

OYSTER CREEK GENERATING STATION SITE RADIOLOGICAL CHARACTERIZATION REPORT

Revision 1
April 24, 2023



BHI Energy | Power Services
97 Libbey Industrial Pkwy
Weymouth, MA 02189
(800) 225-0385



Table of Contents, List of Tables, List of Figures

Originated By: Joseph Bisson
Joseph Bisson (Apr 24, 2023 20:44 EDT)
Joseph Bisson – Sr. Radiological Engineer

Originated By: Christopher M. Gans *Christopher M. Gans*
Christopher Gans – Sr. Radiological Engineer

Originated By: Chris Messier *Chris Messier* *4/24/2023*
Chris Messier – Vice President Engineering

Reviewed By: Martin Erickson *Marty Erickson*
Martin Erickson – Sr. Radiological Engineer

Approved By: James Orr *James Orr*
James Orr (Apr 27, 2023 20:02 EDT)
Jimmy Orr – Vice President of Radiological Operations

Table of Contents, List of Tables, List of Figures

Record of Revision			
Revision Number	Modified By	Revision Summary	Revision Date
0		Initial Issue	3/17/23
1	Gans	Added Section 3.12 for Ground Water and other minor editorial changes	

Table of Contents, List of Tables, List of Figures

List of Tables	iv
List of Figures	vii
Acronyms and Abbreviations	viii
1 Introduction.....	1-1
1.1 Radiological Site Characterization Organization.....	1-3
1.2 Radiological Assessment criteria.....	1-4
1.3 Site Characterization Quality Requirements.....	1-5
1.3.1 Site Characterization Quality Assurance/Quality Control Requirements	1-5
1.3.2 Radiation Detection Instrumentation Sensitivity.....	1-7
1.4 Laboratory Analytical Methods	1-7
2 Radiological Characterization of OCN GS Site.....	2-1
2.1 Survey Methods and Techniques	2-1
2.2 Survey Designs by Area.....	2-4
2.3 Survey Area Plans and Site Characterization Procedures.....	2-4
2.4 BHI Mobile Chemistry Laboratory.....	2-7
3 Radiological Findings	3-1
3.1 NOCA-1 (SAP 01 – Open Land).....	3-3
3.1.1 Area Description.....	3-3
3.1.2 Survey Summary	3-3
3.1.3 Survey Data Summary.....	3-6
3.1.4 Data Quality Comparisons	3-9
3.1.5 Survey Plan Deviation(s).....	3-14
3.1.6 Survey Area Investigations	3-14
3.1.7 Survey Area Conclusions	3-14
3.2 NOCA-2 (SAP 02 – Open Land).....	3-15
3.2.1 Area Description.....	3-15
3.2.2 Survey Summary	3-15
3.2.3 Survey Data Summary.....	3-17
3.2.4 Data Quality Comparisons	3-20
3.2.5 Survey Plan Deviations	3-21
3.2.6 Survey Area Investigations	3-21
3.2.7 Survey Area Conclusions	3-22
3.3 SOCA-1 (SAP 03 – Open Land).....	3-23
3.3.1 Area Description.....	3-23
3.3.2 Survey Summary	3-23
3.3.3 Survey Data Summary.....	3-25
3.3.4 Data Quality Comparisons	3-27
3.3.5 Survey Plan Deviations	3-31
3.3.6 Survey Area Investigations	3-31
3.3.7 Survey Area Conclusions	3-31
3.4 SOCA-2 (SAP 04 – Open Land).....	3-32
3.4.1 Area Description.....	3-32
3.4.2 Survey Summary	3-32
3.4.3 Survey Data Summary.....	3-34

Table of Contents, List of Tables, List of Figures

3.4.4	Data Quality Comparisons	3-35
3.4.5	Survey Plan Deviations	3-38
3.4.6	Survey Area Investigations	3-39
3.4.7	Survey Area Conclusions	3-39
3.5	EOCA-1 (SAP 05 – Open Land)	3-40
3.5.1	Area Description.....	3-40
3.5.2	Survey Summary	3-40
3.5.3	Survey Data Summary:	3-43
3.5.4	Data Quality Comparisons	3-46
3.5.5	Survey Plan Deviation(s).....	3-54
3.5.6	Survey Area Investigations	3-54
3.5.7	Survey Area Conclusions	3-54
3.6	NPA (SAP 06 – Open Land).....	3-55
3.6.1	Area Description.....	3-55
3.6.2	Survey Summary	3-55
3.6.3	Survey Data Summary.....	3-57
3.6.4	Data Quality Comparisons	3-59
3.6.5	Survey Plan Deviations	3-63
3.6.6	Survey Area Investigations	3-63
3.6.7	Survey Area Conclusions	3-63
3.7	SPA (SAP 08 – Open Land)	3-64
3.7.1	Area Description.....	3-64
3.7.2	Survey Summary:.....	3-64
3.7.3	Survey Data Summary.....	3-66
3.7.4	Data Quality Comparisons	3-69
3.7.5	Survey Plan Deviation(s).....	3-73
3.7.6	Survey Area Investigations	3-73
3.7.7	Survey Area Conclusions	3-73
3.8	RCA (SAP 10 – Open Land)	3-74
3.8.1	Area Description.....	3-74
3.8.2	Survey Summary	3-74
3.8.3	Survey Data Summary:	3-77
3.8.4	Data Quality Comparisons	3-80
3.8.5	Survey Plan Deviation(s).....	3-84
3.8.6	Survey Area Investigations	3-84
3.8.7	Survey Area Conclusions	3-84
3.9	DCA (SAP 12 – Open Land)	3-85
3.9.1	Area Description.....	3-85
3.9.2	Survey Summary	3-85
3.9.3	Survey Data Summary.....	3-86
3.9.4	Data Quality Comparisons	3-88
3.9.5	Survey Plan Deviation(s).....	3-89
3.9.6	Survey Area Investigations	3-89
3.9.7	Survey Area Conclusions	3-90
3.10	NPA (SAP 07 – BUILDINGS/STRUCTURES)	3-91
3.10.1	Area Description.....	3-91
3.10.2	Survey Summary	3-91

Table of Contents, List of Tables, List of Figures

3.10.3 Survey Data Summary.....	3-93
3.10.4 Data Quality Comparisons	3-94
3.10.5 Survey Plan Deviation(s).....	3-94
3.10.6 Survey Area Investigations	3-94
3.10.7 Survey Area Conclusions	3-95
3.11 SPA (SAP 09 – BUILDINGS/STRUCTURES)	3-96
3.11.1 Area description	3-96
3.11.2 Survey Summary	3-96
3.11.3 Survey Data Summary.....	3-97
3.11.4 Data Quality Comparisons	3-99
3.11.5 Survey Plan Deviation.....	3-99
3.11.6 Survey Area Investigations	3-100
3.11.7 Survey Area Conclusions	3-100
3.12 GROUNDWATER	3-101
3.12.1 Introduction	3-101
3.12.2 Discussion	3-102
3.12.3 Groundwater Conclusions	3-104
4 Conclusions.....	4-1
5 Recommendations.....	5-1
6 References.....	6-1

LIST OF TABLES

Table 1-1 Survey Areas for the OCNGS Site	1-2
Table 1-2 OCNGS DCGL Values by Radionuclide of Concern (ROC).....	1-5
Table 1-3 Assessment Criteria	1-5
Table 2-1 Summary of Survey Area Plans.....	2-5
Table 3-1 Decision Logic for Evaluating Survey Area Data	3-1
Table 3-2 Field Instrumentation Information.....	3-2
Table 3-3 GPS Coordinates for Sample Locations in the NOCA-1 Survey Area.....	3-4
Table 3-4 On-Site Laboratory Gamma Analysis Results for NOCA1 Surface Soil Samples.....	3-7
Table 3-5 On-Site Laboratory Gamma Analysis Results for NOCA1 Sediment Samples	3-8
Table 3-6 On-Site Laboratory Gamma Analysis Results for NOCA1 Asphalt Samples.....	3-8
Table 3-7 On-Site Laboratory Gamma Analysis Results for NOCA-1 Deep Subsurface Soil Samples ...	3-9
Table 3-8 Duplicate Sample Analysis for NOCA1-SOIL-05-D	3-10
Table 3-9 Duplicate Sample Analysis for NOCA-1-SOIL-14-D.....	3-10
Table 3-10 Duplicate Sample Analysis for NOCA1-SOIL-19-B-D.....	3-11
Table 3-11 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-03-QC	3-12
Table 3-12 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-11-QC	3-13
Table 3-13 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-20-B-QC	3-13
Table 3-14 Off-Site Laboratory Results for HTDs in NOCA-1 QC Samples	3-14
Table 3-15 GPS Coordinates for Sample Collection Locations in the NOCA-2 Survey Area.....	3-16
Table 3-16 On-Site Laboratory Gamma Analysis Results for NOCA-2 Surface Soil Samples	3-18
Table 3-17 On-Site Laboratory Gamma Analysis Results for NOCA-2 Sediment Samples.....	3-18
Table 3-18 On-Site Laboratory Gamma Analysis Results for NOCA-2 Asphalt Samples	3-19
Table 3-19 On-Site Laboratory Gamma Analysis Results for NOCA-2 Deep Soil Samples	3-19
Table 3-20 Duplicate Sample Analysis for NOCA2-SEDI-01-B-D.....	3-20
Table 3-21 On-Site/Off-Site Sample Analysis for NOCA2-SOIL-3-B-QC	3-21
Table 3-22 Off-Site Laboratory Results for HTDs in NOCA-2 QC Sample.....	3-21
Table 3-23 GPS Coordinates for Sample Locations in the SOCA-1 Survey Area	3-24
Table 3-24 On-Site Laboratory Gamma Analysis Results for SOCA-1 Surface Soil Samples.....	3-26
Table 3-25 On-Site Laboratory Gamma Analysis Results for SOCA-1 Asphalt Samples	3-27
Table 3-26 Duplicate Sample Analysis for SOCA1-SEDI-02- D.....	3-27
Table 3-27 Duplicate Sample Analysis for SOCA1-SEDI-06-D.....	3-28
Table 3-28 Duplicate Sample Analysis for SOCA1-SEDI-14-D.....	3-28
Table 3-29 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-05-QC	3-29
Table 3-30 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-13-QC	3-30
Table 3-31 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-15-QC	3-30
Table 3-32 Off-Site Laboratory Results for HTDs in SOCA-1 QC Samples	3-31
Table 3-33 GPS Coordinates for Sample Locations in the SOCA-2 Survey Area	3-33
Table 3-34 On-Site Laboratory Gamma Analysis Results for SOCA-2 Surface Soil Samples.....	3-35
Table 3-35 Duplicate Sample Analysis for SOCA2-SOIL-03-D.....	3-36
Table 3-36 Duplicate Sample Analysis for SOCA2-SOIL-08-D.....	3-36
Table 3-37 On-Site/Off-Site Sample Analysis for SOCA2-SOIL-06-QC	3-37

Table of Contents, List of Tables, List of Figures

Table 3-38 On-Site/Off-Site Sample Analysis for SOCA2-SOIL-13-QC	3-38
Table 3-39 OffSite Laboratory Results for HTDs in SOCA-2 QC Samples.....	3-38
Table 3-40 GPS Coordinates for Sample Locations in the EOCA-1 Survey Area	3-41
Table 3-41 On-Site Laboratory Gamma Analysis Results for EOCA-1 Surface Soil Samples.....	3-44
Table 3-42 On-Site Laboratory Gamma Analysis Results for EOCA-1 Sediment Samples	3-45
Table 3-43 On-Site Laboratory Gamma Analysis Results for EOCA-1 Asphalt Samples	3-46
Table 3-44 Duplicate Sample Analysis for EOCA1-SOIL-02-D	3-46
Table 3-45 Duplicate Sample Analysis for EOCA1-SOIL-20-D	3-47
Table 3-46 Duplicate Sample Analysis for EOCA1-SOIL-24-D	3-47
Table 3-47 Duplicate Sample Analysis for EOCA1-SOIL-26-D	3-48
Table 3-48 Duplicate Sample Analysis for EOCA1-SOIL-33-B-D	3-48
Table 3-49 QC Sample Analysis for EOCA1-SOIL-06-QC.....	3-49
Table 3-50 QC Sample Analysis for EOCA1-SOIL-10-QC.....	3-50
Table 3-51 QC Sample Analysis for EOCA1-SOIL-12-QC.....	3-50
Table 3-52 QC Sample Analysis for EOCA1-SOIL-17-QC.....	3-51
Table 3-53 QC Sample Analysis for EOCA1-SOIL-28-QC.....	3-51
Table 3-54 QC Sample Analysis for EOCA1-SOIL-34-B-QC.....	3-52
Table 3-55 QC Sample Analysis for EOCA1-SOIL-42-B-QC.....	3-52
Table 3-56 Off-Site Laboratory Results for HTDs in EOCA-1 QC Samples.....	3-53
Table 3-57 GPS Coordinates for Sample Locations in the NPA Survey Area	3-56
Table 3-58 On-Site Laboratory Gamma Analysis Results for NPA Surface Soil Samples.....	3-58
Table 3-59 On-Site Laboratory Gamma Analysis Results for NPA Sediment Samples	3-59
Table 3-60 On-Site Laboratory Gamma Analysis Results for NPA Asphalt Samples	3-59
Table 3-61 Duplicate Sample Analysis for NPA-SEDI-02-B-D	3-60
Table 3-62 Duplicate Sample Analysis for NPA-SOIL-10-B-D	3-60
Table 3-63 On-Site/Off-Site Sample Analysis for NPA-SOIL-04-B-QC.....	3-61
Table 3-64 On-Site/Off-Site Sample Analysis for NPA-SOIL-14-B-QC.....	3-62
Table 3-65 Off-Site Laboratory Results for HTDs in NPA QC Samples	3-62
Table 3-66 GPS Coordinates for Sample Locations in the SPA Survey Area.....	3-65
Table 3-67 On-Site Laboratory Gamma Analysis Results for SPA Surface Soil Samples.....	3-67
Table 3-68 On-Site Laboratory Gamma Analysis Results for SPA Sediment Samples	3-68
Table 3-69 On-Site Laboratory Gamma Analysis Results for SPA Subsurface Soil Samples	3-68
Table 3-70 On-Site Laboratory Gamma Analysis Results for SPA Deep Soil Samples	3-69
Table 3-71 On-Site Laboratory Gamma Analysis Results for SPA Asphalt Samples.....	3-69
Table 3-72 Duplicate Sample Analysis for SPA-SEDI-01-B-D	3-70
Table 3-73 Duplicate Sample Analysis for SPA-SEDI-06-B-D	3-70
Table 3-74 On-Site/Off-Site Sample Analysis for SPA-SEDI-02-B-QC	3-71
Table 3-75 On-Site/Off-Site Sample Analysis for SPA-SOIL-12-B-QC	3-72
Table 3-76 Off-Site Laboratory Results for HTDs in SPA QC Samples.....	3-72
Table 3-77 GPS Coordinates for Sample Locations in the RCA Survey Area	3-75
Table 3-78 On-Site Laboratory Gamma Analysis Results for RCA Surface Soil Samples.....	3-78
Table 3-79 On-Site Laboratory Gamma Analysis Results for RCA Sediment Samples	3-79
Table 3-80 On-Site Laboratory Gamma Analysis Results for RCA Deep Soil Samples	3-79

Table of Contents, List of Tables, List of Figures

Table 3-81 On-Site Laboratory Gamma Analysis Results for RCA Subsurface Soil Samples	3-80
Table 3-82 On-Site Laboratory Gamma Analysis Results for RCA Asphalt Samples	3-80
Table 3-83 Duplicate Sample Analysis for RCA-SOIL-04-B-D	3-81
Table 3-84 Duplicate Sample Analysis for RCA-SOIL-12-B-D	3-81
Table 3-85 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-08-B-QC.....	3-82
Table 3-86 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-13-B-QC.....	3-83
Table 3-87 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-20-B-QC.....	3-83
Table 3-88 Off-Site Laboratory Results for HTDs in RCA QC Samples.....	3-84
Table 3-89 GPS Coordinates for DCA Sampling Locations	3-85
Table 3-90 On-Site Laboratory Analysis Results for DCA Sediment Samples.....	3-87
Table 3-91 Duplicate Sample Analysis for DCA-SEDI-03-B-D	3-88
Table 3-92 On-Site/Off-Site Sample Analysis for DCA-SEDI-01-B-QC	3-89
Table 3-93 Off-Site Laboratory Results for HTDs in DCA QC Samples.....	3-89
Table 3-94 Planned Number and Type of Measurements by Structure in the NPA	3-92
Table 3-95 Data Summaries for Statistically-Determined Warehouse Floor Measurement Locations ...	3-93
Table 3-96 Data Summaries for Biasedly-Determined Warehouse Measurement Locations.....	3-94
Table 3-97 Planned Number and Type of Measurements by Structure in the SPA.....	3-97
Table 3-98 Data Summaries for Statistically-Determined OCAB Floor Measurement Locations	3-98
Table 3-99 Data Summaries for Biasedly-Determined OCAB Measurement Locations	3-98
Table 3-100 Data Summaries for Statistically-Determined SEB Floor Measurement Locations.....	3-98
Table 3-101 Data Summaries for Biasedly-Determined SEB Measurement Locations	3-99
Table 3-102 Data Summaries for Statistically-Determined NGF Floor Measurement Locations	3-99
Table 3-103 Data Summaries for Biasedly-Determined NGF Measurement Locations.....	3-99
Table 3-104 Recent Results from the OCNGS NEI 07-07 Groundwater Protection Program	3-103

LIST OF FIGURES

Figure 1-1 Survey Areas Within the OCNGS Site Boundary	1-3
Figure 1-2 Site Characterization Organization	1-4
Figure 3-1 NOCA-1 Survey Area and Sample Locations.....	3-5
Figure 3-2 NOCA-2 Survey Area and Sample Locations.....	3-16
Figure 3-3 SOCA-1 Survey Area and Sample Locations	3-25
Figure 3-4 SOCA-2 Survey Area and Sample Locations	3-34
Figure 3-5 EOCA-1 Survey Area and Sample Locations	3-42
Figure 3-6 NPA Survey Area and Sample Locations	3-57
Figure 3-7 SPA Survey Area and Sample Locations	3-66
Figure 3-8 RCA Survey Area and Sample Locations	3-76
Figure 3-9 DCA Survey Area and Sample Locations.....	3-86
Figure 3-10 OCNGS RGPP Monitoring Wells for the Cohansey Aquifer	3-101
Figure 3-11 OCNGS RGPP Monitoring Wells for the Cape May Aquifer	3-102

ACRONYMS AND ABBREVIATIONS

AC	Assessment Criteria
BHI	BHI Energy Services
CFR	Code of Federal Regulations
CoC	Chain of Custody
cm ²	square centimeters
cpm	counts per minute
CST	Condensate Storage Tank
D&D	Decontamination and Decommissioning
DCA	Discharge Canal Area
DCGL	Derived Concentration Guideline Level
DoD	Department of Defense
DOE	Depart of Energy
DQA	Data Quality Assessment
DQO	Data Quality Objective
dpm	disintegrations per minute
EOCA	East Owner-Controlled Area
EPA	Environmental Protection Agency
FSS	Final Status Survey
GPS	Global Positioning System
HDI	Holtec Decommissioning International
HSA	Historical Site Assessment
HTD	Hard-to-Detect (radionuclide)
ISFSI	Interim Spent Fuel Storage Installation
m ²	square meters
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
mrem/y	millirem per year
NaI	sodium iodide
ND	Not Detected
NELAP	National Environmental Laboratory Accreditation Program
NGF	New Gatehouse Facility
NIST	National Institute of Standards and Technology
NJAC	New Jersey Administrative Code
NOCA	North Owner Controlled Area
NORM	Naturally Occurring Radioactive Materials
NPA	North Protected Area
NRC	(U.S.) Nuclear Regulatory Commission
OCA	Owner Controlled Area
OCAB	Oyster Creek Administration Building
OCNGS	Oyster Creek Nuclear Generating Station
PA	Protected Area

pCi/g	picocuries per gram
pCi/L	picocuries per liter
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCA	Radiologically Controlled Area
RGPP	Radiological Groundwater Protection Program
RMA	Radioactive Material Area
RP	Radiation Protection
RWP	Radiation Work Permit
ROC	Radionuclide-of-Concern
SAP	Survey Area Plan
SCP	Site Characterization Plan
SEB	Site Emergency Building
SOCA	South Owner-Controlled Area
SPA	South Protected Area
uR/h	micro-Roentgen per hour
V&V	Verification and Validation
VSP	Visual Sample Plan

1 INTRODUCTION

Oyster Creek Nuclear Generating Station (OCNGS), located at 741 Route 9 South Forked River, New Jersey, is a single-unit boiling water reactor with a Mark I type containment. It is in Lacey Township, Ocean County, New Jersey, approximately two miles south of the community of Forked River. OCNGS was licensed to generate 1930 megawatts thermal (MWt). The reactor began commercial operation on December 23, 1969, and was licensed to Jersey Central Power and Light (JCP&L).

In 1980 General Public Utilities (parent of JCP&L) assumed responsibility for the operation of OCNGS. The license was transferred to AmerGen on June 6, 1999, and then to Exelon Generation, LLC. on December 23, 2008. The original license was renewed to allow the unit to operate until April 9, 2029.

In February 2018, Exelon announced its plan to retire OCNGS no later than October 31, 2018, in accordance with 10 CFR 50.82(a)(1)(i) and 10 CFR 50.4(b)(8). OCNGS permanently shut down on September 17, 2018. Exelon certified to the U.S. Nuclear Regulatory Commission (NRC) that it had permanently removed fuel from the reactor vessel at Oyster Creek in accordance with 10 CFR 50.82(a)(2).

Holtec Decommissioning International, LLC (HDI) is a wholly owned subsidiary of Holtec International headquartered at the Krishna P. Singh Technology Campus, Camden, NJ. HDI functions as the licensed operator for Holtec-owned nuclear power plants. HDI provides the licensee oversight of the decommissioning work that is performed. HDI's goal for the project is to initiate the prompt decommissioning of OCNGS.

In support of the Oyster Creek decommissioning, the *Oyster Creek Station Site Characterization Plan* [Ref. 1] (SCP) was developed to guide site radiological characterization activities at the OCNGS site. The SCP incorporates guidance in NUREG-1575, *Multi-Agency Radiation Survey, and Site Investigation Manual (MARSSIM)* [Ref. 2]. The primary objectives of the SCP were to provide guidance and a path forward for:

- Closing gaps in the radiological data provided in the *Oyster Creek Station Historical Site Assessment* [Ref. 3] (HSA), and
- the collection of quality characterization data to support future decommissioning decisions.

This report is not an end point for radiological characterization of the OCNGS site. Site characterization is an iterative process. This report only presents the radiological status of the site during the early transition phase (i.e., the time between permanent reactor shutdown and the start of implementation of the decommissioning strategy) and is based on information provided in the HSA. Radiological characterization continues during active dismantling with the objectives to:

- update radiological inventory as site decontamination progresses,
- provide estimates for decontamination factors, and
- update input to FSS planning.

After physical dismantling, decontamination, and remediation, site characterization surveys are performed to:

- demonstrate that technologies applied during decommissioning activity were adequate to achieve site release,
- build confidence of stakeholders that relevant actions were successful, and
- optimize input for FSS planning.

For radiological characterization purposes, the OCNGS site was divided into nine survey areas to increase the efficiency of collecting, managing, and recording data. Boundaries for these areas were established at easily recognizable site features. Table 1-1 lists the survey areas established for the OCNGS site. The boundaries for the survey areas are shown in Figure 1-1.

The SCP followed the guidance in NUREG-1575 to establish the Data Quality Objectives (DQOs) for this characterization project. The project used radiation detection instrumentation, laboratory analyses, and survey designs to ensure the quality of data collected to support decommissioning decisions. Furthermore, the SCP described the approach for developing the individual Survey Area Plans (SAPs) and established the Data Quality Assessment (DQA) process for evaluating and accepting characterization data.

The BHI Site Characterization Team, shown in Figure 1-2, performed all field activities associated with the implementation of the SCP under the OCNGS Radiation Protection Program and the Health and Safety Program between July 11, 2022, and November 17, 2022.

This Characterization report provides detailed information about the radiological conditions of open land areas and building structures within the OCNGS site boundary. It includes information about the types and levels of radioactive materials.

Table 1-1 Survey Areas for the OCNGS Site

Survey Area	Code	Approximate Area (m ²)
North Owner Controlled Area - 1	NOCA1	180,100
North Owner Controlled Area - 2	NOCA2	35,700
South Owner Controlled Area - 1	SOCA1	81,700
South Owner Controlled Area - 2	SOCA2	87,900
East Owner Controlled Area	EOCA1	73,300
Radiation Controlled Area	RCA	22,000
North Protected Area	NPA	73,900
South Protected Area	SPA	51,300
Discharge Canal Area	DCA	35,700

Figure 1-1 Survey Areas Within the OCNGS Site Boundary

1.1 RADIOLOGICAL SITE CHARACTERIZATION ORGANIZATION



Figure 1-2 shows the BHI engineering site radiological characterization organization and the HDI interface.

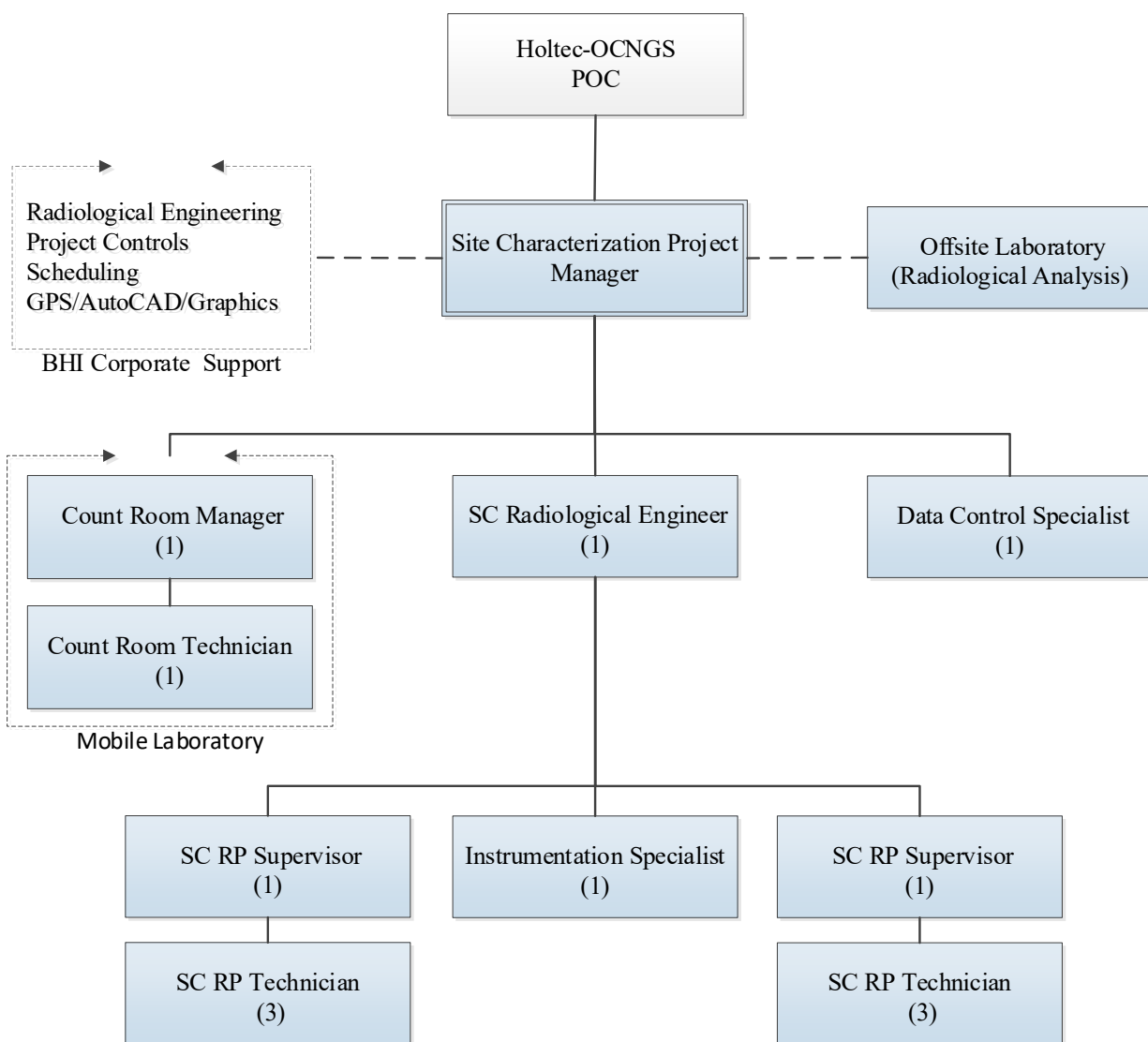


Figure 1-2 Site Characterization Organization

The roles and responsibilities of the OCNGS Site Characterization Organization are provided in section 3.1 of the SCP [Ref. 4].

1.2 RADIOLOGICAL ASSESSMENT CRITERIA

Site-specific Derived Concentration Guideline Level (DCGL) values were developed to demonstrate compliance with the NRC radiological criteria for unrestricted use established in 10 CFR 20.1402.

The DCGL values developed for demonstrating compliance with the NRC unrestricted release criteria, shown in Table 1-2, were ratioed to correspond to the New Jersey Administrative Code (NJAC) 7:28-12.8(a)(1) dose criterion. The 15-mrem/y criterion established in the NJAC serves as the basis for the assessment criteria. The assessment criteria in Table 1-3 represent adjustments to 15 mrem/y and were

applied as the characterization data evaluations. In addition to their use in data assessments, the assessment criteria values have two other applications in site characterization:

- Establishing the basis for required sensitivities for radiation detection instrumentation and laboratory analyses, and
- Support the identification of site areas requiring remediation due to unacceptably high contamination levels.

Table 1-2 OCNGS DCGL Values by Radionuclide of Concern (ROC)

ROC	Soil DCGL (pCi/g)	Building Structure DCGL (dpm/100cm ²)	ROC	Soil DCGL (pCi/g)	Building Structure DCGL (dpm/100cm ²)
Am-241	2.61E+01	1.65E+03	Nb-94	6.93E+00	1.85E+04
C-14	2.84E+00	6.42E+06	Ni-63	7.24E+02	1.63E+07
Cm-243	8.75E+01	2.40E+03	Np-237	1.10E+00	1.34E+03
Cm-244	4.88E+01	3.03E+03	Pu-238	2.19E+01	1.88E+03
Co-60	4.07E+00	1.35E+04	Pu-239	2.81E+01	1.70E+03
Cs-137	9.60E+00	4.70E+04	Pu-240	2.81E+01	1.70E+03
Eu-152	9.80E+00	2.71E+04	Pu-241	8.83E+02	6.75E+04
Eu-154	9.07E+00	2.56E+04	Sb-125	3.06E+01	7.52E+04
Fe-55	5.16E+04	3.85E+07	Sr-90	1.77E+00	8.14E+04
H-3	5.05E+02	2.10E+08	Tc-99	1.57E+01	5.05E+06
Mn-54	1.71E+01	5.34E+04			

Table 1-3 Assessment Criteria

ROC	Soil (pCi/g)	Structures (dpm/100cm ²)	ROC	Soil (pCi/g)	Structures (dpm/100cm ²)
Am-241	1.57E+01	9.88E+02	Nb-94	4.16E+00	1.11E+04
C-14	1.70E+00	3.85E+06	Ni-63	4.35E+02	9.77E+06
Cm-243	5.25E+01	1.44E+03	Np-237	6.58E-01	8.02E+02
Cm-244	2.93E+01	1.82E+03	Pu-238	1.31E+01	1.13E+03
Co-60	2.44E+00	8.10E+03	Pu-239	1.69E+01	1.02E+03
Cs-137	5.76E+00	2.82E+04	Pu-240	1.69E+01	1.02E+03
Eu-152	5.88E+00	1.62E+04	Pu-241	5.30E+02	4.05E+04
Eu-154	5.44E+00	1.53E+04	Sb-125	1.83E+01	4.51E+04
Fe-55	3.10E+04	2.31E+07	Sr-90	1.06E+00	4.88E+04
H-3	3.03E+02	1.26E+08	Tc-99	9.42E+00	3.03E+06
Mn-54	1.03E+01	3.20E+04			

1.3 SITE CHARACTERIZATION QUALITY REQUIREMENTS

1.3.1 Site Characterization Quality Assurance/Quality Control Requirements

All quality assurance/quality control (QA/QC) requirements established by the SCP were met during the radiological characterization activities. Those QA/QC requirements were:

Characterization Sample Analyses:

- QC sample analysis – a contracted commercial radioanalytical laboratory analyzed 10% of the planned volumetric samples from each survey area for gamma-emitters and Hard-to-Detect (HTD) beta-emitters. The HTD beta-emitters identified for the OCNGS are H-3, Sr-90, C-14, Fe-55, Ni-63, Tc-99, and Pu-241. Site-wide presence of these HTD ROCs was not expected based on information in the HSA. All QC samples were analyzed for the Sr-90, C-14, Fe-55, Ni-63, and Tc-99. Pu-241 was included in the HTD analyses for QC samples collected in the NPA, SPA, and RCA; that is, the survey areas having the highest potential for transuranic contamination.
- Duplicate sample analysis – 10% of the planned volumetric and smear samples from each survey area were sent to the on-site mobile laboratory for duplicate analysis.

Sample Control:

- Samples delivered to the contracted commercial radioanalytical laboratory were controlled using a Chain of Custody (CoC) procedure and documented by a completed CoC form.

Radiation detection instruments:

- All radiation detection instruments had current calibrations with the calibration date affixed to the detector and instrument. Calibrations utilized the National Institute of Standards and Technology (NIST)-traceable radioactive sources.
- Pre- and post-use operability checks for field instruments were performed and documented following approved procedures.

Contracted Commercial Laboratory:

- The commercial laboratory supplying radiological analytical services possessed current National Environmental Laboratory Accreditation Program (NELAP) and New Jersey certifications.

On-Site Chemistry Trailer:

- All laboratory radiation detection and counting systems used to collect characterization data were calibrated and operated following approved procedures.
- Daily operability and QC checks were performed and documented as required by the applicable procedure.

1.3.2 Radiation Detection Instrumentation Sensitivity

The detection sensitivity of the radiation detection instruments used for walk-over gamma scans was sufficient for detecting gamma radiation levels at the AC for Cs-137 in soil (listed in Table 1-3). SAPs specified a gamma scan speed of 6 inches per second while maintaining a surface-to-detector distance of 3 inches. The scan speed was reduced to 3 inches per second when the background count rate exceeded 11,000 cpm. Additionally, a slower scan speed was used at the discretion of the SC RP Supervisor when necessary to determine whether an elevated reading was truly elevated or a fluctuation in background radiation.

Section 5.6.2 of the SCP provides the equations to determine the alpha/beta scans' minimum detectable concentration (MDC) values using a Ludlum Model 3003 with a 43-68 gas proportional detector. Section 5.7 provides a detailed discussion of the MDC calculation when performing gamma scans using a Ludlum Model 3003 multi-detector survey meter with a 44-10 NaI scintillator. MDC calculations are maintained as project files.

1.4 LABORATORY ANALYTICAL METHODS

Target detection sensitivities for laboratory analytical methods performed in the on-site chemistry trailer or by the contracted off-site commercial laboratory are 10% of the assessment criteria listed in Table 1-3. If 10% of the assessment criterion is not reasonably achievable, then laboratory methods should be capable of detecting the target ROCs at concentrations that are at least 50% of the assessment criteria. These laboratory analytical sensitivity requirements were achieved during this phase of the site characterization project.

2 RADIOLOGICAL CHARACTERIZATION OF OCNGS SITE**2.1 SURVEY METHODS AND TECHNIQUES**Radiation Scans

Walk-over gamma scans were performed using calibrated Ludlum 3003 survey meter coupled with a 44-10 detector (or equivalent) to identify elevated radioactivity focusing on area boundaries, surface run-off collection points, and drainage and run-off paths. Field personnel adhered to scan speeds no greater than 6 inches per second while maintaining a surface-to-detector distance of 3 inches and using an audible distinction above background as the action level. A scan speed of 3 inches per second was used when the background count rates exceeded 11,000 counts per minute.

Alpha/Beta, radiation scans of structures and buildings at the OCNGS site were performed using:

- Gas proportional detectors attached to two-channel (i.e., alpha and beta) scaler/rate meter (e.g., Ludlum Model 3003 or equivalent) for scans on walls and floor areas:
 - Hand-held 126 cm² gas proportional detectors (e.g., Ludlum Model 43-68 or equivalent), and
 - Cart-mounted 584 cm² large area gas proportional detectors (e.g., Ludlum Model 43-37 or equivalent).
- Scintillation detectors attached to a two-channel (i.e., alpha and beta) scaler/rate meter (e.g., Ludlum Model 3002 or equivalent) for scans on roof areas not accessible with gas proportional detectors:
 - Hand-held 100 cm² Zinc Sulfide plastic scintillator detectors (e.g., Ludlum Model 43-93 or equivalent).

Characterization field personnel relied on audible distinction above the background during the walk-over gamma and beta scans to identify areas of elevated radioactivity.

Total Radioactivity Measurements (direct measurements)

One-minute direct measurements on building and structure surfaces were performed using a hand-held 126 cm² gas proportional detector, such as the Ludlum 3003 with 43-68 or an equivalent device. Quarter-inch “Stand-offs” mounted on the detector were used to ensure a consistent source to detector geometry during direct measurements.

Removable Radioactivity Measurements

Removable surface radioactivity was assessed using cloth disc smears using a standard technique to obtain 100 cm² samples. Smears were analyzed in the mobile laboratory for gross alpha and gross beta contamination.

Volumetric Samples

Volumetric samples were collected using grab sample techniques. The use of hand-held split spoon samplers aided the collection of subsurface soil. Samples consisted of 4 media types; sediment, asphalt, roof gravel, and soil.

Sediment, the solid matter that settles to the bottom of a liquid, was sampled in two forms wet (DCA sediment) and dry (all other sediments). Asphalt samples were obtained in locations where a layer of asphalt covered the desired underlying sample media. Roof gravel, a layer of small stones used as a final coating to protect the roof, was sampled.

All remaining samples were soil, which is the upper layer of earth consisting of a mixture of organic remains, clay, and rock particles, and were obtained at various depths. To check for gross stratification, samples were obtained at multiple depths. Samples designated “SOIL” were taken from the top 6 inches of soil below any asphalt and/or compacted surface covering such as rock. Samples taken at the next depth, between 6 and 12 inches, were designated “SSUB.” Samples designated “DEP1” were taken at depths beginning at either 6 or 12 inches and down to 4 feet below the surface. If taken, samples designated “DEP2” represent depths between 4 and 8 feet.

Samples were transported to the on-site laboratory for preparation. Preparation activities included a process of weighing and drying until minimal change was detected in the sample mass. Following drying, the samples were crushed into a flowable solid consistency and placed in Marinelli containers for analysis (if appropriate). When sufficient sample volume was available, the final sample mass was between 700 and 1000 grams.

The driver for sample location selection was one of three reasons; randomly selected (generated using Visual Sample Plan (VSP)), selected as a bias location based on historical information provided by the HSA, area walk-downs, and professional judgment, or for purposes of investigating elevated scan readings at a location.

Sample Labeling

A standard technique for labeling samples was established to support data management. The technique consisted of identifiers for the survey area, sample media, sample number, and unique designators (e.g., identifiers for QC samples or samples requiring duplicate counts or collected during investigations).

Labeling of samples collected from open land areas used the general convention AAA-BBBB-##-X, where:

AAA = survey area code

BBBB = medium code

asph = asphalt

conc = concrete

sedi = sediment

soil = soil layer 0-6 in

ssub = sub surface layer 15-30 cm

dep1 = deep soil sample using geoprobe up to 4 feet depth or until resistance

dep2 = deep soil sample using geoprobe beyond 4 feet depth or until resistance

xxxx = used on maps only to identify multiple sample media/depths in a single location

= sample number

X = Sample designators

Blank = If no X value is listed, the sample was generated using Visual Sample Plan (VSP).

B = Indicates a biased sample.

I = Indicates an investigative sample.

D = Indicates the sample has been selected for duplicate counting.

QC = Indicates a quality control sample.

Labeling of measurements collected from buildings used the general convention AAA-BBB-##-X, where:

AAA = survey area code

BBB = building/structure code

= sample number

X = Sample designators

Blank = If no "X" designator is listed, the sample was generated using VSP.

B = Indicates a biased sample.

I = Indicates an investigative sample.

D = Indicates the smear sample has been selected for duplicate counting.

Labeling of volumetric samples collected from buildings used the general convention AAA-BBB-CCC-##, where:

AAA = survey area code

BBB = building/structure code

CCC = medium code

sedi = sediment

= sample number

2.2 SURVEY DESIGNS BY AREANOCA-1, SOCA-1, and SOCA-2

Large sections in the north owner-controlled area (NOCA) and the south owner-controlled area (SOCA) are covered by trees and heavy vegetation. These areas likely have not been impacted by the historical use of radioactive materials. Due to the very low probability of residual plant-related contamination in NOCA-1, SOCA-1, and SOCA-2, the characterization surveys for these areas were designed as MARSSIM-compliant Class 3 surveys to collect sufficient quality data to confirm the preliminary Class 3 designation.

The survey designs followed the guidance in NUREG-1575. They differed from survey designs for the other OCNCS site areas by including the rigor of statistical-based random soil sampling enhanced with biased soil sampling and walk-over gamma scans.

NUREG-1575 guidance calls for a random selection of sample locations when designing a MARSSIM Class 3 survey. The requirement for a random selection process for identifying measurement locations within these areas was satisfied using the VSP software. The VSP software also generated coordinates associated with measurement locations within the survey areas. Global Positioning System (GPS) equipment was used to locate and stakeout measurement points in NOCA-1, SOCA-1, and SOCA-2. Alternate locations were selected when VSP-identified soil samples could not be collected due to rock formations, wetlands, or other obstructions. The alternate locations were recorded using GPS.

EOCA-1, NOCA-2, NPA, SPA, RCA and DCA

The survey designs for EOCA-1, NOCA-2, NPA, SPA, RCA, and DCA consisted of random and biased measurement locations. These areas contain radioactive material travel paths, deposited soil from historical site excavation activities, and wooded areas that may have been radiologically impacted by Isolation Condenser releases during operation. Random locations were selected using VSP, and the biased measurement locations were based on historical information provided by the HSA, area walk-downs, and professional judgment.

2.3 SURVEY AREA PLANS AND SITE CHARACTERIZATION PROCEDURES

Eleven Survey Area Plans (SAPs) were developed as area-specific work plans to ensure efficient radiological data collection and compliance with the SCP. The SAPs are shown in Table 2-1. SAP number 11 is designated for RCA building/structure(s). Buildings and structures in this area are scheduled for demolition. Characterization of remaining structure(s), if appropriate, will be scheduled.

Table 2-1 Summary of Survey Area Plans

SAP Number	Survey Area Designator	Planned Samples and Measurements
01	NOCA1 open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Twenty-five samples from 15 random and 8 bias locations (23 surface soil and 2 deep samples)
02	NOCA2 open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Ten samples from 4 biased locations (3 asphalt, 3 soil, 3 deep, and 1 sediment sample).
03	SOCA1 open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Twenty-three samples at 15 random and 7 biased locations. (22 soil and 1 asphalt sample).
04	SOCA2 open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Fifteen soil samples collected from 15 random sample locations.
05	EOCA1 open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Forty-four samples from 13 random and 13 biased sample locations (39 soil, 4 sediments, and 1 asphalt sample).
06	NPA open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Eighteen samples from fifteen biased locations. (8 soil, 7 sediments, 1 asphalt, and 2 deep samples).
07	NPA building/structure(s)	Alpha/Beta scans of 10% of the floor/roof surfaces and 1 m ² scans at survey floor/roof and wall locations. Low-Level Rad Waste Structure: Two hundred fifty samples from 160 random and 90 biased measurement locations. Warehouse: One hundred forty-nine samples from 90 random and 59 biased locations. Demin Storage Tank: Thirteen samples from 13 random locations.

SAP Number	Survey Area Designator	Planned Samples and Measurements
08	SPA open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Twenty-one samples from 16 biased locations (15 soil, 3 asphalt, 2 deep, and 1 sediment sample).
09	SPA building/structure(s)	Alpha/Beta scans of 10% of the floor/roof surfaces and 1 m ² scans at survey floor/roof and wall locations. Oyster Creek Admin Building: One hundred fifty-five samples total (100 random and 55 biased locations) Site Emergency Building: One hundred sixty-five samples total (125 random and 40 biased locations) New Gatehouse Facility Sixty samples total (45 random and 15 biased locations)
10	RCA open land area	Gamma scans at boundaries and 1 m ² scans at each survey location. Thirty-five samples from 19 biased locations (17 soil, 8 asphalt, 3 sediment, 1 subsurface, and 6 deep sample locations).
12	DCA open land area	Seven samples from 7 biased locations (7 sediment sample locations).

BHI site characterization staff utilized the following procedures:

- ENG-OP-001, Radiation Survey Performance
- ENG-OP-002, Volumetric, and Material Sampling
- ENG-OP-003, Chain of Custody for Transferring Samples
- ENG-OP-007, Determination of the Number and Locations for Survey Measurements
- ENG-OP-011, Use of The Ludlum 3003 Multi-Detector Survey Meter
- ENG-OP-012, Operation of the Ludlum 3002 Digital Survey Meter
- ENG-OP-026, Operation, and Calibration of the iMATIC
- ENG-OP-032, GENIE-2000 Gamma Spectroscopy System Calibration
- ENG-OP-033, GENIE-2000 Gamma Spectroscopy System Operation
- ENG-OP-034, Operation of LEICA FLX100 GPS
- ENG-OP-40, Laboratory Balances
- RP-AA-800, Control, Inventory, and Leak Testing of Radioactive Sources

- RP-OC-220-1003, Operation of the iMatic
- SA-AA-117, Excavation, Trenching, and Shoring
- SA-AA-122, Handling and Storage of Compressed Gas Cylinders

2.4 BHI MOBILE CHEMISTRY LABORATORY

The mobile laboratory and dedicated laboratory personnel were provided to expedite the turnaround of characterization sample analyses and increase the SC project's overall efficiency. The laboratory is equipped with the following analytical equipment:

- One iMatic automatic sample changer,
- Three HPGe gamma spectroscopy systems, and
- Isolated sample preparation area within the laboratory.

Staffing for the trailer consisted of a Chemistry Manager and one Chemistry technician. All RCA samples were prepared in the OCNGS hot chemistry laboratory to prevent cross-contamination of the mobile laboratory.

3 RADIOLOGICAL FINDINGS

The SC Project Manager and Radiological Engineers performed the DQA process described in the SCP to ensure the data's quality. The DQA process included the following verification and validation steps:

- Verify the collection of the planned number and types of measurements.
- Validate the detection sensitivities achieved during laboratory analyses.
- Verify procedural adherence.
- Verify the use of calibrated instrumentation.
- Evaluate data against assessment criteria. Comparisons were made directly to the acceptance criteria without consideration of the background.
- Determine the range, mean, standard deviations, and estimates for the percentage of removable contamination of area data sets.
- Verify that QC and duplicate sample requirements were met, including evaluating comparisons of QC and duplicate sample results.

During the review of Co-60 and Cs-137 results, the decision logic shown in Table 3-1 was applied.

Table 3-1 Decision Logic for Evaluating Survey Area Data

Range of Analytical Results				
Area Classification	Nuclide	Lower Concentration	Upper Concentration	Actions to Consider
Class 3	Co-60 Cs-137	Non-Detect ¹ Non-Detect ¹	≤ 0.244 pCi/g ≤ 0.576 pCi/g	• Retain Classification of MARSSIM Class 3 Area
Class 2	Co-60 Cs-137	> 0.244 pCi/g > 0.576 pCi/g	≤ 1.22 pCi/g ≤ 2.88 pCi/g	• Retain Classification of MARSSIM Class 2 Area • Evaluate for HTD beta-emitters
Class 1	Co-60 Cs-137	> 1.22 pCi/g > 2.88 pCi/g	≤ 2.44 pCi/g ≤ 5.76 pCi/g	• Retain Classification of MARSSIM Class 1 Area • Evaluate for HTD alpha/beta-emitters
Class 1	Co-60 Cs-137	> 2.44 pCi/g > 5.76 pCi/g		• Retain Classification of MARSSIM Class 1 Area • Consider Remediation

1 – Results reported as less than the achieved MDC values for Co-60 and Cs-137 were considered “non-detects.”

Agreement between on-site and off-site gamma analyses was demonstrated using the NRC inspection procedure 84525, *Quality Assurance and Confirmatory Measurements for In-Plant Radiochemical Analysis* [Ref. 4].

The instrument information used in the DQA process can be found in Table 3-2. The conversion of the logged count rates to activity allowed for comparing the in-field reading to the assessment criteria for structures listed in Table 1-3.

Table 3-2 Field Instrumentation Information

Instrument Library						
Type	Serial Number		Instrument Efficiency			Calibration Due Date
	Instrument	Detector	Beta	Alpha	Gamma	
3002/43-93	25022547	PR401534	0.1062	0.1987		8/18/23
3002/43-93	25022557	PR402520	0.08	0.1588		8/18/23
3002/43-93	25022558	PR402523	0.1066	0.1888		8/18/23
3002/43-93	25022571	PR402538	0.0897	0.1687		8/18/23
3002/43-93	25022574	PR402505	0.0958	0.1735		8/18/23
3002/43-93	25022587	PR402511	0.0882	0.1718		8/18/23
3003/44-10	25022620	PR404285			0.104	5/17/23
3003/43-68	25022620	PR172197	0.153	0.14		5/17/23
3003/43-68	25022620	PR178495	0.184	0.18		5/17/23
3003/44-10	25022629	PR404293			0.086	5/17/23
3003/43-68	25022629	PR160699	0.173	0.13		5/17/23
3003/43-68	25022629	PR180706	0.188	0.116		5/17/23
3003/43-37	25022631	PR161289	0.2785	0.1531		5/12/23
3003/43-37	25022631	PR401384	0.2923	0.1698		5/12/23
3003/44-10	25022635	PR404290			0.086	5/17/23
3003/43-68	25022635	PR177614	0.184	0.187		5/17/23
3003/43-68	25022635	PR177611	0.176	0.179		5/17/23
3003/43-37	25022636	PR401383	0.2981	0.1705		5/13/23
3003/43-37	25022636	PR190281	0.265	0.1649		5/13/23
3003/44-10	25022643	PR404287			0.1	5/17/23
3003/43-68	25022643	PR190221	0.185	0.168		5/17/23
3003/43-68	25022643	PR190242	0.183	0.17		5/17/23

3.1 NOCA-1 (SAP 01 – OPEN LAND)

3.1.1 Area Description

NOCA-1 is north of the Protected Area; it includes the intake canal and is illustrated in Figure 3-1. It is 180,123 m² in size and covered with trees and vegetative growth. Low-lying areas are wet, as indicated by cattails growing in the area. There are no plant structures within the NOCA-1 area. The HSA preliminarily classified this as an impacted area. Approximately 1000 cubic yards of radiologically clean construction debris (soil, brush, concrete, and asphalt) from the Design Basis Threat (DBT) project was placed here in 2007. Sandblast grit was discovered in the NOCA-1 area. However, the HSA does not state if the grit was from sandblasting of contaminated materials. NOCA-1 is not likely to be impacted by D&D activities; therefore, its radiological status is not expected to change.

3.1.2 Survey Summary

Survey Dates: 8/24/2022 through 9/28/2022

Survey and field activities were governed by SAP 01, *North Owner Controlled Area-1*. Survey planning for the NOCA-1 area included using the VSP program to identify 15 random sample locations consistent with MARSSIM methodology. In addition, The Radiological Engineer selected 8 biased locations where radioactivity from other areas may have been introduced due to plant-related activities. The sample locations are illustrated in Figure 3-1.

Three of the random sample locations were relocated (NOCA1-SOIL-08, -09, and -10) due to the original locations being in the intake canal area. During sampling, alternative sample locations were selected from nearby areas where representative soil samples could be safely collected. BHI recorded GPS coordinates for the alternate sample locations to document the new locations.

A total of 30 samples were obtained from the NOCA-1 area: 23 surface soil samples (15 random and 8 bias locations), 2 sediment samples (1 random and 1 bias location), 2 asphalt samples (1 random and 1 bias location), and 3 samples at depths greater than 6 in (all bias sample locations). Asphalt samples were obtained from locations where the soil was covered by asphalt (NOCA1-ASPH-03 and NOCA1-ASPH-22-B). GPS coordinates for as-taken sample locations are listed in Table 3-3.

Two of the samples obtained at depths greater than 6 in (NOCA1-DEP1-17-B and NOCA1-DEP1-18-B) were selected based on the belief that potentially contaminated soil and/or sandblasting grit had been placed there based on aerial photographs. At the client's request, the third sample was obtained at depths greater than 6 in (NOCA1-DEP1-23-B). This request was based on the sample location where contaminated soil had been deposited and piled.

Walk-over gamma scans at the NOCA-1 boundaries were performed using calibrated Ludlum Model 44-10 detector pairings with Model 3003 multi-detector survey meters. The scans were based on professional judgment, focusing on areas of potential migration of radioactivity into or out of the survey area. Gamma scan measurements were also conducted at each sample location. Count rates were observed between 4,100 and 11,500 cpm at sample locations in the NOCA-1 area. A total of 173 m² were scanned. The gamma scans did not identify areas with an “audible distinction” above the location background count rate.

Table 3-3 GPS Coordinates for Sample Locations in the NOCA-1 Survey Area

Sample Location		Easting	Northing
NOCA1-SOIL-01		574662.7273	358569.9082
NOCA1-SOIL-02		575572.2446	359409.8478
NOCA1-SOIL-03-QC		574094.279	357263.3355
NOCA1-SOIL-04		574549.0376	358943.2147
NOCA1-SOIL-05-D		574321.6583	358383.255
NOCA1-SOIL-06		575231.1756	359223.1946
NOCA1-SOIL-07		575236.5048	358787.6703
NOCA1-SOIL-08:	Original location coordinates	574099.6082	357387.7710
	Sample relocation coordinates	574284.3636	357446.4080
NOCA1-SOIL-09:	Original location coordinates	574554.3668	359067.6502
	Sample relocation coordinates	574591.6753	359020.6040
NOCA1-SOIL-10:	Original location coordinates	574895.4358	359347.6301
	Sample relocation coordinates	574952.9818	359246.6146
NOCA1-SOIL-11-QC		574213.2978	358880.997
NOCA1-SOIL-12		574668.0565	358321.0372
NOCA1-SOIL-13		575577.5738	359160.9768
NOCA1-SOIL-14D		573929.0737	357761.0775
NOCA1-SOIL-15		574838.591	358601.0171
NOCA1-SOIL-16-B		575375.2112	358580.8871
NOCA1-SOIL-17-B		575312.8426	358634.9662
NOCA1-DEP1-17-B			
NOCA1-SOIL-18-B		575256.7897	358620.7556
NOCA1-DEP1-18-B			
NOCA1-SOIL-19-B-D		575175.9485	358477.4286
NOCA1-SOIL-20-B-QC		574881.7451	358406.9308
NOCA1-SOIL-21-B		574573.6641	358311.4534
NOCA1-SOIL-22-B		574258.6444	357989.2174
NOCA1-SOIL-23-B		574046.2985	357240.4575

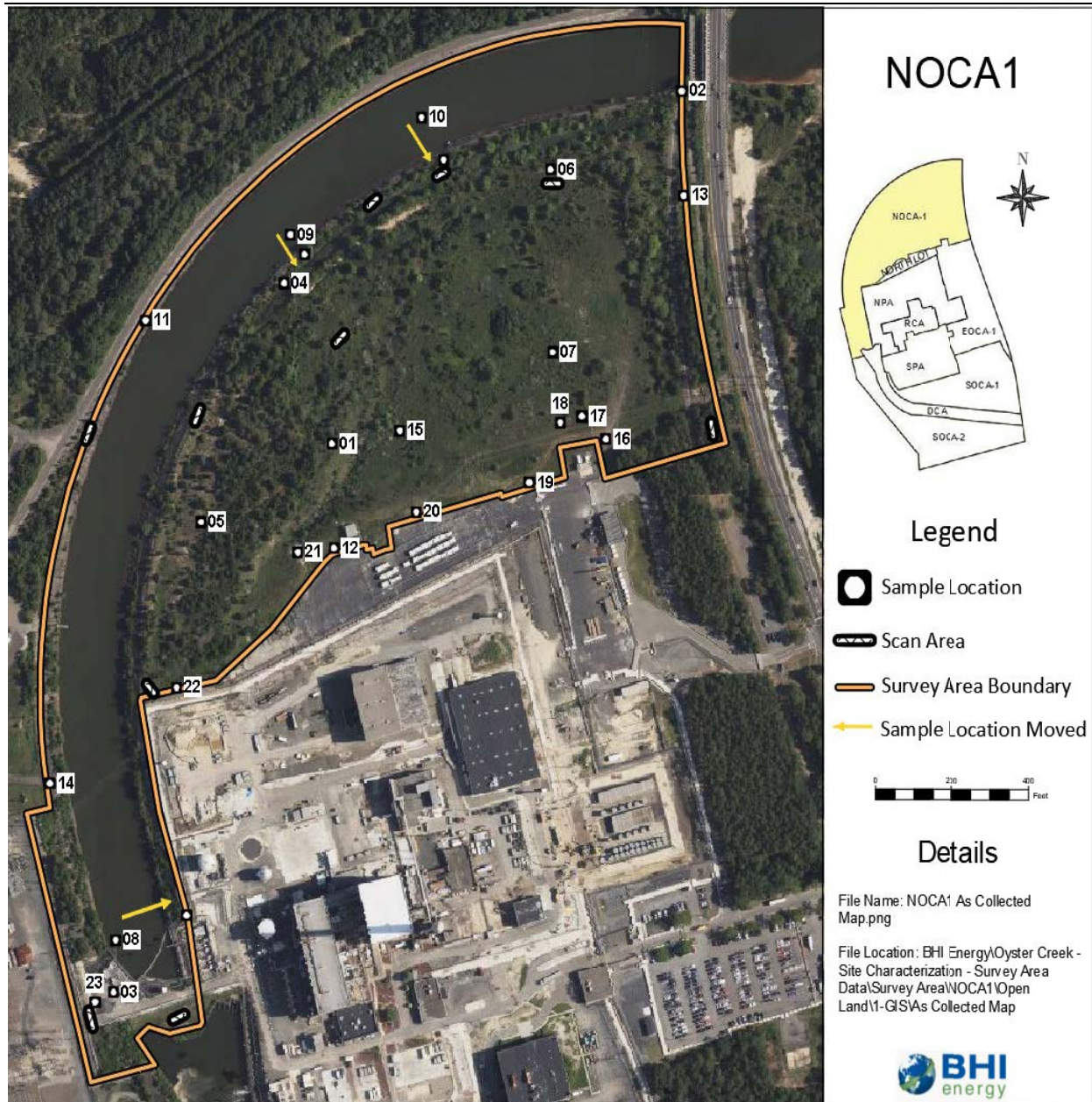


Figure 3-1 NOCA-1 Survey Area and Sample Locations

3.1.3 Survey Data SummaryDiscussion

Cesium-137 concentrations were less than the achieved MDC values for most NOCA-1 samples. However, Cs-137 was detected at concentrations greater than the MDC values in 5 samples (NOCA1-SOIL-07, NOCA1-SOIL-18-B, NOCA1-SOIL-23-B, NOCA1-SEDI-22-B, and NOCA1-DEP1-23-B). The 5 samples were comprised of 3 surface soil samples, 1 sediment sample, and 1 deep subsurface soil sample. Results can be seen in Table 3-4, Table 3-5, and Table 3-7, respectively. The positive findings are all less than 1.60E-01 pCi/g, which is less than 27% of the Class 3 AC for Cs-137. The low Cs-137 concentrations may be attributable to the movement of potentially contaminated soil, site runoff, or fallout from gaseous effluent releases. Table 3-6 provides the results for the asphalt samples.

In contrast, Co-60 concentration results were all below the achieved MDC values. The Co-60 MDC values ranged from 2.71E-02 pCi/g to 8.00E-02 pCi/g, indicating that, if present in NOCA1, Co-60 contamination would likely not be widespread or exceed a small fraction of the Class 3 AC for Co-60.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the NOCA1 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-14, the results did not identify any HTD beta-emitting ROC above the MDC value.

Table 3-4 On-Site Laboratory Gamma Analysis Results for NOCA1 Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:	NOCA1		Number of Samples:		23	
Initial Classification:	Class 3					
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NOCA1-SOIL-1	-1.51E-02	3.65E-02	N	6.37E-02	9.72E-02	N
NOCA1-SOIL-2	-1.67E-02	7.33E-02	N	3.42E-02	6.34E-02	N
NOCA1-SOIL-3-QC	3.52E-03	3.35E-02	N	-2.13E-02	5.38E-02	N
NOCA1-SOIL-4	2.41E-03	3.14E-02	N	2.29E-03	5.48E-02	N
NOCA1-SOIL-5-D	2.15E-02	4.02E-02	N	8.80E-03	5.81E-02	N
NOCA1-SOIL-6	9.88E-03	4.94E-02	N	3.81E-02	9.72E-02	N
NOCA1-SOIL-7	1.09E-02	4.13E-02	N	1.47E-01	5.43E-02	N
NOCA1-SOIL-8	2.11E-03	2.71E-02	N	2.90E-03	5.83E-02	N
NOCA1-SOIL-9	2.90E-02	6.07E-02	N	-1.66E-02	6.56E-02	N
NOCA1-SOIL-10	7.69E-03	4.70E-02	N	4.58E-02	8.51E-02	N
NOCA1-SOIL-11-QC	6.87E-03	4.86E-02	N	4.01E-02	7.58E-02	N
NOCA1-SOIL-12	2.66E-02	4.81E-02	N	6.73E-02	1.05E-01	N
NOCA1-SOIL-13	8.12E-04	5.71E-02	N	4.23E-02	1.15E-01	N
NOCA1-SOIL-14-D	1.90E-02	4.85E-02	N	-1.05E-02	7.11E-02	N
NOCA1-SOIL-15	4.90E-03	5.65E-02	N	3.17E-02	8.71E-02	N
NOCA1-SOIL-16-B	1.65E-02	5.49E-02	N	2.19E-02	5.87E-02	N
NOCA1-SOIL-17-B	4.65E-03	4.81E-02	N	8.19E-03	5.97E-02	N
NOCA1-SOIL-18-B	1.08E-02	4.01E-02	N	8.13E-02	4.39E-02	N
NOCA1-SOIL-19-B-D	-1.07E-02	4.13E-02	N	2.61E-02	7.28E-02	N
NOCA1-SOIL-20-B-QC	1.11E-02	4.58E-02	N	4.88E-02	8.54E-02	N
NOCA1-SOIL-21-B	2.09E-02	5.47E-02	N	3.84E-02	8.09E-02	N
NOCA1-SOIL-22-B	3.60E-02	4.84E-02	N	-1.90E-03	7.35E-02	N
NOCA1-SOIL-23-B	2.42E-02	4.82E-02	N	1.55E-01	6.21E-02	N
Average	9.86E-03			3.71E-02		
SD	1.34E-02			4.49E-02		
Data Range	-1.67E-02 to	3.60E-02		-2.13E-02 to	1.55E-01	

Table 3-5 On-Site Laboratory Gamma Analysis Results for NOCA1 Sediment Samples

Sediment Sample Gamma Spec - Data Quality Assessment							
Survey Area:			NOCA1		Number of Samples:		2
Initial Classification:			Class 3				
Result Comparison							
Co-60					Cs-137		
Sample #	Measured Activity (pCi/g)		Achieved	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved	AC Exceeded (Y/N)
			MDC Value (pCi/g)			MDC Value (pCi/g)	
NOCA1-SEDI-3	4.10E-02		6.15E-02	N	-1.83E-03	5.92E-02	N
NOCA1-SEDI-22-B	3.91E-02		8.00E-02	N	1.21E-01	6.41E-02	N
Average	4.01E-02				5.96E-02		
SD	1.34E-03				8.69E-02		
Data Range	3.91E-02 to		4.10E-02		-1.83E-03 to	1.21E-01	

Table 3-6 On-Site Laboratory Gamma Analysis Results for NOCA1 Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NOCA1	Number of Samples:		2	
Initial Classification:		Class 3				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NOCA1-ASPH-3	2.33E-02	6.36E-02	N	2.00E-02	6.60E-02	N
NOCA1-ASPH-22B	2.23E-03	5.03E-02	N	1.98E-02	6.21E-02	N
Average SD	1.28E-02			1.99E-02		
	1.49E-02			1.41E-04		
Data Range	2.23E-03 to	2.33E-02		1.98E-02 to	2.00E-02	

Table 3-7 On-Site Laboratory Gamma Analysis Results for NOCA-1 Deep Subsurface Soil Samples

Deep Composite Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NOCA1	Number of Samples:			3
Initial Classification:		Class 3				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NOCA1-DEP1-17-B	8.37E-03	6.27E-02	N	2.81E-02	6.49E-02	N
NOCA1-DEP1-18-B	9.91E-03	6.29E-02	N	1.03E-02	7.86E-02	N
NOCA1-DEP1-23-B	2.32E-02	5.78E-02	N	1.02E-01	6.36E-02	N
Average	1.38E-02			4.68E-02		
SD	8.15E-03			4.86E-02		
Data Range	8.37E-03 to	2.32E-02		1.03E-02 to	1.02E-01	

3.1.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples NOCA1-SOIL-5-D, NOCA1-SOIL-14-D, and NOCA1-SOIL-19-B-D are shown in Table 3-8, Table 3-9, and Table 3-10, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-8 Duplicate Sample Analysis for NOCA1-SOIL-05-D

Duplicate Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 5
Sample Description: Duplicate count comparisons from sample measurement location 05 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.							
STANDARD					COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison¹:			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Table 3-9 Duplicate Sample Analysis for NOCA-1-SOIL-14-D

Duplicate Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 14
Sample Description: Duplicate count comparisons from sample measurement location 14 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.							
STANDARD					COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison¹:			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Table 3-10 Duplicate Sample Analysis for NOCA1-SOIL-19-B-D

Duplicate Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 19
Sample Description: Duplicate count comparisons from sample measurement location 19 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.							
STANDARD					COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison¹:			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

On-Site / Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for QC samples NOCA1-SOIL-03-QC, NOCA1-SOIL-11-QC, and NOCA1-SOIL-20-B-QC are shown in Table 3-11, Table 3-12, and Table 3-13, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-11 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-03-QC

QC Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 3
Sample Description: QC sample comparisons from sample measurement location 03 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site & Off-Site results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution Range for Sample Recount Comparison¹:			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Table 3-12 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-11-QC

QC Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 11
Sample Description:							
QC sample comparisons from sample measurement location 11 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site & Off-Site lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

Table 3-13 On-Site/Off-Site Sample Analysis for NOCA1-SOIL-20-B-QC

QC Sample Assessment Form							
Survey Area Name:		NOCA1					
SAP No.:		1			Sample Location:		SOIL 20
Sample Description:							
QC sample comparisons from sample measurement location 20 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site & Off-Site lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

Off-Site Laboratory HTD Analyses

Table 3-14 Off-Site Laboratory Results for HTDs in NOCA-1 QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
NOCA1-SOIL-03-QC	Soil	Sr-90	-1.70E-02	7.35E-02	N
		C-14	-7.45E-02	1.05E+00	N
		Fe-55	1.27E+01	1.97E+02	N
		Ni-63	5.21E+00	1.88E+01	N
		Tc-99	-7.48E-02	2.19E+00	N
NOCA1-SOIL-11-QC	Soil	Sr-90	2.61E-02	8.28E-02	N
		C-14	-4.00E-02	1.07E+00	N
		Fe-55	-1.65E+01	2.00E+02	N
		Ni-63	-7.22E+00	3.29E+01	N
		Tc-99	-1.83E-01	2.18E+00	N
NOCA1-SOIL-20-B-QC	Soil	Sr-90	3.89E-02	4.96E-02	N
		C-14	-3.68E-01	1.05E+00	N
		Fe-55	3.77E+01	1.21E+02	N
		Ni-63	7.43E+00	3.12E+01	N
		Tc-99	-2.39E-01	2.18E+00	N

3.1.5 Survey Plan Deviation(s)

Three sample points required relocation due to safety concerns. The original VSP-determined sample points NOCA1-SOIL-08, -09, and -10 were locations covered by the water of the intake canal. Each of the 3 sample points was relocated to the nearest accessible location on the bank/berm of the canal.

3.1.6 Survey Area Investigations

None.

3.1.7 Survey Area Conclusions

The following conclusions were reached for the NOCA-1 area:

- MARSSIM Class 3 designation is appropriate for the NOCA-1 survey area.
- Excavation or remediation of soil within the NOCA-1 area is not likely within this area to meet the site release criteria.

3.2 NOCA-2 (SAP 02 – OPEN LAND)

3.2.1 Area Description

NOCA-2 (aka North Parking Lot) is the area immediately north of the Protected Area and is illustrated in Figure 3-2. It is 35,667 m² in size and is currently covered with an asphalt parking lot. In 1982 GPU Nuclear received NRC approval to relocate approximately 17,000 cubic feet of contaminated soil under §20.302. The disposal method was burial in shallow trenches below a minimum cover of six inches of clean soil. The area within the NOCA-2 boundary has been preliminarily classified as Class 1 due to the burial of this material.

3.2.2 Survey Summary

Survey Dates: 9/8/2022

Survey and field activities were governed by SAP 02, *North Owner Controlled Area-2*. Survey planning for the NOCA-2 area identified 4 sample locations where plant-related radioactivity might have been introduced from other areas. One sample location was relocated (NOCA2-XXX-04-B) due to the presence of underground utilities and could not be safely collected as planned. An alternative sample location was selected close to the original location and where a representative sample could be safely collected. GPS coordinates for this alternate sample location were recorded during sampling to document the new locations. The sample locations are shown in Figure 3-2.

A total of 10 samples were obtained from the NOCA-2 area: 3 surface soil samples, 1 sediment sample, 3 asphalt samples, and 3 at depths greater than 6 in. All samples collected were from biased locations. Asphalt samples were obtained at locations where the soil was covered by asphalt (NOCA2-ASPH-02-B, -03-B, and -04-B). GPS coordinates for as-taken sample locations are listed in Table 3-15.

Sediment sample location NOCA2-SEDI-01-B was chosen due to the presence of a storm drain that could potentially collect runoff from the surrounding area.

Samples obtained at depths greater than 6 in (NOCA2-DEP1-02-B, -03-B, and -04-B) were selected based on information from the HSA regarding the on-site disposal of approximately 17,000 cubic feet of contaminated soil buried in shallow trenches within the NOCA2 boundary.

Walk-over gamma scans were conducted at the NOCA-2 boundaries. They were performed using calibrated Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify any areas of concern or potential migration of radioactivity beyond the survey area. Gamma scans were also conducted at each sample location. A total of 154 m² were scanned. The observed background count rates ranged between 11,200 and 30,500 cpm. Nearby external sources influenced the count rate observed in several locations in this area. The scans did not identify areas with an “audible distinction” above the location background count rate.

SECTION THREE

Radiological Findings

Table 3-15 GPS Coordinates for Sample Collection Locations in the NOCA-2 Survey Area

Sample Number	Easting	Northing
NOCA2-SEDI-01-B-D	575096.6836	358443.5636
NOCA2-ASPH-02-B NOCA2-SOIL-02-B NOCA2-DEP1-02-B	574907.5087	358358.6976
NOCA2-ASPH-03-B NOCA2-SOIL-03-B-QC NOCA2-DEP1-03-B	574702.6765	358211.0408
NOCA2-ASPH-04-B: Original location coordinates	574550.8564	358106.9594
NOCA2-SOIL-04-B: Sample relocation coordinates	574555.9538	358108.8321
NOCA2-DEP1-04-B		

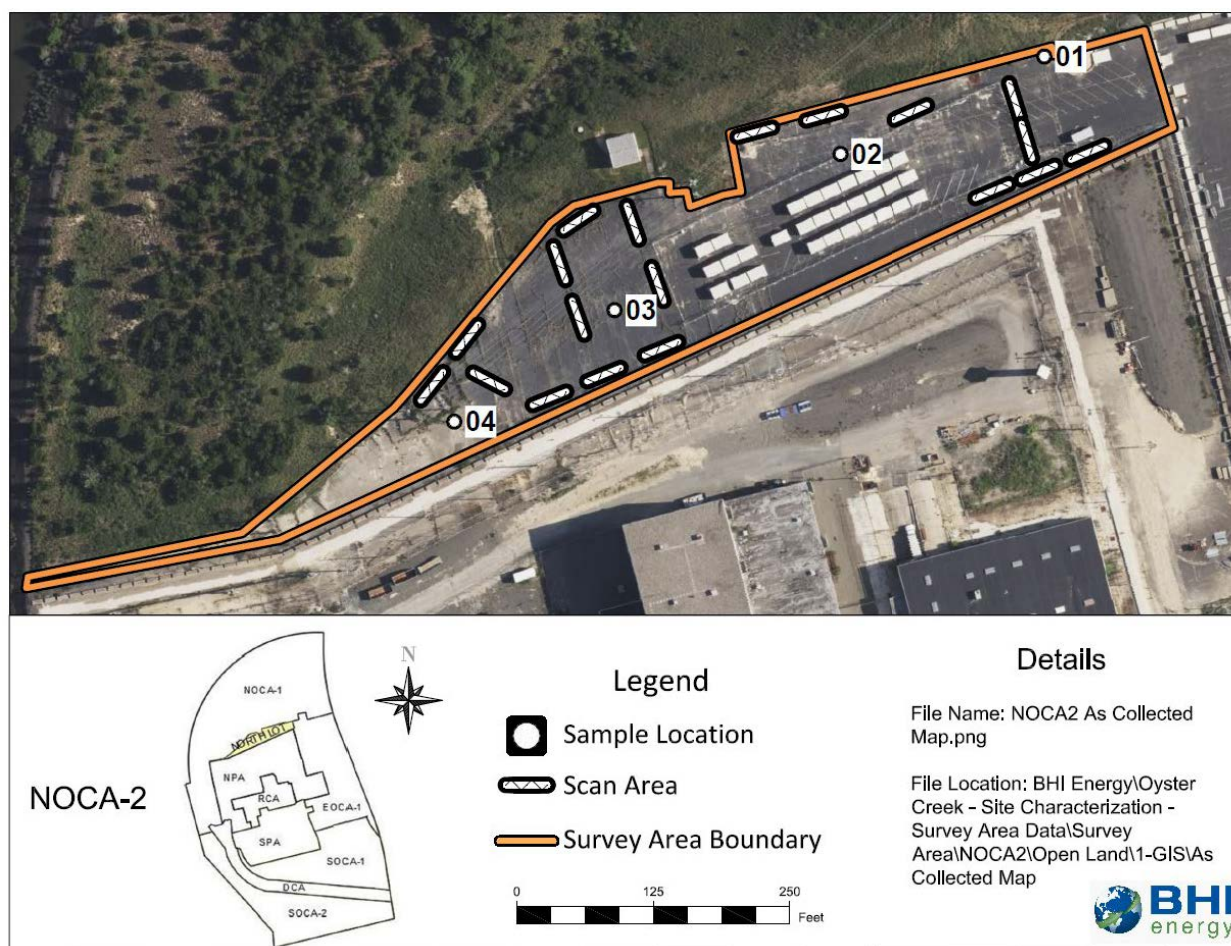


Figure 3-2 NOCA-2 Survey Area and Sample Locations

3.2.3 Survey Data Summary

Discussion

Cesium-137 concentrations were less than the achieved MDC values for most NOCA-2 samples. However, Cs-137 and Co-60 were detected at concentrations greater than the MDC values in one sample (NOCA2-SEDI-01-B-D), and Cs-137 was detected at a concentration greater than the MDC value in one sample (NOCA-DEP1-02-B) as seen in Table 3-19.

The deep soil sample was collected at a depth range of 6 inches to 4 ft.; the on-site gamma analysis report shows the Cs-137 concentration to be $4.75\text{E-}01$ pCi/g, which is less than 9% of the Class 1 AC for Cs-137 ($5.76\text{E+}00$ pCi/g), as seen in Table 3-16. The asphalt and surface soil samples collected directly above the deep sample showed Cs-137 concentrations below the achieved MDC values. The Cs-137 concentration in the deep sample is potentially from the residual contamination associated with the NRC-approved relocation of contaminated site soil to the NOCA-2 area in 1982 prior to the expansion of the North Parking Lot.

The sediment sample from the storm drain sample contained detectable Cs-137 and Co-60 at $1.07\text{E-}01$ pCi/g and $6.51\text{E-}02$ pCi/g, respectively. The activity concentration is less than 6% of the Class 1 AC for Co-60 and Cs-137, as seen in Table 3-17. Positive findings were not wholly unexpected because the storm drain is a collection point for site runoff that may have contained fallout from gaseous effluent releases.

The Co-60 concentrations in the asphalt (Table 3-18), surface soil (Table 3-16), and deep soil samples were below the achieved MDC values, which ranged from $4.66\text{E-}02$ pCi/g to $9.81\text{E-}02$ pCi/g indicating that if present in NOCA-2, Co-60 contamination would likely not be widespread or exceed a small fraction of the Class 1 AC for Co-60.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the NOCA-2 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. The results of those analyses (provided in Table 3-22) did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-16 On-Site Laboratory Gamma Analysis Results for NOCA-2 Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment							
Survey Area:		NOCA2		Number of Samples:		3	
Initial Classification:		Class 1					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured	Achieved	AC	Measured	Achieved	AC	
	Activity	MDC	Exceeded	Data	MDC	Exceeded	
	(pCi/g)	Value	(Y/N)	(pCi/g)	Value	(Y/N)	
	(pCi/g)	(pCi/g)	(Y/N)	(pCi/g)	(pCi/g)	(Y/N)	
NOCA2-SOIL-2-B	1.01E-02	7.29E-02	N	-7.99E-03	9.88E-02	N	
NOCA2-SOIL-3-QC	-2.01E-03	4.66E-02	N	2.54E-02	7.81E-02	N	
NOCA2-SOIL-4-B	1.19E-02	4.95E-02	N	2.01E-02	5.24E-02	N	
Average	6.66E-03			1.25E-02			
SD	7.57E-03			1.79E-02			
Data Range	-2.01E-03 to	1.19E-02		-7.99E-03 to	2.54E-02		

Table 3-17 On-Site Laboratory Gamma Analysis Results for NOCA-2 Sediment Samples

Sediment Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NOCA2	Number of Samples:		1	
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured	Achieved	AC Exceeded	Measured	Achieved	AC Exceeded
	Activity	MDC Value		Data	MDC Value	
	(pCi/g)	(pCi/g)	(Y/N)	(pCi/g)	(pCi/g)	(Y/N)
NOCA2-SEDI-1-B-D	6.51E-02	4.69E-02	N	1.07E-01	6.85E-02	N
Average SD						
Data Range		to			to	

Table 3-18 On-Site Laboratory Gamma Analysis Results for NOCA-2 Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NOCA2	Number of Samples:		3	
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NOCA2-ASPH-2-B	1.76E-02	6.91E-02	n/a	7.55E-03	7.06E-02	n/a
NOCA2-ASPH-3-B	-2.00E-02	7.08E-02	n/a	-3.74E-02	6.55E-02	n/a
NOCA2-ASPH-4-B	2.37E-02	7.22E-02	n/a	1.65E-02	7.32E-02	n/a
Average	7.10E-03			-4.45E-03		
SD	2.37E-02			2.89E-02		
Data Range	-2.00E-02 to	2.37E-02		-3.74E-02 to	1.65E-02	

Table 3-19 On-Site Laboratory Gamma Analysis Results for NOCA-2 Deep Soil Samples

Deep Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NOCA2	Number of Samples:		3	
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured	Achieved	AC	Measured	Achieved	AC
	Activity	MDC	Exceeded	Data	MDC	Exceeded
	(pCi/g)	Value	(Y/N)	(pCi/g)	Value	(Y/N)
NOCA2-DEP1-2-B	6.98E-03	5.72E-02	N	4.75E-01	7.12E-02	N
NOCA2-DEP1-3-B	-1.88E-02	7.73E-02	N	-1.88E-02	7.73E-02	N
NOCA2-DEP1-4-B	3.73E-02	9.81E-02	N	3.73E-02	9.81E-02	N
Average	8.49E-03			1.65E-01		
SD	2.81E-02			2.70E-01		
Data Range	-1.88E-02 to	3.73E-02		-1.88E-02 to	4.75E-01	

3.2.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate sample NOCA2-SEDI-01-B-D are shown in Table 3-20. The comparisons were found acceptable.

Table 3-20 Duplicate Sample Analysis for NOCA2-SEDI-01-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		NOCA2						
SAP No.:		2				Sample Location:		SEDI 1
Sample Description:								
Duplicate count comparisons from sample measurement location 01 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	1.07E-01	2.09E-02	5.1	0.5	2	8.58E-02	0.80	Y
Co-60	6.51E-02	1.22E-02	5.3	0.5	2	6.02E-02	0.92	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Co-60 activity shown for the comparison count is the achieved MDC. The comparisons were found acceptable.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

On-Site / Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC sample NOCA2-SOIL-03-B-QC are shown in Table 3-21. The comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-21 On-Site/Off-Site Sample Analysis for NOCA2-SOIL-3-B-QC

QC Sample Assessment Form							
Survey Area Name:		NOCA2					
SAP No.:		2			Sample Location:		SOIL 3
Sample Description:							
QC sample comparisons from sample measurement location 03 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site & Off-Site Lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Off-Site Laboratory HTD Analyses

Table 3-22 Off-Site Laboratory Results for HTDs in NOCA-2 QC Sample

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
NOCA2-SOIL-03-B-QC	Soil	Sr-90	6.47E-02	8.22E-02	N
		C-14	1.11E-01	5.89E-01	N
		Fe-55	9.91E+01	1.44E+02	N
		Ni-63	-1.79E+00	2.70E+01	N
		Tc-99	-3.36E-02	9.42E-01	N

3.2.5 Survey Plan Deviations

One sample point required relocation due to safety concerns. Sample point NOCA2-XXX-04 was located over underground utilities. The sample point was relocated to the nearest accessible location.

3.2.6 Survey Area Investigations

None.

3.2.7 Survey Area Conclusions

The following conclusions were reached for the NOCA-2 area:

- Excavation of the contaminated soil relocated in 1982 under the North Parking is not likely necessary, as indicated by the low Cs-137 concentration in the deep soil sample (i.e., a measured concentration of less than 10% of the Cs-137 AC). The measured Cs-137 and Co-60 concentrations in NOCA-2 samples indicate that the area meets MARSSIM Class 3 criteria.
- MARSSIM Class 1 designation is appropriate for the NOCA-2 survey area: basis (waste storage location).

3.3 SOCA-1 (SAP 03 – OPEN LAND)

3.3.1 Area Description

SOCA-1 is south of the Protected Area and North of the discharge canal, illustrated in Figure 3-3. It is 81,656 m² in size and includes the south parking lot, with the rest of the area covered with trees, vegetative growth, and wetlands. Other than the parking lot, there are no plant structures within the SOCA-1 area. Although the HSA indicates that SOCA-1 is an impacted area, there is no current or known historical use of radioactive material. SOCA-1 is not likely to be impacted by D&D activities; therefore, its radiological status is not expected to change.

3.3.2 Survey Summary

Survey Dates: 8/29/2022 through 9/28/2022

Survey and field activities were governed by SAP 03, *South Owner Controlled Area-1*. Survey planning for the SOCA-1 area included using the VSP program to identify 15 random sample locations consistent with MARSSIM methodology. In addition, 7 biased locations were selected by the Radiological Engineer as locations where plant-related radioactivity may have been introduced from other areas. The sample locations are shown in Figure 3-3.

Three of the random sample locations were relocated due to the original location being within wetland areas (SOCA1-SOIL-10 and SOCA1-SOIL-12) and the inability to access due to a thorn thicket that made safe passage not possible (SOCA1-SOIL-06-D). Nearby areas where representative soil samples could be collected were selected as alternative sample points. GPS coordinates for these alternate sample locations were recorded during sampling to document the new locations.

Asphalt samples were obtained where the soil was covered by asphalt (SOCA1-ASPH-07 and SOCA1-ASPH-14). A total of 24 samples were obtained from the SOCA-1 area: 22 surface soil samples (15 random and 7 bias samples) and 2 asphalt samples. GPS coordinates for the sample locations are listed in Table 3-23.

Walk-over gamma scans were conducted at the SOCA-1 boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify any areas of elevated radioactivity. A total of 152 m² were scanned. Gamma scan measurements were also conducted at each sample location. Count rates were between 2,800 and 6,550 cpm at sample locations in the SOCA1 area. Scans did not identify areas with an “audible distinction” above the location background count rate.

Table 3-23 GPS Coordinates for Sample Locations in the SOCA-1 Survey Area

Sample Number	Easting	Northing
SOCA1-SOIL-01	575462.3613	356726.8083
SOCA1-SOIL-02-D	575935.8707	356521.5801
SOCA1-SOIL-03	575699.116	357137.2647
SOCA1-SOIL-04	575225.6066	356624.1942
SOCA1-SOIL-05-QC	576172.6254	356932.0365
SOCA1-SOIL-06-D: Original location coordinates	575580.7387	356453.1707
Sample relocation coordinates	575587.6946	356448.5329
SOCA1-ASPH-07	575107.2293	356761.013
SOCA1-SOIL-07		
SOCA1-SOIL-08	576054.2481	357068.8553
SOCA1-SOIL-09	574870.4745	356555.7848
SOCA1-SOIL-10: Original location coordinates	575817.4934	356863.6271
Sample relocation coordinates	575856.7035	356878.9469
SOCA1-SOIL-11	576291.0028	356658.3989
SOCA1-SOIL-12: Original location coordinates	575995.0594	356673.601
Sample relocation coordinates	575945.5869	356582.4727
SOCA1-SOIL-13-QC	575758.3047	356468.3728
SOCA1-SOIL-14-D	575284.7953	356776.2151
SOCA1-SOIL-15-QC	575639.9273	356878.8292
SOCA1-SOIL-16-B	575564.3788	356879.1818
SOCA1-SOIL-17-B	575222.1222	356759.9735
SOCA1-SOIL-18-B	575053.4665	356707.3417
SOCA1-SOIL-19-B	574894.1677	356614.4759
SOCA1-SOIL-20-B	574879.6647	356593.8910
SOCA1-SOIL-21-B	575658.6151	357094.4778
SOCA1-SOIL-22-B	575965.7508	357208.1624

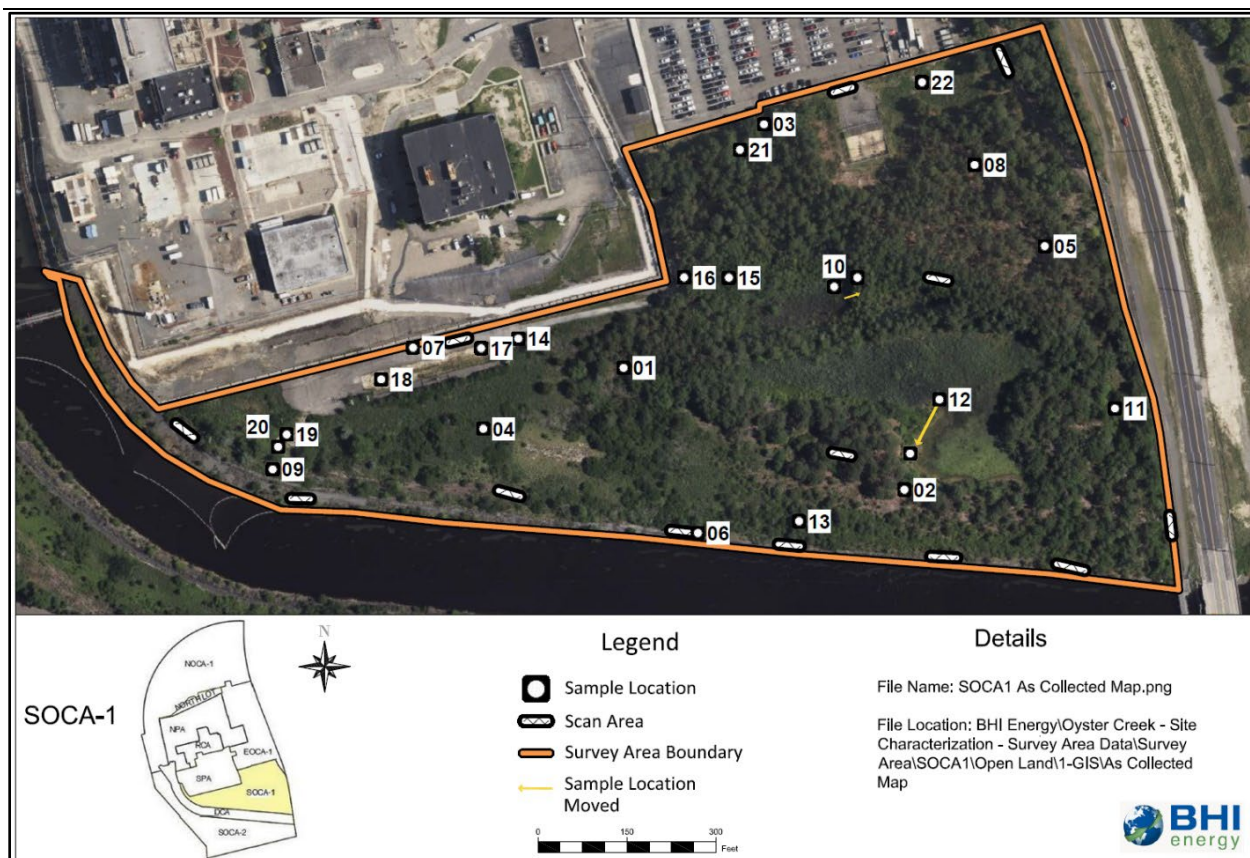


Figure 3-3 SOCA-1 Survey Area and Sample Locations

3.3.3 Survey Data Summary

Discussion

Cesium-137 concentrations were less than the achieved MDC values for most SOCA-1 samples. However, Cs-137 and Co-60 were detected at concentrations greater than the MDC values in one sample (SOCA1-SOIL-22-B); and Cesium-137 only was detected at a concentration greater than the MDC value in five additional samples (SOCA1-SOIL-3, SOCA1-SOIL -4, SOCA1-SOIL -8, SOCA1-SOIL -9, and SOCA1-SOIL -10).

The positive Cs-137 findings are all less than $2.46\text{E-}01$ pCi/g, which is less than 43% of the Class 3 AC for Cs-137 ($5.76\text{E-}01$ pCi/g). The positive Co-60 finding is less than $1.07\text{E-}01$ pCi/g, which is less than 44% of the Class 3 AC for Co-60 ($2.44\text{E-}01$ pCi/g). These results are shown in Table 3-24. Table 3-25 provides the results for the asphalt samples.

The sample containing Cs-137 and Co-60, SOCA1-SOIL-22-B, was collected from a culvert/drain outlet that receives runoff from the parking lot in the southeast corner of the EOCA-1 survey area. Samples containing the highest Cs-137 concentrations, SOCA1-SOIL-09 and SOCA1-SOIL-10, were collected in a washout area at the southwest corner of SOCA1. This location was subject to runoff from the SPA and wet

decomposing organic material. There is no record of current or historical use of radioactive materials in the SOCA1 survey area.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the SOCA1 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-32, the results did not identify any HTD beta-emitting ROC above MDC.

Table 3-24 On-Site Laboratory Gamma Analysis Results for SOCA-1 Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area: Initial Classification:		SOCA1	Number of Samples:		22	
		Class 3				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
SOCA1-SOIL-1	6.39E-03	5.65E-02	N	1.14E-02	7.96E-02	N
SOCA1-SOIL-2-D	1.25E-02	6.01E-02	N	3.93E-02	9.06E-02	N
SOCA1-SOIL-3	1.07E-02	4.24E-02	N	4.74E-02	4.68E-02	N
SOCA1-SOIL-4	8.38E-03	4.74E-02	N	4.43E-02	4.17E-02	N
SOCA1-SOIL-5-QC	5.01E-03	3.01E-02	N	2.10E-02	6.46E-02	N
SOCA1-SOIL-6-D	1.77E-02	5.55E-02	N	4.10E-02	8.67E-02	N
SOCA1-SOIL-7	1.36E-02	5.16E-02	N	2.64E-02	6.91E-02	N
SOCA1-SOIL-8	1.24E-02	4.32E-02	N	6.88E-02	3.63E-02	N
SOCA1-SOIL-9	9.22E-03	4.50E-02	N	2.24E-01	5.42E-02	N
SOCA1-SOIL-10	3.18E-03	5.80E-02	N	2.46E-01	7.30E-02	N
SOCA1-SOIL-11	1.13E-02	5.44E-02	N	4.97E-02	8.17E-02	N
SOCA1-SOIL-12	1.45E-02	5.18E-02	N	4.43E-02	5.21E-02	N
SOCA1-SOIL-13-QC	2.67E-02	5.83E-02	N	3.36E-02	7.74E-02	N
SOCA1-SOIL-14-D	-2.83E-02	4.48E-02	N	2.44E-02	7.34E-02	N
SOCA1-SOIL-15-QC	2.70E-02	6.28E-02	N	3.19E-02	8.72E-02	N
SOCA1-SOIL-16-B	1.20E-02	5.01E-02	N	-1.42E-02	7.31E-02	N
SOCA1-SOIL-17-B	1.81E-02	5.20E-02	N	-2.08E-02	6.62E-02	N
SOCA1-SOIL-18-B	2.71E-02	3.72E-02	N	-8.16E-02	5.78E-02	N
SOCA1-SOIL-19-B	1.89E-03	5.75E-02	N	4.61E-02	6.31E-02	N
SOCA1-SOIL-20-B	9.24E-03	6.69E-02	N	5.22E-02	8.74E-02	N
SOCA1-SOIL-21-B	1.46E-02	5.52E-02	N	4.68E-02	9.39E-02	N
SOCA1-SOIL-22-B	1.07E-01	9.68E-02	N	1.94E-01	1.27E-01	N
Average	1.55E-02			5.35E-02		
SD	2.33E-02			7.57E-02		
Data Range	-2.83E-02 to	1.07E-01		-8.16E-02 to	2.46E-01	

Table 3-25 On-Site Laboratory Gamma Analysis Results for SOCA-1 Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment							
Survey Area:			SOCA1	Number of Samples:			2
Initial Classification:			Class 3				
Result Comparison							
Co-60				Cs-137			
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	
SOCA1-ASPH-7	-3.86E-02	7.40E-02	n/a	2.72E-02	8.33E-02	n/a	
SOCA1-ASPH-14	6.55E-03	5.01E-02	n/a	1.60E-03	6.02E-02	n/a	
Average	-1.60E-02			1.44E-02			
SD	3.19E-02			1.81E-02			
Data Range	-3.86E-02 to	6.55E-03		1.60E-03 to	2.72E-02		

3.3.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples SOCA1-SOIL-02-D, SOCA1-SOIL-06-D, and SOCA1-SOIL-14-D are shown in Table 3-26, Table 3-27, and Table 3-28 respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value, respectively.

Table 3-26 Duplicate Sample Analysis for SOCA1-SEDI-02- D

Duplicate Sample Assessment Form								
Survey Area Name:		SOCA1						
SAP No.:		3			Sample Location:		SOIL 2	
Sample Description:								
Duplicate count comparisons from sample measurement location 02 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<31	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

Table 3-27 Duplicate Sample Analysis for SOCA1-SEDI-06-D

Duplicate Sample Assessment Form							
Survey Area Name:		SOCA1					
SAP No.:		3			Sample Location:		SOIL 6
Sample Description:							
Duplicate count comparisons from sample measurement location 06 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.							
STANDARD					COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

Table 3-28 Duplicate Sample Analysis for SOCA1-SEDI-14-D

Duplicate Sample Assessment Form							
Survey Area Name:		SOCA1					
SAP No.:		3			Sample Location:		SOIL 14
Sample Description:							
Duplicate count comparisons from sample measurement location 14 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.							
STANDARD					COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples SOCA1-SOIL-05-QC, SOCA1-SOIL-13-QC, and SOCA1-SOIL-15-QC are shown in Table 3-29, Table 3-30, and Table 3-31, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

For sample SOCA1-SOIL-15-QC the off-site laboratory analysis showed detectable Cs-137 activity at an activity concentration below the on-site laboratory's MDC value. The agreement is assumed because the off-site laboratory's reported Cs-137 concentration falls between the on-site and the off-site laboratory's MDC values.

Table 3-29 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-05-QC

QC Sample Assessment Form								
Survey Area Name:		SOCA1						
SAP No.:		3			Sample Location:		SOIL 5	
Sample Description:								
QC sample comparisons from sample measurement location 05 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
On-Site & Off-Site Lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-30 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-13-QC

QC Sample Assessment Form							
Survey Area Name:		SOCA1					
SAP No.:		3			Sample Location:		SOIL 13
Sample Description:							
QC sample comparisons from sample measurement location 13 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site & Off-Site Lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

Table 3-31 On-Site/Off-Site Sample Analysis for SOCA1-SOIL-15-QC

QC Sample Assessment Form							
Survey Area Name:		SOCA1					
SAP No.:		3			Sample Location:		SOIL 15
Sample Description:							
QC sample comparisons from sample measurement location 15 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: On-Site Co-60 & Cs-137 <MDC. Off-Site: Co-60 <MDC, but positive Cs-137 (0.0299 pCi/g; MDC = 0.0216 pCi/g). On-Site Cs-137 MDC (0.0872 pCi/g), is above the Off-Site reported Cs-137 concentration and its MDC. Agreement is accepted.				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
				51	200	0.8	1.25
				>200		0.85	1.18

Off-Site Laboratory HTD Analyses

Table 3-32 Off-Site Laboratory Results for HTDs in SOCA-1 QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
SOCA1-SOIL-05-QC	Soil	Sr-90	-1.24E-02	6.81E-02	N
		C-14	-1.48E-01	6.14E-01	N
		Fe-55	-3.78E+01	1.43E+02	N
		Ni-63	-2.94E-01	2.85E+01	N
		Tc-99	4.82E-01	1.51E+00	N
SOCA1-SOIL-13-QC	Soil	Sr-90	2.91E-02	7.75E-02	N
		C-14	-2.34E-01	6.09E-01	N
		Fe-55	7.73E+01	1.97E+02	N
		Ni-63	-9.56E+00	2.85E+01	N
		Tc-99	6.63E-01	1.28E+00	N
SOCA1-SOIL-15-QC	Soil	Sr-90	5.09E-02	7.84E-02	N
		C-14	-3.41E-01	6.03E-01	N
		Fe-55	7.76E+01	1.47E+02	N
		Ni-63	1.10E+00	2.38E+01	N
		Tc-99	7.31E-01	9.42E-01	N

3.3.5 Survey Plan Deviations

Three sample points required relocation due to safety concerns. Sample points SOCA1-SOIL-06-D, -10, and -12 were randomly located by VSP in wetland areas or other environmental hazards. Sample points were relocated to the nearest accessible location on the bank/berm of the canal.

3.3.6 Survey Area Investigations

None.

3.3.7 Survey Area Conclusions

The following conclusions were reached for the SOCA-1 area:

- MARSSIM Class 3 designation is appropriate for the SOCA-1 survey area.
- Excavation or remediation of soil within the SOCA1 area is likely not necessary for the area to meet site release criteria.

3.4 SOCA-2 (SAP 04 – OPEN LAND)

3.4.1 Area Description

SOCA-2 is the small parcel of land south of the Discharge Canal, illustrated in Figure 3-4. It is 87,957 m² in size and includes a roadway, with the rest of the area covered with trees, vegetative growth, and wetlands. There are no plant structures within the SOCA-2 area. The HSA identifies SOCA-2 is an impacted area, with no current or known historical use of radioactive material. The SOCA-2 is not likely to be impacted by D&D activities, and its radiological status is not expected to change.

3.4.2 Survey Summary

Survey Dates: 9/8/2022 through 9/28/2022

Survey activities were governed by SAP 04, *South Owner Controlled Area-2*. Survey planning for the SOCA-2 area included using the VSP program to identify 15 random sample locations consistent with MARSSIM methodology. The sample locations are shown in Figure 3-4.

Four sample locations were relocated because the original location was within wetland areas (SOCA2-SOIL-04, SOCA2-SOIL-09, SOCA2-SOIL-11, and SOCA2-SOIL-15). Nearby areas where representative soil samples could be collected were selected as alternative sample points. GPS coordinates for these alternate sample locations were recorded during sampling to document the new locations.

A total of 15 random surface soil samples were obtained from the SOCA-2 area. GPS coordinates for as-taken sample locations are listed in Table 3-33.

Walk-over gamma scans were conducted at the SOCA-2 boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify the presence of elevated radioactivity in runoff collection areas at the SOCA-2 boundaries and each sample location. A total of 105 m² were scanned. The count rates logged during the gamma scans ranged between 2,800 and 6,670 cpm. Scans did not identify areas with “audible distinction” above the location background count rates.

Table 3-33 GPS Coordinates for Sample Locations in the SOCA-2 Survey Area

Sample Number		Easting	Northing
SOCA2-SOIL-01		575507.8392	356250.8371
SOCA2-SOIL-02		576107.0965	355929.4815
SOCA2-SOIL-03-D		574608.9531	356411.5149
SOCA2-SOIL-04:	Original location coordinates	575208.2105	356090.1593
	Sample relocation coordinates	575213.1507	356044.9800
SOCA2-SOIL-05		574065.8761	357054.226
SOCA2-SOIL-06-QC		576163.2769	356000.8939
SOCA2-SOIL-07		576013.4626	356215.1309
SOCA2-SOIL-08-D		575713.8339	355893.7753
SOCA2-SOIL-09:	Original location coordinates	575039.6693	355947.3346
	Sample relocation coordinates	575122.3388	355924.0927
SOCA2-SOIL-10		574290.5976	356911.4013
SOCA2-SOIL-11:	Original location coordinates	575489.1124	356108.0124
	Sample relocation coordinates	575506.8941	356025.79302
SOCA2-SOIL-12		575788.741	356179.4247
SOCA2-SOIL-13-QC		575002.2157	356232.9840
SOCA2-SOIL-14		576050.9162	356072.3062
SOCA2-SOIL-15:	Original location coordinates	575152.0301	355804.5099
	Sample relocation coordinates	575129.1989	355828.0233

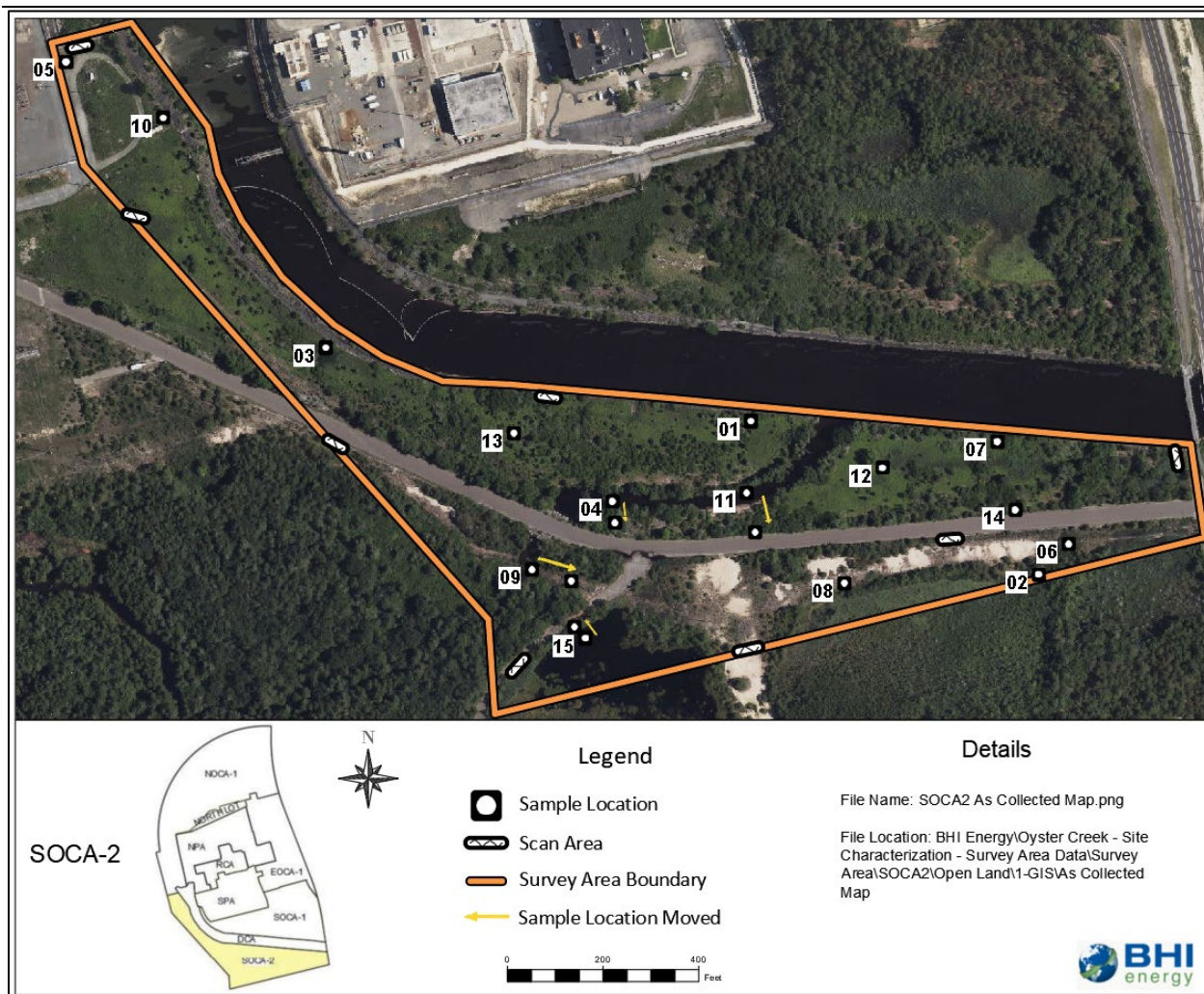


Figure 3-4 SOCA-2 Survey Area and Sample Locations

3.4.3 Survey Data Summary

Discussion

Cesium-137 concentrations were less than the achieved MDC values for just over 50% of the SOCA-2 samples (8 of 15). However, Cs-137 was detected at concentrations greater than the MDC values in 7 samples, SOCA2-SOIL-1, SOCA2-SOIL-4, SOCA2-SOIL-7, SOCA2-SOIL-9, SOCA2-SOIL-12, SOCA2-SOIL-13-QC, and SOCA2-SOIL-14. Although Cs-137 concentrations were less than the achieved MDC values for 8 EOCAL-1 samples, it was detected at low concentrations above the MDC values in 7 soil samples. The positive Cs-137 findings ranged from $5.85\text{E-}2$ pCi/g to $1.63\text{E-}1$ pCi/g, which falls below 29% of the Class 3 AC for Cs-137 ($5.76\text{E-}01$ pCi/g). The results can be seen in Table 3-34. The low Cs-137 concentrations may be attributable to fallout from gaseous effluent releases or the potential presence of background Cs-137.

In contrast, Co-60 concentration results were all below the achieved MDC values. The Co-60 MDC values ranged from 2.71E-02 pCi/g to 8.00E-02 pCi/g, indicating that, if present in NOCA1, Co-60 contamination would likely not be widespread or exceed a small fraction of the 2.44E-01 pCi/g Class 3 AC for Co-60.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the SOCA2 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-25, HTD beta-emitting ROCs were not identified above the MDC.

Table 3-34 On-Site Laboratory Gamma Analysis Results for SOCA-2 Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment							
Survey Area:		SOCA2		Number of Samples:		15	
Initial Classification:		Class 3					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	
SOCA2-SOIL-1	1.57E-02	3.88E-02	N	1.62E-01	5.70E-02	N	
SOCA2-SOIL-2	1.56E-02	5.49E-02	N	1.79E-02	8.95E-02	N	
SOCA2-SOIL-3-D	1.45E-02	4.44E-02	N	7.68E-02	9.97E-02	N	
SOCA2-SOIL-4	1.55E-02	5.58E-02	N	7.73E-02	3.12E-02	N	
SOCA2-SOIL-5	3.35E-02	6.29E-02	N	4.13E-02	9.04E-02	N	
SOCA2-SOIL-6-QC	9.70E-03	3.40E-02	N	4.09E-02	8.84E-02	N	
SOCA2-SOIL-7	1.66E-02	3.66E-02	N	1.63E-01	5.99E-02	N	
SOCA2-SOIL-8-D	2.85E-02	6.43E-02	N	1.23E-02	7.65E-02	N	
SOCA2-SOIL-9	5.27E-03	4.61E-02	N	5.85E-02	4.28E-02	N	
SOCA2-SOIL-10	2.95E-02	6.87E-02	N	6.10E-02	6.35E-02	N	
SOCA2-SOIL-11	1.13E-02	6.71E-02	N	4.15E-02	6.41E-02	N	
SOCA2-SOIL-12	-2.63E-03	2.81E-02	N	1.03E-01	3.74E-02	N	
SOCA2-SOIL-13-QC	1.48E-02	3.03E-02	N	7.54E-02	3.77E-02	N	
SOCA2-SOIL-14	1.83E-02	2.95E-02	N	1.25E-01	4.96E-02	N	
SOCA2-SOIL-15	6.49E-03	3.76E-02	N	4.00E-02	4.24E-02	N	
Average	1.55E-02			7.31E-02			
SD	9.51E-03			4.69E-02			
Data Range	-2.63E-03 to	3.35E-02		1.23E-02 to	1.63E-01		

3.4.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples SOCA2-SOIL-03-D and SOCA2-SOIL-08-D are shown in Table 3-35 and Table 3-36, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-35 Duplicate Sample Analysis for SOCA2-SOIL-03-D

Duplicate Sample Assessment Form								
Survey Area Name:		SOCA2						
SAP No.:		4			Sample Location:		SOIL 3	
Sample Description:								
Duplicate count comparisons from sample measurement location 03 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-36 Duplicate Sample Analysis for SOCA2-SOIL-08-D

Duplicate Sample Assessment Form								
Survey Area Name:		SOCA2						
SAP No.:		4			Sample Location:		SOIL 8	
Sample Description:								
Duplicate count comparisons from sample measurement location 08 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions: Duplicate counts are in agreement: reported Cs-137 and Co-60 concentrations are below achieved MDC values in both counts. Comparison not required.				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples SOCA2-SOIL-06-QC and SOCA2-SOIL-13-QC are shown in Table 3-37 and Table 3-38, respectively. MDC All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

For sample SOCA2-SOIL-06-QC the off-site laboratory analysis showed detectable Cs-137 activity at an activity concentration below the on-site laboratory's MDC value. Agreement is assumed because the off-site laboratory's reported Cs-137 concentration falls between the on-site and the off-site laboratory's MDC values.

Table 3-37 On-Site/Off-Site Sample Analysis for SOCA2-SOIL-06-QC

QC Sample Assessment Form								
Survey Area Name:		SOCA2						
SAP No.:		4			Sample Location:		SOIL 6	
Sample Description:								
QC sample comparisons from sample measurement location 06 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
On-Site Co-60 & Cs-137 <MDC. Off-Site: Co-60 <MDC, but positive Cs-137 (0.0462 pCi/g; MDC = 0.0158 pCi/g). On-Site Cs-137 MDC (0.0884 pCi/g), is above the Off-Site reported Cs-137 concentration and its MDC. Agreement is accepted.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-38 On-Site/Off-Site Sample Analysis for SOCA2-SOIL-13-QC

QC Sample Assessment Form								
Survey Area Name:		SOCA2						
SAP No.:		4				Sample Location:		SOIL 13
Sample Description:								
QC sample comparisons from sample measurement location 13 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.54E-02	1.38E-02	5.5	0.5	2	7.65E-02	1.01	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Off-Site Laboratory HTD Analyses

Table 3-39 OffSite Laboratory Results for HTDs in SOCA-2 QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
SOCA2-SOIL-06-QC	Soil	Sr-90	2.08E-02	7.82E-02	N
		C-14	-9.40E-02	6.15E-01	N
		Fe-55	-9.93E+01	1.77E+02	N
		Ni-63	-8.56E+00	2.60E+01	N
		Tc-99	3.47E-01	1.57E+00	N
SOCA2-SOIL-13-QC	Soil	Sr-90	1.61E-02	1.07E-01	N
		C-14	-1.81E-02	6.08E-01	N
		Fe-55	1.34E-01	1.58E+02	N
		Ni-63	-8.98E+00	3.14E+01	N
		Tc-99	6.77E-01	1.75E+00	N

3.4.5 Survey Plan Deviations

Four sample points required relocation due to safety concerns. Sample points SOCA2-SOIL-04, -09, -11, and -15 were randomly located by VSP in wetland areas. Sample points were relocated to the nearest accessible location.

3.4.6 Survey Area Investigations

None.

3.4.7 Survey Area Conclusions

The following conclusions were reached for the SOCA-2 area:

- MARSSIM Class 3 designation is appropriate for the SOCA-2 survey area.
- Excavation or remediation of soil within the SOCA-2 area is likely not necessary for the area to meet site release criteria.

3.5 EOCA-1 (SAP 05 – OPEN LAND)

3.5.1 Area Description

EOCA-1 is the eastern portion of the Owner Controlled area. It has a 73,337 m² footprint covered with trees, vegetative growth, and asphalt asphalt-covered parking lots. It includes the Northeast Parking Lot, the Main Parking Lot, the East wooded area, and small sections of the North and South Wooded Area, as illustrated in Figure 3-5. The HSA classifies the East Wooded Area and Northeast and Main Parking Lots as a MARSSIM Class 2 area due to potential contamination releases from the isolation condensers and historical uses as a travel path for radioactive shipments. The HSA classifies the small sections of the North and South Wooded Areas as MARSSIM Class 3. Other than travel routes, EOCA1 is not likely to be impacted by D&D activities. Therefore, its radiological status is not expected to change in the future.

3.5.2 Survey Summary

Survey Date: 9/12/2022 through 9/15/2022

Survey and field activities were governed by SAP 05, *East Owner Controlled Area-1*. Planners of the EOCA-1 SAP suspected that the North Wooded Area (EOCA-1A) and the East Wooded Area and South Wooded Area (EOCA-1B) would meet MARSSIM Class 3 criteria. Therefore, survey planning included using VSP to identify 30 random sample locations consistent with MARSSIM methodology in the EOCA-1A and EOCA-1B areas (15 random samples in each area). During the walk-downs, 13 biased locations were identified for the remaining EOCA area. The boundaries of EOCA-1A and -1B and sample locations are shown in Figure 3-5.

A total of 44 samples were obtained from EOCA-1: 39 surface soil samples, 4 sediment samples, and 1 asphalt sample. GPS coordinates for as-taken sample locations are listed in Table 3-40. These samples were obtained in the following areas:

- EOCA-1A – 15 soil samples - Samples EOCA1-SOIL-01 through EOCA1-SOIL-15.
- EOCA-1B – 15 soil samples - Samples EOCA1-SOIL-16 through EOCA1-SOIL-30.
- Northeast and Main Parking Lots – 9 soil samples, 4 sediment samples, and 1 asphalt sample - Samples EOCA1-SOIL-31 through EOCA1-SOIL-43. An asphalt sample EOCA1-ASPH-41-B was obtained where the soil was covered by asphalt. The sediment samples, EOCA1-SEDI-35-B through EOCA1-SEDI-38-B, were in the vicinity of 4 storm drains in the southeastern employee parking lot.

Walk-over gamma scans were conducted at the EOCA-1 boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify the presence of elevated radioactivity. Gamma scan measurements were also conducted at each sample location. A total of 393 m² were scanned. Count rates were logged between 3,540 and 29,100 cpm at sample locations in the EOCA-1 area. The highest measurement was due to the proximity to the ISFSI pad. Scans identified no areas with an audible distinction above the location background count rate.

Table 3-40 GPS Coordinates for Sample Locations in the EOCA-1 Survey Area

Sample Number	Easting	Northing
EOCA1-SOIL-01	575681.4927	358282.9458
EOCA1-SOIL-02-D	575605.8223	358451.3582
EOCA1-SOIL-03	575662.5751	358507.4957
EOCA1-SOIL-04	575586.9048	358226.8083
EOCA1-SOIL-05	575624.7399	358251.7583
EOCA1-SOIL-06-QC	575631.8340	358307.8958
EOCA1-SOIL-07	575556.1637	358476.3082
EOCA1-SOIL-08	575707.5044	358195.6208
EOCA1-SOIL-09	575518.3285	358364.0332
EOCA1-SOIL-10-QC	575669.6692	358532.4457
EOCA1-SOIL-11	575499.4109	358438.8832
EOCA1-SOIL-12-QC	575650.7516	358158.1958
EOCA1-SOIL-13	575575.0813	358326.6083
EOCA1-SOIL-14	575612.9164	358551.1582
EOCA1-SOIL-15	575641.2928	358457.5957
EOCA1-SOIL-16	575727.8106	357726.3475
EOCA1-SOIL-17-QC	575951.8306	357585.5233
EOCA1-SOIL-18	575802.4839	357839.0069
EOCA1-SOIL-19	576101.1774	357416.5342
EOCA1-SOIL-20	575914.4940	357923.5014
EOCA1-SOIL-21	575765.1472	357501.0288
EOCA1-SOIL-22	575690.4739	358007.9959
EOCA1-SOIL-23	575839.8206	357538.5819
EOCA1-SOIL-24-D	575895.8256	357623.0764
EOCA1-SOIL-25	575746.4789	357876.5600
EOCA1-SOIL-26-D	576045.1723	357454.0874
EOCA1-SOIL-27	575671.8055	357707.5709
EOCA1-SOIL-28-QC	575634.4689	357820.2303
EOCA1-SOIL-29	575783.8156	357651.2413
EOCA1-SOIL-30	575709.1422	357482.2522
EOCA1-SOIL-31-B	575493.9878	357124.2337
EOCA1-SOIL-32-B	575559.0088	357423.4646
EOCA1-SOIL-33-B-D	575580.9836	357369.4031
EOCA1-SOIL-34-B-QC	575936.9564	357466.3570
EOCA1-SEDI-35-B	575861.3894	357384.6116
EOCA1-SEDI-36-B	575983.2947	357415.9790
EOCA1-SEDI-37-B	575901.0740	357264.3698
EOCA1-SEDI-38-B	576018.4642	357298.1135
EOCA1-SOIL-39-B	575612.5887	357535.2703
EOCA1-SOIL-40-B	575556.0323	357854.1725

SECTION THREE

Radiological Findings

Sample Number	Easting	Northing
EOCA1-ASPH-41-B	575228.1001	358437.0839
EOCA1-SOIL-41-B		
EOCA1-SOIL-42-B-QC	575480.0000	358237.0000
EOCA1-SOIL-43-B	575346.2032	358527.8593

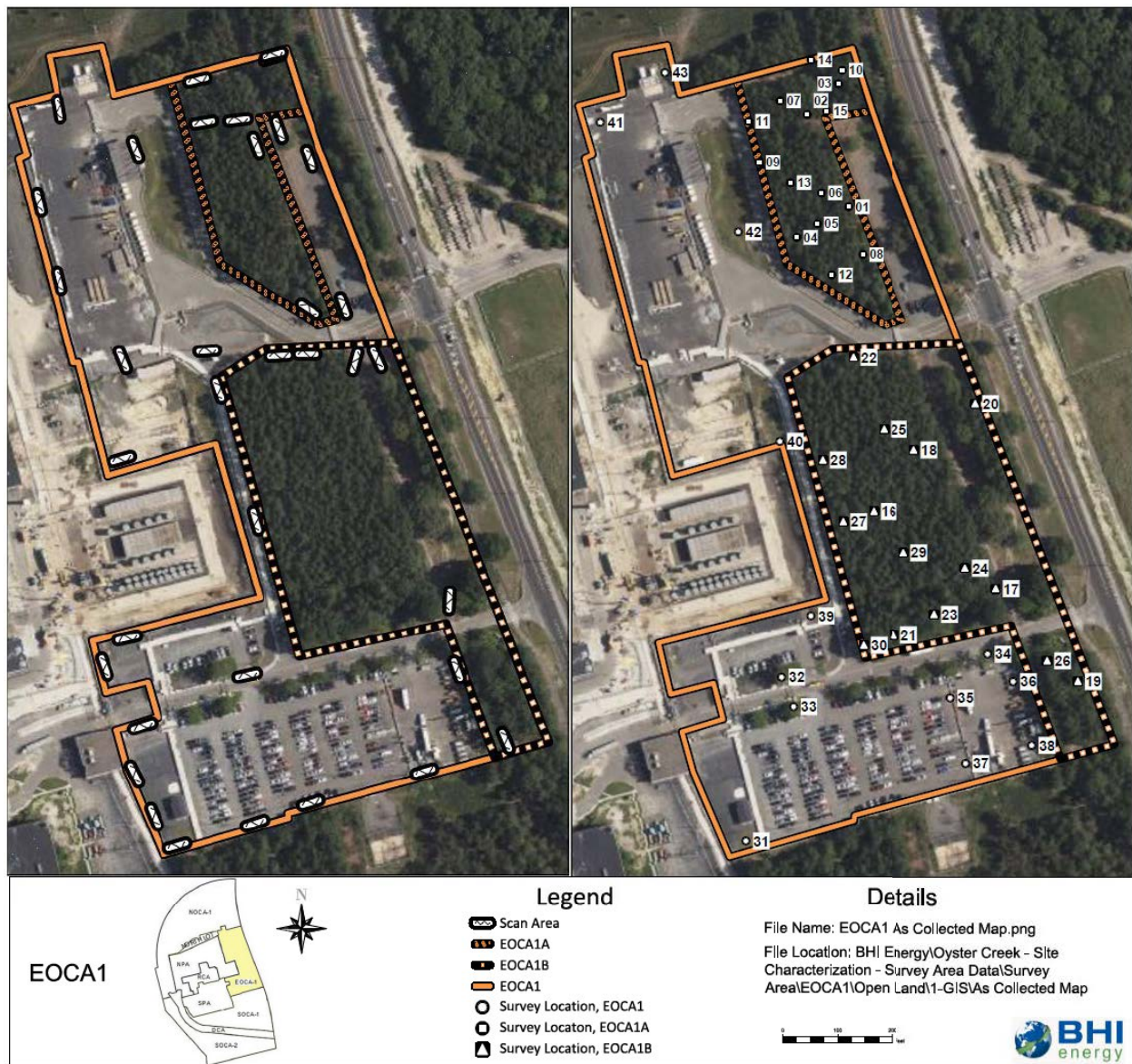


Figure 3-5 EOCA-1 Survey Area and Sample Locations

3.5.3 Survey Data Summary:

Discussion

Twenty-eight of the 44 samples collected from EOCA-1 contained low concentrations of Cs-137.

Fifteen samples were collected from the EOCA-1A area (EOCA1-SOIL-1 through EOCA1-SOIL-15), 9 contained low concentrations of Cs-137. The results are provided in Table 3-41. The positive Cs-137 results ranged from 4.93E-02 pCi/g to 2.49E-01 pCi/g, which is less than 9% of the AC for Cs-137 (2.88E+00 pCi/g). Co-60 was not detected in the EOCA-1A soil samples.

Fifteen samples were collected from EOCA-1B (EOCA1-SOIL-16 through EOCA1-SOIL-30), 12 contained low concentrations of Cs-137. The positive Cs-137 results ranged from 4.12E-02 pCi/g to 2.18E-1 pCi/g, which is less than 8% of the Class 2 AC for Cs-137. Co-60 was not detected in the EOCA-1B soil samples. The results are provided in Table 3-41.

Thirteen samples were collected from 13 locations in the remaining EOCA1 area 8 soil, 4 sediments, and 1 asphalt. The soil sample results are provided in Table 3-41, the sediment samples in Table 3-42, and the asphalt result is in Table 3-43. Six soil samples contained low levels of Cs-137. The positive Cs-137 results ranged from 6.96E-02 pCi/g to 2.85E-01 pCi/g, which is less than 10% of the Class 2 AC for Cs-137. Co-60 was not detected in any of the samples.

One of the 4 sediment samples collected around the drains in the employee parking lot (EOCA1-SEDI-35-B) contained low concentrations of Cs-137 and Co-60. However, the measured Cs-137 and Co-60 concentrations were small percentages of the respective Class 2 ACs (less than 3% and 10%, respectively). Results for the other 3 sediment samples confirmed that widespread contamination is not present in the lot. The asphalt sample results are provided in Table 3-42.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the EOCA-1 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-56, those analyses did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-41 On-Site Laboratory Gamma Analysis Results for EOCA-1 Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		EOCA1	Number of Samples:		43	
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
EOCA1-SOIL-1	6.81E-03	2.92E-02	N	1.49E-01	4.48E-02	N
EOCA1-SOIL-2-D	4.29E-02	1.21E-01	N	2.24E-01	1.36E-01	N
EOCA1-SOIL-3	2.81E-02	3.61E-02	N	6.84E-02	5.37E-02	N
EOCA1-SOIL-4	1.52E-02	4.75E-02	N	2.49E-01	7.14E-02	N
EOCA1-SOIL-5	1.94E-02	4.89E-02	N	1.60E-01	4.83E-02	N
EOCA1-SOIL-6-QC	1.21E-02	3.15E-02	N	6.43E-02	4.64E-02	N
EOCA1-SOIL-7	-2.06E-02	2.84E-02	N	4.93E-02	3.93E-02	N
EOCA1-SOIL-8	-2.96E-03	4.46E-02	N	3.27E-02	7.63E-02	N
EOCA1-SOIL-9	1.75E-02	3.90E-02	N	2.58E-02	7.06E-02	N
EOCA1-SOIL-10-QC	9.42E-03	4.16E-02	N	2.13E-01	4.14E-02	N
EOCA1-SOIL-11	3.56E-03	5.40E-02	N	2.55E-02	5.60E-02	N
EOCA1-SOIL-12-QC	1.47E-02	5.16E-02	N	4.08E-02	5.32E-02	N
EOCA1-SOIL-13	-1.10E-02	3.03E-02	N	1.59E-01	5.13E-02	N
EOCA1-SOIL-14	3.45E-02	4.50E-02	N	4.61E-02	7.56E-02	N
EOCA1-SOIL-15	9.35E-03	4.65E-02	N	4.36E-02	7.20E-02	N
EOCA1-SOIL-16	-1.68E-02	5.02E-02	N	2.15E-01	6.53E-02	N
EOCA1-SOIL-17-QC	2.23E-02	4.50E-02	N	1.79E-01	6.46E-02	N
EOCA1-SOIL-18	1.41E-03	2.52E-02	N	3.47E-02	3.49E-02	N
EOCA1-SOIL-19	8.54E-03	4.70E-02	N	8.40E-02	5.54E-02	N
EOCA1-SOIL-20-D	1.48E-02	4.05E-02	N	4.99E-02	4.83E-02	N
EOCA1-SOIL-21	2.57E-02	4.36E-02	N	2.18E-01	5.71E-02	N
EOCA1-SOIL-22	2.82E-02	8.30E-02	N	4.03E-02	1.21E-01	N
EOCA1-SOIL-23	3.03E-03	2.81E-02	N	1.13E-01	5.30E-02	N
EOCA1-SOIL-24-D	5.84E-03	4.62E-02	N	7.65E-02	3.67E-02	N
EOCA1-SOIL-25	6.56E-03	3.08E-02	N	7.32E-02	4.98E-02	N
EOCA1-SOIL-26-D	4.34E-02	6.78E-02	N	7.69E-02	7.00E-02	N

Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		EOCA1		Number of Samples:		43
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
EOCA1-SOIL-27	1.32E-02	4.63E-02	N	1.97E-01	5.52E-02	N
EOCA1-SOIL-28-QC	-1.13E-02	3.40E-02	N	4.12E-02	3.94E-02	N
EOCA1-SOIL-29	-2.01E-03	3.47E-02	N	2.86E-02	5.17E-02	N
EOCA1-SOIL-30	3.80E-03	3.15E-02	N	1.60E-01	5.21E-02	N
EOCA1-SOIL-31-B	3.65E-03	5.13E-02	N	6.96E-02	5.49E-02	N
EOCA1-SOIL-32-B	2.29E-03	7.38E-02	N	2.85E-01	8.50E-02	N
EOCA1-SOIL-33-B-D	-1.11E-02	6.64E-02	N	1.45E-01	7.67E-02	N
EOCA1-SOIL-34-B-QC	2.41E-02	6.53E-02	N	7.04E-02	5.74E-02	N
EOCA1-SOIL-39-B	1.75E-02	7.10E-02	N	8.95E-02	4.94E-02	N
EOCA1-SOIL-40-B	6.01E-03	5.32E-02	N	1.56E-01	4.30E-02	N
EOCA1-SOIL-41-B	3.25E-02	4.53E-02	N	-1.11E-03	5.24E-02	N
EOCA1-SOIL-42-B-QC	1.46E-03	3.70E-02	N	1.79E-02	6.40E-02	N
EOCA1-SOIL-43-B	-1.09E-03	3.30E-02	N	3.46E-02	7.01E-02	N
Average	1.03E-02			1.03E-01		
SD	1.51E-02			7.60E-02		
Data Range	-2.06E-02 to	4.34E-02		-1.11E-03 to	2.85E-01	

Table 3-42 On-Site Laboratory Gamma Analysis Results for EOCA-1 Sediment Samples

Sediment (SEDI) Sample Gamma Spec - Data Quality Assessment						
Survey Area:		EOCA1		Number of Samples:		4
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
EOCA1-SEDI-35-B	1.13E-01	2.91E-02	N	6.60E-02	5.78E-02	N
EOCA1-SEDI-36-B	2.82E-02	6.25E-02	N	2.43E-02	6.90E-02	N
EOCA1-SEDI-37-B	6.28E-02	8.56E-02	N	3.66E-02	6.41E-02	N
EOCA1-SEDI-38-B	2.25E-02	6.99E-02	N	1.08E-02	6.33E-02	N
Average	5.66E-02			3.44E-02		
SD	4.16E-02			2.35E-02		
Data Range	2.25E-02 to	1.13E-01		1.08E-02 to	6.60E-02	

Table 3-43 On-Site Laboratory Gamma Analysis Results for EOCA-1 Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment						
Survey Area:		EOCA1		Number of Samples:		1
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
EOCA1-ASPH-41-B	3.32E-03	8.22E-02	N	3.59E-02	9.43E-02	N
Average						
SD						
Data Range		to			to	

3.5.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples EOCA1-SOIL-02-D, EOCA1-SOIL-20-D, EOCA1-SOIL-24-D, EOCA1-SOIL-26-D, and EOCA1-SOIL-33-B-D are shown in Table 3-44, Table 3-45, Table 3-46, Table 3-47, and Table 3-48 respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

Table 3-44 Duplicate Sample Analysis for EOCA1-SOIL-02-D

Duplicate Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 2
Sample Description:								
Duplicate count comparisons from sample measurement location 02 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	2.24E-01	3.98E-02	5.6	0.5	2	1.87E-01	0.83	Y
Co-60								
Comments/Corrective Actions: Both On-Site Lab results for Co60 <MDC					Resolution Range for Sample Recount Comparison ¹ :			
					Resolution (d)		Agreement Range (e)	
					Min	Max	Min	Max
					0	<4	0.4	2.5
					4	<8	0.5	2
					8	<16	0.6	1.66
					16	<51	0.75	1.33
					51	200	0.8	1.25
					>200		0.85	1.18

Table 3-45 Duplicate Sample Analysis for EOCA1-SOIL-20-D

Duplicate Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 20
Sample Description:								
Duplicate count comparisons from sample measurement location 20 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	4.99E-02	1.36E-02	3.7	0.4	2.5	7.18E-02	1.44	Y
Co-60								
Comments/Corrective Actions: Both On-Site Lab results for Co60 <MDC					Resolution Range for Sample Recount Comparison ¹ :			
					Resolution (d)		Agreement Range (e)	
					Min	Max	Min	Max
					0	<4	0.4	2.5
					4	<8	0.5	2
					8	<16	0.6	1.66
					16	<51	0.75	1.33
					51	200	0.8	1.25
					>200		0.85	1.18

Table 3-46 Duplicate Sample Analysis for EOCA1-SOIL-24-D

Duplicate Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 24
Sample Description:								
Duplicate count comparisons from sample measurement location 24 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.65E-02	1.37E-02	5.6	0.5	2	1.21E-01	1.58	Y
Co-60								
Comments/Corrective Actions: Both On-Site Lab results for Co60 <MDC				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

Table 3-47 Duplicate Sample Analysis for EOCA1-SOIL-26-D

Duplicate Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 26
Sample Description:								
Duplicate count comparisons from sample measurement location 26 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.69E-02	2.06E-02	3.7	0.4	2.5	1.09E-01	1.42	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site Lab results for Co60 <MDC				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-48 Duplicate Sample Analysis for EOCA1-SOIL-33-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 33
Sample Description:								
Duplicate count comparisons from sample measurement location 33 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	1.45E-01	2.47E-02	5.9	0.5	2	1.53E-01	1.06	Y
Co-60								
Comments/Corrective Actions: Both On-Site Lab results for Co60 <MDC				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples EOCA1-SOIL-06-QC, EOCA1-SOIL-10-QC, EOCA1-SOIL-12-QC, EOCA1-SOIL-17-QC, EOCA1-SOIL-28-QC, EOCA1-SOIL-34-B-QC, and EOCA1-SOIL-42-B-QC are shown in Table 3-49, Table 3-50, Table 3-51, Table 3-52, Table 3-53, Table 3-54, and Table 3-55 respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

For sample EOCA1-SOIL-12-QC the off-site laboratory analysis showed detectable Cs-137 activity at an activity concentration below the on-site laboratory's MDC value. Agreement is assumed because the Cs-137 concentration reported off-site laboratory falls between the on-site and the off-site laboratory's MDC values.

Table 3-49 QC Sample Analysis for EOCA1-SOIL-06-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 06
Sample Description:								
QC sample comparisons from sample measurement location 06 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE						OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	6.43E-02	1.46E-02	4.4	0.5	2	4.39E-02	0.68	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-50 QC Sample Analysis for EOCA1-SOIL-10-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 10
Sample Description:								
QC sample comparisons from sample measurement location 10 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	2.13E-01	2.34E-02	9.1	0.6	1.66	1.79E-01	0.84	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-51 QC Sample Analysis for EOCA1-SOIL-12-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 12
Sample Description:								
QC sample comparisons from sample measurement location 12 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
On-Site Co-60 & Cs-137 <MDC. Off-Site: Co-60 <MDC, but positive Cs-137 (0.0498 pCi/g; MDC = 0.0175 pCi/g). On-Site Cs-137 MDC (0.0532 pCi/g), is above the Off-Site reported Cs-137 concentration and its MDC. Agreement is accepted.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-52 QC Sample Analysis for EOCA1-SOIL-17-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 17
Sample Description:								
QC sample comparisons from sample measurement location 17 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	1.79E-01	2.39E-02	7.5	0.5	2	1.95E-01	1.09	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-53 QC Sample Analysis for EOCA1-SOIL-28-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 28
Sample Description:								
QC sample comparisons from sample measurement location 28 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	4.12E-02	1.16E-02	3.6	0.4	2.5	4.15E-02	1.01	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-54 QC Sample Analysis for EOCA1-SOIL-34-B-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL 34
Sample Description:								
QC sample comparisons from sample measurement location 34 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE						OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.04E-02	1.72E-02	4.1	0.5	2	8.81E-02	1.25	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-55 QC Sample Analysis for EOCA1-SOIL-42-B-QC

QC Sample Assessment Form								
Survey Area Name:		EOCA1						
SAP No.:		5				Sample Location:		SOIL-42
Sample Description:								
QC sample comparisons from sample measurement location 42 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
On-Site & Off-Site Lab results <MDC for both Co-60 and Cs-137 - no comparison required.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Off-Site Laboratory HTD Analyses

Table 3-56 Off-Site Laboratory Results for HTDs in EOCA-1 QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
EOCA1-SOIL-06-QC	Soil	Sr-90	4.96E-02	9.83E-02	N
		C-14	-2.73E-01	1.06E+00	N
		Fe-55	9.72E+00	1.47E+02	N
		Ni-63	-4.24E+00	3.35E+01	N
		Tc-99	2.05E-01	2.30E+00	N
EOCA1-SOIL-10-QC	Soil	Sr-90	6.23E-03	4.91E-02	N
		C-14	-3.31E-02	1.05E+00	N
		Fe-55	1.32E+02	1.99E+02	N
		Ni-63	4.55E+00	3.99E+01	N
		Tc-99	4.79E-01	2.20E+00	N
EOCA1-SOIL-12-QC	Soil	Sr-90	2.23E-02	7.60E-02	N
		C-14	7.44E-02	1.06E+00	N
		Fe-55	2.58E+01	1.08E+02	N
		Ni-63	-8.04E+00	2.59E+01	N
		Tc-99	1.00E+00	2.16E+00	N
EOCA1-SOIL-17-QC	Soil	Sr-90	5.10E-03	6.12E-02	N
		C-14	4.90E-01	1.08E+00	N
		Fe-55	1.17E+02	2.47E+02	N
		Ni-63	-9.24E-01	3.67E+01	N
		Tc-99	1.27E+00	2.13E+00	N
EOCA1-SOIL-28-QC	Soil	Sr-90	-4.40E-03	7.97E-02	N
		C-14	1.17E-02	6.14E-01	N
		Fe-55	6.32E+01	2.42E+02	N
		Ni-63	-4.05E+00	2.25E+01	N
		Tc-99	1.29E+00	1.86E+00	N
EOCA1-SOIL-34-B-QC	Soil	Sr-90	-1.88E-03	5.92E-02	N
		C-14	1.70E-01	1.06E+00	N
		Fe-55	1.09E+02	1.87E+02	N
		Ni-63	-4.35E+00	3.53E+01	N
		Tc-99	3.20E+00	3.54E+00	N
EOCA1-SOIL-42-B-QC	Soil	Sr-90	2.74E-02	4.13E-02	N
		C-14	2.25E-03	6.12E-01	N
		Fe-55	-5.18E+00	1.03E+02	N
		Ni-63	-1.11E+01	2.55E+01	N
		Tc-99	-4.45E-03	1.70E+00	N

3.5.5 Survey Plan Deviation(s)

Four sample points required relocation due to safety concerns. Sample points SOCA2-SOIL-04, -09, -11, and -15 were randomly located by VSP in wetland areas. Sample points were relocated to the nearest accessible location on the bank/berm of the water hazard.

3.5.6 Survey Area Investigations

None.

3.5.7 Survey Area Conclusions

The following conclusions were reached in the EOCA1 area:

- MARSSIM Class 2 designation is appropriate for the waste travel routes within the EOCA-1 boundary.
- EOCA-1A and EOCA-1B should be established as separate MARSSIM Class 3 areas. Residual plant-related contamination in the survey area meets the criteria in NUREG-1575 for a MARSSIM Class 3 area.
- Excavation or remediation of soil within EOCA1 Class 3 areas is likely not necessary to meet site release criteria.

3.6 NPA (SAP 06 – OPEN LAND)

3.6.1 Area Description

NPA is north of the Radiologically Controlled Area (RCA) inside the Protected Area (PA). It includes the area between the RCA and the north parking lot and is illustrated in Figure 3-6. Its 73,931 m² footprint consists of asphalt-covered roadways, concrete pads, buildings, and structures. The NPA has been located outside the RCA since 1979. When the NPA was situated inside the RCA, it was used to store trucks, boxes, and equipment. Several locations were identified to be above the release criteria when surveying the area for release from the RCA. These areas were remediated by removing the contaminated soil from the area. Approximately 1,000 yd³ of soil with potential tritium contamination was relocated to this area beginning in 2009. The soil was deposited in two locations: 1) north of the Warehouse and 2) east within the PA fence by Gate 8.

3.6.2 Survey Summary

Survey Dates: 8/23/2022 through 9/27/2022

Survey and field activities were governed by SAP 06, *North Protected Area*. Planners of the SAP identified 13 sample locations where plant-related radioactivity might have been introduced from other areas. One sample point, NPA-SEDI-12-B, was relocated due to industrial safety concerns. An alternative sample location was selected close to the original point and where representative samples could be safely collected. The sample locations are shown in Figure 3-6. GPS coordinates for an alternate sample location were recorded during sampling to document the new location. One additional sample point, NPA-XXX-03-B, was canceled due to the presence of underground utilities and could not be safely collected as planned. The sample point was evaluated for relocation, and it was determined that due to the distance the sample would have to be moved, the intended purpose of the biased sample location would be lost. Following the initial walk-down and bias point selections, a water main break resulted in a significant erosion of soil. This location NPA-SOIL-16-B was selected following initial planning for sampling due to soil exposure. GPS coordinates for the sample location were recorded during sampling to document the location. GPS coordinates for as-taken sample locations are listed in Table 3-57.

A total of 16 samples were obtained from the NPA area: 8 soil samples, 7 sediment samples, and 1 asphalt sample. All sediment sample locations were chosen based on facility walk-downs and the identification of water runoff pathways. An asphalt sample was obtained at the location where the soil was covered by asphalt, EOCA1-ASPH-41-B.

Walk-over gamma scans were conducted at the NPA boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify the presence of elevated radioactivity. Gamma scan measurements were also conducted at each sample location. A total of 145 m² were scanned. Count rates were logged between 8,490 and 45,400 cpm at sample locations in the NPA area. The highest measurement was due to the proximity to the LLRW truck bay, where a resin liner was loaded into a shipping cask. The gamma scans performed in the NPA survey area did not identify elevated radioactivity requiring further investigation.

Table 3-57 GPS Coordinates for Sample Locations in the NPA Survey Area

Sample Number	Easting	Northing
NPA-SOIL-01-B	574549.7462	357327.0427
NPA-SEDI-02-B-D	574470.9219	357316.4957
NPA-SOIL-03-B ¹	574424.8485	357320.3815
NPA-DEP1-03-B		
NPA-DEP2-03-B		
NPA-SOIL-04-B-QC	574514.2197	357753.6377
NPA-SEDI-05-B	574289.4039	357827.7436
NPA-SEDI-06-B	574256.0978	357834.6824
NPA-SEDI-07-B	574437.8934	357955.9719
NPA-SOIL-08-B	574630.2358	357821.6375
NPA-SOIL-09-B	574716.2764	357870.4864
NPA-SOIL-10-B-D	574891.1332	357876.5925
NPA-SEDI-11-B	574931.1005	357902.6822
NPA-SEDI-12-B	575106.5123	358151.9225
NPA-SEDI-13-B	575137.5980	358056.4452
NPA-ASPH-14-B	575185.6142	358199.3836
NPA-SOIL-14-B-QC		
NPA-SOIL-15-B	575316.6180	357840.7885
NPA-SOIL-16-B	574451.1748	357360.4037

Note ¹: See Survey Plan Deviations

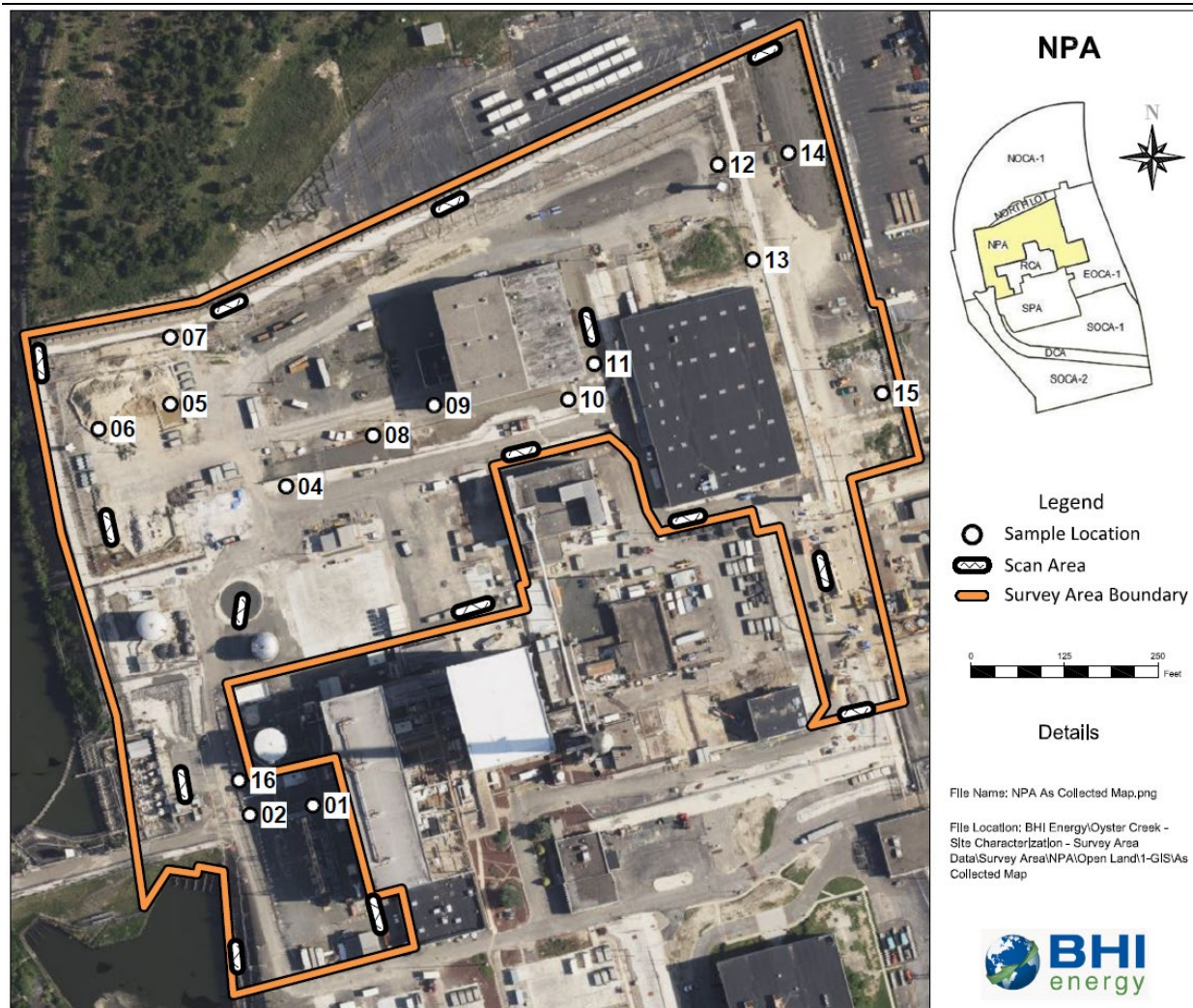


Figure 3-6 NPA Survey Area and Sample Locations

3.6.3 Survey Data Summary

Discussion

Cesium-137 concentrations are less than the achieved MDC values for most NPA samples. However, Cs-137 was detected at concentrations greater than the MDC values in 4 samples (NPA-SOIL-09-B, NPA-SEDI-07-B, NPA-SEDI-11-B, and NPA-SEDI-12-B). The four samples were comprised of 1 surface soil sample and 3 sediment samples. Results can be seen in Table 3-58, Table 3-59, and Table 3-60. The positive findings are all less than 3.39E-01 pCi/g, which is less than 12% of the Class 2 AC for Cs-137 (2.88E+00 pCi/g).

Cobalt-60 concentrations are less than the achieved MDC values for most NPA samples. However, Co-60 was detected at concentrations greater than the MDC values in 2 samples (NPA-SEDI-02-B-D and NPA-SEDI-11-B); both samples were sediment samples. Results can be seen in Table 3-59. The positive

findings are all less than 1.24E-01 pCi/g, which is less than 11% of the Class 2 AC for Co-60 (1.22E+00 pCi/g). Cobalt-60 was not detected in any of the soil samples.

Both Co-60 and Cs-137 concentrations for asphalt samples can be seen in Table 3-60 and are less than the achieved MDC values.

The collected site characterization data provides a snapshot of the current radiological status of the NPA, which may change as the demolition of buildings and structures within the NPA and decommissioning of the OCNCS site precedes. It may be necessary to update the radiological status of the NPA with additional characterization surveys to support FSS planning following the active decommissioning of the site.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, Tc-99, and Pu-241) in the NPA survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-65, those analyses did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-58 On-Site Laboratory Gamma Analysis Results for NPA Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment							
Survey Area: Initial Classification:		NPA		Number of Samples:		8	
		Class 2					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured	Achieved	AC Exceeded	Measured	Achieved	AC Exceeded	
	Activity	MDC Value		Data	MDC Value		
	(pCi/g)	(pCi/g)	(Y/N)	(pCi/g)	(pCi/g)	(Y/N)	
NPA-SOIL-1-B	6.93E-04	5.74E-02	N	2.42E-02	4.25E-02	N	
NPA-SOIL-4-B-QC	-9.91E-04	4.28E-02	N	2.56E-02	7.84E-02	N	
NPA-SOIL-8-B	9.78E-03	4.75E-02	N	1.69E-02	4.02E-02	N	
NPA-SOIL-9-B	4.32E-02	4.51E-02	N	6.36E-02	4.56E-02	N	
NPA-SOIL-10-B-D	2.82E-02	5.13E-02	N	2.05E-02	6.94E-02	N	
NPA-SOIL-14-B-QC	-1.46E-04	3.01E-02	N	2.76E-02	7.39E-02	N	
NPA-SOIL-15-B	-1.14E-02	4.52E-02	N	2.23E-02	5.90E-02	N	
NPA-SOIL-16-B	1.04E-02	5.86E-02	N	4.08E-02	7.49E-02	N	
Average SD	9.97E-03			3.02E-02			
	1.77E-02			1.52E-02			
Data Range	-1.14E-02 to	4.32E-02		1.69E-02 to	6.36E-02		

Table 3-59 On-Site Laboratory Gamma Analysis Results for NPA Sediment Samples

Sediment Sample Gamma Spec - Data Quality Assessment						
Survey Area:	NPA		Number of Samples:		7	
Initial Classification:	Class 2					
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NPA-SEDI-2-B-D	6.72E-02	4.63E-02	N	5.22E-02	5.67E-02	N
NPA-SEDI-5-B	5.11E-03	4.75E-02	N	1.56E-02	7.03E-02	N
NPA-SEDI-6-B	1.13E-02	3.93E-02	N	-4.96E-03	5.93E-02	N
NPA-SEDI-7-B	4.18E-02	1.24E-01	N	3.39E-01	1.04E-01	N
NPA-SEDI-11-B	1.24E-01	2.93E-02	N	1.93E-01	5.18E-02	N
NPA-SEDI-12-B	4.18E-02	7.01E-02	N	1.91E-01	7.30E-02	N
NPA-SEDI-13-B	-2.46E-02	3.15E-02	N	2.30E-02	7.00E-02	N
Average	3.81E-02			1.16E-01		
SD	4.83E-02			1.28E-01		
Data Range	-2.46E-02 to	1.24E-01		-4.96E-03 to	3.39E-01	

Table 3-60 On-Site Laboratory Gamma Analysis Results for NPA Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment						
Survey Area:		NPA		Number of Samples:		1
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
NPA-ASPH-14-B	-2.12E-02	6.38E-02	n/a	1.08E-02	7.14E-02	n/a
Average						
SD						
Data Range		to			to	

3.6.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples NPA-SEDI-02-B-D and NPA-SEDI-10-B-D are shown in Table 3-61 and Table 3-62, respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value., respectively.

Table 3-61 Duplicate Sample Analysis for NPA-SEDI-02-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		NPA						
SAP No.:		6				Sample Location:		SEDI 2
Sample Description:								
Duplicate count comparisons from sample measurement location 02 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	5.22E-02	1.50E-02	3.5	0.4	2.5	5.23E-02	1.00	Y
Co-60	6.72E-02	1.22E-02	5.5	0.5	2	9.42E-02	1.40	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
	>200		0.85	1.18				

Table 3-62 Duplicate Sample Analysis for NPA-SOIL-10-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		NPA						
SAP No.:		6				Sample Location:		SOIL 10
Sample Description:								
Duplicate count comparisons from sample measurement location 10 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site Lab results for Co60 and Cs-137 <MDC. No Comparison Required				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples NPA-SOIL-04-B-QC and NPA-SOIL-14-B-QC are shown in Table 3-63 and Table 3-64, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-63 On-Site/Off-Site Sample Analysis for NPA-SOIL-04-B-QC

QC Sample Assessment Form								
Survey Area Name:		NPA						
SAP No.:		6			Sample Location:		SOIL 4	
Sample Description:								
QC sample comparisons from sample measurement location 04 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 and Cs-137 <MDC. No Comparison Required				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-64 On-Site/Off-Site Sample Analysis for NPA-SOIL-14-B-QC

QC Sample Assessment Form							
Survey Area Name:		NPA					
SAP No.:		6			Sample Location:		SOIL 14
Sample Description:							
QC sample comparisons from sample measurement location 14 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Both On-Site and Off-Site Lab results for Co-60 and Cs-137 <MDC. No Comparison Required				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<51	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Off-Site Laboratory HTD Analyses

Table 3-65 Off-Site Laboratory Results for HTDs in NPA QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
NPA-SOIL-04-B-QC	Soil	Sr-90	2.08E-03	6.30E-02	N
		C-14	-6.22E-03	1.04E+00	N
		Fe-55	6.14E+01	1.21E+02	N
		Ni-63	6.81E+00	3.44E+01	N
		Tc-99	1.72E-01	2.15E+00	N
		Pu-241	8.05E+00	4.20E+01	N
NPA-SOIL-14-B-QC	Soil	Sr-90	2.47E-02	4.98E-02	N
		C-14	8.14E-02	1.07E+00	N
		Fe-55	8.58E+01	1.79E+02	N
		Ni-63	4.29E+00	2.89E+01	N
		Tc-99	-5.72E-01	2.28E+00	N
		Pu-241	3.34E+01	4.19E+01	N

3.6.5 Survey Plan Deviations

One sample point required a deviation due to safety concerns. Sample point NPA-XXX-03-B was located over underground utilities. The sample point was evaluated for relocation; it was determined that due to the distance the sample would have to be moved, the intended purpose of the biased sample location would be lost.

3.6.6 Survey Area Investigations

None.

3.6.7 Survey Area Conclusions

The following conclusions were reached for the NPA survey area:

- The Cs-137 and Co-60 concentrations found in NPA samples do not require excavation or remediation to meet site release criteria at this time. The current radiological status may change as active decommissioning of the site commences.
- Radiological status changes may warrant additional site characterization collection to support FSS planning.
- Additional characterization in yard areas, including walk-over gamma scans and soil sampling, should be considered when the waste containers are removed.

3.7 SPA (SAP 08 – OPEN LAND)

3.7.1 Area Description

SPA is located south of the Radiologically Controlled Area inside the Protected Area. Illustrated in Figure 3-7, it encompasses the area between the RCA and the south parking lot. Its 51,255 m² footprint comprises asphalt-covered roadways, unused parking areas, concrete pads, buildings, and structures. Migration of contaminated soil or resin in this area is suspected of having occurred, particularly in the north along the RCA fence. Soil samples collected between the Main Fuel Oil Tank (MFOT) and the RCA fence in late summer 1999 showed detectable radioactivity below the release criteria to a depth of 3 feet. Contaminated soil was stored in the berms around the MFOT. Historical records indicate soil contamination has been identified in the southwest corner of the augmented off-gas building (AOG) at the RCA boundary, possibly under the asphalt.

There are several vaults located along the southern wall of the Reactor Building. These vaults were used as a form of secondary containment for pipes. Radioactive material is routinely transported through the area.

3.7.2 Survey Summary:

Survey Dates: 8/17/2022 through 8/18/2022

Survey and field activities were governed by SAP 08, *South Protected Area*. Planners of the SAP identified 16 biased sample locations where plant-related radioactivity might have been introduced from other areas. The sample locations are shown in Figure 3-7

A total of 24 samples were obtained from the SPA area; 12 soil samples, 6 sediment samples, 4 asphalt samples, and 2 samples at depths greater than 6 inches. Sediment sample locations (SPA-SEDI-02-B-QC, -04-B, -06-B, and -11-B) were chosen based on facility walk-downs and the identification of water runoff paths. Sediment samples (SPA-SEDI-02-B-QC, -04-B, and -06-B) were planned as soil samples during the original walk down; however, when the team attempted to obtain the soil samples, the material was not soil but sediment that had filled depressions in the asphalt (SPA-SEDI-02-B-QC and SPA-SEDI-04-B) or sediment that covered concrete (SPA-SEDI-06-B). Samples SPA-SEDI-13-B, SPA-ASPH-13-B, SPA-ASPH-16-B, and SPA-SEDI-16-B were added to the originally planned samples because the original walk-down identified the location as soil; these samples were obtained to reach the soil samples below. The 2 remaining asphalt samples, SPA-ASPH-10-B and SPA-ASPH-12-B, were obtained where asphalt covered the soil. Locations of samples greater than 6 inches (SPA-DEP1-15-B and SPA-SSUB-16-B) were selected due to the proximity to piping vaults and to check for potential subsurface migration of contamination, respectively. Sample SPA-SSUB-16-B was initially intended to be taken at a depth between 6 and 48 inches; however, resistance was met at a depth of 12 inches, so the sample was given the designator of SSUB, not DEP1. GPS coordinates for as-taken sample locations are listed in Table 3-66.

Walk-over gamma scans were conducted at the SPA boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify the presence of elevated radioactivity. Gamma scan measurements were also conducted at each sample location. A total of 106 m² was scanned. Count rates were logged between 4,670 and 16,7000 cpm at sample locations in the SPA area. The highest measurement was due to the proximity of radioactive material

SECTION THREE

Radiological Findings

stored in the nearby RCA. The gamma scans performed in the SPA survey area did not identify elevated radioactivity requiring further investigation. Scans identified no areas with an audible distinction above the location background count rate, except as noted above.

Table 3-66 GPS Coordinates for Sample Locations in the SPA Survey Area

Sample Number	Easting	Northing
SPA-SOIL-01-B-D	575476.8132	356905.9381
SPA-SEDI-02-B-QC	575325.8257	356869.8565
SPA-SOIL-03-B	575406.3154	356958.6727
SPA-SEDI-04-B	575332.4870	356904.2728
SPA-SOIL-05-B	575057.7120	356899.8320
SPA-SEDI-06-B-D	575002.2020	356985.3175
SPA-SOIL-07-B	574890.0716	357027.5052
SPA-SOIL-08-B	574799.5901	356922.0360
SPA-SOIL-09-B	574573.1090	357099.1132
SPA-ASPH-10-B	574841.2227	357175.1620
SPA-SOIL-10-B		
SPA-SEDI-11-B	574820.1289	357136.8600
SPA-ASPH-12-B	574888.9614	357330.5902
SPA-SOIL-12-B-QC		
SPA-SEDI-13-B	575170.9526	357411.6350
SPA-ASPH-13-B		
SPA-SOIL-13-B		
SPA-SOIL-14-B	575112.6670	357290.0679
SPA-SOIL-15-B	574794.5942	357187.3742
SPA-DEP1-15-B		
SPA-SEDI-16-B	574755.7372	357062.7541
SPA-ASPH-16-B		
SPA-SOIL-16-B		
SPA-SSUB-16-B		

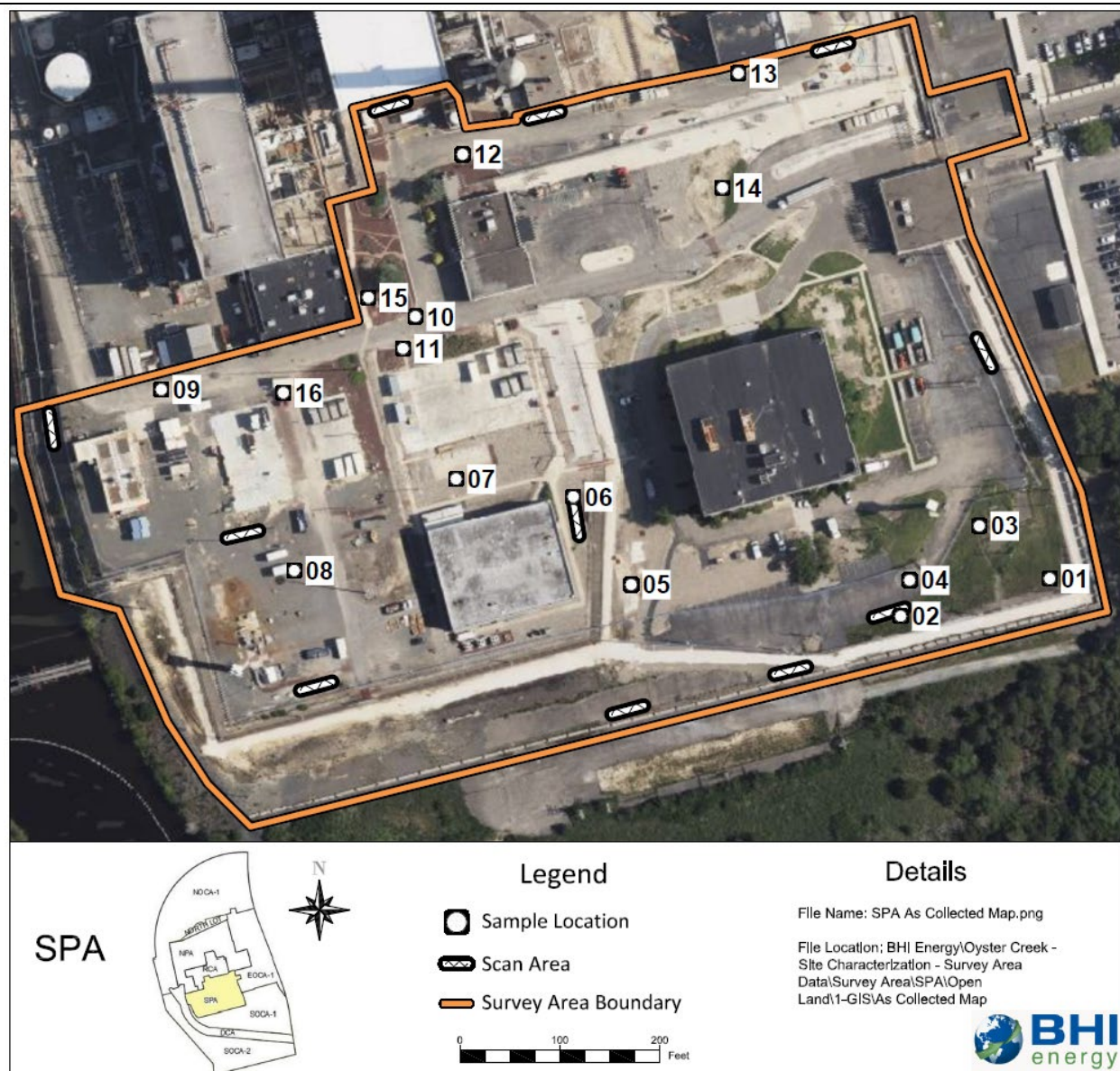


Figure 3-7 SPA Survey Area and Sample Locations

3.7.3 Survey Data Summary

Discussion

Cesium-137 concentrations were less than the achieved MDC values for most (58%) SPA samples. However, Cs-137 was detected at concentrations greater than the MDC values in 10 samples (6 soil samples, 2 sediment samples, 1 asphalt sample, and 1 subsurface sample). The 10 samples are SPA-SOIL-01-B-D, SPA-SOIL-08-B, SPA-SOIL-10-B, SPA-SOIL-13-B, SPA-SOIL-14-B, SPA-SOIL-16-B, SPA-SEDI-02-B-QC, SPA-SEDI-04-B, SPA-SSUB-16-B, and SPA-ASPH-12-B. Results can be seen in Table 3-67, Table 3-68, Table 3-69, and Table 3-71, respectively. The positive findings are all less than $2.52\text{E-}01$ pCi/g, which is less than 9% of the Class 2 AC for Cs-137 ($2.88\text{E+}00$ pCi/g).

SECTION THREE

Radiological Findings

Cobalt-60 concentrations were less than MDC values for most (83%) SPA samples. However, Co-60 was detected at concentrations greater than the MDC values in 4 samples (SPA-SOIL-13-B, SPA-SEDI-04-B, SPA-ASPH-12-B, and SPA-ASPH-13-B). The 4 samples were comprised of 1 soil sample, 1 sediment sample, and 2 asphalt samples. Results can be seen in Table 3-67, Table 3-68, and Table 3-71, respectively. The positive findings are all less than 2.23E-01 pCi/g, which is less than 19% of the AC for Co-60 (1.22E+00).

No activity was detected above the achieved MDC for the sample taken beyond 30 cm, SPA-DEP1-15-B, which can be seen in Table 3-70.

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, Tc-99, and Pu-241) in the SOCA2 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-76, the analyses did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-67 On-Site Laboratory Gamma Analysis Results for SPA Surface Soil Samples

Surface Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		SPA		Number of Samples:		12
Initial Classification:		Class 2				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured	Achieved	AC	Measured	Achieved	AC
	Activity	MDC	Exceeded	Data	MDC	Exceeded
	(pCi/g)	Value	(Y/N)	(pCi/g)	Value	(Y/N)
	(pCi/g)	(pCi/g)	(Y/N)	(pCi/g)	(pCi/g)	(Y/N)
SPA-SOIL-1-B-D	1.92E-02	5.13E-02	N	7.81E-02	6.06E-02	N
SPA-SOIL-3-B	3.17E-02	1.97E-01	N	1.12E-01	2.63E-01	N
SPA-SOIL-5-B	3.51E-02	1.65E-01	N	1.29E-02	1.62E-01	N
SPA-SOIL-7-B	8.80E-03	5.08E-02	N	2.82E-02	3.90E-02	N
SPA-SOIL-8-B	1.65E-02	6.34E-02	N	7.77E-02	7.24E-02	N
SPA-SOIL-9-B	5.71E-03	6.39E-02	N	7.09E-03	7.77E-02	N
SPA-SOIL-10-B	1.93E-02	8.53E-02	N	9.37E-02	7.08E-02	N
SPA-SOIL-12-B-QC	2.88E-02	6.62E-02	N	2.94E-02	1.02E-01	N
SPA-SOIL-13-B	7.60E-02	6.26E-02	N	2.52E-01	7.32E-02	N
SPA-SOIL-14-B	3.52E-02	5.79E-02	N	7.83E-02	4.89E-02	N
SPA-SOIL-15-B	7.99E-03	4.60E-02	N	3.31E-02	5.48E-02	N
SPA-SOIL-16-B	2.63E-02	4.92E-02	N	1.05E-01	4.54E-02	N
Average	2.59E-02			7.56E-02		
SD	1.89E-02			6.64E-02		
Data Range	5.71E-03	to 7.60E-02		7.09E-03	to 2.52E-01	

Table 3-68 On-Site Laboratory Gamma Analysis Results for SPA Sediment Samples

Sediment (SEDI) Sample Gamma Spec - Data Quality Assessment							
Survey Area:		SPA		Number of Samples:		6	
Initial Classification:		Class 2					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	
SPA-SEDI-2-B-QC	8.69E-03	6.04E-02	N	5.33E-02	4.15E-02	N	
SPA-SEDI-4-B	1.26E-01	7.44E-03	N	8.71E-02	4.76E-02	N	
SPA-SEDI-6-B-D	2.08E-02	5.18E-02	N	3.81E-02	7.38E-02	N	
SPA-SEDI-11-B	5.76E-02	2.96E-02	N	6.78E-02	5.90E-02	N	
SPA-SEDI-13-B	2.23E-01	4.28E-02	N	3.01E-01	6.60E-02	N	
SPA-SEDI-16-B	1.33E-02	2.53E-02	N	2.04E-03	6.91E-02	N	
Average	7.49E-02			9.16E-02			
SD	8.48E-02			1.07E-01			
Data Range	8.69E-03	to 2.23E-01		2.04E-03	to 3.01E-01		

Table 3-69 On-Site Laboratory Gamma Analysis Results for SPA Subsurface Soil Samples

Sub-Surface Soil (SSUB) Sample Gamma Spec - Data Quality Assessment							
Survey Area:		SPA		Number of Samples:		1	
Initial Classification:		Class 2					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured	Achieved	AC Exceeded (Y/N)	Measured	Achieved	AC Exceeded (Y/N)	
	Activity (pCi/g)	MDC Value (pCi/g)		Data (pCi/g)	MDC Value (pCi/g)		
SPA-SSUB-16-B	8.53E-03	5.21E-02	N	1.95E-01	3.87E-02	N	
Average							
SD							
Data Range		to			to		

Table 3-70 On-Site Laboratory Gamma Analysis Results for SPA Deep Soil Samples

Deep Composite Soil (DEEP) Sample Gamma Spec - Data Quality Assessment						
Survey Area:	SPA		Number of Samples:		1	
Initial Classification:	Class 2					
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
SPA-DEP1-15-B	1.01E-02	6.03E-02	N	8.37E-02	9.91E-02	N
Average						
SD						
Data Range		to			to	

Table 3-71 On-Site Laboratory Gamma Analysis Results for SPA Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment							
Survey Area:		SPA		Number of Samples:		4	
Initial Classification:		Class 2					
Result Comparison							
Co-60				Cs-137			
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	
SPA-ASPH-10-B	5.28E-02	9.57E-02	N	7.04E-02	1.05E-01	N	
SPA-ASPH-12-B	1.06E-01	4.56E-02	N	1.06E-01	5.45E-02	N	
SPA-ASPH-13-B	5.45E-02	9.31E-03	N	5.03E-02	1.17E-01	N	
SPA-ASPH-16-B	2.53E-02	6.53E-02	N	2.72E-02	4.63E-02	N	
Average	5.97E-02			6.35E-02			
SD	3.37E-02			3.34E-02			
Data Range	2.53E-02 to 1.06E-01			2.72E-02 to 1.06E-01			

3.7.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples SPA-SEDI-01-B-D and SPA-SEDI-06-B-D are shown in Table 3-72 and Table 3-73, respectively. All comparisons were found acceptable. Agreement is assumed when results are below the achieved MDC value.

Table 3-72 Duplicate Sample Analysis for SPA-SEDI-01-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		SPA						
SAP No.:		8				Sample Location:		SOIL 1
Sample Description:								
Duplicate count comparisons from sample measurement location 01 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD						COMPARISON		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.81E-02	1.78E-02	4.4	0.5	2	7.80E-02	1.00	Y
Co-60								
Comments/Corrective Actions: Both On-Site Lab results for Co60 <MDC				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-73 Duplicate Sample Analysis for SPA-SEDI-06-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		SPA						
SAP No.:		8				Sample Location:		SEDI 6
Sample Description:								
Duplicate count comparisons from sample measurement location 06 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site Lab results for Co-60 and Cs-137 <MDC . No Comparison Required				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples SPA-SEDI-02-B-QC and SPA-SOIL-12-B-QC are shown in Table 3-74 and Table 3-75, respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

Table 3-74 On-Site/Off-Site Sample Analysis for SPA-SEDI-02-B-QC

QC Sample Assessment Form								
Survey Area Name:		SPA						
SAP No.:		8				Sample Location:		SEDI 2
Sample Description:								
QC sample comparisons from sample measurement location 02 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	5.33E-02	1.39E-02	3.8	0.4	2.5	2.82E-02	0.53	Y
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-75 On-Site/Off-Site Sample Analysis for SPA-SOIL-12-B-QC

QC Sample Assessment Form							
Survey Area Name:		SPA					
SAP No.:		8			Sample Location:		SOIL 12
Sample Description:							
QC sample comparisons from sample measurement location 12 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.							
ON-SITE					OFF-SITE		
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)	Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137							
Co-60							
Comments/Corrective Actions: Both On-Site and Off-Site Lab results for Co-60 and Cs-137 <MDC. No Comparison Required				Resolution Range for Sample Recount Comparison ¹ :			
				Resolution (d)		Agreement Range (e)	
				Min	Max	Min	Max
				0	<4	0.4	2.5
				4	<8	0.5	2
				8	<16	0.6	1.66
				16	<31	0.75	1.33
51	200	0.8	1.25				
>200		0.85	1.18				

Off-Site Laboratory HTD Analyses

Table 3-76 Off-Site Laboratory Results for HTDs in SPA QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
SPA-SEDI-02-B-QC	Soil	Sr-90	7.04E-03	4.57E-02	N
		C-14	1.10E-01	1.06E+00	N
		Fe-55	5.96E+01	2.14E+02	N
		Ni-63	9.74E-01	3.06E+01	N
		Tc-99	1.41E+00	2.26E+00	N
		Pu-241	6.73E+00	4.11E+01	N
SPA-SOIL-12-B-QC	Soil	Sr-90	5.84E-02	6.63E-02	N
		C-14	1.90E-01	1.06E+00	N
		Fe-55	-4.58E+01	2.22E+02	N
		Ni-63	9.72E+00	3.23E+01	N
		Tc-99	5.85E-01	2.42E+00	N
		Pu-241	1.97E+01	4.43E+01	N

3.7.5 Survey Plan Deviation(s)

None.

3.7.6 Survey Area Investigations

None.

3.7.7 Survey Area Conclusions

The following conclusions were reached based on the collected site characterization data from the SPA survey area:

- The Cs-137 and Co-60 concentrations found in SPA samples do not require excavation or remediation to meet site release criteria at this time. The current radiological status may change as active decommissioning of the site commences.
- Radiological status changes may warrant additional site characterization collection to support FSS planning.
- Additional characterization in yard areas, including walk-over gamma scans and soil sampling, should be considered when waste containers are moved.

3.8 RCA (SAP 10 – OPEN LAND)

3.8.1 Area Description

The RCA is located east and north of the west side of the power block and is illustrated in Figure 3-8. It is a 21,599 m² area covered with asphalt-covered roadways storage areas, concrete pads, and buildings and structures. The RCA Yard area stores radioactive material and containers and supports radioactive material and waste shipments. According to historical records and interviews, several spills occurred in the RCA Yard. Areas were remediated or paved over to contain radioactive material. The yard storm drains are believed to be contaminated by the operation of the isolation condensers and spills. The area under the isolation condensers was found contaminated after auto initiation of the isolation condensers in 2007.

3.8.2 Survey Summary

Survey Dates: 9/14/2022 through 9/21/2022

Survey and field activities were governed by SAP 10, *Radiologically Controlled Area*. The Radiological Engineer identified 16 biased sample locations where plant-related radioactivity had been introduced from spills and plant operations as indicated by the HSA. The client requested the collection of an additional 2 sample locations (RCA-XXX-18-B and RCA-SOIL-19-B). The sample locations are shown in Figure 3-8.

A total of 33 samples were collected from the RCA area; 17 surface soil samples, 4 sediment samples, 7 asphalt samples, and 5 samples at depths greater than 15 cm. GPS coordinates for the sample locations are listed in Table 3-77.

RCA-SOIL-06-B-QC was not able to be collected as initially planned. During the sampling of the asphalt, a concrete slab was encountered; the asphalt sample, RCA-ASPH-06-B, was kept and analyzed. An alternate location was selected, also covered by asphalt resulting in 2 samples, RCA-ASPH-20-B and RCA-SOIL-20-B-QC. GPS coordinates for the alternative location were recorded.

Sediment sample locations RCA-SEDI-03-B and RCA-SEDI-14-B were selected near storm drains. Sediment was also obtained from RCA-SEDI-10-B and RCA-SEDI-18-B because sediment covered these planned survey locations.

Asphalt samples were obtained at the locations where the soil was covered by asphalt. The only exception to this was sample RCA-ASPH-06-B, as discussed previously.

Samples at depths greater than 6 inches were obtained based on indications in the HSA where plant-related radioactivity had been introduced from spills and plant operations. Sample RCA-SSUB-05-B was obtained at a depth of 6-12 inches in the loading dock area of the ORW facility based on the historical potential for material to have penetrated the asphalt. The 4 remaining samples, taken at depths greater than 6 inches, were obtained to a depth from 6 inches to 4 feet. These locations (RCA-DEP1-01-B, -08-B, -11-B, and -15B) were chosen based on historical spills. Two samples were not obtained at depth per the SAP plan, RCA-DEP2-08-B, and RCA-DEP1-16-B. RCA-DEP2-08-B was not obtained due to the client requesting no samples be taken deeper than 4 feet, and RCA-DEP1-16-B was not obtained due to resistance during sampling in the form of a buried concrete slab.

SECTION THREE

Radiological Findings

Walk-over gamma scans were conducted at the RCA boundaries. They were performed using calibrated pairings of Ludlum Model 44-10 detectors with Model 3003 multi-detector survey meters to identify the presence of elevated radioactivity. Gamma scan measurements were also conducted at each sample location. A total of 90 m² were scanned. Count rates were logged between 2,710 and 24,600 cpm at sample locations in the RCA area. Multiple locations in the RCA were scanned with a collimator shield around the Ludlum 44-10 detector to reduce ambient background sources. The highest measurement was due to the presence of exposed Radioactive Waste piping. The gamma scans performed in the RCA survey area did not identify elevated radioactivity requiring further investigation. Scans identified no areas with an audible distinction above the location background count rate.

Table 3-77 GPS Coordinates for Sample Locations in the RCA Survey Area

Sample Number	Easting	Northing
RCA-SOIL-01-B	574483.7340	357378.2728
RCA-DEP1-01-B		
RCA-SOIL-02-B	574498.0594	357446.4421
RCA-SEDI-03-B	574961.9068	357444.4662
RCA-SOIL-04-B-D	574935.7258	357445.4541
RCA-ASPH-05-B	575002.9071	357494.3582
RCA-SOIL-05-B		
RCA-SSUB-05-B	574939.1837	357480.0327
RCA-ASPH-06-B		
RCA-SOIL-06-B-QC	574858.7079	357485.9086
RCA-SOIL-07-B		
RCA-SOIL-08-B-QC	574902.1352	357585.7445
RCA-DEP1-08-B		
RCA-DEP2-08-B	574975.2442	357678.1188
RCA-ASPH-09-B		
RCA-SOIL-09-B-D	574963.3887	357713.1914
RCA-ASPH-10-B		
RCA-SEDI-10-B	574807.2910	357738.1374
RCA-SOIL-10-B		
RCA-SOIL-11-B	574802.8452	357750.9808
RCA-DEP1-11-B		
RCA-SOIL-12-B-D	574757.3990	357568.2082
RCA-ASPH-13-B		
RCA-SOIL-13-B-QC	575023.6543	357596.1181
RCA-SEDI-14-B		
RCA-ASPH-15-B	574857.6770	357462.2495
RCA-SOIL-15-B		
RCS-DEP1-15-B	574849.7019	357496.8474
RCA-ASPH-16-B		
RCA-SOIL-16-B	574470.5863	357423.7885
RCA-DEP1-16-B		
RCA-DEP1-17-B		

SECTION THREE

Radiological Findings

Sample Number	Easting	Northing
RCA-ASPH-18-B	575039.4719	357544.8013
RCA-SEDI-18-B		
RCA-SOIL-18-B		
RCA-SOIL-19-B	575029.3268	357431.0148
RCA-ASPH-20-B	574934.7228	357469.4062
RCA-SOIL-20-B-QC		

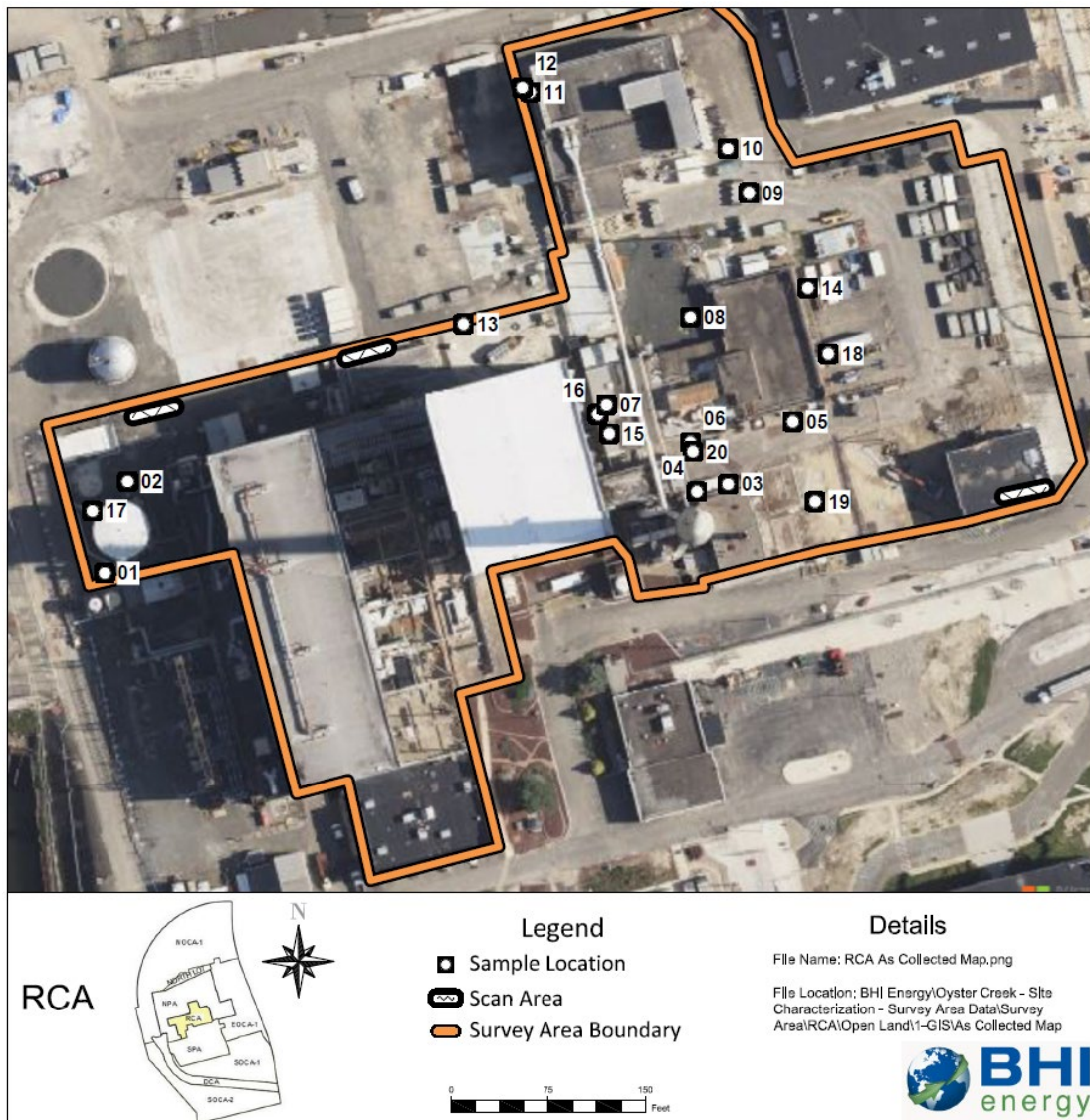


Figure 3-8 RCA Survey Area and Sample Locations

3.8.3 Survey Data Summary:

Discussion

Cesium-137 and Co-60 concentrations exceed the achieved MDC values for most RCA samples. Characterization data for surface soil samples are provided in Table 3-78, sediment samples are provided in Table 3-79, asphalt samples are provided in Table 3-82, and soil samples at depths greater than 15 cm are provided in Table 3-81.

Cs-137 concentrations in surface soil samples ranged from non-detectable concentrations (less than achieved MDC values) to a maximum concentration of $1.62\text{E}+01$ pCi/g, exceeding the Class 1 AC value (approximately 3 times the AC) with 11 of 17 soil samples showing concentrations greater than MDC. The Co-60 concentrations in surface soil samples ranged from non-detectable concentrations (less than achieved MDC values) to a maximum Co-60 concentration of $5.97\text{E}+00$ pCi/g, exceeding the Class 1 AC value (approximately 3 times the AC) with 10 of 17 soil samples showing Co-60 concentrations greater than MDC.

Cs-137 concentrations in sediment samples were greater than the achieved MDC values, ranging from $1.36\text{E}+00$ pCi/g (24% of the Class 1 AC) to $3.232\text{E}+01$ pCi/g (approximately 6 times the Class 1 AC). For Co-60, concentrations in sediment samples were greater than the achieved MDC values and ranged from $1.10\text{E}+00$ pCi/g (45% AC) minimum to $1.32\text{E}+01$ pCi/g (approximately 6 times the AC) maximum, which exceeds the Class 1 AC value.

In asphalt samples, Cs-137 concentrations ranged from non-detectable concentrations (less than achieved MDC values) to a maximum 7 concentration of $1.97\text{E}+00$ pCi/g (34% of the Class 1 AC). A total of 5 of 7 asphalt samples contained Cs-137 at concentrations greater than the MDC. The Co-60 concentrations in asphalt samples ranged from non-detectable concentrations (less than achieved MDC values) to a maximum concentration of $3.49\text{E}-01$ pCi/g (approximately 14% of the Class 1 AC). A total of 4 of 7 asphalt samples contained Co-60 concentrations greater than MDC.

Soil samples collected at depths greater than 6 inches range from non-detectable concentrations (less than achieved MDC values) to a maximum Cs-137 activity concentration of $4.04\text{E}+02$ pCi/g (approximately 70 times the AC). The Co-60 concentrations in those same deep samples range from non-detectable concentrations (less than achieved MDC values) to a maximum Co-60 concentration of $1.11\text{E}+02$ pCi/g (approximately 45 times the Class 1 AC). The greater contamination levels found in the deep soil sample compared to the surface contamination levels indicate historical leakage from the south pipe chase and overflow from a valve pit.

This data provides a snapshot of the current radiological condition of the RCA survey area, which is expected to change as decommissioning of the site moves forward. The collected site characterization data identified 2 areas that may require special attention during decommissioning. The location of samples RCA-SOIL-04-B-D (east of Reactor Building railroad bay doors) and RCA-SOIL-15-B (east side of Reactor Building near the south pipe chase) are areas where the concentrations of both Cs-137 and Co-60 in the surface soil exceeded the respective Class 1 AC values. The surface soil sample RCA-SOIL-04-B-D contained Cs-137 at an activity concentration of $1.62\text{E}+01$ pCi/g (approximately 3 times the Class 1 AC) and Co-60 at $5.11\text{E}+00$ pCi/g (approximately 2 times the Class 1 AC). Sample RCA-SOIL-15-B contained

SECTION THREE

Radiological Findings

Cs-137 at a concentration of 4.94E+00 pCi/g (approximately 86% of the AC) and Co-60 at 5.97E+00 pCi/g (approximately 3 times the Class 1 AC).

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, Tc-99, and Pu-241) in the SOCA2 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As shown in Table 3-88, the analyses did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-78 On-Site Laboratory Gamma Analysis Results for RCA Surface Soil Samples

Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		RCA		Number of Samples:		17
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
RCA-SOIL-1-B	4.10E-03	1.02E-01	N	1.06E-01	1.47E-01	N
RCA-SOIL-2-B	3.55E-02	1.17E-01	N	1.48E-02	1.01E-01	N
RCA-SOIL-4-B-D	5.11E+00	1.21E-01	Y	1.62E+01	2.45E-01	Y
RCA-SOIL-5-B	-2.29E-02	1.19E-01	N	2.22E+00	1.22E-01	N
RCA-SOIL-7-B	5.95E-01	1.54E-02	N	3.51E-01	1.03E-01	N
RCA-SOIL-8-B-QC	1.20E-01	5.59E-02	N	4.21E-01	1.10E-01	N
RCA-SOIL-9-B	3.20E-02	8.83E-02	N	4.87E-02	8.81E-02	N
RCA-SOIL-10-B	3.02E-02	9.47E-02	N	1.07E+00	1.16E-01	N
RCA-SOIL-11-B	2.72E-01	5.27E-02	N	3.05E-01	1.00E-01	N
RCA-SOIL-12-B-D	1.57E-01	1.35E-02	N	7.27E-01	1.05E-01	N
RCA-SOIL-13-B-QC	1.36E-01	1.30E-01	N	5.47E-02	8.94E-02	N
RCA-SOIL-15-B	5.97E+00	1.51E-01	Y	4.94E+00	2.60E-01	N
RCA-SOIL-16-B	1.55E+00	1.35E-01	N	5.95E-01	1.45E-01	N
RCA-SOIL-17-B	1.07E-01	1.09E-01	N	7.31E-02	8.86E-02	N
RCA-SOIL-18-B	4.47E-03	1.05E-01	N	4.31E-03	1.08E-01	N
RCA-SOIL-19-B	1.22E+00	1.09E-01	N	4.57E+00	1.77E-01	N
RCA-SOIL-20-B-QC	1.36E-01	7.31E-02	N	3.34E+00	1.38E-01	N
Average	9.09E-01			2.06E+00		
SD	1.80E+00			3.98E+00		
Data Range	-2.29E-02 to	5.97E+00		4.31E-03 to	1.62E+01	

Table 3-79 On-Site Laboratory Gamma Analysis Results for RCA Sediment Samples

Sediment Sample Gamma Spec - Data Quality Assessment						
Survey Area:		RCA		Number of Samples:		4
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
RCA-SEDI-3-B	1.10E+00	1.48E-01	N	1.40E+01	2.91E-01	Y
RCA-SEDI-10-B	2.87E+00	9.56E-02	Y	2.15E+00	1.61E-01	N
RCA-SEDI-14-B	1.32E+01	2.71E-01	Y	3.23E+01	4.45E-01	Y
RCA-SEDI-18-B	1.41E+00	6.67E-02	N	1.36E+00	1.48E-01	N
Average	4.65E+00			1.25E+01		
SD	5.76E+00			1.44E+01		
Data Range	1.10E+00 to	1.32E+01		1.36E+00 to	3.23E+01	

Table 3-80 On-Site Laboratory Gamma Analysis Results for RCA Deep Soil Samples

Deep Composite Soil (DEEP) Sample Gamma Spec - Data Quality Assessment								
Survey Area:			RCA		Number of Samples:		4	
Initial Classification:			Class 1					
Result Comparison								
Co-60					Cs-137			
Sample #	Measured Activity (pCi/g)		Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)		AC Exceeded (Y/N)	
RCA-DEP1-1-B	9.55E-03		9.58E-02	N	3.32E-02		7.42E-02	N
RCA-DEP1-8-B	7.72E-02		1.45E-01	N	1.02E+00		1.14E-01	N
RCA-DEP1-11-B	-5.67E-03		6.99E-02	N	1.78E-01		9.62E-02	N
RCA-DEP1-15-B	1.11E+02		6.29E-01	Y	4.04E+02		1.22E+00	Y
Average	2.78E+01				1.01E+02			
SD	5.55E+01				2.02E+02			
Data Range	-5.67E-03	to	1.11E+02		3.32E-02	to	4.04E+02	

Table 3-81 On-Site Laboratory Gamma Analysis Results for RCA Subsurface Soil Samples

Sub-Surface Soil Sample Gamma Spec - Data Quality Assessment						
Survey Area:		RCA		Number of Samples:		1
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
RCA-SSUB-5-B	-3.80E-03	6.08E-02	N	3.29E-01	7.84E-02	N
Average						
SD						
Data Range		to			to	

Table 3-82 On-Site Laboratory Gamma Analysis Results for RCA Asphalt Samples

Asphalt Sample Gamma Spec - Data Quality Assessment						
Survey Area:		RCA		Number of Samples:		7
Initial Classification:		Class 1				
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
RCA-ASPH-5-B	5.57E-02	8.93E-02	N	1.97E+00	1.19E-01	N
RCA-ASPH-6-B	1.20E-01	1.23E-01	N	1.49E+00	1.51E-01	N
RCA-ASPH-9-B	1.16E-01	6.86E-02	N	6.82E-02	1.28E-01	N
RCA-ASPH-10-B	1.90E-01	1.49E-01	N	1.49E-01	9.13E-02	N
RCA-ASPH-13-B	1.32E-02	1.81E-01	N	6.68E-02	1.85E-01	N
RCA-ASPH-18-B	1.12E-01	5.75E-02	N	2.20E-01	1.18E-01	N
RCA-ASPH-20-B	3.49E-01	8.85E-02	N	6.57E-01	1.18E-01	N
Average	1.37E-01			6.60E-01		
SD	1.09E-01			7.70E-01		
Data Range	1.32E-02 to	3.49E-01		6.68E-02 to	1.97E+00	

3.8.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate samples RCA-SOIL-04-B-D and RCA-SOIL-12-B-D are shown in Table 3-83 and Table 3-84, respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

Table 3-83 Duplicate Sample Analysis for RCA-SOIL-04-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		RCA						
SAP No.:		10				Sample Location:		SOIL 4
Sample Description:								
Duplicate count comparisons from sample measurement location 03 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	1.62E+01	3.78E-01	42.9	0.75	1.33	1.60E+01	0.99	Y
Co-60	5.11E+00	1.22E-01	41.9	0.75	1.33	5.09E+00	1.00	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

Table 3-84 Duplicate Sample Analysis for RCA-SOIL-12-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		RCA						
SAP No.:		10				Sample Location:		SOIL 12
Sample Description:								
Duplicate count comparisons from sample measurement location 12 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	7.27E-01	5.68E-02	12.8	0.6	1.66	6.95E-01	0.96	Y
Co-60	1.57E-01	2.14E-02	7.3	0.5	2	1.33E-01	0.85	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC samples RCA-SOIL-08-B, RCA-SOIL-13-B-QC, and RCA-SOIL-20-B-QC are shown in Table 3-85, and Table 3-86, respectively. All comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

Table 3-85 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-08-B-QC

QC Sample Assessment Form								
Survey Area Name:		RCA						
SAP No.:		10				Sample Location:		SOIL 08
Sample Description:								
QC sample comparisons from sample measurement location 08 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	4.21E-01	4.45E-02	9.5	0.6	1.66	4.70E-01	1.12	Y
Co-60	1.20E-01	1.91E-02	6.3	0.5	2	1.58E-01	1.32	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
>200		0.85	1.18					

Table 3-86 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-13-B-QC

QC Sample Assessment Form								
Survey Area Name:		RCA						
SAP No.:		10				Sample Location:		SOIL 13
Sample Description:								
QC sample comparisons from sample measurement location 13 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60								
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Co-60 <MDC. No Comparison Required				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Table 3-87 On-Site/Off-Site Laboratory Comparisons for Sample RCA- SOIL-20-B-QC

QC Sample Assessment Form								
Survey Area Name:		RCA						
SAP No.:		10				Sample Location:		SOIL 20
Sample Description:								
QC sample comparisons from sample measurement location 20 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137	3.34E+00	1.32E-01	25.3	0.75	1.33	3.43E+00	1.03	Y
Co-60	1.36E-01	2.90E-02	4.7	0.5	2	1.22E-01	0.90	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Off-Site Laboratory HTD Analyses

Table 3-88 Off-Site Laboratory Results for HTDs in RCA QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
RCA-SOIL-08-B	Soil	Sr-90	4.02E-02	6.52E-02	N
		C-14	-2.73E-01	6.39E-01	N
		Fe-55	5.71E+01	1.68E+02	N
		Ni-63	4.16E+00	2.34E+01	N
		Tc-99	4.27E-01	7.60E-01	N
		Pu-241	1.33E+01	4.17E+01	N
RCA-SOIL-13-B-QC	Soil	Sr-90	1.01E-02	6.35E-02	N
		C-14	-3.78E-01	5.93E-01	N
		Fe-55	8.78E+01	2.24E+02	N
		Ni-63	-4.02E+00	2.30E+01	N
		Tc-99	6.36E-01	1.54E+00	N
		Pu-241	6.65E+00	3.73E+01	N
RCA-SOIL-20-B-QC	Soil	Sr-90	9.71E-03	6.40E-02	N
		C-14	-3.96E-02	6.04E-01	N
		Fe-55	9.24E+01	1.44E+02	N
		Ni-63	1.10E+00	2.28E+01	N
		Tc-99	4.85E-01	1.61E+00	N
		Pu-241	9.00E+00	4.59E+01	N

3.8.5 Survey Plan Deviation(s)

None.

3.8.6 Survey Area Investigations

None.

3.8.7 Survey Area Conclusions

The following conclusions were reached for the RCA survey area:

- The collected data confirms that the RCA is MARSSIM Class 1.
- The Cs-137 and Co-60 concentrations in soil samples from locations 4 and 15 indicate that excavation or remediation is required to meet site release criteria.

3.9 DCA (SAP 12 – OPEN LAND)

3.9.1 Area Description

DCA is the area immediately west of the southern protected area, separating the south owner-controlled areas, as illustrated in Figure 3-9. It is 35,667 m² in size and includes only the water-covered area. There are no plant structures within the DCA. Since the facility shutdown, the DCA canal has been subjected to silting due to tidal action. The silting of the bed adds to the complication of obtaining reliable characterization data.

3.9.2 Survey Summary

Survey Date: 09/13/2022

Survey and field activities were governed by SAP 12, *Discharge Canal Area*. Seven sample locations were identified where plant-related radioactivity might have been introduced from the discharge of radioactive material. Four sample points were relocated to obtain sufficient sample material for analysis. GPS coordinates for the alternate sample locations were recorded during sampling to document the new locations. The sample locations are shown in Figure 3-9.

A total of 7 sediment samples were obtained from the DCA area. GPS coordinates for as-taken samples locations are listed in Table 3-89

Walk-over gamma scans of the DCA were not conducted within the DCA; however, scans were performed on the DCA border with the adjacent survey areas (shown in Figure 3-1, Figure 3-3, Figure 3-4, Figure 3-6, and Figure 3-7).

Table 3-89 GPS Coordinates for DCA Sampling Locations

Sample Number		Easting	Northing
DCA-SEDI-01-B-QC		574426.3648	357054.6517
DCA-SEDI-02-B	Original location coordinates	575559.0088	357423.4646
	Sample relocation coordinates	574489.1854	356864.5772
DCA-SEDI-03-B-D	Original location coordinates	575580.9836	357369.4031
	Sample relocation coordinates	574519.3610	356779.5623
DCA-SEDI-04-B	Original location coordinates	575936.9564	357466.3570
	Sample relocation coordinates	575306.4804	356421.1276
DCA-SEDI-05-B	Original location coordinates	575861.3894	357384.6116
	Sample relocation coordinates	575943.8672	356265.0603
DCA-SEDI-06-B		574542.0237	356701.5201
DCA-SEDI-07-B		574544.9876	356575.5551

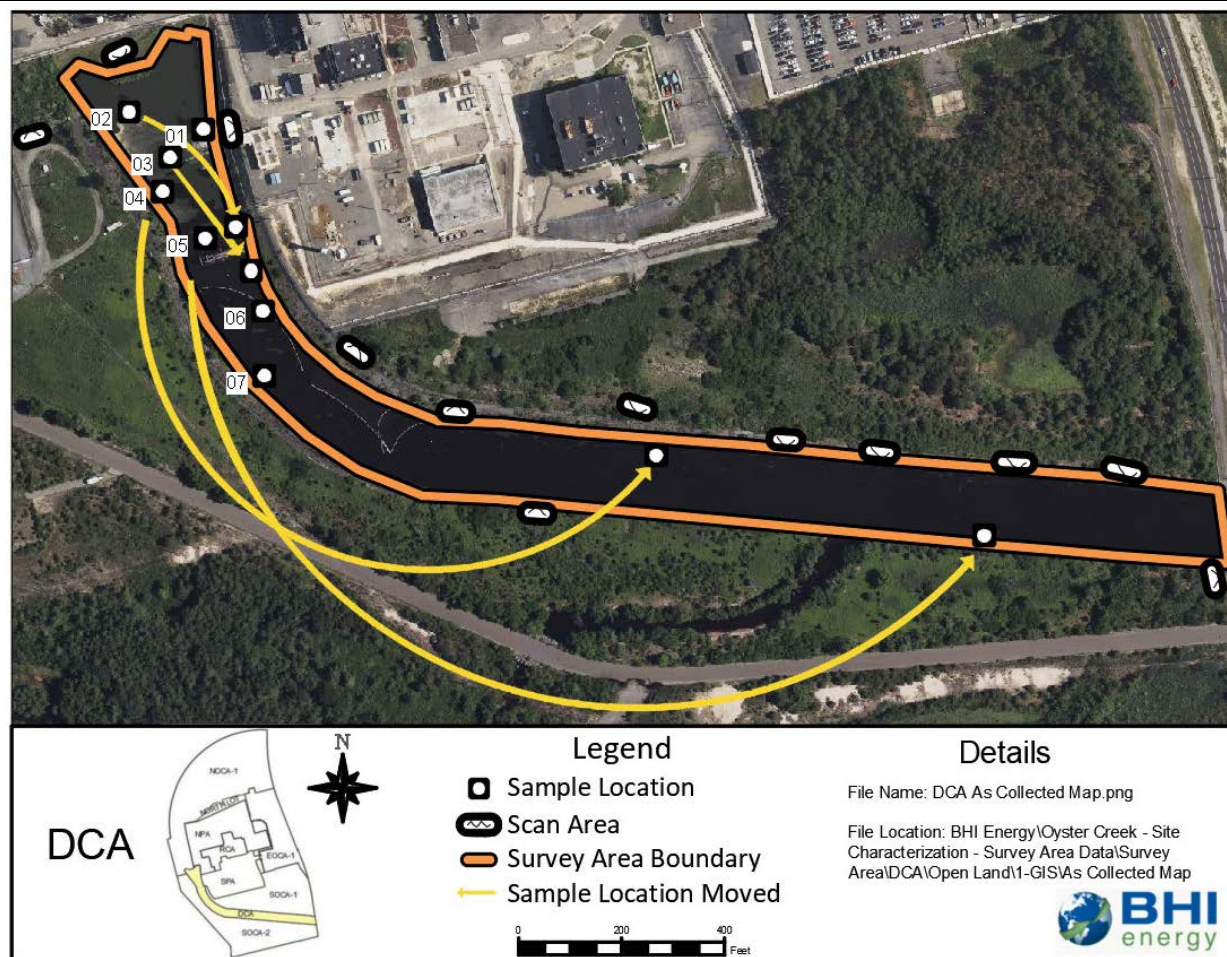


Figure 3-9 DCA Survey Area and Sample Locations

3.9.3 Survey Data Summary

Discussion

Cesium-137 concentrations were less than the achieved MDC values for most DCA samples. However, Cs-137 was detected at concentrations greater than the MDC values in 1 sample, DCA-SEDI-02-B. Sample results can be seen in Table 3-90. The positive findings are all less than $2.35\text{E-}01$ pCi/g, which is less than 41% of the Class 3 AC for Cs-137 ($5.76\text{E-}01$ pCi/g).

Cobalt-60 concentrations are greater than the achieved MDC values for most DCA samples. Concentrations greater than the MDC values were identified in 5 samples (DCA-SEDI-01-B-QC, -02-B, -03-B-D, -04-B, and 06-B). The positive samples range from $1.01\text{E-}01$ pCi/g (approximately 41% Class 3 AC) minimum to a maximum concentration of $5.51\text{E-}01$ pCi/g (3 times the Class 3 AC).

The presence of HTD beta-emitting ROCs (i.e., Sr-90, C-14, Fe-55, Ni-63, and Tc-99) in the SOCA2 survey area was evaluated using analytical results for the QC samples transferred to the off-site laboratory. As

shown in Table 3-93, the analyses did not identify any HTD beta-emitting ROC above the MDC value achieved during the analyses.

Table 3-90 On-Site Laboratory Analysis Results for DCA Sediment Samples

Sediment (SEDI) Sample Gamma Spec - Data Quality Assessment						
Survey Area:		DCA		Number of Samples:		7
Initial Classification:		Class 3				
Assessment Criteria						
		Class 1	Class 2	Class 3		
Co-60		2.44	1.22	0.244	pCi/g	
Cs-137		5.76	2.88	0.576	pCi/g	
Result Comparison						
Co-60				Cs-137		
Sample #	Measured Activity (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)	Measured Data (pCi/g)	Achieved MDC Value (pCi/g)	AC Exceeded (Y/N)
DCA-SEDI-1-B-QC	2.32E-01	5.05E-02	N	2.20E-02	4.98E-02	N
DCA-SEDI-2-B	1.01E-01	3.99E-02	N	2.35E-01	7.02E-02	N
DCA-SEDI-3-B-D	5.51E-01	5.43E-02	Y	7.38E-02	1.21E-01	N
DCA-SEDI-4-B	1.40E-01	2.64E-02	N	5.47E-02	9.11E-02	N
DCA-SEDI-5-B	4.62E-02	1.75E-01	N	3.01E-02	2.17E-01	N
DCA-SEDI-6-B	1.46E-01	4.20E-02	N	2.58E-02	7.15E-02	N
DCA-SEDI-7-B	4.78E-02	1.37E-01	N	1.23E-02	1.20E-01	N
Average	1.81E-01			6.48E-02		
SD	1.75E-01			7.80E-02		
Data Range	4.62E-02 to	5.51E-01		1.23E-02 to	2.35E-01	

3.9.4 Data Quality Comparisons

On-Site Duplicate Counts

The comparisons of the Cs-137 and Co-60 results for the duplicate sample DCA-SEDI-03-B-D are shown in Table 3-91. The comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC Value.

Table 3-91 Duplicate Sample Analysis for DCA-SEDI-03-B-D

Duplicate Sample Assessment Form								
Survey Area Name:		DCA						
SAP No.:		12				Sample Location:		SEDI 3
Sample Description:								
Duplicate count comparisons from sample measurement location 03 are analyzed using gamma spectroscopy by the on-site laboratory. The original count result is the standard count and the recount is the comparison.								
STANDARD					COMPARISON			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60	5.51E-01	2.84E-02	19.4	0.75	1.33	5.53E-01	1.00	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site Lab results for Cs-137 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

On-Site/Off-Site Laboratory Comparisons

The comparisons of the Cs-137 and Co-60 results for the QC sample DCA-SEDI-01-B-QC are shown in Table 3-92. The comparisons were found acceptable. Agreement is assumed when results are less than the achieved MDC value.

Table 3-92 On-Site/Off-Site Sample Analysis for DCA-SEDI-01-B-QC

QC Sample Assessment Form								
Survey Area Name:		DCA						
SAP No.:		12				Sample Location:		SEDI 1
Sample Description:								
QC sample comparisons from sample measurement location 01 are analyzed using gamma spectroscopy by the on-site and off-site analytical laboratories.								
ON-SITE					OFF-SITE			
Target Gamma ROC (a)	Standard Activity (b)	1σ Uncertainty (c)	Resolution (d)=(b)/(c)	Agreement Range (e)		Comparison Activity (f)	Comparison Ratio (h)=(f)/(b)	Acceptable (Y/N)
Cs-137								
Co-60	2.34E-01	2.52E-02	9.3	0.6	1.66	2.85E-01	1.22	Y
Comments/Corrective Actions:				Resolution Range for Sample Recount Comparison ¹ :				
Both On-Site and Off-Site Lab results for Ccs-137 <MDC.				Resolution (d)		Agreement Range (e)		
				Min	Max	Min	Max	
				0	<4	0.4	2.5	
				4	<8	0.5	2	
				8	<16	0.6	1.66	
				16	<51	0.75	1.33	
				51	200	0.8	1.25	
				>200		0.85	1.18	

Off-Site Laboratory HTD Analyses

Table 3-93 Off-Site Laboratory Results for HTDs in DCA QC Samples

Sample Number	Medium	HTD Beta	Measured (pCi/g)	Achieved MDC (pCi/g)	AC Exceeded (Y/N)
DCA-SEDI-01-B-QC	Sediment	Sr-90	1.89E-02	5.32E-02	N
		C-14	-2.23E-01	6.14E-01	N
		Fe-55	2.06E+01	1.70E+02	N
		Ni-63	-2.01E+00	1.87E+02	N
		Tc-99	3.80E+00	1.72E+00	N

3.9.5 Survey Plan Deviation(s)

None.

3.9.6 Survey Area Investigations

None.

3.9.7 Survey Area Conclusions

The following conclusions were reached for the DCA area:

- The Discharge Canal contains detectable quantities of Cs-137 and Co-60.
- The current Co-60 findings warrant the reclassification of the Discharge Canal to a Class 2 area.

3.10 NPA (SAP 07 – BUILDINGS/STRUCTURES)**3.10.1 Area Description**

The buildings and structures within the NPA include the Demin Storage Tank (DST), Low-Level Radioactive Waste Storage Facility (LLRWSF), the Warehouse, Breathing Air Compressor Building, Chlorination Building, Clean Rigging and Storage Trailers, Condensate Transfer Pump House, Contractor Trailer Complex, Drywell Processing Center, Fire Water Pump House, Fish Sample Pond, Hot Machine Shop, Maintenance Supervisor Building, Dilution Pump House, Intake, Discharge Structure, and New Maintenance Building. Refer to section 3.6.1 for the NPA area description. Only the DST, LLRWSF, and the Warehouse are expected to remain following site license termination. This phase of the site characterization effort focused on these three structures. All other NPA buildings are scheduled for demolition and were not surveyed.

Warehouse

RMA storage and staging areas were established in the west Warehouse upper deck by the loading dock and on the east Warehouse lower deck.

LLRWSF and DST

The LLRWSF was controlled as a satellite RCA supporting onsite storage of low-level radioactive waste and material. The bulk of the waste was stored in the form of spent resin, filter sludge, evaporator bottoms, and DAW. Most of the waste and material was containerized and in shippable form. All radioactive materials stored without containers had fixed contamination with no smearable contamination being allowed. Decontamination and assembly of components with smearable contamination was allowed.

DST

The DST was in a fenced, posted RMA. The demineralized water system was cross-contaminated with fuel pool water in 1994. Most of the system was thoroughly flushed; however, pockets of low-level contamination are suspected in low-flow areas of piping. The DST was decontaminated in 1992. There is a potential for trace levels of radioactivity from the deposition of airborne contamination on the tank top from routine operation and the discharge of gaseous effluent.

3.10.2 Survey Summary

Survey Period: 10/18/2022 through 11/15/2022

Survey activities were governed by SAP 07, Building/Structures – North Protected Area. Survey planning for the NPA buildings/structures area included the use of the VSP program to identify random sample locations consistent with MARSSIM methodology. In addition, biased locations were selected by the Radiological Engineer as locations where plant-related cross-contamination may have resulted from personnel. Some random survey locations were located within 6 feet of the roof's edge and were relocated to the closest point greater than 6 feet from the roof's edge for safety reasons. All sample locations included 1m² scans with direct beta and alpha radiation measurements and 100 cm² smears obtained at the highest count rate observed during the scan.

Warehouse

Planning for the survey of the Warehouse building included 90 VSP-generated random sample points on floor surfaces. In addition, 59 biased survey locations were selected on walls, including areas most likely to have been touched by personnel: light switches, door handles, frames, thermostat controllers, etc. Six locations on the warehouse roof were identified and surveyed as investigative samples due to elevated readings at roof drain locations. Two roof sample locations (NPA-WHS-86 and NPA-WHS-87) had to be relocated for safety concerns and are discussed in section 3-943.10.5.

Warehouse scans were conducted at all sample locations and general area floor scans using calibrated gas flow proportional or equivalent survey meters to identify the presence of elevated radioactivity. A total of 14,793 m² were scanned (first floor 6,472 m², second floor 1,241 m², and roof 7,080 m²). Direct measurements were logged. Except for 4 locations on the roof, all the scan surveys did not identify areas with audible distinctions above background. The 4 roof locations were investigated. Details of the investigations are provided in section 3.10.6.

LLRWSF and DST

The SAP 07 included planning for the LLRWSF buildings; however, the implementation of this plan was not performed because these structures continue to be in use to support decommissioning activities as a storage location for radioactive waste material. Characterization surveys for the LLRWSF are expected to be rescheduled when the building is no longer being used for waste storage.

Planning for the survey of the DST structure, it was determined that the tank's exterior would not yield relevant waste characterization or FSS planning information, so the planned survey was not performed. Characterization surveys should be scheduled for the DST when the tank is no longer being used, and the tank's interior surfaces are made accessible.

Table 3-94 summarizes the planned number and types of measurement for each structure in the NPA buildings/structures.

Table 3-94 Planned Number and Type of Measurements by Structure in the NPA

Building/Structure	Code	Fixed-Point Measurements	Smears	LAS	Volumetric Samples
Low-Level Radioactive Waste Storage Facility	LRW	250	250	0	0
Warehouse	WHS	155	155	0	0
Demin Storage Tank	DST	13	13	0	0

3.10.3 Survey Data Summary

Discussion

The characterization data from the Warehouse consist of gross activity measurements without the identification of specific ROCs. It is important to emphasize that gross activity measurements may not reflect only residual plant-related radioactivity and should not be directly compared to any specific ROC's DCGL value without consideration to material background radioactivity (i.e., NORM associated with building materials). Experience has shown that NORM content in various building materials, such as concrete, tiles, wallboard, and ceiling materials, can contribute several hundred counts to gross activity measurements.

The direct beta/gamma measurements collected on the first and second floors of the Warehouse are below the AC for Cs-137 and Co-60, and the direct alpha measurements are below the AC for the representative alpha-emitting ROC (Am-241). The direct measurements from the roof show wider ranges for beta/gamma and alpha measurements. The upper end of those ranges exceeds the AC for Co-60 ($8.10\text{E}+03$ dpm/100 cm²) and Am-241 ($9.88\text{E}+02$ dpm/100 cm²). Smear data from the roof, first, and second floors show no removable contamination.

The higher measurements from the Warehouse roof do not necessarily reflect a need for remediation. They may reflect the presence of a higher quantity of naturally occurring radioactive materials (NORM) in roofing material or possibly residual deposition from gaseous effluent releases. Further characterization data, particularly the collection of material background radioactivity data, should be collected to support final status survey designs for buildings.

The Warehouse is currently designated as a Class 2 structure. The collection of material background data to determine the amount of potential residual plant-related radioactivity may lead to less restrictive MARSSIM classification for FSS.

Table 3-95 Data Summaries for Statistically-Determined Warehouse Floor Measurement Locations

Floor	Gross Measurement	Direct Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	967	5993	3511	1616	0.00%	3003/43-68
	Alpha	0	91	37	30	0.00%	3003/43-68
2nd	Beta	4162	6706	5097	661	0.00%	3003/43-68
	Alpha	0	169	42	42	0.00%	3003/43-68
Roof	Beta	5756	8531	6861	809	0.00%	3002/43-93
	Alpha	239	1093	568	193	0.08%	3002/43-93

Table 3-96 Data Summaries for Biasedly-Determined Warehouse Measurement Locations

Floor	Gross Measurement	Direct Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	2314	4522	3554	571	0.00%	3003/43-68
	Alpha	0	61	24	24	0.00%	3003/43-68
2nd	Beta	1220	4985	3040	1132	0.00%	3003/43-68
	Alpha	0	61	15	19	0.00%	3003/43-68

3.10.4 Data Quality Comparisons

On-Site Duplicate Counts

Duplicate counts for all smears were less than MDC. All comparisons for duplicate smears are maintained as project files.

On-Site/Off-Site Laboratory Comparisons

None – not applicable.

Off-Site Laboratory HTD Analyses

None – not applicable.

3.10.5 Survey Plan Deviation(s)

Two measurement locations required deviations for safety concerns. Sample points NPA-WHS-86 and -87 were randomly located by VSP but were within 6 feet of the building's edge. The measurement locations were moved to maintain the 6-foot safety margin.

3.10.6 Survey Area Investigations

While performing the scan and direct measurements of the VSP-generated survey locations, direct measurements of the warehouse roof revealed 4 roof drains with audible distinction greater than background. To determine the extent of condition, all 6 roof drains were surveyed. The roof drains showed elevated direct measurements and low levels of removable activity. The investigation survey locations were identified with consecutive sample numbers NPA-WHS-150-I through NPA-WHS-155-I. Upon review of the smear results, it was determined that the loose surface activity was attributable to NORM or gaseous effluent fallout.

Additionally, 3 investigative surveys were performed to evaluate the presence of NORM on the roof surface. These sample locations were identified with consecutive sample numbers NPA-WHS-156-I through NPA-WHS-158-I. Upon review of the survey results, it could not be determined conclusively if the measurements were due to either NORM or gaseous effluent fallout.

3.10.7 Survey Area Conclusions

The following conclusions were reached for the NPA Buildings/Structures:

- The Warehouse does not present an unexpected radiological issue or concern.
- Material background data should be collected to support a successful final survey design.
- The preliminary Class 2 designation should be retained until material background data become available for determining the potential presence and amount of residual plant-related radioactivity.
- The source of the removable activity on the roof needs to be evaluated further.
- The LLRWSF and DST should be scheduled for future characterization surveys.

3.11 SPA (SAP 09 – BUILDINGS/STRUCTURES)

3.11.1 Area description

The buildings and structures within the SPA include the Oyster Creek Administration Building (OCAB), Site Emergency Building (SEB), New Gatehouse Facility (NGF), Building 3 Old Machine Shop, Building 4 Site Storage Building, Diesel Generator Building, Hazard Collection Building, Main Access Facility (MAF), Main Gate Security Center, Chlorination Facility, Pretreatment Building, and the liquid nitrogen, main fuel oil, and sodium hypochlorite storage tanks. Refer to section 3.7.1 for the area description. Only the OCAB, SEB, and NGF are expected to remain for use following site license termination. Site characterization focused on these three buildings. All other buildings and structures are scheduled for demolition and were not surveyed during this phase of site characterization.

3.11.2 Survey Summary

Survey Period: 9/26/2022 through 11/15/2022

Survey activities were governed by SAP 09, Building/Structures – South Protected Area. Survey planning for the SPA buildings/structures area included the use of the VSP program to identify random sample locations consistent with MARSSIM methodology. In addition, biased locations were selected by the Radiological Engineer as locations where plant-related cross-contamination may have resulted from personnel. Some random survey locations were located within 6 feet of the roof's edge and were relocated to the closest point greater than 6 feet from the roof's edge for safety reasons. All sample locations included 1m² scans with direct beta and alpha radiation measurements and 100 cm² smears obtained at the highest count rate observed during the scan. The planned number of samples and measurement type for each SPA structure are shown in Table 3-94.

Oyster Creek Administration Building

Planning for the survey of the OCAB included 100 VSP-generated random sample points on floor surfaces. In addition, 56 biased survey locations were selected, 55 on wall surfaces, and 1 on the floor. The biased locations on the walls, including areas below 8 feet, were most likely to have been touched by personnel such as light switches, door handles, frames, thermostat controllers, etc. One of the biased locations (SPA-OCB-156-B) was selected under a false floor in the computer room.

OCAB scans were conducted at all sample locations and general area floor scans using calibrated gas flow proportional or equivalent survey meters to identify the presence of elevated radioactivity. A total of 12,579 m² were scanned (first floor 2,884 m², second floor 3,049 m², third floor 4,366 m², and roof 2,280 m²). Direct measurements were logged. Except for 2 locations on the roof, all the scan surveys did not identify areas with audible distinctions above background. The 2 roof locations were investigated. Details of the investigations are provided in section 3.10.6. Four roof sample locations (SPA-OCB-61, -62, -63, and -64) had to be relocated for safety concerns and are discussed in section 3.11.5.

Site Emergency Building

Planning for the survey of the SEB included 125 VSP-generated random sample points on floor surfaces. In addition, 46 biased survey locations were selected, 43 on wall surfaces, and 3 on the floor. The biased locations on the walls, including areas below 8 feet and were most likely to have been touched by personnel: light switches, door handles, frames, thermostat controllers, etc. Three biased locations were selected under a false floor in the computer room. Three roof sample locations (SPA-SEB-111-D, -112, and -114) had to be relocated for safety concerns and are discussed in section 3.11.5.

SEB scans were conducted at all sample locations and general area floor scans using calibrated gas flow proportional or equivalent survey meters to identify the presence of elevated radioactivity. A total of 5,634 m² were scanned (first floor 2,395 m², second floor 1,821 m², and roof 1,418 m²). Direct measurements were logged.

New Gatehouse Facility

Planning for the survey of the NGF included 45 VSP-generated random sample points on floor surfaces. In addition, 15 biased survey locations were selected on the walls, including areas below 8 feet. They were most likely to have been touched by personnel: light switches, door handles, frames, thermostat controllers, etc. Three roof sample locations (SPA-NGF-48, -54, and -55) had to be relocated for safety concerns and are discussed in section 3.11.5.

NGF scans were conducted at all sample locations and general area floor scans using calibrated gas flow proportional or equivalent survey meters to identify the presence of elevated radioactivity. A total of 1,319 m² were scanned (first floor 802 m² and roof 517 m²). Direct measurements were logged.

Table 3-97 Planned Number and Type of Measurements by Structure in the SPA

Building/Structure	Code	Fixed-Point Measurements	Smears	Volumetric Samples
Oyster Creek Administration Building	OCB	155	155	0
Site Emergency Building	SEB	165	165	0
New Gatehouse Facility	NGF	60	60	0

3.11.3 Survey Data SummaryDiscussion

Comparison of the direct measurements to the AC for Cs-137 and Co-60 shows that while the upper ends of the measurement ranges are less than the Cs-137 AC in all the buildings, they exceed the more conservative AC for Co-60 on at least one floor inside each building. Comparing direct measurement ranges for the roofs to the Co-60 AC show similar results. In addition, the upper ends of the gross alpha measurement ranges for the OCAB and SEB exceed the AC for the representative alpha-emitting ROC (i.e., Am-241). Except for the NGF roof, the mean values for the direct measurements are significantly below the AC.

The finding that some gross measurements exceed AC does not necessarily reflect a need for remediation. Gross measurements collected inside the buildings may reflect varying material backgrounds. Gross measurements from the roofs may reflect a high NORM content in roofing material or possibly residual deposition from gaseous effluent releases. Additional characterization and material background data are needed to determine if the gross measurements reflect NORM or plant-related radioactivity.

Table 3-98 Data Summaries for Statistically-Determined OCAB Floor Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	1241	6120	2931	1576	0.00%	3003/43-68
	Alpha	0	213	44	64	0.00%	3003/43-68
2nd	Beta	3461	9630	4671	1413	0.00%	3003/43-68
	Alpha	0	84	22	27	0.00%	3003/43-68
3rd	Beta	3362	4726	4180	326	0.00%	3003/43-68
	Alpha	0	148	30	45	0.00%	3003/43-68
Roof	Beta	2019	5700	3395	1080	0.00%	3003/43-68
	Alpha	213	911	464	176	0.00%	3003/43-68

Table 3-99 Data Summaries for Biasedly-Determined OCAB Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	1619	7908	2626	1440	0.00%	3003/43-68
	Alpha	0	91	24	26	0.00%	3003/43-68
2nd	Beta	2610	4667	3248	455	0.00%	3003/43-68
	Alpha	0	106	37	25	0.00%	3003/43-68
3rd	Beta	1704	2776	2144	313	0.00%	3003/43-68
	Alpha	0	61	22	24	0.00%	3003/43-68

Table 3-100 Data Summaries for Statistically-Determined SEB Floor Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	3599	8044	5029	981	0.00%	3003/43-68
	Alpha	0	141	47	32	0.00%	3003/43-68
2nd	Beta	2965	7298	4751	1027	0.00%	3003/43-68
	Alpha	0	141	42	40	0.00%	3003/43-68
Roof	Beta	4539	9623	6571	951	0.00%	3002/43-93
	Alpha	209	1171	519	224	0.00%	3002/43-93

Table 3-101 Data Summaries for Biasedly-Determined SEB Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	2714	8044	5029	981	0.00%	3003/43-68
	Alpha	0	141	47	32	0.00%	3003/43-68
2nd	Beta	3496	11034	4799	1778	0.00%	3003/43-68
	Alpha	0	141	42	40	0.00%	3003/43-68

Table 3-102 Data Summaries for Statistically-Determined NGF Floor Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	3085	11225	7797	2241	0.00%	3003/43-68
	Alpha	0	190	33	39	0.00%	3003/43-68
Roof	Beta	7332	11169	9776	1026	0.00%	3002/43-93
	Alpha	60	501	234	137	0.00%	3002/43-93

Table 3-103 Data Summaries for Biasedly-Determined NGF Measurement Locations

Floor	Gross Measurement	Fixed-Point Measurement Range		Mean (dpm/100cm ²)	Standard Deviation (dpm/100cm ²)	Percent Removable ¹	Instrument Type
		Minimum (dpm/100cm ²)	Maximum (dpm/100cm ²)				
1st	Beta	3306	7539	4620	1102	0.00%	3003/43-68
	Alpha	0	113	30	34	0.00%	3003/43-68

3.11.4 Data Quality Comparisons

On-Site Duplicate Counts

Duplicate counts for all smears were less than MDC.

On-Site/Off-Site Laboratory Comparisons

None – not applicable.

Off-Site Laboratory HTD Analyses

None – not applicable.

3.11.5 Survey Plan Deviation

Ten sample points required deviations for safety concerns, 3 each at the SEB and NGF, 4 at the OCB. Sample points SPA-SEB-111-D, SPA-SEB -112, SPA-SEB -114, SPA-OCB-61, SPA-OCB -62, SPA-OCB -63, SPA-OCB -64, SPA-NGF-48, SPA-NGF -54, SPA-NGF -55 were all randomly located by VSP in areas that were within 6 feet of the building edge. Sample points were relocated to the nearest accessible location where the 6-foot safety margin could be maintained.

3.11.6 Survey Area Investigations

Elevated readings were identified during the building surface scan surveys on the OCAB's third floor. The location was investigated and recorded as SPA-OCB-159-I. The measurement was not reproducible during the investigation and was determined to be a false positive.

Additionally, surface scans of the OCB roof revealed two locations, SPA-OCB-157-I and SPA-OCB-158-I, where counts with audible distinctions above background. The investigation measurements at the location were within the statistical range of the data set. Smears were counted and identified the presence of alpha contamination above MDC. The activity was still present when the smears were recounted approximately 6 hours later. Three additional investigation surveys were performed to evaluate the presence of NORM on the roof surface. These sample locations were identified with consecutive sample numbers SPA-OCB-160-I through SPA-OCB-162-I; the results were inconclusive. The investigation continued by collecting a volumetric sample of sediment from the roof. On-site gamma analysis of the sample (SPA-OCB-SEDI-01-I) showed the presence of NORM, Cs-137 (9.74E-01 pCi/g), and Co-60 (1.60E+00 pCi/g).

Three similar investigative surveys were performed on the SEB and NGF roofs. The SEB sample locations were identified with consecutive sample numbers SPA-SEB-169-I through SPA-SEB-171-I. The NGF sample locations were SPA-NGF-61-I through SPA-NGF-63-I. Volumetric samples of sediment were collected from the two roofs. On-site gamma analysis of the SEB volumetric sample (SPA-SEB-SEDI-02-I) showed the presence of NORM and Cs-137 (1.43E-01 pCi/g). On-site gamma analysis of the NGF volumetric sample (SPA-NGF-SEDI-01-I) showed the presence of NORM. The results of the investigations could not conclusively determine if the activity was due to NORM or gaseous effluent fallout.

3.11.7 Survey Area Conclusions

The following conclusions were reached for the SPA Buildings/Structures:

- The OCAB, SEB, and NGF do not present an unexpected radiological issue or concern and areas likely to meet release criteria.
- The roof of the OCAB should be reclassified as MARSSIM Class 2. The preliminary Class 3 should be retained for the remaining portions of the SPA Area structures (OCAB, SEB, and NGF).
- Consider collecting material background data for various structure media types to support final survey design.

3.12 GROUNDWATER

3.12.1 Introduction

NRC regulations (10 CFR 20.1402) and NJAC 7:28-12.8 include dose contributions from groundwater as a drinking water source and through the groundwater exposure pathways in their radiological criteria for unrestricted release. As part of the radiological characterization of the OCNGS, the current radiological status of the groundwater at the OCNGS site was determined by a review of the 2022 groundwater monitoring data summarized in the February 2023 letter from AMO Environmental Decisions to the OCNGS Radiological Groundwater Protection Program (RGPP) Coordinator [Ref. 5].

OCNGS continues to monitor groundwater in accordance with NEI 07-07. The monitoring program includes 14 background wells, 14 detection wells, and 6 long term shutdown wells that allow monitoring of the Cohansey and Cape May Aquifers. Figure 3-10 and Figure 3-11 show the locations of OCNGS RGPP groundwater monitoring wells for each aquifer as well as the site groundwater contours.

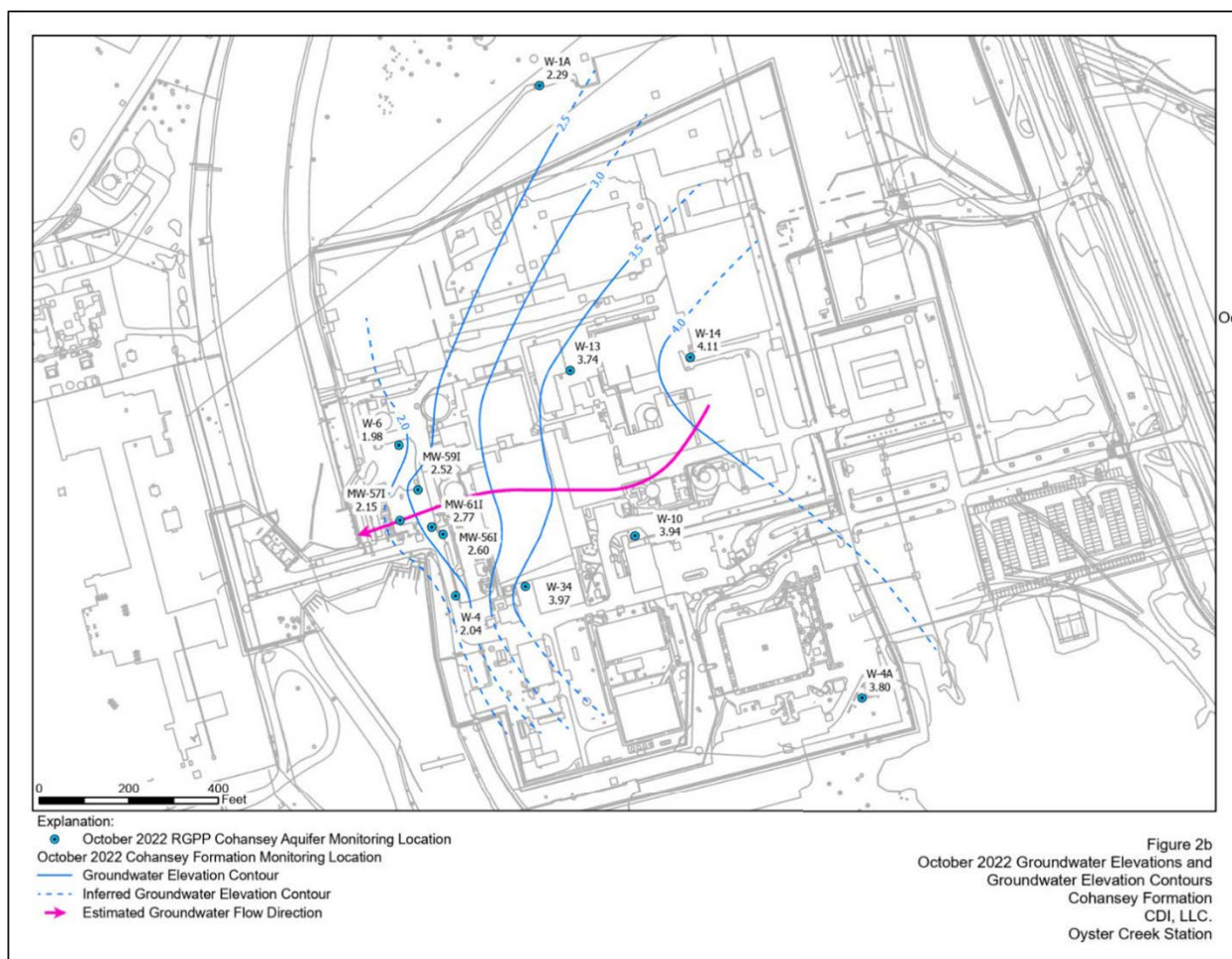


Figure 3-10 OCNGS RGPP Monitoring Wells for the Cohansey Aquifer

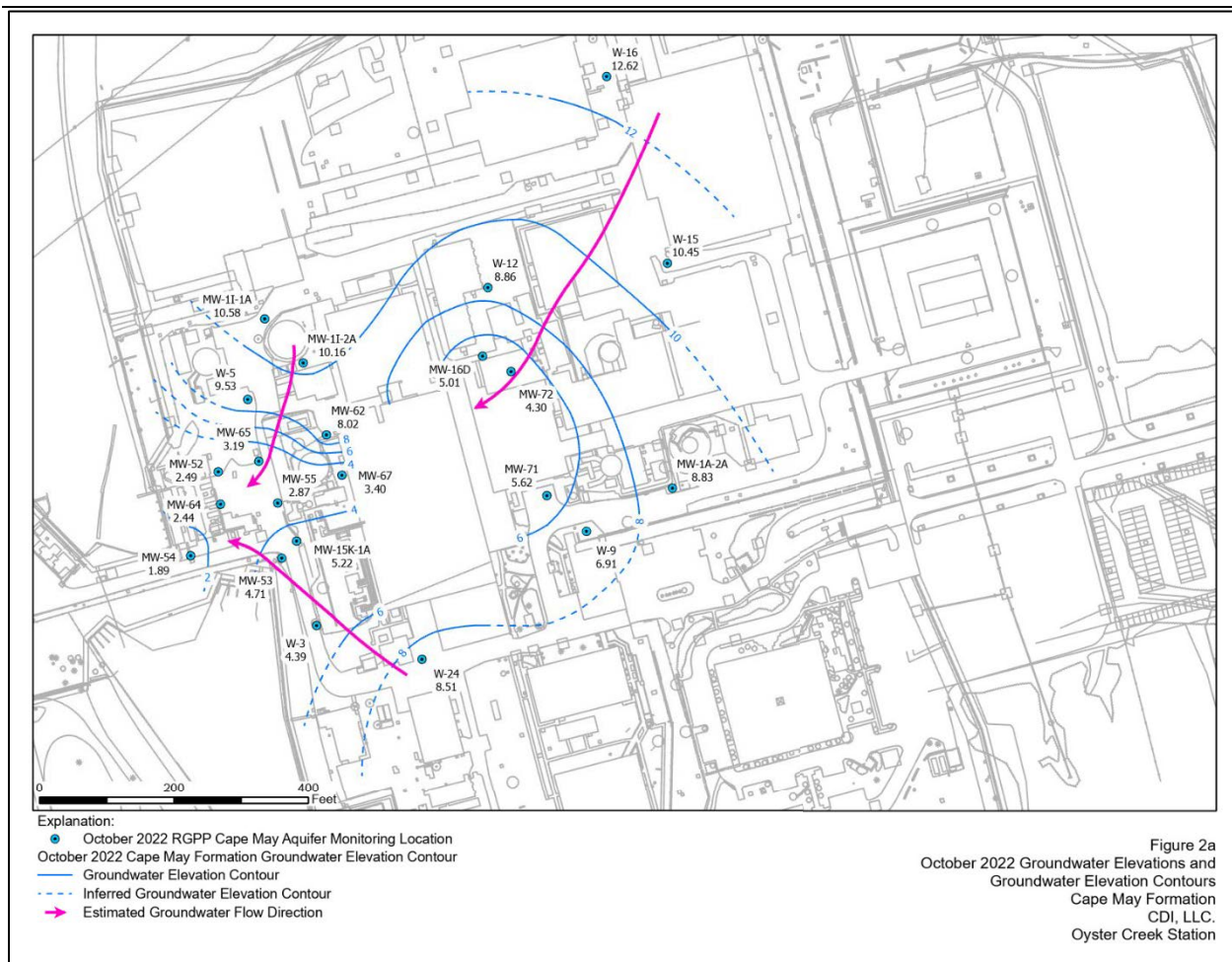


Figure 3-11 OCNCS RGPP Monitoring Wells for the Cape May Aquifer

3.12.2 Discussion

The 2022 groundwater data set includes results for 35 samples collected in April, 2 samples collected in June, and 20 samples collected in October. All samples were analyzed for tritium and gamma-radionuclides. Samples from Detection and Long-Term Shutdown wells were also analyzed for gross-alpha and beta, and strontium-89 and -90. Table 3-104 provides a summary of the 2022 groundwater data.

The OCNCS RGPP detection limit for tritium in groundwater is ≤ 200 pCi/L. Most of the groundwater samples showed non-detectable (i.e., below the detection limit) tritium results. In 2022, tritium was detected at low concentrations in 5 groundwater samples collected from the Cape May Formation wells and in 8 samples collected from Cohansey Formation wells. The positive 2022 data from the Cape May formation wells ranged from 204 pCi/L to 237 pCi/L, whereas the positive 2022 data from the Cohansey formation wells ranged from 209 pCi/L to 605 pCi/L. The Cape May formation sample showing the highest tritium concentration (237 pCi/L) was collected from well MW-54 and the Cohansey formation sample showing the highest concentration (605 pCi/L) was collected from well W-13. Well MW-54 is located West of the reactor and turbine buildings, downstream of the historic Condensate Storage Tank (CST)

SECTION THREE

Radiological Findings

release location. Well W-13 is located northeast of the reactor and turbine buildings, upstream of the historic CST release location. It is noted that several positive detections of tritium in the April samples were found to be significantly lower in the October samples. For example, well MW-13 showed a tritium concentration equal to 605 pCi/L in the April sample and a significantly lower tritium concentration (313 pCi/L) in the June sample.

Analyses for gross-alpha (suspended), gross-beta (dissolved), and gross beta (suspended) did not show concentrations that exceeded their respective alert levels. Gamma-radionuclides, strontium 89 and 90 are analyzed for annually and were not detected in the samples collected.

Table 3-104 Recent Results from the OCNGS NEI 07-07 Groundwater Protection Program

Well ID	Aquifer	Sample Date	Result (pCi/L)	Well ID	Aquifer	Sample Date	Result (pCi/L)
MW-16D	Cape May	4/27/2022	177	W-5	Cape May	4/26/2022	191
		10/26/2022	186			10/25/2022	187
MW-67	Cape May	4/26/2022	236	W-16	Cape May	4/27/2022	222
		10/26/2022	192			6/23/2022	191
MW-71	Cape May	4/27/2022	164	W-24	Cape May	4/28/2022	177
		10/26/2022	192	MW-1A-2A	Cape May	4/27/2022	167
MW-72	Cape May	4/27/2022	165	W-15	Cape May	4/27/2022	180
		10/26/2022	204	MW-52	Cape May	4/26/2022	187
W-12	Cape May	4/27/2022	185	MW-53	Cape May	4/26/2022	180
		10/26/2022	175	MW-54	Cape May	4/26/2022	237
W-9	Cape May	4/27/2022	188	W-34	Cohansey	4/28/2022	179
		10/26/2022	180			10/26/2022	183
MW-15K-1A	Cape May	4/26/2022	173	MW-56I	Cohansey	4/26/2022	209
		10/25/2022	190			10/25/2022	270
MW-11-1A	Cape May	4/27/2022	181	MW-57I	Cohansey	4/26/2022	368
		10/25/2022	191			10/25/2022	189
MW-11-2A	Cape May	4/27/2022	181	MW-59I	Cohansey	4/26/2022	379
		10/25/2022	189			10/25/2022	199
MW-55	Cape May	4/26/2022	172	MW-61I	Cohansey	4/26/2022	183
		10/25/2022	169			10/25/2022	189
MW-62	Cape May	4/26/2022	193	W-13	Cohansey	4/27/2022	605
		10/25/2022	186			6/23/2022	313
MW-64	Cape May	4/26/2022	180	W-1A	Cohansey	4/28/2022	183
		10/25/2022	191	W-4A	Cohansey	4/28/2022	179
MW-65	Cape May	4/26/2022	172	W-10	Cohansey	4/27/2022	193
		10/25/2022	196	W-14	Cohansey	4/27/2022	180
W-3	Cape May	4/26/2022	187	W-6	Cohansey	4/27/2022	187
		10/25/2022	196	W-4	Cohansey	4/26/2022	182

3.12.3 Groundwater Conclusions

- Based on review of the 2022 RGPP sampling data and historic data, there is no ongoing tritium leak at the Station. OCNGS should continue monitoring the site's groundwater through decommissioning of the site.
- The highest tritium concentration in the latest groundwater sampling campaign (i.e., 313 pCi/L in the June 2022 sample from W-13) represents <2% of the EPA drinking water standard (20,000 pCi/L).

4 CONCLUSIONS

The conclusions listed below apply to the OCA's open land areas and structures. Characterization is an iterative process, and additional characterization data will be collected as decommissioning and demolition activities progress.

All gaps identified in the SCP (Table 4-2 *Summary of Radiological Data Gaps by OCS Study Area*) have been resolved.

OPEN LAND AREAS

NOCA-1, SOCA-1, SOCA-2

- MARSSIM Class 3 designation is appropriate for the NOCA-1 survey area.
- Excavation or remediation of soil within the NOCA-1 area is likely not necessary for the area to meet site release criteria.

NOCA-2

- Excavation of the contaminated soil relocated in 1982 under the North Parking is not likely, as indicated by the low Cs-137 concentration in the deep soil sample (i.e., a measured concentration of less than 10% of the Cs-137 AC). The measured Cs-137 and Co-60 concentrations in NOCA-2 samples indicate that the area meets MARSSIM Class 3 criteria.
- MARSSIM Class 1 designation is appropriate for the NOCA-2 survey area: basis (waste storage location).

EOCA-1

- Retaining the MARSSIM Class 2 designation for the waste travel routes within the EOCA-1 boundary is appropriate; this is a historical waste travel route, and its continued use is likely.
- EOCA-1A and EOCA-1B should be established as separate MARSSIM Class 3 areas. Residual plant-related contamination in the survey area meets the criteria in NUREG-1575 for a MARSSIM Class 3 area.
- Excavation or remediation of soil within EOCA1 Class 3 areas is likely not necessary to meet site release criteria.

NPA, SPA

- The Cs-137 and Co-60 concentrations found in NPA samples do not require excavation or remediation to meet site release criteria at this time. The current radiological status may change as active decommissioning of the site commences.
- Radiological status changes may warrant additional site characterization collection to support FSS planning.
- Additional characterization in yard areas, including walk-over gamma scans and soil sampling, should be considered when waste containers are moved.

RCA

- Collected data confirms that the RCA is MARSSIM Class 1.
- The Cs-137 and Co-60 concentrations in soil samples from locations 4 and 15 indicate that excavation or remediation is required to meet site release criteria.

DCA

- The Discharge Canal contains detectable quantities of Cs-137, Co-60, and Tc-99.
- The current Co-60 findings warrant the reclassification of the Discharge Canal to a Class 2 area.

BUILDINGS/STRUCTURES**NPA**

- The Warehouse does not present an unexpected radiological issue or concern.
- Material background data should be collected to support a successful final survey design.
- The preliminary Class 2 designation should be retained until material background data become available for determining the potential presence and amount of residual plant-related radioactivity.
- The source of the removable activity on the roof needs to be evaluated further.
- The LLRWSF and DST should be scheduled for future characterization surveys.

SPA

- The OCAB, SEB, and NGF do not present an unexpected radiological issue or concern and areas likely to meet release criteria.
- The roof of the OCAB should be reclassified as MARSSIM Class 2. The preliminary Class 3 should be retained for the remaining portions of the SPA Area structures (OCAB, SEB, and NGF).
- Consider collecting material background data for various structure media types to support final survey design.

5 RECOMMENDATIONS

The following recommendations are made based on the radiological data collected during this phase of site characterization:

1. Retain the MARSSIM Class 2 designation for the waste travel routes within the EOCA-1 boundary. Establish MARSSIM Class 3 areas for EOCA-1A and EOCA-1B.
2. Retain the MARSSIM Class 1 designation for the NOCA-2 survey area. Additional depth interval sampling should be conducted when waste containers are removed and asphalt is removed to expose underlying soils as part of the iterative characterization process.
3. Perform additional characterization in NPA and SPA yard areas, including walk-over gamma scans and soil sampling when the waste containers are removed.
4. Collect and evaluate building material background data to support final survey design.
5. Retain the preliminary MARSSIM classification of buildings until building material background data becomes available.
6. Reclassify OCAB roof as MARSSIM Class 2.
7. Evaluate the nature of the removable activity (i.e., NORM or plant-related) on the warehouse roof.
8. Schedule LLRWSF and DST characterization surveys when no longer required for site use.

6 REFERENCES

1. *Oyster Creek Generating Station Site Characterization Plan*, Rev. 0, June 2022
2. *NUREG-1575, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, August 2000
3. *Oyster Creek Station Historical Site Assessment*, Rev. 1, November 2020
4. *NRC Inspection Procedure 84525, Quality assurance and confirmatory measurements for in-plant radiochemical analysis (preoperational and supplemental)*, May 1985
5. Letter from AMO Environmental Decision to the OCNGS RGPP Coordinators, dated, February 24, 2023