3. (HDP-4.1.4-Q3) Comment: Section 4.1.4 of the HDP states that "Characterization data for structures to be demolished prior to DP approval are based largely on operational surveys, and will not be discussed in detail in this section. A summary of the operational survey results are provided in Section 4.27 of the HRCR." Section 4.27 of the HRCR does not exist.

   Path Forward: Provide the correct reference to the discussion of operational surveys for structures to be demolished prior to HDP approval, or provide such a discussion in the HDP.

Westinghouse Response:

The proper HRCR section reference is 4.24, titled 'Buildings That Will be Demolished'. The section references will be corrected in the revised Decommissioning Plan.

4. (HDP-4.2-Q4) Comment: Additional information is needed on the radiological status of contaminated systems and equipment. Section 4.2.1 of the HDP states that "radionuclides present and activity fractions in the systems and equipment are the same as those in the contaminated structures, presented in Section 4.1.1." This section and associated references were reviewed, and there is no clear description of radionuclides and activity fractions specific to systems and equipment.

   Details on the derivation of background levels used to analyze contaminated systems and equipment were not provided. It is indicated in HDP Section 4.2.2 that a discussion of these background levels was given in Section 4.1.4. The referenced section deals with "structures to be demolished," and provides no details on background.

   The radiological status of underground systems is not defined. HDP Section 4.2.4 notes that underground systems consist of the Storm Water Drain System (Buildings to Outfall #3) and the SWTP (Buildings to Outfall #1) and states that "additional details regarding these systems are discussed in Section 4.22 of the HRCR." Section 4.22 of the HRCR deals with "Background Soil Samples," and provides no additional details on underground systems.

   Basis: Information needed on the radiological status of contaminated structures and equipment is given in NUREG-1757, Vol. 1, Rev. 2, Appendix D, Section IV.b. The checklist in NUREG-1757 specifies the following:

   - A list or description and the location of all systems or equipment at the facility that contain residual radioactive material in excess of site background levels.
   - A summary of the radionuclides present in each system or on the equipment at each location, the maximum and average radionuclide activities in dpm/100cm^2, and, if multiple radionuclides are present, the radionuclide ratios.

- The maximum and average radiation levels in mrem/hr at the surface of each piece of equipment.
- A summary of the background levels used during scoping or characterization surveys.
- A scale drawing or map of the rooms or work areas showing the locations of the contaminated systems or equipment.

Path Forward: Following guidance in NUREG-1757, Vol. 1, Rev. 2, Appendix D, Section IV.b, provide additional details on the characterization of contaminated systems and equipment at the Hematite site. This description should be provided for the areas specified in Section 4.2 of the HDP (Buildings 110, 230, 231, the SWTP Shed, the Underwater Storm Water Drain, and SWTP piping system) and other systems and equipment that are not approved for removal prior to decommissioning.

Westinghouse Response:

Additional details on the characterization of contaminated systems and equipment at the Hematite site that are not planned to be removed prior to decommissioning are provided below. As Westinghouse previously stated in response to RAI HDPC-14-Q5, buried piping and equipment that will remain in place after site closure that have had a potential for radioactive contamination above the $DCGL_W$ (based on site operating history) or known contamination above the $DCGL_W$ (based on previous radiation surveys or surveys performed during decommissioning) will be designated as Class 1 for the purpose of FSS. In addition, the identified cross references were updated and/or text was revised explaining the relevance of the cross reference.

As discussed with the NRC during the conference call on October 29, 2010, Westinghouse considers that the data request in NUREG-1757, Vol. 1, Rev. 2, Appendix D, Section IV.b to be tempered by the NRC guidance in NUREG-1757, Volume 2, Section 4.2, Heading "Information to be Submitted." Specifically, characterization information supplied by the licensee should include:

- "A discussion of why the licensee considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected;"
- "A discussion of how they were surveyed or why they did not need to be surveyed for areas and surfaces that were considered to be inaccessible or not readily accessible;"

The inaccessibility of systems and equipment, the continued use of systems and equipment, and the process knowledge/historical use of the equipment have either made surveys impractical or made it unlikely that significant quantities of residual radioactivity have gone undetected. Accordingly the amount of characterization data in the following response is limited. The following response also requires that surveys continue through the decommissioning process to identify contamination on systems and equipment, including final status surveys. The response is organized by the bullets from NUREG-1757, Vol. 1, Rev. 2, Appendix D, Section IV.b.

- A list or description and the location of all systems or equipment at the facility that contain residual radioactive material in excess of site background levels.

  Portions of the systems that may remain at the time of license termination include the Storm Drain, SWTP and Buildings 110 and 230 Drain systems, all of which have been designated as having the potential for contamination exceeding the $DCGL_W$. These systems will be designated as Class 1 for the purpose of FSS. The Public and Raw Water systems have a negligible potential for contamination; however, these systems have been conservatively designated as Class 3 for the purpose of FSS.

  Other systems and equipment that are not currently approved for removal prior to decommissioning consist primarily of the sub-slab piping beneath the Process Buildings. Limited information is available on the radiological conditions of this piping due to constraints on access for survey. This piping is shown on DP Figure 4-1. Buried piping beneath the Process Buildings that is removed during decommissioning will be surveyed in accordance with the radiation protection program as described in DP Chapter 10 for disposition as waste.

  Equipment that may remain at the time of license termination includes any equipment remaining in Buildings 110, 115, 230, 231, 235, and the SWTP Shed. This equipment will be included as part of the structural final status survey for the building in which the equipment resides. Based on operational radiological surveys and process knowledge, this equipment has not been identified to be contaminated.

  - Equipment in Building 110 that will remain after license termination consists of: toilets and sinks within washrooms; a mop sink, water softener and water heater in the janitor's closet; an HVAC unit, including a fan in the mechanical room and a condenser outside on grade; an HVAC unit for the lobby with a fan and condenser on the roof; five (5) electric heaters in the ceiling; site telephone and security systems; electrical utilities.
  - Equipment in Building 115 has previously been removed when the raw water system (used primarily for fire protection) became redundant and was replaced by the public water system.
  - Equipment in Building 230 that will remain after license termination consists of: toilets and sinks within washrooms plus showers in the locker rooms; a mop sink, water softener and water heater in the janitor's closet; six (6) rooftop HVAC units with gas heat and air conditioning; one rooftop gas heating unit; a warehouse exhaust fan; the site computer network; site fire alarm system; a sprinkler system in the warehouse area; a kitchen area in the lunch room.
  - Equipment in Building 231 that will remain after license termination consists of: two electric space heaters and one exhaust fan; electrical utilities.
  - Equipment in Building 235 consists of electrical devices and conduit.
  - Equipment in the SWTP Shed that will remain after license termination consists of: the WTP aerators and air lift pumps; electrical utilities.

- A summary of the radionuclides present in each system or on the equipment at each location, the maximum and average radionuclide activities in dpm/100cm^2, and, if multiple radionuclides are present, the radionuclide ratios. The maximum and average radiation levels in mrem/hr at the surface of each piece of equipment.

  The Building Drain system is divided into two Class 1 survey units, Building 110 Floor Drains and Building 230 Floor Drains. The radionuclides identified in samples of pipe scale and debris from Building 110 and Building 230 floor drains included uranium and progeny, Th-232+C, Tc-99, Pu-239/240, Am-241 and Np-237. Activity fractions for the floor drain systems were calculated based on these data and presented in Table 4-1 of the DP. As these fractions show, the majority of the activity can be attributed to uranium, with the other five radionuclides contributing less than 0.9 percent of the total average activity.

  The Storm Drain, SWTP, Public Water system and portions of the Raw Water system piping are currently in operation, thereby limiting accessibility for characterization prior to decommissioning. These systems were not directly associated with the manufacturing process systems, therefore Westinghouse considers it highly unlikely that there will be any significant residual contamination.

  As buried piping becomes accessible, it will be surveyed and evaluated in accordance with the NRC approved FSS buried piping survey methodology referenced in the previously submitted response to RAI HDPC-14-Q6, or by obtaining similar information from the interiors of the piping using remote detectors. If buried piping surveys determine that remediation is required to meet the appropriate DCGLs, remediation activities will be conducted in accordance with radiation protection and nuclear criticality safety program requirements. Following remediation, FSS surveys will be performed of any remaining piping and surrounding soil to verify DCGLs have been met.

  To verify that buried piping leaks have not contaminated surrounding soil adjacent to piping beneath buildings expected to remain, Westinghouse will utilize biased core bore samples through building slabs to evaluate soils adjacent to buried piping against appropriate DCGLs. Factors for determining biased location decisions will include location of pipe joints, low points, and any radiological survey or video evidence available from the buried piping.

- A summary of the background levels used during scoping or characterization surveys.

  Hematite did not correct for background when characterizing the floor drains in Buildings 110 and 230. During the Final Status Survey of systems slated to remain after license termination, the collected data will not be corrected for background.

- A scale drawing or map of the rooms or work areas showing the locations of the contaminated systems or equipment.

  The Storm Drain, SWTP and Buildings 110 and 230 Drain systems is shown on DP Figures 4-1, 4-2 and 4-3.

In addition, DP Section 4.2 will be revised as follows (the reference in Section 4.2.3 below to

Section 14.4.4.1.5.4 is revised per the previous response to RAI HDP-C5-Q18):

"4.2 CONTAMINATED SYSTEMS AND EQUIPMENT

Above ground contaminated systems and equipment from the process buildings have been or will be removed to the extent that the buildings can be safely demolished, prior to or during the demolition of the buildings. As indicated in Section 4.1, all buildings except Buildings 110, 230 and 231, and potentially Buildings 115, 235, and the SWTP Shed, will be demolished prior to license termination. Assuming that the activities initially approved are completed, the systems that will remain at the time of DP approval are:

- Ventilation Systems in Buildings 110, 230 and 231 (Building 231 contains only local unit heaters);
- Floor Drain systems in Buildings 110 and 230;
- Equipment in the SWTP Shed;
- Underground Storm Water Drain and SWTP piping system (See Chapter 5 for table of remaining storm and sanitary drain lines); and
- Underground Raw Water and Public Water systems

4.2.1 RADIONUCLIDES PRESENT

The radionuclides present and activity fractions in the systems and equipment are the same as those in the contaminated structures. Section 4.1.1 identifies the radionuclides present and activity fractions for contaminated structures. Systems and equipment within or associated with these structures would have the same radionuclides and activity fractions as the structure itself.

4.2.2 BACKGROUND LEVELS

During the Final Status Survey of systems slated to remain after license termination, the collected data will not be corrected for background considering that the contribution to detector response from background radioactivity is not expected to exceed a small fraction of the DCGL.

4.2.3 VENTILATION SYSTEMS

Contamination levels for the ventilation systems were measured at the accessible ducts within Buildings 110 and 230, and were included as part of the discussion in Section 4.1.3.2. Surface contamination measurement and air sample requirements to verify ventilation ducts to remain in place have met the criteria for unrestricted release are described in Section 14.4.4.1.5.4.

4.2.4 UNDERGROUND SYSTEMS

The impacted underground systems consist of the Storm Water Drain System (Buildings to Outfall #3) and the SWTP (Buildings to Outfall #1). Additional details regarding these systems are discussed in Section 4.19 of the HRCR. The Floor Drain systems in Buildings 110 and 230, which drain into the SWTP, are also considered impacted.

The Storm Water Drain System and SWTP have both historically received discharges from multiple site structures during operation of the facility. Facility operating history and radiological effluent monitoring indicate that these underground systems contain licensed material. Additionally, facility operating history and recent characterization confirm the presence of licensed material within the Floor Drain systems in Buildings 110 and 230. All three of these impacted underground systems will undergo final status survey as Class 1 survey units.

The Raw Water and Public Water systems are believed to be non-impacted based on process knowledge that indicates these systems have a negligible potential for containing licensed material. However, both of these systems will undergo final status survey as Class 3 survey units.

4.2.4.1 Storm Water Drain System

The impacted area of the site includes an underground Storm Water Drain System which historically received discharge from multiple site structures during operation of the facility (see Figure 4-1). The water from building roof areas and ground surface drains flows to the Site Pond via the Storm Water Drain System (Outfall #3). During site operations the Storm Water Drain System also received condensed steam from the Uranium Hexafluoride (UF_6) vaporizer steam jackets and cooling water from heat exchangers. Facility operating history, building and soil characterization surveys and effluent monitoring indicate the underground Storm Water Drain System is contaminated in excess of background levels.

4.2.4.2 Sanitary Wastewater Treatment Plant

The impacted area of the site includes the SWTP consisting of underground settling and aeration tanks which historically received discharge from multiple site structures during operation of the facility (see Figure 4-1). The SWTP receives water from sinks, toilets, showers and drinking fountains. The SWTP was also used to receive laundry water (after the water was filtered and held for sampling) and waste water from the process water demineralizer system and laboratory sinks. Facility operating history, building and soil characterization surveys and effluent monitoring indicate that the underground SWTP contains licensed material.

The SWTP Shed houses data logging and electronic instrumentation, floor drains and an open work area. The portions of this system that have been impacted by licensed activities are limited to the process components in contact with waste water, and those that have the potential to collect settleable solids.

4.2.4.3 Floor Drain Systems

The impacted area of the site includes underground Floor Drain systems which originate in Buildings 110 and 230 and tie into the SWTP system. Characterization surveys and sampling have confirmed the presence of licensed material within the Floor Drain systems in Buildings 110 and 230. For the purposes of final status survey, this system will be sub-divided into two Class 1 survey units. The physical arrangements of the Floor Drain systems for Buildings 110 and 230 are depicted in Figures 4-2 and 4-3, respectively.

4.2.4.4 Raw Water System

The Raw Water system was formerly supplied by the site well, with pressure maintained by using the storage tank on the hill north of State Road P. The Raw Water system supplied potable water to the site and supplied water to the emergency fire pump in Building 115, which in turn supplied pressurized water to the fire hydrants. In order to separate the process buildings from Buildings 110 and 230, the site well was abandoned, the emergency fire pump removed and the piping isolated. The piping to the process buildings from the supply in Building 240-1 has been severed. All of the underground Raw Water piping is still in place. Approximately half of this piping is currently being utilized by the Public Water system. The portions of the piping no longer in use will undergo final status survey as a Class 3 survey unit. The layout of the Raw Water system piping in depicted in Figure 4-1.

4.2.4.5 Public Water System

The Public Water system replaced the Raw Water system and supplies potable water to Buildings 110 and 230 as well as some remaining fire hydrants and the sprinkler system in Building 230 warehouse. This system utilizes approximately half of the abandoned Raw Water system piping. The Public Water system piping will undergo final status survey as a Class 3 survey unit. The layout of the Public Water system piping in depicted in Figure 4-1."

5. (HDP-4.5.4-Q5) Comment: It is stated in HDP Section 4.5.4 that "...in addition to the very limited number of positive results from the sand/gravel and bedrock aquifers, a review of the location and time of the sample collection indicates a very disparate and disconnected pattern for the positive results. As discussed in Reference 4-7, it appears that the positive results from the bedrock wells could be attributed to sampling or analytical anomalies." There is no Reference 4-7.

   Path Forward: Provide Reference 4-7 or further discussion on the results from bedrock well sampling.

Westinghouse Response:

The correct reference is 4-6, SAIC Report, "Radionuclide Activity in Bedrock Groundwater at Westinghouse Hematite Facility, Hematite, Missouri," Revision 0, July 2009 (submitted to NRC via HEM-09-133, November 10, 2009). The Decommissioning Plan text will be revised to reflect the correct reference.

6. (HDP-4-Q6) Figures 4-6 and 4-7, Impacted Area – Surface Soil Contamination, show areas under buildings that have significant radioactivity. How were these areas and the radioactivity contours determined?

Path Forward: Provide details on how the radioactivity under the buildings was determined and how the radioactivity contours determined.

Westinghouse Response:

Details on how the radioactivity under the buildings was determined and how the radioactivity contours were determined, are provided in the response below.

During the characterization surveys conducted by SAIC, Energy Solutions, and Westinghouse as discussed below, sampling was performed to access the soil underlying the buildings to determine the amount of radioactivity. A concrete coring bit was used to remove a portion of the concrete floor surface at each of the soil sampling locations. After removing the concrete surface, soil samples were obtained and provided to a laboratory for analysis.

In November 2003, SAIC conducted sampling inside the building structures and obtained soil samples from the fill beneath the concrete floor; the soil immediately beneath the fill; and from sub-surface soil at each location referenced in HRCR Section 4.8.1.1. Additionally, SAIC obtained sub-surface soil samples at locations adjacent to the exterior of the buildings in the spring and summer of 2004 as also referenced in HRCR Section 4.8.1.1.

During November 2007, Energy Solutions obtained additional characterization samples of subsurface soil, including the soil beneath the buildings to remain at the time of license termination, as described in HRCR Sections 4.8.1.2 and 4.20.

The various contours included in DP Figures 4-6 to 4-12 are based on the ranges of radionuclide concentrations listed in the legend on the figures. The ESRI ArcGIS, Version 9.2©[1] software was used to place the boundaries for each contour based on those concentration ranges. The boundaries were then manually re-positioned between samples belonging to the various ranges of concentration based on professional judgment. The decisions for final positioning of the boundaries included considerations of the magnitude of the specific sample being examined, and the concentration of the surrounding samples in close proximity.

During 2010 (subsequent to submitting the DP) Westinghouse performed coring of the concrete floors to more extensively characterize the depth of penetration and radionuclide contribution to contamination in concrete. After removing the concrete cores, Westinghouse was afforded the opportunity to obtain additional samples of the underlying soil/gravel fill. These sampling locations are illustrated on Figure 1, and the associated laboratory analytical data are provided in Table 1, below. Please note that these sample results are not included in the contour maps previously discussed.

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[1] **ESRI ArcGIS** is a trademark, registered trademark, or service mark of Esri in the United States, the European Community, or certain other jurisdictions.

Figure 1
Process Building Underlying Soil Sampling Locations - 2010

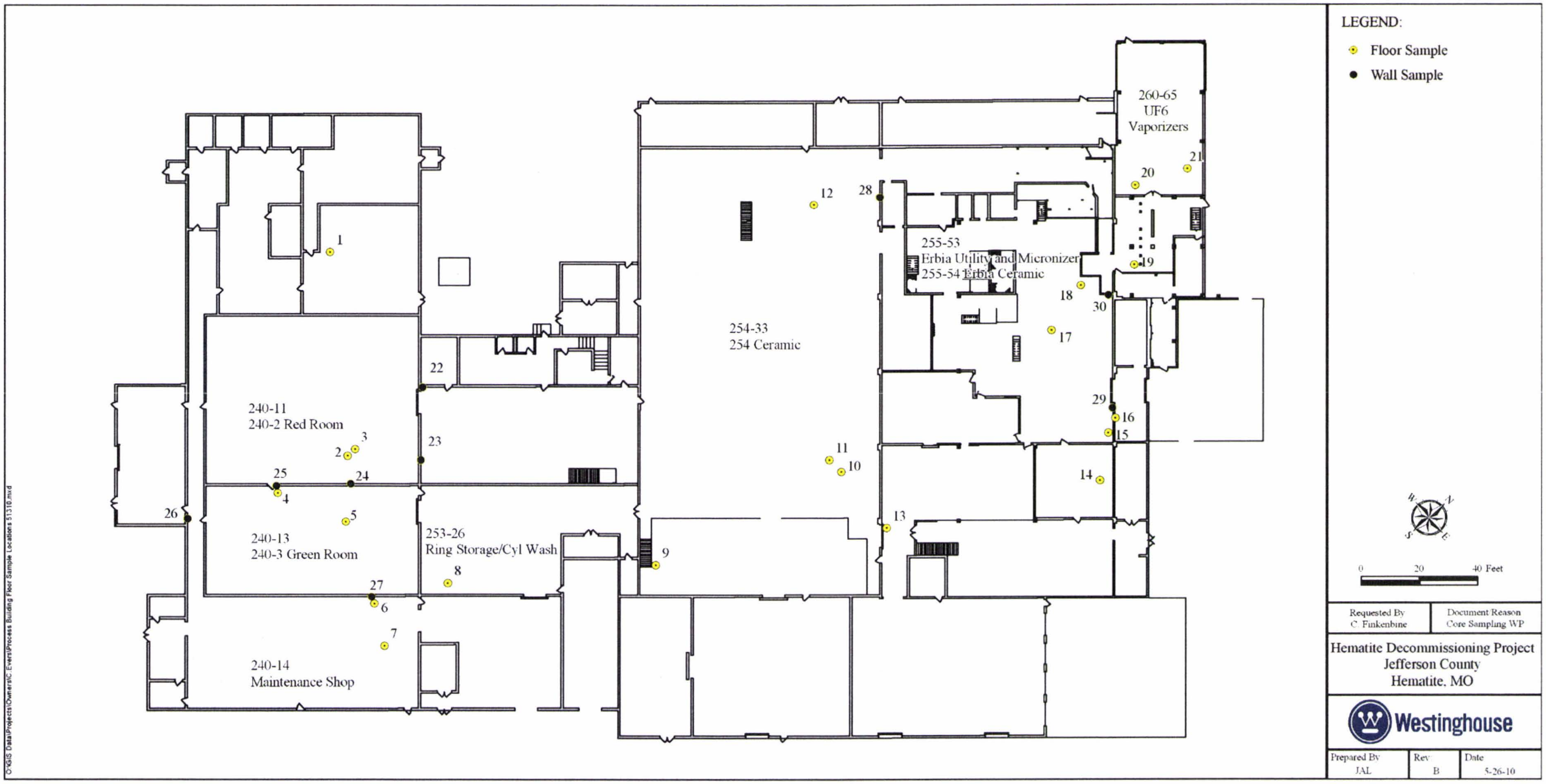


Table 1
Process Building Underlying Soil Sampling Data - 2010

Station ID	Building / Room	Wt % U235	Tc99 (pCi/g)			U234 (pCi/g)			U235 (pCi/g)			U238 (pCi/g)			Notes
			Results	MDA	2σ	Results	MDA	2σ	Results	MDA	2σ	Results	MDA	2σ	
1	240 Resp Wash	7.8	-0.40	2.4	0.87	28	N/A	N/A	1.5	0.15	0.41	2.8	1.8	3.4	1,2
2	240 Red Room	1.3	-0.13	1.7	0.83	0.87	N/A	N/A	0.045	0.10	0.13	0.56	0.25	0.30	N/A
3	240 Red Room	2.2	12	1.9	2.1	1842	N/A	N/A	100	0.82	11	685	2.75	73	1,2
4	240 Green Room	2	-0.18	1.9	0.83	427	N/A	N/A	23	0.37	2.6	178	1.68	22	1,2
5	240 Green Room	2.3	1.3	2.1	0.90	490	N/A	N/A	27	0.43	2.9	173	1.83	22	1,2
8	253	1.9	112	1.6	17	16	N/A	N/A	0.84	0.13	0.32	6.6	1.24	3.7	1,2
7	240 Maint. Shop	17.3	0.71	2.1	0.86	6.1	N/A	N/A	0.31	0.20	0.29	0.23	2.43	4.1	1,2
6	240 Maint. Shop	2.8	0.27	1.7	0.83	1.1	N/A	N/A	0.059	0.07	0.13	0.31	0.18	0.33	2,3
9	254	6.5	0.12	2.1	0.81	8.9	N/A	N/A	0.49	0.083	0.21	1.1	1.9	3.3	1,2
11	254	0.8	0.85	1.8	0.86	0.79	N/A	N/A	0.038	0.061	0.11	0.75	1.2	2.2	1,2
12	254	1.5	0.00	0.81	0.32	3	N/A	N/A	0.16	0.094	0.17	1.6	1.6	2.9	1,2
13	255	3.7	0.97	0.67	0.36	321	N/A	N/A	18	0.34	2.0	72	1.1	11	1,2
14	255 Erbia Lab	22.5	0.54	0.72	0.35	408	N/A	N/A	20	0.39	2.3	11	2.0	6.5	1,2
15	255	2.2	2.1	0.84	0.46	80	N/A	N/A	4.3	0.19	0.66	30	1.6	7.6	1,2
16	260 SW HVAC Rm	1.5	2.3	0.77	0.50	104	N/A	N/A	5.5	0.31	0.87	55	1.4	10	1,2
17	255	1.2	0.23	0.75	0.33	3.5	N/A	N/A	0.18	0.11	0.20	2.3	0.4	1.1	2,3
18	255 / 260	1.4	0.31	0.93	0.36	78	N/A	N/A	4.1	0.19	0.63	46	1.9	9.5	1,2
19	260	1.7	10	0.85	1.4	27	N/A	N/A	1.4	0.12	0.36	13	1.2	4.6	1,2
20	260 Dock	2.7	5.2	0.81	0.85	236	N/A	N/A	13	0.30	1.5	74	2.8	12	1,2
21	260 Dock	2.5	11	0.88	1.4	85	N/A	N/A	4.7	0.23	0.68	28	2.0	8.2	1,2

Notes:

1. Values for U-238 are based on Pa-234m being in equilibrium with U-238.
2. Values for U-234 are calculated based on a U-238 to U-235 ratio in accordance with Section 14.1.4.3.3 of the DP.
3. Values for U-238 are based on Th-234 being in equilibrium with U-238.

7. (HDP-4-Q7) Comment: Figure 4-11 Impacted Area – Sub-Surface Soil Contamination – Th-232 shows that the Burial Pits Soils have a thorium-232 mean specific activity of 34.74 pCi/g and a maximum of 6870 pCi/g. The legend shows that this area is well within the red colored areas used to designate these activity levels but there is no red colored areas identified.

   Path Forward: Update Figure 4-11 to reflect the burial pit soil data consistent with the legend for the Figure.

Westinghouse Response:

Figure 4-11 is updated to reflect the burial pit soil data consistent with the legend for the Figure. Only the portion of the Burial Pit Soils that exhibited elevated Th-232 is shaded red.

In addition to better identify the shaded areas, sample locations outside of the shaded areas have been removed from DP Figure 4-8, Impacted Area – Surface Soil Contamination – Th-232, and Figure 4-11, Impacted Area – Sub-Surface Soil Contamination – Th-232 so that the shaded contours can be better discerned. Additionally, to assist in the review of these figures, the sample IDs for the remaining sample points that are relevant to the evaluation of Th-232 have been added.

The updated figures are shown below; the DP will be revised accordingly.

Figure 4-8
Impacted Area – Surface Soil Contamination – Th-232

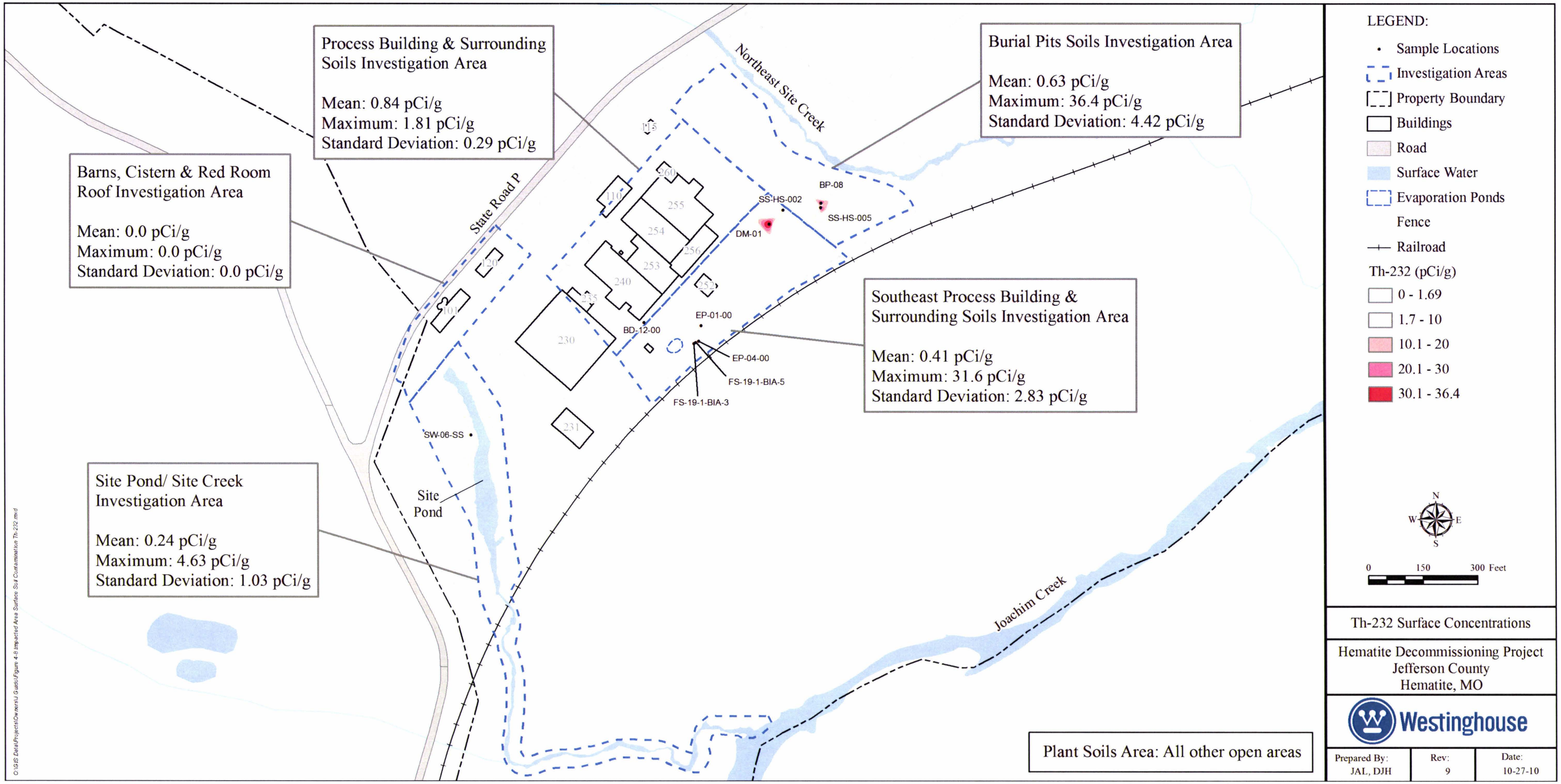
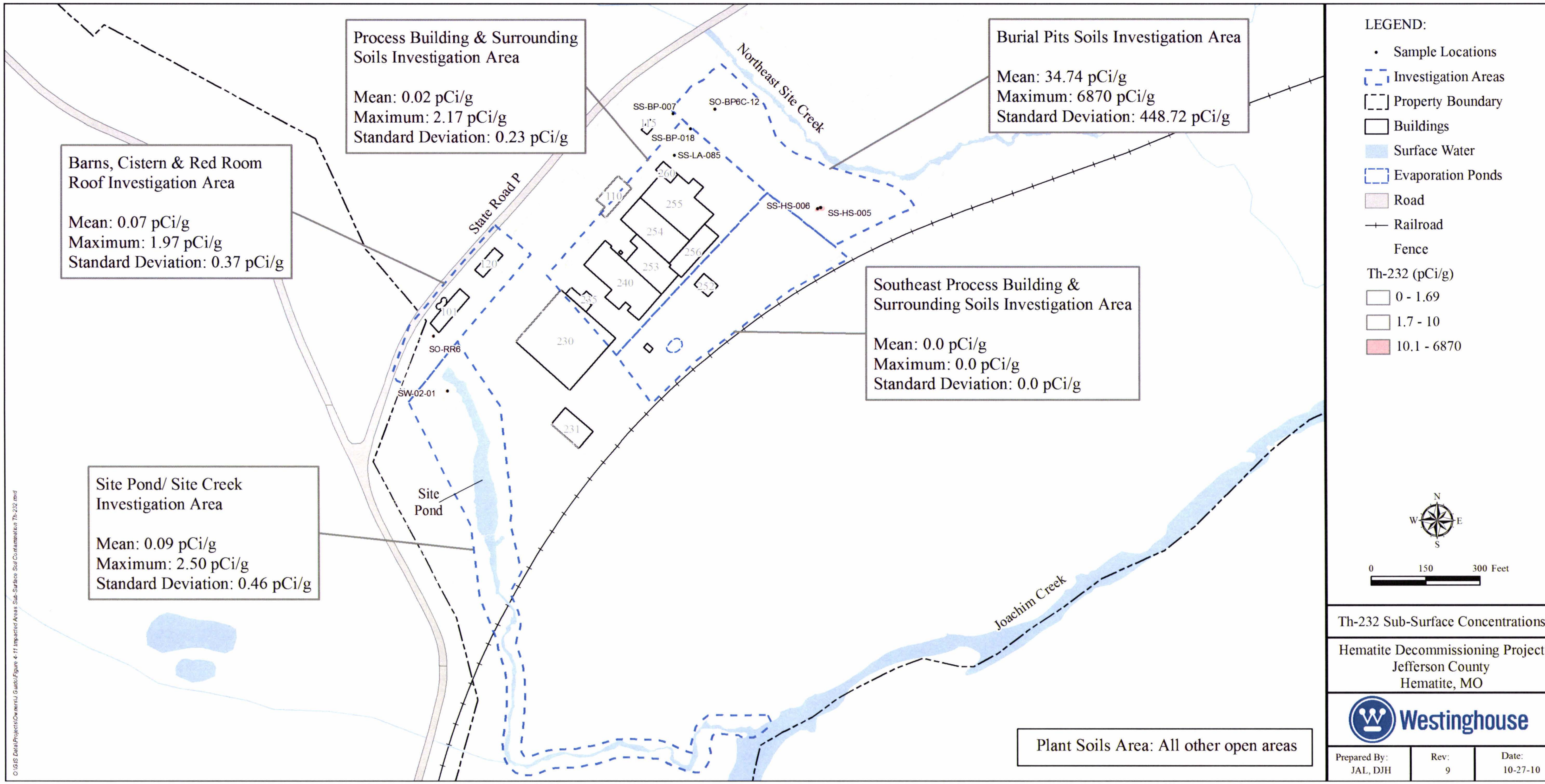


Figure 4-11
Impacted Area – Sub-Surface Soil Contamination – Th-232



8. (HDP-4-Q8) Comment: It is indicated in HDP Section 4.5.4, that additional monitoring wells will be installed in the vicinity of the hybrid wells with positive indications of the presence of radionuclides. The purpose of these wells will be to determine if the radionuclides detected in the sand/gravel aquifer were caused by the well screen extending from the overburden to the underlying sand/gravel aquifer.

   Path Forward: Provide an update on the proposed investigation of the sand/gravel aquifer where radionuclide-impacted hybrid wells were involved. Include well construction and monitoring data for all the monitoring wells used in the investigation.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

9. (HDP-4-Q9) Comment: Table 4-28 and Table 4-29 summarized groundwater monitoring data based on all sampling data and provided statistics of a subset with values above the respected detection limits for all of the hydrogeologic units. The detailed analytical data of each monitoring well from different sampling events were not included.

   Basis: Due to the lack of spatial and temporal information, the staff cannot evaluate the monitoring data provided in these tables to determine whether the spatial and temporal extent of radionuclides is adequately defined in each hydrostratigraphic units.

   Path Forward: Provide a monitoring data table for each of the different hydrostratigraphic units. Include in the table field information (e.g. pH and Redox potential measurements), and analytical results of samples. Also attach a map with monitoring well location and important radionuclide concentrations for each different hydrostratigraphic units.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

10. (HDP-4-Q10) Comment: Statistical results of surface water monitoring were given in Table 4-27. However, the locations for the monitoring stations and analytical data were not included.

    Path Forward: Provide a monitoring data table for each monitoring station, with an updated Figure 4-13 showing the surface water monitoring stations.

Westinghouse Response:

DP Figure 4-13 is updated to include the surface water sampling locations. A copy of the updated DP Figure 4-13 is provided below.

Please note that HRCR Table 4-4 contains the surface water monitoring data used to generate the statistical results in DP Table 4-27; HRCR Table 4-4 is not duplicated in the DP. Additionally, please note that during review of DP Table 4-27, it was determined that the statistical results for Am-241 and Np-237 were incorrectly listed. This table has been revised and an updated DP Table 4-27 is provided below; the DP will be revised accordingly.

Figure 4-13
Surface Water Features

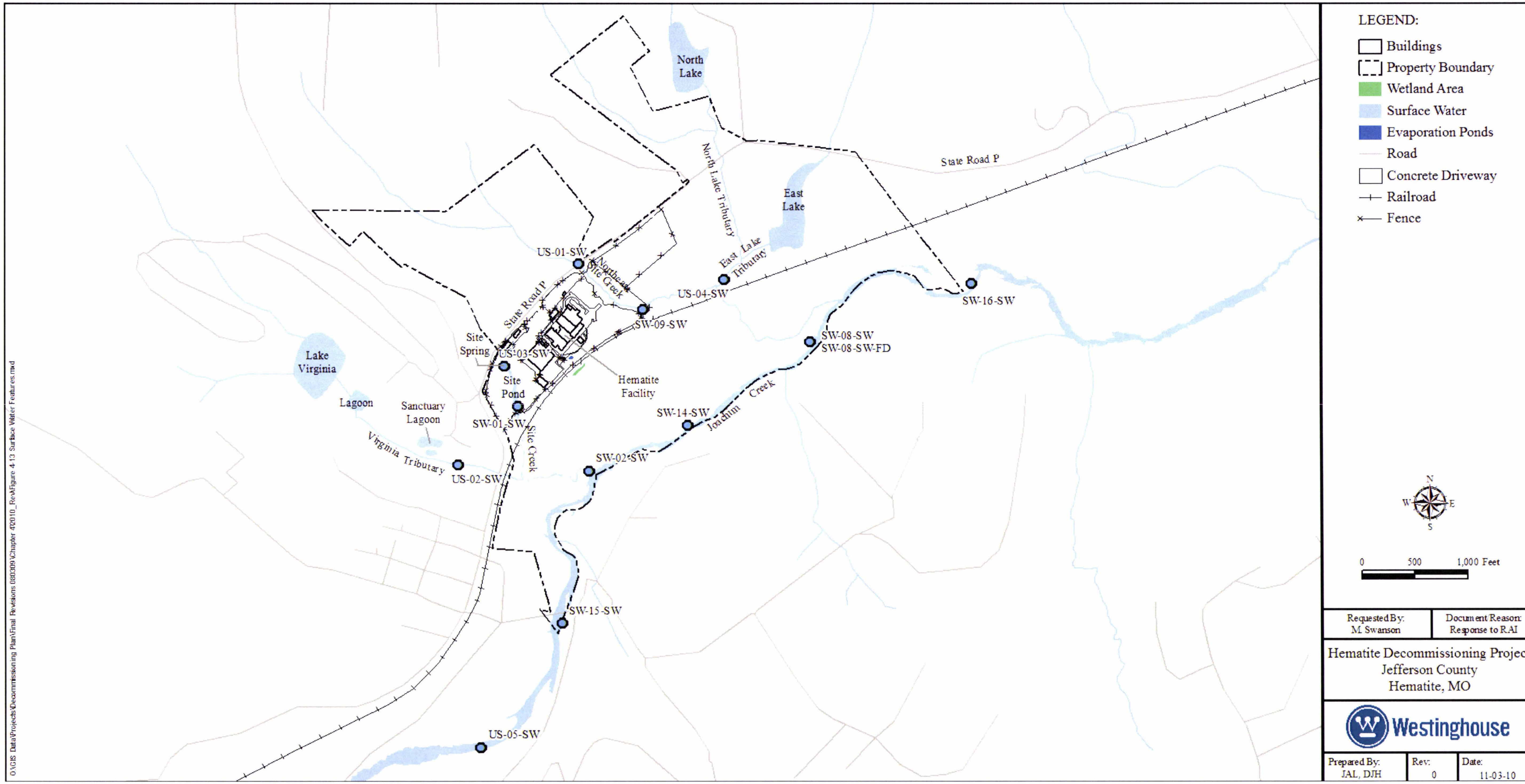


Table 4-27 **Page 1 of 1**

Statistical Results of Surface Water

Statistic [a]	Am-241 (pCi/L)	Np-237 (pCi/L)	Pu-239/240 (pCi/L)	Ra-226 [b] (pCi/L)	Ra-226 [c] (pCi/L)	Tc-99 (pCi/L)	Th-232 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total Uranium (pCi/L)	% Enrich. (U-235)
Background Surface Water												
No. of Detects	0	0	0	0	0	0	0	5	1	5	1	1
No. of Non-Detects	0	0	0	0	0	5	5	0	4	0	4	4
Detection Frequency	NA	NA	NA	NA	NA	0.0%	0.0%	100.0%	20.0%	100.0%	20.0%	20%
Max. Concentration	NA	NA	NA	NA	NA	3.2	0.03	0.68	0.06	0.74	1.5	1.7%
Min. Concentration	NA	NA	NA	NA	NA	-2.3	-0.01	0.44	0.01	0.22	0.67	1.7%
Mean Concentration	NA	NA	NA	NA	NA	0.77	0.01	0.53	0.04	0.36	0.93	1.7%
Standard Deviation	NA	NA	NA	NA	NA	2.1	0.02	0.09	0.02	0.22	0.31	NA
Surface Water												
No. of Detects	0	0	0	0	0	0	0	8	7	8	7	7
No. of Non-Detects	0	0	0	0	0	8	8	0	1	0	1	1
Detection Frequency	NA	NA	NA	NA	NA	0.0%	0.0%	100.0%	87.5%	100.0%	87.5%	87.5%
Max. Concentration	NA	NA	NA	NA	NA	2.4	0.03	29.6	1.2	1.1	32.0	14.5%
Min. Concentration	NA	NA	NA	NA	NA	-0.98	-0.01	0.48	0.00	0.15	0.64	1.3%
Mean Concentration	NA	NA	NA	NA	NA	0.94	0.01	4.5	0.22	0.48	5.2	4.6%
Standard Deviation	NA	NA	NA	NA	NA	1.1	0.01	10.1	0.42	0.33	10.8	4.5%

[a] Calculation of statistics included all analytical data regardless of whether the result was detectable except for Total Uranium and % Enrich. in which only results greater than MDC were included in the calculation.

11. (HDP-4-Q11) Comment: Some of the values for the concentration of radionuclides in Tables 4-28 and 4-29 appear inconsistent with each other.

    Basis: The maximum value for Tc-99 in the Sand/Gravel aquifer is 13.4 pCi/L in Table 4-28 and 5.95 pCi/L in Table 4-29. Similarly, the maximum values for U-234, U-235, and U-238 in the Overburden Unknown Screen Depth are different in the two tables. The text states that the difference between the two tables is that Table 4-29 only includes data that exceed the analytical detection limit and that the quality control data have been removed. The removal of the quality control data and the measurements that were less than the analytical detection limit should not have affected the maximum values measured.

    Path Forward: Provide clarification about the difference in the values between these two tables.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

12. (HDP-4-Q12) Comment: Groundwater is defined in NUREG-1757, Vol. 2 as water contained in pores or fractures in either the unsaturated or saturated zones below ground level. Westinghouse's utilization of the term leachate does not negate the fact that there is radiological contamination in the groundwater.

    Basis: The radiological contamination in the groundwater of the overburden unit is the result of activities performed during the period in which Hemtatite's was licensed. This must be considered as residual radioactivity. To meet the unrestricted release criteria of §20.1402, groundwater sources of drinking water and residual radioactivity must be accounted for in Westinghouse's assessment of the contamination of the site and in their performance assessment.

    Path Forward: Provide a discussion and figures to illustrate the extent of the groundwater contamination for each radiological contaminant in the overburden (i.e., found above the bedrock aquifier, the clay and sand/gravel layer). The figures should show by well name and/or number the extent of the contamination and the activity found in each well for that sampling event. Figures should be provided for multiple sampling events that best represent temporal and spatial changes seen for contaminants in the groundwater of the overburden.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

13. (HDP-4-Q13) Comment: The information provided does not allow the staff to determine whether the background bedrock monitoring wells are located in appropriate sampling locations.

Basis: Figure 3-32 in the HDP indicates that well BR12RB may be downgradient of the site, but the figure lacks sufficient detail to provide a clear understanding of the groundwater flow regime. This ambiguity is significant because bedrock well BR12RB appears to have the highest level of 234U when compared to all other bedrock well data provided in the Radiological Characterization Report.

Path Forward: Provide figures for all bedrock well locations. The figures should include detailed potentiometric elevation maps for each bedrock unit pre and post Festus municipal well shut down.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

14. (HDP-4-Q14) Comment: The background statistical data for bedrock wells BR12RB and BR12JC are not provided in Table 4-1 of the Hematite Radiological Characterization Report.

Basis: The background statistical data for bedrock wells BR12RB and BR12JC is necessary to establish a better understanding of the methodology used for the background statistical evaluation.

Path Forward: Provide the background statistical data for bedrock wells BR12RB and BR12JC. Also provide a discussion that should include the statistical method used to determine background conditions, number of samples used in the analysis and a table to further summarize the results.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

15. (HDP-4-Q15) Comment: Table 4-28 shows that the maximum concentrations of gross alpha and gross beta exceed background levels established for the bedrock aquifers and EPA drinking water standards.

Basis: Gross alpha and gross beta measurements provide indications whether drinking water aquifers were impacted due to activities performed by the licensee.

Path Forward: Evaluate the nature and extent of gross alpha and gross beta in the bedrock aquifers at the Hematite site and any relationship to total uranium concentrations in these aquifiers.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

16. (HDP-4-Q16) Comment: Hybrid wells screened in both the overburden clay and sand/gravel aquifer have the potential to create a hydraulic interconnection between the two overburden units.

    Basis: Contamination in the overburden units has the potential to migrate vertically downward and impact bedrock drinking water supplies as evidenced in the nature and extent of chlorinated hydrocarbon contamination that originated at the Hematite site.

    Path Forward: Evaluate the relationship between radiological contamination found in the hybrid wells and water quality in the lower aquifer-units.

Westinghouse Response:

Response to this RAI will be provided under separate correspondence.

Hematite Decommissioning Plan Chapter 6 - Environmental Information

1. (HDP-6-Q1) Comment: In HDP Section 6.1.1, a wetland area is identified but the section does not provide what, if anything is going to be done during decommissioning with respect to the wetlands.

   Path Forward: Provide what remediation actions will be taken relative to the wetland area on the Hematite site.

Westinghouse Response:

This isolated wetland is an artifact of the drainage ditch to the south of the active rail line. There are no planned activities at or near this wetland; therefore, the wetland will not be disturbed during the course of remedial actions.

The second and third sentences of DP Section 6.1.1 are replaced with: "The single potential wetland identified on the site is located in a small depression south of the active rail line between the railroad berm and a gravel road that goes from the Central Tract Area south towards Joachim Creek (See Figure 6-1). This potential wetland is a small, isolated forested/scrub area confined to the southeast by the gravel road, and to the north and northwest by the railroad berm. There are no planned activities at or near this wetland; therefore, the wetland will not be disturbed during the course of remedial actions."

2. (HDP-6-Q2) Comment: In HDP Section 6.1.2, it is stated that the Site Creek/Pond and the Northeast Site Creek could potentially require remediation to remove contamination in sediment and nearby soil. Given this uncertainty, there is a potential for inadequate financial assurance since those decommissioning tasks are ill defined.

   Path Forward: Describe the remediation actions which will be taken for the Site Creek/Pond and the Northeast Site Creek. If actions have not been determined, provide which actions are under consideration and describe how these potential actions have been accounted for with respect to ensuring adequate decommissioning funding.

Westinghouse Response:

Summary:

Westinghouse has addressed planning for remediation and FSS of the Site Pond/Creek and Northeast Site Creek, and these plans have been included in the decommissioning funding estimates, as well as any required chemical sampling activities to demonstrate compliance to the Remediation Goals (RGs).

Discussion:

The remediation of the Site Creek will be performed as an integrated activity with that of the Site Pond. Performing the remediation in this manner allows for a cost-effective sharing of resources that will result in a minimal schedule increase that should not exceed one week. Material costs for the extension of the Site Pond diversion are also expected to be minimal. The increase in waste volumes can be easily absorbed in the current waste estimates with an anticipated relative increase of less than 0.13% in total anticipated waste inventory.

DP Section 8.5.3.4 discusses the work activities involving the remediation of the Site Pond, Site Creek, and surrounding soils and sediments. DP Section 8.6.2 discusses water diversion for the Site Pond/Creek and the Northeast Site Creek to support decommissioning. DP Figure 4-4 shows both the Site Pond/Creek and the Northeast Site Creek as part of the impacted area. DP Section 14.4.2.3 details the conceptual approach for the configuration of the Final Status Survey (FSS) units for open land areas, as shown in DP Figure 14-14. DP Figure 14-14 includes the open land areas of the Site Creek/Pond in a conceptual Class 1 survey units and the Northeast Site Creek in a conceptual Class 3 survey unit with a portion crossed by a haul road designated as part of a conceptual Class 2 survey unit. Accordingly, Westinghouse has addressed planning for remediation and FSS of the Site Pond/Creek and Northeast Site Creek, and these plans have been included in the decommissioning funding estimates, as well as any required chemical sampling activities to demonstrate compliance to the Remediation Goals (RGs).

The last paragraph of DP Section 6.1.2 is revised to state: "Water flow for the Site Creek/Pond and the Northeast Site Creek are planned to be diverted to support decommissioning as discussed in Section 8.6. Remediation of the Site Creek/Pond is addressed in Section 8.5.3.4 and conceptual Class 1 survey units are identified in Figure 4-14. The Northeast Site Creek does not require remediation and is in a conceptual Class 3 survey unit with a portion crossed by a haul road designated as part of a conceptual Class 2 survey unit."

Additional information on the decommissioning activities for the Northeast Site Creek and the Site Pond/Creek are provided below;

Northeast Site Creek: Remediation actions for contamination in soil/sediment are not currently anticipated for the Northeast Site Creek. The characterization data for the region of the Northeast Site Creek show that soil concentrations do not exceed the proposed DCGLs and no chemical sample results exceeded the RGs. Current planned remediation actions do provide for the diversion of the Northeast Site Creek in the event that hydrostatic pressure from the stream flow would impact the excavation and exhumation actions within the Burial Pits Area. Recent site modifications to the area of the Northeast Site Creek culvert near State Road P should allow for a more confined flow of surface water, and limit any overflow to the area adjacent to northeast section of the Burial Pits Area. Containing the flow of the creek will relieve much of the hydrostatic pressure from standing or slow moving surface water. As such, diversion of the creek may be unnecessary.

Site Pond/Creek: DP Section 8.5.3.4 presents the remediation actions planned for the Site Pond and surrounding soils and sediments. Remediation actions include diversion of the upstream flow of the Site Creek to a location near the railroad culvert, and draining the Site Pond. Excavation and removal of the sediments and soils of the Site Pond and surrounding soils will then be performed, followed by restoration of the area. Additional remediation may be performed of the Site Pond concrete dam if residual contamination is determined to be present. Remediation may include washing and cleaning the concrete dam.

Remediation actions to be taken for contamination in soil/sediment within the Site Creek may extend from the south side of the Site Pond Dam to the railroad culvert crossing. The most recent radiological characterization data for the Site Creek southeast of the Site Pond concrete dam and Outfall #1 indicate the presence of isolated residual contamination that would exceed the proposed surface DCGLs. Table 2 below presents the radiological sampling data obtained from the portion of the Site Creek between the downstream side of the concrete dam and Outfall #2, to the railroad culvert. Analytical results for Samples 0473-SS-90318-0-5 and 0472-SS-90318-0-6, indicate that sediments and surrounding soils from these locations exceed the Sum of Fraction (SOF) for the proposed Surface Derived Concentration Guideline Limits (DCGLs) for Uranium 234, U-235+D, and U-238+D. Samples were collected to a depth of 6-inches. Figure 2 below illustrates the location of the samples collected from the area of the Site Creek.

Based upon this newly available data, it is expected that the area of the Site Creek immediately downstream of the Site Pond concrete dam and Outfall #1 will be excavated to a distance of roughly 50-feet downstream, and to a width of roughly 25-feet. The excavation is expected to be performed to a 1-foot depth. Estimated waste volumes from the excavation are 1,250 cubic feet.

The remediation of the Site Creek will be performed as an integrated activity with that of the Site Pond. Performing the remediation in this manner allows for a cost-effective sharing of resources that will result in a minimal schedule increase that should not exceed one week. Material costs for the extension of the Site Pond diversion are also expected to be minimal. The increase in waste volumes can be easily absorbed in the current waste estimates with an anticipated relative increase of less than 0.13% in total anticipated waste inventory.

Table 2
Site Creek Radioanalytical Results

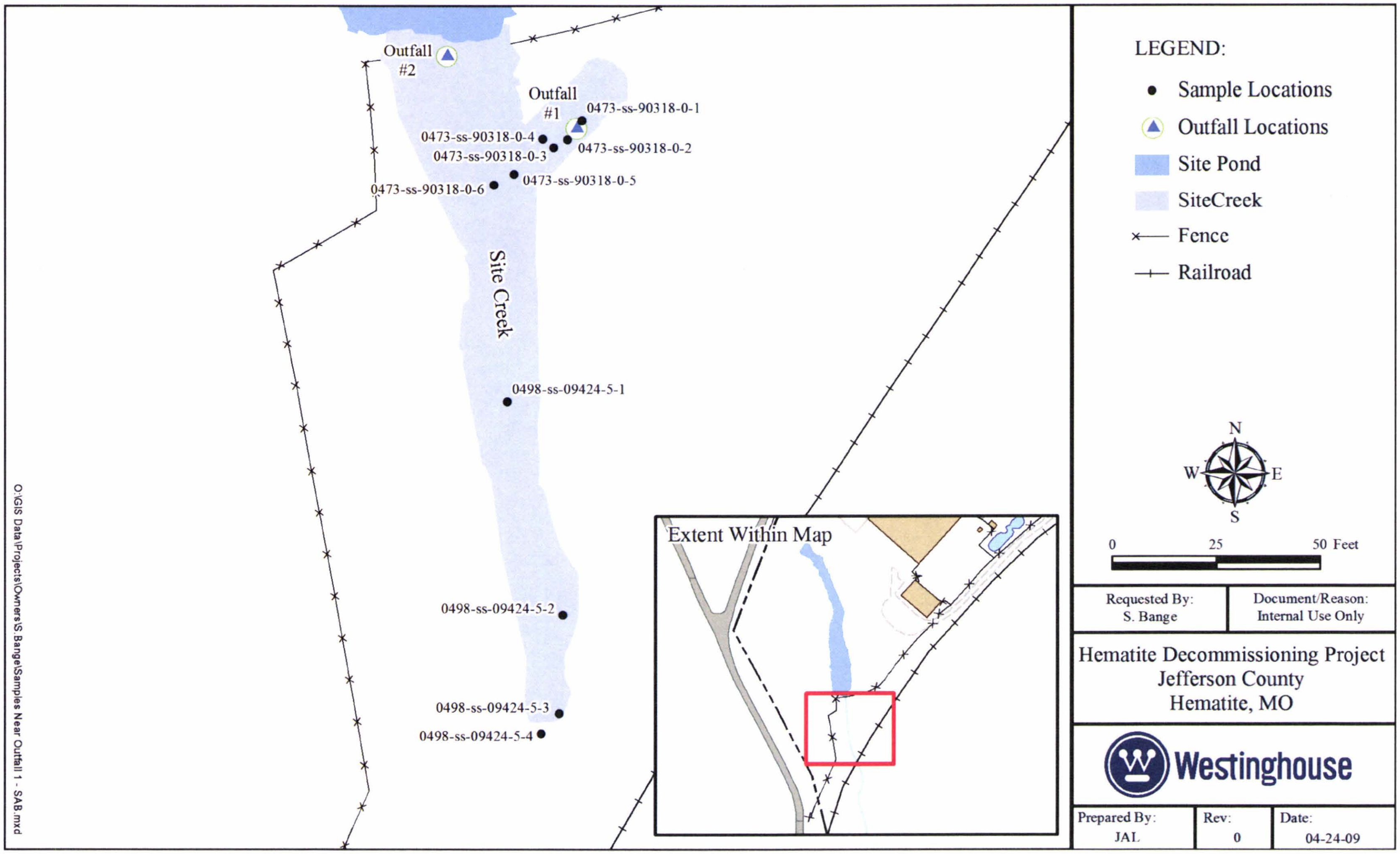
SAMPLE ID	Ac-228 (pCi/g)	Pa-234M (pCi/g)	Ra-226 (pCi/g)	Tc-99 (pCi/g)	Th-232 (pCi/g)	Th-234 (pCi/g)	U-234** (pCi/g)	U-235 (pCi/g)	U-238* (pCi/g)	SOF***
0473-SS-90318-0-1	0.98	23.7	1.18	5.84	0.98	18.2	87	4.8	23.7	0.32
0473-SS-90318-0-2	1.29	31.8	1.54	16.7	1.29	24.8	142	7.86	31.8	0.54
0473-SS-90318-0-3	1.11	57.3	1.69	26	1.11	48.2	261	14.4	57.3	0.96
0473-SS-90318-0-4	1.18	64.1	1.56	33	1.18	32.6	270	14.9	64.1	1.05
0473-SS-90318-0-5	1.3	85	1.69	64.9	1.3	71.7	391	21.6	85	1.60
0473-SS-90318-0-6	1.59	91	2.46	30.1	1.59	122	576	31.8	91	1.83
0498-SS-09424-5-1	0.98	24.3	1.07	6.5	0.98	17.5	73	4	24.3	0.29
0498-SS-09424-5-2	0.78	12.2	0.804	11.1	0.78	7.3	44	2.44	12.2	0.21
0498-SS-09424-5-3	0.83	3.2	0.92	0.2	0.83	1.37	2.5	0.11	3.2	0.02
0498-SS-09424-5-4	0.83	2	1.23	0.03	0.83	1.86	1.6	0.07	2	0.01

* Based on Protactinium-234m
** Calculated based on U-235/U238 ratio
*** SOF calculated using DCGL values from DP

DCGL Values used in calculations

	U234 (pCi/g)	U235 (pCi/g)	U238 (pCi/g)	Tc-99 (pCi/g)
Surface - DP	540	108.7	316.1	160.3

Figure 2
Recent Sample Locations for Site Creek



3. (HDP-6-Q3) Comment: In HDP Section 6.2, it is stated that a letter was received from U. S. Fish and Wildlife Service which indicated "...no federally listed, proposed or candidate species or critical habitat occurs on or near the project site...". This letter is outdated; consequently, information on Federally-listed species and habitat needs to be updated.

   Path Forward: Westinghouse should secure from the U. S. Fish and Wildlife Service updated information on Federally-listed species and habitats. The DP should be revised reflect this information, including the date it was acquired.

Westinghouse Response:

Westinghouse contacted the U.S. Fish and Wildlife Service concerning the potential need to update the information documented in the letter from the U.S. Fish and Wildlife Service to the NRC dated December 10, 2004. The U.S. Fish and Wildlife Service indicated that "there are no changes to the threatened and endangered species or the critical habitat in the project area" and that the information provided to the NRC in the December 10, 2004 letter is still valid. A copy of the e-mail correspondence received from the U.S. Fish and Wildlife Service on October 21, 2010, is provided below as Figure 3.

Westinghouse routinely reviews the U.S Fish and Wildlife publication of Federally listed Threatened, Endangered, Proposed, and Candidate Species for any changes in species or habitat that may affect the project. If a change is noted, the U.S. Fish and Wildlife Service will be consulted.

Figure 3

E-Mail from U.S. Fish and Wildlife Service

From: Rick_Hansen@fws.gov Sent: Thu 10/21/2010 3:41 PM
To: Swanson, Martin B. (SAIC)
Cc: Charlie_Scott@fws.gov; Ellie_Milligan@fws.gov
Subject: T & E evaluation for the Decommissioning Site in Hematitie, MO

Mr. Swanson:

I understand that you talked with Ellie Milligan of our office and provided information in an e-mail (dated 10/20/2010) concerning an evaluation that our office made in 2004 about possible impacts to federally listed threaten and endangered species from the Hematite Decommissioning Site in Hematite, Missouri. There are no changes to the threatened and endangered species or the critical habitat in the project area. Therefore, the information provided in our December 10, 2004 letter to Mr. Amir Kouhestani of the U.S.
Nuclear Regulatory Commission is still valid. If plans should change, then it may be necessary to reinitiate consultation under Section 7 of the Endangered Species Act of 1973, as amended.

If you have further questions, please contact me at the address below.

Rick L. Hansen
U.S. Fish and Wildlife Service
Ecological Services
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203
573-234-2132, ext. 106
fax 573-234-2181
rick_hansen@fws.gov

Hematite Decommissioning Plan Chapter 7 – ALARA Analysis

1. (HDP-7-Q1) Comment: Section 7.4 of the HDP provides an As Low As Reasonably Achievable (ALARA) evaluation for residual radioactivity levels for building surfaces. In Section 7.4.1, Westinghouse provides the basis for concluding that washing of walls is not justified by the ALARA evaluation. The NRC staff considers the basis for that conclusion to be insufficient.

   Basis: In Section 7.4 of the HDP, on page 7-12, Westinghouse provides results of the calculation for washing walls, in terms of a ratio of concentration [average concentration being evaluated] to the $DCGL_W$, or $Conc/DCGL_W$. Results are provided for cases of zero and 0.07 (7%) discount rates. For zero discount rate, the $Conc/DCGL_w$ result is 0.21, which generally indicates that if the actual average concentration is greater than 21% of the $DCGL_W$, then washing of walls should be performed. Westinghouse indicates that use of a zero discount rate is considered overly conservative "...based on the effort and practicality of performing surveys for residual contamination levels at 21 percent of the DCGL, and the costs to remediate to 21 percent of the DCGLs." The NRC staff considers this statement unsupported by the ALARA calculation. The calculations are intended to address costs of performing the action being evaluated (which can include costs of surveys and costs of needed remediation), so if costs have been factored into the calculation, the calculation result provides the indication of whether the costs are reasonable for the benefit. In this case, the result (value of 0.21) appears to indicate that costs are reasonable for the benefit, when the concentration averages greater than 21% of the DCGL.

   In addition, NRC guidance in NUREG-1757, Vol. 2, Chap. 6 and Appendix N, states that for ALARA during decommissioning, all licensees should use typical good-practice efforts such as floor and wall washing and removal of readily removable radioactivity in buildings. This indicates that washing building surfaces is usually considered a good-practice effort, and should usually be considered ALARA, independent of the results of the cost-benefit ALARA evaluation. Westinghouse has not provided justification that building surface washing should not be performed as a good-practice ALARA effort. The NRC staff concludes that the current ALARA evaluation has not sufficiently justified not performing building surface washing.

   Path Forward: Please commit to washing building surfaces or provide a clear justification that such washing is not ALARA.

Westinghouse Response:

Between the time that the Decommissioning Plan (DP) was submitted and the receipt of this RAI, as a good practice after submitting the DP in August 2009, the majority of the discrete areas of elevated activity were decontaminated and/or removed as necessary such that all surfaces (excluding the floor drains, which will be further characterized for appropriate disposition) currently meet the more stringent limits for unrestricted release specified in the SNM-00033 License[2]. Additionally, surfaces were cleaned to the extent that the *maximum individual measurement* of removable surface contamination at this time is less than the administrative limit for clean areas which is 200 dpm/100cm^2, and less than 11 percent of the DCGL . From the perspective of implementing good practices to reduce residual contamination to levels that are ALARA, HDP does not believe there is a need for a commitment to *further* decontaminate building surfaces unless elevated activity is identified during the final status survey.

The historical sequence of decontamination activities for these buildings began during 2004 when the equipment used for fuel fabrication was removed from Building 230 and the building floor surfaces were decontaminated. Radiological surveys of floor and wall surfaces were performed using operational procedures to release the building from radiological control. During 2007, extensive characterization surveys of Buildings 230, 231 and 110 were conducted that identified discrete locations of elevated surface activity within Building 230, and within some of the floor drains within Buildings 230 and 110. The discrete surface areas within Building 230 included; three short sections of ventilation ducting; approximately twenty discrete locations within concrete floor seams, anchor bolt holes and within a utility trench; the floor within the KARDEX room; and portions of the floors within the bathrooms. No elevated measurements were obtained from the Overhead Surfaces, including the walls or ceilings. The radiological conditions at the time of DP submittal are provided in HRCR Tables 4-54 through 4-59.

From a computational perspective based on ALARA calculations consistent with *NUREG/BR-0058, Revision 4, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission"*, two sets of base case estimates have now been developed and presented; one using a 7 percent and another using a 3 percent discount rate (parameter "r"). The threshold fractions of the DCGL where washing surface may be warranted are 1.02 and 0.49 for 7 and 3 percent, respectively. Although the calculation using a discount rate of 7 and 3 percent both show that the residual levels of contamination and associated DCGLs are ALARA, HDP believes that a discount rate of 7 percent is appropriate since NUREG/BR-0058, Revision 4 indicates that the 7 percent rate is applicable to the use of capital in the private sector. Additionally, the lifetime of the buildings is limited (e.g., 70 years), and the detriment from residual contamination will not be significantly intergenerational given the relative impermanent existence of the buildings.

The incremental costs associated with additional decontamination by surface washing and incremental dose avoidance were not evaluated since the current level of removable surface contamination is less than 11 percent of the DCGL , and substantially less than the threshold.

The text following the definitions of parameters through the end of DP Section 7.4.1 is revised to state:

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[2] "Release of equipment and materials from restricted areas to controlled areas or off-site in accordance with the NRC's Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated 1993.

"Assuming a reasonable waste volume of 0.227 m^3 and disposal cost of $1,100/$m^3$, the calculation yield a value which is approximately 1.02 times the established DCGLs (see Table 7-5). NUREG/BR-0058, Revision 4, 'Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission' indicates that the 7 percent rate approximates the marginal pretax real rate of return on an average investment in the private sector, and is applicable to the use of capital in the private sector. When a discount rate of 0.07 is used, the results indicate that the residual contamination levels and associated DCGLs are ALARA.

$$\frac{\text{Conc}}{\text{DCGL}_W} = \frac{\$650}{\$2{,}000 \times 0.09 \times 0.025 \times 0.10 \times 100} \times \frac{0.07 + 1.55\text{E}-10}{1 - e^{-(0.07+1.55\text{E}-10)70}} = 1.02$$

Calculations were also performed using a 0.03 monetary discount rate. The results below show that applying a 0.03 discount rate for building surfaces as a conservative assumption yields a value which is approximately 49 percent of the established DCGLs (see Table 7-5):

$$\frac{\text{Conc}}{\text{DCGL}_W} = \frac{\$650}{\$2{,}000 \times 0.09 \times 0.025 \times 0.10 \times 100} \times \frac{0.03 + 1.55\text{E}-10}{1 - e^{-(0.03+1.55\text{E}-10)70}} = 0.49$$

The guidance in NUREG/BR-0058 is directly applicable to this analysis, as it involves decision-making relative to 'the use of capital in the private sector' and involves the relatively short lifespan of 70 years for buildings when considering intergenerational factors. As the results above indicate, application of a discount rate of 0.07 indicates the DCGLs are reasonable and ALARA. Subsequent to Revision 0 of this DP, Westinghouse performed decontamination operations on the accessible building surfaces as necessary to reduce the maximum individual measurement of removable surface contamination to less than 200 dpm/100 cm^2, which is approximately 11 percent of the DCGL, based on 10 percent of the total surface contamination being in a removable form. Since the current level of removable surface contamination is less than 11 percent of the DCGL, the incremental costs associated with additional decontamination by surface washing and incremental dose avoidance were not evaluated.

Table 7-5 provides the results of additional calculations using alternative estimates for waste volume, and a typical cost per unit volume of waste."

2. (HDP-7-Q2) Comment: Section 7.4.2 of the HDP provides an ALARA evaluation for scabbling building surfaces and a conclusion that scabbling is not reasonable. The NRC staff considers the basis for that conclusion to be insufficient.

   Basis: Westinghouse provides an initial calculation for zero discount rate, which has a result of 0.21, indicating that scabbling could be reasonable for ALARA when concentrations average greater than 21% of the DCGL. However, Westinghouse further indicates that further reduction of DCGLs is likely to result in additional remedial actions and costs, which were not considered in the initial calculation. Westinghouse then provides an *example* that further reduction in DCGLs *could* require certain actions and cost. However, it is not stated that these actions will be required; this appears to be only an example. The result of the revised calculation is a $Conc/DCGL_w$ value greater than 1, which would indicate that reduction of DCGLs with scabbling is not justified. However, if the revised calculation is just an example, that would seem to NRC staff to indicate that scabbling may be ALARA in some cases but not in others. NRC staff considers that if this is only an example, then Westinghouse has not sufficiently justified that the action (scabbling and reduction of DCGLs) is not reasonable to take.

Path Forward: Please clarify which calculations in Section 7.4.2 are representative for scabbling building surfaces. In particular, please clarify whether the revised calculation for zero discount rate is representative, or is just an example that *might* apply. If that calculation is an example, please address how other possible example calculations would impact the conclusions of the ALARA evaluation (i.e., given that the initial calculation provides a conflicting result (less than 1)).

Westinghouse Response:

Between the time that the Decommissioning Plan (DP) was submitted and the receipt of this RAI, Westinghouse had decontaminated accessible surfaces within the buildings that are to remain that had slightly elevated radioactivity. The average total surface contamination levels at this time do not exceed 20 percent of the DCGL. The response to RAI HDP-7-Q1 contains the detailed explanation on the application of discounts rates to calculations for the DP, and the appropriateness of a discount rate of 7 percent for buildings. The first calculation at the top of Page 7-14 that used a 0 percent discount rate was provided only as an example. The second calculation at the top of page 7-14 used a discount rate of 7 percent, and is the appropriate calculation for evaluating the cost/benefit of scabbling building surfaces.

HDP believes that a discount rate of 7 percent is appropriate since NUREG/BR-0058, Revision 4, *"Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission"* indicates that the 7 percent rate is applicable to the use of capital in the private sector. Additionally as noted in above, the building surfaces have been decontaminated to the extent that average total surface contamination levels do not exceed 20 percent of the DCGL; and the lifetime of the buildings is limited (e.g., 70 years) thus the detriment from residual contamination will not be significantly intergenerational given the relative impermanent existence of the buildings.

To address the NRC's concern "how other possible example calculations would impact the conclusions of the ALARA evaluation," please see Table 7-5 in the ALARA chapter. The value for the total cost, $Cost_T$, used in the example calculations shown Section 7.4.2, was the lowest total cost estimated and provides conservative results. As shown in Table 7-5, as the cost increases, the $Conc/DCGL_w$, also increases. Table 7.5 of Chapter 7 – ALARA Analysis is revised to include the 3 percent discount rate.

Another parameter impacting the conclusion is the discount rate parameter. The example showing the 0 percent discount rate provides the worst case, yet unreasonably low estimate given that the annual potential dose based on average residual contamination (which is now less than 20 percent of the DCGL) would be approximately 5 millirem per year. The cost estimate cost associated with scabbling to avert 5 millirem per year would be \$5,350, which far exceeds the cost guideline (\$2,000 per person-rem) for averted dose.

The text following the definitions of parameters through the end of DP Section 7.4.2 is revised to state:

"Using these values and the input parameters from Table 7-4, the estimated costs of remediation by surface scabbling are provided in Table 7-5, using both 0.03 and 0.07 monetary rates as discussed in Section 7.4.1. NUREG/BR-0058, Revision 4, 'Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission' indicates that the 7 percent rate approximates the marginal pretax real rate of return on an average investment in the private sector, and is applicable to the use of capital in the private sector. When a discount rate of 0.07 is used, the results indicate that the residual contamination levels and associated DCGLs are ALARA.

$$\frac{\text{Conc}}{\text{DCGL}_W} = \frac{\$5,350}{\$2,000 \times 0.09 \times 0.025 \times 0.80 \times 100} \times \frac{0.03 + 1.55\text{E}-10}{1 - e^{-(0.03+1.55\text{E}-10)70}} = 0.51$$

$$\frac{\text{Conc}}{\text{DCGL}_W} = \frac{\$5,350}{\$2,000 \times 0.09 \times 0.025 \times 0.80 \times 100} \times \frac{0.07 + 1.55\text{E}-10}{1 - e^{-(0.07+1.55\text{E}-10)70}} = 1.05$$

Characterization results for Building 110, Building 230 and Building 231 are provided in the 'Hematite Radiological Characterization Report' (Reference 7-10), and indicate most surface activity in these buildings is well below the most conservative DCGL (Uranium 234 (U-234), See Chapter 5 for DCGLs). Subsequent to Revision 0 of this DP, Westinghouse performed decontamination operations on elevated radioactivity on accessible building surfaces. As a result, the average total surface contamination levels do not exceed 20 percent of the DCGL. Since the current level of total surface contamination is less than 20 percent of the DCGL, the incremental costs associated with additional decontamination by scabbling and incremental dose avoidance were not evaluated.

In considering remediation of buried drain lines, the estimated cost is \$75,000 for excavation and disposal of radioactive waste of a drain line length of approximately 100 meters with a 1 meter excavation width. When this is factored into the ALARA equation, the results show that the currently established DCGLs continue to be ALARA, even with a 3 percent discount rate applied.

$$\frac{\text{Conc}}{\text{DCGL}_W} = \frac{\$75,000}{\$2,000 \times 0.09 \times 0.025 \times 1 \times 100} \times \frac{0.03 + 1.55\text{E}-10}{1 - e^{-(0.03+1.55\text{E}-10)70}} = 5.7 \text{"}$$

DP Table 7-4 is revised in the second to last row, rightmost column, to replace the parenthetical expression with the following: '[parameter from NUREG/BR-0058, Revision 4].'"

In addition, DP Table 7-5 is revised as follows:

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ALARA Calculations - Building Surfaces

Estimated Waste Volume (m^3)	Estimated Waste Cost Per Unit Volume ($/$m^3$)	$Cost_{WD}$	$Cost_R$	$Cost_{Acc}$	$Cost_{TF}$	$Cost_T$	Discount, r=0.03 $\frac{Conc}{DCGL_W}$	Discount, r=0.07 $\frac{Conc}{DCGL_W}$
ALARA Analysis– Washing Building Surfaces								
0.227	**$1,100**	$250	$400	$0.05	$0.05	$650	0.49	1.02
0.227	**$2,800**	$636	$400	$0.05	$0.05	$1,036	0.79	1.62
1	**$1,100**	$1,100	$400	$0.20	$0.21	$1,500	1.14	2.35
1	**$2,800**	$2,800	$400	$0.20	$0.21	$3,200	2.43	5.02
ALARA Analysis – Scabbling Building Surfaces								
0.318	**$1,100**	$350	$5000	$0.06	$0.07	$5,350	0.51	1.05
0.318	**$2,800**	$890	$5000	$0.06	$0.07	$5,891	0.56	1.15
1	**$1,100**	$1,100	$5000	$0.20	$0.21	$6,100	0.58	1.20
1	**$2,800**	$2,800	$5000	$0.20	$0.21	$7,800	0.74	1.53