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STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

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To: Lori Saliby, Director, Emergency Response & Spill Prevention Division, CT DEEP

From: David Kallander, Ph.D., Toxic Hazards Health Assessment Unit

Through: Jim Vannoy, Chief, Environmental Health Section

Subject: Response to questions regarding toxicology standards for gasoline and effects of early exposures during the Norfolk gasoline spill

Date: February 28, 2023

This memorandum is in response to a request from CT DEEP to answer questions raised by the First Selectman of the Town of Norfolk concerning toxicology standards and potential health effects from exposure to gasoline vapors during the early hours of the release event.

1) What are the toxicology standards as they relate to gasoline

Gasoline is a refined petroleum product made up of a mixture of hydrocarbons, additives and blending agents. The makeup of gasoline varies widely depending on the crude oils used, the refinery processes available, the overall balance of product demand, and the product specifications. When an accidental release of petroleum occurs like it did in Norfolk, DEEP and the Licensed Environmental Professional (LEP) hired to evaluate the site determine how the site should be assessed and what sampling needs to be performed with advice from DPH, when needed. DPH provided advice on air sampling within the residences in the December 14, 2022, and January 27, 2023 memos to DEEP and the Torrington Area Health District following requests from Hygenix. The advice was based on information in the July 2012 joint DEEP/DPH Technical Support Document for Petroleum Hydrocarbons and the March 2003 Proposed Revisions-CT's Remediation Standard Regulations Volatilization Criteria. The referenced documents provide Residential Target Air Concentrations (TACs) for petroleum constituents that are typically measured in residences that may be seeing infiltration of petroleum vapors. The table below provides a partial list of TACs for indoor environments. Note that these guidelines are not for the outdoor, ambient environment.

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Table 1. Residential Target Air Concentrations for petroleum hydrocarbons applicable to indoor air testing for petroleum products.

Fraction	Residential TACs (µg /m^3)
C5-8 aliphatics	400[a]
C9-10 aromatics	34[b]
C9-12 aliphatics	114
Benzene	3.3[c]
Toluene	210
Ethylbenzene	53
Xylenes	220

[a]TAC of 400 µg/m^3 for C5-C8 aliphatics is based on updated IRIS RfC of 0.7 mg/m^3 for n-hexane (IRIS 2005). The updated IRIS value is 3.5-fold higher than outdated IRIS RfC of 0.2 mg/m^3 (IRIS 1990) value that was used to derive the previous risk-based TAC of 114 µg/m^3.

[b]TAC of 34 µg/m^3 for aromatic hydrocarbon ranges of C9-C10 and C11-C22 is calculated using the updated IRIS RfC of 0.06 mg/m^3 for all three trimethylbenzene isomers (IRIS 2016)

[c]From Proposed Revisions Connecticut's Remediation Standard Regulations Volatilization Criteria, 2003

2. How can the exposure to the gasoline during the early hours of the spill effect the residents?

As stated previously, gasoline is a complex mixture of many substances. The finished product has been reported to have more than 150 separate chemicals although as many as 1,000 chemicals have been identified in some blends. In order to identify what health effects someone is likely to suffer from an exposure, there must be data that describes the exposure event, such as what the substance is, how much the person is exposed to, the route(s) of exposure (such as inhalation or ingestion) and for how long the person is exposed. For the Norfolk gasoline spill, we do not have any data on the concentrations of specific gasoline constituents in the air at the time the spill occurred and how long people might have been exposed to those concentrations. The first responders on the scene after the gasoline spill occurred did conduct air testing. According to standard procedure, they used a screening instrument designed to immediately detect whether there were explosive levels of gasoline vapors in the air. The screening instrument also measures the total level of volatile organic chemicals (VOCs) in the air. Total VOC screening is useful for quickly identifying whether VOC levels are excessive from an acute (short term exposure) perspective. A screening instrument gives immediate results (no laboratory analysis is needed) but it cannot identify and quantify specific VOC chemicals that are present (for example, whether

benzene is present, and at what concentration). The detection limit of a screening instrument is also high, meaning VOC levels need to be quite elevated before the screening instrument can detect that VOCs are present. In order to assess the risk from exposure to VOCs in the air, we must have results using air testing that identifies and quantifies each chemical present in the air. This is the type of testing that is currently being conducted in indoor air in some homes, but it was not conducted at the time the spill occurred. Because we do not have data on levels of individual VOC chemicals present in air at the time the spill occurred, we cannot assess exposures from that time. However, we know from screening results that elevated levels of total VOCs in outdoor air diminished significantly and quickly after the spill. In general, exposure to gasoline fumes can cause a variety of effects ranging from minor to severe based on the dose and duration of exposure. Inhaling high levels of gasoline vapors over a short period of time can be irritating to the eyes, skin and respiratory tract and can cause nervous system effects like headaches, nausea, dizziness, and shortness of breath. At high levels of exposure over a long period of time, some of the chemicals present in gasoline, such as benzene are known to cause cancer. The Department of Public Health does not diagnose patients or provide medical advice regarding exposures. If anyone is concerned about health symptoms they are experiencing, they should consult with their doctor.

Please do not hesitate to contact David Kallander (David.kallander@ct.gov) or Meg Harvey (Margaret.harvey@ct.gov) if you have any questions about the information contained in this memo.

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