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(When separated from Enclosure 2, this document is decontrolled since this transmittal document does not otherwise warrant protection from unauthorized disclosure)
Westinghouse Non-Proprietary Class 3 (When separated from Enclosure 2)

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Our ref: HEM-12-67
Date: June 19, 2012

Subject: PARTIAL RESPONSE TO NRC REQUESTS FOR ADDITIONAL INFORMATION DATED MAY 1, 2012, ON THE JANUARY 16, 2012, HEMATITE 20.2002 ALTERNATE DISPOSAL REQUEST (LICENSE NO. SNM-00033, DOCKET NO. 070-00036)

Reference
1) NRC (Hayes) letter to Westinghouse (Copp), dated May 1, 2012, "NRC Request for Additional Information from Westinghouse on the January 16, 2012, Hematite 20.2002 Alternate Disposal Request)"
2) Westinghouse (Copp) letter to NRC (Document Control Desk), dated January 16, 2012, "Request for Additional Alternate Disposal Approval and Exemptions for Specific Hematite Decommissioning Project Waste at US Ecology Idaho"
3) Westinghouse (Copp) letter to NRC (Document Control Desk), dated May 24, 2012, "Request for Extension in Responding to NRC Requests for Additional Information Dated May 1, 2012, on the Hematite Additional 20.2002 Alternate Disposal Request"
4) NRC (Hayes) letter to Westinghouse (Copp), dated May 30, 2012, "Westinghouse Extension Request for Submitting Response to NRC's Request for Additional Information on the January 16, 2012, Hematite 20.2002 Alternate Disposal Request"

Reference 1 transmitted requests for additional information (RAIs) on the Reference 2 request from Westinghouse Electric Company LLC (Westinghouse) for additional alternate disposal approval and exemptions at the US Ecology Idaho facility. Reference 1 requested that Westinghouse's responses to the RAIs be submitted within 30 days of May 1, 2012. Reference 3 requested an extension until June 7, 2012, which was granted by Reference 4. The June 7, 2012, date was exceeded to provide additional substantive information in the responses.

Responses to the RAIs are provided in Enclosure 1, with the exception of the responses to the RAIs pertaining to Material Control and Accounting (MC&A). Responses to the RAIs pertaining to MC&A are provided in Enclosure 2, and as such this enclosure should be withheld from public disclosure pursuant to l0 CFR 2.390(d).

Enclosure 1 identifies that a procedure for survey/sampling of miscellaneous equipment (except for HEPA units since sufficiency of existing data is explained) and piping that are proposed for consignment to USEI will be developed. The Tc-99 results from this survey/sampling will be assigned against the Tc-99 action level. This procedure and other documents requiring revision based on the enclosed RAI responses will be submitted under separate cover by of July 20, 2012.

The characterization plan for process building concrete slabs is provided in Enclosure 1. Data from the process building concrete slabs will be used to establish a conservative profile that is applied to other concrete/asphalt addressed in this 20.2002 request for assignment against the Tc-99 action level. The characterization plan for soil and assignment of Tc-99 against the action level is the same as the characterization plan and action level assignment for soil and debris addressed by the previously approved 20.2002 alternate disposal request and exemption.

Please contact Kevin Davis of my staff at 314-810-3348 should you have questions or need any additional information.

Respectfully,

Robert D. Copp
Director, Hematite Decommissioning Project

Enclosure 1) Responses to Requests for Additional Information on Additional 20.2002 Request for Alternate Disposal at USEI (except MC&A)
2) Responses to Requests for Additional Information on Additional 20.2002 Request for Alternate Disposal at USEI (MC&A)

cc: P. Michalak, NRC/FSME/DWMEP/DURLD/MD
J. J. Hayes, NRC/FSME/DWMEP/DURLD/MD
C. A. Lipa, NRC Region III/DNMS/MIB
M. M. LaFranzo, NRC Region III/DNMS/MCID
J. W. Smetanka, Westinghouse

Enclosure 1
Responses to Requests for Additional Information on
Additional 20.2002 Request for Alternate Disposal at USEI (except MC&A)

NRC issued requests for additional information (RAI) concerning the Westinghouse request for additional 20.2002 alternate disposal approval and exemptions at the US Ecology Idaho (USEI) facility. Responses to the RAIs are provided in this Enclosure 1, with the exception of the responses to the RAIs pertaining to Material Control and Accounting, which are in Enclosure 2 to HEM-12-67. Some of the responses will result in changes to the documents initially submitted in support of this additional 20.2002 request. Those documents (e.g., Enclosure 1 to HEM-12-2, HDP-TBD-WM-906, and NSA-TR-HDP-11-11) will be revised and provided under separate cover by July 20, 2012. In addition, the procedure for survey/sampling of miscellaneous equipment (except for HEPA units where sufficiency of existing data is explained) and piping that are proposed for consignment to USEI will be submitted by July 20, 2012.

These RAI responses are organized in the same manner as the RAIs of NRC letter dated May 1, 2012, followed by the Westinghouse response. For most responses, a response summary is use to provide the 'bottom line' answer, followed by response details that elaborate or justify the answer. Since the RAI numbering restarted at 1 for each of the five sets of RAIs, an alpha-numeric designation associated with the set was added to the RAI numbers (e.g., 'SA-1') to facilitate cross-referencing of RAI responses.

Chapter 5, 6 and 7 -RAIs and Proposed Resolution

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-1	Section 5.1, Attachment 4 to Enclosure 1 to HEM-12-2, RESRAD Input Parameters and Case Files	Conflicting information on volume of Hematite waste proposed for disposal.	10CFR20.2002(a)	Attachment 4 states that the volume of Hematite waste to be received at USEI is 44,687 m^3. The letter states there will be 23,000 cubic meters.	Please correct the typo or explain the conflicting information.
Response Summary: Typographical error.					
Response Detail: The listed value of 44,687 m^3 on page 1 of Attachment 4 "Volume of Hematite Waste Received at USEI" to Enclosure 1 is incorrect. The value of 22,848 m^3 in Section 5.1 of Enclosure 1 is correct. Although the value listed for on page 1 of Attachment 4 is incorrect, the value actually used in the calculation of total Hematite waste volume and the waste dilution factor (shown on page 2 of Attachment 4) was correct (22,848 m^3).					

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-2	Section 5.2.1 Soils	Soil Characterization Upper Confidence Limit	10CFR20.2002(a) and (d)	There is insufficient information to determine how the upper confidence limit of 0.32 Ci is calculated, or what the associated dose is with this upper confidence limit. This is necessary to evaluate the potential dose consequence of the action.	Provide the basis for the upper confidence limit of 0.32 Ci.
Response Summary: The $UCL_{(0.95)}$ is defined as 1.5 times the mean. The post closure dose associated with this UCL is 1.2 mrem.					
Response Detail: Consistent with the 20.2002 application and RAI responses that resulted in Amendment 58 to SNM-33, the $UCL_{(0.95)}$ was set at 1.5 times the mean. The post closure dose associated with this UCL is 1.2 mrem, which is a factor of 1.5 times the dose at the mean concentration. Tc-99 does significantly not contribute to any other dose pathway.					

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-3	Section 5.2.1 Soils	Soil Sampling Plan Contingency Plan Table	10CFR20.2002(a) and (d)	The first two rows of the contingency plan are reproduced with changes in the action level. It is implied that rows 3-5 of the contingency table of Reference 6 would be integrated with the proposed two rows of Section 5.2.1. However, it is unclear as to the appropriateness of the inclusion of row 4, Unexpected Tc-99 results for stockpile, and row 5, Maximum average concentration of Ra-226 and Th-232 within individual railcar. It is unclear if these rows would be applicable to this 20.2002 request.	Please provide a complete contingency table and, if rows 4 and 5 are included, describe why their inclusion is appropriate for this 20.2002 request. If a new action level is defined for rows 4-5 provide the basis for the new action level or provide the basis for why no action level is required.
Response Summary: A table with all 5 rows is provided and justified.					

Response Detail: Rows 4 and 5 were not modified from the prior application because those action levels continue to represent the bounding condition when all project waste is considered. It is intended that the additional soil and debris under consideration in this application will be added to the prior application and will not be treated separately. As such, the limitations on Ra-226 and Th-232 concentrations and peak Tc-99 activity from the previous application are still applicable. The following revision to the contingency plan considers both the proposed and approved 20.2002 requests:

Contingency Plan Table

Prior to shipment, the following conditions will be evaluated:

Parameter	Action Level	How Monitored	Actions
Total Quantity of Tc-99 shipped to USEI (mean)	>1.3 Ci	Running total activity (both shipped and pending shipment), based on laboratory sample results prior to shipment	• Reanalyze composite sample and/or analyze individual aliquots used to create the composite sample; • Resample stockpile and re-evaluate[a]; • Ship material to alternate facility.

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
	95% Upper Confidence Level of the mean Tc-99 shipped to USEI (UCL(0.95)).	>1.75 Ci	Running confidence interval (both shipped and pending shipment) based on laboratory sample data prior to shipment	• Reanalyze composite sample and/or analyze individual aliquots used to create the composite sample; • Resample stockpile and re-evaluate[a]; • Ship material to alternate facility.	
	Total activity contribution from all radionuclides within individual railcar	>3000 pCi/g > 40 μR/hr[b]	Laboratory sample results for stockpile evaluated at 95% UCL prior to shipment Gamma radiation levels on railcars prior to shipment.	• Analyze additional aliquot of composite sample; • Unload railcar (at HDP) and re-load with material containing lower concentration (either blended or alternate material from onsite waste stream)[a]; • Ship material to alternate facility.	
	Unexpected Tc-99 results for stockpile samples	>99th percentile of the site wide dataset (599 pCi/g)[c]	Laboratory sample results for stockpile evaluated prior to shipment	• Analyze additional aliquot of composite sample; • Resample stockpile and re-evaluate[a]; • Blend with less contaminated material, resample stockpile and re-evaluate; • Ship material to alternate facility.	
	Maximum average concentration of Ra-226 and Th-232 within individual railcar	Ra-226 >13 pCi/g Th-232 >16 pCi/g	Laboratory sample results for each railcar evaluated prior to shipment	• Analyze additional aliquot of composite sample; • Resample stockpile and re-evaluate[a]; Blend with less contaminated material, resample stockpile and re-evaluate; • Ship material to alternate facility.	

[a] Re-sampling of material will generally occur after down blending of stockpile material. When such sampling is performed, the new sample dataset will replace the initial data for the purpose of subsequent calculations. If re-sampling is performed without down blending (which would be the case if the material was sampled in-situ railcars) then, the additional samples will be used to augment the initial dataset.

[b] Based on analysis previously transmitted in HEM-10-46, 5/24/10.

[c] Value shown is the 99th percentile of the pooled site wide Tc-99 dataset with EP-08-00-SL and EP-10-00-SL excluded using spreadsheet software.

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-4	Section 5.2.1 Soils	Limestone excavation and sampling	10CFR20.2002(a) and (d)	Will the limestone fill be sampled? According to the soil sampling plan? Will all the limestone be excavated?	Describe sampling plan for limestone fill and if all the limestone will be excavated.
Response Summary: The soil sampling plan will be applied to spent limestone. Spent limestone will be removed prior to terminating any excavation.					
Response Detail: Excavated spent limestone will be subject to the same sampling methodology that is applied to soils in this application and that was applied to the spent limestone piles that were addressed in the 20.2002 application that resulted in Amendment 58 to SNM-33. Section 9.1 of Attachment 1 to Westinghouse letter HEM-11-56 specifies requirements to remove spent limestone prior to terminating any excavation. Westinghouse will follow that requirement independent of this additional 20.2002 request.					

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-5	Section 5.2.1 Soils	Delineation between the soil in the previous and current request.	10CFR20.2002(a)	The 20.2002 request dated May 21, 2009 and approved October 27, 2011 as well as the current request include soil from the Hematite site. It would appear that a distinction needs to be made between the soils from previously approved 20.2002 request and the soil which is covered under this 20.2002 request. A distinction is necessary to properly account for differing limits and action thresholds identified in Section 5.2.1 and in Westinghouse's February 18, 2011 submittal (ML 110530155).	Identify how the soil associated with the previously approved 20.2002 request will remain segregated from the soil associated with this 20.2002 request since they have different action levels.
Response Summary: Segregation of waste between the two requests is not intended since contributions to the total activity and potential dose are summed.					
Response Detail: See the response to RAI CH-3 for the Contingency Plan that sums the action levels from the two requests to provide combined action levels. The activity of Tc-99 in the waste addressed by this request will be added to the activity of Tc-99 from the prior request. This sum will be tracked against the combined action levels. The soil (and only the soil) associated with this request is a subset of the associated with the request approved by Amendment 58 to SNM-33. It was not until after the last RAI response for that original request that Westinghouse was made aware that approval of the request would have a volume limit that could not be exceeded even if the amount of Tc-99 shipped was below the Amendment 58 limit. Thus, additional soil volume was added to this request as a contingency. The soil beneath the process building slabs was used as the additional volume. The radioactivity for this soil is redundantly accounted for in both 20.2002 requests.				

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-6	Section 5.2.1 Soils, and Section 6.5 of HDP-TBD-WM-906	Gamma Walkover is used to inform adequacy of sampling for presence of Tc-99 (beta emitter).	10CFR20.2002(a)	Section 6.5 of HDP-TBD-WM-906 describes how 33 of the 50 samples were targeted in and around areas of elevated activity based on the gamma walkover survey, and the remaining 17 locations were dispersed throughout the remainder of the building. It also explains that areas in which Tc-99 was known to be present, based on historical information, were included in the targeted sampling within Buildings 240 and 260. Since Tc-99 would not be detected by a gamma walkover survey, and there is not an established ratio for Tc-99 to uranium, Westinghouse should describe the adequacy of the sampling locations in terms of detecting any Tc-99 in the material that may not have coincided with areas of elevated gamma readings.	Provide the basis that no areas of Tc-99 have been overlooked given that sample locations were biased based on the gamma walkover survey results.

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
Response Summary: Additional explanation of the current Tc-99 characterization dataset is provided herein, and as suggested, Westinghouse will perform additional sampling on a systematic grid to confirm or update the existing Tc-99 characterization dataset.					
Response Detail: Additional detail on the basis for the locations of the 50 sample stations on the process building slabs is provided in the following Tables A and B to RAI CH-6. • 33 of the 50 sampling stations were biased. Of these, 8 stations were in 5 areas defined as having historical operations involving materials contaminated with Tc-99 (locations 2 – 7; 20, 21), and 12 stations served to bound the 5 areas with elevated Tc-99 activity. • 17 of the 50 sampling stations were not biased. These stations were at selected as being representative of the general area in which they were located and designed to resolve any potential concern regarding data gaps. Total alpha and beta surface contamination surveys were conducted prior to application of surface sealant (circa 2005). While interpretation of these surveys is likely affected by differences in penetration between beta and alpha radiation and may be affected by variation of the depth of the contamination, a qualitative evaluation of these surveys indicates an increase in the beta to alpha ratio in areas corresponding to those identified as areas with historical operations involving materials contaminated with Tc-99. Other areas do not indicate this same increase in ratio. These ratios are provided in Figure A to RAI CH-6. Although Westinghouse believes the existing data are adequate to support this alternate disposal request, Westinghouse will perform additional sampling on a systematic grid as a basis for determination of the activity in material prior to it being shipped. The total inventory of Tc-99 shipped to USEI will then be updated. The tracking system that is in place for soils under the 20.2002 request approved by Amendment 58 will continue to be used and will include Tc-99 activity in concrete / asphalt materials. The current data set will be merged with the new data and used to calculate an average concentration in each of the seven buildings identified in the sampling plan below. The attached sampling plan is the report generated by Visual Sampling Plan (VSP) software. Although this generic report has wording and cost information not specific to HDP, VSP provides for determination of a confidence interval on a mean that is specific to HDP. The half-width of the confidence interval was set to ½ of the mean Tc-99 concentration outside the 5 identified elevated areas. The standard deviation of this same data set was also used. Additional design parameters are indicated on the attached sampling plan which indicates the nominal number of systematic samples to be 20 for each sampling area. Each building (240, 253, 254, 255, 256, 260) with the exception of 252 and 235 (which were combined) was considered a separate sampling area resulting in a total of about 140 samples for the entire process building slabs. The systematic samples will be taken from two depth intervals (0 – 0.75 inch and 0.75 inch to 1.5 inches. The 0.75 inch to 1.5 inch sample will be used in assessing the contamination within the remaining thickness of the concrete slab since the existing data set establishes that the radioactivity of concern is in the top 3/4” of the slab. The merging of the data sets will be 2 separate groups – results from the top 0.75 inches and results from the 0.75 inches to bottom of the slab. The existing evaluation contained in Section 6.5 of HDP-TBD-WM-906 will be used as a basis for the Tc-99 concentration in concrete and asphalt materials located outside of the process buildings, unless adding the systematic data would yield more conservative (higher) Tc-99 concentration. The Tc-99 inventory described above will be updated prior to shipment of these materials.					

Table A to RAI CH-6: Details on Sample Locations, Samples 1 - 21

Sample Station ID	Location	Resurfaced Concrete Regions	Expansion Joints, Crack, Seams, and/or Near Walls	Identified as Hot Spot	Comments
1	Building 240		X		
2A*	Building 240	X		X	Station IDs ending with 'A' indicate samples obtained from the newer (resurfaced) concrete region and those ending with 'B' are from the older concrete region
2B*	Building 240	X		X	
3A*	Building 240	X	X		
3B*	Building 240	X	X		
4*	Building 240		X		
5*	Building 240			X	
6*	Building 240		X		
7*	Building 240			X	
8	Building 253			X	
9	Building 254		X		
10	Building 254			X	
11	Building 254				Representative sample of the general area
12	Building 254				Representative sample of the general area
13	Building 255		X		
14	Building 255		X		
15	Building 255				Representative sample of the general area
16	Building 260		X	X	
17	Building 255		X	X	
18	Building 255		X		
19	Building 260				Representative sample of the general area
20*	Building 260		X		
21*	Building 260			X	

*Sample station in area with historical operations involving materials contaminated with Tc-99.

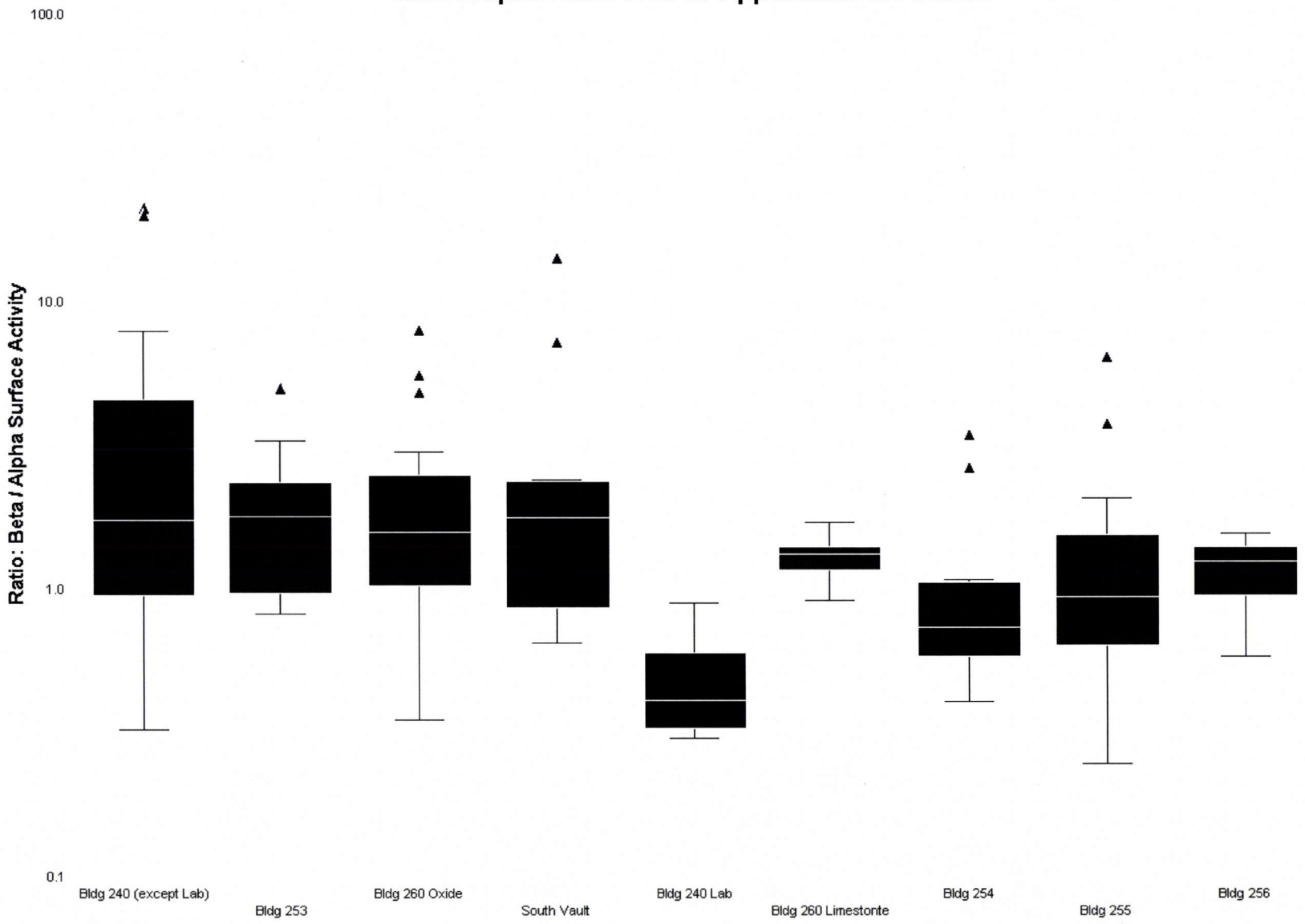
Source: Based on Table 1.1 of NSA-TR-HDP-11-11

Table B to RAI CH-6: Details on Sample Locations, Samples 31 - 55

Sample Station ID	Location	Purpose
31	Building 240	Bound elevated Tc-99
32	Building 240	Bound elevated Tc-99
33	Building 240	Bound elevated Tc-99
34	Building 240	Bound elevated Tc-99
35	Building 240	Bound elevated Tc-99
36	Building 253	Bound elevated Tc-99
37	Building 253	Bound elevated Tc-99
38	Building 260	Bound elevated Tc-99
39	Building 260	Bound elevated Tc-99
40	Building 260	Bound elevated Tc-99
41	Building 260	Bound elevated Tc-99
42	Building 260	Bound elevated Tc-99
43	Building 240	Additional representative sample
44	Building 240	Additional representative sample
45	Building 240	Additional representative sample
46	Building 240	Additional representative sample
47	Building 253	Additional representative sample
48	Building 253	Additional representative sample
49	Building 254	Additional representative sample
50	Building 256	Additional representative sample
51	Building 256	Additional representative sample
52	Building 252	Additional representative sample
53	Building 252	Additional representative sample
54	Building 235	Additional representative sample
55	Building 235	Additional representative sample
56	Building 254	Characterize Elevated Area
57	Building 254	Characterize Elevated Area
58	Building 252	Characterize Elevated Area
59	Building 252	Characterize Elevated Area

Source: Work Package HDP-OPS11-WP-005, Concrete Sampling from Process Building, South Vault and West Vault Floors

Figure A to RAI CH-6: Observed beta/alpha ratios in process building prior to application of sealant



VSP Sample Design Report[1] for Calculating a One-Sided Confidence Interval for the Population Mean Using Systematic Grid Sampling

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Construct a Confidence Interval on the True Mean
Type of Sampling Design	Parametric
Sample Placement (Location) in the Field	Systematic with a random start location
Formula for calculating number of sampling locations	Confidence Limits using Student's t-distribution
Calculated total number of samples	20
Number of samples on map [a]	141
Number of selected sample areas [b]	7
Specified sampling area [c]	10674613.31 in^2
Size of grid / Area of grid cell [d]	29.2278 feet / 739.815 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$2,000.00

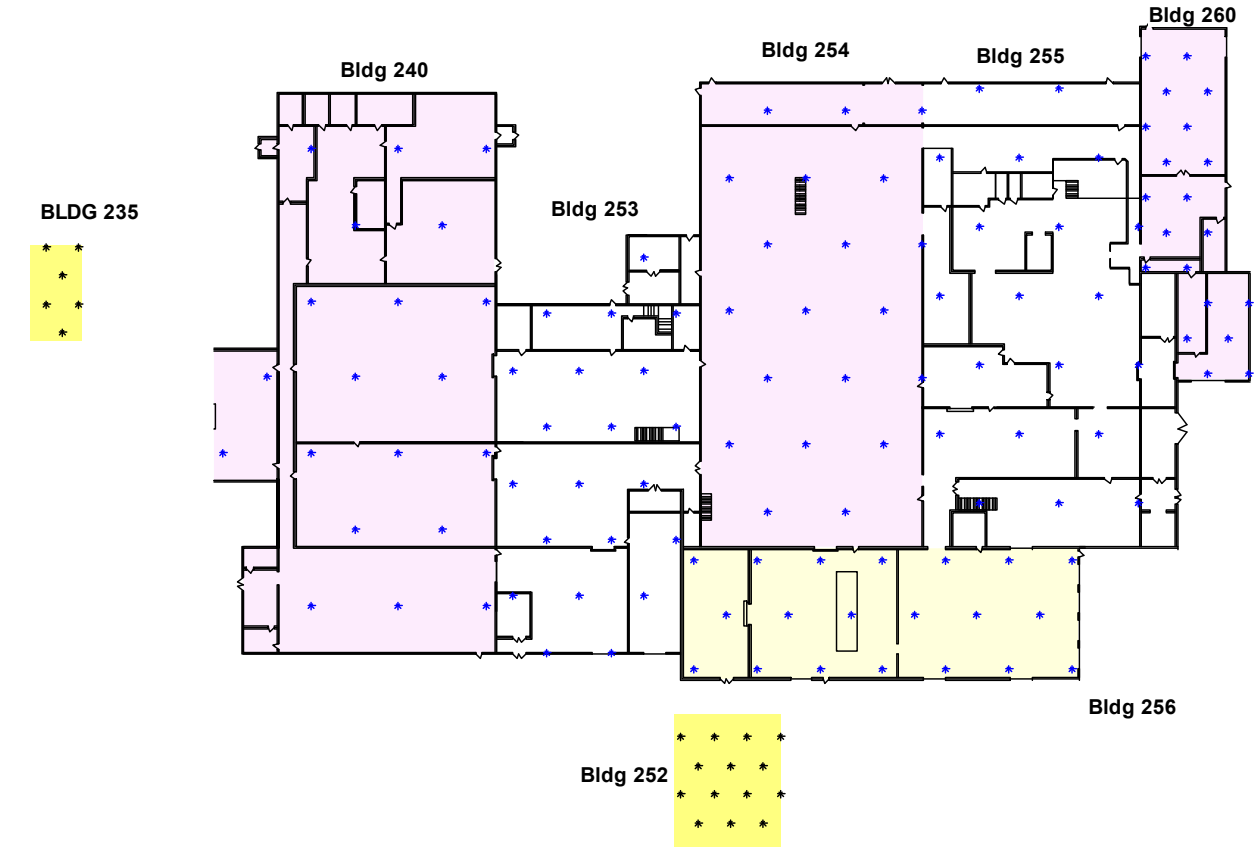
[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

[1] This report was automatically produced* by Visual Sample Plan (VSP) software version 6.0.

Software and documentation available at http://vsp.pnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

VSP Sample Design Report[1] for Calculating a One-Sided Confidence Interval for the Population Mean Using Systematic Grid Sampling



Primary Sampling Objective

The primary purpose of sampling at this site is to construct a confidence interval on the true population mean value. After the samples are collected and analyzed, the resulting sample values can be used to construct a one-sided confidence interval. Once the confidence interval is computed (which will be an upper threshold), you can have the specified confidence that the true population mean is less than the upper threshold.

Selected Sampling Approach

A parametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A parametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that parametric assumptions are true. These assumptions will be examined in post-sampling data analysis.

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Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs

The equation used to calculate the number of samples is based on a confidence interval calculation using the Student's t-distribution. The formula used to calculate the number of samples is:

$$n = \left[\frac{t_{1-\alpha,df} \, S_{total}}{d} \right]^2$$

where

n	is the recommended minimum sample size for the study area,
S_{total}	is the estimated standard deviation due to both sampling and analytical variability,
α	is the maximum acceptable probability that the true mean will not lie in the confidence interval (the confidence level is 1-α),
d	is the width of the confidence interval,
$t_{1-\alpha,df}$	is the value of the Student's t-distribution with $df=n-1$ degrees of freedom such that the proportion of the distribution less than $t_{1-\alpha}$ is 1-α.

Because n appears on both sides of the equation (on the right side it appears in the degrees of freedom of the t-statistic), the equation must be solved iteratively. VSP does this automatically using the iteration scheme in Gilbert (1987, pg. 32).

[1] This report was automatically produced* by Visual Sample Plan (VSP) software version 6.0.

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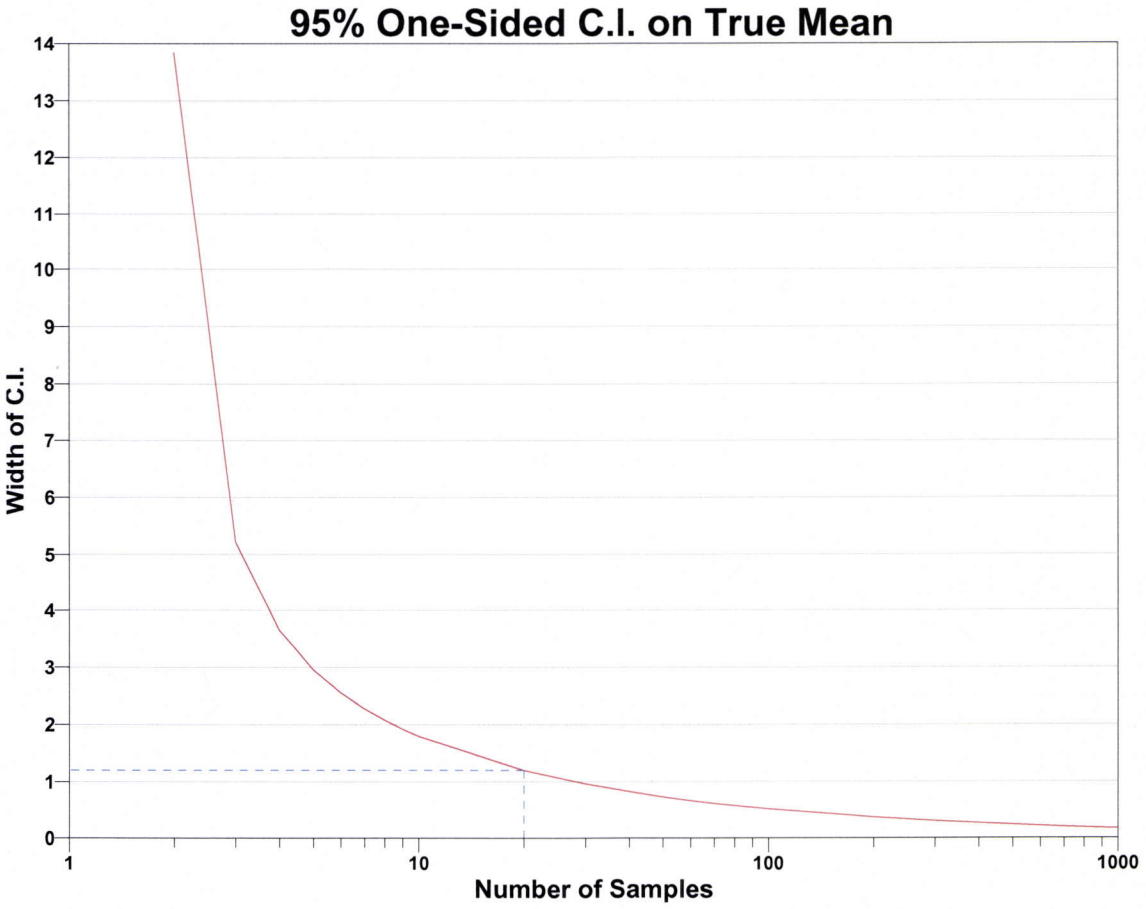
VSP Sample Design Report[1] for Calculating a One-Sided Confidence Interval for the Population Mean Using Systematic Grid Sampling

The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n	Parameter			
		S	d	α	$t_{1-\alpha,df}$
Analyte 1	20	3.1	1.2	5%	1.72913 [a]

[a] This value is automatically calculated by VSP based upon the user defined value of α

The following figure is a graph representing the relationship between the width of the confidence interval and the number of samples. The blue dashed line illustrates the specified maximum desirable confidence interval width. Where this dashed line intersects the red curve is the number of samples calculated by VSP.



[1] This report was automatically produced* by Visual Sample Plan (VSP) software version 6.0.

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VSP Sample Design Report[1] for Calculating a One-Sided Confidence Interval for the Population Mean Using Systematic Grid Sampling

Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. The sample mean is normally distributed,
2. The population values are not spatially or temporally correlated, and
3. The sampling locations will be selected probabilistically.

The first two assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, confidence level (1-α) (%) and width of confidence interval. The following table shows the results of this analysis.

Number of Samples						
	d=0.6		d=1.2		d=1.8	
	s=6.2	s=3.1	s=6.2	s=3.1	s=6.2	s=3.1
CL=99	582	148	148	40	68	20
CL=97	380	97	97	26	45	13
CL=95	291	75	75	20	34	10
CL=93	235	60	60	17	28	8
CL=91	194	50	50	14	23	7

s = Standard Deviation
CL = Confidence Level (1-α) (%)
d = Width of Confidence Interval

Cost of Sampling

The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $2,000.00, which averages out to a per sample cost of $100.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**20 Samples**
Field collection costs	-	$0.00	$0.00
Analytical costs	$100.00	$100.00	$2,000.00
Sum of Field & Analytical costs	-	**$100.00**	**$2,000.00**
Fixed planning and validation costs	-	-	$0.00
Total cost	-	-	**$2,000.00**

[1] This report was automatically produced* by Visual Sample Plan (VSP) software version 6.0.

Software and documentation available at http://vsp.pnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

VSP Sample Design Report[1] for Calculating a One-Sided Confidence Interval for the Population Mean Using Systematic Grid Sampling

Recommended Data Analysis Activities

Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compute a confidence interval, the data should be assessed in this context. Assuming the data are adequate, at least one statistical test should be done to evaluate whether the data are normally distributed. Appropriate confidence intervals for the mean value should then be calculated. Results of the exploratory and quantitative assessments of the data should be reported, along with conclusions that may be supported by them.

[1] This report was automatically produced* by Visual Sample Plan (VSP) software version 6.0.

Software and documentation available at http://vsp.pnl.gov

* - The report contents may have been modified or reformatted by end-user of software.

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-7	Section 5.2.2 Piping	Missing Table designation and missing units for concentration levels.	10CFR20.2002(a)	No concentration units are specified in the unlabeled table describing piping characterization data.	Provide Table number and units for concentration levels.
Response Summary: Typographical errors.					
Response Detail: The intended table referenced as 'Table 2' in the first paragraph of Section 5.2.2 is the table shown immediately following that first paragraph. The units of this table are pCi/g.					

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-8	Section 5.2.2 Piping	Future Characterization of Piping	10CFR20.2002(a)	The sampling approach for piping that potentially will be sent to USEI (Building 253, 254, 255 and Outside Process Buildings) is described on page 6. The data going into the VSP model is based on 10 samples that are listed in Appendix G under Building 255 (6 samples) and Outside (4 samples). The location of these 6 samples was biased on survey results and where there were larger amounts of debris in the pipes. There is no indication that samples of piping under Building 253 or 254 were collected. Westinghouse used VSP to determine that they will take 14 samples per 100 m3 of piping (1 per 7 m3 or 250 ft3). There is no indication that Westinghouse intends to perform additional surveying and bias the location of these additional samples towards either higher survey readings or areas where there is a larger amount of debris.	Describe if Westinghouse intends to perform additional surveys or inspections of the piping and bias the additional sampling that is to be taken (1 per 7 m^3). If biased sampling is not intended, provide the basis for why the current sampling plan is adequate.
Response: During the removal of subsurface piping, screening measurements will be performed and compared to criteria established to identify non-NCS exempt materials (NCSA-TR-11-11, Section 1.4.3). Piping sections that exceed the screening levels corresponding to the limit specified in NCSA-TR-11-11 will be assayed to determine the uranium content. In the event that the assay shows that the uranium in the piping section is Diffuse Material, would not cause USEI waste to exceed an average of 0.1 $g^{235}U/L$, and is to be disposed at USEI, the piping section will be selected for biased sampling and analysis for Tc-99 and uranium. The results of laboratory analysis will be used to assign activity content to the piping section being evaluated by this protocol. Please see the responses to RAIs GEN-1 and SA-2 for additional information regarding statistical sampling.					

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
CH-9	Section 5.2 Waste Characterization, Section 6.4 of HDP-TBD-WM-906	Inconsistencies in Table 6-2 thru Table 6-4 of HDP-TBD-WM-906 and Fig 1 of Appendix 0 of HDP-TBD-WM-906.	10CFR20.2002(a)	It is not clear how the concentrations for each sample in Table 6-2 are compiled to calculate concentrations for each elevated Area in Table 6-5. This information is necessary to adequately review the characterization data. The information in Appendix D Fig. 1 is not consistent with Tables 6-2 and 6-3, which brings ambiguity in matching location sample number to the correct Area. Section 6.5 states that of 50 samples, 33 were targeted in and around areas of elevated activity and 17 were dispersed through the remainder of the building. From this statement, one would expect Table 6-2 (Elevated Areas) to contain 33 samples (minus the 5 that are excluded), and Table 6-3 (Non-Elevated Areas) to contain 17 samples. However this is not the case. Some samples that are not from areas of elevated activity are in Table 6-3 and some samples that are within areas of elevated activity are not in Table 6-3.	Please identify the location Area (1-6) in Table 6-2. Please describe how the data in Table 6-2 is applied in calculating the data in Table 6-5. Please describe how the data from Table 6-4 (subsurface for Area 3) are incorporated into the average for Area 3. Please also explain the following inconsistencies, and any additional inconsistencies that are discovered in your review, between Tables 6-2, 6-3 and Appendix D Figure 1. • Why are samples 1, 10, 13, 17, and 18 listed in Table 6-2 since they are not in one of the marked elevated areas? Why didn't the gamma walkover catch these since they had higher uranium levels? • Why is sample 15 in Table 6-3 if it is inside Area 5? • Why are samples 31-32 in Table 6-3 if they are inside Area 1 (portion that will go to USEI)? • Why are samples 41-42 in Table 6-3 if they are inside Area 5? • Why are samples 45-46 in Table 6-3 if they are inside Area 2? • Why are samples 52-53 in Table 6-3 if they are inside Area 6? • Where are samples 33, 54 and 55 (they are not listed in Fig 1)? • Why is sample 34 included in Table 6-3? Shouldn't it be excluded since this N.E. portion of Area 1 is not going to be sent to US Ecology (as samples 2, 3, and 35 are excluded)?

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
					• Why isn't sample 37 in Table 6-3? It appears to be just outside of Area 2. It is not in 6-2 or 6-3 and is not listed as excluded in the footnote to Table 6-2.

Response Summary: Clarifying information on the Sample Stations and how the sample results are used in calculations is provided.

Response Detail:

Please identify the location Area (1-6) in Table 6-2.
Why are samples 1, 10, 13, 17, and 18 listed in Table 6-2 since they are not in one of the marked elevated areas?
Why is sample 15 in Table 6-3 if it is inside Area 5?
*Why are samples 31-32 in Table 6-3 if they are inside Area 1 (portion that will go to USEI)?*In the context of paragraphs 4 to 6 of Section 6.4 of
Why are samples 41-42 in Table 6-3 if they are inside Area 5?
Why are samples 45-46 in Table 6-3 if they are inside Area 2?
Why are samples 52-53 in Table 6-3 if they are inside Area 6?
Why is sample 34 included in Table 6-3? Shouldn't it be excluded since this N.E. portion of Area 1 is not going to be sent to US Ecology (as samples 2, 3, and 35 are excluded)?

In HDP-TBD-WM-906, the term 'elevated area' should not have been used since this term is used elsewhere in the document for the specific six areas identified on Figure 1 of Appendix D to HDP-TBD-WM-906. In the context of paragraphs 4 to 6 of Section 6.4 'elevated areas' should be replaced with 'areas where GWS exceeded 4,400 cpm or higher Tc-99 samples'. The titles of Tables 6-2 and 6-3 have been changed accordingly in the response to RAI SA-3 below. Since the specific six areas on Figure 1 of Appendix D are not directly relevant to Table 6-2, the samples listed in Table 6-2 are not linked to those areas by adding a new column to the table.

To provide a conservative result for areas with GWS less than 4,400 cpm or higher Tc-99 samples, samples, such as 15, 31, 32, 34, 41, 42, 45, 46, 52, and 53 were included even from within the specific six area identified on Figure 1 of Appendix D. These included samples bounded an area of higher activity (uranium by GWS or Tc-99 by sampling) and are not in and of themselves associated with elevated surface activity. The response to RAI CH-6 identifies Tc-99 bounding samples.

Please describe how the data in Table 6-2 is applied in calculating the data in Table 6-5.
Please describe how the data from Table 6-4 (subsurface for Area 3) are incorporated into the average for Area 3.

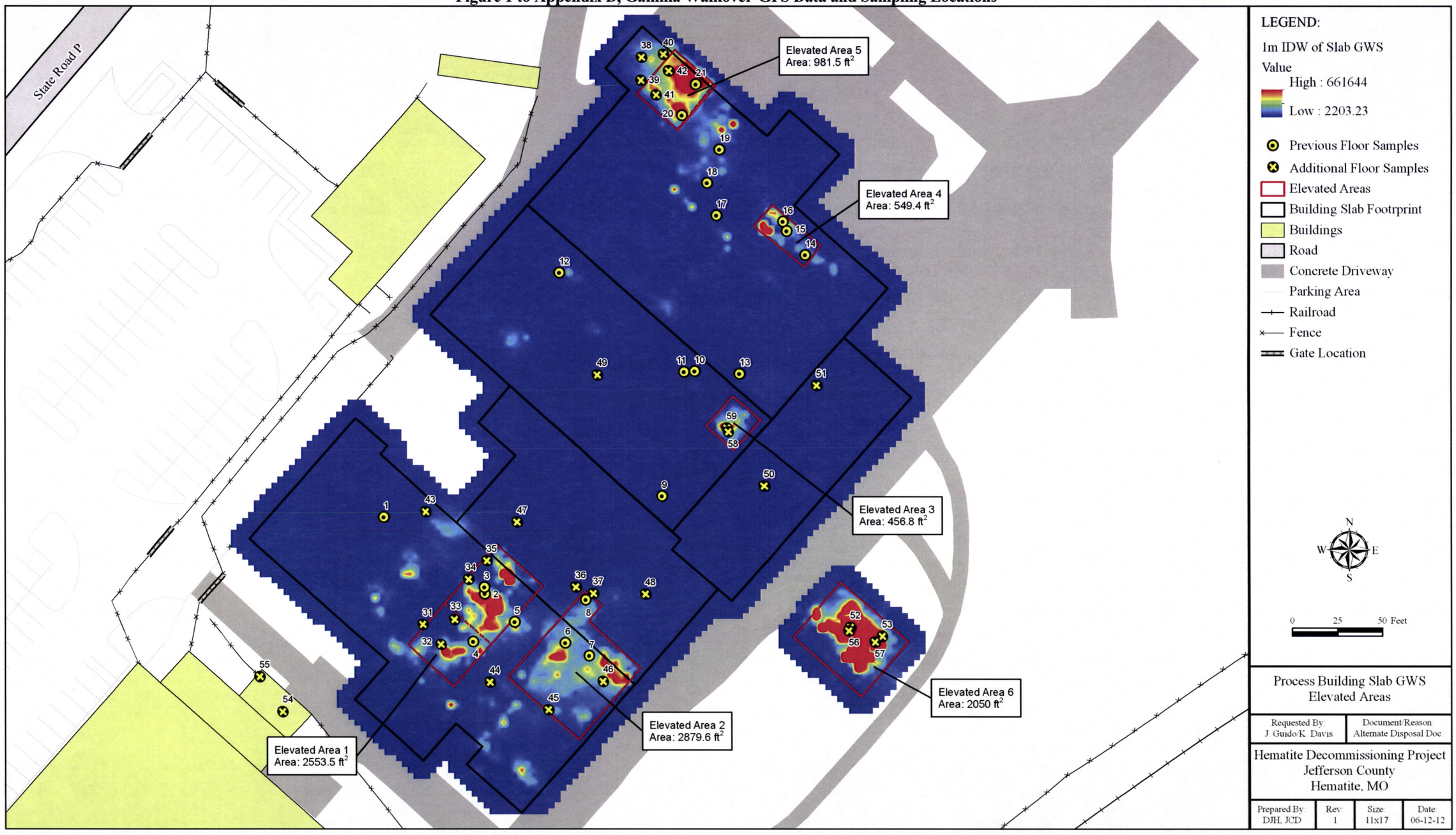
See the response to RAI SA-5 for additional detail on the calculation of values shown in Table 6-5.

Why didn't the gamma walkover catch these [samples 1, 10, 13, 17, and 18] since they had higher uranium levels?

Additional detail has been included in response to RAI CH-6 on the rationale for selection of each survey location. The samples indicated (1,10,13, 17, and 18) were all associated with either hotspots or cracks / seams in the concrete surface. These sample locations were identified during comprehensive gamma walkover surveys performed prior to building demolition and as such were not logged with GPS position data and would not appear on Figure 1 in Appendix D of HDP-TBD-WM-906. For each of these sample locations, the results of gamma walkover surveys prior to building demolition are attached.

RAI No.	Section	Issue	Regulatory Link	Discussion	Path Forward
Where are samples 33, 54 and 55 (they are not listed in Fig 1)? The caption for Sample Station 33 is missing from Figure 1 in Appendix D. Attached is a revised Figure 1 for Appendix D. Sample Station 33 was collected in Building 240, Red Room. Sample Stations 54 and 55 are located on Figure 1 to Appendix D just north of the label for Elevated Area 1. These sample stations are within Building 235, which may be dismantled after its support of other decommissioning activities is finished. *Why isn't sample 37 in Table 6-3? It appears to be just outside of Area 2. It is not in 6-2 or 6-3 and is not listed as excluded in the footnote to Table 6-2.* Sample Station 37 should have been included in Table 6-3. See the response to RAI SA-3 for a revised Table 6-3. Since inclusion of Sample Station 37 lowered the average concentration for Table 6-3, subsequent calculations that use the previous Table 6-3 result (e.g., the estimate of building surface activity) are conservative and are not recalculated.					

Figure 1 to Appendix D, Gamma Walkover-GPS Data and Sampling Locations



Radiological Survey in Area Around Location 1

APPENDIX A
RADIOLOGICAL SURVEY REPORT

Purpose of Survey :	Characterization survey of Process Bldg. floor scan in Process Bldg. 240-9 Laundry					Log Number	0901CH000914
Surveyed by:	Thomas Yardy/Keith Hafley 9-15-09 9-15-09					Reviewed By:	Charles Finkenbine 9/16/09
Instrument	Serial Number	Calibration Due	9-16-09 Probe N/A	Sample Locations	Item Material	Date:	9/14/2009
Lud 2221	228831	2/3/2010	2X2 NaI	Floor	Concrete	Time:	16:00
N/A	N/A	N/A	N/A	N/A	N/A	Smear Area	N/A
N/A	N/A	N/A	N/A	N/A	N/A	Batch #	N/A
N/A	N/A	N/A	N/A	N/A	N/A	RWP:	RP-09-S002 Rev. 2
N/A	N/A	N/A	N/A	N/A	N/A	Misc.	N/A

Remarks: Conducted scans of floor by walk-over with detector 2"-4" above surfaces. See attached map for readings and results.

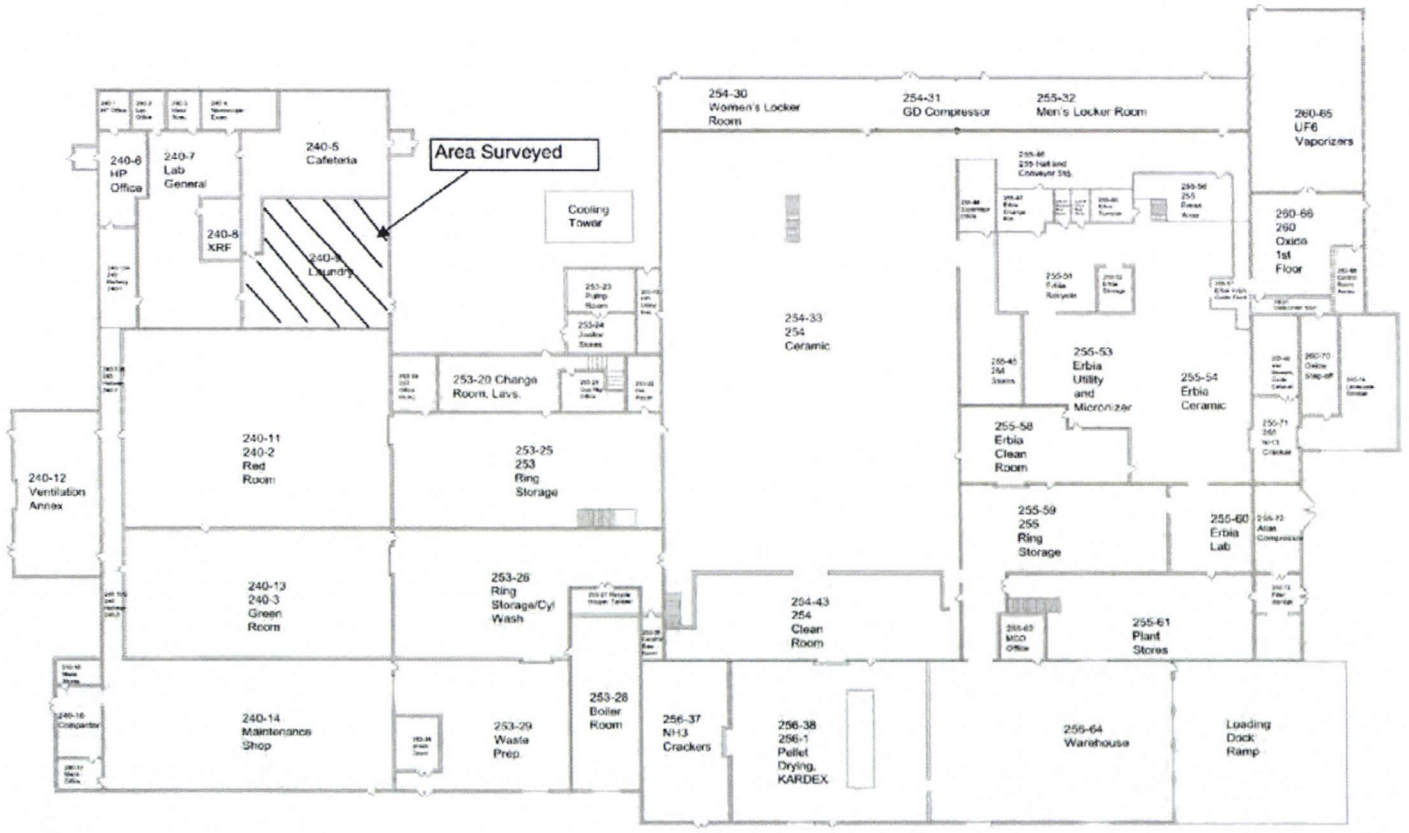
#	Location	Gamma Dose Rate	Backgrounds		Comments
		Contact (μRem/hr)	30 cm μRem/hr	60 cm μRem/hr	
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A
14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A
20	N/A	N/A	N/A	N/A	N/A

Radiological Survey in Area Around Location 1

APPENDIX A
RADIOLOGICAL SURVEY REPORT

Purpose of Survey :	Characterization survey of Process Bldg. floor scan in Process Bldg. 240-9 Laundry					Log Number	0901CH090914
Surveyed by:	Thomas Yardy/Keith Hafley Thomas Yardy 9-15-09 Keith Hafley 9-15-09					Reviewed By:	Charles Finkenbine 9/16/09
Instrument	**Serial Number**	**Calibration Due**	**Probe** N/A	**Sample Locations**	**Item Material**	**Date:**	9/14/2009
Lud 2221	228831	2/3/2010	2X2 NaI + 9-16-09 TY	Floor	Concrete	**Time:**	16:00
N/A	N/A	N/A	N/A	N/A	N/A	**Smear Area**	N/A
N/A	N/A	N/A	N/A	N/A	N/A	**Batch #**	N/A
N/A	N/A	N/A	N/A	N/A	N/A	**RWP:**	RP-09-S002 Rev. 2
N/A	N/A	N/A	N/A	N/A	N/A	**Misc.**	N/A

Remarks: Conducted scans of floor by walk-over with detector 2"-4" above surfaces. See attached map for readings and results.

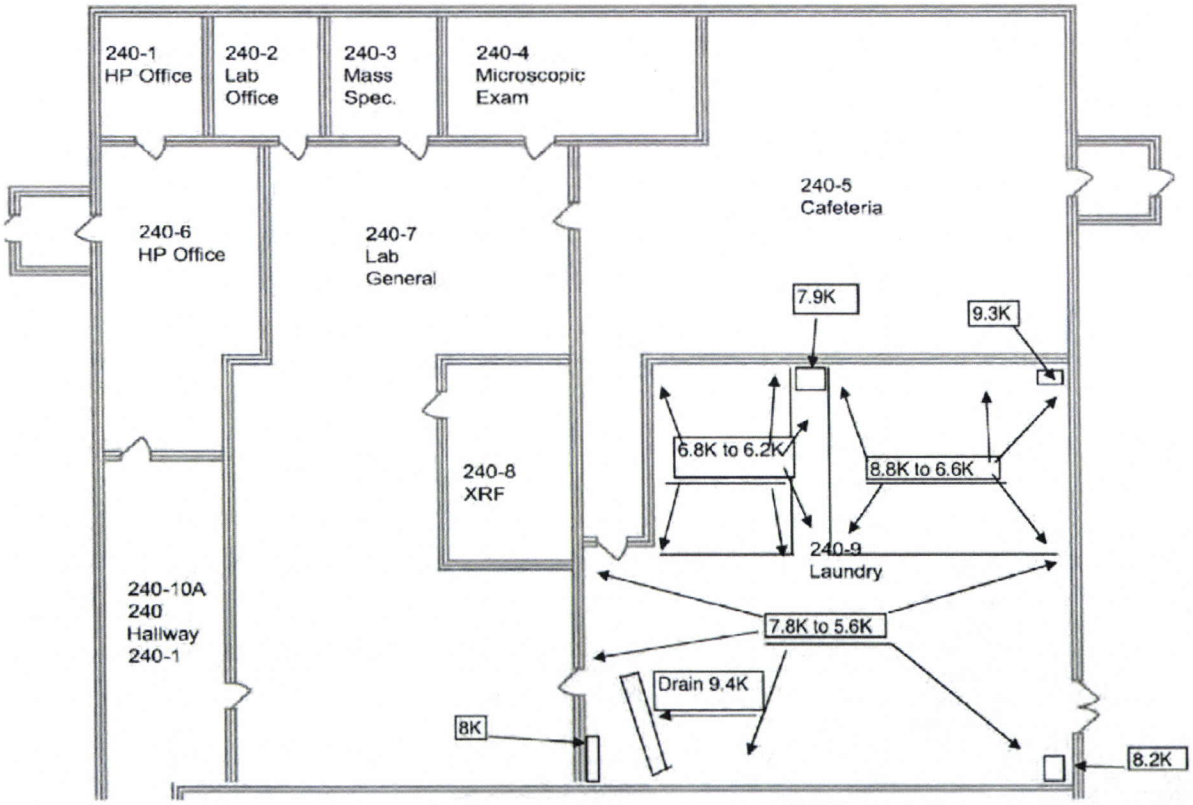


Radiological Survey in Area Around Location 1

APPENDIX A
RADIOLOGICAL SURVEY REPORT

Purpose of Survey :	Characterization survey of Process Bldg. floor scan in Process Bldg. 240-9 Laundry					Log Number	0901CH090914
Surveyed by:	Thomas Yardy/Keith Hafley 9-15-09 9/15/09					Reviewed By: Charles Finkenbine 9/16/09	
Instrument	**Serial Number**	**Calibration Due**	**Probe**	**Sample Locations**	**Item Material**	**Date:**	9/14/2009
Lud 2221	228831	2/3/2010	2X2 NaI N/A 9-16-09	Floor	Concrete	**Time:**	16:00
N/A	N/A	N/A	N/A	N/A	N/A	**Smear Area**	N/A
N/A	N/A	N/A	N/A	N/A	N/A	**Batch #**	N/A
N/A	N/A	N/A	N/A	N/A	N/A	**RWP:**	RP-09-S002 Rev. 2
N/A	N/A	N/A	N/A	N/A	N/A	**Misc.**	N/A

Remarks: Conducted scans of floor by walk-over with detector 2"-4" above surfaces. See attached map for readings and results.



Appendix A
Radiological Survey Report

Purpose of Survey:	Pre-job survey of concrete core drilling area # 1 (Old Resperator Wsh Room)	**Log Number:**	0420 CH 100412
Surveyed By:	W. Clark Evers / W. Evers 4/13/10	**Reviewed By:**	Charles Finkenbine [signature] 4/14/10

Instrument & Probe	Serial Number	Calibration Due	Probe Area (cm²)	Alpha Bkg (cpm)	Alpha Efficiency	Alpha MDA (dpm)	Beta Bkg (cpm)	Beta Efficiency	Beta MDA (dpm)		
Tennelec LB 2 GFPC	68819-1	8/25/10	N/A	0.8	27.4%	20.8	3.1	33.0%	26	**Date:**	4/13/2010
Lud 2221 44-10 E	228822	4/20/10	N/A	N/A	N/A	N/A	N/A	1.3%	N/A	**Time:**	9:30
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**Smear Area:**	~ 100 cm^2
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**Batch #:**	10539
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**RWP:**	RP-10-G004
										Misc:	N/A

Remarks: Pre-job survey performed prior to posting area as CA. Scan of area w/ 2x2 showed higest count rate of 9,800 cpm in crack in floor. Area marked with paint to be sampled.

#	Description	Removable Alpha		Removable Beta		Total Alpha		Total Beta		βγ Dose Rate		Limit Exceeded
		Net CPM	DPM / 100cm²	Net CPM	DPM / 100cm²	Gross CPM	DPM / 100cm²	Gross CPM	DPM / 100cm²	Contact uR/hr	Gen. Area uR/hr	
1	Floor Crack	0.2	<MDA	2.9	<MDA	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Floor	1.2	<MDA	0.5	<MDA	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

α - removable alpha
β - removable beta
ϕ - direct reading

Radiological Survey at Location 1

Appendix A
Radiological Survey Report (Map)

Purpose of Survey:	Pre-job survey of concrete core drilling area # 1 (Old Resperator Wsh Room)									**Log Number:**	0420 CH 100412
Surveyed By:	W. Clark Evers / W. Clark 4/13/10			**Reviewed By:**		Charles Finkenbine 4/14/10					
Instrument	**Serial Number**	**Calibration Due**	**Probe Area (cm^2)**	**Alpha Bkg (cpm)**	**Alpha Efficiency**	**Alpha MDA (dpm)**	**Beta Bkg (cpm)**	**Beta Efficiency**	**Beta MDA (dpm)**	**Date:**	04/13/10
Tennelec LB 2 GFPC	68819-1	8/25/10	N/A	0.8	27.4%	20.8	3.1	33.0%	26	**Time:**	9:30
Lud 2221 44-10 E	228822	4/20/10	N/A	N/A	N/A	N/A	N/A	1.3%	N/A	**Smear Area:**	~ 100 cm2
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**Batch #:**	10539
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**RWP:**	RP-10-G004
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**Misc:**	N/A

Remarks: Pre-job survey performed prior to posting area as CA. Scan of area w/ 2x2 showed higest count rate of 9,800 cpm in crack in floor. Area marked with paint to be sampled.

Building 240
Old Respirator Wash Room