



## U.S. Department of Energy Hanford Site

7/8/2020

20-ECD-0037

Ms. Stephanie Schleif, Deputy Program Manager  
Nuclear Waste Program  
Washington State  
Department of Ecology  
3100 Port of Benton Blvd.  
Richland, Washington 99354

Dear Ms. Schleif:

### EVALUATION OF POTENTIAL TANK SIDE CESIUM REMOVAL SYSTEM AIR EMISSIONS

This letter is in response to 20-NWP-068, dated April 8, 2020. The letter was in response to the U.S. Department of Energy, Office of River Protection's (ORP) submittal of three Temporary Authorization (TA) requests for the Tank Side Cesium Removal System (TSCR) project. 20-NWP-068 indicated that approval of the TA requests would be at least partially dependent on addressing Washington State Department of Ecology (Ecology) concerns related to criteria and toxic air pollutant emissions from the TSCR to confirm an air permit will not need to be issued prior to beginning TSCR construction activities identified in the TA request. Based on subsequent discussions between ORP Environmental Compliance Division and Ecology air permitting staff, the key issues of concern were clarified as follows.

#### TSCR Enclosure:

Analysis to evaluate the activity of drying the used columns to determine if the resultant evaluation of emissions would trigger new source review permitting.

TSCR process emissions are generated during the IX column drying process and vented to the headspace of DST AP-108. Prior to the drying process, two full bed volumes of dilute NaOH (0.1M) and two full bed volumes of water are flushed through the entire process system (filters, columns, media trap, delay tank and piping) to remove tank supernatant remaining when processing is shut down. The bed volume of each column is 162.5 gallons. The flushing flow rate is 7 gallons per minute (gpm), which means it takes approximately 23.2 minutes to complete each bed volume flushing.

There is 156 gallons of crystalline silicotitanate (CST) ion exchange media in each column with a porosity of 0.4. That means that there is approximately 70 gallons of liquid in a full column.  $[156 \times 0.4 + (162.5 - 156)]$ . The flushing process will remove the criteria and toxic pollutants that are in the liquid waste matrix, including inorganics such as metals and ammonia, and route them via drain lines into DST AP-108. The TSCR process itself does not introduce any additional criteria or toxic air pollutants for potential release.

To estimate the quantity of emissions from the column change out process, steady state plug flow reactor equations are first used to estimate how much of the initial 70 gallons of tank supernatant in a full column remains after the flushing is completed. Using a 1<sup>st</sup> order reaction to represent the flushing process, the equation  $X_t = X_0 e^{-kt}$  ( $k=0.1$  and  $t$ =total flushing time) is used to calculate that a trivial amount (approximately 0.0065 gallons or less than 1 fluid ounce) of tank supernatant remain in each column after all flushes are completed.

Initial sampling of the liquid tank supernatant staged in DST AP-107 for processing through TSCR resulted in an average total organic carbon (TOC) concentration of 1800 mg/L. No organic toxic air pollutants listed in WAC 173-460-150 were identified above detection limits. Trace amounts of certain metals and other inorganic criteria or toxic air pollutants, such as ammonia, were detected in the sampling results. These pollutants will be flushed out of the system prior to the air drying process.

If the average supernatant TOC concentration of 1800 mg/L is assumed to be all volatile organic carbon (VOC, which is a criteria pollutant), there would be maximum 44 mg (0.000098 pounds) VOC remaining in each column after flushing; or a total of 133 mg (0.000293 pounds) available for release during each column drying process from all 3 columns combined. The drying process is expected to take approximately 1-4 days (24-96 hours), making the overall estimated release rate of volatilized organics 0.000003-0.000012 pounds/hr (0.000000378-0.0000015 g/sec) during the column drying process, which only occurs a limited number of times each year. This is well below the VOC criteria pollutant exemption threshold of 2 tons per year in WAC 173-400-110(5). As noted previously, any non-organic criteria or toxic air pollutants (such as metals or ammonia) in the original waste in the column are flushed from the system prior to the drying process and would not volatilize as a process emission.

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#### TSCR Column Storage:

Descriptive write-up discussing why TSCR Column Storage results in no source of criteria or toxic air emissions from a dried column that trigger new source review permitting. Radioactive emissions are addressed separately due to the presence of a radionuclide source term. WDOH has issued a Notice of Construction License for the TSCR Column Storage pad and will issue an operating license at a future date.

When TSCR IX columns are determined to be fully loaded with cesium from processing tank supernatant, TSCR waste processing operations are paused so that the columns can be removed from service in preparation for transfer to the storage pad. The process for flushing and drying of the columns are discussed above in the TSCR Enclosure section. The interiors of the IX columns are dry and all liquid has been removed before being placed on the storage pad. At this point, there is no foreseeable release of criteria or toxic air pollutants.

#### Piping:

Descriptive write-up that discusses the history of piping installed in the past allowing for wastes to be transferred from AP tank farm to Waste Treatment and Immobilization Plant (WTP) and for new piping to be installed for future operational contingency to allow for liquid waste to be transferred from WTP to the AP Farm.

In 2003-2004, Project W-211 installed the original “full feed” lines that were intended for transfer of tank waste from AP Farm to WTP, specifically from DST AP-102 to the WTP Pretreatment Facility, which was originally intended to be the initial receipt location of tank waste being sent for vitrification. The transfer lines are of a double-walled pipe-in-pipe configuration with a 3-inch stainless steel primary pipe and a 6-inch outer carbon steel secondary containment. The whole system is then contained within multiple barriers for corrosion protection, consisting of epoxy-coating, surrounded by fiberglass insulation and then encased in a hard plastic shell. These original transfer lines were a wholly contained system with no potential for emissions of criteria or toxic air pollutants. They have not been used to date. Transfer lines being constructed to support DFLAW operations are the same type of piping configuration. A new segment (~525 feet) of piping is being routed from AP-106 to tie-in with the current W-211 lines just east of AP-102 outside the AP Farm fence line. The existing W-211 lines will then be used until approximately the current WTP fence line (~1500 feet). An additional segment (~550 feet) will then be constructed to branch over to connect with lines already constructed by WTP that go to the EMF and then onto the LAW facility. Although, as previously stated, the transfer lines are buried and do not represent a source of criteria or toxic air pollutants, it is worth noting that they perform the same function of transferring waste from AP Tank Farm to WTP as described in the process description section of the existing AP farm toxic air permit, DE11NWP-001.

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As part of future operational contingency, a transfer line will be installed to allow for liquid waste to be transferred from WTP to the AP Farm. The incoming transfer line admits waste to the AP Farm through a downcomer with discharge below the liquid surface. Any contaminants which would be toxic air pollutants if released to the air are anticipated to stay in the liquid during any transfer from WTP to AP Farm and not released during the transfer. The addition of the liquid from WTP to the AP Farm is a change in operation only since this transfer is not currently identified. Once the liquid is transferred, it will be mixed with existing tank waste and any potential emissions will be handled in the same manner as tank waste in the criteria and toxics application that will be submitted for approval before any transfer from WTP to AP farm can happen. The analysis of potential emissions from the TSCR enclosure above would not be materially changed by the addition of the liquid transferred from WTP.

ORP believes that this analysis meets the requirement of a New Source Review under WAC 173-400-110 and demonstrates that preconstruction authorization is not required.

If you have any questions, please contact me, or your staff may contact Bryan R. Trimmerger, Environmental Compliance Division, Office of River Protection, on (509) 376-2674.

Sincerely,

Glyn D. Trenchard, Assistant Manager  
Technical and Regulatory Support  
Office of River Protection

ECD:BRT

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