01	pCi/g

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SDG: 10-02134
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Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.17E-02	2.33E-02	2.33E-02	4.64E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.76E-02	4.23E-02	4.23E-02	6.80E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	5.82E-02	3.06E-02	3.06E-02	6.01E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.05E-02	2.22E-02	2.22E-02	5.00E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-4.30E-04	3.24E-02	3.24E-02	5.28E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	5.68E-03	2.21E-02	2.21E-02	4.24E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	2.49E-02	1.58E-01	1.58E-01	3.16E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	1.31E-02	4.70E-02	4.70E-02	1.04E-01	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	-2.76E-02	4.57E-02	4.57E-02	6.55E-02	pCi/g
10-02134-06	TRG	UM-2009-06-08-01	06/29/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	6.45E-03	3.73E-02	3.73E-02	7.17E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	3.04E-01	4.45E-02	4.45E-02	7.69E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	1.76E-03	6.67E-02	6.67E-02	1.24E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	6.06E-01	1.07E-01	1.07E-01	8.59E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	5.51E-01	8.02E-02	8.02E-02	5.98E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	7.58E-03	4.75E-02	4.75E-02	7.97E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	-2.32E-02	3.75E-02	3.75E-02	6.53E-02	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	2.24E-01	2.83E-01	2.83E-01	5.49E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	-6.17E-02	1.16E-01	1.16E-01	1.96E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.26E-01	1.07E-01	1.07E-01	1.44E-01	pCi/g
10-02134-07	TRG	UM-2009-06-10-01	06/22/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	-3.33E-02	7.11E-02	7.11E-02	1.23E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-108m	LANL ER-130 Modified	1.35E-01	5.13E-02	5.13E-02	1.12E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Silver-110m	LANL ER-130 Modified	3.74E-02	1.15E-01	1.15E-01	1.94E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Barium-133	LANL ER-130 Modified	4.79E-02	7.47E-02	7.47E-02	1.27E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.31E-01	1.04E-01	1.04E-01	1.40E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-134	LANL ER-130 Modified	-3.52E-02	8.00E-02	8.00E-02	1.21E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Cesium-137	LANL ER-130 Modified	2.41E-01	1.17E-01	1.17E-01	1.07E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-152	LANL ER-130 Modified	7.59E-01	4.04E-01	4.04E-01	9.14E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-154	LANL ER-130 Modified	2.27E-01	2.67E-01	2.67E-01	3.55E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Europium-155	LANL ER-130 Modified	1.05E-01	1.59E-01	1.59E-01	2.45E-01	pCi/g
10-02134-08	TRG	UM-2009-06-12-01	06/24/09 00:00	2/24/2010	3/4/2010	10-02134	Manganese-54	LANL ER-130 Modified	3.67E-02	1.04E-01	1.04E-01	1.92E-01	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To:
Mark L. Driscoll
Univ of MI, Occupational Safety & Env Heal
1239 Kepke Drive
Ann Arbor, MI 48109

Work Order Details:
SDG: 10-02134
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Silver-108m	LANL ER-130 Modified	3.58E-01	6.57E-02	6.57E-02	1.32E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Silver-110m	LANL ER-130 Modified	2.02E-01	1.52E-01	1.52E-01	2.67E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Barium-133	LANL ER-130 Modified	1.83E-02	9.37E-02	9.37E-02	1.43E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cobalt-60	LANL ER-130 Modified	4.21E+00	3.62E-01	3.62E-01	1.31E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cesium-134	LANL ER-130 Modified	7.26E-02	4.03E-02	4.03E-02	1.31E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Cesium-137	LANL ER-130 Modified	1.77E+00	3.08E-01	3.08E-01	1.17E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-152	LANL ER-130 Modified	3.52E-01	3.64E-01	3.64E-01	7.19E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-154	LANL ER-130 Modified	6.98E-02	1.84E-01	1.84E-01	3.45E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Europium-155	LANL ER-130 Modified	1.80E-01	1.76E-01	1.76E-01	2.67E-01	pCi/g
10-02134-09	TRG	UM-2009-06-19-01	06/25/09 00:00	2/24/2010	3/5/2010	10-02134	Manganese-54	LANL ER-130 Modified	3.65E-03	1.35E-01	1.35E-01	2.38E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Silver-108m	LANL ER-130 Modified	-1.49E-02	4.39E-02	4.39E-02	7.69E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Silver-110m	LANL ER-130 Modified	-3.03E-02	3.89E-02	3.89E-02	6.49E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Barium-133	LANL ER-130 Modified	-6.26E-03	5.88E-02	5.88E-02	9.42E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cobalt-60	LANL ER-130 Modified	-2.42E-02	4.78E-02	4.78E-02	8.14E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cesium-134	LANL ER-130 Modified	-3.16E-02	4.67E-02	4.67E-02	6.92E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Cesium-137	LANL ER-130 Modified	-5.63E-03	4.03E-02	4.03E-02	7.27E-02	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-152	LANL ER-130 Modified	1.80E-01	2.59E-01	2.59E-01	5.37E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-154	LANL ER-130 Modified	-1.98E-02	1.23E-01	1.23E-01	2.22E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Europium-155	LANL ER-130 Modified	4.15E-02	1.46E-01	1.46E-01	1.91E-01	pCi/g
10-02134-10	TRG	UM-2010-01-29-01	01/29/10 00:00	2/24/2010	3/5/2010	10-02134	Manganese-54	LANL ER-130 Modified	-1.18E-02	4.69E-02	4.69E-02	8.26E-02	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Appendix E

Storage Port Vent Lines Survey Data Sheet

Cutting of Storage Port Bleed-off Lines

Survey NO.: NA

DATE: 10-Dec-08 LOCATION: O/S, West of FNR above Storage Ports TIME: 15:30

Smear Information dpm Frisking Probe Model # 44-142 Serial # 240718

ε_i 38 ε_s 0.25 Frisking Probe Efficiency 0.095

1 Min BKG: 1. 335 2. 355 3. 342

Avg. BKG: 344

L_C Gross CPM: 394 L_C Net CPM: 50

L_D Gross CPM: 417 L_D Net CPM: 73

Note: Removed Storage Port Bleed-off Lines using a bandsaw. Bleed-off lines were 1" in diameter. Pipes were Large Area Wiped internally at each end after cut. (4) Lines were cut in total, starting with the north most pipe. All Large Area Wipes were <Lc. Pipe ends were then taped. All (4) now loose pipes were then placed in the FNR radioactive material area inside the FNR.

During cutting activities, a cardboard tray was used to collect any pipe shavings from cutting the pipes with the bandsaw. Shavings were disposed of as radioactive materials and placed in a radioactive materials slurry/piping drum. Frisk and wipes done for the cardboard tray were all <Lc. Large Area Wipe of the bandsaw was <Lc.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-142	218579 /240714	8-Mar-09	0.095	344	773
			d'=1.38 p=0.5	t (sec) 2	2087
Frisker Detector HV = 1150 Vdc (240714)		Threshold Voltage = 350 mVdc		Detector cable type/length =	59/6ft

Print/Signature of Surveyor: Jerry Shimek Jerry Shimek Date: 10-Dec-08

Comments: _____

Review By: _____ Date: 2/21/2012

Appendix F

Radiological Survey and Swipe Analysis for Storage Port Ends Remaining in FNR Wall

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 1 TIME: 16:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 30 3. 27

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	37	7	<MDA	
2	Static 2	38	8	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	188
			d'=1.38 p=0.5	t (sec) 3	377
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinsel/Jerry Shinsel Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 2 TIME: 16:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 28 3. 38

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	24	0	<MDA	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	196
			d'=1.38 p=0.5	t (sec) 3	395
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek Date: 09-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 3 TIME: 15:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 38 31 3. 29

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	32	0	<MDA	
2	Static 2	34	1	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

***NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.**

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	196
			d'=1.38 p=0.5	t (sec) 3	395
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port #4 TIME: 15:15

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 26 3. 37

Avg. BKG: 32

L_C Gross CPM: 53 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	51	19	<MDA	
2	Static 2	50	18	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	32	193
			d'=1.38 p=0.5	t (sec) 3	389
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek / Jerry Shinek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 5 TIME: 15:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 28 24 3. 32

Avg. BKG: 28

L_C Gross CPM: 49 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	41	13	<MDA	
2	Static 2	42	14	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	28	183
			d'=1.38 p=0.5	t (sec) 3	366
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck Date: 09-Jan-09

Comments:

Review By: Date: 2/28/13

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 6 TIME: 14:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 32 3. 31

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	25	0	<MDA	
2	Static 2	39	9	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 90 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	189
			d'=1.38 p=0.5	t (sec) 3	379
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Strinek / Jerry Strinek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 7 TIME: 14:15

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 35 29 3. 38

Avg. BKG: 34

L_C Gross CPM: 55 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	28	0	<MDA	
2	Static 2	31	0	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	34	199
			d'=1.38 p=0.5	t (sec) 3	403
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek /Jerry Shimek Date: 09-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 8 TIME: 13:50

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 37 30 3. 27

Avg. BKG: 31

L_C Gross CPM: 52 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	31	0	<MDA	
2	Static 2	51	20	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 75 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	31	192
			d'=1.38 p=0.5	t (sec) 3	387
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 9 TIME: 13:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 26 26 3. 28

Avg. BKG: 27

L_C Gross CPM: 48 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	43	16	<MDA	
2	Static 2	46	19	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 65 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	27	179
			d'=1.38 p=0.5	t (sec) 3	357
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Stinnett Jerry Stinnett Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/11

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 10 TIME: 13:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 28 30 3. 26

Avg. BKG: 28

L_C Gross CPM: 49 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	38	10	<MDA	
2	Static 2	47	19	<MDA	
3	Static 3	40	12	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	28	183
			d'=1.38 p=0.5	t (sec) 3	366
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Slivnik Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 11 TIME: 11:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 30 29 3. 31

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	33	3	<MDA	
2	Static 2	46	16	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	189
			d'=1.38 p=0.5	t (sec) 3	379
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinde Date: 09-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 12 TIME: 10:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 35 30 3. 35

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	42	9	<MDA	
2	Static 2	30	0	<MDA	
3	Static 3	28	0	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 68 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	197
			d'=1.38 p=0.5	t (sec) 3	399
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 13 TIME: 10:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 40 41 3. 32

Avg. BKG: 38

L_C Gross CPM: 59 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	54	16	<MDA	
2	Static 2	45	7	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	38	208
			d'=1.38 p=0.5	t (sec) 3	424
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 14 TIME: 9:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 35 3. 27

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	38	8	<MDA	
2	Static 2	33	3	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	188
			d'=1.38 p=0.5	t (sec) 3	377
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 09-Jan-09

Comments:

Review By: Date: 3/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 15 TIME: 9:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 30 28 3. 37

Avg. BKG: 32

L_C Gross CPM: 53 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	23	0	<MDA	
2	Static 2	18	0	<MDA	
3	Static 3	39	7	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	32	193
			d'=1.38 p=0.5	t (sec) 3	389
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek / Jerry Shinek Date 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 16 TIME: 9:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 42 39 3. 31

Avg. BKG: 37

L_C Gross CPM: 58 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	40	3	<MDA	
2	Static 2	32	0	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	37	208
			d'=1.38 p=0.5	t (sec) 3	422
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 09-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 17 TIME: 8:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 25 40 3. 39

Avg. BKG: 35

L_C Gross CPM: 56 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	37	2	<MDA	
2	Static 2	50	15	<MDA	
3	Static 3	41	6	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	35	201
			d'=1.38 p=0.5	t (sec) 3	407
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek / Jerry Shimek Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/22/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 18 TIME: 8:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 35 41 3. 36

Avg. BKG: 37

L_C Gross CPM: 58 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	38	1	<MDA	
2	Static 2	50	13	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	37	208
			d'=1.38 p=0.5	t (sec) 3	422
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinsk Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 9-Jan-09 LOCATION: Port # 19 TIME: 8:10

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 37 38 3. 25

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	32	0	<MDA	
2	Static 2	35	2	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	197
			d'=1.38 p=0.5	t (sec) 3	399
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinde Jerry Shinde Date: 09-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 20 TIME: 14:15

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 40 28 3. 33

Avg. BKG: 34

L_C Gross CPM: 55 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	39	5	<MDA	
2	Static 2	35	1	<MDA	
3	Static 3	52	18	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 60 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	34	198
			d'=1.38 p=0.5	t (sec) 3	401
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek Date: 08-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 21 TIME: 14:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 26 34 3. 31

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	37	7	<MDA	
2	Static 2	33	3	<MDA	
3	Static 3	24	0	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary.
Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	189
			d'=1.38 p=0.5	t (sec) 3	381
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck / Jerry Shinck Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 22 TIME: 13:35

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 28 28 3. 31

Avg. BKG: 29

L_C Gross CPM: 50 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	36	7	<MDA	
2	Static 2	36	0	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	29	186
			d'=1.38 p=0.5	t (sec) 3	372
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck Date: 08-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 23 TIME: 13:10

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 43 3. 37

Avg. BKG: 37

L_C Gross CPM: 58 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	42	5	<MDA	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	37	208
[redacted]			d'=1.38 p=0.5	t (sec) 3	422
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek / Jerry Shimek Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 24 TIME: 13:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 31 44 3. 35

Avg. BKG: 37

L_C Gross CPM: 58 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	36	0	<MDA	
2	Static 2	22	0	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	37	206
			d'=1.38 p=0.5	t (sec) 3	419
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Terry Shinet / [signature] Date: 08-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 25 TIME: 12:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 35 33 3. 25

Avg. BKG: 31

L_C Gross CPM: 52 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	50	19	<MDA	
2	Static 2	43	12	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	31	191
			d'=1.38 p=0.5	t (sec) 3	385
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek / Jerry Shimek Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 26 TIME: 11:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 31 44 3. 39

Avg. BKG: 38

L_C Gross CPM: 59 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	55	17	<MDA	
2	Static 2	53	15	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	38	209
			d'=1.38 p=0.5	t (sec) 3	426
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinch Date: 08-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 27 TIME: 10:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 40 3. 42

Avg. BKG: 36

L_C Gross CPM: 57 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	29	0	<MDA	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	36	205
			d'=1.38 p=0.5	t (sec) 3	417
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek / Jerry Shinek Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 28 TIME: 10:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 29 31 3. 29

Avg. BKG: 30

L_C Gross CPM: 51 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	40	10	<MDA	
2	Static 2	33	3	<MDA	
3	Static 3	31	1	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 60 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	30	188
			d'=1.38 p=0.5	t (sec) 3	377
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck / Jerry Shinck Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 29 TIME: 9:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 35 36 3. 38

Avg. BKG: 36

L_C Gross CPM: 57 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	44	8	<MDA	
2	Static 2	40	4	<MDA	
3	Static 3	25	0	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	36	205
			d'=1.38 p=0.5	t (sec) 3	417
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck/Jerry Shinck Date: 08-Jan-09

Comments: _____

Review By _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 30 TIME: 9:20

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 38 2. 28 3. 36

Avg. BKG: 34

L_C Gross CPM: 55 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	43	9	<MDA	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No Decon Necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	34	199
			d'=1.38 p=0.5	t (sec) 3	403
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Terry Shinnick / Terry Shinnick Date: 08-Jan-09

Comments:

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 31 TIME: 9:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 26 38 3. 39

Avg. BKG: 34

L_C Gross CPM: 55 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	38	4	<MDA	
2	Static 2	40	6	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 80 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	34	200
			d'=1.38 p=0.5	t (sec) 3	405
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinn / Jerry Shinn Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 32 TIME: 8:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 29 33 3. 31

Avg. BKG: 31

L_C Gross CPM: 52 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	47	16	<MDA	
2	Static 2	49	18	<MDA	
3	Static 3	44	13	<MDA	
4	Static 4	47	16	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 61 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	31	191
			d'=1.38 p=0.5	t (sec) 3	385
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek / Jerry Shimek Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/25/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 33 TIME: 8:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 33 3. 39

Avg. BKG: 35

L_C Gross CPM: 56 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	50	15	<MDA	
2	Static 2	39	4	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 63 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	35	201
			d'=1.38 p=0.5	t (sec) 3	407
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek/Jerry Shinek Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 8-Jan-09 LOCATION: Port # 34 TIME: 8:10

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 36 28 3. 24

Avg. BKG: 29

L_C Gross CPM: 50 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	44	15	<MDA	
2	Static 2	30	1	<MDA	
3	Static 3	36	7	<MDA	
4	Static 4	27	0	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 58 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	29	187
			d'=1.38 p=0.5	t (sec) 3	374
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck / Jerry Shinck Date: 08-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 35 TIME: 11:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 33 3. 34

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	48	15	<MDA	
2	Static 2	45	12	<MDA	
3	Static 3	34	1	<MDA	
4	Static 4	32	0	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	197
			d'=1.38 p=0.5	t (sec) 3	397
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek Date: 07-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 36 TIME: 11:15

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 33 3. 37

Avg. BKG: 32

L_C Gross CPM: 53 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	50	18	<MDA	
2	Static 2	37	5	<MDA	
3	Static 3	33	1	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port.
Smear taken was <MDA. No Decon Necessary. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	32	195
			d'=1.38 p=0.5	t (sec) 3	393
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1 33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinsek / Jerry Shinsek Date: 07-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 37 TIME: 11:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 32 38 3. 29

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	39	6	<MDA	
2	Static 2	44	11	<MDA	
3	Static 3	37	4	<MDA	
4	Static 4	26	0	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port.
Smear taken was <MDA. No Decon Necessary. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	197
			d'=1.38 p=0.5	t (sec) 3	397
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Terry Shmidt / [signature] Date: 07-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 38 TIME: 10:50

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 30 34 3. 29

Avg. BKG: 31

L_C Gross CPM: 52 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	50	19	<MDA	
2	Static 2	39	8	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	31	191
			d'=1.38 p=0.5	t (sec) 3	385
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinelt / [signature] Date: 07-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 39 TIME: 10:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 22 3. 36

Avg. BKG: 28

L_C Gross CPM: 49 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	43	15	<MDA	
2	Static 2	36	8	<MDA	
3	Static 3	33	5	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	28	184
[redacted]			d'=1.38 p=0.5	t (sec) 3	368
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinch / [signature] Date: 07-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 40 TIME: 10:15

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 34 34 3. 27

Avg. BKG: 32

L_C Gross CPM: 53 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	43	11	<MDA	
2	Static 2	39	7	<MDA	
3	Static 3	33	1	<MDA	
4	Static 4	37	5	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port.
Smear taken was <MDA. No Decon Necessary. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	32	193
			d'=1.38 p=0.5	t (sec) 3	389
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck / Jerry Shinck Date: 07-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 7-Jan-09 LOCATION: Port # 41 TIME: 10:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 25 32 3. 23

Avg. BKG: 27

L_C Gross CPM: 48 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	37	10	<MDA	
2	Static 2	31	4	<MDA	
3	Static 3	33	6	<MDA	
4	Static 4	36	9	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 77 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	27	179
[redacted]			d'=1.38 p=0.5	t (sec) 3	357
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Terry Shinsel / [signature] Date: 07-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 42 TIME: 15:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 34 37 3. 31

Avg. BKG: 34

L_C Gross CPM: 55 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	36	2	<MDA	
2	Static 2	42	8	<MDA	
3	Static 3	31	0	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 77 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	34	199
			d'=1.38 p=0.5	t (sec) 3	403
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinault / Jerry Shinault Date: 06-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 43 TIME: 14:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 20 32 3. 30

Avg. BKG: 27

L_C Gross CPM: 48 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	38	11	<MDA	
2	Static 2	44	17	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts of the O/S portion end of each port. No decon necessary. Smear taken was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	27	181
			d'=1.38 p=0.5	t (sec) 3	361
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinek / [signature] Date: 06-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 44 TIME: 14:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 22 36 3. 28

Avg. BKG: 29

L_C Gross CPM: 50 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	34	5	<MDA	
2	Static 2	38	9	<MDA	
3	Static 3	34	5	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 74 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	29	185
			d'=1.38 p=0.5	t (sec) 3	370
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shimek Date: 06-Jan-09

Comments:

Review By: Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 23-Dec-08 LOCATION: Port # 45 TIME: 14:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 30 42 3. 41

Avg. BKG: 38

L_C Gross CPM: 59 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	48	10	<MDA	
2	Static 2	46	8	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	38	208
			d'=1.38 p=0.5	t (sec) 3	424
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shirek / Jerry Shirek Date: 23-Dec-08

Comments:

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 23-Dec-08 LOCATION: Port # 46 TIME: 13:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 34 40 3. 42

Avg. BKG: 39

L_C Gross CPM: 60 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	33	0	<MDA	
2	Static 2	29	0	<MDA	
3	Static 3	35	0	<MDA	
4	Static 4	49	10	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	39	211
			d'=1.38 p=0.5	t (sec) 3	430
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinkle / Jerry Shinkle Date: 23-Dec-08

Comments:

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 47 TIME: 14:00

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 27 29 3. 27

Avg. BKG: 28

L_C Gross CPM: 49 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	44	16	<MDA	
2	Static 2	34	6	<MDA	
3	Static 3	37	9	<MDA	
4	Static 4	41	13	<MDA	
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Up to 100 cpm gross pre-decon. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	28	182
			d'=1.38 p=0.5	t (sec) 3	364
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinck / [signature] Date: 06-Jan-09

Comments: _____

Review By: [signature] Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 48 TIME: 13:45

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 33 29 3. 36

Avg. BKG: 33

L_C Gross CPM: 54 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	39	6	<MDA	
2	Static 2	48	15	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	33	196
			d'=1.38 p=0.5	t (sec) 3	395
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinde / Jerry Shinde Date: 06-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 6-Jan-09 LOCATION: Port # 49 TIME: 13:25

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 31 27 3. 29

Avg. BKG: 29

L_C Gross CPM: 50 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	41	12	<MDA	
2	Static 2	46	17	<MDA	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	29	186
			d'=1.38 p=0.5	t (sec) 3	372
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Shinde / Jerry Shinde Date: 06-Jan-09

Comments: _____

Review By: _____ Date: 2/23/12

Storage Port Exterior Survey Report

Survey NO.: NA

DATE: 23-Dec-08 LOCATION: Port # 50 TIME: 13:30

Smear Information dpm Frisking Probe Model # 44-1 Serial # PR249243

ε_i 50.5 ε_s 0.25 Frisking Probe Efficiency 0.12625

1 Min BKG: 1. 34 33 3. 42

Avg. BKG: 36

L_C Gross CPM: 57 L_C Net CPM: 21

L_D Gross CPM: N/A L_D Net CPM: N/A

	Static Count No.	CPM (Gross)	CPM (Net)	DPM	
1	Static 1	45	9	<MDA	
2	Static 2	50	14	<MDA	
3	Static 3	39	3	<MDA	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*NOTE: All counts are 1 minute static counts post-decon of the O/S portion end of each port. Refer to initial port survey report for pre-decon contamination results. Smear taken post-decon was <MDA. Port end is free released up to plane of wall.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
L-2221 / 44-1	218597 / 249243	9-Dec-09	0.502	36	205
[redacted]			d'=1.38 p=0.5	t (sec) 3	417
Tenelec Series 5	2161	28-Jul-09	β = 17.41 α = 17.25	β = 1.33 α = 0.00	β = 23.00 α = 5.23
Frisker Detector HV = 700 Vdc (249243)		Threshold Voltage = 50 mVdc		Detector cable type/length = 59 / 6 ft.	

Print/Signature of Surveyor: Jerry Stinnett Date: 23-Dec-08

Comments:

Review By: [signature] Date: 2/23/12

Sample Report

Batch ID:	Smears - 200901121728	**Count Date:**	1/12/2009 5:28:10PM
Group:	B	**Count Minutes:**	3.00
Device:	S5-XLB	**Count Mode:**	Simultaneous
Batch Key:	233	**Operating Volts:**	1440
Selected	Swipe/Smear		

Efficiency (%)

Alpha: 17.25 ± 0.12
Beta: 17.41 ± 0.05

Sample ID	Sample Type	Alpha (dpm)	Unc	Alpha MDA (dpm)	Beta (dpm)	Unc	Beta MDA (dpm)
Unloaded Swipe	LCS	7.73	3.86	5.23	-1.91	5.07	23.00
Tc-99 Eberline Standard	LCS	27.05	7.23	5.23	14558.19	172.37	23.00
th-230 Eberline Standard	LCS	13851.28	189.21	5.23	2812.46	74.04	23.00
20090112173951-B1	Unknown	0.00	0.00	5.23	-1.91	5.07	23.00
20090112174311-B2	Unknown	0.00	0.00	5.23	3.83	6.05	23.00
20090112174621-B3	Unknown	0.00	0.00	5.23	0.00	5.42	23.00
20090112174941-B4	Unknown	0.00	0.00	5.23	1.91	5.74	23.00
20090112175301-B5	Unknown	1.93	1.93	5.23	-1.91	5.07	23.00
20090112175611-B6	Unknown	0.00	0.00	5.23	0.00	5.42	23.00
20090112175931-B7	Unknown	1.93	1.93	5.23	1.91	5.74	23.00
20090112180251-B8	Unknown	3.86	2.73	5.23	5.74	6.35	23.00
20090112180611-B9	Unknown	1.93	1.93	5.23	7.66	6.63	23.00
20090112180921-B10	Unknown	0.00	0.00	5.23	3.83	6.05	23.00
[redacted]0112181241-B11	Unknown	3.86	2.73	5.23	0.00	5.42	23.00
[redacted]090112181601-B12	Unknown	0.00	0.00	5.23	-1.91	5.07	23.00
20090112181911-B13	Unknown	0.00	0.00	5.23	-5.74	4.28	23.00
20090112182231-B14	Unknown	0.00	0.00	5.23	-5.74	4.28	23.00
20090112182551-B15	Unknown	0.00	0.00	5.23	5.74	6.35	23.00
20090112182911-B16	Unknown	0.00	0.00	5.23	5.74	6.35	23.00
20090112183221-B17	Unknown	0.00	0.00	5.23	-3.83	4.69	23.00
20090112183541-B18	Unknown	0.00	0.00	5.23	0.00	5.42	23.00
20090112183901-B19	Unknown	0.00	0.00	5.23	7.66	6.63	23.00
20090112184211-B20	Unknown	0.00	0.00	5.23	-3.83	4.69	23.00
20090112184531-B21	Unknown	0.00	0.00	5.23	-1.91	5.07	23.00
20090112184851-B22	Unknown	0.00	0.00	5.23	1.91	5.74	23.00
20090112185211-B23	Unknown	0.00	0.00	5.23	9.57	6.90	23.00
20090112185521-B24	Unknown	0.00	0.00	5.23	11.49	7.16	23.00
20090112185841-B25	Unknown	0.00	0.00	5.23	15.32	7.66	23.00
Unloaded Swipe	Background	**Alpha (cpm):** 0.00			**Beta (cpm):** 1.33		
Unloaded Swipe	LCS	1.93	1.93	5.23	1.91	5.74	23.00

[redacted]**Reviewed by:** 2/23/12

Background Report

Batch ID:	Smears - 200901121728	**Count Date:**	1/12/2009 5:28:10PM
Group:	B	**Count Minutes:**	3.00
Device:	S5-XLB	**Count Mode:**	Simultaneous
Batch Key:	233	**Operating Volts:**	1440
Selected	Swipe/Smear		

Background (cpm)

Alpha Rate: 0.00 ± 0.00 **Beta Rate:** 1.33 ± 0.67

Sample ID	Alpha (cpm)	Unc	Beta (cpm)	Unc	Guard (cpm)
20090112172810-B141	1.33	0.67	1.00	0.58	217.67
20090112173311-B149	4.67	1.25	2,536.00	29.07	205.67
20090112173631-B150	2,389.67	28.22	491.00	12.79	213.33
20090112173951-B1	0.00	0.00	1.00	0.58	197.00
20090112174311-B2	0.00	0.00	2.00	0.82	222.67
20090112174621-B3	0.00	0.00	1.33	0.67	213.67
20090112174941-B4	0.00	0.00	1.67	0.75	210.67
20090112175301-B5	0.33	0.33	1.00	0.58	217.33
20090112175611-B6	0.00	0.00	1.33	0.67	213.00
20090112175931-B7	0.33	0.33	1.67	0.75	213.67
20090112180251-B8	0.67	0.47	2.33	0.88	216.33
20090112180611-B9	0.33	0.33	2.67	0.94	206.00
20090112180921-B10	0.00	0.00	2.00	0.82	217.00
20090112181241-B11	0.67	0.47	1.33	0.67	200.00
20090112181601-B12	0.00	0.00	1.00	0.58	209.67
20090112181911-B13	0.00	0.00	0.33	0.33	226.33
20090112182231-B14	0.00	0.00	0.33	0.33	209.67
20090112182551-B15	0.00	0.00	2.33	0.88	218.67
20090112182911-B16	0.00	0.00	2.33	0.88	229.33
20090112183221-B17	0.00	0.00	0.67	0.47	197.33
20090112183541-B18	0.00	0.00	1.33	0.67	221.00
20090112183901-B19	0.00	0.00	2.67	0.94	207.33
20090112184211-B20	0.00	0.00	0.67	0.47	218.00
20090112184531-B21	0.00	0.00	1.00	0.58	214.67
20090112184851-B22	0.00	0.00	1.67	0.75	194.00
20090112185211-B23	0.00	0.00	3.00	1.00	209.00
20090112185521-B24	0.00	0.00	3.33	1.05	210.67
20090112185841-B25	0.00	0.00	4.00	1.15	219.00
20090112190201-B143	0.00	0.00	1.33	0.67	202.67
20090112190511-B147	0.33	0.33	1.67	0.75	216.00
				Guard Avg Rate:	212.24

Reviewed by: 2/23/12

Procedure:

Smears

Is Active

Count Mode

Alpha | Alpha then Beta | Simultaneous

Discriminator Selection
Alpha/Beta ROI:

Tc-99 3.5% 0.8%

Beta Lower:	Beta Upper:	Alpha Lower:
0.25	42.30	72.50

Presets:

Count Time:	3	minutes
Alpha:	0	counts
Beta:	0	counts

New

Preselected Report:

>>

Preselected Group & Device:

None | None

Sample Count Delay

0.1 minutes (0 to 9,999 minutes)

Count Repetitions

Sample: 1 (1 - 99)

Batch: (1 - 10)

Weak Sample Reject

Disable | Enable

Initial Test Time:

Min Count Rate:

Save As

Reporting Units:

dpm

Background Subtraction

Disable | Enable | Previous Stored | Method Blank

Spillover Correction

Disable | Enable

Sample Activity

Disable | Enable

Alpha Cal. Standard: Am-241 47 mm Fi

Beta Cal. Standard: Tc-99 47 mm Filt

Geometry Selection

Geometry: Swipe/Smear

Print

Key 233
Group B

O/S storage Ports 1-50

1-12-09

Appendix G

Radiological Survey Report of Excavation Zone

Former Storage Port No. 1 Location

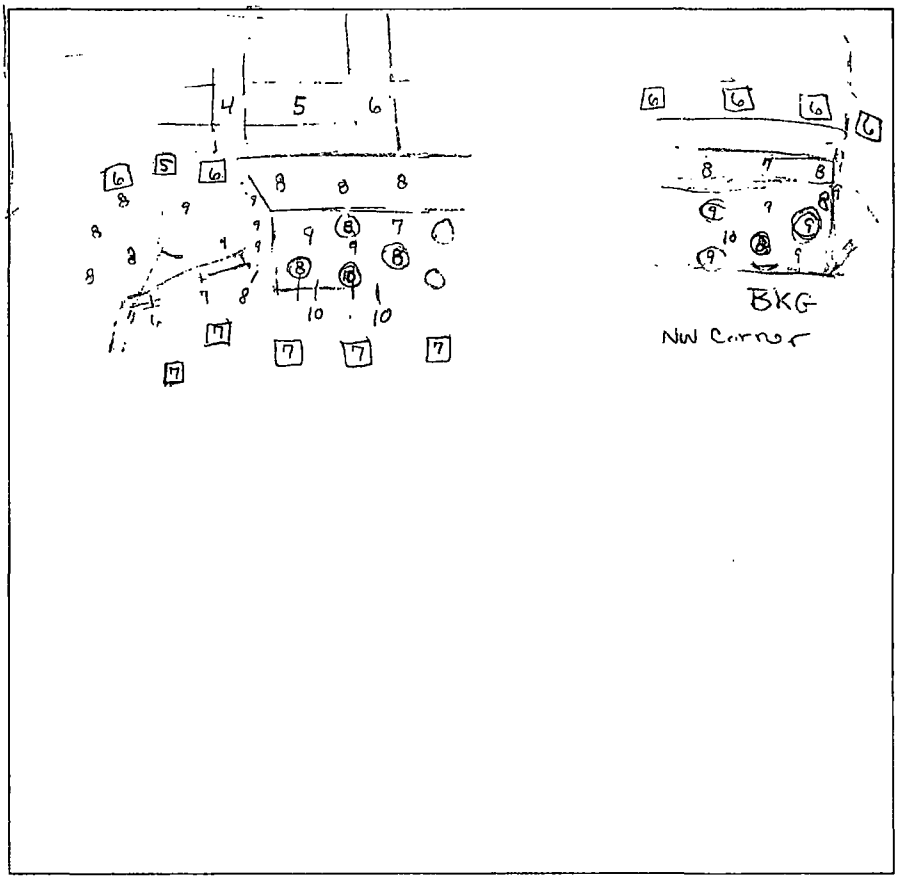
Radiological Survey Report

DATE: 4/13/09 LOCATION: SW Corner of Storage Port Pit SURVEY NO.: 2009-0041 TIME: 1300

Smear Information N/A

No.	Beta/ Gamma	Alpha (20%)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Survey Map



Legend: * = Contact: # / # = Contact Reading / General Area; # = General Area. ① = Smear location: Δ = Air Sample.
Note: Readings in mrem/hr unless noted otherwise.

Instrument	Serial Number	Cal. Due Date	Efficiency	Background (CPM)	MDA (DPM)
Model 19	101763	25 Jul 09	NA	NA	NA
Frisker Detector HV = Vdc		Threshold Voltage = mVdc		Detector cable length = ft.	

Print/Signature of Surveyor: Shannon M Weger / Shannon M. Weger Date: 4/16/09

Comments: ☐ represents readings taken at one Meter height up and one Meter out. SW 4/15/09

BKG was taken at NW Corner

Review By: [signature] Date: 2/23/12

Ludlum Model 19 MicroR Meter

Appendix H

Analytical Data for Final Status Survey of Concrete Support Wall Remaining in Excavation

********** ********** **********
***** GAMMA SPECTRUM ANALYSIS *****
********** ********** **********

Filename: C:\GENIE2K\CAMFILES\Det 264\StoragePortExcavation\UM-2009-04-

Report Generated On : 2/16/2012 5:13:27 PM

Sample Title : UM-2009-04-24-01
Sample Description : Concrete ground from north cut f
Sample Identification : 2009-04-24-01
Sample Type : concrete
Sample Geometry : 500 ml Nalgene

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 39 - 8192
Peak Area Range (in channels) : 47 - 8192
Identification Energy Tolerance : 0.750 FWHM

Sample Size : 6.000E+002 g

Sample Taken On : 2/24/2009 3:00:00 PM
Acquisition Started : 2/7/2012 4:05:55 PM

Live Time : 50000.0 seconds
Real Time : 50005.0 seconds

Dead Time : 0.01 %

Energy Calibration Used Done On : 2/16/2012
Efficiency Calibration Used Done On : 2/5/2012
Efficiency ID : 500ml 2.0 g/cc

Eu-152 8.1E-2 pCi/g MDA 7.3E-2 pCi/g
±29

2/16/12

****
***** NUCLIDE MDA REPORT *****
****

Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: UM-2009-04-24-01
Nuclide Library Used: C:\GENIE2K\CAMFILES\Libraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BE-7	477.60	10.52	3.0238E-001	3.02E-001	2.8237E-002
+	K-40	1460.83*	10.67	3.2978E-007	3.30E-007	7.4985E-006
	MN-54	834.85	99.98	3.7205E-007	3.72E-007	1.0129E-007
+	CO-60	1173.24*	99.97	5.8372E-008	5.84E-008	4.3962E-009
		1332.50*	99.99	5.9717E-008		5.6344E-008
	ZN-65	1115.55	50.60	2.2101E-006	2.21E-006	-1.3088E-007
	NB-94x	702.62	97.90	3.0977E-008	3.10E-008	-1.7010E-008
		871.09	99.90	3.3103E-008		2.8596E-008
	AG-108m	21.10	59.10	2.9021E-007	2.90E-008	-4.2206E-008
		23.80	9.60	1.1000E-006		3.7623E-008
		79.13	8.76	3.0715E-007		-1.2767E-007
		433.94	90.50	2.9036E-008		1.1123E-008
		614.28	89.87	5.8451E-008		-8.9361E-009
		722.91	90.80	3.8072E-008		-5.5848E-009
	CD-109	22.10	85.20	8.2472E-007	8.25E-007	-3.6121E-007
		25.02	16.81	2.6144E-006		-7.5823E-007
		88.03	3.61	3.1183E-006		2.8567E-007
	AG-110m	446.81	3.72	1.2919E-005	6.13E-007	5.8616E-006
		620.36	2.79	1.9121E-005		-1.4550E-005
		657.76	94.00	6.1270E-007		2.0481E-007
		677.62	10.28	5.5135E-006		-2.1508E-006
		687.02	6.39	9.3357E-006		6.0910E-006
		706.68	16.33	3.7046E-006		2.9949E-006
		744.28	4.70	1.2706E-005		6.6709E-006
		763.94	22.14	3.1887E-006		-2.2700E-006
		818.03	7.34	8.5823E-006		2.4817E-006
		884.68	72.70	8.7968E-007		1.0407E-007
		937.49	34.36	2.1135E-006		1.6964E-006
		1384.30	24.28	2.8403E-006		-2.8642E-007
		1475.79	3.99	1.4517E-005		-1.3200E-006
		1505.04	13.04	5.2799E-006		-4.0265E-007
		1562.30	1.03	5.7636E-005		2.3703E-005
	SB-125	176.33	6.79	6.3825E-007	1.86E-007	-2.0701E-007
		380.43	1.52	3.3788E-006		-2.3257E-006
		427.89	29.40	1.8592E-007		-8.1883E-008
		463.38	10.45	5.4579E-007		7.4082E-007
		600.56	17.78	3.4983E-007		1.2418E-008
		606.64	5.02	2.4829E-006		-7.2793E-008
		635.90	11.32	5.0898E-007		-3.8281E-009
		671.41	1.80	3.2759E-006		-3.0495E-006
	BA-133	53.16	2.20	1.1860E-006	7.88E-008	6.1883E-007
		79.62	2.62	1.2292E-006		-5.1558E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BA-133	81.00	34.10	7.8831E-008	7.88E-008	-3.9516E-008
		160.61	0.64	3.7204E-006		-8.9237E-008
		223.23	0.45	6.0509E-006		1.0282E-006
		276.40	7.16	3.8953E-007		1.5544E-007
		302.85	18.33	1.6075E-007		1.3201E-007
		356.02	62.05	7.9624E-008		-1.2952E-008
		383.85	8.94	3.3550E-007		-2.7235E-007
	CS-134	475.35	1.46	4.4711E-006	1.05E-007	2.5662E-006
		563.23	8.38	8.9872E-007		1.4368E-007
		569.32	15.43	4.7562E-007		5.6590E-008
		604.70	97.60	1.4184E-007		-1.8281E-008
		795.84	85.40	1.0511E-007		6.5436E-008
		801.93	8.73	9.7931E-007		4.3651E-007
		1038.57	1.00	9.2355E-006		-1.4515E-006
		1167.94	1.80	6.2161E-006		-1.7210E-006
		1365.15	3.04	2.8191E-006		6.4870E-007
	CS-137	661.66	85.21	3.8032E-008	3.80E-008	1.9934E-008
	CE-139	165.85	79.89	2.6052E-008	2.61E-008	-3.2693E-010
+	EU-152x	121.78*	28.40	7.2633E-008	7.26E-008	8.5815E-008
		244.70*	7.49	3.0332E-007		5.1063E-008
		344.28*	26.60	8.2604E-008		8.2042E-008
		411.11	2.23	1.3423E-006		3.7311E-007
		443.98	2.78	9.9661E-007		-2.2806E-007
		778.90	12.96	2.7508E-007		-8.2245E-009
		867.39	4.15	9.3557E-007		1.0848E-007
		964.13	14.34	3.6014E-007		5.9676E-008
		1085.91	9.92	4.3500E-007		1.4024E-007
		1089.70	1.71	2.5341E-006		3.7245E-007
		1112.12	13.55	3.2576E-007		-1.9859E-009
		1212.95	1.40	3.3727E-006		1.6737E-006
		1299.12	1.63	2.5226E-006		9.1149E-008
		1408.01*	20.87	1.1873E-007		2.4679E-007
	EU-154	123.07	40.40	5.8266E-008	5.83E-008	5.8094E-008
		188.25	0.23	1.4017E-005		-5.0999E-006
		247.93	6.83	4.1119E-007		2.7898E-008
		401.30	0.19	1.6072E-005		-9.9571E-006
		444.39	0.55	5.4894E-006		-2.0581E-006
		478.26	0.21	1.4817E-005		-2.0735E-006
		557.56	0.25	1.3557E-005		4.0431E-006
		582.00	0.89	5.4581E-006		1.6515E-005
		591.76	4.91	6.9397E-007		-3.1158E-007
		625.22	0.32	1.0818E-005		3.8836E-007
		676.59	0.14	2.6160E-005		-1.5677E-005
		692.42	1.78	2.0895E-006		-1.1498E-006
		715.76	0.17	2.2879E-005		-1.0072E-005
		722.30	20.00	2.1599E-007		-2.0578E-009
		756.86	4.50	8.6176E-007		-6.7063E-008
		815.55	0.50	7.9101E-006		-3.3062E-006
		845.39	0.58	6.6414E-006		-1.9085E-007
		850.64	0.23	1.7313E-005		1.3369E-005
		873.20	12.09	3.4367E-007		1.3553E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	8.4607E-006	5.83E-008	2.9852E-006
		904.05	0.85	4.9222E-006		-3.8438E-006
		996.30	10.34	4.3746E-007		-1.1993E-007
		1004.76	17.90	2.5585E-007		4.1773E-008
		1128.40	0.29	1.5780E-005		-8.1276E-006
		1140.90	0.22	2.0837E-005		-8.9336E-006
		1241.60	0.13	4.8046E-005		-7.9671E-006
		1246.60	0.80	5.9038E-006		-4.7195E-006
		1274.51	34.40	1.2941E-007		-7.3095E-008
		1494.08	0.71	5.7687E-006		4.4402E-007
		1596.45	1.80	2.3964E-006		-4.1291E-007
+	TL-208B	72.80	2.02	1.5742E-006	5.50E-008	8.0762E-008
		74.97*	3.41	1.2160E-006		3.4242E-006
		84.90	1.51	1.8101E-006		1.0951E-006
		277.36	6.31	4.4674E-007		2.8983E-007
		510.77*	22.60	3.0421E-007		3.9585E-007
		583.19*	84.50	5.5003E-008		1.4500E-007
		763.13	1.81	2.3043E-006		-2.1353E-006
		860.56*	12.42	4.0579E-007		1.6762E-007
		2614.53	99.16	8.3734E-008		2.3516E-007
+	Pb-210	46.52*	4.05	7.6428E-007	7.64E-007	1.2997E-006
+	PB-212B	74.81*	10.50	3.9491E-007	1.54E-007	1.1121E-006
		77.11*	17.60	2.3351E-007		1.0611E-006
		87.30*	7.90	2.9624E-007		5.9477E-007
		238.63*	43.60	1.5368E-007		4.9668E-007
		300.09*	3.34	6.3681E-007		5.1091E-007
+	BI-214B	609.31*	44.80	1.1250E-007	1.12E-007	1.1332E-006
		665.45	1.29	2.8436E-006		1.8892E-006
		768.36*	4.80	7.6886E-007		7.2145E-007
		806.17	1.12	3.5813E-006		4.3837E-006
		934.06*	3.03	1.4667E-006		7.5853E-007
		1120.29*	14.80	4.2775E-007		1.0248E-006
		1155.19	1.64	2.9536E-006		1.5538E-006
		1238.11*	5.86	8.0533E-007		1.5287E-006
		1280.96*	1.44	3.0451E-006		3.1718E-006
		1377.67*	3.92	2.0322E-006		1.3195E-006
		1401.50*	1.55	2.6183E-006		1.2498E-006
		1407.98*	2.80	9.3357E-007		1.9406E-006
		1509.23	2.12	2.1046E-006		1.1105E-006
		1661.28	1.14	3.0500E-006		-9.8201E-008
		1729.59*	2.88	1.7145E-006		9.7237E-007
		1764.49*	15.36	2.9063E-007		1.2331E-006
		1847.42*	2.04	1.0027E-006		1.7854E-006
		2118.55*	1.14	1.4220E-006		2.9866E-006
		2204.21	4.86	1.0202E-006		1.2169E-006
		2447.86	1.50	2.9615E-006		2.8941E-006
+	PB-214B	53.23*	1.11	2.3899E-006	1.31E-007	6.1958E-007
		74.81*	5.90	7.0280E-007		1.9791E-006
		77.11*	9.90	4.1513E-007		1.8864E-006
		87.30*	4.41	5.3069E-007		1.0655E-006
		241.98*	7.50	8.7664E-007		1.5907E-006

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	2.0020E-007	1.31E-007	1.2695E-006
		351.92*	35.80	1.3081E-007		1.1792E-006
+	RA-226	186.10*	3.50	7.1912E-007	7.19E-007	1.6436E-006
+	AC-228B	12.95	15.10	2.0842E-007	1.96E-007	0.0000E+000
		16.15	20.00	2.5069E-006		7.6400E-006
		19.11	4.60	7.0440E-006		3.4197E-005
		89.96*	3.40	1.1582E-006		6.2816E-007
		93.35*	5.60	7.6131E-007		1.0898E-006
		99.55	1.30	1.6663E-006		-1.8988E-007
		105.36	2.00	1.0916E-006		-5.6032E-007
		129.03*	2.90	5.9468E-007		5.3074E-007
		209.39*	4.10	6.9177E-007		5.6981E-007
		270.26*	3.80	9.7025E-007		1.7062E-006
		328.07*	3.50	9.0526E-007		7.9729E-007
		338.42*	12.40	2.5904E-007		5.8412E-007
		409.62	2.20	1.4270E-006		2.3282E-007
		463.10*	4.60	7.3494E-007		8.7265E-007
		562.65	1.01	3.3551E-006		-1.2755E-006
		755.28	1.32	2.8325E-006		6.5265E-008
		772.28	1.09	3.9958E-006		-1.2434E-006
		794.79*	4.60	9.0227E-007		1.4130E-006
		835.60	1.71	2.4360E-006		1.0529E-006
		911.16*	29.00	1.9637E-007		4.4613E-007
		964.64	5.80	9.5092E-007		3.0068E-007
		968.97*	17.40	3.0238E-007		3.7422E-007
		1459.19	1.06	1.2019E-005		9.4817E-005
		1496.00	1.05	3.7125E-006		-2.3071E-006
		1588.23	3.60	1.2495E-006		8.5727E-007
		1630.47	1.95	1.8751E-006		2.8073E-007
	PA-234B	63.00	3.20	8.7030E-007	9.45E-008	1.1614E-006
		94.67	14.30	1.8379E-007		-6.6375E-008
		98.44	23.00	9.4517E-008		1.7385E-008
		99.70	4.80	4.5318E-007		1.4763E-007
		111.00	10.80	2.0783E-007		-1.4722E-008
		125.40	1.00	2.2601E-006		-5.3145E-007
		131.20	20.00	1.1753E-007		5.1874E-008
		152.70	6.70	3.5868E-007		1.1431E-007
		186.00	2.00	1.5645E-006		4.7542E-006
		200.90	1.00	2.6639E-006		-3.0975E-008
		202.90	1.20	2.2191E-006		-3.1264E-007
		226.40	5.90	4.6867E-007		6.1141E-008
		227.20	5.50	5.0196E-007		-2.4374E-007
		248.90	2.80	9.5020E-007		-7.9629E-008
		272.10	1.00	3.0663E-006		-4.2847E-007
		293.70	3.90	1.0713E-006		1.7151E-009
		369.80	2.90	9.9836E-007		-4.6059E-007
		372.40	1.30	2.2495E-006		-2.7169E-007
		458.80	1.50	2.0759E-006		1.7249E-007
		506.80	1.60	3.0191E-006		-2.0448E-006
		513.70	1.30	3.9086E-006		-2.1919E-007
		565.90	1.40	2.4542E-006		1.2850E-006

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	1.0152E-006	9.45E-008	2.8251E-007
		569.50	10.00	3.3214E-007		6.1554E-008
		574.00	2.00	1.6077E-006		-1.2991E-006
		664.80	1.30	2.8518E-006		1.7045E-006
		666.70	1.60	2.2316E-006		-7.2171E-007
		669.90	1.40	2.5222E-006		1.1666E-006
		692.70	1.50	2.4138E-006		-1.6946E-007
		699.00	4.60	8.1634E-007		4.0541E-007
		706.10	3.10	1.1946E-006		3.1546E-007
		733.00	9.00	4.2152E-007		1.3331E-007
		738.00	1.00	3.5663E-006		3.1910E-008
		742.81	2.40	1.5084E-006		-4.0973E-007
		755.60	1.40	2.6643E-006		3.2781E-007
		780.70	1.10	3.6079E-006		1.6533E-006
		786.27	1.40	2.7699E-006		-7.4167E-007
		793.60	1.50	2.7595E-006		3.7125E-006
		796.30	3.80	1.0711E-006		6.2056E-008
		805.80	3.30	1.2055E-006		1.1891E-006
		819.60	2.60	1.5065E-006		-1.3913E-007
		826.30	4.00	9.8258E-007		2.1059E-007
		831.60	5.50	7.3214E-007		-1.6540E-007
		876.40	4.00	9.6031E-007		-5.7628E-007
		880.50	4.00	9.4959E-007		-3.6541E-008
		880.51	9.00	4.2204E-007		-1.6241E-008
		883.24	15.00	2.5255E-007		-3.6833E-008
		899.00	4.10	1.0078E-006		2.6378E-007
		925.00	2.90	1.4239E-006		6.0873E-007
		926.00	11.00	3.7798E-007		9.0370E-008
		927.10	11.00	3.7718E-007		-4.6172E-007
		946.00	12.00	3.4466E-007		-4.9891E-008
		949.00	8.00	5.2387E-007		-4.0844E-008
		978.80	1.40	2.9640E-006		5.8799E-007
		980.50	2.00	2.0775E-006		4.2875E-007
		980.50	3.00	1.3850E-006		2.8583E-007
		984.00	1.90	2.2035E-006		-7.0030E-007
		1353.30	1.70	2.1771E-006		-7.1542E-007
		1394.10	3.00	1.2357E-006		-5.5449E-007
		1452.70	1.00	4.6547E-006		-5.0377E-006
		1668.50	1.20	2.9992E-006		5.2892E-007
		1694.60	1.20	2.6785E-006		1.5344E-006
	TH-234	63.29	4.50	1.4863E+007	1.49E+007	2.0735E+007
		92.38	2.60	2.5777E+007		1.1490E+008
		92.80	2.60	2.5596E+007		1.0897E+008
+	U-235	72.70	0.11	2.3570E-005	4.37E-008	1.2092E-006
		89.95*	2.80	1.1461E-006		6.2164E-007
		93.35*	4.50	7.7212E-007		1.1053E-006
		94.00	0.40	5.4278E-006		-5.4716E-007
		105.00	2.10	8.4662E-007		-2.4922E-007
		109.16	1.50	1.2132E-006		-1.4208E-007
		140.76	0.22	8.6649E-006		-6.3840E-007
		143.76*	10.90	2.3775E-007		1.6431E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	4.1311E-007	4.37E-008	7.1838E-008
		182.61	0.40	6.0901E-006		1.5608E-007
		185.71*	57.50	4.3717E-008		9.9919E-008
		194.94	0.59	3.6157E-006		-6.0892E-007
		202.11	1.00	2.1629E-006		-4.7616E-007
		205.31*	5.00	4.7894E-007		1.7975E-007
		279.50	0.27	8.4534E-006		-2.4896E-006

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

Appendix I

Analytical Data for Final Status Survey of Soil Located Behind the Section of Support Wall Removed

****
***** GAMMA SPECTRUM ANALYSIS *****
****

Filename: C:\GENIE2K\CAMFILES\Det 264\StoragePortExcavation\UM-2009-03-

Report Generated On	:	2/16/2012 4:18:35 PM
Sample Title	:	UM-2009-03-25-02
Sample Description	:	Soil sample from behind West sup
Sample Identification	:	2009-03-25-02
Sample Type	:	soil
Sample Geometry	:	500 ml Nalgene
Peak Locate Threshold	:	3.00
Peak Locate Range (in channels)	:	39 - 8192
Peak Area Range (in channels)	:	47 - 8192
Identification Energy Tolerance	:	0.750 FWHM
Sample Size	:	1.000E+003 g
Sample Taken On	:	3/25/2009 3:00:00 PM
Acquisition Started	:	2/8/2012 7:31:14 PM
Live Time	:	50000.0 seconds
Real Time	:	50005.3 seconds
Dead Time	:	0.01 %

Energy Calibration Used Done On	:	2/8/2012
Efficiency Calibration Used Done On	:	2/5/2012
Efficiency ID	:	500ml 2.0 g/cc

Eu-152 5.22E-2 pCi/g ± 1.65; MDA 5.29 pCi/g

2/16/12

****
***** NUCLIDE MDA REPORT *****
****

Detector Name: HPGE
Sample Geometry: 500 ml Nalgene
Sample Title: UM-2009-03-25-02
Nuclide Library Used: C:\GENIE2K\CAMFILES\Libraries\Soil_DCGL_

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BE-7	477.60	10.52	1.6456E-001	1.65E-001	1.0882E-001
+	K-40	1460.83*	10.67	3.1760E-007	3.18E-007	1.0858E-005
	MN-54	834.85	99.98	2.4037E-007	2.40E-007	1.6465E-008
	CO-60	1173.24	99.97	4.4321E-008	3.70E-008	3.1633E-008
		1332.50	99.99	3.6979E-008		1.8919E-008
	ZN-65	1115.55	50.60	1.4069E-006	1.41E-006	5.2555E-007
	NB-94x	702.62	97.90	2.2608E-008	2.26E-008	-1.0627E-008
		871.09	99.90	2.3648E-008		1.8787E-008
	AG-108m	21.10	59.10	1.9731E-007	1.96E-008	3.4438E-009
		23.80	9.60	7.7467E-007		-4.7816E-007
		79.13	8.76	2.1390E-007		-3.5145E-008
		433.94	90.50	1.9616E-008		7.2955E-009
		614.28	89.87	3.6118E-008		5.4458E-009
		722.91	90.80	2.6608E-008		-1.9056E-008
	CD-109	22.10	85.20	5.4719E-007	5.47E-007	-1.4555E-007
		25.02	16.81	1.7679E-006		-4.7782E-007
		88.03	3.61	2.1691E-006		2.0459E-006
	AG-110m	446.81	3.72	8.5387E-006	3.82E-007	-6.4813E-007
		620.36	2.79	1.2880E-005		-1.1860E-005
		657.76	94.00	3.8215E-007		-1.8735E-007
		677.62	10.28	3.6133E-006		-3.3784E-007
		687.02	6.39	6.2502E-006		2.8184E-007
		706.68	16.33	2.4534E-006		4.2788E-007
		744.28	4.70	8.4115E-006		3.3779E-006
		763.94	22.14	2.0195E-006		-9.1750E-007
		818.03	7.34	5.2690E-006		-1.7553E-006
		884.68	72.70	5.8287E-007		5.0385E-008
		937.49	34.36	1.3261E-006		-2.8503E-007
		1384.30	24.28	1.8113E-006		-1.0060E-006
		1475.79	3.99	8.2625E-006		1.0959E-006
		1505.04	13.04	3.0801E-006		3.0956E-007
		1562.30	1.03	2.9368E-005		1.5026E-005
	SB-125	176.33	6.79	4.5856E-007	1.23E-007	-2.2914E-008
		380.43	1.52	2.3359E-006		1.3939E-006
		427.89	29.40	1.2257E-007		3.1802E-008
		463.38	10.45	3.7626E-007		5.0984E-007
		600.56	17.78	2.3678E-007		1.3155E-007
		606.64	5.02	1.5158E-006		1.0431E-005
		635.90	11.32	3.6155E-007		3.3139E-007
		671.41	1.80	2.2683E-006		2.4419E-007
	BA-133	53.16	2.20	8.9274E-007	5.36E-008	2.6670E-007
		79.62	2.62	8.5178E-007		-1.4123E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	BA-133	81.00	34.10	5.7807E-008	5.36E-008	-1.0824E-008
		160.61	0.64	2.8696E-006		4.2189E-006
		223.23	0.45	4.3390E-006		-3.3091E-006
		276.40	7.16	2.7894E-007		8.5359E-009
		302.85	18.33	1.1607E-007		1.1813E-008
		356.02	62.05	5.3555E-008		-1.6372E-007
		383.85	8.94	2.2898E-007		-2.0086E-007
+	CS-134	475.35	1.46	3.3991E-006	5.23E-008	-3.9913E-007
		563.23	8.38	6.0952E-007		-7.2275E-008
		569.32	15.43	3.3739E-007		1.6637E-007
		604.70*	97.60	5.5194E-008		1.4989E-008
		795.84*	85.40	5.2280E-008		4.4372E-008
		801.93	8.73	7.0044E-007		-5.4224E-007
		1038.57	1.00	6.7490E-006		-7.9711E-007
		1167.94	1.80	4.2469E-006		-2.6214E-006
		1365.15*	3.04	1.4234E-006		3.1159E-007
	CS-137	661.66	85.21	2.5861E-008	2.59E-008	-1.3351E-008
	CE-139	165.85	79.89	1.8967E-008	1.90E-008	3.7266E-009
+	EU-152x	121.78*	28.40	5.2888E-008	5.29E-008	5.2165E-008
		244.70	7.49	2.8808E-007		-1.9642E-007
		344.28*	26.60	5.7823E-008		4.0024E-008
		411.11	2.23	9.6437E-007		5.5213E-007
		443.98	2.78	7.2525E-007		-1.6170E-007
		778.90	12.96	2.0089E-007		5.8606E-009
		867.39	4.15	6.4664E-007		-7.0299E-008
		964.13*	14.34	3.2956E-007		1.9433E-007
		1085.91	9.92	3.1585E-007		-1.5211E-007
		1089.70	1.71	1.8703E-006		-9.4496E-008
		1112.12	13.55	2.4456E-007		-3.2794E-008
		1212.95	1.40	2.7002E-006		1.3933E-006
		1299.12	1.63	1.9402E-006		1.0649E-006
		1408.01*	20.87	9.5035E-008		1.6590E-007
	EU-154	123.07	40.40	4.4047E-008	4.40E-008	4.0526E-008
		188.25	0.23	9.7103E-006		-2.0107E-006
		247.93	6.83	2.9200E-007		-4.8052E-007
		401.30	0.19	1.1678E-005		-2.6578E-006
		444.39	0.55	3.9730E-006		-1.4680E-006
		478.26	0.21	1.1576E-005		6.5170E-006
		557.56	0.25	9.3724E-006		-6.5241E-006
		582.00	0.89	3.9237E-006		1.5521E-005
		591.76	4.91	4.8753E-007		-3.0548E-007
		625.22	0.32	7.7846E-006		-5.2081E-008
		676.59	0.14	1.8846E-005		1.4567E-005
		692.42	1.78	1.5915E-006		8.4011E-007
		715.76	0.17	1.5699E-005		3.3660E-006
		722.30	20.00	1.4674E-007		-1.0853E-007
		756.86	4.50	6.0252E-007		-1.1843E-008
		815.55	0.50	5.3237E-006		1.3015E-006
		845.39	0.58	4.9127E-006		1.1991E-006
		850.64	0.23	1.2719E-005		6.1022E-006
		873.20	12.09	2.4410E-007		-8.9822E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	EU-154	892.73	0.50	5.9369E-006	4.40E-008	-3.9812E-006
		904.05	0.85	3.6303E-006		7.5720E-007
		996.30	10.34	3.1409E-007		-5.2863E-008
		1004.76	17.90	1.8011E-007		1.1868E-007
		1128.40	0.29	1.2238E-005		2.5642E-006
		1140.90	0.22	1.6436E-005		-6.5126E-006
		1241.60	0.13	3.6399E-005		-1.0478E-005
		1246.60	0.80	5.0657E-006		-5.5569E-006
		1274.51	34.40	1.0241E-007		-1.8171E-008
		1494.08	0.71	3.4519E-006		-5.1743E-007
		1596.45	1.80	1.6311E-006		-5.4889E-007
+	TL-208B	72.80	2.02	1.1090E-006	2.87E-008	-1.6946E-007
		74.97*	3.41	8.6269E-007		1.9967E-006
		84.90	1.51	1.2944E-006		1.7831E-006
		277.36	6.31	3.1700E-007		2.8927E-008
		510.77*	22.60	1.6905E-007		2.4420E-007
		583.19*	84.50	3.3663E-008		1.3488E-007
		763.13	1.81	1.5876E-006		-8.4405E-007
		860.56*	12.42	2.1580E-007		3.5145E-007
		2614.53*	99.16	2.8733E-008		1.3636E-007
+	Pb-210	46.52*	4.05	5.5777E-007	5.58E-007	9.9170E-007
+	PB-212B	74.81*	10.50	2.8017E-007	7.92E-008	6.4845E-007
		77.11*	17.60	1.6617E-007		6.6986E-007
		87.30*	7.90	1.9957E-007		4.1504E-007
		238.63*	43.60	7.9198E-008		4.1724E-007
		300.09*	3.34	5.9844E-007		3.9201E-007
+	BI-214B	609.31*	44.80	7.1392E-008	7.14E-008	6.7005E-007
		665.45*	1.29	2.4325E-006		8.3065E-007
		768.36*	4.80	5.9498E-007		6.7654E-007
		806.17*	1.12	2.3089E-006		1.7023E-006
		934.06*	3.03	9.9556E-007		9.9021E-007
		1120.29*	14.80	3.2186E-007		7.7439E-007
		1155.19	1.64	2.2033E-006		-1.0795E-006
		1238.11*	5.86	7.0030E-007		1.0434E-006
		1280.96	1.44	2.3370E-006		-3.8142E-007
		1377.67	3.92	7.6579E-007		-2.7056E-007
		1401.50	1.55	1.9213E-006		-3.1845E-007
		1407.98*	2.80	7.4626E-007		1.3027E-006
		1509.23*	2.12	1.1704E-006		8.6018E-007
		1661.28*	1.14	2.2138E-006		-8.2237E-008
		1729.59*	2.88	7.8428E-007		1.1796E-006
		1764.49*	15.36	2.5293E-007		6.2268E-007
		1847.42*	2.04	1.1579E-006		1.1147E-006
		2118.55*	1.14	1.7155E-006		1.2161E-006
		2204.21*	4.86	4.3741E-007		1.2394E-006
		2447.86	1.50	1.6636E-006		9.5891E-007
+	PB-214B	53.23*	1.11	1.4791E-006	6.88E-008	7.4841E-007
		74.81*	5.90	4.9861E-007		1.1540E-006
		77.11*	9.90	2.9541E-007		1.1909E-006
		87.30*	4.41	3.5750E-007		7.4349E-007
		241.98*	7.50	4.3887E-007		9.9044E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	PB-214B	295.21*	18.50	1.4388E-007	6.88E-008	7.0992E-007
		351.92*	35.80	6.8828E-008		6.9362E-007
+	RA-226	186.10*	3.50	5.8424E-007	5.84E-007	1.1772E-006
+	AC-228B	12.95	15.10	1.2439E-007	1.24E-007	0.0000E+000
		16.15	20.00	1.6790E-006		5.9664E-006
		19.11	4.60	4.7754E-006		2.8416E-005
		89.96*	3.40	4.7443E-007		2.8156E-007
		93.35*	5.60	3.1238E-007		4.1891E-007
		99.55	1.30	1.2654E-006		6.1971E-008
		105.36	2.00	8.0505E-007		-6.4090E-007
		129.03*	2.90	5.1759E-007		1.9787E-007
		209.39*	4.10	3.8404E-007		3.4966E-007
		270.26*	3.80	4.4207E-007		4.2689E-007
		328.07*	3.50	5.0172E-007		2.9218E-007
		338.42*	12.40	2.0369E-007		3.5388E-007
		409.62	2.20	1.0431E-006		4.9016E-007
		463.10*	4.60	4.3969E-007		4.9870E-007
		562.65	1.01	2.3373E-006		-4.8701E-008
		755.28	1.32	1.9926E-006		3.4770E-007
		772.28	1.09	2.7787E-006		-1.6951E-006
		794.79*	4.60	4.5063E-007		3.8247E-007
		835.60	1.71	1.6578E-006		-1.5997E-007
		911.16*	29.00	1.2384E-007		3.6938E-007
		964.64*	5.80	8.5840E-007		5.0618E-007
		968.97*	17.40	2.9849E-007		4.1136E-007
		1459.19	1.06	1.0954E-005		1.3648E-004
		1496.00	1.05	2.3240E-006		2.6956E-007
		1588.23*	3.60	7.3820E-007		7.4033E-007
		1630.47	1.95	1.2707E-006		-1.2856E-009
	PA-234B	63.00	3.20	6.5526E-007	7.21E-008	7.5600E-007
		94.67	14.30	1.3077E-007		1.9657E-007
		98.44	23.00	7.2108E-008		-5.6487E-008
		99.70	4.80	3.4264E-007		8.1515E-008
		111.00	10.80	1.5421E-007		9.7611E-008
		125.40	1.00	1.6968E-006		-1.1982E-007
		131.20	20.00	8.6539E-008		7.4436E-008
		152.70	6.70	2.6419E-007		2.7261E-007
		186.00	2.00	1.0999E-006		4.4341E-006
		200.90	1.00	2.0015E-006		2.6911E-007
		202.90	1.20	1.6733E-006		-3.8141E-007
		226.40	5.90	3.4537E-007		1.9175E-007
		227.20	5.50	3.7070E-007		1.9853E-007
		248.90	2.80	6.8903E-007		-3.8690E-007
		272.10	1.00	2.0459E-006		1.0987E-006
		293.70	3.90	7.1766E-007		3.6555E-006
		369.80	2.90	7.1962E-007		1.2002E-007
		372.40	1.30	1.5727E-006		-7.0560E-007
		458.80	1.50	1.4812E-006		1.3344E-007
		506.80	1.60	1.8958E-006		-5.5923E-007
		513.70	1.30	2.5046E-006		-2.2409E-007
		565.90	1.40	1.7269E-006		1.6773E-007

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
	PA-234B	568.70	3.30	7.3234E-007	7.21E-008	5.6866E-008
		569.50	10.00	2.4177E-007		1.1922E-007
		574.00	2.00	1.1876E-006		-1.8042E-006
		664.80	1.30	1.9532E-006		-5.1278E-007
		666.70	1.60	1.5728E-006		1.0091E-006
		669.90	1.40	1.7662E-006		-5.0851E-008
		692.70	1.50	1.8270E-006		5.7135E-007
		699.00	4.60	5.9248E-007		2.5955E-007
		706.10	3.10	8.6171E-007		1.8698E-007
		733.00	9.00	3.0143E-007		1.4113E-007
		738.00	1.00	2.5147E-006		-2.3615E-006
		742.81	2.40	1.0934E-006		3.0386E-007
		755.60	1.40	1.8812E-006		2.8458E-007
		780.70	1.10	2.5166E-006		5.7929E-007
		786.27	1.40	1.9096E-006		-2.3880E-006
		793.60	1.50	1.9166E-006		1.1106E-006
		796.30	3.80	7.8208E-007		1.2383E-006
		805.80	3.30	8.2971E-007		-8.2459E-008
		819.60	2.60	9.9808E-007		9.8931E-008
		826.30	4.00	6.4387E-007		-8.0917E-008
		831.60	5.50	4.9043E-007		-1.6702E-007
		876.40	4.00	7.2922E-007		3.6447E-007
		880.50	4.00	7.2378E-007		1.5370E-007
		880.51	9.00	3.2168E-007		6.8312E-008
		883.24	15.00	1.9090E-007		9.7110E-008
		899.00	4.10	7.4940E-007		6.8371E-007
		925.00	2.90	1.0194E-006		2.4656E-007
		926.00	11.00	2.6327E-007		-1.5809E-008
		927.10	11.00	2.7007E-007		7.3471E-008
		946.00	12.00	2.5450E-007		2.4164E-007
		949.00	8.00	3.7757E-007		4.5851E-007
		978.80	1.40	2.2406E-006		1.0624E-006
		980.50	2.00	1.5673E-006		9.7550E-007
		980.50	3.00	1.0448E-006		6.5033E-007
		984.00	1.90	1.6338E-006		4.5651E-008
		1353.30	1.70	1.5263E-006		-1.4107E-006
		1394.10	3.00	8.4235E-007		-1.1945E-006
		1452.70	1.00	3.1833E-006		-1.0275E-005
		1668.50	1.20	1.7071E-006		2.5018E-007
		1694.60	1.20	1.7845E-006		8.7312E-008
	TH-234	63.29	4.50	5.0533E+006	5.05E+006	4.9321E+006
		92.38	2.60	8.2775E+006		3.4568E+007
		92.80	2.60	8.2194E+006		3.1949E+007
+	U-235	72.70	0.11	1.6693E-005	3.55E-008	-2.5506E-006
		89.95*	2.80	4.7200E-007		2.8012E-007
		93.35*	4.50	3.1850E-007		4.2711E-007
		94.00	0.40	3.8695E-006		2.3803E-006
		105.00	2.10	6.2862E-007		-2.9521E-007
		109.16	1.50	8.9941E-007		-6.7060E-008
		140.76	0.22	6.4154E-006		4.1898E-007
		143.76*	10.90	1.3725E-007		-4.6871E-008

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/g)	Nuclide MDA (uCi/g)	Activity (uCi/g)
+	U-235	163.33	5.00	3.0016E-007	3.55E-008	-1.0624E-007
		182.61	0.40	4.2747E-006		7.2673E-008
		185.71*	57.50	3.5518E-008		7.1566E-008
		194.94	0.59	2.7465E-006		1.3752E-006
		202.11	1.00	1.6475E-006		-6.0269E-007
		205.31	5.00	3.3227E-007		-7.3465E-008
		279.50	0.27	6.0267E-006		1.6219E-006

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

Appendix J

Analytical Results from Eberline Analytical for Final Status Survey

Of the Soil under the Former Storage Port No. 1

UM-2008-12-17-01 (4)
UM-2009-02-06-02 (5)
UM-2009-02-06-03 (6)
UM-2009-02-06-04 (7)

University of Michigan

Phoenix Memorial Lab

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #09-02104-OR

March 3, 2009

EBERLINE ANALYTICAL
OAK RIDGE LABORATORY
OAK RIDGE, TN

UM-2009-02-06-02

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EBERLINE SERVICES

EBERLINE ANALYTICAL CORPORATION
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EBS-OR-28435

March 3, 2009

Chris Becker
University of Michigan
Phoenix Memorial Lab
2301 Bonisteel Blvd.
Ann Arbor, MI 48109

CASE NARRATIVE
Work Order # 09-02104-OR

SAMPLE RECEIPT

This work order contains four soil samples received 2/23/2009. These samples were analyzed for Iron-55 and by Gamma Spectroscopy.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
UM-2008-12-17-01	09-02104-04	UM-2009-02-06-03	09-02104-06
UM-2009-02-06-02	09-02104-05	UM-2009-02-06-04	09-02104-07

ANALYTICAL METHODS

Iron-55 was performed using EML Method E-Fe-01-01 modified. Gamma Spectroscopy was performed using Method LANL ER-130 Modified.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

IRON-55

A representative aliquot from each sample was placed into a Petri geometry container. Samples were then counted on a planar low energy photon spectroscopy (LEPS) detector.

Samples demonstrated non-detect equivalent results for Iron-55 activity. Results for the Iron-55 method blank demonstrated non-detect equivalent activity. Results for the Iron-55 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Americium-241 and Cobalt-57 laboratory control sample demonstrated an acceptable percent recovery.

GAMMA SPECTROSCOPY

Samples for Gamma Spectroscopy analysis were prepared by transferring a known mass/aliquot of each prepared and homogenized sample to a standard geometry container. Samples were counted on High Purity Germanium (HPGe) gamma ray detectors.

ANALYTICAL RESULTS CONTINUED

GAMMA SPECTROSCOPY continued

Samples demonstrated non-detect equivalent results for Cerium-139, Cobalt-60, Cesium-134, Europium-152, Europium-154 and Manganese-54 activity. Results for the method blank demonstrated non-detect equivalent activity for all gamma-emitting radionuclides as reported. Results for the Cobalt-60, Cesium-134 and Europium-154 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Cobalt-60 and Cesium-137 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougal
Laboratory Manager

Date: 3/3/2009

Eberline Analytical
Final Report of Analysis

Report To.
Chris Becker
Phoenix Memorial Lab
2301 Bonisteel Blvd.
Ann Arbor, MI 48109

Work Order Details
SDG: 09-02104
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
09-02104-01	LCS	KNOWN	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Americium-241	EML Fe-01-01 Modified	3.73E+03	1.16E+02			pCi/g
09-02104-01	LCS	KNOWN	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-57	EML Fe-01-01 Modified	1.18E+03	3.31E+01			pCi/g
09-02104-01	LCS	SPIKE	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Americium-241	EML Fe-01-01 Modified	3.62E+03	4.35E+02	4.35E+02	4.91E+00	pCi/g
09-02104-01	LCS	SPIKE	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-57	EML Fe-01-01 Modified	1.33E+03	1.35E+02	1.35E+02	4.80E+00	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	4.29E+00	8.18E+00	8.18E+00	9.13E+00	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	-7.20E-01	2.54E+00	2.54E+00	3.86E+00	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	-5.29E-01	2.43E+00	2.43E+00	3.89E+00	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	-1.46E+00	3.24E+00	3.24E+00	3.87E+00	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	-3.86E-01	2.07E+00	2.07E+00	3.37E+00	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Iron-55	EML Fe-01-01 Modified	-4.72E-01	2.55E+00	2.55E+00	4.16E+00	pCi/g
09-02104-01	LCS	KNOWN	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	1.23E+02	3.39E+00			pCi/g
09-02104-01	LCS	KNOWN	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-137	LANL ER-130 Modified	7.64E+01	2.22E+00			pCi/g
09-02104-01	LCS	SPIKE	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	1.30E+02	6.04E+00	6.04E+00	5.22E-01	pCi/g
09-02104-01	LCS	SPIKE	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-137	LANL ER-130 Modified	8.15E+01	5.30E+00	5.30E+00	4.71E-01	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	-5.06E-03	1.76E-02	1.76E-02	3.06E-02	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	-3.98E-03	3.63E-02	3.63E-02	6.69E-02	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	1.92E-02	3.02E-02	3.02E-02	5.60E-02	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	-4.75E-02	1.70E-01	1.70E-01	3.46E-01	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	-1.11E-02	8.19E-02	8.19E-02	1.68E-01	pCi/g
09-02104-02	MBL	BLANK	02/24/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	1.42E-02	2.83E-02	2.83E-02	5.88E-02	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	-1.48E-02	2.81E-02	2.81E-02	4.66E-02	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	2.56E-02	3.11E-02	3.11E-02	5.97E-02	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	1.33E-03	2.30E-02	2.30E-02	3.83E-02	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	-6.92E-02	2.08E-01	2.08E-01	3.14E-01	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	1.65E-02	7.33E-02	7.33E-02	1.36E-01	pCi/g
09-02104-03	DUP	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	2.06E-02	2.71E-02	2.71E-02	5.22E-02	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Eberline Analytical
Final Report of Analysis

Report To.
Chris Becker
Phoenix Memorial Lab
2301 Bonisteel Blvd.
Ann Arbor, MI 48109

Work Order Details:
SDG: 09-02104
Purchase Order: 5000002634
Analysis Category: ENVIRONMENTAL
Sample Matrix: SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	1.30E-02	2.78E-02	2.78E-02	4.83E-02	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	1.60E-03	2.77E-02	2.77E-02	5.04E-02	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	5.21E-03	2.57E-02	2.57E-02	4.30E-02	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	2.19E-01	2.23E-01	2.23E-01	3.17E-01	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	2.12E-02	8.37E-02	8.37E-02	1.53E-01	pCi/g
09-02104-04	DO	UM-2008-12-17-01	01/09/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	2.14E-02	2.82E-02	2.82E-02	4.82E-02	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	-1.60E-02	2.34E-02	2.34E-02	3.87E-02	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	7.64E-02	3.19E-02	3.19E-02	6.51E-02	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	1.79E-02	3.03E-02	3.03E-02	5.38E-02	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	5.10E-01	1.19E-01	1.19E-01	3.58E-01	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	-7.99E-02	1.08E-01	1.08E-01	1.77E-01	pCi/g
09-02104-05	TRG	UM-2009-02-06-02	02/11/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	-2.30E-04	2.90E-02	2.90E-02	5.36E-02	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	1.25E-02	4.03E-02	4.03E-02	7.04E-02	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	7.07E-02	8.29E-02	8.29E-02	1.58E-01	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	1.87E-02	6.21E-02	6.21E-02	1.00E-01	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	9.04E-01	5.11E-01	5.11E-01	1.00E+00	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	-4.91E-02	1.61E-01	1.61E-01	2.99E-01	pCi/g
09-02104-06	TRG	UM-2009-02-06-03	02/17/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	2.02E-02	6.08E-02	6.08E-02	1.11E-01	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Cerium-139	LANL ER-130 Modified	-1.17E-02	4.08E-02	4.08E-02	6.93E-02	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Cobalt-60	LANL ER-130 Modified	-4.62E-02	8.18E-02	8.18E-02	1.32E-01	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Cesium-134	LANL ER-130 Modified	7.58E-03	5.90E-02	5.90E-02	9.39E-02	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-152	LANL ER-130 Modified	3.87E-01	3.45E-01	3.45E-01	7.89E-01	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Europium-154	LANL ER-130 Modified	-6.13E-03	1.81E-01	1.81E-01	3.09E-01	pCi/g
09-02104-07	TRG	UM-2009-02-06-04	02/13/09 00:00	2/23/2009	2/24/2009	09-02104	Manganese-54	LANL ER-130 Modified	5.79E-03	6.36E-02	6.36E-02	1.13E-01	pCi/g

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (2-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

Preliminary Data Report & Analytical Calculations

Work Order: 09-02104-Fe055-1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LSC Known	LCS %R	LCS Flag	RPD Flag	Sample Date	Sample Aliquot	Counting Date/Time	Identified
01	AM-241	LCS	LCS	pCi/g	3.62E+03	4.35E+02	4.91E+00	3.73E+03	97.12	OK		02/24/09 00:00	1.00E+00	02/24/09 12:48	YES
01	CO-57	LCS	LCS	pCi/g	1.33E+03	1.35E+02	4.80E+00	1.18E+03	112.24	OK		02/24/09 00:00	1.00E+00	02/24/09 12:48	YES
02	FE-55	MBL	BLANK	pCi/g	4.29E+00	8.18E+00	9.13E+00					02/24/09 00:00	1.00E+00	02/24/09 13:22	NO
03	FE-55	DUP	UM-2008-12-17-01	pCi/g	-7.20E-01	2.54E+00	3.86E+00				OK	01/09/09 00:00	2.97E+01	02/24/09 14:22	NO
04	FE-55	DO	UM-2008-12-17-01	pCi/g	-5.29E-01	2.43E+00	3.89E+00					01/09/09 00:00	2.97E+01	02/24/09 15:24	NO
05	FE-55	TRG	UM-2009-02-06-02	pCi/g	-1.46E+00	3.24E+00	3.87E+00					02/11/09 00:00	3.05E+01	02/24/09 16:30	NO
06	FE-55	TRG	UM-2009-02-06-03	pCi/g	-3.86E-01	2.07E+00	3.37E+00					02/17/09 00:00	3.61E+01	02/24/09 17:30	NO
07	FE-55	TRG	UM-2009-02-06-04	pCi/g	-4.72E-01	2.55E+00	4.16E+00					02/13/09 00:00	2.86E+01	02/24/09 18:33	NO

Eberline Services
Oak Ridge Laboratory

Preliminary Data Report & Analytical Calculations

Work Order: 09-02104-Gamma-1

Printed: 2/25/2009 1:31 PM

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LSC Known	LCS %R	LCS Flag	RPD Flag	Sample Date	Sample Aliquot	Counting Date/Time	Identified
01	CO-60	LCS	LCS	pCi/g	1.30E+02	6.04E+00	5.22E-01	1.23E+02	105.11	OK		02/24/09 00:00	1.00E+00	02/24/09 14:56	YES
01	CS-137	LCS	LCS	pCi/g	8.15E+01	5.30E+00	4.71E-01	7.64E+01	106.69	OK		02/24/09 00:00	1.00E+00	02/24/09 14:56	YES
02	CE-139	MBL	BLANK	pCi/g	-5.06E-03	1.76E-02	3.06E-02					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
02	CO-60	MBL	BLANK	pCi/g	-3.98E-03	3.63E-02	6.69E-02					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
02	CS-134	MBL	BLANK	pCi/g	1.92E-02	3.02E-02	5.60E-02					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
02	EU-152	MBL	BLANK	pCi/g	-4.75E-02	1.70E-01	3.46E-01					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
02	EU-154	MBL	BLANK	pCi/g	-1.11E-02	8.19E-02	1.68E-01					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
02	MN-54	MBL	BLANK	pCi/g	1.42E-02	2.83E-02	5.88E-02					02/24/09 00:00	1.00E+00	02/24/09 14:37	NO
03	CE-139	DUP	UM-2008-12-17-01	pCi/g	-1.48E-02	2.81E-02	4.66E-02					01/09/09 00:00	7.17E+02	02/24/09 15:28	NO
03	CO-60	DUP	UM-2008-12-17-01	pCi/g	2.56E-02	3.11E-02	5.97E-02				INV	01/09/09 00:00	7.17E+02	02/24/09 15:28	NO
03	CS-134	DUP	UM-2008-12-17-01	pCi/g	1.33E-03	2.30E-02	3.83E-02				INV	01/09/09 00:00	7.17E+02	02/24/09 15:28	
03	EU-152	DUP	UM-2008-12-17-01	pCi/g	-6.92E-02	2.08E-01	3.14E-01					01/09/09 00:00	7.17E+02	02/24/09 15:28	NO
03	EU-154	DUP	UM-2008-12-17-01	pCi/g	1.65E-02	7.33E-02	1.36E-01				OK	01/09/09 00:00	7.17E+02	02/24/09 15:28	NO
03	MN-54	DUP	UM-2008-12-17-01	pCi/g	2.06E-02	2.71E-02	5.22E-02					01/09/09 00:00	7.17E+02	02/24/09 15:28	NO
04	CE-139	DO	UM-2008-12-17-01	pCi/g	1.30E-02	2.78E-02	4.83E-02					01/09/09 00:00	7.17E+02	02/24/09 16:33	NO
04	CO-60	DO	UM-2008-12-17-01	pCi/g	1.60E-03	2.77E-02	5.04E-02					01/09/09 00:00	7.17E+02	02/24/09 16:33	NO
04	CS-134	DO	UM-2008-12-17-01	pCi/g	5.21E-03	2.57E-02	4.30E-02					01/09/09 00:00	7.17E+02	02/24/09 16:33	NO
04	EU-152	DO	UM-2008-12-17-01	pCi/g	2.19E-01	2.23E-01	3.17E-01					01/09/09 00:00	7.17E+02	02/24/09 16:33	NO
04	EU-154	DO	UM-2008-12-17-01	pCi/g	2.12E-02	8.37E-02	1.53E-01					01/09/09 00:00	7.17E+02	02/24/09 16:33	NO
04	MN-54	DO	UM-2008-12-17-01	pCi/g	2.14E-02	2.82E-02	4.82E-02					01/09/09 00:00	7.17E+02	02/24/09 16:33	YES
05	CE-139	TRG	UM-2009-02-06-02	pCi/g	-1.60E-02	2.34E-02	3.87E-02					02/11/09 00:00	6.73E+02	02/24/09 15:27	NO
05	CO-60	TRG	UM-2009-02-06-02	pCi/g	7.64E-02	3.19E-02	6.51E-02					02/11/09 00:00	6.73E+02	02/24/09 15:27	YES
05	CS-134	TRG	UM-2009-02-06-02	pCi/g	1.79E-02	3.03E-02	5.38E-02					02/11/09 00:00	6.73E+02	02/24/09 15:27	NO
05	EU-152	TRG	UM-2009-02-06-02	pCi/g	5.10E-01	1.19E-01	3.58E-01					02/11/09 00:00	6.73E+02	02/24/09 15:27	YES
05	EU-154	TRG	UM-2009-02-06-02	pCi/g	-7.99E-02	1.08E-01	1.77E-01					02/11/09 00:00	6.73E+02	02/24/09 15:27	NO
05	MN-54	TRG	UM-2009-02-06-02	pCi/g	-2.30E-04	2.90E-02	5.36E-02					02/11/09 00:00	6.73E+02	02/24/09 15:27	NO
06	CE-139	TRG	UM-2009-02-06-03	pCi/g	1.25E-02	4.03E-02	7.04E-02					02/17/09 00:00	6.82E+02	02/24/09 15:38	N
06	CO-60	TRG	UM-2009-02-06-03	pCi/g	7.07E-02	8.29E-02	1.58E-01					02/17/09 00:00	6.82E+02	02/24/09 15:38	NO
06	CS-134	TRG	UM-2009-02-06-03	pCi/g	1.87E-02	6.21E-02	1.00E-01					02/17/09 00:00	6.82E+02	02/24/09 15:38	NO
06	EU-152	TRG	UM-2009-02-06-03	pCi/g	9.04E-01	5.11E-01	1.00E+00					02/17/09 00:00	6.82E+02	02/24/09 15:38	NO
06	EU-154	TRG	UM-2009-02-06-03	pCi/g	-4.91E-02	1.61E-01	2.99E-01					02/17/09 00:00	6.82E+02	02/24/09 15:38	NO
06	MN-54	TRG	UM-2009-02-06-03	pCi/g	2.02E-02	6.08E-02	1.11E-01					02/17/09 00:00	6.82E+02	02/24/09 15:38	NO
07	CE-139	TRG	UM-2009-02-06-04	pCi/g	-1.17E-02	4.08E-02	6.93E-02					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO
07	CO-60	TRG	UM-2009-02-06-04	pCi/g	-4.62E-02	8.18E-02	1.32E-01					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO
07	CS-134	TRG	UM-2009-02-06-04	pCi/g	7.58E-03	5.90E-02	9.39E-02					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO
07	EU-152	TRG	UM-2009-02-06-04	pCi/g	3.87E-01	3.48E-01	7.89E-01					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO
07	EU-154	TRG	UM-2009-02-06-04	pCi/g	-6.13E-03	1.81E-01	3.09E-01					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO
07	MN-54	TRG	UM-2009-02-06-04	pCi/g	5.79E-03	6.36E-02	1.13E-01					02/13/09 00:00	6.61E+02	02/24/09 16:39	NO

Appendix K

ORISE Confirmation Samples Collected by NRC

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

June 1, 2009

Mr. Jeremy Tapp
U.S. Nuclear Regulatory Commission
Region III
2443 Warrenville Road
Lisle, IL 60532-4351

SUBJECT: **ORISE CONTRACT NO. DE-AC05-06OR23100**
LETTER REPORT FOR ANALYTICAL RESULTS FOR TWO SOIL SAMPLES AND ONE CONCRETE SAMPLE FROM THE FORD REACTOR AT THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN
[05000002/2009002] (RFTA NO. 09-001)
DCN: 1790-LR-01-0

Dear Mr. Tapp:

The Oak Ridge Institute for Science and Education (ORISE) received two soil samples and one concrete sample on March 26, 2009. The samples were associated with the Ford Reactor at the University of Michigan in Ann Arbor, Michigan. The samples were analyzed by gamma spectroscopy for cobalt-60 with a requested detection limit of 0.4 pCi/g and for europium-152 with a requested detection limit of 1.0 pCi/g. Iron-55(Fe-55) analysis was also requested with a detection limit of 1,000 pCi/g. The sample identifications are presented in Table 1, the data for gamma spectroscopy are presented in Table 2, and the Fe-55 data are presented in Table 3. The pertinent procedure references are included with the respective data tables.

This letter report was delayed due to analytical problems associated with the Fe-55 analysis. We apologize for the delay, but we believe this was necessary to achieve more defensible analytical results.

ORISE's Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

My contact information is listed below. You may also contact Wade Ivey at 865.576.9184 with any questions or comments.

Sincerely,

Dale Condra

Dale Condra, Manager
Laboratory

RDC:WPI:bf

Enclosures

c: T. Carter, NRC/FSME/DWMEP 7J18
T. Patterson, NRC/FSME/TWFN 8D42
W. Snell, NRC Region III
E. Abelquist, ORISE
T. Vitkus, ORISE
File 1790

Distribution approval and concurrence :	Initials
Technical Review	
Quality Review	ILB

P. O. Box 117
Oak Ridge, TN 37831

Voice: 865.241.3242 Fax: 865.241.3248 E-mail: Dale.Condra@orau.org

TABLE 1

SAMPLE IDENTIFICATIONS AND COLLECTION DATA FORD REACTOR UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN

ORISE Sample ID	NRC Region III Sample ID	Collection Date	Collection Time
1790S0001	UOM-09-1-01	3/25/2009	11:12 AM
1790S0002	UOM-09-1-02	3/25/2009	11:27 AM
1790M0001	UOM-09-1-03	3/25/2009	12:15 PM

TABLE 2

CONCENTRATIONS OF SELECTED GAMMA EMITTING RADIONUCLIDES IN SOIL AND CONCRETE SAMPLES BY GAMMA SPECTROSCOPY CP1, REVISION 16 FORD REACTOR UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations, TPUs, and MDCs[a] (pCi/g)	
		Co-60	Eu-152
1790S0001	UOM-09-1-01	0.03 ± 0.03[b] , 0.03	0.02 ± 0.01 , 0.03
1790S0002	UOM-09-1-02	0.01 ± 0.02 , 0.03	0.06 ± 0.02 , 0.04
1790M0001	UOM-09-1-03	0.04 ± 0.03 , 0.05	0.08 ± 0.03 , 0.06

[a]The MDCs are after the comma.

[b]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.

TABLE 3

CONCENTRATIONS OF IRON-55 IN SOIL AND CONCRETE SAMPLES BY LIQUID SCINTILLATION ANALYSIS AP16, REVISION 1; CP4, REVISION 3 FORD REACTOR UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN

ORISE Sample ID	NRC Region III Sample ID	Fe-55 Concentrations, TPUs, and MDCs[a] (pCi/g wet weight)
1790S0001	UOM-09-1-01	0.3 ± 1.4[b] , 2.4
1790S0002	UOM-09-1-02	0.7 ± 1.4 , 2.4
1790M0001	UOM-09-1-03	0.7 ± 1.3 , 2.3

[a]The MDCs are after the comma.

[b]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.

Appendix J:
Recordable Occurrence Letter to the NRC in Regard to the FNR Flood

OSEH
Occupational Safety &
Environmental Health

University of Michigan
Occupational Safety & Environmental Health
Campus Safety Services Building
1239 Kipke Drive, Ann Arbor, MI 48109-1010
Phone: 734 647-1143 • Fax: 734 763-1185

February 14, 2013

Document Control Room
U.S. Nuclear Regulatory Commission
Two White Flint North
11545 Rockville Pike
(Mail Code: 03H8)
Rockville, Maryland 20852-2738

RE: **Reportable Occurrence # 24**
Reactor Building Flood - Ruptured Fire Suppression Line
University of Michigan / Ford Nuclear Reactor
Reactor License R-28 / Docket 50-2
Technical Specification (Section 1.0 / Item 8)

Decommissioning Branch / Materials Safety Branch:

In accordance with the University of Michigan (U-M) – Ford Nuclear Reactor (FNR) technical specifications [Section 6.7(2)(a)], the U-M is submitting this reportable occurrence report for a flooding event that occurred within the facility on Monday evening, January 28, 2013 at approximately 20:00 hours. The FNR (License R-28 / Docket 50-2) is a non-power reactor in the final stages of decommissioning (final status survey) and is currently an empty and gutted building. No licensed radioactive material was known to be released from the restricted area as a result of this event.

The U-M believes this flooding event may be a reportable occurrence as defined in the Technical Specifications (Section 1.0 / Definitions / 'Reportable Occurrence' / Item 8): *'Conditions arising from natural or man-made events that affect or threaten to affect the safe operation of the facility.'*

A NRC Region III Materials Safety inspector happened to be at the U-M the night of the flood and observed U-M staff handling the event at the FNR facility the next morning (Tuesday, January 29, 2013). That inspector reported his findings back to the Region III offices. In addition, the U-M Radiation Safety Officer notified the NRC Decommissioning Project Manager at NRC headquarters in Washington, D.C. about the flood event on Tuesday morning, January 29th.

On January 28th, a four inch fire suppression line ruptured in Room 2111 on the second floor of the reactor building. We believe the break occurred due to freeze/thaw weather experienced over the previous week, added to the lack of heat in the facility as the decommissioning process had removed all mechanical systems. Room 2111 is located over the north area of the reactor building first floor.

The rupture caused extensive flooding of the north portion of the first floor, the open area beneath the first floor where the reactor pool had been removed, and the reactor basement. The volume of water released from the fire suppression line was estimated to be 150,000 - 200,000 gallons and was based on an approximate flow rate of 4,000 - 5,000 gallons per minute for approximately 40 minutes. The time is estimated from the time it took for water to flow under the door separating the structure from the adjacent Phoenix Lab where workers noted it, to the time when maintenance staff actually turned off the water. A more accurate estimate of the total volume of water released was not possible because the fire suppression line was not metered.

Water from the ruptured fire suppression line was channeled by cutout areas of the first floor slab to the basement. The slab cutouts were created by the removal of imbedded piping earlier in the decommissioning process. The bulk of the water escaped through cuts in the first floor and basement floor slab where soil beneath the reactor building was exposed. No water was intentionally pumped-out into the sanitary sewer system from the FNR building, however, water did drain from the FNR basement into the connecting Phoenix building basement tunnel, eventually finding its way to the Phoenix sanitary sewer system and Phoenix retention tank pit area.

Soil / sediment from the exposed soils on the first floor & basement floor slab pipe trenches of the FNR was washed into the lower levels of the FNR basement and the base of the reactor pool / hold-up tank area.

It should be noted that a comprehensive final status survey was conducted by a decommissioning contractor between November 26 – December 12, 2012 and confirmatory FSS surveys were conducted by the NRC / ORAU consultants the week of December 3, 2012. No residual radioactivity above the established gross beta DCGL (5125 dpm/100 cm2) for structural surfaces was discovered during these FSS activities.

A comprehensive radiological survey was conducted after the flooding event using a final status survey (FSS) approach (survey scans, static readings, and swipes). The radiological survey revealed no contamination within the facility. The survey was conducted on all floor levels impacted by the flood water (2^{nd} floor, 1^{st} floor. and basement). A contamination survey conducted in the Phoenix basement tunnel also revealed no contamination. The swipes were counted using a liquid scintillation counter (LSC) and/or gas proportional counter (GPC) and no counts statistically above background were noted.

In addition, 3 water and 2 sediment/soil samples were collected from the impacted FNR basement and reactor pool hold-up tank area and analyzed using a sensitive HPGe gamma spectrometer. The HPGe system is calibrated to the same geometry (500 ml plastic bottles) as the samples counted. No contamination was identified in the water or soil/sediment samples. The minimum detectable activity (MDA) for the primary FNR sourced radionuclides of

interest (Co-60, Ag-108m, and Cs-137) in the water and soil/sediment samples were less than 0.1 pCi/ml and less than 0.1 pCi/g, respectively.

A ground water sample was collected on February 12, 2013 from a monitoring well located at the front (south end) of the Phoenix building. The screen length in this monitoring well is 5 feet (10-slot PVC). The perched water under the FNR and Phoenix buildings flows in a north-to-south direction. The static water level of this monitoring well was 38.88 feet below the top of the well casing, which corresponds to a groundwater elevation of 808.26 feet. This sample was analyzed using the HPGe gamma spectrometer. No reactor sourced contaminant isotopes were detected. The MDA was less than 0.1 pCi/ml for Co-60, Ag-108m and Cs-137.

It should also be noted that the expandable plug inserted into the foundation drain tile pipe located in the east wall of the FNR basement did not leak any of the flood water or sediment into the truncated drain tile pipe. In addition, when the drain tile plug was carefully removed, no water or sediment came into the FNR basement through the drain tile pipe.

After a post-flood follow-up conference call with the NRC decommissioning branch staff on February 13, 2013, a decision was made to obtain and analyze an additional four sediment / soil samples from the pipe trenches and near the former sump area. Split samples in these strategic locations will be collected so the NRC can have independent analyses of the samples conducted by the ORAU staff.

In accordance with Section 6.7 / Item #2 ('Non-Routine Reports') of the FNR Technical Specifications, corrective action to prevent recurrence of this flooding event included turning off the water to the fire suppression line in question and assessing other water lines within the FNR building. There is currently only one active water line in the FNR building; that line is located in the 1st floor stairwell, and the temperature in that area has never dropped below 36 degrees Fahrenheit in the past 4 years.

Thank you for your time and consideration with respect to this report. Please do not hesitate to contact me at OSEH / Radiation Safety Service (734) 647-2251 or 764-6200) should you have any questions or comments regarding this report or the flooding event.

Sincerely,

Mark L. Driscoll
Director / Radiation Safety Officer
OSEH / Radiation Safety Service

MLD/RBB/PS/TGA/mld
NRCFllod012813Report.doc

Appendix K:
Individual Survey Unit Exposure Calculations

Calculated TEDE by Survey Unit Results

Survey Unit	Class	MDC	Survey Unit Mean	Standard Deviation	DCGL	TEDE (mRem/year)	Calculated based on
		(dpm/100 cm^2)					
FNR - 1-1	1	1,087	717	343	5,125	5.30	MDC
FNR - 1-10	1	1,336	-801	953	5,125	6.52	MDC
FNR - 1-11	2	1,514	354	436	5,125	7.39	MDC
FNR - 1-12	1	1,336	-308	611	5,125	6.52	MDC
FNR - 1-13	1	1,313	-164	1,059	5,125	6.41	MDC
FNR - 1-14	2	1,336	-528	255	5,125	6.52	MDC
FNR - 1-15	2	1,336	-56	434	5,125	6.52	MDC
FNR - 1-16	1	1,336	-473	207	5,125	6.52	MDC
FNR - 1-17	1	1,074	-70	325	5,125	5.24	MDC
FNR - 1-18	2	1,074	119	218	5,125	5.24	MDC
FNR - 1-2	1	1,313	263	320	5,125	6.41	MDC
FNR - 1-3	1	1,313	413	462	5,125	6.41	MDC
FNR - 1-4	1	1,087	630	241	5,125	5.30	MDC
FNR - 1-5	1	1,105	215	806	5,125	5.39	MDC
FNR - 1-6	1	1,105	-5	296	5,125	5.39	MDC
FNR - 1-7	1	1,105	286	496	5,125	5.39	MDC
FNR - 1-8	1	1,105	-140	271	5,125	5.39	MDC
FNR - 1-9	1	1,105	-121	352	5,125	5.39	MDC
FNR - 2-1	2	1,105	126	325	5,125	5.39	MDC
FNR - 2-10	2	1,514	533	640	5,125	7.39	MDC
FNR - 2-11	2	1,413	898	782	5,125	6.89	MDC
FNR - 2-12	1	1,514	947	495	5,125	7.39	MDC
FNR - 2-13	2	1,514	371	544	5,125	7.39	MDC
FNR - 2-2	1	1,087	469	283	5,125	5.30	MDC
FNR - 2-3	1	1,105	75	579	5,125	5.39	MDC
FNR - 2-4	2	1,141	205	458	5,125	5.56	MDC
FNR - 2-5	2	1,141	454	456	5,125	5.56	MDC
FNR - 2-6	2	1,105	236	388	5,125	5.39	MDC
FNR - 2-7	1	1,105	501	321	5,125	5.39	MDC
FNR - 2-8	2	1,105	217	340	5,125	5.39	MDC
FNR - 2-9	2	1,105	264	345	5,125	5.39	MDC
FNR - 3-1	2	1,105	507	488	5,125	5.39	MDC
FNR - 3-10	2	1,141	191	472	5,125	5.56	MDC
FNR - 3-11	1	1,087	671	156	5,125	5.30	MDC
FNR - 3-12	1	1,336	-523	347	5,125	6.52	MDC
FNR - 3-13	1	1,105	-345	304	5,125	5.39	MDC
FNR - 3-14	2	1,336	-211	370	5,125	6.52	MDC
FNR - 3-15	1	1,087	777	560	5,125	5.30	MDC
FNR - 3-16	2	1,074	75	396	5,125	5.24	MDC
FNR - 3-2	2	1,105	712	409	5,125	5.39	MDC
FNR - 3-3	1	1,141	857	335	5,125	5.56	MDC
FNR - 3-4	2	1,141	497	556	5,125	5.56	MDC
FNR - 3-5	1	1,105	528	490	5,125	5.39	MDC
FNR - 3-6	2	1,105	324	327	5,125	5.39	MDC
FNR - 3-7	1	1,514	293	437	5,125	7.39	MDC

Calculated TEDE by Survey Unit Results

Survey Unit	Class	MDC	Survey Unit Mean	Standard Deviation	DCGL	TEDE (mRem/year)	Calculated based on
		(dpm/100 cm^2)					
FNR - 3-8	2	1,514	524	537	5,125	7.39	MDC
FNR - 3-9	1	1,141	400	495	5,125	5.56	MDC
FNR - 4-1	3	1,371	846	802	5,125	6.69	MDC
FNR - 4-2	1	888	550	656	5,125	4.33	MDC
FNR - B-1	1	1,087	287	247	5,125	5.30	MDC
FNR - B-2	1	1,313	195	305	5,125	6.41	MDC
FNR - B-3	1	1,313	181	363	5,125	6.41	MDC
FNR - B-4	1	1,313	-379	367	5,125	6.41	MDC
FNR - B-5	1	1,336	-142	353	5,125	6.52	MDC
FNR - B-6	2	1,105	93	285	5,125	5.39	MDC
FNR - Misc-1	1	888	12	213	5,125	4.33	MDC
FNR - Misc-2	1	1,087	1,867	1,218	5,125	9.11	Average Activity
FNR - R&O-1	3	888	1,356	296	5,125	6.61	Average Activity
FNR - R&O-2	1	1,087	573	474	5,125	5.30	MDC
FNR - S-1	3	1,105	79	525	5,125	5.39	MDC
FNR - S-2	2	1,105	178	450	5,125	5.39	MDC
FNR - S-3	3	1,105	365	529	5,125	5.39	MDC
FNR - S-4	1	1,371	853	606	5,125	6.69	MDC
FNR - S-5	2	1,371	654	539	5,125	6.69	MDC

Appendix L:
RESRAD Output Reports for Foundation Drain Tile

Summary : RESRAD Default Parameters
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Summary : RESRAD Default Parameters
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ag-108 (Source: FGR 12)	1.143E-01	1.143E-01	DCF1(1)
A-1	Ag-108m (Source: FGR 12)	9.640E+00	9.640E+00	DCF1(2)
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(3)
A-1	C-14 (Source: FGR 12)	1.345E-05	1.345E-05	DCF1(4)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(5)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(6)
A-1	Eu-152 (Source: FGR 12)	7.006E+00	7.006E+00	DCF1(7)
A-1	Gd-152 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(8)
A-1	H-3 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(9)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ag-108m+D	2.830E-04	2.830E-04	DCF2(1)
B-1	C-14(p) (Class: ORGANIC)	2.090E-06	2.090E-06	DCF2(2)
B-1	C-14(g) (Class: CO2)	2.350E-08	2.350E-08	C14GInhDCF
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(7)
B-1	H-3	6.400E-08	6.400E-08	DCF2(8)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ag-108m+D	7.620E-06	7.620E-06	DCF3(1)
D-1	C-14	2.090E-06	2.090E-06	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(7)
D-1	H-3	6.400E-08	6.400E-08	DCF3(8)
D-34	Food transfer factors:			
D-34	Ag-108m+D , plant/soil concentration ratio, dimensionless	1.500E-01	1.500E-01	RTF(1,1)
D-34	Ag-108m+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-03	3.000E-03	RTF(1,2)
D-34	Ag-108m+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.500E-02	2.500E-02	RTF(1,3)
D-34				
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(2,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(2,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(5,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(8,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(8,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(8,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ag-108m+D , fish	5.000E+00	5.000E+00	BIOFAC(1,1)
D-5	Ag-108m+D , crustacea and mollusks	7.700E+02	7.700E+02	BIOFAC(1,2)
D-5				
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(2,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(7,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(8,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(8,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : RESRAD Default Parameters
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.000E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ag-108m	4.760E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): C-14	1.020E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	3.300E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	2.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	6.000E-01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): H-3	1.900E+00	0.000E+00	---	S1(8)
R012	Concentration in groundwater (pCi/L): Ag-108m	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): C-14	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	5.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ag-108m				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.333E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	4.600E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	4.600E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.246E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	-1.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.040E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	-1.000E+00	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	-1.000E+00	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.040E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.710E-02	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	5.710E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Summary : RESRAD Default Parameters
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Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

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

Summary : RESRAD Default Parameters
File : C:\USERS\THANSEN\DESKTOP\U OF MI\WORKER.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters
File : C:\USERS\THANSEN\DESKTOP\U OF MI\WORKER.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	50.00 square meters	Ag-108m	4.760E+01
Thickness:	1.00 meters	C-14	1.020E+01
Cover Depth:	5.00 meters	Co-60	3.300E+00
		Cs-137	2.000E+00
		Eu-152	6.000E-01
		H-3	1.900E+00

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.777E-25	1.576E-25	1.239E-25	5.350E-26	4.879E-27	2.965E-30	0.000E+00	0.000E+00
M(t):	7.107E-27	6.303E-27	4.958E-27	2.140E-27	1.952E-28	1.186E-31	0.000E+00	0.000E+00

Maximum TDOSE(t): 1.777E-25 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.775E-25	0.9991	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.587E-28	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.777E-25	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.775E-25	0.9991
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.587E-28	0.0009
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.777E-25	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.574E-25	0.9990	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.525E-28	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.576E-25	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.574E-25	0.9990
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.525E-28	0.0010
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.576E-25	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.238E-25	0.9989	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.408E-28	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.239E-25	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.238E-25	0.9989
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.408E-28	0.0011
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.239E-25	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	5.340E-26	0.9980	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.066E-28	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.350E-26	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.340E-26	0.9980
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.066E-28	0.0020
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.350E-26	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	4.831E-27	0.9901	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	4.808E-29	0.0099	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.879E-27	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.831E-27	0.9901
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.808E-29	0.0099
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.879E-27	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.965E-30	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.965E-30	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.965E-30	1.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.965E-30	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters
File : C:\USERS\THANSEN\DESKTOP\U OF MI\WORKER.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m+D	Ag-108m+D	1.000E+00	1.171E-32	2.489E-33	1.123E-34	2.196E-39	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	5.380E-26	4.771E-26	3.752E-26	1.618E-26	1.464E-27	3.261E-31	1.198E-41	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	3.484E-32	3.453E-32	3.392E-32	3.187E-32	2.666E-32	1.427E-32	2.393E-33	4.624E-36
Eu-152	Eu-152	7.208E-01	1.907E-28	1.832E-28	1.692E-28	1.281E-28	5.776E-29	3.561E-30	1.243E-33	1.401E-45
Eu-152	Eu-152	2.792E-01	7.385E-29	7.097E-29	6.554E-29	4.960E-29	2.237E-29	1.379E-30	4.814E-34	0.000E+00
Eu-152	Gd-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	∑DSR(j)		7.385E-29	7.097E-29	6.554E-29	4.960E-29	2.237E-29	1.379E-30	4.814E-34	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13
C-14	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12
Co-60	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15
Cs-137	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13
Eu-152	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14
H-3	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax) (pCi/g)	G(i,tmax) (pCi/g)
Ag-108m	4.760E+01	0.000E+00	0.000E+00	*2.609E+13	0.000E+00	*2.609E+13
C-14	1.020E+01	0.000E+00	0.000E+00	*4.455E+12	0.000E+00	*4.455E+12
Co-60	3.300E+00	0.000E+00	5.380E-26	*1.132E+15	5.380E-26	*1.132E+15
Cs-[redacted]	2.000E+00	0.000E+00	0.000E+00	*8.704E+13	0.000E+00	*8.704E+13
Eu-[redacted]	6.000E-01	0.000E+00	2.645E-28	*1.765E+14	2.645E-28	*1.765E+14
H-3	1.900E+00	0.000E+00	0.000E+00	*9.597E+15	0.000E+00	*9.597E+15

*At specific activity limit

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	Ag-108m	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	1.775E-25	1.574E-25	1.238E-25	5.340E-26	4.831E-27	0.000E+00	0.000E+00	0.000E+00
Cs-137	Cs-137	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	Eu-152	7.208E-01	1.144E-28	1.099E-28	1.015E-28	7.683E-29	3.466E-29	2.137E-30	0.000E+00	0.000E+00
Eu-152	Eu-152	2.792E-01	4.431E-29	4.258E-29	3.932E-29	2.976E-29	1.342E-29	8.277E-31	0.000E+00	0.000E+00
Eu-152	∑DOSE(j)		1.587E-28	1.525E-28	1.408E-28	1.066E-28	4.808E-29	2.965E-30	0.000E+00	0.000E+00
Gd-152	Eu-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	Ag-108m	1.000E+00	4.760E+01	9.968E+00	4.371E-01	7.718E-06	2.029E-19	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	1.020E+01	2.147E+00	9.517E-02	1.744E-06	5.103E-20	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	3.300E+00	2.892E+00	2.222E+00	8.830E-01	6.322E-02	6.208E-06	2.197E-17	0.000E+00
Cs-137	Cs-137	1.000E+00	2.000E+00	1.954E+00	1.866E+00	1.586E+00	9.978E-01	1.970E-01	1.911E-03	1.719E-10
Eu-152	Eu-152	7.208E-01	4.325E-01	4.104E-01	3.696E-01	2.561E-01	8.979E-02	2.292E-03	6.434E-08	7.544E-24
Eu-152	Eu-152	2.792E-01	1.675E-01	1.590E-01	1.432E-01	9.919E-02	3.478E-02	8.876E-04	2.492E-08	2.922E-24
Eu-152	∑S(j):		6.000E-01	5.694E-01	5.127E-01	3.553E-01	1.246E-01	3.179E-03	8.926E-08	1.047E-23
Gd-152	Eu-152	2.792E-01	0.000E+00	1.047E-15	2.983E-15	8.350E-15	1.613E-14	1.975E-14	1.832E-14	1.380E-14
H-3	H-3	1.000E+00	1.900E+00	3.782E-01	1.499E-02	1.856E-07	1.771E-21	0.000E+00	0.000E+00	0.000E+00

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

RESCALC.EXE execution time = 0.46 seconds

Summary : RESRAD Default Parameters
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ag-108 (Source: FGR 12)	1.143E-01	1.143E-01	DCF1(1)
A-1	Ag-108m (Source: FGR 12)	9.640E+00	9.640E+00	DCF1(2)
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(3)
A-1	C-14 (Source: FGR 12)	1.345E-05	1.345E-05	DCF1(4)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(5)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(6)
A-1	Eu-152 (Source: FGR 12)	7.006E+00	7.006E+00	DCF1(7)
A-1	Gd-152 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(8)
A-1	H-3 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(9)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ag-108m+D	2.830E-04	2.830E-04	DCF2(1)
B-1	C-14(p) (Class: ORGANIC)	2.090E-06	2.090E-06	DCF2(2)
B-1	C-14(g) (Class: CO2)	2.350E-08	2.350E-08	C14GInhDCF
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(7)
B-1	H-3	6.400E-08	6.400E-08	DCF2(8)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ag-108m+D	7.620E-06	7.620E-06	DCF3(1)
D-1	C-14	2.090E-06	2.090E-06	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(7)
D-1	H-3	6.400E-08	6.400E-08	DCF3(8)
D-34	Food transfer factors:			
D-34	Ag-108m+D , plant/soil concentration ratio, dimensionless	1.500E-01	1.500E-01	RTF(1,1)
D-34	Ag-108m+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-03	3.000E-03	RTF(1,2)
D-34	Ag-108m+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.500E-02	2.500E-02	RTF(1,3)
D-34				
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(2,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(2,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(5,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(8,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(8,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(8,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ag-108m+D , fish	5.000E+00	5.000E+00	BIOFAC(1,1)
D-5	Ag-108m+D , crustacea and mollusks	7.700E+02	7.700E+02	BIOFAC(1,2)
D-5				
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(2,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(7,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(8,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(8,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : RESRAD Default Parameters
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	5.000E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ag-108m	4.760E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): C-14	1.020E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	3.300E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	2.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	6.000E-01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): H-3	1.900E+00	0.000E+00	---	S1(8)
R012	Concentration in groundwater (pCi/L): Ag-108m	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): C-14	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	5.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ag-108m				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.333E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.246E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.040E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+00	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.040E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.833E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	8.330E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.250E-01	FPLANT
R018	Contamination fraction of meat	-1	-1	0.250E-02	FMEAT
R018	Contamination fraction of milk	-1	-1	0.250E-02	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters
File : C:\USERS\THANSEN\DESKTOP\U OF MI\FARMER.RAD

Contaminated Zone Dimensions	
Area:	50.00 square meters
Thickness:	1.00 meters
Cover Depth:	5.00 meters

Initial Soil Concentrations, pCi/g	
Ag-108m	4.760E+01
C-14	1.020E+01
Co-60	3.300E+00
Cs-137	2.000E+00
Eu-152	6.000E-01
H-3	1.900E+00

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.028E-24	1.689E+00	5.719E+00	1.882E-03	5.032E-17	2.338E-29	0.000E+00	0.000E+00
M(t):	4.112E-26	6.757E-02	2.287E-01	7.528E-05	2.013E-18	9.351E-31	0.000E+00	0.000E+00

Maximum TDOSE(t): 5.861E+00 mrem/yr at t = 4.280 ± 0.009 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 4.280E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	6.142E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	7.743E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	6.149E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Summary : RESRAD Default Parameters
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 4.280E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	5.381E+00	0.9181	4.747E-03	0.0008	0.000E+00	0.0000	2.138E-02	0.0036	8.656E-04	0.0001	1.578E-02	0.0027	5.423E+00	0.9254
C-14	3.244E-01	0.0554	1.106E-01	0.0189	0.000E+00	0.0000	5.132E-04	0.0001	5.818E-05	0.0000	1.981E-04	0.0000	4.358E-01	0.0744
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.142E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.743E-28	0.0000
H-3	1.416E-03	0.0002	1.093E-08	0.0000	0.000E+00	0.0000	6.174E-06	0.0000	1.680E-07	0.0000	4.783E-07	0.0000	1.423E-03	0.0002
Total	5.707E+00	0.9737	1.153E-01	0.0197	0.000E+00	0.0000	2.190E-02	0.0037	9.240E-04	0.0002	1.598E-02	0.0027	5.861E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.027E-24	0.9991	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	9.182E-28	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.028E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.027E-24	0.9991
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.182E-28	0.0009
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.028E-24	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	9.108E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	8.824E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.117E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	1.555E+00	0.9204	1.319E-03	0.0008	0.000E+00	0.0000	5.776E-03	0.0034	1.715E-04	0.0001	4.045E-03	0.0024	1.566E+00	0.9271
C-14	9.224E-02	0.0546	3.023E-02	0.0179	0.000E+00	0.0000	1.332E-04	0.0001	1.400E-05	0.0000	5.576E-05	0.0000	1.227E-01	0.0726
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.108E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.824E-28	0.0000
H-3	4.772E-04	0.0003	3.541E-09	0.0000	0.000E+00	0.0000	1.912E-06	0.0000	4.560E-08	0.0000	1.566E-07	0.0000	4.794E-04	0.0003
Total	1.648E+00	0.9753	3.155E-02	0.0187	0.000E+00	0.0000	5.911E-03	0.0035	1.855E-04	0.0001	4.101E-03	0.0024	1.689E+00	1.0000

* Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	7.163E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	8.148E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.171E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	5.253E+00	0.9186	4.631E-03	0.0008	0.000E+00	0.0000	2.085E-02	0.0036	8.383E-04	0.0001	1.536E-02	0.0027	5.295E+00	0.9259
C-14	3.146E-01	0.0550	1.071E-01	0.0187	0.000E+00	0.0000	4.967E-04	0.0001	5.621E-05	0.0000	1.920E-04	0.0000	4.225E-01	0.0739
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.163E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.148E-28	0.0000
H-3	1.475E-03	0.0003	1.137E-08	0.0000	0.000E+00	0.0000	6.419E-06	0.0000	1.742E-07	0.0000	4.978E-07	0.0000	1.482E-03	0.0003
Total	5.569E+00	0.9738	1.118E-01	0.0195	0.000E+00	0.0000	2.135E-02	0.0037	8.947E-04	0.0002	1.555E-02	0.0027	5.719E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	3.089E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	6.167E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.096E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	1.722E-03	0.9152	1.560E-06	0.0008	0.000E+00	0.0000	7.156E-06	0.0038	3.477E-07	0.0002	5.488E-06	0.0029	1.737E-03	0.9229
C-14	1.070E-04	0.0569	3.744E-05	0.0199	0.000E+00	0.0000	1.795E-07	0.0001	2.136E-08	0.0000	6.580E-08	0.0000	1.447E-04	0.0769
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.089E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.167E-28	0.0000
H-3	3.414E-07	0.0002	2.705E-12	0.0000	0.000E+00	0.0000	1.572E-09	0.0000	4.652E-11	0.0000	1.178E-10	0.0000	3.432E-07	0.0002
Total	1.830E-03	0.9722	3.900E-05	0.0207	0.000E+00	0.0000	7.337E-06	0.0039	3.691E-07	0.0002	5.554E-06	0.0030	1.882E-03	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	2.795E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.782E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.823E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	4.567E-17	0.9074	4.135E-20	0.0008	0.000E+00	0.0000	1.897E-19	0.0038	9.217E-21	0.0002	1.455E-19	0.0029	4.605E-17	0.9151
C-14	3.156E-18	0.0627	1.104E-18	0.0219	0.000E+00	0.0000	5.295E-21	0.0001	6.301E-22	0.0000	1.941E-21	0.0000	4.269E-18	0.0848
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.795E-26	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.782E-28	0.0000
H-3	3.286E-21	0.0001	2.603E-26	0.0000	0.000E+00	0.0000	1.513E-23	0.0000	4.477E-25	0.0000	1.133E-24	0.0000	3.303E-21	0.0001
Total	4.883E-17	0.9702	1.146E-18	0.0228	0.000E+00	0.0000	1.950E-19	0.0039	9.848E-21	0.0002	1.474E-19	0.0029	5.032E-17	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	6.226E-30	0.2663	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.715E-29	0.7337	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.338E-29	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.226E-30	0.2663
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.715E-29	0.7337
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.338E-29	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ag-108m	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m+D	Ag-108m+D	1.000E+00	6.777E-32	3.290E-02	1.112E-01	3.649E-05	9.675E-19	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	0.000E+00	1.203E-02	4.142E-02	1.419E-05	4.185E-19	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	3.112E-25	2.760E-25	2.171E-25	9.362E-26	8.470E-27	1.887E-30	6.932E-41	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	2.016E-31	1.998E-31	1.963E-31	1.844E-31	1.542E-31	8.256E-32	1.385E-32	2.675E-35
Eu-152	Eu-152	7.208E-01	1.103E-27	1.060E-27	9.789E-28	7.409E-28	3.342E-28	2.060E-29	7.190E-33	5.605E-45
Eu-152	Eu-152	2.792E-01	4.273E-28	4.106E-28	3.792E-28	2.870E-28	1.295E-28	7.981E-30	2.785E-33	2.803E-45
Eu-152	Gd-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	∑DSR(j)		4.273E-28	4.106E-28	3.792E-28	2.870E-28	1.295E-28	7.981E-30	2.785E-33	2.803E-45
H-3	H-3	1.000E+00	0.000E+00	2.523E-04	7.799E-04	1.806E-07	1.738E-21	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	*2.609E+13	7.598E+02	2.248E+02	6.851E+05	*2.609E+13	*2.609E+13	*2.609E+13	*2.609E+13
C-14	*4.455E+12	2.079E+03	6.036E+02	1.762E+06	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12
Co-60	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15
Cs-137	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13
Eu-152	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14
H-3	*9.597E+15	9.909E+04	3.205E+04	1.384E+08	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 4.280 ± 0.009 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ag-108m	4.760E+01	4.283 ± 0.009	1.139E-01	2.194E+02	1.139E-01	2.194E+02
C-14	1.020E+01	4.285 ± 0.009	4.272E-02	5.851E+02	4.272E-02	5.852E+02
Co-60	3.300E+00	0.000E+00	3.112E-25	*1.132E+15	1.861E-25	*1.132E+15
Cs-137	2.000E+00	0.000E+00	0.000E+00	*8.704E+13	0.000E+00	*8.704E+13
Eu-152	6.000E-01	0.000E+00	1.530E-27	*1.765E+14	1.291E-27	*1.765E+14
H-3	1.900E+00	3.007 ± 0.006	7.799E-04	3.205E+04	7.489E-04	3.338E+04

*At specific activity limit

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	Ag-108m	1.000E+00	0.000E+00	1.566E+00	5.295E+00	1.737E-03	4.605E-17	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	0.000E+00	1.227E-01	4.225E-01	1.447E-04	4.269E-18	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	1.027E-24	9.108E-25	7.163E-25	3.089E-25	2.795E-26	6.226E-30	0.000E+00	0.000E+00
Cs-137	Cs-137	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	Eu-152	7.208E-01	6.618E-28	6.360E-28	5.873E-28	4.445E-28	2.005E-28	1.236E-29	0.000E+00	0.000E+00
Eu-152	Eu-152	2.792E-01	2.564E-28	2.464E-28	2.275E-28	1.722E-28	7.767E-29	4.789E-30	0.000E+00	0.000E+00
Eu-152	∑DOSE(j)		9.182E-28	8.824E-28	8.148E-28	6.167E-28	2.782E-28	1.715E-29	0.000E+00	0.000E+00
Gd-152	Eu-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	4.794E-04	1.482E-03	3.432E-07	3.303E-21	0.000E+00	0.000E+00	0.000E+00

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

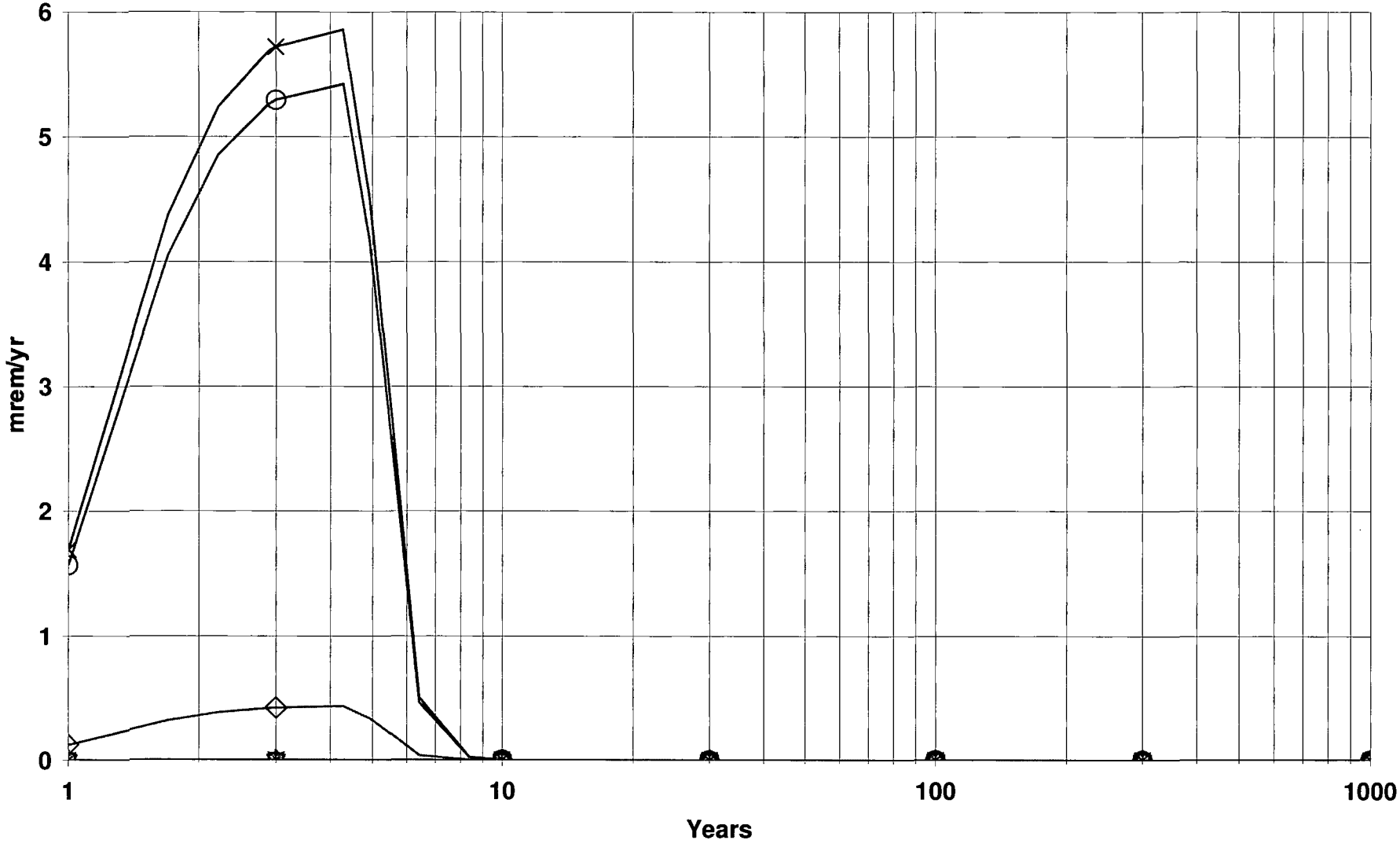
Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ag-108m	Ag-108m	1.000E+00	4.760E+01	9.968E+00	4.371E-01	7.718E-06	2.029E-19	0.000E+00	0.000E+00	0.000E+00
C-14	C-14	1.000E+00	1.020E+01	2.147E+00	9.517E-02	1.744E-06	5.103E-20	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	3.300E+00	2.892E+00	2.222E+00	8.830E-01	6.322E-02	6.208E-06	2.197E-17	0.000E+00
Cs-137	Cs-137	1.000E+00	2.000E+00	1.954E+00	1.866E+00	1.586E+00	9.978E-01	1.970E-01	1.911E-03	1.719E-10
Eu-152	Eu-152	7.208E-01	4.325E-01	4.104E-01	3.696E-01	2.561E-01	8.979E-02	2.292E-03	6.434E-08	7.544E-24
Eu-152	Eu-152	2.792E-01	1.675E-01	1.590E-01	1.432E-01	9.919E-02	3.478E-02	8.876E-04	2.492E-08	2.922E-24
Eu-152	∑S(j):		6.000E-01	5.694E-01	5.127E-01	3.553E-01	1.246E-01	3.179E-03	8.926E-08	1.047E-23
Gd-152	Eu-152	2.792E-01	0.000E+00	1.047E-15	2.983E-15	8.350E-15	1.613E-14	1.975E-14	1.832E-14	1.380E-14
H-3	H-3	1.000E+00	1.900E+00	3.782E-01	1.499E-02	1.856E-07	1.771E-21	0.000E+00	0.000E+00	0.000E+00

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

RESCALC.EXE execution time = 0.78 seconds

DOSE: All Nuclides Summed, All Pathways Summed



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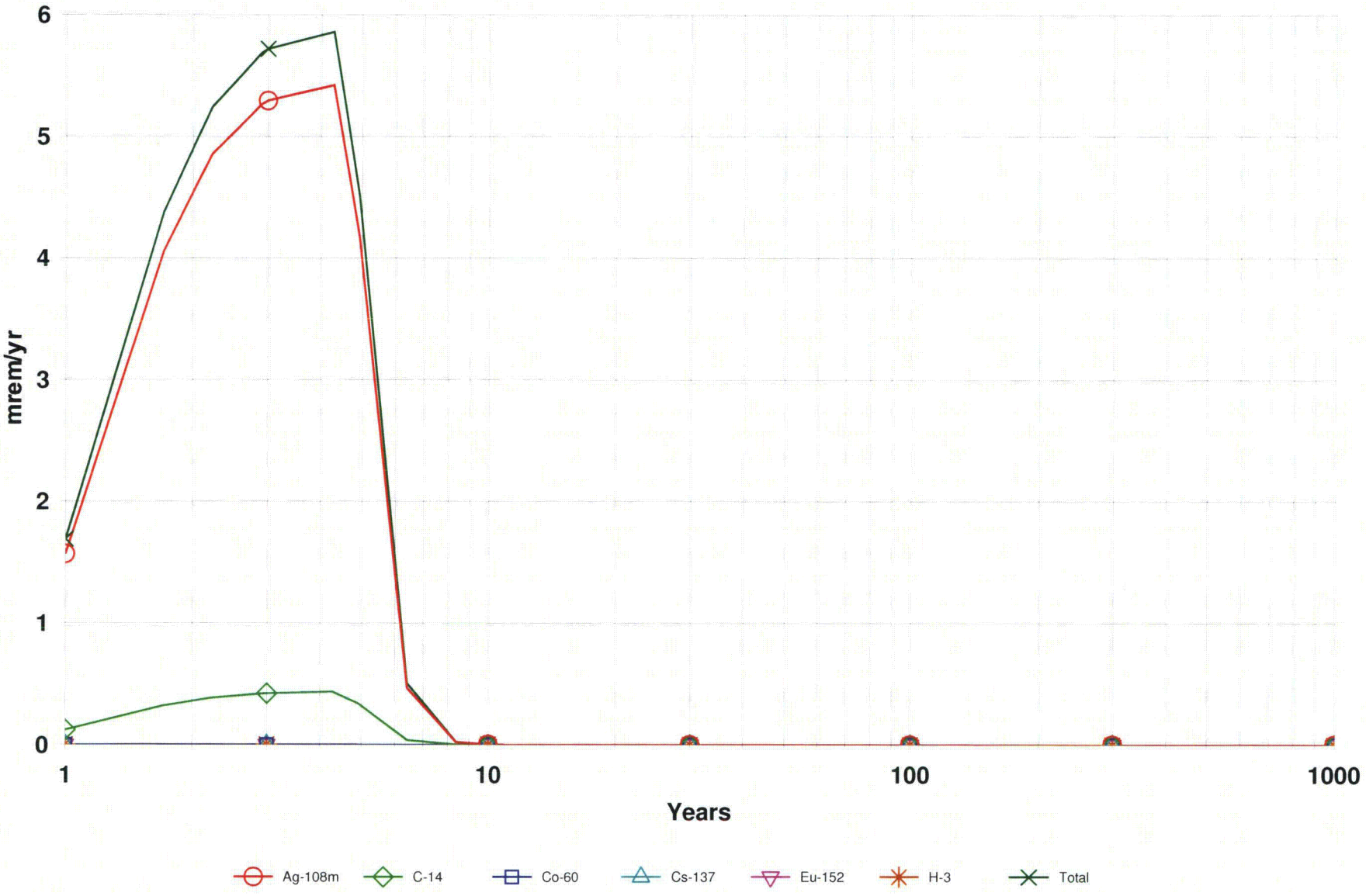
DOSE: All Nuclides Summed, All Pathways Summed



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Appendix M:
Quality Assurance
Precision Comparison
Results

Quality Assurance Precision Comparison Results

Location	Gross Counts cpm/100cm^2		RPD
	FSS	QA	
FNR_B-1_F1_C_020	299	307	2.6%
FNR_B-1_F1_C_022	266	318	17.8%
FNR_B-2_F1_C_019	276	297	7.3%
FNR_B-3_W1_C_017	269	279	3.6%
FNR_B-4_W1_C_020	239	242	1.2%
FNR_B-4_W1_C_026	270	252	6.9%
FNR_B-5_W1_C_019	300	319	6.1%
FNR_B-6_C1_D_018	226	293	25.8%
FNR_1-1_F1_C_019	350	307	13.1%
FNR_1-2_F1_C_020	310	284	8.8%
FNR_1-3_F1_C_017	279	261	6.7%
FNR_1-4_F1_C_018	311	328	5.3%
FNR_1-5_W1_C_020	259	306	16.6%
FNR_1-6_W1_C_020	237	265	11.2%
FNR_1-7_W1_C_017	296	306	3.3%
FNR_1-8_W1_D_020	212	301	34.7%
FNR_1-8_W1_D_025	258	264	2.3%
FNR_1-9_W1_A_018	268	266	0.7%
FNR_1-10_W1_C_017	220	141	43.8%
FNR_1-11_W1_A_017	348	343	1.4%
FNR_1-12_W1_D_018	255	235	8.2%
FNR_1-13_F1_C_020	264	283	6.9%
FNR_1-13_F1_C_023	460	493	6.9%
FNR_1-14_W1_D_019	264	250	5.4%
FNR_1-15_C1_D_019	236	240	1.7%
FNR_1-16_W1_D_021	247	261	5.5%
FNR_1-16_W1_C_028	267	254	5.0%
FNR_1-17_C1_M_021	168	145	14.7%
FNR_1-17_C1_M_024	223	200	10.9%
FNR_1-18_C1_M_017	170	183	7.4%
FNR_2-1_W1_D_018	246	247	0.4%
FNR_2-2_F1_C_019	266	290	8.6%
FNR_2-3_W1_C_018	265	328	21.2%

Location	Gross Counts cpm/100cm^2		RPD
	FSS	QA	
FNR_2-4_W1_C_018	287	368	24.7%
FNR_2-5_W1_A_020	343	317	7.9%
FNR_2-5_W1_B_028	308	400	26.0%
FNR_2-6_W1_A_018	322	319	0.9%
FNR_2-7_W1_A_019	312	310	0.6%
FNR_2-8_W1_A_017	341	317	7.3%
FNR_2-9_C1_D_020	284	333	15.9%
FNR_2-9_W1_A_022	301	357	17.0%
FNR_2-10_W1_W_020	546	549	0.5%
FNR_2-10_W1_W_026	609	571	6.4%
FNR_2-11_F1_C_017	395	435	9.6%
FNR_2-12_W1_A_017	402	429	6.5%
FNR_2-13_C1_D_019	299	311	3.9%
FNR_3-1_C1_C_020	270	281	4.0%
FNR_3-1_W1_D_025	310	278	10.9%
FNR_3-2_C1_D_020	286	323	12.2%
FNR_3-2_W1_A_022	341	354	3.7%
FNR_3-3_W1_A_017	347	346	0.3%
FNR_3-4_W1_A_017	351	347	1.1%
FNR_3-5_W1_A_018	323	323	0.0%
FNR_3-6_C1_C_020	284	310	8.8%
FNR_3-6_W1_A_025	310	346	11.0%
FNR_3-7_W1_W_020	549	612	10.9%
FNR_3-8_W1_D_020	315	295	6.6%
FNR_3-8_W1_A_022	373	350	6.4%
FNR_3-9_F1_C_018	315	317	0.6%
FNR_3-10_C1_C_020	241	262	8.3%
FNR_3-10_C1_C_022	268	312	15.2%
FNR_3-11_F1_C_018	336	325	3.3%
FNR_3-12_W1_D_018	238	258	8.1%
FNR_3-12_W1_D_022	270	298	9.9%
FNR_3-13_W1_D_018	260	268	3.0%
FNR_3-14_W1_D_017	186	280	40.3%
FNR_3-15_F1_C_017	286	194	38.3%
FNR_3-16_S1_M_016	168	144	15.4%

Location	Gross Counts cpm/100cm^2		RPD
	FSS	QA	
FNR_4-1_W1_R_017	443	424	4.4%
FNR_4-2_W1_M_018	181	181	0.0%
FNR_S-1_W1_A_017	242	291	18.4%
FNR_S-2_F1_C_020	264	335	23.7%
FNR_S-2_F1_C_029	301	343	13.0%
FNR_S-3_W1_D_019	289	251	14.1%
FNR_S-4_C1_M_020	298	247	18.7%
FNR_S-4_C1_M_027	277	206	29.4%
FNR_S-5_W1_D_017	308	308	0.0%
FNR_R&O-1_F1_M_017	298	281	5.9%
FNR_R&O-2_F1_C_020	315	312	1.0%
FNR_R&O-2_F1_C_040	313	313	0.0%
FNR_R&O-2_F1_C_060	302	299	1.0%
FNR_R&O-2_F1_C_080	318	368	14.6%
FNR_R&O-2_F1_C_084	366	394	7.4%
FNR_MISC-1_S1_M_017	175	181	3.4%
FNR_MISC-2_F1_C_005	334	371	10.5%
		Maximum	43.8%