MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

To: File for Disodium Hydrogen Phosphate (CAS No. 7558-79-4)

From: Keisha Williams, Air Quality Division (AQD), Toxics Unit

Date: July 23, 2015

Subject: Screening Level for Disodium Hydrogen Phosphate

The initial threshold screening level (ITSL) for disodium hydrogen phosphate is 10 µg/m3 (annual averaging time) based on the Environmental Protection Agency's (EPA's) reference concentration (RfC) value for phosphoric acid (EPA, 1995). The ITSL value was established by AQD on August 1, 2012 (MDEQ, 2012; see attached).

The ITSL was originally established with an averaging time set at 24 hours, the default averaging time, per Rule 232 (2). It is being changed at this time to annual, as allowed per Rule 229 (2), because the EPA derivation of the RfC included an accounting for chronic exposure.

References:

EPA. 1995. Summary for Phosphoric Acid (CASRN 7664-38-2). Integrated Risk Information System, US Environmental Protection Agency, Accessed on July 23, 2015. http://www.epa.gov/iris/subst/0697.htm

MDEQ. 2012. Memo from Michael Depa to File for Disodium Hydrogen Phosphate (CAS No. 7558-79-4). Subject: Screening Level. August 1, 2012. AQD, MDEQ.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

August 1, 2012

To: File for Disodium Hydrogen Phosphate (CAS No. 7558-79-4)

From: Michael Depa, Air Quality Division, Toxics Unit

Subject: Screening Level

The Initial Threshold Screening Level (ITSL) for disodium hydrogen phosphate is 10 µg/m³ with 24-hr averaging time. This ITSL is based on an Environmental Protection Agency (U.S. EPA) reference concentration (RfC) for phosphoric acid. Disodium hydrogen phosphate (DSHP) was deemed to be sufficiently similar to phosphoric acid (PA) based on chemical/physical similarity of these compounds (see Table 1). The screening level was adjusted using a molecular weight conversion of DSHP to PA as follows:

$$\frac{\text{x (screening level for DSHP)}}{10\ \mu g/m^3\ \text{screening level for PA}} = \frac{141\ \text{g Mol. weight of DSHP}}{98\ \text{g Mol. weight of PA}}$$

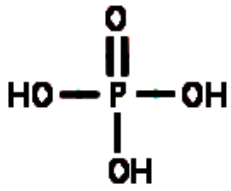
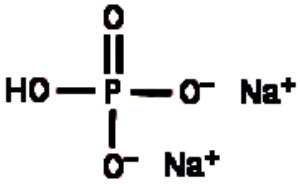
$$x = 10\ \mu g/m^3\ x\ (^{141g}/_{98g})$$

$$x = 14.1 \mu g/m^3$$

Rounding to 1 significant figure results in a ITSL for DSHP of 10 µg/m³.

The US EPA RfC for phosphoric acid (CAS No. 7664-38-2) is based on a 13-week rat inhalation study by Aranyi et al. (1988), where bronchiolar fibrosis was significantly elevated over controls. Bronchiolar fibrosis was observed in all rats examined that had been exposed to 750 or 1200 mg/m³, including those necropsied after an 8-week recovery period, and was judged predominately as moderate and severe. This lesion was present with minimal severity in 9/20 animals exposed to 300 mg/m³, 4/20 animals exposed to 180 mg/m³, and 0/20 animals exposed to 50 mg/m³. Based on the histologic lesions in the tracheobronchiolar region, 180 mg/m³ is the lowest-observed-adverse-effect-level (LOAEL), and 50 mg/m³ is the no-observed-adverse-effect-level (NOAEL). EPA calculated a benchmark dose/concentration 0.01 mg/m³. Based on a BMC10 (HEC) of 3.4 mg/m³, with a total uncertainty factor of 300 (3 for inter species, 10 for sensitive individuals and 10 for subchronic to chronic extrapolation).

Table 1. Physical Chemical Information

Compound	Molecular Structure	Molecular Weight
Phosphoric Acid		98 g
Disodium Hydrogen Phosphate		141 g

Atmospherically, the phosphoric acid is likely to be dissolved in water vapor and/or adsorbed onto a particle. A similar environmental fate is likely for disodium hydrogen phosphate (7558-79-4), even though it is a solid at STP. DSHP is hygroscopic. On exposure to air it will absorb from 2 to 7 moles of water depending on the temperature and humidity (HSDB, 2012a). The ionic and/or acid-base characteristics also make it likely these compounds are dissolved in water vapor and aerosolized in the ambient environment typical of Michigan.

The HSDB (2012b) indicates that DSHP is a "Dust: Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Solid: Irritating to skin and eyes."

References

Aranyi, C., M.C. Henry, S.C. Vana, R.D. Gibbons and W.O. Iverson. (1988). Effects of multiple intermittent inhalation exposures to red phosphorus/butyl rubber obscurant smokes in Sprague-Dawley rats. Inhalation Toxicology, Premier Issue. p. 65-78.

HSDB (2012a) Hazardous Substance Database: Disodium Hydrogen Phosphate (CASRN: 7558-79-4). http://toxnet.nlm.nih.gov/ Then Search 7558-79-4, then go to: Other Chemical/Physical Properties: [O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 1488]

HSDB (2012b) Hazardous Substance Database: Disodium Hydrogen Phosphate (CASRN: 7558-79-4). http://toxnet.nlm.nih.gov/ Then Search 7558-79-4, then go to: Chemical Safety & Handling: [U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.]

U.S. EPA. National Center for Environmental Assessment. Integrated Risk Information System (IRIS) http://www.epa.gov/iris/subst/0697.htm