HDP – EMC Areas Review

During the February 1, 2018, NRC – Westinghouse publicly noticed teleconference the NRC and Westinghouse reviewed the 5 agenda items discussions/proposed path forward Westinghouse response to the January 24, 2018 agenda items identified at that time. During the February 1, 2018, teleconference a 6^{th} agenda item was preliminarily discussed.

The NRC noted that there was a survey unit that contained an elevated area that required an Elevated Measurement Comparison (EMC) in which the boundary of the EMC area included the survey unit boundary.

Westinghouse understood the NRC comments to be as follows:

6. How many LSA survey units contain an elevated area? How many survey units contained a shared EMC/survey unit boundary? The EMC areas are of concern as in the future they may be excavated and brought to the surface. The EMC areas that have a shared boundary with a survey unit appear that the EMC area is also in an adjacent survey unit. The concern would be a dose consequence for the adjacent survey unit.

Discussion

During the February 1, 2018, teleconference Westinghouse provided a preliminary response to the agenda item.

In response to the first two questions, as provided in Table 1, *EMC Areas Summary* (see below), there are 11 survey units at the site that contain an EMC evaluation. Of those 11 survey units 5 survey units have an EMC Area that was expanded all the way out to the survey unit boundary.

In response to the comments regarding an EMC within a survey unit expanded outward to match the SU boundary, and the adjacent survey unit boundary the following is provided to give historical context to how the EMC evaluations were implemented within the Final Status Survey program and why survey unit boundaries were not changed to have a survey unit boundary entirely encompass an EMC area.

A review of the HDP Chapter 5, Dose Modeling indicates the recognition of the need to have the ability to perform an EMC Evaluation. DP Chapter 5 provides the following:

> *5.3.5 SOIL DCGL CALCULATIONS*
>
> *An initial unit concentration of 1 picocurie per gram (pCi/g) for each radionuclide of concern was used in conjunction with the RESRAD input parameters provided in Table 5-6 for the dose assessments. The peak dose to the average member of the critical group, from each ROC, was calculated over a 1000-year period and was defined as the peak dose-to-source ratio (DSR). The DSR, in units of mrem/yr per pCi/g, was then divided into the*

25 mrem/yr dose limit to determine the site-specific DCGL for each ROC. The RESRAD Summary Reports for the four CSMs (Surface, Root, Deep, and Uniform) are provided in Appendices C through F.

Table 5-7, Table 5-8, Table 5-9 and Table 5-10 provide the results of the dose assessment (i.e., DSR) and DCGL calculations. Each radionuclide-specific DCGL represents the concentration of residual activity, above background, that would result in 25 mrem/yr to the average member of the critical group. When multiple radionuclides are present, compliance will be addressed using the unity rule. Note that the concentration of U-235 in soil at the time of license termination will be lower than the listed DCGLs because of the presence of U-234, and to a lesser extent U-238, and the required application of the unity rule when demonstrating compliance. Based upon the lower and upper range of expected Uranium enrichment, the actual concentration of U-235 will be approximately five percent of the DCGL values.

5.1.1 ALTERNATE SCENARIO – EXCAVATION

The site soil DCGLs were calculated assuming the in-situ configuration of the residual contamination at the time of license termination. However, it is possible that the subsurface soil could be excavated at some time in the future. Therefore, an excavation scenario was evaluated to ensure that the DCGLs would also be acceptable if the soil is excavated and brought to the surface.

NUREG-1757, Appendix J provides guidance on an excavation scenario for buried waste. Although buried waste will not be present at the time of license termination, residual subsurface contamination would be an analogous source term configuration. Therefore, the Appendix J scenario was used. The excavation scenario assumed that a 200 m^2 house is constructed that includes a 3 m deep basement. The resulting 600 m^2 volume of soil is uniformly mixed during excavation and spread over a 700 m^2 area on the ground surface at a depth of 0.9 m.

The soil concentration in the excavated soil that would result in 25 mrem/yr to the Resident Farmer was determined using the RESRAD DCGL parameter set for the Surface CSM (Table 5-6) with three changes; the depth of contamination was set to 0.9, the contaminated area was set to 700 m^2, and the unsaturated zone was set to 8.2 m (for consistency with site-specific conditions). As with the DCGL calculation, the input concentration was 1 pCi/g for each ROC. The resulting excavation DSR was divided into 25 to calculate the concentration that would result in 25 mrem/yr to the Resident Farmer. The RESRAD Summary Report for the excavation scenario is provided in Appendix G. Table 5-11 provides the ROCs, the DSRs, and the soil concentrations resulting in 25 mrem/yr for the excavation scenario.

The Surface, Root and Uniform DCGLs do not require cross-check with the excavation scenario because they were calculated assuming essentially the same configuration as that assumed for the excavation scenario. However, the Deep DCGLs do require checking because no contact with the surface was assumed in the Deep CSM.

The Deep DCGLs were checked by assuming the presence of deep soil only with a 1.5 m clean soil cover. Soil was assumed to be excavated down to 3 m and uniformly mixed. The concentrations of the hypothetical excavated Deep soil are provided in Table 5-11, Column 4 which clearly exceed the 25 mrem/yr concentrations listed in Column 3. The one exception is Np-237, where the Deep DCGL is limiting. The conclusion from review of Table 5-11 is that a hypothetical future excavation could result in a dose greater than 25 mrem/yr to the Resident Farmer. Therefore, the alternate, i.e., lower concentrations will be used as the DCGL values for Deep soil (i.e., greater than 1.5 m) to account for possible future excavation. As stated above, Np-237 is an exception and the Deep DCGL listed in Table 5-9 will be used for Np-237. The alternate DCGLs were calculated by simply multiplying the concentration in Table 5-11, Column 3 by a factor of two to account for the mixing with the assumed 1.5 m clean cover soil during excavation. The alternate DCGLs (hereafter called Excavation DCGLs) for Deep soil are provided in Table 5-12.

From a technical perspective, the Deep DCGLs provided in Table 5-9 would be applicable to residual radioactivity in soil below 3 m because the hypothetical excavation does not exceed 3 m. However, a review of Table 5-9 shows that the Deep DCGLs are relatively high. The remediation of soil to lower concentrations would likely be cost effective and therefore, as an ALARA measure, the Excavation DCGLs will be applied to soil at all depths below 1.5 m. However, Westinghouse reserves the option to apply the Deep DCGLs if continued excavation would introduce undue hazards to personnel or to members of the general public, or would result in costs that are not justified based on the ALARA principle. If the application of the Deep DCGLs is required, the residual concentrations will be less than those listed in Table 5-9 but may exceed the Excavation DCGLs.

5.3.7 AREA FACTORS

Area factors were developed in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Reference 5-9) to evaluate the dose from small areas of elevated activity. The application of the AFs during FSS is discussed in Chapter 14.

The areas factors were developed for each of the four CSMs by adjusting the size of the Contaminated Zone. The resulting DCGL for the smaller areas of activity ($DCGL_{EMC}$) was then divided by the applicable site DCGL to determine the corresponding AF. Area Factors were determined for contaminated zone sizes of 1, 3, 10, 30, 100, 300, 1,000, 3,000 and 10,000 m^2. The AFs are provided in Table 5-13.

The method described above for calculating area factors is not directly applicable to the Excavation DCGLs for soil greater than 1.5 m deep. However, the excavation scenario does include an assumption of a 200 m^2 basement footprint. Therefore, the AFs for soil at depths greater than 1.5 m are defined as the range of values that satisfy the requirement that the area-weighted average concentration over a 200 m^2 does not exceed the Excavation DCGL. The only limitation would be that the radionuclide concentration identified in an individual sample could not exceed the Deep DCGL listed in Table 5-9.

However, since the Deep DCGLs are relatively high, as an administrative ALARA measure, the AF for the Excavation DCGLs will be limited to an arbitrary factor of two to allow reasonable flexibility in implementation.

The above information contained in the DP was integrated and implemented through the FSS procedures. The approach for assessment of Elevated Areas was described in FSSFR Volume 3, Chapter 1 as follows.

From Volume 3, Chapter 1, Section 3.1.3, Elevated Areas:

To address small areas of elevated radioactivity in a survey unit a simple comparison to an investigation level is used to assess the impact of potentially elevated areas rather than using statistical methods. The investigation level for this comparison is the $DCGL_{EMC}$, which is the $DCGL_{W}$ modified by an Area Factor (AF) to account for the small area of the elevated radioactivity. An area correction is used because the exposure assumptions are the same as those used to develop the $DCGL_{W}$. (The consideration of small areas of elevated radioactivity applies only to Class 1 survey units as Class 2 and Class 3 survey units should not have contamination in excess of the $DCGL_{W}$.)

The AFs for soil were developed by using the CSMs and adjusting the size of the contaminated zone. The AFs for the Surface, Root, and Uniform Soil strata are provided in Table 3-2a (of Volume 3, Chapter 1). The AFs for the Excavation CSM (and corresponding Deep $DCGL_{W}$) are provided in Table 3-2b and 3-2c (of Volume 3, Chapter 1).

The areas factors were developed for each CSM by adjusting the size of the Contaminated Zone and dividing the resulting DCGL for the smaller areas of activity ($DCGL_{EMC}$) by the applicable site DCGL. AFs for the Surface, Root, and Uniform CSMs were determined for contaminated zone sizes ranging from 1 to 10,000 m^2, although it is not anticipated that AFs for areas greater than 300 m^2 will be utilized.

AFs for the Excavation CSM were calculated for contaminated zone sizes ranging from 1 to 100 m^2 in accordance with the MARSSIM using the RESRAD parameters which were modified for use with the excavation scenario (as detailed in Section 5.3.6). However, unlike for the development of the $DCGL_{W}$ values presented in Table 3-1 (of Volume 3, Chapter 1), the elevated activity was not assumed to be mixed with the clean cover. Instead, the elevated activity was assumed to be excavated intact and brought to the surface, with the only modification to "flatten" the material from an assumed depth of 1.5 m to the excavation scenario depth of 0.9 m. The excavation scenario area factors are subject to the following constraints:

1. *The excavation scenario for a small area of elevated activity must account for the increase in area after being excavated to the surface. An adjustment factor of 1.67 (1.5/0.9) was applied during modeling for geometrical transformation between the assumed excavation geometry depth (1.5 m) and the geometry modeled in RESRAD (0.9 m). For example, an elevated area of 1 m^2 and a depth of 1.5 m was assumed to be excavated to the surface and cover an area of 1.67 m^2 (1 $m^2 \times 1.67$) and a depth of 0.9 m. The modeled area factors are presented in Table 3-2b (of Volume 3, Chapter*

1) with the listed areas representing the post-excavation condition. This constraint limits the concentration within an area of elevated activity which remains contiguous during excavation to less than the $DCGL_{EMC}$.

2. *The excavation scenario for a small area of elevated activity must also account for the fact that the scenario's excavation footprint is 200 m^2 and residual activity cannot exceed the $DCGL_W$ for post-excavation configurations that exceed 200 m^2. Therefore the calculated area factor is limited to the quotient 200 m^2 divided by the extent of the elevated area in square meters. This constraint limits the weighted average concentration over each 200 m^2 area to the $DCGL_W$.*

The resultant area factors based on the two constraints discussed above are shown in Table 3-2c (of Volume 3, Chapter 1). The area factor selected for each radionuclide and area combination is the smallest of the values calculated based on each of the two constraints. Table 3-2b (of Volume 3, Chapter 1) is provided for informational purposes only as Table 3-2c (of Volume 3, Chapter 1) will always be used to determine AFs for use with the Excavation $DCGL_W$.

During the FSS process, locations with potential residual radioactivity exceeding investigation levels will be marked for further investigation and biased sampling or measurement. For Class 1 survey units, the size and average radioactivity level within the elevated area may be acceptable if it complies with the AFs and other criteria as it applies to the $DCGL_{EMC}$. The Elevated Measurement Comparison (EMC) will be applied to Class 1 survey units only when an elevated area is identified by surface scans and/or biased and systematic samples or measurements. The EMC provides assurance that areas of elevated radioactivity receive the proper attention and that any area having the potential for significant dose contribution is identified. Locations identified by surface scans or sample analyses which exceed the $DCGL_w$ are subject to additional surveys to determine compliance with the elevated measurement criteria. Based upon the size of the elevated measurement area, the corresponding AF will be determined. The EMC will be applied by summing the contributing dose fractions of the survey unit through the unity equation. This will be performed by determining the fraction of dose contributed by the average radioactivity across the survey unit and by adding the additional dose contribution from each individual elevated area."

The discussion provided above from Volume 3, Chapter 1 provides an outline for the EMC process. To simplify the process, it can be described as follows:

Identify "Hot Spot"→ Determine Size of "Hot Spot"→Look up AF's →Determine $DCGL_{EMC}$ → Determine Dose from EMC → Sum all SU Dose

Determination of the EMC area boundary is accomplished through the assessment of radiological survey and soil sample data along with radiological engineering assessment. Once an elevated area has been identified, the data is assessed to identify if the elevated area is due to elevated Uranium or elevated Tc-99.

When Uranium is the elevated nuclide, in addition to soil sample data scanning can provide a clear delineation of the size and appropriate boundary of the elevated area. Therefore, whenever possible scanning is used to assist in the determination of the boundary of the elevated area along with soil sample data. As can be seen by the LSA 10-04 figure below, scanning can provide a relatively defined elevate area boundary.

When Tc-99 is the elevated nuclide, as a "hard to detect" nuclide, scanning does not provide adequate data to determine the boundary of the elevated area. Therefore, a conservative assessment of the elevated area boundary (size) is performed using the nearest surrounding "clean" samples in the survey unit as the primary data points to determine the elevated area boundary. The Radiological engineering assessment to assist in determining the elevated area boundary includes review of data such as the depth of excavation, topography of the survey unit, previous characterization data, the Tc-99 area investigation data (specific to LSA 08-01), remediation data, the survey unit boundary, location relative to structures, relative location within the survey unit and biased sample data.

LSA 08-11 provides a good example in which an area of elevated Tc-99 activity was identified, and the surrounding "clean" systematic samples were used to determine the elevated area boundary. As the area of the triangular grid in which the elevated area is located, as defined by systematic soil sample location was 40.2 m^2. Therefore an AF of 40.2 was assigned and determined to be sufficiently conservative to perform the EMC evaluation to ensure compliance with the release criteria.

LSA 08-01 provides an example in which an area of elevated Tc-99 activity was identified and the boundary of the elevated area was not completely surrounded, within the survey unit, by "clean" systematic samples or additional "clean" biased samples. In this instance radiological data combined with a radiological engineering assessment defined the boundary of the elevated area. Using the radiological data gained during remediation. and by the Tc-99 area investigation, it was evident to the Health Physics staff that the size of the areas of elevated Tc-99 activity was usually very small in nature. Therefore, in order to determine the AF to use when evaluating the elevated area, the radiological engineering assessment resulted in a determination to expand the "assumed" EMC area boundary outward to reach the survey unit boundary. The determination to extend the elevated area boundary up to the survey unit boundary was chosen by the Health Physics staff as it would be inappropriate for an EMC area to extend beyond the boundaries of an individual survey unit, and that expanding the estimated size of the EMC area (and resulting AF) results in an over estimate (conservative) of the dose contribution to the survey unit.

In all EMC evaluation instances it was never a consideration to change a survey unit boundary to totally encompass an elevated area. There were a number of considerations/determinations that supported keeping all survey unit boundaries as close as possible to the conceptual survey unit boundaries provided in the DP.

- All survey units were remediated to the same criteria (DCGLs). Thus providing an expectation that the elevated area portion in the adjacent survey unit would not be significantly different in radiological status then the area being evaluated.
- Changing the survey unit boundaries could change the number of previously taken soil samples within a survey unit such that there was an inadequate number of samples taken to demonstrate compliance.
- Changing the survey unit boundaries would also change the distribution of systematically placed samples across the survey unit, and thus making the remaining systematically collected samples more or less spatially representative of the survey unit. Changing the spatial representation of the survey unit, or the number of systematically collected samples could also skew the average concentration of the soil sample results higher or lower.
- From an ALARA perspective, with the knowledge derived from the radiological data taken during characterization and remedial action support surveys that upon completion of remediation survey units would be acceptable for unrestricted release, the additional cost with no discernable benefit to the workers or public health and safety to realign survey unit boundaries, perform further soil samples and additional FSS precluded changing survey unit boundaries.

The Table 1 below identifies and provides a summary of the 11 survey units where an EMC was performed.

Table 1
EMC Areas Summary

Survey Unit	Utilizes the Survey Unit Boundary	Nuclide	EMC Boundary Set By	Size (m^2) Determination of Elevated Area	EMC Dose Contribution as Reported in Survey Area Release Record (mrem/year	Dose Summation as Reported in Survey Area Release Record (mrem/year)	Adjacent Survey Unit to EMC Area	Dose Summation of Adjacent Survey Unit as Reported in Survey Area Release Record (mrem/year)
LSA 02-01	No	U	Systematic Samples	95.5	6.0	12.75	N/A	N/A
LSA 02-02	No	U	Systematic Samples	120	6.25	14.50	N/A	N/A
LSA 02-03	Yes	U	Combination of Systematic / Biased Samples and the SU Boundary	55	4.75	16.50	LSA 04-04	13.25
LSA 05-01	No	Tc-99	Combination of Systematic / Biased Samples	87	2.75	10.75	N/A	N/A
LSA 08-01	Yes	Tc-99	Combination of Systematic / Biased Samples and the SU Boundary	40	5.5	17.0	LSA 08-02	11.75
LSA 08-10	Yes	Tc-99	½ Distance to Bounding Systematics, Extended to Boundary	138	2.75	19.25	LSA 11-02	5.75
LSA 08-11	No	Tc-99	Set by bounding Systematic Samples	40.2	5.25	13.5	N/A	N/A
LSA 08-12	Yes	Tc-99	Combination of Systematic / Biased Samples and the SU Boundary	113.1	3.50* See LSA 08-12 below for exp.	15.0* See LSA 08-12 below for exp.	LSA 08-11 LSA 09-02	13.5
LSA 10-04	Yes	U	GWS Scan Data	30	3.5	11.0	LSA 10-03	12.5
LSA 10-07	No	U	Biased Samples	1	0.25	8.25	N/A	N/A
LSA 11-06	Yes	Tc-99	Combination of Systematic / Biased Samples and the SU Boundary	26.4	1.75	9.5	LSA 11-02	5.75

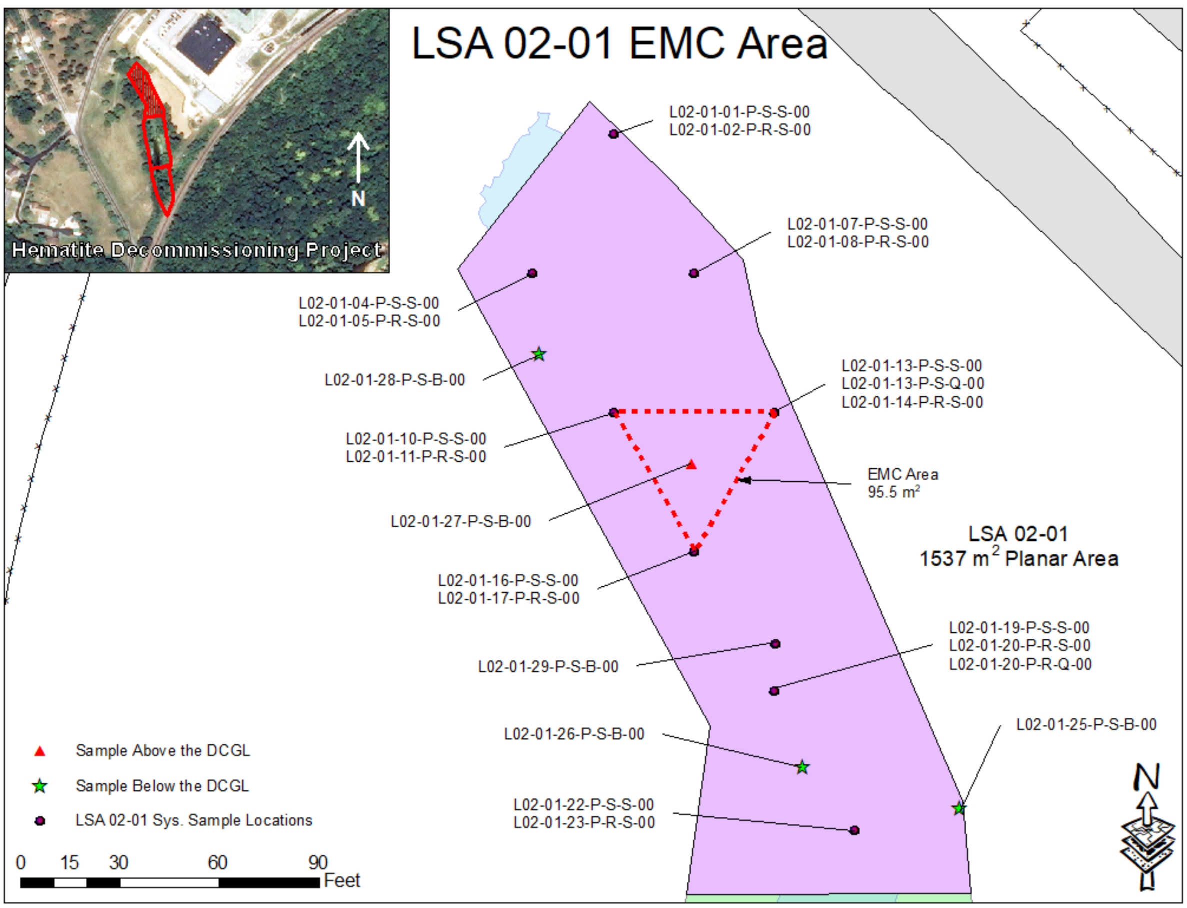
The following sections provide specific information for each survey unit in which an EMC evaluation was performed as part of FSS.

<u>LSA 02-01</u>

As stated in the report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic locations to define a polygonal area of 95.5 m^2 as calculated by GIS software.

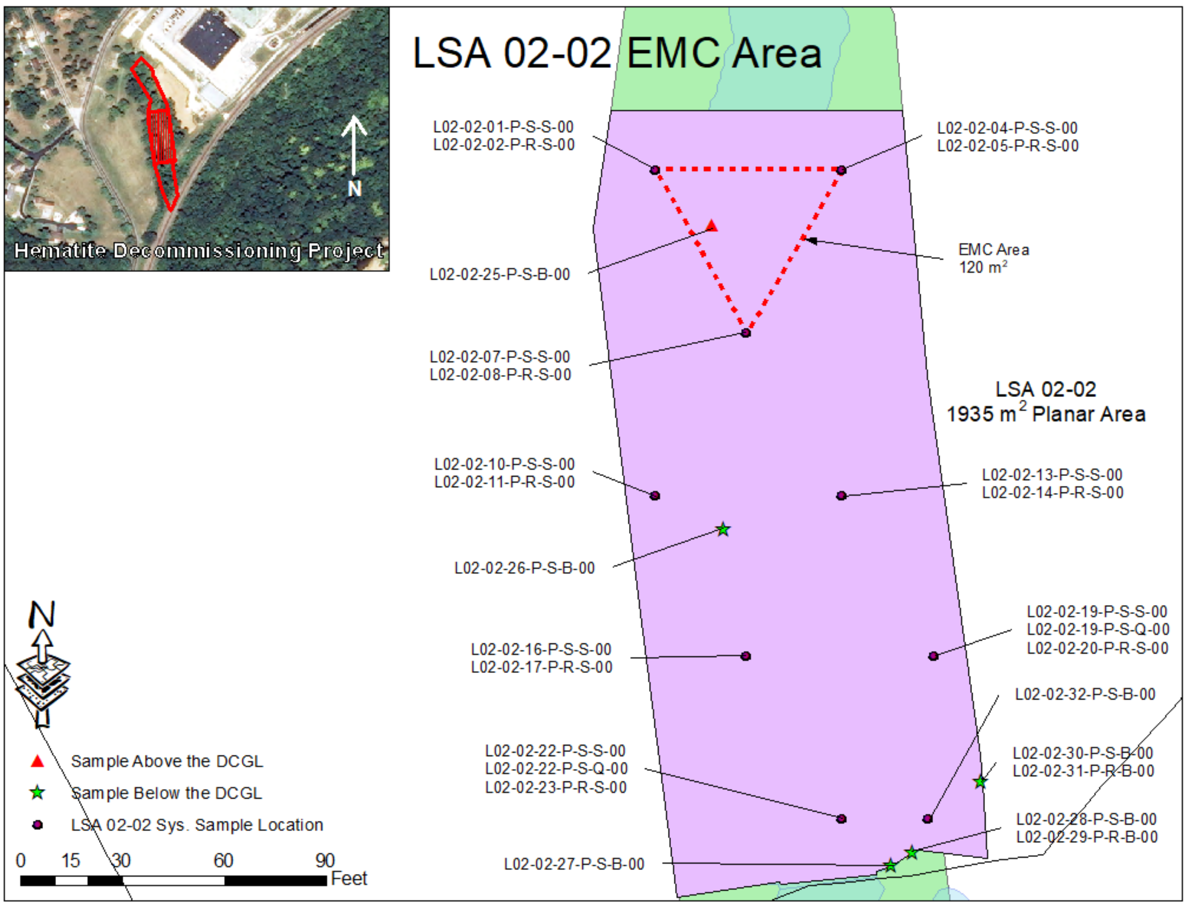
EMC Investigation Area within LSA 02-01



LSA 02-02

As stated in the report:
The size of the associated elevated area surrounding this biased location was determined by using the nearest “clean” systematic locations to define a polygonal area of 120 m2 as calculated by GIS software.

EMC Investigation Area within LSA 02-02



LSA 02-03

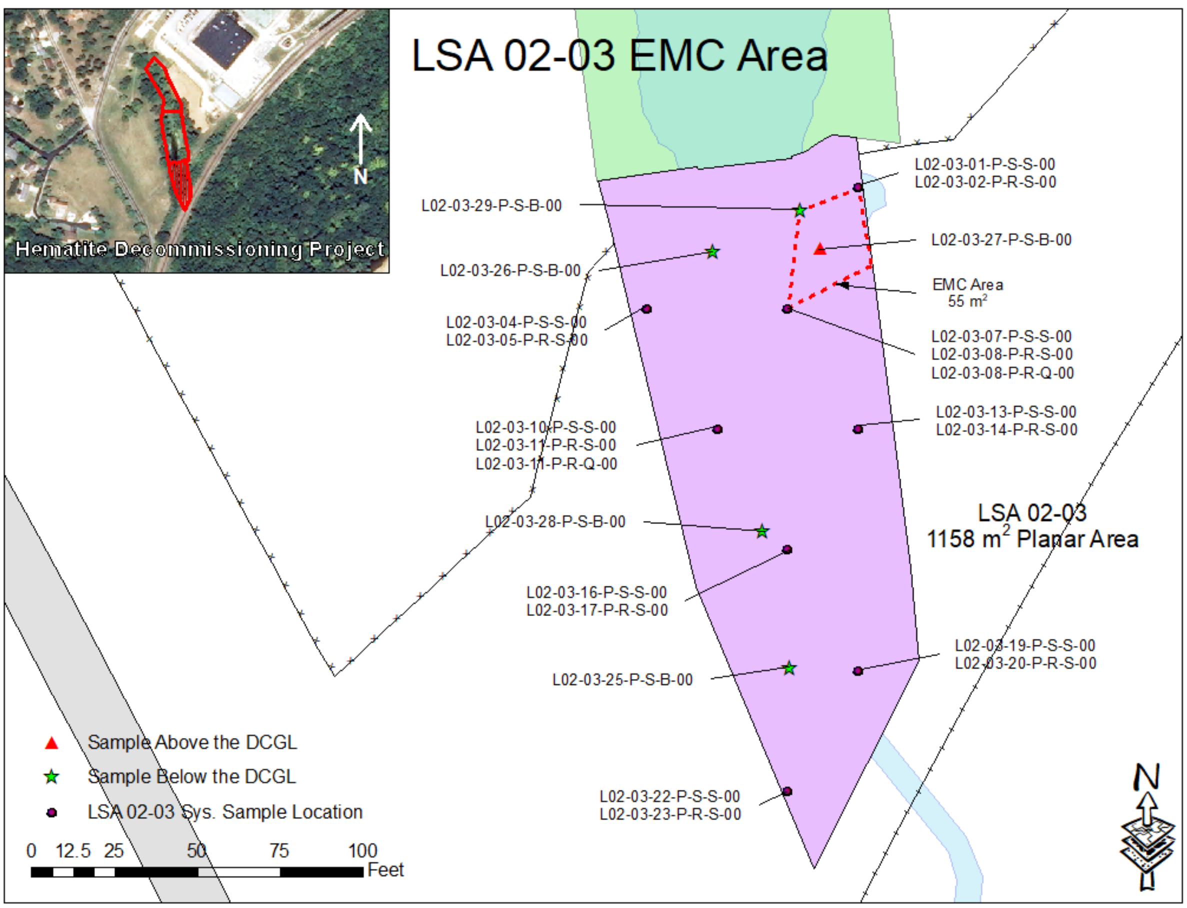
As stated in the report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic locations, biased sample locations, and the boundary of the SU to define a polygonal area of 55 m^2 as calculated by GIS software.

Additional Discussion:

While it was not specifically stated in the FSSR for LSA 02-03 (Volume 3, Chapter 22) that scanning was also used to determine that the EMC area did not extend beyond the SU boundary, since the elevated area was due to Uranium a review of the GWS data does indicate that the area is very small, and clearly does not extend outside of LSA 02-03.

EMC Investigation Area within LSA 02-03



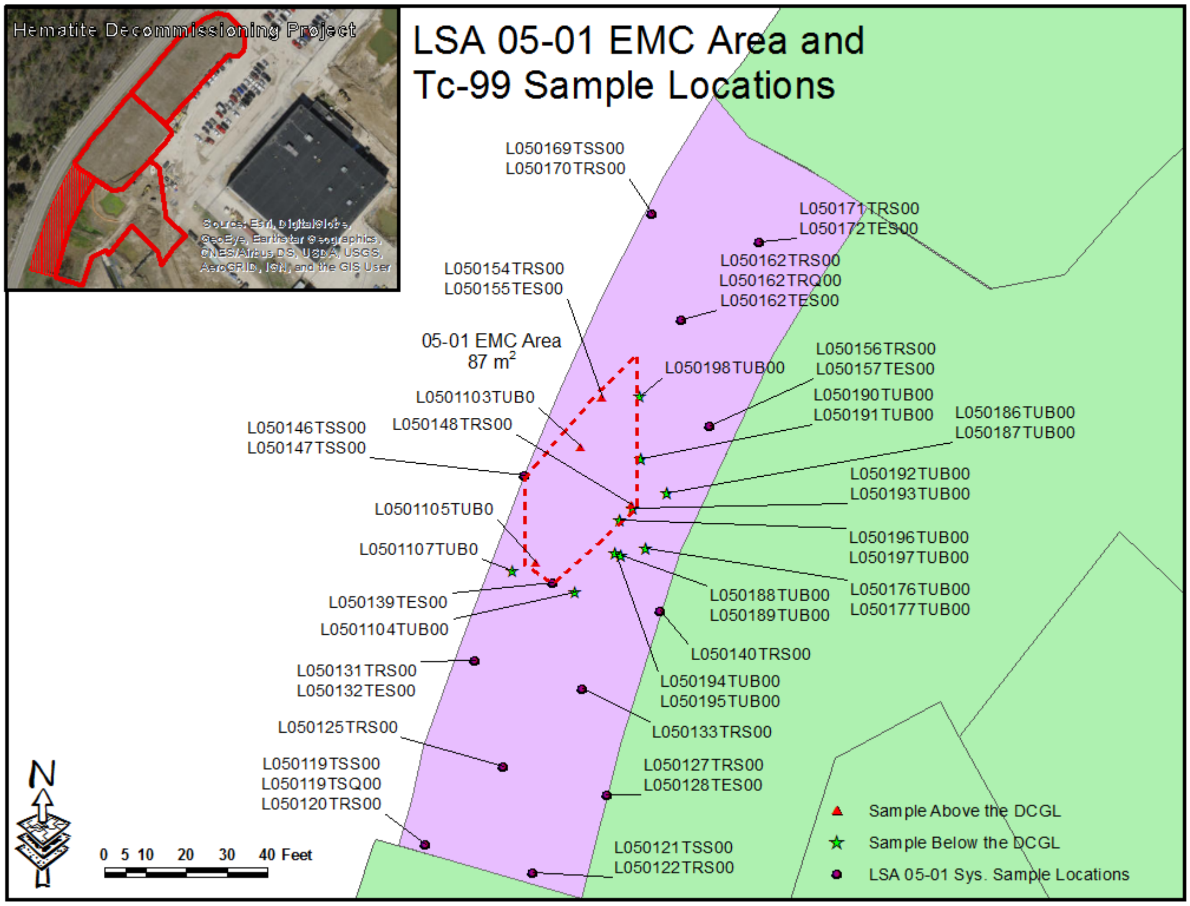
LSA 05-01

As stated in the report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic and biased locations to define a polygonal area of 87 m^2 as calculated by GIS software. This 87 m^2 polygon was placed around the elevated biased sample locations to define the area where the elevated sample activity remains within the SU. To the East, South, and West of the EMC area, there were a significant number of "clean" samples, creating a clear boundary. However to the North of the EMC area, there was less available sample data which required the Health Physics Staff to rely on professional judgment. Since LSA 05-01 borders a public roadway (State Road P), and excavation into the "right of way" of the roadway was limited by the Missouri DOT, less excavation (and thus less sampling) was performed in this area. Three elevated samples were identified to remain in the Northern portion of the EMC area. While there is less available "clean" sample data creating an easily defined boundary to the North, the area in question is still relatively small. There is less than 15 feet in linear distance from each of the elevated samples, to the nearest "clean" sample. Given these factors, the Health Physics Staff placed the Northern EMC boundary so that the three elevated sample points were completely enclosed within the 87 m^2 polygon, and that the all systematic samples collected above the Northern most boundary of the EMC area were significantly less than the DCGLs.

Furthermore, the Health Physics Staff considered given the radiological conditions of the EMC area what the maximum size of the EMC are could be without exceeding a SF of 1.0 for the survey unit. Evaluations determined that the area of the EMC would have to exceed 500 m^2 in order for the EMC evaluation to be unsuccessful. Knowing that the allowable maximum area is significantly larger than the actual estimated area provides an additional layer of confidence, but the purpose of the EMC evaluation is to determine the actual radiological conditions that remain in the area, not the allowable maximum, therefore the 87 m^2 polygon is considered appropriate.

EMC Investigation Area within LSA 05-01



LSA 08-01

As stated in the report:

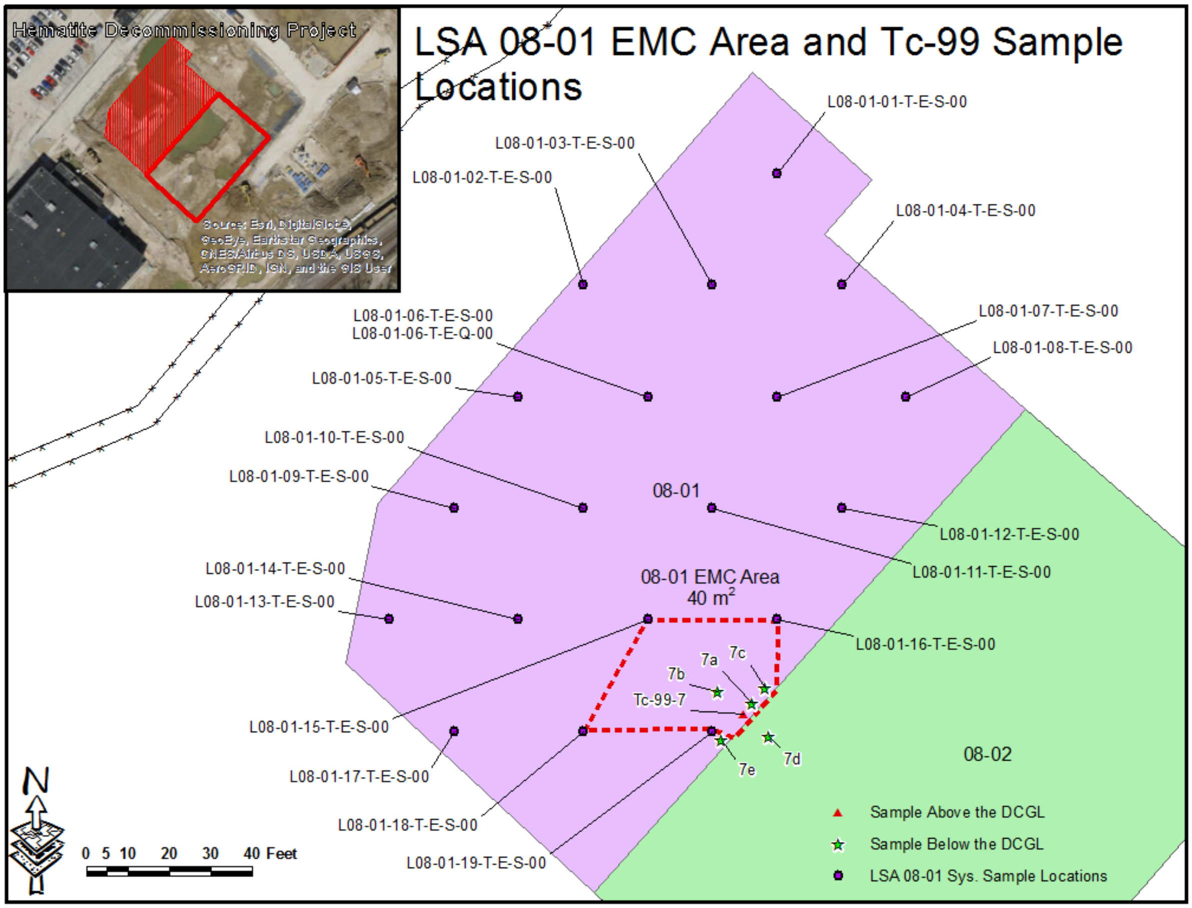
The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic and biased locations and the boundary edges of the SU itself to define a polygonal area of 40 m^2 as calculated by GIS software.

Additional Discussion:

While not specifically stated in the FSSR for LSA 08-01 (Volume 3, Chapter 12), sample points 7d, and 7e in the figure below were included to provide additional confidence that the general size of the elevated area is relatively small compared to the larger "assumed" EMC Area. Using sample points 7b, 7c, 7d, and 7e in the figure below, the EMC area could be estimated to be 14 m^2. However this smaller area was not used as point 7d is in the neighboring LSA 08-02.

Since the estimated AF of 40 m^2 was chosen to be sufficiently conservative, and the SU still passed the EMC evaluation, it was determined that additional sampling would not be beneficial as it would only serve to reduce the estimated dose for LSA 08-01.

EMC Investigation Area within LSA 08-01



LSA 08-10

As stated in the report:

One sample in LSA 08-10 was identified to contain elevated levels of Tc-99 as indicated by the analysis, performed at the offsite laboratory, of the systematic soil samples collected in the SU. While no individual nuclide within the sample exceeded the appropriate $DCGL_W$, the SOF for the sample (1.11) did exceed a Uniform SOF value of 1.0.

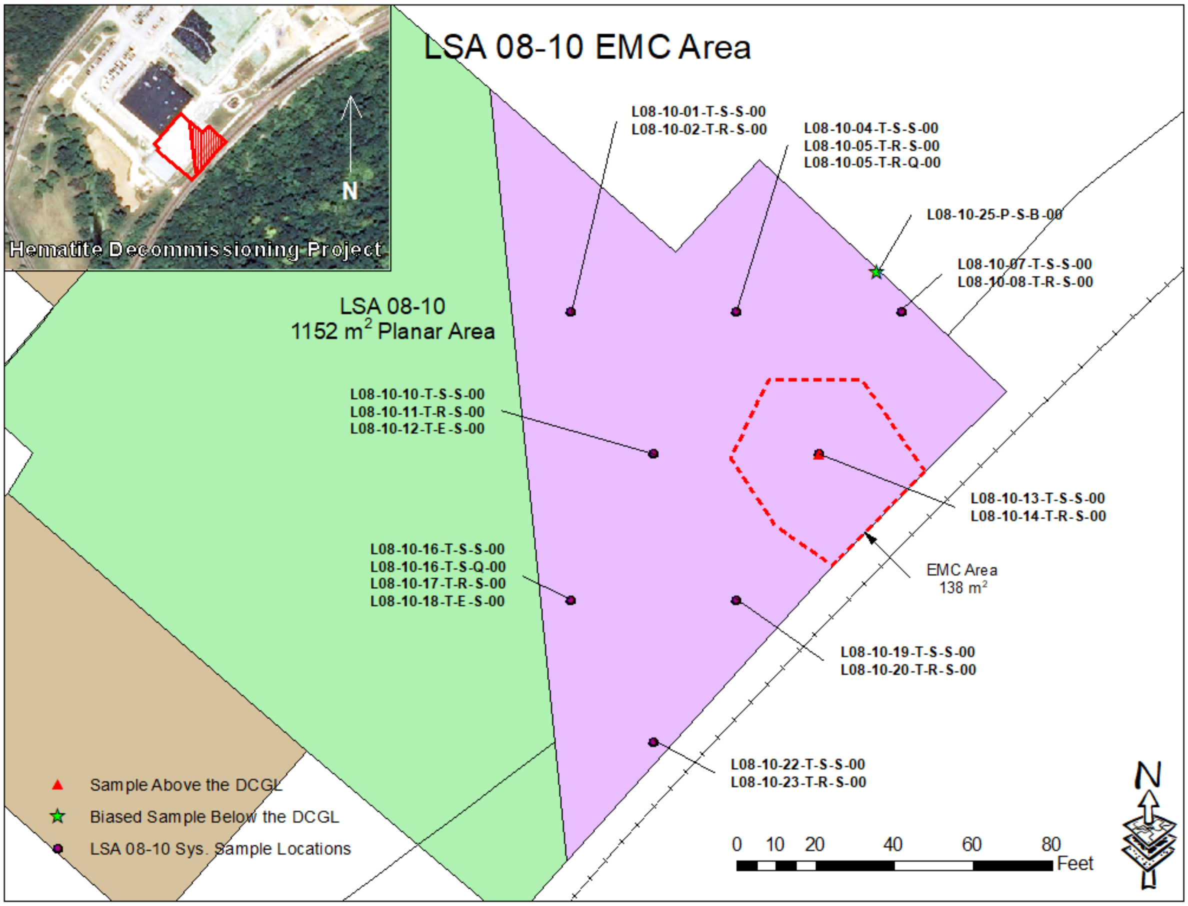
Therefore, an Elevated Measurement Comparison (EMC) evaluation was performed for LSA 08-10 as required by Procedure HDP-PR-FSS-721 Final Status Survey Data Evaluation. The size of the associated elevated area surrounding this location was determined by using half the distance to the nearest "clean" systematic locations and the boundary edges of the SU itself to define a polygonal area of 138 m2 as calculated by GIS software. Following the steps presented in Section 8.6.7 of HDP-PR-FSS-721, the $DCGL_{EMC}$s for all nuclides were calculated based on the nuclide-specific area factors corresponding to 138 m^2.

Additional Discussion:

While not specifically stated in the FSSR for LSA 08-10, the following assumptions were made to determine the estimated size of the EMC area. Review of previously performed characterization data showed no other similar areas of elevated activity, and the GWS data did not indicate the presence of any elevated gamma measurements. As no individual nuclide exceeded the individual $DCGL_W$, and characterization data supports the conclusion that the slightly elevated contamination is not widespread, the elevated area was assumed to be very small in nature. In order to determine how large a hypothetical hot spot could be and still meet the unrestricted release criteria, a reverse EMC calculation determined that at these soil concentrations the hot spot would have to exceed 500 m^2 before additional remedial actions became necessary for the SU to meet release criteria.

Next, in an attempt to accurately estimate the appropriate size of the elevated area, the distribution of the systematic samples was reviewed. Since each systematic sample spatially represent a certain portion of the SU, the elevated area was estimated by using half the distance to the nearest "clean" systematic locations and the boundary edges of the SU itself to define a polygonal area (as seen below). While it is still assumed that the elevated area is quite small in nature, it was determined that by expanding the EMC area all the way to the SU boundaries the estimate of 138 m^2 was sufficiently conservative, and more accurately reflected the residual dose in the SU compared to using the "hypothetical worst case" scenario.

EMC Investigation Area within LSA 08-10

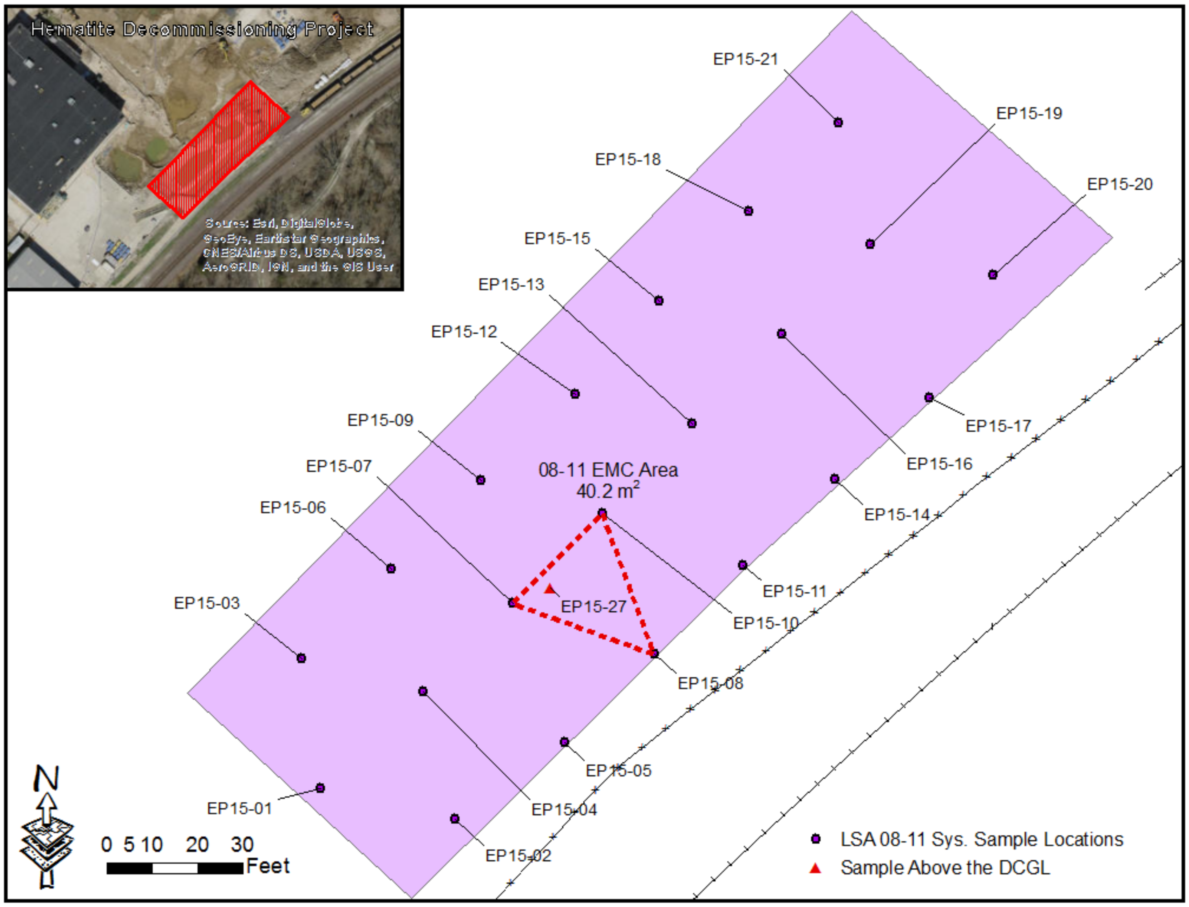


LSA 08-11

As stated in report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic and biased locations and the boundary edges of the survey unit itself to define a polygonal area of 40.2 m^2 as calculated by GIS software.

EMC Investigation Area within LSA 08-01



LSA 08-12

As stated in the report:

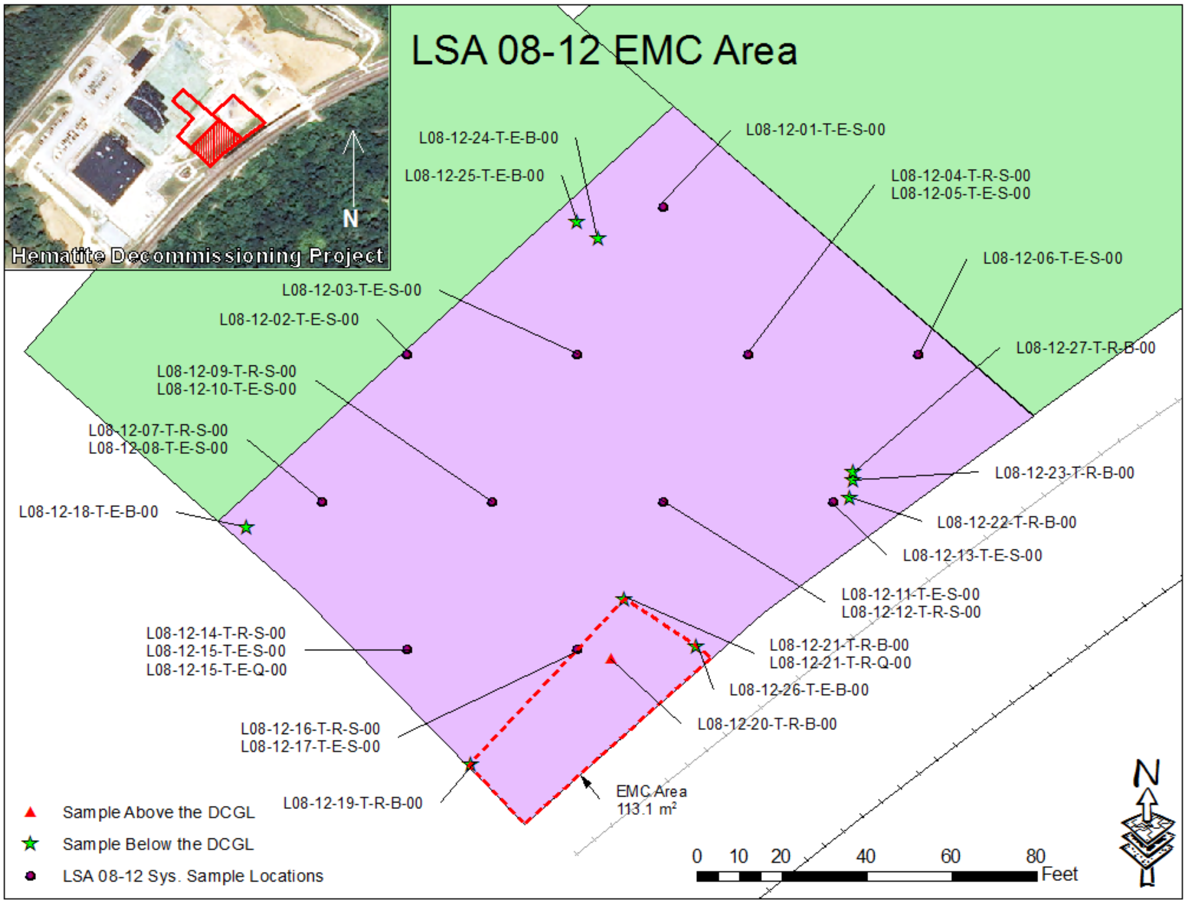
The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic and biased locations and the boundary edges of the survey unit itself to define a polygonal area of 113.1 m^2 as calculated by GIS software.

Additional Discussion:

While not specifically stated in the FSSR for LSA 08-12, the following assumptions were made to determine the estimated size of the EMC area. Review of the surrounding sample data showed that the nearest three clean sample points were approximately 10, 15, and 20 feet away from the elevated area respectively, indication that the EMC area is quite small. So the decision was made to conservatively expand the EMC area outward to the survey unit boundaries in order to give a high level of confidence that the elevated area had been completely encompassed and accounted for in the final survey unit dose assessment.

NOTE: During review of the LSA 08-12 data, a minor typographical error was identified that will require correction, and re-submittal of Volume 3, Chapter 21, to Revision 2 (LSA 08-09, LSA 08-12 and LSA 08-13). The EMC determination inadvertently used the Excavation DCGLs, when the Root DCGLs should have been used, thus slightly increasing the EMC dose estimate from 1.25 mrem/year to 3.5 mrem/year. The Root AFs were properly applied, as were all other applicable DCGLs to the remaining soil samples in the survey unit. The survey unit still meets the unrestricted release criteria, with a survey unit total dose estimate of 11.68 mrem/year (using the final ground water dose contribution), well below the 25 mrem/year dose criteria.

EMC Investigation Area within LSA 08-12

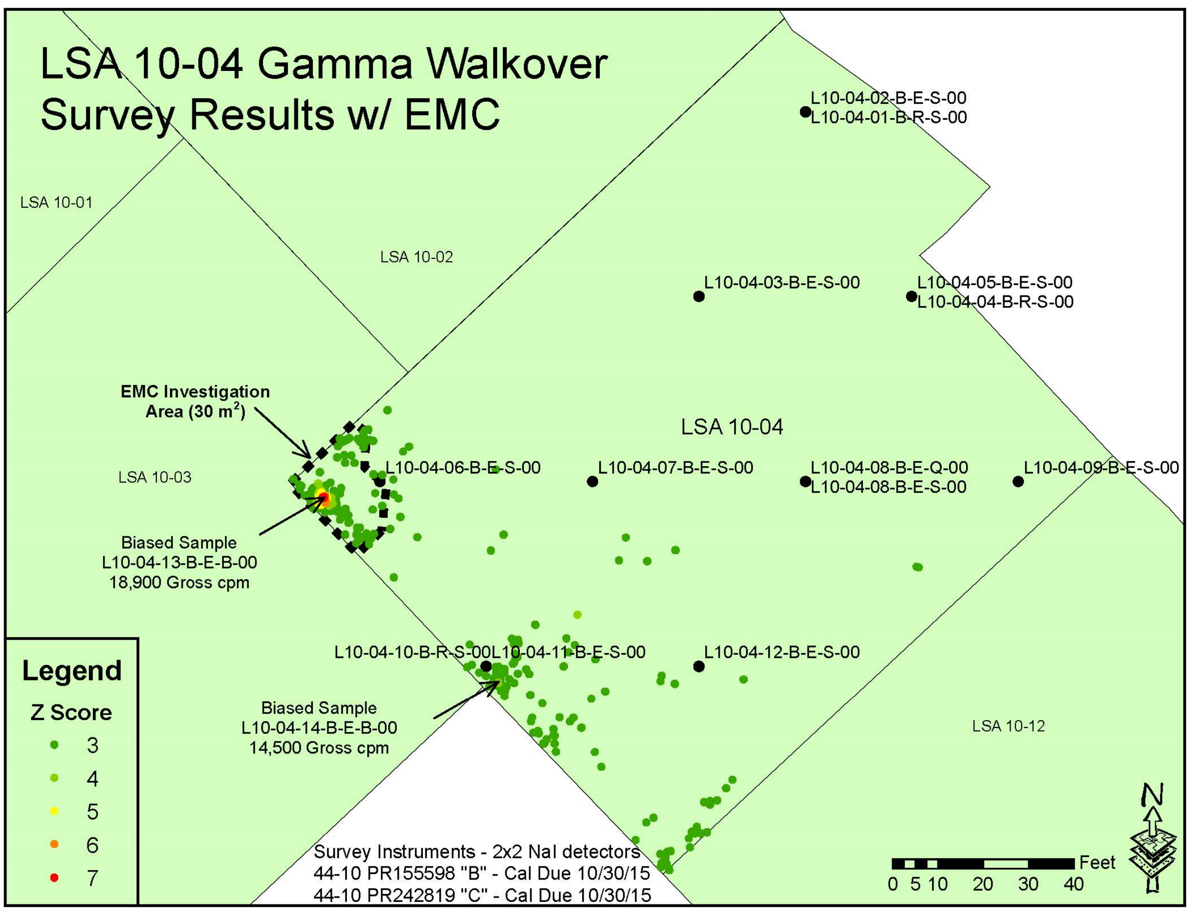


LSA 10-04

As stated in the report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest "clean" systematic location and the boundary edges of the SU itself to define a polygonal area of 30 m^2 as calculated by GIS software. The shape of the EMC area was designed so as to include the elevated GWS measurements proximal to the elevated biased sample.

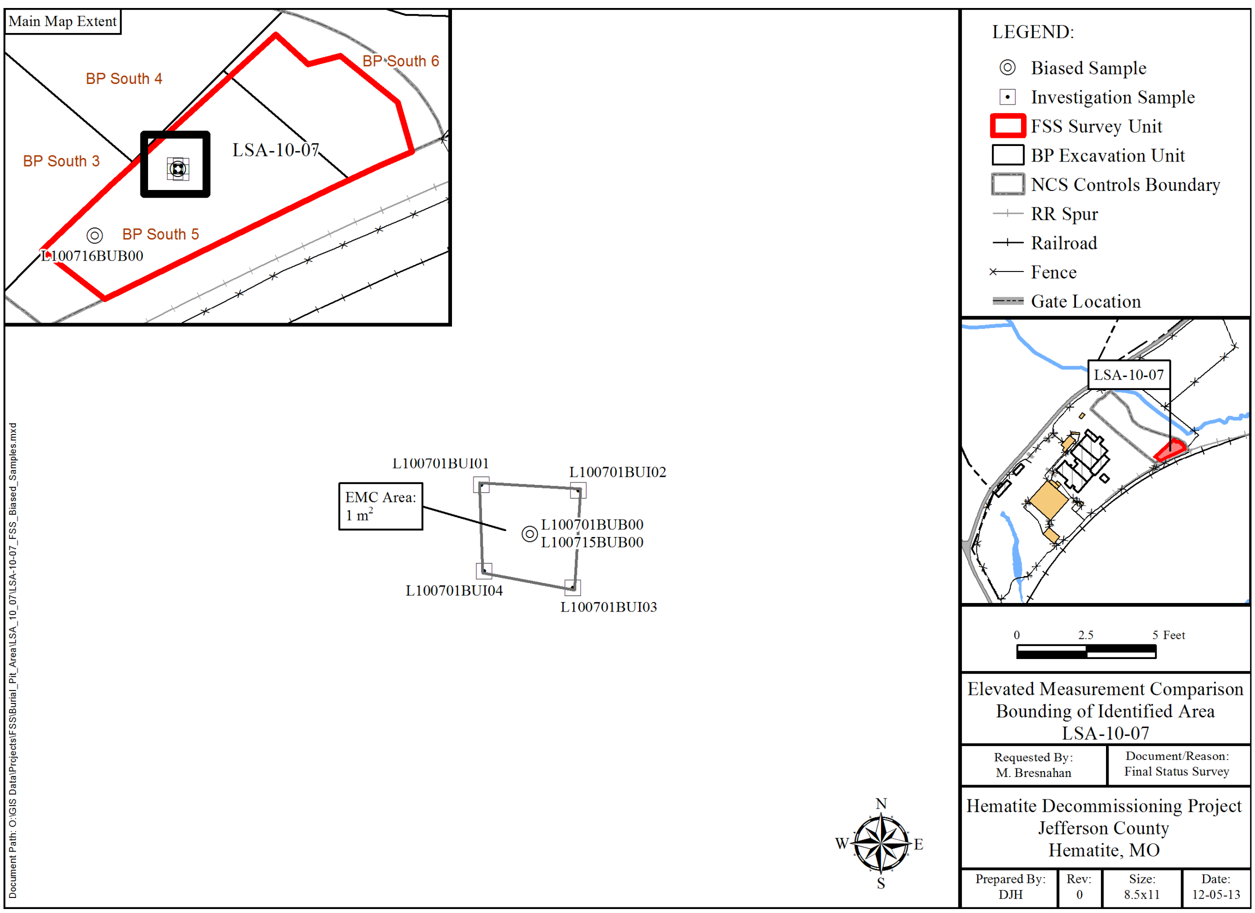
EMC Investigation Area within LSA 10-04



LSA 10-07

As stated in the report:
The size of the associated elevated area surrounding this biased location was determined by "bounding" where four investigation samples were collected in a 1 meter square grid surrounding the sample. As all four investigation samples had SOF results less than 1.0, the area was determined not to exceed 1 m2. Furthermore, subsequent scanning of the area indicated that the count rates had greatly decreased since the first biased sample was collected. An additional sample (L10-07-15-B-U-B-00) was collected at the exact sample location as the elevated sample, but at a depth of 6 to 12 inches bgs, (where the original sample was collected at 0 to 6 inches bgs). This sample also had a result that was less than a Uniform SOF of 1.0. These sample results indicate a very small area of elevated contamination that was contained within the elevated biased sample (e.g. deconning by sampling), and was no longer present in the SU. Nevertheless, an EMC was performed to demonstrate that the results of the elevated biased sample still meet the release criteria within the LSA.

EMC Investigation Area within LSA 10-07



LSA 11-06

As stated in the report:

The size of the associated elevated area surrounding this biased location was determined by using the nearest “clean” systematic and biased locations and the boundary edges of the SU itself to define a polygonal area of 26.4 m^2 as calculated by GIS software.

As also stated as part of the Tc-99 Hot Spot Assessment:

The highest observed Tc-99 sample collected from LSA 11-06 was 159 pCi/g. As this sample result exceeds the Uniform $DCGL_W$ (and as such, an EMC investigation was performed), a Tc-99 hotspot evaluation will also be performed.

The surface area covered by the SU is 298 m^2, and there were 8 systematic locations collected within the SU, resulting in 1 sample per 37.25 m^2. Using the table provided in Appendix E of HDP-PR-FSS-721 (Table 14-12 in Chapter 14 of the DP), and interpolating the area of 37.25 m^2 provides an Area Factor (AF) of 27.6 for Tc-99. The hypothetical $DCGL_{EMC}$ is then determined by multiplying the $DCGL_W$ by the AF, which results in a maximum $DCGL_{EMC}$ value of 693 pCi/g for Tc-99. Furthermore, using the actual sample maximum sample result of 159 pCi/g, an AF of 6.3 would be required for the area to successfully pass an EMC investigation. An AF on 6.3 would require a minimum sample density of 1 sample per every 163 m^2 of the SU.

As the maximum observed value of 159 pCi/g is significantly less than the maximum allowable value, and that the actual sample density collected of 37.25 m^2 is much greater than the minimum sample density requirements, the Tc-99 hot spot assessment is considered successful.

Additional Discussion:

While not specifically stated in the FSSR for LSA 11-06, the elevated area was assumed to be quite small based on the physical nature of the area. The elevated Tc-99 activity was identified in the low lying portion of a ditch, a conclusion was drawn that this area served as a collection point. Additionally, the investigation sampling surrounding the area showed that the level of contamination was greatly diminishing away from the identified center of the elevated area. Additional sampling would have proven problematic as the identified area falls adjacent to the active rail line that traverses the southern portion of the site. While this limits the range of sampling, it also prevents the potential for any inadvertent contact by the public, and given the Tc-99 hot spot assessment above concluded that the sampling that was performed was suitable, the EMC area was expanded all the way to the survey unit border, and the conservative estimate of 26.4 was assigned to the EMC area.

EMC Investigation Area within LSA 11-06