Kingston Upon Hull City Council

2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June, 2023

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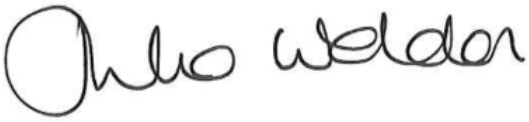
Signed and Approved by the Director of Public Health and Deputy Chief Executive. **Julia Weldon**	

Executive Summary: Air Quality in Our Area

Measured concentrations of all pollutants achieve the air quality objectives throughout the Authority Area, and the general trend is one of year-on-year improvement.

Kingston upon Hull City Council is keen to ensure that this not only continues but improves further in future years. To enable that, The Air Quality Strategy and Integral Action Plan was produced in 2017, and a report on its progress is presented to the Full Cabinet on an annual basis.

It was hoped that we could carry out a full appraisal of the Action Plan, which is something suggested in the feedback from the ASRs, but unfortunately, we were unsuccessful in two bids for Defra funding. As an alternative, we have carried out an internal screening, and determined that the creation of an emissions inventory to inform computer dispersion modelling would be an appropriate way forward.

This will be used to progress measures to improve local air quality, to help assess the progress towards Net Zero, and to investigate further the apparent anomaly of having relatively good outdoor air quality yet having a higher-than-average number of people presenting at medical centres with air quality related ailments. This was the subject of a joint report which was produced by Environmental Health and Public Health experts locally.

Air Quality in Kingston upon Hull.

Air pollution is associated with several adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

The mortality burden of air pollution within the UK is equivalent to 29,000 to 343,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4]. The situation post covid is still settling down, and the significant changes to the local highways network mentioned in previous reports are still on going, which means that a clear picture of the current situation is still emerging, but as a general observation, monitored levels of all pollutants are continuing to fall across the local authority area.

We have tried to look for the opportunities that are often available in times of change, and the promotion of changes to modes of personal transport is showing signs of success, which is being supported by changes to the cycle network across the City, and into neighbouring authorities.

The levels around the Transport Interchange that were mentioned as a concern in previous reports continue to show a reduction in concentrations.

Although there were no exceedances of the air quality objectives anywhere within the authority, there are currently numerous highways related changes on-going across the City. It has been decided to leave the AQMA in place for the coming year to ensure that the decision to remove it is a robust one and the improvement in air quality can be consistently maintained in the future.

The road improvements to the A63, and other work across the City indicate that we are on target to revoke the AQMA, in place due to the exceedance of the objective for the annual average NO_2, once the road improvements are operational. We continue to work closely with the port operators and Port Authority, and along with colleagues from the Local Authorities around the Humber Estuary, we have regular meetings to share data and information, discuss issues and look for ways to continue working collaboratively.

This includes discussing the potential impacts of a number of new and proposed installations around the Estuary that are liable to have a regional impact. We believe that this is beneficial not only to the Environment Agency, National Highways and the public in protecting health, but also to developers as the joint approach reduces the number of individual meetings, and

[3] Defra. Air quality appraisal: damage cost guidance, January 2023

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

also means that there is liable to be a reduced chance of conflicting messages resulting in a clearer understanding of the needs in each area and also the appropriate contact details.

Our monitoring illustrates that:

- There were no exceedances of the 1-hour mean nitrogen dioxide objective at any of the automatic monitoring sites.
- The annual mean objective nitrogen dioxide objective is achieved across the Authority area.
- There have been no measured exceedances of the PM_{10} annual mean or daily mean objectives over the period 2018 to 2022.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[5] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy, due to be published in 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in their areas. The Road to Zero[6] details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

The Council's Air Quality Strategy and integral Action Plan continues to provide the main structure for our activities, although the usual workshops we found out if we had been successful with the grant bid, which meant that we would move the workshops forward with the Co-Benefits Delivery Group.

The regular feedback to Cabinet has been well received, and the Strategy continues to be well supported by Council members.

[5] Defra. Environmental Improvement Plan 2023, January 2023

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

In late 2021 and again in 2022, Kingston upon Hull City Council (KUHCC) applied for grant funding to support an Air Quality Actions Feasibility Study (AQAFS) to be carried out by Ricardo Energy & Environment (Ricardo).

Unfortunately, we were unsuccessful in both of these bids, and instead decided to prioritise the emissions inventory and modelling as we believe this is crucial to the on-going success of the strategy.

In the interim, we have continued to work closely with colleagues across the Authority, and further afield to ensure that measures to improve local air quality are duly considered.

We are looking at ways to hold a joint workshop with colleagues in Public Health and also in the Climate Change team to investigate joint actions that will support a cohesive strategy to reduce concentrations and emissions to protect health which will be incorporated into a revised Air Quality Action Plan (AQAP) which will be directly linked to Public Health and Climate Change Plans.

As part of this, in conjunction with colleagues in Public Health, we produced an Air Quality Joint Strategic Needs Assessment (AQJSNA) which investigates the apparent anomaly of having relatively good air quality yet having a higher-than-average number of people presenting at medical centres with ailments that can be attributed to poor air quality.

The AQJSNA forms a part of the considerations for a number of research projects being carried out by Hull University, who we are assisting with studies that are primarily investigating atmospheric micro-plastics, both indoor and outdoor, with analysis of human organs and other samples to determine the potential health impacts from these pathways. This should also give us a better understanding of particulate levels around the City. We are looking at the possibilities of utilising a PhD or Masters student to look at the information in the AQJSNA in more detail.

It is felt to be testament to the strength of earlier work with the Strategy, that levels continue to fall, and local air quality remains a key focus for the Authority, and some of the initiatives introduced to support people and the economy during this period will help to encourage this further.

Conclusions and Priorities

The existing AQMA is largely a consequence of the emissions from vehicles on the national trunk road that runs along the southern edge of the City Centre, and this is being addressed by National Highways, the priority for Kingston upon Hull City Council in the coming year is to continue to support this by reducing annual mean nitrogen dioxide concentrations outside of the existing AQMA. As can be seen from the monitored results, so far this can be seen as successful, and is on target to result in the revocation of the AQMA once the road is operational.

In conjunction with colleagues in the Climate Change and Public Health Teams, we will hold engagement events to encourage involvement and ideas aimed at minimising the Council's impact on the environment and promote the ethos of the Air Quality Strategy. As initiatives are continuing to move quickly in some areas, we feel it is important to keep the report up to speed and will include measures for the current year in the report.

We continue to work with the local University in a study they are carrying out into micro-plastics in the atmosphere, including investigating the possibilities that may arise from studying the slides produced by the National Pollen Bureau. This could have a benefit in the speciation of particulate matter. We are also investigating a joint scheme to investigate the impact of indoor air quality on health locally, and we are in the process of inputting to the University's Climate Strategy.

A key priority that we have not progressed as far as we would have liked relates to community engagement, and this is something we see as a priority for this year and believe that this would have been a major outcome from the Air Quality Actions Feasibility Study. We are also seeking to raise Local Air Quality as a key consideration for the Health and Well Being Strategy.

We are in the process of purchasing the atmospheric dispersion modeling package, ADMS_Urban, and we will be building the emissions inventory for the package in house. This should assist us in demonstrating the requirements to achieve the long-term goals proposed by the revised national air quality strategy.

Covid 19.

Appendix F of the 2022 ASR provides an update on the additional measures being considered or applied as a consequence of the experiences during the lockdown period.

Local Engagement and How to get Involved

Members of the public can help improve air quality in the City by travelling using sustainable transport options, such as walking, running, cycling and public transport. Kingston upon Hull City Council's website's air quality pages have now been upgraded to provide more information on how members of the public can help to improve air quality in the City: http://www.hull.gov.uk/environment/pollution/air-quality

It can be seen in this report that we take every opportunity to engage with key stakeholders and decision makers.

Local Responsibilities and Commitment

This ASR was prepared by the Directorate of Public Health and Adult Social Care of Kingston upon Hull City Council with the support and agreement of the following officers and departments:

This ASR has been approved by: Julia Weldon (Director of Public Health and Deputy Chief Executive) and supported and agreed with Martin Budd (Climate Change Manager).

If you have any comments on this ASR please send them to Kingston upon Hull City Council's Air Quality Officer at:

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1 Local Air Quality Management

This report provides an overview of air quality in Kingston upon Hull during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Kingston upon Hull City Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

A summary of AQMAs declared by Kingston upon Hull City Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within Kingston upon Hull. Appendix D: Map(s) of Monitoring Locations and AQMAs provides a map of the AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objective pertinent to the current AQMA designation is as follows:

- NO_2 annual mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
Hull AQMA 1 (A)	01/08/2005	NO_2 Annual Mean	An area of the City centre, bordered to the west by Coltman St, Hessle Rd and Strickland St and to the north by Anlaby Rd, Carr Ln, Whitefriargate, Scale Ln and Silver St and to the east by the River Hull and the south by the Humber Estuary.	YES	64	32	2	Hull Air Quality Action Plan. Incorporated into the Hull City Council Air Quality Strategy	http://www.hull.go01/08/2005v.uk/environment/pollution/air-quality

☒ **Kingston upon Hull City Council confirm the information on UK-Air regarding their AQMA(s) is up to date.**

☒ **Kingston upon Hull City Council confirm that all current AQAPs have been submitted to Defra.**

Progress and Impact of Measures to address Air Quality in Kingston upon Hull

Defra's appraisal of last year's ASR concluded:

The report is detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

1. Detailed discussion is provided throughout, which demonstrates the Council's understanding of air quality concerns within the district, in addition to their commitment to improving air quality across their jurisdiction.

2. Trends are presented and discussed and a comparison with the air quality objectives is provided.

3. A long list of measures is shown in Table 2.2. However, parts of the table are incomplete. More detailed information about specific measures could be included in future.

Response.

This is noted. It was hoped that this would be addressed with the AQAF mentioned in point 4, but unfortunately, we were not successful in our grant funding bid to Defra. However, we have revisited the action plan to ensure the table is complete.

1. The council mentioned Air Quality Actions Feasibility Study (AQAFS). This is viewed as an effective way to streamline priorities in future years.

Response:

Unfortunately, we were not successful in our grant funding bid to Defra.

2. The formatting throughout the report is very inconsistent and in parts causes the report to be difficult to read. In particular the tables are all formatted differently and numbered out of order. Sections of Table 2.2 were small and

blurry. For future reports the Council should consider using an up-to-date report template.

Response:

Noted and addressed in this report.

3. QA/QC of the data was thorough. The national bias adjustment factor was used for the non-automatic network and distance correction performed. Annualisation data is also presented. Discussion of the choice of bias adjustment factor was given. It is noted that the choice of the lower factor may not represent a worst-case scenario and that the higher local adjustment factor could have been applied in its place. It is suggested that in the future more consideration is given to which factor will be used.

Response:

Noted and addressed in this report.

4. The report included measures to address $PM_{2.5}$ and links to the Public Health Outcomes Frameworks. This is welcomed and encouraged to continue.

5. Some spelling errors and other inconstancies were noted in the report. NO_2, $PM_{2.5}$ and PM_{10} should always be subscripted. Also, in text it states that automatic monitoring was undertaken at one site, whereas there are three sites listed in the tables.

Response:

Noted and addressed in this report.

6. Maps are included which show the location of monitoring sites across the District and in relation to the AQMA. This is welcomed. The maps themselves do not have north arrows, scale bars or legends. The inclusion of these would make the maps easier to read. The Council notes that locations of the newly added diffusion tube sites were purposely not included as their locations could still be altered. It would be useful to include these locations in future reports once the locations are confirmed.

Response:
Noted and addressed in this report.

7. The report reference list requires updating with calculation tools spreadsheets and policy documents.

Response: Noted and addressed in this report.

Kingston upon Hull City Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2, with the type of measure and the progress Kingston upon Hull City Council have made during the reporting year of 2022 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans which is an integral part of the Council's Air Quality Strategy adopted in 2017. Kingston upon Hull City Council anticipates that the measures stated above will achieve compliance in Hull AQMA 1 when National Highways complete their works.

A Report is submitted each year to the Cabinet to provide them with information on the annual submission. The outcome of the AQAFS grant bid and the progress on acquiring the ADMS Urban modelling package were not known at the time of presenting to the cabinet, and those presented in November 2022 can be found in Appendix F.

Measures to Improve Air Quality.

Table 2.2 shows the Action Plan and progress of measures that the Authority has implemented to maintain and improve the air quality within the City Boundaries. It had been hoped to fully revise the Action Plan, but unfortunately, we were unsuccessful in two bids for funding. As an alternative, we have acquired the ADMS_Urban dispersion model, and will use this in house to determine our progress on the proposed new objectives, and also to appraise the measures in the Action Plan. The key for Table 2.2 on progress made is shown below:

	Completed
	On target
	Desirable, but not fully progressed
	Long term or not currently viable

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
2	Dunswell Park & Ride	Alternatives to private vehicle use	Bus based Park & Ride	2017	2025	Highways	Internal or external funding bid	No	Not Funded	£500k - £1 million	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	This has been discussed for a number of years, and is still a desired option.Was submittde for funding as prt of unsucessful LUF bid in 2022	Issues over location and funding
3	Permitted processes	Environmental Permits	Introduction/increase of environment charges through permit systems and economic instruments	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
4	Permitted processes	Environmental Permits	Introduction/increase of environmental funding through permit systems and economic instruments	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
5	Permitted processes	Environmental Permits	Large Combustion Plant Permits and National Plans going beyond BAT	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
6	Permitted processes	Environmental Permits	Measures to reduce pollution through IPPC Permits going beyond BAT	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
7	Permitted processes	Environmental Permits	Other measure through permit systems and economic instruments	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
8	Permitted processes	Environmental Permits	Tradable permit system through permit systems and economic instruments	2010	2020	Environmental Health / DEFRA	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	All inspections carried out on target and any issues found resolved.
9		Freight and Delivery Management	Delivery and Service plans	2025	2030	Fleet - Major Projects	Internal	No	Under review	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Under intermittant review as opportunities arise	Under intermittant review as opportunities arise
10		Freight and Delivery Management	Freight Consolidation Centre	2025	2030	Fleet - Planners - Major Projects	Internal	No	Under review	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Under intermittant review as opportunities arise	Geographic issues mean that the hub would not necessarily be cost effective for reductions

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
11		Freight and Delivery Management	Freight Partnerships for city centre deliveries	2025	2030	Fleet - Major Projects	Internal	No	Under review	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Under intermittant review as opportunities arise	Geographic issues mean that the hub would not necessarily be cost effective for reductions
12		Freight and Delivery Management	Quiet & out of hours delivery	2026	2030	Planning - EH - Major Projects	Internal	No	Not Funded	< £10k	Completed	reduced emissions	Supporting general background improvements.	On going as part of liaison with planning Dept.	Under intermittant review as opportunities arise
13		Freight and Delivery Management	Route Management Plans/ Strategic routing strategy for HGV's	2026	2030	Planning - Highways - Transport Policy - Major Projects	Internal	No	Not Funded	Under review	Under review	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Individual developments have consruction managementplans as part of manging deliveries the strategic routing of HGVs is under review as part of the development of a new Local Transport Plan
14		Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017	2017	Planning + EH	Internal	No	Not Funded	< £10k	Completed	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under intermittant review as opportunities arise
15		Policy Guidance and Development Control	Low Emissions Strategy	2017	2017	EH and all other departments	Internal	No	Not Funded	< £10k	Completed	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Whilst not termed a low emission strategy, the Council's Air Quality Strategy is designed to reduce emissions. Disoersion model acquired and emissions inventory being compiled. Both carried out in house.
16		Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2017	2030	EH + YALPAC	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Some measures implemented, link to Public Health
17		Policy Guidance and Development Control	Sustainable Procurement Guidance	2025	2030	Procurement +EH+ Climate Change	Internal	No	Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	On going	Assessment of highest carbon emiiting procurment areas underway
18		Promoting Low Emission Plant	Emission control equipment for small and medium sized stationary combustion sources / replacement of combustion sources	2024	2030	EH - Planning - DEFRA	Internal	No	Not Funded	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Actioned in SPD's and EH Permiting
19		Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	2024	2030	Fleet - EH - Procurement - regen	Internal	No	Partially Funded	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	On going discussions with Fleet.
20		Promoting Low Emission Plant	Other measure for low emission fuels for stationary and mobile sources	2024	2030	Fleet - EH - Procurement - regen	Internal	No	Partially Funded	n/k	Under intermittant review as opportunities arise	reuced emissions	Supporting general background improvements.	Completed and reviewed annually	On going discussions with Fleet.

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
21		Promoting Low Emission Plant	Public Procurement of stationary combustion sources	2024	2030	Fleet - EH - Procurement - regen	Internal	No	Partially Funded	n/k	Under intermittant review as opportunities arise	reuced emissions	Supporting general background improvements.	Completed and reviewed annually	On going discussions with Fleet.
22		Promoting Low Emission Plant	Regulations for fuel quality for low emission fuels for stationary and mobile sources	2024	2030	Fleet - EH - Procurement - regen	Internal	No	Partially Funded	n/k	Under intermittant review as opportunities arise	reuced emissions	Supporting general background improvements.	Completed and reviewed annually	On going discussions with Fleet.
23		Promoting Low Emission Plant	Shift to installations using low emission fuels for stationary and mobile sources	2024	2030	Fleet - EH - Procurement - regen	Internal	No	Partially Funded	n/k	Under intermittant review as opportunities arise	reuced emissions	Supporting general background improvements.	Completed and reviewed annually	On going discussions with Fleet.
24		Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2017	2030	Fleet - procurement - Climate Change manager	Internal	No	Not Funded	n/k	Under intermittant review as opportunities arise	reuced emissions	Supporting general background improvements.	Completed and reviewed annually	In progress sub 2.5 tonne vehicles EV by 2025 remaining fleet 2030
25		Promoting Low Emission Transport	Low Emission Zone (LEZ) ie Fruit Market Area.	2017	2030	EH -Highways - Planners - Transport policy - Climate Change Manager - Major Projects	Internal	No	Not Funded	< £10k	Aborted	reduced emissions and act as example	Supporting general background improvements.	Completed and reviewed annually	The scheme was well received, and supported, however changes in he vicinity meant that the reductions were achieved withouth the need for additional measures.
26		Promoting Low Emission Transport	Priority parking for LEV's	2017	2030	EH -Highways - Planners - Transport policy - Parking - Major Projects	External	No	Funded	£50k - £100k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Current focus on providing EV charge points, consideration given in Parking Strategy. External funding secured for EV infrastructure strategy. External funding bid made in 2023 for infrastructure delivery, award is not yet announced.
27		Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2019	2027	EH -Climate Change	External	No	Funded	£1 million - £10 million	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Local Electric Vehicle Infrastructure Strategy and Delivery Plan complete 2024. Delivery 24-27.
28		Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2022	2030	Fleet - Climate Change advisor	Internal	No	No funded	n/k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Investigating Hubs for public and potentially commercial operators linked to outcome of line 27.
29		Promoting Low Emission Transport	Taxi emission incentives	2019	2030	EH + licensing	Internal	No	Not Funded	n/k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under intermittant review as opportunities arise
30		Promoting Low Emission Transport	Taxi Licensing conditions	2019	2030	licensing	Internal	No	Not Funded	n/k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under intermittant review as opportunities arise

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
31		Promoting Travel Alternatives	Encourage / Facilitate home-working	2020	2030	Human resources	Internal	No	Funded	£100k - £500k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Advanced due to pandemic.
32		Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2020	2030	healthy lifestyles + sustainable travel officer	Internal and External	No	Funded	£15m up to 2027 for cycle infrasructure. Unfunded beyond	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	On going promotions advocating a school parking pledge to address issues associated with the school run. LCWIP identifies infrastructure plan and funding for core network is identified and schemes being delivered.
33		Promoting Travel Alternatives	Personalised Travel Planning	2024	2030	healthy lifestyles + sustainable travel officer	Internal	No	Not Funded	TBC	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	New appointments being saught
34		Promoting Travel Alternatives	Promote use of rail and inland waterways	2026	2030	EH	Internal	No	Not funded	n/k	Under intermittant review as opportunities arise	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under review
35		Promoting Travel Alternatives	Promotion of cycling	2020	2030	healthy lifestyles + sustainable travel officer + active travel marketing officer	Internal	No	Funded	£30 kpa	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Advanced due to pandemic. TravelHull website set up.
36		Promoting Travel Alternatives	Promotion of walking	2020	2030	healthy lifestyles + sustainable travel officer + active travel marketing officer	Internal	No	Funded	£30 kpa	Implementation	reduced emissions	Supporting general background improvements.	On going and reviewed annually	Advanced due to pandemic.
37		Promoting Travel Alternatives	School Travel Plans	2020	2025	healthy lifestyles + sustainable travel officer	Internal	No	Funded	£10k - 50k	Implementation	reduced emissions	Supporting general background improvements.	On going and reviewed annually	Delivered through Modeshift with support from First Step
38		Promoting Travel Alternatives	Workplace Travel Planning	2020	2025	healthy lifestyles + sustainable travel officer + Travel Planner (business) officer	Internal	No	Funded	£30 kpa	Implementation	reduced emissions	Supporting general background improvements.	On going	On going as part of LTP and Climate Strategy. Travel Planner (Business) officer appointed. Working through Modeshift to support businesses to develop travel plans
39		Public Information	Via leaflets	2020	2025	Media Relations	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	In discussions with corporate medoia re media strategy.
40		Public Information	Via other mechanisms	2020	2025	Media Relations	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	In discussions with corporate medoia re media strategy.

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
41		Public Information	Via radio	2020	2022	Media Relations	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	In discussions with corporate media re media strategy.
42		Public Information	Via television	2020	2022	Media Relations	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	In discussions with corporate medoia re media strategy.
42a		Public Information	Via the Internet	2020	2022	Media Relations	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	In discussions with corporate medoia re media strategy.
44		Traffic Management	Anti-idling enforcement	2020	2025	EH	Internal	No	Not funded	<£10k	Planning	reduced emission	Supporting general background improvements.	on going	Included in considerations for Schools Parking Pledge (Item 32)
45		Traffic Management	Emission based parking or permit charges	2024	2025	Parking - Transport Policy	Internal	No	Not Funded	n/k	Planning	reduced emission	Supporting general background improvements.	on going	On going as part of Parking Strategy.
46		Traffic Management	Reduction of speed limits, 20mph zones	2020	2030	Highways - Transport Policy	Internal	No	Not Funded	n/k	Planning	reduced emissions	Supporting general background improvements.	on going	On going as part of Highways Policy
47		Traffic Management	Road User Charging (RUC)/ Congestion charging	2020	2020	Highways - Transport Policy	Internal	No	Not Funded	n/k	Aborted	reduced emissions	Location dependant	Not considered required at this time	Other measures effective so far.
48		Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2020	2020	Highways - Transport Policy - Parking - Major Projects	Internal	No	Funded	£1 million - £10 million	Implementation	reduced emissions	Location dependent	on going	Advanced due to pandemic.
49		Traffic Management	Testing Vehicle Emissions	2020	2025	EH	Internal	No	Not Funded	< £10k	Implementation	reduced emissions	Supporting general background improvements.	This has been on hold during pandemic, but expected to resume.	Under review

Measure No.	Measure	Category	Classification	Year measure introduced	Estimated/ Actual completion year	Organisations involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measures	Measure Status	Reduction in Pollutant/Emissions from measure	Key Performance Indicator	Progress to Date	Comments/Barriers to Implementation
50	A63 Improvements	Traffic Management	UTC, Congestion management, traffic reduction	2020	2025	Highways England	Internal	No	Funded	> £10 million	Implementation	revoke AQMA	AQMA Revoked	On going	On target
50(a)		Traffic Management	UTC, Congestion management, traffic reduction	2020	2023	Highways and Transportation	Internal	No	Funded	£100k - £500k	Planning	reduced emissions	Location dependent	A number of projects inder discussion	TM relating to UTC and congestion management is with Streetscene
51		Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2025	2030	Planners - Major Projects - Parking	Internal	No	Not Funded	n/k	Implementation	reduced emissions	Supporting general background improvements.	on going	Powers for Movng Traffic offences applied for - awaiting parliamentary time
52		Transport Planning and Infrastructure	Bus route improvements	2020	2025	Transport Policy	Internal	No	Funded	£100k - £500k	Implementation	reduced emissions	Supporting general background improvements.	On going	Bus lane operating time extended but now under consideation to reverse
53		Transport Planning and Infrastructure	Cycle network	2020	2020	Sustainable travel officer + Project Manager	Internal + External	No	Funded	£15m up to 2027 for cycle infrasructur e. Unfunded beyond	Implementation	reduced emissions	Supporting general background improvements.	On Going	Delivering draft LCWIP consultation on LCWIP to be undertaken.
54		Transport Planning and Infrastructure	Public cycle hire scheme	2025	2030	Major Projects	Internal	No	Not Funded	n/k	Planning	reduced emissions	Supporting general background improvements.	No suitable scheme found as yet	Competetive dialogue process to deliver concession csheme when staff resources identified
55		Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2020	2025	Transport Policy	Internal	No	Funded	£50k - £100k	Implementation	reduced emissions	Location dependent	Completed and reviewed annually	Ongoing works but are funding dependant.
56		Vehicle Fleet Efficiency	Driver training and ECO driving aids	2020	2030	Fleet management	Internal	No	Not Funded	n/k	Under review	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under review
57		Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2020	2030	Fleet management	Internal	No	Not Funded	n/k	Under review	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	On going
58		Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2020	2030	EP - Licensing	Internal	No	Partially Funded	£1 million - £10 million	Planning	reduced emissions	Supporting general background improvements.	Some initiatives progressed, with others under discussion.	Some delays as linked to national companies plans for city. Timeline extended to 2030.
59		Vehicle Fleet Efficiency	Testing Vehicle Emissions	2019	2030	Fleet management	Internal	No	Funded	£10k - 50k	Implementation	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	On going
60		Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	2019	2030	Fleet management	Internal	No	Not Funded	n/k	Under constant review	reduced emissions	Supporting general background improvements.	Completed and reviewed annually	Under constant review
61		Alternatives to private vehicle use	Car & lift sharing schemes	2024	2030	Human resources	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Under intermittant review.	Part of LTP and Climate Strategy
62		Alternatives to private vehicle use	Car Clubs	2024	2030	Human resources	Internal	No	Not Funded	< £10k	Planning	reduced emissions	Supporting general background improvements.	Under intermittant review.	Part of LTP and Climate Strategy
63		Alternatives to private vehicle use	Rail based Park & Ride	2025	2030	External	Internal	No	Not Funded	n/k	Under constant review	reduced emissions	Supporting general background improvements.	Under discussion for options.	We have no rail stops inside city boundary . Rail stations outside of city have parking spaces already. Focus change to promote rail use in travel to work area of city.

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$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

$PM_{2.5}$ has been monitored at one site in Kingston upon Hull since the 27th of August 2008. The finer particulates are targeted instead of PM_{10} to align more closely with reports from Public Health England and health interests of the Joint Strategic Needs Assessment.

Kingston upon Hull City Council is taking forward measures within the Air Quality Strategy, which incorporates the Action Plan, which will help to address $PM_{2.5}$ concentrations. The measures which focus on behavioural change should also reduce $PM_{2.5}$ emissions from transport, as well as the proposals for the A63 Trunk Road and the changes to the traffic light system, which will help reduce fuel usage to some extent (by smoothing traffic flow), and hence $PM_{2.5}$ emissions.

As mentioned in the previous reports, Kingston upon Hull City Council continues to work with Public Health colleagues to prioritise action on air quality in their local area to help reduce the health burden from air pollution. The Public Health Outcomes Framework (PHOF) is a Department of Health data tool for England, intended to focus public health action on increasing healthy life expectancy and reducing differences in life expectancy between communities. The PHOF includes an indicator, based on the effect of particulate matter ($PM_{2.5}$) on mortality. The approach used in partnership with Public Health colleagues includes the encouragement of active travel, which will also have wider public health benefits captured in other indicators such as increased physical activity (indicator 2.13) and reducing excess weight at various ages (indicators 2.6 & 2.12). NICE guidance on air pollution and health is in draft at this current time. When this has been adopted the measures suggested by the NICE guidance on control and reduction of $PM_{2.5}$ emissions will be adopted.

We have also collaborated with colleagues in Public Health to investigate the apparent anomaly, where despite measuring relatively good concentrations for air quality, the health data suggests that there are a larger than average number of people presenting at health centres with ailments that can be attributed to poor air quality. We have produced an

AQJSNA and are looking at options to utilise PhD or Master's students to investigate the findings.

Transport is a significant source of local $PM_{2.5}$. Kingston upon Hull Local Transport Plan 2011 sets out a number of measures by which it aims to improve air quality in Kingston upon Hull that will have an effect on the levels of $PM_{2.5}$. For example, Chapter 11 of the plan looks at Air Quality, and states that:

- The Council already has a network of 52 electric vehicle charging points, 14 of which are located in George Street multi-storey and the rest are at Council buildings and depots. The charging points were installed when the Council had an electric vehicle fleet five years ago before the manufacturer withdrew from the market.

  The Council was part of a Yorkshire bid for funding from the Plugged in Places initiative to develop a network of charging points throughout Yorkshire including up to 70 additional charging points in 37 locations throughout the City. Unfortunately, the bid was unsuccessful but the Council is still looking for alternative sources of funding to progress this initiative.

- The Council is currently purchasing 10 electric vehicles a year as part of the decarbonising of its fleet and has added a number of electric pool vehicles for use by staff.

- Investigations into reducing tyre wear are ongoing.

The above measures have since been enhanced, with an additional 12 public charge points, and an additional 20 for its own fleet, with plans to install 20 more over the next two years.

The recent Carbon Neutral Strategy supports Hull City Council's Air Quality Strategy by seeking to increase modal shift to more sustainable transport options as well as increase the adoption of electric vehicles though an expanded charging infrastructure. It also supports a variety of measures, such as alternative fuels to diesel, and options for fuelling heavier vehicles to encourage the decarbonisation.

Air Quality is a key element in the Local Plan for Kingston upon Hull, which is currently under review and the reduction of $PM_{2.5}$ will be considered within this.

The planning system is inevitably focussed on addressing issues within the AQMA declared for NO_2. However, it is important that measures to address NO_2 do not inadvertently increase $PM_{2.5}$ concentrations. One example of this may be through giving centralised energy plant consent without fully assessing the impacts on PM_{10} and $PM_{2.5}$ concentrations. An

Environmental Quality Supplementary Planning Document was produced and adopted as part of the Local Plan 2018. We continue to apply the requirements of this when commenting on planning applications and ensure that they meet the requirements of Hull City Council's Air Quality Strategy. The aim is to minimise emissions to protect health.

The existing 25 Smoke Control Orders in force in the City, were enacted between 1959 and 1992, and were the cause of some confusion. An order was made for these to be revoked, and replaced by a single, clearer Smoke Control Order covering the whole of the City. This came into force in June 2020. This is seen as an opportunity to raise awareness of the issues around solid fuel combustion and fine particulate.

We are also assisting the local University in a study of atmospheric micro-plastics, which could provide additional detail on the make-up of fine particulate.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

This section sets out the monitoring undertaken within 2022 by Kingston upon Hull City Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Kingston upon Hull City Council undertook automatic (continuous) monitoring at one site during 2022. Table A.1 in Appendix A shows the details of the automatic monitoring site (site ID: CM1). Data from two automatic monitoring sites (site IDs CM2 & CM3) that form part of a national network managed on behalf of Defra is also available through the UK-Air website .

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Kingston upon Hull City Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 143 sites during 2022. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g., annualisation and/or distance correction), are included in Appendix C.

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.3 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

The results from the monitoring undertaken in 2022 indicate that the levels continue to fall across the City, and that there were no exceedences of the air quality objectives, including within the AQMA. As the results are liable to be still influenced by the recent restrictions on movement due to covid to some degree, we do not intend to revoke the AQMA, particularly as the area is subject to a series of road improvement schemes. and we will

continue to closely monitor the situation, which can be seen in the five year trend shown In Figure A.1.

There were no values over 60µg/m^3 from the diffusion tubes, and no exceedances of the 1-hour mean nitrogen dioxide objective at any of the automatic monitoring sites.

3.1.4 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

There have been no measured exceedances of the PM_{10} annual mean or daily mean objectives over the period 2012 to 2022.

3.1.5 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

$PM_{2.5}$ is monitored at Hull Freetown AURN site, and values have shown very little variation since 2011 and are generally around the WHO value of 10µg/m^3.

3.1.6 Sulphur Dioxide (SO_2)

Table A.9 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2022 with the air quality objectives for SO_2.

SO_2 is monitored at the Hull Freetown AURN site, and has been suspended at the Council's own site as a review showed that there have been no exceedances of the objective from either site and levels have been consistently low, so the cost of continuing to monitor was not felt to be justified.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Hull ABP	Industrial	513309	429319	NO_2; PM_{10}	N	API	0.5	8	2.5
CM2	Hull Freetown (AURN)	Urban background	509482	429322	NO_2; $PM_{2.5}$; SO_2; CO; O_3	N	API, FIDAS	0	2	2.5
CM3	Hull Holderness Rd (AURN)	Roadside	511794	430511	NO_2; PM_{10}	N	API, FDMS	3	3	2.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable

Table A.2 – Details of Non-Automatic Monitoring Sites

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
1	Plimsoll Way	Roadside	510721	428732	NO_2	Not in AQMA	3.0	1.0	No	2.5
2	Hessle Rd	Roadside	508140	427802	NO_2	Not in AQMA	0.0	3.0	No	2.5
3	269 Hessle Rd	Kerbside	507972	427770	NO_2	Not in AQMA	3.0	1.0	No	2.5
4	Calvert Station	Kerbside	506018	428892	NO_2	Not in AQMA	3.0	2.0	No	2.5
5	Calvert Lane	Kerbside	505914	429362	NO_2	Not in AQMA	4.0	2.0	No	2.5
6	Granville St	Kerbside	507331	428719	NO_2	Not in AQMA	3.0	3.0	No	2.5
7	Anlaby Road	Kerbside	507345	428738	NO_2	Not in AQMA	3.0	1.0	No	2.5
8	261, Anlaby Rd	Kerbside	508149	428670	NO_2	Not in AQMA	3.0	1.0	No	2.5
9	HRI	Kerbside	508413	428659	NO_2	Hull AQMA 1	3.0	2.0	No	2.5
10	Ice House Road	Kerbside	508905	428502	NO_2	Hull AQMA 1	0.0	3.0	No	2.5
11	Daltry St	Roadside	508489	427986	NO_2	Hull AQMA 1	0.0	2.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
12	Cambridge St	Roadside	508921	428659	NO_2	Hull AQMA 1	3.0	1.0	No	2.5
13	Princes Dock Side	Roadside	509727	428473	NO_2	Hull AQMA 1	0.0	3.0	No	2.5
14	Castle st (Road)	Kerbside	509917	428437	NO_2	Hull AQMA 1	4.0	0.0	No	2.5
15	Castle st (Wall)	Urban Centre	509913	428446	NO_2	Hull AQMA 1	0.0	10.0	No	2.5
16	Lowgate	Kerbside	510039	428687	NO_2	Not in AQMA	2.0	0.0	No	2.5
17, 18, 19	Francis Street (AQMS)c	Urban Background	509482	429322	NO_2	Not in AQMA	0.0	2.0	No	2.5
20	Francis St	Kerbside	509465	429281	NO_2	Not in AQMA	3.0	3.0	No	2.5
21	Portland Pl	Kerbside	509125	429228	NO_2	Not in AQMA	2.0	1.0	No	2.5
22	Paragon Square (Road)	Kerbside	509273	428811	NO_2	Not in AQMA	3.0	0.5	No	2.5
23	Paragon Square (Cenotaph)	Roadside	509299	428797	NO_2	Not in AQMA	3.0	3.0	No	2.5
24	St Stephens Crossing	Roadside	509186	428904	NO_2	Not in AQMA	4.0	0.5	No	2.5
25	Brook St	Kerbside	509198	429022	NO_2	Not in AQMA	2.0	1.0	No	2.5
26	Cherry Court	Kerbside	509134	429115	NO_2	Not in AQMA	2.0	1.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
27	Nero	Kerbside	509202	428944	NO_2	Not in AQMA	3.0	1.0	No	2.5
28	Pearson St	Kerbside	509102	429228	NO_2	Not in AQMA	2.0	1.0	No	2.5
29	27, Spring Bank	Kerbside	509004	429312	NO_2	Not in AQMA	3.0	1.0	No	2.5
30	72 Spring Bank	Kerbside	508865	429378	NO_2	Not in AQMA	3.0	3.0	No	2.5
31	Spring Bank	Kerbside	508819	429372	NO_2	Not in AQMA	2.0	3.0	No	2.5
32	Louis St	Kerbside	508241	429602	NO_2	Not in AQMA	3.0	2.0	No	2.5
33	Park Street/Londesborough St	Roadside	508780	428925	NO_2	Not in AQMA	3.0	0.5	No	2.5
34	Princes Ave	Kerbside	508233	429887	NO_2	Not in AQMA	3.0	1.0	No	2.5
35	Middleton St	Kerbside	508327	429572	NO_2	Not in AQMA	0.0	2.0	No	2.5
36	29, Princes Ave	Kerbside	508201	429800	NO_2	Not in AQMA	3.0	3.0	No	2.5
37	Peel St	Kerbside	508537	429492	NO_2	Not in AQMA	3.0	3.0	No	2.5
38	Park Grove	Kerbside	508258	429939	NO_2	Not in AQMA	3.0	1.0	No	2.5
39	Newland Bridge	Roadside	508276	430730	NO_2	Not in AQMA	0.0	3.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
40	County Rd	Roadside	506590	430671	NO_2	Not in AQMA	3.0	3.0	No	2.5
41	Inglemire Lane	Kerbside	507876	432075	NO_2	Not in AQMA	3.0	1.0	No	2.5
42	Sutton Rd	Roadside	508299	432952	NO_2	Not in AQMA	3.0	0.5	No	2.5
43	Wetherby Close	Kerbside	506972	433172	NO_2	Not in AQMA	0.0	40.0	No	2.5
44	Ashcombe Rd	Roadside	508698	434348	NO_2	Not in AQMA	4.0	3.0	No	2.5
45	Leads Rd Roundabout	Roadside	511529	433117	NO_2	Not in AQMA	3.0	1.0	No	2.5
46	Fortune Close	Kerbside	512678	432075	NO_2	Not in AQMA	3.0	8.0	No	2.5
47	Hold AQMS	Kerbside	511793	430508	NO_2	Not in AQMA	3.0	3.0	No	2.5
48	Marfleet Lane	Kerbside	513877	430355	NO_2	Not in AQMA	3.0	1.0	No	2.5
49	Hall Rd - Marfleet Junction (7/7)	Kerbside	514113	429329	NO_2	Not in AQMA	3.0	2.5	No	2.5
50	Hedon Road/Marfleet	Roadside	514129	429321	NO_2	Not in AQMA	3.0	1.0	No	2.5
51	Hedon Road/Valetta St	Roadside	514387	429162	NO_2	Not in AQMA	3.0	0.5	No	2.5
52	Diadem	Roadside	514195	432166	NO_2	Not in AQMA	25.0	0.5	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
53	171, James Reckitt Ave	Kerbside	511024	430853	NO_2	Not in AQMA	3.0	1.0	No	2.5
54	Glebe Rd	Kerbside	510317	431730	NO_2	Not in AQMA	4.0	1.0	No	2.5
55	Rivaulx Court	Kerbside	510320	431650	NO_2	Not in AQMA	3.0	3.0	No	2.5
56	Stoneferry Road	Kerbside	510380	431236	NO_2	Not in AQMA	3.0	2.0	No	2.5
57	Reservoir Rd	Kerbside	509941	431405	NO_2	Not in AQMA	3.0	3.0	No	2.5
58	Beverley Rd	Other	508603	431582	NO_2	Not in AQMA	3.0	3.0	No	2.5
59	Inglemire/Bev Rd	Kerbside	508520	431875	NO_2	Not in AQMA	3.0	1.0	No	2.5
60	Grafton St	Kerbside	508741	431050	NO_2	Not in AQMA	3.0	1.0	No	2.5
61	Adderbury Grove	Kerbside	508918	430568	NO_2	Not in AQMA	3.0	1.0	No	2.5
62	Bedford St	Kerbside	510364	430215	NO_2	Not in AQMA	3.0	1.0	No	2.5
63	229 Beverley Rd	Kerbside	508929	430340	NO_2	Not in AQMA	0.0	2.0	No	2.5
64	Spencer St	Kerbside	509155	429125	NO_2	Not in AQMA	2.0	1.0	No	2.5
65, 66, 67	ABP c	Industrial	513309	429319	NO_2	Not in AQMA	0.0	8.0	No	2.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	513309	429319	Industrial	99.9	99.9			25.3	24.8	23
CM2	509482	429322	Urban Background	99	99	22	22	18	18	18
CM3	511794	430511	Roadside	98	98	27	26	21	22	22

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction.**

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
1	510721	428732	Roadside	100	100.0	24.9	23.6	18.3	20.2	18.5
2	508140	427802	Roadside	90.38461538	90.4	29.2	29.5	23.5	25.8	27.3
3	507972	427770	Kerbside	90.38461538	90.4				29.1	27.1
4	506018	428892	Kerbside	82.69230769	82.7	27.9	23.2	17.9	20.8	20.2
5	505914	429362	Kerbside	90.38461538	90.4	27.3	25.5	21.1	21.5	21.7
6	507331	428719	Kerbside	100	100.0				27.6	28.5
7	507345	428738	Kerbside	92.30769231	92.3	35.9	33.7	28.1	30.9	30.7
8	508149	428670	Kerbside	100	100.0				30.1	31.9
9	508413	428659	Kerbside	80.76923077	80.8	28.2	27.1	24.3	26.2	24.2
10	508905	428502	Kerbside	100	100.0	20.7	19.9	17.8	17.6	16.4
11	508489	427986	Roadside	92.30769231	92.3	28.8	29.5	23.0	24.9	24.0
12	508921	428659	Roadside	76.92307692	76.9	33.5	36.0	31.2	27.0	23.8

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
13	509727	428473	Roadside	92.30769231	92.3	37.7	36.9	30.3	27.8	26.2
14	509917	428437	Kerbside	100	100.0	**41.5**	36.3	26.1	26.4	26.0
15	509913	428446	Urban Centre	100	100.0	33.2	31.5	30.7	32.8	31.9
16	510039	428687	Kerbside	90.38461538	90.4	33.0	31.9	24.2	25.1	26.7
17, 18, 19	509482	429322	Urban Background	100	100.0	22.9	22.9	18.9	18.4	18.7
20	509465	429281	Kerbside	90.38461538	90.4				24.1	25.0
21	509125	429228	Kerbside	73.07692308	73.1				29.2	30.7
22	509273	428811	Kerbside	100	100.0	38.2	**40.1**	32.8	31.7	33.3
23	509299	428797	Roadside	100	100.0	29.8	30.4	23.2	25.0	26.8
24	509186	428904	Roadside	92.30769231	92.3	**45.4**	**45.2**	33.2	36.6	33.0
25	509198	429022	Kerbside	100	100.0				27.6	30.6
26	509134	429115	Kerbside	90.38461538	90.4				28.6	29.3
27	509202	428944	Kerbside	90.38461538	90.4				37.0	38.6
28	509102	429228	Kerbside	92.30769231	92.3				30.7	29.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
29	509004	429312	Kerbside	84.61538462	84.6				33.6	35.1
30	508865	429378	Kerbside	82.69230769	82.7				28.0	27.0
31	508819	429372	Kerbside	82.69230769	82.7	32.0	28.7	23.4	24.8	26.5
32	508241	429602	Kerbside	92.30769231	92.3				31.3	31.7
33	508780	428925	Roadside	92.30769231	92.3	26.5	26.7	21.3	23.3	24.4
34	508233	429887	Kerbside	100	100.0	32.1	25.8	23.9	25.5	27.5
35	508327	429572	Kerbside	100	100.0				31.3	33.6
36	508201	429800	Kerbside	82.69230769	82.7				33.2	38.1
37	508537	429492	Kerbside	92.30769231	92.3				23.7	23.3
38	508258	429939	Kerbside	82.69230769	82.7				28.8	29.4
39	508276	430730	Roadside	84.61538462	84.6	26.3	24.0	19.7	20.9	18.5
40	506590	430671	Roadside	100	100.0	25.6	25.1	19.4	21.6	21.0
41	507876	432075	Kerbside	100	100.0	17.4	17.3	13.8	13.3	14.9
42	508299	432952	Roadside	100	100.0	29.2	26.6	21.8	24.1	23.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
43	506972	433172	Kerbside	100	100.0	14.2	13.3	11.4	10.1	11.4
44	508698	434348	Roadside	90.38461538	90.4	21.3	19.6	15.2	16.3	19.7
45	511529	433117	Roadside	100	100.0	31.9	27.4	23.9	23.8	25.7
46	512678	432075	Kerbside	100	100.0	17.2	16.7	13.9	13.9	14.0
47	511793	430508	Kerbside	90.38461538	90.4				24.4	25.7
48	513877	430355	Kerbside	82.69230769	82.7				21.4	23.9
49	514113	429329	Kerbside	100	100.0	35.4	29.8	27.4	26.4	27.8
50	514129	429321	Roadside	100	100.0	39.1	36.7	31.9	30.5	35.8
51	514387	429162	Roadside	100	100.0	34.6	34.3	28.5	32.2	31.4
52	514195	432166	Roadside	67.30769231	67.3					31.9
53	511024	430853	Kerbside	100	100.0				21.6	20.3
54	510317	431730	Kerbside	92.30769231	92.3	39.5	38.2	32.7	33.4	33.6
55	510320	431650	Kerbside	73.07692308	73.1				30.6	32.2
56	510380	431236	Kerbside	92.30769231	92.3	34.2	34.6	29.8	27.0	30.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
57	509941	431405	Kerbside	100	100.0				21.3	23.0
58	508603	431582	Other	90.38461538	90.4	32.0	30.9	26.4	27.6	29.8
59	508520	431875	Kerbside	82.69230769	82.7				25.8	27.8
60	508741	431050	Kerbside	75	75.0				28.8	30.2
61	508918	430568	Kerbside	100	100.0				26.7	28.4
62	510364	430215	Kerbside	100	100.0				24.6	26.5
63	508929	430340	Kerbside	90.38461538	90.4				27.0	26.3
64	509155	429125	Kerbside	90.38461538	90.4				28.7	30.3
65, 66, 67	513309	429319	Industrial	100	100.0			19.5	23.7	22.9

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **Diffusion tube data has been bias adjusted.**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

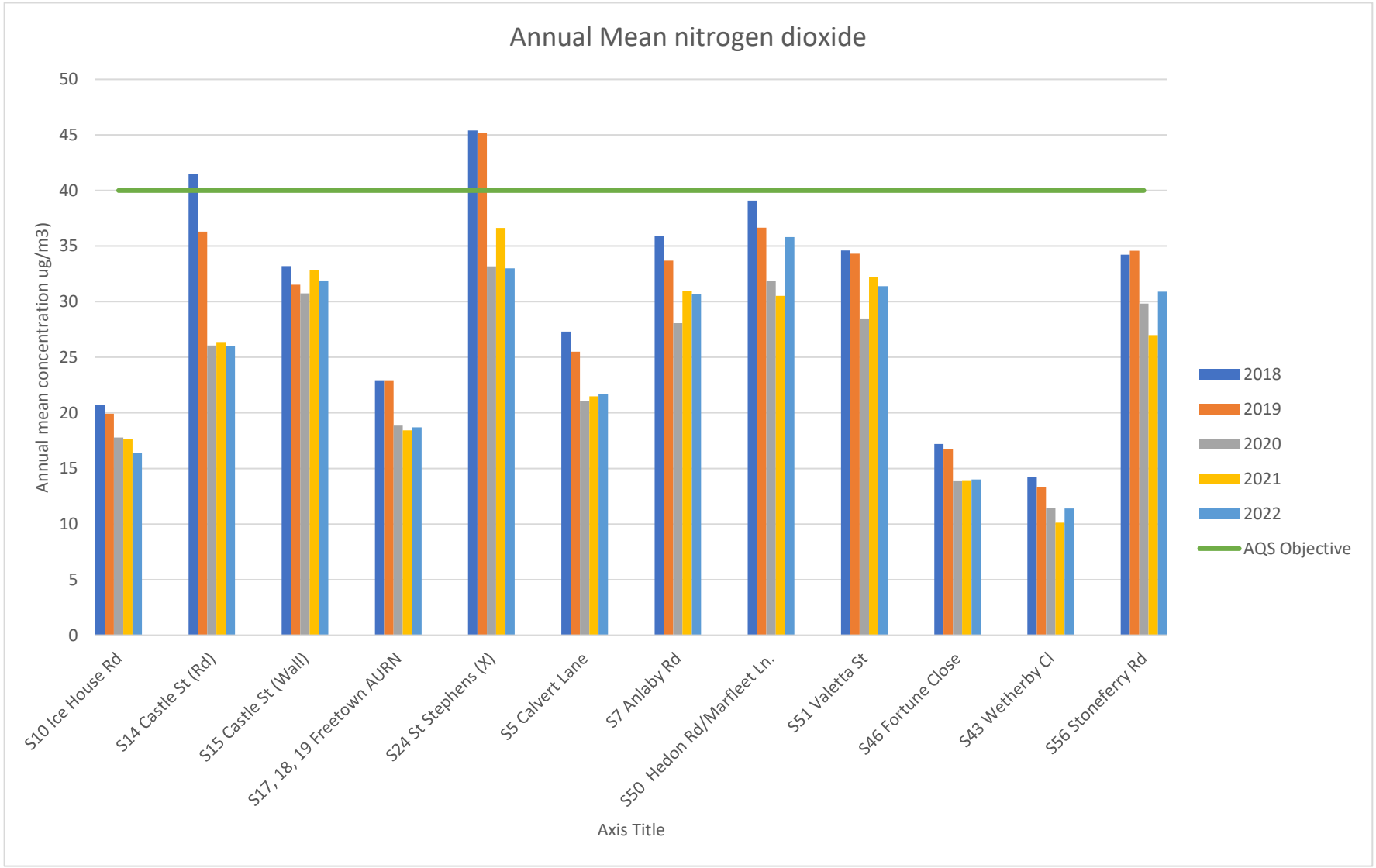


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	513309	429319	Industrial	99.9	99.9				0	0
CM2	509482	429322	Urban Background	99	99	0	0	0	0	0
CM3	511794	430511	Roadside	98	98	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.6 – Annual Mean PM_{10} Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM2	509482	429322	Urban Background	100	100		15	15	14	15
CM3	511794	430511	Roadside	95	95	20	21	20	18	19

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	513309	429319	Industrial	99	99			0	3	8
CM2	509482	429322	Urban Background	99	99		0	0	0	0
CM3	511794	430511	Roadside	88	88	2 (34)	9	0	1	0

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM2	509482	429322	Urban Background	100	100	11	11	9	8	9

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.**

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.9 – SO_2 2022 Monitoring Results, Number of Relevant Instances

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	Number of 15-minute Means > 266µg/m³	Number of 1-hour Means > 350µg/m³	Number of 24-hour Means > 125µg/m³
CM2	509482	429322	Urban background	95	95	0	0	0

Notes:

Results are presented as the number of instances where monitored concentrations are greater than the objective concentration.

Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year).

If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO_2 2022 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1	510721	428732	27.3	23.1	35.0	26.0	18.8	16.3	17.8	22.7	23.9	22.2	24.5	30.9	24.0	18.5	-	
2	508140	427802	43.5	32.1	52.9	39.9	25.9	32.8	32.4	31.6	31.1	33.4	34.4		35.5	27.3	-	
3	507972	427770	36.9	37.7	46.2	27.0		30.5	31.2	33.3	32.5	32.5	37.0	42.4	35.2	27.1	-	
4	506018	428892	37.1		44.6		15.9	12.1	22.8	20.3	22.7	22.8	31.0	32.4	26.2	20.2	-	
5	505914	429362	32.7	24.0	38.4	32.3	17.8	15.1	24.8	27.6	29.1		34.3	33.7	28.2	21.7	-	
6	507331	428719	23.8	35.9	54.7	32.9	34.5	34.5	36.5	38.7	36.5	38.4	37.3	40.6	37.0	28.5	-	
7	507345	428738	57.3	39.6		38.6	36.2	36.6	34.2	37.1	41.2	39.5	34.8	43.2	39.8	30.7	-	
8	508149	428670	52.8	35.5	52.7	37.1	37.1	36.7	38.1	40.5	38.7	40.1	45.0	42.8	41.4	31.9	-	
9	508413	428659	47.5	41.3	38.9		29.7	30.6	27.5	27.9	27.7	31.3	11.6	<0.5	31.4	24.2	-	
10	508905	428502	31.8	20.5	31.6	23.3	15.7	11.5	15.1	18.4	19.9	21.6	20.8	25.9	21.3	16.4	-	
11	508489	427986	46.0	22.9		23.7	29.2	30.6	29.0	26.5	26.4	40.5	31.6	37.0	31.2	24.0	-	
12	508921	428659				37.5	30.0	24.9	25.3	33.7	29.6	28.7	25.7	42.5	30.9	23.8	-	
13	509727	428473	47.6	33.6	40.6	26.9	31.0	32.5	28.7	28.5	28.1	36.0		40.6	34.0	26.2	-	
14	509917	428437	53.0	35.4	38.2	33.3	29.4	28.9	29.5	31.6	37.5	28.0	20.9	39.9	33.8	26.0	-	
15	509913	428446	53.6	37.7	50.6	38.7	35.5	34.6	38.4	37.7	47.0	34.6	40.6	47.5	41.4	31.9	-	
16	510039	428687	49.3	38.2	38.3	29.7	32.2	31.8	27.8	29.7	28.5	38.2	38.0		34.7	26.7	-	
17	509482	429322	28.9	26.7	33.6	19.2	19.2	19.5	19.1	17.7	18.4	22.3	26.7	33.0	-	-	-	Triplicate Site with 17, 18 and 19 - Annual data provided for 19 only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
18	509482	429322	44.5		33.4	21.0	18.7	18.2	18.7	18.0	18.0	26.9	25.4	30.1	-	-	-	Triplicate Site with 17, 18 and 19 - Annual data provided for 19 only
19	509482	429322	33.0	28.3	32.6	19.7	18.3	19.3	18.5	16.6	18.1	27.6	28.7	29.1	24.3	18.7	-	Triplicate Site with 17, 18 and 19 - Annual data provided for 19 only
20	509465	429281	47.9	33.9	35.2		26.4	29.1	27.4	21.7	26.8	36.7	35.8	36.4	32.5	25.0	-	
21	509125	429228	48.2	37.1	53.8		32.5	37.5	38.1	33.6		40.1	38.4		39.9	30.7	-	
22	509273	428811	61.9	52.2	45.6	41.4	45.3	45.2	32.7	34.3	41.7	42.4	31.0	45.5	43.3	33.3	-	
23	509299	428797	51.6	43.2	36.5	28.8	49.3	30.2	26.4	25.2	28.5	30.3	28.8	39.2	34.8	26.8	-	
24	509186	428904	58.5		50.0	37.4	29.4	47.5	43.3	37.2	42.9	41.2	29.3	54.9	42.9	33.0	-	
25	509198	429022	49.5	37.4	59.4	35.5	33.5	37.6	35.2	32.5	36.8	36.6	35.5	48.0	39.8	30.6	-	
26	509134	429115	47.3	35.9	48.8		32.7	33.6	35.5	35.9	39.5	30.1	34.4	44.6	38.0	29.3	-	
27	509202	428944	65.1	52.6	56.8	43.1	46.9	47.0	46.2	43.2	48.4	50.4	51.9		50.1	38.6	31.5	
28	509102	429228	44.0	43.8	50.4	37.3	31.6	39.2	35.7	29.7	35.6	36.0		43.8	38.8	29.9	-	
29	509004	429312		42.2	58.8	33.9	36.4		44.6	41.2	44.5	51.1	52.0	51.3	45.6	35.1	-	
30	508865	429378	43.7	32.6	44.5		28.7	25.8		32.7	34.7	34.3	37.0	37.2	35.1	27.0	-	
31	508819	429372	37.1	28.6	50.5		25.9	27.6		29.7	34.0	33.9	33.7	43.7	34.5	26.5	-	
32	508241	429602	71.1	47.1	46.1	31.2	25.1	40.9	38.2	29.5	22.7	51.2		50.0	41.2	31.7	-	
33	508780	428925	38.0	27.9	47.6	30.3	23.4		28.4	28.0	28.7	29.0	33.2	34.2	31.7	24.4	-	
34	508233	429887	41.9	34.1	45.2	28.3	36.3	22.2	26.5	26.2	28.6	60.9	32.9	44.8	35.7	27.5	-	
35	508327	429572	59.2	42.5	53.4	34.2	38.4	37.8	41.0	35.8	37.4	48.6	48.6	47.2	43.7	33.6	-	
36	508201	429800	61.9	54.9	54.8		41.5	49.1		34.4	43.7	57.7	36.6	60.5	49.5	38.1	33.6	
37	508537	429492	35.9		39.6	23.9	23.3	27.4	25.1	23.6	36.3	31.1	29.3	37.8	30.3	23.3	-	
38	508258	429939	51.9	36.8	50.6	33.1	26.7	32.7	33.9		34.5	44.1	37.1	<0.5	38.1	29.4	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
39	508276	430730	38.7			17.0	18.4	19.5	20.2	19.7	24.0	26.2	21.1	35.8	24.1	18.5	-	
40	506590	430671	41.7	28.7	36.5	26.0	21.0	19.1	22.8	20.5	24.3	27.6	23.2	35.3	27.2	21.0	-	
41	507876	432075	28.0	17.5	31.0	23.5	15.6	13.3	15.8	8.2	14.2	19.4	20.6	25.2	19.4	14.9	-	
42	508299	432952	46.5	30.0	42.0	24.4	21.8	24.4	24.0	24.7	27.9	32.8	34.2	36.7	30.8	23.7	-	
43	506972	433172	24.9	14.4	19.9	10.9	9.7	9.0	11.8	12.9	9.9	16.5	17.7	19.6	14.8	11.4	-	
44	508698	434348	42.2	24.1	31.3	18.5	15.5	15.2	20.2	17.3	18.1	<0.5	49.9	28.9	25.6	19.7	-	
45	511529	433117	52.4	35.7	40.7	23.2	30.3	31.1	32.3	25.0	26.1	34.8	25.8	43.8	33.4	25.7	-	
46	512678	432075	29.0	19.8	29.2	13.9	12.8	12.7	13.6	12.2	13.2	19.8	18.7	24.0	18.2	14.0	-	
47	511793	430508	49.3	36.1	39.2	25.7		35.9	32.8	26.3	27.8	41.5	7.5	44.6	33.3	25.7	-	
48	513877	430355	42.7	36.0	43.6	22.5	23.2		29.5	21.0	22.6		33.9	34.8	31.0	23.9	-	
49	514113	429329	32.3	39.6	49.4	26.8	33.8	32.7	34.9	27.1	35.3	41.0	36.5	44.0	36.1	27.8	-	
50	514129	429321	59.8	52.8	53.1	46.0	37.9	39.6	42.1	35.9	43.6	49.5	48.8	49.3	46.5	35.8	-	
51	514387	429162	58.7	51.1	46.7	34.3	41.2	34.3	32.7	30.7	42.0	39.8	33.0	44.5	40.8	31.4	-	
52	514195	432166					39.3	39.6	38.5	35.0	38.1	40.2	26.8	47.4	38.1	31.9	-	
53	511024	430853	42.6	30.6	34.9	22.3	20.1	18.2	20.1	18.0	20.7	27.5	29.9	31.3	26.4	20.3	-	
54	510317	431730	53.4	44.8	38.8	38.5	36.9	41.9	38.1	38.8	<0.7	47.3	43.5	57.3	43.6	33.6	-	
55	510320	431650	47.1	42.4			35.9	34.9	37.5	40.0	44.0	47.3	46.8		41.8	32.2	-	
56	510380	431236	51.9	42.1	45.7	33.9	31.9	34.6	35.3		38.3	42.7	38.0	47.6	40.2	30.9	-	
57	509941	431405	39.9	31.9	43.6	25.8	20.2	23.0	26.5	23.2	27.1	32.3	32.1	32.8	29.9	23.0	-	
58	508603	431582	44.2	36.7	56.5	35.4	29.9	35.1	33.2	30.3	36.7		44.1	43.8	38.7	29.8	-	
59	508520	431875	48.1	35.0	41.0	31.2	33.3	32.4	38.7	27.8	36.4	36.6		<0.5	36.1	27.8	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
60	508741	431050	49.4		52.0	33.9		31.3	31.0	29.1		35.5	38.7	52.4	39.3	30.2	-	
61	508918	430568	36.6	32.4	44.4	31.2	34.0	38.0	36.5	32.4	40.3	35.5	40.3	41.4	36.9	28.4	-	
62	510364	430215	44.6	37.2	42.3	33.6	29.9	25.0	27.5	26.0	27.6	36.3	43.7	39.2	34.4	26.5	-	
63	508929	430340	52.7	40.9	41.5	29.0	23.3	33.7	30.8	26.5	34.0	39.4	23.4	<0.5	34.1	26.3	-	
64	509155	429125	58.7	40.7	49.6	33.9	<0.5	38.1	38.1	36.6	30.1	39.0	21.3	46.7	39.3	30.3	-	
65	513309	429319	43.3	34.3	37.0	40.3	24.3	21.5	24.1	25.4	29.3	24.3	23.5	35.3	-	-	-	Triplicate Site with 65, 66 and 67 - Annual data provided for 67 only
66	513309	429319	41.9	34.0	39.5	36.1	25.0	20.6	24.3	24.9	30.5	23.5	24.0	34.2	-	-	-	Triplicate Site with 65, 66 and 67 - Annual data provided for 67 only
67	513309	429319	33.8	37.9	38.2	31.4	24.1	20.7	24.9	24.5		26.5	22.3	35.0	29.7	22.9	-	Triplicate Site with 65, 66 and 67 - Annual data provided for 67 only

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **Kingston upon Hull City Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

QA/QC of Automatic Monitoring

General

"Monitoring" means the use of devices (of different degrees of sophistication) to measure the concentration of specific pollutants at a given point.

The technology now exists to monitor air quality automatically with good accuracy, precision and time resolution: An extensive national network has been established over the last few years with such equipment, including monitoring sites in Hull.

Hull City Council has also established its own monitoring station and other sites for nitrogen dioxide diffusion tubes throughout the City.

As a general rule, the better and more detailed the data produced by a piece of equipment, the more expensive it tends to be to buy and operate. However, cheap simple devices are useful as a survey tool.

Technical details of the various monitoring techniques are summarised in Appendix 3 of Stage Three of Kingston upon Hull City Council Update and Screening Assessment of Air Quality, December 2015. Full details of the analysers can be found in the AUN site operator's manual.

Types of Monitoring

Automatic Analysers

These are sophisticated, automatic instruments that continuously measure pollutant levels. Data is stored and transmitted to a central control-point for checking and analysis. The instruments are subject to elaborate calibration checks to ensure the reliability of the data generated. Variations in pollutant levels can be seen virtually in real time with these instruments.

The Government has a network of these analysers in cities across the United Kingdom, known as the Automated Urban Network (AUN). These are organised in monitoring stations containing instruments for measuring Carbon monoxide, Nitrogen oxides (NO and $N0_2$), Sulphur dioxide, Ozone and PM_{10} particulates. One of the stations is located in Francis Street in the City centre and is managed by the City Council.

The data produced is used nationally to prepare bulletins for TV, Teletext and other media and it is also made available to anyone who wants access to it, for example via the Internet.

Hull City Council had previously established its own network of analysers approved to a similar standard, but now operates one automatic site. These were used to investigate air quality at different places of interest in the city.

New or Changed Sources Identified Within Kingston upon Hull During 2022

There have been a number of new sources identified during 2022, which are all associated with changes to the Highways Network and are liable to run in to future years. Stationary developments are controlled through the Planning regime which is supported by the Environmental Quality Supplementary Planning Document we have in place, which enables us to ensure that background creep of levels is minimised or even eliminated.

For the changes to the Highways Network, we have built further upon the earlier close liaison we have with colleagues in the Highways Department, as well as National Highways, to ensure that the air quality impacts are fully considered.

Areas we are looking closely at include the various schemes initiated and proposed for cycle lanes, changes to Stoneferry Road, and the on-going work by National Highways on the A63.

Additional Air Quality Works Undertaken by Kingston upon Hull City Council During 2022

We have been involved in a number of studies with Hull University, associated with micro-plastics in the atmosphere, as well as some funding bids to investigate indoor air quality.

QA/QC of Diffusion Tube Monitoring

QA/QC of Diffusion Tube Monitoring

Summary of Method

Where NO_2 is monitored using diffusion tubes, the standard method recommended by NETCEN in the "UK NO_2 Diffusion Tube Survey Instruction Manual" is followed. (This method is based on the Harwell Laboratory Report, reference AERE-R12133, "Measurement of NO_2 in the Outdoor Environment Using Passive Diffusion Tubes", C.H.F. Atkins, February 1996).

NO_2 diffusion tubes are clear plastic tubes, with one open end and a closed end containing a NO_2 absorbing chemical matrix (triethanolamine). The open end is sealed with a plastic cap before it is transported to the site. At the site, the cap is removed and the tube is mounted vertically with the open end at the bottom.

The device operates on the principle that during exposure nitrogen dioxide in air will migrate to the absorbent at a rate dependent on several quantifiable variables defined by Fick's First Law of Diffusion:

- The path length between the top surface of the monitor and the absorbent matrix
- The cross-sectional area of the sampler
- The exposure time
- The diffusion coefficient of nitrogen dioxide through air
- The ambient concentration of nitrogen dioxide

At the end of the monitoring period, the tubes are re-sealed and returned to the laboratory where they are analysed by a colorimetric method.

Description of Monitoring Sites

General

In Hull, diffusion tubes have been used to monitor nitrogen dioxide since 1992. Previously there were 53 tubes at 49 sites that consist of 4 former UK Survey sites and 45 permanent sites (which have built up to this number since 1992). In November 2020, we added an additional 90 sites along the key road networks so that we had information on general trends, as we were aware of a number of proposed changes to the Highway Network.

We have subsequently revisited our monitoring strategy, and now have 67 diffusion tubes sited around the area.

These tubes are used to monitor general urban air pollution therefore are not located close to industrial sources. The sites that have been selected are in areas where people are present. Local knowledge has been used to select the most appropriate sites, which fall into three categories.

(a) Near-road site (kerbside):

These are situated close to a busy road (1-5m from a kerb edge). This is to show the maximum concentration of NO_2 to which people may be exposed (even if it is only for short periods).

(b) Intermediate:

These are sites at distance of 20-30m from a busy road. These are to show how much NO_2 people living close to busy roads are exposed to. In Hull, large numbers of people live in areas close to busy roads. Here the NO_2 may not be as high as that measured close to the road but may not be as low as typical urban background locations.

(c) Urban background:

These are sites at least 50m from a busy road. At these locations, the NO_2 concentrations will have equilibrated to a general urban background level.

Revised Guidance

In August 2000 AEA Technology issued revised guidance regarding the classification of “Intermediate sites”. They state that the above mentioned intermediate site classification is no longer consistent with Technical Guidance Note LAQM TG1 and therefore ‘Intermediate’ sites have been dropped from the Network.

Long term survey

A comprehensive site survey has been in progress since 1992, with diffusion-tubes being exchanged at each site monthly. Monthly data is therefore available for complete years from 1993 to 2022 inclusive, apart from minor gaps.

Quality Assurance and Quality Control

Diffusion tube preparation and handling

The interval between preparation and analysis is kept to a minimum (NO_2 tubes are known to degrade with storage). During storage the tubes are kept in a sealed plastic bag in a refrigerator.

The laboratory used for NO_2 diffusion tube analysis during 2010 was South Yorkshire Air Quality Samplers of Sheffield, but we have since changed to Environmental Scientifics Group of Didcot, who state that the samples have been analysed in accordance with SOCOTEC’s standard operating procedure ANU/SOP/1015 Issue 1. This method meets the guidelines set out in DEFRA’s ‘Diffusion Tubes For Ambient NO_2 Monitoring: Practical Guidance.’

The tubes were prepared by spiking acetone:triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and

the extract analysed using a segmented flow autoanalyser with ultraviolet detection. All samples were received in good condition, unless otherwise stated in the comments field of results table. Please note:

(i) As set out in the practical guidance, the results were initially calculated assuming an ambient temperature of 11^{o}C, the reported values **have** been adjusted to 20^{o}C to allow for direct comparison with EU limits.

(ii) The reported results have not been bias adjusted.

This analysis of diffusion tube samples to determine the amount of nitrogen dioxide present on the tube is within the scope of our UKAS schedule. Any further calculations and assessments requiring exposure details and conditions fall outside the scope of our accreditation. In the AIR PT intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes, SOCOTEC currently holds the highest rank of a **Satisfactory** laboratory.

Diffusion tube positioning

In August 2000 AEA Technology issued revised guidance regarding the classification of “Intermediate sites”. They state that the above mentioned intermediate site classification is no longer consistent with Technical Guidance Note LAQM.TG1 and therefore “Intermediate” sites have been dropped from the Network.

The tubes are mounted on a mixture of lighting columns and drain pipes. No tubes are placed in recesses or corners as these can be subject to increased turbulence or stagnant air. The tubes are mounted on to spacer blocks (e.g. a plastic block) and not attached directly to any surface. However, this makes them more prominent, therefore more prone to theft. Ideally, tubes should be placed head height, but some have been placed higher where they are unlikely to be stolen.

Each site has a unique number and the tube exposed at that site is given the same number so it can be identified during analysis. A careful record is made of the start and end date/time of the exposure period.

Time exposure and limitations of technique

The time resolution of this technique is limited and can only provide information on the integrated average NO_2 concentration over the exposure period (typically 1-4 weeks). The tubes in Hull are exposed for approximately 4 weeks. Therefore the tubes cannot be used to check compliance with average hourly and daily air quality standards.

Diffusion Tube Annualisation

All sites with data capture less than 75% but greater than 25% were annualised in line with current guidance and detailed in Table C2 below.

Table C.1 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Hull ABP	Annualisation Factor Hull Freetown AURN	Annualisation Factor Hull Holderness AURN	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
52	1.1305	1.0914	1.0395	1.0871	38.1	41.4

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

The diffusion tube processing tool spreadsheet (v.1.) for diffusion tube precision and accuracy returned the following values for tri-located diffusion tubes:

Local Bias adjustment - Freetown Way	0.73
National factor.	0.77

It was decided to use the factor of 0.77 as the correction for the diffusion tube data, as with due consideration to the comments in the previous Defra appraisal, and that the local value from Freetown Way Urban background site whilst possibly appropriate, was not quite as consistent with previous values as the factor derived from the national scheme.

Sensitivity analysis was carried out, by applying each value to the data in order to determine which seemed to correlate more with the results of previous years, as well as the real time analysers.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	3/23	0.77
2021	National	03/22	0.78
2020	National	03/21	0.77
2019	National	03/19	0.77
2018	National	03/18	0.76

Table C.3 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2
Periods used to calculate bias	11	12
Bias Factor A	0.74 (0.71 - 0.77)	0.73 (0.62 - 0.89)
Bias Factor B	36% (30% - 41%)	37% (13% - 60%)
Diffusion Tube Mean (µg/m^3)	23.3	29.7
Mean CV (Precision)	4.3%	4.8%
Automatic Mean (µg/m^3)	17.1	21.8
Data Capture	98%	97%
Adjusted Tube Mean (µg/m^3)	17 (17 - 18)	22 (18 - 26)

Notes:

A single local bias adjustment factor has been used to bias adjust the 2022 diffusion tube results.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in $\mu g/m^3$)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
27	1.0	4.0	38.6	13.0	31.5	27
36	3.0	6.0	38.1	13.0	33.6	36

QA/QC of Automatic Monitoring

Quality Assurance

When carrying out a Review and Assessment of air quality or simply monitoring to provide information on air quality for the public, the data collected must be trustworthy and scientifically credible. It is vital, when monitoring pollution to know the accuracy and precision of the technique used.

Accuracy is defined as "the closeness of agreement between a single measured value and the actual air quality characteristic or its accepted reference value".

Precision is the "closeness of agreement between mutually independent test results obtained by repeating a measurement several times under stipulated conditions".

Another important aspect of monitoring is data capture. This is the proportion of the time that the instrument in question is gathering good data, i.e. it is not malfunctioning or out of service. With respect to monitoring performed in connection with LAQM, Review and Assessment, the statutory Guidance prescribed 90% data capture as the minimum standard to aim for.

Detailed, documented procedures are laid down to ensure that accuracy and precision is kept with acceptable limits. These are referred to as Quality Assurance/Quality Control ("QA/QC") procedures. In compliance with the Government Guidance detailing how this Review and Assessment should be done, full details of these matters, together with estimates of the accuracy and precision of the various monitoring techniques used are set out in Review and Assessment: Technical Guidance LAQM. TG(16) DEFRA.

The factors taken into account can be summarised as follows:

• Site Selection:

Sites are chosen to represent the appropriate site classification, as discussed above.

Sites should be broadly representative of population exposure, if that is their purpose. Sites that are likely pollution "hotspots" will be selected using a combination of local knowledge, passive diffusion tube data, traffic flow and other emissions data and model simulations.

• Equipment Selection

Except for broad survey work, the most accurate and proven analytical technique for each pollutant is selected, using equipment which has been type tested and approved by an expert Government body, the National Air Quality Technical Centre (NETCEN). It is important to ensure the intercomparability of measurements made between sites, not only across Hull, but also across the UK and beyond.

• Equipment Maintenance

As well as regular inspections of equipment and checks on the data being collected by Council staff, service agreements are in place with suppliers of the equipment to ensure regular preventative maintenance and prompt rectification in the event of malfunction.

• Calibration

With simpler techniques like diffusion tubes, precise procedures are also laid down. These include the use of "blank" tubes to act as controls and periodic intercomparison exercises between analytical laboratories to ensure that uniform standards are maintained.

• Data Collection, Processing and Validation

From April 2013 until May 2019, data was managed by SupportingU in line with AURN procedures and the results displayed on www.air-quality.net. Since May 2019, the equipment is maintained by Enviro Technology, with the data being managed by AQDM, whose QA/QC procedures are shown below.

QA/QC of Automatic Air Quality Instruments

Air quality measurements from the automatic instruments are validated and ratified by Air Quality Data Management (AQDM) http://www.aqdm.co.uk to the standards described in the Local Air Quality Management – Technical Guidance LAQM (TG16) https://laqm.defra.gov.uk/technical-guidance.

Validation

This process operates on data during the data collection stage. All data are continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference, or other disturbances. Automatic screening can only safely identify spurious results that need further manual investigation.

Raw data from the gaseous instruments (e.g. NO_x, O_3, SO_2 and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity may change over time. Regular calibrations with certified gas standards are used to measure the zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g. PM_{10} and $PM_{2.5}$) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling is applied and all anomalies are appropriately edited. Generally this operates at three, six or twelve month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three and six monthly cycles helps build a reliable dataset that is finalised at the end of the year.

There is a diverse range of additional information that can be essential to the correct understanding and editing of data anomalies. These may include

• the correct scaling of data

• ignoring calibrations that were poor e.g. a spent zero scrubber

• closely tracking rapid drifts or eliminating the data

• comparing the measurements with other pollutants and nearby sites

• corrections due to span cylinder drift

• corrections due to flow drifts for the particulate instruments

• corrections for ozone instrument sensitivity drifts

• eliminating measurements for NO_2 conversion inefficiencies

• eliminating periods where calibration gas is in the ambient dataset

• identifying periods where instruments are warming-up after a power cut

• identification of anomalies due to mains power spikes

• correcting problems with the date and time stamp

• observations made during the sites visits and services

The identification of data anomalies, the proper understanding of the effects and the application of appropriate corrections requires expertise gained over many years of operational experience. Instruments and infrastructure can fail in numerous ways that significantly and visually affect the quality of the measurements. There are rarely simple faults that can be discovered by computer algorithms or can be understood without previous experience.

The PM_{10} and $PM_{2.5}$ concentrations may require scaling into Gravimetric Equivalent concentration units by use of the Volatile Correction Model (VCM) http://www.volatile-correction-model.info or by corrections published by Defra https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme depending on the measurement technique.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

There are two AURN sites within the Authority area, both measure PM_{10}, with the Hull Freetown Site also measuring $PM_{2.5}$. The Authority also has its own air quality monitoring station, which monitors for PM_{10}. The data from this site that is presented in this report is scaled to gravimetric equivalent concentration units by use of the Volatile Correction Model (VCM).

Automatic Monitoring Annualisation

Annualisation is required for any site with data capture less than 75% but greater than 25%. It can be seen from the annualisation data presented in Table C.2. that there was 1 site within the Authority area that required annualising, that being a new site, S52 Diadem Grove.

Table C.5 – Annualisation Summary (concentrations presented in µg/m^3)

Annualisation Summary - Information Only

Go to STEP 3 - Bias Adjustment

Diffusion Tube ID	Annualisation Factor Hull ABP	Annualisation Factor Hull Freetown AURN	Annualisation Factor Hull Holderness AURN	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)	Comments
52	1.1305	1.0914	1.0395		1.0871	38.1	41.4	

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

The Diffusion Tube Data Processing Tool (v3.0) was utilised and showed that fall-off-with-distance calculations were required for two non-automatic monitoring sites located outside of the AQMA. The sites are labelled as S36 Princes Ave and S27 Nero. The output from the Diffusion Tube Data Processing Tool is presented in Table C.4. Distance correction was considered at any monitoring site where the annual mean concentration was greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure (taking the limitations of the calculator into account).

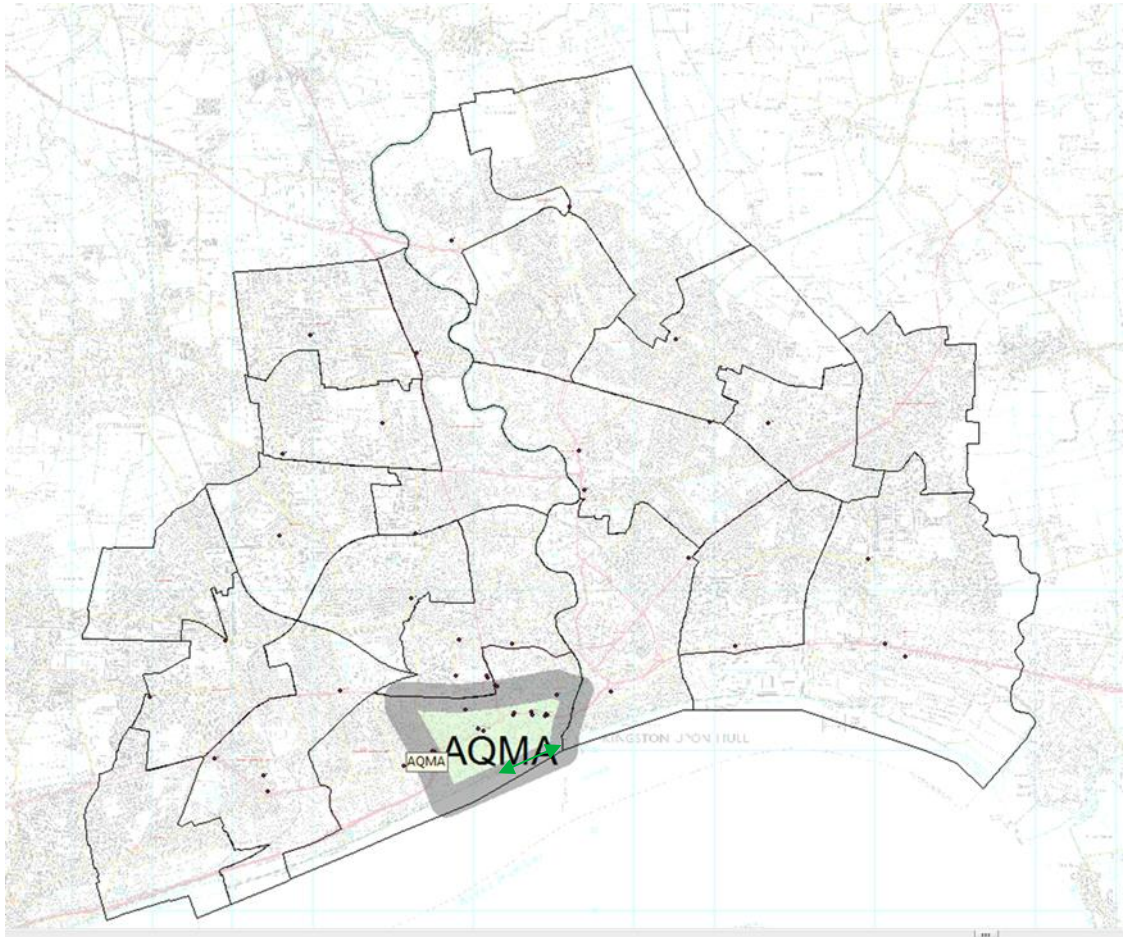
Distance correction should be considered at any monitoring site where the annual mean concentration is greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure (taking the limitations of the calculator into account).

Table C.6 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

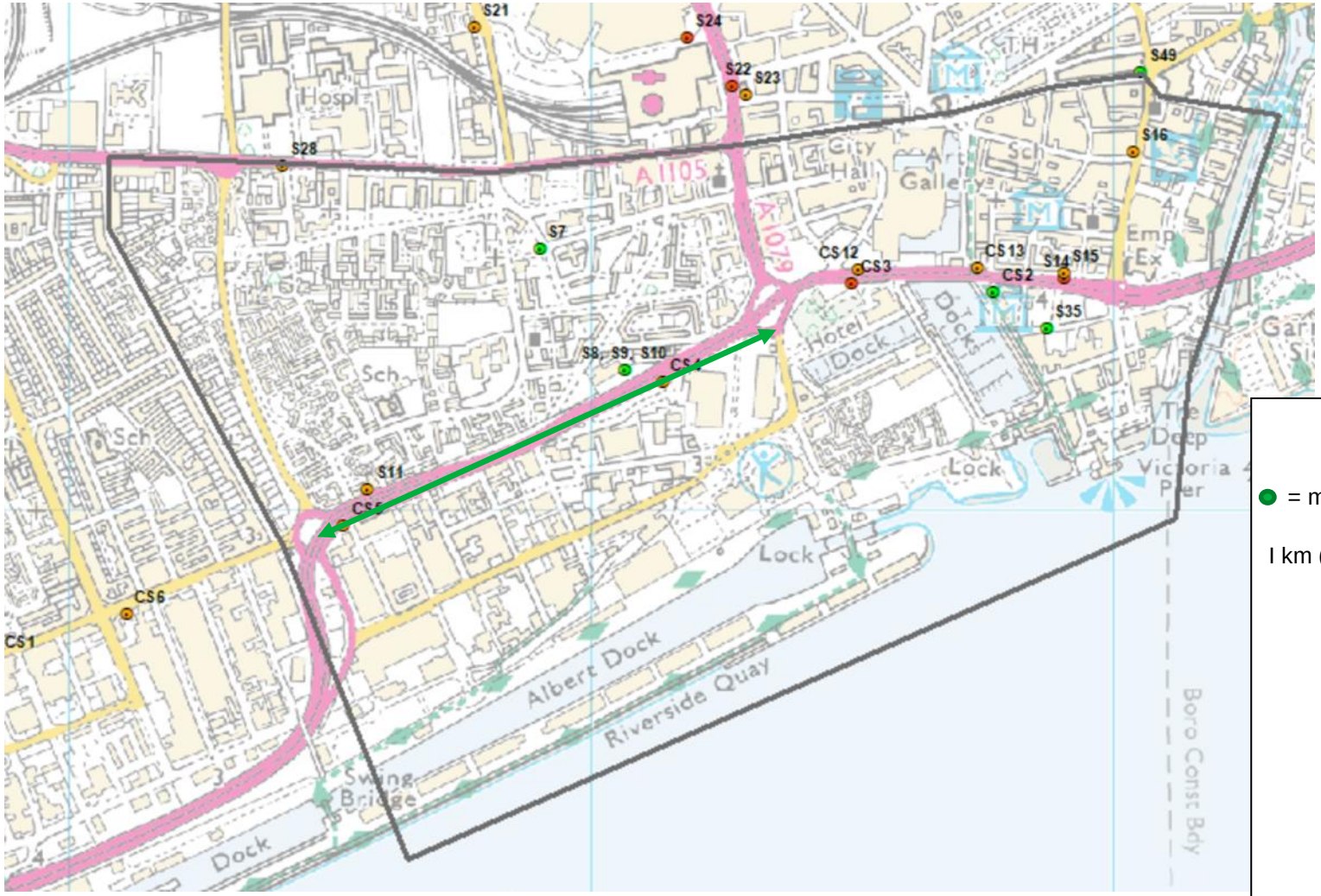
Diffusion Tube ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)		
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted and Annualised	Background	Predicted at Receptor
27	1.0	4.0	38.6	13.0	31.5
36	3.0	6.0	38.1	13.0	33.6

Appendix D: Map(s) of Monitoring Locations and AQMAs

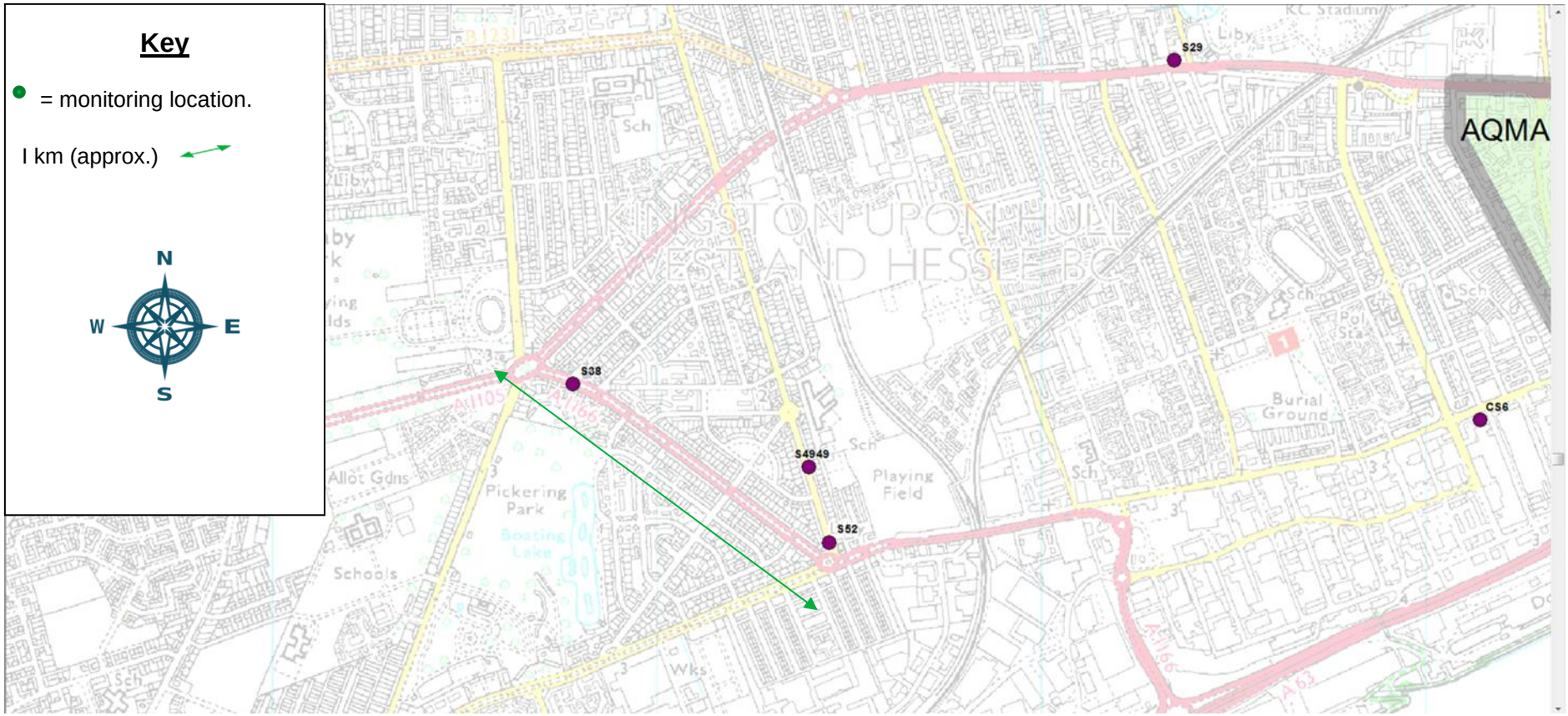
Figure D.1 – Monitoring Locations Overview



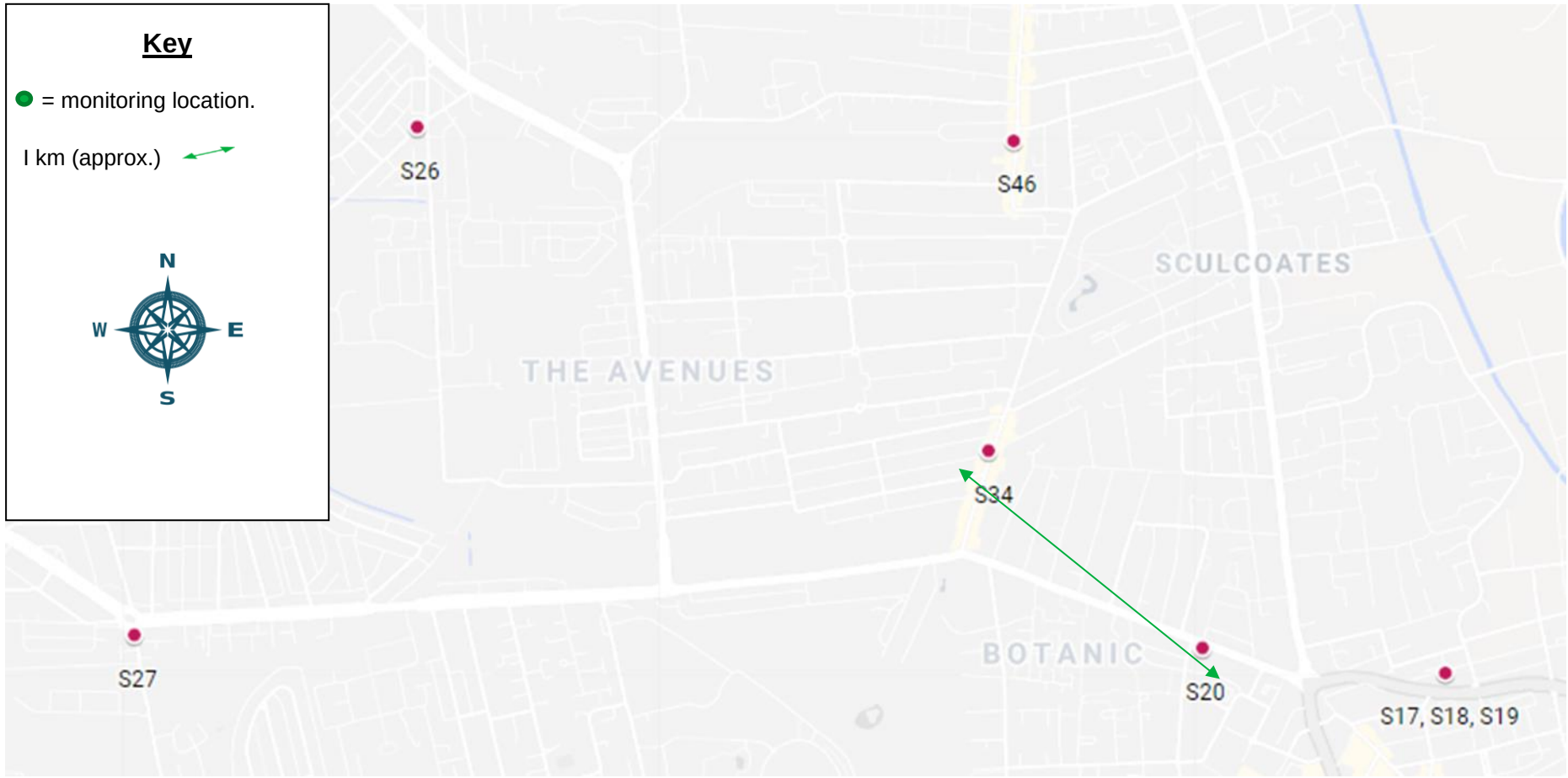
D2 Monitoring Locations in AQMA



D3 Monitoring Locations West

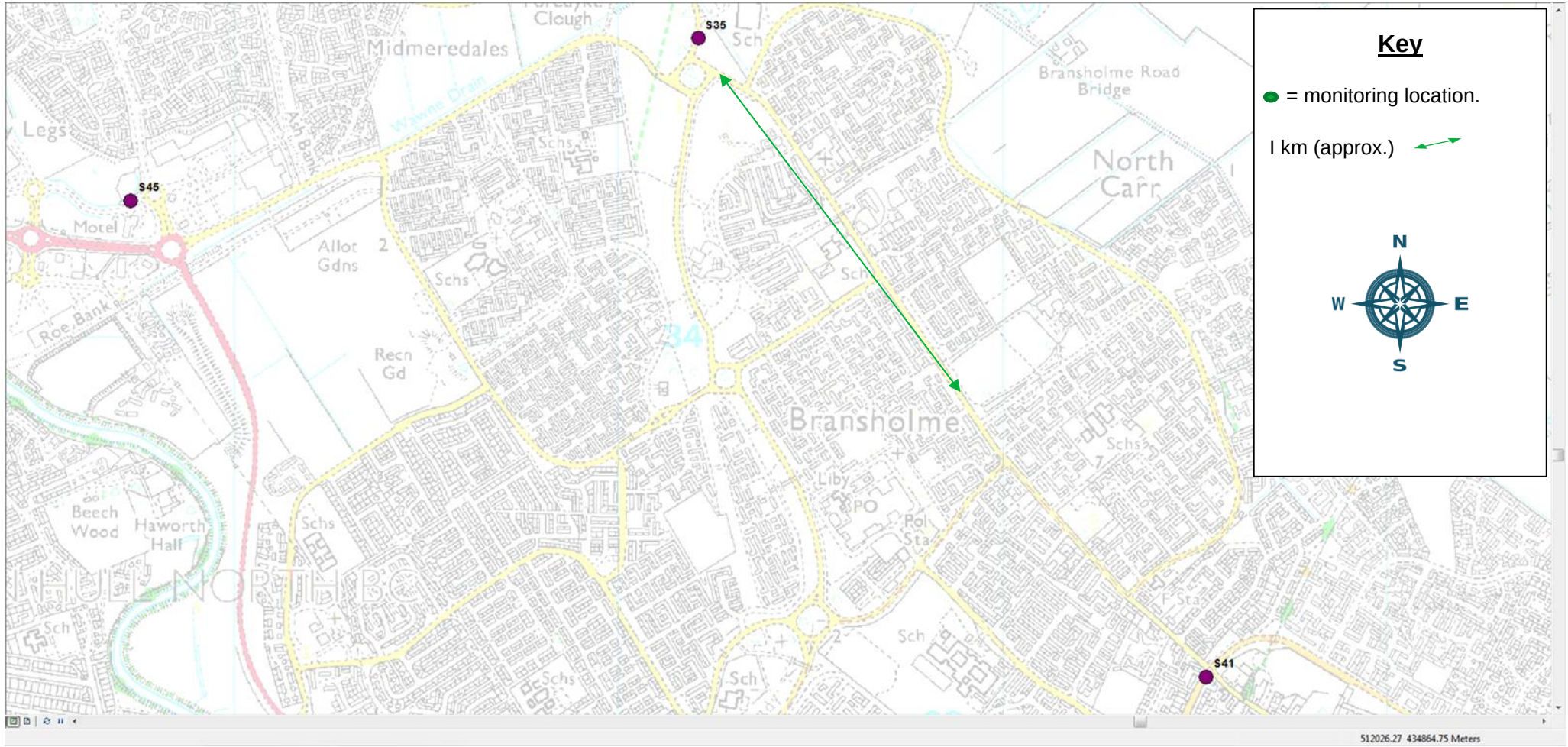


D4 Monitoring Locations North West

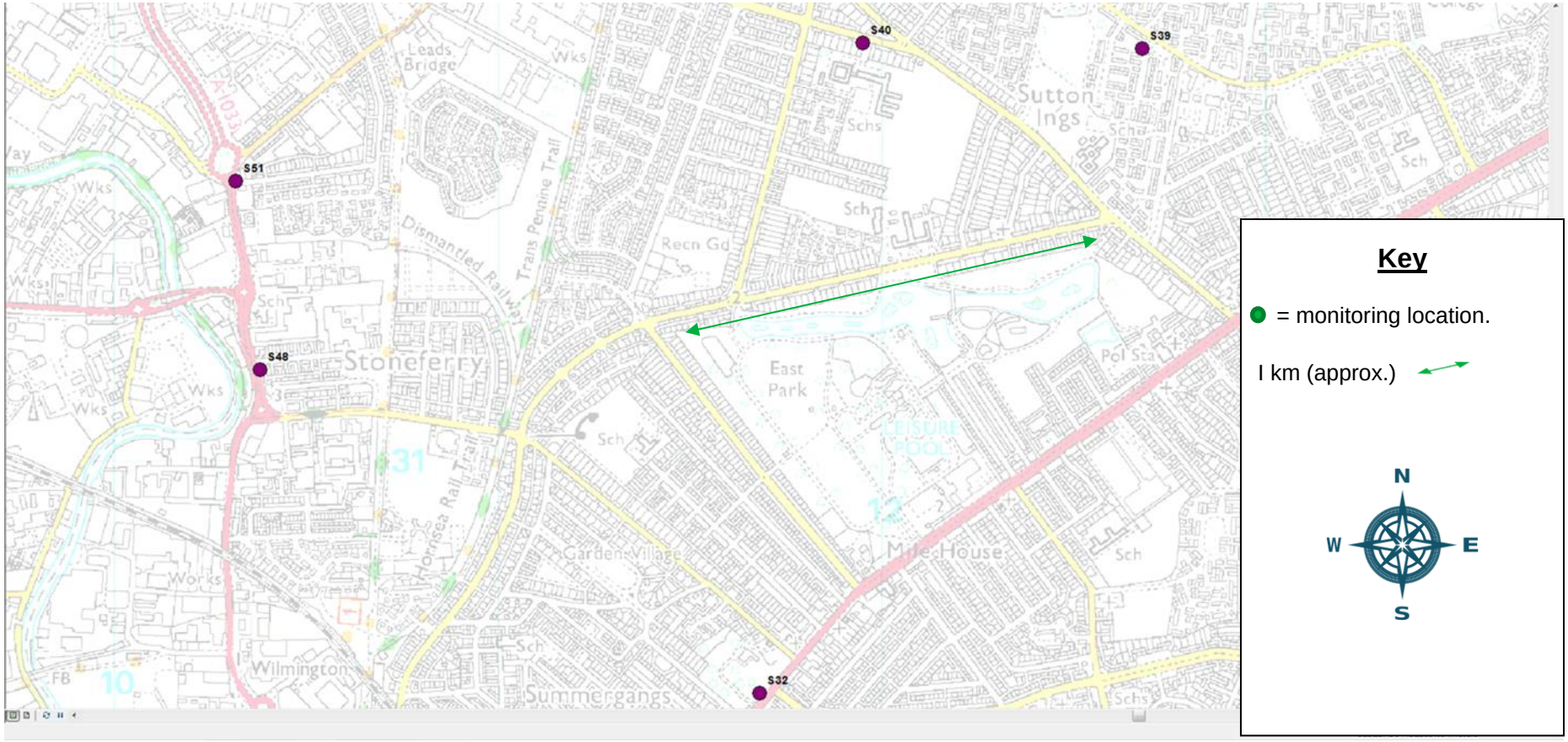


D5 Monitoring Locations North.

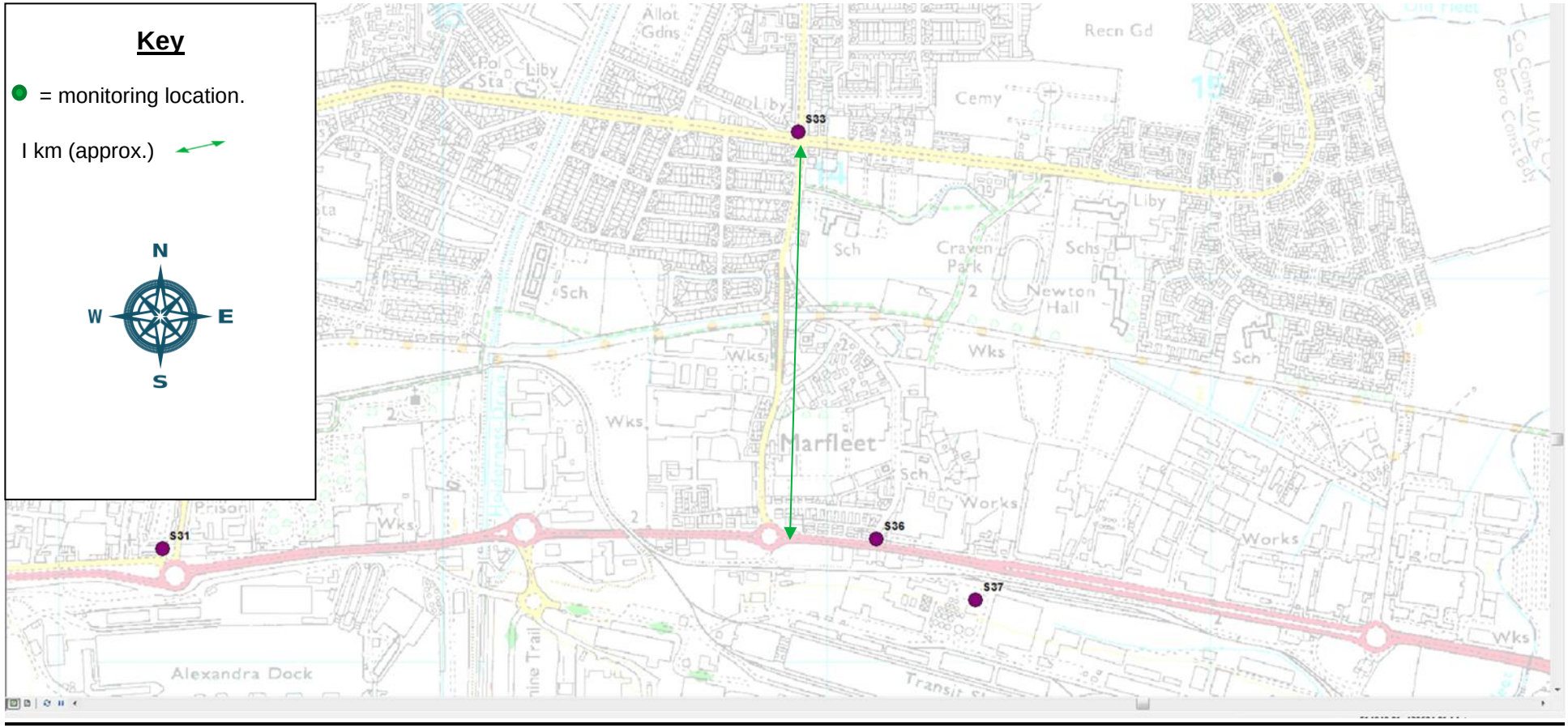
D6 Monitoring Locations Kingswood



D7 Monitoring Locations North East



D8 Monitoring Locations East



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[7] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Appendix F: Achievements Priorities and Problems. As presented to Kingston upon Hull City Council Cabinet.

Kingston upon Hull City Council has taken forward a number of direct measures since the last Cabinet report of March 2021 in pursuit of improving local air quality and in addition to those listed in previous reports, the following measures have been achieved.

The focus to date has primarily been on NO_2, but as current monitored levels indicate that the success of our actions so far mean that the objective for NO_2 is liable to be achieved, and also to fulfil our obligations to the National Air Quality Strategy, the future emphasis will be more towards $PM_{2.5}$.

1. Achievements

The ASR mentioned above demonstrates that the Air Quality Objectives are being achieved across the Authority Area, and that this is consistent with the longer term trend.

Kingston upon Hull City Council is taking the following measures to address $PM_{2.5}$: $PM_{2.5}$ has been monitored at one site in Kingston upon Hull since the 27th of August 2008. The finer particulates are targeted instead of PM_{10} to align more closely with reports from Public Health England and health interests of the Joint Strategic Needs Assessment.

a) Kingston upon Hull City Council is taking forward measures within the Air Quality Strategy, which incorporates the Action Plan, which will help to address $PM_{2.5}$ concentrations. The measures which focus on behavioural change should also reduce $PM_{2.5}$ emissions from transport, as well as the proposals for the A63 Trunk Road and the changes to the traffic light system, which will help reduce fuel usage to some extent (by smoothing traffic flow), and hence $PM_{2.5}$ emissions.
b) As mentioned in the previous reports, Kingston upon Hull City Council continues to work with Public Health colleagues to prioritise action on air quality in their local area to help reduce the health burden from air pollution. The Public Health

Outcomes Framework (PHOF) is a Department of Health data tool for England, intended to focus public health action on increasing healthy life expectancy and reducing differences in life expectancy between communities. The PHOF includes an indicator, based on the effect of particulate matter ($PM_{2.5}$) on mortality. The approach used in partnership with Public Health colleagues includes the encouragement of active travel, which will also have wider public health benefits captured in other indicators such as increased physical activity (indicator 2.13) and reducing excess weight at various ages (indicators 2.6 & 2.12). NICE guidance on air pollution and health is in draft at this current time. When this has been adopted the measures suggested by the NICE guidance on control and reduction of $PM_{2.5}$ emissions will be adopted.

c) Transport is a significant source of local $PM_{2.5}$. Kingston upon Hull Local Transport Plan 2011 sets out a number of measures by which it aims to improve air quality in Kingston upon Hull that will have an effect on the levels of $PM_{2.5}$. For example, Chapter 11 of the plan looks at Air Quality, and states that:

- The Council already has a network of 52 electric vehicle charging points, 14 of which are located in George Street multi-storey and the rest are at Council buildings and depots. The charging points were installed when the Council had an electric vehicle fleet five years ago before the manufacturer withdrew from the market.

  The Council was part of a Yorkshire bid for funding from the Plugged in Places initiative to develop a network of charging points throughout Yorkshire including up to 70 additional charging points in 37 locations throughout the City. Unfortunately, the bid was unsuccessful, but the Council is still looking for alternative sources of funding to progress this initiative.

- The Council is currently purchasing 10 electric vehicles a year as part of the decarbonising of its fleet and has added a number of electric pool vehicles for use by staff.

- Investigations into reducing tyre wear are ongoing.

The above measures have since been enhanced, with an additional 12 public charge points, and an additional 20 for its own fleet, with plans to install 20 more over the next two years.

d) The recent Carbon Neutral Strategy supports Hull City Council's Air Quality Strategy by seeking to increase modal shift to more sustainable transport options

as well as increase the adoption of electric vehicles though an expanded charging infrastructure. It also supports a variety of measures, such as alternative fuels to diesel, and options for fuelling heavier vehicles to encourage the decarbonisation

e) Air Quality is a key element in the Local Plan for Kingston upon Hull, and the reduction of $PM_{2.5}$ will be considered within this.

f) The planning system is inevitably focussed on addressing issues within the AQMA declared for NO_2. However, it is important that measures to address NO_2 do not inadvertently increase $PM_{2.5}$ concentrations. One example of this may be through giving centralised energy plant consent without fully assessing the impacts on PM_{10} and $PM_{2.5}$ concentrations. A Supplementary Planning Document has been produced, and was adopted as part of the Local Plan 2018. We continue to apply the requirements of this when commenting on planning applications and ensure that they meet the requirements of Hull City Council's Air Quality Strategy. The aim is to minimise emissions to protect health.

g) The existing 25 Smoke Control Orders in force in the City, were enacted between 1959 and 1992, and can be the cause of some confusion. An order was made for these to be revoked, and replaced by a single, clearer Smoke Control Order covering the whole of the City. This came into force in June 2020. This is seen as an opportunity to raise awareness of the issues around solid fuel combustion and fine particulate.

h) The Hull City Council Action Plan includes measures to ensure that operators of industrial processes subject to an Environmental Permit are encouraged wherever possible to introduce controls that exceed the minimum Permit Condition requirements for minimising emissions. A number of operators have changed their method of operation in order to do so. One such example is a roadstone coating plant that has over the last three years embarked on a large-scale capital investment to try and fully resolve a problem of occasional dust (particulate matter) escapes from aggregate stockpiles and roadways on site during dry weather and to be a better 'neighbour'. Rather than only relying on localised water suppression (e.g., the use of a water bowser) this has involved a significant amount of work identifying the Yorkshire Water main supply to the Freightliner Road area in order to secure permission to 'tap into' the main supply to provide sufficient water resource for a large-scale water storage, capture and spray bar system, backed up with mains supply for extremely dry periods to allow them to keep the site and stockpiles

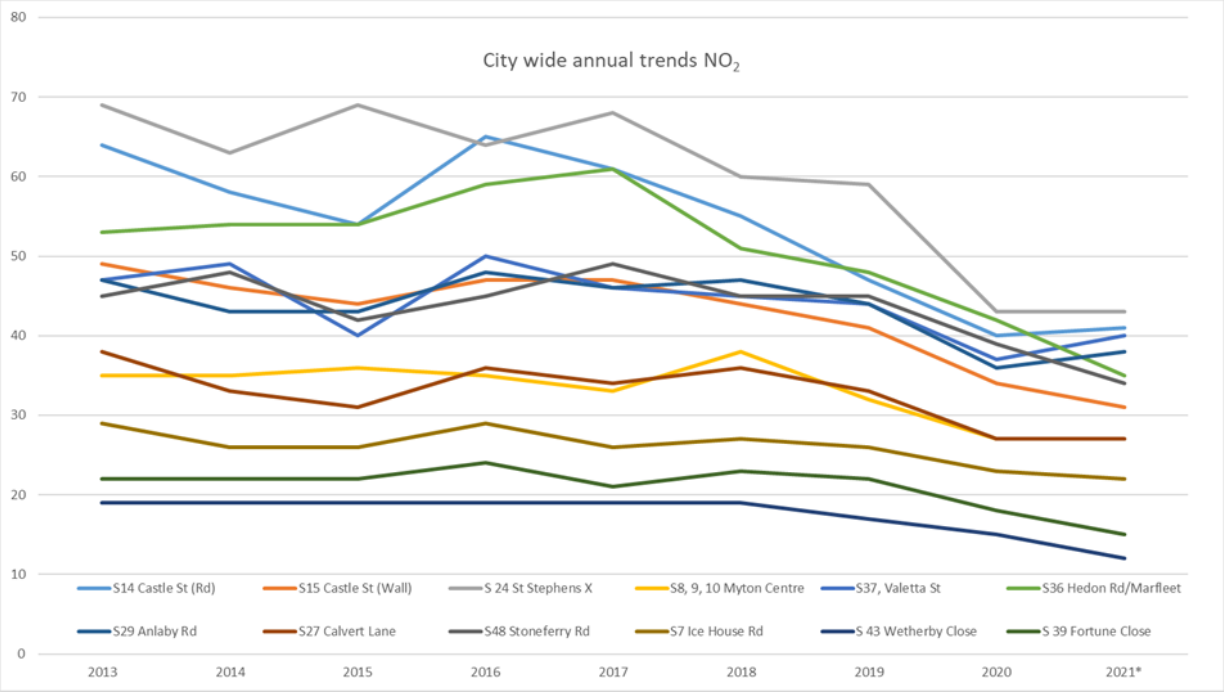
damped down at all times. The system of rainwater harvesting and storage, backed up with mains supply and semi-automated spray bars has recently been completed and is proving to be successful.

i) We are also assisting the local University in a study of atmospheric micro-plastics, which could provide additional detail on the make-up of fine particulate.

j) The following chart shows the trend in the monitored levels of nitrogen dioxide, which is primarily due to motor vehicle emissions. It can be seen that the long-term trend is for year on year reductions.

The apparent slight increase at some sites is mainly due to the reductions in previous years due to lockdown, but it can be seen that it still follows the general trend for improvements.

Trends in Annual mean NO_2 concentrations.



*To September, uncorrected.

2. Issues

a) The Joint Strategic Needs Assessment indicates that Hull has a higher than average number of people presenting to medical centres with ailments associated with poor air quality. This is at odds with the findings of the ASR and suggests that there is a need to investigate further. Among a number of possible areas for investigation

involve domestic indoor and occupational exposure to pollutants, as the air quality objectives relate to outdoor, non-occupational locations. The Air Quality Team and Public Health are investigating this further, with a report being submitted to the Health Protection Oversight & Assurance Group with a view to advancing the research.

b) A bid has been submitted to Defra for funding for an appraisal of the existing Air Quality Action Plan to ensure that it is prioritising the key areas and aligned with recent changes in focus from central Government. A similar bid was submitted last year but was unsuccessful. The more recent bid includes proposals for a strategy specifically to address fine particulate matter, as this has been associated with poor health, and many experts argue that there is no safe level.

3. Priorities

To ensure that the existing Action Plan prioritises the most cost-effective actions in the key areas, a bid has been submitted for an Air Quality Actions Feasibility Study (AQAFS). The AQAFS will consider the potential for air quality measures to be introduced in Hull to reduce emissions of particulate matter (PM_{10} and $PM_{2.5}$), and nitrogen dioxide (NO_2) and with the aim of supporting compliance with the air quality objectives along the A63 Trunk Road, and ongoing improvements in air quality across the city.

The AQAFS will consist of the following steps:

The FPS will consist of the following steps:

Step 1: Creation of a long-list of potential measures to target sources of fine particulates in Hull up to 2030;

Step 2: Screening exercise to identify a short-list of measures for air quality and economic analysis;

Step 3: Emissions assessment to assess the impact of the priority measures on fine particulates;

Step 4: Cost-benefit analysis of priority measures;

Step 5: Preparation of implementation roadmaps for priority measures; and

Step 6: Preparation of a Fine Particulate Strategy for Hull CC.

A Multi-Criteria Analysis (MCA) will be applied to the long list of measures, considering the likely impact of each measure on:

- Air quality emissions and concentrations;

- Traffic and congestion;
- Practicality of implementation and associated timescales; and
- Political acceptability.

The MCA will be undertaken in close collaboration with key Council stakeholders. The results of the analysis will be presented at a formal meeting to allow full and open discussion and feedback.

We will hold a workshop meeting with key Council stakeholders to present the short list of measures and to agree final assumptions in relation to impacts on traffic and vehicle fleets. We will also discuss opportunities, roles and responsibilities and potential funding routes for the implementation of the shortlisted measures.

The AQAFS will qualitatively consider how the options fit with wider local policy, such as Health and Well Being, Climate Change and the Local Transport Plan.

This will aim to provide sufficient, robust evidence to enable the Council to identify and prepare a roadmap for implementing a shortlist of priority air quality actions. The actions will support ongoing air quality improvements across Hull, including reductions in both NO_2 and PM_{10}/$PM_{2.5}$, and support engagement and awareness raising on air quality issues.

If successful, the AQAFS will commence in June 2023, and is expected to take 18 weeks to complete.

If the bid is unsuccessful, alternative funding streams, including opportunities for internal funding will be sought.

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.