

Assessment of emissions to air from the former Bayer site at Hauxton, Cambridgeshire						Centre for Radiation, Chemical and Environmental Hazards, London																				
Compound (1)	Pework (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)	Month 10 (ppb) (12)	Month 11 (ppb) (13)	Month 12 (ppb) (14)	Month 13 (ppb) (15)	Month 14 (ppb) (16)	Month 15 (ppb) (17)	Month 16 (ppb) (18)	Month 17 (ppb) (19)	Month 18 (ppb) (20)	WHO Air Quality Guidelines (ppb) (21)	UK long term Environmental Assessment Level (ppb) (22)	Irritation threshold (ppb) 8hrs exposure unless stated (23)	Average house levels (ppb) (24)	Common Uses (25)		
1R- α -Pinene	<1	<1	1.04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	100,000 (turpentine)		Deodorant		
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.03	<1	N/A	N/A	No data		Insecticide, dye		
Acetone	<1	<1	1.16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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	<1	<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	<1	<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	<1	<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	<1	<1	<1	<1	<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	<1	<1	<1	<1	1.01	<1	<1	<1	<1	N/A	10.25 (1,2,4 trichlorobenzene)	3000 (total trichlorobenzenes)		Degreaser		
Benzene, 1,2,3-trichloro-4-methyl	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.16	<1	<1	<1	2.12	<1	<1	1.16	1.41	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	<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	<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	<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-methyl-2-(1-methylethyl)-	<1	<1	<1	<1	<1	<1	<1	<1	1.44	<1	<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		
Benzene, 1-methyl 3-propyl	2.41	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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- α -dimethyl styrene	<1	<1	6.19	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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	<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		
Cyclopentane, methyl	<1	<1	<1	<1	<1	<1	1.06	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	N/A	No data		Not Known		
1,2 Dichloro-Benzene (DCB)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.11	<1	<1	<1	<1	N/A	254 (1,4- DCB)	10 US ATSDR Chronic $\geq$ 1 year MRL (1,4-DCB)		Solvent, pesticides		
1,3 Dichloro-Benzene (DCB)	<1	<1	<1	4.03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	254 (1,4- DCB)	10 US ATSDR Chronic $\geq$ 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	<1	<1	<1	<1	<1	<1	<1	<1	<1	N/A	254 (1,4- DCB)	10 US ATSDR Chronic $\geq$ 1 year MRL (1,4-DCB)				
D-limonene	<1	<1	73	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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	2.34	<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		
Undecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.23	<1	<1	<1	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Heptadecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.01	<1	<1	<1	<1	<1	<1	<1	<1	3.95	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Heptadecane, 2-methyl	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.42	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Heptadecane, 3-methyl	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.43	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Heptadecane, 4-methyl	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.67	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Heptane, 2,2,4,6,6-pentamethyl	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3.67	<1	<1	<1	N/A	N/A	200,000 US CDC REL (Nonane)		Kerosene-based fuels		
Hexane	<1	<1	<1	<1	<1	<1	1.45	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.15	<1	N/A	204	1000000-25000000 (30-60minutes)		Paint / Thinners/ Cleaning agent		
Hexadecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.13	N/A	N/A	200,000 US CDC REL (Nonane)		Solvent		
Naphthalene	3.75	2.1	1.21	<1	<1	3.6	6.36	3.65	2.15	1.53	1.06	1.73	1.92	1.2	2.29	<1	1.18	13	6.61	N/A	N/A	75,000		Mothballs		
Naphthalene, 2-methyl-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.63	<1	N/A	N/A	75,000 (naphthalene)		Insecticide		
Nonadecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.12	N/A	N/A	200,000 US CDC REL (Nonane)		Petroleum		
Octadecane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3.16	N/A	N/A	200,000 US CDC REL (Nonane)		Solvent		
Pentane, 2-methyl-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.18	<1	N/A	N/A	5000000 for 10 minutes no irritation (pentane)		Solvent		
Pentane, 3-methyl-	<1	<1	<1	<1	<1	<1	1.01	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.28	<1	N/A	N/A	5000000 for 10 minutes no irritation (pentane)		Solvent		
Phenanthrene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.88	<1	N/A	N/A	No data		Dyestuffs, organic chemical manufacturing		
o-Xylene	5.48	2.04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<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	<1	<1	<1	<1	<1	<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	2.62	<1	<1	<1	1.06	<1	<1	1.89	<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	<1	<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	6.55	1.42	<1	2.88	9.83	1.89	2.78	3.42	5.03	37	509	50,000		Dry Cleaning		
Toluene	<1	2.13	11.24	16	13	25.73	3.61	3.32	9.9	4.59	7.17	1.19	3.97	2.08	2	<1	<1	1.05	4.22	69	507	50,000	4***	Paint / Thinners		
Trichloroethylene	<1	<1	<1	<1	<1	<1	<1	2.75	1.11	<1	<1	<1	<1	<1	1.77	<1	<1	<1	1.13	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

References

* 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

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

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

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 horizontal 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 18/03/10 - 15/04/10. 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 monitoring results for the VOCs from 25/11/10 to 21/12/10. The maximum concentrations from the site boundary are shown.

Column (13) - Lists the monitoring results for the VOCs from 21/12/10 to 20/01/11. The maximum concentrations from the site boundary are shown.

Column (14) - Lists the monitoring results for the VOCs from 20/01/11 to 17/02/11. The maximum concentrations from the site boundary are shown.

Column (15) - Lists the monitoring results for the VOCs from 17/02/11 to 17/03/11. The maximum concentrations from the site boundary are shown.

Column (16) - Lists the monitoring results for the VOCs from 17/03/11 to 14/04/11. The maximum concentrations from the site boundary are shown

Column (17) - Lists the monitoring results for the VOCs from 14/04/11 to 12/05/11. The maximum concentrations from the site boundary are shown

Column (18) - Lists the monitoring results for the VOCs from 12/05/11 to 09/06/11. The maximum concentrations from the site boundary are shown

Column (19) - Lists the monitoring results for the VOCs from 09/06/11 to 13/07/11. The maximum concentrations from the site boundary are shown

Column (20) - Lists the monitoring results for the VOCs from 13/07/11 to 15/08/11. The maximum concentrations from the site boundary are shown

Column (21) - 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 (22) - 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 (23) - 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 (24) - 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 (25) - Lists the common uses of the VOCs identified.