**Department of Energy**
West Valley Demonstration Project
10282 Rock Springs Road
West Valley, NY 14171-9799

October 21, 2010

Dr. Keith I. McConnell, Deputy Director,
Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Responses to Nuclear Regulatory Commission (NRC) Comments on the Phase 1 Final Status Survey Plan (FSSP) and Phase 1 Characterization Sampling and Analysis Plan (CSAP) for the West Valley Demonstration Project (WVDP)

REFERENCE: Letter (103083), K. I. McConnell to B. C. Bower, "Comments on Phase 1 Final Status Survey Plan and Phase 1 Characterization Sampling and Analysis Plan for the West Valley Demonstration Project," dated May 17, 2010

Dear Dr. McConnell:

The U.S. Department of Energy (DOE) acknowledges NRC's review and May 17, 2010 comments on the Phase 1 FSSP for the WVDP, December 2009 and Phase 1 CSAP for the WVDP, February 2010. To that end, the DOE-WVDP is providing the attached comment response matrix (Attachment A).

Should you have any questions or comments regarding this transmittal, please contact Moira Maloney of my staff at (716) 942-4255.

Sincerely,

Bryan C. Bower, Director
West Valley Demonstration Project

Enclosure: Attachment A - Responses to NRC Comments on the Phase 1 Final Status Survey Plan (FSSP) for the WVDP, December 2009 and Phase 1 Characterization Sampling and Analysis Plan (CSAP) for the WVDP, February 2010

cc: M. S. Bellis, DOE-EMCBC, AC-DOE, w/enc.
Z. Z. Zadins, DOE-WVDP, AC-DOE, w/enc.
P. L. Piciulo, NYSERDA, AC-NYS, w/enc.

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**Attachment A**
**Reponses to NRC Comments on the Phase 1 Final Status Survey Plan (FSSP) for the WVDP, December 2009 and Phase 1 Characterization Sampling and Analysis Plan (CSAP) for the WVDP, February 2010**

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| FSSP 1 | | **Comment:** Section 1.0 (Introduction and Purpose) states that the Phase 1 Decommissioning Plan (DP) includes Derived Concentration Guideline Level (DCGL) requirements for stream sediments and that stream sediments are not expected to be included in Phase 1 Final Status Survey activities. In comparing the Final Status Survey Plan (FSSP) Table 1 with Phase 1 DP, Rev 2 Table 5-14, both tables are the same except for the values in the last column for Streambed Sediment "CGemc" (Cleanup Goals applicable to limited areas of elevated concentrations within a survey unit). It is not clear why these values are different. Consistent with NUREG-1757, Chapter 4 (Facility Radiation Surveys), the U.S. Department of Energy (DOE) has included streambed sediments as an integral part of the Phase 1 DP. Therefore, remedial action support surveys and final status surveys for streambed sediments need to be addressed in the FSSP even if stream sediments are not expected to be included in Phase 1 final status survey activities. The U.S. Nuclear Regulatory Commission (NRC) staff recognizes that there may be technical challenges to be addressed in the performance of surveys involving moist sediments. NRC staff is also concerned that the soils at the bottom of excavations typically are moisture laden and have a significant impact on the ability to perform quality measurements both in the excavation and streambeds.<br>**Basis:** NUREG-1507 "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Containments and Field Conditions" addresses the impacts such as moisture on survey measurements.<br>**Path Forward:** Address the inconsistency in Table 1 values in the FSSP. DOE also needs to develop the survey plans and procedures to ensure that quality measurements can be achieved to demonstrate that the unrestricted release criteria are met. Many of the measurements in the remedial action and final status surveys may not be taken under optimal conditions, and the survey program needs to establish the limitations for the performance of the measurements based on the instrumentation and field conditions. NRC staff recommends that these issues be considered during the Characterization Sampling and Analysis | Table 1 of the Phase 1 FSSP will be corrected so that sediment $CG_{emc}$ values match those found in Table 5-14 in the Phase 1 DP, Rev 2.<br><br>The NRC correctly points out that, in many cases, surveys of exposed surfaces will be conducted under conditions that are not optimal. Examples include: surveys of soils/sediments that may be near saturation conditions; surveys where geometry effects may be significant (e.g., streambed footprints with deeply incised streams, and walls of deep excavations); and surveys where soils are covered with a significant amount of organic matter (e.g. leaves, grass, etc.). The effects of these conditions on detection sensitivity for various radionuclides are radionuclide-specific and detector-specific, as discussed in NUREG-1507. The Phase 1 FSSP recognizes that scans will be inadequate to establish $CG_{emc}$ compliance for all radionuclides of interest; hence the derivation and application of area factors combined with soil sampling to be able to address both $CG_w$ and $CG_{emc}$ concerns via soil sampling. It is important to note that the Phase 1 FSSP process was designed so that determining compliance with $CG_w$ and $CG_{emc}$ standards can be accomplished with sample results alone in the event that scanning performance is unsatisfactory. This is in recognition of the facts that (1) some of the radionuclides of interest are not detectable at their CG levels by scans, even under optimal conditions; and (2) the detectability of other radionuclides of interest may be compromised by environmental factors such as elevated soil moisture levels. In this context, scans provide an additional level of confidence that activity concentrations at levels of CG concern will be identified, even though the scans are not definitive regarding the presence or absence of contamination. All final status survey (FSS) scan data will be electronically logged with coordinates to allow post-processing and analysis. This logging will provide the ability to observe trends and/or anomalies in surface gross activity that are potentially indicative of contamination, and consequently will provide the |

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| | | Plan (CSAP) implementation. | ability to support the selection of biased samples to either confirm contamination or to determine CG compliance.<br><br>Extensive scans will be conducted as part of Phase 1 CSAP pre-remediation data collection activities and are an integral part of the Phase 1 FSSP process. These scans will be performed under a wide range of conditions. In general, scans will be conducted to avoid adverse field conditions to the extent possible (e.g., allowing surface soils to dry after heavy precipitation events, scheduling scans when foliage is at a minimum, etc.). Section 6.11.2 of the CSAP discusses scan performance evaluation procedures in more detail for NaI detectors. In addition, when surface soil samples are collected, corresponding scan data will be matched to the soil sampling location to allow a field-based evaluation of detector performance and detection sensitivities. This activity is not explicitly discussed in the Phase 1 FSSP or Phase 1 CSAP; text will be added to both documents detailing this requirement, including how scan data will be paired to sample results, and which types of subsequent data review will be conducted. As Phase 1 CSAP data collection proceeds, scan information combined with surface soil sample results (both systematic and biased) will provide information on the types of radionuclides present above background conditions in surface soils, and on the performance of scans in detecting elevated radionuclide-specific activity concentrations. This information, in turn, will be used to modify scanning procedures to improve performance, when possible, and to flag settings where scan results may be ineffective for identifying CG exceedances. Based on the results of CSAP work, the FSSP may be modified to reflect the lessons learned. |
| FSSP 2 | | Section 2.3 (Key Assumptions), the assumption titled "CG Definitions" describes a potential issue, that in part, states "(3) the presence of thin, highly elevated zones overlain by clean surface soils will be evaluated by the CSAP data collection. In the last instance, if near surface contaminated layers are encountered by CSAP data collection that result in potential dose | The use of the term "near surface" in the Phase 1 FSSP and Phase 1 CSAP was intended to refer to contamination within the top 1 m of soil but that was not apparent on the immediate soil surface. Both the Phase 1 FSSP and Phase 1 CSAP will be revised so that the term "near surface" is removed and instead contamination will be referred to as appearing in |

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| | | concerns, but that would not have been identified by the proposed FSS [Final Status Survey] data collection, then the FSS process will be modified to meet the specific needs of those areas." The assumption titled "Subsurface 2 Soil Contamination" states that the Phase 1 FSS process is not applicable to areas outside the Waste Management Area (WMA) 1 and 2 excavations where subsurface soil contamination exists greater than one meter in depth. Section 5.1.2 of the DP states the subsurface DCGLs "apply only to the bottoms and lower sides" of the two large excavations in WMA 1 and WMA 2. Clarify the meaning of the term "near surface" relative to the meaning of the terms for surface soil and subsurface soil.<br>**Basis:** NUREG-1575 "The Multi-Agency Radiation Site Survey and Investigations Manual" (MARSSIM) defines surface soils as 0-15 cm in depth, and depths below 15 cm are considered subsurface soils. In the FSSP, DOE uses the term "near surface" which is not defined, and the potential issue description gives the impression that the thin layers may be subsurface.<br>**Path Forward:** Clarify the meaning of the term "near surface" and the application of DCGLs for potential near surface contaminated layers. | surface soils (i.e., in the 0 – 1 m interval) or subsurface soils (i.e., deeper than 1 m). In those instances where the discussion focuses on layers of contamination within the 0 – 1 m interval but without evidence on the immediate soil surface, the language used will make that reference clear.<br><br>As the Phase 1 FSSP states, if Phase 1 CSAP data collection encounters situations where contaminated layers exist in the 0 – 1 m depth interval that would potentially result in dose concerns but that satisfy the current set of Phase 1 CG requirements because of the 0 – 1 m depth averaging taking place, then the FSSP data collection protocols will need to be modified to address this issue. |
| FSSP 3 | | Section 2.3 (Key Assumptions) "Analytical Methods" states that a field based laboratory may prove advantageous, particularly for those radionuclides that will likely be the primary decision drivers, Cs-137 and Sr-90.<br>**Basis:** The above statement infers that surrogates will be employed to determine the specific activity of hard-to-detect radionuclides such as C-14, Sr-90, and I-129. It is not clear in either the CSAP or FSSP how surrogate relationships will be determined and how quality assurance procedures will be employed to ensure surrogate ratios remain valid.<br>**Path Forward:** Develop the technical basis for determining the surrogate relationships and quality assurance procedures to ensure the surrogate relationships remain valid during the remedial action surveys and final status survey program. The basis for the surrogate relationships and quality assurance requirements need to be in the revised FSSP. | Although the CSAP discusses data collection to evaluate the possibility of using surrogates, there is no expectation that surrogates will prove useful at the WVDP premises for FSS evaluation. The Phase 1 FSSP was written assuming that surrogates would not be useful; consequently, the use of surrogate relationships and associated QA procedures are not included. If the Phase 1 CSAP data collection indicates surrogates would be useful in the FSS process, then the Phase 1 FSSP would require revision to reflect the use of surrogates and would include appropriate quality assurance requirements.<br><br>There is the expectation that for large portions of the facility, SOR exceedances will be dominated either by Cs-137, by Sr-90, or by a combination. The primary purpose of the on-site/field-based laboratory is to support decision-making in that context. Specifically, the on-site lab could be used to |

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| | | | support decisions regarding the extent of characterization work. Also, the on-site lab could be used to conduct initial assessments of whether areas are ready for FSS data collection. For example, if a surface soil sample intended to laterally bound contamination yields either Cs-137 or Sr-90 on-site lab results above their respective CG levels, a quick decision could be made to continue sampling until the limits of contamination are encountered (and eventually confirmed by off-site laboratory analyses). Likewise in the deep excavations, when excavation has attained its design depth, analysis of FSS samples in the on-site lab will provide a quick assessment that a particular survey unit either does or does not comply with CG values. If on-site lab results demonstrate that the survey unit clearly does not comply with CG values, then there would be no reason to perform the required collection of FSS samples for off-site analyses until additional excavation had taken place and the exposed surface re-sampled for FSS evaluation. |
| FSSP 4 | | NRC staff is concerned that while it is appropriate to identify a reference area that has not been radiologically impacted by site activities, it is also important to be able to distinguish site radioactivity from natural background. Soils may have naturally occurring radioactivity, including uranium and thorium, and may contain cesium and strontium from fallout.<br>**Basis:** Section 4.8 (Reference Area) describes the need to identify a 2000 m2 reference area prior to FSS data collection, and the selection will be based on CSAP data collection results. The reference area will be chosen such that there is no measureable evidence of impacts from historical site activities. The NRC limit for unrestricted release criteria is 25 mrem per year (plus ALARA) and does not include contribution from natural background.<br>**Path Forward:** DOE needs to determine the natural background radioactivity of the soils. NRC staff suggests that DOE conduct a background study outside the West Valley Demonstration Project (WVDP) premises, but in the local area near the site with similar or native soils to determine the background contribution | DOE recognizes the importance of a defensible background reference area to support CSAP-related data evaluations, and potentially for use in the FSS process (although currently the Sign test, not the WRS test, is expected to be used for FSS data analysis). A background reference area has not, as yet, been selected; the expectation is that this would be an area outside the WVDP premises but within the WNYNSC property. Consequently, one of the initial tasks to be performed as part of the CSAP effort will be the identification of an appropriate background reference area. Stakeholder consensus on the appropriateness of the selected area will be extremely important. Stakeholder input on potential areas will be solicited and considered during the selection process. DOE is currently working with NYSERDA to identify potential background reference area candidates. |

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| | | in soils. The results of this study can be used to ensure the onsite reference area is representative of natural background. DOE may want to consider including stakeholder participation in the study as was performed at DOE's Rocky Flats site. | |
| FSSP 5 | | Appendix A (Composite Sampling Technical Basis), the composite sampling approach may meet a number of the objectives detailed in the Phase 1 FSSP. However, based on the NRC staff review and Oak Ridge Institute for Science and Education (ORISE) review (ORISE is an NRC independent contractor), the technical basis for the composite sampling plan does not provide adequate detail and sufficient site-specific information that is necessary to evaluate multiple areas of concern. The NRC staff concerns are based on the following factors:<br>1. The FSSP needs to provide specific information as to how the presence of multiple radionuclides will be accounted for in the plan and reporting, other than committing to apply the sum-of-ratios (SOR) calculation to the analytical results. The FSSP must include SOR considerations in the planning and should include the following:<br>a. Detail as to how the presence of multiple radionuclides of interest (ROI) will impact the necessary samples to account for hot spots in Class 1 survey units, when the actual scan minimum detection concentration (MDC) is greater than required scan MDC for many of the radionuclides. The plan mistakenly compares the Table 5 scan MDC to the CGemcs listed in Table 1. The CGemcs listed in Table 1 are for a 1 m2 area. Therefore, unless sample spacing will be no more than that, many of the listed MDCs are not adequate.<br>b. There is no accounting for the impact of the proposed composite sampling approach on any of the ROIs except for Sr-90. Of particular concern are those hard-to-detect ROIs with low DCGLs, such as I-129 and Np-237. The combination of the analytical limitations on detection together with low DCGLs may result in lost information as to when an action level has been exceeded.<br>c. There is no discussion on the possible reduction in the dose | In deference to NRC's continued reservations about composite soil sampling strategies, DOE will rewrite both the CSAP and the FSSP so that they are based on discrete soil sampling protocols.<br><br>DOE will commit to a minimum sampling density of one sample per 100 $m^2$ area for Class 1 units. This is the equivalent of a minimum of 20 samples per Class 1 survey unit, a number more than sufficient to meet the Type I error rate goal of no more than 5%.<br><br>DOE will rely on gross gamma activity scans to identify $CG_{emc}$ concerns for areas smaller than 100 square meters, for those radionuclides that can be addressed by scanning.<br><br>The original sample numbers derived for the FSSP were obtained using VSP. Additional detail will be added to the plan to clarify the basis for the proposed sample numbers.<br><br>DOE will use CSAP data to establish the area-specific radionuclides of interest that will be carried into the FSS process. To be removed from consideration during the FSS process for a specific area, radionuclides would have to satisfy the following criteria:<br>• Cannot be present above $CG_w$ standards<br>• Cannot contribute more than 10% of the overall dose<br>• Removal would not result in the changing of an SOR score from greater than 1 to less than 1<br><br>All FSS samples will be analyzed for both Cs-137 and Sr-90, at minimum. Ten percent of FSS samples will be analyzed for all 18 ROI. |

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| | | criteria that should be included in adjusted DCGLs and therefore action levels to account for those radionuclides contributing less than 10% of the dose.<br>2. The FSSP does not adequately address accounting for residual hot spots. It appears that the investigation thresholds will not identify potential residual contamination due to unacceptable scan MDCs and the composite sampling approach. These issues are discussed in greater detail in the ORISE Report DCN: 2012-TR-02 (ML101230077).<br>3. The decision logic presented in the FSSP is not appropriate for investigations of Class 2 and 3 survey units. The FSSP compares results to the CGw (Cleanup Goals applicable to the average concentration over a survey unit) times an appropriate area factor. Class 2 and 3 results must be compared to a fraction of the CGw to prevent missing contamination in Class 2 or 3 areas due to dilution of the individual samples. This may cause under classification of a survey unit. This issue is also a concern with the CSAP. The primary focus of the technical basis also appears to be on providing a means for reducing the probability of a Type II error or failing to reject the null hypothesis (H0) which states that the survey unit exceeds the release criteria (a false positive). However, the plan does not clearly account for ensuring that a Type I error does not occur, that is rejecting the null hypothesis (H0) when it is true.<br>**Basis:** The basic premise, hypotheses, or position of the regulating agency is that the survey unit/site is contaminated. In this premise, there are two types of errors that the regulating agency must be concerned with. The first type of error is the Type I error. A Type I error implies that a sample may be identified as not being contaminated (below the DCGL) when in fact the sample is contaminated (above the DCGL). The second type of error is the Type II error. A Type II error implies that a sample may be identified as being contaminated (above the DCGL) when in fact the sample is not contaminated (below the DCGL). The guidance in NUREG-1757 and NUREG-1575 is focused on ensuring that Type I errors do not occur (releasing an area as clean and below the DCGL when in fact it is still above | |

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| | | the release criteria) and is critical to decision making in the final status survey process. From a regulatory perspective, the Type I error is considered more serious than the Type II error. The Type I error is the more serious error because of the possibility of leaving contamination behind (above the DCGL) and determining the site as not being contaminated. In order to ensure that not too many Type I errors occur, the regulatory agency establishes a low probability of a Type I error occurring (i.e., 5%, 10% etc.). In other words, if someone was to make repeated sampling (n=100) in an area where the concentration is known to exceed the DCGL, there is a chance that five of those samples would be identified as not being contaminated (below the DCGL) when in fact they did exceed the DCGL. The regulatory agency is establishing a tolerance to allow only five chances out of a possible 100 chances for a sample to be identified as not contaminated when in fact it is contaminated. Establishing such a tolerance provides an incentive to collect sufficient samples (burden of proof) to demonstrate that the site is not contaminated.<br>**Path Forward:** DOE should address above concerns and consider employing established industry computer codes, such as the Pacific Northwest National Laboratory – Visual Sample Plan (VSP). This code is intended for use in the development of survey plans where the principle ROIs are hard-to-detect. The FSSP will require revision at the completion of the CSAP. The revision to the FSSP should be provided to NRC for consultancy review and comment. | |
| CSAP 1 | | It does not appear that an evaluation of surrogates will be a major characterization goal of the CSAP. NRC staff believes that a well defined set of surrogate DCGL ratios will be vital to the efficacy of FSSs, as it has been stated that DOE may use characterization data for FSS purposes. NRC staff believes that additional surrogate analyses are necessary to determine the applicability of surrogates at the site.<br>**Basis:** Section XIV.b. (Characterization Surveys) of the Decommissioning Plan Annotated Checklist gives the expectation "For sites, areas, or buildings with multiple | Although the CSAP discusses data collection to evaluate the possibility of using surrogates, there is no expectation that surrogates will prove useful on the WVDP premises. The reason for this is that the limited data currently available indicate that relative activity concentrations among the 18 ROI vary significantly spatially, as one would expect given the diverse nature of activities at the site, the various releases that occurred, and the varying environmental fate and transport characteristics of the 18 ROI. It is important to note that almost all pre-remediation soil and sediment samples collected |

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| | | radionuclides, a discussion justifying the ratios of radionuclides that will be assumed in the final status survey or an indication that no fixed ratio exists and each radionuclide will be measured separately." Section 9.4.1 (Characterization Sample and Analysis Plan Content) of the Phase 1 DP states that the CSAP "will identify the radionuclides of interest," and that "it will also address the variability of radionuclide ratios across the site and identify areas where the ratios need to be confirmed for use in the Phase 1 final status survey analysis." The CSAP states in Section 2.1 (Pre-Remediation Data Collection Objectives) that "there is a question as to whether ROI ratios are consistent enough to allow for the use of surrogates in future data collection efforts (e.g., remedial support and FSS)," and "data collection is required to determine area-specific radionuclide ratios and determine their consistency." However, there appears to be a lack of commitment to surrogate determination as the CSAP states in Section 6.3 (Explore the Possibility of Surrogate ROI) "The data presented in Section 6.1 suggest that it is unlikely that a surrogate ROI can be found that would be applicable across the WVDP premises. CSAP data collection is expected to confirm that this is the case. There will be no CSAP data collection specific to this goal; instead CSAP data collected to support the other goals will be used to explore the possibility of a surrogate ROI." The data presented in Section 6.1, Table 2 (ROI Sample Results from Three Locations) do not appear to be conclusive enough to determine the utility of surrogates at the WVDP site, as most of the data are either below detection limits and/or estimated. In reviewing the characterization goals for each WMA (as listed in the CSAP Appendices) it was also noted that the following areas do not list "Explore the Possibility of Surrogate ROI" as a goal: WMA 1, WMA 2, WMA 3, WMA 4, WMA 6, WMA 12, and WMA 12 North. There was no discussion of why surrogates were only considered in some areas.<br>**Path Forward:** NRC staff agrees that it will be difficult to define site-wide surrogate DCGL ratios and believes there needs to be a commitment to explore surrogate ratios throughout all | as part of CSAP efforts from all of the WMAs to be addressed will be analyzed for all 18 ROI, which in turn will allow for a surrogate analysis if the data suggested that would be beneficial.<br><br>Surrogates are typically used to control analytical costs when one easily measurable radionuclide exists in predictable ratios to other radionuclides of interest. The measurable radionuclide may or may not be the primary dose driver. As part of a surrogate analysis, the DCGL for the measurable radionuclide is adjusted down to a level where one can be confident that if all radionuclides of interest present had been analyzed, the resulting SOR value would have been less than unity. While surrogates can reduce analytical costs, they also have the potential for increasing false negative error rates if the assumed radionuclide ratio fails to hold over the area of interest, or to significantly increase false positive error rates if conservative surrogate assumptions are used to control false negative errors.<br><br>If one or more of the 12 radionuclides of potential interest are identified in a specific area, further analysis of samples from that area will be required to potentially allow for a surrogate analysis. |

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| | | areas of the WVDP site. NRC staff has addressed this issue in Appendix O.3 (Lessons Learned During Decommissioning Final Status Survey In-Process Inspections and Confirmatory Surveys) of NUREG-1757, Vol. 2, Rev. 1. Section O.3.4.1 (Contaminant Variability Ratio: Difference Across a Site) addresses site-wide ratiovariability as follows: This issue can be readily avoided provided representative samples are collected in such a manner that the ratio developed accurately represents both spatial, and in some cases, depth variability. Furthermore, it may not be reasonable to select a single ratio for application across a site. Rather, it may be necessary to develop multiple ratios and specifically identify sites areas where each ratio will apply. In other cases, the ratio may vary to the extent that no consistent ratio can be inferred, meaning the surrogate approach would not be an option and radionuclide specific measurements are then required. Additionally, the ratio is typically verified for a percentage of the FSS samples. This is especially true in remediated areas where the decontamination may alter the ratio through either physical or chemical processes. If the usage of surrogate ratios is viable, it will potentially allow for optimization of future characterization and final status surveys. However, if surrogates cannot be used, alternative survey/sampling methods may need to be expanded (e.g. additional soil sampling). NRC staff suggests placing a stronger emphasis on surrogate determination during characterization as the results of such analyses may affect future survey/sampling requirements. | |
| CSAP 2 | | DOE has indicted that detection of Cs-137 and Sr-90 will be used to establish areas of contamination across the site. DOE has also acknowledged that Sr-90 will not be detectable by a gamma walkover survey (GWS) and that some site areas have Sr-90 contamination in isolation. NRC staff has some concerns that areas of contamination may be missed in this scenario. It is also not clear what path forward will be taken as a result of GWS conclusions.<br>**Basis:** Section 11.2 (Detector Technologies) of the CSAP states the following: "Two radionuclides are known to have relatively | A decision flow-chart will be prepared and included in the CSAP per NRC request.<br><br>There are several key points to note regarding the comment:<br><br>• There are no historical surface soil sample results where Sr-90 is detected in the absence of elevated Cs-137 activity concentrations. Soil samples with this characteristic have only been detected in the subsurface.<br>• In each of the WMAs, almost all surface soil samples |

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| | | widespread environmental impacts onsite: Cs-137 and Sr-90. Cs-137 is readily detectable at its CG levels but Sr-90 is not. There are areas of the WVDP premises where one or the other of these radionuclides exists in isolation. Examples include the northern border of the premises where surface contamination is likely only Cs-137 and its progeny (associated with the Cs-137 prong that extends to the north), and the north plateau groundwater plume extending underneath WMA 4, where subsurface contamination is likely only Sr-90 and its progeny." Section 6.5 (Determine Extent of Surface Soil Contamination) of the CSAP presents a plan for GWS data utilization, and states "Based on process knowledge and the limited surface soil samples available, it is expected that surface soil contamination above surface soil CGw levels will always be accompanied by Cs-137 elevated at levels detectable for a GWS. The GWS data will be used to further refine WMA-specific initial conceptual site models. In particular, GWS data will be used to identify areas where GWS results indicate surface contamination likely exceeds CGw requirements, areas where it is very unlikely surface contamination exceeds CGw requirements and areas where the GWS data are inconclusive." The basis for determining that Cs-137 will always accompany areas with surface soil contamination above CGw levels is not clear, and it seems to contradict other statements pertaining to areas of Cs-137 and Sr-90 in isolation. It is also not clear what path forward will be taken for each of the three possible GWS conclusions. Section 6.5 continues to note that "Areas where GWS data clearly indicate surface contamination is highly unlikely to exceed CGw requirements and there are no subsurface contamination concerns will be flagged as potentially ready for Phase 1 FSS data collection. It is likely that no additional surface soil samples will be collected from these areas as part of CSAP efforts unless there is a specific need identified; sampling for FSS purposes may take place separate from CSAP activities during Phase 1, or FSS sampling may be deferred until Phase 2." NRC staff is concerned that the proposed GWS methodology could result in areas of contamination being missed when Sr-90 | collected during the pre-remediation CSAP data collection effort will be analyzed for all 18 ROI.<br>• If there is evidence of historical surface disturbance and/or possibility of buried contamination, GWS will be supplemented with systematic soil sampling, with all samples analyzed for all 18 ROI.<br>• In the unlikely event that neither the GWS nor pre-remediation soil sampling identified Sr-90 impacts, Sr-90 activity concentrations elevated above CG standards would be detected during the FSS process since all Phase 1 FSS samples will be analyzed for Sr-90. |

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| | | exists in isolation from Cs-137.<br>**Path Forward:** NRC staff suggests that DOE develop a flow chart to clarify the steps that will be taken as a result of each possible GWS conclusion, which were stated as: 1. Areas where surface contamination likely exceeds CGw requirements, 2. Areas where it is very unlikely surface contamination exceeds CGw requirements, and 3. Areas where the GWS data are inconclusive. NRC staff suggests that the flow chart additionally clarify how such conclusions can be reached for areas of isolated Sr-90 contamination, and DOE may need to augment the GWS to ensure that these areas are not mischaracterized. As stated in CSAP Comment #1, the establishment of accurate radionuclide ratios across the site may play an important role in performing a comprehensive site characterization. In this respect, it would be useful to correlate the ROIs to Cs-137 or Sr-90 throughout the site. | |
| CSAP 3 | | One of the CSAP objectives is to establish background data sets. It is not clear in the CSAP whether DOE intends to use an on-site or off-site location for the background reference area. It is also not clear what background levels will be used for comparison to various characterization scans.<br>**Basis:** It was stated in Section 9.3 (Background Surveys) of the Phase 1 DP that "the surveys and sampling in non-impacted offsite areas to establish a basis for background radioactivity levels will be described in detail in the Characterization Sample and Analysis Plan." The CSAP states the following in Section 8 (Reference Area): "A surface soil reference area will be established and maintained for the duration of Phase 1 activities. The reference area will be approximately 2,000 m2 in size and will encompass surface soil types and conditions similar to those expected within the WVDP premises. The reference area will have no historical evidence of contamination from NFS or WVDP activities and there will be no reason to believe such impacts might exist." It is not clear where the reference area will be chosen, on-site or off-site. Section 6.11.2 (Down-Hole and Ex Situ Core Scans) of the CSAP indicates that "Average background values and background variability for down-hole | It is DOE's expectation that the background reference area will not be within the WVDP premises, but will be within the WNYNSC property. The selection process will be consistent with MARSSIM. Please see the response to FSSP Comment #4.<br><br>In the case of down-hole and ex situ core surveys, background information will be acquired as CSAP data collection proceeds and soil cores are retrieved that do not exhibit activity concentrations that are inconsistent with background, based on laboratory results. For these cores, the observed down-hole and/or ex situ scanning results will be added to the background set of information available for down-hole and ex situ scanning.<br><br>In the case of a background reference area appropriate for deep excavation comparisons, there are no other deep excavations planned for the WVDP premises prior to initiation of the WMA 1 and WMA 2 deep excavations. To be useful, a background deep excavation would need to penetrate the Lavery Till (since background gross activity for the Lavery |

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| | | gamma scans and ex situ soil core scans will be determined based on data from CSAP soil cores where no contamination is found present above background levels. This variability will, in turn, allow the development of field investigation levels that can be applied to downhole and ex situ surveys to flag results that are inconsistent with background and potentially indicative of the presence of radionuclides above background levels." It is not clear where the "CSAP soil cores where no contamination is found present above background levels" will be taken. Section 7.1 (WMA 1 and WMA 2 Excavation Support) of the CSAP states that "Since a deep subsurface background reference area will not be available prior to the initiation of WMA 1 and WMA 2 excavations, the initial round of scanning results will also be used to identify a portion of the excavation surface that appears to be at background conditions," and that "Assuming the analyses confirmed background conditions for these soils, the scan data from this area would be used as a point of comparison for scan data collected as part of remedial action support elsewhere in the excavations." It is not clear why a deep subsurface reference area will not be available prior to the initiation of WMA 1 and WMA 2 excavations, and it is not clear what comparison will be used to establish that background conditions exist in these soils. It also appears that DOE may be using a portion of an impacted area as a background reference area, which is not consistent with MARSSIM guidance.<br>**Path Forward:** NRC staff suggests that MARSSIM (NUREG-1575) guidance be used to determine an appropriate background reference area. According to MARSSIM, an area should be selected "that has similar physical, chemical, radiological, and biological characteristics as the survey unit(s) being investigated but has not been contaminated by site activities (i.e., non-impacted)." MARSSIM Section 4.5 and NUREG-1505 provide additional details on the selection of a background reference area. NRC suggests that a clear justification be provided for the selection of background reference areas and that clarification be provided on the background levels used for comparison to various characterization scans. Clarification should also be | Till is expected to be measurably different from that of overlying soils), and also would need to be large enough to capture the variability present across the Lavery Till.<br><br>DOE will look off the WVDP premises but within the WNYNSC property for a location where the Lavery Till might be readily accessible to allow for a background gamma walkover survey to be performed.<br><br>DOE will add a set of background soil cores to the reference area work to allow for the evaluation of background responses for ex situ core scans and in situ down hole bore scans. |

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| | | provided on why a suitable deep subsurface background reference area will not be available prior to the initiation of WMA 1 and WMA 2 excavations. NRC staff cautions against using a background reference area that is a part of the same survey unit being evaluated. If such a situation is not avoidable, DOE should provide justification that background is truly being represented. MARSSIM Section 4.5 provides the following guidance on this topic: "In some situations, a reference area may be associated with the survey unit being evaluated, but cannot be potentially contaminated by site activities. For example, background measurements may be taken from core samples of a building or structure surface, pavement, or asphalt. This option should be discussed with the responsible regulatory agency during survey planning. Generally, reference areas should not be part of the survey unit being evaluated." | |
| CSAP 4 | | Details on the application of background data during site characterization are not clear. There were statements in the Phase 1 DP indicating that MARSSIM Chapter 8 guidance would be used for this purpose. However, the CSAP provides only limited information on background data application which does not appear to be consistent with MARSSIM guidance. **Basis:** Section 9.3 (Background Surveys) of the Phase 1 DP states: "The application of the background data during assessment and use of the data obtained in the characterization and Phase 1 final status surveys will be based on guidance in Chapter 8 of the MARSSIM (NRC 2000) and will be described in each of the respective plans." A limited discussion on the application of background data was provided in Section 8.3 (Radionuclide-Specific Background Activity Concentrations) of the CSAP as follows: "For surface soils, a sample result will be considered inconsistent with background if the activity concentration of one or more radionuclides exceed their respective 95%UTL by more than three times the reported error associated with the reported result. For subsurface soils, the same rule will apply as for surface soils for those radionuclides that are naturally occurring. For those radionuclides that are anthropogenic (and consequently not expected to exist at | MARSSIM guidance in Chapter 8 pertains to FSS decision-making, not characterization work. MARSSIM provides no guidance on the use of background data for pre-FSS decision-making.<br><br>The primary purpose of soil sample results from the reference area is to assist in determining the lateral and vertical extent of contamination above background conditions at individual locations so that CSAP decisions can be made about when sampling vertically or laterally can cease. This is a different decision-making requirement than what is contained in Chapter 8 of MARSSIM.<br><br>The CSAP provides a method for deriving field investigation levels from reference area data to determine when individual soil CSAP results are inconsistent with background. |

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| | | measurable levels in subsurface soils), a result that is greater than three times its reported uncertainty will be considered inconsistent with background conditions." These statements do not appear to be consistent with MARSSIM guidance on the non-parametric statistical analysis of background data.<br>**Path Forward:** Clarification is needed on the application and statistical analysis of background data during characterization. It should be clear how the proposed analyses relate to MARSSIM Chapter 8 guidance. | |
| CSAP 5 | | Estimated scanning MDCs of radionuclides in soils were given in Table 4 of the CSAP, and Table 5 provided radionuclide target sensitivity for laboratory sample analysis. Actual sensitivities were not provided, as was expected in the Decommissioning Plan Annotated Checklist. Field/laboratory instrument sensitivities were also not given for the twelve radionuclides of potential interest listed in Table 6 of the CSAP.<br>**Basis:** It is stated under Section 11.2 (Detector Technologies) of the CSAP that "Because of the range of field conditions and data collection requirements that fall under the CSAP, providing details about all potential detectors and their performance characteristics is beyond the scope of this document." NRC staff believes that this should be within the scope of the document and that additional details should be provided on the actual sensitivities of field and laboratory instruments to be used for characterization. The expectation from the Phase 1 DP was given in Section 9.4.1 (Characterization Sample and Analysis Plan Content), and states that: "The Characterization Sample and Analysis Plan will specify the field and laboratory instruments to be used and the sensitivity of these instruments and methods." Section XIV.b. (Characterization Surveys) of the Decommissioning Plan Annotated Checklist provides expectations for "a description of the field instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods," and "a description of the laboratory instruments and methods that were used for measuring concentrations and the sensitivities of those | Laboratory method (off-site and on-site) radionuclide-specific MDC requirements for the 18 ROI are provided in Table 5 of the CSAP.<br><br>Expected detection sensitivities for the primary detectors to be deployed by the CSAP for the 18 ROI are provided in Table 4 of the CSAP.<br><br>Additional tables will be provided in the CSAP revision to provide the equivalent information for the 12 secondary ROI.<br><br>Actual sensitivities are a function of site-specific parameters and can only be known during the course of data collection. The CSAP data collection will result in site-specific actual MDC values for the radionuclides that are encountered. The FSSP will be updated with these values once they are obtained.<br><br>Estimated sensitivities can be obtained from past experience at other sites and/or from theoretical calculations. It has been our experience that the former is a much more accurate representation of detector performance, particularly for low energy radionuclides such as the plutonium isotopes. |

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| | | instruments and methods."<br>**Path Forward:** In accordance with the Decommissioning Plan Annotated Checklist and Section 9.4.1 of the Phase 1 DP, DOE should provide the actual sensitivities and methods for field and laboratory instruments that will be used during site characterization. | |
| CSAP 6 | | Generic Soil Screening Values from NUREG-1757 Vol. 2, Appendix H are provided for the twelve radionuclides of potential interest listed in Table 6 of the CSAP. It is not clear why these screening values were provided, as they are intended to be used at non-complex sites and would not be useful at West Valley.<br>**Basis:** Appendix H.2.2 (Qualification of the Site for Screening) of NUREG-1757 Vol. 2 lists the following stipulations on the usage of site screening values:<br>The residual radioactivity on building surfaces (e.g., walls, floors, ceilings) should be surficial and non-volumetric [e.g., #10 mm (0.39 in) of penetration]. Residual radioactivity on surfaces is mostly fixed (not loose), with the fraction of loose (removable) residual radioactivity no greater than 10 % of the total surface activity. The screening criteria are not being applied to surfaces such as buried structures (e.g., drainage or sewer pipes) or equipment within the building without adequate justification; such structures, buried surfaces, and clearance of equipment should be treated on a case-by-case basis. The initial residual radioactivity (after decommissioning) is contained in the top layer of the surface soil [e.g., approximately 15 cm (5.9 in)]. The unsaturated zone and the ground water are initially free of residual radioactivity. The vertical saturated hydraulic conductivity at the specific site is greater than the infiltration rate (e.g., there is no ponding or surface run-off).<br>**Path Forward:** Clarification is needed on the intended usage of the NUREG-1757 Vol. 2, Appendix H Screening Values. | The NUREG 1757 Vol. 2 Appendix H values are provided in Table 6 simply as a reference point to the typical soil background activity generally observed and have no further implications for the CSAP. If any of the 12 secondary ROI were identified at levels that would potentially contribute to doses of concern, then appropriate site-specific Phase 1 CG standards would need to be developed and the Phase 1 FSSP revised accordingly.<br><br>As noted in response to CSAP Comment #5, MDC requirements for the off-site laboratory for the 12 secondary ROI will be provided in Revision 1 of the CSAP. |
| CSAP 7 | | It is not clear how (or if) investigation levels for scanning surveys will be determined during the CSAP. Section 9.5.2 (Scan Surveys and Direct Measurements) and Appendix G (Phase 1 Final Status Survey Conceptual Framework) of the | The investigation level referred to in Section 9.5.2 is the gross activity level that, if encountered, would be inconsistent with background conditions as observed in the reference area. This is not the same as an investigation level that might be |

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| | | Phase 1 DP indicate that investigation levels for gamma scans will be developed during the implementation of the CSAP. However, information in Section 11.3 (Background) of the CSAP appears to contradict this statement, and suggests that "spatial trends or localized anomalies" will be used to indicate the presence of contamination.<br>**Basis:** Appendix G (Phase 1 Final Status Survey Conceptual Framework) of the Phase 1 DP states: As part of Characterization Sample and Analysis Plan data collection, a background reference area will be identified that can be used to assess the background response of the detector used and that can serve as a source of background samples if a WRS test is required to demonstrate DCGLW compliance. One outcome of reference area gross gamma data collection will be the identification of appropriate field investigation levels to be applied to gross gamma data during routine use of detectors for pre-design characterization, remediation support, and final status survey data collection Section 11.3 (Background) of the CSAP states: Because of varying background conditions and because areas where contamination is present in surface soils may have more than one gamma-emitting radionuclide above background conditions, it will not be possible to establish a unique field investigation level for determining when contamination is present that potentially exceeds surface soil CG levels. Instead, gamma walkover data will be mapped and reviewed to identify spatial trends or localized anomalies that are indicative of the potential presence of contamination.<br>**Path Forward:** Clarification is needed on how the data from gamma walkover scans will be analyzed and interpreted and if the data will be used to develop survey investigation levels for the Final Status Survey. CSAP Comment #2 on gamma walkover surveys expressed the concern that areas of isolated Sr-90 might allow contamination to go undetected, and similar concerns are raised for "spatial trends or localized anomalies" analyses. DOE should consider the expectations given in Section XIV.b. (Characterization Surveys) of the Decommissioning Plan Annotated Checklist for "A discussion of why the licensee | confidently used to identify CG exceedances. As Section 11.3 of the CSAP indicates, there is no expectation that such an investigation level can be derived for the site since there are some radionuclides included in the 18 ROI that are virtually undetectable by gross gamma scans; to clarify this, the CSAP text will be modified in Sections 9.5.2 and 11.3.<br><br>In practice for a site like the WVDP premises with a long ROI list including some that are hard to detect and others that are virtually impossible to detect by scans, the primary utility of logged gross activity scan data is the ability to evaluate the data sets once collected. The data evaluation would determine whether there is evidence of spatial trends or anomalies inconsistent with an assumption of background conditions as documented by the reference area. Experience has shown that this type of review results in much lower detection sensitivities than those based simply on a radiological field technician differentiating between elevated readings from background conditions during the course of a scan. Areas of potential concern as identified by a logged gamma walkover survey can then be appropriately targeted by biased sampling to clarify the contamination status of the soils in the area of interest.<br><br>It is also important to note that a FIDLER has sufficient sensitivity to see relatively nuanced background variations in gross activity levels over large areas. These types of variations often occur at a scale that is larger than a reference area; conversely, it is unlikely that one reference area would capture the full range of potential background conditions across a site as large as the WVDP premises.<br><br>The level of scanning data analysis and QA/QC planned for the WVDP site goes beyond what MARSSIM specifies in an attempt to gain as much useful information from scans as possible regarding the contamination status of exposed soils at the site. For example, all scanned data will be logged for |

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| | | considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected." | subsequent review. All accessible portions of the site will be scanned (MARSSIM only requires 100% scanning for Class 1 areas). All surface soil sample locations will be matched with scan rate measurements to allow a robust evaluation of detector sensitivities and to facilitate interpretation of scanning data as work progresses. A portion of the reference area will be secured and protected to allow for normalization of detector results when multiple detectors are deployed across the site.<br><br>Please also see the response to CSAP Comment #2. |
| CSAP 8 | | A demonstration that field screening should be capable of detecting residual radioactivity at the DCGL was not provided. **Basis:** According to Section XIV.c. (In-Process Surveys) of the Decommissioning Plan Annotated Checklist "A demonstration that field screening should be capable of detecting residual radioactivity at the DCGL" should be provided. A statement is made in Section 7.0 (Remedial Action Surveys) of the CSAP that "The expectation for both Cs-137 and Sr-90 is that rapid turn-around analytical support will be available as part of remedial action survey activities, and that those methods (gamma spectroscopy for Cs-137 and liquid scintillation for Sr-90) will have sufficiently low detection limits to support the required decision making at CGw activity concentrations," but no additional details are provided on the sensitivity of field screening instrumentation. DOE indicates in a comment to Section XIV.c. of the Annotated Checklist that "methods and instruments for in-process surveys will be similar to those used during characterization and final status surveys. The field instruments suitable for scanning soil will not be able to detect nongamma emitting radionuclides." As noted in CSAP Comment #5, sensitivities and methods for the actual field and laboratory instruments to be used during characterization were not provided. Therefore, it cannot be concluded that methods and instruments "similar to those used during characterization and final status surveys" will be capable of detecting residual radioactivity at the DCGL during in-process surveys. **Path Forward:** A demonstration that field screening should be | There are not any field detectors available that can confidently scan for and identify all 18 ROI at their surface soil CG levels. The two NaI detectors proposed for use (FIDLER and 2×2) are believed to provide the greatest coverage in terms of the number of the Phase 1 ROI that can potentially be identified at their CG levels. Table 4 of the Phase 1 CSAP provides estimates of the MDCs that are likely to be observed when these detectors are in use; actual site-specific sensitivities will be developed and monitored based on CSAP field data once the instruments are deployed. Based on Table 4, only two of the 18 ROI are likely detectable at their surface soil $CG_w$ level (Am-241 and Cs-137); in contrast, 14 of the 18 ROI would likely be detectable if their activity concentrations exceeded the surface soil $CG_{emc}$ value associated with a 50 $m^2$ area.<br><br>DOE is exploring the development and deployment of alternative beta detectors that might prove field deployable and result in scan sensitivities close to Sr-90 CG requirements; however, such systems are not commercially available at the moment. DOE is committed to fielding the most effective suite of detectors as current technology allows. In the event that detectors other than those described in the CSAP are identified and also deployed at the site to enhance overall characterization performance, documentation pertinent to those detection systems (i.e., implementation protocols, expected performance, etc.) will be provided to the NRC. |

**Attachment A**
**Reponses to NRC Comments on the Phase 1 Final Status Survey Plan (FSSP) for the WVDP, December 2009 and Phase 1 Characterization Sampling and Analysis Plan (CSAP) for the WVDP, February 2010**

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| | | capable of detecting residual radioactivity at the DCGL should be provided. | |