Arnolds Field Air Quality Report | November 2023

This is a report about fires and air quality for November 2023 at Arnolds Field (shown on the top left). $PM_{2.5}$ and NO_2 data is collected by Breathe London nodes (an example node is shown in the image on the bottom left).

The Havering Council Department for Public Health would be grateful to receive feedback from residents about the updated content and information shared in these reports. It is important that these reports contain public health and environmental information that is relevant and of interest to Havering residents.

Please visit the following link to share your feedback .

Contents

Overview of Air Quality around Arnolds Field in November 2023

Arnolds Field has been the site of frequent fires over the last five years.

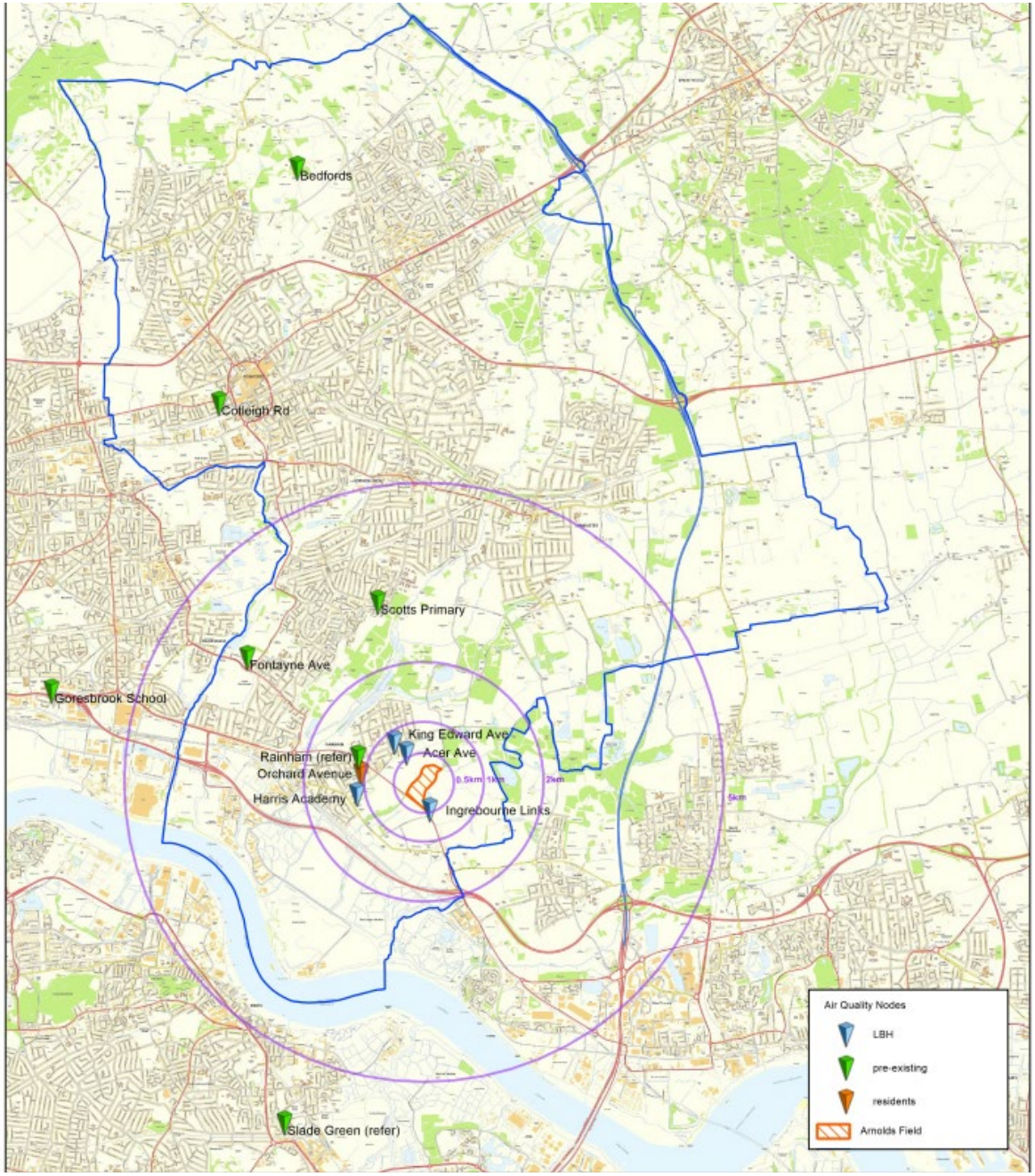
This report describes levels of two types of air pollution – fine particulate matter ($PM_{2.5}$) and Nitrogen Dioxide (NO_2) in residential areas adjacent to Arnolds Field. In summary:

- Levels of NO_2 pollution (Table 1, page 9) were consistently 'low' throughout November when compared to the UK Government's 'Daily Air Quality Index' (DAQI).
- Levels of $PM_{2.5}$ pollution (Table 2, page 10) were consistently 'low' when compared to the DAQI
- There were no fire incidents or callouts at Arnolds Field in November (see Page 6).
- $PM_{2.5}$ hourly levels were at times slightly elevated, these peaks aligned with regional rises and not related to any fires as can be seen since Bedfords Park was impacted - 10km away from Arnolds Field (Table 3, page 11). These increases were not sufficiently prolonged to affect the DAQI score, which is based on the average concentration for the day as a whole.
- Some of these short peaks in air pollution did exceed the daily limit on $PM_{2.5}$ set by the World Health Organisation (see pages 13-19). The UK Government has not set a limit of short-term exposure to $PM_{2.5}$.
- The UK limit for annual average $PM_{2.5}$ concentrations has not been exceeded at any of the three sites around Arnolds Field that have now been monitored for 12 months or longer. Pollution was well above the corresponding WHO limit, which is much lower than the UK equivalent.

Measuring Air Quality around Arnolds Field

- Havering Council has commissioned enhanced air quality monitoring in response to concerns about possible health impacts of recurrent fires at Arnolds Field, off Launders Lane, in Rainham.
- The report currently presents data about levels of particulate matter ($PM_{2.5}$) and Nitrogen Dioxide (NO_2). Information about levels of specific pollutants will be available shortly.
- Comparisons are made with:
    - levels of pollution recorded at sites elsewhere in Havering and in adjacent boroughs (see map to the right) to show whether the trends seen are local to Rainham or due to conditions affecting London as a whole.
    - relevant UK and WHO air quality limits
- Details of fires that required a response by the London Fire Brigade (LFB) are presented to show whether periods of high air pollution in Rainham coincided with visible fires at Arnolds Field.

Figure 1. Breathe London nodes closer to and further away from Arnolds field

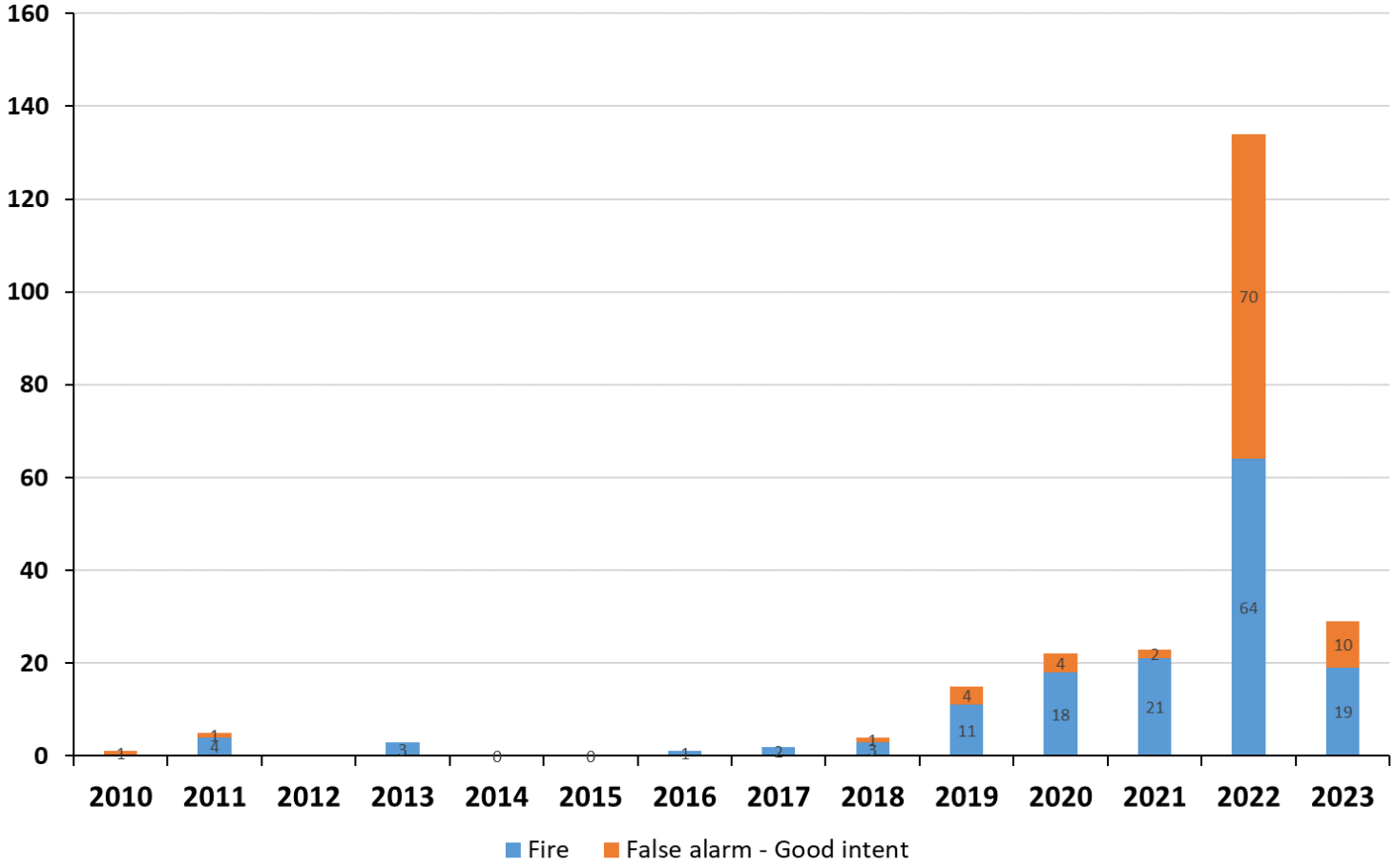


General Information About Air Pollution

- **Who is measuring & what is being measured?**
  - Havering Council is working with the Environmental Research Group at Imperial College London to monitor $PM_{2.5}$ and NO_2 using Breathe London sensor nodes.
  - Residents have independently sourced their own node (Orchard avenue), which forms part of the ring of sensors now surrounding Arnolds Field.
- **What is NO_2 how does it affect health?**
  - NO_2 (nitrogen dioxide) is a harmful, gaseous air pollutant primarily emitted from vehicles and industrial processes.
  - Inhalation of NO_2 can irritate the respiratory system, leading to increased respiratory symptoms in the general population and putting people with pre-existing conditions like asthma and COPD at risk of severe crises.
  - Children, older residents and individuals with pre-existing health conditions are particularly vulnerable
  - However $PM_{2.5}$ is more likely be impacted by fires at Arnolds field as previous monthly reports of air quality at Arnolds field have shown
- **What is $PM_{2.5}$ and how does it affect health?**
  - $PM_{2.5}$ (particulate matter with a diameter of 2.5 micrometres or smaller) consists of tiny particles that can penetrate deep into the lungs produced by road traffic, industrial activities, domestic wood burners and wild fires.
  - Short-term exposure to high levels of $PM_{2.5}$ increases respiratory symptoms and exacerbates pre-existing respiratory and cardiovascular problems increasing the risk of heart attacks, strokes, and respiratory crises. Exposure over the long term increases the risk of developing respiratory and cardiovascular disease, lung cancer and dementia and reduces overall life expectancy.
- **Air pollution and inequalities.**
  - The harm caused by air pollution is not equally distributed. Air quality is generally worse in urban areas and the poorer, more ethnically diverse communities that tend to live in these areas are hardest hit. These communities tend to contribute less to air pollution than more affluent counterparts do e.g. they are less likely to drive their own car and more likely to use public transport.
- **How is air quality regulated in the UK?**
  - The Department for Environment, Food and Rural Affairs (DEFRA) sets limits for levels of air pollution in the UK that must be achieved now by law and targets to be achieved in the future. The World Health Organization (WHO) publishes recommended limits that if achieved would minimise harm to health. The WHO limits are consistent with the most up-to-date evidence about the health effects of air pollution and are much lower than the corresponding UK limit where this exists.
- **Action to control air pollution**
  - Initiatives such as low-emission zones and improvements to the public transport network aim to improve air quality in urban areas.
  - Individual residents can also help by leaving the car at home whenever possible; not having bonfires and minimising use of wood burners.
  - For more information about actions to control air pollution read a report by the Chief Medical officer here .

Fires at Arnolds Field

Figure 2. LFB callouts to Arnolds Field (including fires and false alarms)



History of fires

The LFB responded to 64 fires at Arnolds Field in 2022.

In 2023, so far the LFB have responded to 19 fires (see blue bar for 2023).

Fires in November 2023

During November 2023 there were no fire incidents or false alarms at the Arnolds Field site.

Average annual concentrations of $PM_{2.5}$ and NO_2 : Nov'22 – Oct'23

Three of the Breathe London nodes around Arnolds Field (Acer Avenue, King Edwards Avenue, and the Rainham Reference site highlighted in grey in Figures 3 & 4) have been in place for at least 12 months allowing calculation of average concentrations of air pollution over a full year. This allows comparisons to be made against the relevant annual UK limit (for $PM_{2.5}$ this is 20 micrograms/m^3 and 40 micrograms/m^3 for NO_2), which is described in terms of the maximum allowable annual average concentration. The annual concentrations for sites close to Arnolds field (grey bars) are also compared to sites further away (blue bars) which have also been in place for 12 months or more.

Concentrations of both $PM_{2.5}$ and NO_2 at the three sites in Rainham have been similar to levels recorded by nodes elsewhere in Havering and in adjacent boroughs. Suggesting that fires at Arnolds Field have not significantly changed background levels of NO_2 and $PM_{2.5}$ over the long term.

Those background levels are also well below the relevant UK limit. However, and in common with sites across London, they are also well above the levels recommended by the WHO and above which harm to health is likely.

Further action is necessary to reduce levels of air pollution closer to the relevant WHO recommendation. Stopping recurrent fires at Arnolds Field would help achieve this.

Figure 3. Annual $PM_{2.5}$ against UK and WHO annual limits for sites closer to and further away from Arnolds field

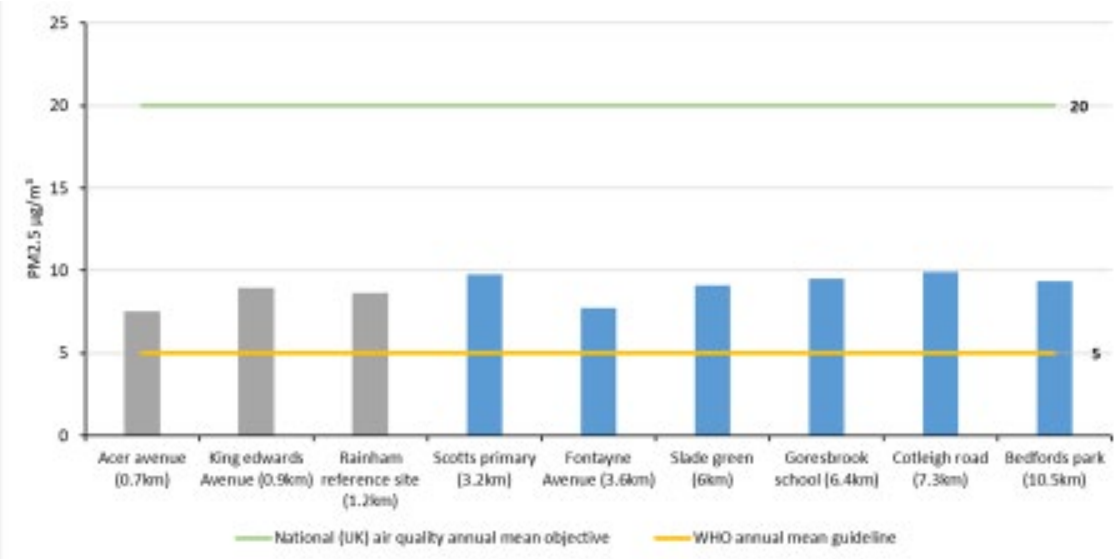
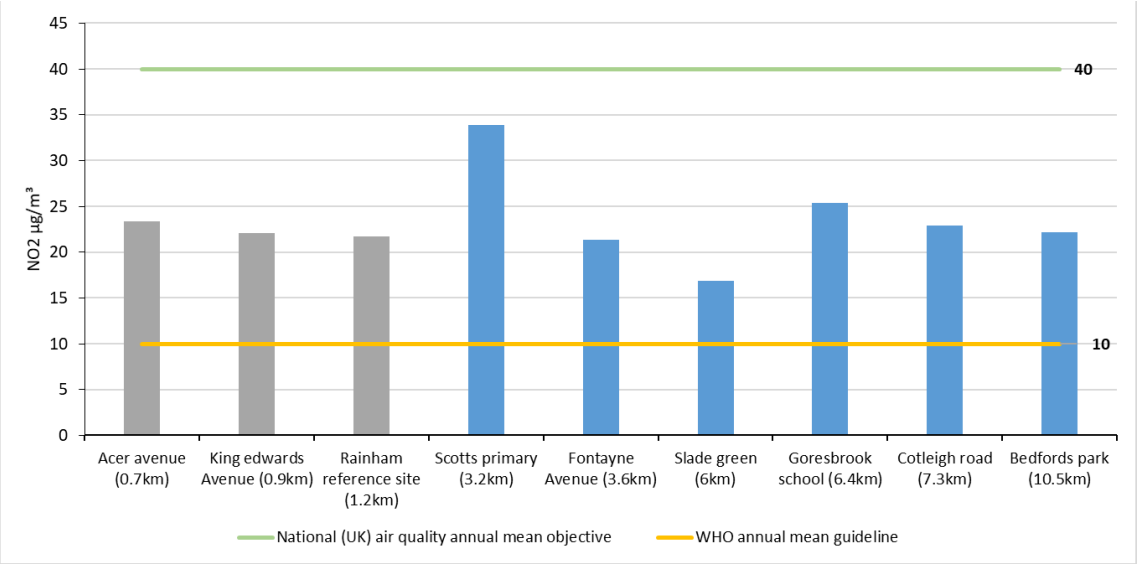


Figure 4. Annual NO_2 against UK and WHO annual limits for sites closer to and further away from Arnolds field



Levels of pollution presented as DAQI scores : November ’23

The Daily Air Quality Index (DAQI) was designed by DEFRA to act as the air pollution equivalent of the pollen or UV index. It is used in the presentation of the air pollution forecast – alerting UK residents to predicted periods of high air pollution so that we can take steps to reduce the potential for harm.

As shown in the table to the right, DAQI scores are based on the average daily concentration of $PM_{2.5}$ and the average hourly concentration of NO_2.

Scores vary from 1 to 10.

1-3 indicates low air pollution when no one needs to make any changes to their behaviour to reduce the risk of harm from air pollution

10 is very high air pollution when everyone is advised to reduce physical exertion, particularly outdoors, especially if they experience symptoms such as cough or sore throat; and adults and children with health problems that make them more vulnerable and older people, are advised to avoid strenuous physical activity and may need to adjust their medication.

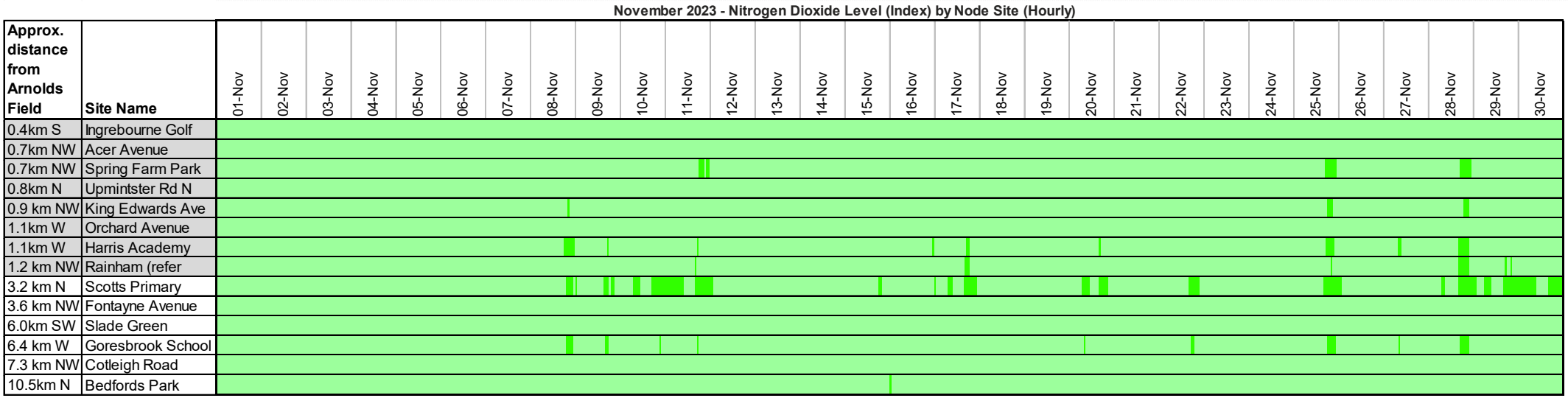
Figure 5. Daily Air Quality Index

Band	Index	PM2.5 (24 hour mean µg/m3)	Nitrogen dioxide (1 hour mean µg/m3)
Low	1	0-11	0-66
	2	12-23	67-133
	3	24-35	134-200
Moderate	4	36-41	201-267
	5	42-46	268-334
	6	47-53	335-400
High	7	54-58	401-467
	8	59-64	468-534
	9	65-70	535-600
Very High	10	>71	>601

The DAQI score is used in this report to describe how pollution in Rainham varied over the past month and help residents make comparisons with levels of pollution observed at nodes further away from Arnolds Field. Changes that happened across all nodes at the same time are probably due to a regional issue e.g. weather that traps air pollution within urban areas. Poor air quality in Rainham alone is more likely to be due to a local issue – such as a fire at Launders Lane.

Dates this month where the LFB attended a fire at Launders Lane (if there were any) are highlighted in red in **Tables 1-3** that follow.

Table 1: November 2023 - NO_2 level (DAQI score) by node site (hourly) - Based on the hourly mean concentration



Based on the hourly mean concentration

Levels of NO_2 air pollution were low throughout November at all sites. DEFRA would not have recommended any change to the behaviour of residents to reduce the risk of immediate harm given this level of air pollution. Levels of NO_2 detected by nodes around Arnolds Field did not display a distinctly different pattern from that seen elsewhere. As such, these data do not suggest a significant source of air pollution unique to Rainham this month.

Table 2: November 2023 - $PM_{2.5}$ Particles Level (Index) by Node Site (Daily) - Based on the daily mean concentration for historical data, latest 24 hour running mean of current day

Approx. distance from Arnolds Field	Site Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0.4km S	Ingrebourne Links G	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
0.7km NW	Acer Avenue, Rainh	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
0.7km NW	Spring Farm Park	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1
0.8km N	Upminster Rd N																											1	1	1	1
0.9 km NW	King Edw ards Ave	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	2	1
1.1km W	Orchard Avenue	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1
1.1km W	Harris Academy, Ra	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	2	1
1.2 km NW	Rainham (refer	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
3.2 km N	Scotts Primary	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	2	1
3.6 km NW	Fontayne Avenue	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6.0km SW	Slade Green	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	2	1
6.4 km W	Goresbrook School	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	2	2	1	1	1	1	1	1	1	1	2	1	1	2	1
7.3 km NW	Cotleigh Road	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	2	2
10.5km N	Bedfords Park	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	2	1

Based on the daily mean concentration for historical data, latest 24 hour running mean of current day

N.B. there were no fires in November.

In the analysis of the $PM_{2.5}$ daily values (Table 2), looking at the values which are not Index 1:

- The days of slight increases (11th, 12th, 16th, 26th and 29th) were regional fluctuations. This is evident as most nodes, including those at Cotleigh Road (over 7km away from Arnolds Field) and Bedfords Park (over 10km from Arnolds Field) also saw increases from 1.
- $PM_{2.5}$ increases for short periods were seen on other days but were not prolonged enough to elevate the daily index

Short term fluctuation in Air Quality : November'23

Table 3. November 2023 - $PM_{2.5}$ Particles Level (Index) by Node Site (Hourly) - Based on the hourly mean concentration

Legend	PM2.5 - 1 hour mean (µg/m3)
0 10 20 30 40	50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300

November 2023 - PM2.5 Particles Level by Node Site (Hourly)

Approx. distance from Arnolds Field	Site Name	01-Nov	02-Nov	03-Nov	04-Nov	05-Nov	06-Nov	07-Nov	08-Nov	09-Nov	10-Nov	11-Nov	12-Nov	13-Nov	14-Nov	15-Nov	16-Nov	17-Nov	18-Nov	19-Nov	20-Nov	21-Nov	22-Nov	23-Nov	24-Nov	25-Nov	26-Nov	27-Nov	28-Nov	29-Nov	30-Nov
0.4km S	Ingrebourne Golf																														
0.7km NW	Acer Avenue																														
0.7km NW	Spring Farm Park																														
0.8km N	Upminster Rd N																														
0.9 km NW	King Edwards Ave																														
1.1km W	Orchard Avenue																														
1.1km W	Harris Academy																														
1.2 km NW	Rainham (refer																														
3.2 km N	Scotts Primary																														
3.6 km NW	Fontayne Avenue																														
6.0km SW	Slade Green																														
6.4 km W	Goresbrook School																														
7.3 km NW	Cotleigh Road																														
10.5km N	Bedfords Park																														

Based on the hourly mean concentration

Table 3 shows $PM_{2.5}$ levels as an hourly average. These data cannot be directly compared with the DAQI which is based on a daily average so an alternative index has been produced by the Arnolds Field Technical Group. However, they can provide further confirmation that a fire at Arnolds Field is the cause of an increase in air pollution levels e.g. if the table shows an increase in air pollution at the same time as a fire at Arnolds Field i.e. darker colours on the legend; and sensors downwind of the fire at that time show the greatest increase. $PM_{2.5}$ hourly levels were at times slightly elevated, these peaks aligned with regional rises and not related to any fires as can be seen since Bedfords Park was impacted (10km away from Arnolds Field).

Air Quality at individual Breathe London nodes surrounding Arnolds field: November ’23

What follows is a presentation of data collected by Breathe London nodes at the eight sites immediately around Arnolds Field.

Figure A shows the number of days that $PM_{2.5}$ and NO_2 levels exceeded the WHO recommendation for daily average concentration (see WHO recommendations in Table 4).

NB. The UK does not have a daily target for $PM_{2.5}$ and the UK daily limit for NO_2 is considerably higher than the WHO recommendation. However, the WHO recommended limits are consistent with research evidence regarding the level above which harm to health is likely.

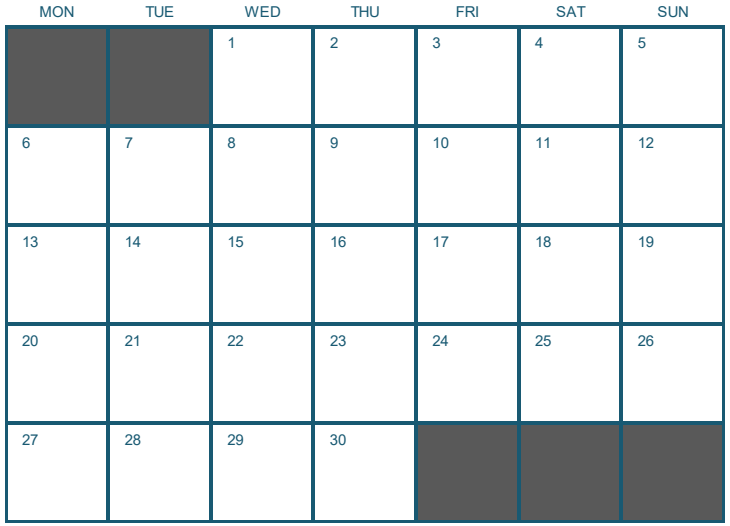
Figure B shows a trace of $PM_{2.5}$ and NO_2 levels recorded at 60 minute intervals. These data cannot be directly compared with recommended levels. However, they can provide further confirmation that a fire at Arnolds Field is the cause of an increase in air pollution levels e.g. if the trace shows an increase in air pollution at the same time as a fire at Arnolds Field; and sensors downwind of the fire at that time show the greatest increase.

Figure C shows the location of the specific node

Table 4. $PM_{2.5}$ and NO_2 UK air quality standards and WHO limits

Pollutant	Averaging time	WHO recommendations	UK Air quality limits
$PM_{2.5}$ µg/m3	Hourly		
	Daily	15	The UK does not have a daily target for $PM_{2.5}$
	Annual	5	20
NO_2 µg/m3	Hourly		200
	Daily	25	
	Annual	10	40

Figure 6. Calendar view of fires (highlighted red) at Arnolds Field



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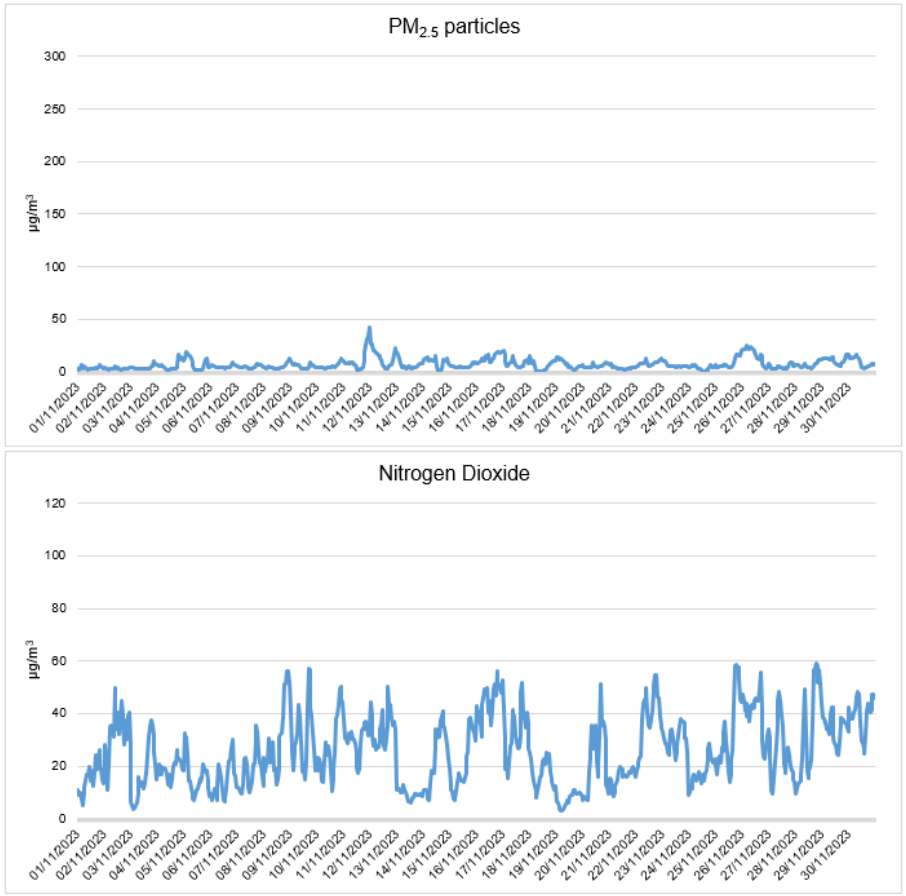

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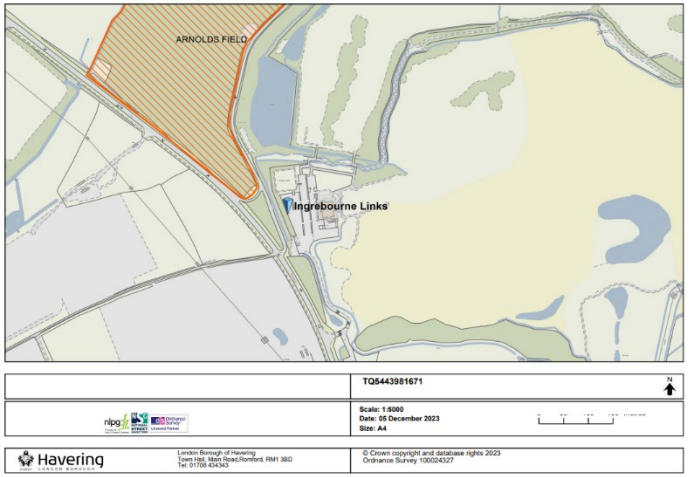


Ingrebourne Links Golf & Country Club

The last visible fires at Arnolds Field were in August 2023.

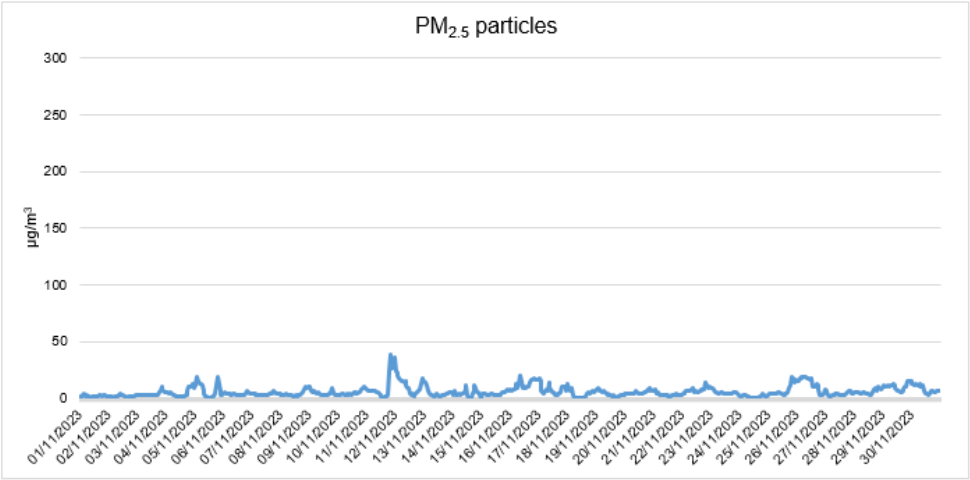
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 14 times respectively.

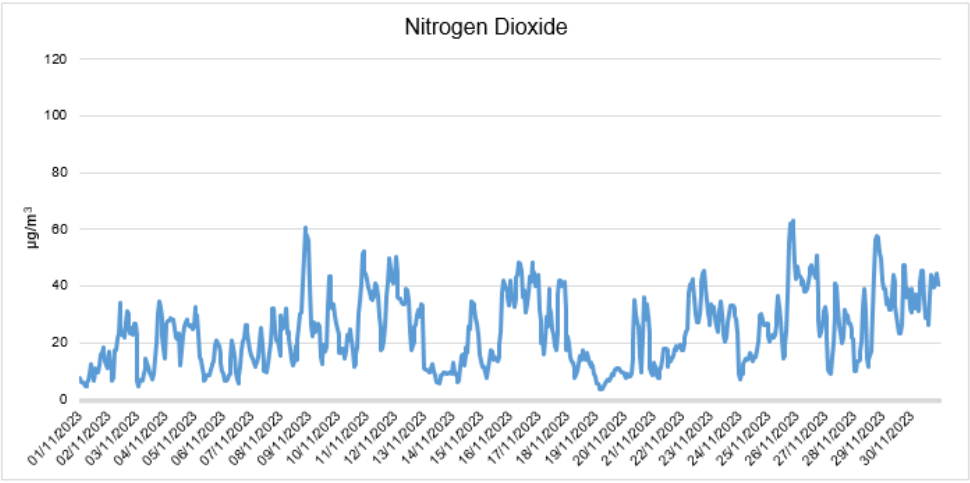
The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 43 and 60 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B





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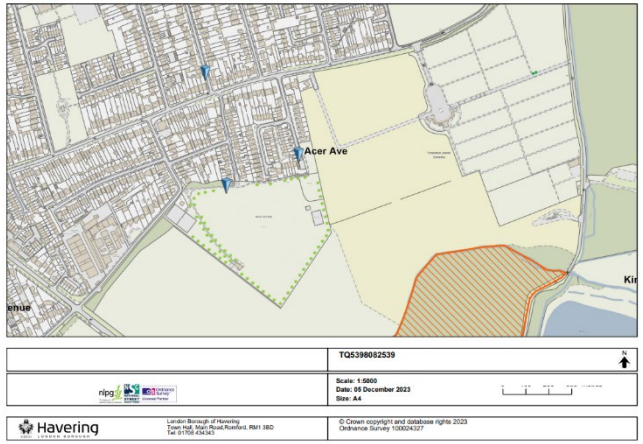


Acer Avenue

The last visible fires at Arnolds Field were in August 2023.

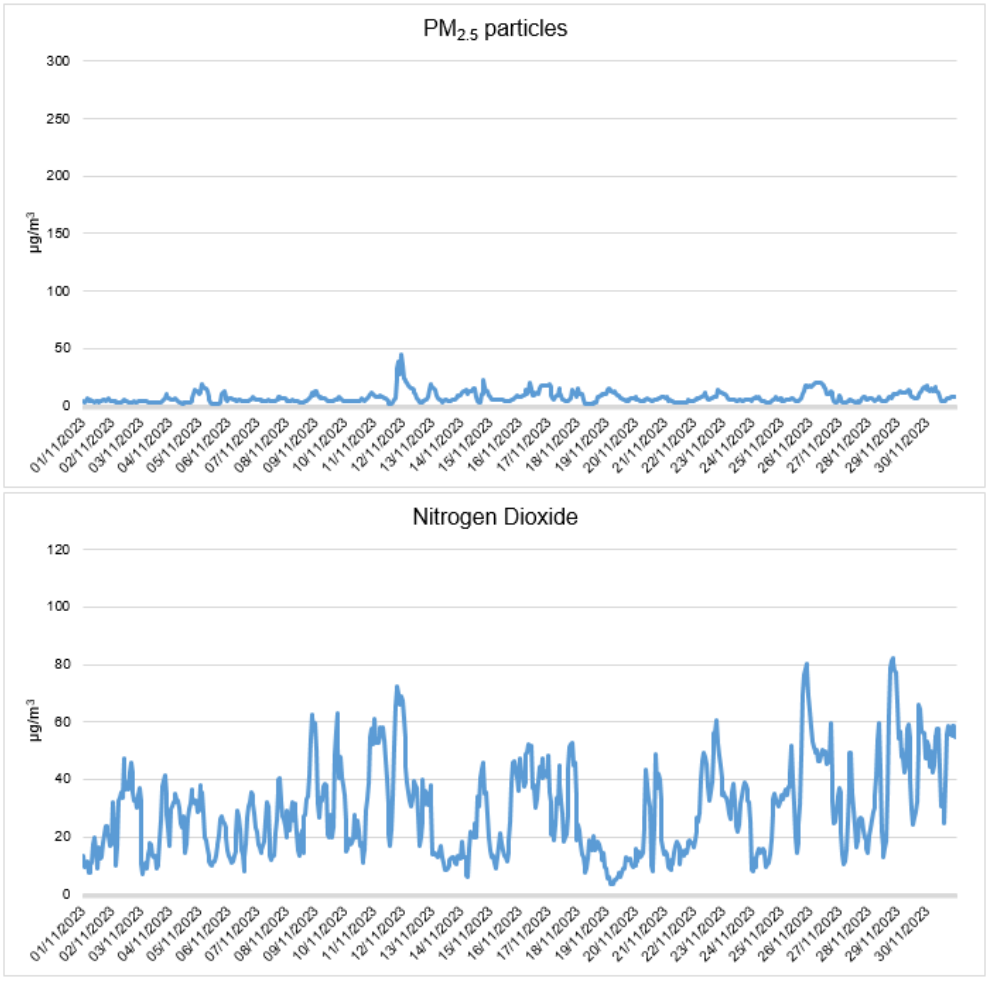
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 0 and 13 times respectively.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 39 and 64 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B



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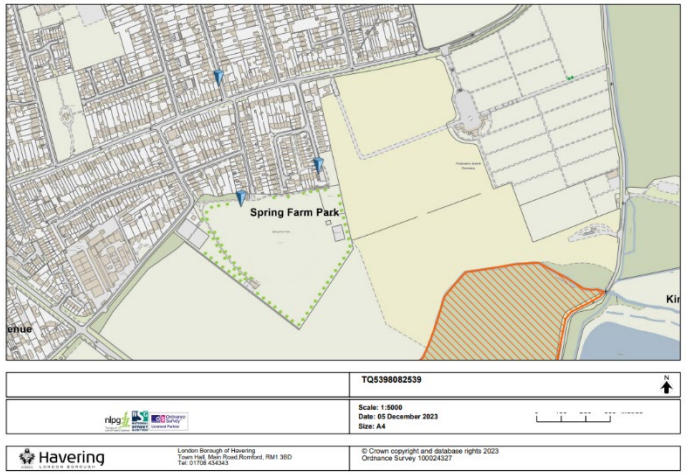


Spring Farm Park

The last visible fires at Arnolds Field were in August 2023.

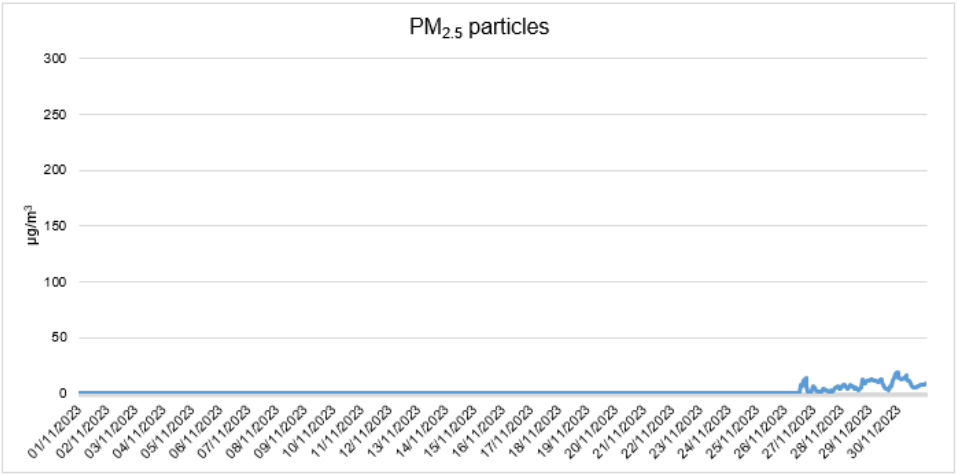
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 0 and 13 times respectively.

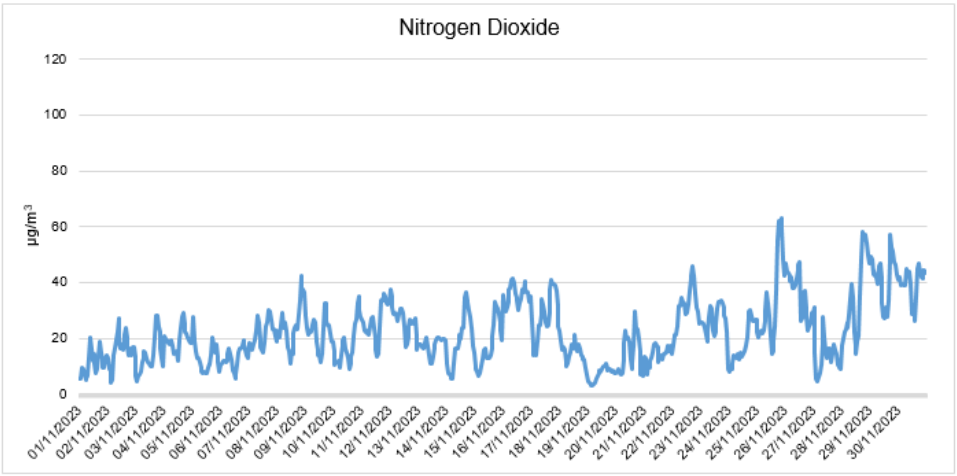
The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 45 and 83 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B





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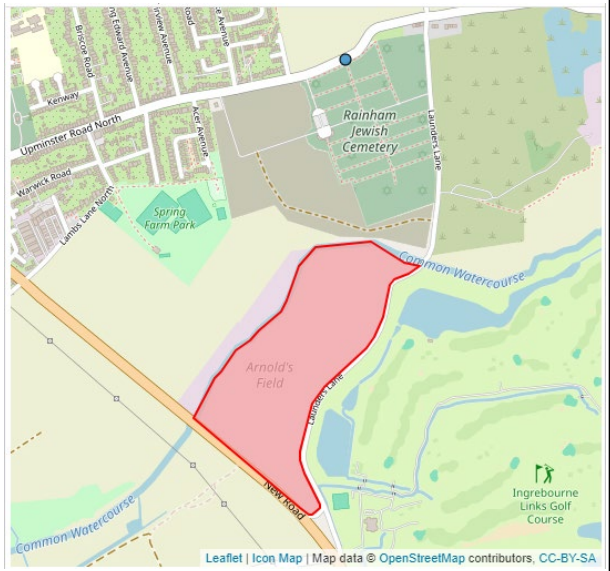


Upminster Road North

The last visible fires at Arnolds Field were in August 2023.

During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 0 and 7 times respectively.

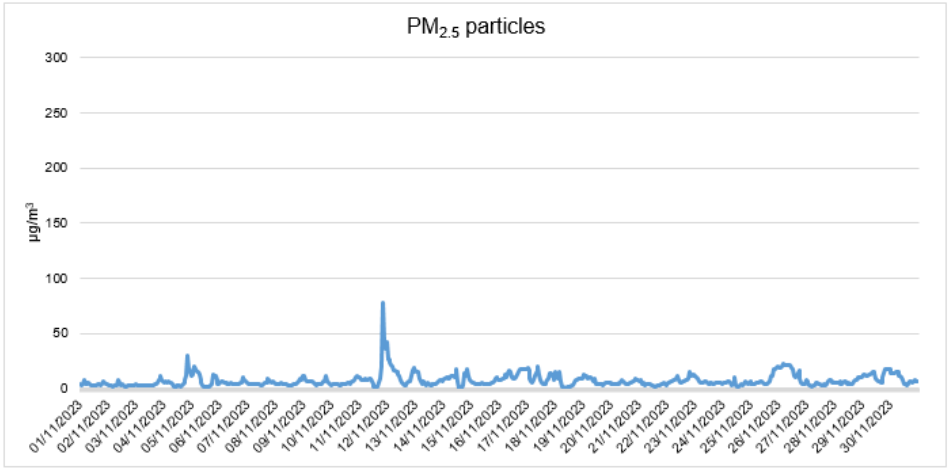
The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 19 and 64 micrograms/m^3, respectively.

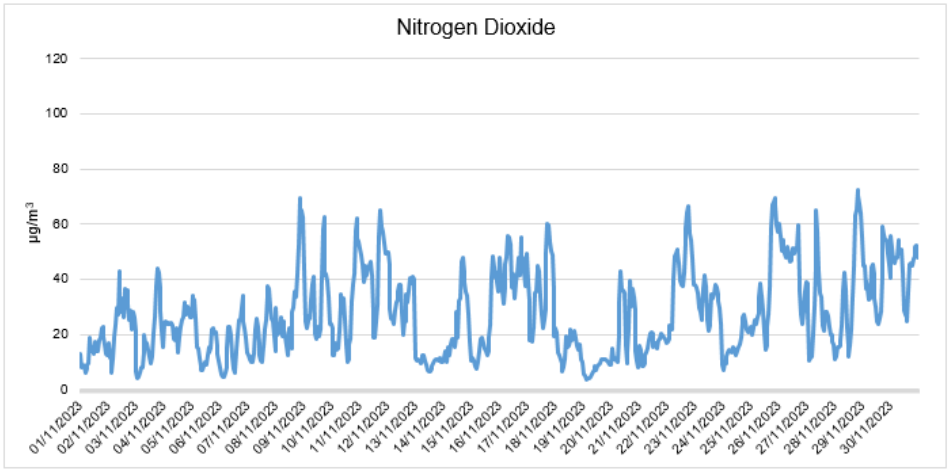
This site launched late October for NO_2 monitoring and on 26th November at 1300 for $PM_{2.5}$ monitoring.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B





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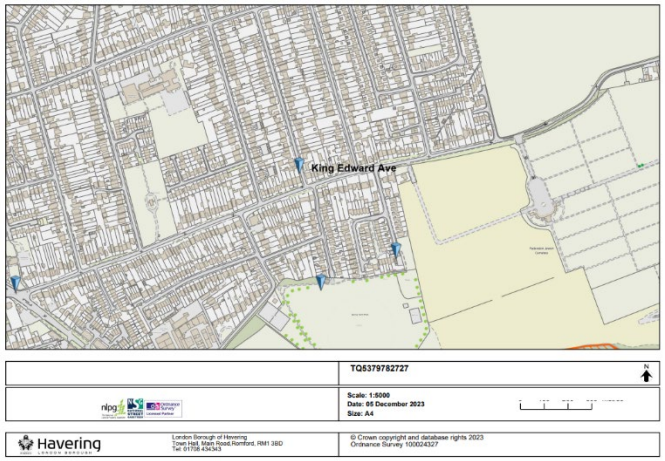


King Edward Avenue

The last visible fires at Arnolds Field were in August 2023.

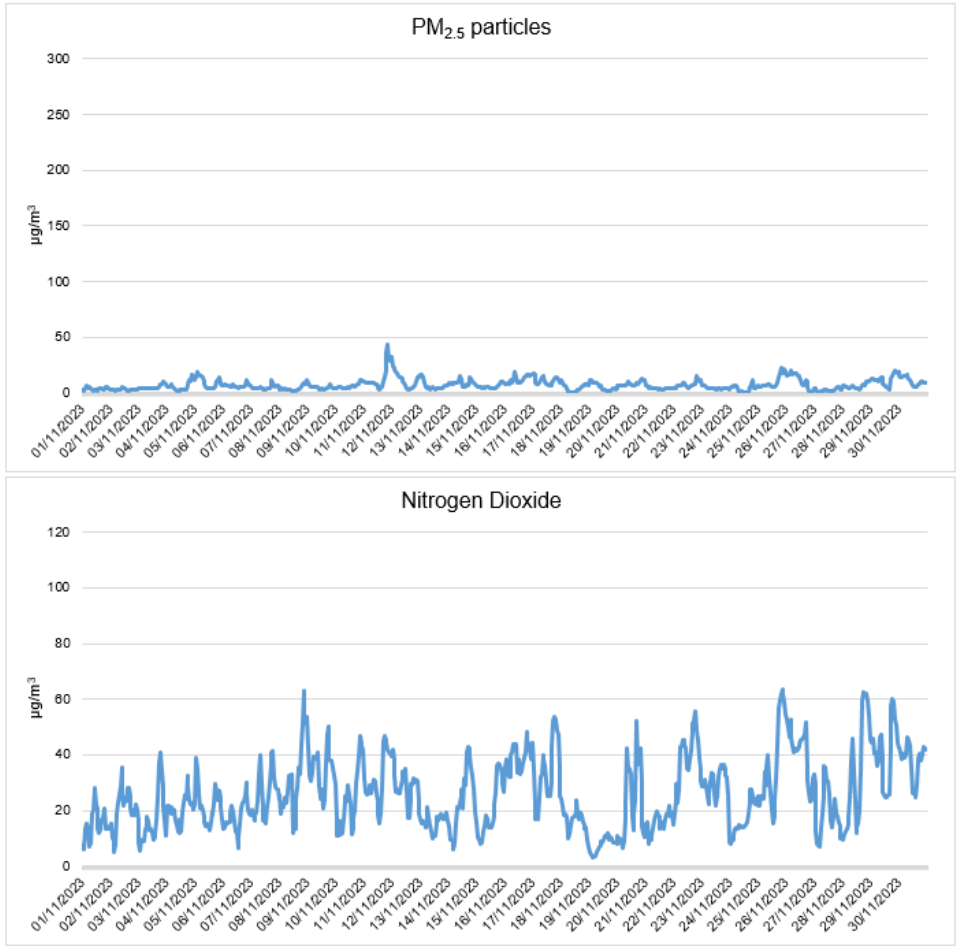
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 14 times respectively.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 79 and 73 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B



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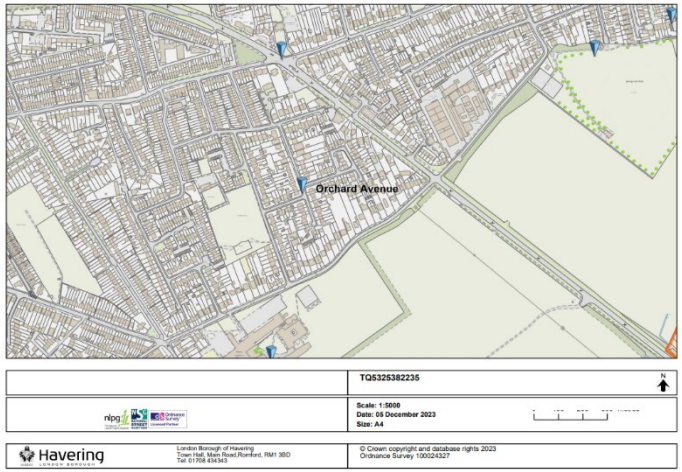


Orchard Avenue

The last visible fires at Arnolds Field were in August 2023.

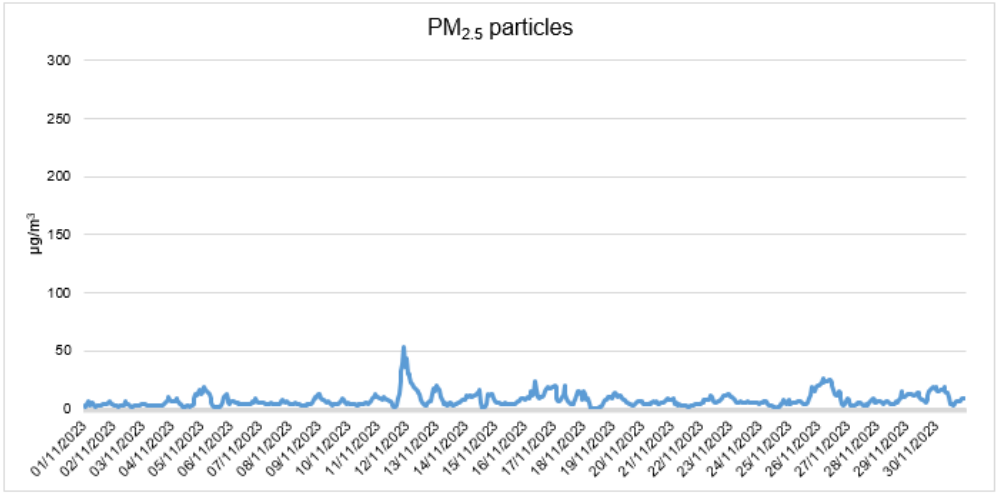
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 13 times respectively.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 44 and 64 micrograms/m^3, respectively.

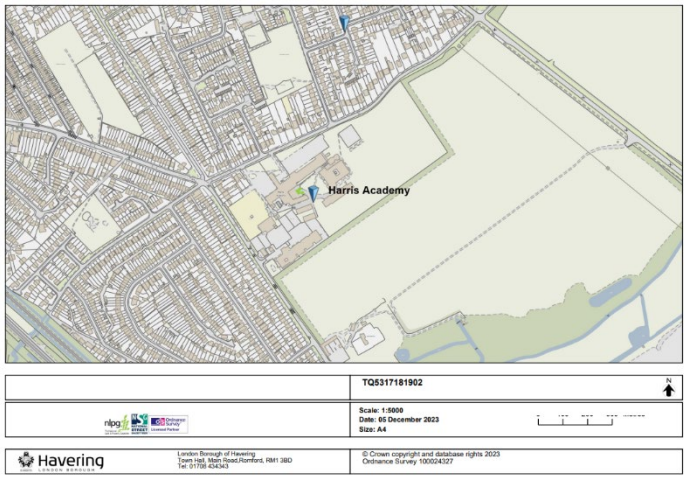
In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A

B



C



Harris Academy

The last visible fires at Arnolds Field were in August 2023.

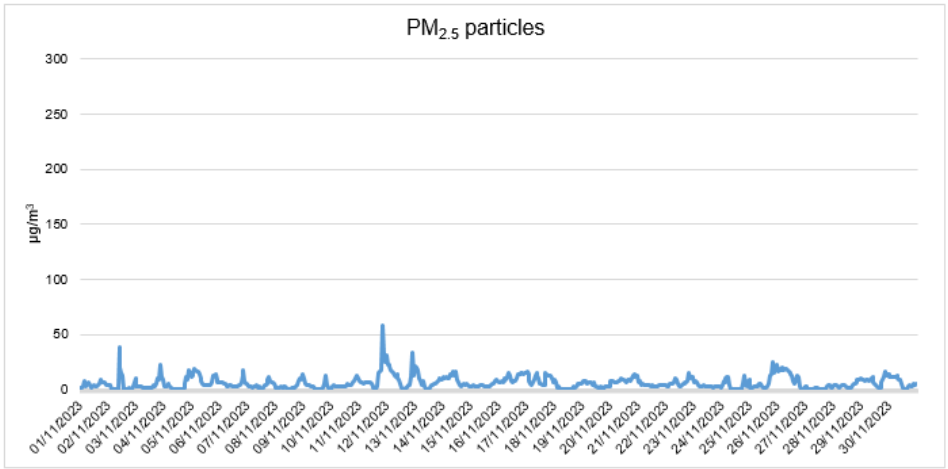
During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 18 times respectively.

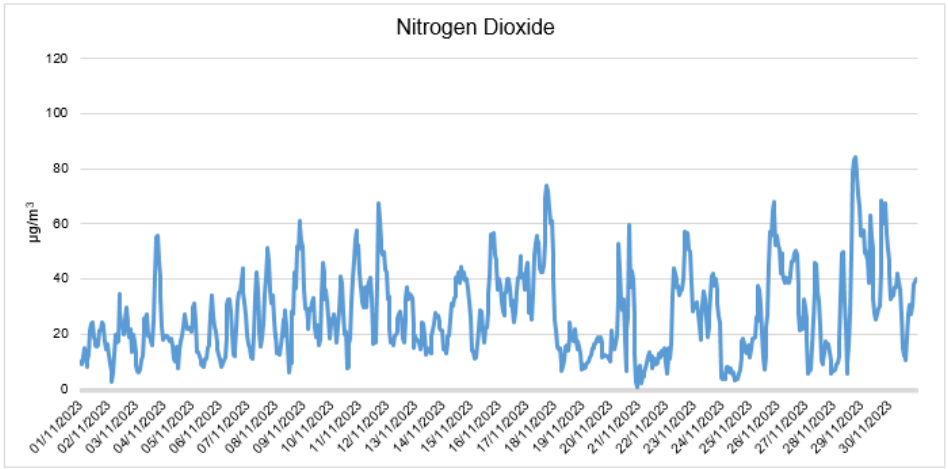
The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 44 and 64 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

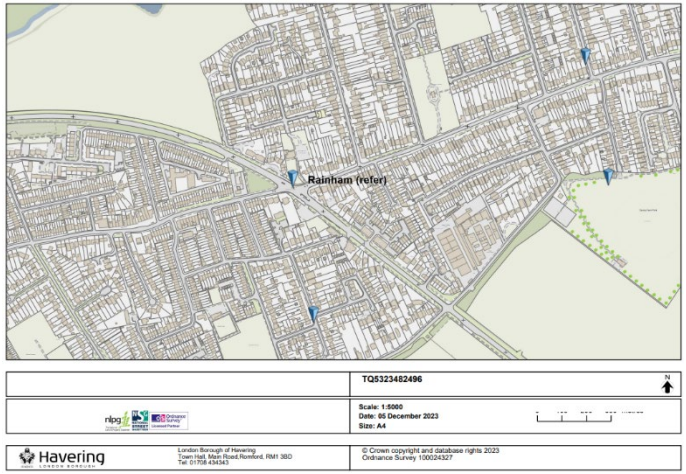
A

B





C



Rainham (reference co location)

The last visible fires at Arnolds Field were in August 2023.

During November, at this node site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 14 times respectively.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 59 and 85 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

Opportunity for Feedback

The Havering Council Department for Public Health would be grateful to receive feedback from residents about the updated content and information shared in these reports. It is important that these reports contain public health and environmental information that is relevant and of interest to Havering residents.

Please visit the following link to share your feedback