NRC Clarification Questions for CH2M Hill Contractors Regarding the West Valley Demonstration Project Main Plant Process Building Demolition Modeling

Documents Reviewed:

- **WVDP-605**: Estimated Radiological Air Emission During Open-Air Demolition, Main Plant Process Building
- **WVDP-606**: West Valley Demonstration Project Main Plant Process Building, Main Plant Process Building Radionuclide Inventory for 40 CFR 61 Subpart H
- **WVDP-607**: Air Dispersion Modeling for Open-Air Demolition, Main Plant Process Building

Clarification Questions:

1. **There is significant uncertainty in the dose predictions using CAP-88.** Inventory, assumed meteorology, and location of the receptor are expected to have a significant impact on the dose. Chemical form, which influences the dose conversion factors, and particle size could also have a moderate influence on the dose (e.g., changes in Am-241 particle size and chemical form had a moderate influence on dose with Am-241 inhalation dose dominating the base case dose results). Could DOE explain how uncertainty in model parameters was considered or mitigated in the CAP-88 modeling. In addition, could DOE clarify how the sector and distance to the maximally exposed individual was determined (e.g., location of highest sector averaged concentration and distance to the WNYNSC boundary or specific receptor distance). Note: The NRC staff calculated a shorter distance from the source locations to AF16 of around 1740 meters versus 1900 meters.

2. **Inventory is arguably the single-most important parameter influencing the dose calculations.** DOE assumes that 80% of the product purification cell (PPC) south inventory will be removed through nitrocision activities. AERMOD simulation results for the PPC were not included in the WVDP-607, Appendix A schedule, emission rates and results table, which included north and east wall simulations that do not appear to be affected by the PPC south inventory assumptions. Please clarify if AERMOD simulations with the assumed 80% removal of the PPC south inventory (and other simulations for the PPC east and north walls) are available. **It is unclear if the Appendix A table in WVDP-606 includes the 80% reduction in PPC south inventory.** WVDP-606, Appendix A lists the environmental material at risk (MAR) grouped by proposed demolition method. Please confirm that the PPC inventory for walls and ceilings for PPC south is reduced by 80% in WVDP-606, Appendix A, and that the inventory for other PPC components is based on current estimates.

3. **Information about key risk drivers would also be beneficial to help NRC focus on the most risk-significant activities.** For example, the data provided in the figures below shows that certain activities, areas, or key radionuclides may drive the risk (e.g., concrete saw, hot cutting; extraction cell, hot cell, off gas cell). CAP-88 modeling shows that Am-241 and Cs-137 seem to be the risk drivers for member of the public doses. Information on key risk drivers based on the AERMOD modeling results would also be useful to NRC staff.

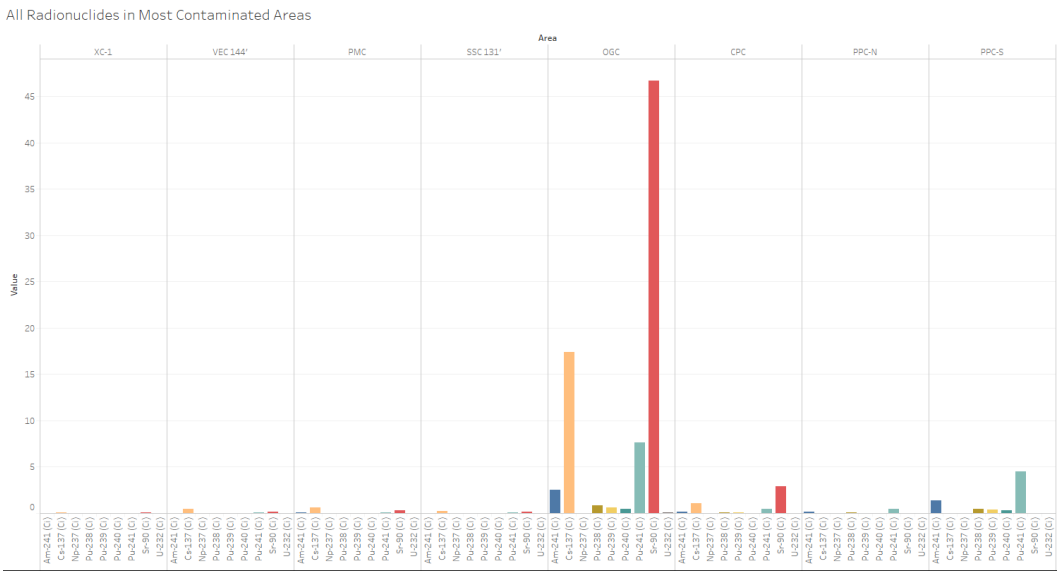

Figure 1 Main Plant Process Building Inventory for Select Areas

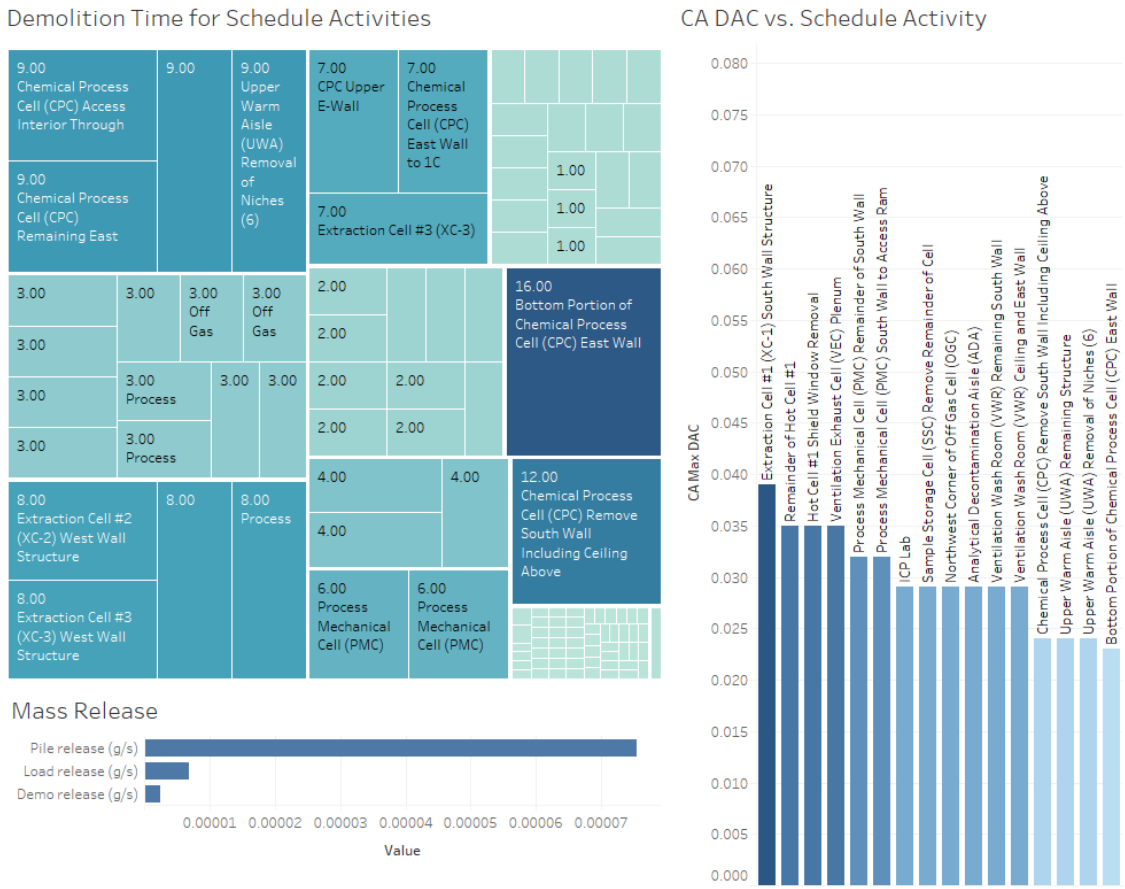

Figure 2 Demolition Time, Mass Release Rates, and Highest Derived Air Concentration (DAC) Values for Scheduled Activities

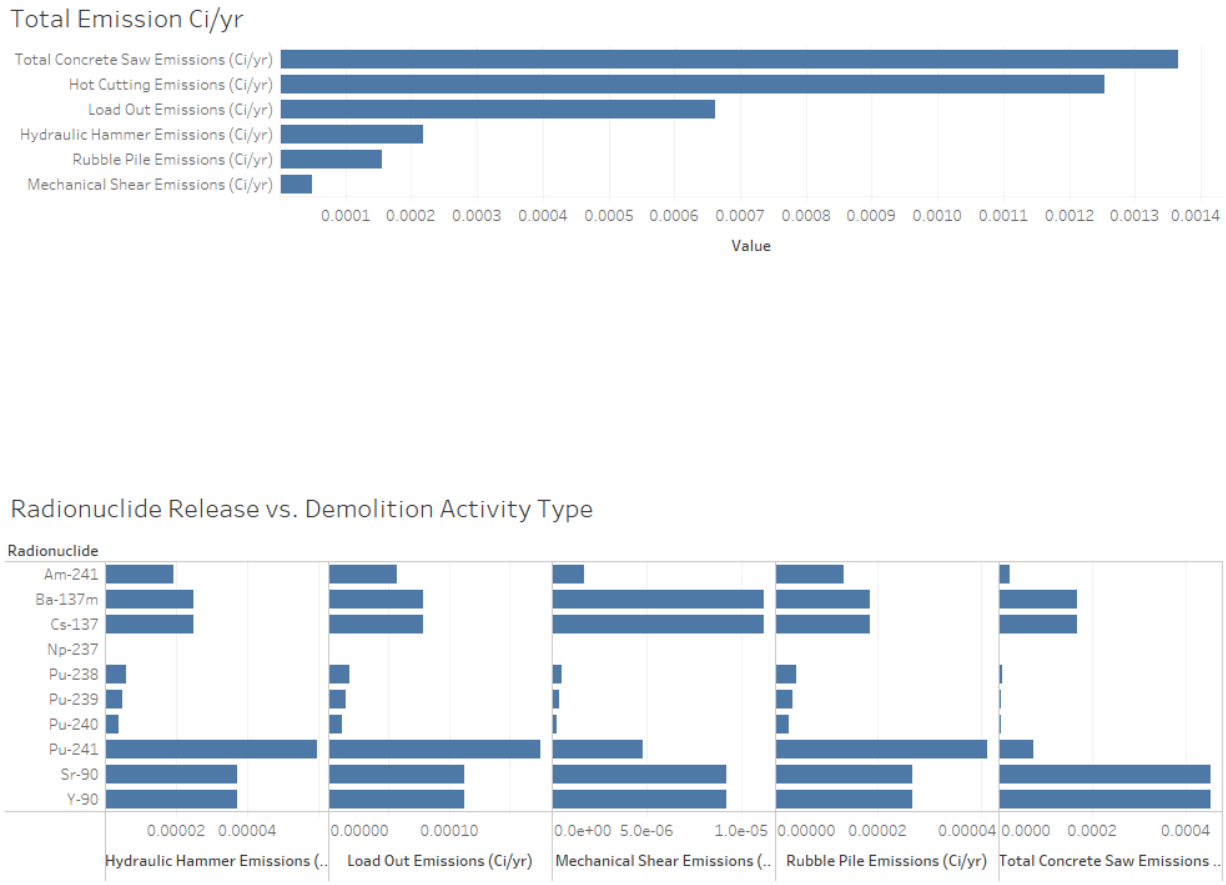

Figure 3 Total Release Rates and Key Radionuclide Release Rates by Demolition Activity

4. WVDP-606 indicates that "pipes that are greater than or equal to 1-inch in diameter and are less than or equal to 60 inches in length are embedded in a wall and have been foamed filled. It is assumed that 10% of these pipes are damaged enough to release radionuclides. All other pipes are assumed to be removed with a mechanical shear, unless otherwise noted." **Please clarify if 10% of the inventory of pipes is assumed to be damaged or if 10% of the pipes are assumed to be damaged.**

5. **The NRC had previously commented that hot cutting validation study adjustments to the physical state factor for hot cutting were not demonstrably conservative.** While DOE indicates that hot cutting activities with the oxylance torch will not be used, DOE also indicates the need for hot cutting of the shield wall between the CPC and SRR using other hot cutting techniques. Presumably, DOE is referring to lower temperature hot cutting tools with appropriate approvals by Radiological Engineering. The NRC staff still has technical concerns with the assumed hot cutting parameters that influence the emission factors for this demolition activity. Accordingly, the NRC will plan to monitor the use of hot cutting during demolition of the MPPB, review the associated approvals through Radiological Engineering, and assess the associated calculations. Could DOE

describe under what conditions hot cutting activities will be reviewed and approved by Radiological Engineering during demolition of the MPPB.

6. **Additional information is needed for the NRC to review the basis for the surrogate ratios for Tc-99 and I-129 (and other radionuclides).** If possible, the NRC would like to be provided with a copy of WVDP-EIS-014 and other documents providing the scaling factors used to determine the MAR, or inspect onsite at an upcoming monitoring visit.

7. **Particle size can have a significant influence on environmental transport and biosphere calculations.** The relevance of the MacMillan study for demolition activities at the WVDP site should be discussed to provide support for the assumed values, or a sensitivity analysis should be conducted to illustrate the reasonableness of the assumed particle sizes. A comparison of demolition activities and controls (e.g., types of fixatives) in the MacMillan study versus the WVDP planned demolition activities would also help to provide support for assumptions regarding particle size in the AERMOD simulations for various types of demolition activities. The NRC staff would note that literature cited in the MacMillan study for hot cutting activities support smaller submicron particle diameters, which calls into question the use of a single set of particle sizes for all WVDP demolition and dismantlement activities. Please explain how uncertainty in the particle size distributions is considered during biosphere and air transport modeling.

8. **The WVDP Characterization Database has over 2200 sets of radiological data for the MPPB structure.** The assumed contamination levels for each structure are the average of multiple (generally five) samples, followed by a surface scan to ensure that the data is representative of the entire structure. An isotopic ratio is assigned to various locations in the MPPB based on prior knowledge resulting from laboratory analysis of waste collected from those areas. Could DOE explain in more detail (1) the methods for sampling and field or laboratory analysis of these samples; (2) how different measurement techniques are correlated and/or combined; and (3) how many sets of isotopic ratios are used to determine the inventory for different MPPB systems, structures, and components (SSCs).

9. **Table 4 of WVDP-607 contains conversion factors for surface activity from mass to decays per minute per area.** The Pu-241 conversion factor appears to be larger than the total beta conversion factor summed at the bottom of the table. Please check whether this is in error and/or explain the Pu-241 conversion factor.

10. **After reviewing and running the AERMOD input files provided by DOE, some unexpected behavior is noted in the output/results.** Please see figure below generated by AERMOD View (Using Lakes Environmental v. 10.0.1). The NRC staff also has the following questions on model parameters and consideration of uncertainty:

    - Explain the stray concentrations in the NW (insufficient offsite receptor locations; glitches with contour algorithm at low concentrations).

    - Explain the bias in the results to the W/SW (what meteorological conditions are causing these results or due to building wake effects), or provide the data or provide a reference to meteorological data by stability class that may help explain the results.

- Explain how the AERMOD results are used to understand offsite release potential, or if the results are primarily used to establish contamination area and buffer area boundaries.

- Comment on the meteorological data used for the modeling and how uncertainty in the meteorological conditions is considered in the modeling. If 95th percentile concentrations are used, explain how these are determined (the AERMOD modeling files produced seems to output maximum concentrations, which would be more conservative than 95th percentile, but it is not clear what concentrations are used as part of decision-making; 95th percentile concentrations are provided in the WVDP-607 report).

- Explain how variable source emissions or the time of source emission are specified in the AERMOD model.

- Explain how cumulative emissions are considered in the modeling for multiple schedule activities (WVDP-607, Appendix A). For example, multiple schedule activities could lead to cumulative dose.

- Provide the basis for the averaging time used in the calculations (e.g., are EPA protocols for averaging time used; 8-hour concentration results are provided in the WVDP-607 report).

- Explain whether every area has its own conversion factors (i.e., radionuclide mass ratios or how variation in radionuclide distributions is considered).

- Please provide a set of AERMOD modeling files with the deposition algorithm employed.

Note: Appendix A of WVDP-607 shows schedule activities and durations. AERMOD appears to be run separately for each of the schedule activities. Please clarify which AERMOD option is used to specify the length of time of the emission or the time variant release conditions. In addition, please explain how activities that occur over the same time period are accounted for and summed to estimate concentrations and deposition. Please also explain the output options used to determine the controlled area and radiological boundary areas (i.e., averaging time periods and assumed meteorology).

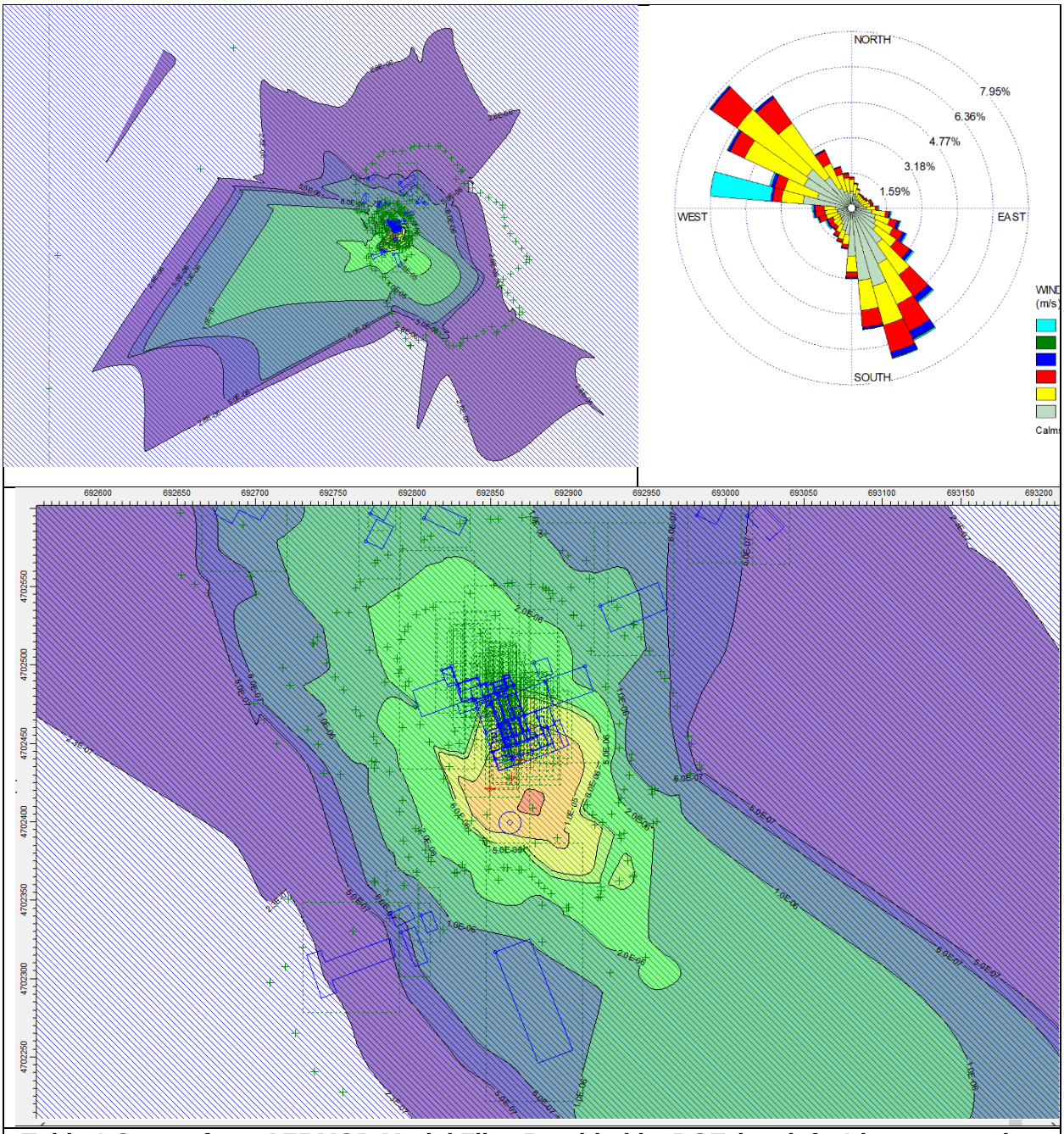

Table 1 Output from AERMOD Model Files Provided by DOE (top left, 1 hour averaging period, top right wind rose data, and bottom 95th percentile concentrations)