Assessment of emissions to air from the former Bayer site at Hauxton, Cambridgeshire

Centre for Radiation, Chemical and Environmental Hazards, London

Health Protection Agency

Compound (1)	Prework (ppb) (2)	Month 1 (ppb) (3)	Month 2 (ppb) (4)	Month 3 (ppb) (5)	Month 4 (ppb) (6)	Month 5 (ppb) (7)	Month 6 (ppb) (8)	Month 7 (ppb) (9)	Month 8 (ppb) (10)	Month 9 (ppb) (11)	WHO Air Quality Guidelines (ppb) (12)	UK long term Environmental Assessment Level (ppb) (13)	Irritation threshold (ppb) 8hrs exposure unless stated (14)	Average house levels (ppb) (15)	Common Uses (16)
1R-.alpha.-Pinene	<1	<1	1.04	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	100,000 (turpentine)		Deodorant
Acetone	<1	<1	1.16	<1	<1	<1	<1	<1	<1	<1	N/A	7,620	200,000*		Nail varnish remover
Benzene, 1,2,3-trimethyl	3.34	1.85	<1	<1	<1	<1	<1	<1	<1	<1	N/A	254 total trimethylbenzenes	25,000 (no effect for 2 hrs) total trimethylbenzenes		Petroleum
Benzene, 1,2,4-trimethyl	10.73	4.97	<1	<1	<1	<1	<1	<1	<1	<1	N/A	254 total trimethylbenzenes	25,000 (no effect for 2 hrs) total trimethylbenzenes		Petroleum
Benzene, 1,3,5-trimethyl	3.61	1.62	<1	<1	<1	<1	<1	<1	<1	<1	N/A	254 total trimethylbenzenes	25,000 (no effect for 2 hrs) total trimethylbenzenes		Petroleum
Benzene, 1,3,5-trichloro	<1	<1	<1	<1	1.11	<1	<1	<1	<1	<1	N/A	10.25 (1,2,4 trichlorobenzene)	3000 (total trichlorobenzenes)		Degreaser
Benzene, 1,2,4-trichloro-3-methyl	<1	<1	<1	<1	1.11	1.41	<1	<1	<1	<1	N/A	10.25 (1,2,4 trichlorobenzene)	3000 (total trichlorobenzenes)		Degreaser
Benzene, 1-ethyl 2-methyl	8.73	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	100,000 irritant for long term exposure (total ethyl benzenes)		Petroleum
Benzene, 1-ethyl 3-methyl	2.13	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	100,000 irritant for long term exposure (total ethyl benzenes)		Petroleum
Benzene, 1-ethyl 4-methyl	<1	2.89	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	100,000 irritant for long term exposure (total ethyl benzenes)		Petroleum
Benzene, 1-methyl-2-(1-methylethyl)-	<1	<1	<1	<1	<1	<1	<1	<1	1.44	<1	N/A	1,016 (total ethyl benzenes)	No data but very similar structure to ethyl benzenes		Petroleum
Benzene, 1-methyl 3-propyl	2.41	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	No data but very similar structure to ethyl benzenes		Petroleum
para-alpha-dimethyl styrene	<1	<1	6.19	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	50,000 US CDC REL (Cumene)		Deodorant
Benzene, 2-ethyl 1,4-dimethyl	2.41	1.21	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	100,000 irritant for long term exposure (total ethyl benzenes)		Petroleum
Cyclopentane, methyl	<1	<1	<1	<1	<1	<1	1.06	<1	<1	<1	N/A	N/A	5000000 for 10 minutes no irritation (pentane)		Solvent
Dichlorotoluene	<1	<1	1.36	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	No data		Not Known
1,3 Dichloro-Benzene (DCB)	<1	<1	<1	4.03	<1	<1	<1	<1	<1	<1	N/A	254 (1,4- DCB)	10 US ATSDR Chronic ≥1 year MRL (1,4-DCB)		Herbicides, insecticides, medicine, and dyes
1,2 Dichloro-3-Methyl-Benzene	<1	<1	<1	4.03	<1	1.49	<1	<1	<1	<1	N/A	254 (1,4- DCB)	10 US ATSDR Chronic ≥1 year MRL (1,4-DCB)		
D-limonene	<1	<1	73	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	>80,000	1.1***	Deodorant / Natural
Ethylbenzene	4.25	1.4	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total ethyl benzenes)	100,000 irritant for long term exposure (total ethyl benzenes)		Paint / Thinners
Heptadecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.01	N/A	N/A	No data		Not Known
Hexane	<1	<1	<1	<1	<1	<1	1.45	<1	<1	<1	N/A	204	1000000-25000000 (30-60minutes)		Paint / Thinners/ Cleaning agent
Naphthalene	3.75	2.1	1.21	<1	<1	3.6	6.36	3.65	2.15	1.53	N/A	N/A	75,000		Mothballs
Pentane, 3-methyl-	<1	<1	<1	<1	<1	<1	1.01	<1	<1	<1	N/A	N/A	5000000 for 10 minutes no irritation (pentane)		Solvent
o-Xylene	5.48	2.04	<1	<1	<1	<1	<1	<1	<1	<1	N/A	1,016 (total xylenes)	110,000 (total xylenes)	0.88 (total xylenes)**	Paint / Thinners
p-Xylene	19	6.49	<1	2.14	<1	2.04	<1	<1	<1	<1	N/A	1,016 (total xylenes)	110,000 (total xylenes)	0.88 (total xylenes)**	Paint / Thinners
mp-Xylene	<1	<1	<1	<1	<1	<1	1.05	2.13	<1	<1	N/A	1,016 (total xylenes)	110,000 (total xylenes)	0.88 (total xylenes)**	Paint / Thinners
Sulfanilamide	<1	1.4	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	140 Russian STEL OEL **		Antibacterial
Tetrachloroethylene	<1	<1	7.15	12.09	14	36.31	11.87	12.14	17	2.9	37	509	50,000		Dry Cleaning
Toluene	<1	2.13	11.24	16	13	25.73	3.61	3.32	9.9	4.59	69	507	50,000	4***	Paint / Thinners
Trichloroethylene	<1	<1	<1	<1	<1	<1	<1	2.75	1.11	<1	43,000, 4300, 430#	205	200,000 (transient eye irritation)		Dry cleaning, degreaser

US ATSDR = United States Agency For Toxic Substances And Disease Registry

STEL = Short term exposure limit. **REL** = Recommended Exposure Limit. **N/A** = Not Available.

OEL = Occupational exposure limit. **US CDC** = United States Centre for Disease Control. **MRL** = Minimum Risk Level

Based on excess lifetime risk of 1:10 000, 1:100 000 and 1:1 000 000

* McParland M and Bates N, *Toxicology of Solvents* , Rapra Ltd 2002,

** U.S. Department of Health and Human Services, *Registry of Toxic Effects of Chemical Substances,* 2010

Other references - Bingham et al, *Patty's Toxicology 5th Ed* , Wiley ltd, 2001

***Coward et al, *Indoor AQ in homes in England* , BRE, 2002

Guide to the VOC monitoring results summary sheet
This summary presents the results of 28 day average VOC monitoring results taken at the perimeter of the Hauxton remediation site. The VOCs found at levels above 1 part per billion are listed. The names of the chemicals, the levels found and data about the identified VOCs are presented in horizonal rows across the table.
Column (1) - Lists the individual VOCs identified at the site perimeter.
Column (2) - Lists the monitoring results for these VOCs taken in the month prior to excavation taking place. The maximum concentrations from the site boundary are shown.
Column (3) - Lists the monitoring results for the VOCs from 06/08/10 - 03/09/10. The maximum concentrations from the site boundary are shown.
Column (4) - Lists the monitoring results for the VOCs from 15/4/10 - 13/5/10. The maximum concentrations from the site boundary are shown.
Column (5) - Lists the monitoring results for the VOCs from 13/5/10 – 10/6/10. The maximum concentrations from the site boundary are shown.
Column (6) - Lists the monitoring results for the VOCs from 10/6/10 to 8/7/10. The maximum concentrations from the site boundary are shown.
Column (7) - Lists the monitoring results for the VOCs from 08/07/10 to 05/08/10. The maximum concentrations from the site boundary are shown.
Column (8) - Lists the monitoring results for the VOCs from 06/08/10 to 03/09/10. The maximum concentrations from the site boundary are shown.
Column (9) - Lists the monitoring results for the VOCs from 03/09/10 to 30/09/10. The maximum concentrations from the site boundary are shown.
Column (10) - Lists the monitoring results for the VOCs from 30/09/10 to 28/10/10. The maximum concentrations from the site boundary are shown.
Column (11) - Lists the monitoring results for the VOCs from 28/10/10 to 25/11/10. The maximum concentrations from the site boundary are shown.
Column (12) - Lists the World Health Organisation air quality guideline levels for the VOCs, where available. These guideline levels provide a basis for protecting public health from adverse effects of air pollution. They are calculated to protect the health of the whole population, including susceptible groups, based on a lifetime exposure to the chemicals.
Column (13) - Lists the Environmental assessment levels (EALs) for the identified VOCs. EALs are calculated for the protection of health by the Environment Agency. They are used to provide direction in the risk management decisions for industrial processes under the Environmental Permitting (England and Wales) Regulations 2007.
Column (14) - Lists the results of studies of health effects arising from exposure to VOCs. The levels shown indicate the amount of the VOC required in the air to lead to health effects such as irritation.
Column (15) - Lists the levels of the VOCs found in a study of indoor air quality carried out by the Department of the Environment, Food and Rural Affairs in 2002
Column (16) - Lists the common uses of the VOCs identified.