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Decommissioning Project Final Report (DPFR)
Building 728-N, Shipping Cask and Railroad Car Repair Facility

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HISTORY OF REVISIONS

Revision	Date	Revised Section	Change
0	3/18/2020	N/A	Initial Issue

LIST OF ABBREVIATIONS AND ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of Concern
COPC	Constituent of Potential Concern
D&D	Deactivation and Decommissioning
DPFR	Decommissioning Project Final Report
EC&ACP	Environmental Compliance & Area Completion Projects
EPC	Exposure Point Concentration
FDE	Facility Decommissioning Evaluation
HEPA	High Efficiency Particulate Air
HH	Human Health
ICA	Inactive Contamination Area
MCL	Maximum Contaminant Level
MDA	Minimum Detectable Activity
ND	Non-detect
PRG	Preliminary Remediation Goal
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
S&M	Surveillance and Maintenance
SCDHEC	South Carolina Department of Health and Environmental Control
SPRG	Surface Preliminary Remediation Goal
SRNS	Savannah River Nuclear Solutions
SRS	Savannah River Site
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VZCOMML©	Vadose Zone Contaminant Migration Model - Multi-Layered©

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1.0 SUMMARY

The Shipping Cask and Railroad Car Repair Facility was built/occupied in 1959 and initially used for repair and refurbishment of cask cars. SRS used cask cars to transport irradiated fuel and targets from SRS reactors to the F and H Canyons. In 1995, the facility became a satellite operation to the Building 105-C Decontamination Facility. The facility saw limited use, primarily to decontaminate radiologically contaminated equipment using a vacuum blasting process inside an internal hut, which has been removed. In 2000, the mission of the building was changed from a decontamination facility to a storage facility for contaminated equipment either in sealed containers or wrapped in plastic. It was during this time period that an inactive contamination area (ICA) was established along the building northwest wall including the High Efficiency Particulate Air (HEPA) filter assembly, located on a pad outside the northwest wall. The facility was reclassified as a radioactive materials storage area and has been idle since. Contaminated materials and equipment have been removed.

Supported by the above, this project has been conducted using the Integrated Sampling Model described in Facility Disposition Manual 1C, Procedure 501.

The decommissioning end-state for this facility was demolition of the above ground portion of the structure to the concrete slab at grade. Interfacing utilities were isolated, disconnected and plugged. The dry sump and any other floor penetrations were filled/sealed with grout to achieve a uniform surface. Surrounding soil, disturbed during demolition/decommissioning, was restored to its original configuration

A human health (HH) risk screening evaluation and an analysis of the potential for contaminant migration to groundwater were conducted on the Building 728-N slab based on biased sample locations from the 0-2 inch depth interval of the concrete slab. Potential risks based on a reasonable maximum exposure (RME) scenario were estimated for an industrial worker hypothetically exposed to residual contamination at Building 728-N. The radiological cancer risk based on a RME scenario for a future industrial worker exposed to the general slab area is estimated to be 2.7E-04 based on the maximum detected activity; the risk estimate based on the mean activity across the entire slab is 9.6E-05. Cs-137 is the risk driver.

In addition, final surveys and soil sampling were performed by Radiological Protection after the building was demolished. All dose rates, direct probes, smears, and soil samples were below detection utilizing Radiological Protection methods. Based on this information, no radiological controls are required for the slab and surrounding soils.

Contaminant fate and transport analysis was performed using the Vadose Zone Contaminant Migration Model - Multi-Layered© (VZCOMML©), which accounts for decay processes, infiltration rate, soil properties, vadose zone thickness, and chemical behavior. Based on this evaluation, there are no contaminant migration to groundwater concerns.

2.0 PURPOSE AND SCOPE

The purpose of this report is to document what was done to the facility as a part of the decommissioning project, and the condition the facility was left in at the completion of the project. The requirement for this report is found in the Facility Disposition Manual 1C, Procedure 506, "Preparing a Decommissioning Project Final Report".

2.01 Facility Description

Building 728-N, Shipping Cask and Railroad Car Repair Facility was initially classified as a "Radiological" facility in the Savannah River Nuclear Solutions "Standards/Requirements Identification Document Facility List" (Reference 8.01). A 2007 radiological survey of the facility and assay of the HEPA filter assembly found the remaining radiological hazards to be below the 40 CFR 302.4 threshold, enabling Building 728-N to be downgraded from "Radiological" to "Other Industrial" Hazard Classification. Based on this, Building 728-N was subsequently downgraded in 2009. The 728-N facility was located in Central Shops (N Area). The facility was built/occupied in 1959 and initially used for repair and refurbishment of cask cars. SRS used cask cars to transport irradiated fuel and targets from SRS reactors to the F and H Canyons.

Building 728-N was a single story, wood frame structure covering approximately 2,000 square feet on a concrete slab. The slab varies in thickness from 22 inches under the railroad track to 8 inches elsewhere. The main portion of the building consisted of a high bay approximately 20 feet in height. The high bay area had one personnel exit and a roll-up door. The high bay consisted of a large open area built to accommodate a railroad car. The exterior of the building and roof were sided with sheet metal and the roof had a twenty-foot section that was removable to allow crane operations. The interior walls and ceiling were covered with two layers of plywood with fire resistant plastic sheeting between the layers. A vestibule was provided on the east side of the building and was used as an airlock. A skid shack was attached at the vestibule and used as a change room. A sandblasting system, used during rail car and cask repair, remained on the east side of the building. A High Efficiency Particulate Air (HEPA) filter system, used to exhaust the high bay, was provided on the northwest side of the building at some time during the life of the facility to provide the ability to maintain a slight negative pressure during sandblasting and decontamination operations. A small dry sump, now grouted, was located in the northwest corner of the building.

The building was provided with electrical power and communications services. There were no drains in the building slab or the sump.

In 1995, the facility became a satellite operation to the Building 105-C Decontamination Facility. The facility saw limited use, primarily to decontaminate radiologically contaminated equipment using a vacuum blasting process inside an internal hut, which has been removed. In 2000, the mission of the building was changed from a decontamination facility to a storage facility for contaminated equipment either in sealed

containers or wrapped in plastic. It was during this time period that an inactive contamination area (ICA) was established along the building northwest wall including the HEPA filter assembly, located on a pad outside the northwest wall. The facility was reclassified as a radioactive materials storage area and has been idle since. Contaminated materials and equipment have been removed.

Sandblasting equipment, which remained on the compressor pad, was ancillary to 728-N and included in the decommissioning scope of this facility.

2.02 New Facility Information

SRS identified no new facility information during or as a result of the facility decommissioning.

3.0 DECOMMISSIONING MODEL APPROVAL

The facility was decommissioned using the Integrated Sampling Model as described in Facility Disposition Manual 1C. The selection of the model was based on a Facility Decommissioning Evaluation (FDE) (Reference 8.02). The regulatory walkdown of the facility occurred on August 25, 2009. The FDE received United States Environmental Protection Agency (USEPA) concurrence on January 29, 2010 (Reference 8.03). FDE concurrence was received from South Carolina Department of Health and Environmental Control (SCDHEC) on January 13, 2010 (Reference 8.04).

4.0 DECOMMISSIONING ACTIVITIES COMPLETED

Execution of the 728-N decommissioning project was planned and described in the FDE (Reference 8.02) and the Decommissioning End Points Document (Reference 8.05). As discussed in Sections 1.0 and 2.0, decommissioning of 728-N involved demolition of the building structure down to, but not including, the building slab and removal of the ancillary sandblasting equipment from the compressor pad. The overall decommissioning project included completing preparatory operations, performing asbestos abatement, performing dismantlement and removal activities, performing demolition activities, and completing project closure activities. Interfacing utilities were isolated, disconnected and plugged or capped (e.g., underground conduit for the Public Address system) prior to the start of decommissioning. Surrounding soil, disturbed during demolition and/or decommissioning, was restored to its original configuration. Final Verification Sampling of the concrete floor slab was performed. No changes were required to the original planning for decommissioning.

5.0 WASTE MANAGEMENT

5.01 Salvage and Reuse

Sixty (60) cubic yards of scrap metal from the 728-N decommissioning were transferred to 741-1N for recycling.

5.02 Waste Disposal

Table 1: Waste Generation

Waste Classification	Waste Source	Disposed to	Total Volume**
LLW	*Structure and components from process area, job control waste*	*SRS E-Area Slit Trenches*	*360 cu yd*
ACM	*Non-friable asbestos waste*	*Three Rivers Landfill*	*6 cu yd*
UW	*Light bulbs*	*SRS HWSF**	*1 cu ft*
CSR	*Miscellaneous demolition rubble*	*Construction & Demolition (C&D) Landfill*	*60 cu yd*
CSR	*Scrap metal for recycle*	*741-1N*	*60 cu yd*

LLW – Low level radioactive waste
ACM – Asbestos-containing material
UW – Universal Waste
CSR – Clean Structural Rubble
HWSF – Hazardous Waste Storage Facility

* Due to small volumes generated these wastes were consolidated with similar decommissioning wastes and are being managed in accordance with state and federal regulations until shipment for off-site treatment and disposal and/or recycle, as appropriate.

** The volume is determined by the total volume of the containers generated and transferred to the receiving facility. The waste within the containers is not compacted.

6.0 FINAL FACILITY CONDITION

6.01 Final Facility Condition and Remaining Hazards

Demolition of the 728-N Shipping Cask and Railroad Car Repair Facility to its concrete floor slab is complete. With the exception of normal surface disruption caused by construction equipment, the surrounding areas remain undisturbed. All interfacing utilities (e.g., electrical power and communications circuitry) were isolated, disconnected, and plugged/capped prior to demolition/decommissioning, as documented in References 8.06 and 8.07.

All decommissioning activities have been completed including waste disposal, in accordance with State and Federal regulations. Even though the concrete floor slab is slightly above surrounding grade, there are no hazards associated with the remaining structure, since it is not located in a trafficked area. No further decommissioning action is required.

6.02 Risk Evaluation Summary

A human health risk screening evaluation and an analysis of the potential for contaminant migration to groundwater were conducted on the Building 728-N slab based on a final verification survey that included biased sample locations. Potential risks based on a RME scenario were estimated for an industrial worker hypothetically exposed to residual contamination at Building 728-N. The radiological cancer risk based on a RME scenario for a future industrial worker exposed to the general slab area is estimated to be 2.7E-04 based on the maximum detected activity; the risk estimate based on the mean activity across the entire slab is 9.6E-05. Cs-137 is the risk driver.

Contaminant fate and transport analysis was performed using the Vadose Zone Contaminant Migration Model – Multi-Layered© (VZCOMML©), which accounts for decay processes, infiltration rate, soil properties, vadose zone thickness, and chemical behavior. Soil screening limits (SSLs) were calculated by the model; an exceedance of a SSL by a constituent indicates that the predicted maximum groundwater concentration has the potential to exceed the regulatory limits (i.e., maximum contaminant levels [MCLs]). Based on this evaluation, there are no contaminant migration to groundwater concerns.

6.02.01 Data

The objective of the Final Verification Survey was to demonstrate that the average residual contamination of the concrete slab does not exceed the applicable risk levels. The survey identifies Cs-137 as the primary radionuclide of concern. A biased sampling methodology was employed for the 728-N slab to identify the highest levels of contamination. A total of 10 samples were collected at locations where contamination was previously identified (i.e., concrete surface directly below contaminated baseboards and former contamination areas). The concrete samples were collected at 0-2 inch depth interval. A map of the sample locations is provided in Appendix B. A summary of the data used in this evaluation is provided in Appendix C; Table C-1 presents the gross alpha, nonvolatile beta and Cs-137 results from each sample location. Table C-2 is a statistical summary of the Cs-137 results.

As presented in the FDE for Building 728-N, Shipping Cask and Railroad Car Repair Facility, the list of constituents of potential concern (COPCs) (i.e., Cs-137) was determined based on process knowledge of past facility operational activities and supplemented by characterization conducted to support the facility decommissioning effort (Reference 8.02). The entire facility footprint was evaluated to quantify residual amounts of contamination.

6.02.02 Human Health Risk Screening Evaluation

Receptor Description

The "future industrial worker" receptor scenario is a standard USEPA scenario which addresses long-term risks to workers who are hypothetically exposed to unit contaminants within an industrial setting. The standard exposure assumptions are 25 years, 250 days per year, and 8 hours per day.

Sources of Toxicity Values

The USEPA publishes preliminary remediation goals (PRGs) for radiological constituents and regional screening levels (RSLs) for non-radiological constituents that are risk-based activities (or concentrations) that can be used to evaluate potentially contaminated sites. PRGs and RSLs combine current USEPA toxicity values with standard exposure factors that represent RME conditions to estimate contaminant concentrations in various media that the agency considers protective of humans over a prescribed period of time. The concentrations are based on direct exposure pathways for which generally accepted methods, models, and assumptions have been developed for specific land use conditions.

The *USEPA Surface Preliminary Remediation Goals (SPRGs) for Radionuclides* website is the source of the SPRGs used in this assessment for the evaluation of radionuclides for concrete surfaces (Reference 8.09). The SPRGs for a Composite Worker, 2-D Exposure to Fixed Contaminated Finite Slabs scenario were obtained using the website calculator function and all default parameters for two-dimensional direct external exposure were applied. The website was accessed on February 4, 2020. A copy of the SPRG website output is provided in Appendix D.

Human Health Risk Screening Evaluation Process

The process used to calculate risk is summarized below:

Risk estimates are based on the RME exposure point concentration (EPC), which is defined as the lesser of the maximum concentration and the 95% upper confidence limit (UCL) on the mean concentration. The 95%UCL is calculated using the USEPA ProUCL Software package (Reference 8.08). This software provides a recommended concentration to be used as the 95% UCL based on the dataset distribution.

- For radiological carcinogens, the risk estimate = ([EPC] / [SPRG]) x 1E-06
- Constituents with risk > 1E-06 are identified as HH COCs and are further assessed in a lines-of evidence (uncertainty) evaluation.

Human Health Risk Screening Evaluation Results

Table D-1 in Appendix D identifies Cs-137 as a HH COC with a risk of 2.7E-04 for the industrial worker scenario.

Human Health Risk Screening Evaluation Uncertainty Discussion

Cesium-137 is identified as a COC for the industrial worker scenario (risk = 2.7E-04). It was detected in 1 of 10 samples; activities ranged from non-detect (ND) to 18.9 pCi/g. The single detection was at sample location (W-18181-09). Because of the high number of NDs (90%), the ProUCL software program could not calculate a 95% UCL. Therefore, the EPC used in the risk calculation was the maximum detected activity of 18.9 pCi/g. Use of the maximum detected activity to estimate risk is considered a conservative approach and tends to bias the calculation high. The SPRG (set at risk = 1E-06) for the industrial worker scenario is 0.0691 pCi/g.

The minimum detectable activity (MDA) for the concrete powder samples was relatively high compared to a typical MDA for an environmental sample (e.g., soil MDA ~ 0.05 pCi/g) that would be used to support a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk assessment. The MDAs ranged from 8.91 pCi/g to 17.8 pCi/g, and 9 of 10 sample results are considered non-detect (i.e., <MDA). The risk estimate based on the maximum detected activity of 18.9 pCi/g should be considered an upper bounding calculation (i.e., actual risk is <2.7E-04) for the industrial worker scenario.

For comparison purposes, a risk estimate based on the mean activity across the entire slab can be calculated using a value of ½ the MDA as a surrogate for the NDs. The resultant mean Cs-137 activity is 6.6 pCi/g (Table C-2). The risk estimate based on the mean activity = 9.6E-05.

All of the gross alpha screening results were below the screening criteria of 20 pCi/g. However, sample location W-18181-02 was above the nonvolatile beta screening threshold of 50 pCi/g. The nonvolatile beta result from this location is 110 pCi/g.

In addition, final surveys and soil sampling were performed by Radiological Protection after the building was demolished. All dose rates, direct probes, smears, and soil samples were below detection utilizing Radiological Protection methods (Appendix F). Based on this information, no radiological controls are required for the slab and surrounding soils.

Human Health Risk Screening Evaluation Conclusion

Cesium-137 is identified as a COC for the industrial worker scenario. The risk estimate based on the maximum detected activity is 2.7E-04; the risk estimate based on the mean activity across the entire slab is 9.6E-05.

6.02.03 Contaminant Migration Analysis

The vadose zone contaminant fate and transport model (VZCOMML©[1]) was used to assess the potential impact from residual contamination that could leach from the concrete slab into groundwater within a 1,000 year time period.

The groundwater impact contaminant migration level is defined as the maximum allowable contaminant concentration in the concrete that will not exceed, within a 1,000 year evaluation period, the groundwater Safe Drinking Water Act Maximum Contaminant Level (MCLs). The groundwater analysis performed for Building 728-N provides a tool by which to evaluate hazardous chemicals and radionuclides, including the contaminants of concern at this facility.

Contaminant Migration Results

No constituents were identified as contaminant migration COCs (Table E-1).

Contaminant Migration Conclusion

There are no contaminant migration to groundwater concerns.

6.03 Post Decommissioning Requirements

The remaining structure (slab) is free of physical, chemical, and radiological hazards; therefore, it needs no further decommissioning action. No surveillance and maintenance (S&M) activities were identified for the remaining slab structure by SRS's Radiological Control program while awaiting area completion. The SRS Area Completion Project will address the remaining contamination during N-Area completion activities.

7.0 CONCLUSIONS/RECOMMENDATIONS

Building 728-N was demolished to grade and the foundation has been left in place. All decommissioning activities have been completed, including waste disposal in accordance with Federal and State regulations. The remaining structure is free of physical, chemical, and radiological hazards; therefore, it needs no further decommissioning action. No S&M activities were identified for the remaining structure, because it poses no threat to human health or the environment while awaiting area completion.

In accordance with the "Memorandum of Agreement for Achieving an Accelerated Cleanup Vision at the Savannah River Site," this report will be maintained as a record for reference and use in the N-Area Completion, Record of Decision. To ensure facility

[1] VZCOMML© is a spreadsheet-based calculation developed by SRS. The calculation simulates the migration of vadose zone contaminants to groundwater using one-dimensional flow, average flow over the period of interest, and an infinite mass of contaminants. The calculation is consistent with applicable USEPA guidance and protocols.

remnants are addressed during the N-Area completion process, Building 728-N will be added to Appendix C.4 of the Federal Facility Agreement for the SRS.

8.0 REFERENCES

8.01 SRNS-RP-2008-00086-000-M&O, "Standards/Requirements Identification Document, Functional Area 00, S/RID Purpose and Development, Revision 19-01-MO, February 14, 2019.

8.02 E. G. McCallum, "Facility Decommissioning Evaluation, Building 728-N, Shipping Cask and Railroad Car Repair Facility", G-FDE-N-00014, Revision 1, August 13, 2009.

8.03 Hugh Hazen, "EPA Response To Savannah River Site Response to EPA Comments on the Facility Decommissioning Evaluation (FDE), Shipping Cask and Railroad Car Repair Facility, Building 728-N (email), G-FDE-N-00014, Revision 1, dated August 13, 2009", ARF # 16871, received January 29, 2010.

8.04 Leigh Beatty, "SCDHEC Concurrence on the Savannah River Site Responses to Regulatory Comments on the Facility Decommissioning Evaluation (FDE), Shipping Cask and Railroad Car Repair Facility, Building 728-N (email), G-FDE-N-00014, Revision 1, dated August 13, 2009, ARF # 16868, dated January 13, 2010.

8.05 E. G. McCallum, "Decommissioning End Points Document, Building 728-N, Shipping Cask and Railroad Car Repair Facility", V-PMP-N-00011, Revision 0, August 14, 2009.

8.06 Brian Getson, "Cold and Dark Electrical Isolations for 728-N", SDD-2019-00002, Revision 0, April 4, 2019.

8.07 Brian Getson, "Verification of Hazardous Energy Isolations for 728-N", SDD-2019-00040, Revision 0, June 6, 2019.

8.08 USEPA 2015. *ProUCL Version 5.1, Statistical Software for Environmental Applications for Data Sets with and without Non-detect Observations*, U.S. Environmental Protection Agency, Office of Research and Development, Washington DC.

8.09 USEPA 2018. *USEPA Preliminary Goal for Radionuclides in Outdoor Surfaces (SPRG)* website, U.S. Environmental Protection Agency (May), https://epa-sprg.ornl.gov/

9.0 APPENDICES

Appendix A - Photographs

Appendix B – Sample Location Map

Appendix C – Data Summary Table

Appendix D – Human Health Risk/Hazard Calculation

Appendix E – Contaminant Migration Analysis

Appendix F – Final Survey/Soil Sampling (DDSG-M-20191120-1)

APPENDIX A

PHOTOGRAPHS

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Photo 1 – Building 728-N, Shipping Cask and Railroad Car Repair Facility - Before (Looking Southwest)

Photo 2 – Building 728-N, Shipping Cask and Railroad Car Repair Facility - After (Looking Southwest)

APPENDIX B

SAMPLE LOCATION MAP

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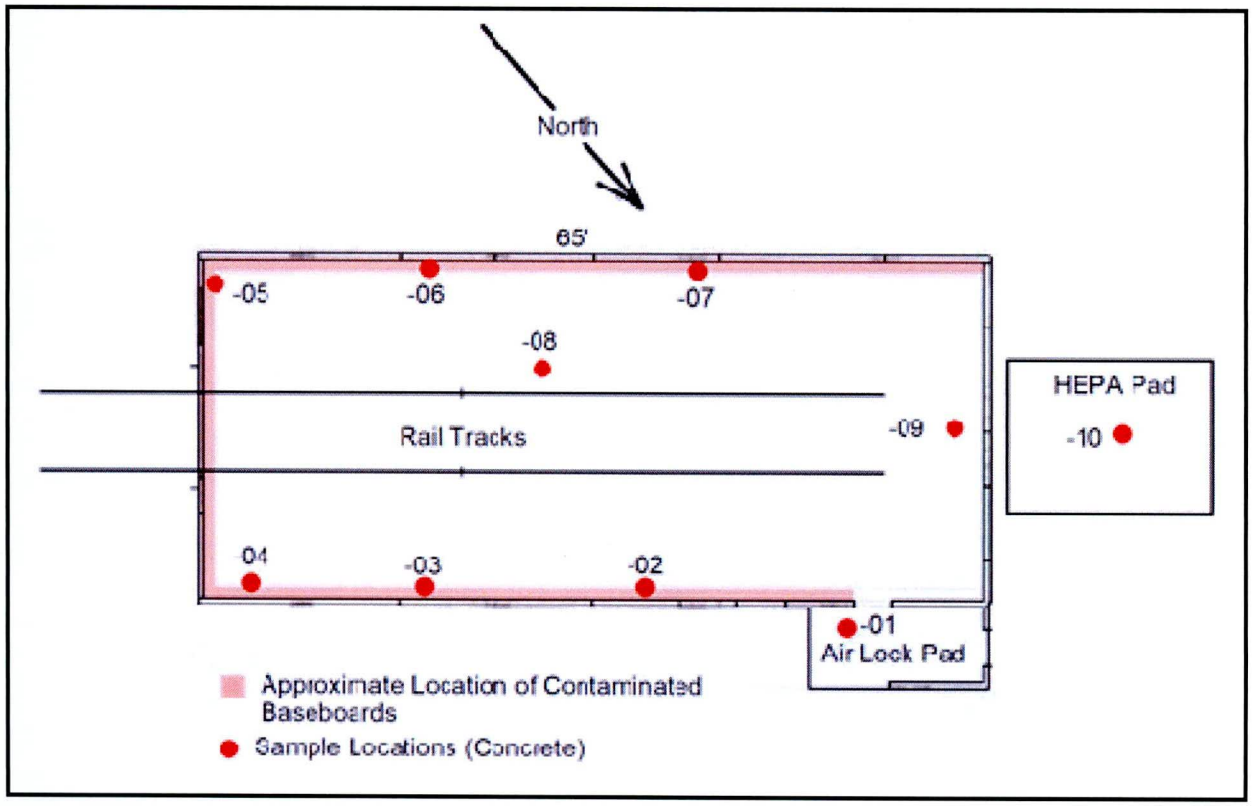

Figure 1. Concrete Sampling Locations (W-18181-)**

** indicates sample number -01 through -10

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APPENDIX C

DATA TABLES

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Table C-1. Verification Sample Results for Building 728-N Concrete Slab

Sample ID	Analyte	Result (pCi/g)	Qualifier	MDA (pCi/g)
W-18181-01	alpha	6.95E+00		4.83E+00
	beta	1.04E+01		2.99E+00
	Cs-137	1.18E+00	U	1.03E+01
W-18181-02	alpha	7.76E+00		4.70E+00
	beta	1.10E+02		2.90E+00
	Cs-137	1.96E+00	U	1.02E+01
W-18181-03	alpha	9.55E+00		5.14E+00
	beta	1.36E+01		3.17E+00
	Cs-137	6.24E-01	U	1.03E+01
W-18181-04	alpha	1.38E+01		5.21E+00
	beta	8.38E+00		3.11E+00
	Cs-137	-8.57E-01	U	9.53E+00
W-18181-05	alpha	8.63E+00		4.63E+00
	beta	1.18E+01		2.85E+00
	Cs-137	2.18E+00	U	9.91E+00
W-18181-06	alpha	1.22E+01		5.06E+00
	beta	6.96E+00		3.13E+00
	Cs-137	8.61E-01	U	9.57E+00
W-18181-07	alpha	1.07E+01		4.85E+00
	beta	1.82E+01		2.92E+00
	Cs-137	1.60E+00	U	8.91E+00
W-18181-08	alpha	1.34E+01		5.13E+00
	beta	1.98E+01		3.28E+00
	Cs-137	1.02E+01	U	1.60E+01
W-18181-09	alpha	9.72E+00		4.95E+00
	beta	1.91E+01		2.90E+00
	Cs-137	1.89E+01		1.78E+01
W-18181-10	alpha	1.09E+01		4.96E+00
	beta	9.54E+00		3.04E+00
	Cs-137	-7.85E-01	U	1.02E+01
W-18181-10D	alpha	1.34E+01		5.29E+00
	beta	6.93E+00		3.19E+00
	Cs-137	-1.55E-02	U	9.57E+00

U = Nondetect, < MDA
D = Lab duplicate

Table C-2. Statistical Summary Table for Building 728-N

Analyte	Units	Samples	Non-Detects	Detects	J-Detects	Distribution	UCL Method[1]	Mean[2]	95% UCL of Mean[1]	Max	Min	RME	Max Location	Qualifier of Max
Radionuclides														
Cesium-137	pCi/g	10	9	1	0	I	NC	6.64	NC	18.9	ND	18.9	W-18181-09	---

Distribution Code: I Indeterminate

ND = Non-Detect
NC = Not Calculated

1 - ProUCL Warning: Only one distinct data value was detected. ProUCL (or any other software) should not be used on such a data set.
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters.
The data set for Cs137 could not be processed and the 95%UCL could not be calculated.

2 - mean calculated using 1/2 MDA as surrogate for nondetects

APPENDIX D

HUMAN HEALTH RISK/HAZARD CALCULATION

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Table D-1. Human Health Risk Screening Calculation for Building 728-N (Concrete Slab Surface)

Industrial Worker Scenario

Analyte[1]	Exposure Point Concentration[2]	Industrial SPRG[3]	Industrial Risk Estimate[4]	COC?[5]
Radionuclides (pCi/g)				
Cesium-137	1.89E+01	6.91E-02	2.74E-04	YES
		Total Risk =	**2.74E-04**	

1 - Analytes that were identified as COPCs in the Facility Decommissioning Evaluation.

2 - EPC = exposure point concentration. Reasonable maximum exposure (RME) point concentration (EPC) is the lesser of the maximum detected concentration and the 95% upper confidence limit on the mean concentration.

3 - Industrial SPRGs for radionuclides in concrete media are the generic composite worker values from the *USEPA Surface Preliminary Remediation Goals for Radionuclides* website (February 4, 2020).

4 - Industrial Risk Estimate for carcinogens = (EPC/SPRG) x 1E-06

5 - Analyte identified as a COC if risk $\geq$ 1E-06.

Table D-2. USEPA Surface Preliminary Remedial Goal (SPRG) Website Output

Default

Composite Worker Equation Inputs for 2-D Direct External Exposure

Variable	Value
Slab size for ACF (area correction factor) m^2	Default
TR (target cancer risk) unitless	0.000001
t_w (time - composite worker) yr	25
F_{AM} (area and material factor) unitless	1
$F_{OFF\text{-}SET}$ (off-set factor) unitless	1
EF_w (exposure frequency - composite worker) day/yr	250
ED_w (exposure duration - composite worker) yr	25
ET_w (exposure time - composite worker) hr/day	8
GSF_s (outdoor surfaces gamma shielding factor) unitless	1

Default

Composite Worker Surface Preliminary Remediation Goals for 2-D Direct External Exposure - Secular Equilibrium

Isotope	Soil Volume SPRG TR=1.0E-6 (pCi/g)	Soil Volume @ 1cm SPRG TR=1.0E-6 (pCi/g)	Soil Volume @ 5cm SPRG TR=1.0E-6 (pCi/g)	Soil Volume @ 15cm SPRG TR=1.0E-6 (pCi/g)	Ground Plane SPRG TR=1.0E-6 (pCi/cm^2)
**Secular Equilibrium SPRG for Cs-137*	***6.91E-02***	***3.39E-01***	***1.20E-01***	***7.75E-02***	***3.46E-01***

Yellow highlight identifies SPRG used in the risk evaluation.

APPENDIX E

CONTAMINANT MIGRATION ANALYSIS

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Table E-1. Contaminant Migration Analysis Summary Table for Building 728-N

Subunit	# Tier 1 COPCs	Tier 1 COPCs	Tier 2 COPCs	CM COCs	Refined CM COCs
728-N Slab	0				none

Table E-2. Tier 1 Screening Results for the Building 728-N

Analyte	Source Zone Concentration	Tier I Source-Specific SSL	Tier I Mass Limit SSL	Failing Analytes
	(mg/kg or pCi/g)			
Cesium-137	1.89E+01	1.38E+02	2.28E+01	

APPENDIX F

FINAL SURVEY/SOIL SAMPLING RESULTS
(DDSG-M-20191120-1)

NOTE:
Individual Soil Sample Analysis Worksheet Attachments (pages 9-30) are not included in this appendix.
The complete report can be found in the D&D Project files.

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VSDS Standard Map RSLS

Procedure 5Q1.2-133A RSM Track # 10025

Survey DDSG-M-20191120-1

General Information

Title: SGN: 728-N Demolition Completion
Survey Date/Time: 11/20/2019 06:38
Survey Type: Job Coverage
Counted By:
RWP #: 19-SGP-102
Facility: SGN
Status: Approved by: CROY, EVAN JOHN, 3/5/2020 07:48:30

Lead Inspector: PRICE, SOLOMON JERRY
Work Order/Task #: 2
ID: K5211
ID: B0340

Additional Inspectors

Inspector	Cmp Alt	Approve
MASSENGALE, ZACH	J3818	☑

Dose Rate (DR) Object Prefixes/Suffixes

Dose Rates with Prefixes:
E = Extrem
S = Skin

Dose Rates with No Prefixes:
W Body

Default Prefixes:
HS = Hot Spot

Default Suffixes:
"n" = Neutron
"b" = Beta
"c" = Corrected

Postings Legend

CA=Contamination Area
RBA=Radiological Buffer Area
RMA=Radioactive Material Area

Instruments Used

#	Instrument Model	Instrument Serial #
1	RO-20	CMC008061
2	12-110	CMC004492
3	12-Alpha	CMC006824
4	Easy Count	CMC016721
5	12-110	CMC006929
6	12-Alpha	CMC003937

VSDS Standard Map RSLS

Procedure 5Q1.2-133A RSM Track # 10025

Comments:

Provided job coverage for operations to complete demolition of building 728-N

Implemented soil sample analysis plan, and gathered 21 soil samples from around 728-N

All dose rates: ND mrem/hr

All direct probes: ND dpm/100cm2 alpha, ND dpm/100cm2 Beta Gamma

All LAWs: ND/dpm alpha, Beta-gamma

All smears: <20dpm/100cm2 Alpha, <200dpm/100cm2 Beta Gamma

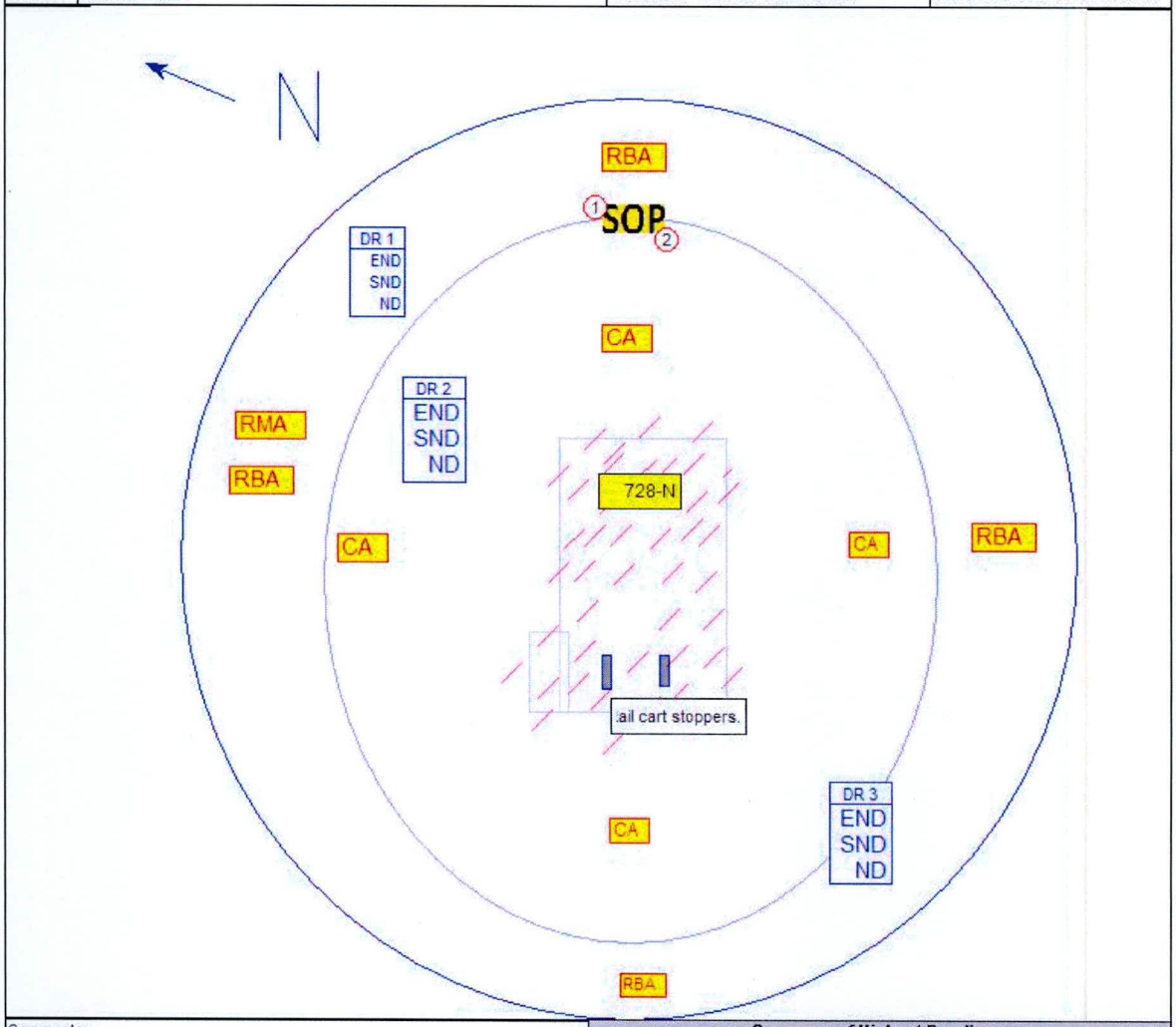
All samples: <20 dpm/100cm2 Alpha <200 dpm/100cm2 Beta Gamma

Once samples were counted and deemed clean, they were returned to 728-N and RP barricades were removed

VSDS Standard Map RSLS

Procedure 5Q1.2-133A **RSM Track # 10025**

Map: 1	BLANK MAP	Survey #: DDSG-M-20191120-1	Date/Time: 11/20/2019 06:38



Comments:

Summary of Highest Readings
(All available values may not be listed)

Smears	Air Samples & Wipes
2) <20 DPM/100 cm2 α	
2) <200 DPM/100 cm2 β/γ	

Type: Job Coverage

Symbol Legend (for example only) RWP #: 19-SGP-102

DR 1	DOSE RATE	SMEAR	WIPE
E15	EXTREMITY	DIRECT	
S10	SKIN		
3	WHOLEBODY	AIR SAMPLE	

Unless otherwise noted, dose rates in mrem/hr.

Lead Inspector: PRICE, SOLOMON JERRY	Status: Approved by: CROY, EVAN JOHN, 3/5/2020 07:48:30
Location Code: COMMON	Bldg/Area Name: BLANK MAP
Location Description: BLANK MAP	

Document #: N/A
Survey #: DDSG-M-20191120-1 - PDF Generated On: 3/5/2020 07:51

Image File: COMMON\MISC DIAGRAMS\BLANK MAP
Page 3 of 30

VSDS Standard Map RSLS

Procedure 5Q1.2-133A RSM Track # 10025

Data Point Details

Survey #: DDSG-M-20191120-1

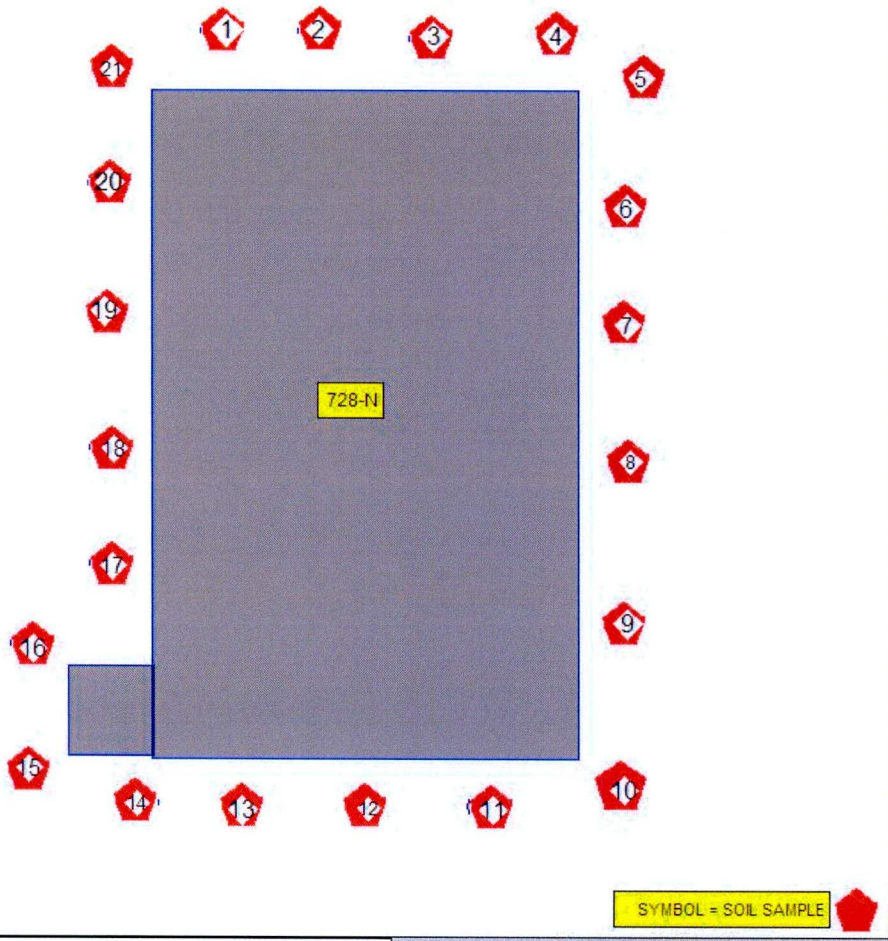
Map: 1 - COMMON\MISC DIAGRAMS\BLANK MAP

#	Type	Inst.	Value	Units	Position	Notes
1	DR γ	N/A	E ND	mrem/hr		
		N/A	S ND	mrem/hr		
		N/A	ND	mrem/hr		
2	DR γ	N/A	E ND	mrem/hr		
		N/A	S ND	mrem/hr		
		N/A	ND	mrem/hr		
3	DR γ	N/A	E ND	mrem/hr		
		N/A	S ND	mrem/hr		
		N/A	ND	mrem/hr		
1	Smear	N/A	α <20	DPM/100 cm2	Step Off Pad	
		N/A	β/γ <200	DPM/100 cm2		
		N/A	Tritium N/A	DPM/100 cm2		
2	Smear	N/A	α <20	DPM/100 cm2	Step Off Pad	
		N/A	β/γ <200	DPM/100 cm2		
		N/A	Tritium N/A	DPM/100 cm2		
	Text		728-N			
	Text		Rail cart stoppers.			
	Posting		RBA			
	Posting		RBA			
	Posting		RBA			
	Posting		RBA			
	Posting		CA			
	Posting		CA			
	Posting		CA			
	Posting		CA			
	Posting		RMA			

VSDS Standard Map RSLS

Procedure 5Q1.2-133A **RSM Track # 10025**

Map: 2	BLANK MAP	Survey #: DDSG-M-20191120-1	Date/Time: 11/20/2019 06:38



Comments:

Summary of Highest Readings
(All available values may not be listed)

Smears	Air Samples & Wipes

Type: Job Coverage

Symbol Legend (for example only) RWP #: 19-SGP-102

DR 1	DOSE RATE	SMEAR	WIPE
E15	EXTREMITY	DIRECT	
S10	SKIN		
3	WHOLEBODY	AIR SAMPLE	

Unless otherwise noted, dose rates in mrem/hr.

Lead Inspector: PRICE, SOLOMON JERRY	Status: Approved by: CROY, EVAN JOHN, 3/5/2020 07:48:30
Location Code: COMMON	Bldg/Area Name: BLANK MAP
Location Description: BLANK MAP	

Document #: N/A
Survey #: DDSG-M-20191120-1 - PDF Generated On: 3/5/2020 07:51

Image File: COMMON\MISC DIAGRAMS\BLANK MAP
Page 5 of 30

VSDS Standard Map RSLS

Procedure 5Q1.2-133A RSM Track # 10025

Data Point Details

Survey #: DDSG-M-20191120-1

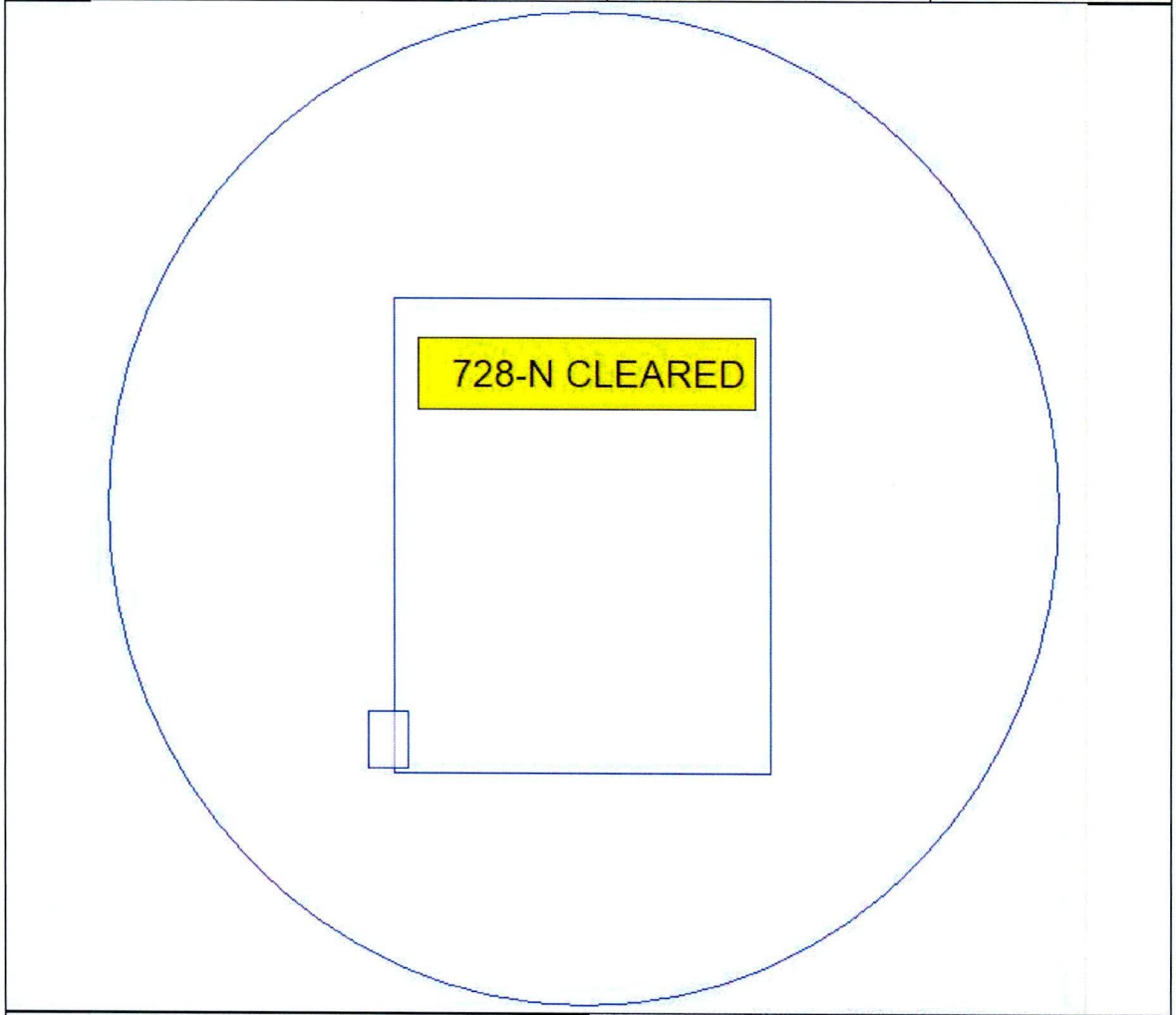
Map: 2 - COMMON\MISC DIAGRAMS\BLANK MAP

#	Type	Inst.	Value	Units	Position	Notes
1	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
2	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
3	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
4	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
5	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
6	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
7	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
8	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
9	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
10	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
11	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
12	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
13	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
14	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
15	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
16	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
17	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
18	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
19	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
20	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
21	Direct	N/A	α ND	DPM/100 cm2 (T)		
		N/A	β/γ ND	DPM/100 cm2 (T)		
	Text		728-N			
	Text		SYMBOL = SOIL SAMPLE			

VSDS Standard Map RSLS

Procedure 5Q1.2-133A **RSM Track # 10025**

Map: 3	BLANK MAP	Survey #: DDSG-M-20191120-1	Date/Time: 11/20/2019 06:38



Comments:

Summary of Highest Readings (All available values may not be listed)	
Smears	**Air Samples & Wipes**

Type: Job Coverage

Symbol Legend (for example only) RWP #: 19-SGP-102

DR 1	DOSE RATE	SMEAR	WIPE
E15	EXTREMITY	DIRECT	
S10	SKIN		
3	WHOLEBODY	AIR SAMPLE	

Unless otherwise noted, dose rates in mrem/hr.

Lead Inspector: PRICE, SOLOMON JERRY	Status: Approved by: CROY, EVAN JOHN, 3/5/2020 07:48:30
Location Code: COMMON	Bldg/Area Name: BLANK MAP
Location Description: BLANK MAP	

Document #: N/A
Survey #: DDSG-M-20191120-1 - PDF Generated On: 3/5/2020 07:51

Image File: COMMON\MISC DIAGRAMS\BLANK MAP
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VSDS Standard Map RSLS

Procedure 5Q1.2-133A RSM Track # 10025

Data Point Details

Survey #: DDSG-M-20191120-1

Map: 3 - COMMON\MISC DIAGRAMS\BLANK MAP

#	Type	Inst.	Value	Units	Position	Notes
	Text		728-N CLEARED			