Memo

Health Risk Consultation

Date: November 20, 2014

To: Kristie Ellickson, Risk Evaluation & Air Modeling
Minnesota Pollution Control Agency

From: James Jacobus, Health Risk Assessment Unit
Division of Environmental Health

Subject: NorthMet Draft EIS, Nickel Inhalation and Uncertainty Factor Allocation for chronic non-cancer toxicity

This memo is in response to the Minnesota Pollution Control Agency's (MPCA) request that the Minnesota Department of Health (MDH) provide an evaluation of intrahuman uncertainty factor use for the nickel inhalation toxicity value referenced in the NorthMet Draft EIS.

Background:

Air emissions of nickel compounds are anticipated from the NorthMet Project Plant Site. The focus of this consultation is the interpretation of the intraspecies uncertainty factor (UF) for the chronic non-cancer effects from inhalation of nickel. The chronic non-cancer inhalation Relative Exposure Level (REL) developed by the California Office of Environmental Health Hazard Assessment (OEHHA, also referred to as 'Cal EPA') was selected as the appropriate toxicity value for use at this site. Importantly, this chronic REL has recently been updated by OEHHA, and includes an additional uncertainty factor for nickel exposures in children, a sensitive receptor. In certain areas of the proposed site, children are not anticipated receptors.

Evaluation of Proposed Changes:

Documentation submitted to the Minnesota Pollution Control Agency (MPCA) by Barr Engineering (prepared for Poly Met Mining, Inc. and dated November 2014) includes a discussion on the updated OEHHA value and use of this toxicity value at the proposed site. Specifically, on page 13 of this document, the following passage is salient:

> *The current chronic noncancer toxicity value for nickel compounds of 0.014 μg/m^3 was derived by California OEHHA using the more rigorous benchmark dose methodology and a dosimetric adjustment factor that accounts for the smaller lungs of infants and children. California OEHHA included an additional uncertainty (safety) factor of 10 for potential increased sensitivity for infants and children in deriving the final value of 0.014 μg/m^3. For potential exposure scenarios where there will be no chronic exposure to infants and children, removing the additional safety factor of 10 results in an inhalation value of 0.14 μg/m^3.*

The uncertainty factor described above for infant and children susceptibility is contained within the intraspecies/intrahuman UF. This factor contains two important components, toxicokinetics and toxicodynamics. Minnesota risk assessment practices ascribe a standard 3-fold uncertainty factor for each component (toxicokinetics and toxicodynamics), equaling a total 10-fold intrahuman UF.

MDH has reviewed documentation for OEHHA's chronic nickel REL uncertainty factor allocation and consulted with OEHHA on their standard risk assessment practice for derivation of REL air values. The removal of a factor of 10 is inappropriate in this situation (as highlighted above), as this removes the entire pharmacodynamic portion of the uncertainty factor. A 3-fold pharmacodynamic UF for intrahuman variability (in adults) should remain. Reference to the value of 0.14 $\mu g/m^3$ as an adult-only toxicity value, therefore, is also inappropriate.

The amount of additional pharmacodynamic uncertainty added by OEHHA for concerns in children was 3-fold (technically referred to as the square-root of 10 in OEHHA documentation or $\sqrt{10}$). While the document could be interpreted as the entire 10-fold is attributed for children, this is not the case, nor would this be considered standard practice in risk assessment. The standard 3-fold UF for adult individual pharmacodynamic variability, along with the 3-fold toxicokinetic UF, are the appropriate intrahuman UFs to apply in areas where it was certain that children would not be a receptor. In summary, the proposal by Barr Engineering would reduce the overall intrahuman UF to 3 in areas where adult-only exposure was anticipated. It is the evaluation of MDH that the intrahuman UF should be 10, and that a toxicity value of 0.14 $\mu g/m^3$ for adult-only exposures has not been calculated according to MDH or OEHHA standard risk assessment practices. This value of 0.14 $\mu g/m^3$ is not used further in the report, and the purpose of its derivation is unclear.

OEHHA applied an additional 3-fold UF for child-specific concerns due to known susceptibilities in children to asthma, respiratory, and immune-related toxicities. If areas of the proposed project exist where children are estimated with high certainty to not be a receptor, then the removal of this 3-fold UF would be considered appropriate. Using a toxicity value of 0.05 $\mu g/m^3$ for nickel in adult-only areas is appropriate, while adherence to the more stringent 0.014 $\mu g/m^3$ toxicity value is appropriate for areas where children could be exposed.

If you have any questions regarding the evaluation provided please contact James Jacobus (651) 201-4917.

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