STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

RICK SNYDER
GOVERNOR

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June 8, 2012

Mr. Brian Kelly, On-Scene Coordinator
USEPA Region 5 Emergency Response Branch
9311 Groh Road, Mail Code SE-GI
Grosse Ile, MI 48138-1697

Dear Mr. Kelly:

As the U.S. Environmental Protection Agency (EPA) On-Scene Coordinator for the Pleasant Street site in Detroit, Michigan, you asked the Michigan Department of Community Health (MDCH) for assistance in evaluating ambient and indoor air data sampled from January 2011 through February 2012 in a neighborhood in southwest Detroit, Wayne County, Michigan. Specifically, the objective of the sampling was to determine if benzene-containing wastewater from the Marathon Petroleum Company Detroit Refinery (Marathon) was impacting air concentrations and if emergency response measures were necessary.

I have concluded that the concentrations of airborne chemicals reported for this investigation are *not* likely to increase the risk of cancer or non-cancer health effects. Therefore, emergency response measures would not be necessary at these levels. The discussion below details my evaluation of the data.

Reason for Investigation
The EPA conducted this investigation in response to a resident's reports of sewer gas odors in the outdoor air near sewer manholes and in one basement, in January 2011. The resident reported that a grab sample taken in the basement had been analyzed and reportedly had a high level of benzene. There are four sewer manholes near the house. EPA removed the manhole covers and took real-time benzene readings just inside the openings. Benzene readings were 2-6 parts per million (ppm).[1] EPA traced the sewer line back to Marathon's outfall and detected 13 ppm benzene at the manhole there. Marathon has a National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit, but it does not contain a limit for benzene. Discussions with Marathon revealed that a flare event had caused a discharge several days earlier and the company believed the problem to be fixed (ARCADIS 2012, MDCH file notes).

The next day, EPA returned to the complainant home to test the manholes again. The readings indicated 2 ppm of benzene emanating from the wastewater in the sewer. EPA requested access to the home and took readings in the basement but did not get any detections. Concerned that the real-time air monitor may not be sensitive enough to detect benzene levels of potential health

[1] The Michigan 2010 Air Quality Report (2011) indicates that benzene air levels for the Dearborn and Detroit/Fort Street monitoring stations, which are located in and around southwest Detroit, average 0.0003-0.0004 ppm (equivalent to 0.3-0.4 parts per billion).

concern, EPA conducted follow-up 24-hour testing inside the home, using SUMMA canisters and the TO-15 analytical method. This testing revealed indoor air concentrations of benzene at 8-12 parts per billion (ppb; MDCH file notes). The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) for benzene in air are 3, 6, and 9 ppb for chronic, intermediate, and acute exposures, respectively (ATSDR 2012). The investigation revealed that the home's sewer trap, which would normally prevent vapors from the sewer from entering indoor air, was broken. MDCH recommended that the residents of the home (two adults) be relocated until corrective measures could be taken. Marathon provided for alternative housing for the residents while having the sewer trap repaired.

Based on the situation in and around the complainant's house, EPA, along with Marathon and local and state agencies, developed a plan to correct the discharge from Marathon, provide indoor air testing and sewer trap inspections for area residents, and monitor the ambient air near the manholes for volatile organic compounds, including benzene (ARCADIS 2012, MDCH file notes).

Wastewater Effluent from Marathon

Marathon diverted its wastewater effluent from entering the sewer until the nature of the problem could be identified and corrected. In February 2011, Marathon began working on improvements to its wastewater treatment. Monitoring data from February 2011 through March 2012 for benzene concentrations in influent and effluent indicate that the carbon beds and peroxide system were reducing benzene concentrations in the wastewater to non-detect levels (less than 1 ppb; ARCADIS 2012; EPA 2011-2012).

Additional Indoor Air Testing and Sewer Trap Inspections

Other area residents were given the opportunity to have their sewer traps checked and their indoor air screened for benzene. Thirty-four out of 38 inspected homes had working traps; the traps in the remaining four houses were plugged. Seventeen of the homes, including the original complainant's, had SUMMA canisters placed in them as well as in their yards to determine levels of benzene. One home had a detection of 6 ppb benzene but the resident refused further intervention and the sewer trap was not inspected. Therefore, the source of the benzene in that home is not known. The original complainant's home had no exceedances of the MRLs following the initial investigation there. The rest of the homes' SUMMA results did not exceed the MRLs. When detected, ambient benzene levels were usually less than indoor levels (ARCADIS 2012).

Ambient Air Near Manholes[2]

EPA selected four manhole locations near the Pleasant Street area for ambient air testing, choosing areas where people would be expected to pass by the manhole and sampling at breathing-zone height. Based on its internal guidance, EPA conducted the sampling on days when winds were expected to be less than seven miles per hour. Along with the four manhole locations, EPA also placed SUMMAs at upwind locations to obtain background air concentrations. This 24-hour air testing was conducted monthly from March 2011 through February 2012 (EPA 2011-2012; MDCH file notes). Note that the sampling frequency (once a

[2] Although the EPA investigation focused on benzene, MDCH evaluated data for all chemicals that were detected.

month) is less than that done by MDEQ in its air monitoring network. More frequent sampling may have characterized short-term and long-term ambient air impacts more clearly.

Out of the approximately 60 chemicals detectable by the TO-15 method, 37 were detected at some point during the ambient air sampling (ARCADIS 2012; EPA 2011-2012). Those chemicals were:

1,1,1-Trichloroethane	Carbon tetrachloride	Methylene Chloride
1,2,4-Trimethylbenzene	Chloroform	Naphthalene
1,3,5-Trimethylbenzene	Chloromethane	n-Heptane
1,4-Dioxane	cis-1,2-Dichloroethene	n-Hexane
2-Butanone	Cyclohexane	o-Xylene
2-Hexanone	Dichlorodifluoromethane	Propene
2-Propanol	Ethanol	Styrene
2,2,4-Trimethylpentane	Ethyl acetate	Tetrachloroethene
4-Methyl-2-pentanone	Ethylbenzene	Tetrahydrofuran
4-Ethyltoluene	Isopropylbenzene	Toluene
Acetone	m&p-Xylene	Trichloroethene
Benzene	Methyl methacrylate	Trichlorofluoromethane
Carbon disulfide		

MDCH compared the results of the detected chemicals to several health-protective screening levels, shown in Table 1.

Ten chemicals detected at the manholes exceeded their most protective screening level in at least one sampling location on at least one occasion: benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, carbon tetrachloride, m&p-xylene, methylene chloride, naphthalene, o-xylene, tetrachloroethene, and trichloroethene (Table 2, attached). Five of those chemicals, and one additional chemical, exceeded their screening levels in background samples: benzene, 1,2,4-trimethylbenzene, methylene chloride, tetrachloroethene, tetrahydrofuran, and trichloroethene (Table 2; ARCADIS 2012; EPA 2011-2012).

Most of the chemicals that exceeded their screening levels did so sporadically and/or were not consistently present among the four sampling locations. This suggests that the source was not the sewer but, instead, something unique to the sampling date and location. For instance, field notes recorded during the sampling events indicated times when there was increased vehicle activity, which could increase air concentrations of benzene and other petroleum-related compounds during the higher activity times (EPA 2011-2012).

Three chemicals exceeded their most protective screening levels fairly consistently and are discussed further here: benzene, methylene chloride and trichloroethene.

Table 1. Screening levels used to evaluate chemicals detected in the Pleasant Street neighborhood ambient air investigation, conducted March 2011 through February 2012 in Detroit, Michigan.

Screening Level Used	Definition	Exposure Assumptions
ATSDR Cancer Risk Evaluation Guide (CREG; ATSDR 2005)	Concentration unlikely to cause an increase in theoretical cancer risk (1 in 1,000,000) in an exposed population.	Lifetime exposure, but screening level applies to adults only, not to children.
ATSDR MRLs (ATSDR 2005)	Estimate of daily exposure (for a specified duration) likely to be without risk of non-cancer health effects.	"Acute" exposure is less than 14 days. "Intermediate" is 14 days to less than 1 year. "Chronic" is greater than 1 year.
EPA's Reference Concentration (RfC; EPA 2012c)	Estimate of daily exposure likely to be without risk of non-cancer health effects.	Lifetime exposure.
California chronic Reference Exposure Limit (CA REL; OEHHA 2012)	Estimate of daily exposure likely to be without risk of non-cancer health effects.	Lifetime exposure.
Michigan Department of Environmental Quality (MDEQ) Initial Risk Screening Level (IRSL; MDEQ 2012)	Used in permitting process to ensure health protection of ambient air impact, for individual carcinogens from a process: concentration unlikely to cause an increase in cancer risk (1 in 1,000,000) in an exposed population.	Lifetime exposure.
MDEQ Secondary Risk Screening Level (SRSL; MDEQ 2012)	Used in permitting process to ensure health protection of ambient air impact, for individual carcinogens facility-wide: concentration unlikely to cause a 1-in-100,000 cancer risk	Lifetime exposure.
MDEQ Initial Threshold Screening Level (ITSL; MDEQ 2012)	Used in permitting process to ensure health protection of ambient air impact: concentration likely to be without risk of non-cancer health effects.	"Averaging time" (1 hour, 8 hours, 24 hours, or annual) is based on the study used to determine the ITSL.

Discussion and Public Health Conclusions

Benzene was detected for nearly every sampling event, including the background locations, and exceeded its ATSDR Cancer Risk Evaluation Guide (CREG) of 0.04 ppb (ATSDR 2012) each time. The CREG is the concentration of a chemical that is unlikely to cause an increase in a

theoretical cancer risk of 1 in 1,000,000 in an exposed population. This means if 1,000,000 people were exposed to 0.04 ppb benzene for a lifetime, only one additional cancer, in theory, may occur as a result of that exposure. The CREG is not predictive, and the actual increased risk might be zero (ATSDR 2005). An "acceptable" cancer risk may range from 1 in 10,000 to 1 in 1,000,000, depending on agency policy or state law.

Comparing one 24-hour sample to a screening level intended to address a lifetime exposure is not an appropriate comparison. Rather, long-term data collection is necessary to understand long-term potential exposure. Therefore, the average air concentration is the more appropriate value to use. Table 2 shows the average concentration of benzene detected for the total number of sampling events. If benzene was not detected for a sampling event, one-half the reporting limit was used, which is more protective than using zero for non-detects. The average air concentrations of benzene shown in Table 2 generally suggest an increased cancer risk of 1 in 100,000 (10 times the CREG, or 0.4 ppb), which is considered acceptable by the State of Michigan. Also, the average concentrations seen around the Pleasant Street neighborhood were, for the most part, within the range seen at the background locations. It is *not* likely that benzene concentrations around the Pleasant Street neighborhood are increasing any acceptable cancer risk for this area.

The next most protective screening level for benzene used in this evaluation is the ATSDR chronic Minimal Risk Level, which is 3 ppb (ATSDR 2012). MRLs are estimates of daily exposure likely to be without risk of non-cancer health effects. Only one sample, taken at the Patricia location in May 2011, exceeded the chronic MRL. No samples exceeded the acute MRL for benzene of 9 ppb. It is *not* likely that benzene concentrations recorded for this evaluation would have negative, non-cancer health effects in the long- or short-term.

Methylene chloride, also known as dichloromethane, was detected in about half of the samples taken, including the background locations, and frequently exceeded its CREG of 0.6 ppb (ATSDR 2012). Concentrations of this common industrial solvent reported for the Dearborn and Detroit/Fort Street air monitoring stations ranged from 0.2 to 0.4 ppb in 2010 (MDEQ 2011), with detections occurring on nearly every sampling occasion.

As discussed with benzene, an average air concentration is the more appropriate value to compare to screening levels. The average air concentrations of methylene chloride shown in Table 2 generally suggest an increased cancer risk of 1 in 100,000 (10 times the CREG, or 6 ppb), which is considered acceptable by the State of Michigan. Also, the average concentrations seen around the Pleasant Street neighborhood were, for the most part, within the range seen at the background locations. It is *not* likely that methylene chloride concentrations around the Pleasant Street neighborhood are increasing any acceptable cancer risk for this area.

The next most protective screening level for methylene chloride used in this evaluation is the EPA Reference Concentration (RfC) of 170 ppb (EPA 2012a). The RfC is an estimate of daily lifetime exposure likely to be without risk of non-cancer health effects. None of the sampling locations around the Pleasant Street neighborhood exceeded the RfC, however the background sample taken in April 2011 did, with a result of 263 ppb. The average concentrations for methylene chloride in this investigation were all below the RfC. It is *not* likely that methylene

chloride concentrations recorded for this evaluation would have negative (non-cancer) health effects.

Trichloroethene (TCE) was detected in about one-fourth of the samples taken, including background, and exceeded its CREG of 0.045 ppb (ATSDR 2012) every time. Detection frequency of TCE at the Dearborn air monitoring station in 2010 was about 25%, the highest concentration being 0.07 ppb; it was not detected at the Detroit/Fort Street location that year (MDEQ 2011).

The average air concentrations of TCE shown in Table 2 generally suggest an increased cancer risk of 1 in 100,000 (10 times the CREG, or 0.45 ppb), considered acceptable by the State of Michigan. However, the very high concentration noted at the Liebold location was the only detection at that location during this investigation, strongly suggesting that it was an anomaly. If that concentration, 249 ppb, were not included in the calculation, then the average TCE concentration around the Pleasant Street neighborhood, using one-half the detection limit for non-detects, would be 0.25 ppb. It is *not* likely that TCE concentrations around the Pleasant Street neighborhood are increasing any acceptable cancer risk for this area.

The next most protective screening level for TCE used in this evaluation is the RfC of 0.37 ppb (EPA 2012b). Although most of the detections in this investigation exceeded the RfC, the average concentration at each location generally was less than the RfC. It is *not* likely that TCE concentrations recorded for this evaluation would have negative (non-cancer) health effects.

The results of the EPA investigation in the Pleasant Street neighborhood do *not* indicate that there is an excess risk of cancer or non-cancer health effects. This conclusion is qualified by the fact that the sampling frequency, once a month, was less than that used by the MDEQ in their air monitoring programs. Also, the sampling events ended after one year of data collection and may not be reflective of year-to-year air quality in the neighborhood. Nearby long-term air monitoring stations at Dearborn and Detroit/Fort Street can provide area-wide information, but local impacts, such as sewers off-gassing benzene might not be apparent in those databases. Fortunately, in this case, the Marathon wastewater problem appears to be solved and no longer affecting air quality in the Pleasant Street neighborhood.

If I can be of further assistance in this matter, please do not hesitate to contact me.

Sincerely,

Christina Rose Bush

Christina Bush, Toxicologist
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Division of Environmental Health
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Attachment (Table 2)

CC: MDEQ Air Quality Division
Detroit Water and Sewerage Department
Detroit Health and Wellness Promotion Department
Marathon Petroleum Company

References:

ARCADIS. Marathon Petroleum Company LP Incident Summary Report. Detroit Refinery, 1300 S. Fort Street, Detroit, Michigan. May 1, 2012.

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Table 2. Number of detections, number of exceedances, the most protective screening level, the concentration range, and the average concentration of chemicals that exceeded their screening levels at least once during ambient air sampling conducted monthly March 2011 through February 2012 near the Pleasant Street neighborhood in Detroit, Michigan. (Concentrations in parts per billion by volume [ppbv].)

	I-75				**Patricia**			
Chemical	*No. Detects (No. Exceeds)*	*Screening Level*	*Range*	*Average*	*No. Detects (No. Exceeds)*	*Screening Level*	*Range*	*Average*
Benzene	11 (11)	0.04[A]	0.26 - 1.1	0.43	10 (10)	0.04[A]	0.22 - 6.87	1
1,2,4-Trimethylbenzene	6 (3)	2[B]	0.36 - 640	NC[E]	5 (1)	2[B]	0.32 - 10.5	NC[E]
1,3,5-Trimethylbenzene	3 (1)	45[B]	0.36 - 180	NC[E]	2 (0)	45[B]	0.28 - 2.14	NC[E]
Carbon tetrachloride	0 (0)	0.03[A]	ND[D]	NC[E]	0 (0)	0.03[A]	ND[D]	NC[E]
m&p-Xylene	7 (1)	20[B]	0.43 - 84	NC[E]	6 (0)	20[B]	0.64 - 10.6	NC[E]
Methylene chloride	3 (3)	0.6[A]	0.71 - 1.36	0.43	8 (4)	0.6[A]	0.2 - 10.8	1.3
Naphthalene	1 (1)	0.6[B]	3.2	NC[E]	1 (1)	0.6[B]	14.9	NC[E]
o-Xylene	3 (1)	20[B]	0.26 - 30	NC[E]	5 (0)	20[B]	0.272 - 4.49	NC[E]
Tetrachloroethene	1 (1)	0.57[A]	1.36	NC[E]	1 (0)	0.57[A]	0.28	NC[E]
Tetrahydrofuran	0 (0)	0.2[C]	ND[D]	NC[E]	0 (0)	0.2[C]	ND[D]	NC[E]
Trichloroethene	3 (3)	0.045[A]	0.311 - 2.14	0.35	4 (4)	0.045[A]	0.201 - 0.85	0.21
	Liebold				**Liddesdale**			
Chemical	*No. Detects (No. Exceeds)*	*Screening Level*	*Range*	*Average*	*No. Detects (No. Exceeds)*	*Screening Level*	*Range*	*Average*
Benzene	9 (9)	0.04[A]	0.26 - 1.48	0.47	10 (10)	0.04[A]	0.22 - 1.2	0.4
1,2,4-Trimethylbenzene	5 (0)	2[B]	0.21 - 0.72	NC[E]	6 (0)	2[B]	0.28 - 0.8	NC[E]
1,3,5-Trimethylbenzene	2 (0)	45[B]	0.32 - 0.36	NC[E]	2 (0)	45[B]	0.32 - 0.4	NC[E]
Carbon tetrachloride	1 (1)	0.03[A]	0.172	NC[E]	1 (1)	0.03[A]	0.172	NC[E]
m&p-Xylene	8 (0)	20[B]	0.43 - 1.6	NC[E]	6 (0)	20[B]	0.47 - 1.3	NC[E]
Methylene chloride	5 (3)	0.6[A]	0.21 - 49	4.3	7 (3)	0.6[A]	0.2 - 3.54	0.65
Naphthalene	2 (2)	0.6[B]	0.789 - 0.939	NC[E]	1 (1)	0.6[B]	0.695	NC[E]
o-Xylene	3 (0)	20[B]	0.29 - 0.7	NC[E]	3 (0)	20[B]	0.408 - 0.44	NC[E]
Tetrachloroethene	1 (0)	0.57[A]	0.464	NC[E]	1 (0)	0.57[A]	0.421	NC[E]
Tetrahydrofuran	0 (0)	0.2[C]	ND[D]	NC[E]	0 (0)	0.2[C]	ND[D]	NC[E]
Trichloroethene	1 (1)	0.045[A]	249	21	3 (3)	0.045[A]	0.348 - 15	1.4

Table 2. Number of detections, number of exceedances, the most protective screening level, the concentration range, and the average concentration of chemicals that exceeded their screening levels at least once during ambient air sampling conducted monthly March 2011 through February 2012 near the Pleasant Street neighborhood in Detroit, Michigan. (Concentrations in parts per billion by volume [ppbv].)

	Background			
Chemical	*No. Detects (No. Exceeds)*	*Screening Level*	*Range*	*Average*
Benzene	10 (10)	0.04[A]	0.27 - 1.69	0.34 - 0.77
1,2,4-Trimethylbenzene	9 (1)	2[B]	0.21 - 3	NC[E]
1,3,5-Trimethylbenzene	3 (0)	45[B]	0.34 - 0.76	NC[E]
Carbon tetrachloride	1 (0)	0.03[A]	0.188	NC[E]
m&p-Xylene	8 (0)	20[B]	0.42 - 3	NC[E]
Methylene chloride	6 (5)	0.6[A]	0.566 - 263	0.16 - 11
Naphthalene	0 (0)	0.6[B]	ND[D]	NC[E]
o-Xylene	6 (0)	20[B]	0.21 - 1	NC[E]
Tetrachloroethene	2 (1)	0.57[A]	0.406 - 8.85	NC[E]
Tetrahydrofuran	1 (1)	0.2[C]	3.67	NC[E]
Trichloroethene	3 (3)	0.045[A]	0.275 - 0.97	0.1 - 0.34

Notes (see descriptions of screening levels in text):

A. Cancer Risk Evaluation Guide

B. Reference Concentration

C. Initial Risk Screening Level

D. Not detected

E. Not calculated