Sefton Council

2020 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

September 2020

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Report Reference number	Sefton ASR 2020
Date	September 2020

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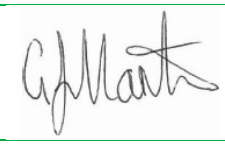
Prepared by	Greg Martin	Principal Environmental Health Officer		20/09/20
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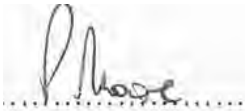
Approved by	Peter Moore	Head of Highways and Public Protection		07/10/20

Executive Summary: Air Quality in Our Area

Air Quality in Sefton

Air pollution is associated with a number of 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 and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

In 2019 Sefton Council continued to undertake detailed monitoring using both automatic air quality monitoring equipment and an extensive network of passive diffusion tubes to determine the levels of certain harmful pollutants that the Council is required to monitor by Government. Through this monitoring, the Council has identified a number of small areas, all in the south of the Borough, where air quality has exceeded or is currently exceeding national standards.

The two pollutants for which air quality standard objectives have been exceeded in Sefton are Nitrogen Dioxide (NO_2) and historically fine Particulate Matter (PM_{10}). The areas where objectives have not been met are generally located around busy road junctions or near busy roads and residents living closest to these junctions and roads are most affected.

The locations where air quality has been identified as a current concern are shown below. The pollutant(s) that have shown exceedance are shown in brackets:

- Lathom Close, Princess Way, Seaforth (NO_2).
- Millers Bridge/Derby Road junction, Bootle (PM_{10} & NO_2).
- South Road/Crosby Road North junction, Waterloo (NO_2).
- Hawthorne Road/Church Road junction, Litherland (NO_2).

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

These areas where air quality objectives have been exceeded (or likely to be exceeded) have been designated as Air Quality Management Areas (AQMAs) and maps have been produced showing the extent and boundaries of the AQMA, see Appendix D and also via the following link to DEFRA's website:

https://uk-air.defra.gov.uk/aqma/list?la=S&country=all&pollutant=alllist

Sefton Council is not alone in having declared AQMAs. Currently over 700 AQMAs have been designated by UK local authorities, mostly for NO_2.

In Sefton, road traffic is the main source of NO_2 and PM_{10}, particularly emissions from heavy goods vehicles (HGVs), light goods vehicles (LGVs) and diesel cars. Emissions from industrial activities within the Port of Liverpool have also historically been identified as a source of PM_{10}.

Current Air Quality levels in Sefton

The latest air quality monitoring in Sefton shows that in relation to Particulate Matter levels in Sefton, like previous years, are well within the NAQS objectives and this pollutant continues to show an overall decline. With regard to NO_2, levels in 2 AQMA's appear to be declining but 2 AQMA's potentially being impacted by increasing port traffic are showing increased levels of this pollutant in 2019. Members of the public can view current and past pollutant levels from all the monitoring locations on Sefton Council's breathing space air quality website at:

http://breathingspace.sefton.gov.uk/Default.aspx?bsPage=air_pollution

Detailed Air Quality Action Plans (AQAPs) have been developed and are in place to address the areas where pollutant levels are high. The Action Plans contain a number of measures to improve air quality within the AQMAs. These action plans are due to be updated in the near future with additional actions which are currently ongoing.

A number of other initiatives and actions are also currently underway/under consideration with the aim of further improving air quality. Which are summarised in this section and discussed in more detailer later in the report.

Sefton Council's air quality officers continue to work closely with a number of internal and external partners with the objective of collaboratively improving air quality in the Borough. Within Sefton Council an Air Quality Members Reference Group consisting of Ward Councillors, Environmental Health, Public Health, Planning, Highways,

Economic Development, and Communications teams, oversee the work being undertaken in respect of Air Quality within the Borough.

A Liverpool City Region (LCR) Air Quality Task Force Group has also recently been convened to support and advise the Liverpool Region Combined Authority in its strategic leadership and advocacy role in order to raise the profile of, and to actively tackle poor air quality across the LCR. This is by harnessing the collective strengths, roles and best practice of the consistent members of group.

Air quality officers regularly work with external partners outside the Council including the Environment Agency, Highways England, Public Health England, Merseytravel and Peel Ports (who operate the Port of Liverpool).

Sefton Council's air quality officers attend regular scheduled meetings with air quality officers from other local authorities within the Merseyside & Cheshire region, through the Merseyside and Cheshire Air Quality Management Group, to discuss air quality issues and how to improve air quality within the wider Liverpool City Region and Cheshire. This group includes Liverpool City Region air quality officers from Sefton Council, Liverpool City Council, St Helens Council, Knowsley Council, Wirral Council, Halton Borough Council, and officers from Cheshire East, and Cheshire West and Chester Councils.

Actions to Improve Air Quality

Sefton Council has developed and implemented Action Plans for all of its AQMAs. The plans include two categories of Action Plan measures that are called **site specific measures** and **general measures**.

Site specific measures are targeted measures to address particular site specific air quality issues within an individual AQMA. These measures provide the greatest benefits in terms of air pollutant emissions reductions for an identified source of pollution at each particular AQMA.

General measures are measures that will benefit **all** AQMAs. Individually they may not have the same extent of emissions reduction as site specific measures, but collectively they will bring significant benefits to all AQMAs.

The AQAPs for Sefton can be viewed at:

http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

Examples of site specific measures that have been included in the Action Plans include:

- A package of measures contained within the A565 Route Management Strategy and Action Plan, which includes junction improvements to the South Road/Crosby Road North/ Haigh Road, Waterloo junction.
- Hurry Call traffic management system to allow HGVs through the Millers Bridge/ Derby Road traffic lights without having to stop/start on the incline at Millers Bridge, thus reducing pollution from this vehicle type.
- Effective regulatory control and monitoring of industrial sites within the Port of Liverpool to minimise their impact on PM_{10} levels.
- A study on HGVs using the A5036, to gain information on destination, age of vehicle & Euro emission standard.
- HGV booking system to improve movement of HGVs within the Port of Liverpool.
- ECO Stars fleet recognition scheme to improve emissions from HGV fleet operators using roads in Sefton and Sefton Council's own fleet of vehicles.
- Port expansion mitigation measures. These include a Defra funded study looking at an alternative fuels strategy (AFS) for HGVs and buses in Sefton and the Liverpool City Region, rather than using diesel as a fuel.

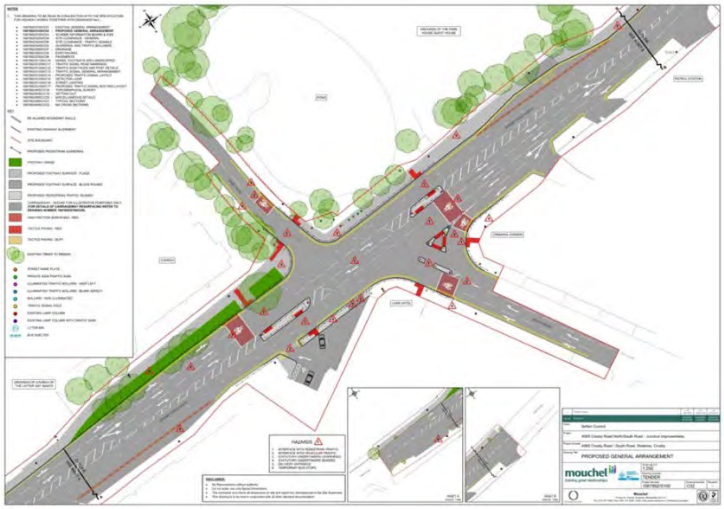
Many of the site specific measures detailed above and in the AQAPs have already been successful in reducing pollutant levels within the AQMAs.

Sefton recognises, however, that dealing with air pollution is an ongoing challenge and continues to invest significant resource to bring about further improvements in air quality.

Examples of more recent air quality initiatives and interventions are detailed below:

South Road/Crosby Road North Junction improvement (AQMA4)

Significant Junction improvement works have been completed to improve traffic flow and associated congestion in the area around the South Road/Crosby Road North/ Haigh Road junction in Waterloo. (AQMA 4 was declared in this area). Levels of NO_2 in 2018 and 2019 showed compliance with the NAQS objective at all locations in this AQMA indicating that the works have had a positive effect on lowering pollution. Monitoring data for 2020 will be reviewed prior to commencement of any revocation application..



Millers Bridge Junction Improvement Works (AQMA2)

As part of the North Liverpool Key Corridor scheme (NLKC) significant works to improve traffic flow and reduce congestion in the Millers Bridge area have recently been completed (spring 2020).

Sefton is currently monitoring if the improvement works have improved traffic flow and air quality in the area. The results will be reported in next year's ASR.

DEFRA GRANT - Domestic Solid Fuel Behaviour Change Project

Sefton is concerned that the increased use of domestic solid fuel is potentially adding to particulate matter levels in the Borough especially $PM_{2.5}$. Sefton, like all Local Authorities has new duties with regard to $PM_{2.5}$ and the reduction of this particular airborne pollutant. Sefton successfully obtained a £100,000 grant from DEFRA to undertake a Solid Domestic Fuel behaviour change project which is currently ongoing

with the primary aim to minimise the Particulate Matter (PM) contribution from domestic solid fuel use in Sefton.

The project is employing a number of behaviour change methods and interventions aimed at engaging with householders, fuel suppliers, appliance suppliers and installers to promote best practice. Further detail is provided within the body of the report

Sefton's Clean Air Plan

Sefton recognises that there are still challenges ahead, with regard to reducing levels of NO_2 in some of Sefton's AQMAs particularly those impacted by traffic entering and leaving the Port of Liverpool. Following the outcome of a Preliminary Clean Air Zone (CAZ) feasibility study which indicated that a CAZ type B could have a positive effect on reducing NO2 exceedances in and around the AQMA's The Council committed to undertaking a more detailed project and commenced the development of an Outline Business Case (OBC) for Sefton looking at air quality interventions including a Sefton based CAZ . This detailed work is ongoing and likely to be completed in early 2020. Further detail on the OBC is provided later on in the ASR.

$PM_{2.5}$ Monitoring

Although Sefton Council monitors PM_{10} at a number of locations in the Borough, there is now clear evidence that even smaller particles with an aerodynamic diameter of 2.5µm or less, known as $PM_{2.5}$, have a significant impact on human health. A new dual PM_{10}/$PM_{2.5}$ monitor was installed in July 2017 at the Millers Bridge monitoring site with data being used to provide accurate levels of $PM_{2.5}$ in the area to assist in providing data for the Councils new role in reducing levels of $PM_{2.5}$. A further $PM_{2.5}$ monitor was installed in 2020 to monitor urban background levels of this pollutant. Monitoring data from this unit will be reported in next year's ASR.

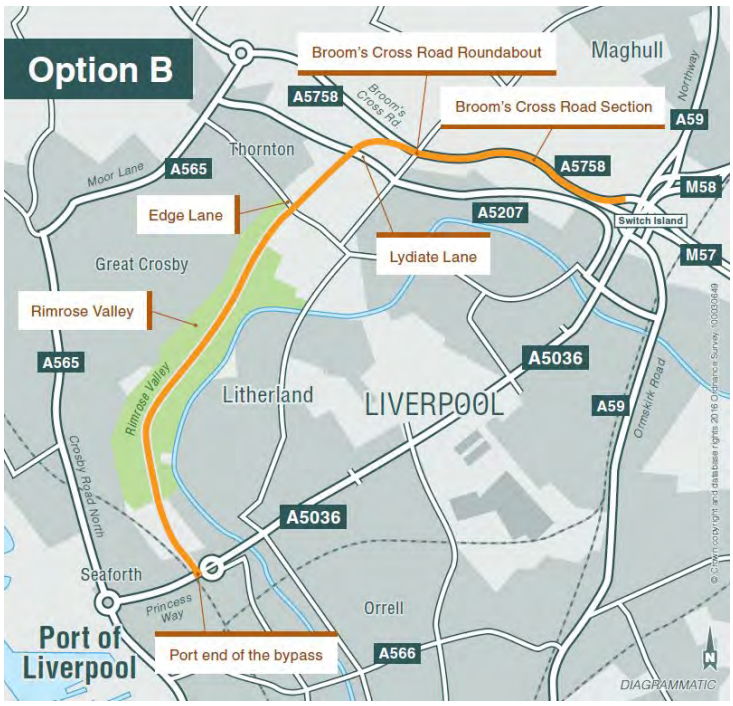
Dual PM_{10}/$PM_{2.5}$ dual particulate monitor

Conclusions and Priorities

As in last year's ASR the main on-going priority in Sefton for the coming years is to fully understand the effects that the predicted increase in HGVs due to port expansion will have on air quality and how this can be mitigated. This is undoubtedly the most significant challenge for the Council in terms of air quality impact in the Borough at the present time, due to the scale of the expansion and the potential for this to impact on air quality in existing AQMAs and impact on public exposure at residential receptors on port access routes.

Although port expansion will bring significant economic benefits to the region, it is also predicted to lead to a significant increase in HGVs using the A5036, the main port access route, and to a lesser extent the A565, and will pass through three of Sefton's AQMAs, potentially leading to a worsening of air quality in areas that are already identified as having poor air quality and congestion, particularly on the A5036.

Highways England are currently progressing a Port of Liverpool Access Improvement Scheme (POLAS) which entails the construction of a new carriageway through the Rimrose Valley (see map below) , linking to Brooms Cross Road (Thornton to Switch Island Link) and once operational will hopefully alleviate congestion on parts of the A5036 and wider network.



The next stages in the process are

- **Development phase**. Focus at this stage is on the design and environmental assessment of the selected option, taking it through all statutory processes to where the decision to build can be made. This includes preliminary design, community consultation, statutory procedures and powers, construction preparation and commitment to construct.
- **Construction phase**. This stage involves construction of the chosen option, commissioning, handover for operation and opening of the road to traffic.

The route improvement works have been delayed and work is predicted now to start in 2024. This however is still a number of years away and assessing the impact increased traffic flow may have on air quality between now and when the new road opens is also being undertaken by Sefton as part of the Clean Air Plan.

Local Engagement and How to get Involved

Sefton developed an air quality communication plan in 2019 as part of Sefton's 2030 vision of a cleaner, greener and healthier Borough.

The overall communications aim is to increase people's knowledge of the importance of air quality, and in doing so encourage less polluting choices.

A key objective throughout the campaign is to encourage behaviour change that will positively impact on Sefton's air quality.

A number of Community engagement activities were organised in 2019 and the beginning of 2020 and included a Schools Air Quality Day at Sefton's ECO Centre, ongoing social media campaigns and presentations by officers at local community group meetings.

Examples of Social media releases are provided below:

Local ward Councillors and officers regularly attend residents' meetings regarding the issues surrounding the port expansion and the proposed road improvement scheme. AQ officers have briefed Councillors on the AQ issues related to these meetings.

Sefton maintains the public Breathing Space website where you can get more information on air quality in Sefton. On Breathing Space you can gain access to the latest results from all the electronic monitoring stations in the Borough, which are updated hourly, and also all historic air quality data that has been carried out using the following link: http://breathingspace.sefton.gov.uk/

The website also contains Local Air Quality Management (LAQM) reports that have been submitted to Defra. These include Air Quality Progress reports, Updating and Screening Assessment reports, Detailed and Further Assessment reports, Air Quality Action Plans and Action Plan Progress reports and will include all future Annual Status Reports. Various air quality Technical reports that have been completed are also included in this section of the website.

Further information on air quality is also available on Defra's air quality website:

https://uk-air.defra.gov.uk/

Simple actions that all can take to help reduce air pollution

There are a number of things the public can do to help improve air quality in their area. These include:

- Reducing the use of your car and consider cycling, walking or using public transport more. 55% of car journeys are less than five miles. Many of these trips could be walked or made by bike or public transport.

- Consider car sharing. When two or more people share a car and travel together, it allows people to benefit from the convenience of the car, sharing travel costs, whilst helping to reduce congestion and air pollution.

- When using your car consider taking an 'eco-driving' approach. This can not only save you money in reduced fuel costs but also reduce emissions of air pollutants and impact on climate change. This includes:

  - Regular maintenance and servicing of your vehicle according to the manufacturers schedule to maintain the engine's efficiency.
  - Making sure your tyres are inflated to the manufacturer's recommended pressures. Under-inflated tyres create more rolling resistance and so use more fuel.
  - Removing unused roof racks or roof boxes to reduce wind resistance and not overloading your vehicle or carrying unnecessary weight.
  - Reducing your use of air conditioning which increases fuel consumption at low speeds.
  - Avoid warming up your car while stationary this can consume more fuel and increase pollution. If you start driving immediately, the engine will reach its working temperature quicker
  - Avoiding unnecessary idling of your car engine when in traffic or waiting to pick up people.
  - Driving smoothly and avoiding sharp acceleration and harsh braking.
  - Shifting into a higher gear as soon as possible; Maintaining a steady speed, using the highest gear possible as soon as possible between 2000rpm and 2500rpm to keep your engine working most efficiently.
  - The faster you go, the greater the fuel consumption and pollution. For example, driving at 70mph uses up to 9% more fuel than at 60mph and up to 15% more than at 50mph.

- Consider purchasing a lower emissions, hybrid or electric vehicle or high efficiency petrol vehicle.
- If possible, avoid driving during the morning and evening peak times as levels of congestion and therefore air pollution will be highest.
- If stationary in a traffic jam, traffic lights or at a pelican crossing for example for over 30 seconds switch off your engine to reduce air pollution.

Other things you can do:

- Don't burn garden or domestic waste. This not only releases pollutants into the atmosphere, it can also cause a nuisance to your neighbours. All waste should be either disposed of or recycled. Details of waste and recycling facilities in Sefton can be found here https://www.sefton.gov.uk/bins-recycling/.aspx

- Should I burn wood? Air pollution affects the health of everyone in Sefton. Along with emissions from transport and construction, burning wood and other solid fuels can contribute to this air pollution problem. The main pollutant emitted by solid fuel burning is ultra-fine particulate matter, also known as $PM_{2.5}$. This pollutant is not visible to the naked eye, so even "smokeless" fuels and appliances may be causing pollution.

- If you need to burn solid fuels to heat your home, choosing what you burn and how you burn it can make a big difference to the pollution it creates.

- Parts of Sefton are designated as Smoke Control Areas and the type of fuel and/or appliance you are allowed use is restricted in these locations. You can check if you property is in one of Sefton's Smoke Control Areas by clicking on the following link https://www.sefton.gov.uk/environmental-protection/pests,-pollution-and-food-hygiene/pollution/smoke-control-areas.aspx

- Open fireplaces are the most polluting way to burn solid fuels. Using a well-designed, properly installed stove or appliance can make a big difference.

- As a minimum, you should make sure that your stove meets the legal requirements, but even approved stoves can emit high levels of pollution. The Stove Industry Alliance has recently introduced the "Eco-design Ready" label.

- An Eco-design Ready stove can emit up to 80 per cent less pollution than a normal Defra approved appliance. An up to date list of these stoves can be found on the HETAS website. https://www.hetas.co.uk/ecodesign-ready/

- Any stove or fireplace should also be properly maintained, and your chimney should be swept regularly.

- If you are using an open fireplace it is recommended that you should only burn smokeless fuels. if in doubt ask your supplier.

- If you are using a stove or other appliance you can usually use normal wood as well as smokeless fuels. Usually wood that has been kiln dried or seasoned to have a lower moisture content will be much less polluting, as much as 50 per cent less pollution than emitted from burning fresh logs. Drier wood is also more efficient, producing more heat per log.

- Wood that has the Woodsure Ready to Burn label is certified to have a low moisture content, for a full list of suppliers see the list on the Woodsure website. https://woodsure.co.uk/

- You should not burn old pallets, furniture or scrap wood as it may contain contaminants that can be harmful to your health and the environment.

- It is important to store your fuels correctly to make sure your wood does not get damp from the rain or damp in the ground.

- Additional information on the use of solid fuels and how to reduce pollution can be found here www.burnright.co.uk BurnRight is a national consumer awareness campaign which seeks to address the issue of domestic combustion and unnecessary air pollution. It is particularly concerned with the issues concerning wood burning stoves.

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1 Local Air Quality Management

This report provides an overview of air quality in Sefton during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Sefton Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 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 must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Sefton Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=226 see full list at https://uk-air.defra.gov.uk/aqma/list>. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

For reference, a map of Sefton's monitoring locations is also available in Appendix D.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
AQMA2 Princess Way	2009	NO2 Annual Mean	Seaforth	An area encompassing a number of residential properties from the Ewart Road flyover, Princess Way (A5036) up to and including the roundabout and flyover at the junction with Crosby Road South (A565).	YES	45.8	µg/m3	36.3	µg/m3	Draft Air Quality Action Plan for Sefton Council	2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA3, Millers Bridge	2009	NO2 Annual mean	Bootle	An area encompassing a number of residential properties around the	NO	60	µg/m3	46.6	µg/m3	Draft Air Quality Action Plan for	2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_

				junction of Millers Bridge (A5058) and Derby Road (A565)						Sefton Council		AQAP_AQMAs_1-5_2015.pdf
AQMA4, South Road	2012	NO2 Annual Mean	Waterloo	An area encompassing the Liver Hotel and a number of residential properties around the junction of Crosby Road North (A565) and South Road.	NO	48	µg/m3	36.5	µg/m3	Draft Air Quality Action Plan for Sefton Council	2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA5 Hawthorne road	2012	NO2 Annual Mean	Litherland	An area encompassing a number of residential properties around the junction of Hawthorne Road (B5058) and Church Road (A5036).	YES	42.6	µg/m3	32.8	µg/m3	Draft Air Quality Action Plan for Sefton Council	2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

AQMA3, Millers Bridge	2009	PM10 24 Hour Mean	Bootle	An area encompassing a number of residential properties around the junction of Millers Bridge (A5058) and Derby Road (A565)	NO	46	exc	1	exc	Draft Air Quality Action Plan for Sefton Council	2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

☒ **Sefton Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Sefton

Defra's appraisal of last year's ASR is summarised below along with actions taken by Sefton in response to these comments (in italics and bold)

The report is well structured, detailed, and provides the information specified in the Guidance.

The following comments are designed to help inform future reports:

1. The report is detailed and presents all the information required in an Annual Status Report.
2. A downward trend can be seen at some of the monitoring sites. However, higher NO_2 concentrations still persist in the hotspots in the AQMAs. It is suggested that these are closely monitored. ***(These results are discussed later in the report)***
3. The AQAP is due for renewal in 2020 and it is very encouraging to see that the Council has taken the initiative to update the AQAP for submission to DEFRA by the end of 2019. ***(The AQAP is being updated and will be submitted as soon as practicable further measures to improve air quality are reported in the ASR)***
4. It is recommended that the workings of distance correction be shown in the report for the reviewer to check the calculations. **(examples of distance calculations are included in the appendices)**
5. Table 2.2 of the report shows the progress of various measures implemented by the Council. Although the table consists of detailed measures, most of these have been completed and it would be beneficial to replace these with new measures for areas with persisting exceedances. ***(table 2.2 contains measures that have been completed but also measures that are currently ongoing)***
6. In terms of $PM_{2.5}$, it is recommended that reference be made to the Public Health Outcomes Framework (PHOF). The PHOF sets out a high-level overview of public health outcomes, at national and local level, supported by a broad set of indicators. These indicators are helpful to compare the Council's outcomes with regional and national outcomes. (**This is discussed in the ASR)**
7. The Council has carried out a Clean Air Zone (CAZ) feasibility study, the results of which are encouraged to be included in next year's report. ***(Details of the CAZ feasibility study and Clean air Plan are reported within this ASR)***

Sefton has taken forward a number of direct measures during the current reporting year of **2019/2020** in pursuit of improving local air quality. A summary of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in their respective Action Plans

Sefton Council Draft Action Plan measures consist of 11 general measures that are applicable to all AQMA's and a number of site specific measures that are applicable to each individual AQMA. General measures GM1 - GM11 have all been implemented.

Please note the AQAP is currently being updated to include the additional air quality improvement measures discussed after the site specific measures detailed below.

Key site specific measures that have been completed/ongoing since last year's ASR reporting years are as follows:

AQMA 2 Princess Way, Seaforth

- ECOSTARS fleet recognition scheme funding secured to continue for a further 12 months.
- Port expansion mitigation measures: (i) Highways England - Port of Liverpool Port Access Road Scheme (POLAS) progressing. Stage 1 study completed. Offline route option through Rimrose valley chosen. Further detailed assessment and design of this option now underway by Highways England and their consultant.

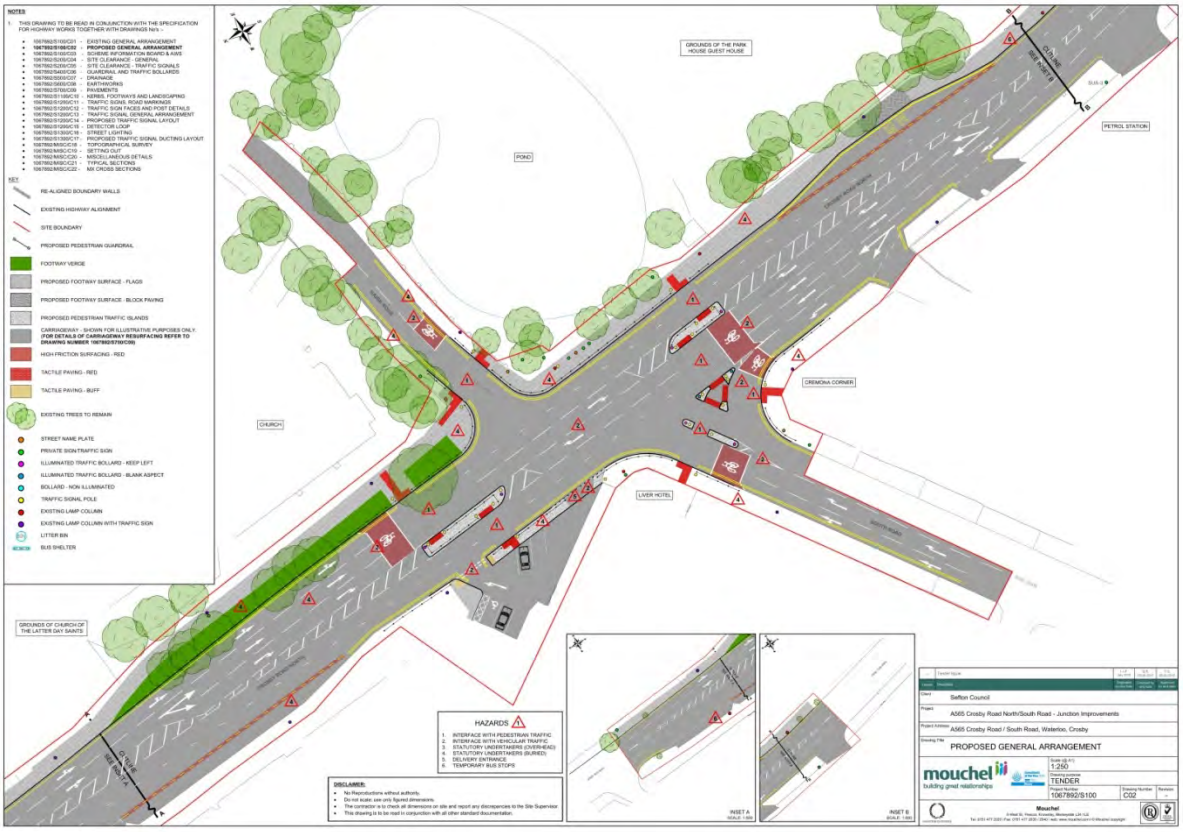
AQMA 3 Millers Bridge, Bootle

- Hurry Call traffic light management system to allow HGVs passage through traffic lights at Millers Bridge during non-peak hours without having to stop/start implemented and continues to operate.
- ECOSTARS fleet recognition scheme funding secured to continue for a further 12 months.

AQMA 4 South Road, Waterloo

- Work on the South Road/ Crosby Road North/Haigh Road junction improvements has been complete.

- With regard to **AQMA4 Waterloo** declared for NO_2 Annual Mean exceedances the junction improvement detailed above works continue to have had a positive effect on reducing levels of NO_2 within the AQMA boundary. NO_2 Levels at all receptors within the AQMA in 2018 and 2019 were below the NAQS objective. To ensure that levels remain consistently below the NAQS prior to any revocation application a further 12 months monitoring is to be undertaken and a decision made following review of the 3 years of data.



AQMA 5 Hawthorne Road, Litherland

- As AQMA 2

Further Air Quality Improvement Actions

In addition to those measures detailed above and specified in the AQAPs a number of additional actions and interventions aimed at improving air quality in Sefton are currently underway. These are due to be included in the AQAPs when they are updated

.

Preliminary Clean Air Zone Study

A number of air quality actions as detailed above have already been implemented to improve air quality in Sefton's AQMA's. Whilst these have had some success in reducing air pollution there is concern that due to the ongoing expansion of the port and associated additional port traffic levels of air pollution will increase in the existing air quality management areas and could also mean further air quality management areas will have to be declared.

In response to these concerns AECOM environmental consultants were appointed in 2018 to undertake a preliminary study of local air quality, to determine future baseline conditions of both nitrogen dioxide (NO_2) and fine particulate matter ($PM_{10}/_{2.5}$), and to understand the extent of the air quality challenge the Borough faces and the potential improvements required.

The preliminary study also determined how the implementation of a Clean Air Zone (CAZ) could reduce emissions and contribute to improvements in local air quality, health and wellbeing of the local population.

Study Outputs:

- The study identified key locations in the Borough where levels of Nitrogen Dioxide concentrations are likely to exceed the national standards in 2020 without further air quality interventions. **70** properties were identified in the south of the Borough around busy junctions along the A5036 and A565 which are predicted to exceed the NO_2 annual standard (40 ug/m^3) .
- The CAZ assessment modelling determined that significant emissions reductions could potentially be achieved in key locations by targeting buses and HGVs (CAZ-B scenario). Further reductions (although less significant) could be achieved throughout the Borough by also targeting LGVs and cars, although

  this would affect larger areas and be less targeted, and so the effects may be proportional to the area targeted. A non-charging CAZ is likely to have little or no effect on reducing vehicle related emissions.
- Due to budget constraints, the modelled CAZ scenarios were applied to the whole of the Sefton study area and did not consider in detail the effects of the

redistribution of non-compliant vehicles. It is considered that, for Sefton, a more targeted CAZ(s) focusing on a smaller defined area encompassing our pollution hotspots would be more appropriate than a Borough wide CAZ.

Sefton Clean Air Plan (CAZ Outline Business Case)

In view of these outputs from the preliminary study and evidence of the potential level of NO_2 exceedances further exploration of a proposed Sefton based CAZ was considered necessary.

In November 2019 Sefton's Cabinet approved the development of a Clean Air Zone Outline Business Case (OBC), which will explore in detail the case for investing in a charging Clean Air Zone in more depth and under five distinct criteria.

In line with the guidance provided by the Government's Joint Air Quality Unit (JAQU), the development of the OBC will follow the UK Treasury's '5 Case Model', as set out in the HM Treasury Green Book. This is an established project management approach for developing complex programmes of work. This Business Case model is an evolving record, which supports transparent decision making, balanced assessment of cost, benefits, risk and value for money.

Sefton's OBC will specifically consider the following elements:

Strategic Case – this interrogates and establishes the continuing rationale for considering a CAZ. It includes measurable objectives, and the main benefits, risks, constraints, dependencies and uncertainties.

Economic Case – This section of the business case assesses the economic costs and benefits of the proposal to society as a whole. It includes cost benefit analyses to make comparisons between possible options and a range of impacts. This is needed to inform the selection of a final preferred option.

Economic costs extend beyond the purely financial, for example, impact on income, employment opportunity, costs from displacement of polluting traffic onto adjacent roads or other environmental impact.

Commercial Case – this aims to answer the question 'can this be delivered?' It details the service needs, supplier capability and capacity, and the procurement route. In covering the procurement strategy, this element of the document will also seek to detail:

- Required procurement packages and their outputs
- Preferred procurement routes and the options appraisal undertaken
- Allocation of risk
- Contract timescales
- Contract management
- Appropriate resources to successfully deliver the strategy

Financial Case – this aims to answer the question, 'how will this be financed?' It details the funding needs, sources of finance, and financial model for the lifetime of the CAZ. The purpose is to present the costs and associated sensitivity analysis of the preferred option in terms of capital and revenue elements with associated profiling of costs, income streams and overall financial performance i.e. will potential income cover the cost of the CAZ. This is presented alongside wider consideration of the financial risks and implications of the project.

Management Case – this aims to address how development, implementation, running and decommissioning will be successfully delivered to ensure established objectives are met. It details the governance and risk management arrangements, and resource requirements. The management case also specifies the delivery programme, stakeholder management, communication and engagement plans, and monitoring and evaluation programmes.

In April 2020 Environmental consultants AECOM were engaged to undertake the additional technical work required to inform the outline business case and provide support in the preparation of the OBC.

This detailed work is currently ongoing with traffic and air quality modelling underway. It is anticipated that the outline business case will be completed towards the end of 2020 and be reported in next year's ASR.

Millers Bridge Junction Improvements (AQMA3)

Levels of NO_2 within AQMA3-Millers Bridge are still above the annual average NAQS objective. In an attempt to improve congestion in the area work commenced in 2019 on improving traffic flow and reducing emissions along this key route as detailed below

The North Liverpool Key Corridor (NLKC) project is a major joint scheme between Sefton Council and Liverpool City Council which will create a modern fully 'dualled' road link on the A565 Great Howard Street and Derby Road between Sefton and Liverpool.

New and improved cycling routes on Regent Road, reduced congestion, improved local access and better east-west movement will also strengthen the connections between Liverpool and Sefton.

The scheme will also support the development projects being undertaken as part of Liverpool Waters, North Liverpool Regeneration and the SuperPort.

As part of this project significant improvements are also to be made to the Millers Bridge junction which is designed to improve traffic flow through this area.

It is anticipated that on completion of these works levels of NO_X and NO_2 within AQMA 3 will reduce .

The Millers Bridge element of the scheme was completed in spring 2020 and as such any improvements to air quality will only be observed in 2020 monitoring results. This will be reported in next year's ASR.

Intensive Road Washing (AQMA2, AQMA3, AQMA5)

Although there are currently no PM exceedances of the NAQS objectives within Sefton, visual inspections of road and pavement conditions within AQMA2, AQMA3 and AQMA5 showed large accumulations of debris and road grime.

Following a previous successful intensive road washing exercise where levels of PM were actively reduced, preparation of a further project began in 2019. The project was planned to start following the completion of the Millers Bridge Junction improvement works, however this was only completed in spring this year and due to the Covid pandemic the project was put on hold. We are currently reviewing when the project can commence.

Joint Sefton MBC DVSA Emissions enforcement Project

The Driver and Vehicles Standards Agency (DVSA) undertook an enforcement project in 2017 looking for vehicles fitted with emission cheat devices or emission control systems that had been tampered with.
Examples of these include:

- using devices designed to stop emissions control systems from working
- removing the diesel particulate filter or trap
- using cheap, fake emission reduction devices or diesel exhaust fluid
- using illegal engine modifications which result in excessive emissions
- removing or bypassing the exhaust gas recirculation valve.

DVSA officers found that approximately 8% (449 vehicles) of the vehicles stopped during the exercise had some form of cheat device fitted or their emissions control system had been tampered with. Vehicles with these emission control systems deactivated can emit up to 20 times more pollutants compared to vehicles with the systems operating correctly.
If the use of cheat devices nationally replicates the findings of this localised exercise, it could mean that HGV's and PSV's are producing significantly more PM and NOx emissions than predicted and/or anticipated by virtue of these illegally operating vehicles.

From 1 September 2018, DVSA enforcement staff across Great Britain commenced checking lorries for emissions cheat devices as part of routine checks. Drivers caught with an emissions cheat device or a faulty emissions control system have 10 days to remove the device and repair their emissions system. If they continue to use a device

or fail to repair the system, they can be fined £300 and have their vehicle taken off the road.

The type and manner in which these devices are installed has become more and more sophisticated and therefore more difficult to detect. Currently DVSA officers are physically checking for the presence of these devices without knowing whether the vehicle emissions are actually higher than they should be, (which potentially could be an indicator that the emission control system has been tampered with). A method of determining whether a vehicle may be emitting higher than expected emissions would assist in the potential detection of these devices.

A neighboring Local Authority (Liverpool City Council) recently used a fully accredited MCERTS mobile air quality monitoring vehicle (MAQMV) to undertake mobile dynamic ambient air pollution level monitoring around the city as part of an air quality campaign around Clean Air Day 2019. Whilst the Liverpool exercise was aimed at monitoring ambient air quality levels it became apparent that the equipment was able to detect very localised spikes in levels of PM and NO_2 caused by vehicles passing with what appeared to be poorly maintained emission control systems.

DVSA have recently acquired new on-board diagnostic (OBD) equipment, a prototype diesel particulate filter (DPF) tester along with the latest diesel smoke meter (DSM), this equipment will be used as part of the DVSA roadside inspection.

Project Summary

Following discussions with enforcement officers from Sefton and DVSA the MAQMV will be utilised to help identify HDV's travelling on the A5036 that may be emitting higher than expected levels of NO_x and PM therefore potentially indicating the presence of an emission cheat device or tampered emissions control system.

This would then allow the DVSA inspectors to undertake more detailed investigations to determine the presence of any cheat devices.

Initial agreement has been reached to undertake a preliminary study with DVSA whereby Sefton has agreed to provide approx. £5000 to fund the cost of the monitoring vehicle and trained operator for a period of 3 days to assist in the dynamic detection of high pollutant emitting vehicles..

The monitoring vehicle will be used on the A5036 in live traffic taking real time air quality samples. Should vehicles being followed show unusually high levels of NOx and PM compared with other vehicles the registration and description of vehicle will be radioed on to inspectors at the DVSA checkpoint at Switch Island, who will then require the vehicle to stop and be subject to detailed inspection.

DVSA will carry out an initial visual inspection of the vehicle, paying particular attention to the emissions control systems and engine warning lights. The OBD equipment will be used to identify any fault codes and to carry out diagnostic tests on the emissions control system. The DPF tester and DSM will be used to carry out an exhaust emissions tailpipe test.

The project is due to commence in early 2021 and the results reported in next year's ASR.

Schools Air Quality Project

Sefton Council continues to work closely with schools to ensure that its youngest residents are aware of both the causes and risks of air pollution and the steps they can take to avoid it. The 'Clean Air Crew' website continues to be developed with additional teaching resources and interactive learning opportunities for all schools to use. The site has been developed thanks to active engagement with schools and can be found at www.southportecocentre.com/cleanaircrew

Domestic Smoke Behaviour Change Project

Sefton was successful in applying for grant funding to undertake a domestic solid fuel behaviour change project. The project is now underway and work is ongoing.

Objectives of the project are :

- Improve understanding and awareness of the extent and impact of domestic solid fuel use in Sefton – through evidence gathering on number and location of properties using solid fuel and the monitoring of particulate matter

- Reduce emissions of particulate matter from domestic solid fuel use in Sefton – by raising awareness of the issues and by communicating and promoting good practice in partnership with stove suppliers, fuel suppliers and chimney sweeps

- Improve public health – by reducing exposure to particulate matter from domestic solid fuel use and encouraging behaviour change among users of solid fuel

- Improve the regulatory measures for control of domestic emissions – through a review and possible extension of Sefton's Smoke Control Areas

Specific Project Activities ongoing include:

- Installation of dual PM_{10}/$PM_{2.5}$ monitor in residential area to monitor levels of PM associated with domestic solid fuel use.
- Determination of current $PM_{2.5}$ levels in study area.
- Identification of fuel suppliers/stove suppliers/chimney sweeps in Borough.
- Surveys /questionnaires used to ascertain the type, frequency and intensity of solid fuel use by targeting suppliers and chimney sweeps.
- Identify information needs of fuel Suppliers, appliance suppliers/Chimney Sweeps in relation to the new Clean Air Strategy and industry best practice standards and codes. Supportive, early engagement to enable more trusting and effective collaboration
- Develop good practice guides for engagement with local fuel suppliers/appliance suppliers/chimney sweeps.

- Work with Sefton Communications and engagement teams to identify gaps in our knowledge about public beliefs, behaviours, motivations, preferences etc. This work can specifically address gaps in knowledge around public use of wet or dry wood, outdoor burning, fire laying practices and the use of wood collected rather than purchased by householders[4]

- Development of Sefton website to promote good practice in terms of domestic solid fuel use, including storage and choice of fuel, routine use and maintenance of systems, choice of appliance and details of requirements in relation to SCAs. This can incorporate existing guidance[5] [6]

- In association with relevant community health, public sector and voluntary sector services, devise simple key messages, which can build off the Council's successful Making Every Contact Count Training and augment current carbon monoxide risk perception work.

- Include impact of domestic solid fuel use in Sefton's existing schools air quality education programme[7]

- Development of positive action/publicity campaign promoting good practice with regard to solid fuel use using the most effective media channels based on market segmentation and key messages informed by insight work and behavioural science approaches from PHE's recently published Behavioural Science Strategy.[8]

- Evaluation of project using monitoring data from actual $PM_{2.5}$. monitoring

- Review on options to expanding Sefton's network of Smoke Control Areas

- Development of positive action/publicity campaign promoting good practice with regard to solid fuel use using the most effective media channels based on market segmentation and key messages informed by insight work and behavioural science approaches from PHE's recently published Behavioural Science Strategy.[9]

[4] https://consult.defra.gov.uk/airquality/domestic-burning-of-wood-and-coal/supporting_documents/180129%20Evidence%20background%20documentation.pdf
[5] https://consult.defra.gov.uk/++preview++/airquality/domestic-burning-of-wood-and-coal/supporting_documents/open%20fires%20wood%20burning%20stoves%20%20guideA4update12Oct.pdf
[6] https://burnright.co.uk/
[7] http://www.southportecocentre.com/cleanaircrew
[8] https://www.gov.uk/government/publications/improving-peoples-health-applying-behavioural-and-social-sciences
[9] https://www.gov.uk/government/publications/improving-peoples-health-applying-behavioural-and-social-sciences

The project is due to be completed in April 2021 with the outcome reported in next year's ASR.

Compliance in AQMA's

- Sefton anticipates that the measures stated above and in Table 2.2 will achieve compliance in **AQMA 3 Millers Bridge** declared for PM_{10} 24hour mean with consistent ongoing compliance for a number of years. The Council is looking to make the necessary arrangements to revoke this particular AQMA declared for PM_{10} 24hour mean.
- With regard to **AQMA4 Waterloo** declared for NO_2 Annual Mean exceedances the junction improvement works detailed above continue to have a positive effect on reducing levels of NO_2 within the AQMA boundary. NO_2 Levels at all receptors within the AQMA in 2018 and 2019 were below the NAQS objective. Levels of NO_2 at a number of receptor locations are, however, close to the NAQS objective and it is not proposed to revoke this AQMA at the present time pending further review of monitoring data.
- Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Sefton anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA **AQMA2 Princess way** (NO_2 Annual Mean), **AQMA3 Millers Bridge** (NO_2 Annual Mean) and **AQMA5 Hawthorne Road** (NO_2 Annual Mean). As detailed earlier on in this section Sefton is currently preparing an OBC for the development of a Sefton Clean Air Zone. This detailed work builds on the previous CAZ feasibility study and ultimately will determine whether the Councils looks to implement a Clean Air Zone in its Borough. This complex and technical work is likely to be completed by early 2021 and will be reported in full as part of next year's ASR.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved	Date Measure Introduced	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
AQMA2 SS1	Port Booking System	Freight and Delivery Management	Delivery and Service plans	Peel Ports	2009	Peel	Feedback on effectiveness of port booking system via port liaison meetings	No Target pollution reduction set-hard to quantify	vehicle booking system introduced and completed in 2009.New L2 terminal operating Autogate technology introduced 2015.	completed	Reduced HGV waiting times on the port will reduce pollutant emissions from the port estate affecting AQMA.
AQMA2 SS2	ANPR Specialised goods vehicle count	Traffic Management	Other	Sefton MBC	2012	LA	Analysis of information and interpretation of data to further inform action plan	N/A	Completed	Completed	Measure was used to gain information on HGV's travelling to and from the port on the A5036 and A565. Information used to support new port expansion mitigation and Eco Stars measures.
AQMA2 SS2	Port expansion mitigation measure No1 Highways England A5036 Road option study	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Highways England	Not implemented yet	HE	Compliance with the NO2 air quality objective. New road built to timescales	No Target pollution reduction set-hard to quantify	Stage1 offline option chosen. Detailed assessment underway by HE consultants	potentially not until 2026 when new road is built	Awaiting detailed assessment from consultants
AQMA2 SS2	Port expansion mitigation measure No3. Alternative fuels strategy for HGV's and buses	Vehicle Fleet Efficiency	Other	Sefton MBC	N/A	DEFRA/LA	Results of study to inform decision making process	N/A	DEFRA AQ grant For Alt fuels refuelling and infrastructure strategy awarded 2014. Consultant appointed 2015. Report issued 2016.	completed	Main recommendation to undertake further CAZ study being undertaken
AQMA2 SS2	Port expansion mitigation measure No4. HGV parking demand study	Transport Planning and Infrastructure	Other	Sefton MBC	N/A	LA	Robust assessment of HGV parking	no Target pollution reduction set-hard to quantify	Stage 2 report completed. Detailed phase 2 study on preferred HGV parking site underway.	end 2016	Council to take forward recommendations.
AQMA2 SS3	ECOstars Vehicle fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Sefton MBC and Transport Research Laboratory	ongoing	DEFRA/LA	compliance with target to recruit 25 members completed	no Target pollution reduction set-hard to quantify	ECOstars commenced 2013,funded by DEFRA AQ grant, to run initially for 2 years. Formal launch in 2014. Recruited 50 operators	completed/ongoing	Mainly 4 and 5 star operators recruited. Benefits in context of port expansion low. Scheme however funded for a further 2 years with aim of recruiting a further 15 members.

AQMA3 SS1	Hurry Call System	Traffic Management	UTC, Congestion management, traffic reduction	Sefton MBC	2011	LA	Number of activations of hurry call system	No Target pollution reduction set-hard to quantify	Implemented July 2011. Number of activations of the system per hour reviewed and system continues to show that the system is working well.	completed	Difficult to quantify emissions reduction, but number of activations outside of peak hours indicate successful in facilitating HGV passage through traffic lights and reducing NOx and PM10 emissions.
AQMA3 SS2	Control of dust from industry	Environmental Permits	Other	Sefton MBC/Environment Agency	2011	N/A	Compliance results from Local Authority and Environment Agency site inspection visits to permitted industrial sites within the Port of Liverpool and the number of exceedances of the PM10 daily mean standard when predominantly north westerly winds. Compliance results from Local Authority and Environment Agency site inspection visits to permitted industrial sites within the Port of Liverpool and the number of exceedances of the PM10 daily mean standard when predominantly north westerly winds.	no Target pollution reduction set-hard to quantify	Meetings with EMR and EA. New EMR dust management plan produced 2010. Number of exceedances of PM10 24-hour mean when wind direction from the direction of the port continues to remain low.	completed	Compliance with PM10 AQOs achieved. Improved dust control at EMR & relocation of JMD Haulage has significantly contributed to reducing PM10 levels at Millers Bridge.
AQMA5 SS1	Port expansion mitigation measure No 1 Highways England A5036 Road options study	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Highways England	Not implemented yet	HE	Compliance with the NO2 air quality Objectives... New road built to timescale.	No Target pollution reduction set-hard to quantify	Stage 1 offline option chosen. Detailed assessment underway by HE consultants	Potentially not until 2026 when new road built	Awaiting consultant report on options.

AQMA5 SS1	Port expansion mitigation measure No 3 Alternative Fuels Strategy for HGVs & buses	Vehicle Fleet Efficiency	Other	Sefton MBC	N/A	DEFRA/LA	Results of study to inform decision making process	no Target pollution reduction set-hard to quantify	Defra AQ grant for HGV alternative fuels refuelling infrastructure & strategy awarded 2014. Consultant appointed in 2015. Report issued2016.	completed	Main recommendation to undertake further CAZ study being undertaken
AQMA5 SS1	Port expansion mitigation measure No 4 HGV parking demand study	Transport Planning and Infrastructure	Other	Sefton MBC	N/A	LA	Robust assessment of HGV parking	No Target pollution reduction set-hard to quantify	Consultant appointed in 2015 to carryout .project Report issued March 2016.	completed	Council to take forward recommendations.
AQMA5 SS2	ECO Stars fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	Sefton MBC	ongoing	DEFRA/LA	Compliance with target to recruit 25 operators in the 2 years of scheme operation	no Target pollution reduction set-hard to quantify	ECO Stars commenced 2013, funded by Defra AQ grant, to run initially for two years. Formal launch in 2014. 50 operators recruited.	completed/ongoing	Mainly 4 & 5 star operators recruited. AQ benefits in context of port expansion low. Scheme now funded for a further 2 years with aim of recruiting a further 15 members.
AQMA4 - Junction Improvements	South Road/ Crosby road North junction improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Sefton MBC	2018	LA	Compliance with NO2 objective in AQMA	no Target pollution reduction set-hard to quantify	Junction improvement works now completed – Compliance observed in 2018 -further monitoring to continue in 2019 to assess continued compliance	completed	Compliance with NO2 limit value in AQMA4 currently achieved in 2018. Further monitoring of levels will continue in 2019
AQMA3 -Junction improvements	Millers Bridge Junction improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Sefton MBC	2020	LA/CA	Compliance with NO2 objective in AQMA	no Target pollution reduction set-hard to quantify	Millers Bridge Junction improvement works currently underway	ongoing	Works ongoing - once completed will review impact new junction has on reducing connection and emissions
GM1	SCOOT	Traffic Management	UTC, Congestion management, traffic reduction	Sefton MBC	2010	LA	Liaison with Sefton Council Highways Maintenance Manager on optimisation of the SCOOT system	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	SCOOT system is optimised and operating successfully.

GM2	Variable Message Signs(VMS)	Public Information	Via other mechanisms	Sefton MBC	2013	LA	Ensure system operating effectively	No target pollution reduction set - difficult to quantify	Implemented 2013	Completed	VMS system operational since July 2013 and linked to Sefton Council breathing space air quality website to display current levels.
GM3	Work Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	Sefton MBC	2010	LA	Number of work place travel plans implemented	No target pollution reduction set - difficult to quantify	implemented 2010	completed	
GM5	Cycling & Walking	Promoting Travel Alternatives	Promotion of cycling	Sefton MBC	2010	LA	Increase in participation	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
GM6	Land use planning	Policy Guidance and Development	Air Quality Planning and Policy Guidance	Sefton MBC	2010	LA	Percentage of planning permissions granted where the submitted air quality assessment shows no action was required or the air quality impact of a development was mitigated	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	100% of planning permissions either required no action or the air quality impact of the development mitigated
GM7	Low emissions Strategies	Policy Guidance and Development	Low emissions Strategy	Sefton MBC	2010	LA	Number of LES measures implemented	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	Increasing number of EV charging points installed.
GM8	Tree planting	Other	Other	Sefton MBC	2010	LA	Number of trees planted within AQMA. Compliance with the PM10 air quality Objectives	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
GM9	AQ awareness	Public Information	Via other mechanisms	Sefton MBC	2010	LA	Maintenance of Sefton Council air quality website. Number of AQ awareness events	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
GM10	Freight Quality Partnership (FQP)	Freight and Delivery Management	Other	Merseytravel	2010	LA	Number of meetings held. Number of AQ initiatives undertaken	No target pollution reduction set - difficult to quantify	Implemented 2010	Completed	
GM11	Taxi Quality Partnership (TQP)	Promoting Low Emission Transport	Taxi emission incentives	Merseytravel	2011-2012	LA	Number of operators participating	No target pollution reduction set - difficult to quantify	Implemented 2013	Completed	
GM - Solid Fossil Fuel Project	Solid Fossil Fuel Project	Other	Other	Sefton MBC and DEFRA grant	ongoing	DEFRA/LA	improvement in levels of PM2.5 following implementation of behaviour change solid fossil fuels project	No target pollution reduction set - difficult to quantify	Project underway	ongoing	
GM- E Taxi project	Evolve -E - Taxi project	Promoting Low Emission Transport	Other	Sefton MBC	2018	LA	Number of drivers/operators choosing RV taxi	No target pollution reduction set - difficult to quantify	Journey Assessments currently being undertaken by consultant	ongoing	
GM-Schools Project	Schools Air Quality project	Other	Other	Sefton MBC	2018	LA	Number of Schools participating in AQ sessions	No target pollution reduction set - difficult to quantify	AQ session delivered to 15 schools already- currently looking for further funding . Clean Air Crew website launched.	ongoing	

GM- Sefton CAP	Clean Air Plan	Promoting Low Emission Transport	Low Emission Zone (LEZ)	Sefton MBC	ongoing	LA	reduction in Nox and PM levels	No target pollution reduction set - difficult to quantify	Consultants currently preparing outline business case	ongoing	

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), 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.

As reported previously Sefton Council is already taking a number of measures to address $PM_{2.5}$, as many of the existing measures in the current Air Quality Action Plans to reduce PM_{10} also serve in reducing $PM_{2.5}$, see **Table 2.2**.

These include:

- Traffic Management measures - SCOOT and Hurry Call systems.
- Promoting Alternative Travel through school and workplace travel plans and encouraging walking and cycling.
- Reducing dust emissions from industry through the LAPPC Environmental Permitting system.
- Reducing emissions from the freight transport sector through the continuation of the ECO Stars Fleet Recognitions Scheme.
- Strategic highway and junction improvements to reduce congestion and pollutant emissions specifically at Millers Bridge and Crosby Road North/South Road Junctions.
- Addressing particulate matter emissions through the land use planning and development control system.

Specific actions to address $PM_{2.5}$

Domestic Solid Fuel Behaviour Change Project

Evidence from ongoing research suggests that the use of domestic fossil fuels can increase local levels of particulates including $PM_{2.5}$.

Sefton was successful in obtaining a grant through the Local Authority grant fund to the sum of £100,000. The primary aim of the 18 month project is to minimise the

Particulate Matter (PM) contribution from domestic solid fuel use in Sefton. The project is underway however the coronavirus pandemic has significantly impacted on the project for obvious reasons. Notwithstanding the impact of the pandemic the following headline actions/activities have been completed and/or are ongoing

- Recruitment of Project Officer
- Mapping of concentrations of domestic wood/ multifuel burner use in Borough
- Identification of stove suppliers/ installers /chimney sweeps and fuel suppliers in area.
- Development of questionnaires for public and business
- Development of behaviour change/engagement plan.
- Development of behaviour change publicity material- leaflets posters etc
- Installation and commissioning of dual particulate monitor measuring PM_{10} and $PM_{2.5}$ in high stove use area.
- Development of Sefton good practice website.

The project is due to be completed in April 2021to be reported in full as part of next year's ASR.

Smoke Control Areas

Large parts of Sefton are already covered by Smoke Control Areas which formally restrict the type of fuel and/or appliance that can be used in these areas. Residents can easily determine if their property is within a Smoke Control Area by checking on Sefton's mapping system and website:

http://maps.sefton.gov.uk/webmaplayers/?datalayers=Smoke%20Control%20Areas&resolution

https://www.sefton.gov.uk/environmental-protection/pests,-pollution-and-food-hygiene/pollution/smoke-control-areas.aspx

Compliance in Sefton's smoke control areas is actively enforced and any complaints or allegations of properties breaching the smoke control area regulations are

investigated and appropriate action taken. These measures although hard to quantify assist in reducing levels of particulates including PM $_{2.5}$ in Sefton.

Intensive Road Washing

Following recent visual inspections of road and pavement conditions within AQMA2, AQMA3 and AQMA5 it was apparent that large accumulations of debris and road grime have accumulated. Seton undertook a successful intensive road/ footpath cleaning project previously and is in the process of designing a further scheme focusing on the 3 AQMA's above with a view to reducing the level of re-entrained dust particulates. This is also predicted to reduce levels of pm2.5 being re-entrained into the atmosphere. The project is now due to start in spring next year and will be reported within the 2021 ASR.

Particulate Control at Construction/Demolition sites

Through the planning process officers in the air quality team recommend the inclusion of formal conditions requiring the implementation of dust control measures for large construction and demolition sites. This helps reduce and mitigate the release of particulates during the construction phase of a development.

$PM_{2.5}$ monitoring

In July 2017 $PM_{2.5}$ monitoring at the existing Millers Bridge air quality station commenced, in light of the clear evidence of the health effects of $PM_{2.5}$ and to monitor this in the context of port expansion.

As part of the domestic solid fuel behaviour change project a further $PM_{2.5}$ monitor has been installed in an residential area in Crosby. This will provide further information and specific data on levels of this pollutant within the Borough

As a greater understanding of the areas and $PM_{2.5}$ emission sources that need to be targeted in Sefton is developed through actual monitoring, further measures to reduce $PM_{2.5}$ may need to be implemented as necessary.

Health impacts of fine particulate matter ($PM_{2.5}$) in Sefton

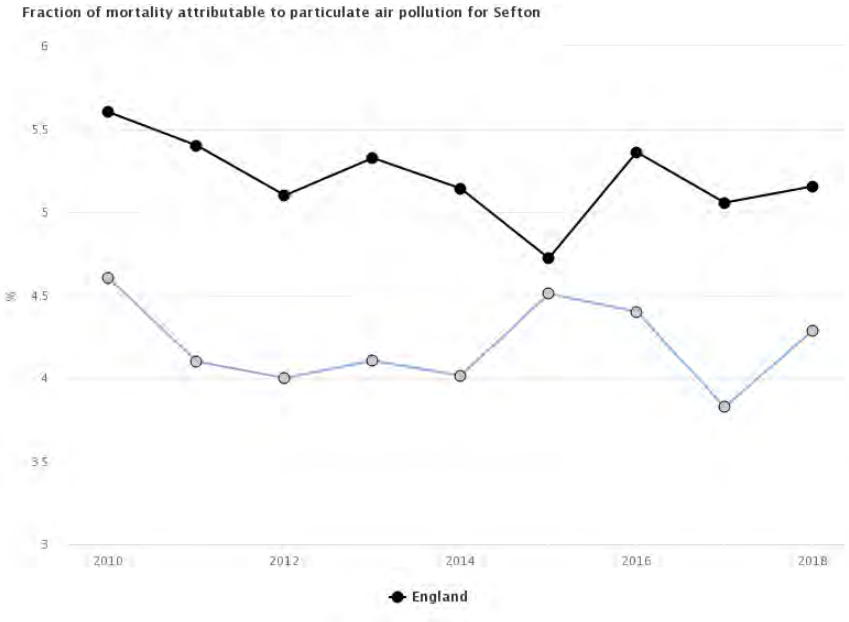
Public Health Outcomes Framework

The Public Health Outcomes Framework (PHOF) includes a modelled estimate of mortality attributable to particulate air pollution (indicator 3.01)[10]. This is one of 161 indicators in this national dataset and is listed under the Health Protection domain. Indicator 3.01 is published annually; it applies to the whole local authority area.

The indicator is defined as, 'the fraction (%) of annual all-cause adult mortality attributable to anthropogenic (human-made) particulate air pollution measured as fine particulate matter, PM2.5.' Exposure is determined from 1km x 1km background (Automatic Urban and Rural Network) $PM_{2.5}$ monitoring data supplied by DEFRA with corrections and additional data applied to isolate exposure from man-made $PM_{2.5}$ (in recognition that this is the modifiable component).

Mortality attributable to $PM_{2.5}$ in Sefton

In Sefton, the fraction of mortality attributable to $PM_{2.5}$ is 4.3 % an increase from the last reported year. See trend graph below



[10] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/3/gid/1000043/pat/6/par/E12000002/ati/102/are/E08000014/iid/30101/age/230/sex/

However, Sefton is in the lower half of the range of values for North West Unitary and 2 tier local authorities ranging from 5.1 % to 3.2% ranking 6th lowest out of 23 Authorities.

Fraction of mortality attributable to particulate air pollution 2018 — Proportion - %

Area	Recent Trend	Neighbour Rank	Count	Value	95% Lower CI Lower CI	95% Upper CI Upper CI
England	–	-	-	5.2	-	-
North West region	–	-	-	4.3	-	-
Liverpool	–	-	-	5.1	-	-
Knowsley	–	-	-	4.9	-	-
Salford	–	-	-	4.8	-	-
Manchester	–	-	-	4.8	-	-
Halton	–	-	-	4.7	-	-
Bolton	–	-	-	4.6	-	-
Tameside	–	-	-	4.6	-	-
St. Helens	–	-	-	4.6	-	-
Oldham	–	-	-	4.5	-	-
Warrington	–	-	-	4.5	-	-
Trafford	–	-	-	4.5	-	-
Bury	–	-	-	4.5	-	-
Stockport	–	-	-	4.4	-	-
Rochdale	–	-	-	4.4	-	-
Wirral	–	-	-	4.4	-	-
Wigan	–	-	-	4.4	-	-
Blackburn with Darwen	–	-	-	4.3	-	-
Sefton	–	-	-	4.3	-	-
Lancashire	–	-	-	4.0	-	-
Cheshire West and Chester	–	-	-	4.0	-	-
Blackpool	–	-	-	3.9	-	-
Cheshire East	–	-	-	3.9	-	-
Cumbria	–	-	-	3.2	-	-

The social gradient in health and air pollution

Patterns of health, disease, longevity and premature death are closely patterned on lines of socio-economic advantage and disadvantage. Health determinants include educational attainment, income, housing, quality of local environment (including air quality), networks of support, good quality health and care services. In Sefton, there is a 12 year gap in life expectancy between the most and least disadvantaged communities.

Emissions data shows that $PM_{2.5}$ hotspots are highest in more built-up areas in the south of the borough, close to Sefton's AQMAs, and to a smaller extent in the area of Southport to the north. The populations that live in these areas experience the highest rates of long-term vascular, cancer and respiratory conditions in Sefton, and individuals can be considered more vulnerable to the harmful effects of air pollution. Local sources of $PM_{2.5}$ are commercial and domestic combustion sources, shipping and dockside activity and road transport. Car and vehicle ownership are lower than average in this area (for example car and van ownership is 38% in Linacre ward); however, some residents may be at increased risk through occupational exposure in addition to background $PM_{2.5}$ concentrations, for example through work that involves a lot of driving.

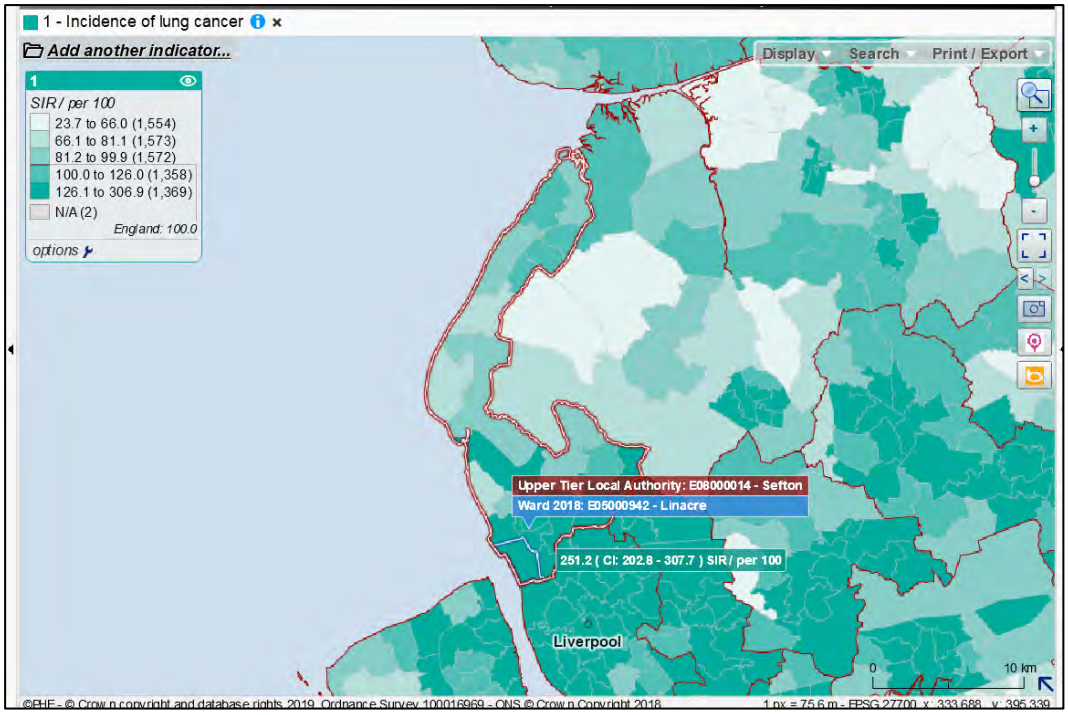
Health impacts

There is good evidence to show that $PM_{2.5}$ exposure is an independent risk factor for cardiovascular disease including stroke, asthma and lung cancer, and growing evidence of an association with diabetes, chronic obstructive pulmonary disease and low birthweight.[11]

It is not possible to routinely measure the distinct effects of $PM_{2.5}$ exposure on the health of individuals. And the evidence base already provides a compelling case to take preventative and protective action. However, it is possible to present the much higher health needs of people living around Sefton's AQMA areas and $PM_{2.5}$ emissions hotspots using mapping tools such as Local Health Profiles[12], which represents relevant health statistics at middle super output area or ward level scale.

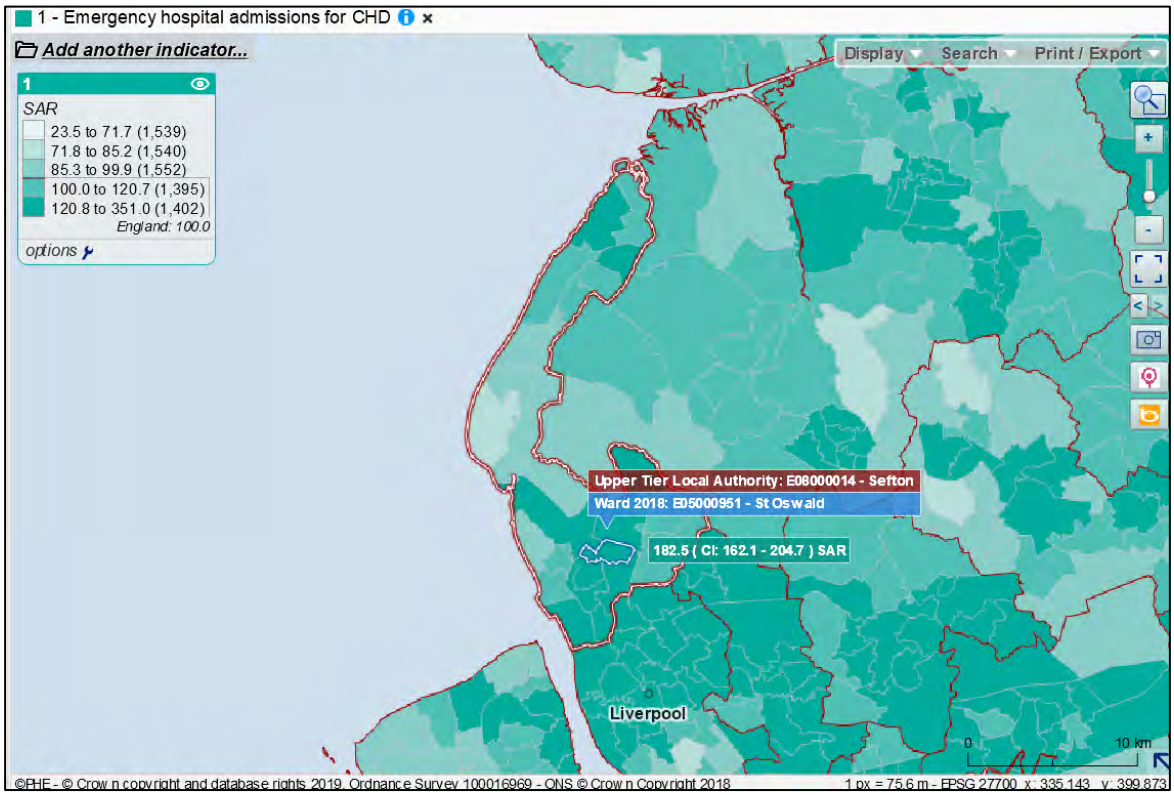
The examples below show ward level rates for new diagnoses of lung cancer, Heart disease and stroke in areas around our AQMA's.

Map: standardised incidence ratio for lung cancer in Sefton, by ward, 2016, showing the highest rate of new lung cancer diagnoses in Linacre ward (2 to 3 times the national rate)

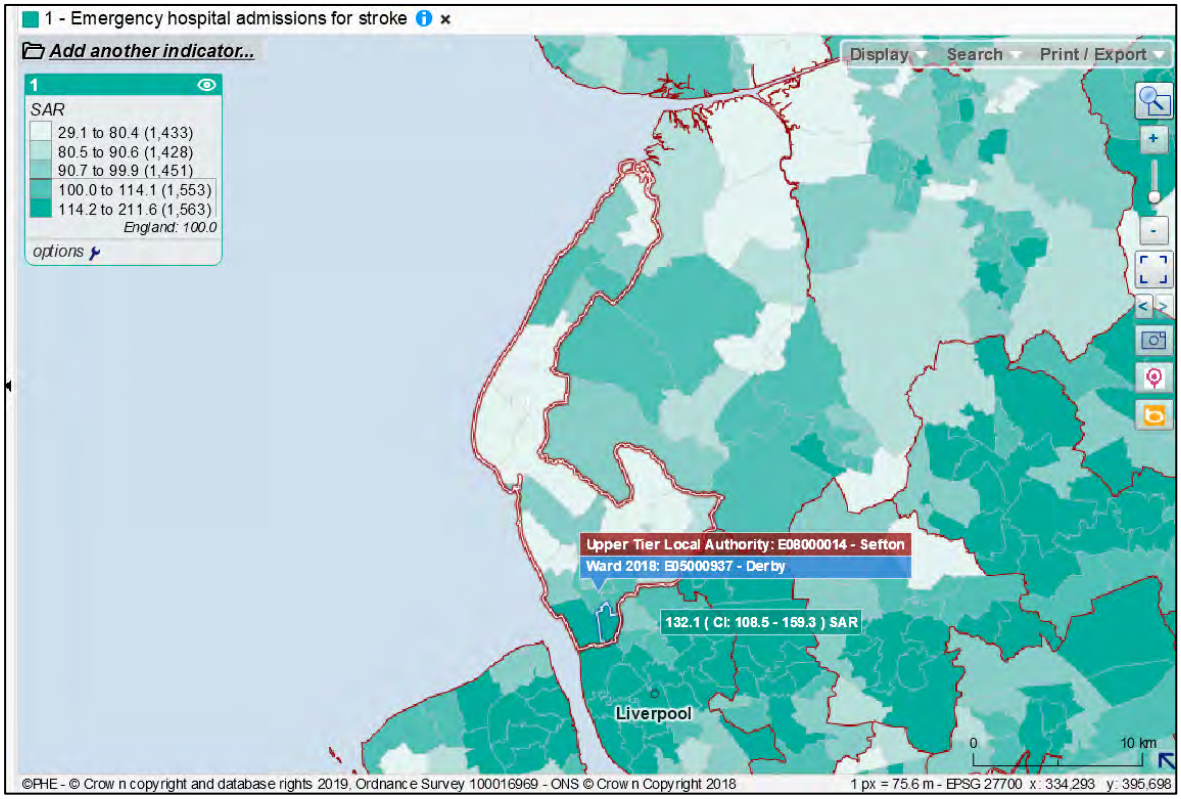


Map: standardised emergency admission ratio for coronary heart disease in Sefton, 2017-18 showing the highest rate of emergency admissions on St Oswald ward (1.5 to 2 times higher than the national rate)

[11] PHE, Health Matters: air pollution https://publichealthmatters.blog.gov.uk/2018/11/14/health-matters-air-pollution-sources-impacts-and-actions/
[12] Local Health http://www.localhealth.org.uk/#l=en;v=map15



Map: standardised emergency admission ratio for stroke in Sefton, 2017-18 showing the highest rate of emergency admissions in St Derby ward (1.0 to 1.5 times higher than the national rate)



Public Health

Sefton's Public Health teams response is in line with the hierarchy of interventions model promoted by Public Health England in their recent comprehensive review: prevent, mitigate, avoid.[13] Our public health annual report 2019 set out continuing commitments to prevent air pollution at source, including work on indoor air pollution, and we are mindful that actions aimed at reducing nitrogen dioxide emissions from transport may deliver only a limited reduction in $PM_{2.5}$. In the coming year we will also work with NHS colleagues to support clinical advice-giving to risk groups, explore options for communicating air quality event alerts and health messages, and making best use of NHS Sustainable Development Management Plans to implement pollution reduction recommendations in the NHS Long Term Plan.

Additionally officers from the Public Health Team continue to work in partnership with Officers from Environmental Health, Planning, Transport and Highways to ensure the priority air quality improvement actions agreed by the Air Quality Members Reference group are carried out. It is hoped that the actions detailed above will have a positive effect on reducing overall levels of $PM_{2.5}$ in the borough and a subsequent positive effect on the PHOF indicator- mortality attributable to particulate air pollution for Sefton.

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/795185/Review_of_interventions_to_improve_air_quality.pdf

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Sefton undertook automatic (continuous) monitoring at 5 sites during 2019. Table A.1 in Appendix A shows the details of the sites. The pollutants monitored in Sefton include nitrogen dioxide (NO_2) at all five sites, particulate matter (PM_{10}) at all of the sites, sulphur dioxide (SO_2) at one location and $PM_{2.5}$ at one location NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. Previous review and assessment work has confirmed that there are no local issues with these pollutants in Sefton. National monitoring results are available at https://uk-air.defra.gov.uk/data/

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

Sefton undertook non- automatic (passive) monitoring of NO_2 at 71 sites during 2019. Table A.2 in Appendix A shows the details of the 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.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[14], "annualisation" (where the data capture falls below 75%), and distance correction[15]. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3. Note that the concentration data presented in Table A.3 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 2019 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.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Automatic Monitoring Results

1 of the 5 automatic monitoring sites where NO_2 is monitored, showed exceedance of the NO_2 annual mean objective in 2019 at the monitoring site. This was at the CM4 Princess Way monitor where a NO_2 annual mean of 41.6 µg/m^3 was recorded. Site CM4 is within the Princess Way AQMA. This monitor is located a short distance away from relevant exposure as defined in TG 16 and as such the level at the nearest receptor loction has been estimated using the fall off with distance calculations thus giving a level of 36.3 µg/m^3 . There is concern that due to increases in port traffic and location in relation to the proposed Port of Liverpool Access Scheme (POLAS) levels of NO_2 will increase in this AQMA and as such it is not proposed to revoke the Princess way AQMA at the present time.

[14] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[15] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

All other automatic monitoring sites showed compliance with the annual NO_2 objective of 40 µg/m^3 in 2019. See table A3 for results

There were no exceedances of 1-hour mean objective at any of the automatic monitoring sites.

Diffusion Tube Monitoring Results

9 non-automatic (passive) diffusion tube monitoring sites showed levels above or very close to the NO_2 annual mean objective in 2019 at the monitored location and are discussed below.

Millers Bridge / Derby Road Area

Due to the ongoing junction improvements around the millers bridge area taking place in 2019 tubes: BM Millers Bridge and EM Millers Bridge had to be removed as a result of street furniture being removed. It was not possible to relocate these monitoring points in 2019 as replacement street furniture was only re instateed in ealry 2020. As a result only 1 diffusion tube in the area showed an exceedance of the annual standard. Site ID: BR Derby Road, Bootle showed an NO_2 annual mean of 50.5µg/m^3 in 2019. As this site recorded a 2019 NO_2 annual mean concentration in exceedance of the air quality objective at a monitoring site which is not representative of public exposure, the concentration at the nearest receptor for this location was estimated using the Defra NO_2 fall off with distance calculator. This showed the estimated concentration of 46.6µg/m^3 indicating an exceedance of the NO_2 annual mean objective at a relevant public exposure location in this area. This is within AQMA 3

Hawthorne Road/ Church Road Area

Around the Hawthorne Road area site ID DD Hawthorne Road, Litherland showed annual average NO_2 levels of 39.2 µg/m^3 . As this site recorded a 2019 NO_2 annual mean concentration very close to the air quality objective and at a monitoring site which is not representative of public exposure, the concentration at the nearest receptor for this location was estimated using the Defra NO_2 fall off with distance calculator. When adjusted for distance the levels at the receptor were estimated to be 32.8 µg/m^3 . Site ID CI Hawthorne Road, Litherland showed an exceedance of the annual standard with average NO_2 levels of 40.8 µg/m^3 at the monitorong location . When adjusted for fall off with distance the level at the receptor was estimated to be 29.5 µg/m^3 both sites

are within AQMA5.Site ID FH Church Road showed an annual mean of 40.4 µg/m^3 in 2019. When adjusted for distance the level at receptor was estimated to be 25.4 µg/m^3 well within the annual standard. It is not currently intended to declare an AQMA in this location.

Hawthorne Road/ Linacre Lane

DO Hawthorne Road, Litherland showed annual average NO_2 levels of 43.8 µg/m^3 at the monitoring location - In excess of the NAQS. When adjusted for distance the levels at the receptor were estimated to be 34.0 µg/m^3 below the NAQS . Due to relatively high kerbside levels this area will be kept under review but It is not currently intended to declare an AQMA in this location.

Princess Way Area

Site ID EY showed an annual mean of 40.5 µg/m^3 in 2019 at the monitored location. At the nearest receptor levels were estimated to be 35.8 µg/m^3 within the NAQS. This site is within AQMA 2

Heman Street/A565

Following elevated results in 2017 and 2018 at Site ID FI Heman Street additional diffusion tube monitoring in the area commenced to determine if the exceedance was continuing and the extent of the exceedance. Diffusion tube FI Heman street showed levels of 38.1 µg/m^3 in 2019 (receptor level 33.2 µg/m^3). The new Diffusion Tubes in the area GG, GH and GI showed levels of 40.9 µg/m^3, 47 µg/m^3 and 30.7 µg/m^3 in 2019. These when corrected for fall off with distance showed levels at receptors of GG 36.3 µg/m^3 and GH 36.3 µg/m^3 respectively. All therefore showed compliance within the NAQS in 2019. Due to current compliance it is not intended that an AQMA is declared at this location at the present time, however as the adjusted levels are close to the NAQS objective this will be kept under review pending analysis of 2020 monitoring results.

South Road Waterloo

Around and within the South Road AQMA, all sites showed complinace with the NAQS objective in 2019 at the monitored location with no exceedances when adjusted at the receptor . Results from diffusion tubes within the AQMA are as follows CJ: 38 µg/m^3 (adjusted at receptor 36.5 µg/m^3), GM: 39.9 µg/m^3 (adjusted at receptor 28.0 µg/m^3),

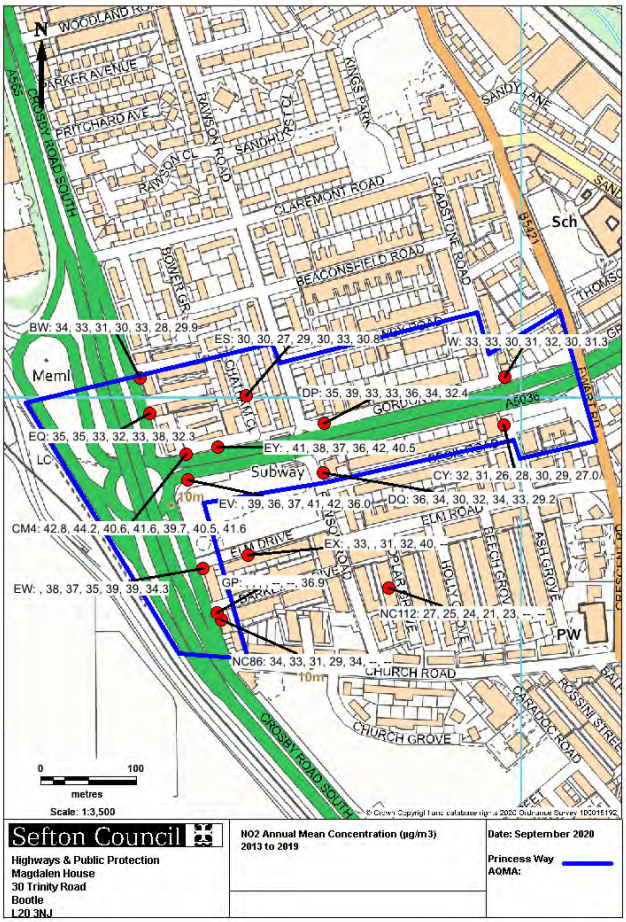
DH: 32.4 µg/m^3 , DI :36.3 µg/m^3 (adjusted at receptor 36.3 µg/m^3) and DR :34.6 µg/m^3 . All levels are now below the NAQS objective following the pattern observed in 2018 and providing further evidence that the that the junction improvement works have had a positive effect on reducing levels of NO_2 in this area since their completion.

Compliance with NAQS in current AQMA's

A summary of each AQMA with regards to NO_2 objective exceedance/compliance is discussed below.

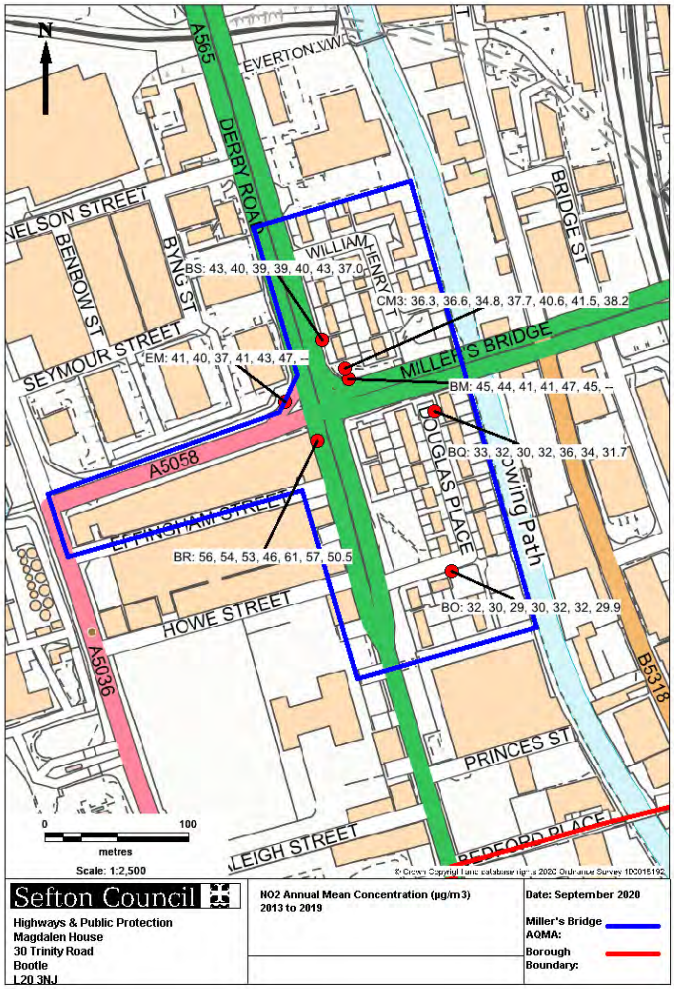
- **AQMA 2 Princess Way, Seaforth**. Exceedance of the NO_2 annual mean objective at the automatic monitoring location and at 1 diffusion tube site was observed in 2019, when adjusted for diatance both show complaince with the NAQS. Complaince the 1-hour mean objective was also achieved at this location. Notwithstanding this there is still concern that increases in port related traffic will impact on pollution levels in this area and as such this AQMA is not being considered for revocation in the immediate future.

Map showing details of the monitoring sites and last 5 years results in and around the AQMA.



- **AQMA 3 Millers Bridge, Bootle**. An exceedance of the NO_2 annual mean objective occurred in 2019 at 1 diffusion tube site. Compliance with the 1 hour mean objective was, however, achieved at this location. In view of the levels monitored within the AQMA and exceedances predicted at residential receptors this AQMA is not being considered for revocation.

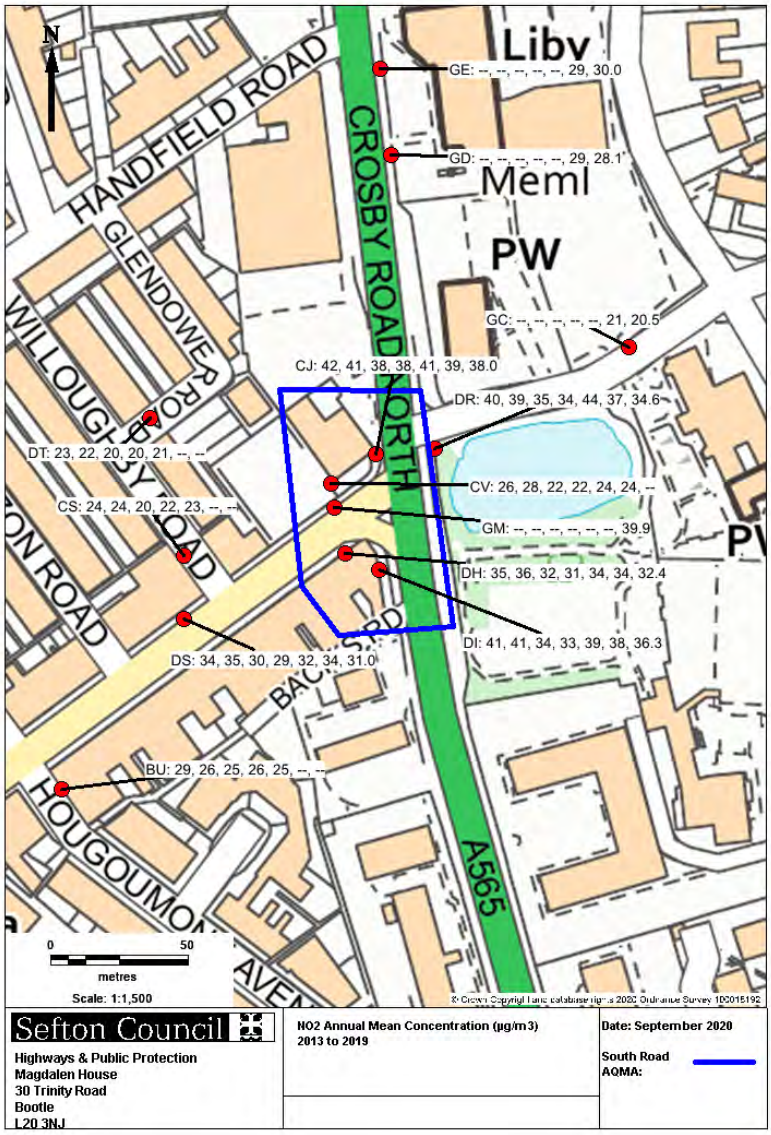
Map showing details of the monitoring sites and last 5 years results within and around the AQMA



- **AQMA4 Waterloo**. No automatic NO_2 monitoring is carried out within AQMA 4. Diffusion tube monitoring has shown compliance with the NAQS objective when adjusted at all receptor locations within the AQMA and surrounding area during 2019. Since the junction improvement works have been completed, overall levels of NO_2 have reduced when compared to 2017 levels . Prior to any decision to

revoke the AQMA a review of 2020 monitoring is to take place, as whilst the area now shpws complaince, levels are still relatively close to the NAQS objective.

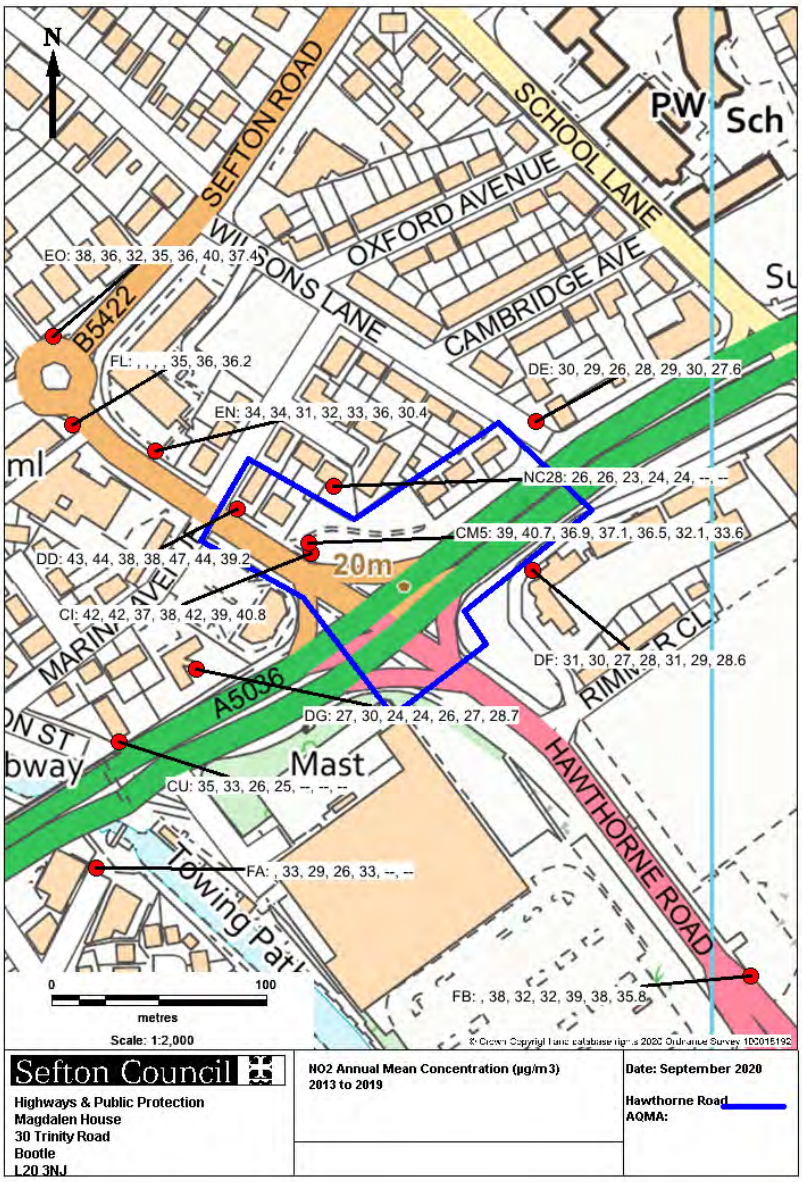
Map showing details of the monitoring sites and last 5 years results within and around the AQMA.



- **AQMA 5 Hawthorne Road, Litherland**. Compliance with the NO_2 annual mean objective and 1-hour mean objective at the automatic monitoring location was achieved in 2019 at the automatic monitoring site, however, 2 diffusion tube monitoring locations showed levels close to or inexcess of the annual standard in 2019. Whilst levels predicted at receptor locations are within the NAQS objective kerbside levels are relatively high. Due to these factors and the

uncertanties surrounding the impact the port expansion will have on pollution levels in this area this AQMA is not being considered for revocation in the immediate future.

Map showing details of the monitoring sites and last 5 years results within and around the AQMA



Trends in NO_2 automatic monitoring Data across all sites

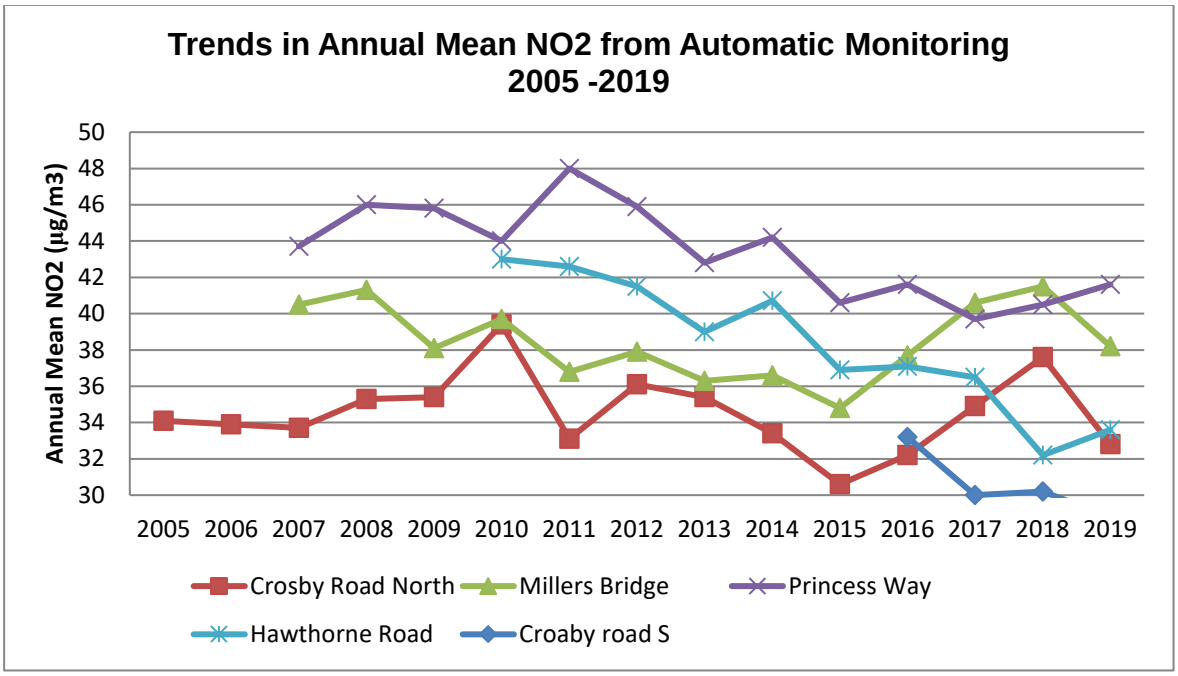


Figure F1 above shows the trends in Annual mean NO_2 levels between 2005 and 2019 at each of the continuous monitoring sites.

- Princess Way monitor (CM4) which is located within AQMA 2 showed levels in exceedance of the NO_2 annual mean objective of 40$\mu g/m^3$ in 2019 as indicated by the purple line in **Figure F.1**. This represents an increase in levels compared to 2017 and 2018 potentially associated with increases in port traffic predicted as a result of the port expansion. Monitoring will continue in this location so future trends can be determined.

- Hawthorne Road monitor (CM5) which is located within AQMA 5 shows an increase when compared to 2018 levels but still remains below the NAQS and has done since 2014 when the AQMA was declared. Due to the port expansion this monitor is ideally placed to assess any future increases.

- The trend from automatic monitoring at Millers Bridge (CM3) which is located within AQMA 3 has been one of compliance with the annual mean objective from 2009 – 2016, however levels generally appear to be rising since 2015 with exceedances observed in 2017 and again in 2018. Levels in 2019 were slightly lower than 2018 and compliant possibly associated with the upgraded junction. Monitoring will continue in this location.

- Trends at Crosby Road North automatic monitoring site (CM2), continue to show compliance with the annual standard, however overall levels do appear to be increasing again from the lowest level recorded in 2015. This will continue to be monitored closely. This monitor location is not within an AQMA

- Levels at Crosby Road South CM6 were well within the NAQS objective and remain fairly constant.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

No exceedances of either the PM_{10} annual mean objective or the 24-hour mean objective at any of the five sites where PM_{10} is monitored were recorded in 2019. It is also positive to see that the overall downward trend in the annual mean and the exceedances of the 24 hour mean continues in 2019.

AQMA 3 Millers Bridge is the only current AQMA that has been declared for PM_{10}. This was was due to exceedance of the 24- hour mean objective. Compliance with the objective at Millers Bridge has now been met since 2008 (with 2008 showing borderline compliance) and although a Detailed Assessment in 2014 concluded that the PM_{10} declaration could be revoked, the 2015 Air Quality Action Plan Progress Report concluded that the declaration for PM_{10} should remain in place due to the

potential future impacts of port expansion on PM_{10} levels at Millers Bridge. **This is currently being reviewed due to continued compliance with the NAQS objective for PM_{10}.**

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Automatic Monitoring of $PM_{2.5}$ commenced in July 2017 at the Millers Bridge monitoring site. The results indicate that since monitoring began in 2017 levels of $PM_{2.5}$ are showing an increasing trend. Levels are still, however, well below the current $PM_{2.5}$ annual mean limit value of 25$\mu g/m^3$. Monitoring will continue in this location to monitor future trends.

As part of Sefton's successful AQ grant bid an additional $PM_{2.5}/PM_{10}$ monitor has recently been installed in a residential location in the Crosby area with a view to ascertaining levels of $PM_{2.5}$ associated with domestic solid fuel use. Results will be reported in next year's ASR.

3.2.4 Sulphur Dioxide (SO_2)

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2019 with the air quality objectives for SO_2.

Sefton Council recommenced automatic monitoring for SO_2 at one location near to the Port of Liverpool at Crosby Road South, Seaforth (Site ID:CM6) in April 2015, due to concerns that SO_2 concentrations from shipping may increase as a result of port expansion. The aim was to establish baseline SO_2 concentrations prior to the new deep water berth becoming operational towards the end of 2016 and to then monitor any increase in SO_2 concentrations that may occur and determine any potential non-compliance with SO_2 air quality objectives.

Discussion of SO_2 Objective Compliance/Exceedance

No exceedances of the 15-minute, 1-hour or 24-hour SO_2 objectives were recorded in 2019 and continued compliance with the standard is observed at this monitoring site.

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?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM2	Crosby Road North,	Roadside	332,174.59	398,483.27	NO2; PM10	NO	Chemiluminescene;Beta attenuation monitor (BAM)	4.49	4.11	1.8
CM3	Millers Bridge, Bootle.	Roadside	333,772.36	394,602.27	NO2;PM10;PM2.5	YES	Chemiluminescence;FIDAS	6.23	8.68	1.8
CM4	Lathom Close, Princess Way, Seaforth.	Roadside	332,648.51	396,941.57	NO2;PM10	YES	Chemiluminescence;Beta attenuation monitor (BAM)	10.63	3.81	1.8
CM5	Hawthorne Road, Litherland.	Roadside	333,811.59	397,518.59	NO2,PM10	YES	Chemiluminescence	13.84	7.04	1.8
CM6	Crosby Road South,	Urban Background	332,873.66	396,549.21	NO2;PM10,SO2	NO	Chemiluminescence;TEOM,UV	N/A	23.5	2.8

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BB	Eaton Avenue, Seaforth	Roadside	333509.906	397186.176	NO_2	NO	3	1.9	NO	2.7
BL	Litherland Road/Marsh Lane, Bootle	Roadside	334432	395820	NO_2	NO	0	2.3	NO	2.5
BM	Millers Bridge, Bootle	Roadside	333784.302	394595.688	NO_2	YES	16.9	5	NO	2.6
BO	Douglas Place, Bootle	Roadside	333846.94	394461.346	NO_2	YES	5.2	1.85	NO	2.7
BQ	Douglas Place/Millers Bridge, Bootle	Roadside	333834.762	394572.335	NO_2	YES	6.5	1.82	NO	2.8
BR	Derby Road, Bootle	Roadside	333753.201	394551.8	NO_2	YES	1.63	1.05	NO	2.6
BS	Derby Road, Bootle	Roadside	333757	394622	NO_2	YES	7.19	2.8	NO	2.5
BV	Quarry Road, Thornton	Roadside	333395.37	400862.903	NO_2	NO	7.51	1.72	NO	2.5
BW	Crosby Road South/Riversdale Road, Seaforth	Roadside	332600.204	397021.204	NO_2	YES	2.05	1.3	NO	2.6
CI	Hawthorne Road, Bootle	Roadside	333812.64	397513.553	NO_2	YES	17.89	3.2	NO	2.5
CJ	South Road, Waterloo	Roadside	332204.248	398228.819	NO_2	YES	0.65	2.47	NO	2.6

CR	Parker Avenue, Seaforth	Roadside	332510.918	397332.214	NO_2	NO	2.46	2.07	NO	2.7
CV	South Road Waterloo	Roadside	332,186.80	398,218.80	NO_2	YES	0	10.35	NO	2.2
CY	Lytton Grove, Seaforth	Roadside	332980.557	396972.038	NO_2	YES	3.66	2.2	NO	2.6
DC	Marsh Lane, Bootle	Kerbside	334339.384	395800.213	NO_2	NO	4.05	0.6	NO	2.5
DD	Hawthorne Road, Litherland	Roadside	333777.928	397534.487	NO_2	YES	5.63	2.26	NO	2.6
DE	Wilson's Lane, Litherland	Roadside	333917.158	397574.971	NO_2	NO	9.4	2.15	NO	2.6
DF	Church Road flats. Litherland	Roadside	333915.796	397505.738	NO_2	NO	3.94	12.25	NO	2.6
DG	Marina Avenue, Litherland	Roadside	333759	397460	NO_2	NO	0	16.7	NO	2.1
DH	South Road, Waterloo	Roadside	332,193.40	398,192.81	NO_2	YES	0	3.59	NO	2.8
DI	Crosby Road North, Waterloo	Roadside	332,205.68	398,186.77	NO_2	YES	0	3.62	NO	2.5
DO	Hawthorne Road/ Linacre Lane, Bootle	Kerbside	334639.624	396399.039	NO_2	NO	4.68	0.63	NO	2.6
DP	Gordon Road/ Rawson Road, Bootle	Kerbside	332792.503	396973.797	NO_2	YES	9.21	0.61	NO	2.7
DQ	Rawson Road, Bootle	Roadside	332791.498	396922.302	NO_2	YES	5.55	1.72	NO	2.6
DR	Crosby Road North, Waterloo	Roadside	332225.716	398230.708	NO_2	NO	21.1	2.45	NO	2.5
DS	South Road, Waterloo	Roadside	332134.399	398168.805	NO_2	NO	2.12	1.36	NO	2.6

DU	Liverpool Road/ Kingsway, Waterloo	Roadside	332196.353	398785.848	NO_2	NO	6.93	3.54	NO	2.6
DV	Moor Lane, Crosby	Roadside	332341.4	400167.903	NO_2	NO	4.74	1.4	NO	2.6
DW	Church Road/ Kirkstone Road North	Roadside	334571.851	397918.273	NO_2	NO	7.44	7.26	NO	2.6
DX	Merton Road, Bootle	Roadside	334737.802	395137.533	NO_2	NO	13.57	5.8	NO	2.6
DY	Hougoumont Avenue/Crosby Road North	Kerbside	332249.794	398008.38	NO_2	NO	6.18	0.43	NO	2.4
DZ	Bailey Drive, Bootle	Roadside	335393.977	397281.889	NO_2	NO	8.26	2.29	NO	2.6
EA	Copy Lane, Netherton	Roadside	336638.651	399495.675	NO_2	NO	10.47	35.1	NO	2.5
EB	Copy Lane, Netherton	Roadside	336591.597	399452.837	NO_2	NO	22.67	1	NO	2.6
EC	Copy Lane/ Dunningsbridge Road	Roadside	336539	399477	NO_2	NO	25.68	2.71	NO	2.6
EE	Copy Lane Police Station, Netherton	Roadside	336572.016	399523.734	NO_2	NO	N/A	3.43	NO	2.6
EK	Hawthorne Road, Bootle	Roadside	334781.591	395188.948	NO_2	NO	13.05	1.06	NO	2.3
EL	Breeze Hill, Bootle	Kerbside	335265.082	394968.091	NO_2	NO	8.17	0.88	NO	2.6
EM	Millers Bridge Industrial Estate, Bootle	Roadside	333735.786	394597.465	NO_2	NO	34.3	3.36	NO	2.6
EN	Hawthorne Road, Litherland	Roadside	333739.853	397561.249	NO_2	NO	9.55	3.85	NO	2.5

EO	Hatton Hill Road, Litherland	Roadside	333692.411	397614.604	NO_2	NO	8.37	1.96	NO	2.6
EP	Ash Road, Seaforth	Roadside	333343.422	397209.994	NO_2	NO	11.45	1.26	NO	2.6
EQ	Crosby Road South, Seaforth	Roadside	332610.502	396984.604	NO_2	YES	3.79	2.3	NO	2.6
ER	Green Lane, Seaforth	Kerbside	333,165.40	397,102.60	NO_2	NO	2.81	0.58	NO	2.7
ES	Chatham Close, Seaforth	Roadside	332711.603	397002.599	NO_2	YES	7.1	1.33	NO	2.6
EV	Princess Way, Seaforth	Kerbside	332650.169	396914.61	NO_2	YES	N/A	0.23	NO	2.6
EW	Crosby Road South, Seaforth	Roadside	332665.744	396821.821	NO_2	YES	1.1	1.22	NO	2.7
EX	Elm Drive No 14	Roadside	332722.047	396836.623	NO_2	NO	0.9	3.2	NO	2.7
EY	Lathom Avenue, Seaforth	Roadside	332681.302	396949.104	NO_2	YES	6.22	1.24	NO	2.7
FB	Hawthorne Road, Litherland	Roadside	334017	397317	NO_2	NO	N/A	2.38	NO	2.6
FC	St Phillips Avenue, Litherand	Roadside	334216.953	397662.84	NO_2	NO	9.9	2.3	NO	2.6
FD	Church Road, Litherland	Roadside	334242.328	397712.677	NO_2	NO	7.94	2.62	NO	2.6
FE	Church Road, Litherland	Roadside	334642.41	397923.332	NO_2	NO	6.44	7	NO	2.6
FF	Boundary Road, Litherland	Roadside	334978.217	398170.5	NO_2	NO	14.39	1.15	NO	2.6
FH	Church Road, Netherton	Kerbside	334962.072	398134.04	NO_2	NO	12.23	0.59	NO	2.6
FI	Hemans Street, Bootle	Roadside	333279.77	395957.948	NO_2	NO	13.49	8.74	NO	2.6
FL	Hawthorne Road opp 20A Litherland	Kerbside	333701.439	397573.795	NO_2	NO	6.8	0.7	NO	2.5

GA	Lord Street	Roadside	333431.41	417165.922	NO_2	NO	9.6	1.52	NO	2.6
GB	Lord Street	Roadside	333704.011	417414.806	NO_2	NO	9.7	1.81	NO	2.6
GC	Haigh Road - Illuminated Sign	Roadside	332296.398	398267.697	NO_2	NO	15.01	1	NO	2.6
GD	Crosby Road North - Lighting Column 46D	Roadside	332209.8	398337.697	NO_2	NO	N/A	2.04	NO	2.6
GE	Crosby Road North - Lighting Column 48D	Roadside	332205.76	398368.998	NO_2	NO	N/A	1.57	NO	2.6
GF	Bridle Road - Lighting Column 0010	Roadside	335347.053	397500.241	NO_2	NO	12.52	1.26	NO	2.6
GG	A565/Hemans Street - Lighting Column 0038	Roadside	333270.041	395967.365	NO_2	NO	5.3	3.06	NO	2.6
GH	A565 opp car wash - Lighting Column 0044	Roadside	333230.91	396068.856	NO_2	NO	12.38	3.54	NO	2.6
GI	St Joans Close opp No.40	Roadside	333281.122	396027.099	NO_2	NO	2.2	1	NO	2.6
GJ	A565 Liverpool Road - Lighting column 120D	Kerbside	332087.963	399829.23	NO_2	NO	4	0.56	NO	2.6
UK 2	Church Road, Litherland	Roadside	334798.812	398065.228	NO_2	NO	7.05	1.68	NO	2.5
UK 4	Crosby Road North, Waterloo	Kerbside	332171.362	398546.757	NO_2	NO	3.49	0.85	NO	2.6
W	Gladstone Road/Gordon Road, Seaforth	Roadside	332981.851	397022.013	NO_2	YES	1.42	2.35	NO	2.6
GK	Derby Road, Bootle	Roadside	333,669.30	394,912.10	NO_2	NO	8	2.1	NO	2.6

GL	Green Lane, Seaforth	Roadside	333,109.98	397,071.55	NO_2	NO	1.4	2.2	NO	2.6
GM	South Road, Waterloo	Roadside	332,189.20	398,209.50	NO_2	YES	9.52	1.46	NO	2.6
GN	Moor Lane, Thornton	Roadside	333,326.30	400,771.80	NO_2	NO	10.77	1.4	NO	2.6
GO	Marsh Lane, Bootle	Roadside	334,203.59	395,748.63	NO_2	NO	3.8	2.35	NO	2.6
GP	Barkeley Drive, Seaforth	Roadside	332,680.52	396,776.00	NO_2	YES	0.77	1	NO	2.6
GQ	Mariners Road, Blundellsands	Roadside	330,706.41	398,904.21	NO_2	NO	11.5	0.56	NO	2.6

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3) (4)				
							2015	2016	2017	2018	2019
CM2	332,174.59	398,483.27	Roadside	Automatic	72	72	30.6	32.2	34.9	37.6	32.8
CM3	333,772.36	394,602.27	Roadside	Automatic	95	95	34.8	37.7	40.6	**41.6**	38.2
CM4	332,648.51	396,941.57	Roadside	Automatic	88	88	**40.6**	**41.6**	**39.7**	**40.5**	**41.6**
CM5	333,811.59	397,518.59	Roadside	Automatic	95	95	36.9	37.1	36.5	32.1	33.6
CM6	332,873.66	396,549.21	Urban Background	Automatic	90	90	34.6	33.2	29.6	30.2	28.8
BB	333509.906	397186.176	Roadside	Diffusion Tube	92	92	28	29	28	28	26.6
BL	334432	395820	Roadside	Diffusion Tube	0	0	29	29	33	29	
BM	333784.302	394595.688	Roadside	Diffusion Tube	0	0	**41**	**41**	**47**	**45**	
BO	333846.94	394461.346	Roadside	Diffusion Tube	83	83	29	30	32	32	29.9
BQ	333834.762	394572.335	Roadside	Diffusion Tube	100	100	30	32	36	34	31.7
BR	333753.201	394551.8	Roadside	Diffusion Tube	75	75	**53**	**46**	**61**	**57**	**50.5**
BS	333757	394622	Roadside	Diffusion Tube	100	100	39	39	**40**	**43**	37.0
BV	333395.37	400862.903	Roadside	Diffusion Tube	100	100	31	33	31	34	31.6
BW	332600.204	397021.204	Roadside	Diffusion Tube	92	92	31	30	33	28	29.9
CI	333812.64	397513.553	Roadside	Diffusion Tube	100	100	37	38	**42**	39	**40.8**

CJ	332204.248	398228.819	Roadside	Diffusion Tube	100	100	38	38	**41**	39	38.0
CR	332510.918	397332.214	Roadside	Diffusion Tube	83	83	30	29	31	32	31.6
CV	332,186.80	398,218.80	Roadside	Diffusion Tube	0	0	22	22	24	24	
CY	332980.557	396972.038	Roadside	Diffusion Tube	100	100	26	28	30	29	27.0
DC	334339.384	395800.213	Kerbside	Diffusion Tube	100	100	33	33	**40**	38	36.3
DD	333777.928	397534.487	Roadside	Diffusion Tube	92	92	38	38	**47**	**44**	39.2
DE	333917.158	397574.971	Roadside	Diffusion Tube	92	92	26	28	29	30	27.6
DF	333915.796	397505.738	Roadside	Diffusion Tube	92	92	27	28	31	29	28.6
DG	333759	397460	Roadside	Diffusion Tube	92	92	24	24	26	27	28.7
DH	332,193.40	398,192.81	Roadside	Diffusion Tube	100	100	32	31	34	34	32.4
DI	332,205.68	398,186.77	Roadside	Diffusion Tube	100	100	34	33	39	38	36.3
DO	334639.624	396399.039	Kerbside	Diffusion Tube	100	100	38	**40**	**47**	**45**	**43.8**
DP	332792.503	396973.797	Kerbside	Diffusion Tube	92	92	33	33	36	34	32.4
DQ	332791.498	396922.302	Roadside	Diffusion Tube	100	100	30	32	34	33	29.2
DR	332225.716	398230.708	Roadside	Diffusion Tube	92	92	35	34	**44**	37	34.6
DS	332134.399	398168.805	Roadside	Diffusion Tube	100	100	30	29	32	34	31.0
DU	332196.353	398785.848	Roadside	Diffusion Tube	100	100	33	33	34	36	33.3
DV	332341.4	400167.903	Roadside	Diffusion Tube	100	100	36	36	39	**40**	36.6

DW	334571.851	397918.273	Roadside	Diffusion Tube	92	92	31	33	34	34	32.6
DX	334737.802	395137.533	Roadside	Diffusion Tube	100	100	33	33	36	36	35.2
DY	332249.794	398008.38	Kerbside	Diffusion Tube	92	92	22	23	28	24	24.4
DZ	335393.977	397281.889	Roadside	Diffusion Tube	100	100	30	33	35	35	32.7
EA	336638.651	399495.675	Roadside	Diffusion Tube	100	100	29	28	30	29	26.3
EB	336591.597	399452.837	Roadside	Diffusion Tube	100	100	34	31	37	36	30.4
EC	336539	399477	Roadside	Diffusion Tube	100	100	32	32	35	37	32.4
EE	336572.016	399523.734	Roadside	Diffusion Tube	83	83	34	36	36	35	36.0
EK	334781.591	395188.948	Roadside	Diffusion Tube	92	92	30	32	34	35	37.0
EL	335265.082	394968.091	Kerbside	Diffusion Tube	100	100	38	**40**	**42**	**44**	37.5
EM	333735.786	394597.465	Roadside	Diffusion Tube	0	0	37	**41**	**43**	**47**	
EN	333739.853	397561.249	Roadside	Diffusion Tube	92	92	31	32	33	36	30.4
EO	333692.411	397614.604	Roadside	Diffusion Tube	100	100	32	35	36	**40**	37.4
EP	333343.422	397209.994	Roadside	Diffusion Tube	100	100	27	30	30	32	29.2
EQ	332610.502	396984.604	Roadside	Diffusion Tube	100	100	33	32	33	38	32.3
ER	333,165.40	397,102.60	Kerbside	Diffusion Tube	0	0	27	24	27	27	
ES	332711.603	397002.599	Roadside	Diffusion Tube	83	83	27	29	30	33	30.8
EV	332650.169	396914.61	Kerbside	Diffusion Tube	100	100	36	37	**41**	**42**	36.0

EW	332665.744	396821.821	Roadside	Diffusion Tube	100	100	37	35	39	39	34.3
EX	332722.047	396836.623	Roadside	Diffusion Tube	0	0	-	31	32	**40**	
EY	332681.302	396949.104	Roadside	Diffusion Tube	92	92	38	37	36	**42**	**40.5**
FB	334017	397317	Roadside	Diffusion Tube	100	100	32	32	39	38	35.8
FC	334216.953	397662.84	Roadside	Diffusion Tube	92	92	27	27	30	25	31.2
FD	334242.328	397712.677	Roadside	Diffusion Tube	92	92	26	26	29	29	27.3
FE	334642.41	397923.332	Roadside	Diffusion Tube	100	100	31	32	36	32	30.0
FF	334978.217	398170.5	Roadside	Diffusion Tube	92	92	32	35	38	39	35.1
FH	334962.072	398134.04	Kerbside	Diffusion Tube	100	100	37	39	**44**	**43**	**40.4**
FI	333279.77	395957.948	Roadside	Diffusion Tube	100	100	34	35	**42**	38	38.1
FL	333701.439	397573.795	Kerbside	Diffusion Tube	100	100			35	36	36.2
GA	333431.41	417165.922	Roadside	Diffusion Tube	83	83				34	34.3
GB	333704.011	417414.806	Roadside	Diffusion Tube	83	83				33	34.3
GC	332296.398	398267.697	Roadside	Diffusion Tube	100	100				21	20.5
GD	332209.8	398337.697	Roadside	Diffusion Tube	100	100				29	28.1
GE	332205.76	398368.998	Roadside	Diffusion Tube	100	100				29	30.0
GF	335347.053	397500.241	Roadside	Diffusion Tube	100	100				35	35.5
GG	333270.041	395967.365	Roadside	Diffusion Tube	100	100				39	**40.9**

GH	333230.91	396068.856	Roadside	Diffusion Tube	100	100				**48**	**47.0**
GI	333281.122	396027.099	Roadside	Diffusion Tube	100	100				33	30.7
GJ	332087.963	399829.23	Kerbside	Diffusion Tube	100	100				34	33.5
UK 2	334798.812	398065.228	Roadside	Diffusion Tube	100	100	27	28	29	28	27.5
UK 4	332171.362	398546.757	Kerbside	Diffusion Tube	100	100	32	31	36	36	34.4
W	332981.851	397022.013	Roadside	Diffusion Tube	100	100	30	31	32	30	31.3
GK	333,669.30	394,912.10	Roadside	Diffusion Tube	92	92	-				37.1
GL	333,109.98	397,071.55	Roadside	Diffusion Tube	92	92	-				29.2
GM	332,189.20	398,209.50	Roadside	Diffusion Tube	92	92	-				39.9
GN	333,326.30	400,771.80	Roadside	Diffusion Tube	92	92	-				31.9
GO	334,203.59	395,748.63	Roadside	Diffusion Tube	92	92	-				34.6
GP	332,680.52	396,776.00	Roadside	Diffusion Tube	83	83	-				36.9
GQ	330,706.41	398,904.21	Roadside	Diffusion Tube	92	92	-				21.7

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **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 adjustment**

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.**

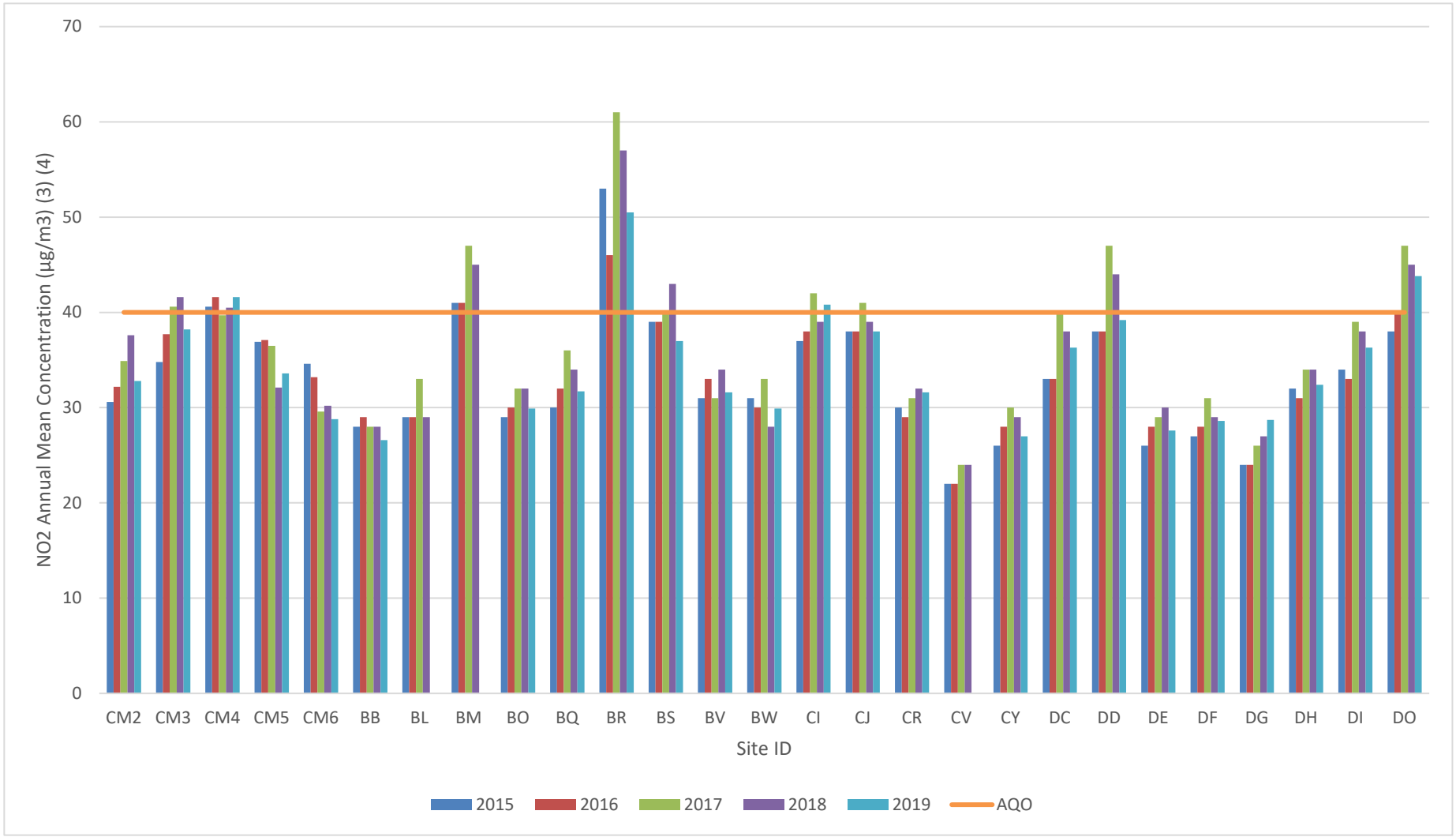
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

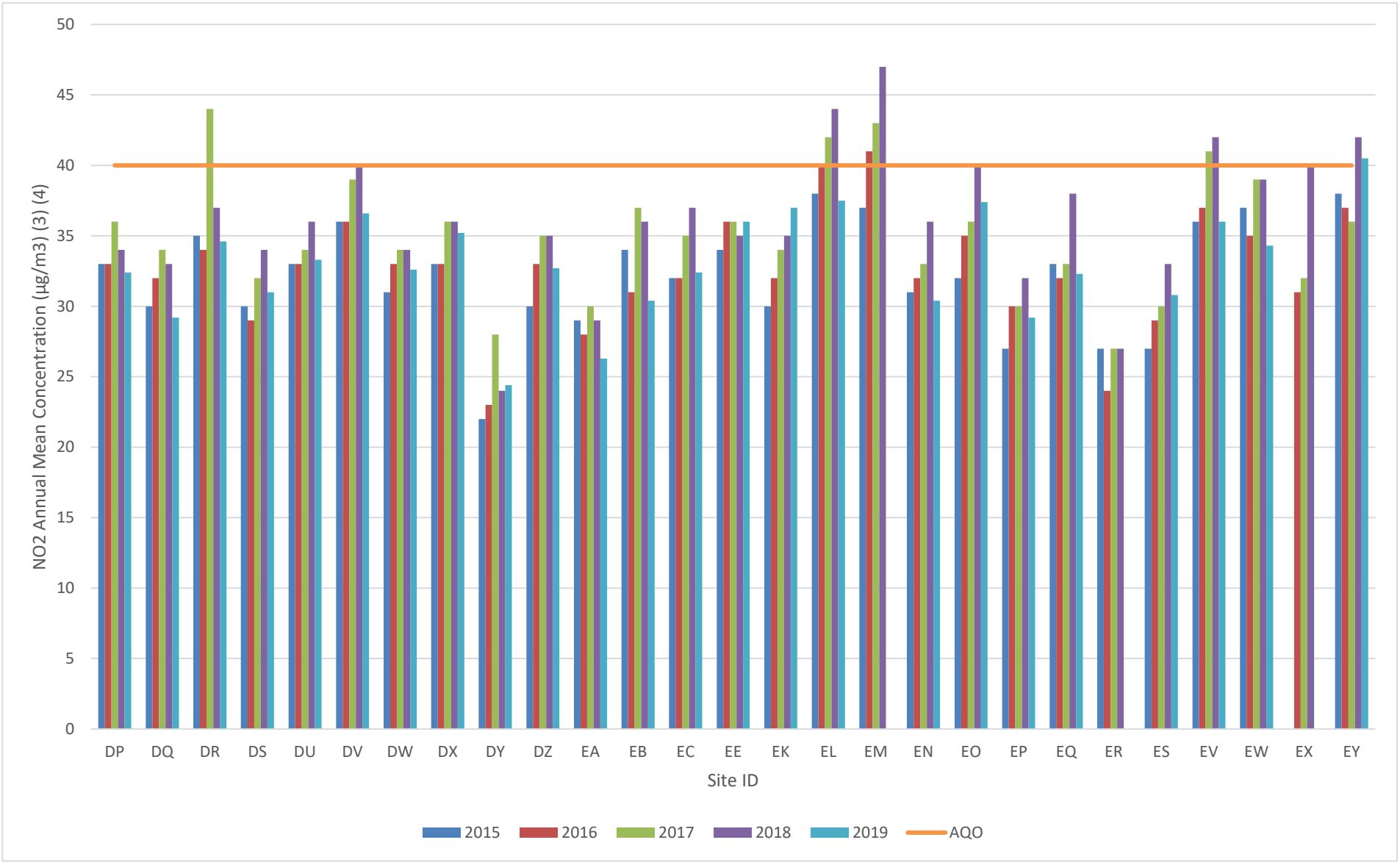
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations




50
45
40
35
30
25
20
15
10
5
0
NO2 Annual Mean Concentration (µg/m3) (3) (4)
DP
DQ
DR
DS
DU
DV
DW
DX
DY
DZ
EA
EB
EC
EE
EK
EL
EM
EN
EO
EP
EQ
ER
ES
EV
EW
EX
EY
Site ID
2015
2016
2017
2018
2019
AQO

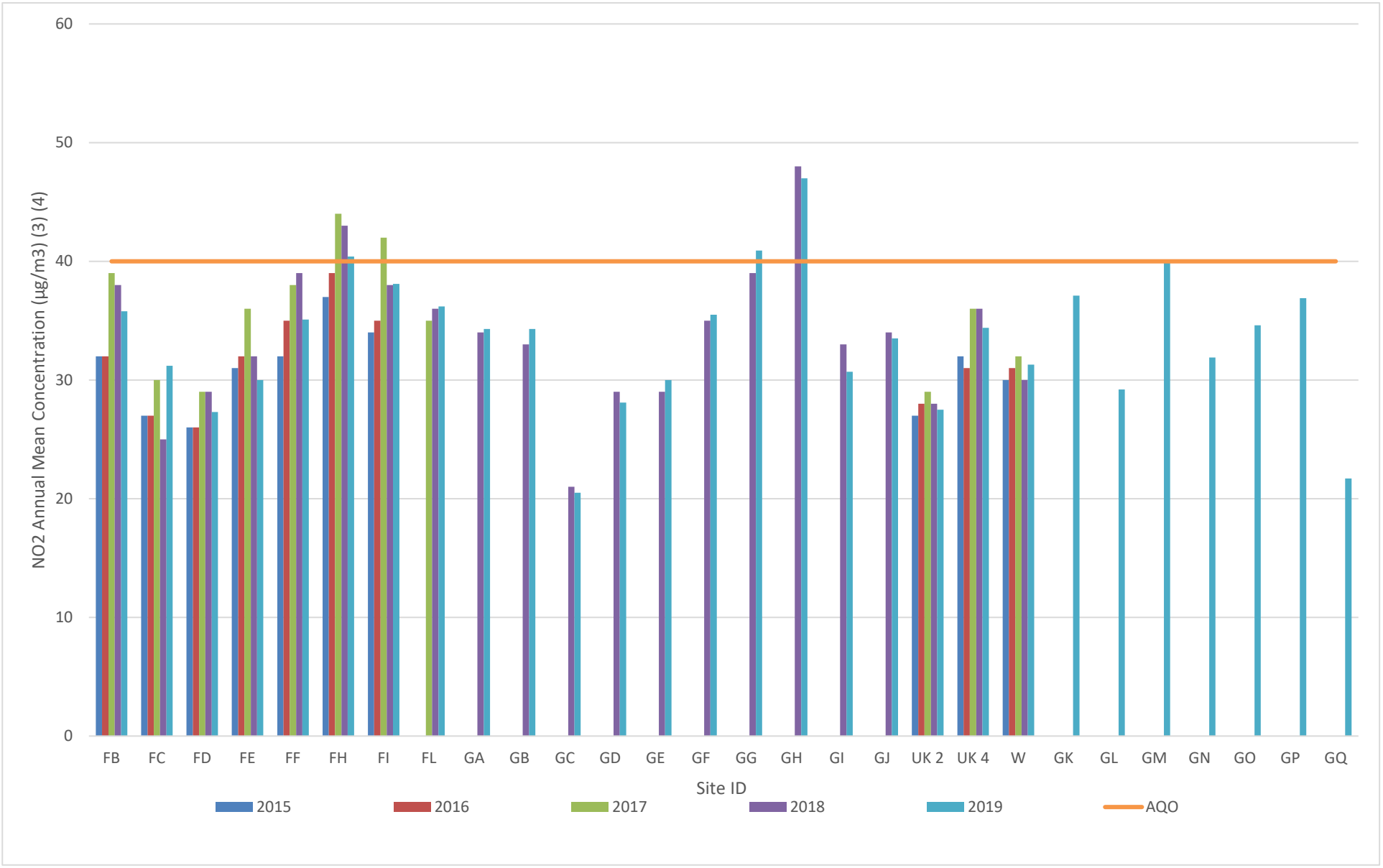

60
50
40
30
20
10
0
NO2 Annual Mean Concentration (µg/m3) (3) (4)
FB FC FD FE FF FH FI FL GA GB GC GD GE GF GG GH GI GJ UK 2 UK 4 W GK GL GM GN GO GP GQ
Site ID
2015
2016
2017
2018
2019
AQO

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m³ (3)				
							2015	2016	2017	2018	2019
CM2	332,174.59	398,483.27	Roadside	Automatic	72	72	0	0	0	**0(113)**	**0(127)**
CM3	333,772.36	394,602.27	Roadside	Automatic	95	95	0	0	0	**0**	**0**
CM4	332,648.51	396,941.57	Roadside	Automatic	88	88	0	0	0	0	0
CM5	333,811.59	397,518.59	Roadside	Automatic	95	95	0	0	**0(120)**	**0(105)**	0
CM6	332,873.66	396,549.21	Urban Background	Automatic	90	90	0	**0(82)**	**0(91)**	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold.**

(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%).

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

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
						2015	2016	2017	2018	2019
CM2	332,174.59	398,483.27	Roadside	72	72	23.7	17	21.1	19.9	26.2
CM3	333,772.36	394,602.27	Roadside	59	59	28.7	25.4	23.9	20.1	17.6
CM4	332,648.51	396,941.57	Roadside	71	71	26.7	23.8	23.1	22.6	16.9
CM5	333,811.59	397,518.59	Roadside	89	89			23.9	23.7	23.7
CM6	332,873.66	396,549.21	Urban Background	0	0	25.5	22.4	19.5	21.2	N/A

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

(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%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

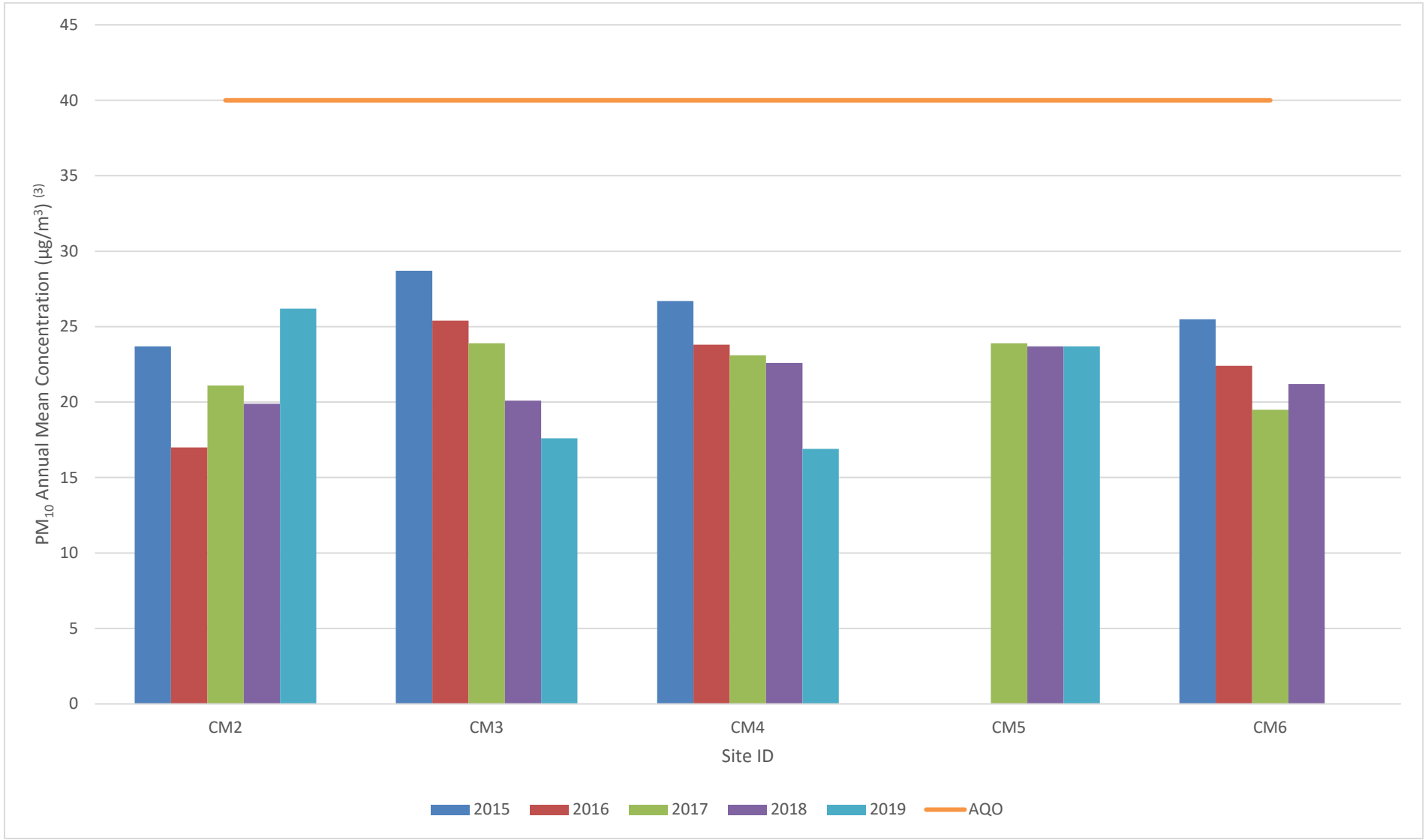


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
CM2	332,174.59	398,483.27	Roadside	72	72	4	2	6	**1(32)**	**1(35)**
CM3	333,772.36	394,602.27	Roadside	59	59	15	5	17	**1(25)**	**1(27)**
CM4	332,648.51	396,941.57	Roadside	71	71	14	6	7	3	**1(28)**
CM5	333,811.59	397,518.59	Roadside	89	89			**2(29)**	**3(33)**	10
CM6	332,873.66	396,549.21	Urban Background	0	0	5	2	**1(28)**	**6(33)**	**N/A**

Notes:

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.**

(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%).

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

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
CM3	333,772.36	394,602.27	Roadside	59	59			7.1	8.9	10.2

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

(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%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.3 – Trends in Annual Mean $PM_{2.5}$ Concentrations

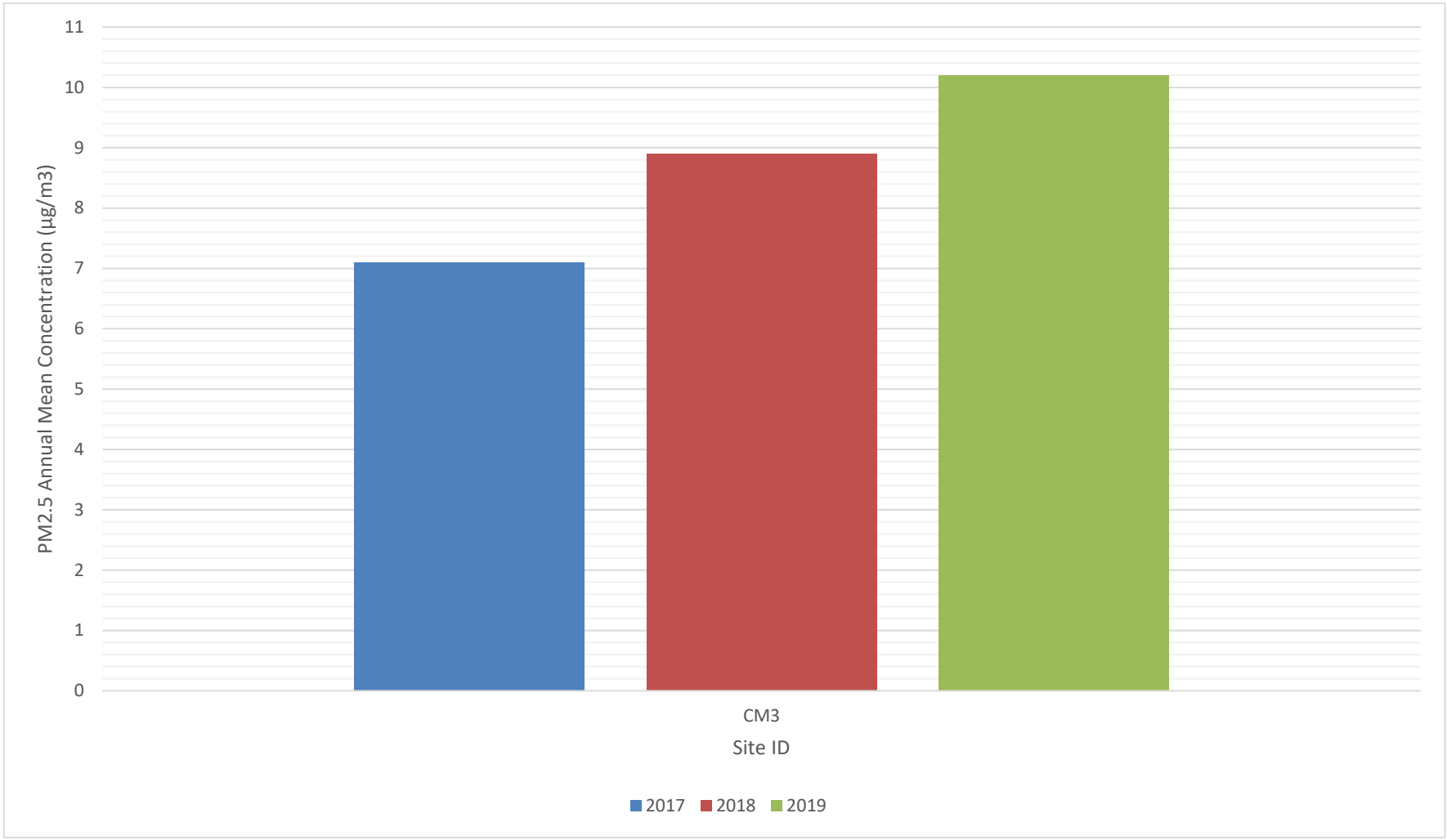


Table A.8 – SO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	Number of Exceedances 2019 (percentile in bracket) [3]		
						15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
CM6	332,873.66	396,549.21	Urban Background	90	90	0	0	0

Notes:

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)

(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%).

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

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO_2 Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BB	333509.906	397186.176	40.5	34.7	26.0	24.7		26.0	23.1	27.0	24.0	28.5	37.1	30.2	29.2	26.6	
BO	333846.94	394461.346	46.13	43.94	34.27	29.89	26.18	31.09	30.78	29.36	29.32	27.44			32.8	29.9	
BQ	333834.762	394572.335	49.02	39.17	35.96	25.39	32.15	29.45	35.23	30.67	30.38	35.18	40.09	35.01	34.8	31.7	
BR	333753.201	394551.8	72.99				52.50	58.00	53.74	46.54	48.42	56.99	59.78	50.26	55.5	**50.5**	**46.6**
BS	333757	394622	53.52	48.53	41.21	36.04	35.59	38.94	39.28	38.04	35.83	40.69	36.58	43.93	40.7	37.0	34.7
BV	333395.37	400862.903	45.37	44.93	32.42	35.5	31.61	32.39	30.29	25.7	31.29	36.48	40.87	30.5	34.8	31.6	
BW	332600.204	397021.204	39.6	46.6		35.05	24.29	24.59	28.24	29.4	24.86	35.43	38.03	35.41	32.9	29.9	
CI	333812.64	397513.553	52.33	61.75	40.51	50.74	39.25	36.48	39.69	44.33	31.39	46.7	49.05	45.38	44.8	**40.8**	29.5
CJ	332204.248	398228.819	53.27	55.46	34.04	42.4	34.95	36.75	38.79	35.89	33.14	42.11	51.02	43.37	41.8	38.0	36.5
CR	332510.918	397332.214	39.09	48.09	30.86	30.15		28.52	30.14	30.29		35.56	38.98	35.12	34.7	31.6	
CY	332980.557	396972.038	38.16	43.47	26.77	25.49	22.95	26.41	24.67	24.73	24.59	32.4	36.38	30.56	29.7	27.0	
DC	334339.384	395800.213	52.38	52.25	36.12	39.52	35.2	38.88	36.69	27.31	34.29	39.2	50.51	36.99	39.9	36.3	31.3
DD	333777.928	397534.487	49.96	69.59	38.72	51.04		38.28	30.42	33.07	22.69	40.03	48.33	51.53	43.1	39.2	32.8
DE	333917.158	397574.971	40.89		19.71	35.54	25.4	24.29	23.69	28.91	24.71	34.5	36.29	39.33	30.3	27.6	
DF	333915.796	397505.738	42.55	41.58	30.74	26.86	22.1		41.1	25.06	21.99	30.48	35.85	27.87	31.5	28.6	

DG	333759	397460	37.49	45.45		36.28	24.36	26.35	21.38	25.35	24	34.51	39.29	32.89	31.6	28.7	
DH	332,193.40	398,192.81	39.96	50.17	30.8	33.29	26.11	32.66	27.7	32.66	29.55	38.25	44.23	42.33	35.6	32.4	
DI	332,205.68	398,186.77	52.72	55.48	36.41	33.65	32.73	36.67	35.38	36.14	31.4	40.51	45.74	41.65	39.9	36.3	36.3
DO	334639.624	396399.039	60.13	59.41	42.34	47.78	45.26	49.3	46.4	41.54	39.29	48.48	49.65	47.52	48.1	**43.8**	34.0
DP	332792.503	396973.797	46.64	52.21	25.47	21.91	29.03	29.3	30.09	32.12		42.6	42.75	40.13	35.7	32.4	
DQ	332791.498	396922.302	44.31	41.05	34.35	25.08	24.16	29.98	29.83	31.67	27.17	34.82	36.35	26.65	32.1	29.2	
DR	332225.716	398230.708		55.57	39.18	25.92	32.28	31.06	35.31	35.03	33.21	39.02	43.51	48.17	38.0	34.6	
DS	332134.399	398168.805	46.99	45.48	28.51	30.23	28.78	31.12	29.39	26.51	27.32	37.03	41.15	36.9	34.1	31.0	
DU	332196.353	398785.848	47.6	51.3	35.19	29.48	27.49	32.31	34.07	32.7	28.69	33.48	43.88	42.31	36.5	33.3	
DV	332341.4	400167.903	52.74	49.11	35.25	37.68	36.53	38.59	35.84	33.86	34.15	42.72	48.59	37.69	40.2	36.6	28.1
DW	334571.851	397918.273	47.12	42.15	27.46	42.17	28.99	31.57	26.63	27.98		42.21	42.87	35.12	35.8	32.6	
DX	334737.802	395137.533	51.58	48.26	36.89	39.91	29.68	34.46	31.32	32.35	29.81	41.54	47.37	41.36	38.7	35.2	
DY	332249.794	398008.38		36.39	21.35	26.65	18.43	24.71	21.16	18.5	25.09	31.17	40.31	30.88	26.8	24.4	
DZ	335393.977	397281.889	50.77	41.55	34.95	34.71	22.36	30.92	28.45	31.24	30.12	42	48.44	35.23	35.9	32.7	
EA	336638.651	399495.675	42.51	36.01	31.85	10.54	26.99	19.92	23.93	27.54	27.65	28.78	38.86	32.01	28.9	26.3	
EB	336591.597	399452.837	44.74	33.42	34.67	25.7	11.29	32.23	33.73	31.8	30.67	38.54	48.5	35.74	33.4	30.4	
EC	336539	399477	44.95	53.1	18.03	37.86	31.09	33.76	27.21	26.49	30.74	44.23	44.23	35.2	35.6	32.4	
EE	336572.016	399523.734	47.24	51.41	28.29	50.05	31.11	32.53	25.77			37.74	49.73	41.85	39.6	36.0	36.0
EK	334781.591	395188.948	51.41	52.66	35.01	41.95	31.13	34.65		34.4	33.09	43.47	48.98	40.1	40.6	37.0	29.6
EL	335265.082	394968.091	57.2	42.49	45.53	39.64	38.07	40.05	36.89	33.31	35.06	44.23	49.02	33.37	41.2	37.5	29.5
EN	333739.853	397561.249	49.49		30.23	34.07	32.79	31.15	33.89	31	25.33	29.24	39.35	31.06	33.4	30.4	
EO	333692.411	397614.604	49.84	55.85	37.31	42.08	35.07	36.24	34.86	37.18	28.73	46.76	48.84	40.44	41.1	37.4	29.9
EP	333343.422	397209.994	42.59	44.61	22.45	38.16	24.75	26.48	24.6	29.24	25.08	39.39	41.83	25.61	32.1	29.2	
EQ	332610.502	396984.604	42.94	49.55	33.23	36.57	28.66	26.88	30.3	32.82	24.16	41.38	39.4	39.44	35.4	32.3	
ES	332711.603	397002.599	41.17	48.96	28.18	32.21	24.59	23.65			27.05	37.66	40.49	34.02	33.8	30.8	
EV	332650.169	396914.61	55.47	48.22	43.97	30.53	30.99	36.31	38.12	38.98	31.88	37.69	45.92	37.21	39.6	36.0	36.0
EW	332665.744	396821.821	50.62	45.39	37.64	32.76	28.33	30.58	38.33	38.47	33.21	37.9	39.29	39.21	37.6	34.3	

EY	332681.302	396949.104	51.37	57.74	41.78	47.21	38.87		33.25	43.32	33.89	48.63	50.07	43.48	44.5	**40.5**	35.8
FB	334017	397317	54.32	48.67	38.26	28.97	34.05	31.59	34.04	38.02	31.74	45.26	44.72	43.03	39.4	35.8	35.8
FC	334216.953	397662.84	80.53	37.73	30.65		29.43	23.66	23.88	23.71	24.02	33.51	39.5	30.89	34.3	31.2	
FD	334242.328	397712.677	43.51	38.7	27.91	27.68	23.01	24.51	20.11	25.98	25		38.16	35.09	30.0	27.3	
FE	334642.41	397923.332	50.17	30.89	35.48	24.14	29.42	24.68	28.88	26.79	27.94	38.13	45.35	33.2	32.9	30.0	
FF	334978.217	398170.5	53.51		34.22	45.49	30.65	33.75	29.3	27.73	31.38	46.34	51.8	39.62	38.5	35.1	
FH	334962.072	398134.04	58.05	41.11	46.97	36.75	43.46	39.65	39.64	40.26	42.05	47.52	52.58	44.88	44.4	**40.4**	25.4
FI	333279.77	395957.948	53	49.15	51.62	29.02	35.41	30.75	43.6	42.86	33.8	42.64	45.66	45.11	41.9	38.1	33.2
FL	333701.439	397573.795	48.05	53.73	30.6	46.31	31.85	32.25	27.53	32.68	31.31	48.43	49.7	45.03	39.8	36.2	28.1
GA	333431.41	417165.922	50.82	36.26	33.05	32.27	32.41	32.49			29.16	40.98	52.17	37.54	37.7	34.3	
GB	333704.011	417414.806	49.88	44.78	34.44	29.46		32.68	33.27		32.02	41.13	46.49	32.54	37.7	34.3	
GC	332296.398	398267.697	33.65	35.01	22.46	6.03	15.82	17.57	17.07	17.83	19.51	25.85	33.97	25.81	22.5	20.5	
GD	332209.8	398337.697	45.48	40.22	26.51	22.38	20.51	23.91	24.5	22.74	27.65	36.05	43.34	37.56	30.9	28.1	
GE	332205.76	398368.998	47.65	41.04	31.49	25.78	26.98	25.61	26.96	23.5	29.5	36.69	45.21	35.63	33.0	30.0	
GF	335347.053	397500.241	57.24	47.22	39.34	23.35	33.1	31.22	36.56	34.34	35.43	41.29	45.09	44.59	39.1	35.5	25.9
GG	333270.041	395967.365	63.98	56.31	52.49	30.4	39.21	37.76	38.43	37.17	36.29	42.05	52.99	52.66	45.0	**40.9**	36.3
GH	333230.91	396068.856	77.86	57.37	61.09	37.42	50.04	41.24	48.71	42.46	42.86	49.22	54.14	56.94	51.6	**47.0**	36.3
GI	333281.122	396027.099	48.11	40.62	40.7	24.49	28.3	24.57	30.88	28.55	27.45	36.25	38.72	36.82	33.8	30.7	
GJ	332087.963	399829.23	44.82	44.16	39.87	26.31	30.76	30.98	32.78	29.08	35.3	42.55	45.31	39.39	36.8	33.5	
GK	333,669.30	394,912.10		52.33	45.73	32.15	41.53	33.23	38.64	34.93	37.26	43.05	51.14	38.97	40.8	37.1	34.4
GL	333,109.98	397,071.55		39.23	35.54	24.96	29.14	25.61	27.96	30.43	31.47	37.48	38.58	32.5	32.1	29.2	
GM	332,189.20	398,209.50		55.99	68.28	52.01	35.02	33.62	30.32	31.89	36.27	43.23	49.9	46.03	43.9	39.9	28.0
GN	333,326.30	400,771.80		52.28	35.29	38.21	29.09	30.22	28.44	28.03	28.05	36.4	45.58	33.81	35.0	31.9	
GO	334,203.59	395,748.63		46.62	37.86	45.94	32.5	32.8	28.78	36.73	33.8	34.38	49	40.29	38.1	34.6	
GP	332,680.52	396,776.00		59.38		36.96	27.47	29.28	31.33		59.62	40.06	35.75	45.59	40.6	36.9	35.9
GQ	330,706.41	398,904.21		39.82	16.98	32.76	17.94	17.24	14.5	12.56	20.24	30.07	38.1	22.18	23.9	21.7	
UK 2	334798.812	398065.228	38.58	40.3	26.33	32.93	27.17	23.87	20.34	22.97	27.17	34.09	41.05	27.93	30.2	27.5	

UK 4	332171.362	398546.757	52.4	47.24	34.93	37.18	31.09	29.81	31.96	26.14	33.1	40.51	49.65	39.11	37.8	34.4	
W	332981.851	397022.013	43.45	52.68	33.3	34.89	22.45	26.48	27.24	31.61	27.46	37.54	40.68	34.95	34.4	31.3	

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

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

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.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure where the NO_2 level at the monitor is above 36 µg/m^3

Where no data is shown in the table above, the data for that particular month has not been included – this may be because of the diffusion tube going missing or being tampered with or concerns regarding the validity of the data.

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

QA/QC

No new sources of pollution have been identified in 2019, however, a number of minor changes to the diffusion tube monitoring network have taken place in 2019 to assess levels of NO_2 at locations of interest. Maps detailing the location of all diffusion tubes are provided in appendix D.

QA/QC for Automatic Monitoring

Sefton Council's monitoring network is operated and run by officers who have been trained in all aspects of air quality monitoring, including routine site maintenance, calibration of analysers and data ratification. The QA/QC procedures used are detailed below.

Horiba 360 and 370 series analysers are used for gaseous pollutants and TEOM (VMS corrected) and BAM analysers used for particulates PM_{10}. FIDAS dual Particulate monitor is used for $PM_{2.5}$ PM_{10}

Sefton Council have in place a rigorous QA/QC programme which incorporates the daily screening, by visual examination of all monitoring and calibration data to ascertain if any immediate action is necessary, fortnightly site visits to carry out routine maintenance and calibration checks, equipment maintenance support including breakdown repair and 6 monthly servicing following the manufacturers recommendations carried out by trained service engineers, 6 monthly QA/QC audits carried out by an external UKAS accredited (RICARDO) field auditor and data validation and ratification of all datasets.

The QA/QC audit independent organisation used must hold UKAS accreditation to ISO 17025 for the on-site calibration of the NO_x gas analysers and for flow rate checks on particulate (PM_{10}) analysers and for the determination of the spring constant, k0, for conventional and TEOM-FDMS instruments. ISO17025 accreditation provides confidence that the analyser calibration factors produced are traceable to national metrology standards, that the calibration methodology is suitable, and that the

uncertainties are appropriate for data reporting purposes and ISO17025 accreditation for laboratory certification of NO, NO2, CO and SO2 gas cylinders is also held.
Horiba gas analysers carry out automatic checks every three days for zero and span calibration and Horiba software scales the data of the three-day calibration checks. Monitoring and calibration data from automatic monitors for the previous day(s) are examined on the morning of each working day by an air quality officer to check for spurious or unusual readings, allowing for the identification of anomalies or instrument faults, so they can be investigated and dealt with promptly.

An air quality officer carries out routine site visits every 30 days in accordance with a documented procedure, during which routine maintenance is carried out including the changing of all sample inlet filters. Zero and span calibration checks and gas cylinder pressures checks are also made. Any faults identified are either rectified at the time of the visit or are reported immediately to the instrument supplier service department to arrange an engineer call out.

Sefton Council has a maintenance contract currently with Horiba UK, which includes six monthly servicing intervals and breakdown cover to ensure optimum performance of the analysers throughout the year. External QA/QC audits are carried out at 6 monthly intervals. This work is presently carried out by Ricardo Energy & Environment, who provide a report with recommendations and comments relating to data management as a result of the audit and any necessary action to correct data for long term drift or any other matters which need to be addressed.

Primary data validation (application of calibration factors, screening of data for spurious and unusual measurements) is followed up with a more detailed process known as data ratification, a more rigorous data management procedure involving a critical review of all information relating to a particular dataset, the purpose being to verify, amend or reject as necessary. These methods are given in more detail in DEFRA technical guidance LAQM.TG (16).

PM_{10} Monitoring Adjustment

In 2019 Sefton Council used 4 different instrument types to measure PM_{10}

- Tapered Element Oscillating Microbalance (TEOM) with heated inlet
- Eberline ESM FH 62 IR Beta Attenuation Monitor (BAM) with heated inlet
- Met-One 1020 Beta Attenuation Monitor (BAM) with unheated inlet
- FIDAS dual monitor with unheated inlet

The UK PM_{10} Objectives and European Union (EU) limit values are based upon measurements carried out using the European reference sampler, which is a gravimetric device where the particle mass is collected onto a filter and subsequently weighed. This method has a number of disadvantages in that only 24-hour mean concentrations are recorded and the data cannot be disseminated to the public in real time and the operation is labour intensive. Historically TEOM analysers have been predominantly used in the UK, however other samplers are also used such as BAM's. A significant problem with instruments using heated inlets is the loss of semi-volatile components when heated to drive off excess moisture. A default correction factor of 1.3 was recommended to be applied to the data of analysers using heated inlets in order to generate a nominal 'gravimetric-equivalent' result. However for TEOM data the guidance is now to use the volatile correction model (VCM) which uses the Filter Dynamics Measurement System (FDMS) 'purge measurement' as an indicator of the volatile component of PM_{10} and is based on the assumption that the volatile component of PM_{10} lost during the heated sampling with a standard TEOM is consistent across a defined geographical area, such that the measurements of this component at one location may be used to correct measurements at another. A VCM web portal allows local authorities to download geographically specific correction factors to apply to TEOM PM_{10} results.
The technical guidance also recommends that Met-One BAM (with unheated inlets) measured concentrations reported at standard conditions be divided by a factor of 1.2.

The following PM_{10} adjustment factors were used and have been applied to the measured PM_{10} concentrations contained in this report.

- TEOM data pre 2008 – multiplied by 1.3
- TEOM data 2008 onwards – Volatile Correction Model (VCM) used (and x 1.3 factor also used for comparative purposes)
- Eberline Beta Attenuation Monitor (BAM) data – multiplied by 1.3
- Met-One Beta Attenuation Monitor (BAM) data – divided by 1.2

QA/QC for Non - Automatic Monitoring, Nitrogen Dioxide Diffusion Tubes

Sefton Council use a large number of passive nitrogen dioxide diffusion tubes to monitor NO_2 throughout the Borough, the majority of which form part of its in-house monitoring programme and the remainder are used for the Community Air Watch programme.

The tubes are currently prepared and analysed by Gradko International Limited, St Martins House, 77 Wales Street, Winchester, Hampshire,
SO23 0RH. Gradko are amongst the market leaders in the preparation, supply and analysis of NO_2 diffusion tubes. Gradko representatives participated and provided input into the working group on the harmonisation of diffusion tubes set up to manage the process of harmonisation of NO_2 tube preparation and analysis methods. The diffusion tubes used are prepared by making up a solution of 20% Triethanolamine (TEA) solution and 80% deionised water. The grey caps are loaded with two stainless steel mesh grids onto which is pipetted 50μL of 20%TEA/water. The tube is then fully assembled and stored under refrigerated conditions ready for use. On receipt the unexposed tubes are stored in a refrigerator prior to and following exposure and then returned to Gradko for analysis. A travel blank is also used to identify possible contamination of diffusion tubes while in transport or storage. Analysis is carried out in accordance with Gradko's documented UKAS accredited in-house laboratory method GLM7 and follows the harmonisation practical guidance for diffusion tube.

Gradko participate in AIR, an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL Workplace Analysis Scheme for Proficiency (WASP) PT scheme.

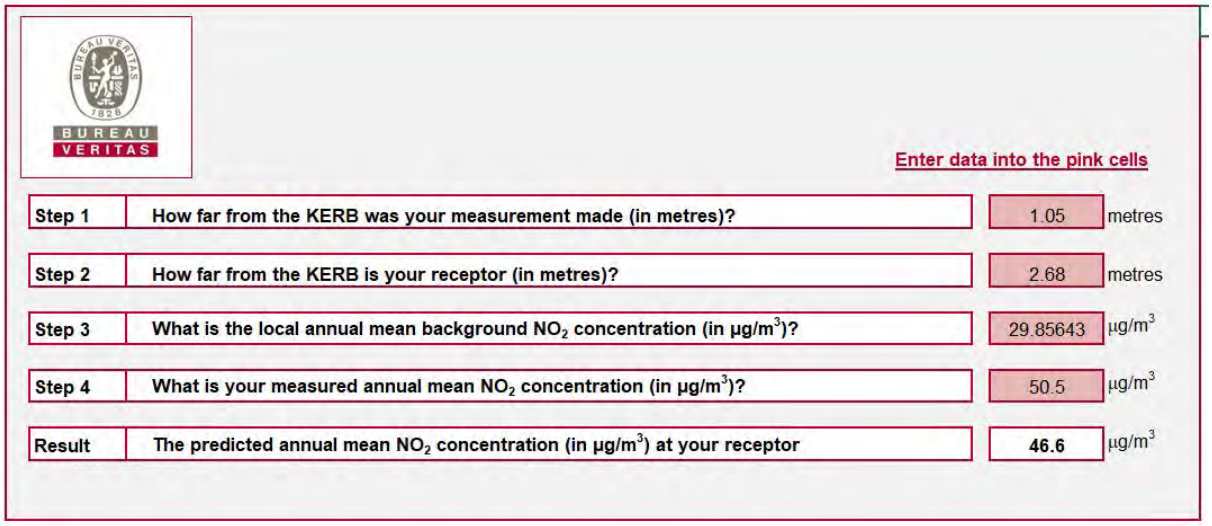
NO_2 Diffusion Tube Bias Adjustment Factors

Diffusion tubes may exhibit substantial under or over estimation compared with the reference chemiluminescence method, due to factors in the field affecting performance, such as wind induced shortening of the effective diffusive path length, that are not related to the laboratory's preparation or analysis of the tubes.

Sefton utilised the national bias adjustment figures for 2019– The Gradko adjustment using the latest spreadsheet (09/2020) was 0.91. This bias adjustment has been applied to all diffusion tubes.

Nitrogen Dioxide Drop Off With Distance Calculations

The results from all Diffusion tubes Sites with NO_2 levels above 36 ug/m^3 in 2019 have been adjusted so that the concentration at the nearest receptor is estimated. This has been done in accordance with TG 16 using DEFRA background NO_2 maps and the approved fall off with distance calculator. An example of the calculation for diffusion tube BR Derby is shown below:



BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.05	metres
Step 2	How far from the KERB is your receptor (in metres)?	2.68	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	29.85643	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	50.5	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	**46.6**	µg/m^3

Annualisation of results

Where monitoring has taken place with data capture falling below the required 75% capture rate annualisation of these results has been carried in accordance with TG 16 to estimate the likely annual result.

The tables below show a summary of the annualisation that was applied to each data set below the required threshold.

CM2- Crosby Road North Waterloo Annualisation adjustment-NO_2

Measurements from 3 of the nearest background AURN monitoring sites with the necessary data has been used in this annualisation process.

Monitor site	NO_2 Annual Mean 2019 (A_m)	NO_2 Period Mean (P_m)	Ratio (A_m/P_m)
Blackpool Marton Urban Background	12.3	13.5	0.91
Preston urban Background	22.8	23.6	0.97
Wigan Centre urban Background	19.2	20.24	0.95
Average (R_a)			**0.94**

The measured unadjusted (M) NO_2 concentration at Crosby Road North Waterloo CM2 for the period monitored was 34.8 µg/m^3

Annualisation of the NO_2 annual mean concentration at Waterloo CM2 for 2019 is therefore M x Ra = 34.8 x 0.94 = 32.8 µg/m^3.

CM2- Crosby Road North Annualisation adjustment-PM_{10}

Measurements from 3 of the nearest background AURN monitoring sites with the necessary data has been used in this annualisation process.

Monitor Location	PM10 Annual Mean 2019 (A_m)	NO_2 Period Mean (P_m)	Ratio (A_m/P_m)
Salford Eccles UB	15.4	14.2	1.082
York Bootham UB	14.0	13.4	1.044
Sheffield Devonshire UB	14.9	13.5	1.104
Average (R_a)			**1.077**

The measured unadjusted (M) PM_{10} concentration at Crosby Road North CM2 for the period is 24.3 µg/m^3

Annualisation of the annual mean concentration at Crosby Road North CM2 for 2019 is M x Ra = 24.3 x 1.077 = 26.2 µg/m^3.

CM3 – Millers Bridge Annualisation adjustment PM $_{10}$

Measurements from 3 of the nearest background AURN monitoring sites with the necessary data has been used in this annualisation process.

Monitor Location	PM_{10} Annual Mean 2019 (A_m)	PM_{10}Period Mean (P_m)	Ratio (A_m/P_m)
Salford Eccles UB	15.4	14.3	1.077
York Bootham UB	14.0	13.3	1.053
Sheffield Devonshire UB	14.9	13.9	1.072
Average (R_a)			**1.067**

The measured unadjusted (M) PM_{10} concentration at Millers Bridge CM3 for the period is 16.5 µg/m^3

Annualisation of the annual mean concentration at Millers Bridge for 2019 is M x Ra = 16.5 x 1.067 = 17.6 µg/m^3.

CM4-Princess Way Annualisation adjustment PM $_{10}$

Monitor Location	PM_{10} Annual Mean 2019 (A_m)	PM_{10}Period Mean (P_m)	Ratio (A_m/P_m)
Salford Eccles UB	15.4	16.1	0.957
York Bootham UB	14.0	14.5	0.966
Sheffield Devonshire UB	14.9	15.7	0.949
Average (R_a)			**0.957**

The measured unadjusted (M) PM10 concentration at Princess Way CM4 for the period is 17.7 µg/m^3

Annualisation of the annual mean concentration at Princess Way for 2019 is M x Ra = 17.7 x 0.957 = 16.9 µg/m^3.

CM3 – Millers Bridge Annualisation adjustment PM 2.5

Data from 3 of the nearest backgound sites which form part of the AURN network with the necessary data were used to undertake the annualisation process

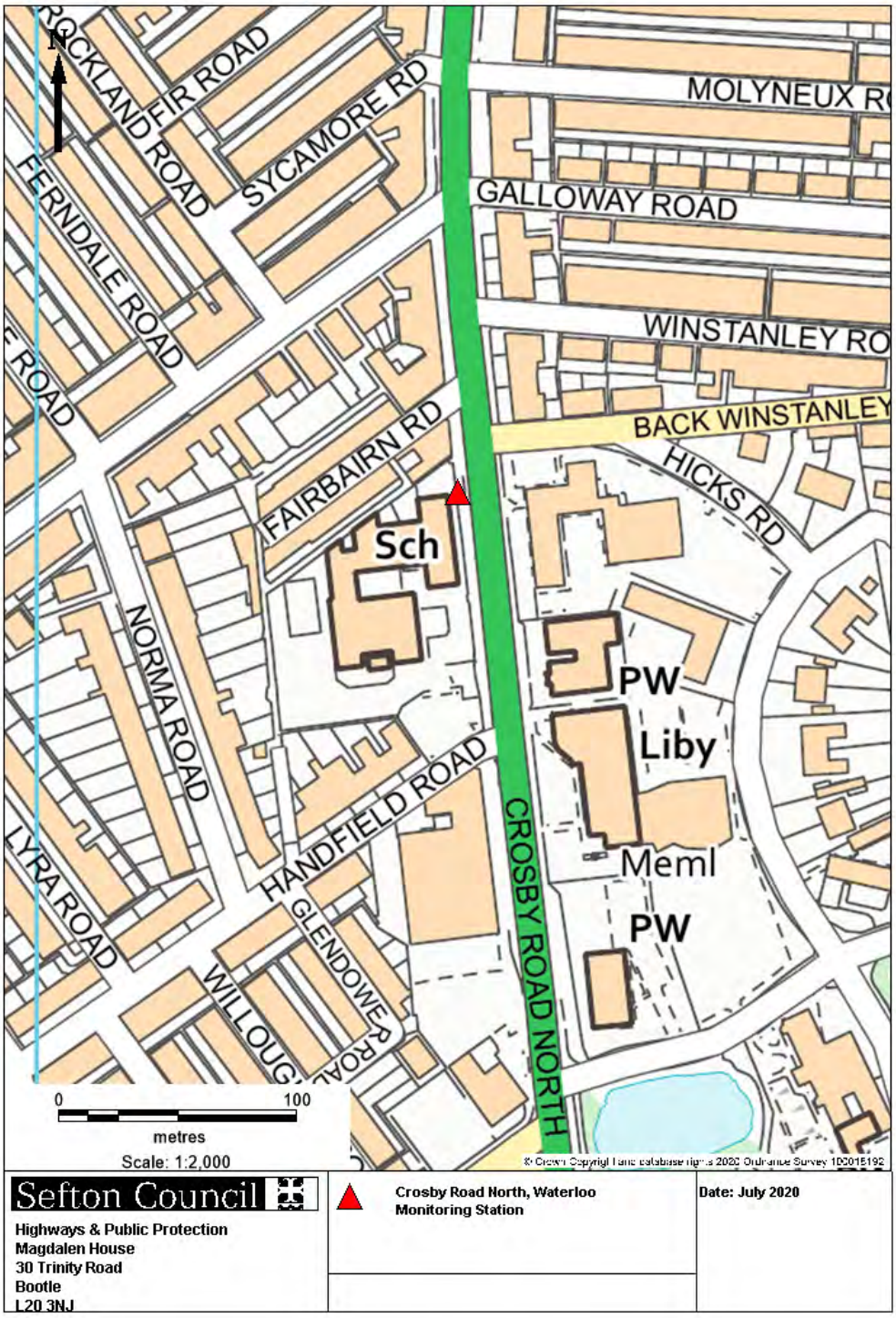
Monitor Location	PM_{10} Annual Mean 2019 (A_m)	PM_{10}Period Mean (P_m)	Ratio (A_m/P_m)
Preston UB	9.4	8.5	1.106
Wigan Centre UB	9.5	8.9	1.067
Wirral tranmere UB	8.0	7.5	1.067
Average (R_a)			**1.08**

The measured unadjusted (M) PM 2.5 concentration at Millers Bridge CM3 for the period is 9.4 µg/m^3

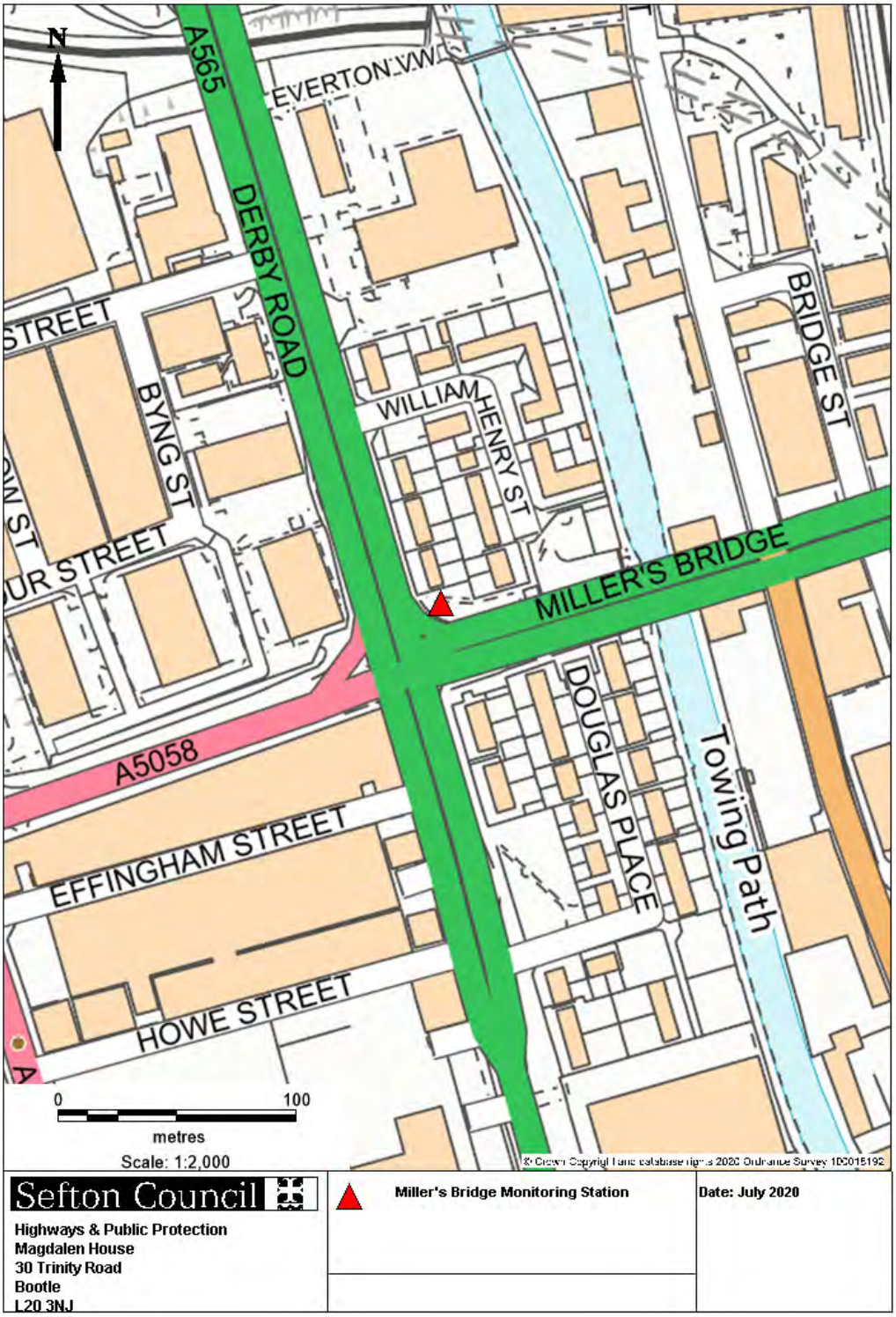
Annualisation of the annual mean concentration at Millers Bridge for 2019 is M x Ra = 9.4 x 1.08 = 10.2 µg/m^3.

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

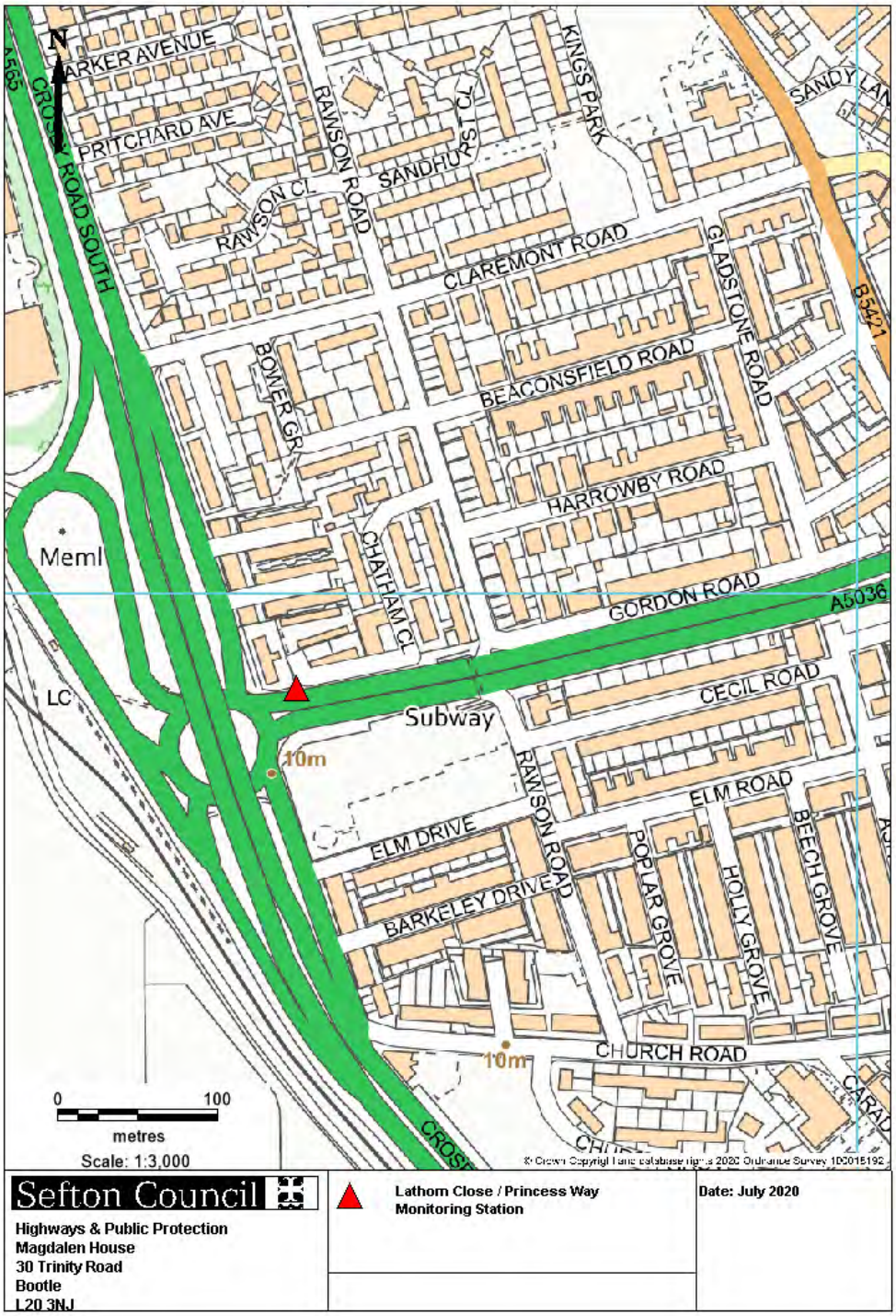
Location of Monitoring Station CM2 – Crosby Road North Waterloo



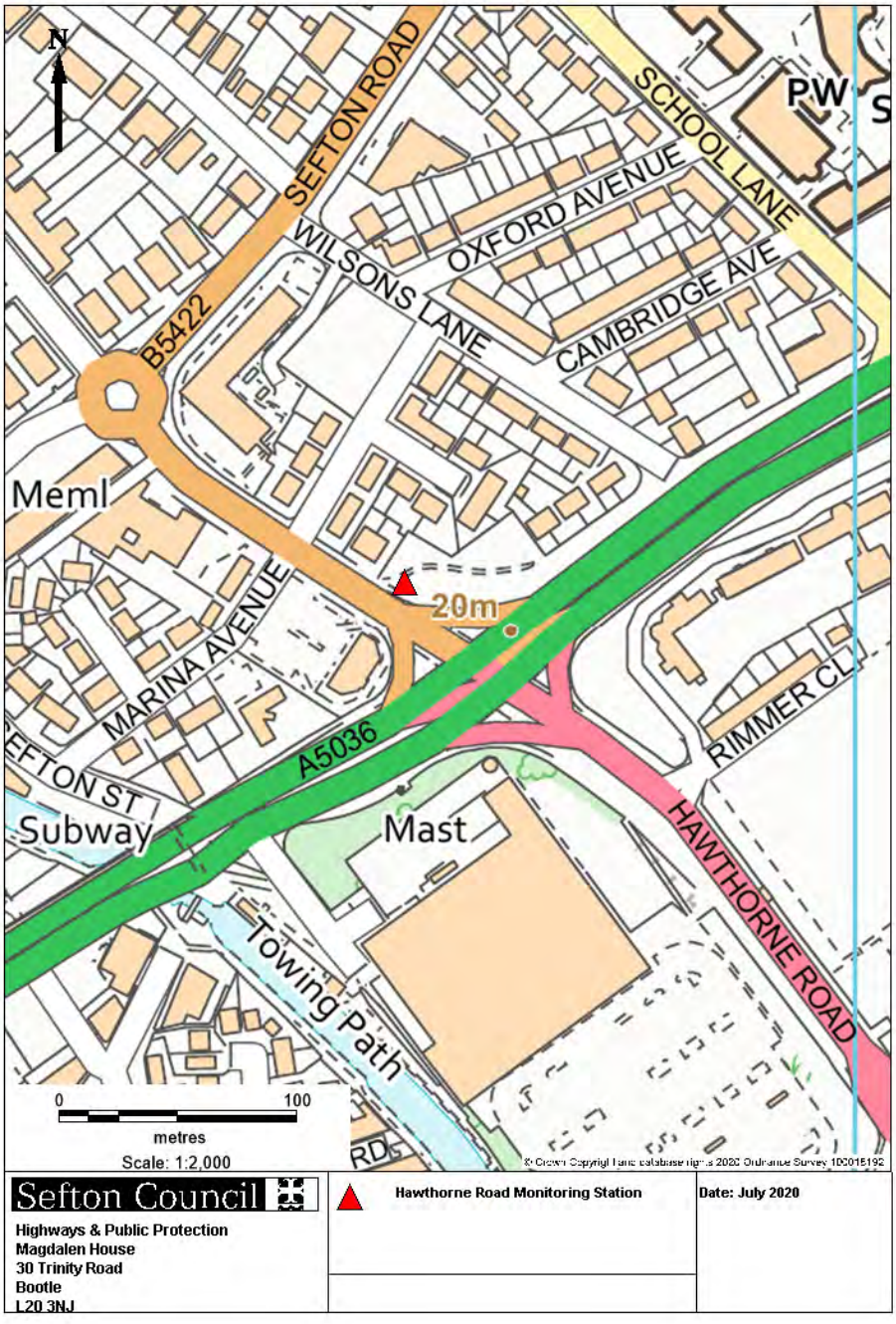
Location of Monitoring Station CM3 – Millers Bridge Bootle



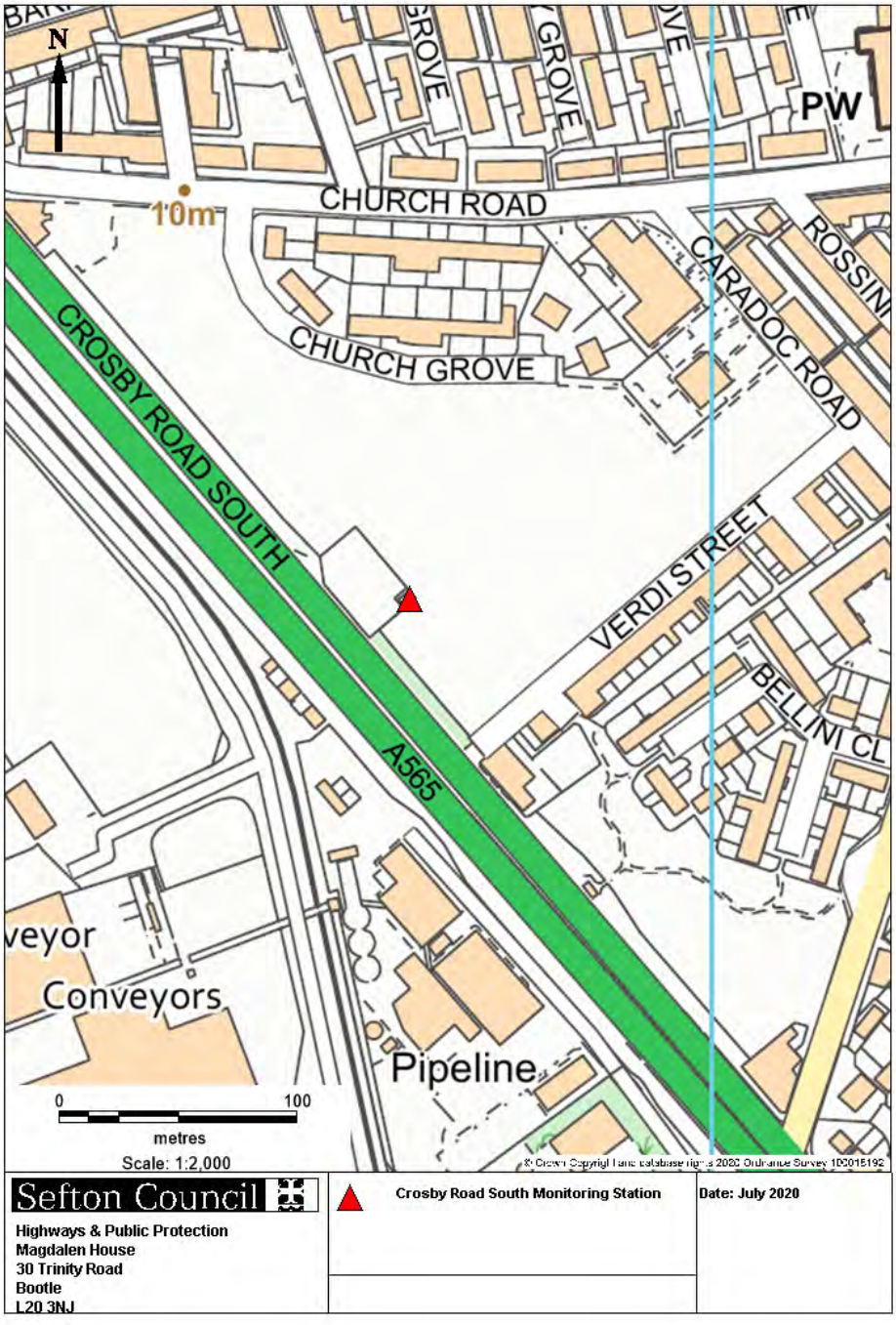
Location of Monitoring Station CM4 – Lathom Close, Princess Way Seaforth



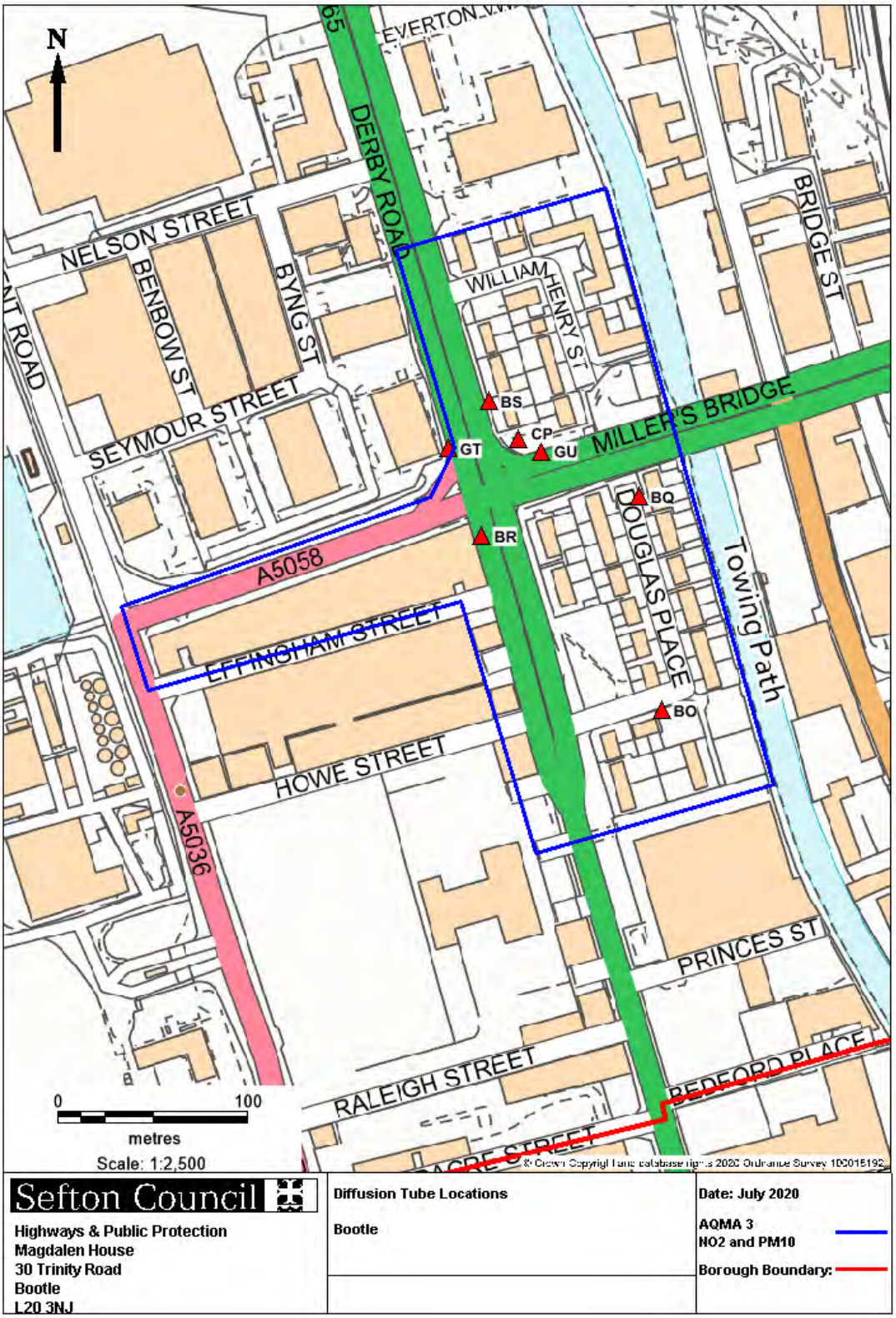
Location of monitoring station CM5 Hawthorne Road, Netherton

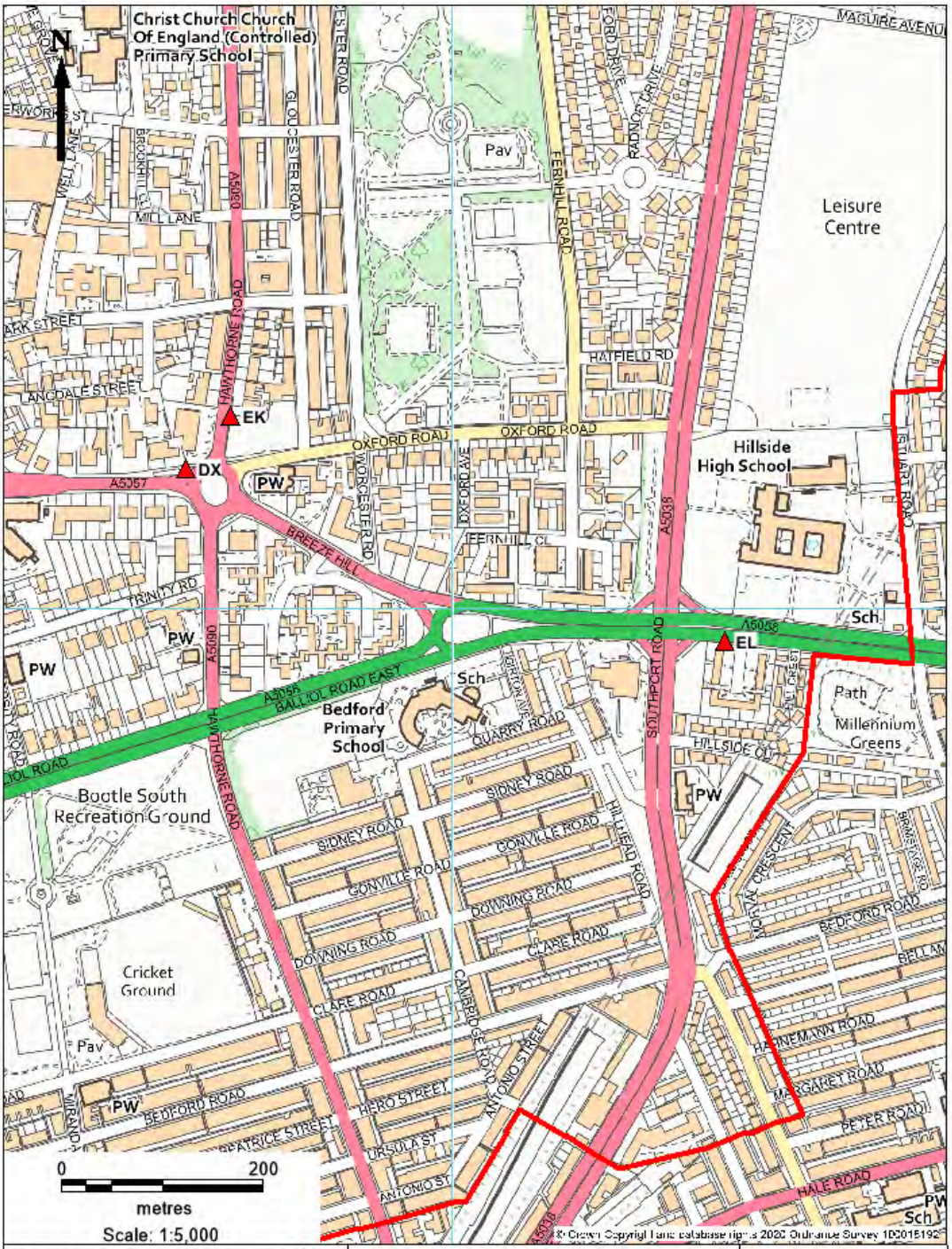


Location of Monitoring Station CM6 Crosby Road South Seaforth



Maps showing location of diffusion tubes




Christ Church Church Of England (Controlled) Primary School
Leisure Centre
Hillside High School
Bedford Primary School
Bootle South Recreation Ground
Cricket Ground
Millennium Greens
Path
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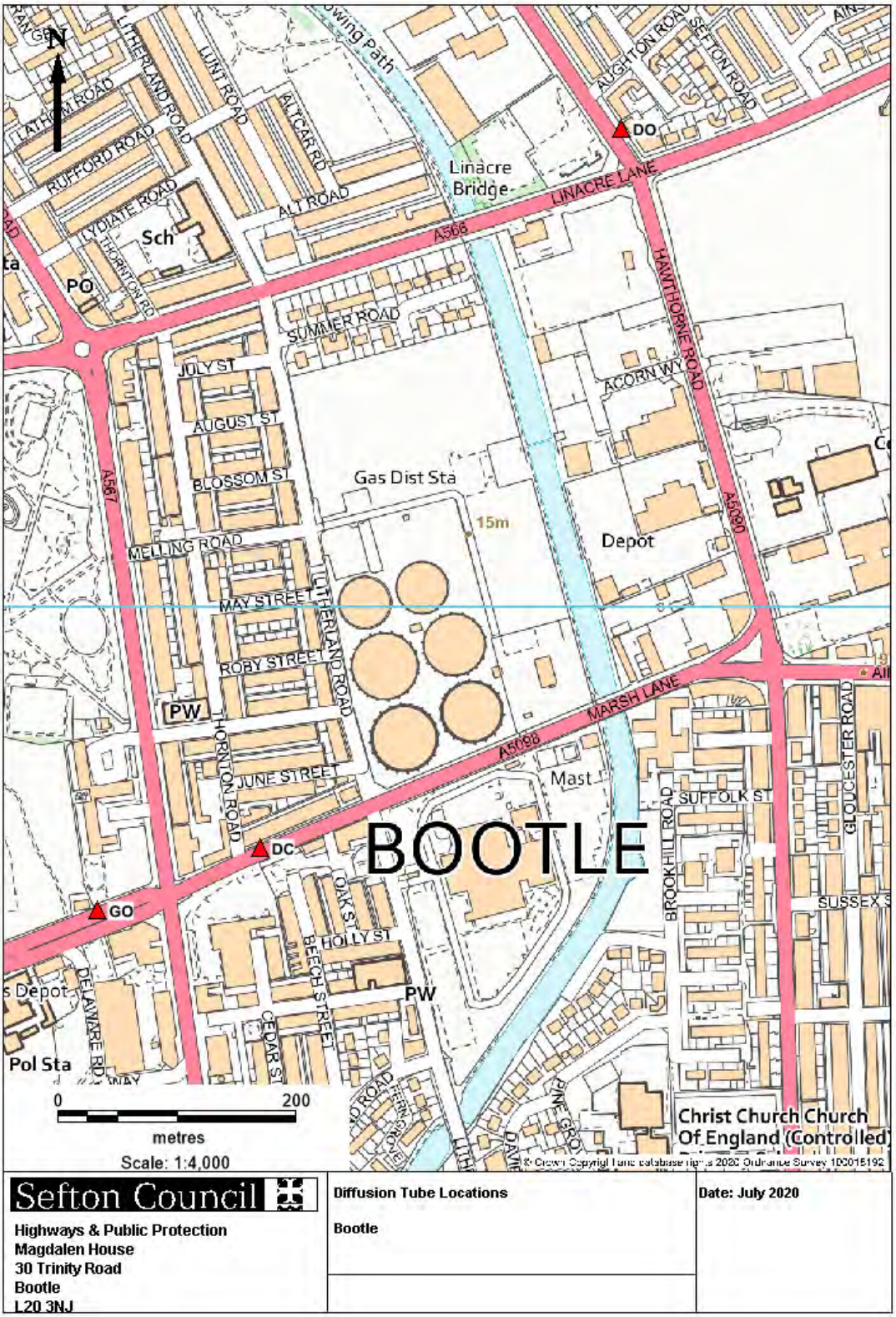
Scale: 1:5,000
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle
Date: July 2020
Borough Boundary: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BOOTLE
Linacre Bridge
LINACRE LANE
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HAWTHORNE ROAD
Gas Dist Sta
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Depot
MARSH LANE
A5098
MELLING ROAD
MAY STREET
ROBY STREET
JUNE STREET
THORNTON ROAD
LUTHERLAND ROAD
JULY ST
AUGUST ST
BLOSSOM ST
SUMMER ROAD
ACORN WY
RUFFORD ROAD
LYDIATE ROAD
ALT ROAD
ALTCAR RD
LUNT ROAD
AUGHTON ROAD
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L20 3NJ
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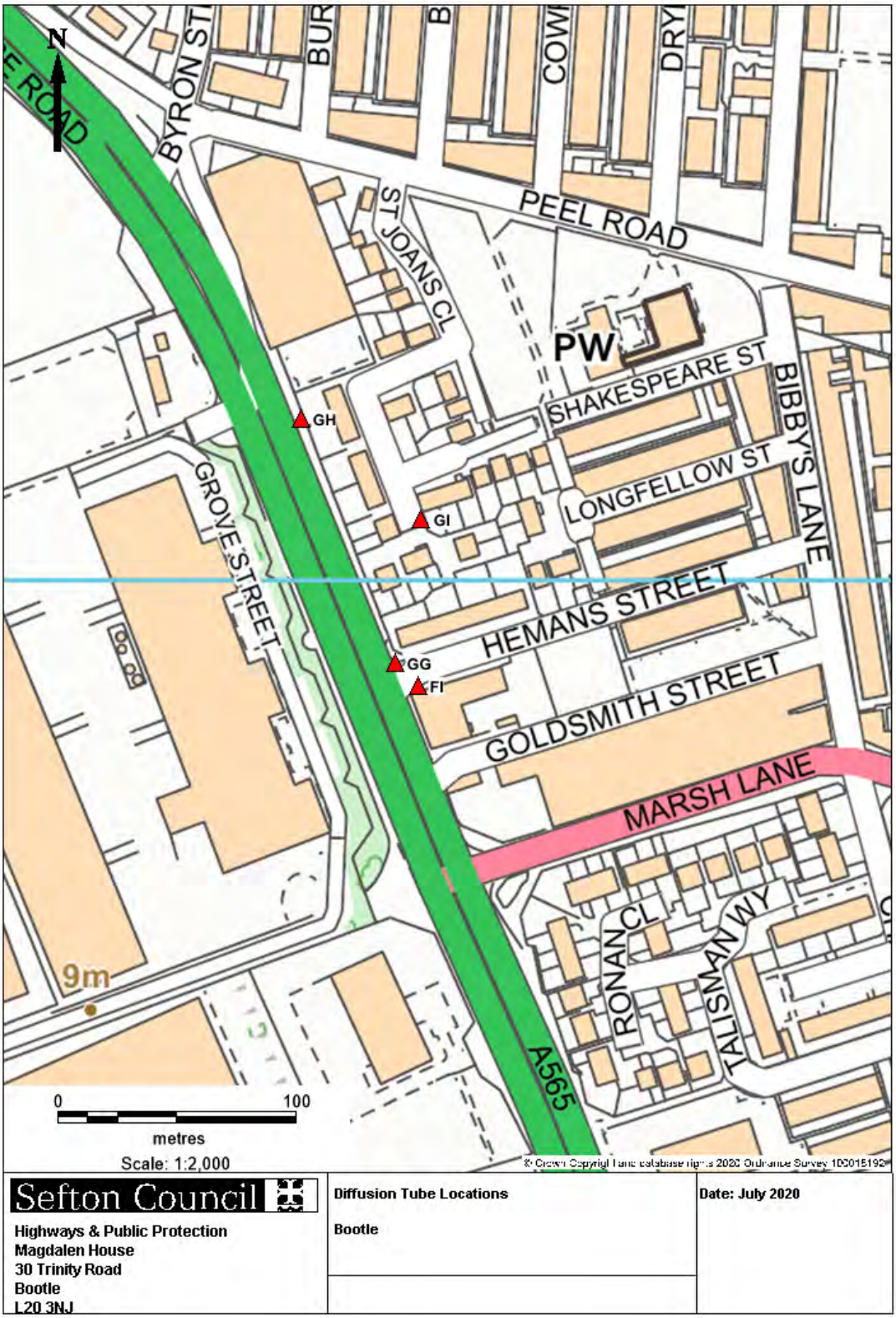
Bootle
Date: July 2020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ST JOANS CL
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SHAKESPEARE ST
BIBBY'S LANE
LONGFELLOW ST
GROVE STREET
HEMANS STREET
GOLDSMITH STREET
MARSH LANE
RONAN CL
TALISMAN WY
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Highways & Public Protection
Magdalen House
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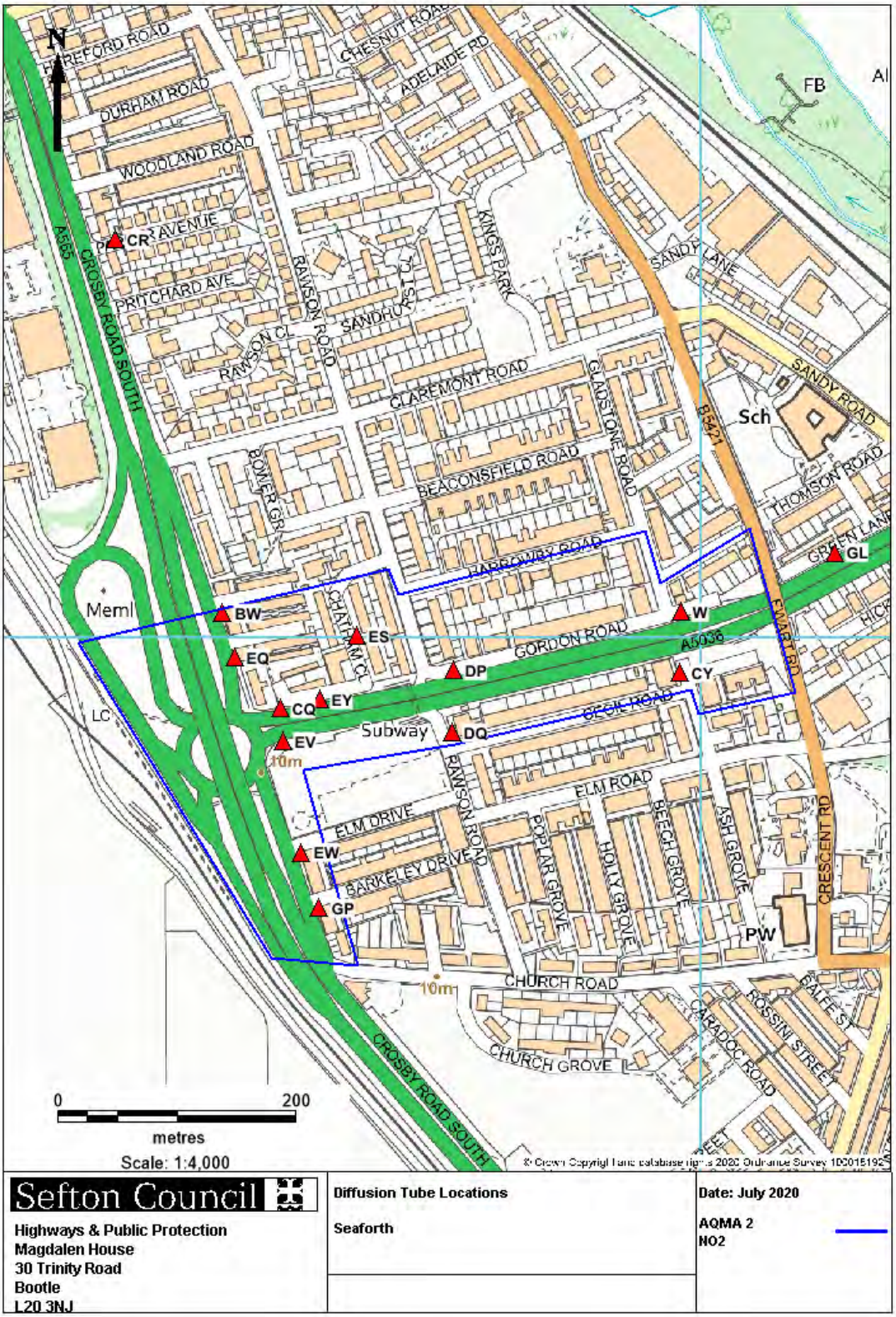
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle
Date: July 2020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AVENUE
PRITCHARD AVE
RAWSON CL
RAWSON ROAD
SANDHURST
KINGS PARK
CLAREMONT ROAD
GLADSTONE ROAD
BOWER GR
BEACONSFIELD ROAD
HARROWBY ROAD
CHATHAM CL
SANDY LANE
B5421
Sch
SANDY ROAD
THOMSON ROAD
GL
W
BW
ES
EQ
DP
CY
GORDON ROAD
A5036
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CQ
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CECIL ROAD
Subway
DQ
EV
10m
ELM ROAD
ELM DRIVE
RAWSON ROAD
POPLAR GROVE
BEECH GROVE
HOLLY GROVE
ASH GROVE
CRESCENT RD
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CHURCH ROAD
CHURCH GROVE
CARADOC ROAD
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Bootle
L20 3NJ
Diffusion Tube Locations
Seaforth
Date: July 2020
AQMA 2
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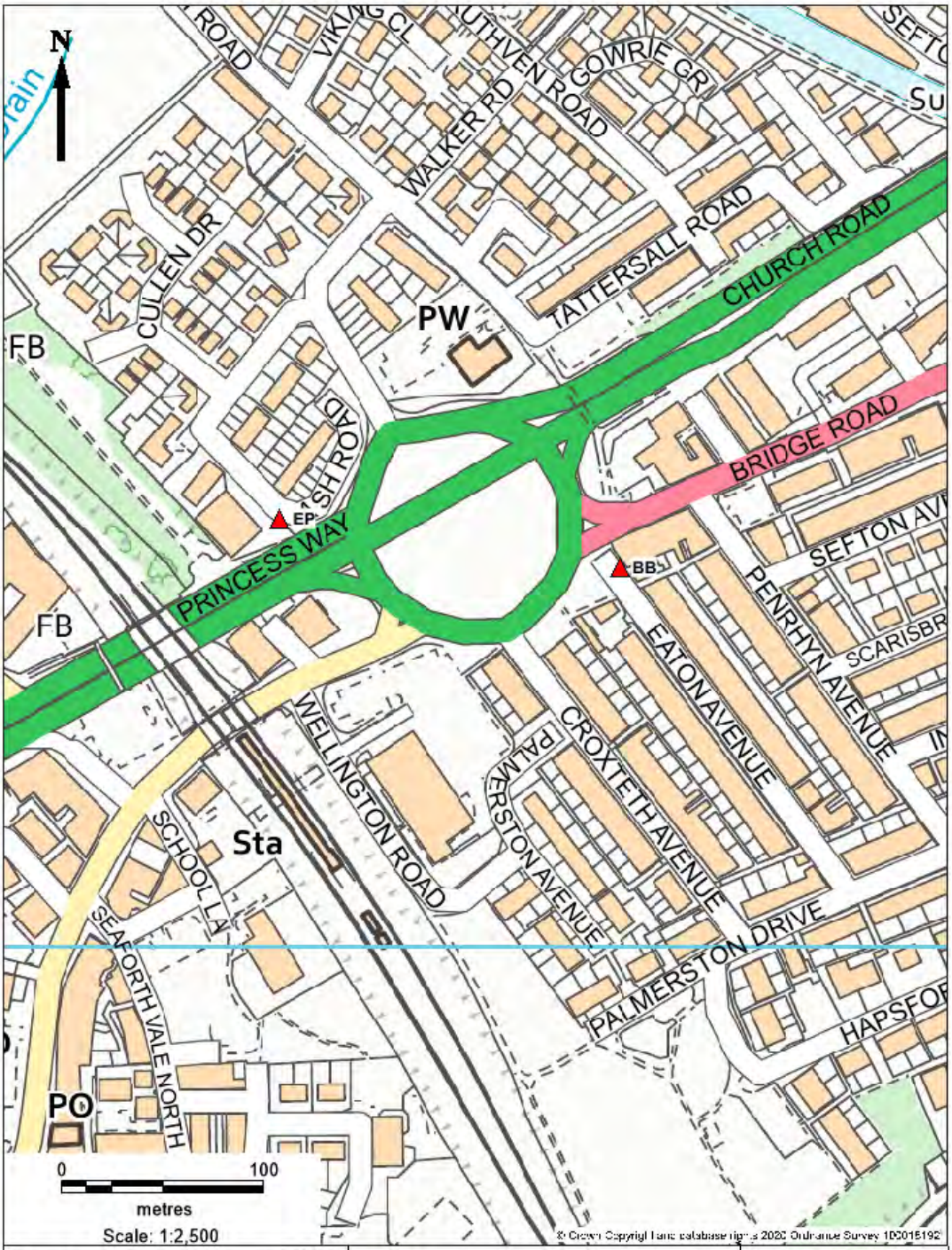
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GOWRIE GR
WALKER RD
CULLEN DR
TATTERSALL ROAD
CHURCH ROAD
PW
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BRIDGE ROAD
EP
PRINCESS WAY
BB
SEFTON AV
PENRHYN AVENUE
SCARISBR
FB
EATON AVENUE
CROXTETH AVENUE
PALMERSTON DRIVE
WELLINGTON ROAD
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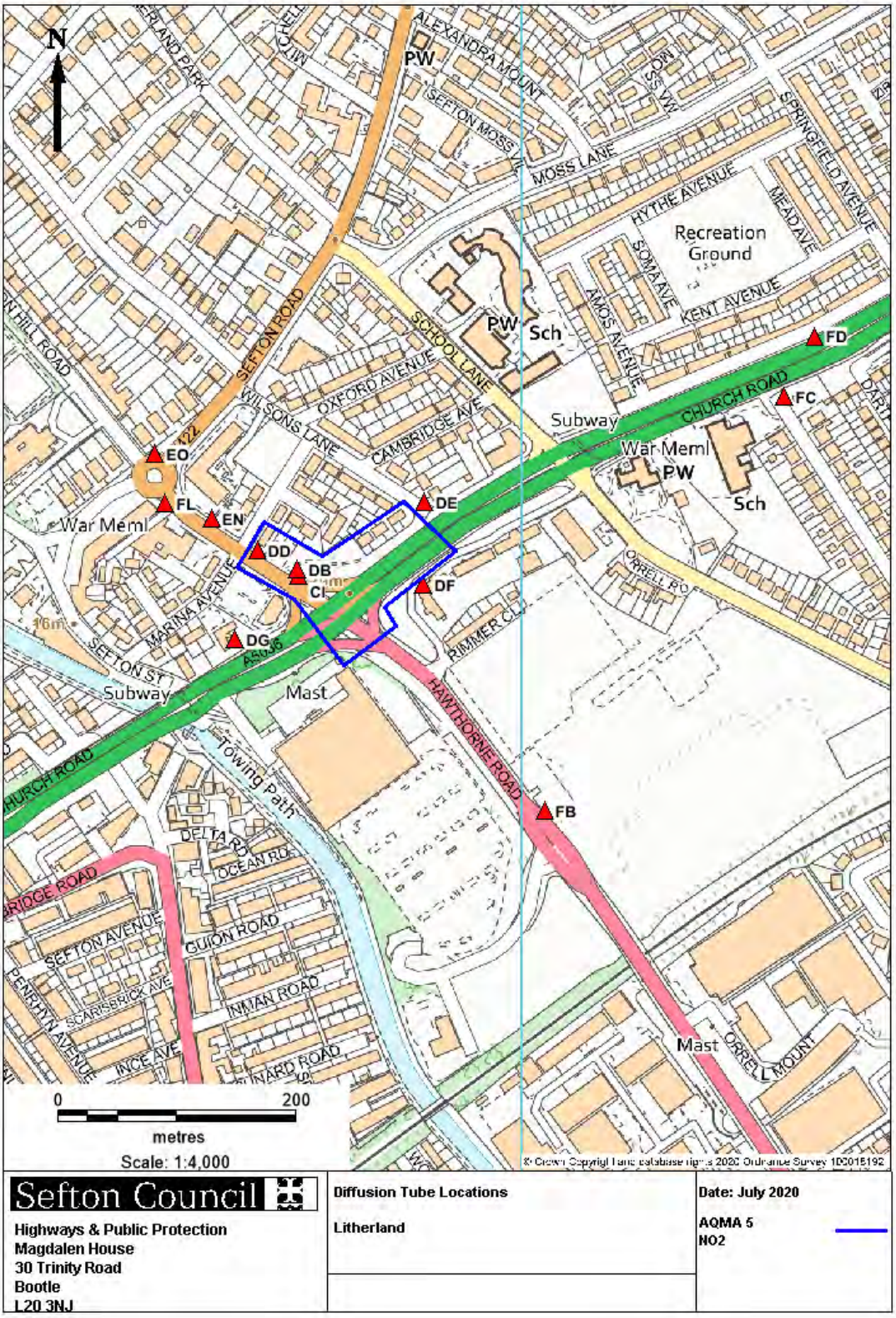
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Litherland & Seaforth
Date: July 2020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PW
SEFTON MOSS VIEW
MOSS LANE
HYTHE AVENUE
MEADAVE
SPRINGFIELD AVENUE
Recreation Ground
SOMA AVE
KENT AVENUE
AMOS AVENUE
SEFTON ROAD
SCHOOL LANE
PW
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FC
OXFORD AVENUE
WILSONS LANE
CAMBRIDGE AVE
Subway
CHURCH ROAD
War Meml
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War Meml
ORRELL RD
MARINA AVENUE
DG
A5036
RIMMER CL
SEFTON ST
Subway
Mast
HAWTHORNE ROAD
FB
Towing Path
DELTA RD
OCEAN RD
GUION ROAD
SEFTON AVENUE
SCARISBRICK AVE
PENRHYN AVENUE
INMAN ROAD
INCE AVE
INNARD ROAD
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ORRELL MOUNT
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Scale: 1:4,000
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Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Litherland
Date: July 2020
AQMA 5
NO2


Sports Park
Sports Ground
Litherland Moss Primary School
Playing Field
MOSS LANE
ANDERSON ROAD
HARRINGTON ROAD
BOUNDARY ROAD
CH
DUNNINGS BRIDGE
Mast
FF
FH
UK 2
DW
FE
CHURCH ROAD
THIRLMERE DRIVE
KESWICK DR
ARNSIDE
Pav
HAWKSHEAD DR
GRASMERE DRIVE
KESWICK DRIVE
NETHERTON WAY
Savio High School
THIRLMERE AVE
DERWENT DRIVE
SILVERDALE DRIVE
NETHERTON PARK ROAD
ENNERDALE DR
ECCLESALL AVENUE
KIRKSTONE ROAD SOUTH
THORNBRIDGE AVENUE
ENNERDALE DRIVE
HARRIS DR
CRASSEFIELD CRES
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Highways & Public Protection
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L20 3NJ
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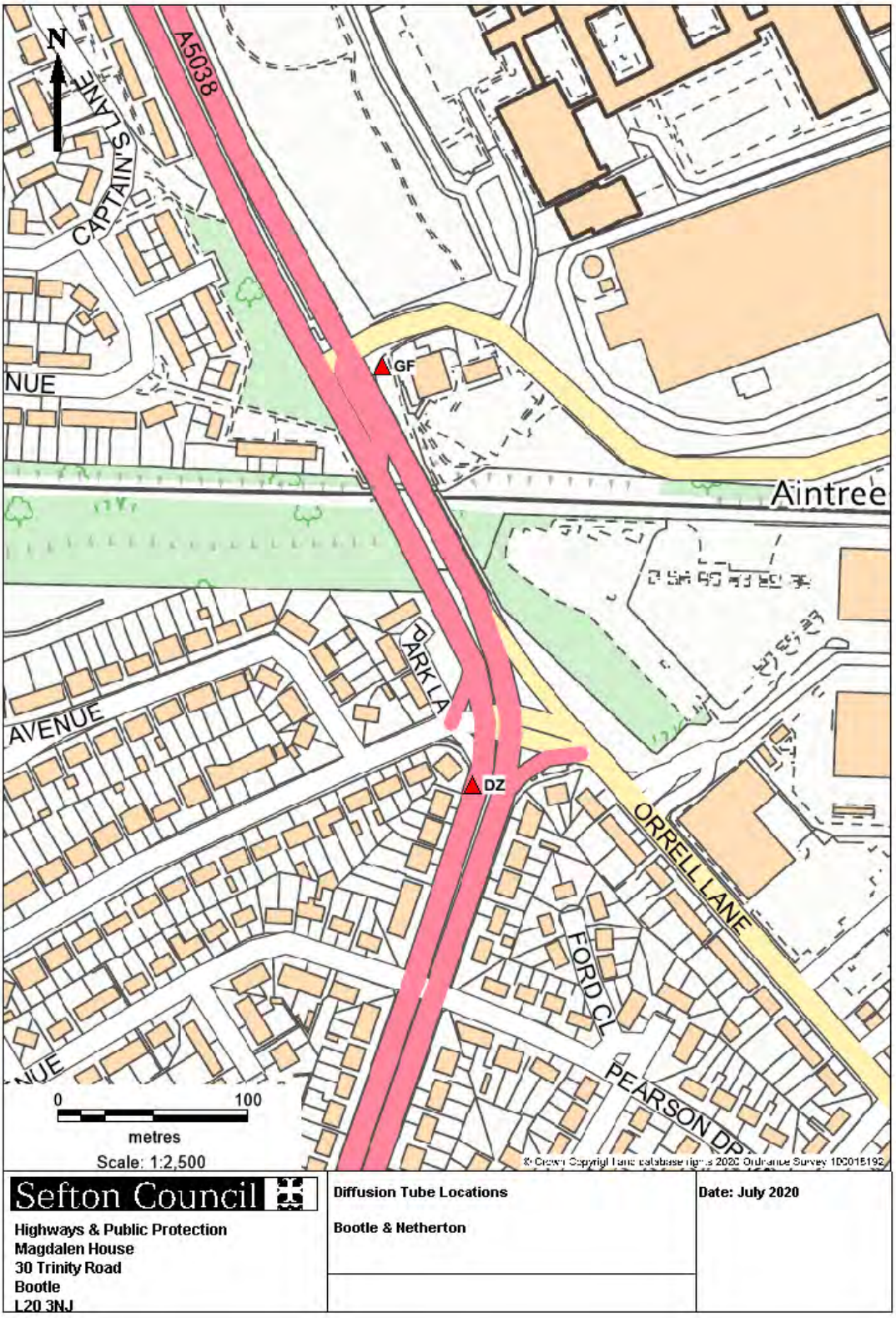
Litherland
Date: July 2020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PARK LA
AVENUE
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ORRELL LANE
FORD CL
PEARSON DR
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Scale: 1:2,500
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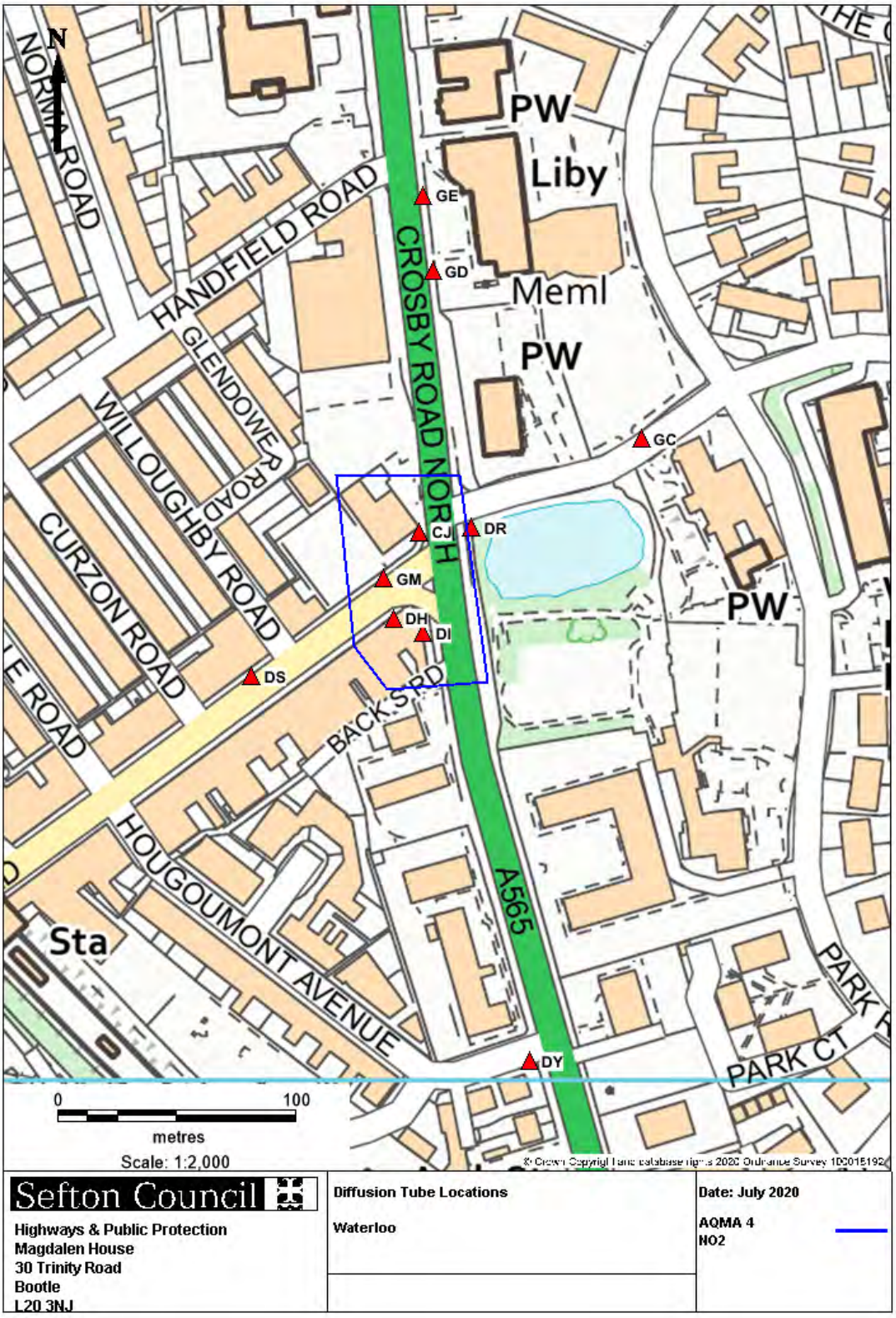
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle & Netherton
Date: July 2020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HANDFIELD ROAD
GLENDOWER ROAD
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CURZON ROAD
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BACK S RD
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Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Waterloo
Date: July 2020
AQMA 4
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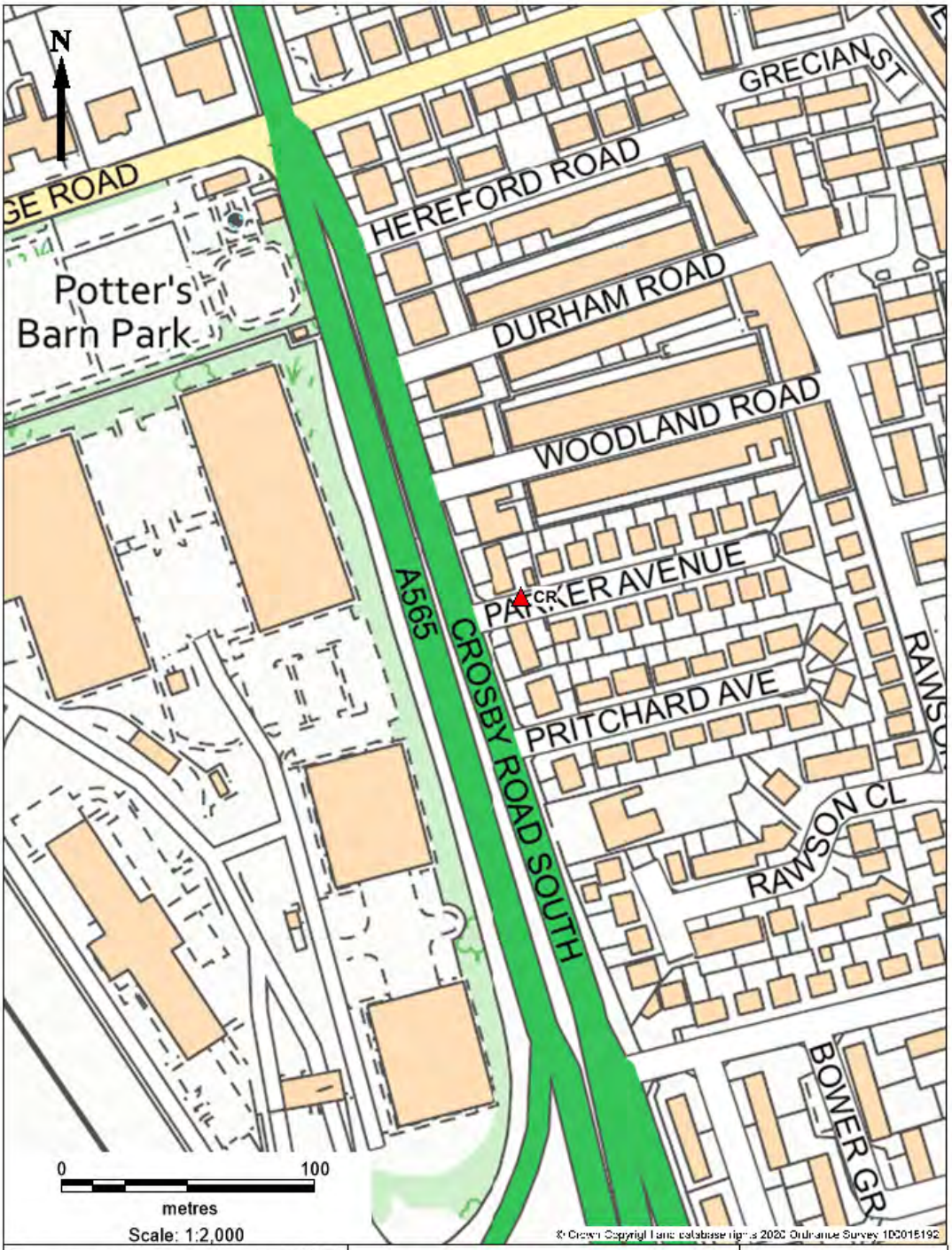
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Potter's
Barn Park
HEREFORD ROAD
GRECIAN ST
DURHAM ROAD
WOODLAND ROAD
A565
CROSBY ROAD SOUTH
PARKER AVENUE
CR
PRITCHARD AVE
RAWSON CL
BOWER GR
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metres
Scale: 1:2,000
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Highways & Public Protection
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Bootle
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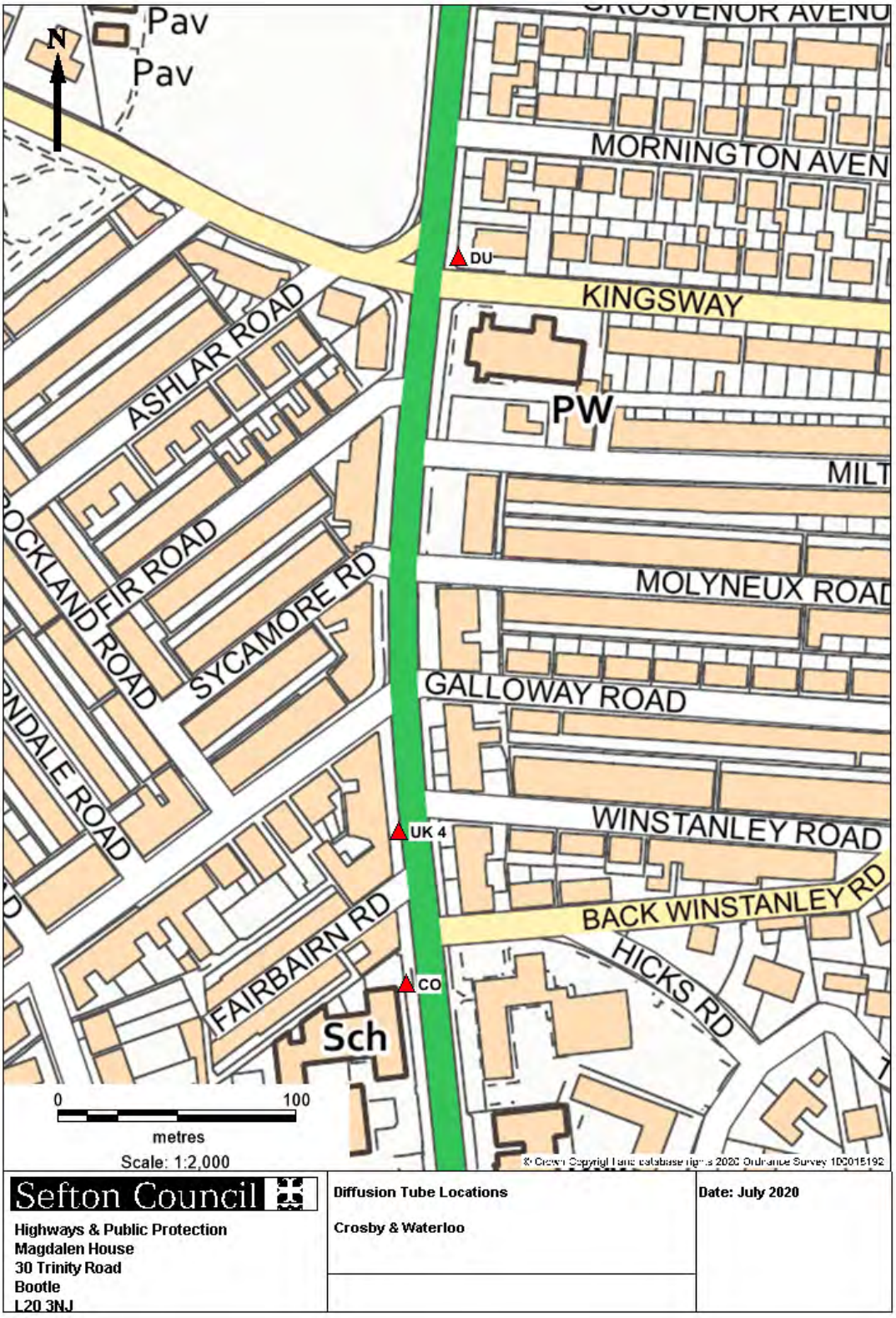
Diffusion Tube Locations
Seaforth
Date: July 2020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KINGSWAY
ASHLAR ROAD
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MILT
FIR ROAD
SYCAMORE RD
MOLYNEUX ROAD
GALLOWAY ROAD
WINSTANLEY ROAD
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Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Crosby & Waterloo
Date: July 2020


N
Allot Gdns
WILLOW WAY
MAYFAIR AVENUE
DE VILLIERS AVENUE
PARK AVENUE
ESPLEN AVENUE
MOOR LANE
DV
12m
WINDMILL AVENUE
MOOR DRIVE
THE BYWAYS
LITTLE CROSBY ROAD
RICHMOND ROAD
NEVILLE HYMUS WAY
13m
Sch
PW
ISLINGTON
B5193
Masts
Great Crosby
GJ
YORK ROAD
LUNE ST
QUEENS ROAD
ENFIELD AVENUE
ASCOT PARK
THE PRECINCTS
VALE ROAD
ST LUKE'S ROAD
Sch
FAIRFIELD
Great Crosby Roman Catholic Primary School
ROSEDALE AVENUE
St Mary's College
CLAREMONT RD
A565
FAIRHOLME ROAD
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200
metres
Scale: 1:4,000
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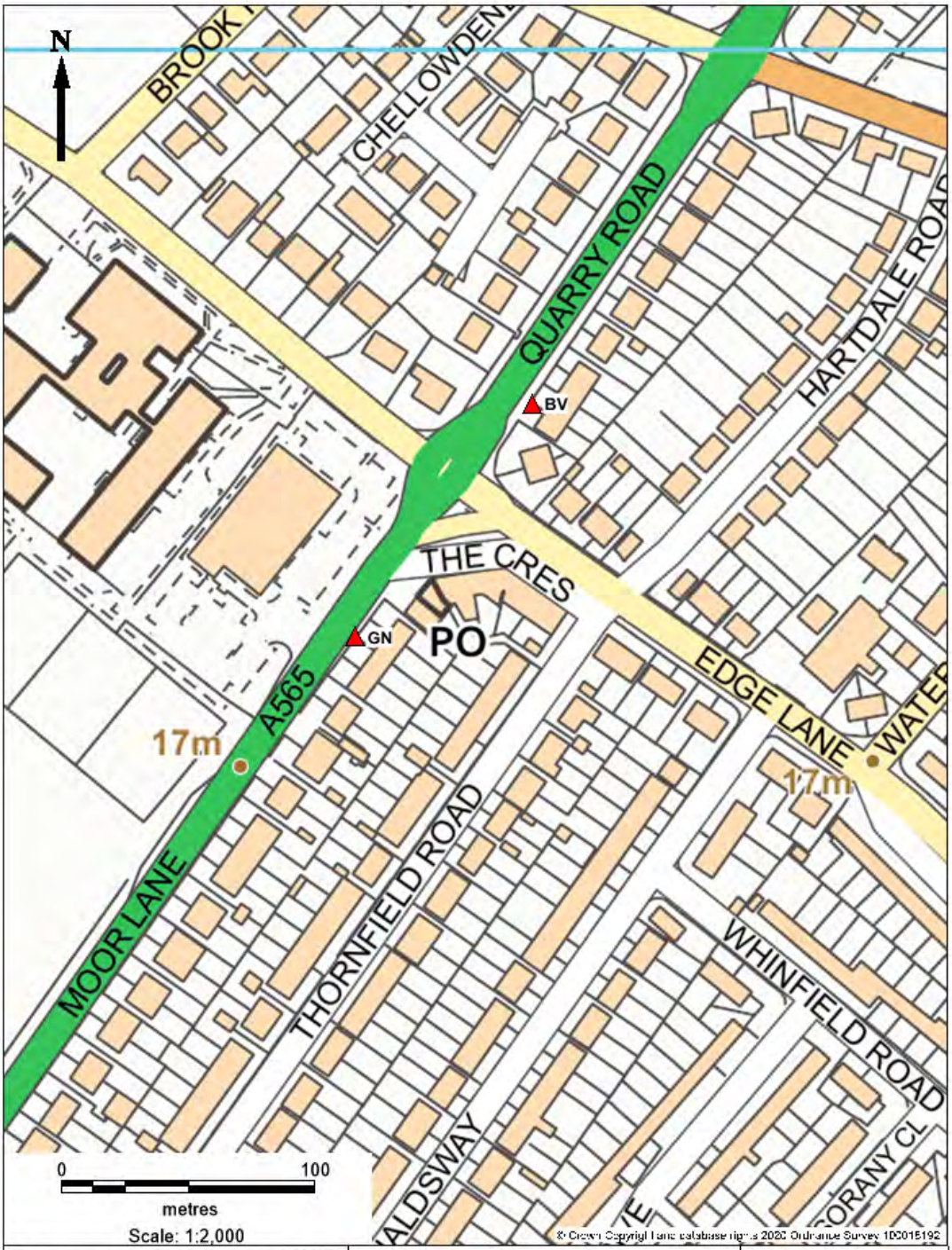
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Crosby
Date: July 2020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QUARRY ROAD
HARTDALE ROAD
BV
THE CRES
GN
PO
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EDGE LANE
WATER
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17m
MOOR LANE
THORNFIELD ROAD
WHINFIELD ROAD
0
100
metres
Scale: 1:2,000
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Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Thornton
Date: July 2020


N
B5207
Pol Sta
A5036
DUNNINGS
DOOLEY DRIVE
COPY LA
CUMBERLAND GT
EE
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COPY LANE
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WATERWAY AVENUE
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MANOR DRIVE
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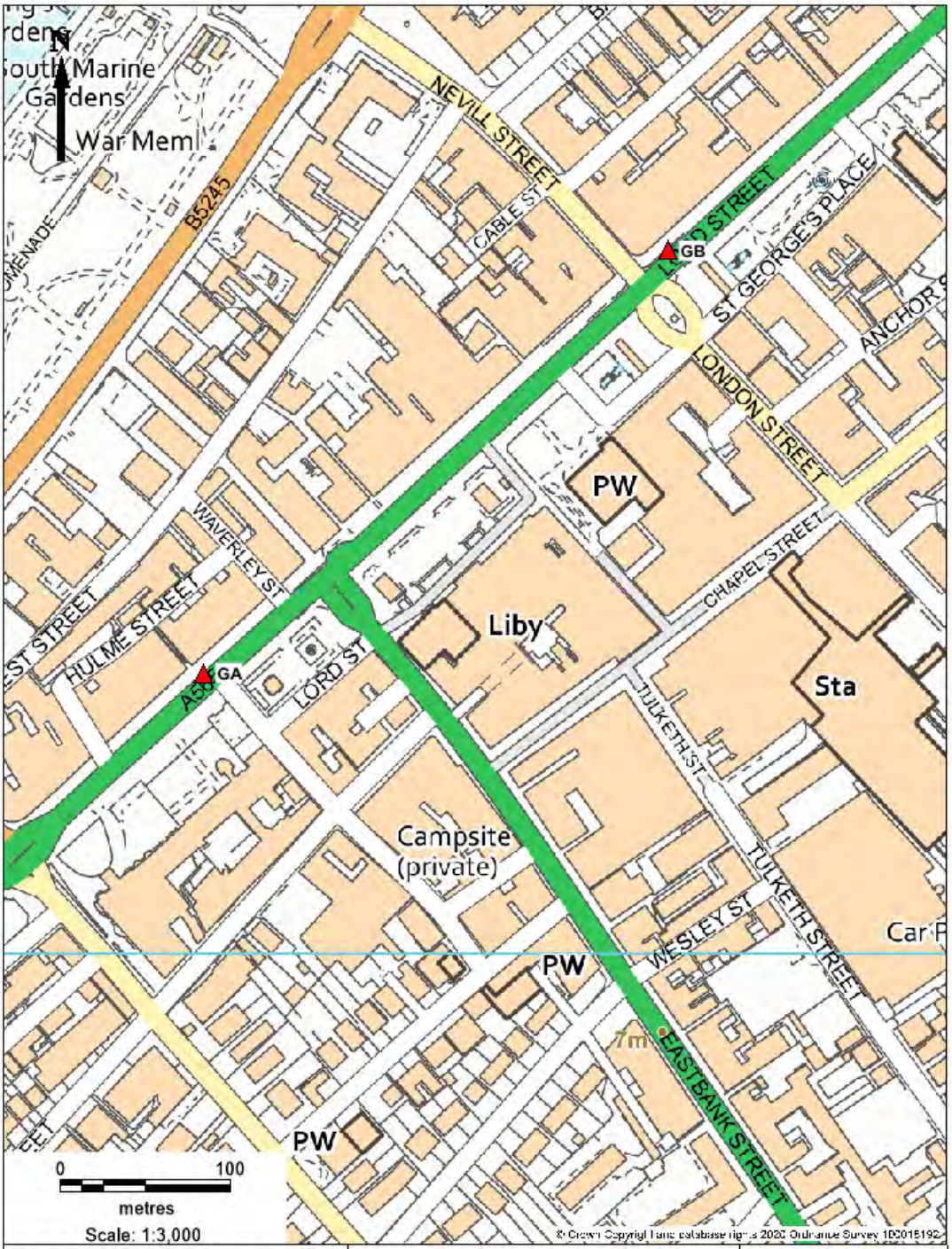
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Netherton
Date: July 2020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Gardens
War Mem
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NEVILL STREET
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ST GEORGE'S PLACE
ANCHOR
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CHAPEL STREET
WAVERLEY ST
HULME STREET
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Liby
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(private)
WESLEY ST
TULKETH STREET
PW
7m
EASTBANK STREET
PW
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metres
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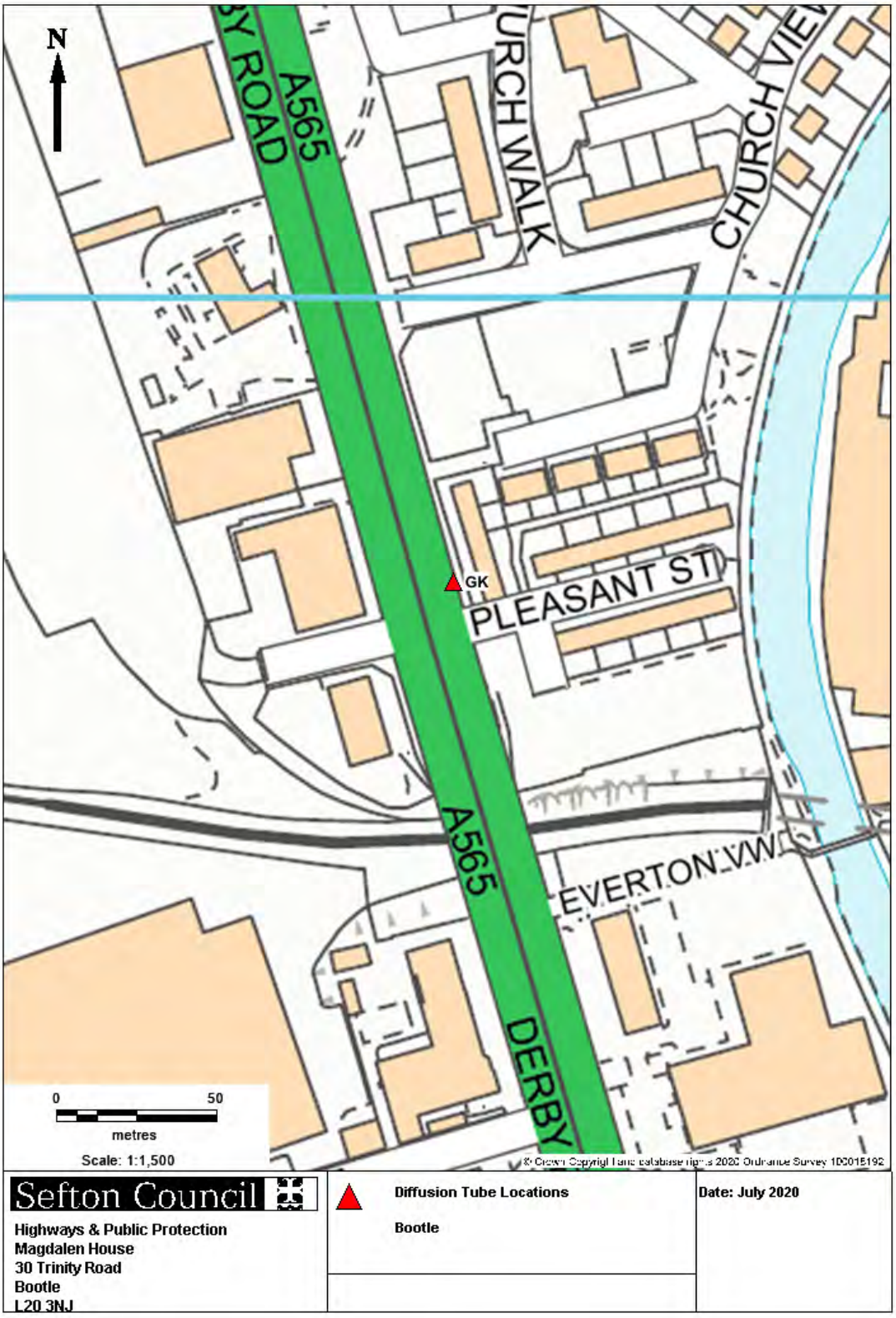
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Southport
Date: July 2020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URCH WALK
CHURCH VIEW
GK
PLEASANT ST
A565
DERBY
EVERTON VW
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metres
Scale: 1:1,500
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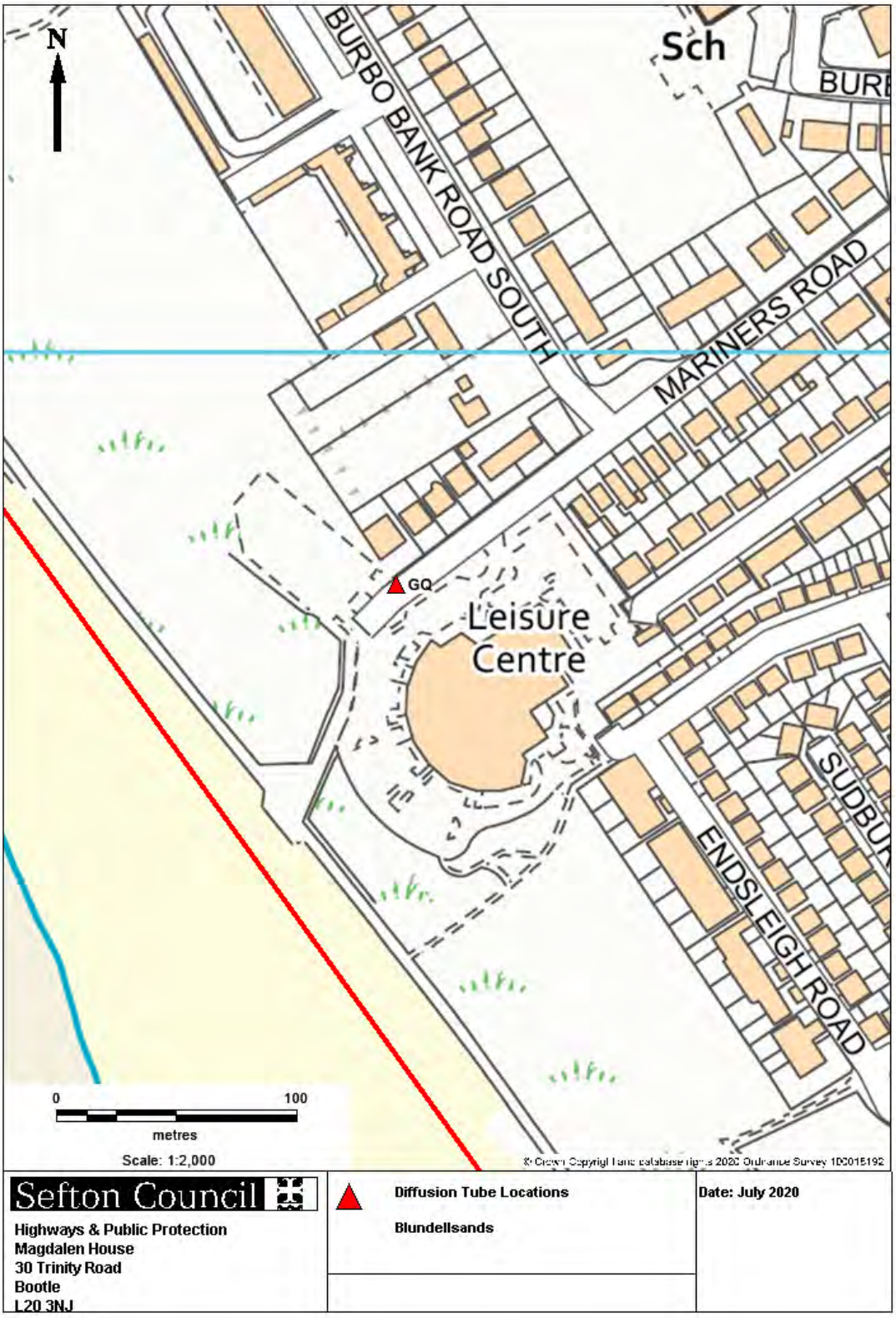
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle
Date: July 2020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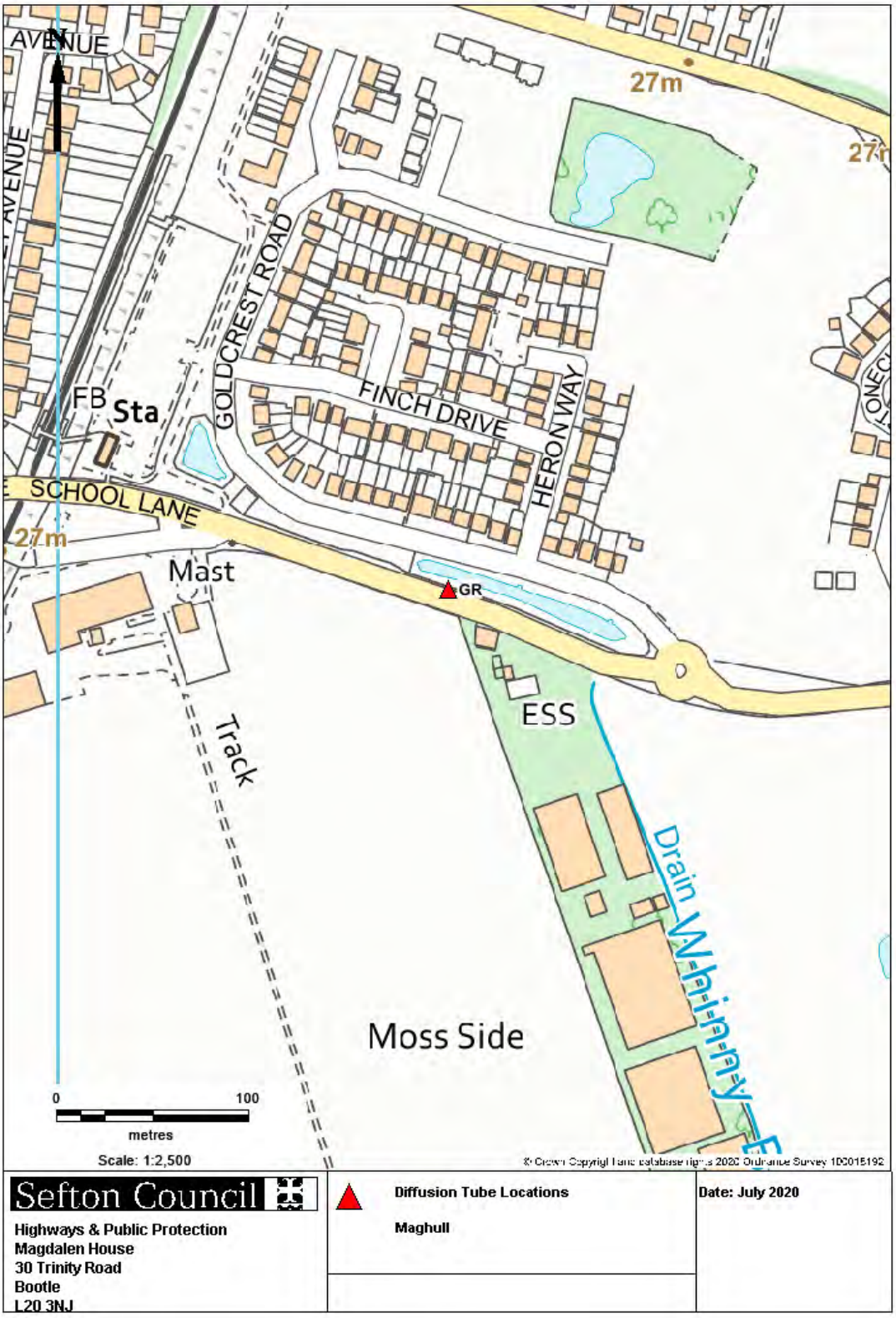
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Maghull
Date: July 2020


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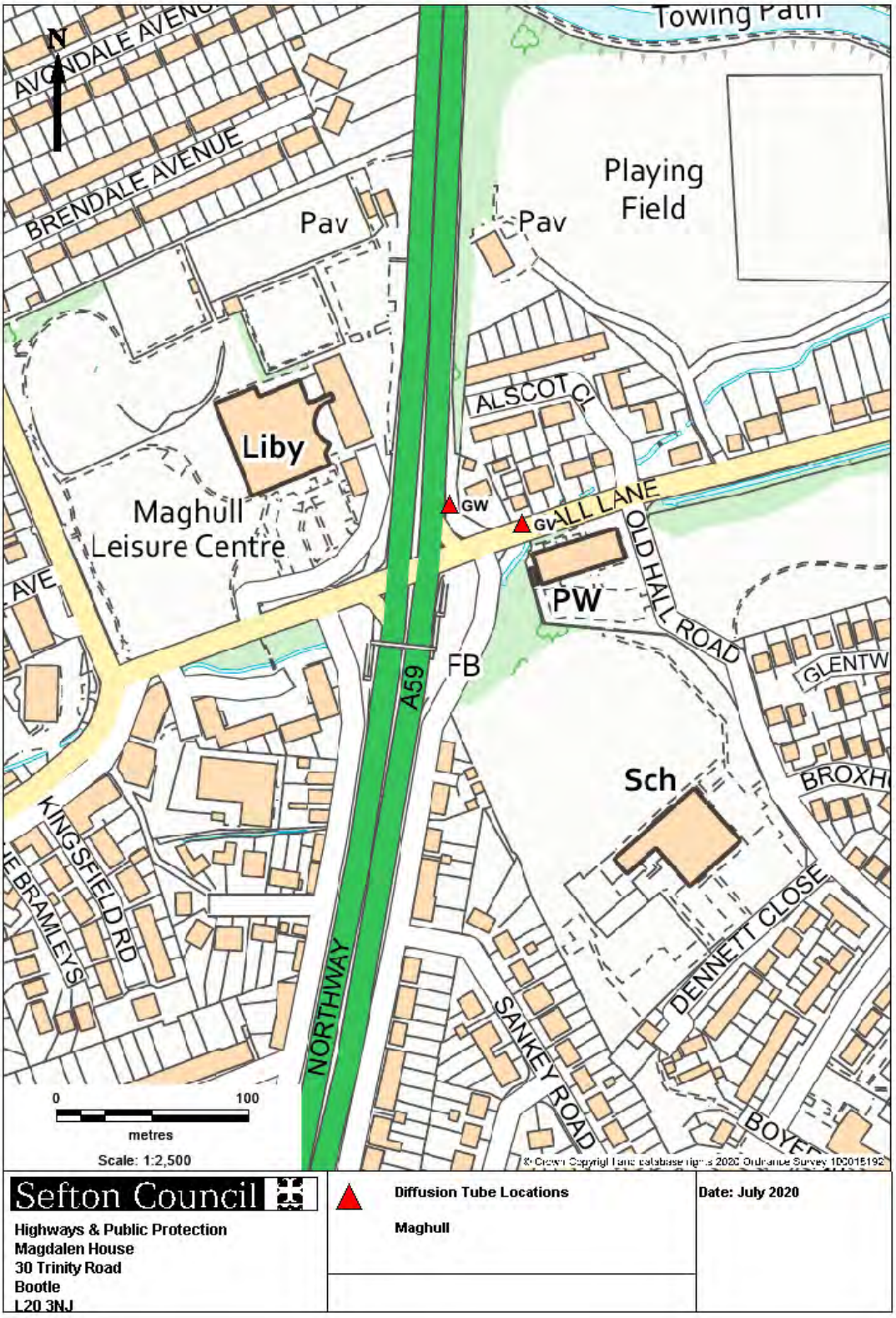
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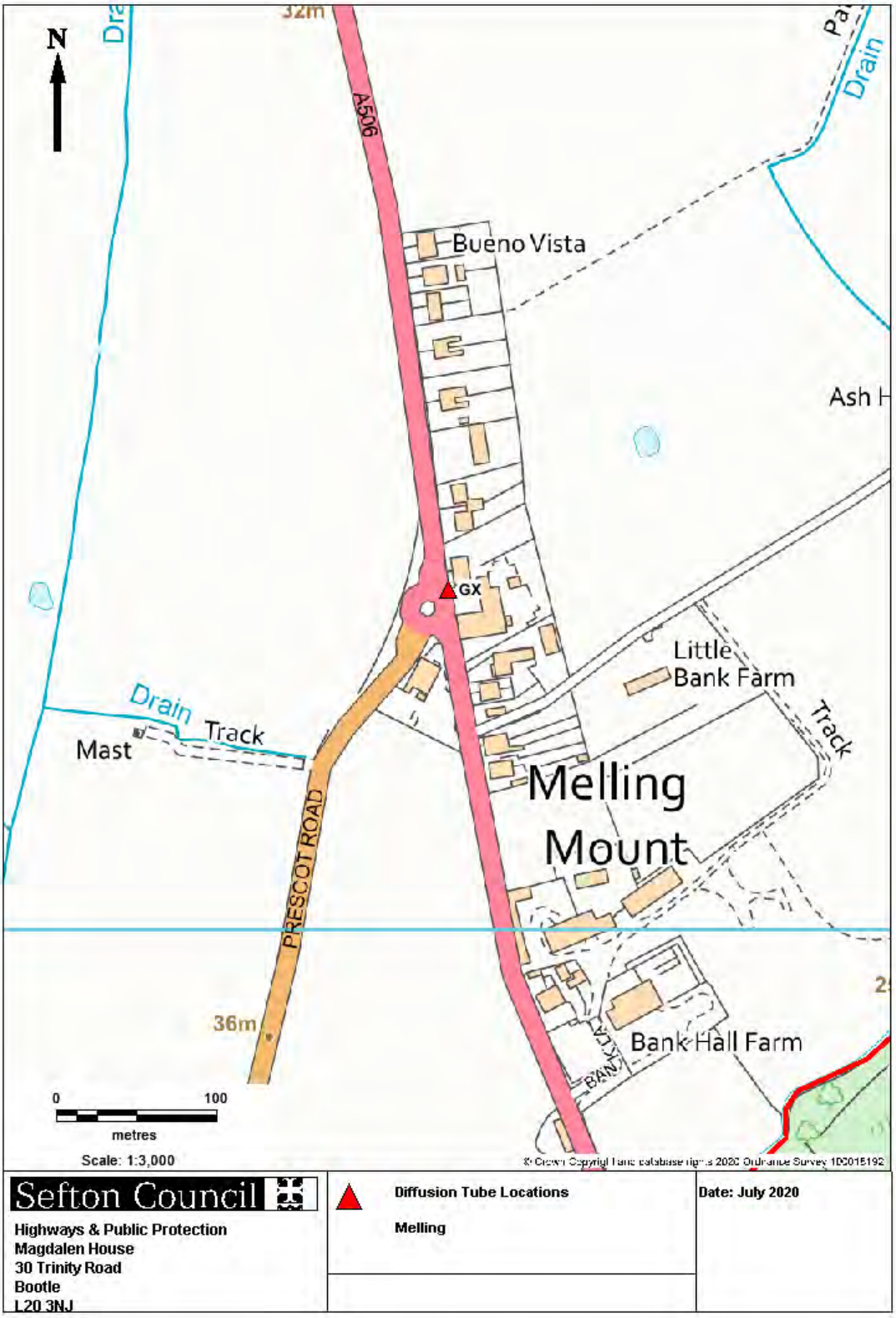
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Bank Hall Farm
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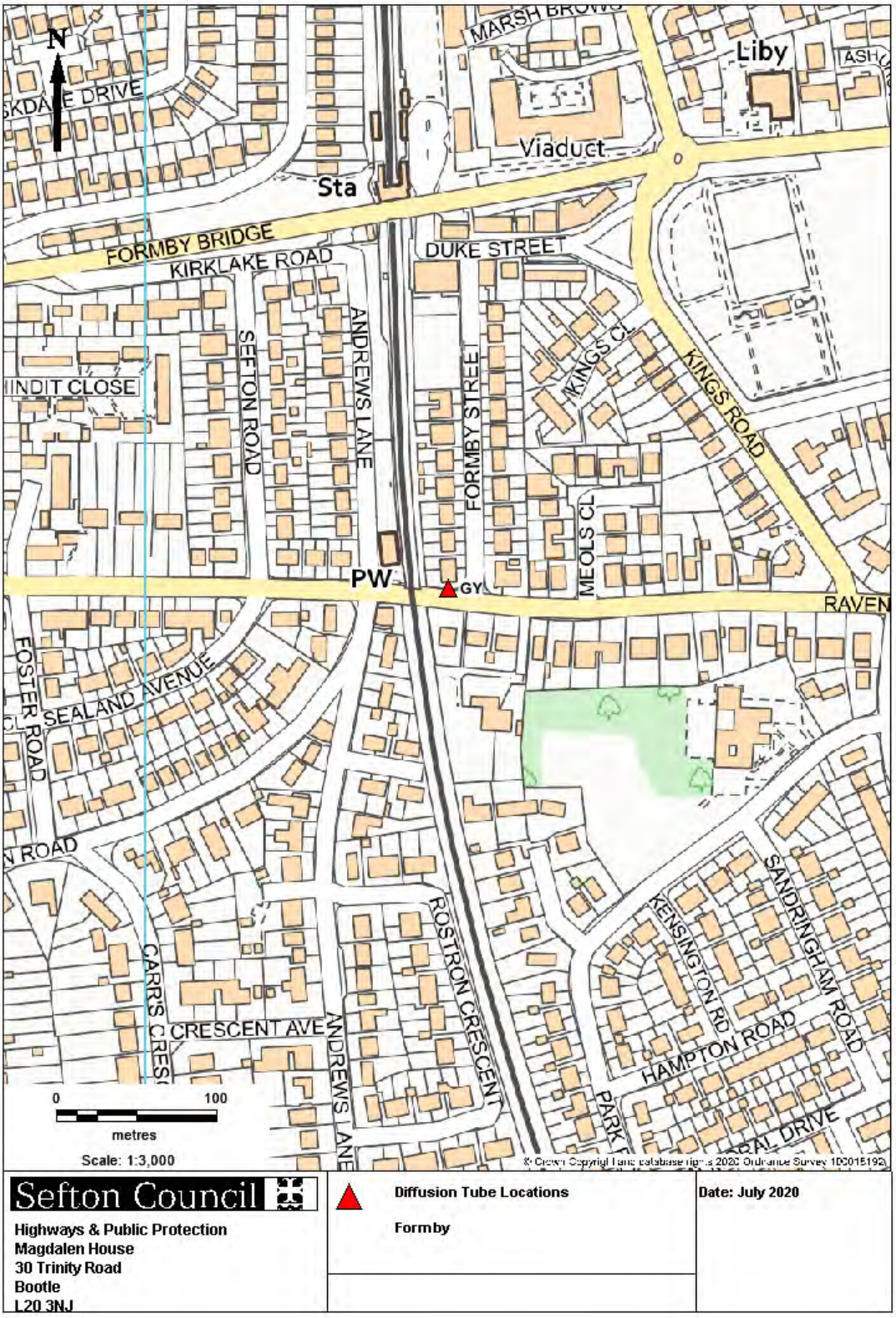
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KINGS ROAD
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PW
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RAVEN
FOSTER ROAD
SEALAND AVENUE
CRESCENT AVE
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Date: July 2020


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BOLTON ROAD
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Magdalen House
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Diffusion Tube Locations
Birkdale
Date: July 2020

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[16]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

Abbreviation	Description
AFS	Alternative Fuels Strategy
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
AQO	Air Quality Objective
AQS	Air Quality Standard
ANPR	Automatic Number Plate Recognition
ASR	Air Quality Annual Status Report
BAM	Beta Attenuation Monitor
CAZ	Clean Air Zone
CM	Continuous Monitor
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EA	Environment Agency
EMR	European Metal Recycling Limited
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
FQP	Freight Quality Partnership
GM	General Measure in the Air Quality Action Plan
HGV	Heavy Goods Vehicle

JSNA	Joint Strategic Needs Assessment
LAQM	Local Air Quality Management
LCR	Liverpool City Region
LES	Low Emissions Strategy
LEZ	Low Emission Zone
L2	Liverpool 2 (Peel Ports new deep water container terminal)
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PHOF	Public Health Outcomes Framework
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
RIS	Road Investment Strategy
SCOOT	Split Cycle Offset Optimisation Technique
SGVC	Specialised Goods Vehicle Count
SO_2	Sulphur Dioxide
SS	Site Specific Measure in the Air Quality Action Plan
SSNA	Sefton Strategic Needs Assessment
TEOM	Tapered Element Oscillating Microbalance
TQP	Taxi Quality Partnership
TSP	Total Suspended Particulates
VCM	Volatile Correction Model
VMS	Variable Message Sign

References