NYSERDA New York State Energy Research and Development Authority
Vincent A. DeIorio, Esq., *Chairman*
Toll Free: 1 (866) NYSERDA
www.nyserda.org • info@nyserda.org

November 16, 2010

Dr. Keith I. McConnell, Deputy Director
Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
U. S. Nuclear Regulatory Commission
Washington, DC 20555-001

Dear Dr. McConnell:

SUBJECT: Final Status Survey Plan (FSSP) for the Bulk Storage Warehouse (BSW) at the Western New York Nuclear Service Center (WNYNSC), November 2010

I am submitting the FSSP for the BSW for the U.S. Nuclear Regulatory Commission (NRC) review and comment.

The FSSP, which is consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), provides a strategy for conducting a final status survey of the BSW and immediate surrounding soils. The purpose of the survey is to verify that the building and surrounding soils meet relevant requirements for an unrestricted release. The results of the FSS will be submitted with a future application for a license amendment to remove the BSW and portions of the WNYNSC from the license No. CSF-1.

While the New York State Energy Research and Development Authority (NYSERDA) plans to begin implementation of the plan this fall, weather permitting. We remain interested in receiving NRC's comments on all aspects of the FSSP and will respond accordingly.

Please call me at 716-942-9960 ext. 4900 if you have any questions.

Sincerely,

WEST VALLEY SITE MANAGEMENT PROGRAM

Paul J. Bembia, Director

PLP/amd

Enclosure: *Final Status Survey Plan for the Bulk Storage Warehouse at the Western New York Nuclear Service Center,* November 2010

PJB/10amd050.plp

Main Office
Albany
17 Columbia Circle
Albany, NY 12203-6399
Toll Free: 1 (866) NYSERDA
Phone: (518) 862-1090
Fax: (518) 862-1091

West Valley Site Management Program
10282 Rock Springs Road
West Valley, NY 14171-9799
Phone: (716) 942-9960
Fax: (716) 942-9961

New York City
485 Seventh Ave., Suite 1006
New York, NY 10018
Phone: (212) 971-5342
Fax: (212) 971-5349

Buffalo
Larkin at Exchange Building
726 Exchange Street, Suite 821
Buffalo, New York 14210
Phone: (716) 842-1522
Fax: (716) 842-0156

FSME21

Final Status Survey Plan for the Bulk Storage Warehouse at the Western New York Nuclear Service Center

Final

November 2010

Prepared for:

New York State Energy Research and Development Authority
9030-B Route 219
West Valley, New York 14171

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AEC	(U.S.) Atomic Energy Commission
ALARA	as low as reasonably achievable
Am	americium
ASER	Annual Site Environmental Report
Ba	barium
BSW	Bulk Storage Warehouse
CFR	Code of Federal Regulations
cm	centimeter
Co	cobalt
COC	contaminant of concern
cpm	counts per minute
Cs	cesium
CSM	conceptual site model
CY	calendar year
DCGL	Derived Concentration Guideline Level
DOE	(U.S.) Department of Energy
dpm	disintegrations per minute
DQI	data quality indicator
DQO	data quality objective
E & E	Ecology and Environment, Inc.
EPA	(U.S.) Environmental Protection Agency
Eu	europium
FIDLER	Field Instrument for Detection of Low-Energy Radiation
FSS	final status survey
FSSP	Final Status Survey Plan
FSSR	Final Status Survey Report
g	gram
GPS	Global Positioning System
GWS	gamma walkover survey
HEPA	high-efficiency particulate air
HSA	historical site assessment
I	iodine
K	potassium
LBGR	Lower Boundary of the Gray Region

MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MeV	megaelectron volt
mrad	millirad
mrem	millirem
NAD83	North American Datum 1983
NaI	sodium iodide
NIST	National Institute of Standards and Technology
NRC	(U.S.) Nuclear Regulatory Commission
NUREG	NRC nuclear regulatory document
NYSASDA	New York State Atomic and Space Development Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOC	New York State Department of Commerce
NYSERDA	New York State Energy Research and Development Authority
PARCC	precision, accuracy, representativeness, completeness, and comparability
pCi	picocurie
PSF	Plutonium Storage Facility
Pu	plutonium
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
SD	standard deviation
SML	Scrap Material Landfill
SOR	sum of ratios
Sr	strontium
SUNY	State University of New York
U	uranium
WNYNSC	Western New York Nuclear Service Center
WRS	Wilcoxon Rank Sum
WVDP	West Valley Demonstration Project
WVNSCO	West Valley Nuclear Services Company
y	year

1.0 INTRODUCTION AND PURPOSE

The New York State Energy Research and Development Authority (NYSERDA) is pursuing a partial site release of a portion of the Western New York Nuclear Service Center (WNYNSC). This Final Status Survey Plan (FSSP) provides a strategy for conducting a final status survey (FSS) of the Bulk Storage Warehouse (BSW) and immediate surrounding soils. The purpose of the survey is to verify that the building and surrounding soils meet the relevant requirements for release for unrestricted use.

Although the structure was considered acceptable for unrestricted use based on the results of a 1974 closeout radiation survey (followed by termination of the license under Title 10, Part 70 of the Code of Federal Regulations [10 CFR 70] that governed radiological activities performed therein), the U.S. Nuclear Regulatory Commission (NRC) has indicated that the partial site release process and criteria in 10 CFR 50.83 for an "impacted area" must be satisfied in order for the BSW property to be removed from NYSERDA's 10 CFR 50 license. (An impacted area is defined in 10 CFR 50 as an area with some reasonable potential for residual radioactivity in excess of natural background or fallout levels.) This includes the performance of surveys to demonstrate compliance with the radiological criteria specified in 10 CFR 20.1402 for impacted areas.

The FSS will be used to confirm that radioactivity concentrations on BSW building surfaces and in surrounding surface soils are consistent with background levels and/or below other specified release criteria. This Plan is based on guidance in the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NRC 2000) and related documents on planning, performing, and assessing radiological surveys. The data compiled during this effort will serve as final verification that the site complies with appropriate limits to allow release for unrestricted use.

2.0 HISTORICAL SITE ASSESSMENT AND CONCEPTUAL SITE MODEL

The historical site assessment (HSA) was conducted to identify areas of the BSW site that may have been impacted by radiological activities. Figure 2-1 shows the location of the BSW at the WNYNSC and Figure 2-2 shows the BSW area. A review of available records and files for the BSW site was conducted for this Plan, including radiological survey results as well as accident, incident, and leak test reports. A description and historical overview of the BSW and its activities are included in the HSA and the Conceptual Site Model (CSM) basis in Appendix A. In summary, the HSA showed:

- The BSW was licensed from 1969 to 1975 to receive and store plutonium nitrate from fuel reprocessing activities that occurred from 1966 to 1972 at the main plant and operational area of the WNYNSC. The main plant and immediate operational area are now the site of the U.S. Department of Energy (DOE)-managed West Valley Demonstration Project (WVDP), a cleanup project that began in 1980. The BSW was known at the time of operation as the Plutonium Storage Facility (PSF) but will be referred to as the BSW for most of this Plan.

- Plutonium nitrate was delivered to the BSW in polyethylene bottles, which were sealed in gas-tight stainless steel capsules and enclosed in concrete-shielded shipping containers. Capsules were transferred within a specially-designed containment hood to concrete-shielded storage casks. Each step of the transfer process required contamination monitoring and monthly surveys of the facility and storage containers were performed.

- All plutonium nitrate was removed from the BSW in 1974, closeout radiation surveys were performed in 1974 and 1975, and the NRC 10 CFR 70 license was terminated in 1975. The empty storage casks and transfer hood were later buried in a nearby trench. The contents of the trench are not considered to be radioactive, are outside the study area, and are not addressed by this Plan.

- Subsequent to license termination, from approximately 1983 to 2009, DOE used the BSW as a storage warehouse for files and office equipment. Other than a battery acid spill in 1995 that was successfully contained and remediated, no records have been identified that document the handling of hazardous or radioactive materials at the site subsequent to termination of the NRC license and burial of the storage casks.

- No inspection reports, survey data, or employee statements indicate any accidents or incidents involving radioactive materials, licensed or unlicensed. Available radiological surveys conducted by DOE contractors did not indicate any areas of concern in or around the BSW.

Based on the historical review of BSW activities (including its license for handling special nuclear materials), the contaminants of concern (COCs) identified for the FSS consist of radionuclides that were stored at the BSW, relevant daughter products of those radionuclides, and radionuclides potentially at the BSW site due to activities at the main plant area of the WNYNSC that might have affected the BSW area. Table 2-1 lists the COCs for the BSW along with their decay characteristics, reason for inclusion in the FSS, and potential for presence in local background (which is germane to survey strategy and interpreting survey results).

Table 2-1 BSW FSS Contaminants of Concern

Radio-nuclide	Half-life	Principal Decay (MeV)	Reason for Inclusion in FSS	Potential for Presence in Local Background
Am-241	432.2 y	α (5.49) X (0.060)	Readily detectable Pu-241 daughter	Unlikely or negligible
Cs-137/ Ba-137m	30.1 y	β_{max} (0.514, 1.18) γ (0.662)	Dominant radionuclide in airborne emissions from main process plant at WNYNSC	Yes, primarily from global fallout from nuclear weapons testing
Pu-239	2.4E+04 y	α (5.11, 5.14, 5.16) X (0.017)	Predominant plutonium isotope in the plutonium nitrate solution stored at the BSW	Unlikely or negligible
Pu-240	6.6E+03 y	α (5.12, 5.17)	In the plutonium nitrate solution stored at the BSW	Unlikely or negligible
Pu-241	14.4 y	β_{max} (0.021) α (4.90)	In the plutonium nitrate solution stored at the BSW	Unlikely or negligible

Key:
α = alpha.
β_{max} = beta, maximum energy.
γ = gamma.
X = X-ray.
Am = americium.
Ba = barium.
Cs = cesium.
Pu = plutonium.
MeV = megaelectron volt.
y = year.

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L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 2-1 BSW_Project_Area.mxd 11/10/2010

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WNYNSC Boundary
West Valley Demonstration Project boundary
Bulk Storage Warehouse boundary

**Figure 2-1
Bulk Storage Warehouse
Location at
Western New York
Nuclear Service Center**

N
0 250 500 1,000 Feet

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© Ecology & Environment, Inc. GIS Department Project #002177.NZ08.02
L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 2-2 BSW Aerial.mxd 11/10/2010

Figure 2-2
Bulk Storage Warehouse

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Based on the HSA, the following assumptions and CSM details were developed for the BSW and the FSS:

- Overall, measurable residual contamination likely does not exist in the BSW or the surrounding property.

- Structural contamination, if any, would exist only in the interior of the BSW and specifically on floor surfaces, in the ventilation system (equipment, ducts, and miscellaneous mechanical equipment), and in the drainage system (drains, traps, sumps, and piping). There is no known pathway for the walls and ceiling to have been contaminated.

- Volumetric contamination is not anticipated in BSW structure materials (such as the concrete floor) nor should any COCs migrate past the surface and exist only in the subsurface (i.e., without any residual surface contamination).

- Any contamination on the exterior surfaces of the BSW, if there previously was any, would have been washed off by rain or snow in the 35 years since the license was terminated and the BSW was released for unrestricted use, and would be present in the surrounding surface soil.

- Surface contamination exterior to the BSW, if any, would exist only in surface soils and would have resulted from airborne deposition from BSW activities, airborne deposition from other WNYNSC activities, precipitation runoff from the building's exterior surfaces, or incidental spills at the BSW property (none of the latter were reported). Any contamination on the concrete driveway would have been washed off by rain or snow in the 35 years since the license was terminated and the BSW was released for unrestricted use, and would be present in the surrounding surface soil.

- Subsurface contamination, if any, would exist only in subsurface drain traps, subsurface piping, and the septic tank that is buried on the site property. There is no known pathway for subsurface soil and groundwater to have been contaminated unless radioactive material was introduced to the drainage system or the surface soil was contaminated, both of which are considered historically to be unlikely and will be investigated by the FSS nevertheless. Contamination in subsurface soil would not be expected to exist without accompanying surface soil contamination.

- Based on the historical predominant wind directions for the WNYNSC (winds from southerly and westerly directions) and environmental monitoring data for the BSW location, the BSW property likely has not been affected by airborne deposition from other WNYNSC activities. Investigating the five COCs identified for the BSW FSS (Table 2-1) will adequately address the low potential for airborne deposition from other WNYNSC activities because the five COCs have historically been dominant emissions from those activities.

- Potential impurities in the plutonium nitrate solution (such as uranium from fuel reprocessing activities) would be dominated by the plutonium content, and investigating the Am-241 and plutonium COCs will adequately address the potential for other contaminants associated with the solution.

- Any residual contamination associated with the BSW property would be evident by investigating accessible areas, i.e., there would be no hidden areas of contamination that would not be revealed by investigating accessible areas.

3.0 SURVEY PLANNING

FSS planning followed the data quality objective (DQO) process, as recommended by MARSSIM. The DQO process is a series of steps defined by the U.S. Environmental Protection Agency (EPA) to ensure that the type, quantity, and quality of survey data used in decision-making are sufficient for the data's intended purpose.

3.1 Statement of the Problem

NYSERDA is pursuing a partial site release of a portion of the WNYNSC in accordance with 10 CFR 50.83 requirements. Based on existing information, the BSW property is considered to be currently unaffected by historical radiological activities and to be uncontaminated. Because the BSW was previously used for radiological operations and NRC considers it to be an impacted area (see Section 1), as part of the partial site release process NYSERDA will perform an FSS to verify that the BSW and immediate surrounding soils meet the relevant radiological release criteria and can be released for unrestricted use. The planning team includes representatives from NYSERDA (implementation and decision-making), Argonne National Laboratory (technical support and expertise), and Ecology and Environment, Inc. (technical support and plan implementation).

3.2 Identification of the Decision

Based on the assumption that the BSW and surrounding soils are currently unaffected by historical radiological activities (or affected to such a minimal degree that radioactivity concentrations would be below relevant release criteria), the intent of the FSS is to confirm that radioactivity concentrations on interior BSW building surfaces and in immediate surrounding surface soils are consistent with background levels and/or below other specified release criteria. If so, then the BSW property may be released for unrestricted use. If not, then NYSERDA will further evaluate the partial site release effort and potential actions for the BSW.

3.3 The Study Boundary

3.3.1 Spatial Boundary

The spatial boundary of the FSS is the approximately 1.2-acre area within the BSW fenceline (see Figures 2-2 and 3-1). The study area consists of the interior of the BSW structure, the grounds immediately inside the fence, and the belowground drainage piping and septic tank (the septic tank itself is located just outside of the BSW fenceline).

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L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 3-1 BSW FFS Survey Units.mxd 10/21/2010

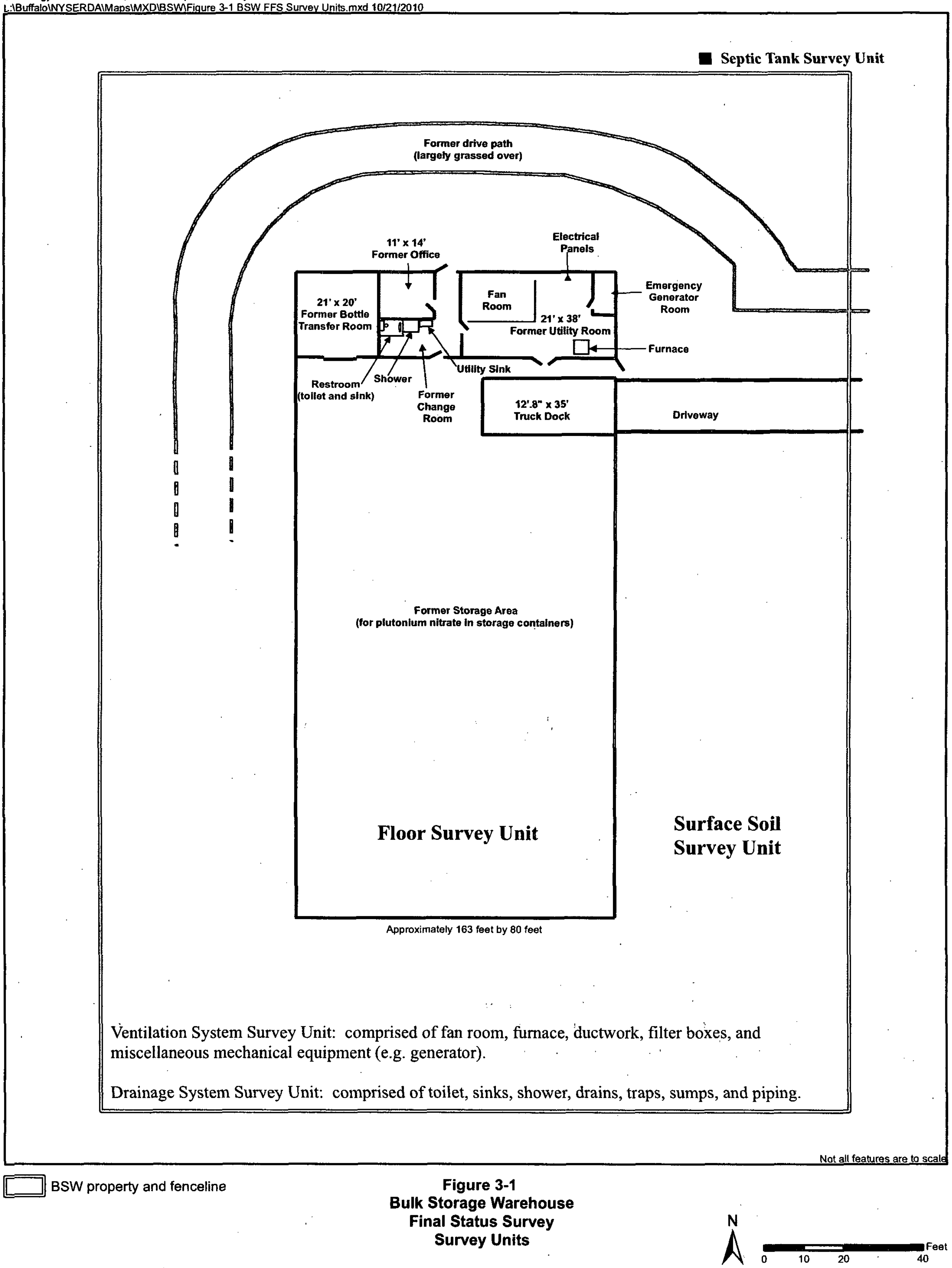

Figure 3-1
Bulk Storage Warehouse
Final Status Survey
Survey Units

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3.3.2 Classification of Survey Areas

Although the site is considered to be an impacted area for the purposes of the partial site release effort (see Section 1), available historical information (including NRC termination of the original 10 CFR 70 license and release of the structure for unrestricted use) indicates that the BSW structure and surrounding surface soils are currently unaffected by historical radiological activities and are uncontaminated. No remediation activities are planned or anticipated in order to meet NRC criteria. Consistent with MARSSIM guidance, the BSW structure and surrounding surface soils are therefore considered to be Class 3 areas, i.e., not expected to contain residual radioactivity and with very low potential for contamination exceeding applicable release criteria.

3.3.3 Identification of Survey Units

A survey unit is a physical area that has been subjected to a consistent set of contamination processes, and it is the smallest area to which a release decision would apply. Survey units of the same classification within a survey area may vary substantially in size but may be sampled with a similar number of measurements if they have similar contamination levels and variability and are subject to the same closure requirement. MARSSIM has no recommended limit on the size of Class 3 structure areas or land areas, and Class 3 areas may comprise a single or several survey units. The FSS will focus on those areas where residual contamination, if present, would most likely be found. For this FSS, the survey units consist of (also see Figure 3-1):

- Structure Survey Units:
  - Floor Survey Unit: the floor in the BSW, including the floor of the truck dock.
  - Ventilation System Survey Unit: ventilation system components, including heating, ventilation, and air conditioning equipment, air movers, fans, and ductwork. Other minor miscellaneous equipment remaining in the BSW are included in this survey unit, such as electrical panels and the emergency generator.
  - Drainage System Survey Unit: industrial and sanitary drainage system components, including sinks, the shower, the toilet, drains, drain traps, sumps, and drainage piping.

- Septic Tank Survey Unit: the belowground septic tank just outside the BSW fenceline.

- Surface Soil Survey Unit: surface soils surrounding the BSW and within the BSW fenceline. Surface soils will be defined as the top 15 centimeters (cm) of soil, consistent with MARSSIM.

A background reference area will be used for the statistical evaluation of data from the BSW floor survey unit because there are no directly applicable Derived Concentration Guideline Levels (DCGLs) for that unit (discussed further in Section 3.5). The background reference area will be the Town of Ashford Highway Department building floor. The Highway Department building is of similar construction, size, and age as the BSW; has no recorded history of the handling, use, or storage of radioactive materials; and is located just off the WNYNSC property, about 0.5 miles south of the BSW (see Figure 2-1).

A background reference area is not part of the protocol for the other survey units. However, a soil background area (not technically a background reference area) will be identified for the survey of the surface soil survey unit to aid in understanding the contribution of local background radioactivity in soil to measurements and samples collected for the BSW soil survey unit. The use of the soil background area is further discussed in Section 3.5.2. The soil background area will be selected to be close to but outside of the WNYNSC, in an area with terrain and surface features that resemble those of the BSW property. The soil background area will preferably be to the southeast or southwest to avoid potential airborne impacts from WNYNSC activities at the main plant area (see the HSA).

3.4 Information Inputs to the Decision

MARSSIM emphasizes use of a graded approach to ensure that survey efforts are focused in those areas with the highest probability for residual contamination (or greatest potential for adverse impacts of residual contamination). The use of a graded approach is primarily reflected in the categorization of a site into survey unit classes, with the level of data collection dependent on this classification.

A list of radionuclide COCs (Table 2-1) was developed based on the HSA and CSM. The CSM (see Section 2), which is based on historical records and survey data, provides the initial input to determine survey unit classification for the BSW and surrounding surface soils. The FSS is a new data collection effort, with survey measurements being performed for the building and surface soils and appropriate background/reference areas. Radiological sampling/monitoring has previously been performed at various locations within and around the WNYNSC (including the WVDP and BSW sites), but the data have been used only to formulate the CSM and guide the efforts of this Plan. Previous sampling/monitoring activities will not be used for quantitative inputs into the FSS because details for these data sets were not available or were missing necessary technical or quality control information.

Several radiation survey techniques will be employed to generate information on radiological COCs for the BSW and surrounding surface soils. The FSS for the Class 3 survey units will consist of scanning surveys, direct measurements, collection and analysis of swipe samples for removable contamination, and collection and analysis of samples of specific media. The direct measurements and samples will consist of both random measurements, which will be statistically assessed in accordance with MARSSIM procedures, and biased measurements. Measurement techniques for alpha, beta, and gamma radiation have been selected based on the radiological characteristics of the COCs for building surfaces/systems and surface soils. Section 3.5.2 and Section 4 contain additional detail regarding the survey design and conducting the survey.

3.5 The Decision Rule

The decision rule relates the radioactivity concentration in a survey unit to the relevant release criteria so that decisions can be made based on the results of the FSS.

3.5.1 Appropriate Release Criteria

Normally, radioactivity concentration levels that correspond to the relevant dose criterion are established by dose modeling for the type of contamination found in the contaminated media. For the BSW FSS, the relevant dose criterion is per 10 CFR 20.1402, Radiological Criteria for

Unrestricted Use (part of Subpart E, Radiological Criteria for License Termination). This criterion says that the site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent to an average member of the critical group that does not exceed 25 millirem per year (mrem/y) and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

In lieu of dose modeling and the use of DCGLs for the BSW structure, for which no suitable DCGLs exist for the COCs, data collected for the building floor will be statistically compared with corresponding data for a background reference area. MARSSIM and NRC nuclear regulatory (NUREG) document NUREG-1505 (NRC 1998) refer to this approach as "Scenario B," where radioactivity at the site is assumed to be indistinguishable from background. This approach will be used to demonstrate that the radioactivity status of the floor is, on average, consistent with that of background. Scanning results for the BSW floor will be statistically compared to scanning and direct measurement results for background to verify that the gross activity levels between the areas are the same. Specified data (results for randomly located direct measurements and swipe samples) will be statistically assessed using the Wilcoxon Rank Sum (WRS) test, which is used because some natural (background) radioactivity can be expected in the concrete and masonry building materials used in the construction of both the BSW and the background reference area building (the WRS test is described in Appendix B). In addition, NRC Regulatory Guide 1.86 Table 1, Acceptable Surface Contamination Levels (U.S. Atomic Energy Commission [AEC] 1974), will be used as a secondary comparison for individual measurement/sample results.

In lieu of appropriate DCGLs or analogous background areas for building systems such as the ventilation and drainage systems, data collected for those systems will be compared to NRC Regulatory Guide 1.86 Table 1 limits. Using those limits would be expected to result in doses well below the 25 mrem/y criterion. (The NRC Regulatory Guide 1.86 Table 1 limits also will be used for any direct measurements performed for the septic tank survey unit.)

In lieu of site-specific DCGLs developed for BSW surface soils and because a representative surface soil background reference area might prove difficult to locate or impractical to broadly survey and sample, surface soil screening values in NUREG-1757, Volume 2, Table H.2 (NRC 2006) will be used as the primary release criteria. These values represent surficial surface soil concentrations of individual radionuclides that would be deemed in compliance with the 25 mrem/y unrestricted release dose limit in 10 CFR 20.1402. The values are typically interpreted to be average values to be attained over an area the size of a survey unit. Table 3-1 contains the surface soil screening values for the BSW COCs as well as the typical laboratory analytical method for each. For the purposes of this FSS, these screening values will be considered the equivalent of MARSSIM $DCGL_W$ values. As prescribed by NUREG-1757 Table H.2, because there are multiple radionuclides, the sum of ratios (SOR) and unity rule approach will be used to evaluate the results for the multiple COCs for each sample against the screening values. In accordance with MARSSIM, the SOR for the soil results also will be statistically evaluated. The Sign test (see Appendix B) will be used because most of the FSS COCs are not expected to be present in background.

Table 3-1 Surface Soil Screening Values for BSW COCs

Radionuclide	Surface Soil $DCGL_w$ (pCi/g)	Typical Laboratory Analytical Method
Am-241	2.1	Alpha spectroscopy
Cs-137/Ba-137m	11	Gamma spectroscopy
Pu-239	2.3 [a]	Alpha spectroscopy
Pu-240	[a]	Alpha spectroscopy
Pu-241	72	Alpha spectroscopy

Source: NUREG-1757 Table H.2 (NRC 2006).

[a] NUREG-1757 Table H.2 does not have a soil screening value for Pu-240. As well, analytical results for Pu-239 and Pu-240 will be reported together as Pu-239/240 because they cannot be distinguished using the standard radioanalytical method. The screening value for Pu-239 will therefore be applied to the combined Pu-239/240 result, which will be a conservative approach.

Key:

pCi/g = picocuries per gram.

In lieu of appropriate DCGLS or analogous background areas for building residues and other specific materials that are able to be sampled (see Section 3.5.2; e.g., concrete floor, drain traps, and septic tank), data collected for those materials will be compared to the NUREG-1757 Table H.2 surface soil screening values as feasible. In this context, the soil screening values are considered conservative. For example, residuals such as those in drain traps or the septic tank would constitute a relatively small volume and pose a more limited set of completed exposure pathways than surface soils.

3.5.2 Survey Approach and Decision Rule

The flowcharts in Figures 3-2 through 3-5 illustrate the survey measurements and decision steps for each survey unit, which are also described below. Section 4 contains additional detail regarding the survey design and conducting the survey.

Floor Survey Unit (Figure 3-2)

A 100% scanning survey and a pre-determined number of random direct measurements and swipe samples will be performed for gross alpha/beta activity for the floor of the background reference area. The results in the background reference area will be used to understand the average gross activity and degree of variability in background, establish a statistical baseline for background, and derive an investigation level for subsequent measurements of the BSW floor survey unit. A 100% scanning survey and the same number of random direct measurements and swipe samples will be performed for gross alpha/beta activity for the BSW floor survey unit. The scanning results for the floor survey unit will be evaluated against the results for the background reference area, using an investigation level or other applicable comparison (see Section 3.6), to determine if the floor survey unit has isolated areas or spatial trends indicative of contamination impacts, or if there are systematic differences in gross activity between the floor survey unit and background. Based on the results of the scanning survey (e.g., areas of elevated radioactivity or suspicious spatial trends in radioactivity), visual observations, and historical use of the BSW, biased direct measurements and swipe samples will be performed for gross alpha/beta activity at locations of interest. Although volumetric contamination of the floor is not anticipated, one volumetric sample of the concrete BSW floor will be collected from an area representing the highest potential for surface contamination, and analyzed for FSS COCs.

The results for the random direct measurements and swipe samples will be statistically assessed using the WRS test (Appendix B) to determine if the radioactivity concentrations for the floor survey unit are, on average, statistically consistent with those for the background reference area. The results for the scanning survey, direct measurements, and swipe samples for the floor survey unit additionally will be compared to NRC Regulatory Guide 1.86 Table 1 contamination limits as a further evaluation of contamination status. The analytical results for the volumetric floor sample will be compared to NUREG-1757 Table H.2 soil screening values using the SOR for the results.

If the results confirm the hypothesis that radiation on the floor survey unit is indistinguishable from background and below applicable release criteria, the FSS for the floor survey unit will be complete and the floor will be acceptable for release for unrestricted use. If any results suggest or confirm the presence of radionuclides at levels that are inconsistent with background or relevant release criteria, NYSERDA will reassess and develop a short-term action plan. Such actions could include remeasurement, performing a dose assessment to determine whether the incremental dose is less than 25 mrem/y, re-submitting samples for additional analysis to gain more information, or determination of potential impacts on other survey units. If the short-term actions provide results that demonstrate compliance with the release criteria, the floor survey unit will be acceptable for release for unrestricted use. If not, NYSERDA will take further action beyond the scope of this Plan, which could include characterization, remedial action, or reclassifying the survey unit.

Ventilation System and Drainage System Survey Units (Figure 3-3)

For the building ventilation system and drainage system, data collection will be focused on biased measurements at accessible locations. Limited scanning surveys will be performed for gross alpha/beta activity (or alternatively for gamma activity depending on access restrictions and probe designs) at accessible areas and also will be used to identify suitable locations for other biased measurements. Biased direct measurements and swipe samples will be performed for gross alpha/beta activity (or alternatively for gamma activity) at accessible locations and at other locations of interest based on the results of the scanning survey (e.g., areas of elevated radioactivity or spatial trends), visual observations, and historical use of the BSW. If possible, samples of any material/residue in drain traps or sumps will be collected and analyzed for FSS COCs.

The results for the scanning survey, direct measurements, and swipe samples will be compared to NRC Regulatory Guide 1.86 Table 1 contamination limits. The analytical results for any residual material that is sampled will be compared to NUREG-1757 Table H.2 soil screening values using the SORs for the results.

If the results are below the limits, the FSS for the building systems will be complete and those systems will be acceptable for release for unrestricted use. If any results are above the limits, NYSERDA will reassess and follow the same actions and decision path as described for the floor survey unit.

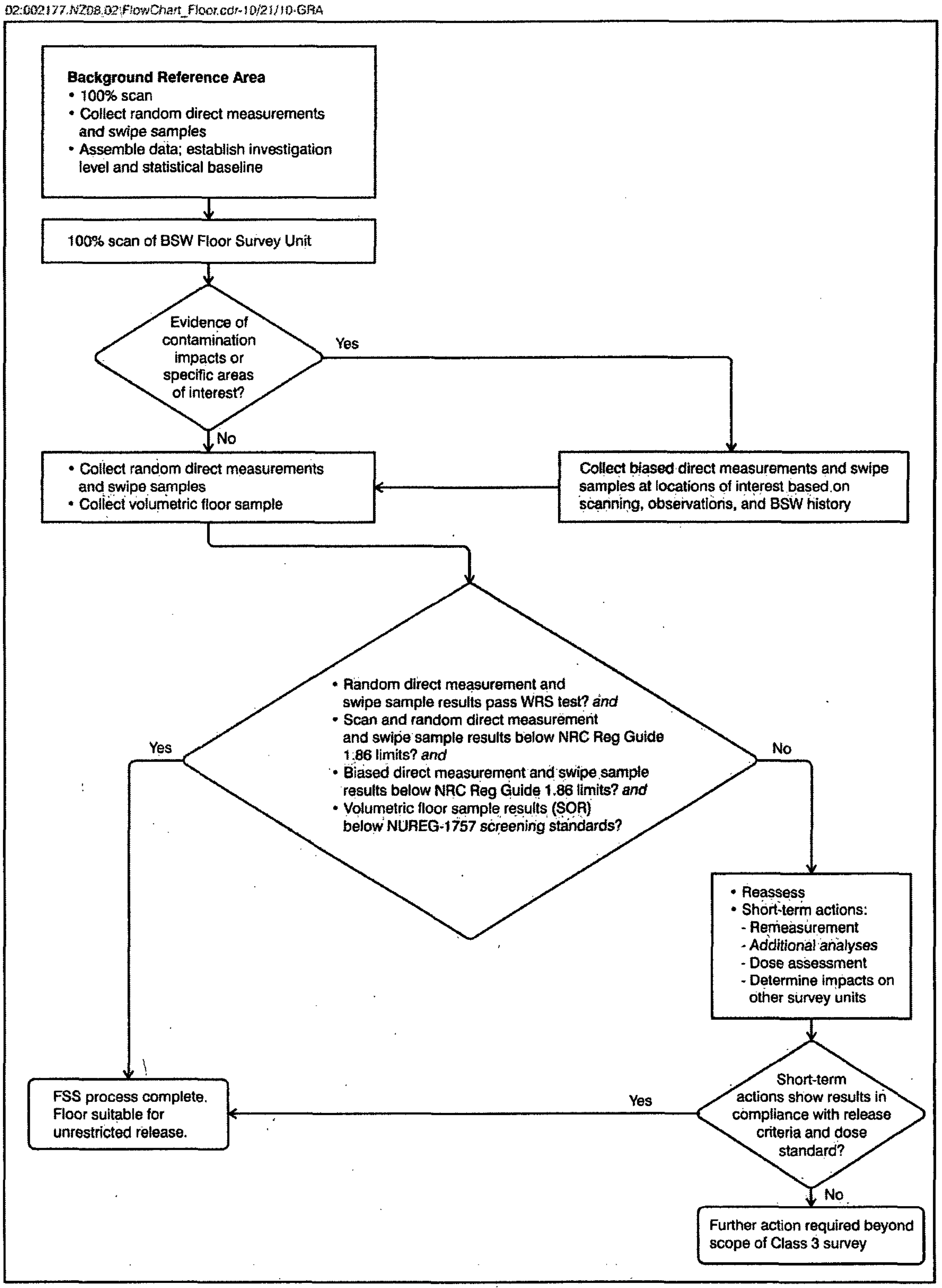

Figure 3-2 Floor Survey Unit: Survey Approach and Decisions

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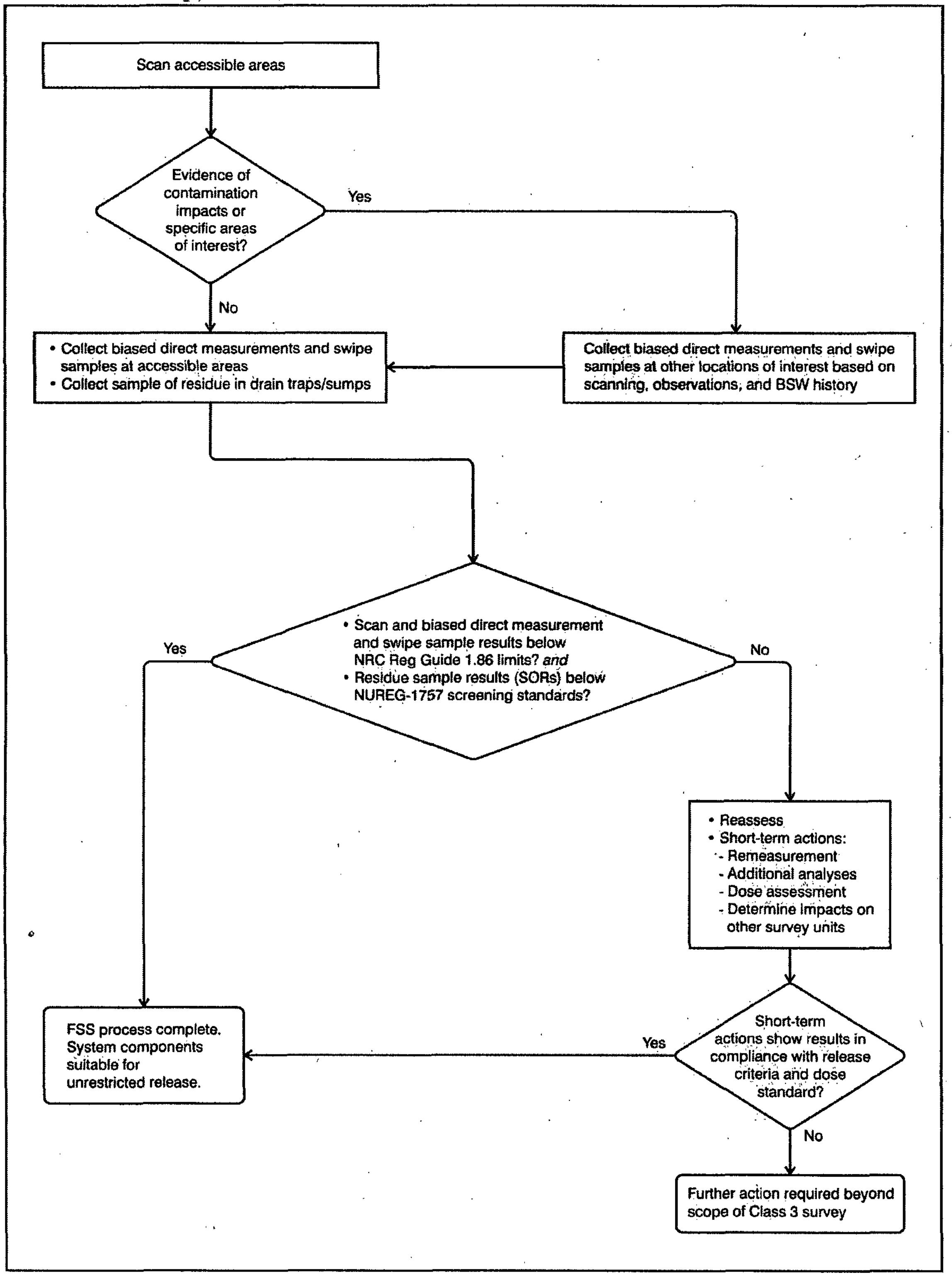

Figure 3-3 Ventilation System and Drainage System Survey Units: Survey Approach and Decisions

Septic Tank Survey Unit (Figure 3-4)
For the septic tank survey unit, data collection will be focused on biased measurements at accessible locations. Limited scanning surveys will be performed for gross alpha/beta activity (or alternatively for gamma activity depending on access restrictions and probe designs) at accessible areas and also will be used to identify suitable locations for biased direct measurements/samples. Based on the results of the scanning survey (e.g., areas of elevated radioactivity) and visual observations, biased direct measurements will be performed for gross alpha/beta activity (or alternatively for gamma activity) at other locations of interest. As well, samples of residual material in the septic tank will be collected and analyzed for FSS COCs.

The results for the scanning survey and direct measurements will be compared to NRC Regulatory Guide 1.86 Table 1 contamination limits. The analytical results for any residual material that was sampled will be compared to NUREG-1757 Table H.2 soil screening values using the SORs for the results.

If the results are below the limits, the FSS for the septic tank will be complete and the tank will be acceptable for release for unrestricted use. If any results are above the limits, NYSERDA will reassess and follow the same actions and decision path as described for the floor survey unit.

Surface Soil Survey Unit (Figure 3-5)
Direct measurements of gamma activity (both low-energy emitters and other emitters) and surface soil samples will be obtained at a limited number of locations in the soil background area. These data will be used to aid in understanding the contribution of local background to measurements and samples collected for the surface soil survey unit so that normal background is not mistaken for COCs. For the BSW COCs, this is primarily pertinent to Cs-137, which is expected to be present in local soil background from global fallout. Conversely, there are other likely contributors to background radioactivity in soil (such as uranium, thorium, and potassium-40 [K-40]) that are not FSS COCs but will possibly be detected during the real-time survey of the BSW surface soil survey unit and will need to be accounted for. Therefore, it will be useful to approximately quantify both the gamma survey instruments' responses in a background area and the background levels of COCs in surface soil. The direct measurements in the soil background area will be used to establish an approximate baseline for background for the field survey instruments and an investigation level for scanning and direct measurements performed at the BSW surface soil survey unit.

Gamma walkover surveys (GWSs) (minimum of one measurement per square meter) and a predetermined number of random direct measurements will be performed for both low-energy and general gamma activity for the surface soil survey unit. The scanning results will be evaluated against the measurement results for the soil background area or can be self-compared, using an investigation level or other applicable comparison (see Section 3.6), to determine if the soil survey unit has isolated areas or spatial trends indicative of contamination impacts. Based on the results of the GWSs (e.g., areas of elevated radioactivity or suspicious spatial trends in radioactivity) and other information such as visual observations and historical use of the BSW, biased direct measurements will be performed for both low-energy and general gamma activity at locations of interest. Surface soil samples (maximum depth of 15 cm) will be collected from the same pre-determined random locations and biased locations where direct measurements are performed, and analyzed for FSS COCs.

The results for the GWSs and direct measurements will be generally compared to the direct measurements obtained in the soil background area or can be self-compared, using an appropriate comparison (see Section 3.6), to help evaluate and interpret the results for the soil samples and the survey unit as a whole. The results for the random and biased soil samples will be compared to NUREG-1757 Table H.2 surface soil screening values using the SORs for the results. The average SOR for the random soil sample results also will be evaluated to determine if it is less than one and the SORs for the random soil sample results will be statistically assessed using the Sign test (Appendix B).

If the results for the soil samples are below the surface soil screening values and pass the other tests/comparisons, the FSS for the surface soil survey unit will be complete and the soil unit will be acceptable for release for unrestricted use. If any results suggest or confirm the presence of radionuclides at levels that are inconsistent with background or relevant release criteria, NYSERDA will reassess and follow the same actions and decision path as described for the floor survey unit.

3.6 Tolerable Limits on Decision Error

Part of the DQO process is to define the types, number, and locations of measurements needed to support a decision within prescribed limits on error. Two general types of data evaluations will be made for FSS data collected per this Plan.

The first type of evaluation is to determine if individual measurement results indicate the presence of contamination. For most of the individual comparisons, a determination of error rate is not applicable or appropriate. For the BSW floor survey unit, scanning results will be compared to the mean plus two standard deviations for the scanning and direct measurements obtained in the background reference area. This investigation level, which will be indicative of the presence of contamination with approximately 95% confidence, also will be used to help determine potential locations for biased direct measurements and swipe samples for the floor survey unit.

For the surface soil survey unit, GWS results will be compared to the mean plus two standard deviations for the direct measurements obtained in the soil background area or, because the BSW soil is assumed to not be contaminated, might be able to be self-compared to the mean plus two standard deviations for their own data set. These types of investigation levels, which will be indicative of contamination or anomalous results with approximately 95% confidence, also will be used to help determine potential locations for biased direct measurements and soil samples for the surface soil survey unit. The GWS and random/biased direct measurement results for the surface soil survey unit also will be compared to the mean plus two standard deviations for the direct measurements in the soil background area, or might be able to be self-compared, to further help evaluate and interpret the results for the survey unit.

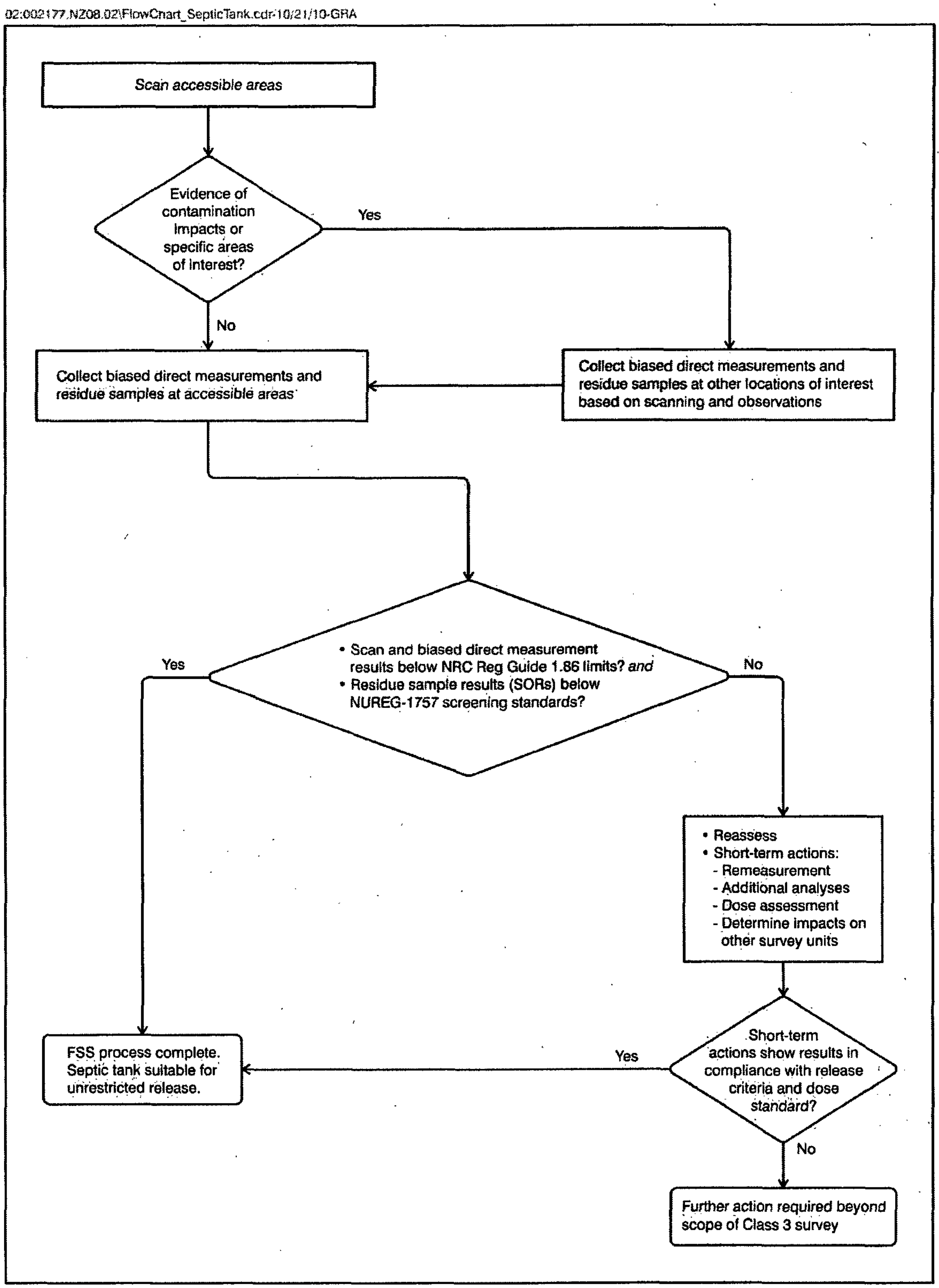

Figure 3-4 Septic Tank Survey Unit: Survey Approach and Decisions

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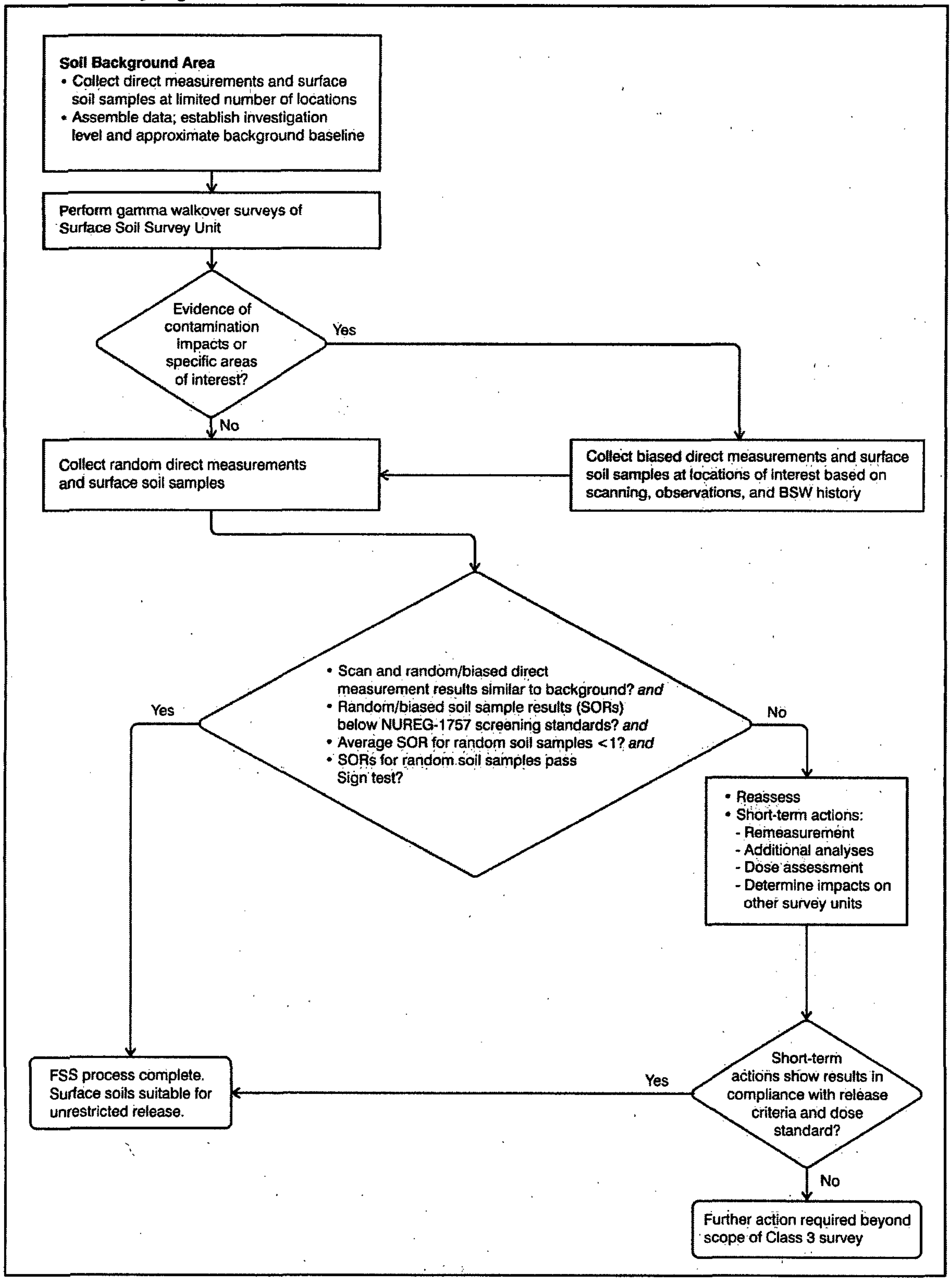

Figure 3-5 Surface Soil Survey Unit: Survey Approach and Decisions

The second type of data evaluation is to determine if the general statistical distribution of results from a survey unit is indicative of contamination. For the building floor survey unit, the non-parametric WRS test will be used for this evaluation (Appendix B). The null hypothesis for this test will be that the distribution of radionuclides for the survey unit is consistent with background conditions. The Type I error rate (rejecting the null hypothesis when in fact it is true) will be set to $\alpha = 0.05$. Likewise, the Type II error rate (accepting the null hypothesis when in fact it is false) will be set to $\beta = 0.05$. For the surface soil survey unit, the Sign test will be used (Appendix B). The Sign test does not require the use of a reference area. The null hypothesis will be that the distribution of radionuclides for the survey unit exceeds surface soil screening values. The Type I error rate will be set to 0.05 and the Type II error rate will be set to 0.05.

3.7 Design Optimization

The BSW FSS has been designed to produce the most resource-effective survey that is expected to meet the DQOs. Although Class 3 survey units are not expected to contain any areas of significant contamination and wide-area or 100% scanning would not typically be performed, 100% scanning of the floor survey unit and comprehensive GWSs of the surface soil survey unit have been included based on the history of the WNYNSC and the BSW and the plans to release the BSW property for unrestricted use in advance of full WNYNSC decommissioning and closure. Using the CSM, a judgmental approach was then used, as is appropriate for Class 3 areas, to select areas of interest that would most likely be contaminated if contamination were present. Process knowledge and pathway analysis were employed to select locations that, if free of contamination, would indicate that the survey unit as a whole is also clean. As is appropriate for data collection for Class 3 survey units, the BSW FSS is focused on scanning measurements that are augmented by selected discrete measurements and samples to enhance scanning detection limits and maximize the capability of finding contamination that is not thought to be there.

The appropriate number of random survey measurements for the Class 3 survey units is determined by the needs of the statistical tests to be employed. For the building floor survey unit, the WRS test (Appendix B) will be used to statistically compare the results for direct measurements and swipe samples collected at random locations on the floor survey unit with similar measurements collected for the background reference area floor. For the purposes of estimating measurement numbers, fixed contamination is assumed to be the primary concern and the Lower Boundary of the Gray Region (LBGR) is estimated to be one-half of the NRC Regulatory Guide 1.86 Table 1 average fixed contamination standard limit for transuranics, i.e., one-half of 100 disintegrations per minute (dpm)/100 cm^2, which is 50 dpm/100 cm^2. The variability in background direct measurements is assumed to be 25 dpm/100 cm^2. This translates into a requirement of 13 random locations for direct measurements and swipes assuming a Type I error rate of 0.05 and a Type II error rate of 0.05.

For the surface soil survey unit, the Sign test (Appendix B) will be used to statistically evaluate the results for random soil samples with the NUREG-1757 Table H.2 surface soil screening values. An SOR will be determined for each sample prior to the evaluation because there are multiple radionuclides. The BSW surface soils are believed to contain radioactivity at background levels. Based on historical data (see Appendix A), the surface soil screening values are estimated to be more than 10 times greater than the soil concentrations for the five COCs in BSW surface soil, which would result in an SOR less than 0.5. Estimating the standard deviation (SD) of soil concentrations to be no higher than 0.1 pCi/g (based on historical data), the following equation yields a relative shift of 5:

$$\text{Relative shift} = (\text{DCGL} - \text{LBGR})/\text{SD}$$
$$\text{Relative shift} = (1 - 0.5)/0.1 = 5$$

A higher relative shift means fewer samples (see Table 5.5. in MARSSIM). To ensure that an adequate number of samples is collected, the relative shift will be set to 3. Using MARSSIM Table 5.5, this translates into a requirement of 14 random locations for surface soil samples assuming a Type I error rate of 0.05 and a Type II error rate of 0.05.

Biased data collection consisting of direct measurements, swipe samples, and samples of specific media has been included in the survey, as addressed in the survey approach in Section 3.5.2. Biased measurements will be performed in order to:

- Further investigate elevated or anomalous scanning results.
- Investigate areas with a higher probability of contamination, such as depressions, stained areas, worn areas, locations of intensive operations, and locations where contaminated material would be expected to collect, such as the air filter housing and fan room, high-efficiency particulate air (HEPA) filter box, exhaust ducts and stack, air intakes and returns, the loft area, drains, drain traps, sumps, the truck bay, the septic tank, and soil at the base of gutter downspouts.
- Further evaluate an approximately 200 square foot portion of the BSW floor in the northwest corner of the storage area, which was not represented in the 1974/1975 closeout survey.

Based on the HSA and CSM, the locations where contamination, if any, would most likely exist are all accessible and will be represented by the scheduled random and biased survey measurements, i.e., there would be no hidden areas of contamination that would not be revealed by surveying at the accessible areas. For example, surveying entry points (drains), accessible mid-points (drain traps), and the end point (septic tank) of the drainage system will adequately address that system and, if those points are clean, it would be unlikely that subsurface and other drainage piping would be potentially contaminated and require surveying. The estimated numbers of biased measurements/samples are included in Table 4-1.

The walls and ceiling of the BSW have been excluded from the survey based on the HSA and CSM. Biased measurement/sampling of the walls or ceiling will only be conducted if data collection for other survey units identifies the presence of contamination inconsistent with background assumptions or suggests that contamination might extend to the walls or ceiling.

The DQO process is an iterative method. As new information is obtained, it will be incorporated into survey planning. Data from initial survey efforts may result in redistribution of biased measurements, reclassification of survey units, or adjustment to numbers of measurements to reflect residual contamination or background levels different from those assumed herein.

4.0 SURVEY IMPLEMENTATION AND DATA COLLECTION

4.1 FSS Work Plan and Quality Assurance Project Plan

A separate FSS Work Plan and Quality Assurance Project Plan (QAPP) will be developed to address specific details of implementing the survey that are beyond the scope of this Plan or that need to be addressed at the time of implementation. Such details would include more information on likely biased measurement locations; exact field survey instrumentation to be used; field instrument minimum detectable concentrations (MDCs) calculated for those instruments; scanning speeds; the numbers, types, and locations of quality assurance (QA) measurements; more-detailed maps and figures; and documentation forms.

4.2 Coordinate System

As applicable, each survey unit and the building floor background reference area will have a defined benchmark that serves as an origin for referencing and documenting survey measurements. For the floors, a numbering system will be used that starts in the southwest corner (0,0) and is numbered consecutively using an appropriate nomenclature. Coordinate points would be denoted as the number of feet to the north and east of the origin (or alternatively along an *x* and *y* axis from the origin). The location of other biased/judgment samples in buildings will be documented in terms of linear horizontal and vertical distances from a designated corner and will be recorded on a drawing of the area. Data collected from the Class 3 surface soil unit will include coordinate information reported in both latitude/longitude and New York West State Plane feet (North American Datum 1983 [NAD83]).

4.3 General Use of Survey Instrumentation

Field and laboratory instrumentation will be specified in the FSS work plan, operated in accordance with established NYSERDA-approved procedures, and calibrated to National Institute of Standards and Technology (NIST)-traceable standards in accordance with license provisions. Survey instrument types will be provided with a correction factor if the sources used for calibration do not adequately approximate those encountered in the field. Survey instrument performance will be tested daily and operational checks documented appropriately. Calibration documentation will be maintained in accordance with the QAPP.

4.4 Survey Methods

Surveys will employ a combination of statistical and judgmental measurements, using scanning, direct measurement, swipe sampling, and material sampling to demonstrate compliance with the release criteria. The degree and proportion of the types of measurements that will be used depend on the media targeted. Measurement instruments will be employed that are appropriate for the types of measurements to be made. The following sections contain general information on the survey techniques that will be used to implement the survey described in Section 3.5.2.

4.4.1 Scanning Surveys

Surface scanning will be performed to locate anomalies that might indicate elevated areas of residual radioactivity and that require further investigation. Instruments selected for scanning surveys will be of types that respond to the principal types of radiation that are emitted from the COCs. Scanning will be performed with coordinate tracking (e.g., Global Positioning System [GPS] or total station tracking) and data logging to automatically record results and spatially reference them. Measurements will be made by moving the detector over an area at a uniform rate and distance from the surface. Field investigation levels will be established for each scanning survey to determine whether a survey unit requires additional investigation; the investigation levels will typically be based on an assessment of data sets collected for a background area (see Section 3.6). A one-minute integrated count, at a minimum, will be performed at locations where elevated measurements are observed during scanning.

Based on the primary COCs at the BSW site, primarily instruments that measure gross alpha/beta will be used for the surveys of the BSW structure and the septic tank. Scanning for alpha and beta activity on the structure floor and in the background reference area will be performed using an appropriate scaler/ratemeter and detector (such as a Bicron FLM-3D floor monitor, Ludlum 43-37 large-area gas-flow proportional counter, or equivalent). Scanning will be performed to provide uniform, complete coverage of the floor.

Portable instruments that measure gross alpha/beta will be used for scanning accessible portions of the ventilation and drainage system survey units (such as a Ludlum 2350 data logger with a Ludlum 43-68 gas-flow proportional counter, or a Ludlum 2360 data logger with a Ludlum 43-89 alpha/beta scintillator, where access is limited). Specialized survey instruments such as telescoping detectors or "peanut" detectors attached to a rod may be used for hard-to-reach areas such as ducts, drains, or the septic tank. Depending on probe design, sodium iodide (NaI) gamma detectors might need to be used in lieu of alpha/beta detectors.

Due to the low probability of finding alpha/beta contamination in surface soil while scanning, gamma detection instruments such as NaI detectors will be used for surveying the soil survey unit. The GWSs for gamma activity in surface soils will be performed using a NaI FIDLER (Field Instrument for Detection of Low-Energy Radiation) or equivalent for low-energy emitters, such as those from the plutonium COCs, and a standard NaI detector for gamma emissions from other COCs such as Cs-137. The scan speed, acquisition time, and line spacing will be selected to provide approximately one measurement per square meter. The two surveys may be conducted concurrently if practicable. It is anticipated that there will be some degree of crossover between the results, i.e., the FIDLER and standard NaI detectors will detect many of the same gamma emitters albeit using different energy patterns. For example, for Cs-137, the FIDLER will detect the low-energy K shell X-rays from the radioactive daughter while the standard NaI detector will detect the higher-energy gamma rays from Cs-137 and the daughter. There likely will be little crossover in the detection of plutonium and its daughters in surface soil.

4.4.2 Direct Measurements

Direct measurements (also known as static or fixed-point measurements) are made by holding a detector at a fixed location over a surface for a specific counting duration. As such, they measure both fixed and removable (i.e., total) contamination. When combined with the use of scanning surveys, they function to improve on the detection limits from the scanning portion of the survey.

Random and biased direct measurements will be performed as specified in Section 3 for the survey units. Direct measurements will generally be made with the same instruments used for scanning. When the same instrument is used for both scanning and direct measurements, the measurements may be conducted concurrently in an area to optimize field efforts. A standard counting time will be used for direct measurements.

4.4.3 Swipe Sample Collection and Analysis

Swipe samples of selected building surfaces and systems will be collected to assess the presence of primarily alpha and beta removable contamination. Swipe samples will typically be collected at every location where a random or biased direct measurement is performed, as specified in Section 3, and might be collected at additional biased locations deemed necessary based on visual observations and professional judgment (e.g., in locations of interest where a direct measurement is not feasible due to access or other limitations). Swipe samples will typically be collected to represent a 100 cm^2 area. The swipe samples will be analyzed by gas proportional counting. Following counting/analysis, the swipe samples will be archived for potential reanalysis or additional spectroscopic analysis that might be needed to further investigate elevated or anomalous results.

4.4.4 Media Sample Collection and Analysis

The volumetric sample collected for the floor survey unit will be collected by chipping the floor or by using a concrete corer or similar device, focusing on the top 2 cm of floor surface. The sample will be analyzed for COCs. Following completion of the FSS, the hole should be backfilled using a concrete patch or equivalent.

Samples of specific media such as residue in the drainage system survey unit (e.g., drain traps) and the septic tank survey unit will be collected using clean implements and in enough volume to satisfy analytical requirements. A direct measurement will be performed at the sampling location prior to sample collection. The samples will be analyzed for COCs.

Random and biased surface soil samples will be collected as specified in Section 3. A direct measurement will be performed prior to sample collection. Surface soil samples will be collected from the top 15 cm of soil using clean implements and in enough volume to satisfy analytical requirements. The samples will be analyzed for COCs.

In general, following analysis, the samples of specific on-site media will be archived for potential reanalysis or additional analysis that might be needed to further investigate elevated or anomalous results.

4.5 Instrument Sensitivity Analysis

MDCs for scanning and direct measurements will be determined when the actual instruments are selected and finalized for the FSS. The MDCs will be calculated using formulas derived from equations provided in MARSSIM Chapter 6 as follows:

$$MDC_{scan} = \frac{{}^{60}\!/_{i} \cdot 3.28\sqrt{B_R \cdot t}}{\sqrt{p}\,\varepsilon_s \varepsilon_i \frac{A}{100}}$$

$$MDC_{static} = \frac{3 + 4.65\sqrt{B}}{\varepsilon_s \varepsilon_i \frac{A}{100}}$$

where:

- i = observation time interval in seconds (2, MARSSIM)
- B_R = background rate in counts per minute (cpm)
- t = scan observation interval in minutes (0.03, MARSSIM)
- p = surveyor efficiency (0.5, MARSSIM)
- ε_s = surface efficiency in counts per disintegration (0.5, MARSSIM)
- ε_i = 4π instrument efficiency in counts per disintegration
- A = active probe area in cm^2
- B = the number of background counts that are expected to occur while performing the actual measurement

The constant in the numerator of the MDC_{scan} (3.28) is taken from MARSSIM (Table 6.5) and corresponds to performance criteria of 5% false positive proportion and 95% true positive proportion.

Once the instrument MDCs are determined, they will be compared with the DCGLs and other assessment criteria to ensure sufficient sensitivity.

Scanning for alpha emitters in land survey units is generally not considered effective due to attenuation and media interferences, so a FIDLER is most widely used for determining the presence of Pu isotopes. For Pu-239 scanning in surface soils, a typical FIDLER background is 400 cpm and the MDC is 1,800 dpm/100 cm^2 (20 pCi/g). This MDC is for fresh deposition; performance diminishes for Pu distributed in soil. In Class 3 areas (particularly outdoor areas), the MDCs of scanning instruments may be above the appropriate soil screening criteria (as is the case with a FIDLER). Nevertheless, a FIDLER is useful for identifying areas of potentially elevated radionuclide concentration and the MDC limitation is offset by the collection of soil samples for analysis of COCs.

When the scanning MDC exceeds soil screening values, any indication of measurable residual radioactivity inconsistent with background conditions during a scan warrants further investigation. GPS-enabled data logging eliminates the reliance on a surveyor to recognize elevated count rates and initiate direct measurements and biased sampling.

4.6 Surveys Planned for Each Survey Unit

Table 4-1 contains a summary of the surveys planned for the BSW FSS as described thus far in this Plan. Additional detail regarding the surveys will be included in the FSS Work Plan and QAPP. Figures 4-1 through 4-3 show the locations of planned random measurements for applicable survey units.

4.7 Additional Survey Considerations

Some additional considerations will apply to the collection and interpretation of the BSW FSS measurements.

1. The BSW will be free of dirt, insulation, loose paint, and debris to ensure that measurements of residual radioactive materials are not obstructed or obscured.

2. The FSS has been designed as a relatively non-destructive survey. Drain traps underneath the restroom and utility sinks will be accessed by detaching the pipes and preferably not by cutting them. Ventilation ductwork and subsurface drainage piping will be accessed from accessible points. It is not intended that building materials be compromised or soil be excavated to access building systems. The HSA and CSM indicate that the locations where contamination, if any, would most likely exist are accessible and will be represented by the scheduled random and biased survey measurements (see Section 3.7). If scanning and other measurements suggest a potential for contamination that can only be investigated by dismantling portions of building systems, then NYSERDA will be consulted before proceeding.

3. Biased measurement/sampling of the walls or ceiling will only be conducted if data collection for other survey units identifies the presence of contamination inconsistent with background assumptions or suggests that contamination might extend to the walls or ceiling.

4. Access to subsurface drains (such as the one in the truck bay) and the buried septic tank will be required for measurement/sampling. These are thought to be easily accessible.

5. The surface soil survey unit will be mowed prior to the survey to maximize accessibility for the radiation detectors for scanning and direct measurements. The surface soil survey will not be performed if there is snow cover, immediately following heavy rains, or if there is evidence of saturated soils (e.g., standing water).

5.0 DATA ASSESSMENT

Data assessment will evaluate whether data meet the objectives of the survey and are sufficient to determine compliance with the release criteria. It will consist of data verification and validation, review of survey design basis, and data analysis.

Verification will determine whether data collection activities conformed to the specifications in this Plan and the supplemental FSS Work Plan. Any problems encountered during survey implementation will be documented. Validation will determine whether project-specific data quality goals were achieved. The review of the survey design basis will determine whether the data support the underlying assumptions that were the basis for the data collection design. These three activities (verification, validation, and survey design basis review) will establish that the resulting data sets are of sufficient quality to support the required decisions and associated data analyses. Data reduction, analysis, and interpretation will dictate acceptance or rejection of the initial assumption — that radioactivity associated with the BSW and surrounding soils is consistent with background levels.

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
Floor Background Reference Area	100% scanning survey	---	Gross alpha/beta activity	Alpha/beta floor monitor (e.g., GFPC)	• Quantify average gross activity and degree of variability in background. • Provide data for investigation levels to interpret scanning results and guide biased measurement/sampling for BSW floor survey unit.	---
	Random direct measurement	13	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Provide data for floor survey unit statistical comparison (fixed + removable contamination).	---
	Random swipe sample	13	Gross alpha/beta activity	Alpha/beta counting/analysis	• Provide data for floor survey unit statistical comparison (removable contamination).	---
Floor Survey Unit	100% scanning survey	1	Gross alpha/beta activity	Alpha/beta floor monitor (e.g., GFPC)	• Determine if floor survey unit has isolated areas or spatial trends indicative of contamination impacts. • Determine if there are systematic differences in gross activity between the floor survey unit and background. • Identify locations for biased measurement and sampling.	• General statistical comparison to scanning and direct measurement results for background reference area to verify that gross activity levels between the areas are the same. • Individual point comparison to NRC Reg Guide 1.86 Table 1 contamination limits as applicable.
	Random direct measurement	13	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Assess total (fixed + removable) contamination at discrete locations.	• Statistical (WRS test) comparison to background. • NRC Reg Guide 1.86 Table 1 contamination limits.

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
(Floor Survey Unit, cont.)	Random swipe sample	13	Gross alpha/beta activity	Alpha/beta counting/analysis	• Assess removable contamination at discrete locations.	• Statistical (WRS test) comparison to background. • NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased direct measurement	2	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Assess total (fixed + removable) contamination at locations based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased swipe sample	2	Gross alpha/beta activity	Alpha/beta counting/analysis	• Assess removable contamination at locations based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Volumetric concrete floor sample	1	COCs	Laboratory analysis for COCs	• Assess potential for volumetric contamination at area with highest potential for floor contamination.	• NUREG-1757 Table H.2 surface soil screening values.
Ventilation System Survey Unit (equipment, ducts, misc mechanical equipment)	Limited scanning survey (accessible locations)	Varied	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Determine if survey unit has isolated areas indicative of contamination impacts. • Identify other locations for biased measurement and sampling.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased direct measurement (accessible locations and locations of interest)	10	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Assess total (fixed + removable) contamination at accessible locations and other locations of interest based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
Ventilation System Survey Unit, cont.)	Biased swipe sample (accessible locations and locations of interest)	10	Gross alpha/beta activity	Alpha/beta counting/analysis	• Assess removable contamination at accessible locations and other locations of interest based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.
Drainage System Survey Unit (drains, traps, sumps, piping)	Limited scanning survey (accessible locations)	Varied	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Determine if survey unit has isolated areas indicative of contamination impacts. • Identify other locations for biased measurement and sampling.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased direct measurement (accessible locations and locations of interest)	5	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Assess total (fixed + removable) contamination at accessible locations and other locations of interest based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased swipe sample (accessible locations and locations of interest)	5	Gross alpha/beta activity	Alpha/beta counting/analysis	• Assess removable contamination at accessible locations and other locations of interest based on scanning results, visual observations, and BSW history.	• NRC Reg Guide 1.86 Table 1 contamination limits.
	Biased residue sample (e.g., drain traps)	5	COCs	Laboratory analysis for COCs	• Assess radioactivity at areas with higher contamination potential.	• NUREG-1757 Table H.2 surface soil screening values.

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
Septic Tank Survey Unit	Limited scanning survey (accessible locations)	Varied	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Determine if survey unit has isolated areas indicative of contamination impacts. • Identify locations for biased measurement and sampling.	• NRC Reg Guide 1.86 Table 1 contamination limits as applicable.
	Biased direct measurement (accessible locations and locations of interest)	2	Gross alpha/beta activity	Alpha/beta detector (e.g., GFPC)	• Assess total (fixed + removable) contamination at locations based on scanning results and visual observations.	• NRC Reg Guide 1.86 Table 1 contamination limits as applicable.
	Biased residue sample (accessible locations and locations of interest)	2	COCs	Laboratory analysis for COCs	• Assess radioactivity of feature with higher contamination potential.	• NUREG-1757 Table H.2 surface soil screening values.
Soil Background Area	Direct measurement	3	Low-energy gamma emitters Other gamma emitters	FIDLER NaI detector	• Quantify local background contribution to detector response. • Quantify average gross activity in background. • Provide data for investigation levels to interpret scanning results and guide biased measurement/sampling for BSW surface soil survey unit.	---
	Surface soil sample	3	COCs	Laboratory analysis for COCs	• Quantify background levels of COCs in surface soil.	---

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
Surface Soil Survey Unit	Gamma walkover survey	---	Low-energy gamma emitters Other gamma emitters	FIDLER NaI detector	• Determine if surface soil survey unit has isolated areas or spatial trends indicative of contamination impacts. • Determine if there are differences in gross activity between the surface soil survey unit and background and/or within the survey unit itself. • Identify locations for biased measurement and sampling.	• General statistical comparison to direct measurements for soil background area to verify that gross activity levels between the areas are the same. • General statistical self-comparison to verify that gross activity levels for the survey unit are self-consistent.
	Random direct measurement	14	Low-energy gamma emitters Other gamma emitters	FIDLER NaI detector	• Assess radioactivity at discrete locations. • Document activity prior to sampling.	• General statistical comparison to direct measurements for soil background area to verify that gross activity levels between the areas are the same. • General statistical comparison to other scanning/direct measurements for the survey unit to verify that gross activity levels are self-consistent.
	Random surface soil sample	14	COCs	Laboratory analysis for COCs	• Assess COCs in surface soil at discrete locations.	• NUREG-1757 Table H.2 surface soil screening values. • Statistical (Sign test) comparison to screening values.

Table 4-1 Surveys Planned for Each Survey Unit

Survey Unit	Survey Component	Estimated Number of Measurements[a]	Contaminant of Interest	Suggested Instrument	Purpose	Data Assessment Criteria
(Surface Soil Survey Unit, cont.)	Biased direct measurement	2	Low-energy gamma emitters Other gamma emitters	FIDLER NaI detector	• Assess radioactivity at locations based on scanning results, visual observations, and BSW history. • Document activity prior to sampling.	• General statistical comparison to direct measurements for soil background area to verify that gross activity levels between the areas are the same. • General statistical comparison to other scanning/direct measurements for the survey unit to verify that gross activity levels are self-consistent.
	Biased surface soil sample	2	COCs	Laboratory analysis for COCs	• Assess COCs in surface soil at locations based on scanning results, visual observations, and BSW history.	• NUREG-1757 Table H.2 surface soil screening values.

[a] The actual number of measurements performed might deviate from the estimate based on real-time results and observations from the survey as it is performed.

Key:
GFPC = Gas-flow proportional counter.
Misc = Miscellaneous.

Notes:
1) Biased measurements will be performed in order to:
   - Further investigate elevated or anomalous scanning results.
   - Investigate areas with a higher probability of contamination, such as depressions, stained areas, worn areas, locations of intensive operations, and locations where contaminated material would be expected to collect, such as the air filter housing and fan room, HEPA filter box, exhaust ducts and stack, air intakes and returns, the loft area, drains, drain traps, sumps, the truck bay, the septic tank, and soil at the base of gutter downspouts.
   - Further evaluate an approximately 200 square foot portion of the BSW floor in the northwest corner of the storage area, which was not represented in the 1974/1975 closeout survey.
2) For ventilation system, drainage system, and septic tank survey units — gamma surveying with a NaI detector can alternatively be used in lieu of alpha/beta surveying with an alpha/beta detector if access is restricted and the NaI probe design is better suited.

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L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 4-1 RefArea_random_locs.mxd 10/21/2010

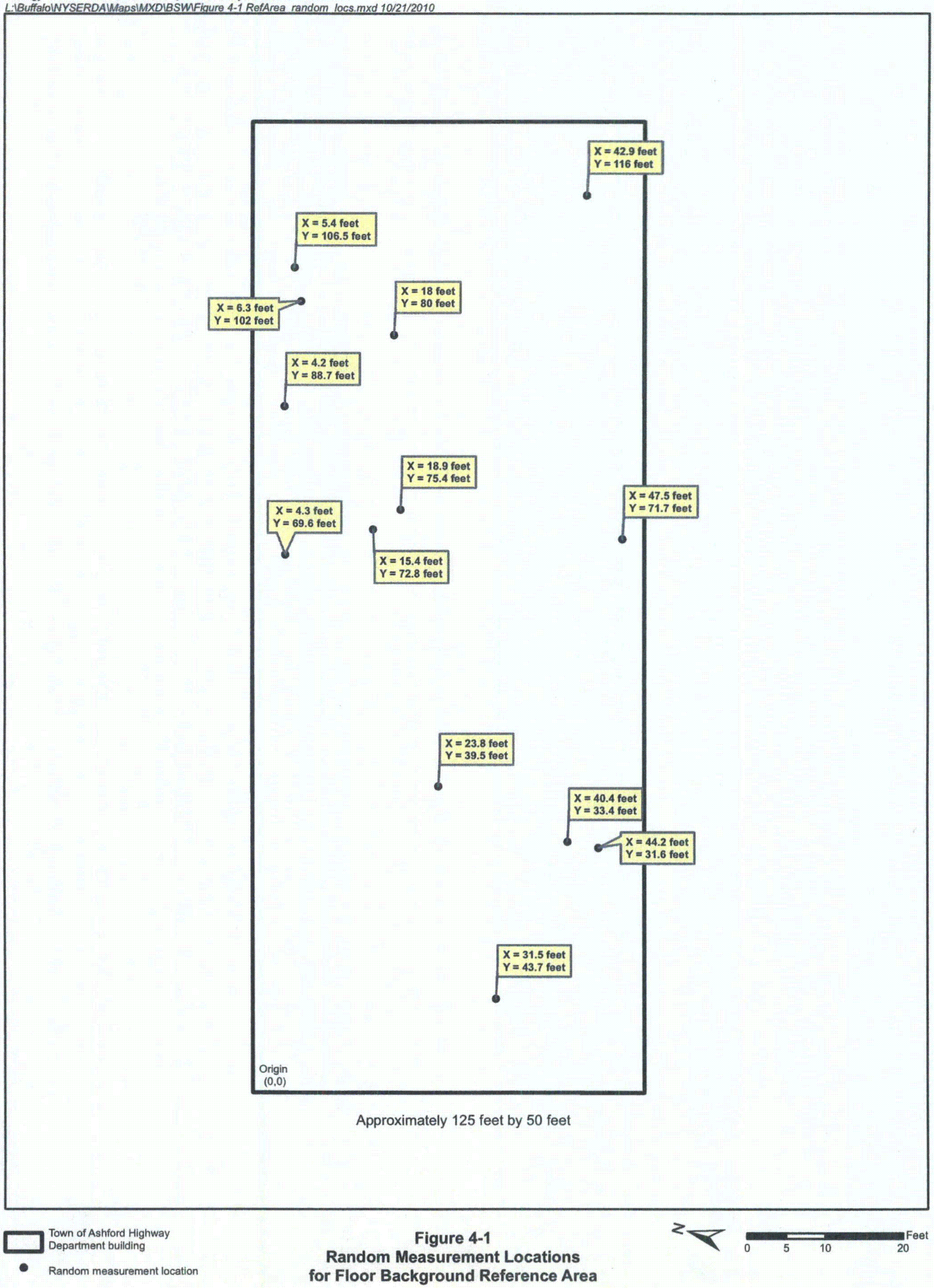

Figure 4-1
Random Measurement Locations for Floor Background Reference Area

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L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 4-2 BSW Floor Random Locs.mxd 10/21/2010

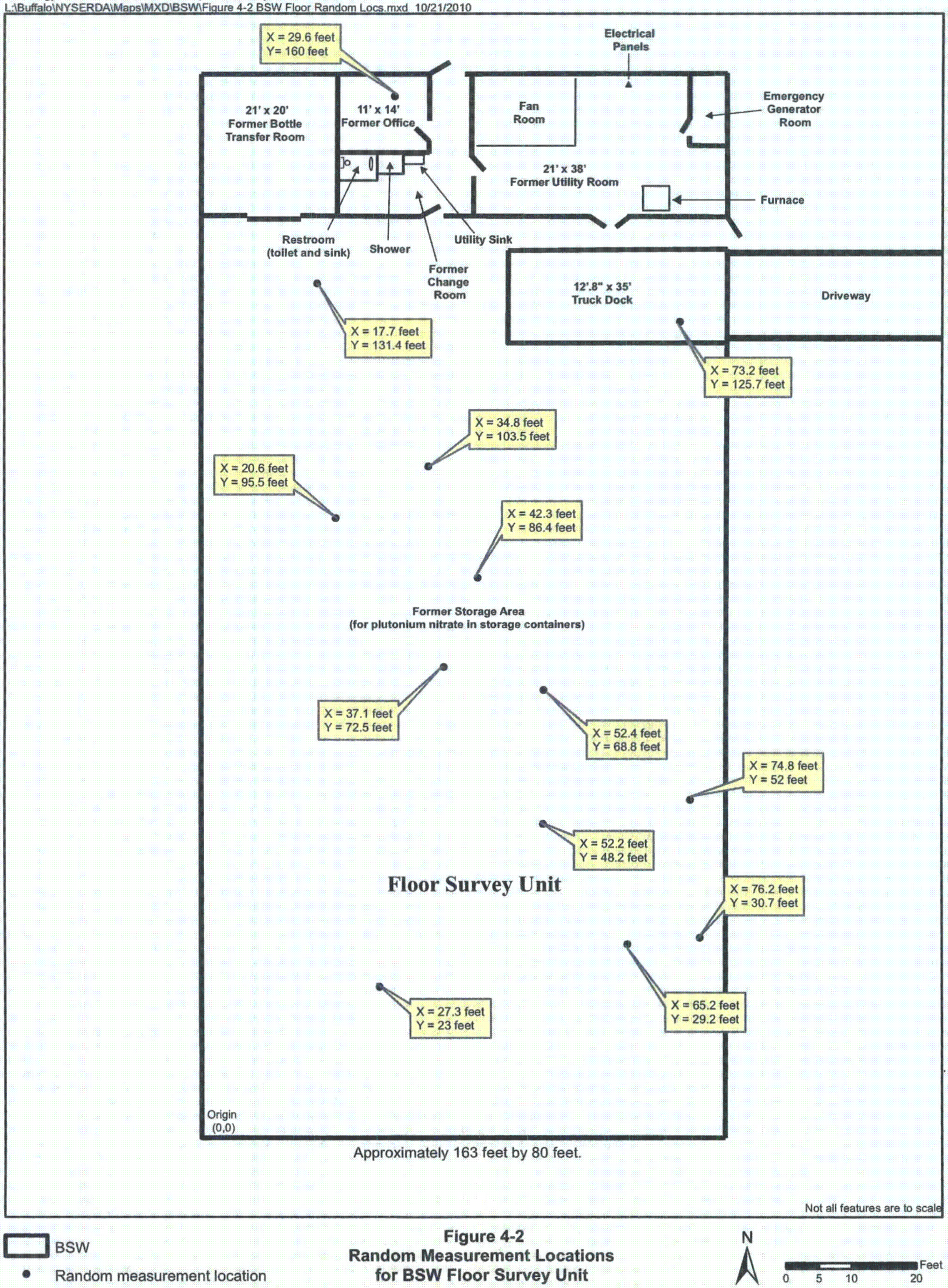

Figure 4-2
Random Measurement Locations for BSW Floor Survey Unit

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Ecology & Environment, Inc. GIS Department Project # 002177.NZ08.02
L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure 4-3 BSW Soil Random Locs.mxd 10/21/2010

NYS Digital Orthoimagery 2007

BSW property
● Random measurement location

Figure 4-3
Random Measurement Locations for BSW Surface Soil Survey Unit

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0 25 50 100 Feet

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6.0 FINAL STATUS SURVEY REPORT

A Final Status Survey Report (FSSR) describing and documenting the FSS for the BSW survey units will be prepared for review and approval after all DQOs have been satisfied. The FSSR will then be provided to NRC for review and approval prior to proceeding with license amendment. The report will be stand-alone and include the following at a minimum:

- Description of the survey units.
- Classification rationale for each survey unit.
- Characterization data associated with each survey unit.
- Remediation activities (if any) performed in the survey unit.
- Discussion of the survey design.
- Tabular and graphical depiction of survey results.
- Discussion of data assessment.
- Conclusions that survey units meet or fail applicable criteria.

In the event that the FSS data collection identifies the presence of radionuclides inconsistent with the assumption of background conditions for the BSW property, the FSSR will also include the results of follow-up actions that demonstrate compliance with the release criteria for the Class 3 survey units, such as a dose assessment based on the data collected.

If the FSS data collection or subsequent dose assessment indicate that a remedial action is warranted, then the Class 3 survey categorization assumed by this Plan is no longer valid. An FSS data collection process consistent with MARSSIM Class 1 requirements would need to be developed and applied to the areas of concern post-remediation to demonstrate that release criteria have been met.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL MEASURES

Quality assurance and quality control (QA/QC) measures will be employed throughout the FSS process to ensure that decisions are made on the basis of data of acceptable quality. The DQO process will be followed in the design of surveys and in the specification of measurement types and instrumentation. A QAPP will be prepared to cover project QA/QC requirements and activities, as well as project DQOs.

Data quality indicators (DQIs) are quantitative and qualitative measures of the reliability of the selected measurement methods. Such indicators include the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data. Measurement instruments and methods will be evaluated in terms of these indicators when they are selected. DQIs will be addressed in the QAPP.

A QA program will be conducted during surveys that, in accordance with the QAPP, will specify and measure the performance of measurement methods through the collection of an appropriate number or frequency of QC measurements/samples. Such measurements/samples could include field and laboratory blanks, field duplicates, laboratory replicates, and spiked samples. Field instruments will be calibrated to NIST-traceable standards at a frequency prescribed in the QAPP.

Twice-daily response checks will be performed for field instruments before use. Corrective actions will be conducted if performance falls outside of expected ranges.

Surveys and measurement/sample collection for the FSS also will be performed in accordance with other established QA/QC requirements. Replicate surveys, measurement/sample recounts, instrument performance checks, chain of custody, documentation, control of field survey data and databases, and QC investigations will provide the highest level of confidence in the data collected to support the survey outcome. In addition, QA/QC measures will ensure that trained personnel conduct surveys with approved QAPP procedures and properly calibrated instruments.

8.0 REFERENCES

(U.S.) Atomic Energy Commission (AEC). 1974. Termination of Operating Licenses for Nuclear Reactors. Regulatory Guide 1.86. (Commonly referred to as an NRC document.) Available at: http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/rg/ (accessed 09-30-2010).

(U.S.) Nuclear Regulatory Commission (NRC). 1998. A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys. NUREG-1505, Rev. 1. Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1505/sr1505.pdf (accessed 05-26-2009).

NRC. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). NUREG-1575, Rev. 1. Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1575/r1/ (accessed 05-26-2009).

NRC. 2006. Consolidated Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria. Volume 2, Revision 1. NUREG-1757. Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1757/ (accessed 05-26-2009).

Appendix A

BSW Historical Site Assessment and Conceptual Site Model Basis

A.1 Background

Commissioned by the New York State Atomic and Space Development Authority (NYSASDA) in 1969 as the Plutonium Storage Facility (PSF), the BSW is located approximately 1.4 miles east-southeast of what is now the site of the West Valley Demonstration Project (WVDP) (Figures A-1 and A-2). It was licensed by the U.S. Atomic Energy Commission (AEC) in 1969 to receive and store plutonium nitrate from fuel reprocessing activities at the main operational area of the Western New York Nuclear Service Center (WNYNSC). That main operational area is now the site of the WVDP (NYSASDA 1968c; AEC 1969). The PSF functioned to receive and store plutonium nitrate from 1969 to 1974.

The isotopic composition of plutonium (by weight) in the solution stored at the PSF was approximately 0% Pu-238; 63.2% Pu-239; 22.6% Pu-240; 11.6% Pu-241; and 2.6% Pu-242 (NYSASDA 1968c). The plutonium nitrate was delivered to the facility in 10-liter polyethylene bottles, which were sealed in gas-tight stainless steel capsules and enclosed in the supplier's concrete-shielded shipping containers (NYSASDA ca. 1968a, 1968b). Stainless steel capsules were then transferred within a specially-designed containment hood to concrete-shielded storage casks for the duration of their stay. Each step of the transfer process required contamination monitoring and monthly surveys of the facility and storage containers were performed. In addition, quarterly electrical continuity leak tests were performed on each storage container.

In 1974, NYSASDA decided not to upgrade the facility to comply with new AEC security requirements (New York State Department of Commerce [NYSDOC] 1974a). All plutonium nitrate was subsequently shipped to authorized receivers (NYSDOC 1974b), closeout radiation surveys were performed, the facility's NRC 10 CFR 70 license was terminated, and the empty storage casks and transfer hood were subsequently buried in a nearby trench (NYSERDA 1982c), which is now known as the Scrap Material Landfill (SML).

Subsequent to license termination, from about 1983 to 2006, the BSW was used by the U.S. Department of Energy (DOE) as a storage warehouse for files and office equipment. Other than a battery (sulfuric) acid spill in 1995 that was successfully contained and remediated (West Valley Nuclear Services Company [WVNSCO] 1995), no records have been identified that document the handling of hazardous or radioactive materials in the building subsequent to termination of the NRC license or burial of the storage casks. This finding is shared by a Resource Conservation and Recovery Act (RCRA) facility investigation in 1994, which concluded that the BSW was "not an area of concern" (Ecology and Environment, Inc. [E & E] 1994).

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L:\Buffalo\NYSERDA\Maps\MXD\BSW\Figure A-1 BSW_Project_Area.mxd 11/10/2010

WNYNSC Boundary
West Valley Demonstration Project boundary
Bulk Storage Warehouse boundary

Figure A-1
Bulk Storage Warehouse Location at Western New York Nuclear Service Center

NYS Digital Orthoimagery 2007

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0 250 500 1,000 Feet

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Figure A-2
Bulk Storage Warehouse

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A.2 Building Construction and Features

The BSW is surrounded by a 7-foot chain-link fence (Figure A-3), with a short driveway and access road connecting the facility's truck bay to Buttermilk Road, the nearest public road (Figures A-2 and A-4). The approximately 1.2-acre BSW property includes the building, some surrounding grassy area, the fence, and the portion of the driveway within the fence (Figure A-2). The 80-foot-by-163-foot building was constructed of prefabricated, rigid-frame steel on a 6-inch reinforced concrete slab and houses a 3-ton capacity overhead crane.

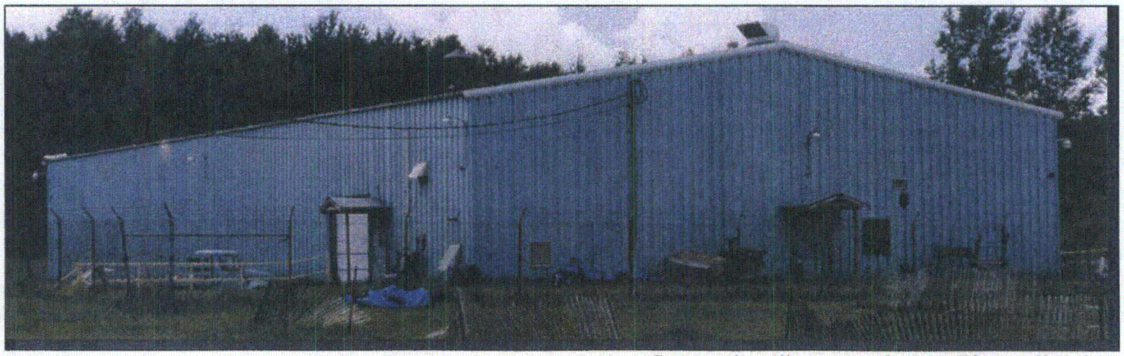
The inside of the exterior walls and roof are insulated and lined with steel paneling, cinder block, and other masonry. Located at one end of the building are a truck well and four small rooms that functioned as an office, transfer room, change room, and utility room. The largest room in the building is an open, unpartitioned storage area (Figure A-5). The floor of the truck well is depressed by 4 feet 2 inches (to level truck beds with the facility floor) and slightly sloped to prevent pooling of rainwater in the truck bay area.

A.3 Mechanical Systems

The only drain identified in the building floor plan (Figure A-6) is a storm drain near the lowest point of the exterior truck bay. Information about the routing/disposition of this drain is not available. However, the facility construction contract (NYSASDA 1968e) specifies "connection to utilities" (including water), presumably meaning a nearby storm sewer or French drain.

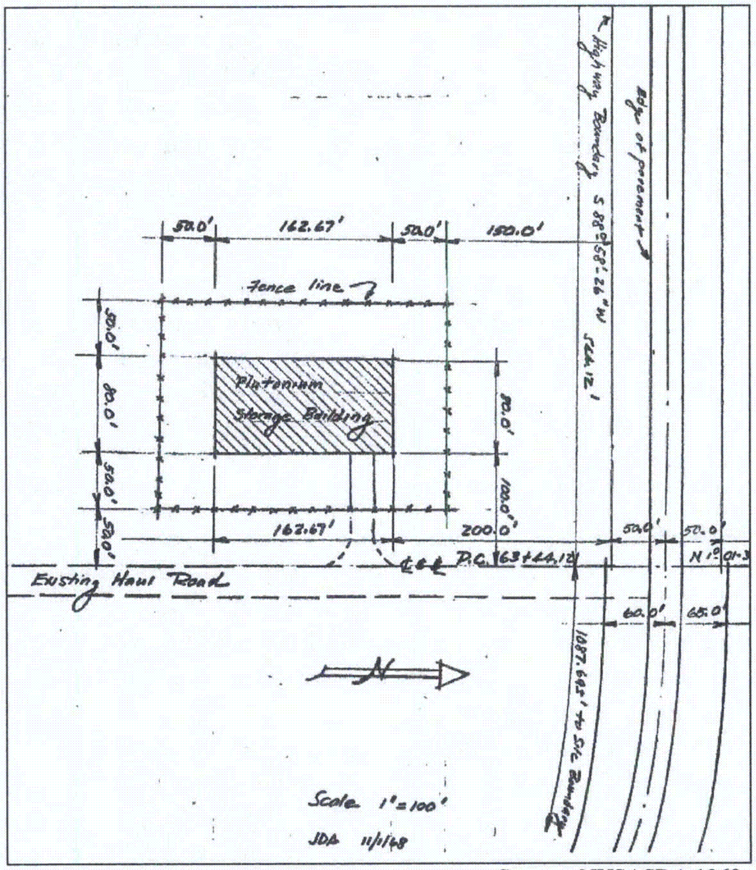
The other plumbing fixtures specified in available documents are a toilet, sink, and shower (in the change room) and a janitor's sink. Figure A-6 shows the building floor plan and Figure 3-1 in the body of this Plan shows the as-built locations of the plumbing fixtures. Some or all of these fixtures are assumed to empty into the 750-gallon septic tank, as described in the construction contract. There is no information available regarding the status of the tank, nor if it was discharged or sampled for contamination after the commencement of facility operations.

A single building ventilation system was designed to provide airflow from clean to potentially contaminated areas; specifically, from the storage area to the transfer area prior to HEPA filtration (99.97% for 0.3 micron) and exhaust. There were also provisions for recirculation of filtered exhaust into the storage and transfer areas. The three clean rooms (office, change room, and utility room) share a separate air intake and discharge into the exhaust plenum upstream of the HEPA filters.



Source: http://www.wv.doe.gov/Photogallery.htm

Figure A-3 BSW Exterior Facing Southwest

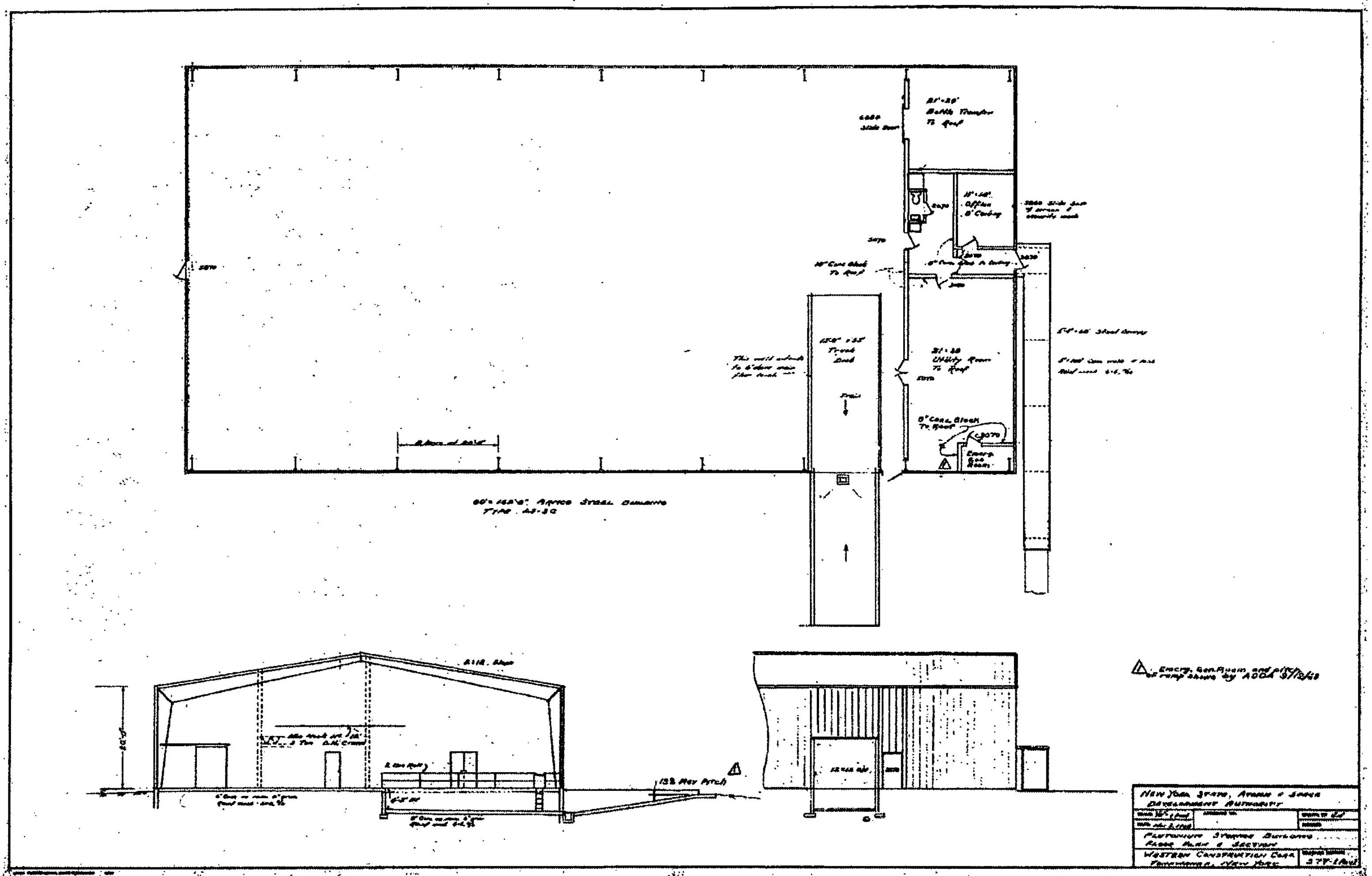


Source: NYSASDA 1968e

Figure A-4 BSW Site Plan

Source: DOE 2007

Figure A-5 BSW Interior Facing Truck Door



Source: NYSASDA 1968d

Figure A-6 BSW Floor Plan and Section

A.4 Contamination Monitoring Activities and Other Records

The facility contamination monitoring program included the following (NYSASDA 1968a, 1968b):

- Isokinetic, high-volume filter sampling of HEPA-filtered air exhaust (analyzed monthly);
- Parallel continuous (alpha) air monitoring of HEPA-filtered air exhaust;
- Continuous (alpha) air monitoring near the location of the transfer room during transfer activities;
- Portable contamination monitoring instrumentation in the transfer and change rooms;
- Contamination monitoring of incoming shipments and trucks;
- Quarterly electrical continuity leak/failure testing of polyethylene storage containers;
- Monthly portable airborne contamination monitoring of storage area; and
- Monthly surface contamination monitoring of storage and transfer rooms.

After removal of all plutonium nitrate from the facility, the PSF staff performed a closeout radiation survey of the building interior and storage casks in October 1974 (NYSASDA 1974; State University of New York [SUNY] at Buffalo 1974), followed by a resurvey of grid points for fixed contamination in January 1975 (SUNY at Buffalo 1975). The first survey consisted of 1,464 grid (floor) swipes for removable alpha and beta contamination (Beckman Lowbeta II gas-flow proportional counter), 593 storage cask swipes (internal and external) for removable alpha and beta contamination (Beckman Low-Beta II gas-flow proportional counter), and 48 direct readings of the facility for fixed beta/gamma contamination using a portable Geiger counter to measure exposure rate (Eberline E-500B). The resurvey consisted of direct readings for fixed contamination using a portable alpha scintillator (Eberline PAC-4S) and Geiger-Mueller meter (Victoreen Thyac III). Based on the survey results, the staff concluded that residual contamination levels were below AEC limits for unrestricted use.

Upon receiving the results of the closeout surveys, the NRC dispatched an inspector to survey the facility and verify the closeout survey results. During the inspection, PSF representatives noted that the only contamination identified during facility operation was occasionally on the outside of stainless steel capsules that were removed from shipping containers (NRC 1975a). The staff also noted that no contamination had been identified on the original roughing (intake) filters that were removed from the ceiling exhaust duct in the storage area (which ran the length of the ceiling peak). The NRC inspector's confirmatory survey included the interiors of the transfer hood exhaust duct and HEPA filter bank housing. No contamination was identified and the inspector concluded that there was no contamination at the ceiling level. The inspector agreed that residual surface contamination and dose levels were below the then-current limits for unrestricted use (as established by the Division of Materials and Fuel Cycle Facility Licensing) in Table A-1.

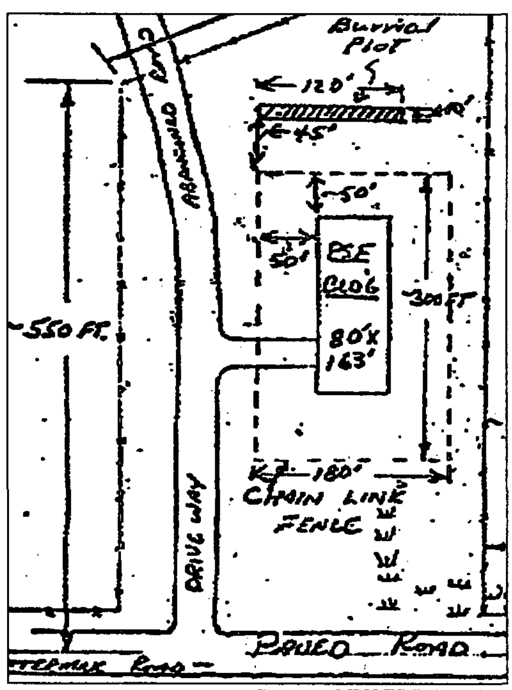
The NRC provided formal concurrence of the closeout survey findings in February 1975 and officially terminated the facility's license in April 1975 (NRC 1975b).

Table A-1 Acceptable Contamination Levels Used to Release PSF for Unrestricted Use in 1975

Constituent	Maximum	Average	Removable
Alpha	2,500 dpm/100 cm^2	500 dpm/100 cm^2	100 dpm/100 cm^2
Beta-gamma	1.0 mrad/h at 1 cm	0.2 mrad/h at 1 cm	1,000 dpm/100 cm^2

Source: NRC 1975a.
Key:
dpm = disintegration per minute.
mrad = millirad.

Because new limits for alpha contamination were adopted by the AEC in 1974 (AEC 1974b), the New York State Department of Environmental Conservation (NYSDEC) requested NRC confirmation in 1981 that the closeout survey remained compliant with current regulations and that the survey included the empty storage casks (NYSDEC 1981). This was necessary to support NYSDEC's decision on NYSERDA's (successor to NYSASDA) proposal to dispose of the casks in a sanitary landfill. NRC responded that six casks were not represented in the survey and one required decontamination prior to release for unrestricted use (NRC 1981; NYSDEC 1982a; NYSERDA 1981, 1982a). After decontamination and/or resurvey of the seven casks and concurrence from NRC (NRC 1982), NYSDEC approved NYSERDA's request to dispose of the storage casks in a landfill or via onsite burial (NYSERDA 1982b; NYSDEC 1982b). The casks and transfer hood were subsequently buried in a disposal trench (14 feet deep, 10 feet wide, 120 feet long) located approximately 100 feet south of the BSW (Figure A-7) (NYSERDA 1982c; WVNSCO 1990; E & E 1994).



Source: NYSERDA 1982c

Figure A-7 BSW Disposal Trench Plan

Other than the closeout survey, no records have been identified that contain actual data from pre-1982 monitoring activities. However, an AEC inspection in April 1974 noted that stack sampling and continuous air monitoring records showed airborne contamination to be "well within" applicable limits, the storage area was monitored constantly for airborne contamination using a portable air sampler, and storage container seals were tested for leaks on a quarterly basis (AEC 1974a). This echoed the findings from an earlier AEC inspection, which found no evidence of surface contamination in monthly facility survey records (AEC 1973a). At least two other AEC inspections verified the performance of required surveys but did not comment on the survey findings (AEC 1972, 1973b). There are no records indicating that the floor of the BSW was painted as part of other PSF or BSW activities and a long-term employee of the WVDP indicated that it had not been painted while in service as the BSW (NYSERDA 2010).

There is limited information available regarding the monitoring of soils or roads external to the facility (routinely or as part of the facility closeout survey). NYSDEC performed soil sampling in and around the WNYNSC site in 1971, but none of the samples were taken near the BSW (NYSDEC 1972). Although of limited use for plutonium, aerial gamma flyover surveys performed in 1979 and 1984 did not indicate the presence of an elevated dose contour in the vicinity of the BSW (EG&G 1991). An overland gamma survey was performed around the BSW in 1991 and the results did not indicate any areas of elevated soil radioactivity (WVNSCO 1991). Aside from the septic system (piping and tank), surface soils are the only external feature considered to be potentially contaminated since the only credible pathways for external contamination are airborne deposition and surface spills. As well, any airborne deposition on the exterior of the BSW or on the driveway would have since been washed off onto the surface soil. Air and surface soil samples have been collected from the BSW area as part of the WVDP environmental monitoring program and are discussed in Section A.5.

Site contractors have continued to monitor the BSW for contamination on a periodic basis. The most recent survey showed no floor contamination in excess of established action levels (WVNSCO 2007).

A.5 Potential Contamination from Other WNYNSC Activities

Aside from the plutonium nitrate storage operations directly conducted at the PSF and discussed in Section A.1, other WNYNSC activities that could have potentially affected the BSW property would be airborne deposition from fuel reprocessing activities at the main plant area (1966 to 1972), the main plant ventilation failure in 1968, and cleanup activities at the WVDP site (1982 to the present), each of which is briefly discussed below.

Records of airborne releases from the operation of the main plant during the days of fuel reprocessing were not available for review for this Plan.

The ventilation failure in 1968 consisted of two filter failures at the main plant that disseminated primarily Cs-137 over a forked area several miles to the northwest of the main plant, both on and off the WNYNSC, and which has historically been referred to as the cesium prong (Washington Safety Management Solutions 2009). Cs-137 has been noticeably detected in surface soils in that area. The cesium prong is over 1.5 miles to the northwest of the BSW. Based on the known boundaries of the cesium prong, it is unlikely that the ventilation failure event noticeably affected the BSW area.

The WVDP site, its near environs, the perimeter of the WNYNSC, and selected off-site locations are routinely monitored for radioactivity in various releases and environmental media as part of the DOE environmental monitoring program for WVDP activities. The results are reported in the WVDP Annual Site Environmental Reports (ASERs), which go back to calendar year (CY) 1982. According to the ASERs, the main ventilation stack at the main plant has been the primary source of permitted airborne releases from the WVDP. The main stack has been monitored for various radionuclides over the years, typically gross alpha, gross beta, Am-241, Cs-134, Cs-137, cobalt-60 (Co-60), europium-154 (Eu-154), iodine-129 (I-129), Pu-238, Pu-239/240, strontium-90 (Sr-90), tritium, and uranium (typically U-232, U-233/234, U-235/236, and U-238). The gaseous I-129 and tritium are not considered to be pertinent to the BSW property because they would dissipate rapidly and not tend to fall out. Of the remaining radioactive particulates typically released from the main ventilation stack, in most years Am-241, Cs-137, Eu-154, plutonium isotopes, and Sr-90 have tended to be present in relatively greater activity than the others. Of these, Cs-137 was typically present in the greatest activity.

According to the WVDP ASERs, the BSW served as one of six WNYNSC perimeter ambient air sampling locations from December 1992 through CY2005. Ambient air results for the BSW sampling location (AFBLKST) (see Figure A-2) for gross alpha, gross beta, Cs-137, and Sr-90, which were monitored on varying schedules during that time, were generally indistinguishable from results at the off-site background points used for the program, indicating no effect from WVDP activities at that time. The primary background location used for the annual comparison is in Great Valley, New York, approximately 20 miles south of the WNYNSC. The results for the BSW air sampling location from CY1993 through CY2005 also were similar to those for an upwind community monitoring point in West Valley, New York, about 4.5 miles southeast of the BSW. After CY2005, the BSW location was no longer monitored for ambient air. In 2006 and 2007, ambient air sampling at WNYNSC perimeter locations continued at three locations, two of which are not far from the BSW — at Route 240, approximately 1.5 miles north of the BSW, and at Fox Valley Road, less than one mile south of the BSW at the southeastern limit of the WNYNSC. The radioanalytical results for ambient air at those two locations were similar to background for CY2006 and CY2007. Since 2007, no WNYNSC perimeter air sampling has been conducted as part of the WVDP environmental monitoring program

Surface soil samples were collected at least annually from 1992 through CY2004 at the same WNYNSC perimeter locations as the ambient air samples and analyzed for various radionuclides depending on the year. Results for the BSW location (SFBLKST) (see Figure A-2) for gross alpha, gross beta, Am-241, Co-60, Cs-137, K-40, Pu-238, Pu-239/240, and Sr-90 in surface soil were reported to be generally indistinguishable from results at the off-site background points (the off-site background locations were the same as those used for the ambient air monitoring). Since 2004, the BSW location has not been sampled for surface soil as part of the WVDP environmental monitoring program.

Therefore, based on historical predominant wind directions for the WNYNSC (winds from southerly and westerly directions) and the ambient air and surface soil results for the BSW sampling location, the BSW area is not routinely downwind of the WVDP and likely has not been much affected by airborne deposition from daily WVDP activities.

A.6 BSW Contamination Status

Based on a thorough review of available historical documentation for the BSW property (which includes findings of periodic AEC inspections, conclusions from the 1974/1975 facility closeout surveys, and no references to any radiological contamination, releases, or unusual occurrences), there is little reason to believe that measurable, residual contamination exists within the BSW or surrounding soils that would be attributable to facility operations prior to license termination in 1975. It should be noted, however, that the available documents generally pertain to building status through 1975, that few records have been identified pertaining to soil analyses during the time of PSF operation, and that the results of contemporaneous monthly contamination surveys and air sample analyses were not available for review. Similarly, based on a review of some historical documentation for activities at the main plant area of the WNYNSC, there is little reason to believe that residual contamination exists on external surfaces of the BSW structure or in surrounding soils that would be attributable to either the main plant ventilation failure of 1968 or WVDP cleanup activities from 1982 to the present.

Based on the above, it is appropriate to consider the BSW structure and surrounding soils as Class 3 survey units under MARSSIM guidelines. A final site status survey consisting of random and biased data collection is appropriate. Potential locations for biased data collection include the air filter housing and fan room, HEPA filter box, exhaust ducts and stack, air intakes and returns, the loft area, drains, drain traps, sumps, the truck bay, the septic tank, the soil at the base of gutter downspouts, and an approximately 200 square foot portion of the floor in the northwest corner of the storage area that was represented in the 1974/1975 closeout survey.

A.7 References

(U.S.) Atomic Energy Commission (AEC). 1969. Letter to NYSASDA: Special Nuclear Material License No. SNM-1138.

AEC. 1972. Letter to NYSASDA: Inspection No. 70-1156/72-01.

AEC. 1973a. Inspection Report No. 70-1156/73-01.

AEC. 1973b. Letter to NYSASDA: Inspection No. 70-1156/73-02.

AEC. 1974a. Letter to NYSASDA: Inspection No. 70-1156/74-01.

AEC. 1974b. Termination of Operating Licenses for Nuclear Reactors. Regulatory Guide 1.86. (Commonly referred to as an NRC document.)

(U.S.) Department of Energy (DOE). 2006. Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project: Final. DOE/EA-1552. Available at http://www.gc.energy.gov/NEPA/ea1552.htm (accessed 05-26-2009).

DOE. 2007. WVDP Update. Available at http://westvalleyctf.org/dec07_materials/DOE_Project_Update_112807.pdf.

Ecology and Environment, Inc. (E & E). 1994. RCRA Facility Investigation for NYSERDA-Maintained Portions of the Western New York Nuclear Service Center. Final Report.

E & E. 2010. Field notes from August 2010 site visit to BSW.

EG&G Energy Measurements (EG&G). 1991. An Aerial Radiological Survey of the West Valley Demonstration Project and Surrounding Area, West Valley, New York.

New York State Atomic and Space Development Authority (NYSASDA). ca. 1968a. Technical Information: Plutonium Storage Facility, Western New York Nuclear Service Center.

NYSASDA. ca. 1968b. Plutonium Storage Facility Procedures.

NYSASDA. 1968c. Application for License Filed with U.S. Atomic Energy Commission.

NYSASDA. 1968d. Plutonium Storage Facility Floor Plan and Section.

NYSASDA. 1968e. Construction Contract.

NYSASDA. 1969. Plutonium Storage Facility Procedures.

NYSASDA. 1974. Close Out Survey Report: NYSASDA Plutonium Storage Facility.

New York State Department of Commerce (NYSDOC). 1974a. Intra-Departmental Memorandum: ASDA's Plutonium Storage Facility.

NYSDOC. 1974b. Memorandum: Plutonium Shipped from ASDA Plutonium Storage Facility.

New York State Department of Environmental Conservation (NYSDEC). 1972. Memorandum from William Bentley to Commissioner Diamond: 1971 Annual Report of Environmental Radiation in New York State.

NYSDEC. 1981. Letter to NRC: NYSERDA Disposal of Plutonium Storage Casks.

NYSDEC. 1982a. Memorandum: Part 364 Permit Request.

NYSDEC. 1982b. Letter to NYSERDA: Concurrence with Method of Disposal.

New York State Energy Research and Development Authority (NYSERDA). 1981. Memorandum: Storage Containers in PSF.

NYSERDA. 1982a. Letter to NRC: Docket No. 70-1156. Letter from Mr. T.K. DeBoer, Program Director, West Valley, dated February 17, 1982.

NYSERDA. 1982b. Memorandum: Burial of Containers and Hood.

NYSERDA. 1982c. Letter to NYSDEC: Disposal of Storage Containers and Hood at West Valley.

NYSERDA. 2010. E-mail communication from NYSERDA to E & E regarding the potential for the BSW to have been painted. February 11, 2010.

(U.S.) Nuclear Regulatory Commission (NRC). 1975a. Letter to NYSASDA: Inspection No. 70-1156/75-01.

NRC. 1975b. Letter to NYSASDA: Close Out of ASDA Plutonium Storage Facility at West Valley, New York Site.

NRC. 1981. Letter to NYSDEC: Docket No. 70-1156.

NRC. 1982. Letter to NYSDEC: Docket No. 70-1156.

State University of New York (SUNY) at Buffalo. 1974. Letter to NYSASDA: Conclusion of the PSF Survey Results.

SUNY at Buffalo. 1975. Letter to NYSASDA: PSF Resurvey.

Washington Safety Management Solutions, URS Washington Division, and Science Applications International Corporation. 2009. Phase 1 Decommissioning Plan for the West Valley Demonstration Project. Prepared for DOE.

West Valley Environmental Services LLC and URS. 2008 through 2010. West Valley Demonstration Project Annual Site Environmental Report. Issued for each of calendar years 2007 through 2009. Prepared for DOE.

West Valley Nuclear Services Company (WVNSCO). 1983 through 2007. West Valley Demonstration Project Annual Site Environmental Report. Issued for each of calendar years 1982 through 2006. Prepared for DOE. (The reports had slightly varied names over the years. WVNSCO collaborated with Dames & Moore and later URS for most of the later reports.)

WVNSCO. 1990. Letter to DOE: Review of Solid Waste Management Unit Records.

WVNSCO. 1991. 1990-1991 Overland Gamma Radiation Survey: Site Characterization Facility Assessment Program. Report WVDP-EIS-0003.

WVNSCO. 1995. Environmental Affairs Substance Release Report Form.

WVNSCO. 2007. Radiation and Contamination Survey Report #142096.

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Appendix B

MARSSIM Statistical Test Application

B.1 WRS Test Application

When monitoring for COCs that are present in background (or when detector background is expected to represent most of the gross counting results), the WRS test is conducted to compare measurements from the reference area with each survey unit. The null hypothesis will be that the distribution of radionuclides for the survey unit is consistent with background conditions. The following procedure describes how the WRS test will be applied in this FSS.

1. Obtain the adjusted sample area measurements by subtracting the LBGR from each survey unit measurement. The LBGR will be set to one-half of the NRC Regulatory Guide 1.86 Table 1 value for the parameter of interest (average acceptable surface contamination for transuranics).

2. Pool the *m* adjusted survey unit sample measurements with the *n* reference sample measurements and rank them in order of increasing size from 1 to N (where $N = m + n$).

3. If several measurements share the same value, assign the average rank of that group of tied measurements.

4. If there are *t* "less than" values, assign the average of the ranks for the group (i.e., [n + 1]/2).

5. Sum the ranks of the adjusted measurements from the survey unit (W_s).

6. Compare W_s with the critical value given in MARSSIM Table I.4 for the appropriate values of *m*, *n*, and α. If W_s is greater than the tabulated value, reject the hypothesis that the survey unit is indistinguishable from background. For the purposes of this evaluation, α is set to 0.05.

B.2 Sign Test Application

For multiple radionuclides, the unity rule (calculated SOR) is used as the basis for applying the statistical test. The unity rule for the *n* radionuclides states that:

$$C_1/D_1 + C_2/D_2 + C_3/D_3 + \ldots + C_n/D_n \leq 1$$

The following procedure describes how the Sign test will be applied in this FSS. The null hypothesis will be that the distribution of radionuclides for the survey unit exceeds the relevant standard.

1. List the SORs for the survey unit measurements, X_i, $i = 1, 2, 3, \ldots N$.

2. Subtract each measurement, X_i, from 1 to obtain the differences.

3. Count the number of positive differences. An exact zero would be a positive difference. The result is the test statistic S+.

4. Compare S+ to the critical value in Table I.3 of MARSSIM. If S+ is greater than the critical value, reject the null hypothesis.