Review of $PM_{2.5}$ concentrations in the vicinity of Arnold's Field, Launders Lane, Rainham

Purpose of Report

To review the data for $PM_{2.5}$ from monitoring of smoke in the areas of Arnolds Field, Launders Lane, Rainham ("the Site"), and to provide a recommendation if hourly concentrations of $PM_{2.5}$ as a marker of the health impacts of smoke in the area of are causing a significant harm or a significant possibility of significant harm to human health.

This recommendation forms part of the decision concerning whether the Site should be identified by the Council as "contaminated land" within the meaning of Part 2A of the Environmental Protection Act 1990.

Summary

It is recommended that the daily concentrations of $PM_{2.5}$ are not causing a significant harm to human health with regard to the requirements of contaminated land.

Decision-Maker

This report is prepared for the Launders Lane Officers Group and to assist with the determination of the Site under Part 2A of the Environmental Protection Act 1990 by Michael Richardson, Team Leader, Environmental Health (Environmental Protection).

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Background

1. History the Site was an historic sand and gravel pit which was landfilled in the late 1960s/early 1970s with a mixture of household, commercial, inert, industrial and liquid sludge wastes. Since 2011 large amounts of illegal mixed waste was

deposited across the site. Fires creating smoke have occurred since this time and LFB records show they are more frequent since 2019.

2. This report is one of several being produced to summarise the monitoring and investigations that are being undertaken at the Site, and to assist in the determination of the Site as contaminated land.

3. The monitoring of $PM_{2.5}$ has included reviewing the data from 7 monitoring nodes, made by Clarity, close to Launder's Lane between July 2023 and December 2024. The Environmental Research Group, Imperial College, London manage the nodes and data correction, which were installed by members of the Public Protection Team.

4. During the monitoring period the Mayor of London also funded a network of nodes across London. Imperial College was contracted to manage this network for a four-year period until December 2024. They managed the Breathe London website until this date, when another company won the new contract. The Imperial College data has been transferred to a new website Breathe London Communities.

Air Quality in the Contaminated Land Regime

5. In light of the judicial review judgment of Kettle-Frisby v London Borough of Havering [2025] and the report from Dr Nathanail, the Council is proceeding on the basis that the smoke from the site is a "substance" for the purposes of Part IIA of the Environmental Protection Act (1990).

6. The contaminated land legislation specifies that for land to be determined as Contaminated Land a significant risk of harm to human health or a significant possibility of significant harm (SPOSH) to human health must be established. Making a decision that a significant risk of harm is being caused when reviewing air pollution data is not straightforward. It is not clear whether harm or significant harm is embedded in the risk assessment process for air quality guideline values. The author endeavoured to contact the WHO to confirm this and a response was not received.

7. Assessing the health impacts of air pollutants within the context of contaminated land legislation is complex with respect to attributing the pollutant to the site. This is because fine particulate matter is transboundary and travels over great distances. In addition to this, London average concentrations of $PM_{2.5}$ tend to be high. The impact of $PM_{2.5}$ attributed to fires adds to the existing

London $PM_{2.5}$ concentrations. Assessing mixtures of contaminants is far less uncertain with land contamination, groundwater or gas vapour assessments.

8. Additionally, when assessing the health impacts of $PM_{2.5}$ derived from landfill fires, the effects of the toxicity of a mixture of particles is uncertain. This means how a person's health is impacted by the combined effect of individual toxicants interacting with each other.

Review of PM2.5 Clarity Node Data

Monitoring Locations

9. PM2.5 data was collated from the following nodes:

10. Spring Farm Park, data collected from 27 July 2023 to 31 December 2024. This node is funded by the Council.

11. Orchard Avenue, data collected from 8 August 2023 to 31 December 2024. This node is funded by Bloomberg on behalf of Clear the Air in Rainham.

12. Kind Edward's Avenue, was installed on 21 October 2022 and data analysed collected from 1 July 2023 to 31 December 2024. This node was funded by the Council, and removed in February 2025.

13. Acer Avenue, data collected from 1 July 2023 to 29 October 2024. This node was funded by the Council and removed in February 2025.

14. Harris Academy was installed on 18 July 2023, and data collected from 21 July 2023 to 31 December 2024. This node is funded by the Council.

15. Upminster Road South, was installed on 24 November 2023, and data collected between 26 November 2023 and 31 December 2024. This node is funded by the Council, but was replaced 3 times due to data collection issues from when first installed on 2 October 2023.

16. Corner of Upminster Road and New Road known as Rainham Reference site (co located with the Council's real time air quality monitoring station) data was collected from 1 July 2024 to 31 December 2024. This node was funded by the Mayor of London.

17. Ingreborne Golf Links, data was collected from 27 July 2023 to 17 December 2024. This node is funded by the Council, and relocated to the junction of Launders Lane/New Road on 17 December 2024.

Figure 1. Location of nodes. Source [Breathe London Communities]

Key

- Rainham reference site
- Spring Farm Park
- Orchard Avenue
- King Edward Avenue
- Acer Avenue
- Harris Academy
- Ingreborne Golf Links
- Upminster Road South
- Arnold's Field, Launders Lane

Data Accuracy

18. It is well established that the accuracy of low cost sensor nodes is significantly less than European and UK reference methods such as automatic monitoring stations (AMS). Sensors are designed to provide an 'indicative' measurement of regulated pollutants in ambient air for a much lower cost than AMS, rather than a precise and accurate reading.

19. Imperial College supply and deploy Clarity nodes[1].

20. For particulate sensors, Defra has produced an MCERTS [2] performance standard for indicative sensors, which stipulates a measurement uncertainty of +/-50% at the relevant limit value.

21. To reduce the uncertainty of node data, Imperial College developed a methodology for increasing node accuracy[3]. This method is fully traceable back to regulatory reference measurements, and is not adjusted by a "black box" AI system. The Imperial College method involves co-locating sensors with a London Air[4] reference site prior to deployment for further QA/QC reasons.

22. A number of Imperial College Nodes are permanently co-located with 20 London Air reference sites to allow them to calculate real-time correction factors for PM2.5 and to continually assess performance of the Nodes vs the reference network.

23. Imperial College provided accuracy figures for each of the nodes in Rainham (see Table 1).

[1] Clarity.io
[2] GOV.UK | MCERTS performance standard for indicative sensors
[3] Network Accuracy — Breathe London Communities
[4] Londonair | London

Site Name	Start Date	End Date	Evaluation Date	Corrected Uncertainty%
Rainham (reference co-location)	23/02/2021 13:46	01/08/2023 09:59	04/02/2022 14:19	24.29
Rainham (reference co-location)	01/08/2023 10:00	NULL	04/02/2022 14:20	21.27
Acer Avenue, Rainham	21/10/2022 09:19	01/11/2024 00:00	27/03/2022 12:01	24.62
King Edwards Ave, Rainham	21/10/2022 10:24	01/11/2024 00:00	27/03/2022 12:01	16.23
Harris Academy Rainham	19/07/2023 10:58	NULL	16/08/2022 00:30	9.14
Ingrebourne Links Golf and Country Club	25/07/2023 12:11	14/06/2024 11:00	03/01/2023 00:30	10.6
Ingrebourne Links Golf and Country Club	14/06/2024 12:00	17/12/2024 09:30	23/08/2023 00:30	7.58
Spring Farm Park	26/07/2023 16:55	NULL	16/08/2022 00:30	9.68
Rainham Against Pollution (Orchard Ave)	09/08/2023 00:00	NULL	03/01/2023 00:30	10.15
Upminster Road North	02/10/2023 23:19	10/10/2023 11:00	03/01/2023 00:30	10.63
Upminster Road North	10/10/2023 12:00	24/11/2023 14:00	06/08/2023 00:30	6.92
Upminster Road North	24/11/2023 15:00	02/09/2024 00:00	27/03/2022 12:01	17.8
Upminster Road North	06/09/2024 09:00	12/11/2024 11:00	19/03/2024 09:25	24.36
Upminster Road North	12/11/2024 12:00	NULL	14/06/2024 13:16	10.88
Launders Lane/New Road	17/12/2024 09:49	NULL	23/08/2023 00:30	7.58

Table 1. Corrected uncertainty percentage for each node

24. Imperial College provided data (mean scaled data) from an average of London-wide Imperial reference nodes, for the monitoring period. This data is used to compare the Rainham node data with average London-wide data, in order to account for London-wide pollution incidents.

25. The Council manages an AMS reference site that monitors $PM_{2.5}$ and is located at the corner of Upminster Road and New Road. Only data for 2023 is available for this station. It was not operational in 2024 due to instrument faults. Consequently, this data has not been included in the report.

Assessment Values

26. Annual mean concentrations of data were reviewed in the report published by Dr Paul Nathanail[5]. It was found that the annual average of $PM_{2.5}$ was not exceeded at any of the node locations, as required by the Air Quality Standards Regulations 2010. He also commented on their relation to the upcoming targets for $PM_{2.5}$ required by the Environment Act 2021, and Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 and the more stringent World Health Organisation guideline values (WGV).

[5] LQM Report: Part 2A Risk Assessment, Arnolds Field, Launders Lane, London Borough of Havering.

27. In order to understand the possible health impact to health caused during shorter period smoke episodes, the following daily mean assessment values have been used:

    a. WHO daily mean guideline value[6] 15 µg/m^3 (WGV), not to be exceeded more than 3-4 days per year. This guideline is an aspirational target which informs government policy to drive improvements in air quality, particularly in cities.

    b. UK Target Values (UKTV)[7] monthly mean value of 12 µg/m^3. The daily mean target value 36 µg/m^3 is estimated[8]. The UK target values are adopted in English legislation (Environmental Targets (Fine Particle Matter) (England) Regulations 2023) and have been set as an interim target to be achieved by 2028, they are currently under review. The WHO advised that interim targets are set to support the planning of incremental milestones in a progressive reduction in improving air quality and are intended for use in areas where pollution is high.

28. The WHO recommend that the daily mean should not be exceeded more than 3-4 times per year.[6]

29. The WHO has produced hourly mean guideline values for NO_2 and SO_2 air pollutants but not for $PM_{2.5}$. Neither has the UK government.

30. For $PM_{2.5}$ and PM_{10}, the recommended guideline levels are based on 24-hour and annual averaging times because these periods are most strongly supported by evidence on health outcomes. The WHO steering group, guideline development group, systematic review team and external review group comprised of worldwide academics found that there is currently insufficient evidence to recommend guideline levels for shorter averaging times.[9] Thus, it is not reasonable for a local authority to develop hourly guideline values.

31. Consequently, the daily average WHO guideline value (WGV) has been used for assessing $PM_{2.5}$ concentrations from the 8 monitoring locations.

32. The Council's Public Health department published two reports regarding possible health impacts on the local population as a result of the fires in

[6] What are the who air quality guidelines - WHO.int
[7] Concentrations of particulate matter pm10 and pm25 - GOV.UK
[8] This value has been estimated by observing the relationship between the WHO Daily guideline value which is three times the WHO annual guideline value.
[9] WHO global air quality guidelines - WHO.INT

2024. This information is more local to the use of WGV, it accounts not only for $PM_{2.5}$ but also the component toxicants and their impacts.

33. One report was an assessment of the potential impact of fire incidents at the Site, Launder's Lane on local residents' respiratory health. The population are within a two miles radius from the Site. [10]

34. The other report explores and interprets cancer incidence data between 2011 – 2020 to identify any differences between residents living around the Launders Lane site compared with the rest of Havering and England as a whole.[11]

Days Which Fires Occurred

35. The Public Health department assessed whether fire incidents increased respiratory illness related attendances at General Practices (GP) and Accident and Emergency (A&E), as well as any increases in GP prescriptions and hospital admissions. It was decided to use incidences of London Fire Brigade (LFB) attendance at Arnold's Field as an indicator of when fires occurred.

36. TRL also used the LFB data in their air quality report. London-wide background concentrations of all the pollutants monitored do not exist. It was important to correlate pollutant concentrations with days in which fires occurred.

37. Fires attended by the London Fire Brigade occurring on Arnold's field, off Launders Lane for the monitoring period 1 July 2023 until 31 December 2024 are collated by the Council's Public Health department, presented in Table 2.

38. The Public Health data differs from the data published by the LFB because the former takes into account that some fires burn for more than one day, so the raw LFB data only accounts for the day fire crews attended. On some days there was more than one fire burning on the Site (i.e. at different locations on the site). LFB do not attend every occasion there is burning/smouldering, only when called by members of the public.

39. Dr Nathanail also used LFB data in his report and did not modify it.[12]

[10] The Effect of Arnold's Field Fires on the Respiratory Health of the Surrounding Population.
[11] Possible Health Impact of Fires at Launders Lane: Havering Cancer Incidence.
[12] LQM Report: Part 2A Risk Assessment, Arnolds Field, Launders Lane, London Borough of Havering.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2018												1	1
2019				1		1	3	1	2	1	1		10
2020				1				5	6	1			13
2021					4	1				8		6	19
2022		2		6	4	17	15	2					46
2023							2	17					19
2024					10		9	5	3	1			28

Table 2. Public Health Fire Data

40. When considering $PM_{2.5}$ concentrations, the LFB call out data is helpful. In addition, the Rainham sensor data is compared to the London-wide $PM_{2.5}$ monitoring network. This is a good indicator to identify $PM_{2.5}$ concentrations originating from Arnold's Field, particularly when smoke continues after LFB visits. The possibility of other local additional sources of $PM_{2.5}$ cannot be excluded, such as other fires in the vicinity, and transboundary pollution incidents.

Health Impacts of Exposure to Short Term Peaks of PM2.5

41. People with pre-existing disease are likely to be most sensitive to effects of short-term $PM_{2.5}$ exposures, including respiratory and cardiovascular conditions. In developing health criteria values, the WHO and DEFRA focus on protecting the most vulnerable in society.

42. Following the publication of the WGV, the Committee on the Medical Effects of Air Pollutants (COMEAP) advised Defra on the development of UK $PM_{2.5}$ target values. However, in these target values, a short-term $PM_{2.5}$ value was not derived. The committee advised that, "The evidence indicates that the effects of long-term exposure to $PM_{2.5}$ have a greater impact on public health than effects of short-term exposure."[13]

43. Defra publishes a Daily Air Quality Index (DAQI) to inform the public about current air pollution levels. The COMEAP (2011) Review of the UK Air Quality Index[14] notes that "The acute effects of particle exposure include increases in hospital admissions and premature death of the old and sick due to diseases of the respiratory and cardiovascular systems. The evidence is that both $PM_{2.5}$ and PM_{10} cause additional hospital admissions and deaths on high pollution

[13] COMEAP PM2.5 targets health evidence questions responses - GOV.UK
[14] COMEAP: review of the UK air quality index - GOV.UK

days. There are also less severe effects of short-term particle exposure during pollution episodes, such as worsening of asthma symptoms and even a general feeling of being unwell leading to a lower level of activity (termed reduced activity days)".

44. The DAQI index for PM2.5 rates "high" between 54-70 µg/m^3, and the full DAQI index is presented below[15] in Figure 2. A high DAQI rating would potentially be aligned with the legal definition of significant possibility of significant harm.

45.

$PM_{2.5}$ Particles

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

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µgm^{-3}	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

Figure 2: DAQI index for $PM_{2.5}$

46. The assessment of fine particulate matter is based on the health impacts purely due to this size range within the respiratory and cardiovascular systems. It does not consider the toxicity of the mixture of particles which $PM_{2.5}$ is comprised of. The composition of mixtures of pollutants in the air are in a constant state of flux and the relationship between each of the pollutants can have an additive, synergistic or antagonistic effect on health. These effects have not been included in the derivation of the WHO guideline values. It is not a reasonable requirement that the Council are responsible for conducting long-term complex toxicological and epidemiological studies.

47. $PM_{2.5}$ concentrations resulting from fires occur most frequently during the summer months, where there are warm weather conditions. Therefore, any decisions on $PM_{2.5}$ concentrations cannot not be based on this guideline value alone, due to its complex toxicity. For the purposes of Launder's Lane, the use of the WGV is indicative. Reviewing medical data on the local population is more efficacious.

[15] Taken from UK Air: What is the Daily Air Quality Index?: DAQI - UK-AIR.DEFRA.GOV.UK

Monitoring results

48. The data from the 8 nodes listed in paragraphs 10-18 was analysed. To account for uncertainty which exists in the node data, corrected uncertainty factors were applied. The corrected uncertainty factors detailed in Table 1 are expressed as percentages. These percentages were applied to the node daily average, both subtracted and added to give a range of uncertainty. The upper correction value is used (+accuracy), so that a conservative concentration of $PM_{2.5}$ is derived.

49. Fine particles have been demonstrated to disperse over greater distances than larger particulate matter. This means that the concentrations monitored in Rainham are also impacted by particles which originate from Greater London, Essex and Kent, continental Europe and much further afield.

50. Historically, when contaminated land data is assessed it has been for factors regarding soil concentrations, gas vapours in enclosed buildings or groundwater pollution concentrations. These contaminant pathways can be clearly attributed to the land in question. In the instance of air pollution, $PM_{2.5}$ is not as clearly defined and so the following 2 scenarios are considered:

Scenario 1: Exceedances which are due to Launder's Lane only.

51. This scenario accounts for exceedances which are predominantly derived from smoke arising from the Site. In this scenario London daily average concentrations are subtracted from the Launder's Lane daily average.

52. Methodology involved subtracting the London wide average from the upper corrected concentration to discount pollution incidents that are measured London wide. The site specific concentrations were then compared with the WGV recommendations. None of the London-wide pollution incidents can be attributed to fires from the Site. When considering contaminated land issues, contaminants must be specific to the site. The data would also be cross referenced to the days that the LFB attended Launder's Lane.

53. The presumption in this scenario is that exceedances of the WGV causes significant risk of harm to human health, for the following occasions:

    - In 2023 there were 3 exceedances of the daily WGV on 06/08/2023, 29/08/2023 and 30/08/2023.
    - In 2024 there were 3 exceedances in 2024 of the daily WGV on 10/05/2024, 11/07/2024 and 27/09/2024.

Scenario 2: Exceedances when Launder's Lane fires add to London concentrations.

54. This scenario explores exceedances which occur as a result of Launder's Lane fires adding to existing London concentrations.

55. Should the land be determined as contaminated land, this scenario provides a significant challenge for the Council in making a decision about which persons are liable to pay for remediation. The appropriate persons are not responsible for paying for the remediation of London concentrations, which do not arise from land affected by contamination.

56. The methodology used does not include subtracting the London-wide average data. Incidents where London-wide data exceeds the guideline value alone are not included. For example, the Spring Farm Park node reveals there were 30 exceedances of the WGV in 2024 not attributed to the fires. This means Rainham residents are already subjected to short-term concentrations that are detrimental to health according to WHO guidelines[10].

Node Data Results

57. It is clear that there are many exceedances of the WGV throughout each year around Launders Lane. The majority of these exceedances are reflected in the London wide node monitoring data. Scenario 2 does not indicate any exceedances of the 3-4 limit of exceedances of the WGV per year.

58. Smoke dispersion is dependent on meteorological conditions such as wind direction and speed. The Imperial College reports discusses the effects of these[16]. Of particular note is the prevailing meteorological conditions where wind speed regularly drops overnight, temperature inversions and the lowering of the boundary layer height, which means that any locally produced pollutants recirculate locally and can build up.

59. The following information will assist in the understanding of the data presented:

[16] Initial report relating to fires at Arnolds Field on Launders Lane in Rainham, Havering and 2nd (update) report relating to fires at Arnolds Field on Launders Lane in Rainham, Havering, Environmental Research Group, Imperial College London

a. Red lines - concentrations when LFB have attended the Site. This includes any exceedances prior to their attendance which are clearly attributed to local $PM_{2.5}$ concentrations not London-wide concentrations.
b. Green lines denote London-wide average concentrations.
c. Blue lines denote the node daily average and upper correction value for each node.

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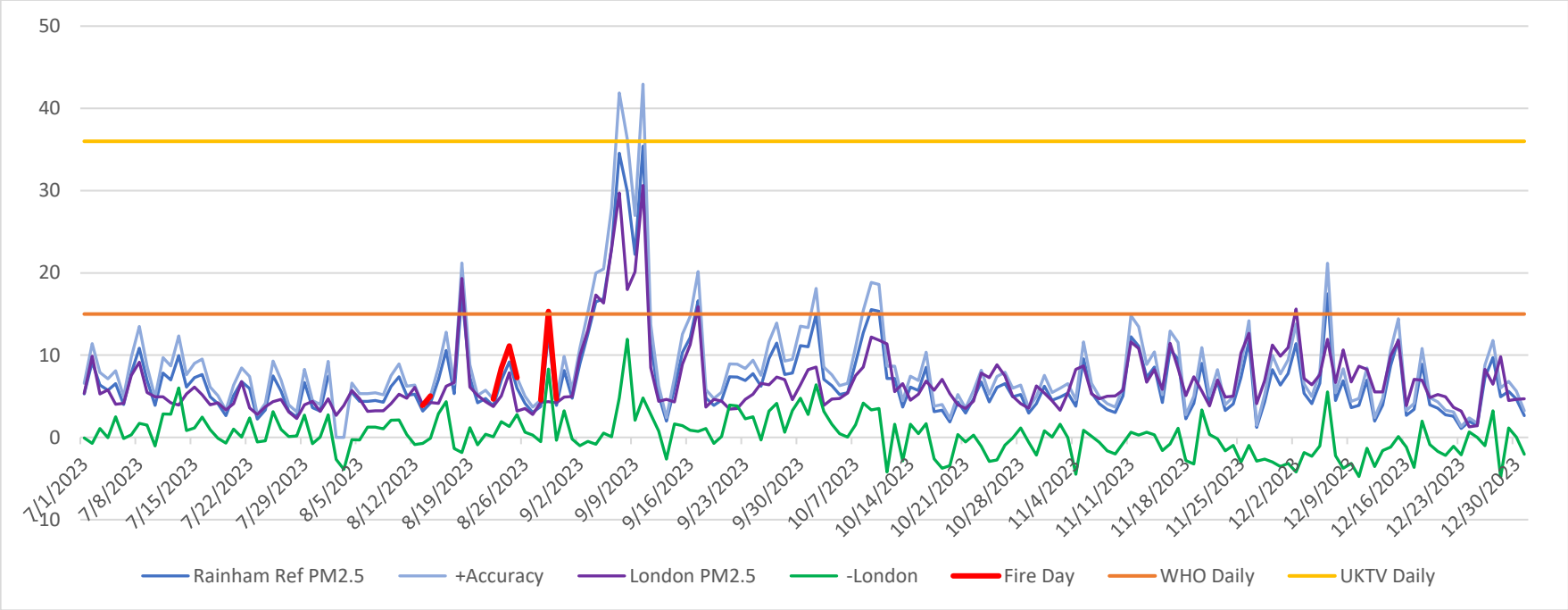
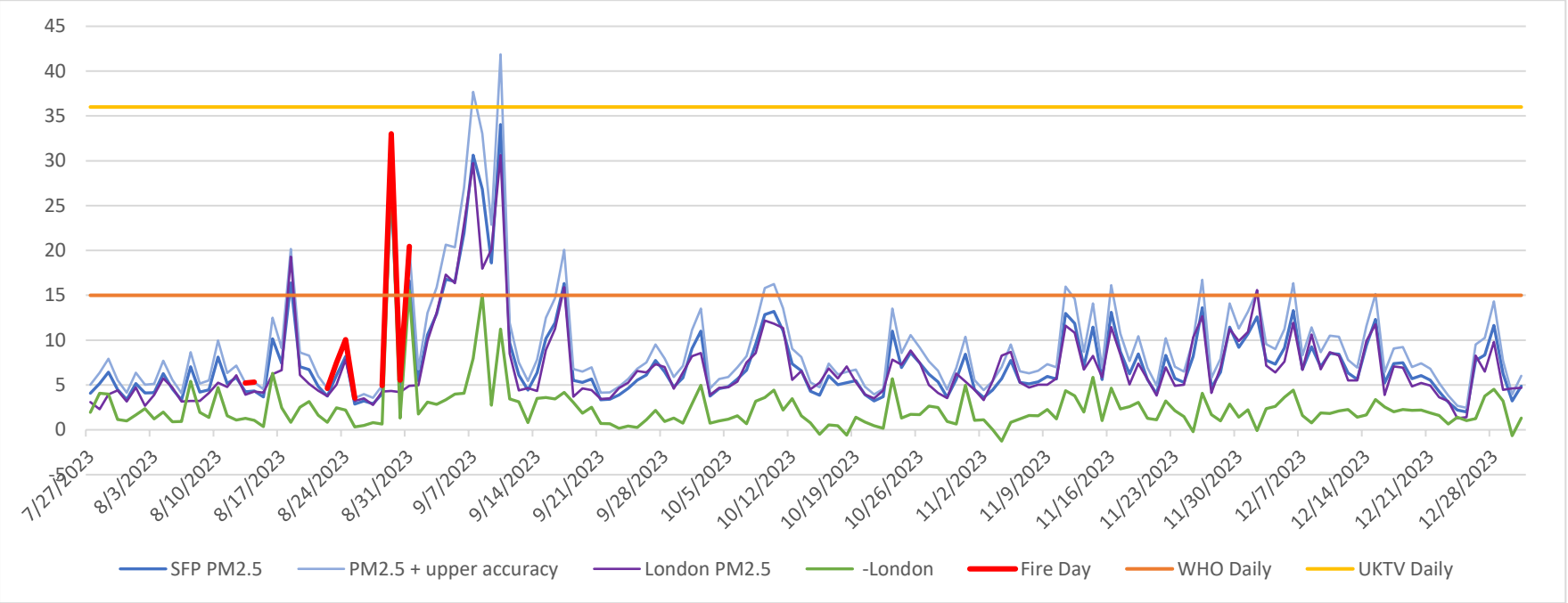
Node Data 2023

60. Rainham Reference Site Node Data 2023



61. Two exceedances of the WGV occurred on 18 August and 29 August 2023. These were 21.2 µg/m^3 one day after LFB attendance of a fire and 15.3 µg/m^3 respectively. This under the recommended WHO 3-4 exceedance limit per year in this location

62. Spring Park Farm Node Data 2023



63. As a result of the fires on the 29-30 August 2023, there were two pollution peaks that exceed the WGV. On the 29 August 33.0 µg/m^3 and 31 August 20.4 µg/m^3 (London 15.6 µg/m^3). This under the recommended WHO 3-4 exceedance limit per year in this location

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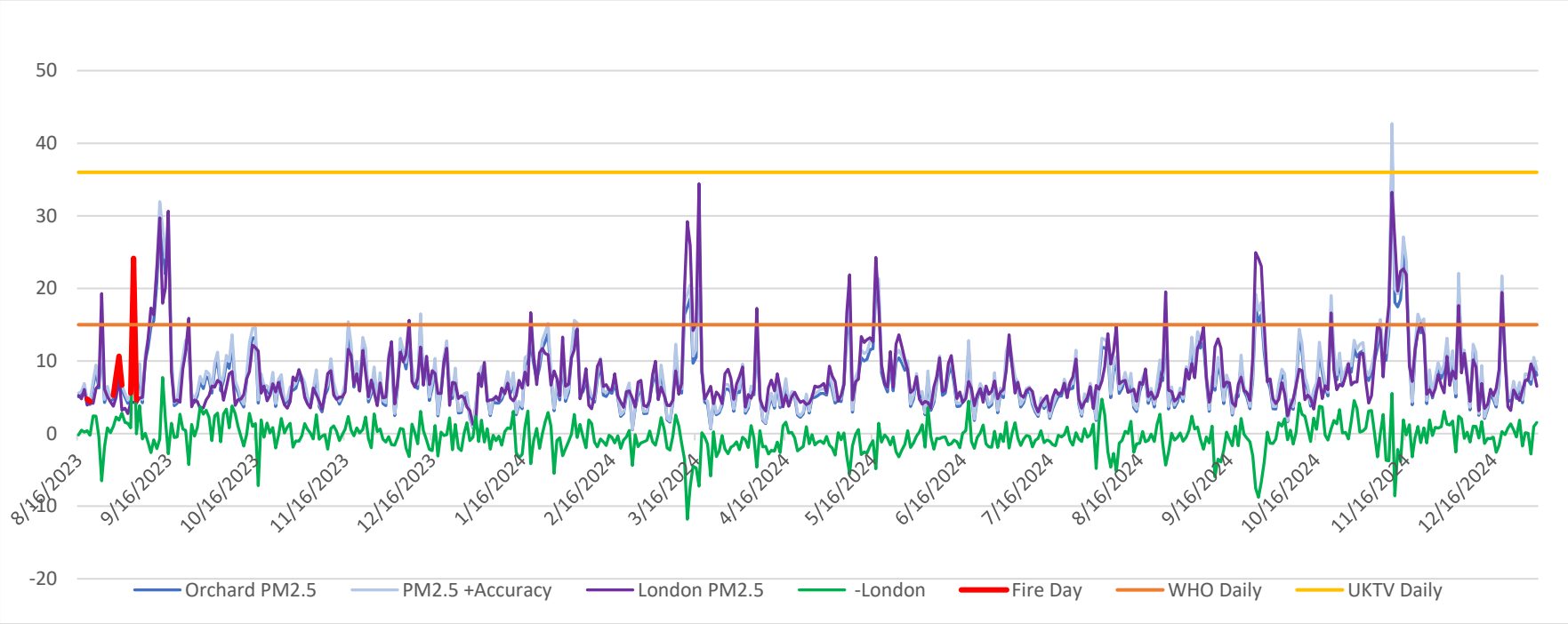
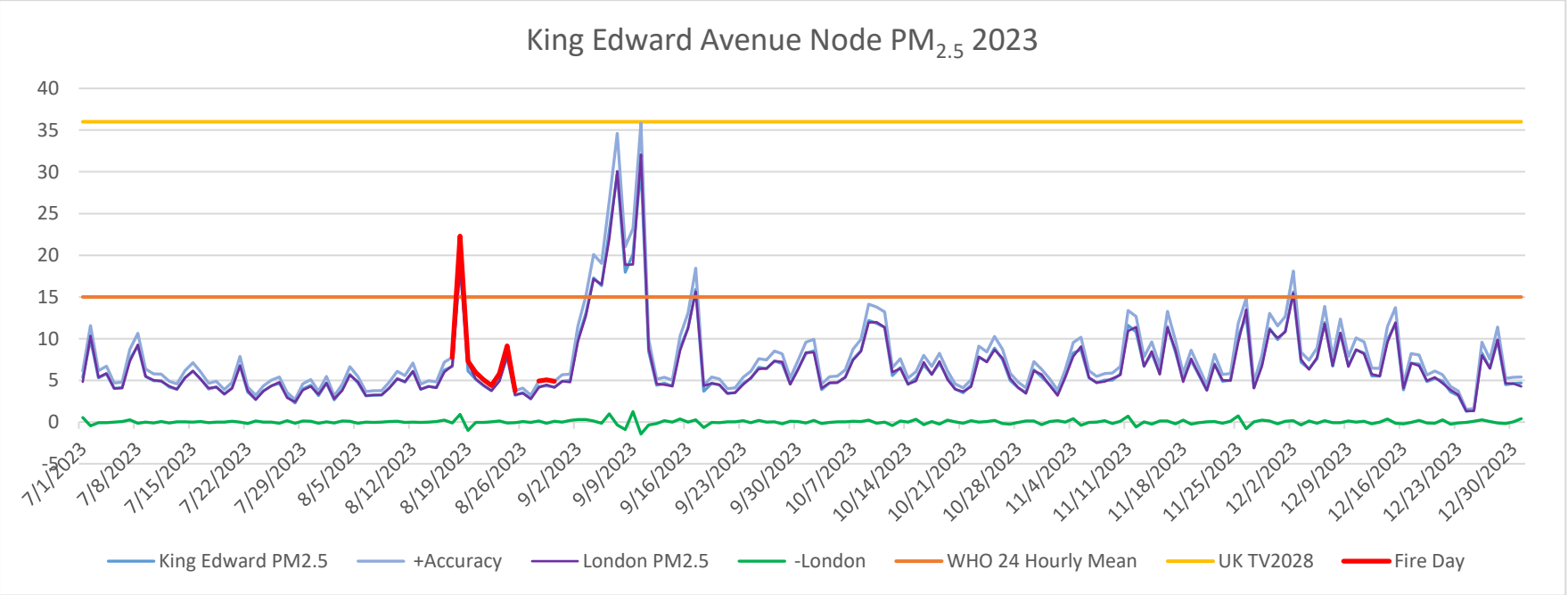
64. Orchard Avenue Node Data 2023



65. One exceedance of the hourly mean occurred on the 29 August 2023 of 24.2 µg/m^3, the London average was 17.6 µg/m^3 during the 28-30 August reported fires. This under the recommended WHO 3-4 exceedance limit per year in this location

66. King Edward Avenue Node Data 2023



67. One exceedance of the WGV occurred on the 18 August, 22.3 µg/m^3, the London average was 18.4 µg/m^3.This under the recommended WHO 3-4 exceedance limit per year in this location

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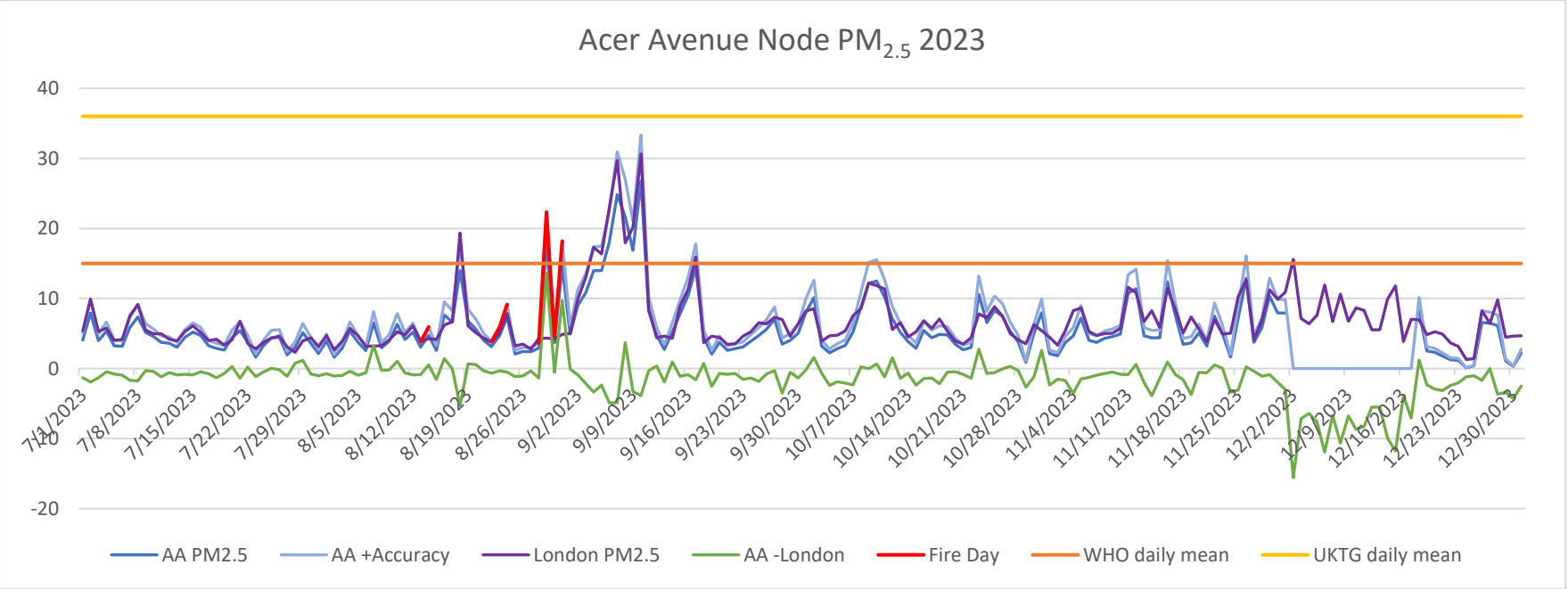
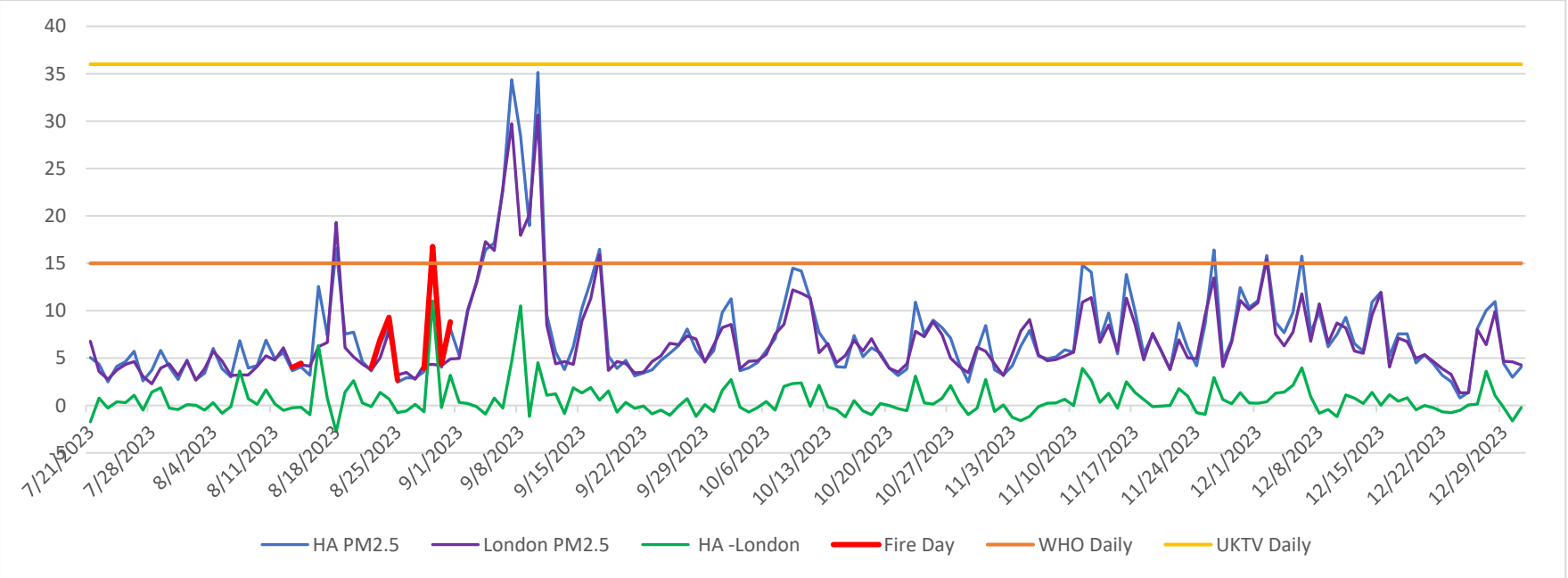
68. Acer Avenue Node Data 2023



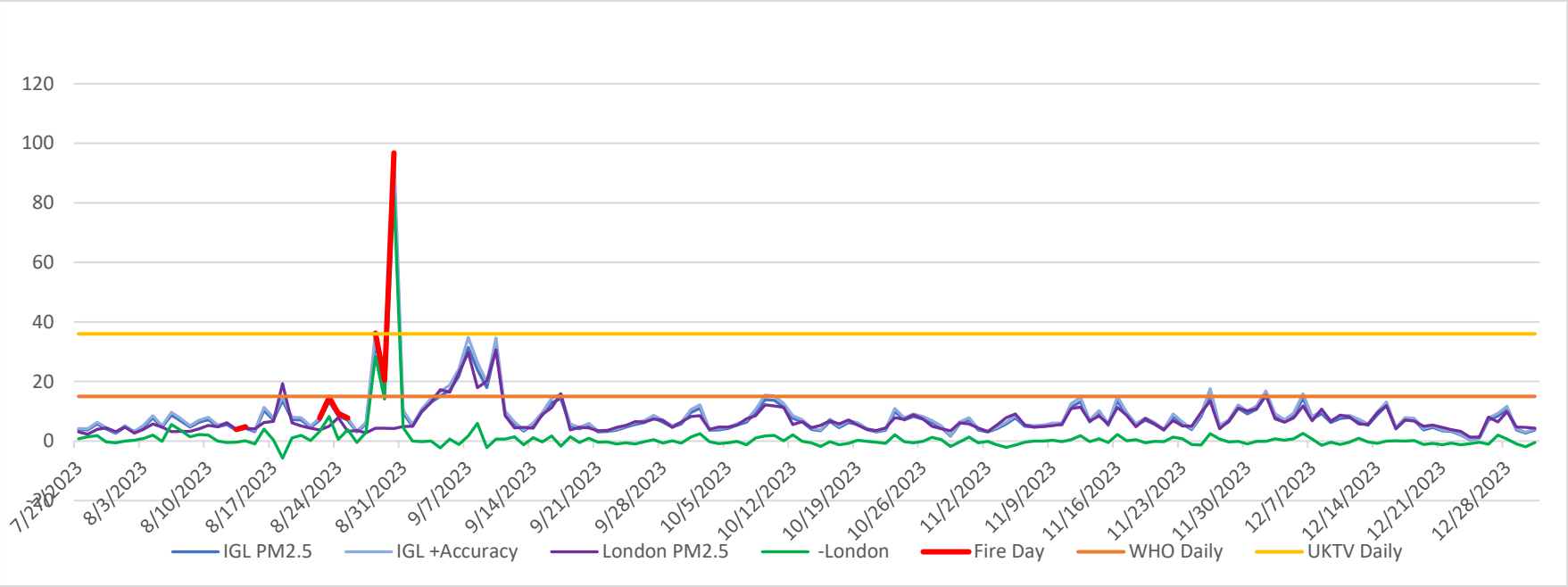
69. Two exceedances of the WGV are attributed to the 28-30 August fire: 22.3 µg/m^3 on 29 August and 18.2 µg/m^3 on the 31 August. This under the recommended WHO 3-4 exceedance limit per year in this location

70. Harris Academy Node Data 2023



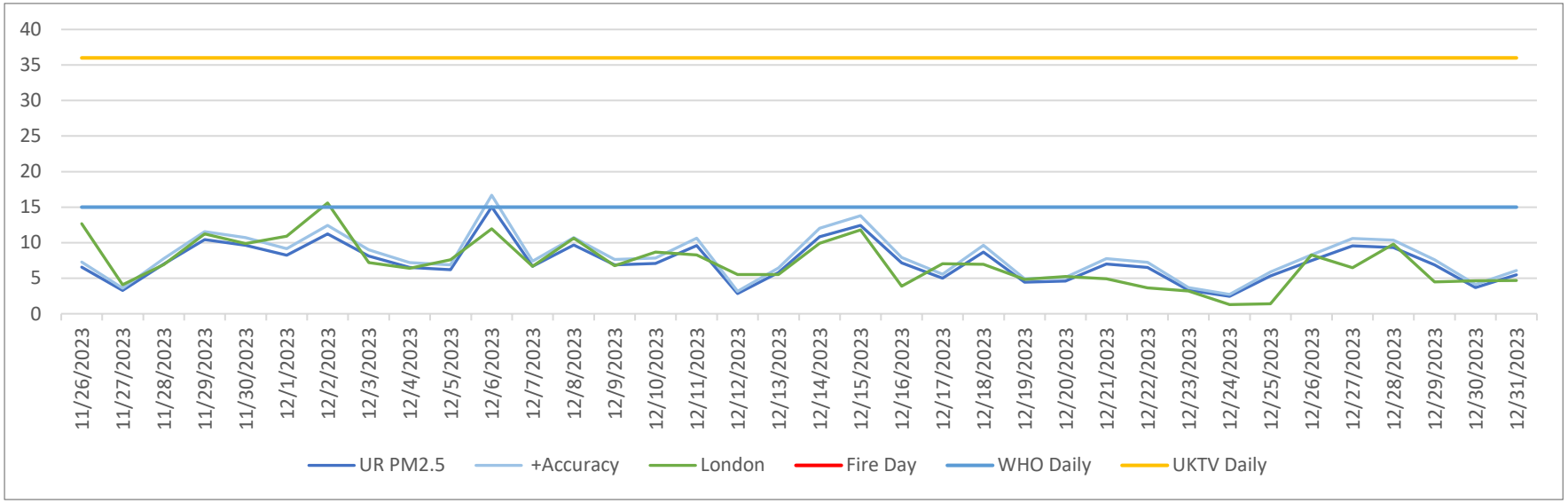
71. An exceedance of the WGV occurred during 2023 on 29 August 16.8 µg/m^3. This under the recommended WHO 3-4 exceedance limit per year in this location. London wide exceedances occurred in early September which doubled the Harris Academy mean (37.5 µg/m^3).

72. Ingreborne Links Node Data 2023



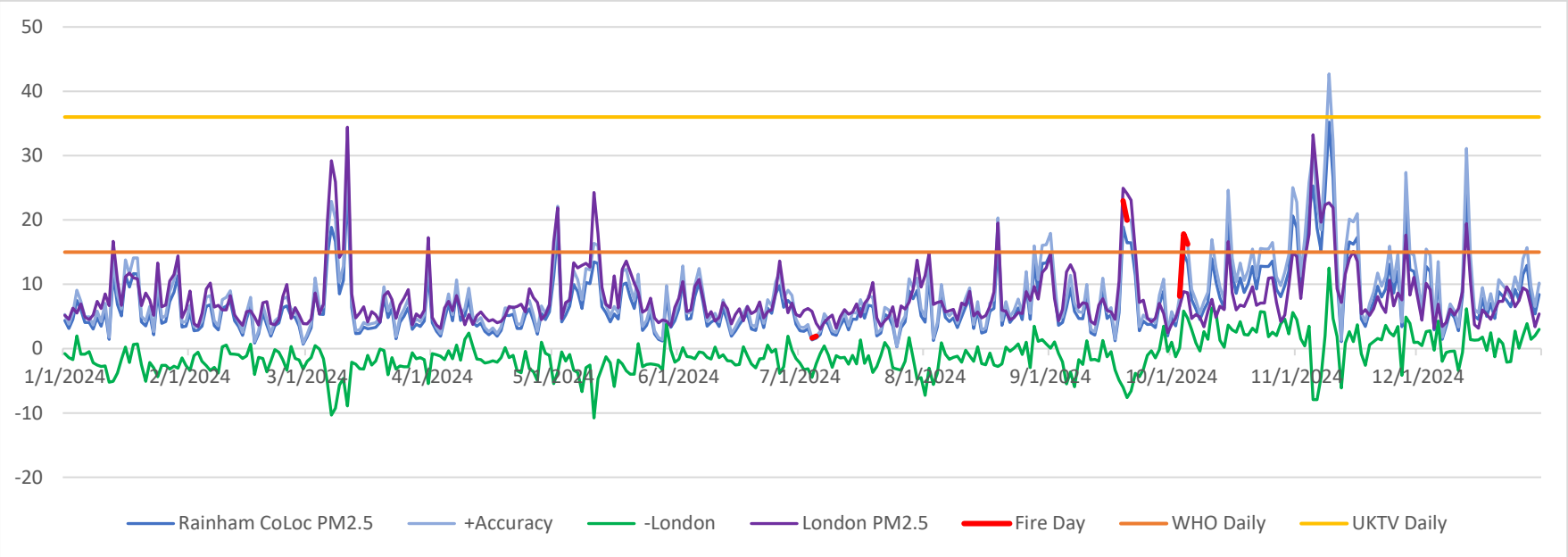
73. Three exceedances of the WGV occurred on 28 August 36.2 µg/m^3, 29 August 20.4 µg/m^3 and 30 August 96.6 µg/m^3. The third instance is in the “very high” DAQI band. This means that adults and children with lung problems, adults with heart problems, and older people, should avoid strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often. Ingreborne Links is a golf course located south-east of Arnold’s Field, so exposure to these levels is less impactful than when considering the wider Rainham population.

74. Upminster Road Node Data 2023



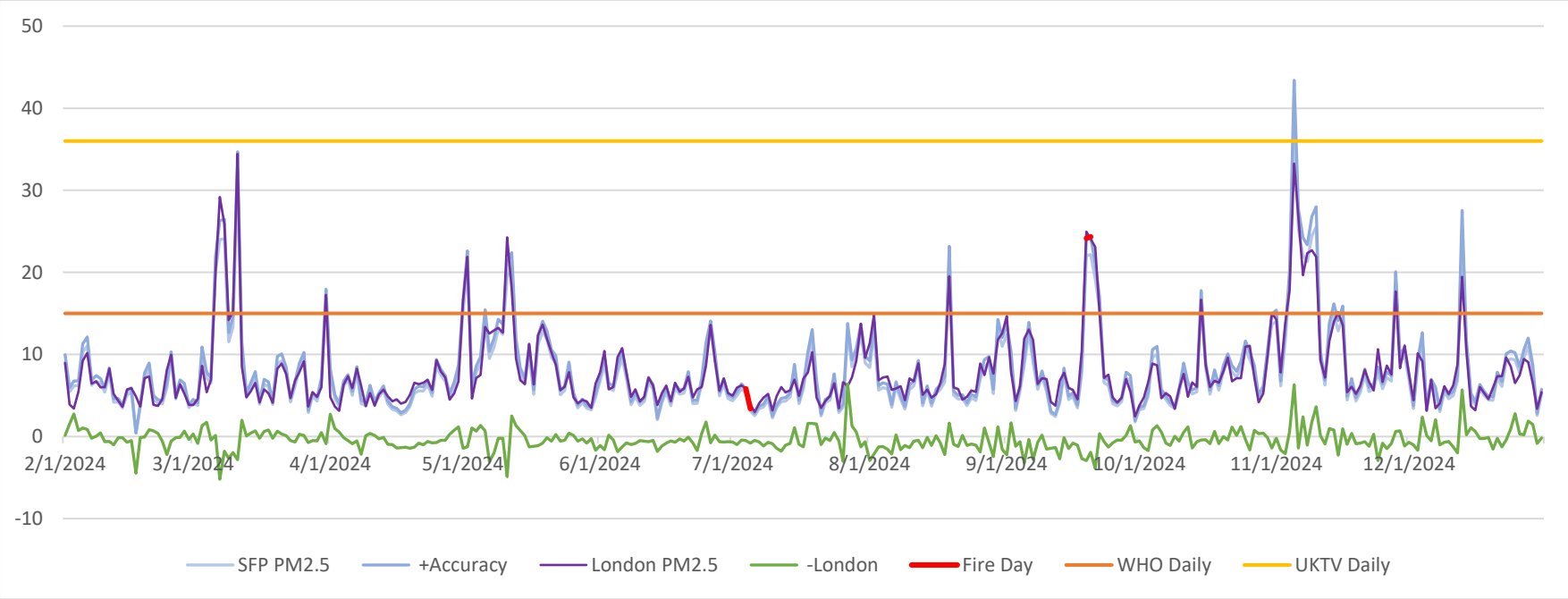
This node was commissioned on 26 November 2023. An exceedance of the WGV occurred on 6 December 2023, however this is not attributed to landfill fires.

75. Rainham Reference Site Node Data 2024



76. Three exceedances occurred in 2024. On 29 August, the level was 16.8 µg/m^3. LFB attended on 3 October with no exceedances recorded, but exceedances occurred on both the 4 October (17.8 µg/m^3) and 5 October (16.2 µg/m^3.) This on the cusp of the recommended WHO 3-4 exceedance limit per year in this location

77. Spring Farm Park Node Data 2024



78. Two exceedances occurred in 2024 on 19 September 24.1, (London 24.9 µg/m^3) and 20 September 24.3 µg/m^3, (London 24.1 µg/m^3). These concentrations are similar to the London wide $PM_{2.5}$ levels, so it is difficult to accurately attribute these exceedances to the fires.

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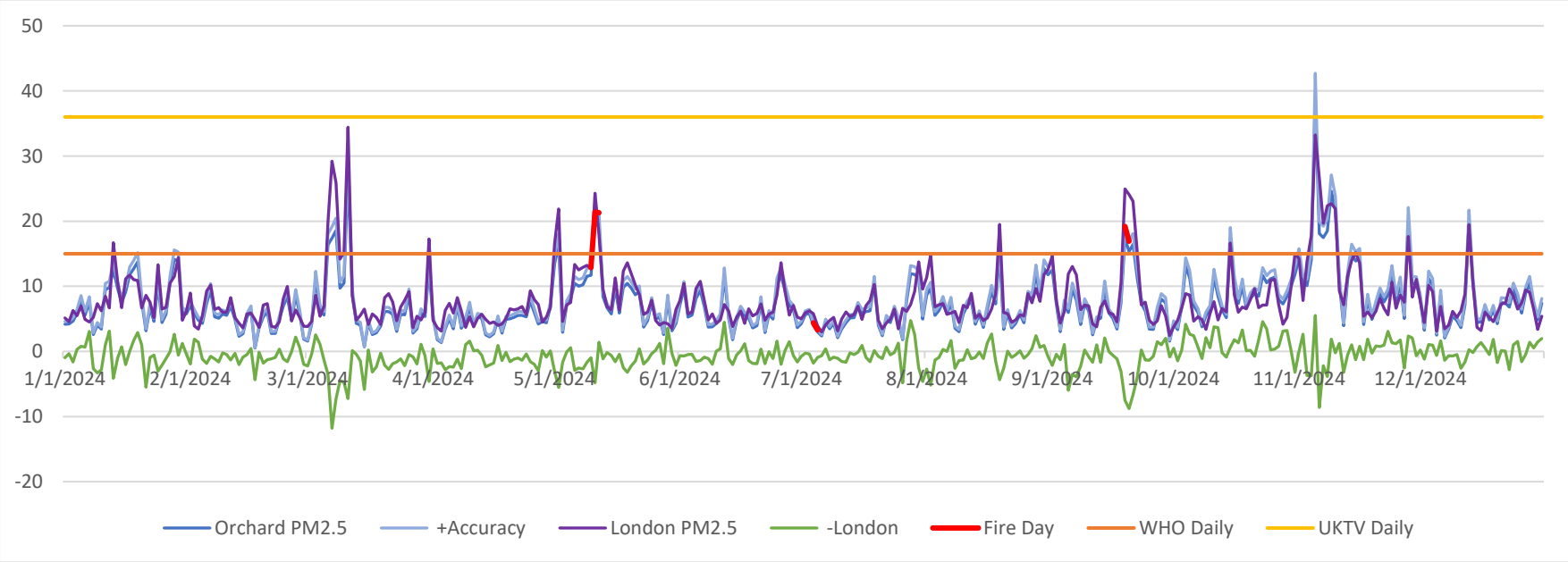
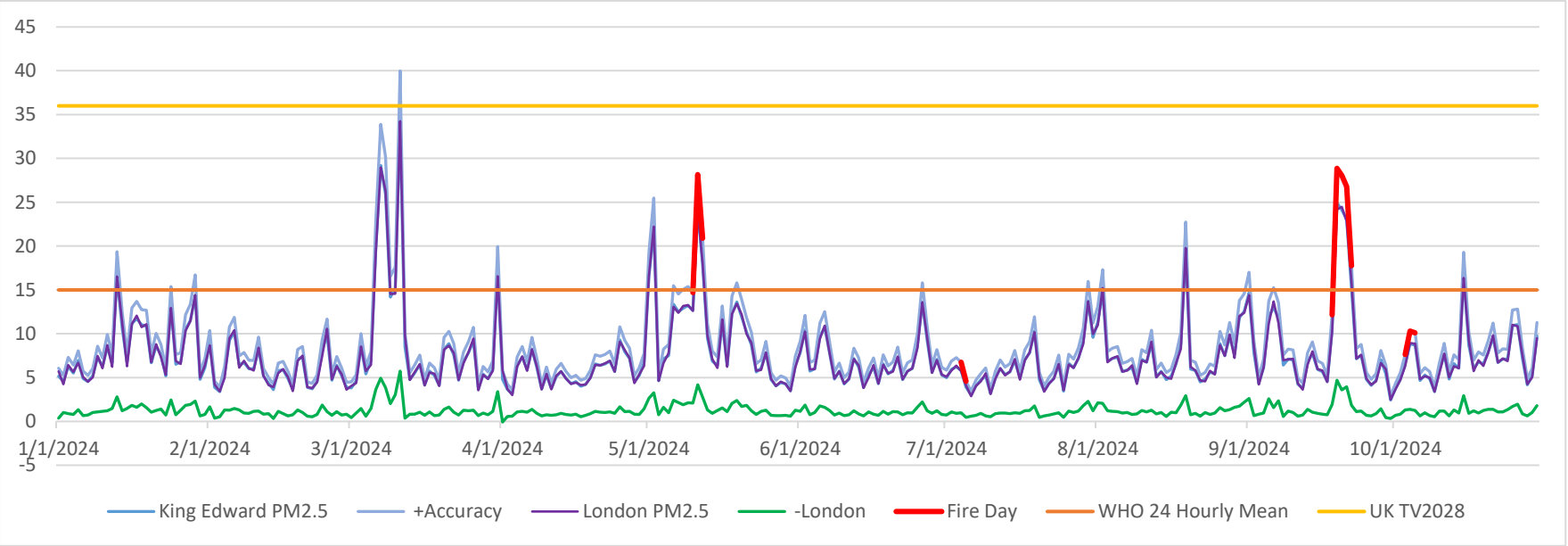
79. Orchard Avenue Node Data 2024



80. The LFB attended the Site on 10 May and exceedances occurred on the 11 May 21.4 µg/m^3, (London 24.3 µg/m^3) and 12 May 21.3 µg/m^3, (London 18.0 µg/m^3). The LFB also attended on 19 September where levels were 19.2 µg/m^3, (London 24.5 µg/m^3) and 20 September 16.9 µg/m^3, (London 24.1 µg/m^3). The London concentrations were higher than the Orchard Avenue concentrations.

81. King Edward Avenue Node Data 2024



82. Several exceedances of the WGV occurred in 2024. These exceedances are not straight forward as the London average already exceeded the WGV. These have been outlined in Table 2

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84. Table 2 Comparison of King Edward Ave Exceedances with the London Average

Date	King Edward Ave µg/m³	London Average µg/m³
10/05/2024	28.16	23.99
11/05/2024	20.88	18.10
12/05/2024	28.16	23.99
19/09/2024	28.87	24.18
20/09/2024	28.07	24.47
21/09/2024	26.77	22.82
22/09/2024	17.75	15.91

Key: fire attendance day cells are highlighted in red.

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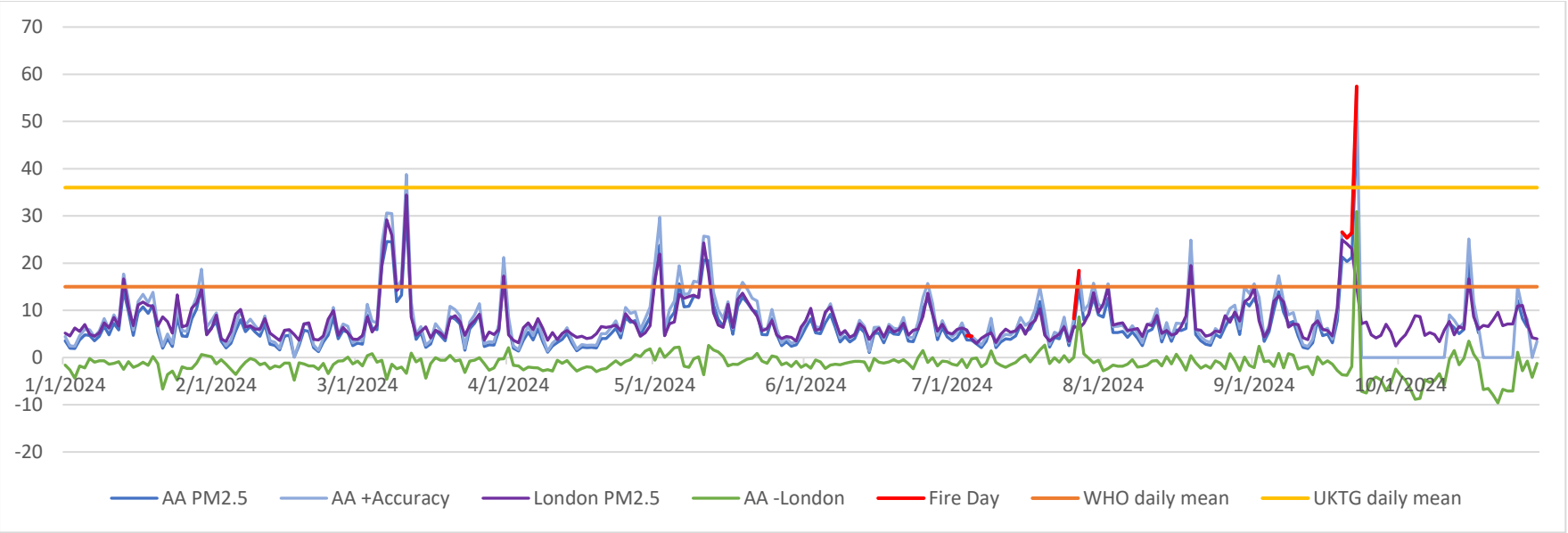
85. Acer Avenue Node Data 2024



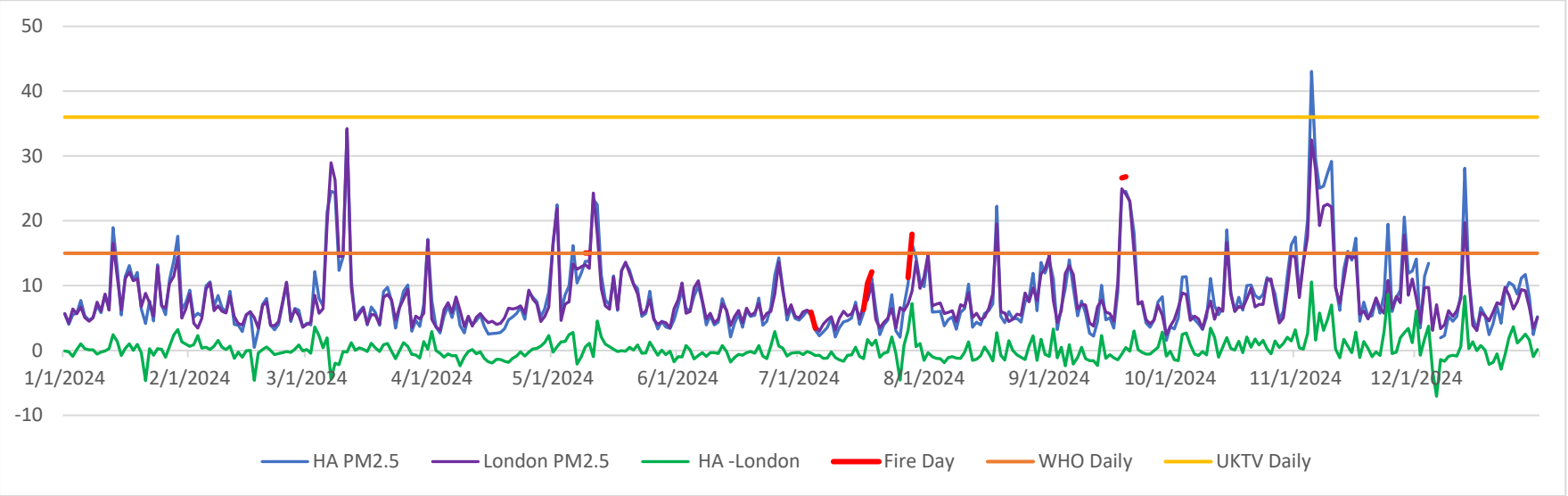
86. 7 Exceedances of the WGV occurred in 2024 however, they are not easily attributable to the Site. Table 3 explains each exceedance.

87. Table 3 Acer Avenue Comparison of Exceedances With the London Average

Date	Acer Ave µg/m³	London Average µg/m³	Comments
10/05/2024	15.96	12.66	King Edward Avenue is 3.3 µg/m³more than London
26/07/2024	8.27	6.62	No exceedance on Fire Day
27/07/2024	18.38	6.13	King Edward Avenue has a clear exceedance the day after
19/09/2024	26.57	24.95	King Edward Avenue is 1.5 µg/m³ more than London
20/09/2024	25.35	24.10	King Edward Avenue is 1.25 µg/m³ more than London
21/09/2024	26.38	23.07	King Edward Avenue is 3.31 µg/m³more than London
22/09/2024	57.42	15.17	King Edward Avenue has a clear exceedance

Key: fire attendance day cells are highlighted in red.

88. Harris Academy Node Data 2024

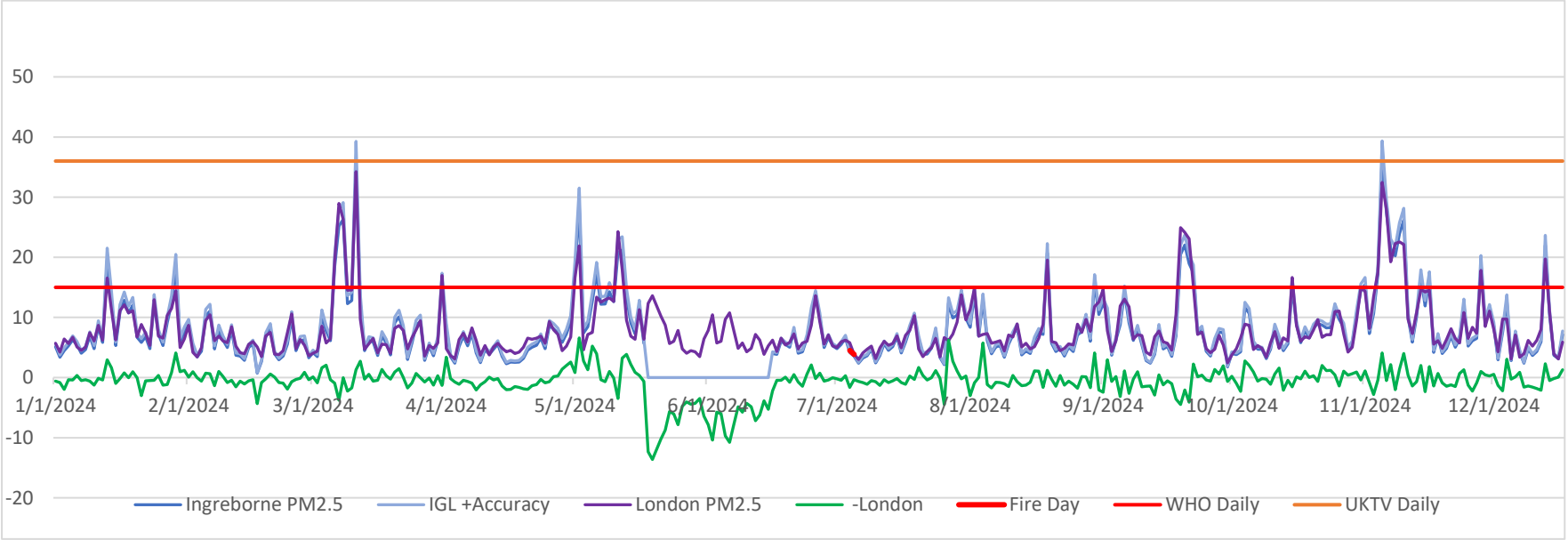


89. There are 3 exceedances of the WGV in 2024 however, 2 of these are very close to the London average concentration, (Table 4.)

90. Table 4

Date	Harris Academy µg/m³	London Average µg/m³	Comments
29/07/2024	17.96	9.20	Harris Academy has a clear exceedance
19/09/2024	26.61	24.94	Harris Academy is 1.67 µg/m³ more than London
20/09/2024	26.81	24.10	Harris Academy is 2.71 µg/m³ more than London

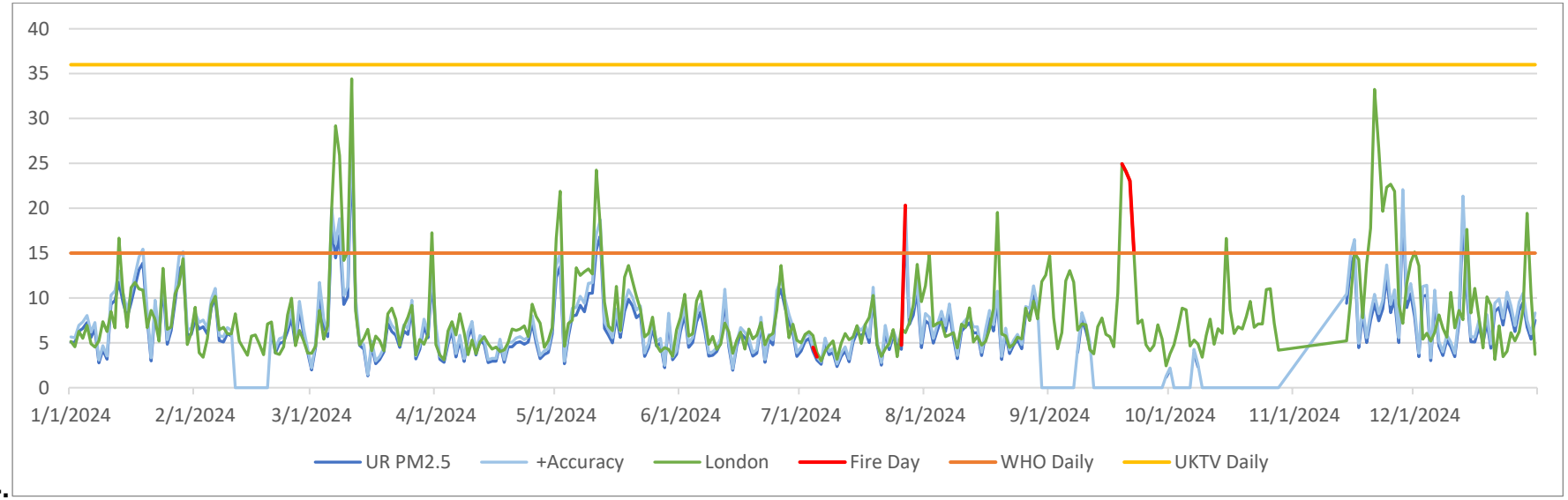
91. Ingreborne Golf Links Node Data 2024



92. There were no exceedances of the WGV in 2024 attributable to fires at the Ingreborne Golf Club.

93. Upminster Road Node Data 2024

94.



95. There were 2 exceedances of the WGV in 2024 on the 27 July and 19-22 September. Data collection during this year was only 79% at this node.

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Summary

96. Across all monitoring nodes the WGV limit of 3-4 exceedances per year was not met in either 2023 or 2024.

97. When considering the findings within the ERG report, analysis of the wind speed and direction would indicate that the most common wind direction was from the south-west, with easterly winds occurring more frequently during the spring and summer months, when fires were most frequently recorded. These conditions could expose the residents to the west of Arnolds Field to smoke.

98. The south-westerly winds transport smoke from fires at Arnolds Field towards the north-east. This area has limited residential housing but does have industrial areas and a cemetery where people could be exposed to smoke.

99. Longer periods of increased PM2.5 concentrations at Rainham were associated with widespread pollution events during the analysis period so the Launders Lane fires are not the main source of exposure to particulate pollution for residents in this area. However, the detection of smoke at the measurement sites which is likely to affect the wider area is a concern due to unknown and potentially toxic components (see TRL compositional analysis).

100. By comparing London-wide node data with data from the Rainham nodes it was possible to delineate localised $PM_{2.5}$ pollution. Whether the PM2.5 concentrations were due to the fires was dependent on weather conditions such as wind direction and speed. Some fire days yielded higher $PM_{2.5}$ concentrations, other fire days did not.

101. Although some fires were detected by monitoring, the variability of emissions in terms of sustained magnitude and area of impact meant that levels at single locations, were only impacted significantly enough to drive banding above DAQI “low” on few occasions and these were primarily driven by regional conditions.

102. It is not possible to delineate other potential $PM_{2.5}$ pollution sources in Rainham for example grass fires, with those derived from the site. There are too many external variables that are open to challenge any decision made by the Council, when using air quality data to determine land as contaminated land.

103. When considering the annual average of $PM_{2.5}$ there is no observable difference between the levels detected at monitoring around Arnolds Field and the immediate wider area, or across London. This is due to the number of fire days being small compared to non-fire days.

104. Whilst the levels at local monitoring locations may exceed the WHO guideline value of 15µg/m^3 on occasion, all of London breaches this, and much of the south east of England.

105. The levels around the site do not exceed the WHO guideline value of no more than 3-4 exceedances of 15 µg/m^3, when removing the influence of London levels on the readings taken by the nodes.

106. It should be noted that the WHO guideline value is an aspirational target. Furthermore, there is no evidence that any UK limits are being broken currently.

107. Fires at the Arnolds Field site increase particulate air pollution ($PM_{2.5}$) on some occasions at monitoring sites in the area with impacts detectable at least 1 km away. This influence is greatest when wind speed is very low or conditions are “stagnant”. However, this increase has a limited contribution to daily average levels and very limited contribution to annual average concentrations.

Recommendation

108. Daily $PM_{2.5}$ concentrations do not indicate significant harm is being caused as a response to fires at the Site. This means that the legal test for significant possibility of significant harm has not been met for daily average $PM_{2.5}$ concentrations.

109. In spite of the above recommendation, a precautionary approach towards landfill fires is advised. It is important that the cumulative impact of each component of the detailed inspection is considered and this is discussed in the delegated report.