



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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January 21, 2016

Ron Skinnarland
Waste Management Section
Nuclear Waste Program
Washington Department of Ecology

Re: Second Tier Petition by the U.S. Department of Energy

Dear Mr. Skinnarland:

This correspondence documents the Washington Department of Ecology Air Quality Program (AQP) review of the Health Impact Assessment (HIA) for the Second Tier Review Petition for Hanford Tank Farm and Waste Treatment Plant Dimethyl Mercury Emissions.^[1] As required for SEPA compliance, the title of this review is: *Second Tier review of DOE-WRPS's Health Impact Analysis (RPP-ENV-59016 Rev.01)*. This AQP review is the basis of my approval, which is also provided herein.

The US Department of Energy and their contractor, Washington River Protection Solutions (DOE-WRPS), anticipate they will need numerous air toxic Notice of Construction (NOC) approvals to permit tank waste retrieval, transfer, and treatment processes at the Hanford tank farms and at the Waste Treatment and Immobilization Plant (WTP). Ordinarily, each of these applications would require a separate HIA. For efficiency, DOE-WRPS prepared a single HIA encompassing extreme emissions scenarios. The resulting HIA is highly precautionary.

To facilitate timely cleanup, AQP expedited review of the HIA and related documents. We carefully scrutinized the potential health risks posed by dimethyl mercury (DMM) and the other toxic air pollutants (TAPs) defined in WAC 173-460. DMM was the only TAP whose concentration exceeded its Acceptable Source Impact Level (listed WAC 173-460-150). DMM is neurotoxic to anyone overly exposed to it. We required DOE-WRPS to add the neurotoxicity risk of DMM to risks of the other neurotoxic TAPs potentially emitted by the cleanup activities.

¹ RPP-ENV-59016, Rev. 01, Second Tier Review Petition for Hanford Tank Farm and Waste Treatment Plant Dimethyl Mercury Emissions, Prepared by: Washington River Protection Solutions, LLC (December 2015).



The HIA and related documents received by AQP satisfy Second Tier Review requirements for future NOC applications:

- On January 4, 2016, AQP received the HIA and corresponding AERMOD atmospheric dispersion modeling system files from DOE-WRPS.
- On January 19, 2016, AQP received the draft NOC for the first project scoped in the HIA.^[2] The proposed project, if constructed and operated as required in the draft NOC, will allow the operation of a portable exhauster to support retrieval operations of Tank AY-102 and will provide BACT and tBACT in accordance with applicable rules and regulations in Chapter 173-400 WAC and Chapter 173-460 WAC.
- We concur with the proposed Best Available Control Technology determination for toxics (tBACT).
- The HIA provides sufficient descriptions of facilities and planned activities to encompass potential emissions from planned tank waste retrieval, transfer and treatment processes, and from the Tank Farms and Waste Treatment and Immobilization Plant.
- On January 4, 2016, AQP received receipt for payment of the application fee by DOE-WRPS allowing us to continue reviewing the application.

Taken together, the HIA, AERMOD files, tBACT decision and NOC preliminary determination provide sufficient information to derive conclusions about the health risks posed by TAP emissions from the described cleanup activities, specifically:

- The HIA includes a thorough identification of emitted TAPs hazards.
- The DMM emissions DOE-WRPS modeled and evaluated exceed any likely potential emissions of all planned activities.
- As an ample precaution, they overestimated the emission rates likely to occur. They evaluated multiple worst-case tank farm emissions sources, assuming simultaneous operation and continuously along with WTP and secondary waste processing activities.
- They calculated increased DMM emissions rates by a factor of 100 for one tank in each farm, and increased the resulting estimates by a factor of 100 in modeling air dispersion and deposition.
- As a precaution in estimating DMM emissions from the WTP, they assumed all of the permitted total mercury limit for WTP to be in dimethyl mercury form. We take this to be a precaution since any DMM treated by the WTP is likely to be demethylated by the treatment, and other data in the HIA^[3] indicate the ratio of emissions of elemental mercury to DMM is approximately 700:1.

² Non-Radioactive Air Emissions Notice of Construction Approval Order, Conditions and Restrictions DE11NWP-001, Revision 4.

³ Table B-1. Toxic Air Pollutant Emission Rates and Comparison to the WAC 173-460-150 SQER Levels.

- AQP validated the data in the AERMOD files. We checked the input data and confirmed the output data correspond to concentrations evaluated in the HIA.
- We note that the claim ‘no DMM will reach the “nearest” school, water or resident’ made in Part 4.1.3 of the HIA (*Atmospheric Fate*) does not make sense in light of the atmospheric transformation rates and the wind rose data. Instead, these data imply that at least 2% of the time each year, emissions drift toward the school at sufficient velocity that when they reach it, about two thirds of the DMM will not have transformed into other mercury species. The remaining third will be transformation products including mono-methyl mercury, elemental mercury and mercury oxide. Likewise a larger portion of untransformed DMM will reach the nearest water, and a lesser -but not zero- portion would reach the nearest resident. Nonetheless, on this point we agree that the dispersion modeling shows the actual mercury species exposures at these locations will be far less than those that could pose any health risk.
- DOE-WRPS adequately assessed human population exposure, including assessment of inhalation and food crop ingestion pathways to the most susceptible populations. They examined two exposure scenarios to calculate the potential hazard to the public: 1) 30-year mother-child living at the point of maximum 24-hour concentration and deposition and 2) 70-year resident living at the location of the nearest resident. Their calculated project-attributable DMM inhalation dose to a maximally exposed person is $5.4E-03 \mu\text{g}/\text{m}^3$. Likewise their calculated ingestion dose to a maximally exposed person is $6.3E-05 \text{ mg}/\text{kg}$ body weight per day.
- At these exposure levels, the neurotoxicity hazard quotient is 0.67, which is less than 1.0 (above which exposure would pose significant risk).
- DOE-WRPS adequately assessed cumulative risks of the co-emitted TAPs that might have posed neurotoxicity risks similar to DMM. Addition of these risks to the risk posed by DMM does not significantly increase overall risk.
- The HIA did not provide an adequate assessment of additional risk from existing levels of DMM in the background. Page 27 of the HIA says:

“The background is minimal compared to the modeled concentration. Adding the background concentration to the assessment is unnecessary, because 1) uncertainties in the modeled concentration are greater than the potential background concentration, and 2) the modeled concentration is highly conservative and can be said to include a minimal potential background concentration.”

Assessing the exposure to proposed emissions together with background DMM concentrations (including ambient concentrations and previously permitted onsite emissions) is required for Second Tier Analysis. To facilitate the review, AQP compiled the data (Table 1).

Table 1. Assessment of additional risk posed by existing levels of DMM

Receptors with highest 24-hour average concentration	DMM (ng/m ³)
Maximum 24-hr modeled concentration (point west of Hwy 225 and the Yakima R. near the south-central side of the Hanford Site boundary) ^[4]	5.4
Maximum concentration attributable to operation of the 241-SY, 241-AP and 241-AY/AZ Ventilation Systems (point on Hwy 240) ^[5]	7.7E-05
Maximum concentration attributable to operation of Hanford High Purge Gas Mode Core Sampler (point on Hwy 240) ^[6]	5.3E-06
Maximum published ambient concentration (Antarctica)	0.63
Total	6.030082
The DMM risk threshold concentration (24-hr Time Weighted Average)	144

Even though the maximum DMM concentrations do not occur at same place in assessments, the data indicate the maximum concentration in the current application, together with maximum ambient and previously permitted concentrations (about 6- ng/m^3), is much less than the risk threshold concentration (144- ng/m^3).

- DOE-WRPS also covered fundamental uncertainties in its HIA assumptions. One assumption uncertainty is the maximum DMM emissions rate from waste storage tanks. The rate evaluated was based on the highest concentration observed in any tank's headspace. The headspace DMM measurements were done in tanks that were quiescent at the time of sampling. DMM concentrations in headspaces may be greater at times when the tanks' contents are being disturbed. Although this possibility was not quantitatively assessed in the HIA, it is unlikely to present a serious threat because the high volatility and miscibility of DMM in aqueous solutions must tend to make its concentrations fairly uniform throughout

⁴ Section 5.3.2 of the current HIA (*Air Modeling Results*)

⁵ RPP-ENV-48231, lists maxima in several places: 7.8E-08 $\mu\text{g}/\text{m}^3$ on p. 19, 7.7E-08 $\mu\text{g}/\text{m}^3$ on p. 20, and 8.5E-08 $\mu\text{g}/\text{m}^3$ on p. 31.

⁶ Page 13, Figure 4 of *Second Tier Review Petition for the Operation of the Core Sampler in High Purge Gas Mode. TOC-ENV-NOC-0008. Washington River Protection Solutions LLC, for United States Department of Energy, Office of River Protection, Richland, Washington. Received August 14, 2014*

tank contents. It seems unlikely DMM headspace concentrations would increase much during tank operations that disturb the contents.

- As previously noted, DOE-WRPS made a series of precautionary assumptions in preparing the HIA. Their use of overestimated DMM concentrations provide strong precautions against uncertainty. Even if these extensive and compounded precautionary calculations failed, resulting DMM exposures would not exceed the level that might cause harm to anyone outside the current site boundary.
- There is some uncertainty in the toxic potency of DMM. DMM has not been studied as much as the other neurotoxic TAPs evaluated in this HIA. AQP's review of the available scientific literature on DMM toxicity did not find evidence it might be more toxic than expected based on its exposure and metabolic fate. The DMM risk-based exposure limits in the HIA are plausible.

In conclusion, the TAP emissions from the operations defined in the HIA will have no significant impact on air quality. The activities noted in the HIA comply with WAC 173-460-090 (7) *Approval Criteria for Second Tier Review*. In my capacity as the AQP Risk Manager for Second Tier Assessments, I accept the review team's recommendation to allow the risks evaluated in the HIA and its accompanying documents.

Please contact me or Matt Kadlec (matt.kadlec@ecy.wa.gov 360-407-6817) with any questions regarding this review.

Best regards,



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