



UK Health  
Security  
Agency

## **Health Risk Assessment of air quality monitoring results from March 2021 to August 2023: Walleys Quarry Landfill Site, Silverdale Newcastle-under-Lyme**

### **Regarding ongoing response to odours and health concerns associated with the site**

#### **Walleys Quarry landfill site: hydrogen sulphide monitoring - update**

On 5th October 2023 the Environment Agency (EA) announced that there were concerns about the accuracy of the historic hydrogen sulphide data collected around the Walleys Quarry landfill site. This means that UK Health Security Agency (UKHSA) cannot currently rely on this hydrogen sulphide data to assess the risk to people's health. The risk of long-term health problems is likely to be small but cannot be excluded at this stage. UKHSA know that some people continue to experience short-term health effects.

Due to the issues with the calibration of monitoring equipment raised by the EA, the historic hydrogen sulphide data that UKHSA has used to produce monthly risk assessments since March 2021 now has a greater degree of uncertainty. Therefore, UKHSA cannot currently rely upon this data for risk assessments and no reference to this monitored hydrogen sulphide data has been included within this month's risk assessment.

The EA have sought advice from the manufacturer of the instruments and are seeking further advice from independent experts to see if it is possible to reliably adjust the historic hydrogen sulphide data to correct for this calibration issue. UKHSA has agreed to consider the outcome of this work but recognise the complexities and uncertainties involved and appreciate the likely timescales.

The August risk assessment continues to assess data for other ambient air pollutants up to the end of August 2023 provided by the EA and unaffected by the calibration issue. This includes updated data for particulate matter, nitrogen dioxide, sulphur dioxide and methane.

UKHSA have been informed that the EA have installed new analysers for the continuation of hydrogen sulphide monitoring going forward from September 2023. Pending further investigation, this new hydrogen sulphide data cannot form a continuation of the old datasets. This is because the historic hydrogen sulphide data has a greater degree of uncertainty which currently invalidates the previous human health risk assessments carried out by UKHSA. UKHSA will set out how this new hydrogen sulphide data will be assessed going forward in the next human health risk assessment where this data will be introduced.

## Non-Technical Summary

The site is owned by Walleys Quarry Limited (formerly Red Industries RM Ltd), who operate the site as an active landfill which accepts non-hazardous waste. Their Environmental Permit also allows the acceptance of stable non-reactive hazardous waste such as gypsum and asbestos in a separate cell, however the company has chosen not to put the required infrastructure in place and therefore they cannot accept this material at this time.

In response to increased community concern of odours within Silverdale and the surrounding areas, from March 2021 the Environment Agency (EA) installed four air quality Mobile Monitoring Facility (MMF) units, three of which are to remain in place to collect monitoring data to continuously assess air quality<sup>1</sup>. MMF6 was decommissioned on 27th June 2023.

Data, provided to UK Health Security Agency (UKHSA) by the EA up to the end of August 2023, have been compared to appropriate health-based air quality guidelines and standards or assessment levels for particulate matter, nitrogen dioxide, sulphur dioxide, methane and volatile organic compounds (VOCs comprising benzene, toluene, ethylbenzene and xylene (BTEX)). In addition, toluene concentrations have been compared to the odour annoyance guideline and odour detection thresholds respectively. Air concentrations of particulate matter, nitrogen dioxide, sulphur dioxide, methane and VOCs are lower than appropriate health-based and odour standards, guidelines or assessment levels, and therefore, the risk to health from these substances is minimal.

On 5<sup>th</sup> October 2023, the EA published concerns about the calibration of the hydrogen sulphide monitors around the Walleys Quarry landfill site. This means that UKHSA cannot currently rely on the hydrogen sulphide data provided by these monitors to assess the risk to human health. UKHSA has been informed that in September 2023, the EA have installed new instruments at all MMFs for the continuation of hydrogen sulphide monitoring going forward.

Any new hydrogen sulphide certified data (collected by the EA from September 2023 onwards) cannot currently be connected or compared to historic hydrogen sulphide data in UKHSA's future risk assessments in order to assess long-term exposure. Furthermore, as the situation currently stands, UKHSA will only be able to consider current exposures with this new rectified dataset going forward. As such, the September 2023 human health risk assessment for hydrogen sulphide will be regarded as an entirely new risk assessment.

This issue does not affect other ambient air quality pollutants measured at Walleys Quarry Limited and UKHSA will continue to assess these pollutants.

Hydrogen sulphide is an odorous chemical; the human nose is very sensitive to odours. Exceedances of the odour annoyance guideline value may result in headache, nausea, dizziness, watery eyes, stuffy nose, irritated throat, cough or wheeze, sleep problems and stress. At hydrogen sulphide concentrations below the World Health Organization (WHO) odour annoyance guideline value, odour may still be present, however as concentrations fall to lower levels it is anticipated that the strength of any odour should also reduce. The more

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<sup>1</sup> It should be noted that the three MMFs monitor the ambient air in the locality and not exclusively, the emissions from the landfill site

time spent above the guideline, the greater the likelihood of symptoms being experienced and impacting on people’s health and wellbeing.

UKHSA recommends that all appropriate measures continue to be taken to reduce the off-site odours from the landfill site, to reduce the health impacts experienced in the local community.

## Scope

The EA has shared with UKHSA monitoring data from MMF units MMF2 and MMF9 from which there is rectified<sup>2</sup> data from the 5th March 2021 – 31st August 2023 (911 days) and 6th March 2021 – 31st August 2023 (910 days) respectively. In April, two additional MMF units were deployed: MMF1 from which there is rectified data from the 14th April 2021 – 31st August 2023 (870 days) and MMF6 from which there is rectified data from the 24th April 2021 – 27th June 2023 (795 days).

UKHSA has reviewed the available data from the MMF units, listed below, and shown on a map in Figure 1:

**MMF1 Location** – Silverdale Cemetery, Newcastle-under-Lyme

**MMF2 Location** – Silverdale Pumping Station, Newcastle-under-Lyme

**MMF6 Location** – Newcastle Community Fire Station, Newcastle-under-Lyme

**MMF9 Location** – Galingale View, Newcastle-under-Lyme

The pollutants monitored at each MMF are provided in Table 1.

**Table 1 Monitoring stations and the contaminants they are monitoring**

Monitoring station	*Hydrogen sulphide (H <sub>2</sub> S)	Methane (CH <sub>4</sub> )	Nitrogen dioxide (NO <sub>2</sub> )	Sulphur dioxide (SO <sub>2</sub> )	Particulate matter (PM <sub>10</sub> , PM <sub>2.5</sub> )	Benzene, toluene, ethylbenzene and xylene
MMF1	✓	✓		✓	✓	
MMF2	✓	✓	✓		✓	✓
MMF6 <sup>§</sup>	✓	✓		✓	✓	
MMF9	✓	✓	✓	✓	✓	✓

\*Hydrogen sulphide data currently no longer valid and therefore previously collected hydrogen sulphide data (prior to 31<sup>st</sup> August 2023) have not been included in this human health risk assessment. Hydrogen sulphide data collected up to (and including) 31<sup>st</sup> August 2023 is termed historic data in this risk assessment.

<sup>§</sup> MMF6 decommissioned on 27<sup>th</sup> June 2023

<sup>2</sup> Rectified data - Data is collected by the Environment Agency (EA) from four of the EA's Mobile Monitoring Facilities (MMF) located adjacent to the Walleys Quarry and Landfill Site in Newcastle-under-Lyme. There may be gaps in data as a result of power supply failure, hardware failure, communication loss or software updates. In some cases, it may be possible to retrospectively include this information. The EA call this data, 'rectified data' as it has undergone a basic quality assurance check and has been subjected to calibration where possible. However, as the calibration dates don't directly match the data collection period, this is not 'final data' and it is likely that this rectified data set may be updated following further quality assurance.

**Figure 1 Map showing the location of the four monitoring sites**



Map courtesy of the Environment Agency

## **Methodology**

### **Air quality guidelines, standards and assessment levels**

The data provided to UKHSA have been compared to appropriate health-based air quality guidelines, standards or assessment levels. There are a variety of health-based standards and assessment levels that have been derived by a number of organisations shown below:

- UK health-based guidance values
- UK air quality standards
- World Health Organization (WHO) air quality guidelines
- Other UK air quality assessment levels
- National air quality assessment levels or health-based guidance values (other than UK)

## **Hydrogen sulphide**

The health-based guidance values used by UKHSA for the risk assessment for acute, intermediate and lifetime exposure to hydrogen sulphide are summarised in Table 2.

**Table 2: Health based guidance values used for this risk assessment**

WHO air quality guidelines	ATSDR- MRL**	US EPA RfC***
<b>30-minute (average)*</b> 7 µg/m <sup>3</sup> (5 ppb) Based on odour annoyance	<b>Intermediate (up to 1 year)</b> 30 µg/m <sup>3</sup> (20 ppb) Based on lesions of the nasal olfactory epithelium in rats.	<b>For assessment of lifetime exposure</b> 2 µg/m <sup>3</sup> (1 ppb) Based on lesions of the nasal olfactory epithelium in rats.
<b>24-hour (average)</b> 150 µg/m <sup>3</sup> (107 ppb) Based on eye irritation in humans.		

\*The WHO guideline value of 7 µg/m<sup>3</sup> (5 ppb) over a 30-minute averaging period is a short-term odour value protective of odour annoyance<sup>1</sup>.

\*\* An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. They are derived for acute (>1, ≤14 days), intermediate (>14, <364 days), and chronic (365 days and longer) exposure durations<sup>2</sup>.

\*\*\* An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime<sup>3</sup>.

## Assessment of previous monitoring data for hydrogen sulphide

It is understood there is an issue with the calibration process for the hydrogen sulphide instruments at Walleys Quarry Limited which impacts the EA's published dataset for monitoring from March 2021 through to August 2023 (inclusive) as well as the previous historic campaigns undertaken in 2017/18 and 2019.

## Hydrogen sulphide acute (short-term) exposure

### WHO 30-minute (average) guideline

When exposures are above the WHO odour annoyance guideline level for hydrogen sulphide, there is potential for significant odour complaints.

Odours can become a nuisance and start to affect people, causing temporary symptoms including headache, nausea, dizziness, watery eyes, stuffy nose, irritated throat, cough or wheeze, particularly if a person has a pre-existing respiratory condition, sleep problems and stress. Individuals will react differently to the odour of hydrogen sulphide. Some people may be more sensitive to hydrogen sulphide odour than others. As the hydrogen sulphide concentration increases more people would be expected to have symptoms, particularly when the concentration exceeds the WHO 30-minute odour annoyance level of 7 µg/m<sup>3</sup> on a regular basis.

Exceedances of the odour annoyance guideline value may result in the health impacts described above. This is reflected in the impacts on the effects on people's wellbeing and the symptoms they are experiencing.

The more time spent above the guideline, the greater the likelihood of symptoms being experienced and consequently impacting on people's health and wellbeing. UKHSA

recommends that all appropriate measures continue to be taken to reduce the off-site odours from the landfill site.

### WHO 24-hour (average) guideline

It is not possible to say with certainty whether the WHO 24-hour guideline value had been breached on occasions prior to March 2021 as there was no monitoring data available to assess this. March 2021 historic data did show an exceedance of the WHO 24-hour guideline value during 7 to 8 March and without confidence in the historic hydrogen sulphide dataset UKHSA cannot say whether further breaches of the WHO 24-hour guideline have occurred.

Exposure to concentrations of hydrogen sulphide above the WHO 24-hour guideline value does not necessarily mean eye irritation or other health effects will occur, but it reduces the margin of safety that is considered desirable to protect health.

### Peak exposures

**Table 3: US Environmental Protection Agency (US EPA) Acute Exposure Guideline Levels (AEGLs) for hydrogen sulphide**

	10 min	30 min	60 min	4 hour	8 hour
<b>AEGL-1<sup>†</sup></b>					
ppb	750	600	510	360	330
µg/m <sup>3</sup>	(1045)	(836)	(711)	(502)	(460)
<b>AEGL-2<sup>††</sup></b>					
ppb	41000	32000	27000	20000	17000
µg/m <sup>3</sup>	(57150)	(44600)	(37660)	(27880)	(23700)
<b>AEGL-3<sup>†††</sup></b>					
ppb	76000	59000	50000	37000	31000
µg/m <sup>3</sup>	(105900)	(82240)	(69690)	(51570)	(43210)

<sup>†</sup> The level of the chemical in air at or above which the general population could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

<sup>††</sup> The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

<sup>†††</sup> The level of the chemical in air at or above which the general population could experience life-threatening health effects or death<sup>4</sup>.

To assess short-term peak exposures, UKHSA compare data to Acute Exposure Guideline Values (AEGLs) (see Table 3) which are expressed as specific concentrations of airborne chemicals at which health effects may occur (there are three AEGL values set for hydrogen sulphide). They are designed to protect the elderly and children, and other individuals who may be susceptible. Exposure to concentrations above the AEGL-1 values may cause notable discomfort, irritation or certain asymptomatic, non-sensory effects. However, the effects are not disabling, and are transient and reversible upon cessation of exposure. Exposure to concentrations above AEGL-2 values may cause irreversible or other serious long-lasting effects or impaired ability to escape. Exposure to concentrations above AEGL-3 values may cause life-threatening health effects or death.

Data reported in March 2021 showed that AEGL-1 had been exceeded. Without confidence in the current hydrogen sulphide dataset UKHSA cannot say whether further breaches of the

AEGL-1 have occurred. However, hydrogen sulphide concentrations would have been required to be a factor of 50 times higher to reach the AEGL-2 values, where there may have been concern for irreversible or other serious long-lasting effects or impaired ability to escape, which is extremely unlikely.

## **Hydrogen sulphide medium-term exposure in 2021**

In previous risk assessments the medium-term exposure to hydrogen sulphide during 2021 was assessed by comparing the calculated average concentrations from March to December to the Agency for Toxic Substances and Disease Registry (ATSDR) Intermediate Minimal Risk Level (MRL) of 30 µg/m<sup>3</sup>, which applies cumulatively to up to 1 year. It was considered appropriate to use the ATSDR intermediate MRL to assess exposure in 2021, rather than a long-term (lifetime) health-based guidance value, as the previous monitoring data for 2017/18 and 2019 indicated that the levels of hydrogen sulphide were not consistently elevated.

Due to the historic hydrogen sulphide data having a greater degree of uncertainty and previous human health risk assessments being invalid, it is now not clear when exposure to elevated levels of hydrogen sulphide began. If levels in 2017/18 and 2019 were elevated, then it may be more appropriate to compare the levels in 2021 to the long-term (lifetime) health-based guidance value.

## **Hydrogen sulphide long-term exposure**

Due to the historic hydrogen sulphide data having a greater degree of uncertainty and previous human health risk assessments being invalid, UKHSA can now only qualitatively assess the risk to human health on a theoretical basis assuming that the local population may have been exposed to levels of hydrogen sulphide above the US EPA reference concentration value since 2016 when an increase in complaints were received. This reference concentration value can be used to assess long-term health impacts.

UKHSA cannot currently rely on this historic hydrogen sulphide data to assess the risk to people's health. The risk of long-term health problems is likely to be small but cannot be excluded at this stage. UKHSA is aware that some people continue to experience short-term health effects.

There are limited data available to assess the impacts of prolonged (many years) exposure to hydrogen sulphide. Studies of communities exposed to higher levels of hydrogen sulphide (e.g. populations located near certain industrial sites) have reported increased incidences of fatigue, irritability, headaches, poor memory, stress and nausea. Such studies have a number of limitations including limited monitoring data, exposure to other chemicals and limited control for confounders. Therefore, it is not currently possible to draw any definitive conclusion that the effects seen are caused by exposure to hydrogen sulphide.

## Particulate matter

**Table 4: Particulate matter UK Air Quality Objectives**

Substance	UK limit values
PM <sub>10</sub>	50 µg/m <sup>3</sup> not to be exceeded more than 35 times a year 24 hour mean
	40 µg/m <sup>3</sup> Annual mean
PM <sub>2.5</sub>	25 µg/m <sup>3</sup> Annual mean

**Table 5: Average particulate matter concentrations**

Monitoring Station	50 µg/m <sup>3</sup> not to be exceeded more than 35 times a year (count)	Monitoring dates
MMF1	16	12/04/2021 to 31/08/2023
MMF2	3	04/03/2021 to 31/08/2023
MMF6	1	29/04/2021 to 27/06/2023
MMF9	1	05/03/2021 to 31/08/2023
Monitoring Station	Average PM <sub>10</sub> concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF1	14.2	12/04/2021 to 31/08/2023
MMF2	13.4	04/03/2021 to 31/08/2023
MMF6	12.3	29/04/2021 to 27/06/2023
MMF9	11.7	05/03/2021 to 31/08/2023
Monitoring Station	Average PM <sub>2.5</sub> concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF1	8.0	14/04/2021 to 31/08/2023
MMF2	8.3	04/03/2021 to 31/08/2023
MMF6	8.2	24/04/2021 to 27/06/2023
MMF9	7.7	05/03/2021 to 31/08/2023

These results are all below the relevant annual air quality objectives.

## Nitrogen dioxide

**Table 6: Nitrogen dioxide (NO<sub>2</sub>) UK Air Quality Objectives**

Substance	UK limit values
NO <sub>2</sub>	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year 24-hour mean
	40 µg/m <sup>3</sup> Annual mean



**Table 7: Average NO<sub>2</sub> concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	13.8	04/03/2021 to 31/08/2023
MMF9	11.0	04/03/2021 to 31/08/2023

These results are all well below the relevant annual air quality objectives in the UK Air Quality Strategy.

## Sulphur dioxide

**Table 8: Sulphur dioxide (SO<sub>2</sub>) UK Air Quality Objectives**

Substance	UK limit values
SO <sub>2</sub>	266 µg/m <sup>3</sup> not to be exceeded more than 35 times a year 15 min mean
	350 µg/m <sup>3</sup> not to be exceeded more than 24 times a year 1 hour mean
	125 µg/m <sup>3</sup> not to be exceeded more than 3 times a year 24 hour mean

**Table 9: Average SO<sub>2</sub> concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF1	1.4	24/06/2021 to 31/08/2023
MMF6	1.5	24/06/2021 to 27/06/2023
MMF9	3.1	28/05/2021 to 31/08/2023

The SO<sub>2</sub> data for the period averaged are all well below the respective limit values for SO<sub>2</sub> in the UK Air Quality Strategy. Therefore, no significant risks to health from SO<sub>2</sub> are expected during this monitoring period.

## Methane

Methane (CH<sub>4</sub>) is generally considered to be an asphyxiant rather than a toxic gas. It is typically only a risk to health in high concentrations in enclosed spaces. There are no ambient air quality standards. However, levels greater than 80% methane may cause asphyxia (1% methane is equivalent to 6,556 mg/m<sup>3</sup>) and the Lower Explosive Limit is 32,781 mg/m<sup>3</sup>.

The average concentration of methane recorded are given in Table 10.

**Table 10: Average methane concentrations**

Monitoring Station	Average concentration (mg/m <sup>3</sup> )	Monitoring dates
MMF1	2.2	14/04/2021 to 31/08/2023
MMF2	2.1	05/03/2021 to 31/08/2023
MMF6	1.6	24/04/2021 to 27/06/2023
MMF9	3.1	06/03/2021 to 31/08/2023

All the maximum concentrations of methane were significantly below the values discussed above.

## Benzene, toluene, ethylbenzene and xylene (BTEX)

### Benzene

**Table 11: Benzene UK Air Quality Objective and health-based guidance value**

Substance	UK Air Quality Objective and health-based guidance value
Benzene	UK Air Quality Objective: 5 µg/m <sup>3</sup> (annual mean)
	Short-term Environmental Assessment Level (EAL)*: 30 µg/m <sup>3</sup> (24-hour mean)

\* EALs represent a pollutant concentration in ambient air at which no significant risks to public health are expected<sup>5</sup>.

**Table 12: Average and maximum 30-minute benzene concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	0.29	10/03/2021 to 23/02/2023
MMF9	0.33	10/03/2021 to 23/02/2023
Monitoring Station	Maximum 30-minute concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	12.24	10/03/2021 to 23/02/2023
MMF9	6.59	10/03/2021 to 23/02/2023

The calculated averages for the monitoring period are below the UK Air Quality Objective and the maximum 30-minute concentrations are below the short-term EAL therefore there would not be expected to be any significant risks to health at these levels of exposure.

## Toluene

**Table 13: Toluene health-based guidance values**

Substance	Health-based guidance values
Toluene	PHE indoor air quality guideline (long-term)*: 2300 µg/m <sup>3</sup> (24-hour average)
	PHE indoor air quality guideline value (short-term)*: 15,000 µg/m <sup>3</sup> (8-hour average)
	WHO odour detection threshold level**: 1000 µg/m <sup>3</sup> (30-minute average)

\*An estimate of a level human exposure to a chemical in air at which no significant risks to health are expected. Whilst these values have been set to assess indoor exposure, they are also relevant for assessment of outdoor exposure<sup>6</sup>.

\*\* The WHO recommends that the peak concentrations of toluene in air should be kept below the odour detection threshold level of 1000 µg/m<sup>3</sup> as a 30-minute average<sup>7</sup>.

**Table 14: Average and maximum 30-minute toluene concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	1.87	10/03/2021 to 23/02/2023
MMF9	2.31	10/03/2021 to 23/02/2023
Monitoring Station	Maximum 30-minute concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	85.39	10/03/2021 to 23/02/2023
MMF9	40.72	10/03/2021 to 23/02/2023

The calculated averages and maximum 30-minute concentrations are below the health-based guidance values. Therefore, there would not be expected to be any significant risk to health at these levels of exposure.

## Ethylbenzene

**Table 15: Ethylbenzene health-based guidance values**

Substance	Health-based guidance values
Ethylbenzene	ATSDR chronic MRL <sup>†</sup> : 260 µg/m <sup>3</sup>
	ATSDR acute MRL <sup>‡</sup> : 22,000 µg/m <sup>3</sup>

\*An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. They are derived for acute (>1, ≤14 days), intermediate (>14, <364 days), and chronic (365 days and longer) exposure durations<sup>8</sup>.

‡ The MRL value in this report is different to reports up to December 2021 because an error in the conversion of the MRL from ppb to µg/m<sup>3</sup> has been identified and corrected. This does not change the conclusions on the risks to health from exposure to the reported levels of ethylbenzene.

**Table 16: Average and maximum 30-minute ethylbenzene concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	0.51	10/03/2021 to 23/02/2023
MMF9	0.41	10/03/2021 to 23/02/2023
Monitoring Station	Maximum 30-minute concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	121.56	10/03/2021 to 23/02/2023
MMF9	88.58	10/03/2021 to 23/02/2023

The calculated averages and maximum 30-minute concentrations are below the health-based guidance values. Therefore, there would not be expected to be any significant risk to health at these levels of exposure.

## Xylene

**Table 17: Xylene health-based guidance values**

Substance	Health-based guidance values
Xylene	PHE indoor air quality guideline value (long-term)*: 100 µg/m <sup>3</sup>
	ATSDR acute MRL** #: 8700 µg/m <sup>3</sup>

\*An estimate of a level human exposure to a chemical in air at which no significant risks to health are expected. Whilst these values have been set to assess indoor exposure, they are also relevant for assessment of outdoor exposure<sup>6</sup>.

\*\*An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. They are derived for acute (>1, ≤14 days), intermediate (>14, <364 days), and chronic (365 days and longer) exposure durations<sup>9</sup>.

# The MRL value in this report is slightly different to reports up to December 2021 because an error in the conversion of the MRL from ppb to µg/m<sup>3</sup> has been identified and corrected. This does not change the conclusions on the risks to health from exposure to the reported levels of xylene.

**Table 18: Average and maximum 30-minute xylene concentrations**

Monitoring Station	Average concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	1.74	10/03/2021 to 23/02/2023
MMF9	1.16	10/03/2021 to 23/02/2023
Monitoring Station	Maximum 30-minute concentration (µg/m <sup>3</sup> )	Monitoring dates
MMF2	142.71	10/03/2021 to 23/02/2023
MMF9	140.28	10/03/2021 to 23/02/2023

The calculated averages for the monitoring period are below the PHE indoor air quality guideline value and the maximum 30-minute concentrations are below the ATSDR acute

MRL therefore there would not be expected to be any significant risks to health at these levels of exposure.

## Conclusions

The monitoring results for particulate matter, nitrogen dioxide and sulphur dioxide were below UK air quality objectives. Levels of benzene, toluene, ethylbenzene and xylene were below health-based guidance values. Therefore, there would be minimal risks to health at these levels of exposure.

Due to the historic hydrogen sulphide data having a greater degree of uncertainty which currently invalidates the previous human health risk assessments, UKHSA can at this stage only qualitatively assess the risk to human health on a theoretical basis assuming that the local population may have been exposed to levels of hydrogen sulphide above the long-term health-based guidance value prior to September 2023.

UKHSA cannot currently rely on historic hydrogen sulphide data to assess the risk to people's health. The risk of long-term health problems is likely to be small but cannot be excluded at this stage. UKHSA is aware that some people continue to experience short-term health effects.

There are currently limited data available to assess the impacts of hydrogen sulphide exposure over many years. Studies of communities exposed to higher levels of hydrogen sulphide (for example populations located near certain industrial sites) have reported increased incidences of fatigue, irritability, headaches, poor memory, stress and nausea. These studies have a number of limitations, and it is therefore not possible to draw any definitive conclusion that the effects seen are caused by exposure to hydrogen sulphide.

Exceedances of the odour annoyance guideline value may result in headache, nausea, dizziness, watery eyes, stuffy nose, irritated throat, cough or wheeze, sleep problems and stress. The more time spent above the guideline, the greater the likelihood of symptoms being experienced and consequently impacting people's health and wellbeing.

UKHSA recommends that all appropriate measures continue to be taken to reduce the off-site odours from the landfill site, to reduce the health impacts experienced in the local community.

## Notes

On 1 October 2021, Public Health England (PHE) transitioned to the newly established UK Health Security Agency (UKHSA)<sup>3</sup>. From 1 October, PHE's Category 1 functions under the Civil Contingencies Act 2004 transferred to the UKHSA. The UKHSA West Midlands Health Protection Team will continue to provide senior representation at Local Resilience Forum (LRF) meetings and events. They will provide the expert health protection advice to local authority Directors of Public Health, the local NHS and to LRF structures and programmes. UKHSA, as a Category 1 Responder, will be the point of contact for public health incidents and will be responsible for establishing Scientific and Technical Advisory Cells (STACs) during relevant responses.

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<sup>3</sup> All reference to Public Health England has now been changed to UKHSA in this report.

## References

1 World Health Organization (WHO) Air Quality Guidelines for Europe, 2nd Edition, Chapter 6, page 146 <https://iris.who.int/bitstream/handle/10665/107335/9789289013581-eng.pdf?sequence=1>

2 U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), Toxicological profile for Hydrogen Sulphide, 2006. <http://www.atsdr.cdc.gov/ToxProfiles/tp114.pdf>

3 U.S. Environmental Protection Agency Reference Concentration for Hydrogen Sulphide. [https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance\\_nmbr=61](https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=61)

4 Hydrogen Sulphide Acute Exposure Guideline Levels (AEGs) [Acute Exposure Guideline Levels for Airborne Chemicals | US EPA](#)

5 Environment Agency Environmental Assessment Levels (EALs) <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

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7 World Health Organization (WHO) Air Quality Guidelines for Europe, 2<sup>nd</sup> Edition, Chapter 5, page 112 <https://iris.who.int/bitstream/handle/10665/107335/9789289013581-eng.pdf?sequence=1>

8 U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), Toxicological profile for ethylbenzene, 2010. <https://www.atsdr.cdc.gov/ToxProfiles/tp110.pdf>

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