

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

INTEROFFICE COMMUNICATION

TO: Beth Vens, Assistant District Supervisor, RRD

FROM: Shane Morrison, Toxicology Specialist, RRD

DATE: October 7, 2021

SUBJECT: 11545 Van Dyke Site-Specific Criteria Evaluation

The following site-specific volatilization to indoor air criteria (SSVIAC) are the Michigan Department of Environment, Great Lakes, and Energy's (EGLE's) determination of values that reflect best available information regarding the toxicity and exposure risks posed by the hazardous substances present at the facility. These values are based upon the information provided with the request to develop SSVIAC for this facility. These values may be used provided it is documented that the conditions used to develop the site-specific criteria are met at the facility. Other values may be developed by a person consistent with the statutory provisions for development of site-specific criteria and provided for EGLE review and approval.

Correspondence transmitting these values to the submitter/consultant as part of a report, review, or other request must incorporate the appropriate sections of the volatilization to indoor air pathway (VIAP) model document language. As indicated in this document, when groundwater volatilization to indoor air inhalation criteria (GVIIC) and soil volatilization to indoor air inhalation criteria (SVIIC) are not applicable, the correspondence must include language indicating the requirement to evaluate all potentially affected three media i.e., groundwater, soil, and soil gas. In addition, all of the following SSVIAC tables must be copied into the correspondence or letter as part of your response to the submitter/consultant. If representative groundwater and soil sampling indicate that site concentrations are below unrestricted residential SSVIAC, there is not a vapor source and there is not a requirement to evaluate the migration of vapors with soil gas sampling. Exceedance of unrestricted residential SSVIAC for any media necessitates a representative soil gas investigation to evaluate the VIAP.

Unrestricted residential site-specific criteria were included in the evaluation based on information provided and EGLE's residential conceptual site model. Exceedance of the unrestricted residential SSVIAC will require restrictions or institutional controls for closure or aid in the determination of off-site migration.

Nonresidential SSVIAC may be adjusted for some hazardous substances to reflect a reasonable maximum worker exposure of 12-hour per day; however, if a person does not exceed the provided nonresidential site-specific criteria, no adjustment is necessary.

Please contact me at MorrisonS5@michigan.gov or 517-284-5063 if you require any clarification of these comments and criterion or have additional questions.

cc: Eric Wildfang, Toxicology Unit Supervisor, RRD
Paul Owens, District Supervisor, RRD

Table 1. Site-Specific Volatilization to Indoor Air Criteria to evaluate vapor migration within preferential pathways.

CAS#	Hazardous Substance	Preferential Conduit Vapor ($\mu\text{g}/\text{m}^3$)	
		Unrestricted Residential	Restricted Nonresidential
83329	Acenaphthene	220 nc	320 nc
208968	Acenaphthylene	220 nc	320 nc
75070	Acetaldehyde	9.4 nc	14 nc
64197	Acetic acid	260 nc	380 nc
67641	Acetone	31,000 (EE) st	31,000 (EE) st
75058	Acetonitrile	63 nc	92 nc
98862	Acetophenone	3,200 (DD) dev	3,200 (DD) dev
107028	Acrolein	2.1E-02 nc	3.1E-02 nc
79107	Acrylic acid	0.21 nc	0.31 nc
107131	Acrylonitrile	0.37 ca	0.88 ca
309002	Aldrin	5.2E-03 ca	1.2E-02 ca
7664417	Ammonia	520 nc	1,200 (EE) st
994058	t-Amyl methyl ether (TAME)	65 nc	95 nc
120127	Anthracene	1,000 nc	1,500 nc
103333	Azobenzene	0.82 ca	1.9 ca
71432	Benzene	3.3 ca	7.7 ca
56553	Benzo(a)anthracene	0.17 (MM) mut	1.0 ca
100447	Benzyl chloride	0.51 ca	1.2 ca
111444	bis-2-Chloroethylether	7.7E-02 ca	0.18 ca
108861	Bromobenzene	63 nc	92 nc
75274	Bromodichloromethane	1.4 ca	3.1 nc
75252	Bromoform	23 ca	54 ca
74839	Bromomethane	10 nc	15 nc
71363	n-Butanol	370 nc	540 nc

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CAS#	Hazardous Substance	Preferential Conduit Vapor (µg/m ³)	
		Unrestricted Residential	Restricted Nonresidential
78933	2-Butanone (MEK)	5,000 (DD) dev	5,000 (DD) dev
123864	n-Butyl acetate	420 nc	610 nc
75650	t-Butyl alcohol	75 nc	110 nc
104518	n-Butylbenzene	210 nc	310 nc
135988	sec-Butylbenzene	0.42 nc	0.61 nc
98066	t-Butylbenzene	0.42 nc	0.61 nc
79925	Camphene	83 nc	120 nc
75150	Carbon disulfide	730 nc	1,100 nc
56235	Carbon tetrachloride	4.5 ca	11 ca
57749	Chlordane	0.20 (EE) st	0.28 (EE) st
108907	Chlorobenzene	52 nc	77 nc
75683	1-Chloro-1,1-difluoroethane	52,000 nc	77,000 nc
75003	Chloroethane	4,200 nc	6,100 nc
110758	2-Chloroethyl vinyl ether	TX	TX
67663	Chloroform	1.1 ca	2.6 ca
74873	Chloromethane	94 nc	140 nc
91587	beta-Chloronaphthalene	TX	TX
95578	2-Chlorophenol	18 (DD) dev	18 (DD) dev
95498	o-Chlorotoluene	83 nc	120 nc
74908	Cyanide, Hydrogen	0.83 nc	1.2 nc
110827	Cyclohexane	6,300 nc	9,200 nc
108941	Cyclohexanone	730 nc	1,100 nc
72559	4-4'-DDE	0.26 ca	0.62 ca
117840	Di-n-octyl phthalate	490 nc	720 nc

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CAS#	Hazardous Substance	Preferential Conduit Vapor ($\mu\text{g}/\text{m}^3$)	
		Unrestricted Residential	Restricted Nonresidential
123422	Diacetone alcohol	2,500 nc	3,700 nc
132649	Dibenzofuran	4.2 nc	6.1 nc
124481	Dibromochloromethane	0.43 (MM) mut	2.5 ca
96128	Dibromochloropropane	1.9E-03 (MM) mut	1.1E-02 ca
74953	Dibromomethane	4.2 nc	6.1 nc
95501	1,2-Dichlorobenzene	310 nc	460 nc
541731	1,3-Dichlorobenzene	3.1 nc	4.6 nc
106467	1,4-Dichlorobenzene	6.5 ca	15 ca
75718	Dichlorodifluoromethane	340 nc	510 nc
75343	1,1-Dichloroethane	16 ca	37 ca
107062	1,2-Dichloroethane	0.98 ca	2.3 ca
75354	1,1-Dichloroethylene	210 nc	310 nc
156592	cis-1,2-Dichloroethylene	8.3 nc	12 nc
156605	trans-1,2-Dichloroethylene	83 nc	120 nc
78875	1,2-Dichloropropane	4.2 nc	6.1 nc
542756	1,3-Dichloropropene	6.4 (J) ca	15 (J) ca
60571	Dieldrin	5.5E-03 ca	1.3E-02 ca
60297	Diethyl ether	1,000 nc	1,500 nc
108203	Diisopropyl ether	700 (DD) dev	700 (DD) dev
108189	Diisopropylamine	210 nc	310 nc
127195	N,N-Dimethylacetamide	100 nc	150 nc
121697	N,N-Dimethylaniline	2.1 ca	5.0 ca
68122	Dimethylformamide	7.3 nc	11 nc
123911	1,4-Dioxane	5.1 ca	12 ca

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CAS#	Hazardous Substance	Preferential Conduit Vapor ($\mu\text{g}/\text{m}^3$)	
		Unrestricted Residential	Restricted Nonresidential
115297	Endosulfan	TX	TX
106898	Epichlorohydrin	1.0 nc	1.5 nc
64175	Ethanol	19,000 (EE) st	19,000 (EE) st
141786	Ethyl acetate	73 nc	110 nc
637923	Ethyl-tert-butyl ether (ETBE)	390 nc	570 nc
100414	Ethylbenzene	10 ca	24 ca
106934	Ethylene dibromide	4.2E-02 ca	1.0E-01 ca
86737	Fluorene	150 nc	210 nc
50000	Formaldehyde	0.80 (MM) mut	4.6 ca
64186	Formic acid	0.31 nc	0.46 nc
76448	Heptachlor	2.0E-02 ca	4.6E-02 ca
1024573	Heptachlor epoxide	9.8E-03 ca	2.3E-02 ca
142825	n-Heptane	3,700 nc	5,400 nc
87821	Hexabromobenzene	TX	TX
118741	Hexachlorobenzene (C-66)	3.7E-02 nc	5.4E-02 nc
87683	Hexachlorobutadiene (C-46)	1.2 ca	2.7 ca
77474	Hexachlorocyclopentadiene (C-56)	0.21 nc	0.31 nc
67721	Hexachloroethane	2.5 ca	6.0 ca
110543	n-Hexane	730 nc	1,100 nc
591786	2-Hexanone	31 nc	46 nc
78831	Isobutyl alcohol	1,600 nc	2,300 nc
67630	Isopropyl alcohol	210 nc	310 nc
98828	Isopropyl benzene	2.4 ca	5.7 ca
58899	Lindane	TX	TX

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CAS#	Hazardous Substance	Preferential Conduit Vapor (µg/m ³)	
		Unrestricted Residential	Restricted Nonresidential
Varies	Mercury (Total)	0.31 nc	0.46 nc
74828	Methane	8.4E+06 (GG)	8.4E+06 (GG)
67561	Methanol	20,000 (DD) dev	20,000 (DD) dev
109864	2-Methoxyethanol	1.1 nc	1.7 nc
109024	N-Methyl-morpholine	TX	TX
108101	4-Methyl-2-pentanone (MIBK)	820 (EE) st	820 (EE) st
1634044	Methyl-tert-butyl ether (MTBE)	98 ca	230 ca
96377	Methylcyclopentane	730 nc	1,100 nc
75092	Methylene chloride	630 nc	920 nc
91576	2-Methylnaphthalene	10 nc	15 nc
2385855	Mirex	TX	TX
91203	Naphthalene	0.75 ca	1.8 ca
98953	Nitrobenzene	0.64 ca	1.5 ca
88755	2-Nitrophenol	5.2E-02 nc	7.7E-02 nc
608935	Pentachlorobenzene	0.10 nc	0.15 nc
82688	Pentachloronitrobenzene	11 nc	17 nc
109660	Pentane	1,000 nc	1,500 nc
109682	2-Pentene	TX	TX
335671	Perfluorooctanoic acid	TX	TX
85018	Phenanthrene	0.10 nc	0.15 nc
110894	Piperidine	7,300 nc	11,000 nc
1336363	Polychlorinated biphenyls (PCBs)	0.25 (J) ca	0.60 (J) ca
79094	Propionic acid	310 nc	460 nc
71238	Propyl alcohol	2,500 (EE) st	2,500 (EE) st

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CAS#	Hazardous Substance	Preferential Conduit Vapor ($\mu\text{g}/\text{m}^3$)	
		Unrestricted Residential	Restricted Nonresidential
103651	n-Propylbenzene	1,000 (DD) dev	1,000 (DD) dev
129000	Pyrene	100 nc	150 nc
110861	Pyridine	3.7 nc	5.4 nc
100425	Styrene	45 ca	100 ca
95943	1,2,4,5-Tetrachlorobenzene	1.0 nc	1.5 nc
630206	1,1,1,2-Tetrachloroethane	3.4 ca	8.1 ca
79345	1,1,1,2-Tetrachloroethane	0.44 ca	1.0 ca
127184	Tetrachloroethylene	41 (EE) st	41 (EE) st
109999	Tetrahydrofuran	2,100 nc	3,100 nc
632224	1,1,1,3-Tetramethylurea	0.83 nc	1.2 nc
509148	Tetranitromethane	1.7E-03 ca	4.0E-03 ca
108883	Toluene	5,200 nc	7,500 (EE) st
2303175	Triallate	200 (DD) dev	200 (DD) dev
102829	Tributylamine	7.3 nc	11 nc
87616	1,2,3-Trichlorobenzene	28 nc	41 nc
120821	1,2,4-Trichlorobenzene	2.1 nc	3.1 nc
71556	1,1,1-Trichloroethane	5,000 (EE) st	7,000 (EE) st
79005	1,1,2-Trichloroethane	0.21 nc	0.31 nc
79016	Trichloroethylene	2.0 (DD) dev	2.0 (DD) dev
75694	Trichlorofluoromethane	460 nc	670 nc
96184	1,2,3-Trichloropropane	0.31 nc	0.46 nc
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	20,000 nc	29,000 nc
1582098	Trifluralin	3,100 nc	4,600 nc
540841	2,2,4-Trimethyl pentane	3,700 nc	5,400 nc

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CAS#	Hazardous Substance	Preferential Conduit Vapor ($\mu\text{g}/\text{m}^3$)	
		Unrestricted Residential	Restricted Nonresidential
107404	2,4,4-Trimethyl-2-pentene	TX	TX
526738	1,2,3-Trimethylbenzene	63 (JT) nc	92 (JT) nc
95636	1,2,4-Trimethylbenzene	63 (JT) nc	92 (JT) nc
108678	1,3,5-Trimethylbenzene	63 (JT) nc	92 (JT) nc
126727	tris(2,3-Dibromopropyl)phosphate	4.8E-02 ca	0.11 ca
108054	Vinyl acetate	210 nc	310 nc
75014	Vinyl chloride	1.6 (MM) mut	14 ca
1330207	Xylenes	230 (J) nc	340 (J) nc

FOOTNOTES

**Soil vapor site-specific volatilization to indoor air criteria (SSVIAC) are applicable for all depths.

- Acceptable Air Values (AAV) endpoint basis used for SSVIAC: (**ca**) = Carcinogenic; (**nc**) = Non-Carcinogenic; (**dev**) = Developmental; (**mut**) = Mutagenic cancer; (**st**) = Short-term (i.e., less than chronic exposure).
- Footnote **(#)**: Acceptable air concentrations (AAC) cannot be adjusted to a 12-hour exposure time for hazardous substance.
- Footnote **AA**: Health-based groundwater SSVIAC are not available due to insufficient toxicological data. Dissolved-phase methane in groundwater is not explosive; however, if liberated and allowed to accumulate in an enclosed structure the principle health and safety concerns are explosive, flammable, and asphyxiant properties of gas phase methane. The acceptable groundwater concentration is the flammability and explosivity screening level (**FESL**) of 10,000 µg/L.
- Footnote **C**: The health-based SSVIAC exceeds the chemical-specific soil saturation screening level (**Csat**). Because this table does not list Csat values both were provided, with the calculated (health-based) value listed first and Csat provided in parenthesis. The person proposing or implementing response activity must document whether additional response activity is required to control non aqueous phase liquid (**NAPL**) to protect against risks associated with NAPL by using methods appropriate for the NAPL present.
- Footnote **CC**: Insufficient chemical-physical input parameters have been identified to allow the development of a health-based SSVIAC using standard methods. The health based SSVIAC for groundwater is developed based solely on the approach that the department uses for shallow groundwater. If groundwater detections are present, soil vapor may be the most appropriate media to evaluate risk posed from the VIAP.
- Footnote **DATA**: Insufficient physical chemical parameters to calculate a health based SSVIAC for specified media. If detections are present in specified media, health-based soil vapor SSVIAC should be used to evaluate risk.
- Footnote **DD**: Hazardous substance causes developmental effects. Residential SSVIAC are protective of both prenatal exposure using a pregnant female receptor and postnatal exposure using a child receptor. Nonresidential SSVIAC are protective of prenatal exposure using a pregnant female receptor. Prenatal developmental effects may occur after an acute (i.e. short-term) or full-term exposure.
- Footnote **EE**: The acceptable air concentration (**AAC**) for the volatile hazardous substances is not derived using standard methods. The hazardous substance may cause adverse human health effects for less than chronic exposures (i.e. short-term or acute). The AAC for these hazardous substances is the acute or intermediate minimum risk level (MRL) developed by the Agency for Toxic Substances and Disease Registry (ATSDR), a United States Environmental Protection Agency Integrated Risk Information System (IRIS) acute reference concentration, or EGLE's Air Quality Division acute initial threshold screening level (ITSL).
- Footnote **FF**: The AAC for the volatile hazardous substances are based on toxicity values that have been identified to have the potential to cause adverse human health effects for less than chronic exposures (i.e. short-term or acute). The short-term exposure for shallow groundwater health based SSVIAC are based on modification of the standard methods by the department to develop applicable shallow groundwater values.
- Footnote **GG**: Health-based SSVIAC for soil vapor are not available due to insufficient toxicological data. The soil vapor value addresses the health and safety concerns of explosive, flammable, and asphyxiant properties of gas phase methane. The acceptable soil vapor concentration is derived based on 25% of the lower explosive level (**LEL**) for methane.
- Footnote **GW**: The calculated health based SSVIAC for a hazardous substance based upon shallow groundwater is considered protective when it is greater than the calculated value for groundwater.
- Footnote **ID**: Requires further evaluation to determine the appropriate media to sample.
- Footnote **J**: Hazardous substance may be present in several isomer forms. Isomer-specific concentrations must be added together for comparison to criteria.
- Footnote **JT**: Hazardous substance may be present in several isomer forms. The health-based SSVIAC may be used for the individual isomer provided that it is the sole isomer detected; however, when multiple isomers are detected in a medium, the isomer-specific concentrations must be added together and compared to the most restrictive health-based SSVIAC of the detected isomers.
- Footnote **M**: The health based SSVIAC may be below target detection limits (**TDL**). In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater than the developed health-based SSVIAC, the TDL is used to evaluate the risk posed from the pathway.
- Footnote **MM**: Hazardous substance is a carcinogen with a mutagenic mode of action. The cancer potency values used in calculating health-based SSVIAC are modified using age-dependent adjustment factors for those carcinogenic chemicals identified as mutagenic.
- Footnote **NA**: The hazardous substance does not meet the department's definition of a volatile; therefore, no health based SSVIAC were developed.
- Footnote **NR**: The hazardous substance has not been previously evaluated by the Remediation and Redevelopment Division Toxicology Unit. The identification, collection, and evaluation of toxicological literature and chemical-physical data cannot be completed within the timeframe requested.
- Footnote **S**: Calculated health-based SSVIAC exceeds the hazardous substance-specific water solubility limit; therefore, the water solubility limit is used to evaluate the risk posed from the pathway. When this occurs the basis for the screening level is noted as "sol".
- Footnote **TX**: The Remediation and Redevelopment Division Toxicology Unit has not identified an inhalation toxicity value for the hazardous substance.