Memorandum
Air Quality Program

January 16, 2019

To: 460 Rulemaking Stakeholders

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Subject: Updating the Small Quantity Emission Rates

Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollution Sources, establishes the list of toxic air pollutants and includes the following for each pollutant:

- Acceptable source impact level (ASIL) – an emissions level requiring a refined modeling evaluation.
- Small quantity emission rate (SQER) – a screening level for emissions that does not require dispersion modeling. Emissions below the SQER pose little risk to public health.
- De minimis emission level – trivial level of emissions that does not pose a public health or environmental risk established at five percent of the SQER. A rate of increased emissions equal to or higher than a de minimis emission level requires an air quality permit (notice of construction approval order).

How did we update the small quantity emission rates?

Each toxic air pollutant in WAC 173-460-150 has a small quantity emission rate (SQER). The SQER values are derived from the acceptable source impact level (ASIL) values, back-calculated through screening level air dispersion modeling using AERSCREEN Version 16216. We examined several possible source and building configurations to simulate a realistic yet conservative scenario that would apply anywhere.
**AERSCREEN Model Configuration**

The following model inputs and calculations were used to establish SQER values.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission rate</td>
<td>1 gram per second</td>
</tr>
<tr>
<td>Point source stack height</td>
<td>10, 10.5 and 11 meters</td>
</tr>
<tr>
<td>Point source stack diameter</td>
<td>0.33 meters</td>
</tr>
<tr>
<td>Point source exit velocity</td>
<td>1.5 and 10 meters per second</td>
</tr>
<tr>
<td>Point source stack temperature</td>
<td>Ambient</td>
</tr>
<tr>
<td>Point source stack location</td>
<td>Four locations</td>
</tr>
<tr>
<td>Volume source side length</td>
<td>0.5, 1, 2 and 3 meters</td>
</tr>
<tr>
<td>Volume source release height + initial</td>
<td>• 5 + 5.5 meters</td>
</tr>
<tr>
<td>vertical dimension</td>
<td>• 6.5 + 4 meters</td>
</tr>
<tr>
<td>Flagpole receptor height</td>
<td>1.6 meters</td>
</tr>
<tr>
<td>Urban or rural dispersion</td>
<td>Rural</td>
</tr>
<tr>
<td>Building downwash</td>
<td>Only applies to point sources</td>
</tr>
<tr>
<td>Building height</td>
<td>10 meters</td>
</tr>
<tr>
<td>Building dimensions</td>
<td>10 x 20 meters</td>
</tr>
<tr>
<td>Terrain effects</td>
<td>No</td>
</tr>
<tr>
<td>Meteorology options</td>
<td>• Temperature 250 – 310K (Kelvin)</td>
</tr>
<tr>
<td>Surface characteristics</td>
<td>• Desert shrubland</td>
</tr>
<tr>
<td>Receptor distances</td>
<td>5 to 50 meters in 5 meter increments</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AERSCREEN Model Results**

The median of all concentrations between 5 and 50 meters downwind of the source predicted by each of the 124 model runs was 4282 µg/m³. We consider this a robust and sufficiently conservative estimate of the concentration resulting from an emission rate of 1 gram per second.
SQER Calculations

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Carcinogenic TAP</th>
<th>Non-carcinogenic TAP</th>
<th>Acute reference exposure level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Averaging period</td>
<td>Year</td>
<td>24-hour</td>
<td>1-hour</td>
</tr>
<tr>
<td>Emission unit</td>
<td>Grams/second</td>
<td>Grams/second</td>
<td>Grams/second</td>
</tr>
<tr>
<td>Formula</td>
<td>ASIL/(4282*0.1)</td>
<td>ASIL/(4282*0.6)</td>
<td>ASIL/4282</td>
</tr>
<tr>
<td>Result</td>
<td>Pounds/year</td>
<td>Pounds/day</td>
<td>Pounds/hour</td>
</tr>
</tbody>
</table>

TAP means toxic air pollutant.

We used the following calculations to establish SQER values for the year, 24-hour and 1-hour ASIL.

**Year ASIL**

\[
\text{SQER (lb/year)} = \left[ \frac{\text{Annual ASIL} \left( \frac{\mu g}{m^3} \right) \times 60 \left( \frac{\min}{\sec} \right) \times 60 \left( \frac{\text{hr}}{\min} \right) \times 8760 \left( \frac{\text{hr}}{\text{yr}} \right)}{4282 \left( \frac{\mu g}{m^3} \right) \times 0.1 \times 453.6 \left( \frac{g}{lb} \right)} \right] \times \frac{1}{1 \left( \frac{g}{sec} \right)}
\]

**24-hour ASIL**

\[
\text{SQER (lb/day)} = \left[ \frac{24 - \text{hr ASIL} \left( \frac{\mu g}{m^3} \right) \times 60 \left( \frac{\min}{\sec} \right) \times 60 \left( \frac{\text{hr}}{\min} \right) \times 24 \left( \frac{\text{hr}}{\text{day}} \right)}{4282 \left( \frac{\mu g}{m^3} \right) \times 0.6 \times 453.6 \left( \frac{g}{lb} \right)} \right] \times \frac{1}{1 \left( \frac{g}{sec} \right)}
\]

**1-hour ASIL**

\[
\text{SQER (lb/hour)} = \left[ \frac{1 - \text{hr ASIL} \left( \frac{\mu g}{m^3} \right) \times 60 \left( \frac{\min}{\sec} \right) \times 60 \left( \frac{\text{hr}}{\min} \right)}{4282 \left( \frac{\mu g}{m^3} \right) \times 453.6 \left( \frac{g}{lb} \right)} \right] \times \frac{1}{1 \left( \frac{g}{sec} \right)}
\]

**Conversion Factors**

Converting ppm to µg/m³

\[
Y \left( \frac{\mu g}{m^3} \right) = \frac{(X \text{ ppm})(\text{molecular weight})}{24.45} \times 1000
\]

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1 The 7/26/2018 draft ASIL table identifies 14 chemicals with a 1-hour acute reference exposure level.
Establishing a SQER for dimethyl and diethyl mercury

These compounds are known to cross the blood–brain barrier and to be highly neurotoxic. In the most recent known instance (1998) of a serious poisoning, a chemist died after spilling about 0.44-ml of dimethyl mercury onto a gloved hand. In light of that, in the last rule-making, we intentionally set the ASIL, SQER, and de minimis emission values for both dimethyl mercury and diethyl mercury to 1.00E-99, which is extremely close to zero. Since then, we have reviewed health impacts assessments of several Hanford cleanup projects that have potential emissions of dimethyl mercury, but we have not received any project applications for diethyl mercury emissions.

Prenatal brain development is sensitive to very small amounts of dimethyl- and diethyl mercury. Maternal inhalation of contaminated air exposes the fetus via placental transfer from the maternal bloodstream. Based on evaluation of dimethyl mercury research and other available information, we are proposing an ASIL of 0.14-ug/m³ (daily TWA) for dimethyl- and diethyl mercury, as part of this rulemaking effort. The corresponding SQER and de minimis values will be derived using the same methods we use for other toxic air pollutants.

### AERSCREEN conversion factors

<table>
<thead>
<tr>
<th>Convert from</th>
<th>Convert to</th>
<th>Multiply hourly value by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-hour average</td>
<td>1-hour or 3-hour average</td>
<td>1</td>
</tr>
<tr>
<td>1-hour average</td>
<td>8-hour average</td>
<td>0.9</td>
</tr>
<tr>
<td>1-hour average</td>
<td>24-hour average</td>
<td>0.6</td>
</tr>
<tr>
<td>1-hour average</td>
<td>Annual average</td>
<td>0.1</td>
</tr>
</tbody>
</table>