Sefton Council

2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: July, 2022

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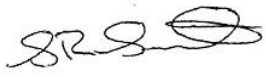
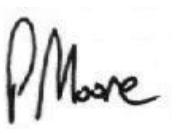
Reviewed by	Steve Smith	Environmental Health Manager		08.08.2022
Approved by	Peter Moore	Assistant Director (Highways and Public Protection)		12.08.2022

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].
- The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].
- In 2021 Sefton Council as part of its ongoing Local Air Quality Management duties continued to undertake detailed air quality monitoring using both automatic air quality monitoring equipment and an extensive network of passive diffusion tubes to assess levels of certain harmful pollutants that the Council is required to monitor by Central Government.
- Through this monitoring, the Council has identified a number of discrete 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

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

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

[3] Defra. Air quality appraisal: damage cost guidance, July 2021

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

road junctions or near heavily trafficked 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 in Sefton are shown below. The pollutant(s) that have shown exceedance are shown in brackets:
    - Lathom Close, Princess Way, Seaforth (NO_2 Annual Mean).
    - Millers Bridge/Derby Road junction, Bootle (Exceedance of the 24 hr Mean Limit - PM_{10} & NO_2 Annual Mean).
    - South Road/Crosby Road North junction, Waterloo (NO_2 Annual Mean).
    - Hawthorne Road/Church Road junction, Litherland (NO_2 Annual Mean).
- 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 AQMAs, 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 activities associated with the Port of Liverpool also have an impact on air quality in the Bootle and Seaforth area.

Current Air Quality levels in Sefton

- As reported in last year's ASR the NO_2 monitoring results for 2020 were significantly lower than previous years which was undoubtedly due to the impact of the Covid pandemic and associated lockdowns/social restrictions with much reduced traffic levels during the various lockdowns. Notably only one monitoring site in 2020 showed an exceedance of the NO_2 National Air Quality Standard (NAQS) objective the lowest number of exceedances recorded since monitoring began.
- NO_2 levels in 2021 have increased overall compared to 2020 but have not returned to pre-covid levels as seen in 2019. The majority of monitoring locations in Sefton

during 2021 have shown compliance with the NO_2 NAQS objective with only 4 monitoring sites exceeding the national limit.

- Levels of Particulate Matter have increased slightly compared to 2020 but as in previous years all AQMA's show compliance with the PM_{10} national air quality standard objective by some margin.
- As we know 2020 was an exceptional year for air quality due to the Covid Pandemic. It does appear that its legacy has continued to have a positive effect on Sefton's air quality in 2021 as overall levels have still not returned to pre-pandemic levels.
- The extensive air pollution monitoring will continue in 2022 and beyond to determine future trends and compliance in Sefton. 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
- Previous Annual Air Quality Status Reports with full details of previous years monitoring results can also be viewed. Air quality (sefton.gov.uk)

  The full air quality monitoring results are discussed in more detail in section 3 of this ASR.

Working in partnership to improve air quality

- As in previous years 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 acts as a strategic steering group to oversee the work being undertaken in respect of Air Quality within the Borough. The inter-departmental group is chaired by Cabinet Members for Health and Wellbeing and Regulation and Compliance, and consists of Ward Councillors, Senior Officers from Environmental Health, Public Health, Planning, Highways, Economic Development, and Communications teams.
- Air quality officers regularly work with external partners outside the Council including National Highways, the Liverpool City Region Combined Authority, The Environment Agency, Public Health England, Merseytravel and Peel Ports (who operate the Port of Liverpool).

- Sefton is currently working with the Driver and Vehicle Standards Agency (DVSA) and John Moores University (JMU) on two innovative projects which are discussed in more detail later in the ASR.
- In addition 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

- Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.
- The 2019 Clean Air Strategy[5] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that most of the Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.
- Sefton Council has developed and implemented Air Quality Action Plans (AQAPs) for all of its AQMAs.

  (please note Sefton's AQAP's are due to be updated).
- The plans include two categories of Action Plan measures that are called **site specific measures** and **general measures**.

[5] Defra. Clean Air Strategy, 2019

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

- **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 current AQAPs for Sefton can be viewed at:

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

Examples of successful 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 Port booking system to reduce congestion on the routes into the Port and 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 been completed and were 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.

Current and ongoing air quality improvement initiatives

Examples of more recent air quality initiatives and interventions which will be included in the updated AQAP's are detailed below:

AQ improvement action - Sefton's Clean Air Plan (CAP)

- 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. A Preliminary Clean Air Zone (CAZ) feasibility study indicated that a CAZ type B could have a positive effect on reducing NO_2 exceedances in and around the AQMA's.
- Following this the Council committed to undertaking a more detailed assessment and commenced the development of an Outline Business Case (OBC) for Sefton looking at air quality interventions including a Sefton based CAZ under an overarching Sefton Clean Air Plan. This work commenced in 2020 but unfortunately was heavily impacted upon by the Covid Pandemic during 2020/2021. The outline business case is now complete.
- The outcomes of the OBC were presented to Sefton's cabinet in July 2022 with the next steps currently under consideration . Further detail on Sefton's Clean Air Plan and OBC can be found on Sefton's Your Sefton Your Say engagement website. SeftonCleanAirPlan - Sefton Council - Citizen Space
- Further detail is also provided later on in the ASR.

AQ improvement action - Joint Sefton/ Driver and Vehicle Standards Agency (DVSA) Emissions Enforcement Project

- A joint Sefton / DVSA vehicle emissions enforcement project took place in December 2021 to identify HGV's and PSV's travelling on the A5036 between the Port and Switch Island, emitting unacceptable levels of pollution. A Sefton funded Mobile Air Quality Monitoring Vehicle was utilised to help identify HGV's travelling on the A5036 that may be emitting higher than expected levels of NOx (oxides of nitrogen) and PM (Particulate matter) therefore potentially indicating the presence of an emission cheat device or tampered emissions control system.
- The monitoring vehicle was used on the A5036 in live traffic taking real time air quality samples. For any vehicles being followed that showed unusually high levels of NOx and PM, compared with other vehicles, the registration and description of vehicle were radioed on to inspectors at the DVSA checkpoint at Switch Island, who then required the vehicle to stop and be subject to detailed inspection.
- As a result of high levels of pollution being detected, a number of vehicles were stopped by DVSA officers and subjected to more detailed investigations to determine if any faults or cheat devices were present. DVSA carried out an initial visual inspection of the vehicle, paying particular attention to the emissions control systems and engine warning lights. Onboard diagnostic (OBD) testing equipment was used to identify any fault codes and to carry out diagnostic tests on the emissions control system. A Diesel Particulate Filter tester and Diesel Smoke Monitor were also used to carry out an exhaust emissions tailpipe test.

- Several vehicles were subject to follow up action by the DVSA officers with Euro 5 Vehicles (manufactured between 2009-2014) most commonly stopped/likely to have issues. Evidence from the exercise also indicated that relatively high levels of emissions were observed from all HGV's leaving the port regardless of their Euro Standard. It is thought that whilst the vehicles are within the port moving slowly/idling their emission control systems cool down and as such do not function as efficiently which results in high emissions when the vehicles are leaving the port and accelerating up to speed on Princess Way. Plans are in place to re-run the project in September 2022

AQ monitoring action - Low-Cost Sensor co-location project Sefton /JMU

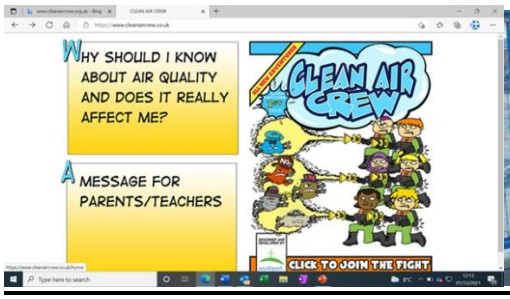
- Sefton Council and John Moores University (JMU) are currently undertaking a joint air quality monitoring co-location study to determine how accurate lower cost air pollution sensors are, compared to Sefton's own DEFRA approved automatic monitoring equipment.
- The study is underway at our Millers Bridge monitoring site and in collaboration with JMU, 3 lower cost sensors are currently being tested for accuracy. The 3 sensors being tested are:
    - Libelium Smart Cities Plug & Sense (NO_2)
    - Aeroqual AQY (NO_2, $PM_{2.5}$ and PM_{10})
    - Earth Sense Zephyr (NO, NO_2, PM_1, $PM_{2.5}$ and PM_{10})

- Comparison of NO/NO_2/PM_{10}/$PM_{2.5}$ data has commenced, and the project is planned to continue for 12 months.

AQ improvement action - DEFRA Grant Funded 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 Air Quality grant fund with the primary aim of minimising the Particulate Matter (PM) contribution from domestic solid fuel use in Sefton through behaviour change. The project was unfortunately impacted upon by the pandemic but is now complete as far as practicable.
- Notwithstanding the impact of the pandemic several successful elements were completed and will remain as a legacy of the project with the ongoing objective of reducing PM emissions including PM2.5. The headline actions are detailed below:
    - Development of a library of behaviour change publicity material - leaflets, posters, factsheets etc
    - Continued engagement with stove suppliers/ installers /chimney sweeps and fuel suppliers in area using communication material produced as part of the project.
    - Real time ongoing measurement of PM_{10} and $PM_{2.5}$ levels in the Crosby area (high stove use neighbourhood) using a FIDAS dual particulate monitor.
    - Development of a public website https://smokecontrolsefton.co.uk/ which contains a host of behaviour change information for householders, businesses, and suppliers on ways to minimise particulate emissions from the use of solid fuels for heating.
- Full details of the project outcomes are reported later in the ASR

AQ improvement action - DEFRA Grant Funded Educational Behaviour Change Project




- Officers from Sefton's Energy and Environmental Management Team supported by Environmental Health were successful in obtaining a DEFRA AQ grant of £122,500 to undertake an educational behaviour change project. The Project commenced in April 2021 and is planned to run for 2 years.
- The overall aim of the project is to raise awareness of Air Quality and in turn encourage behavioural changes that will have immediate and long- term positive impacts on Air Quality in Sefton.
- In partnership with Sefton Council's Educational Staff based in the Eco Centre, a termly programme of AQ support and learning will be offered to all Sefton Primary schools (and in turn the wider local community) during 2021/22 academic year, with a particular focus on schools within or close to one of Sefton's 4 Air Quality Management Areas (AQMAs).

  The programme consists of:

  - A dedicated Educational officer to support schools with a termly programme of AQ support and learning all linking to core national curriculum subjects. Including lesson plans, activity sheets, homework booklets, campaigns (walk to school, anti-idling), activities, how-to guides.
  - Expansion of the Clean Air Crew website, including also making it appeal to KS3/4 (Secondary schools)
  - Development of higher level online AQ training course for parents/ teachers/ Sefton Staff/ residents

- **Installation of a state of the art, digital technology immersive room at the Eco Centre and the development of 2 immersive experiences based on AQ.** This will be accessed by both schools and the wider community. It will also be managed by the educational staff after the programme has finished leaving a legacy of the project for years to come.
- **In addition, 20 schools in the AQMA areas will be provided with an AQ monitoring pack and training of how to use it (including 12 monthly NO2 diffusion tubes that will provide localised AQ evidence of any immediate improvements).**

AQ improvement action - Low-Cost Sensor / School Streets AQ monitoring Project

- Officers from Highways and Environmental Health are currently working on a joint air quality project as part of the School Streets and active travel agenda.

- Three low-cost air quality sensors (Earth Sense Zephyr as shown on picture) have been installed to monitor air quality levels around 3 schools identified as part of the initial phases of the School Streets project. AQ levels will be monitored before and after the School Street initiatives are implemented to assess any reductions in pollution as a result of the measures. Sensors will also be used to determine the different travel methods used (walk /cycle/car).

AQ Improvement Action -Traffic signal upgrade/incorporation of AQ sensors:

- As part of a City Region traffic signal upgrade project, funding for 7 air quality sensors (Earthsense Zephyr) was secured which are now operational. The sensors are located at 7 key traffic light junctions in the Borough and integrated into Sefton's traffic signal control system (Stratos). Real time air pollution data is now available from the sensors at these key locations, which can also be used to trigger specific traffic signal strategies to alleviate congestion if levels of localised pollution are of concern. Officers from Highways and Environmental Health are currently working together to developer potential traffic light strategies based on the sensor outputs

Conclusions and Priorities

- 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 also impact on public exposure receptor residential locations on port access routes.
- The Port of Liverpool has undergone a £300 million expansion, known as L2, which included the building of a new deep-water berth. This allows large post panamax container ships to berth there.
- Although port expansion is expected to bring 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.
- Sefton has recently undertaken its own detailed traffic and air quality modelling to assess the impact of this potential increase in port traffic on air quality levels. This modelling has been used to inform Sefton's Clean Air Plan (CAP) Outline Business Case (OBC) which includes consideration of a Sefton Based CAZ. A number of possible air quality intervention options to deal with the predicted increase in emissions, including an HGV only CAZ are currently being considered by Sefton

Council. Further detail on Sefton's Clean Plan Outline Business Case and options under consideration is provided in section 2 of this ASR - Actions to improve air quality.

- In addition to this work being undertaken by Sefton to deal with current and future air quality issues associated with increasing traffic levels, **National Highways** who manage the A5036 are currently progressing a route improvement option known as POLAS (Port of Liverpool Access Scheme)
- An Offline route option through Rimrose Valley has been chosen by National Highways (NH) as the preferred option. Further detailed assessment and design of this option is now underway by NH and their appointed consultant. Covid has delayed the project significantly however the various studies and assessments have now recommenced. National Highways is currently working to understand the impact of the pandemic on the proposed scheme. Changes in trade patterns following Brexit, initiatives like the Freeport, local employment and commuting habits since the pandemic struck in early 2020, need to be considered. As a result Traffic modelling is due to be updated, following this an updated project plan will be released. Further details regarding the project and progress can be found via the following link: https://highwaysengland.co.uk/our-work/north-west/a5036-port-of-liverpool-access/

Local Engagement and How to get Involved

- Sefton continues to engage with the community on air quality and uses a number of different techniques to facilitate this.

As detailed within the ASR Officers are currently undertaking a complex study into the potential use of a Clean Air Zone in Sefton under an overarching Clean Air Plan. Sefton is using our internet based 'Your Sefton Your Say' consultation hub to provide information to the public about the study and air quality matters in general. YSYS hub can be accessed via the following link:

https://yourseftonyoursay.sefton.gov.uk/seftoncleanairplan/

- As the study progresses the YSYS will be used as a consultation platform to engage and seek views from the community on the outcomes and proposals in regard to the Clean Air Zone study and wider air quality matters.
- Real time data from Sefton's monitoring network can be viewed by the public using Sefton's Breathing Space website. Historical information and air quality reports are also available.

  Link to website http://breathingspace.sefton.gov.uk/
- Sefton's AQ officers have completed a Defra AQ grant funded domestic solid fuel behaviour change project with the aim of reducing particulate emissions from the burning of this fuel. A number of engagement activities including questionnaires and presentations were undertaken as part of the project which are discussed in more detail within the ASR. Additionally a public website was developed which provides information and advice on this topic for residents who may be using solid fuel stoves/fires and businesses selling stoves and/or fuels.

  Link to website https://smokecontrolsefton.co.uk/
- Sefton is currently undertaking a Defra grant funded schools air quality education project. Part of the project includes the development of an immersive room at Sefton's Ecocentre. The immersive room will be used as an educational and engagement tool on air quality for school pupils and the wider community alike. Sefton's Clean Air Crew website which was designed to engage with school children, teachers and parents has also been further developed as part of the grant project.
  Link to website https://www.cleanaircrew.co.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, but 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 to use is restricted in these locations. You can check if your 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.

Local Responsibilities and Commitment

This ASR was prepared by the Public Protection Service of Sefton Council

This ASR has been approved by: Peter Moore Assistant Director (Highways and Public Protection).

If you have any comments on this ASR please send them to Greg Martin, report author at:

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Figures

Tables

1.0 Local Air Quality Management

- This report provides an overview of air quality in Sefton during 2021. 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 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 are presented in Table E.1.

2.0 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 should prepare an Air Quality Action Plan (AQAP) within 12 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 0.1. The table presents a description of the 4 AQMAs that are currently designated within Sefton. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations are as follows:
  - NO_2 annual mean;
  - PM_{10} 24-hour mean;

Table 0.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA2 Princess Way	2009	NO_2 Annual Mean	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/m^3	35.9 µg/m^3	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	NO_2 Annual mean	An area encompassing a number of residential properties around the junction of Millers Bridge (A5058) and Derby Road (A565)	NO	60 µg/m^3	46 µg/m^3	Draft Air Quality Action Plan for Sefton Council, 2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf
AQMA4, South Road	2012	NO_2 Annual Mean	An area encompassing the Liver Hotel and a number of residential properties around the junction of Crosby Road	NO	48 µg/m^3	35.2 µg/m^3	Draft Air Quality Action Plan for Sefton Council, 2015	http://breathingspace.sefton.gov.uk/Docs/Action_Plans/Draft_AQAP_AQMAs_1-5_2015.pdf

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
			North (A565) and South Road.					
AQMA5 Hawthorne Road	2012	NO_2 Annual mean	An area encompassing a number of residential properties around the junction of Hawthorne Road (B5058) and Church Road (A5036).	YES	42.6 µg/m^3	36.4 µg/m^3	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	PM_{10} 24 Hour Mean	An area encompassing a number of residential properties around the junction of Millers Bridge (A5058) and Derby Road (A565)	NO	46	3	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.**

☒ **Sefton Council that all current AQAPs have been submitted to Defra.**

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

- Sefton Council has taken forward a number of direct measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out at the end of this section in Table 0.2. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 0.2.
- Sefton Council has developed and implemented Action Quality Action Plans (AQAPs) 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 current AQAPs for Sefton can be viewed at:

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

- Sefton Council Draft Air Quality 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 some action plan measures are being implemented by other Agencies and are not controlled by Sefton Council. This includes the Port Expansion mitigation measure which is being progressed by National Highways.

NB In addition to the actions detailed in the AQAP's further actions are also underway which are discussed in more detail below. The AQAP is due to be updated imminently to include these additional measures.

The progress/update on key site-specific measures within the AQMA's are discussed in more below:

2.21 AQMA 2 Princess Way, Seaforth and AQMA5 Hawthorne Road

- Port expansion mitigation measure No1 National Highways A5036 Road option study. The Port of Liverpool Port Access Road Scheme (POLAS) is currently being progressed by **National Highways**.
- Stage 1 of the study has been completed. An Offline route option through Rimrose Valley has been chosen by National Highways/Department for Transport. Further detailed assessment and design of this option is now underway by National Highways and their appointed consultant. Covid has delayed the project significantly however the various studies and assessment have now recommenced.
- National Highways is currently working to understand the impact of the pandemic on the proposed scheme. Changes in trade patterns following Brexit, initiatives like the Freeport, local employment and commuting habits since the pandemic struck in early 2020, need to be considered. As a result Traffic modelling is due to be updated following this an updated project plan will be released. Further details regarding the project and progress can be found via the following link:

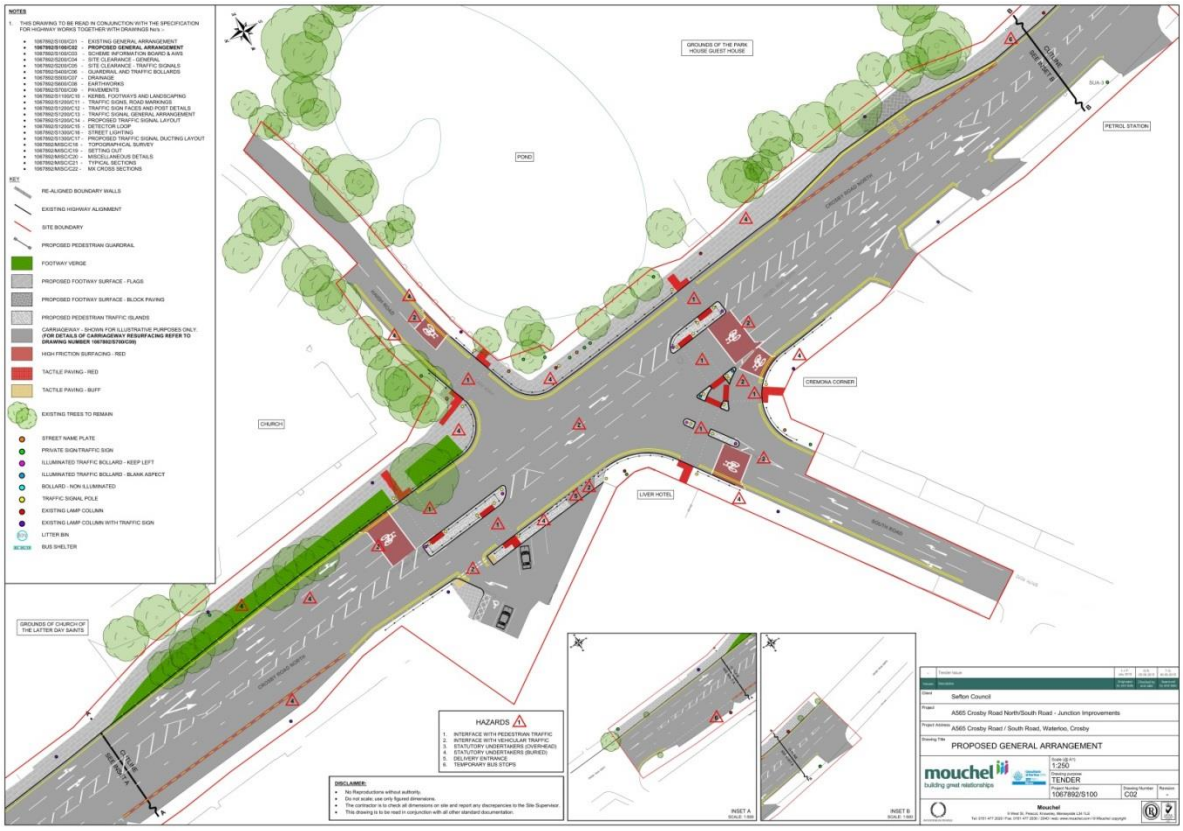
  https://highwaysengland.co.uk/our-work/north-west/a5036-port-of-liverpool-access/

2.22 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.

2.23 AQMA 4 South Road, Waterloo

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



- As reported in last year's ASR the junction improvement work shown above continues 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, 2019, 2020 and 2021 were below the NAQS objective. Obviously in 2020 and to a lesser degree 2021 Covid had a 'additional' positive impact on NO_2 in this AQMA due to reduced traffic levels and the various lock downs and work from home mandates.
- As detailed in this ASR an outline business case which includes the potential implementation of a CAZ is now complete and Sefton is currently considering the next steps. Should a CAZ be introduced there may be localised changes to traffic routing and, in view of this and ongoing changes to commuting habits resulting from Covid, the Council is currently reviewing the position regarding the revocation of this AQMA.

In addition to the improvement actions associated with the AQAPs with the AQMA's Sefton continues to develop further strategies and actions to tackle poor air quality. These will be included within Sefton's updated AQAP.

These additional actions are discussed in more detail below:

2.24 Sefton's Clean Air Plan (CAP)

- Despite the positive effects of Covid on reducing levels of air pollution in 2020/2021 Sefton has observed traffic on key port access routes (A565 and A5036) start returning to pre-covid levels. In addition traffic associated with the expansion of the port is predicted to increase significantly in the coming years. As such there is likely to be significant challenges ahead regarding reducing levels of NO_2 in some of Sefton's AQMAs particularly those impacted by traffic entering and leaving the Port of Liverpool.
- In view of these challenges officers from Environmental Health, Public Health and Transport teams, overseen by the Air Quality Member Reference Group, commissioned environmental consultants AECOM to undertake a preliminary Clean Air Zone (CAZ) feasibility study, to assess the feasibility of implementing CAZs in Sefton to reduce traffic related emissions. A copy of the Technical report (May 2019) can be found here https://www.sefton.gov.uk/media/1016/sefton-clean-air-zone-feasibility-study.pdf
- AECOM's report concluded that given the current and projected make-up of the traffic in the four AQMA areas, a Charging CAZ could deliver more rapid improvements in NO_2 emissions than existing measures, taking account of forecast improvements in the emissions profile of the vehicles on Sefton's roads. The study predicted that in 2020 if no further improvement actions took place there would still be 70-point NO_2 exceedances in the south of the Borough. The key study outcomes indicated the following:
    - A CAZ would achieve reduced emissions within the defined zone.
    - A CAZ B (HGVs, taxis, buses), including the junction of A5036/A565, would potentially achieve the most significant benefits.

- Further analysis would be necessary to identify the type and location of the CAZ.

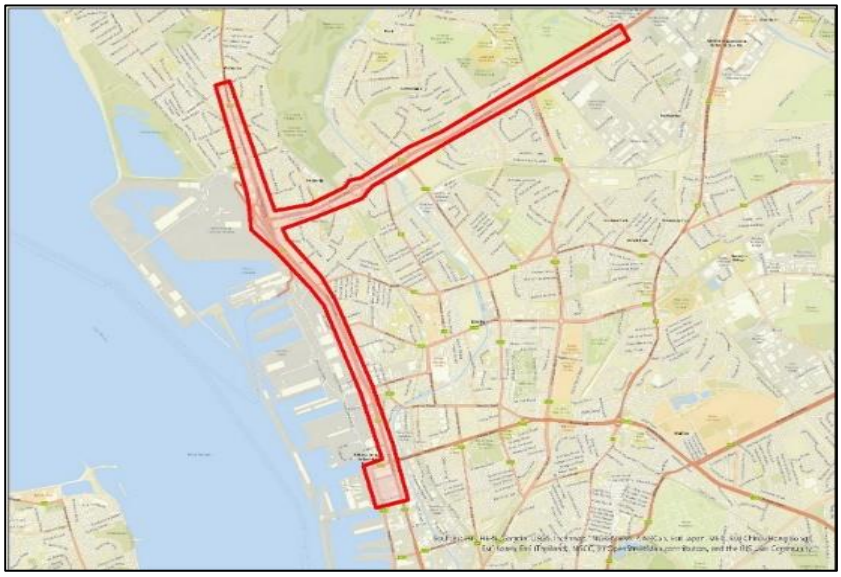
CAZ Outline Business Case (OBC)

- Following on from the Preliminary CAZ feasibility study Sefton's Cabinet gave approval for Officers to progress a detailed Clean Air Plan (CAP) Outline Business Case (OBC) which included consideration of a Sefton Based CAZ, in line with the approach recommended by DEFRA.
- AECOM were commissioned in May 2020 to undertake the additional air quality and transport modelling work needed and prepare a draft OBC in conjunction with Council Officers. The development of the OBC forms part of the Council's wider AQ programme overseen by the AQ Cabinet Member Reference Group.

CLEAN AIR PLAN OBC PROCESS AND KEY OUTCOMES

- The Clean Air Plan (CAP) proposal comprises a **CAZ scheme** that **aims to address persistent air quality issues identified within Sefton in the shortest time possible**. The CAZ scheme proposed as the preferred option (referred to as 'Option 2A') features a charging CAZ applied to non-compliant HGV's that cross into a designated section of the Sefton highway network. The CAZ would apply to HGVs only, meaning any good vehicle with a maximum gross weight of greater than 3.5 tonnes. The daily charge for entering the CAZ is anticipated to be £50 per day for all non-compliant HGVs.
- The preferred option CAZ is focused on the A565 and A5036 corridors, incorporating all four of the existing Air Quality Management Areas (AQMAs). Incorporating the A5036 within the CAZ requires entry and exit signs and enforcement cameras to be installed on the National Highways network and would require a co-operative approach between Sefton Council and National Highways. The boundaries of the proposed CAZ are shown on the following page:

Preferred CAZ Option 2A – Two Key Corridors (A565 / A5036)



- As part of the Clean Air Plan, an Outline Business Case (OBC) has been prepared in order to make a case for taking forward the CAZ scheme. The OBC has been developed in line with Treasury's advice on evidence-based decision making for investment as set out in the Green Book and uses the DfT's best practice OBC five case model approach which includes the **Strategic case, Economic case, Financial case, Commercial case and Management case**. Some of the key outcomes from specific elements of the cases are set out below.

Strategic Case – Key Outcomes

The Case for Change:

- The key impetus for change is that the Government, and Local Authorities, in accordance with their local air quality management responsibilities, **are required to meet air quality limit values in the shortest possible time**. Within Sefton, this is also **supported by a local desire to go further ('beyond compliance')** to improve air quality and health and well-being. Further to the key driver set out above, the case for change (and benefits of the scheme) is further articulated under several key strands, as follows:
    - **Legal** - Legal drivers and incentives at a national and international level, including EU and UK Government limits and directives leading to mandates issued to local authorities to address air quality exceedances. (*Note – Sefton not currently mandated)*

- **Environmental** - The Climate Change Emergency declared by Sefton Council in July 2019 underlines the Council's commitment to achieving environmental objectives which include improving local air quality.
- **Public Health** - Poor air quality has a detrimental impact public health and the wider economy, contributing to chronic illnesses and disease.
- **Societal** - There is a disproportionate impact of air pollution in areas of high deprivation within Sefton, in particular among communities in close proximity to the Port of Liverpool and the A565 and A5036 corridors.
- **Transport** - Road transport is a major source of NO_2 within Sefton. Whilst the overall fleet is improving in terms of emissions and engine technology, increased demand for access to the Port poses significant challenges and may lead to worsening air quality in some locations if not addressed.

Option Identification and Assessment – Preferred Option 2A:

- An Option Assessment Framework was adopted, that included the evaluation of options against the four strategic objectives determined for the study (see below) and a range of six key deliverability criteria (**technical feasibility, affordability, stakeholder acceptability, delivery mechanism, business impacts, and value for money)**.

Sefton's Clean Air Plan Strategic Objectives

Strategic Objectives
To improve air quality in the shortest possible time in known hotspot areas in Sefton's four AQMAs and achieve compliance with national standards in the shortest possible time.
To promote improved air quality in the wider area (outside the four declared AQMAs) through more rapid switchover to vehicles with minimal exhaust emissions.
To reduce human exposure to air pollution, and thus improving public health, particularly for areas of Sefton with high levels of deprivation.
To reduce emissions relating to the A5036 for HGV vehicle traffic, particularly around high density residential areas.

- Following an assessment of a 'long list' of options, the options shortlisted included four alternative CAZ boundary options and specific assumptions on CAZ vehicle classification, charging levels and assumed behavioural responses. The four options include alternative CAZ boundary specifications, based around cordon, corridor and gateway alternatives
- Based on the option assessment process, **Option 2A** has been determined as the preferred and recommended CAZ boundary option. This option consists of a CAZ including the A565 and A5036 (Part of National Highways SRN) corridors, thus including all of the existing AQMAs and focusing on areas of greatest concern based on the outcomes of the 'Business As Usual' modelling.
- It is also **recommended that Option 2B (A A565 corridor only CAZ) is retained as a reserve option**, contingent upon liaison with JAQU/National Highways regarding the potential inclusion of the A5036 within a CAZ.

Economic Case – Key Outcomes

Economic Appraisal – key points:

- The costs of poor air quality to public health and Sefton's communities cannot all be fully quantified based on the evaluation of the conventional economic, environmental and social benefits (***which are more appropriate for traditional transport/road improvement schemes than for a CAZ)***. The total economic benefits estimated do not fully reflect the impacts of poor air quality at a local level, nor take into account the particular level of vulnerability of those exposed to it. It is therefore important to recognise that the key imperative in the identification of the preferred option is the **delivery of air quality improvements in Sefton**, in line with the strategic objectives of the study as set out in Error! Reference source not found.. In this context the Economic Case does not drive the decision-making process but seeks to quantify the scheme costs and benefits (as far as possible) for each CAZ boundary option.
- The scope of **economic benefits** considered include:
    - **Health and Environmental impacts** - including air quality impacts and Greenhouse Gas impacts – CAZ has positive economic impact
    - **Transport User Benefits** – including travel time savings, vehicle operating costs and CAZ charge costs to users CAZ has negative economic impact

- **Vehicle Upgrade costs** – including costs of upgrading non-compliant vehicles CAZ has negative economic impact

  Note – Transport User Benefits / Vehicle Upgrade Costs – always lead to dis-benefits for a Charging CAZ scheme as no improvement in de-congestion benefits and incurs cost to upgrade/pay CAZ charge.

- **Scheme Implementation costs** – including all estimated costs of implementing and maintaining/operating the scheme. CAZ has negative economic impact.

- The economic impact has been assessed relative to a 'Business As Usual' (BAU) scenario without a CAZ intervention. The CAZ scheme has a positive health and environmental impact, but negative impacts for the other elements of the assessment which is a typical outcome for any CAZ scheme. As such, this results in a negative overall **Net Present Value of Benefits (PVB) of -£8.7 million**, as set out in **the table below**

Analysis of Monetised Costs and Benefits (£m, 2010 prices discounted to 2010)

Measure	Option 2A
Present Value of Benefits (PVB)	**-8.7m**
Present Value of Costs (PVC)	**6.4m**
Net Present Value (NPV)	**-15.1m**

- The **Net Present Value of Costs (PVC)** are calculated based on CAZ scheme costs (total Capital and Operating costs) to enable a 'like' for like' comparison of quantified scheme costs to calculate the **Net Present Value (NPV)** of the scheme of £6.4 million, as set out in **Table 1**. The total NPV for the scheme is -£15.1m.

- **The Economic Appraisal for a typical transport scheme would include a Benefit-Cost Ratio (BCR) to provide a high-level indication of value for money. However, this is not applicable for a CAZ scheme, as an illogical value would be created due to the negative PVB.** A negative PVB value is the normal expectation for a CAZ Charging scheme, since the key objectives are not focussed

on delivery of conventional user benefits (such as travel time savings), but on improving local air quality.

- In the case of a scheme such as the Clean Air Plan the measures of success of the scheme lie outside the standard benefits using the conventional DfT appraisal framework and it is not expected to provide an economic return on the investment. Therefore, the NPV does not provide a full measure of value for money. Since Option 2A would deliver against the core strategic objectives of the scheme, which are focused on improving local air quality in the shortest time possible, it is considered that the **preferred scheme option does represent the best value option when balanced against the Option Assessment Criteria**.

Distributional Impact Appraisal – key points:

- The economic appraisal is supplemented by a **Distributional Impacts Appraisal** (DIA), which provides an analysis of the potential differential impacts of the scheme between groups of people or businesses across Sefton. Distributional analysis helps to understand **whether a particular policy/scheme unduly favours or disadvantages particular groups**. This can be used to inform measures to mitigate the impact of the policy on those groups or the amendment of the policy itself.
- The DIA analysis suggests that the **air quality benefits of the scheme are particularly concentrated in areas that have some of the highest levels of income and health deprivation within Sefton**, therefore benefitting some of the most vulnerable people.
- It should however be recognised that there are many locally registered HGVs that would be potentially subject to the CAZ charges if they are non-compliant with the CAZ, and the operators of these vehicles may require assistance with bringing forwards any upgrades to their vehicle fleet. It should be **noted that the appraisal undertaken at this stage does not capture the potential costs or impacts of any mitigation measures**, for example, to support local SMEs with funding for vehicle upgrades.

FINANCIAL CASE – KEY OUTCOMES

Capital and Operating Costs:

- As the scheme is at the OBC stage, the Financial Case represents the position pre-procurement for the capital and operating costs. This means there is further work

required to develop and advance the cost estimates, particularly through further detailed design work and engagement with the market.

- There is some **uncertainty** with specific cost elements at OBC stage, including such elements as CAZ service implementation, staffing requirements, and operating costs. On this basis, costing has used detailed information where available for specific elements and a benchmarking approach for elements with less evidence available.
- **The total capital costs are estimated at £4,101,000, with operating costs of circa £1 million per annum (all in 2021 prices[7]).** Assuming that the CAZ is operational for five years, together with development, implementation and decommissioning costs, the current capital and operating costs across the lifecycle are reported at **£9,227,000 in 2021 prices**[8]. The total costs are summarised in the table below.

Table: Total Scheme Costs (to the nearest thousand £, 2021 prices)

Capital Cost Item	Total Cost (scheme life span)
Total Capital Costs excluding inflation	**£4,101,000**
Total Operating Costs	**£5,126,000**
Total Costs	**£9,227,000**

- The costs presented above do not include some key development related costs that would be incurred in taking the scheme forward. Whilst the above costs include estimated costs relating to the design of the CAZ highway infrastructure, there will

[7] The estimated scheme costs do not factor in inflation which would need to be included to determine a final funding requirement.

[8] This value differs from the total costs used in economic appraisal, which are adjusted to 2010 prices and discounted.

also be broader scheme development costs, including further work to develop the Full Business Case (FBC) such as consultation, and associated technical work.

- In addition, no mitigation funding has been included in the OBC modelling at this stage. These are costs that the Council (or for example, JAQU Clean Air Fund) could provide through business grants to help alleviate the financial impacts for required vehicle upgrades. **Estimated mitigation costs based on wider CAZ studies and an estimation on the number of vehicles needing to upgrade could be around c.£10m for a Sefton based CAZ (depending on grant amounts and uptake levels).**

CAP KEY CONCLUSIONS AND CONSIDERATIONS

OBC Evidence-Base Conclusions for implementing Preferred Option 2A CAZ:

- The **aim** of the CAP OBC is to Identify the best value CAZ option to meet the objectives set out by Cabinet. HGV CAZ Option 2A (key corridors A565 and A5036) has been determined as the preferred and recommended CAZ option for the CAP scheme. The Evidence-Base indicates that **significant AQ benefits can be gained within the CAZ Boundary area (Port Routes/AQMAs) and wider AQ improvements (reduced impact) can potentially be gained if proceed to FBC for Option 2A**. It is recommended that Option 2B (key corridors, A565 only) is retained as a reserve option, subject to liaison with JAQU/National Highways regarding the inclusion of the A5036 within a CAZ.
- Since Option 2A would **deliver against the core strategic objectives of the scheme** *(i.e. includes all AQMAs, key Port routes, will benefit some of the most health/income deprived areas)*, which are focused on improving local air quality in the shortest time possible, it is considered that the **preferred scheme option does represent the best value option when balanced against the Option Assessment Criteria** i.e. least deliverability barriers to implementation.

Key Considerations for Proceeding to Full Business Case:

- Progression of the CAP scheme to FBC will be contingent upon a number of factors, including key risks and constraints identified through the OBC and the following factors need to be given due consideration, as follows:
  - A **CAZ is not an all-encompassing solution for AQ issues** (requires synergy with ongoing Council policies/initiatives and key stakeholders).

- High **background concentrations** (and associated exceedances) linked to the **Port** require liaison on Peel Port's combined **Air Quality / Carbon Reduction Strategy to supplement traffic measures,**
    - particularly due to fact that e**xceedances remain** for Option 2A (and all options in 2023 modelling) even with the CAZ in place (Millers Bridge / A5036).
- **Air Quality Benefits** require consideration **against** significant **funding source** required for **CAZ Costs:**
    - **Benefits:** Evidence for Option 2A - significant AQ benefits in CAZ Boundary area plus wider overall AQ/health improvements
    - **Costs*:* £4.1m capital / £5.2m operating costs - £9.3 million** in 2021 prices (5-year operation)
    - Also estimated **potential mitigation** funding for **business impacts** potentially **c. £10m** and further **scheme development funding** required (e.g. for consultation)
- Expected **natural improvements** in Air Quality within next few years due to fleet. improvements – however, Port-related HGV growth an issue on our key corridors with existing issues
- **JAQU** – exceedances (particularly at JAQU receptors) would form basis of potential mandate – benefits and risks to consider (further modelling likely required).
- **JAQU** agreement **/ National Highways** support is required for inclusion of A5036.
- **COVID pandemic –** A5036 HGV traffic has returned to pre-pandemic levels **–** however the pandemic has impacted cost/availability of newer compliant vehicles – effect on overall fleet composition still to be realised.

KEY DECISIONS TO BE MADE TO DETERMINE NEXT STEPS –

- Sefton Council's Cabinet are currently considering the potential next steps in the process which are summarised in the table below. An update on this will be provided in next year's ASR.

- Further information on Sefton's CAP along with the Cabinet Report and CAP Executive Summary is available via Sefton's Your Sefton Your Say information hub which will be updated regularly as the CAP progresses. https://yourseftonyoursay.sefton.gov.uk/seftoncleanairplan/

Possible pathways for consideration based on OBC Outcomes *(Note - funding source to be identified for all options other than Business as Usual):*

<u>Do not proceed to FBC</u> for charging CAZ:		
1	**Business As Usual (BAU)**	Due to generally improving air quality situation and likely compliance with national thresholds within the next few years and the significant costs of implementing a charging CAZ. **Maintain current initiatives and monitoring.**
2	**BAU plus Option 2A Corridor focussed measures i.e. a Non-Charging CAZ (in AQ hotspots)**	**Focus available resources on additional and targeted measures** to improve air quality in the **proposed CAZ corridors**, for example supporting a vehicle upgrade programme.
2+	**BAU plus Option 2A Corridor focussed measures plus wider measures i.e. a Non-Charging CAZ (in AQ hotspots) plus wider area measures**	As for 2 but **allocate additional resources for wider measures** to improve air quality across south Sefton and **expand to include carbon reduction initiatives** targeted at the freight sector.
<u>Proceed to FBC</u> for a charging CAZ along the A565 and A5036:		
3	**FBC for Charging CAZ (if can gain**	Only if JAQU support is gained through exploring/securing funding opportunities based on OBC outcomes i.e. **begin**

	JAQU funding/NH support)	**approach for JAQU liaison now** – understand current funding position / prepare submission.
4	**FBC for Charging CAZ (Council funded)**	Decision about submission to **JAQU to be made at a later date** i.e. Council fund FBC. *But also need to consider implementation/consultation/mitigation funding needed – recommend funding secured prior to proceeding to FBC.*

2.25 Millers Bridge Junction Improvements (AQMA3)

- A project aimed at improving congestion in the area around Millers Bridge and the A565 heading into Liverpool commenced in 2019 and is summarised 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.
- The Millers Bridge junction improvement element of the scheme was completed in 2020. Due to the completion of this intervention during the Covid pandemic which extended into the reporting year of 2021 it has not been possible to assess whether the works have resulted in any quantifiable improvements in air quality due to the ongoing impact of the pandemic in 2020/2021. Monitoring will continue in the area but it may prove difficult to determine whether any improvements have occurred solely because of the redesigned junction as the ongoing impact of Covid on traffic levels and pollution is still unknown.

2.26 Joint Sefton MBC DVSA Emissions Enforcement Project

- Following delays due to Covid in 2020 and the first half of 2021 the planned joint emissions enforcement project took place in December 2021. Details of the project along with the results/conclusions are provided below:

Project Summary

- Following discussions with air quality officers from Sefton and enforcement officers from DVSA, During December 2021 over 3 days, a Mobile Air Quality Monitoring Vehicle (MAQMV) was used to help identify HGV's travelling on the A5036 - Dunningsbridge Road between Switch Island and the Port of Liverpool that were emitting higher than expected emissions. Levels of NO_x and PM were monitored both in live traffic and at the roadside to identify high emitting vehicles potentially indicating the presence of an emission cheat device or tampered emissions control system.
- DVSA then required the identified suspect vehicle to stop at the DVSA inspection depot at Switch Island. Enforcement officers then carried out an initial visual inspection of the vehicle, paying particular attention to the emissions control systems and engine warning lights. On Board Diagnostic (OBD) interrogation

equipment was then used to identify any fault codes and to carry out diagnostic tests on the emissions control system along with A Diesel Particulate Filter tester and Diesel Smoke Monitor to carry out exhaust emissions tailpipe test.

Results

- 20 Vehicles were stopped following indicated high pollution levels being detected as a result of roadside and live traffic monitoring with the largest proportion of vehicles stopped were of Euro 5 standard.
- Using OBD interrogation equipment DVSA inspectors identified 10 vehicles with emission system control faults. Inspectors found some difficulty, given the limited time allowed to retain the vehicles, in identifying the cause of the fault. Notwithstanding this DVSA issued 2 Enforcement Notices to vehicle operators following identification of a specific issue.
- We are currently making final arrangements to re-run the project in September 2022 using monitoring equipment fitted to DVSA stop vehicles. In addition to the A5036 monitoring checks are also planned to be undertaken over a wider range of locations including the motorway network, Brooms Cross Road and the A565. The results of this follow-on project will be reported in next year's ASR.

2.27 Traffic signal upgrade project / incorporation of AQ sensors:

- As part of a City Region traffic signal upgrade project, funding for 7 air quality sensors (Earthsense Zephyr) in Sefton was secured and are now operational.
- The sensors are located at 7 key traffic light junctions in the Borough and integrated into Sefton's traffic signal control system (Stratos).
- Real time air pollution data is now available from the sensors at these key locations, which can also be used to trigger specific traffic signal strategies to alleviate congestion if levels of localised pollution are of concern.
- Officers from Highways and Environmental Health are currently working together to developer potential traffic light strategies based on the sensor outputs.

2.28 Co-location Monitoring Project Sefton Council and John Moores University (JMU)

- Sefton Council and John Moores University (JMU) are currently undertaking a joint air quality monitoring co-location project which commenced in June 2021 and is looking to determine how accurate lower cost air pollution sensors are, compared to Sefton's own automatic monitoring equipment.
- The study is underway at our Millers Bridge monitoring site. In collaboration with JMU 3 lower cost sensors provided by JMU have been installed alongside our automatic monitors.
- The 3 sensors currently being trailed are:

  Libelium Smart Cities Plug & Sense (NO_2)

  Aeroqual AQY (NO_2, $PM_{2.5}$ and PM_{10})

  Earth Sense Zephyr (NO, NO_2, PM_1, $PM_{2.5}$ and PM_{10})
- Comparison of NO/NO_2/PM_{10}/$PM_{2.5}$ data has commenced and the project is planned to continue for 12 months. Details of the results of the project and how monitor outputs compare will be presented in next year's ASR.

2.29 Low-cost sensor / school streets AQ monitoring project

- Officers from Highways and Environmental Health are currently working on a joint air quality project as part of the School Streets and active travel agenda.
- Three low-cost air quality sensors (Earth Sense Zephyr as shown on picture) have been purchased to monitor air quality levels around 3 schools identified as part of the initial phases of the School Streets project. AQ levels will be monitored before and after the School Street initiatives are implemented to assess any reductions in pollution as a result of the measures. Sensors will also be used to determine the different travel methods used (walk /cycle/car).
- Results from the study will be presented in next years ASR.

2.3 Progress on DEFRA AQ Grants

2.31 Schools Educational Project

- Officers from Sefton's Energy and Environmental Management Team supported by Environmental Health were successful in obtaining a DEFRA AQ grant of £122,500 to undertake an educational behaviour change project. The Project commenced in April 2021 and is planned to run for 2 years.

- The overall aim of this project will be to raise awareness of Air Quality and in turn encourage behavioural changes that will have immediate and long- term positive impacts on Air Quality in Sefton.
- Sefton has 4 AQMA areas and some of the highest levels of childhood asthma and respiratory disease in the country. Therefore, in partnership with Sefton Councils Educational Staff based in the Eco Centre, a termly programme of AQ support and learning will be offered to all Sefton Primary schools (and in turn the wider local community) during 21/22 academic year, with a particular focus on schools within or close to one of Sefton's four Air Quality Management Areas (AQMAs).
- The educational staff at the Eco Centre have been operating for over 15 years and have strong, established and trusted relationships with all schools in Sefton. In addition, they have already created in-house an air quality website aimed at children www.cleanaircrew.co.uk.

The programme will consist of;

- A dedicated Educational officer to support schools with a termly programme of AQ support and learning all linking to core national curriculum subjects. Including lesson plans, activity sheets, homework booklets, campaigns (walk to school, anti-idling), activities, how to guides
- Expansion of the Clean Air Crew website, including also making it appeal to KS3/4 (Secondary schools)
- Development of higher level online AQ training course for parents/ teachers/ Sefton Staff/ residents

- Installation of a state of the art, digital technology immersive room at the Eco Centre and the development of 2 immersive experiences based on AQ. This will be accessed by both schools and the wider community. It will also be managed by the educational staff after the programme has finished leaving a legacy of the project for years to come.
- A programme of NO_2 monitoring at participating schools in the Borough.
- Over primary 24,000 school children, plus their teachers and parents will receive a broad but thorough introduction to AQ issues. The above campaigns will mean that direct action can be taken immediately by over 70 schools, resulting in air quality benefits in the next 2 years and beyond.
- In addition, approximately 20 schools in the AQMA's will be provided with an AQ monitoring pack and training of how to use it (including 12 NOx tubes that will provide localised AQ evidence of any immediate improvements).

Project outputs to date

Quarter 1 – end of June 2021

- 70 sign ups from Sefton Schools to Clean Air Crew website.
- New KS2 resources and interactive features added to website.
- All teachers and parents that have signed up, now have logins to access the website.
- Clean Air Day promotion through Clean Air Crew website and Sefton Communications team (social media and press releases).

Quarter 2 – end of September 2021

- Total of 85 sign ups from Sefton Schools to date to Clean Air Crew website.
- New KS2 resources and interactive features added to website.
- Autumn term campaign – Air watch (Dedicated link/section on website, including teacher/pupils toolkit and associated resources)
- Autumn term campaign Air watch promotion through Clean Air Crew website, our own comms strategy (incl. social media) and Sefton Communications team (social media and press releases).

Quarter 3 – end of December 2021

- 100+ additional parent sign ups to Clean Air Crew web resource.
- 4 new curriculum resources developed, designed and uploaded to website.
- Autumn term campaign – Air watch completed (Dedicated link/section on website, including teacher/pupils toolkit and associated resources)
- Spring term campaign Air Monitoring development schools engaged, Nox tubes ordered and installed, resources developed. Along with promotion through Clean Air Crew website, our own comms strategy (incl. social media) and Sefton.
- Communications team (social media and press releases).
- One immersive room experience created. Second experience in development.

Quarter 4 – end of March 2022

- 49 additional parent sign ups to Clean Air Crew web resource.
- 2 additional school sign ups to Clean Air Crew web resource.
- 3 new curriculum resources developed, designed and uploaded to website.
- Spring term campaign – AQ monitoring ongoing (Dedicated link/section on website, including teacher/pupils toolkit and associated resources)
- Summer term campaign Anti-Idling development schools engaged; resources developed. Along with promotion through Clean Air Crew website, our own comms strategy (incl. social media) and Sefton.
- Communications developed and promoted by the resident teachers and also shared by SMBC communications team (social media and press releases).
- Immersive room experiences/ games created and continuously being further developed

Quarter 5 – end of June 2022

- 38 additional parent sign ups to Clean Air Crew web resource.
- 1 new curriculum resources developed, designed and uploaded to website.
- Summer term campaign – Anti Idling launched (including teacher/pupils toolkit and associated resources). Promotion through Clean Air Crew website, our own comms strategy (incl. social media) and Sefton.

- Communications developed and promoted by the resident teachers and also shared by SMBC communications team (social media and press releases).
- Immersive room experiences continuously being further developed
- 508 people that have interacted with the AQ immersive room experiences

2.32 Defra Funded Domestic Solid Fuel Use Behaviour Change Project

- Sefton Air Quality Officers were successful in securing a £100,000 DEFRA AQ grant to fund a domestic solid fuel behaviour change project with the overall goal of reducing particulate matter emissions from the use of domestic solid fuel in the Borough. The project ran from June 2019 to September 2021 (with extension as a result of the Covid Pandemic). The project employed several behaviour change interventions and approaches to enable householders, fuel suppliers, appliance suppliers and installers, and maintenance professionals such as chimney sweeps to promote, select and use appliances and solid fuels in ways that sustainably minimise PM release and exposure.
- The project included a review of a range of baseline data, evidence, and insight activities to characterise the scale, distribution, and root causes of PM emissions caused by domestic burning. This information was used to further identify, refine and target effective and cost-effective intervention entry point; spanning policy levers, regulation, individual behaviour change and improvements to fuel and appliance market choice.
- The Evaluation sought to measure an anticipated reduction in relevant PM emissions in year two, associated outcomes such as positive changes in knowledge, behaviour and intentions, and revised smoke control areas, plus other outputs, e.g., adoption of embedded and systematic opportunities to reinforce key messages as part of routine professional engagement with the public.

Project Aims

- Sefton recognises there is important work to undertake to better understand where different domestic burning appliances are in use, and to define relevant at-risk populations and evaluate the level of current and achievable PM emissions. The understandable focus on Air Quality Management Areas has tended to give most attention to vehicle emissions and behaviour change. A recent community

engagement event on the Draft Clean Air Strategy arranged by Sefton Council's Air Quality Strategy Group highlighted low levels of awareness amongst the public about other sources of air pollution. Given that harm from PM is known to occur on a continuum rather than as a threshold effect, there is a clear need to enable reductions in emissions from all sources where possible. The goal is to realise the greatest possible health and environmental benefits by using the powers, resource and assets available to us.

- Sefton is concerned that the increased use of domestic solid fuel is adding to particulate matter levels in the Borough. Sefton, like all Local Authorities has new duties with regard to $PM_{2.5}$ and the reduction of this particular airborne pollutant. It is considered that this PM reduction project would form an essential part of Sefton's action plans to achieve continuing $PM_{2.5}$ reductions.
- Sefton has a number of smoke control areas (SCAs)already in existence, however as it is many years since the SCAs were designated there is concern residents who currently live in these areas are no longer aware of the restrictions and requirements of an SCA and this coupled with the increased popularity of domestic solid fuel use/solid fuel appliances in indoor, but also outdoor settings (e.g. chimenea/fire pits) may be leading to increasing non-transport related particulate levels, including in some areas not previously associated with air quality issues.
- Intaking the above into account the following overarching aims of the project were developed and as listed below:
    - ***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.***

To achieve the overall aims and objectives set out above a comprehensive work activity package was developed along with a project plan. The main project activities proposed at the commencement of the project included:

- **Purchase and installation of dual PM_{10}/$PM_{2.5}$ monitor to be installed in an area of high domestic solid fuel/stove use.**
- **Assess levels of domestic stove/solid fuel use in Sefton.**
- **Determination of current $PM_{2.5}$ levels in study area chosen. This could include testing to validate extant modelled, larger-scale estimates of PM from domestic fuel burning**
- **Identification of fuel suppliers/stove suppliers/chimney sweeps in area.**
- **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[9]**

[9] https://consult.defra.gov.uk/airquality/domestic-burning-of-wood-and-coal/supporting_documents/180129%20Evidence%20background%20documentation.pdf

- **Create/develop 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[10] from PHE's recently published Behavioural Science Strategy.[11]**
- **Evaluation of project using monitoring data from actual $PM_{2.5}$ monitoring**

Main Work Activities Undertaken

- Following the successful recruitment of a project officer unfortunately the project and associated work activities/outputs were heavily affected by the restrictions associated with covid pandemic which impacted the project from March 2020 onwards.
- The majority of work package activities were nevertheless undertaken, and the headline activities are discussed in more detail on the following pages:

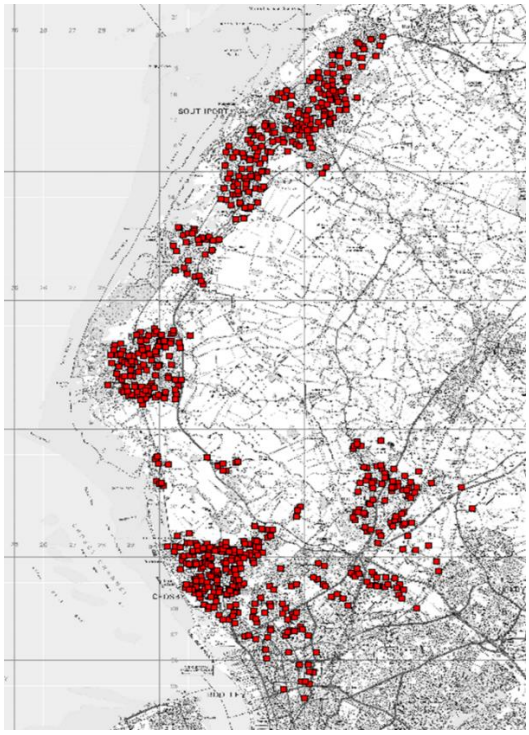
Work Activity-Stove Use Mapping

- One of the initial work activities carried out was to identify an area of high domestic solid fuel use for the study area and a location for the installation of the dual particulate monitor.
- A detailed mapping exercise was undertaken to plot the location of wood burning / multifuel stoves already installed in Sefton which were likely to be in use. Information was provided by Sefton's Building Control team and included stoves installed in the past 5 years which were either installed by a competent person or were signed off by Building Control.

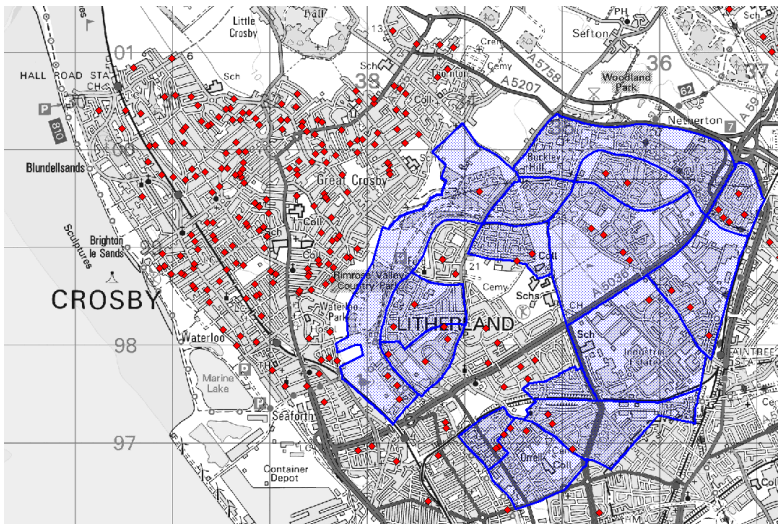
[10] https://consult.defra.gov.uk/++preview++/airquality/domestic-burning-of-wood-and-coal/supporting_documents/open%20fires%20wood%20burning%20stoves%20%20guideA4update12Oct.pdf

[11] https://www.gov.uk/government/publications/improving-peoples-health-applying-behavioural-and-social-sciences

- This mapping was then used to inform the location where the monitor would be installed based upon the higher density areas of stove installations. Areas of Crosby, Formby and Ainsdale were found to have high concentrations of stove installations.
- Following a review of the mapping the decision was made to install the dual particulate monitor in the suburbs of Crosby as this area had the highest concentration of stove use and there were a number of suitable locations for the monitor.
- We made the decision not to place the monitor within a Smoke Control Area as people there may already be aware of the local fuel restrictions, and we wanted a view of a typical area to support the objective of establishing if current Smoke Control Areas should be increased.
- Examples of the mapping outputs are provided below on the following page



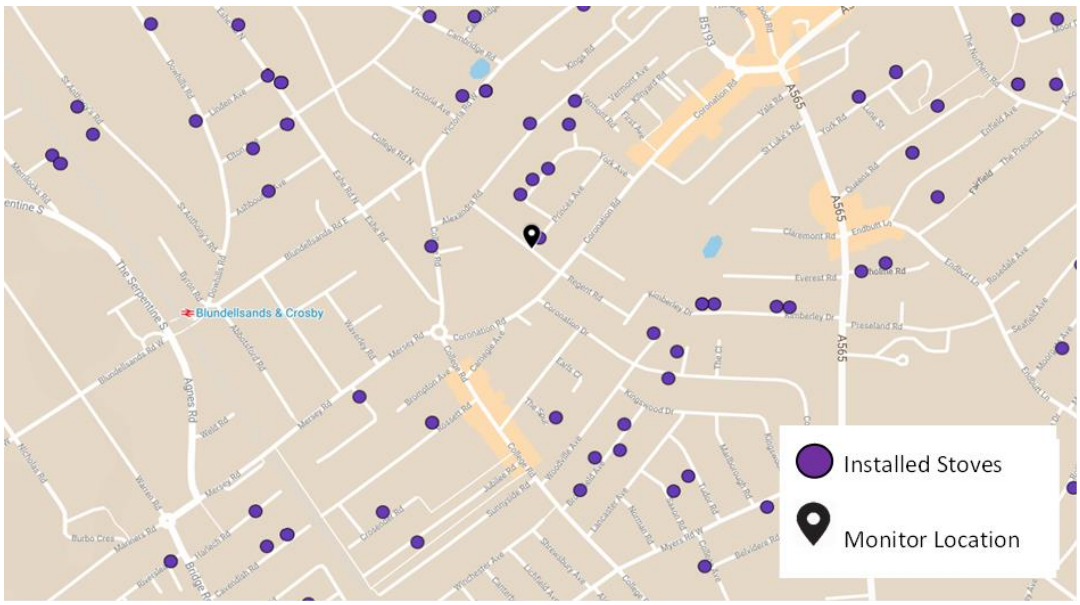
Stove use across Sefton, the red boxes represent stoves installed within the previous 5 years.



Stove use in the Crosby area. The red dots indicate the location of the stoves installed within the last 5 years and the blue areas are current smoke control areas within Sefton.

Work Activity-Monitoring Station

- To provide appropriate data to inform the study a FIDAS dual PM_{10}/$PM_{2.5}$ particulate monitor was chosen as a suitable monitoring system and the appropriate procurement exercise took place. A number of site surveys took place and a location identified for the monitor.
- The monitor was installed on Regent Road, within the Crosby area. The monitor is located in a mainly residential area, near to two parks and a number of small businesses (restaurants and shops). This site was selected as it represented an urban background and was not impacted significantly by road traffic emissions as the site is located approximately 500 meters from the nearest A road.
- The data from this monitoring station has been used to inform the project. The public are also able to view real time and historic data on Sefton Council's "Breathing Space" website, alongside Sefton's existing automatic monitoring station network. Unfortunately, due to significant issues as a result of covid the installation was significantly delayed. Further discussion on this issue and the results is provided later on in the report.
- The map below shows the location of the dual particulate monitor, and an image is also provided of the monitor in situ:



Work Activity-Surveys/Questionnaire

- A number of surveys/questionnaires aimed at the public were developed as part of the study to help us ascertain the type, frequency and intensity of domestic solid fuel use along with current practices used by residents.
- Surveys to engage with industry were also used to help 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.
- A summary of the main surveys and results is provided below:

Sefton Wood Allotment Association Survey

- As part of the development phase of the project and subject design of surveys a meeting was arranged with a community group called Sefton Wood Allotment Association (SWAA) who as volunteers undertake forestry clearance work for

Green Sefton (Part of Sefton Council) and are able to utilise the wood as fuel in their homes.

- It was considered that this group would be a good focus group for the project and allow us to better understand the level of knowledge with regard to stove use and practices around seasoning of wood etc.
- Initially, a meeting was arranged with the SWAA. During this meeting we presented a summary of the project and discussed the possibility of using them as a model example of good practice, when good burning habits are discussed and encouraged as a group. We predicted to see good practice commonly amongst the group; however, were willing to arrange training if any members did not seem aware of the risks of PM, which arise from burning fresh wood or having poor burning habits.
- Following agreement from the group the SWAA were asked to complete a survey to investigate their knowledge and habits in regard to solid fuel burning within the home, there was a prize draw of five moisture meters to encourage participation. The survey was required to pass an internal consultation and engagement panel before being issued to the group, this ensured that the survey was of a sufficient quality, relevant, fair and simple enough for all of the general public.

SWAA Survey Results

- Responses to the questionnaire showed that in general, all members of the SWAA were concerned with current environmental issues and only half the respondents suggested that receiving free wood to burn was their main reason for attending SWAA sessions, with all others suggesting that they were more interested in the environmental benefit of their actions and the fact that the wood they receive is from a sustainable source.
- Whilst the surveys showed that members generally understood the need to season wet wood and store it correctly some of the more technical aspects of stove use were less well understood. Not all members of the group knew about HETAS, Smoke control areas, the difference between stoves (eco-design and DEFRA approved) and how regularly their chimney should be swept. This indicates to us that the general public may be even less aware of these factors than this focus group.

- The results of the surveys and engagement were used to help inform the design and focus of the website and promotional/engagement materials going forward.

Public Survey

- Following the focused SWAA survey a public facing survey was designed. Due to the covid pandemic and associated restrictions that were imposed it was decided to undertake this survey online and as such was launched on Sefton's consultation hub website, with the aim of reaching as many residents as possible to gain an understanding of their knowledge and views on the overall topic of domestic solid fuel use, stove use and smoke control etc. The survey had again been authorised by Sefton's internal consultation and engagement panel.

Public Survey Results

- Responses to the public survey were mixed and the level of returns was quite low probably due to the pandemic. Notwithstanding this Some of the results from the public survey were quite positive and showed some understanding around the topic area such as:
    - 94% of respondents being able to identify that wood needs to be dried/seasoned correctly to ensure it burns efficiently.
    - Majority of respondents understood the health impacts of particulate matter pollution
    - 64% understood what $PM_{2.5}$ is.

Whereas in other areas a much lower level of knowledge was observed:

- Only 35% of respondents could identify the correct way to start a fire in a log/multifuel stove,
- Less than half – 47% – of respondents could identify what would be classed as a smokeless fuel.
- Only 6% of respondents identified the correct frequency for chimney sweeping if you had a wood burning stove.

As with the SWAA results, the results of this survey were used to help inform the design and focus of the website and promotional/engagement materials.

Industry survey

- An industry survey was designed to target key professionals working within Sefton, this included:
    - Chimney sweeps
    - Stove retailers
    - Stove installers
    - Fuel retailers
- The industry survey was originally intended to be conducted as an in-person engagement style interview but unfortunately had to be transferred into a written survey which was posted out due to the pandemic restrictions. This survey had also been authorised by Sefton's internal consultation and engagement panel.

Industry Survey Results

- We had a range of industries represented with stove retailers, stove installers fuel retailers and chimney sweeps returning completed questionnaires, however due to the covid pandemic a poor response rate was observed.
- It was positive to observe that all respondents were aware of HETAS, and the services provided and:
- All respondents were aware of the Clean Air Strategy 2019 and the proposal therein.
- All Respondents confirmed they offered advice on good practice in relation to the purchase of stoves, fuel choice and operation of stoves etc.
- Whilst respondents were aware of HETAS and other competent persons schemes 43% were not registered with such an organisation and further research to better understand the reasons for this would be useful.
- Only 16.7% of industry workers offer year-round eco-friendly incentives to their customers. These incentives could be an effective way of changing behaviour of residents, but the lack of current offers may suggest that money is an issue as 60% stated that they would not be prepared to arrange beneficial rates or offers to Sefton residents. This is something which could we peruse in the future through collaboration between different sectors of the industry or grant funding.

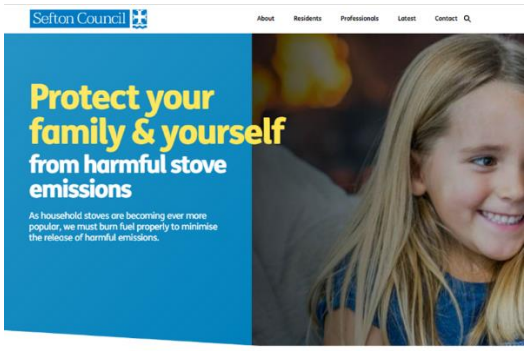
- The survey was conducted before the “The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020” were introduced. All of the respondents stated that they promoted the use of more efficient fuels (dry wood and smokeless manufactured fuels) with their customers. This point is less important due to the lack of availability of inefficient fuels now, but still indicates towards the environmentally conscious mindset of those questioned.

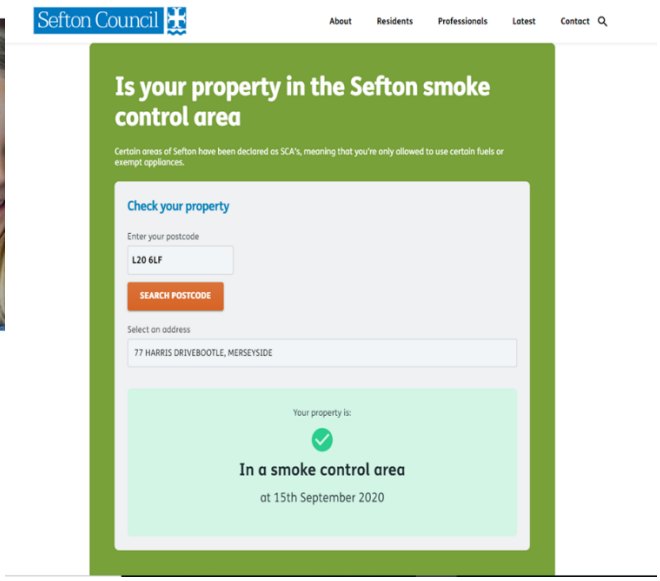
Work Activity-Website development

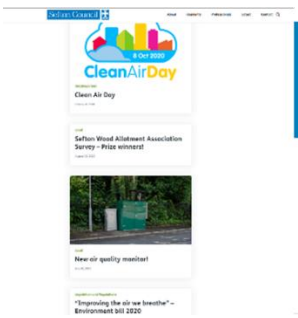
- The project website was seen as an important tool to engage with the public and industry and as such a significant proportion of time and resource was set aside to develop a useful and interactive website which would be a legacy of the project.
- The website design company Diva Creative was engaged to help design and create the project website based on content provided by ourselves. A number of detailed website planning meetings were held to agree on the content and the operation of the website.
- The website www.smokecontrolsefton.co.uk contains a vast amount of information on the topic of domestic solid fuel use and is aimed at all residents including those who own a stove already and those considering purchasing one and business and industry.
- The website has been designed to act as an information hub which can easily be updated and refreshed. The website contains a vast amount of information and to ensure it is user friendly its presented in smaller sections and across many pages. The website has been designed to be visually appealing through the use of colour, imagery and videos. The text was kept simple and in plain English in order to be inclusive.
- Videos included on the website were sourced from the Burn Right organisation, we were fortunate to be offered the use of these during a meeting with one of the co-founders of the organisation. Having access to these videos allows us to effectively reach more users as some people learn better through an audio or visual format rather than just reading.
- Other interactive features were created for the website such as the smoke control area (SCA) look-up, this allows visitors to search their postcode and discover if they live in a current SCA, if yes then the page directs them to information around this. We opted to use a look-up rather than show the areas on a map in order to make it

as simple as possible for the user. This page also includes good practice advice for those who are not in a SCA.

- Another page which is particularly useful is the ‘news’ webpage, this page gives users a reason to keep returning. As a whole, our understanding of the dangers associated with poor air quality is a focus of many streams of research; this increasing level of understanding leads to better advice being published and new regulations being brought in. Rather than placing them on multiple pages where users would have to search for any new information, the news page allows clear identification of updates.
- A number of website screenshots are provided below for information. The operational website can be found via www.smokecontrolsefton.co.uk

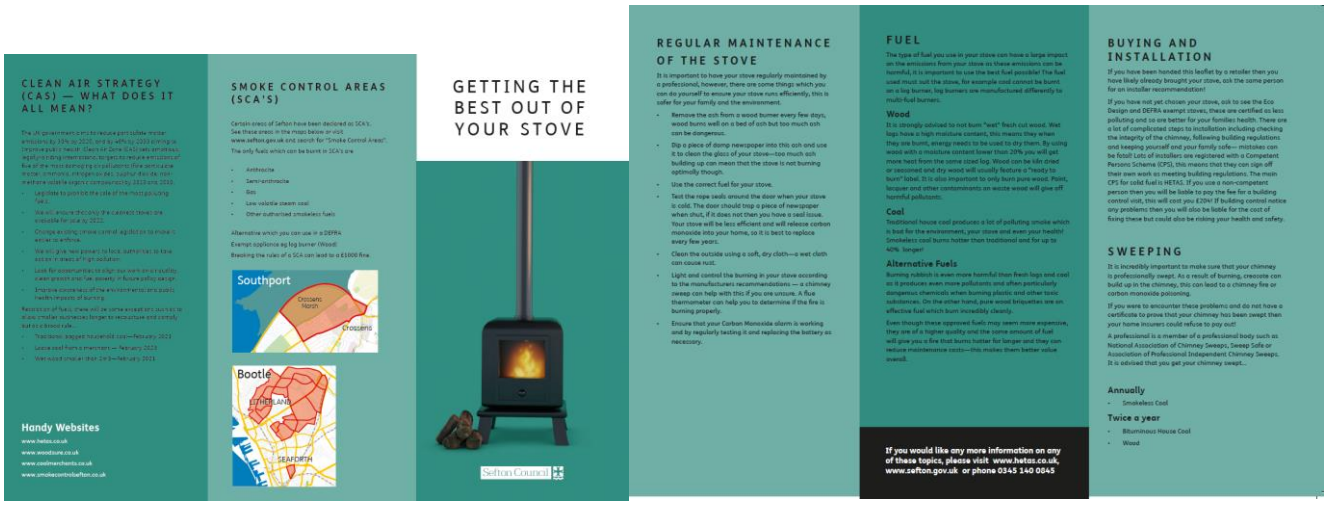






Work Activity-Publicity Materials / Communications

- Following the review and analysis of the questionnaires a number of leaflets were created for the project and designed in house. These targeted particular areas/themes that had been identified through the review process. The points of focus were:
    - Families – Issued by family health services/ nurses/ midwifes to expectant mothers and families with young children focusing on the impacts of air pollution on children.
    - Current Stove owners – Information on stove use, maintenance and fuel choice.
    - Prospective Stove owners – a more concise version of the above ‘current owners’ leaflet, this also includes information on installation.
    - Indoor Air Pollution – Focusing on the impacts of pollution from solid fuel burning directly within the home, rather than just what is emitted via the chimney.
    - Advice sheet – Issued by Building Control when a new solid fuel burning appliance is installed and registered. This provides key information on solid fuel burning in an easy to digest form, the poster will also refer the reader to the website for more information.
    - Examples are provided on the following page:



Work Activity-Comparison of Summer and Winter $PM_{2.5}$ levels

- One of the initial work activities proposed was to determine levels of $PM_{2.5}$ in the study area during winter 2019/2020 (prior to any behaviour change activities taking place) and subsequently compare these with PM levels during the winter of 2020/2021 (following the completion of the behaviour change elements of the project) to determine if any reductions had been achieved as a result of the behaviour change activities.
- Unfortunately, due to initial delays with the supply of the monitor in late 2019/ early 2020 and the subsequent lockdown associated with the Covid pandemic in March 2020 the installation of the particulate monitor was significantly delayed, and initial PM background levels could not be monitored as planned.

- The Particulate monitor was installed in August 2020 and became operational in September 2020 following a temporary relaxation of the lockdown restrictions. As discussed previously the Covid pandemic also impacted on the timings of the behaviour change elements of the project and the project plan was adjusted accordingly. An extension for the project was also offered/approved by DEFRA as a result of the pandemic. A number of behaviour change elements took place/ were completed during the winter of 2020/2021 and as such results from winter 2020/21 have been compared with winter 2021/2022 for the purposes of the report.
- *Figure A* on the following Page shows the weekly average $PM_{2.5}$ levels from the automatic monitor between September 2020 and February 2022. Weekly average PM results have been used to enable some comparison of pre and post behaviour change levels. Winter and summer periods have also been identified in line daylight saving dates to assist with comparison this process.
- As shown, the trend across the whole timeline is decreasing levels of $PM_{2.5}$. Overall, the levels recorded at this site are well within the National Air Quality Standard objective of 25 µg/m^3, most weekly averages were also under the WHO guideline limit of 10 µg/m^3 with just 9.59% of the results being higher than 10 µg/m^3 and only 1.37% of the results being higher than 13 µg/m^3.
- Figure C shows the average $PM_{2.5}$ Levels during winter and summer periods. When classifying summer and winter in line with daylight savings, the summer average is 5.15 µg/m^3 and the winter average is 7.49 µg/m^3 (8.16 µg/m^3 for 2020-2021 winter and 6.57 µg/m^3 for 2021-2022 winter).
- In comparing pre and post behaviour change $PM_{2.5}$ levels, as can be observed levels during the winter of 2021/2022 following the behaviour change work were 6.57 µg/m^3 and had reduced compared to the previous winter where an average level of 8.16 µg/m^3 was found.
- The results do confirm a reduction of $PM_{2.5}$ levels following the engagement work and it is feasible that this has in part lead to the reductions observed. A number of other factors are however likely to impact on reduced $PM_{2.5}$ levels including the restrictions on the sale and type of solid fuel able to be sold as a result of The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 coming into force in May 2021. With only 2 winters results being compared ongoing monitoring will be key to determine if the downward trend continues.

- *Figure B* and D shows the same comparison but of PM_{10} data. All data points are well within the national air quality standard of 40 µg/m^3. The weekly averages considered in this graph provide a summer average of 8.59 µg/m^3, with a combined winter average of 11.76 µg/m^3 (12.35 µg/m^3 for 2020-2021 winter and 10.91 µg/m^3 for 2021-2022 winter). The trend mirrors the $PM_{2.5}$ levels.

Figure A – The weekly $PM_{2.5}$ level from the Regent Road automatic monitoring station since installation (27/09/2020 – 27/02/2022). The summer and winter periods have been highlighted in line with British Summer Time. The dotted line is a linear trend line.

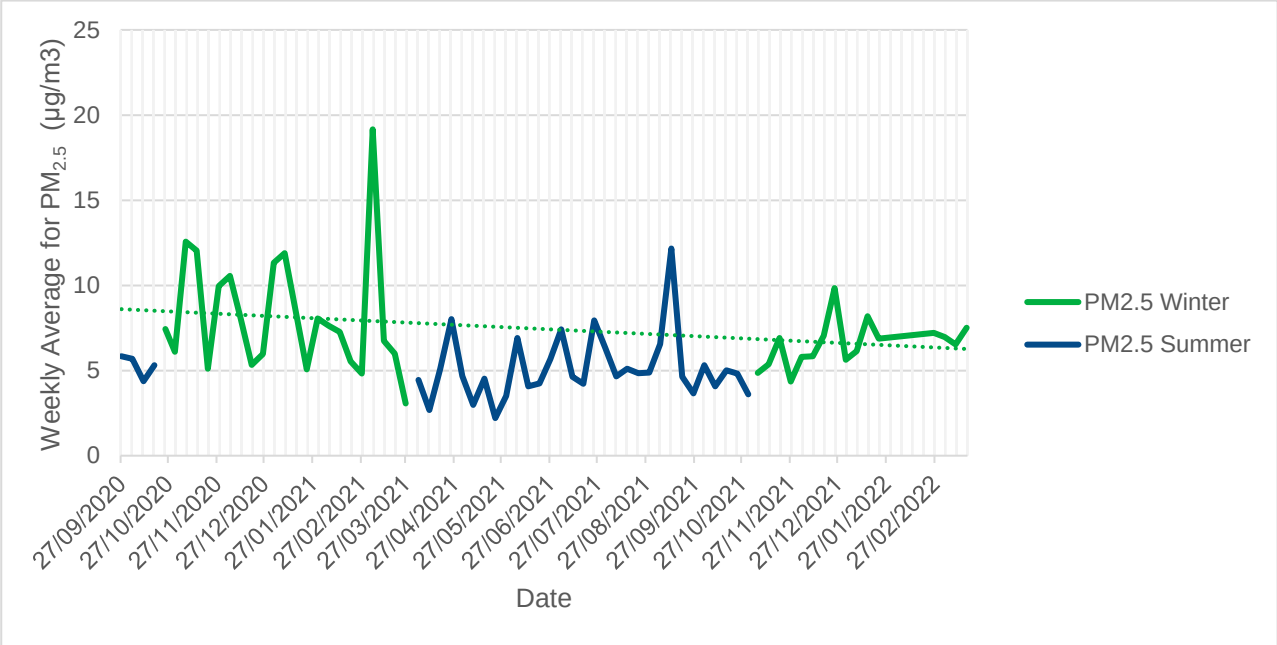


Figure B - The weekly PM_{10} level from the Regent Road automatic monitoring station since installation (27/09/2020 – 27/02/2022). The summer and winter periods have been highlighted in line with British Summer Time. The dotted line is a linear trend line.

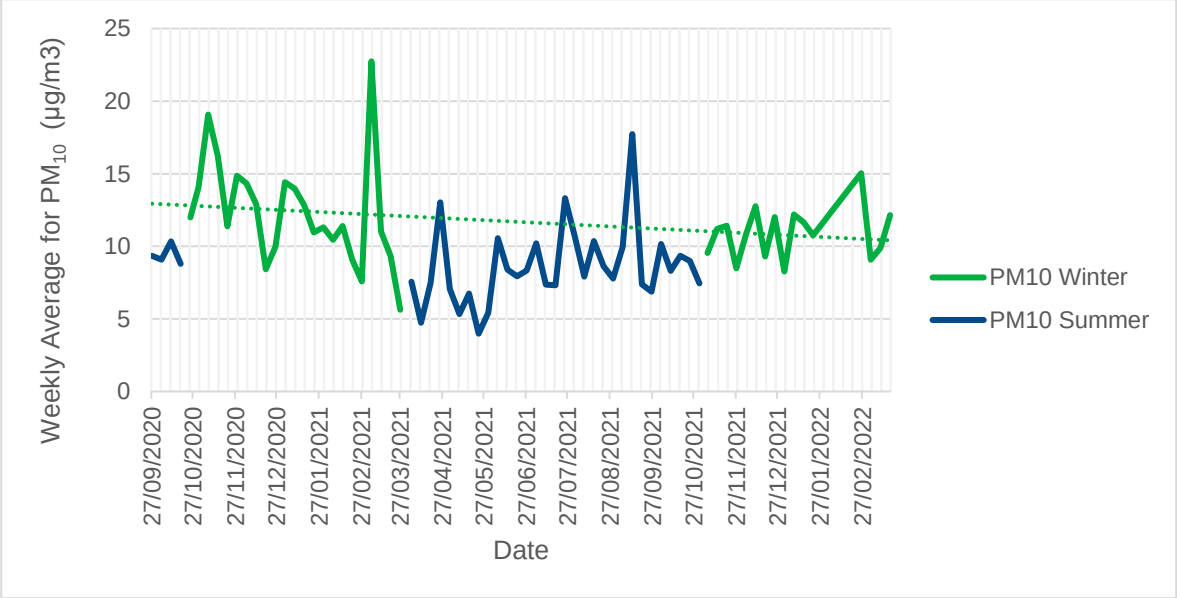


Figure C – Seasonal average $PM_{2.5}$ levels

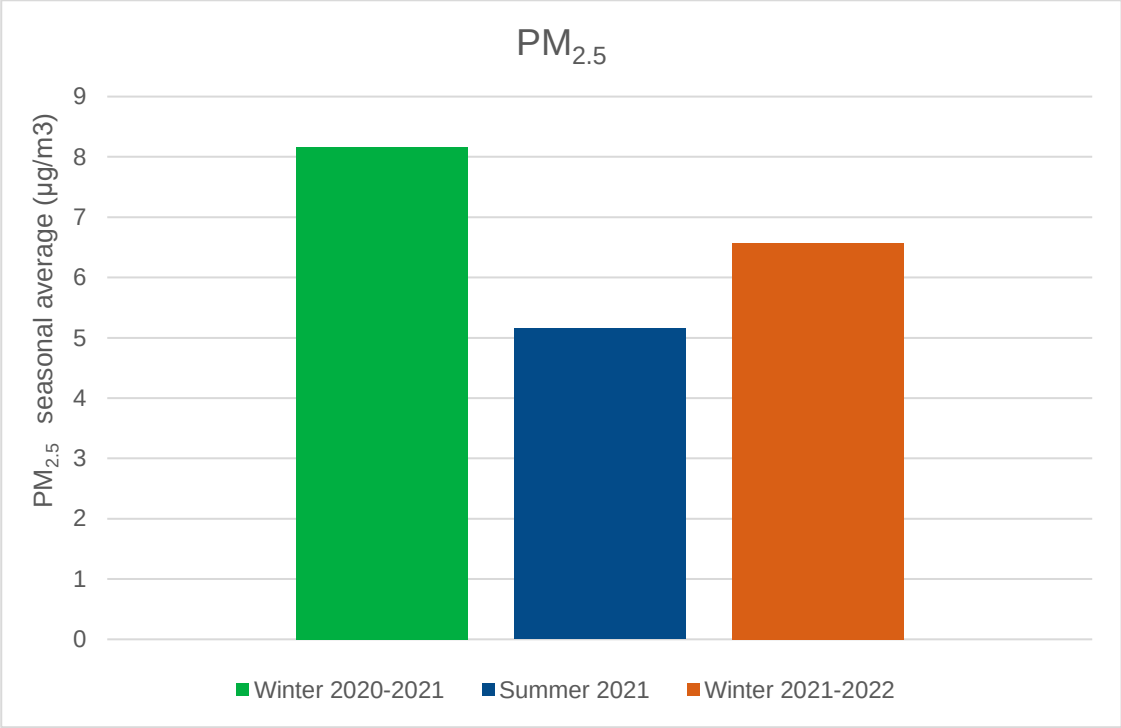
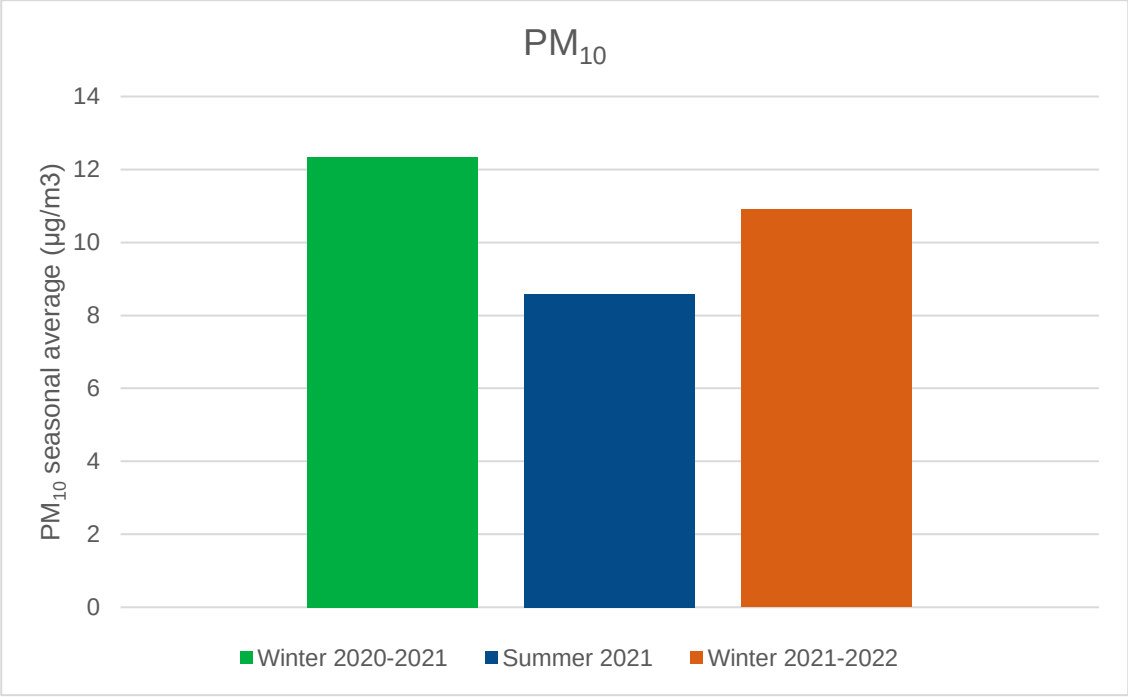


Figure D- Seasonal average PM_{10} levels



Work Activity-Stakeholder Engagement

- Stakeholder engagement formed an essential part of the project with the following engagement activities taking place:

- In the initial phase of the project all relevant potential industry/commercial stakeholders were identified (including stove suppliers, stove installers, fuel suppliers and chimney sweeps). that may be operating in and around Sefton. Sefton's Business database was utilised for this activity.
- All identified business contacts were sent a profession specific questionnaire (examples of which can be found in the appendix). The responses to the questionnaire were used to inform the design of this behaviour change material.
- Virtual engagement sessions with representatives from HETAS and BURNRIGHT took place and information gleaned from these sessions used to develop the behaviour change material.
- A number of advice/engagement leaflets were designed as part of the project. A selection of these were provided to the industry stakeholders to help them engage with their customers.
- As part of the project an advice note was developed in conjunction with our Building Control Team. The note was then Issued by Building Control when a new solid fuel burning appliance is installed and registered.
- Again, in the initial phase of the project we worked closely with the Sefton Wood Allotment Association (SWAA) who as volunteers undertake wood clearance work and utilise the wood as fuel. During our meetings we presented information to them, bounced ideas with them and utilised their responses in the design of project questionaries.
- A public survey was launched online using Sefton Councils consultation hub your sefton your say to engage with the general public on the topic of domestic solid fuel use. The consultations responses were used to inform the design of the behaviour change website and associated /advice leaflets.

Project Evaluation/Conclusions.

To achieve the main overall aims and objectives a comprehensive work activity package was developed. The table below summarises the main work activity elements planned, whether these were completed and discussion around the effectiveness/ impact on project aims.

Work Activity	Status	Discussion
Recruit Project Officer	Completed November 2019	This was one of the main initial project activities and an essential element of the project
Assess levels of stove use in Sefton.	Completed February 2020	Stove use mapping completed. Study area and monitor location identified.
Purchase and installation of dual PM_{10}/$PM_{2.5}$ monitor to be installed in an area of high domestic solid fuel/stove use	Completed August/Sept 2020	Monitor installed and operational essential for evaluation of effectiveness of behaviour change study. Monitor install delayed due to covid
Determination of current $PM_{2.5}$ levels in study area chosen. This could include testing to validate extant modelled, larger-scale estimates of PM from domestic fuel burning	Completed April 2021	Levels of $PM_{2.5}$ in study area determined using data from the particulate monitor. Data used to assess project aims/goals
Identification of fuel suppliers/stove suppliers/chimney sweeps in area.	Completed January 2020	Industry contacts identified - essential project activity to enable effective stakeholder engagement and subsequent behaviour change activities

Surveys /questionnaires used to ascertain the type, frequency and intensity of solid fuel use by targeting suppliers and chimney sweeps.	Partially Completed June 2020 -December 2020.	A number of postal and online surveys were undertaken to obtain background information to inform the project. A number of survey activities not possible due to covid restrictions
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	Partially Completed 2020	A number of engagement activities were planned to include face to face interviews were planned, however due to covid these were not possible, and questionnaires had to be used. This activity was also delayed due to covid however Some positive information was obtained and used in the design of the project website
Develop good practice guides for engagement with local fuel suppliers/appliance suppliers/chimney sweeps.	Completed	Leaflets / guides designed, and copies sent out to industry contacts

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	Partially Completed	From March 2020 the priority for Sefton's Communications and engagement team was work related to the Covid pandemic as such the majority of planned project activities were not able to be progressed. A public questionnaire was however developed and launched with results being used to update the behaviour change website
Create/develop 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	Completed	The Project Website www.smokecontrolsefton.co.uk Which has been developed is an essential element of the behaviour change techniques used and will remain as an easily accessible knowledge transfer tool and be regularly updated. The website contains detailed information on all aspects of solid fuel use and can be accessed by both

requirements in relation to SCAs.		members of the public and businesses.
Evaluation of project using monitoring data from actual $PM_{2.5}$ monitoring	Completed	Whilst there has been project delays some data has been available and used to evaluate the project. This is discussed in more detail in section 7.2.2 below

The effectiveness of the study activities in meeting the main overall aims and objectives of the project are also discussed in more detail below:

Project Aim - ***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***

- The mapping exercise undertaken with assistance from our Building Control Team enabled us to plot where new solid fuel stoves had been installed. Whilst is acknowledged this did not include households using older stoves and those using an open fire, it is still a good indicator to inform our understanding of solid fuel use in the Borough.
- It's clear that the use of solid fuel stoves in domestic premises in Sefton is a popular means of household heating and from the mapping exercise there are noticeable concentrations in the more affluent suburban areas including, Crosby, Formby, Birkdale and Southport.
- As advised previously a PM monitor was installed within the Crosby suburbs as this area had the highest concentration of stoves installed in the Borough. The monitor has and continues to provide data on $PM_{2.5}$ levels within this area and allows us to make some observations in relation to stove use and particulate levels.
- The data available does show that $PM_{2.5}$ levels in the area during the winter period (when stoves are likely to be used) is higher than the summer period (when stoves are less likely to be in use). Whilst it is difficult to conclude that the increase in levels during winter is solely down to solid fuel use it is likely that this will be one of the main contributing factors.

- Notwithstanding the above when comparing $PM_{2.5}$ levels during both winter periods with National Air Quality Standard limits (25 µg/m^3) and recommended WHO guidelines (10 µg/m^3) levels observed are well within both these standards/guidelines.
- In this particular study area whilst we don't currently have an issue with compliance with $PM_{2.5}$ standards/guidelines the monitoring does suggest solid fuel use in winter is having an impact on overall PM levels.
- There has been some difficulty in showing that the behaviour change elements of the project has led to reductions in PM emissions.

Project Aim- ***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***

- A number of activities specifically took place that were intended to raise public awareness of the issues around domestic burning, particulate matter and the promotion of good practice:
- Following the completion of the stakeholder surveys the project website was developed and launched. This was one of the main tools designed to raise public awareness of the issues around domestic solid fuel burning and promote good practice. The website has been designed to be a legacy of the project and can easily be updated.
- A number of positive comments have been received regarding the website and its content from both members of the public and businesses.
- In addition to the website a number of leaflets and advisory notes were developed following information gleaned from the stakeholder surveys (copies of these can be found in the appendix).
- The leaflets have been designed to raise awareness on topics around solid fuel use, stove use and the dangers of particulate matter. They contain information on good practice in relation to choosing stoves, fuel storage and choice/use and maintenance.

- Whilst the engagement with businesses was affected heavily by the covid pandemic Leaflet packs were able to be sent out to all businesses identified in the area that either sold solid fuel burning appliances, fuel or provided maintenance services e.g., chimney sweeps. businesses who confirmed receipt responded positively to the design and content of the leaflets and advised they would use the leaflets to engage with their customers and promote good practice.
- The surveys of industry professionals also highlighted their enthusiasm towards good practice and confirm they endeavour to engage with their customers in terms stove and fuel choice and how to store and manage fuel.
- Residents that install a new stove within the borough that are either approved by the Councils Building Control team or installed by a competent person receive a good practice guidance note giving advice on stove use, maintenance and fuel choice etc. A link to the project website is also provided.
- The website and community outreach during this project have placed a large focus on educating residents to make responsible choices when buying and maintaining a stove and purchasing the appropriate solid fuels.
- As described above a number of activities have taken place to promote awareness and good practice with input from industry. The covid pandemic did however impact significantly on the project and a number of activities were not possible/considered appropriate.
- In trying to determine if the behaviour change /awareness activities have reduced PM emissions as can be seen from the results of the PM monitoring at the study monitor (discussed in section 3.6 and shown in figures 1 to 4) levels of $PM_{2.5}$ have reduced when comparing levels during the winter of 2020/2021 and the winter of 2021/2022.
- As discussed earlier a number of the behaviour change/awareness raising activities and elements of the project only occurred during the winter of 2020/2021 due to issues and delays around the covid pandemic and such it is feasible that behaviour change/ awareness raising activities undertaken has in part lead to the reductions in $PM_{2.5}$ observed.

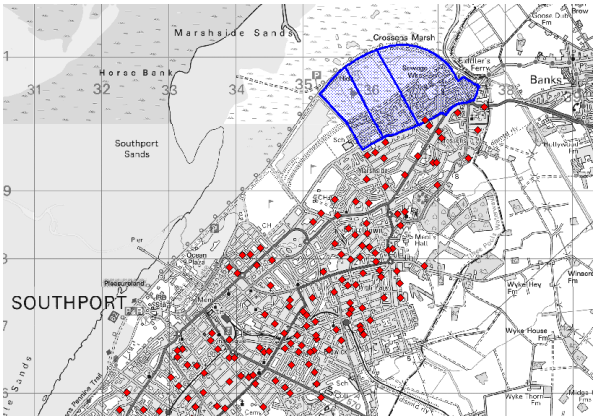
- It has only been possible to compare results from 2 winters and as such It will be interesting to see if this downward trend continues over the coming years both as a consequence of this project and legislation such as The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 coming into force formally restricting the type and quality of solid fuel that can be sold. PM Monitoring will continue at this site as a legacy of the project and any future trends / reductions will be able to be determined.

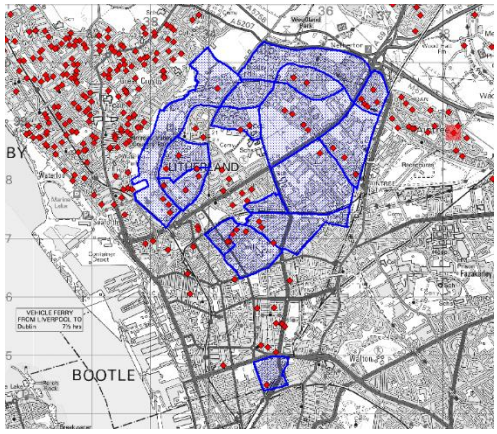
Project aim- ***Improve public health by reducing exposure to particulate matter from domestic solid fuel use and encouraging behaviour change among users of solid fuel***

- The results of the particulate matter monitoring have shown a reduction in PM levels over the project period in the study area and as discussed above with the various caveats may be in part due to the behaviour change/awareness raising elements undertaken as part of the project.
- This reduction in PM levels observed will also result in a reduction in exposure to PM for local residents in the study area.
- Although a reduction in exposure appears to have been achieved in the study area whether this has improved public health is very difficult to prove or disprove. Changes in public health will not be immediately apparent as the positive impact of any reductions in air pollution many take some time to take effect.
- With regard to this particular project aim detailed engagement with GPs, Hospitals, Health Practitioners etc would have been required and due to the covid pandemic and the extreme pressures the National Health Service was under it was not considered appropriate to undertake this element of the engagement work and as such further work / research would be necessary to prove or disprove the above aim.

Project Aim - ***Improve the regulatory measures for control of domestic emissions – through a review and possible extension of Sefton's Smoke Control Areas (SCA)***

- Only a small proportion of Sefton is currently covered by Smoke Control Areas as can be seen on the map below outlined in Blue.





- An initial review took place of the number of complaints received in the Borough regarding smoke from domestic chimneys over the last 5 years. The table below shows this information:

Year	Number of complaints regarding smoke from a domestic chimney	Number of properties where source address is within a SCA
2016	9	1
2017	8	2
2018	2	0
2019	2	0
2020	2	0
2021	2	0

- As can be observed the Council receives very few complaints regarding smoke emissions from domestic chimneys each year. In comparison complaints regarding noise made to the Council can be in the region of 1000 per year. We can conclude that the emission of smoke from domestic Chimneys is not currently a significant source of complaint for residents of Sefton, and this also needs to be taken into account in terms of the SCA review.

- The study site and location of the PM monitor is not within a smoke control area. Data from the PM monitor in the study area does show levels of $PM_{2.5}$ are higher in winter than summer and this could in part be attributable to domestic solid fuel use, however putting this into context $PM_{2.5}$ levels over two concurrent winter periods in the study area were both found to be well below National Air Quality objectives and WHO guideline levels.
- During the latter stages of the project period new Legislation came into force that restricted the sale and type/quality of solid fuels available with traditional house coal being phased out in preference to smokeless fuel and the sale of wet unseasoned wood restricted. – The controls specified within these new regulations (Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020), provide similar controls that the Smoke Control Area smokeless fuel restrictions apply.
- In addition to the above regulations all new stoves sold from January 2022 have to meet stringent eco-design standards in terms of energy efficiency and level of smoke produced. These standards are equal or greater than the SCA requirements.
- Intaking into account the above three factors i.e low chimney smoke complaint incidents, levels of PM observed in an area of high stove use but outside a SCA and the new legislation control sold fuels and standard of appliances it was not considered necessary to expand Sefton's SCA's currently.

2.4 Compliance with National Air Quality Standard Objectives in AQMA's

- With regard to **AQMA 3 Millers Bridge** declared for PM_{10} 24hour mean there has been consistent ongoing compliance with the NAQS objective for a number of years. The Council will be making the necessary arrangements to revoke this particular AQMA declared for PM_{10} 24hour mean when resources permit.
- With regard to **AQMA4 Waterloo** declared for NO_2 Annual Mean exceedances the junction improvement work 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, 2019, 2020 and 2021 were below the NAQS objective.

  Obviously in 2020 and 2021 Covid had a positive impact on NO_2 in this AQMA due to reduced traffic levels. Whilst it is anticipated that even without the impact of Covid levels of NO_2 in 2021 would have been below the NAQS, we do feel it is appropriate to hold off revoking the AQMA until a further year's data is obtained and analysed.

- 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 **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 has prepared an OBC for Sefton's Clean Air Plan which includes the development of a Sefton Clean Air Zone. This detailed work builds on the previous CAZ feasibility study and ultimately will determine whether the Council looks to implement a Clean Air Zone in its Borough. Due to the Covid pandemic and the sheer complexity of the project it has taken longer than originally anticipated to complete. The full details of the study have been presented in this ASR, however a decision on the next steps is still to be made by Sefton. This will be reported in next year's ASR and incorporated into the updated AQAP's.

2.5 Defra's appraisal of last year's ASR is detailed below:

Sefton Metropolitan Borough Council are commended on the thorough detail provided in terms of both monitoring/trend analysis within each of the AQMAs and across the wider borough, the links presented between PM2.5 and health, and also the ongoing delivery of measures to improve air quality within their jurisdiction. In addition, the impacts of COVID-19 commentary contains a good level of detail

It is noted that works are continuing of the development of a revised AQAP, alongside the ongoing Local NO2 Plan works developing an Outline Business Case for the implementation of a Clean Air Zone within Sefton. Once the AQAP is complete it should be submitted through the LAQM Portal to allow appraisal.

Based on the evidence provided by the local authority the conclusions reached are accepted for all sources and pollutants. The next step is for Sefton Metropolitan Borough Council to submit their Annual Status Report in 2022.

Commentary

The following comments are designed to help inform future reports. ***Sefton's response (where required) to these comments are shown in bold after each point***

The comments made in the 2020 appraisal have been detailed and responded to within the 2021 ASR.

1. *Distance correction has been completed for the relevant NO2 monitoring locations, as per TG(16).*
2. *The Council should consider the revocation of AQMA 3 for the 24-hour mean PM10 designation, all other AQMA designations should remain in force at the current time with reviews completed every year. Due to ongoing compliance* ***the Revocation of AQMA3 24-hour mean PM_{10} is planned. This work element will be factored in around the other ongoing air quality obligations and actioned as soon as possible.***
3. *Updates to the revised AQAP are continuing in conjunction with the development of a Business Case to support the implementation of a CAZ within Sefton. It is recommended that the AQAP be completed in conjunction with the Local NO2 Plan as there will be a high level of cross-over between the two projects. As soon as the*

AQAP has been completed it should be submitted through the LAQM Portal for appraisal with an update to be provided within the 2022 ASR. ***Work on the Council's Clean Air Plan and Outline Business Case a key air quality action has taken longer to complete than initially anticipated due to the complexities of the project and ongoing impacts of Covid in 2021. The Outline Business Case is now complete and the outcomes have been presented to Sefton Council's Cabinet for their consideration. Further details of the OBC outcomes are detailed within this ASR. Once Cabinet has given their approval in terms of the next steps this will be incorporated into the updated air quality action plan. It is acknowledged that support to update the action plans may be required and the council is currently reviewing proposals from a number of environmental consultants to support the review work.***

4. *A large number of measures and initiatives are currently being implemented within Sefton by the Council and based upon the long-term monitoring trends the hard work does show improvements in a number of areas across the borough. The level of detail presented throughout the ASR in terms of actions and assessment of compliance is welcomed.*
5. *The level of detail and analyses presented within Appendix F, Impacts of COVID-19 on LAQM is also welcomed.*
6. *The bias adjustment factor applied to the diffusion tube data should be presented in Table B.1.* ***(The Bias adjustment factor used in this year's ASR is presented in table B.1)***
7. *The ASR benefits from detailed maps of the AQMA boundaries and relevant monitoring locations. Considerable trend analysis graphs are also presented, but the Council should take care to ensure that some of these pages are presented in landscape so that the entire graph can be shown.* ***(All graphs and plans where required are presented in landscape)***

Table 0.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
AQMA2 SS1	Port Booking System	Freight and Delivery Management	Delivery and Service plans	2015	2017	Peel ports	Private	NO	Funded	£50k - £100k	Completed	No Target pollution reduction set-hard to quantify	Feedback on effectiveness of port booking system via port liaison meetings	vehicle booking system introduced and completed in 2009.New L2 terminal operating autogate technology introduced 2015.	Reduced HGV waiting times on the port will reduce pollutant emissions from the port estate affecting AQMA.
AQMA2 SS2	Port expansion mitigation measure No1 National Highways 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	2017	2028	National Highways	NH	NO	Funded	> £10 million	Planning	No Target pollution reduction set-hard to quantify	Compliance with the NO2 air quality objective. Strategic highways improvements delivered to timescales	Stage1 offline option chosen by NH/DfT. Detailed assessment underway by NH consultants. Delays due to Covid	Awaiting detailed assessment from consultants
AQMA2 SS3	Port expansion mitigation measure No3. Alternative fuels strategy for HGV's and buses	Vehicle Fleet Efficiency	Other	2016	2017	Sefton MBC	DEFRA/LA	YES	Funded	£50k - £100k	Completed	N/A	Results of study to inform decision making process	DEFRA AQ grant For Alt fuels refuelling and infrastructure strategy awarded 2014. Consultant appointed 2015. Report issued 2016.	Main recommendation to undertake further CAZ study being undertaken
AQMA2 SS4	Port expansion mitigation measure No4. HGV parking demand study	Transport Planning and Infrastructure	Other	2015	2015	Sefton MBC	LA	NO	Funded	£50k - £100k	Completed	no Target pollution reduction set-hard to quantify	Robust assessment of HGV parking	Stage 2 report completed. Detailed phase 2 study on preferred HGV parking site underway.	Council to take forward recommendations.
AQMA2 SS5	ECOstars Vehicle fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2015	2021	Sefton MBC	LA	NO	Funded	£10k - 50k	Completed	no Target pollution reduction set-hard to quantify	compliance with target to recruit 25 members completed	ECOstars commenced 2013,funded by DEFRA AQ grant, to run initially for 2 years. Formal launch in 2014. Recruited 50 operators	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	2011	2015	Sefton MBC	LA	NO	Funded	£10k - 50k	Completed	No Target pollution reduction set-hard to quantify	Number of activations of hurry call system	Implemented July 2011. Number of activations of the system per hour reviewed and system continues to show that the system is working well.	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.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
AQMA3 SS2	Control of dust from industry	Environmental Permits	Other	2011	2015	Sefton MBC	N/A	NO	Not Funded	£50k - £100k	Completed	no Target pollution reduction set-hard to quantify	Compliance results from Local Authority and Environment Agency site inspection visits to permitted industrial sites within the Port of Liverpool and the number of exceedences 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 exceedences of the PM10 daily mean standard when predominantly north westerly winds.	Meetings with EMR and EA. New EMR dust management plan produced 2010. Number of exceedences of PM10 24-hour mean when wind direction from the direction of the port continues to remain low.	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 National Highways 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	2017	2028	National Highways	NH	NO	Funded	> £10 million	Planning	No Target pollution reduction set-hard to quantify	Compliance with the NO2 air quality objective. Strategic highways improvements delivered to timescales	Stage 1 offline option chosen Stage1 offline option chosen by NH/DfT. Detailed assessment underway by NH consultants. Delayed due to covid	Awaiting consultant report on options.
AQMA5 SS2	Port expansion mitigation measure No 3 Alternative Fuels Strategy for HGVs & buses	Vehicle Fleet Efficiency	Other	2016	2017	Sefton MBC	DEFRA/LA	YES	Funded	£50k - £100k	Completed	no Target pollution reduction set-hard to quantify	Results of study to inform decision making process	Defra AQ grant for HGV alternative fuels refuelling infrastructure & strategy awarded 2014. Consultant appointed in 2015. Report issued2016.	Main recommendation to undertake further CAZ study being undertaken
AQMA5 SS3	Port expansion mitigation measure No 4 HGV parking demand study	Transport Planning and Infrastructure	Other	2015	2015	Sefton MBC	LA	NO	Funded	£50k - £100k	Completed	No Target pollution reduction set-hard to quantify	Robust assessment of HGV parking	Consultant appointed in 2015 to carryout .project Report issued March 2016.	Council to take forward recommendations.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
AQMA5 SS4	ECO Stars fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2015	2021	Sefton MBC	DEFRA/LA	NO	Funded	£10k - 50k	Completed	no Target pollution reduction set-hard to quantify	Compliance with target to recruit 25 operators in the 2 years of scheme operation	ECO Stars commenced 2013, funded by Defra AQ grant, to run initially for two years. Formal launch in 2014. 50 operators recruited.	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.
AQMA5 SS4	ECO Stars fleet recognition scheme	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2015	2021	Sefton MBC	DEFRA/LA	NO	Funded	£10k - 50k	Completed	no Target pollution reduction set-hard to quantify	Compliance with target to recruit 25 operators in the 2 years of scheme operation	ECO Stars commenced 2013, funded by Defra AQ grant, to run initially for two years. Formal launch in 2014. 50 operators recruited.	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	2018	2020	Sefton MBC	LA	NO	Funded	£1 million - £10 million	Completed	no Target pollution reduction set-hard to quantify	Compliance with NO2 objective in AQMA	Junction improvement works now completed – Compliance observed in 2018/2019/2020/2021 consideration being given to revocation of AQMA	Junction improvement works now completed – Compliance observed in 2018/2019/2020/2021- consideration being given to revocation of AQMA
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	2020	2022	Sefton MBC	LA/CA	NO	Funded	£1 million - £10 million	Completed	no Target pollution reduction set-hard to quantify	Compliance with NO2 objective in AQMA	Millers Bridge Junction improvement works completed	Works only just completed - Commencing review of monitoring data
GM1	SCOOT	Traffic Management	UTC, Congestion management, traffic reduction	2010	2015	Sefton MBC	LA	NO	Funded	£100k - £500k	Completed	No target pollution reduction set - difficult to quantify	Liaison with Sefton Council Highways Maintenance Manager on optimisation of the SCOOT system	Implemented 2010	SCOOT system is optimised and operating successfully.
GM2	Variable Message Signs(VMS)	Public Information	Via other mechanisms	2013	2017	Sefton MBC	LA	NO	Funded	£10k - 50k	Completed	No target pollution reduction set - difficult to quantify	Ensure system operating effectively	Implemented 2013	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	2010	2015	Sefton MBC	LA	NO	Funded	£10k - 50k	Completed	No target pollution reduction set - difficult to quantify	Number of work place travel plans implemented	implemented 2010	
GM5	Cycling & Walking	Promoting Travel Alternatives	Promotion of cycling	2010	2015	Sefton MBC	LA	NO	Funded	< £10k	Completed	No target pollution reduction set -	Increase in participation	Implemented 2010	

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
												difficult to quantify			
GM6	Land use planning	Policy Guidance and Development	Air Quality Planning and Policy Guidance	ongoing	2015	Sefton MBC	LA	NO	Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	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	ongoing	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	2010	2015	Sefton MBC	LA	NO	Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Number of LES measures implemented	Implemented 2010	Increasing number of EV charging points installed.
GM8	Tree planting	Other	Other	2010	2015	Sefton MBC	LA	NO	Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Number of trees planted within AQMA. Compliance with the PM10 air quality Objectives	Implemented 2010	
GM9	AQ awareness	Public Information	Via other mechanisms	2010	2015	Sefton MBC	LA	NO	Not Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Maintenance of Sefton Council air quality website. Number of AQ awareness events	Implemented 2010	
GM10	Freight Quality Partnership (FQP)	Freight and Delivery Management	Other	2010	2015	Merseytravel	CA	NO	Not Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Number of meetings held. Number of AQ initiatives undertaken	Implemented 2010	
GM11	Taxi Quality Partnership (TQP)	Promoting Low Emission Transport	Taxi emission incentives	2013	2015	Merseytravel	CA	NO	Not Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Number of operators participating	Implemented 2013	
GM - Solid Fossil Fuel Project	Solid Fossil Fuel Project	Other	Other	2018	2022	Sefton MBC	DEFRA/LA	YES	Funded	£50k - £100k	Completed	No target pollution reduction set - difficult to quantify	improvement in levels of PM2.5 following implementation of behaviour change solid fossil fuels project	Project Complete as far as possible. Some reductions observed	Covid had significant impact on behaviour change elements
GM-Schools Project	Schools Air Quality project	Other	Other	2017	2019	Sefton MBC	LA	NO	Funded	< £10k	Completed	No target pollution reduction set - difficult to quantify	Number of Schools participating in AQ sessions	AQ session delivered to 15 schools already- currently looking for further funding . Clean Air Crew website launched.	
GM- Sefton Clean Air Plan	Clean Air Plan	Promoting Low Emission Transport	Low Emission Zone (LEZ)	2018	2023	Sefton MBC	LA	NO	Funded	£500k - £1 million	Implementation	No target pollution reduction set - difficult to quantify	reduction in Nox and PM levels	Outline business case completed - Council considering next steps	
GM-Education Project	Educational Air Quality project	Other	Other	2020	2022	Sefton MBC	DEFRA/LA	YES	Funded	£100k - £500k	Implementation	No target pollution reduction set - difficult to quantify	Schools participating, Users of website/users of immersive room	Project underway in line with project plan	

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
GM- Joint Sefton /DVSA Emission Enforcement project	Emission Enforcement Project	Other	Other	2021	2021	Sefton MBC/DVSA	Sefton MBC/DVSA	NO	Funded	£10k - 50k	Completed	No target pollution reduction set - difficult to quantify	Compliance with NO2 objective in AQMAS	Initial project complete-looking to re-run Sept 2022	Number of Vehicles identified with Emissions control system issues- DVSA taking follow up action.

3.0 $PM_{2.5}$ – 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.
- Sefton Council has already implemented a number of measures to address $PM_{2.5}$, as many of the existing actions in the current Air Quality Action Plans to reduce PM_{10} also serve in reducing $PM_{2.5}$, see **Table 2.2**.
- These measures that continue to have a positive effect on reducing $PM_{2.5}$ in 2021/2022 include:
    - Traffic Signal optimisation/Management measures - SCOOT and Hurry Call systems.
    - Ongoing Promotion of 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 from construction activities through specific conditions using the land use planning and development control system.

3.1 Specific actions to address $PM_{2.5}$ in Sefton

3.11 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 $PM_{2.5}$.

As reported in last year's ASR Sefton was successful in obtaining a grant through the Local Authority Air Quality grant fund to the sum of £100,000 with the primary aim of minimising the Particulate Matter (PM) contribution from domestic solid fuel use in Sefton through behaviour change. The project is now complete as far as practicable and the details of the outcomes and conclusions that were able to be drawn are provided in detail within section 2.2.

Notwithstanding the impact of the pandemic a number of successful elements were completed and will remain as a legacy of the project with the ongoing objective of reducing PM emissions including PM2.5.

These are discussed in detail in section 2. but the headline actions are detailed below:

- Development of library of behaviour change publicity material - leaflets, posters, factsheets etc
- Continued engagement with stove suppliers/ installers /chimney sweeps and fuel suppliers in area using comms material produced as part of the project
- Real time ongoing measurement of PM10 and PM2.5 levels in the Crosby area (high stove use neighbourhood) using a FIDAS dual particulate monitor measuring PM_{10} and $PM_{2.5}$
- Development of and ongoing support for https://smokecontrolsefton.co.uk public website which contains behavior change information for householders, businesses and suppliers on ways to minimise particulate emissions from the use of solid fuels for heating.

3.12 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/environment/pests-pollution-and-food-hygiene/pollution/smoke-control-areas/

- 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.

3.13 Particulate Control at Construction/Demolition sites

- Through the development control process officers in the Pollution and Air Quality teams are consulted on developments which involve external construction/demolition works likely to give rise to particulate emissions. To proactively control PM emissions from construction works officers recommend the inclusion of formal conditions requiring the submission and approval of a detailed Construction Environmental Management Plan (CEMP) which includes dust control measures. This helps reduce and mitigate the release of particulates during the demolition and future construction phase of a development thus helping to reduce $PM_{2.5}$ emissions from these activities.

3.14 Joint Sefton DVSA emissions enforcement project

- As detailed earlier in the ASR a successful joint Sefton / DVSA emissions project was undertaken in December 2021 to identify vehicles emitting higher than expected emissions including NOx and PM. A number of vehicles were identified by our monitoring activities and then and stopped by DVSA officers. Some of the faults identified included Diesel Particulate Matter (DPF) filter issues which required rectification. This project is due to be re-run in September 2022 and will help with Sefton's $PM_{2.5}$ reduction responsibilities.

3.15 The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020.

- The Government has recently introduced new regulations known as **The Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020** restricting the supply of certain solid fuels with the aim of reducing air pollution. In particular, they aim to reduce the amount of $PM_{2.5}$ emissions in smoke that can cause long term health problems for humans. Domestic burning of wood and coal has been identified by the Government as a major source of these emissions. Local Authorities are responsible for enforcing the regulations.

A summary of the changes /restrictions is provided below:

- the supply of **traditional house coal (bituminous coal)** is **phased out**;
- the supply of **wet wood** in units up to 2 cubic metres is **phased out**;
- **smoke emissions limits** are introduced for **manufactured solid fuels**.
- **Only dry wood (Moisture content less the 20%)** can be sold in quantities of 2 cubic meters or less and has to show the ready to burn logo:

- Air quality officers in Sefton have been engaging with businesses likely to sell solid fuels for domestic purposes and an advisory letter and leaflet has been sent to over 200 businesses in the Borough. Officers have undertaken targeted inspections of the main suppliers to ensure compliance with the new regulations. It is envisaged that with these powers restricting the use of wet wood, phasing out of traditional house coal in preference to smokeless fuel emissions of $PM_{2.5}$ will further reduce in the Borough.

3.2 $PM_{2.5}$ Monitoring

- Sefton monitored $PM_{2.5}$ at 2 locations in Sefton in 2021 (Millers Bridge, Bootle and Regent Road, Crosby). A further FIDAS dual PM_{10}/$PM_{2.5}$ monitor was purchased and installed late 2021 at our Princess Way station. This will provide additional monitoring data from 2022 onwards. The further expansion of our $PM_{2.5}$ monitoring capability will allow us to determine trends across the south of the Borough and develop site specific measures to work towards reducing emissions of this pollutant. The results of the $PM_{2.5}$ monitoring are discussed in more detail in section 3 of the ASR.

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

This section sets out the monitoring undertaken within 2021 by Sefton and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

4.1 Summary of Monitoring Undertaken

4.11 Automatic Monitoring Sites

- Sefton undertook automatic (continuous) monitoring at 6 sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. 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. The Breathing space (sefton.gov.uk) page presents automatic monitoring results for Sefton with general air quality data available via the UK-Air website https://uk-air.defra.gov.uk/

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.

4.12 Non-Automatic Monitoring Sites

Sefton undertook non- automatic (i.e. passive) monitoring of NO_2 at 82 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

4.13 Changes to NO_2 Diffusion tube monitoring network

Some additional diffusion tube monitoring sites were added in 2021 to expand the network

The changes and reasons are summarised in the table below

Site ID	Address	Reason for Monitoring
HA	Liverpool Road South	Monitoring effects of revised junction at this location
HB	Breeze Hill	Expand network around exiiting junction
HC	Breeze Hill	Expand network around exisiting junction

4.2 Individual Pollutants

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

4.21 Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

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

4.22 Automatic Monitoring Results (NO_2)

- Following the substantial traffic reductions due to the various lockdowns and social restrictions associated with the Covid pandemic in 2020, levels of NO_2 at Sefton's automatic stations in 2021 have shown an increasing trend compared to 2020 as can be seen in the trend graph below. Notably they have not however returned to pre covid levels experienced in 2019. The impact of the pandemic has continued to have an effect on traffic levels certainly in the first part of 2021 as a number of restrictions and lockdowns remained.
- levels of NO_2 at all of the 5 automatic monitoring sites again showed compliance with the NO_2 annual mean objective in 2021 (at the monitoring location) with the highest monitored level of 35 µg/m^3 observed at the Millers Bridge site. See table A3 for full results and Figure F1 below for graphs representing trends.
- There were no exceedances of 1-hour mean objective at any of the automatic monitoring sites.

Trends in Annual Mean NO_2 automatic monitoring Data across all Sefton sites

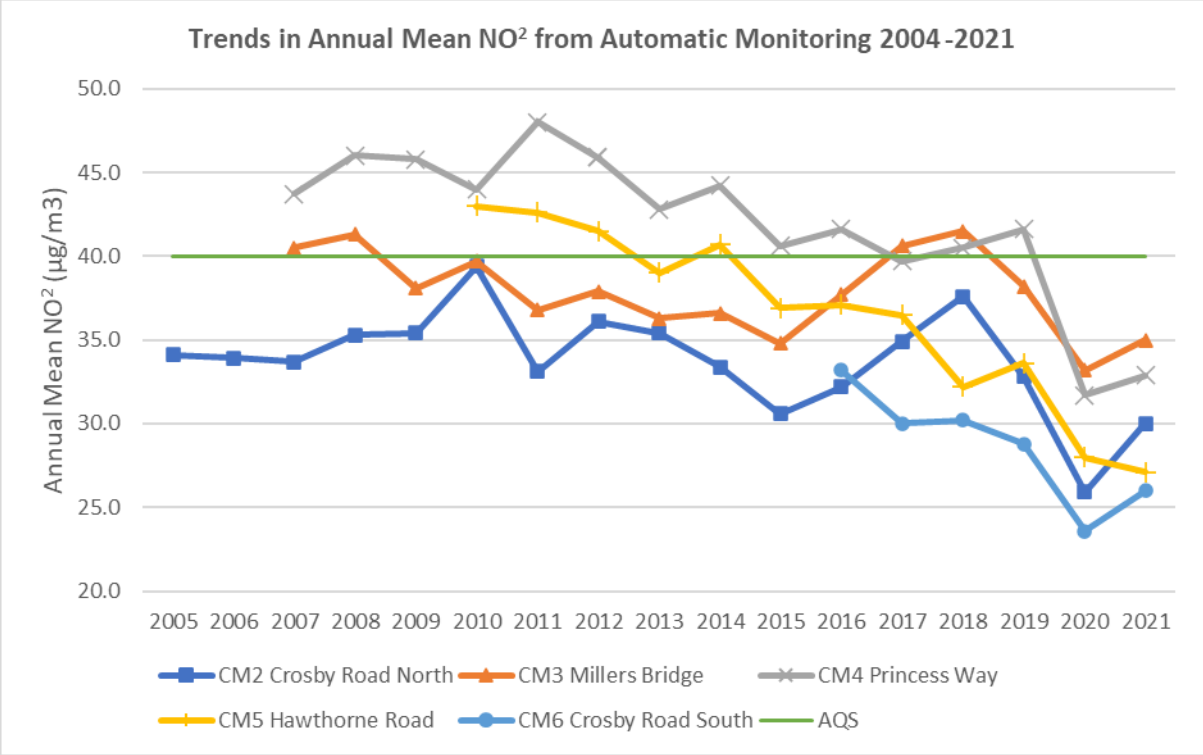


Figure F1 above shows the trends in Annual mean NO_2 levels between 2005 and 2021 at each of the continuous monitoring sites.

- As can be observed in 2021 4 out of the 5 sites showed an increase in levels following the 2020 pandemic. The site at Hawthorne did however show a further reduction in annual levels. All sites were well below the NAQS objective. During 2021 there were still ongoing impacts from the covid pandemic in terms of traffic levels and commuting habits. Monitoring will continue to enable future trends to be observed.

4.23 Diffusion Tube Monitoring Results

- In line with the automatic monitoring results, the non-automatic diffusion tube monitoring sites showed an increase in NO_2 annual mean levels compared to 2020 (where previous monitoring is available). Levels across these sites have not, however, returned to those observed pre-covid (2019) Trend charts can be found in figure A1 and are split up into regions.

In 2021 4 diffusion tube sites showed an exceedance of the NAQS objective at the monitoring location and are discussed below

- Diffusion tube Site ID: BR Derby Road, Bootle showed an exceedance of the NAQS objective in 2021 with an NO_2 annual mean of 46.0 µg/m^3 . As this site recorded a 2021 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 distance correction via the Defra diffusion tube processing tool. This showed the estimated concentration of 42.7µg/m^3 indicating an exceedance with the NO_2 annual mean objective at a relevant public exposure location in this area. This is within AQMA 3 - Millers Bridge.
- Diffusion tube Site ID: GH A565 Derby Road, Seaforth, showed an exceedance of the NAQS objective in 2021 with an NO_2 annual mean of 40.6 µg/m^3 . As this site recorded a 2021 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 distance correction via the Defra diffusion tube processing tool. This showed the estimated concentration of 32.1µg/m^3 indicating compliance with the NO_2 annual mean objective at a relevant public exposure location in this area. Monitoring will continue in this area.
- Diffusion tube Site ID: HB Breeze Hill, Bootle, showed an exceedance of the NAQS objective in 2021 with an NO_2 annual mean of 41.5 µg/m^3 . As this site recorded a

2021 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 distance correction via the Defra diffusion tube processing tool. This showed the estimated concentration of 33.2µg/m^3 indicating compliance with the NO_2 annual mean objective at a relevant public exposure location in this area. Monitoring will continue in this area.

- Diffusion tube Site ID: HC Breeze Hill Bootle, showed an exceedance of the NAQS objective in 2021 with an NO_2 annual mean of 40.2 µg/m^3. This site is located in excess of 50 meters away from public exposure and as such as per TG/16 can't be corrected for fall off with distance. Given the distance between the tube and the nearest receptor we can assume the level at the receptor is well within the NAQS.

  In line with TG/16, 7 other sites showed annual mean levels above 36 µg/m^3 and have been adjusted for distance accordingly.

- Site ID: BS Derby Road, Bootle recorded a level of 36.9 µg/m^3 at the monitoring site with the levels estimated to be 34.3 µg/m^3 at the location of public exposure. This site is within AQMA 3 - Millers Bridge.
- Site ID: GT Millers Bridge Bootle recorded a level of 38.2 µg/m^3 at the monitoring site with the levels estimated to be 32.2 µg/m^3 at the location of public exposure. This site is within AQMA 3 – Millers Bridge.
- Site ID: GU Millers Bridge Bootle recorded a level of 36.2 µg/m^3 at the monitoring site with the levels estimated to be 32.9 µg/m^3 at the location of public exposure. This site is within AQMA 3 – Millers Bridge.
- Site ID: DD Hawthorne Road Litherland recorded a level of 36.4 µg/m^3 at the monitoring site with the levels estimated to be 30.5 µg/m^3 at the location of public exposure. This site is within AQMA 5 – Hawthorne Road.
- Site ID: DO Hawthorne Road, Linacre Lane recorded a level of 38.9 µg/m^3 at the monitoring site with the levels estimated to be 30.5 µg/m^3 at the location of public exposure.
- Site ID: FI Hemans Street recorded a level of 36.2 µg/m^3 at the monitoring site with the levels estimated to be 31.6 µg/m^3 at the location of public exposure.
- Site ID: GG A565,Hemans Street recorded a level of 39.4 µg/m^3 at the monitoring site with the levels estimated to be 34.9 µg/m^3 at the location of public exposure.

- All other sites showed annual mean levels below 36 µg/m^3 and as such in line with TG/16 have not been adjusted for distance.

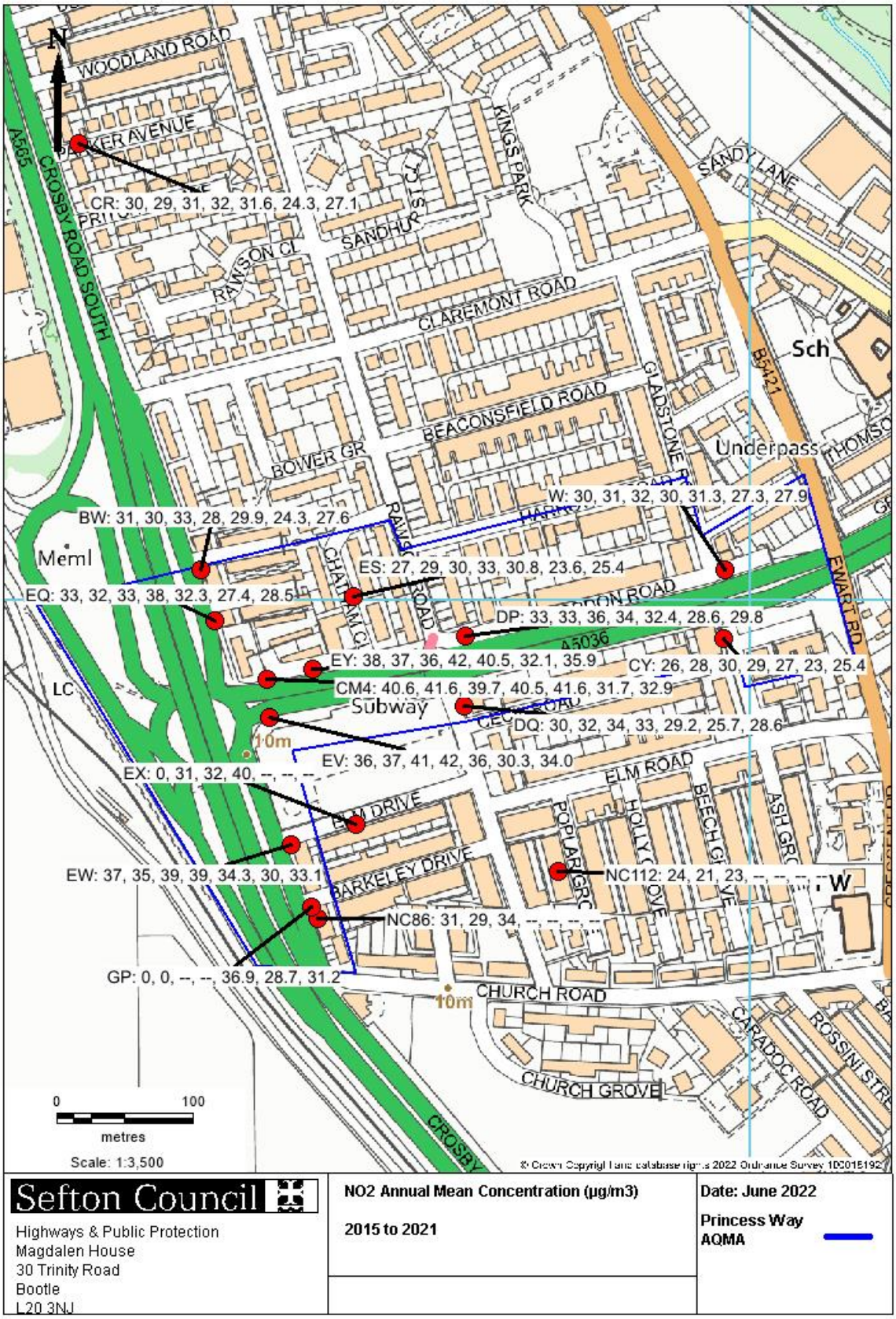
Further discussion of the monitoring results focused around the AQMA's can be found below.

4.3 Compliance with National Air Quality Standard objectives in current AQMA's

A summary of each AQMA with regards to NO_2 objective exceedance/compliance is discussed below. **Maps showing details of the monitoring sites and last 5 years results in and around each AQMA are also provided after each discussion** .

4.31 AQMA 2 Princess Way, Seaforth.

- Similar to 2020 no exceedance of the NO_2 annual mean objective was observed in 2021 either at the automatic monitor or any diffusion tube site. All results in 2021 were within the NAQS objective with the highest level of 35.9 µg/m^3 observed at diffusion tube site ID: EY -Lathom Close. Complaince with the 1-hour mean objective was also achieved at this location. Levels in 2021 have increased compared to 2020 however have not yet returned to pre-covid levels.
- As can be seen from the map below pre covid monitoring data has shown regular exceedances of the NO_2 annual mean limit in this AQMA. Whilst it is positive to see that current levels in this AQMA are within the NAQS, it is still unclear whether this trend will continue 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. All existing monitoring will continue in this AQMA also.


N
WOODLAND ROAD
PARKER AVENUE
A565
CROSBY ROAD SOUTH
CR: 30, 29, 31, 32, 31.6, 24.3, 27.1
SANDHURST
KINGS PARK
SANDY LANE
RAWSON CL
CLAREMONT ROAD
B5421
Sch
BEACONSFIELD ROAD
GLADSTONE RD
Underpass
BOWER GR
W: 30, 31, 32, 30, 31.3, 27.3, 27.9
BW: 31, 30, 33, 28, 29.9, 24.3, 27.6
Meml
ES: 27, 29, 30, 33, 30.8, 23.6, 25.4
EQ: 33, 32, 33, 38, 32.3, 27.4, 28.5
DP: 33, 33, 36, 34, 32.4, 28.6, 29.8
EY: 38, 37, 36, 42, 40.5, 32.1, 35.9
CY: 26, 28, 30, 29, 27, 23, 25.4
CM4: 40.6, 41.6, 39.7, 40.5, 41.6, 31.7, 32.9
LC
Subway
DQ: 30, 32, 34, 33, 29.2, 25.7, 28.6
10m
EV: 36, 37, 41, 42, 36, 30.3, 34.0
EX: 0, 31, 32, 40, --, --, --
ELM ROAD
ELM DRIVE
EW: 37, 35, 39, 39, 34.3, 30, 33.1
BARKELEY DRIVE
NC112: 24, 21, 23, --, --, --
NC86: 31, 29, 34, --, --, --
GP: 0, 0, --, --, 36.9, 28.7, 31.2
10m
CHURCH ROAD
CHURCH GROVE
CARADOC ROAD
ROSSINI STR
CROSBY
0
100
metres
Scale: 1:3,500
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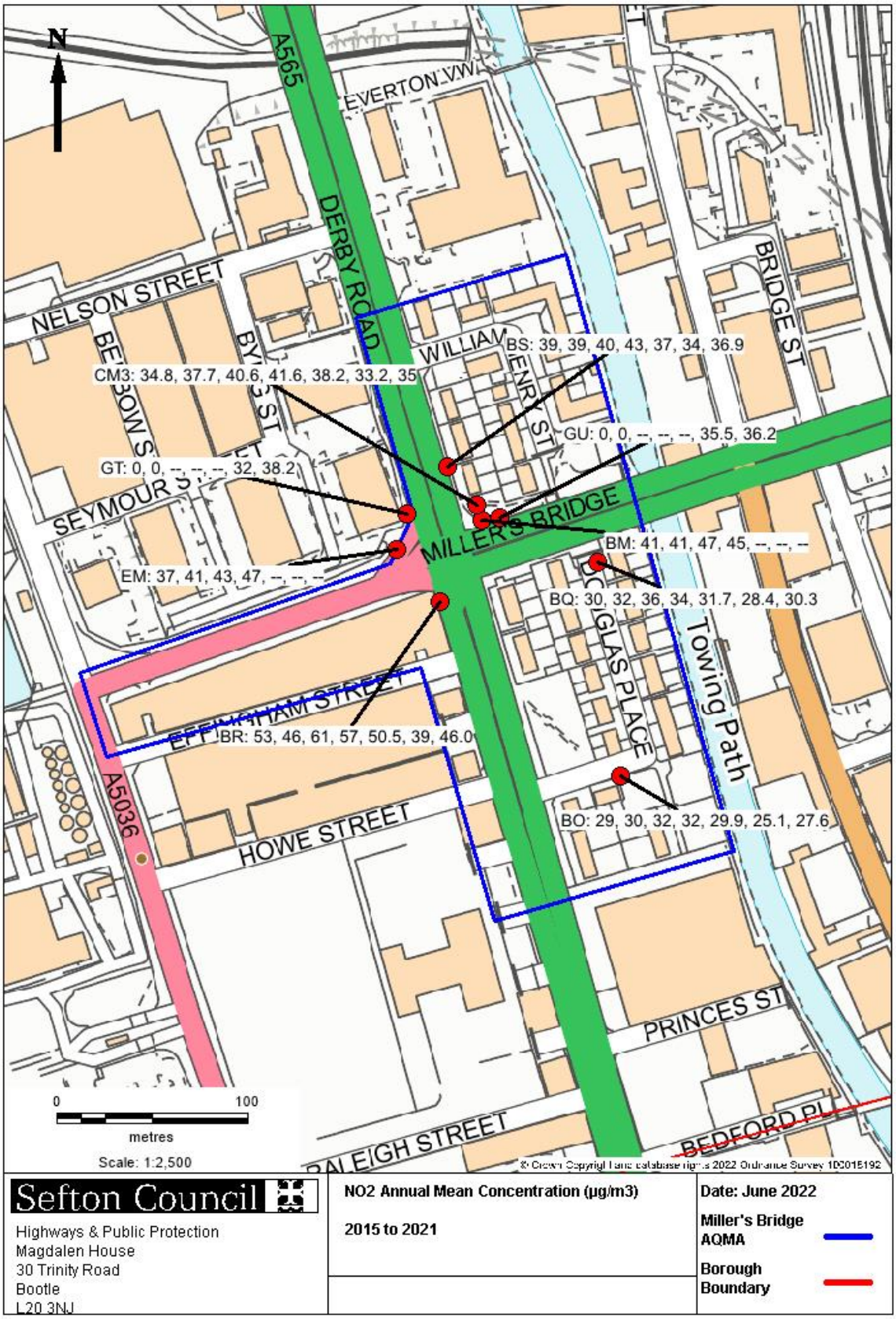
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
NO2 Annual Mean Concentration (µg/m3)
2015 to 2021
Date: June 2022
Princess Way AQMA

4.32 AQMA 3 Millers Bridge, Bootle.

- An exceedance of the NO_2 annual mean objective occurred in 2021 at 1 diffusion tube Site ID: BR Derby Road, Bootle with an annual mean of 46.0 µg/m^3 . As this site recorded a 2021 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 distance correction via the Defra diffusion tube processing tool. This showed the estimated concentration of 42.7 µg/m^3 which is an exceedance of the NAQS.
- The next highest diffusion tube level observed was Site ID: GT Millers Bridge Bootle which recorded a level of 38.2 µg/m^3 at the monitoring site with the levels estimated to be 32.2 µg/m^3 at the location of public exposure.
- Site ID: GU Millers Bridge Bootle recorded a level of 36.2 µg/m^3 at the monitoring site with the levels estimated to be 32.9 µg/m^3 at the location of public exposure.
- In line with other results for 2021 levels in AQMA 3 have increased compared to 2020, however, have not returned to those observed before the covid pandemic hit. Compliance with the 1 hour mean objective was again achieved at this location. Due to the exceedance observed and the potential for traffic to increase as a result of the expansion of the port this AQMA is not being considered for revocation.



Sefton Council

Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

NO2 Annual Mean Concentration (µg/m3)

2015 to 2021

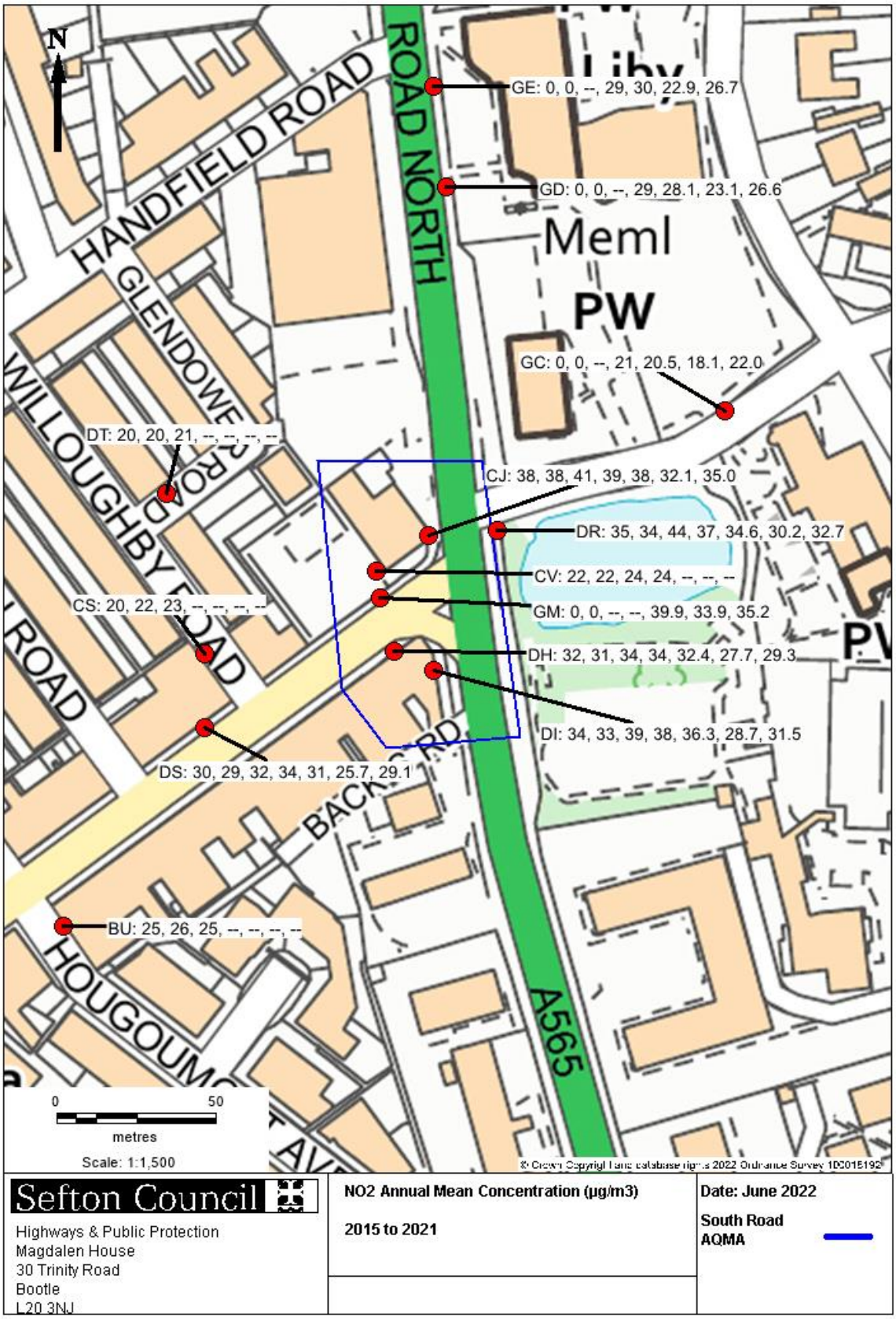
Date: June 2022

Miller's Bridge AQMA

Borough Boundary

4.34 AQMA4 Waterloo.

- As in previous years no automatic NO_2 monitoring was undertaken within AQMA 4. Diffusion tube monitoring in 2021 has shown compliance with the NAQS objective at all monitoring locations with with an increase compoared to 2020 levels but below pre-covid levels observed in 2019. The maximum monitored level in 2021 was Site ID: GM - South Road with an annual mean level of 35.2 µg/m^3 .
- Since the junction improvement works have been completed, overall levels of NO_2 have reduced and shown consistent compliance with NAQS objectives.
- In 2020 and 2021 Covid had a positive impact on NO_2 in this AQMA due to reduced traffic levels. Whilst it is anticipated that even without the impact of Covid levels of NO_2 in this AQAM would have been below the NAQS, we do feel it is appropriate to hold off revoking the AQMA until a further year's data is obtained and analysed due to uncertainties around the ongoing impact of covid and the expansion of the port,


N
ROAD NORTH
HANDFIELD ROAD
GLENDOWE
WILLOUGHBY ROAD
ROAD
A565
Meml
PW
GE: 0, 0, --, 29, 30, 22.9, 26.7
GD: 0, 0, --, 29, 28.1, 23.1, 26.6
GC: 0, 0, --, 21, 20.5, 18.1, 22.0
DT: 20, 20, 21, --, --, --, --
CJ: 38, 38, 41, 39, 38, 32.1, 35.0
DR: 35, 34, 44, 37, 34.6, 30.2, 32.7
CV: 22, 22, 24, 24, --, --, --
GM: 0, 0, --, --, 39.9, 33.9, 35.2
CS: 20, 22, 23, --, --, --, --
DH: 32, 31, 34, 34, 32.4, 27.7, 29.3
DI: 34, 33, 39, 38, 36.3, 28.7, 31.5
DS: 30, 29, 32, 34, 31, 25.7, 29.1
BU: 25, 26, 25, --, --, --, --
HOUGOUM
0
50
metres
Scale: 1:1,500
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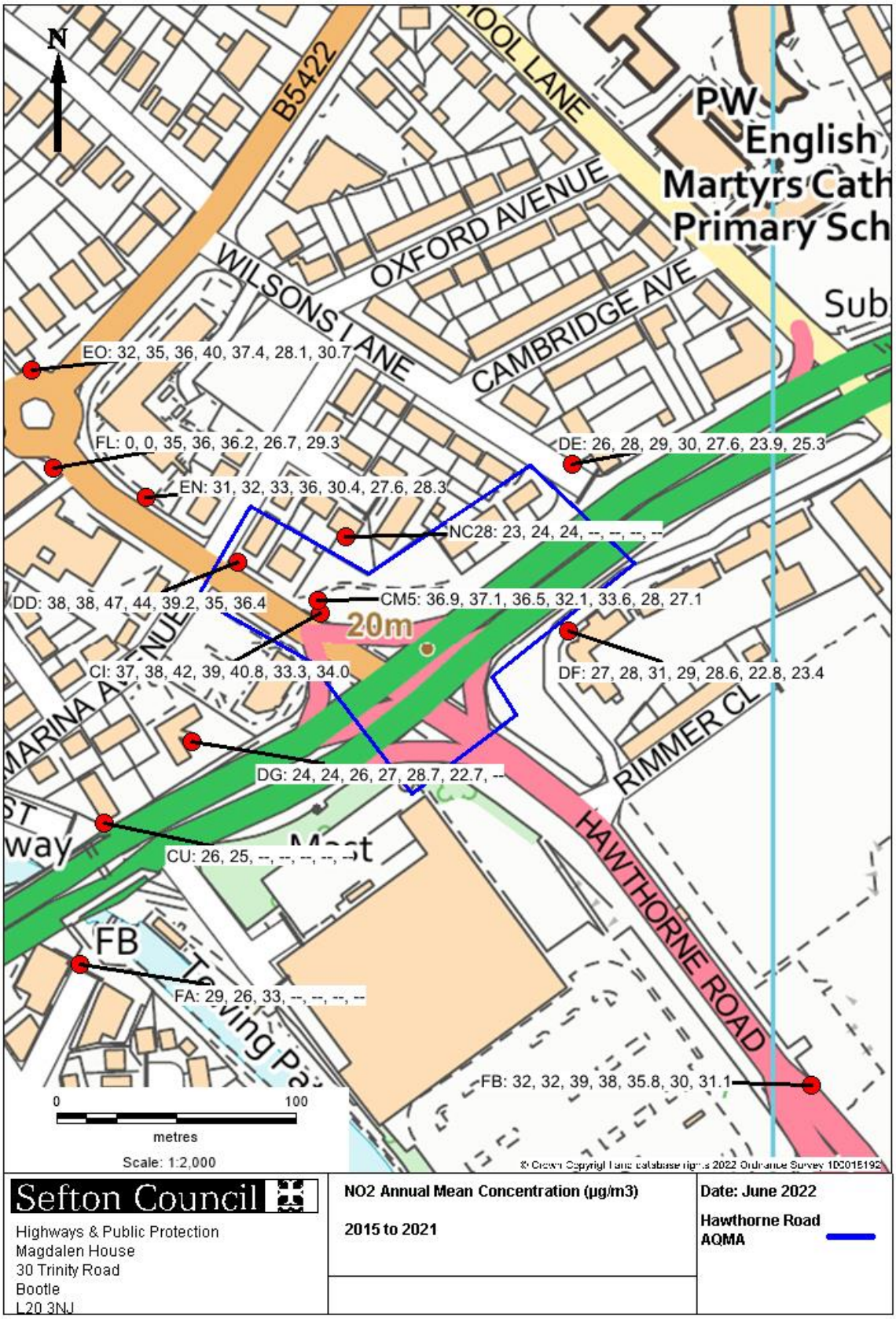
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
NO2 Annual Mean Concentration (µg/m3)
2015 to 2021
Date: June 2022
South Road
AQMA

4.35 AQMA 5 Hawthorne Road, Litherland.

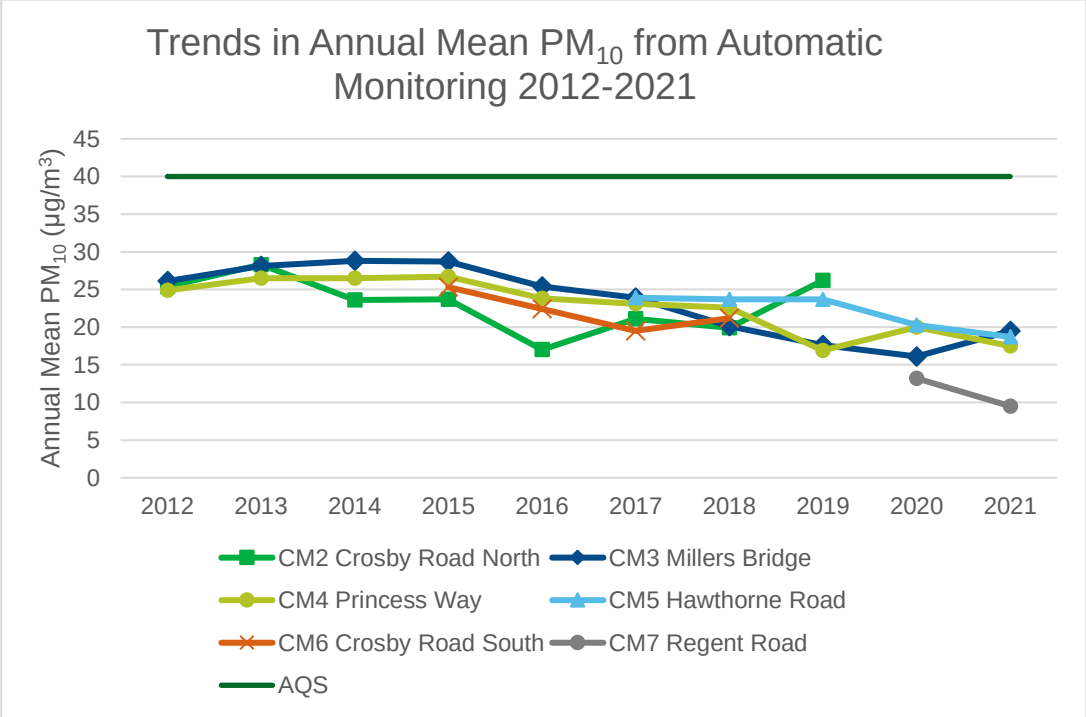
- Compliance with the NO_2 annual mean objective and 1-hour mean objective at the automatic monitoring location was achieved in 2021 at the automatic monitoring site. For the second conseutive year all diffusion tube monitoring locations in this AQMA also showed levels in compliance with the NAQS objective in 2021. Levels have increased compared to 2020 but remain well within the NAQS objective The highest level recorded in 2020 in this AQMA was site ID: DD -Hawthorne Road with a level of 36.4 µg/m^3. Due to the ongoing uncertanties around covid and unknown impact the port expansion will have on pollution levels in this area, this AQMA is not being considered for revocation in the immediate future.



Sefton Council Highways & Public Protection Magdalen House 30 Trinity Road Bootle L20 3NJ	NO2 Annual Mean Concentration (µg/m3) 2015 to 2021	Date: June 2022 Hawthorne Road AQMA

4.4 Particulate Matter (PM_{10})

- Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.
- Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.
- PM_{10} monitoring at CM6 Crosby Road South ceased in 2020 due the TEOM failing audit checks and due to its age and non-availability of spares could not be repaired. Both this unit has been decommissioned. Monitoring of PM_{10} at CM2 only recommenced in 2022 with the relocation of the BAM from Princess Way CM4 so no data is available for the monitoring year of 2021 at this location
- No exceedances of either the PM_{10} annual mean objective or the 24-hour mean objective at any of the four sites where PM_{10} is monitored were recorded in 2021 with levels of PM_{10} well within NAQS objectives. This follows the trend in previous years as can be seen in the trend graph below



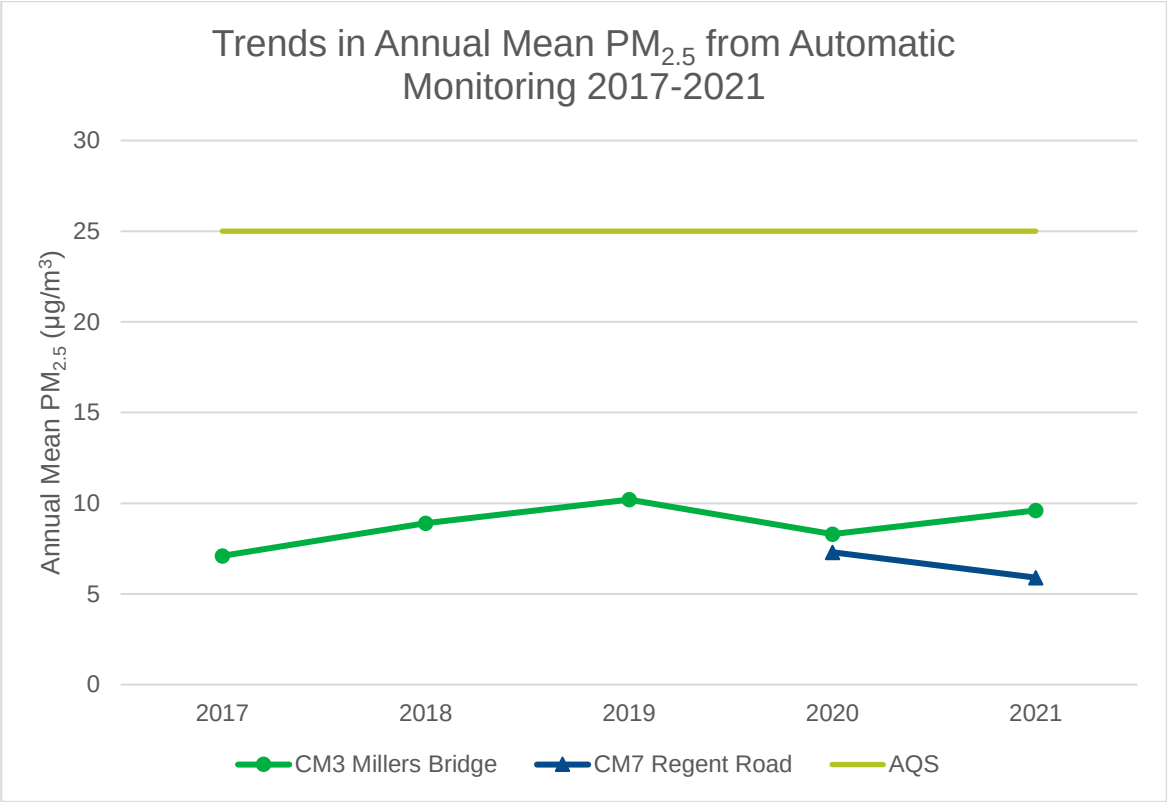
- AQMA 3 Millers Bridge is the only current AQMA that has been declared for PM_{10}. This was was due to historical exceedance of the 24-hour mean objective. Compliance with the objective at Millers Bridge has now been met since 2008 (with

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 advised 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. Notwithstanding this there has been consitent complaince and arrangements are being made to revoke this AQMA will in due course where resource permits.

4.5 Particulate Matter ($PM_{2.5}$)

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

- Automatic Monitoring of $PM_{2.5}$ commenced in July 2017 at the Millers Bridge monitoring site. The results indicate that levels of $PM_{2.5}$ are relatively stable and well below the current $PM_{2.5}$ annual mean limit value of 25μg/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 was installed in August 2020 at Regent Road to monitor background levels of PM. Levels in this location for the 2021 monitoring period show compliance with the current limit value. Monitoring will continue to determine future trends. In addition a new Dual $PM_{2.5}$/PM_{10} monitor has recently been installed at the Princess Way monitoring enclosure. Results for 2022 at this location will be presented in next years ASR.
- The trend graph below the results of $PM_{2.5}$ monitoring as can be observed levels at both sites are well below the current standard of 25μg/m^3



4.6 Sulphur Dioxide (SO_2)

Table A.9 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2021 with the air quality objectives for SO_2.

No exceedances of the 15-minute, 1-hour or 24-hour SO_2 objectives were recorded in 2021 and follows a similar trend to previous years.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM2	Crosby Road North,	Roadside	332,174.59	398,483.27	NO2	NO	Chemiluminescene;	4.49	4.11	1.8
CM3	Millers Bridge, Bootle.	Roadside	333,772.36	394,602.27	NO2;PM10;PM2.5	YES AQMA3	Chemiluminescence;FIDAS	6.23	8.68	1.8
CM4	Lathom Close, Princess Way, Seaforth.	Roadside	332,648.51	396,941.57	NO2;PM10	YES AQMA2	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 AQMA5	Chemiluminescence,Beta attenuation	13.84	7.04	1.8
CM6	Crosby Road South,	Urban Background	332,873.66	396,549.21	NO2,SO2	NO	Chemiluminescence;	N/A	23.5	2.8
CM7	Regent Road	Urban Background	331.643.192	399.587.690	PM10 PM2.5	NO	FIDAS	N/A	3	1.8

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
BB	Eaton Avenue, Seaforth	Roadside	333509.906	397186.176	NO2	No	3.0	1.9	No	2.7
BO	Douglas Place, Bootle	Roadside	333846.94	394461.346	NO2	Yes AQMA 3	5.2	1.9	No	2.7
BQ	Douglas Place/Millers Bridge, Bootle	Roadside	333834.762	394572.335	NO2	Yes AQMA 3	6.5	1.8	No	2.8
BR	Derby Road, Bootle	Roadside	333753.201	394551.8	NO2	Yes AQMA 3	1.6	1.1	No	2.6
BS	Derby Road, Bootle	Roadside	333757	394622	NO2	Yes AQMA 3	7.2	2.8	No	2.5
BV	Quarry Road, Thornton	Roadside	333395.37	400862.903	NO2	No	7.5	1.7	No	2.5
BW	Crosby Road South/Riversdale Road, Seaforth	Roadside	332600.204	397021.204	NO2	Yes AQMA 2	2.1	1.3	No	2.6
CI	Hawthorne Road, Bootle	Roadside	333812.64	397513.553	NO2	Yes AQMA 5	17.9	3.2	No	2.5
CJ	South Road, Waterloo	Roadside	332204.248	398228.819	NO2	Yes AQMA 4	0.7	2.5	No	2.6
CR	Parker Avenue, Seaforth	Roadside	332510.918	397332.214	NO2	No	2.5	2.1	No	2.7
CY	Lytton Grove, Seaforth	Roadside	332980.557	396972.038	NO2	Yes AQMA 2	3.7	2.2	No	2.6
DC	Marsh Lane, Bootle	Kerbside	334339.384	395800.213	NO2	No	4.1	0.6	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DD	Hawthorne Road, Litherland	Roadside	333777.928	397534.487	NO2	Yes AQMA 5	5.6	2.3	No	2.6
DE	Wilson's Lane, Litherland	Roadside	333917.158	397574.971	NO2	No	9.4	2.2	No	2.6
DF	Church Road flats. Litherland	Roadside	333915.796	397505.738	NO2	No	3.9	12.3	No	2.6
DH	South Road, Waterloo	Roadside	332193.401	398192.808	NO2	Yes AQMA 4	0.0	3.6	No	2.8
DI	Crosby Road North, Waterloo	Roadside	332205.678	398186.77	NO2	Yes AQMA 4	0.0	3.6	No	2.5
DO	Hawthorne Road/ Linacre Lane, Bootle	Kerbside	334639.624	396399.039	NO2	No	4.7	0.6	No	2.6
DP	Gordon Road/ Rawson Road, Bootle	Kerbside	332792.503	396973.797	NO2	Yes AQMA 2	9.2	0.6	No	2.7
DQ	Rawson Road, Bootle	Roadside	332791.498	396922.302	NO2	Yes AQMA 2	5.6	1.7	No	2.6
DR	Crosby Road North, Waterloo	Roadside	332225.716	398230.708	NO2	Yes AQMA 2	21.1	2.5	No	2.5
DS	South Road, Waterloo	Roadside	332134.399	398168.805	NO2	No	2.1	1.4	No	2.6
DU	Liverpool Road/ Kingsway, Waterloo	Roadside	332196.353	398785.848	NO2	No	6.9	3.5	No	2.6
DV	Moor Lane, Crosby	Roadside	332341.4	400167.903	NO2	No	4.7	1.4	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DW	Church Road/ Kirkstone Road North	Roadside	334571.851	397918.273	NO2	No	7.4	7.3	No	2.6
DX	Merton Road, Bootle	Roadside	334737.802	395137.533	NO2	No	13.6	5.8	No	2.6
DY	Hougoumont Avenue/Crosby Road North	Kerbside	332249.794	398008.38	NO2	No	6.2	0.4	No	2.4
DZ	Bailey Drive, Bootle	Roadside	335393.977	397281.889	NO2	No	8.3	2.3	No	2.6
EA	Copy Lane, Netherton	Roadside	336638.651	399495.675	NO2	No	10.5	35.1	No	2.5
EB	Copy Lane, Netherton	Roadside	336591.597	399452.837	NO2	No	22.7	1.0	No	2.6
EC	Copy Lane/ Dunningsbridge Road	Roadside	336539	399477	NO2	No	25.7	2.7	No	2.6
EE	Copy Lane Police Station, Netherton	Roadside	336572.016	399523.734	NO2	No	N/A	3.4	No	2.6
EK	Hawthorne Road, Bootle	Roadside	334781.591	395188.948	NO2	No	13.1	1.1	No	2.3
EL	Breeze Hill, Bootle	Kerbside	335265.082	394968.091	NO2	No	8.2	0.9	No	2.6
EN	Hawthorne Road, Litherland	Roadside	333739.853	397561.249	NO2	No	9.6	3.9	No	2.5
EO	Hatton Hill Road, Litherland	Roadside	333692.411	397614.604	NO2	No	8.4	2.0	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
EP	Ash Road, Seaforth	Roadside	333343.422	397209.994	NO2	No	11.5	1.3	No	2.6
EQ	Crosby Road South, Seaforth	Roadside	332610.502	396984.604	NO2	Yes AQMA 2	3.8	2.3	No	2.6
ES	Chatham Close, Seaforth	Roadside	332711.603	397002.599	NO2	Yes AQMA 2	7.1	1.3	No	2.6
EV	Princess Way, Seaforth	Kerbside	332650.169	396914.61	NO2	Yes AQMA 2	N/A	0.2	No	2.6
EW	Crosby Road South, Seaforth	Roadside	332665.744	396821.821	NO2	Yes AQMA 2	1.1	1.2	No	2.7
EY	Lathom Avenue, Seaforth	Roadside	332681.302	396949.104	NO2	Yes AQMA 2	6.2	1.2	No	2.7
FB	Hawthorne Road, Litherland	Roadside	334017	397317	NO2	No	N/A	2.4	No	2.6
FC	St Phillips Avenue, Litherand	Roadside	334216.953	397662.84	NO2	No	9.9	2.3	No	2.6
FD	Church Road, Litherland	Roadside	334242.328	397712.677	NO2	No	7.9	2.6	No	2.6
FE	Church Road, Litherland	Roadside	334642.41	397923.332	NO2	No	6.4	7.0	No	2.6
FF	Boundary Road, Litherland	Roadside	334978.217	398170.5	NO2	No	14.4	1.2	No	2.6
FH	Church Road, Netherton	Kerbside	334962.072	398134.04	NO2	No	12.2	0.6	No	2.6
FI	Hemans Street, Bootle	Roadside	333279.77	395957.948	NO2	No	13.5	8.7	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
FL	Hawthorne Road opp 20A Litherland	Kerbside	333701.439	397573.795	NO2	No	6.8	0.7	No	2.5
GA	Lord Street	Roadside	333431.41	417165.922	NO2	No	9.6	1.5	No	2.6
GB	Lord Street	Roadside	333704.011	417414.806	NO2	No	9.7	1.8	No	2.6
GC	Haigh Road - Illuminated Sign	Roadside	332296.398	398267.697	NO2	No	15.0	1.0	No	2.6
GD	Crosby Road North - Lighting Column 46D	Roadside	332209.8	398337.697	NO2	No	N/A	2.0	No	2.6
GE	Crosby Road North - Lighting Column 48D	Roadside	332205.76	398368.998	NO2	No	N/A	1.6	No	2.6
GF	Bridle Road - Lighting Column 0010	Roadside	335347.053	397500.241	NO2	No	12.5	1.3	No	2.6
GG	A565/Hemans Street - Lighting Column 0038	Roadside	333270.041	395967.365	NO2	No	5.3	3.1	No	2.6
GH	A565 opp car wash - Lighting Column 0044	Roadside	333230.91	396068.856	NO2	No	12.4	3.5	No	2.6
GI	St Joans Close opp No.40	Roadside	333281.122	396027.099	NO2	No	2.2	1.0	No	2.6
GJ	A565 Liverpool Road - Lighting column 120D	Kerbside	332087.963	399829.23	NO2	No	4.0	0.6	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
GK	Derby Road, Bootle	Roadside	333669.3	394912.097	NO2	No	8.0	2.1	No	2.6
GL	Green Lane, Seaforth	Roadside	333109.979	397071.549	NO2	No	1.4	2.2	No	2.6
GM	South Road, Waterloo	Roadside	332189.204	398209.503	NO2	Yes AQMA 4	9.5	1.5	No	2.6
GN	Moor Lane, Thornton	Roadside	333326.297	400771.8	NO2	No	10.8	1.4	No	2.6
GO	Marsh Lane, Bootle	Roadside	334203.588	395748.628	NO2	No	3.8	2.4	No	2.6
GP	Barkeley Drive, Seaforth	Roadside	332680.519	396776.004	NO2	Yes AQMA 2	0.8	1.0	No	2.6
GQ	Mariners Road, Blundellsands	Roadside	330706.409	398904.207	NO2	No	11.5	0.6	No	2.6
GR	School Lane	Roadside	339200.952	402502.574	NO2	No	32.9	2.4	No	2.6
GS	Poverty Lane	Kerbside	338710.429	401570.881	NO2	No	13.6	0.7	No	2.6
GT	Miller's Bridge	Roadside	333735.786	394597.465	NO2	Yes AQMA 3	34.3	3.4	No	2.6
GU	Miller's Bridge	Roadside	333784.302	394595.688	NO2	Yes AQMA 3	16.9	5.0	No	2.6
GV	Hall Lane	Roadside	337536.736	401542.169	NO2	No	16.1	1.6	No	2.6
GW	A59 Northway	Roadside	337499.197	401551.997	NO2	No	11.6	2.0	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
GX	Prescot Road	Kerbside	340334.22	401214.143	NO2	No	5.2	0.7	No	2.6
GY	Raven Meols Lane	Roadside	329187.928	406599.572	NO2	No	1.6	2.0	No	2.6
GZ	Weld Parade	Roadside	332987.982	415800.064	NO2	No	9.0	2.6	No	2.6
UK 2	Church Road, Litherland	Roadside	334798.812	398065.228	NO2	No	7.1	1.7	No	2.5
UK 4	Crosby Road North, Waterloo	Kerbside	332171.362	398546.757	NO2	No	3.5	0.9	No	2.6
W	Gladstone Road/Gordon Road, Seaforth	Roadside	332981.851	397022.013	NO2	Yes AQMA 2	1.4	2.4	No	2.6
HA	Liverpool Road South	Roadside	337294.859	400873.891	NO2	No	11.9	2.5	No	2.5
HB	Breeze Hill	Roadside	335,137.01	394,995.76	NO2	No	7.6	2.1	No	2.5
HC	Breeze Hill	Roadside	335,266.99	394,994.60	NO2	No	50.0	2.5	No	2.5

Notes:

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

(2) N/A if not applicable.

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM2	332,174.59	398,483.27	Roadside	98.5	98.5	34.9	37.6	32.8	25.9	30
CM3	333,772.36	394,602.27	Roadside	99.3	99.3	40.6	**41.6**	38.2	33.2	35
CM4	332,648.51	396,941.57	Roadside	87.8	87.8	**39.7**	**40.5**	**41.6**	31.7	32.9
CM5	333,811.59	397,518.59	Roadside	99.7	99.7	36.5	32.1	33.6	28	27.1
CM6	332,873.66	396,549.21	Urban Background	99.2	99.2	29.6	30.2	28.8	23.6	26

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16 – All sites have greater than 75% data capture so no annualisation required**

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

Notes:

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

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
BB	333509.906	397186.176	Roadside	100.0	100.0	28.0	28.0	26.6	22.0	24.2
BO	333846.94	394461.346	Roadside	100.0	100.0	32.0	32.0	29.9	25.1	27.6
BQ	333834.762	394572.335	Roadside	100.0	100.0	36.0	34.0	31.7	28.4	30.3
BR	333753.201	394551.8	Roadside	100.0	100.0	**61.0**	**57.0**	**50.5**	**41.3**	**46.0**
BS	333757	394622	Roadside	82.7	82.7	**40.0**	**43.0**	37.0	34.0	36.9
BV	333395.37	400862.903	Roadside	100.0	100.0	31.0	34.0	31.6	25.4	25.7
BW	332600.204	397021.204	Roadside	100.0	100.0	33.0	28.0	29.9	24.3	27.6
CI	333812.64	397513.553	Roadside	100.0	100.0	**42.0**	39.0	**40.8**	33.3	34.0
CJ	332204.248	398228.819	Roadside	100.0	100.0	**41.0**	39.0	38.0	32.1	35.0
CR	332510.918	397332.214	Roadside	100.0	100.0	31.0	32.0	31.6	24.3	27.1
CY	332980.557	396972.038	Roadside	100.0	100.0	30.0	29.0	27.0	23.0	25.4
DC	334339.384	395800.213	Kerbside	100.0	100.0	**40.0**	38.0	36.3	32.2	34.0
DD	333777.928	397534.487	Roadside	84.6	84.6	**47.0**	**44.0**	39.2	35.0	36.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
DE	333917.158	397574.971	Roadside	92.3	92.3	29.0	30.0	27.6	23.9	25.3
DF	333915.796	397505.738	Roadside	100.0	100.0	31.0	29.0	28.6	22.8	23.4
DH	332193.401	398192.808	Roadside	100.0	100.0	34.0	34.0	32.4	27.7	29.3
DI	332205.678	398186.77	Roadside	92.3	92.3	39.0	38.0	36.3	28.7	31.5
DO	334639.624	396399.039	Kerbside	100.0	100.0	**47.0**	**45.0**	**43.8**	35.4	38.9
DP	332792.503	396973.797	Kerbside	100.0	100.0	36.0	34.0	32.4	28.6	29.8
DQ	332791.498	396922.302	Roadside	92.3	92.3	34.0	33.0	29.2	25.7	28.6
DR	332225.716	398230.708	Roadside	100.0	100.0	**44.0**	37.0	34.6	30.2	32.7
DS	332134.399	398168.805	Roadside	100.0	100.0	32.0	34.0	31.0	25.7	29.1
DU	332196.353	398785.848	Roadside	100.0	100.0	34.0	36.0	33.3	27.3	29.6
DV	332341.4	400167.903	Roadside	100.0	100.0	39.0	**40.0**	36.6	29.5	32.9
DW	334571.851	397918.273	Roadside	100.0	100.0	34.0	34.0	32.6	25.5	27.9
DX	334737.802	395137.533	Roadside	100.0	100.0	36.0	36.0	35.2	28.2	31.8
DY	332249.794	398008.38	Kerbside	90.4	90.4	28.0	24.0	24.4	20.8	21.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
DZ	335393.977	397281.889	Roadside	100.0	100.0	35.0	35.0	32.7	26.4	28.1
EA	336638.651	399495.675	Roadside	100.0	100.0	30.0	29.0	26.3	21.5	23.1
EB	336591.597	399452.837	Roadside	100.0	100.0	37.0	36.0	30.4	26.1	28.8
EC	336539	399477	Roadside	100.0	100.0	35.0	37.0	32.4	24.6	27.6
EE	336572.016	399523.734	Roadside	100.0	100.0	36.0	35.0	36.0	24.7	29.5
EK	334781.591	395188.948	Roadside	100.0	100.0	34.0	35.0	37.0	28.4	31.3
EL	335265.082	394968.091	Kerbside	100.0	100.0	**42.0**	**44.0**	37.5	31.5	35.2
EN	333739.853	397561.249	Roadside	100.0	100.0	33.0	36.0	30.4	27.6	28.3
EO	333692.411	397614.604	Roadside	100.0	100.0	36.0	**40.0**	37.4	28.1	30.7
EP	333343.422	397209.994	Roadside	90.4	90.4	30.0	32.0	29.2	22.8	24.8
EQ	332610.502	396984.604	Roadside	100.0	100.0	33.0	38.0	32.3	27.4	28.5
ES	332711.603	397002.599	Roadside	100.0	100.0	30.0	33.0	30.8	23.6	25.4
EV	332650.169	396914.61	Kerbside	100.0	100.0	**41.0**	**42.0**	36.0	30.3	34.0
EW	332665.744	396821.821	Roadside	92.3	92.3	39.0	39.0	34.3	30.0	33.1

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
EY	332681.302	396949.104	Roadside	82.7	82.7	36.0	**42.0**	**40.5**	32.1	35.9
FB	334017	397317	Roadside	100.0	100.0	39.0	38.0	35.8	30.0	31.1
FC	334216.953	397662.84	Roadside	100.0	100.0	30.0	25.0	31.2	22.5	23.9
FD	334242.328	397712.677	Roadside	100.0	100.0	29.0	29.0	27.3	22.2	23.8
FE	334642.41	397923.332	Roadside	82.7	82.7	36.0	32.0	30.0	24.7	27.7
FF	334978.217	398170.5	Roadside	100.0	100.0	38.0	39.0	35.1	27.2	28.9
FH	334962.072	398134.04	Kerbside	100.0	100.0	**44.0**	**43.0**	**40.4**	31.9	34.2
FI	333279.77	395957.948	Roadside	92.3	92.3	**42.0**	38.0	38.1	32.0	36.2
FL	333701.439	397573.795	Kerbside	92.3	92.3	35.0	36.0	36.2	26.7	29.3
GA	333431.41	417165.922	Roadside	100.0	100.0		34.0	34.3	24.5	26.9
GB	333704.011	417414.806	Roadside	76.9	76.9		33.0	34.3	28.4	27.4
GC	332296.398	398267.697	Roadside	92.3	92.3		21.0	20.5	18.1	22.0
GD	332209.8	398337.697	Roadside	100.0	100.0		29.0	28.1	23.1	26.6
GE	332205.76	398368.998	Roadside	100.0	100.0		29.0	30.0	22.9	26.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
GF	335347.053	397500.241	Roadside	100.0	100.0		35.0	35.5	29.9	30.0
GG	333270.041	395967.365	Roadside	75.0	75.0		39.0	**40.9**	32.7	39.4
GH	333230.91	396068.856	Roadside	100.0	100.0		**48.0**	**47.0**	38.6	**40.6**
GI	333281.122	396027.099	Roadside	100.0	100.0		33.0	30.7	25.5	27.2
GJ	332087.963	399829.23	Kerbside	100.0	100.0		34.0	33.5	26.1	32.1
GK	333669.3	394912.097	Roadside	100.0	100.0			37.1	31.6	35.0
GL	333109.979	397071.549	Roadside	100.0	100.0			29.2	24.8	26.4
GM	332189.204	398209.503	Roadside	82.7	82.7			39.9	33.9	35.2
GN	333326.297	400771.8	Roadside	100.0	100.0			31.9	26.1	29.0
GO	334203.588	395748.628	Roadside	92.3	92.3			34.6	26.7	32.5
GP	332680.519	396776.004	Roadside	100.0	100.0			36.9	28.7	31.2
GQ	330706.409	398904.207	Roadside	100.0	100.0			21.7	16.1	18.5
GR	339200.952	402502.574	Roadside	100.0	100.0				16.7	17.7
GS	338710.429	401570.881	Kerbside	100.0	100.0				13.7	14.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
GT	333735.786	394597.465	Roadside	100.0	100.0				36.9	38.2
GU	333784.302	394595.688	Roadside	100.0	100.0				35.5	36.2
GV	337536.736	401542.169	Roadside	100.0	100.0				23.7	25.6
GW	337499.197	401551.997	Roadside	92.3	92.3				22.8	24.2
GX	340334.22	401214.143	Kerbside	100.0	100.0				19.6	21.3
GY	329187.928	406599.572	Roadside	100.0	100.0				14.0	18.0
GZ	332987.982	415800.064	Roadside	100.0	100.0				14.6	15.6
UK 2	334798.812	398065.228	Roadside	84.6	84.6	29.0	28.0	27.5	22.2	21.4
UK 4	332171.362	398546.757	Kerbside	90.4	90.4	36.0	36.0	34.4	24.8	29.7
W	332981.851	397022.013	Roadside	100.0	100.0	32.0	30.0	31.3	27.3	27.9
HA	337294.859	400873.891	Roadside	82.7	82.7					19.2
HB	335,137.01	394,995.76	Roadside	90.4	90.4					**41.5**
HC	335,266.99	394,994.60	Roadside	92.3	92.3					**40.2**

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16 -Annualisation not required as all sites have greater than 75% data capture.**

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

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

Notes:

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

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

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

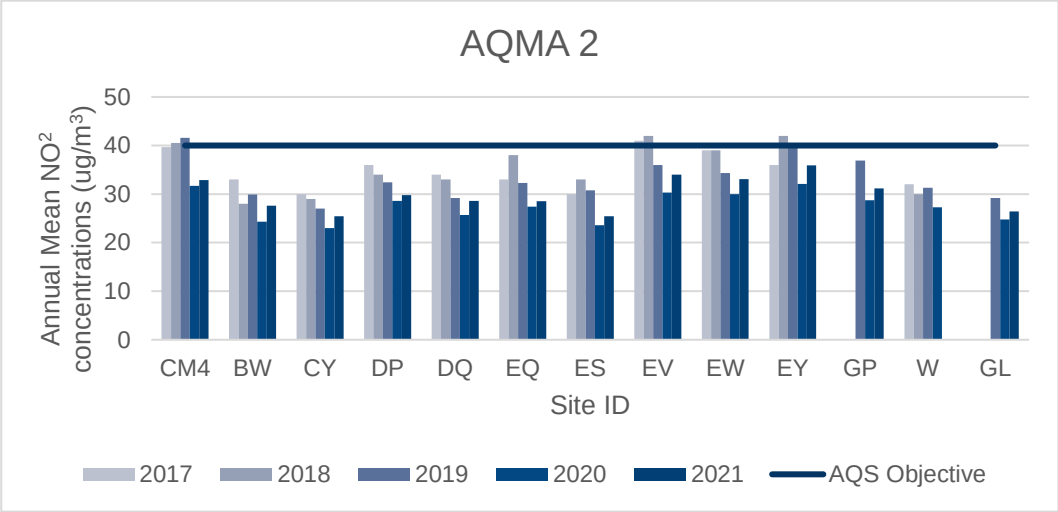
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

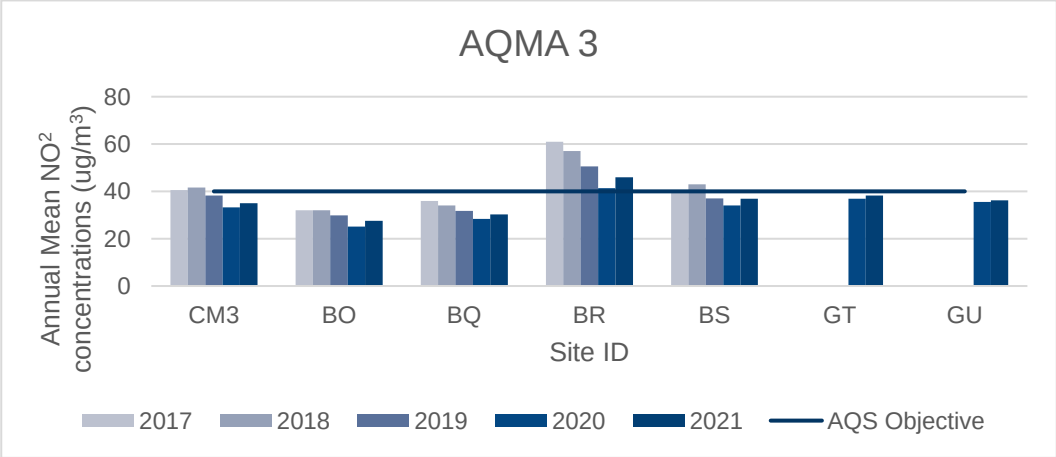
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

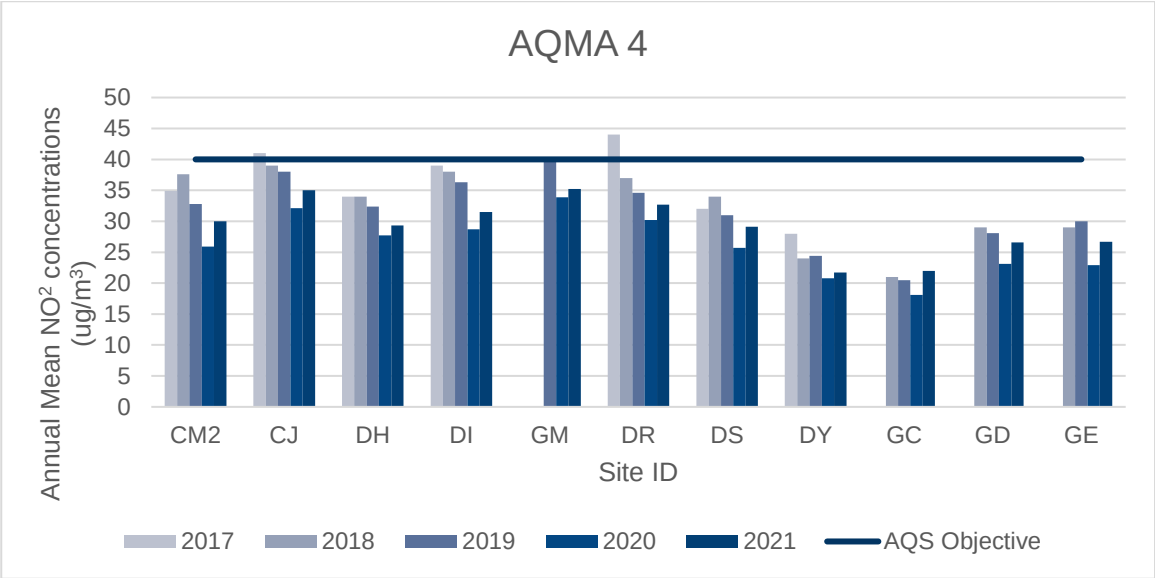
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

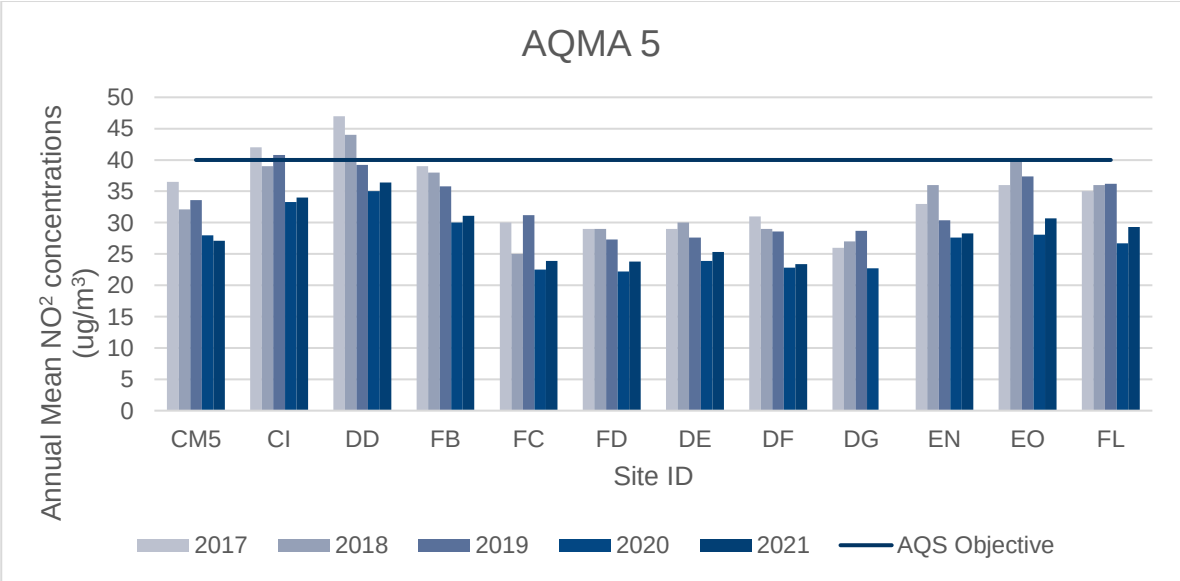
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

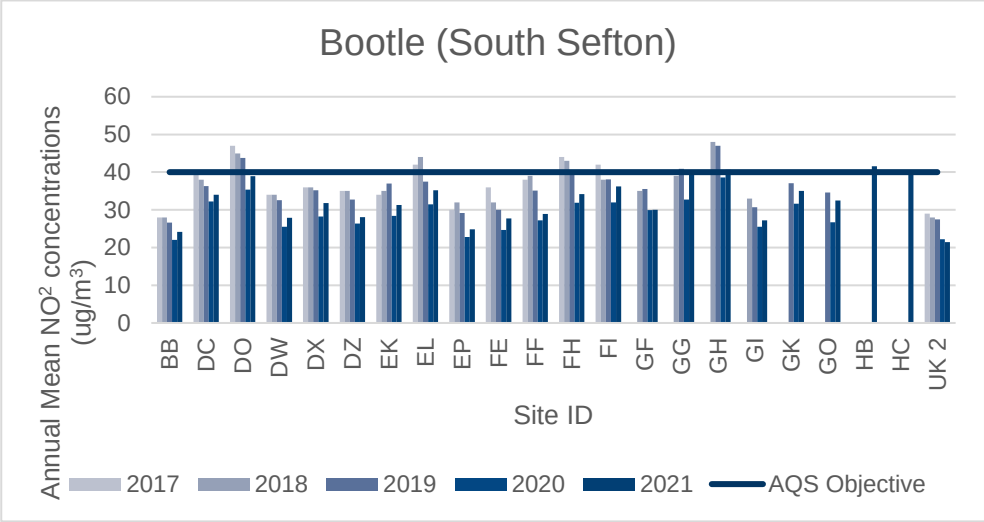
Figure A.1 – Trends in Annual Mean NO_2 Concentrations

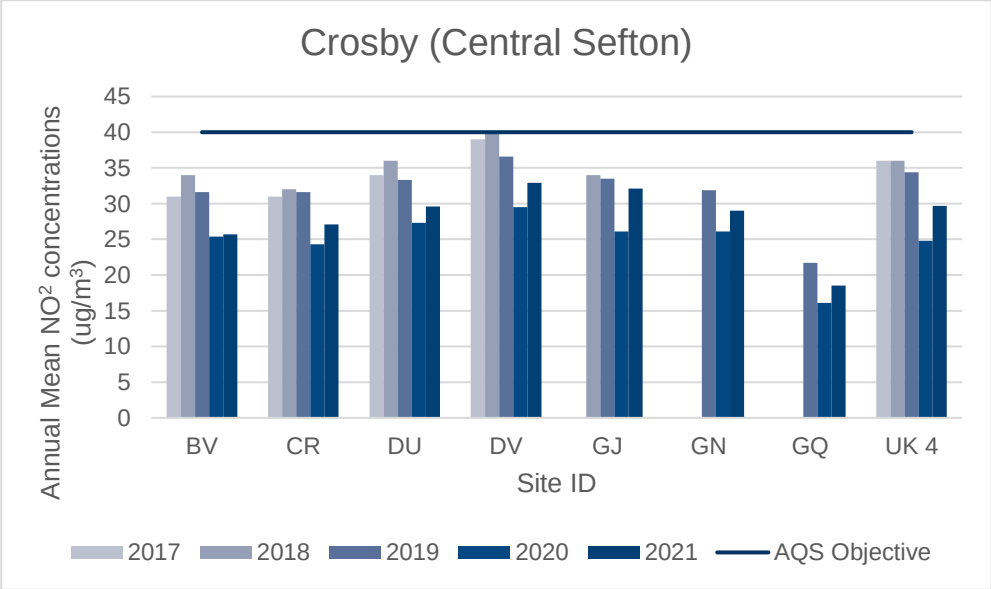


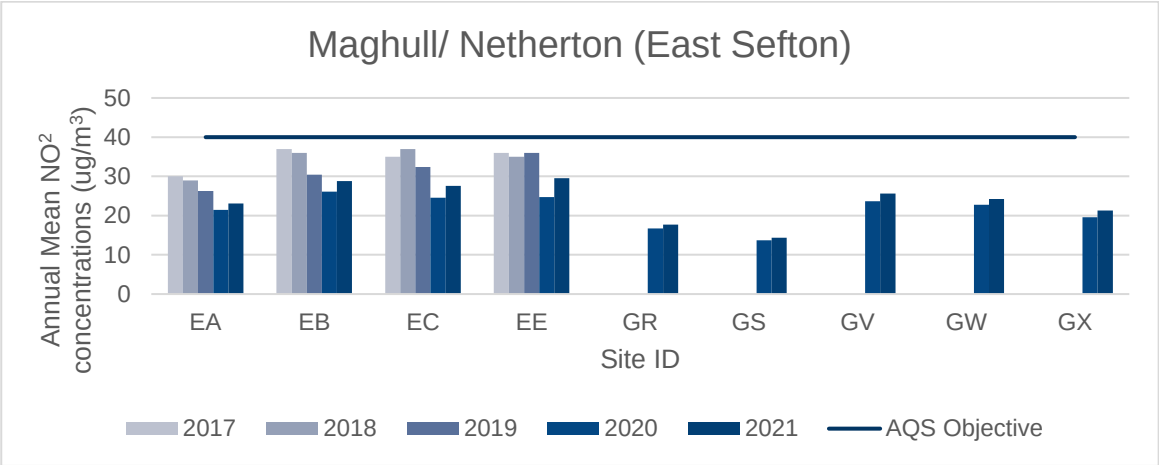



AQMA 4
Annual Mean NO2 concentrations (ug/m3)
50
45
40
35
30
25
20
15
10
5
0
CM2
CJ
DH
DI
GM
DR
DS
DY
GC
GD
GE
Site ID
2017
2018
2019
2020
2021
AQS Objective


AQMA 5
Annual Mean NO2 concentrations (ug/m3)
50
45
40
35
30
25
20
15
10
5
0
CM5
CI
DD
FB
FC
FD
DE
DF
DG
EN
EO
FL
Site ID
2017
2018
2019
2020
2021
AQS Objective


Bootle (South Sefton)
Annual Mean NO2 concentrations (ug/m3)
60
50
40
30
20
10
0
BB
DC
DO
DW
DX
DZ
EK
EL
EP
FE
FF
FH
FI
GF
GG
GH
GI
GK
GO
HB
HC
UK 2
Site ID
2017
2018
2019
2020
2021
AQS Objective


Crosby (Central Sefton)
Annual Mean NO2 concentrations (ug/m3)
45
40
35
30
25
20
15
10
5
0
BV
CR
DU
DV
GJ
GN
GQ
UK 4
Site ID
2017
2018
2019
2020
2021
AQS Objective


Maghull/ Netherton (East Sefton)
Annual Mean NO2 concentrations (ug/m3)
50
40
30
20
10
0
EA
EB
EC
EE
GR
GS
GV
GW
GX
Site ID
2017
2018
2019
2020
2021
AQS Objective

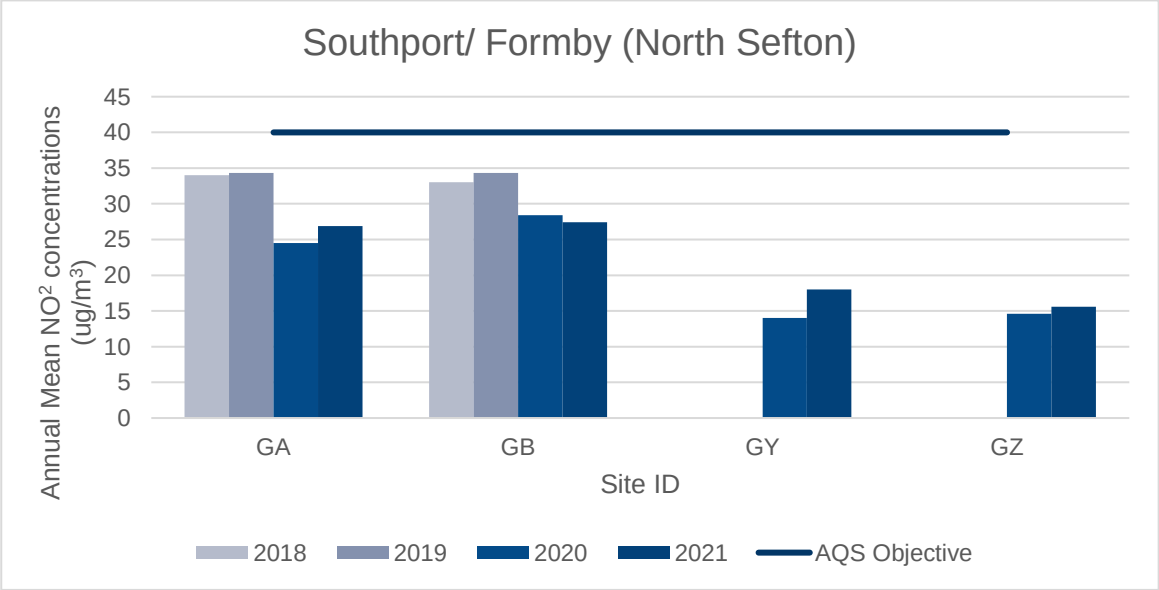

Southport/ Formby (North Sefton)
Annual Mean NO2 concentrations (ug/m3)
45
40
35
30
25
20
15
10
5
0
GA
GB
GY
GZ
Site ID
2018
2019
2020
2021
AQS Objective

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM2	332,174.59	398,483.27	Roadside	98.5	98.5	0	**0(113)**	**0(127)**	0	0
CM3	333,772.36	394,602.27	Roadside	99.3	99.3	0	**0**	**0**	0	0
CM4	332,648.51	396,941.57	Roadside	87.8	87.8	0	0	0	0	0
CM5	333,811.59	397,518.59	Roadside	99.7	99.7	**0(120)**	**0(105)**	0	0	0
CM6	332,873.66	396,549.21	Urban Background	99.2	99.2	**0(91)**	0	0	0	0

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM2	332,174.59	398,483.27	Roadside	N/A	N/A	21.1	19.9	26.2	N/A	N/A
CM3	333,772.36	394,602.27	Roadside	76	76	23.9	20.1	17.6	16.1	19.5
CM4	332,648.51	396,941.57	Roadside	94	94	23.1	22.6	16.9	20	17.5
CM5	333,811.59	397,518.59	Roadside	98.9	98.9	23.9	23.7	23.7	20.3	18.7
CM6	332,873.66	396,549.21	Urban Background	N/A	N/A	19.5	21.2	**N/A**	N/A	N/A
CM7	331.643.192	399.587.690	Urban Background	99.8	99.8				13.2	9.5

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16 . Annualisation not required as all sites have greater than 75% data capture.**

Notes:

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

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

All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

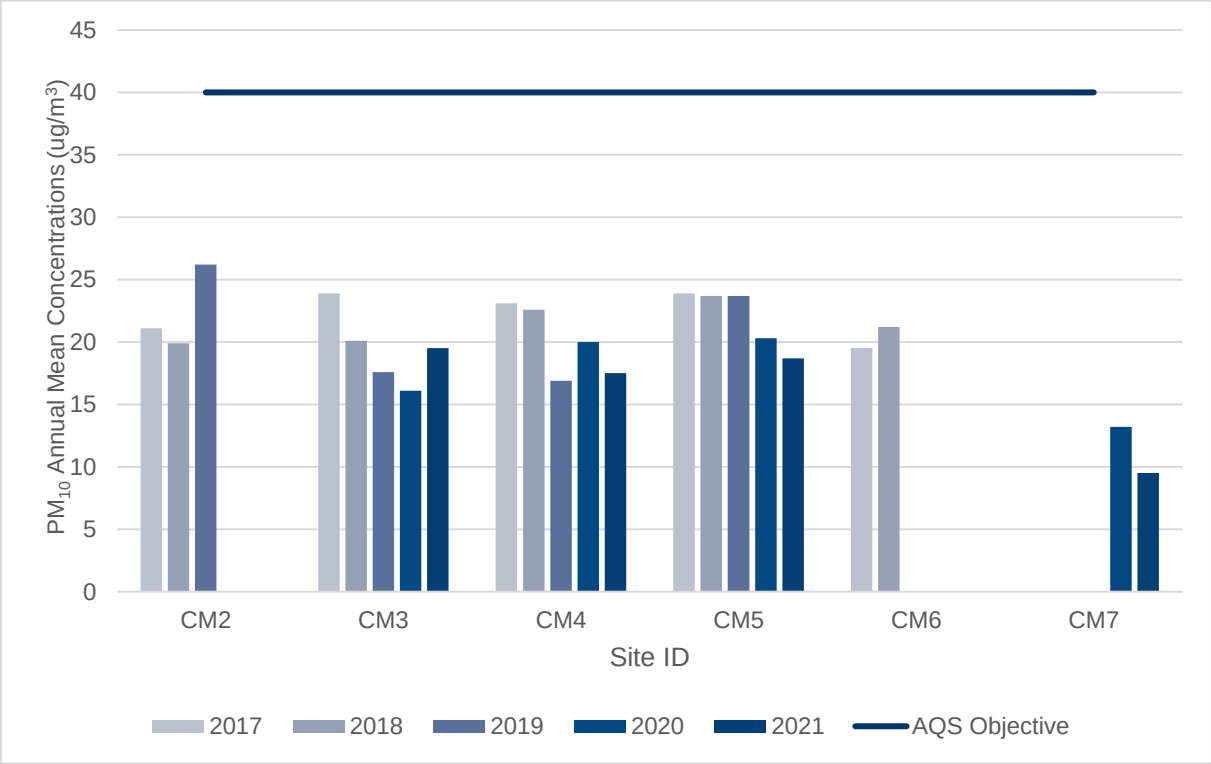


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM2	332,174.59	398,483.27	Roadside	N/A	N/A	6	**1(32)**	**1(35)**	**N/A**	**N/A**
CM3	333,772.36	394,602.27	Roadside	76	76	17	**1(25)**	**1(27)**	2	3
CM4	332,648.51	396,941.57	Roadside	94	94	7	3	**1(28)**	1	2
CM5	333,811.59	397,518.59	Roadside	98	98	**2(29)**	**3(33)**	10	1	2
CM6	332,873.66	396,549.21	Urban Background	N/A	N/A	**1(28)**	**6(33)**	**N/A**	N/A	N/A
CM7	331.643.192	399.587.690	Urban Background	99	99	N/A	N/A	N/A	0(18)	0

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM3	333,772.36	394,602.27	Roadside	75	75	7.1	8.9	10.2	8.3	9.6
CM7	331.643.194	399.587.690	Urban Background	99	99	N/A	N/A	N/A	7.3	5.9

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16 . Annualisation not required as all sites have greater than 75% data capture.**

Notes:

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

All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

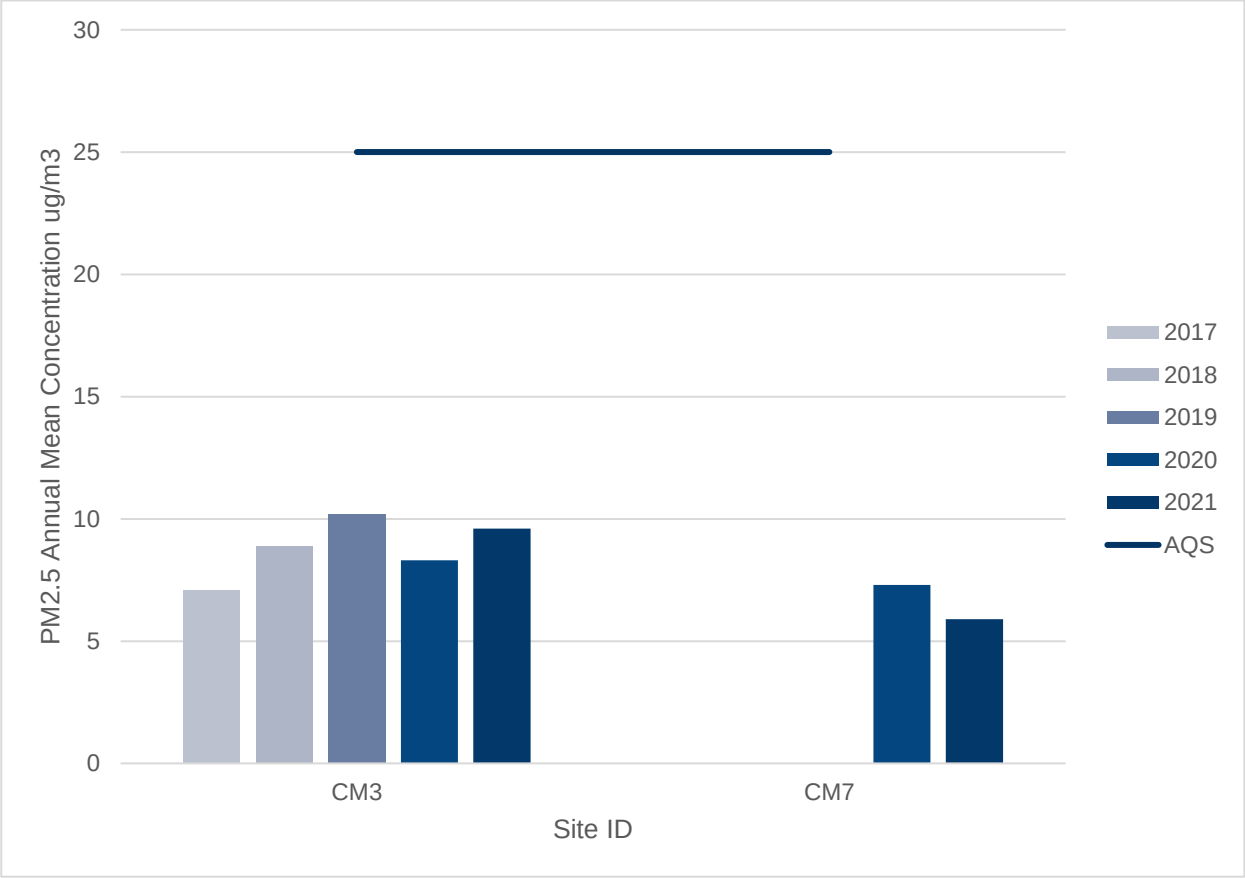


Table A.9 – SO_2 2021 Monitoring Results, Number of Relevant Instances

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	Number of 15-minute Means > 266µg/m^3	Number of 1-hour Means > 350µg/m^3	Number of 24-hour Means > 125µg/m^3
CM6	332,873.66	396,549.21	Urban Background	99	99	0	0	0

Notes:

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

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted(0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
BB	333509.906	397186.176	39.6	26.6	29.5	23.2	21.2	23.6	24.3	20.9	28.0	30.9	34.8	32.1	27.9	24.2	-	
BO	333846.94	394461.346	43.5	26.6	35.2	28.4	26.9	30.8	32.9	23.0	31.1	33.9	35.0	35.1	31.9	27.6	-	
BQ	333834.762	394572.335	45.9	33.1	39.1	31.2	34.3	31.4	40.0	27.5	31.2	37.3	36.4	32.6	35.0	30.3	-	
BR	333753.201	394551.8	60.3	39.2	56.6	50.8	54.5	55.3	61.5	40.5	48.5	60.3	58.0	50.6	53.0	**46.0**	**42.7**	
BS	333757	394622	52.0	38.0	40.6	35.8	40.9	41.0			44.3	46.2	45.2	41.8	42.6	36.9	34.3	
BV	333395.37	400862.903	40.3	39.1	32.2	30.2	28.3	26.8	28.3	22.8	32.5	30.6	12.5	32.8	29.7	25.7	-	
BW	332600.204	397021.204	40.7	39.2	35.2	25.8	27.6	26.2	27.4	20.8	32.4	39.4	33.9	32.9	31.8	27.6	-	
CI	333812.64	397513.553	45.2	44.1	39.6	36.9	41.2	32.6	34.8	28.7	40.6	43.5	39.5	44.3	39.2	34.0	-	
CJ	332204.248	398228.819	48.6	43.0	38.0	36.0	41.1	37.5	40.4	34.3	42.4	44.6	40.0	39.0	40.4	35.0	-	
CR	332510.918	397332.214	38.4	39.2	33.7	25.6	27.7	25.5	22.9	20.7	33.3	37.2	35.5	35.6	31.3	27.1	-	
CY	332980.557	396972.038	40.5	31.8	32.5	23.3	22.7	25.6	25.2	20.3	29.8	33.3	33.8	32.6	29.3	25.4	-	
DC	334339.384	395800.213	49.2	40.7	39.1	33.8	37.1	36.2	38.9	28.2	40.4	42.9	45.1	39.8	39.3	34.0	-	
DD	333777.928	397534.487		42.9	40.3	33.7	40.5	35.8	35.9	27.9		80.6	39.7	42.6	42.0	36.4	30.5	
DE	333917.158	397574.971	37.7	36.1	29.0	20.1	23.1	19.4	17.5		44.4	31.6	27.1	35.4	29.2	25.3	-	
DF	333915.796	397505.738	38.3	34.2	28.8	22.1	20.0	21.5	23.3	18.0	28.5	28.8	30.3	30.0	27.0	23.4	-	
DH	332193.401	398192.808	42.2	41.6	36.2	26.0	29.8	27.7	24.9	24.5	37.3	39.7	35.7	40.0	33.8	29.3	-	
DI	332205.678	398186.77	46.6	40.0	37.0	29.4	34.5	33.8	32.5	26.5		41.8	39.0	38.8	36.4	31.5	-	
DO	334639.624	396399.039	58.3	48.6	44.8	43.0	42.3	41.3	37.4	31.4	53.6	45.2	48.1	44.7	44.9	38.9	30.5	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted(0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DP	332792.503	396973.797	45.0	47.0	41.9	27.2	27.9	27.0	22.6	21.9	35.6	39.9	36.7	40.1	34.4	29.8	-	
DQ	332791.498	396922.302	41.8	36.8	34.9	27.4	28.3	30.8	29.6	25.1	35.3	36.7		36.9	33.0	28.6	-	
DR	332225.716	398230.708	44.7	41.6	39.2	34.4	35.1	36.7	33.6	24.7	39.5	41.6	42.1	39.2	37.7	32.7	-	
DS	332134.399	398168.805	42.7	38.1	34.3	30.3	32.6	32.5	29.2	25.2	34.8	33.2	35.8	34.7	33.6	29.1	-	
DU	332196.353	398785.848	43.7	37.6	34.1	28.9	28.3	31.4	28.7	25.7	37.3	38.7	37.0	37.7	34.1	29.6	-	
DV	332341.4	400167.903	48.2	49.8	37.8	38.5	33.3	34.1	35.8	25.7	42.3	37.7	37.8	34.5	38.0	32.9	-	
DW	334571.851	397918.273	43.8	44.4	33.7	30.8	26.0	25.0	22.4	23.5	34.4	30.5	32.5	38.5	32.1	27.9	-	
DX	334737.802	395137.533	47.5	40.9	34.9	31.2	33.3	32.6	31.5	25.6	41.9	38.2	41.4	41.6	36.7	31.8	-	
DY	332249.794	398008.38	31.2	32.9	24.1	23.9	22.2	19.9	19.6	18.9	28.6	26.6	27.2		25.0	21.7	-	
DZ	335393.977	397281.889	46.1	33.8	32.7	28.6	26.4	26.3	24.6	21.9	37.7	33.5	40.9	36.4	32.4	28.1	-	
EA	336638.651	399495.675	35.8	33.0	29.1	22.9	23.1	22.9	21.0	17.7	25.4	26.3	33.1	29.0	26.6	23.1	-	
EB	336591.597	399452.837	41.6	33.5	33.3	34.0	29.5	32.1	31.6	23.1	34.3	31.1	37.9	36.3	33.2	28.8	-	
EC	336539	399477	43.9	38.8	28.5	31.1	29.1	26.7	22.7	23.7	38.1	32.8	28.3	38.1	31.8	27.6	-	
EE	336572.016	399523.734	45.6	44.6	32.4	35.0	30.5	26.8	22.7	24.7	38.1	31.4	33.8	42.2	34.0	29.5	-	
EK	334781.591	395188.948	44.2	39.8	38.1	35.1	29.9	32.2	31.7	25.0	40.1	36.9	40.1	39.8	36.1	31.3	-	
EL	335265.082	394968.091	50.4	38.8	43.7	43.0	34.6	42.1	43.9	27.5	39.2	34.5	45.9	44.2	40.6	35.2	-	
EN	333739.853	397561.249	40.3	38.0	31.7	31.6	28.4	31.4	25.0	19.7	33.9	35.2	35.5	40.7	32.6	28.3	-	
EO	333692.411	397614.604	46.3	44.5	35.5	31.5	20.5	33.6	25.9	26.1	41.0	37.5	40.2	42.3	35.4	30.7	-	
EP	333343.422	397209.994	39.2	38.5	27.9	25.6	24.1	21.7	19.4	19.4	34.0		30.3	34.7	28.6	24.8	-	
EQ	332610.502	396984.604	42.6	37.9	32.5	29.3	33.0	27.3	19.7	21.4	35.9	37.8	37.5	39.6	32.9	28.5	-	
ES	332711.603	397002.599	40.8	40.2	34.4	20.9	24.2	21.6	18.9	18.5	31.8	33.0	31.2	36.5	29.3	25.4	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted(0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
EV	332650.169	396914.61	48.2	39.4	43.6	38.4	33.1	38.0	35.4	27.2	42.1	39.7	45.4	39.6	39.2	34.0	-	
EW	332665.744	396821.821	47.0	39.9	38.7	32.4	30.6	34.6	31.9		41.3	41.1	39.3	43.5	38.2	33.1	-	
EY	332681.302	396949.104	47.7	47.6	43.8			34.1	28.3	25.9	47.4	47.5	44.7	46.9	41.4	35.9	-	
FB	334017	397317	44.9	41.5	41.7	29.3	30.0	30.9	28.3	25.9	38.4	34.1	39.0	45.8	35.8	31.1	-	
FC	334216.953	397662.84	38.3	31.5	29.6	23.4	21.1	24.0	21.9	21.3	28.0	27.2	32.9	32.2	27.6	23.9	-	
FD	334242.328	397712.677	40.5	35.4	30.4	22.8	19.9	19.8	17.6	19.1	28.0	27.5	33.3	35.4	27.5	23.8	-	
FE	334642.41	397923.332	42.2	33.6	33.6	29.0	25.3	27.1			32.1	27.3	35.9	33.2	31.9	27.7	-	
FF	334978.217	398170.5	49.1	39.7	35.1	32.3	25.1	27.0	22.6	17.4	40.1	34.5	35.1	42.3	33.4	28.9	-	
FH	334962.072	398134.04	51.1	39.4	37.6	40.9	34.7	36.6	37.0	24.0	45.8	37.1	46.0	42.4	39.4	34.2	-	
FI	333279.77	395957.948	47.7	49.1	46.4	33.1		41.2	38.8	29.1	43.4	42.3	46.0	42.7	41.8	36.2	31.6	
FL	333701.439	397573.795	45.3	31.5	31.0	32.5		29.0	21.6	23.7	42.1	34.4	38.4	42.9	33.8	29.3	-	
GA	333431.41	417165.922	40.1	31.3	25.0	34.7	28.3	33.2	28.2	23.5	34.8	26.2	36.1	31.6	31.1	26.9	-	
GB	333704.011	417414.806				34.3	27.3	26.4	28.1	21.0	36.5	33.6	40.8	36.9	31.7	27.4	-	
GC	332296.398	398267.697	34.7	27.9	25.5	19.3	19.9		18.9	23.4	24.6	25.9	28.7	30.5	25.4	22.0	-	
GD	332209.8	398337.697	40.0	36.0	31.6	30.3	26.2	26.1	24.4	15.9	31.4	33.5	35.7	36.8	30.6	26.6	-	
GE	332205.76	398368.998	41.7	39.4	31.2	30.0	25.5	25.2	23.7	16.9	34.2	30.8	34.7	36.4	30.8	26.7	-	
GF	335347.053	397500.241	48.0	36.9	39.0	28.9	26.6	30.4	28.5	14.6	40.3	34.7	45.4	42.3	34.6	30.0	-	
GG	333270.041	395967.365	53.4	38.0	42.2	40.9		41.6	38.5		53.5		48.8	52.0	45.4	39.4	34.9	
GH	333230.91	396068.856	57.9	42.7	57.9	47.1	41.6	49.7	46.7	22.5	43.9	43.2	55.2	53.8	46.8	**40.6**	32.1	
GI	333281.122	396027.099	46.4	28.6	38.3	27.8	23.4	30.9	25.8	18.1	33.9	30.6	34.6	38.0	31.4	27.2	-	
GJ	332087.963	399829.23	49.1	32.8	37.8	33.9	30.9	34.1	32.9	26.4	45.6	37.8	43.1	39.5	37.0	32.1	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted(0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
GK	333669.3	394912.097	51.2	37.5	44.2	37.8	32.5	39.1	37.2	24.7	42.8	42.3	44.7	50.6	40.4	35.0	-	
GL	333109.979	397071.549	41.3	30.4	36.5	27.3	25.1	26.3	23.7	19.5	34.0	29.0	36.5	36.0	30.4	26.4	-	
GM	332189.204	398209.503	50.9	46.1	48.9	44.5	35.5		31.1	25.8	45.6	37.0	40.0		40.5	35.2	-	
GN	333326.297	400771.8	44.6	34.2	35.2	34.8	28.6	29.2	26.0	25.2	38.9	30.6	36.6	37.8	33.5	29.0	-	
GO	334203.588	395748.628	56.0	40.0	37.8	33.5	27.6	31.0	29.5		38.8	33.8	43.0	41.9	37.5	32.5	-	
GP	332680.519	396776.004	46.6	36.9	41.1	33.5	31.0	34.0	29.1	21.8	40.3	38.7	44.9	33.3	35.9	31.2	-	
GQ	330706.409	398904.207	31.9	33.4	17.0	17.5	19.6	15.4	14.1	15.1	22.2	23.6	17.6	28.5	21.3	18.5	-	
GR	339200.952	402502.574	34.2	22.4	19.2	17.3	16.8	14.3	15.1	12.3	22.7	20.1	23.5	26.6	20.4	17.7	-	
GS	338710.429	401570.881	28.9	21.6	13.3	14.1	13.7	11.0	10.9	10.5	16.4	16.0	20.4	21.9	16.6	14.4	-	
GT	333735.786	394597.465	60.1	47.1	35.2	43.2	37.3	38.6	39.6	33.1	44.1	52.7	48.1	49.4	44.0	38.2	32.2	
GU	333784.302	394595.688	58.4	38.6	43.7	40.1	43.9	40.7	40.7	30.2	43.7	45.0	44.4	31.0	41.7	36.2	32.9	
GV	337536.736	401542.169	41.9	28.9	27.2	26.7	26.5	23.5	25.2	11.5	31.0	32.8	35.0	43.4	29.5	25.6	-	
GW	337499.197	401551.997	39.4	25.6	27.6	25.6	26.9	22.6	22.9	16.1		33.7	35.7	31.4	28.0	24.2	-	
GX	340334.22	401214.143	30.8	26.7	23.9	25.3	22.2	22.0	22.4	18.0	25.6	23.3	28.9	26.0	24.6	21.3	-	
GY	329187.928	406599.572	29.4	55.2	15.9	18.0	14.9	13.3	14.0	13.2	19.4	15.4	21.2	19.2	20.7	18.0	-	
GZ	332987.982	415800.064	27.5	21.0	12.8	17.4	16.0	13.8	14.2	13.1	19.7	16.1	23.0	22.1	18.0	15.6	-	
UK 2	334798.812	398065.228			27.2	22.5	21.3	20.5	18.0	18.7	30.5	25.7	31.4	31.1	24.7	21.4	-	
UK 4	332171.362	398546.757	42.3	40.4	29.9	33.4	32.9	28.4		24.8	37.8	35.6	37.9	33.5	34.3	29.7	-	
W	332981.851	397022.013	46.4	42.0	36.0	23.6	23.9	24.9	22.1	19.8	34.0	37.3	35.7	40.9	32.2	27.9	-	
HA	337294.859	400873.891	33.8	26.2	18.9	24.3	19.6	16.1	14.7	15.9			25.2	26.5	22.1	19.2	-	
HB	335,137.01	394,995.76	68.4	41.5	48.8		37.4	45.3	50.3	37.1	50.2	45.0	54.9	48.2	47.9	**41.5**	33.2	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted(0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
HC	335,266.99	394,994.60	61.0	42.6	48.1	43.6	45.7		39.2	32.2	52.9	51.8	45.2	47.3	46.3	**40.2**	-	

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

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16. Annualisation not required as all sites have greater than 75% data capture.**

☒ **Local bias adjustment factor used.**

☐ **National bias adjustment factor used.**

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

☒ **Sefton Confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**.

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Sefton During 2021

- Sefton has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Sefton During 2021

- Sefton has not completed any additional air quality works within the reporting year of 2021 that has not already been reported in this ASR.

QA/QC of Diffusion Tube Monitoring

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. AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient, indoor, stack and workplace air. One such sample is the AIR NO_2 test sample type that is distributed to participants in a quarterly basis.

AIR NO_2 PT forms an integral part of the UK NO_2 Network's QA/QC and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the webpages at: http://laqm.DEFRA.gov.uk/diffusion-tubes/qa-qc-framework.html. This information is updated on a quarterly basis following completion of each AIR PT round.

Defra advise that diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR PT scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

The information is used to help the laboratories to identify if they have problems and may assist devising measures to improve their performance and forms part of work for DEFRA and the Devolved Administrations under the LAQM Services Contract.

Laboratory Performance

The AIR PT scheme uses laboratory spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis and continues the format used in the preceding Workplace Analysis Scheme for Proficiency WASP PT scheme. Such tubes are not designed to test other parts of the measurement system e.g. sampling. Every quarter, roughly January, April, July and October each year, each

laboratory receives four diffusion tubes doped with an amount of nitrite, known to LGC Standards, but not the participants. At least two of the tubes are usually duplicates, which enables precision, as well as accuracy, to be assessed. The masses of nitrite on the spiked tubes are different each quarter, and reflect the typical analytical range encountered in actual NO_2 ambient monitoring in the UK.

Preparation of test samples

Diffusion tubes are spiked using a working nitrite solution prepared from a stock solution. The concentration of this stock solution is initially assayed using a titrimetric procedure. All steps in the subsequent test sample production process, involving gravimetric and volumetric considerations, are undertaken using calibrated instruments employing traceable standards. As an additional cross check, 12 spiked Palmes tubes are picked at random from each spike loading level and submitted to a third-party laboratory which is accredited to ISO 17025 to undertake this analysis using an ion chromatographic procedure.

In summary, the tube spiking precision is calculated to be better than 0.5 %, expressed as a standard deviation, and this is derived from repeat gravimetric checking of the pipette device used to spike the test samples. The calculated spike values, derived from titrimetric, gravimetric and volumetric considerations, are found to be typically within ± 3 % of results obtained by the third-party laboratory using an ion chromatographic analytical procedure.

Scheme operation

The participants analyse the test samples and report the results to LGC Standards via their on-line PORTAL data management system. LGC Standards assign a performance score to each laboratory's result, based on how far their results deviate from the assigned values for each test samples. The assigned values are best estimates of the levels of nitrite doped onto the test sample tubes and are calculated from the median of participant results, after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. At the completion of the round, laboratories receive a report detailing how they have performed and how their results relate to those of their peers.

Performance scoring

The z-score system is used by LGC to assess the performance of laboratories participating in the AIR PT NO_2 scheme.

The Z_{score}, may be defined as:

$$Z_{score} = \frac{(x_{lab} - \bar{x}_{assigned})}{\sigma_{SDPA}}$$

Where:
x_{lab} = participant result from a laboratory

$\bar{x}_{assigned}$ = assigned value

σ_{SDPA} = standard deviation for performance assessment (currently set at 7.5% of $\bar{x}_{assigned}$)

Performance score interpretation

A Z_{score} is interpreted as described below:

$|Z_{score}| \leq 2$, indicates satisfactory laboratory performance.

$2.0 < |Z_{score}| < 3$, indicates questionable (warning) laboratory performance.

$|Z_{score}| \geq 3$, indicates unsatisfactory (action) laboratory performance.

As a rule of thumb, provided that a laboratory does not have systematic sources of bias in their laboratory measurement system, then on average, 19 out of every 20 z-scores should be ≤± 2. In this scheme each laboratory receives 4 test samples per round and therefore submits 4 z-scores per round. Hence over 5 rounds laboratories would receive 20 test samples and report 20 z-scores.

Assessing the performance of a laboratory

End users that avail of analytical services from laboratories should satisfy themselves that such laboratories meet their requirements. A number of factors ideally need to be considered including:

· Expertise and skills of staff within the laboratory?

· Does the laboratory follow accepted measurement standards, guidance?
· Does the laboratory operate a robust internal quality control system?
· Is the laboratory third party accredited to relevant standards such as ISO 17025?
· Does the laboratory successfully participate in relevant external proficiency testing schemes?
· How good is their customer care (communication, turnaround times, pricing etc)?

Participation, therefore, in an external proficiency-testing scheme such as AIR PT, represents but one factor in such considerations. Participation in a single round of an external proficiency-testing scheme represents a “snap-shot” in time of a laboratory’s analytical quality. It is more informative therefore to consider performance over a number of rounds.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Sefton recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance regarding the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2

continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Sefton have applied a local bias adjustment factor of 0.87 to the 2021 monitoring data. A summary of bias adjustment factors used by Sefton over the past five years is presented in Table C.1 below.

Sefton's co-location study in 2021 consisted of 3 sites using triplicate diffusion tubes located at the automatic monitoring station. The local bias adjustment factor has been calculated using Defra's diffusion tube processing tool to ensure the calculations are undertaken in accordance with LAQM.TG16 Chapter 7: NO_x and NO_2 Monitoring, NO_2 by Diffusion Tubes.

The local bias adjustment output from the DTDPT is provided below:

Local Bias Adjustment Outputs - Information Only

Go back to STEP 3 - Bias Adjustment to define factor

	STEP 3a Local Bias Adjustment Input 1	STEP 3b Local Bias Adjustment Input 2	STEP 3c Local Bias Adjustment Input 3	STEP 3d Local Bias Adjustment Input 4	STEP 3e Local Bias Adjustment Input 5	STEP 3f Local Bias Adjustment Input 6	STEP 3g Local Bias Adjustment Input 7
Periods used to calculate bias	10	8	10				
Bias Adjustment Factor A	0.87 (0.81 - 0.94)	0.92 (0.87 - 0.99)	0.82 (0.76 - 0.88)				
Diffusion Tube Bias B	15% (6% - 24%)	8% (1% - 16%)	23% (13% - 32%)				
Diffusion Tube Mean (µg/m^3)	32.1	36.9	31.2				
Mean CV (Precision)	4.1%	2.8%	4.5%				
Automatic Mean (µg/m^3)	27.9	34.0	25.4				
Data Capture	98%	98%	98%				
Adjusted Tube Mean (µg/m^3)	28 (26 - 30)	34 (32 - 36)	26 (24 - 27)				

Overall Diffusion Tube Precision	Good Overall Precision	Good Overall Precision	Good Overall Precision	Good Overall Precision			
Overall Continuous Monitor Data Capture	Good Overall Data Capture	Good Overall Data Capture	Good Overall Data Capture	Good Overall Data Capture			

Combined Local Bias Adjustment Factor	0.87	

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.87
2020	National	06/21	0.81
2019	National	09/20	0.91
2018	National	06/19	0.93
2017	National	06/18	0.89

NO_2 Fall-off with Distance from the Road

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

automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

11 diffusion tube NO_2 monitoring locations within Sefton required distance correction during 2021.

This distance correction was completed using the Diffusion Tube Data Processing Tool and a summary of the results presented in table C4

QA/QC of 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 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 field auditor (RICARDO) 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).

Defra and the Devolved Administrations have approved a number of different monitoring technologies to be equivalent to the reference method. In some cases, the data must be corrected before they can be used.

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

In 2021 Sefton Council used 2 different instrument types to measure PM_{10}

- Met-One 1020 Beta Attenuation Monitor (BAM) with unheated inlet
- FIDAS dual monitor with unheated inlet

In accordance with LAQM.TG16 Chapter 7: the following correction factors have been applied:

- Met-One 1020 Beta Attenuation Monitor (BAM) with unheated inlet - divide by 1.2
- FIDAS dual monitor with unheated inlet -$PM_{2.5}$ - divide by 1.06

Automatic Monitoring Annualisation

All automatic monitoring locations within Sefton recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website.

No automatic NO_2 monitoring locations within Sefton required distance correction during 2021 as no annual mean concentrations recorded were greater than 36µg/m^3.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

No Annualisation is required

Table C.3 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3
Periods used to calculate bias	10	8	10
Bias Factor A	0.87 (0.81 - 0.94)	0.92 (0.87 - 0.99)	0.82 (0.76 - 0.88)
Bias Factor B	15% (6% - 24%)	8% (1% - 16%)	23% (13% - 32%)
Diffusion Tube Mean (µg/m^3)	32.1	36.9	31.2
Mean CV (Precision)	4.1%	2.8%	4.5%
Automatic Mean (µg/m^3)	27.9	34.0	25.4
Data Capture	98%	98%	98%
Adjusted Tube Mean (µg/m^3)	28 (26 - 30)	34 (32 - 36)	26 (24 - 27)

Notes:

A combined local bias adjustment factor of 0.87 has been used to bias adjust the 2021 diffusion tube results.

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

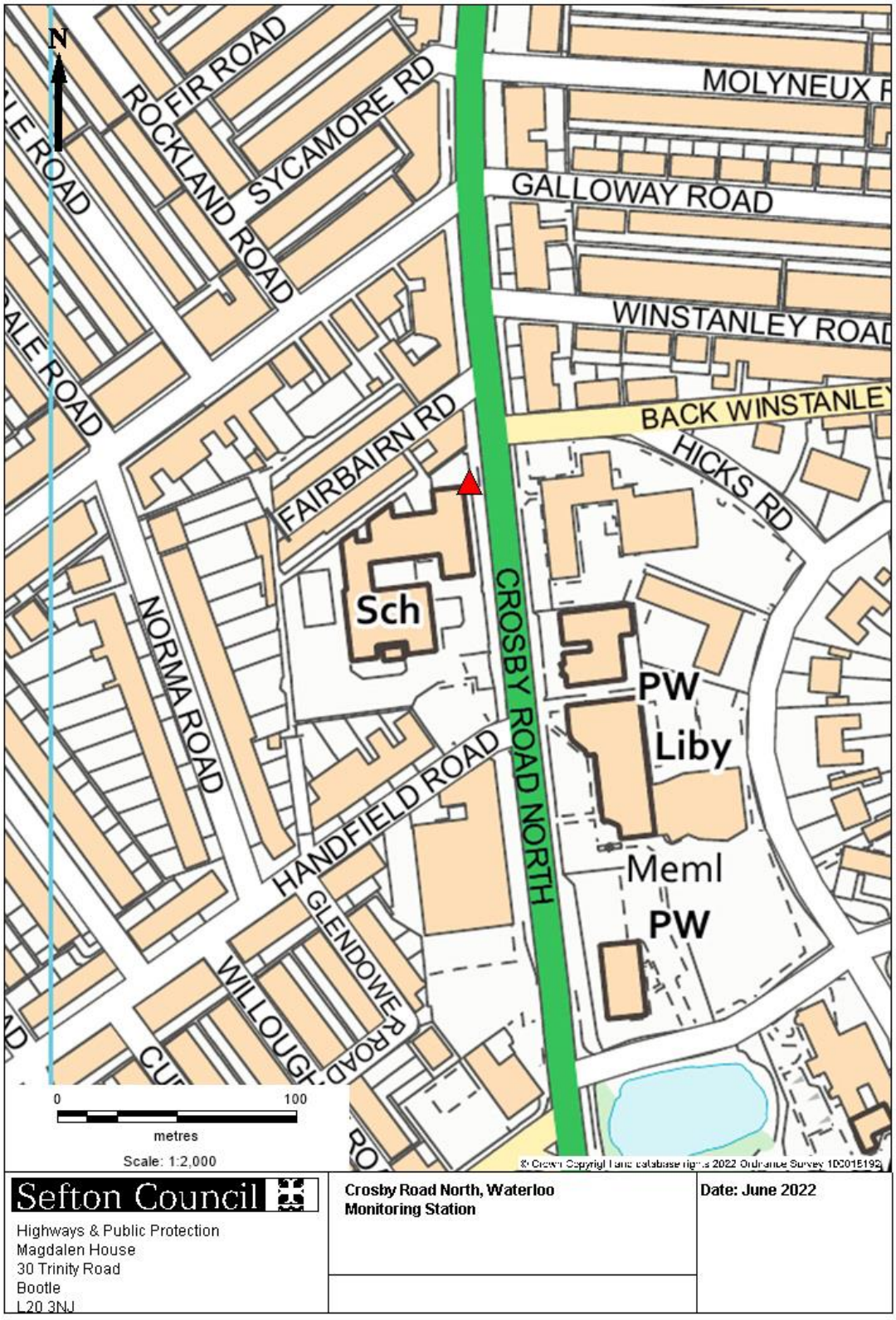
Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
BR	1.1	2.7	46.0	28.9	**42.7**	*Predicted concentration at Receptor above AQS objective.*
BS	2.8	10.0	36.9	28.9	34.3	
DD	2.3	7.9	36.4	17.0	30.5	
DO	0.6	5.3	38.9	17.56154	30.5	
FI	8.7	22.2	36.2	22.23991	31.6	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
GG	3.1	8.4	39.4	22.2	34.9	
GH	3.5	15.9	40.6	19.7	32.1	
GT	3.4	37.7	38.2	28.9	32.2	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*
GU	5.0	21.9	36.2	28.9	32.9	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*
HB	2.1	9.7	41.5	18.6	33.2	

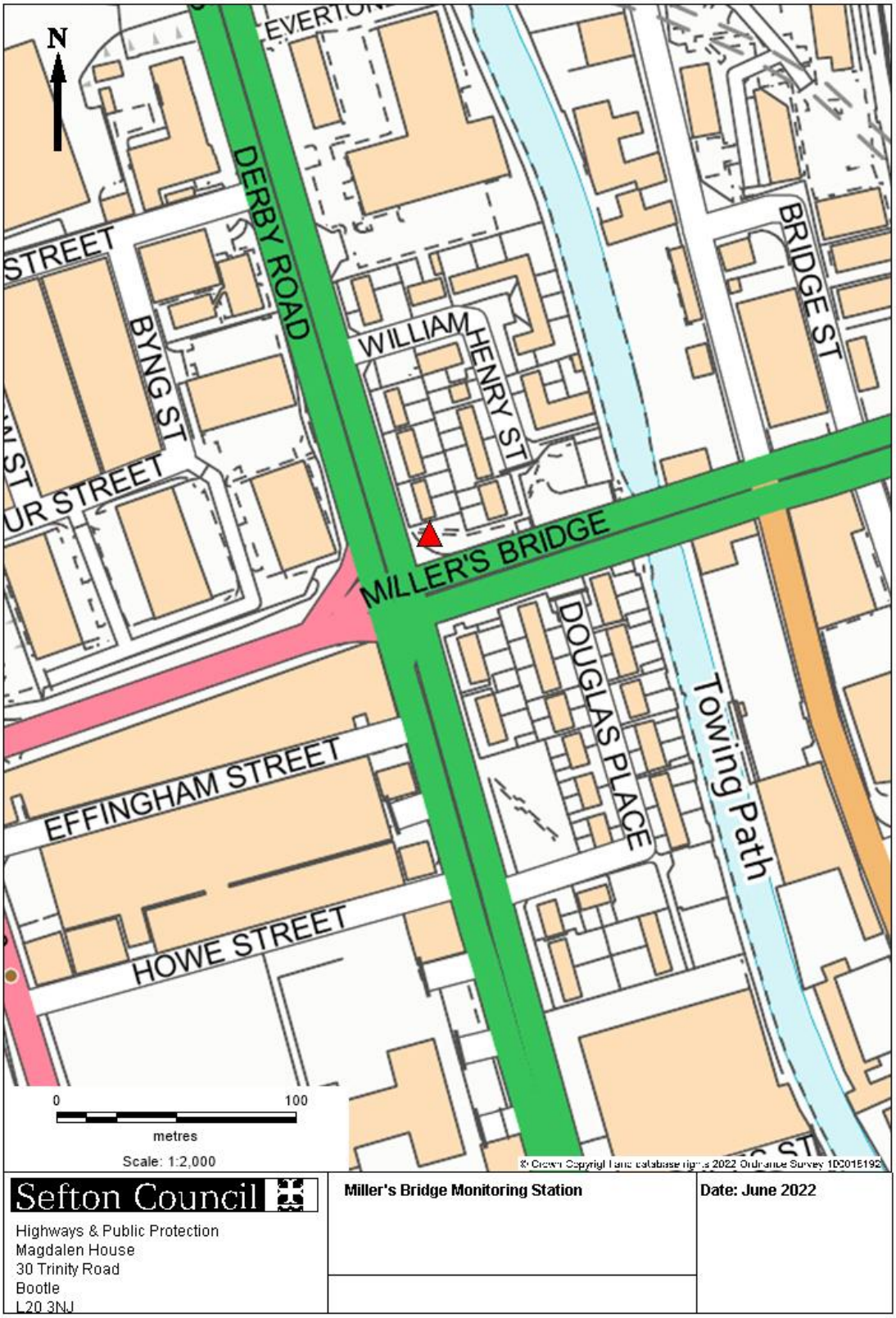
Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
HC	2.5	52.5	40.2	18.6	-	*Warning: Receptor to kerb must be between 0.1m and 50m to calculate concentration. Please check distances and update STEP 2 - Diffusion Tube Inputs tab Columns Distance to Relevant Exposure and Distance to Kerb of Nearest Road*

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

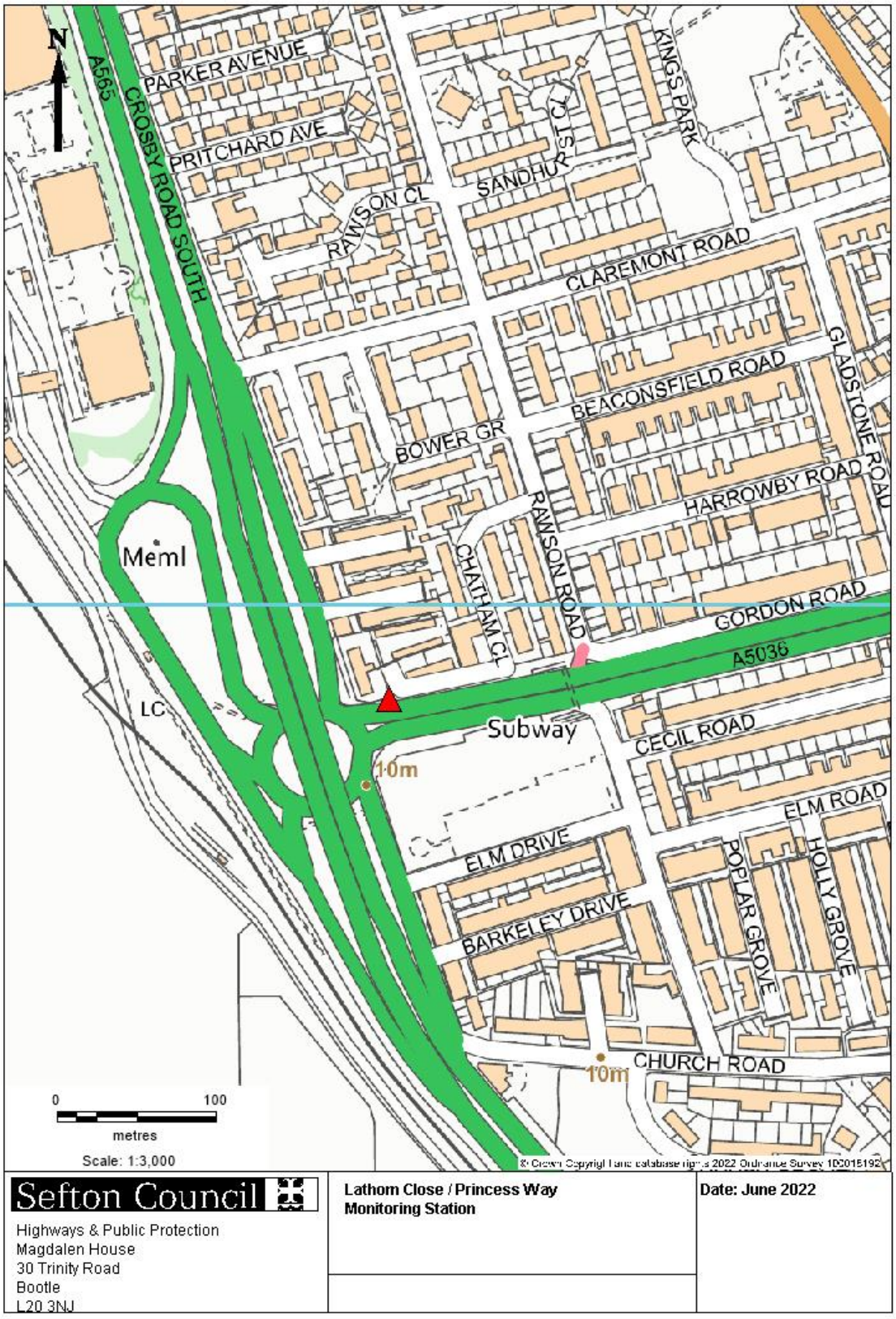
CM2 Automatic Monitoring Station – Crosby Road North



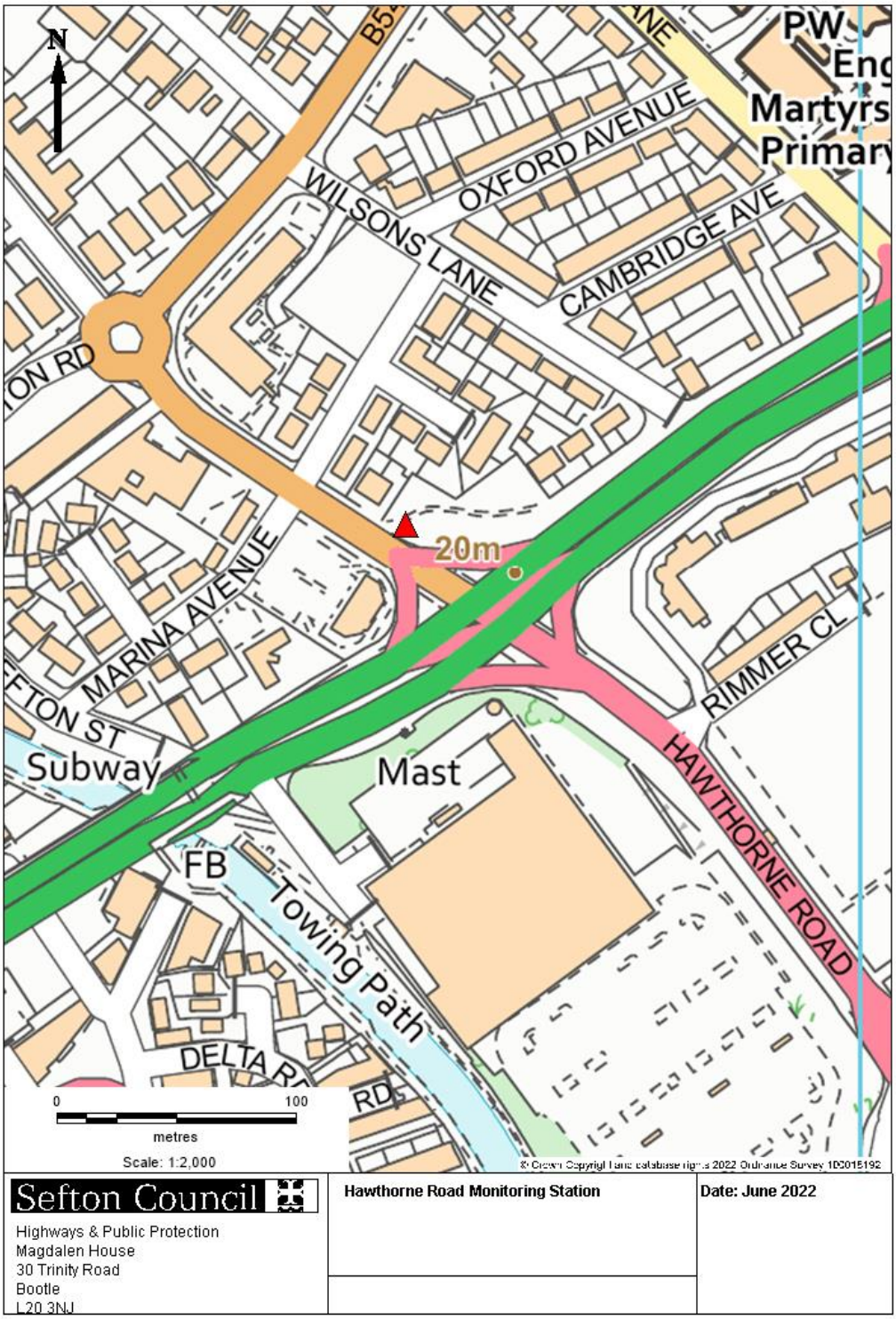
CM3 –Automatic monitoring Station-Millers Bridge



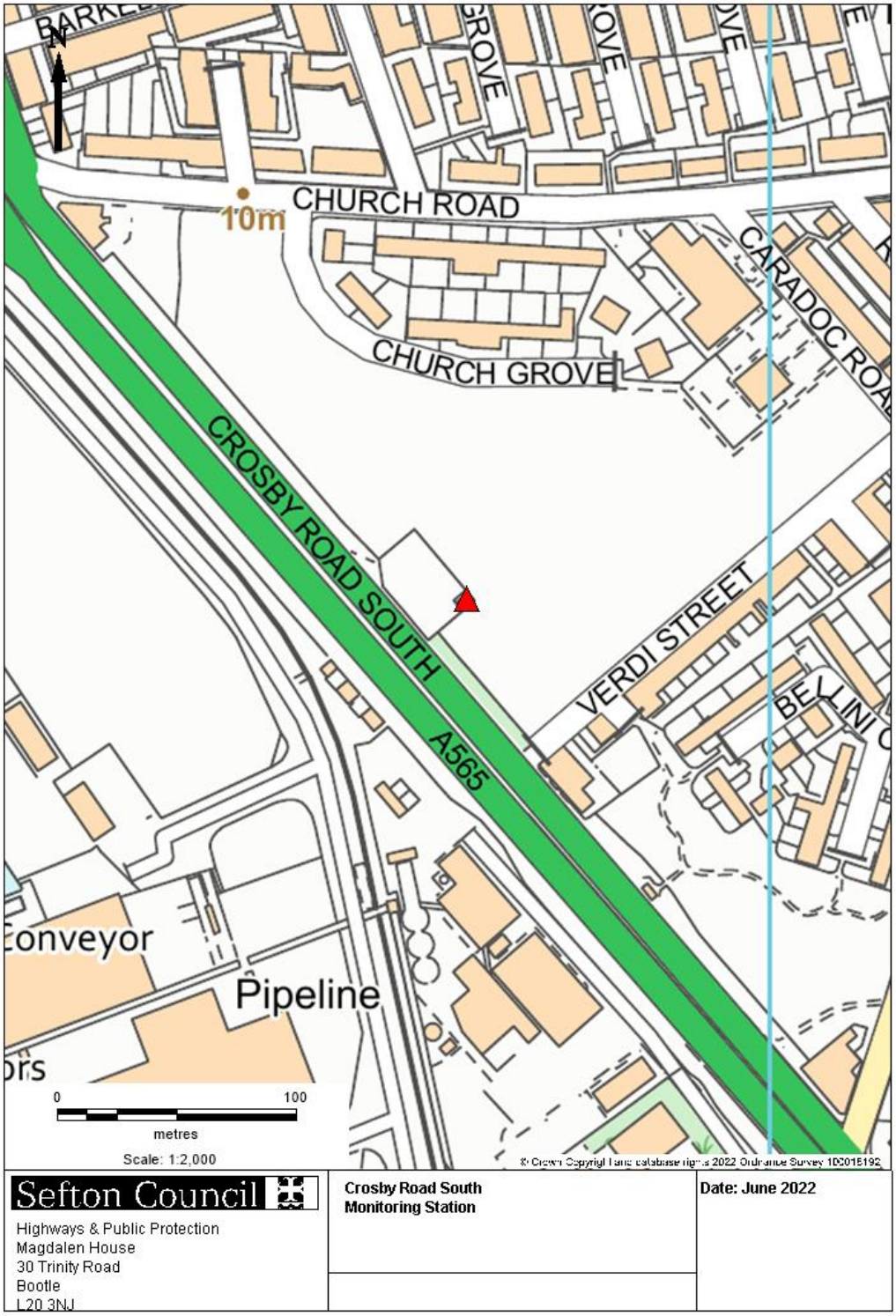
CM4 – Automatic Monitoring Station -Lathom Close



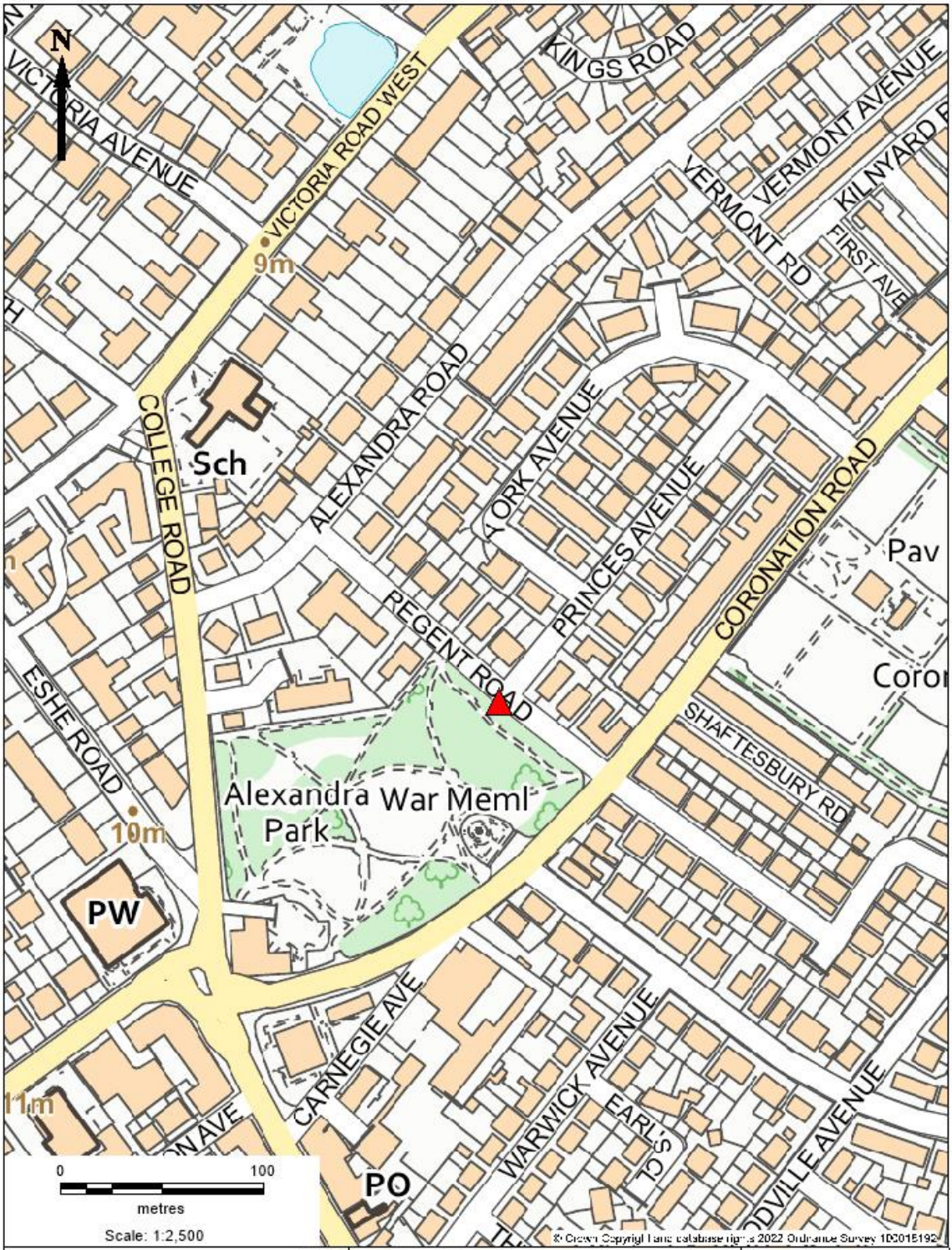
CM5 – Automatic Monitoring Site – Hawthorne Road



CM6 -Automatic Monitoring Station- Crosby Road South

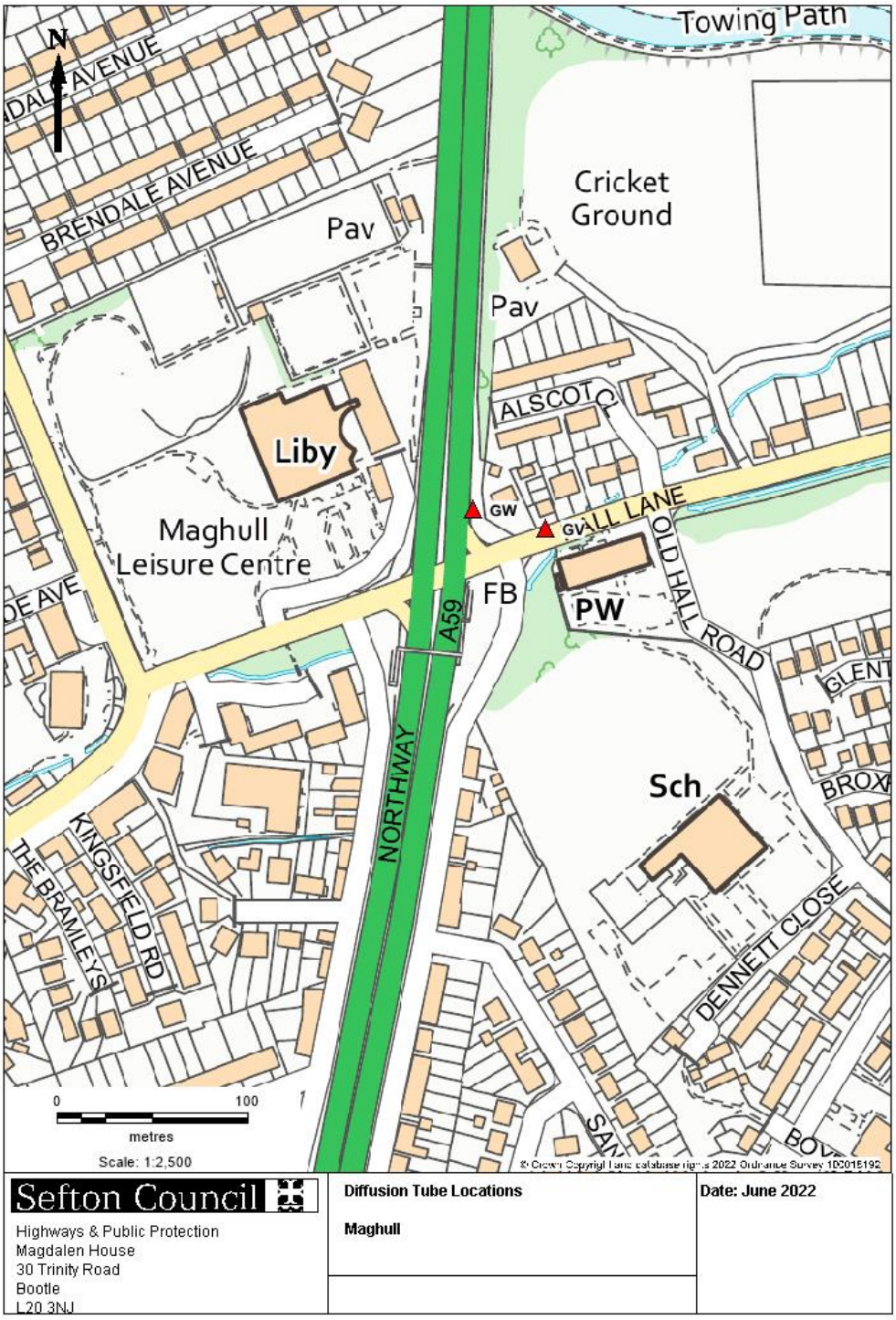


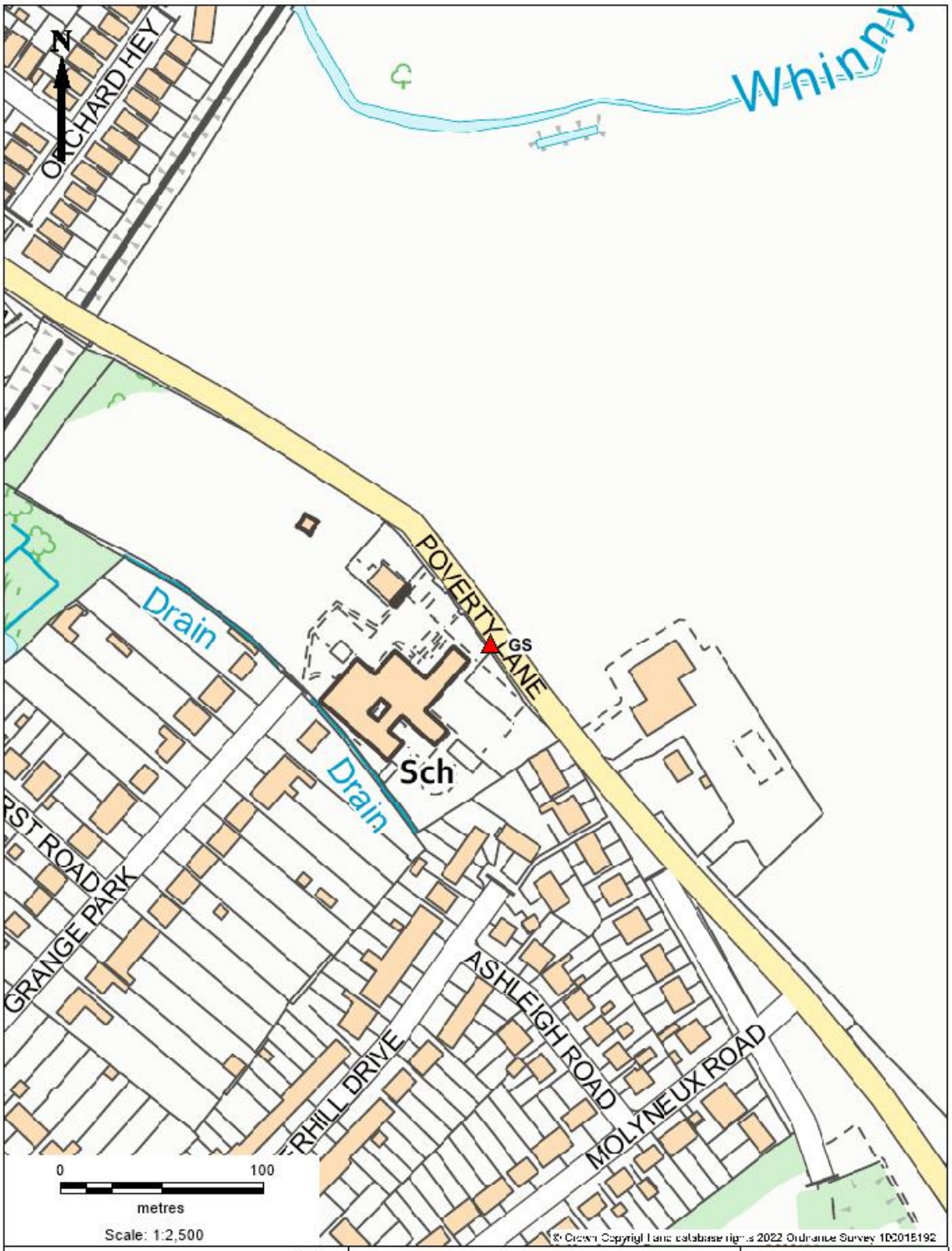
CM7- Automatic Monitoring Site - Regent Road

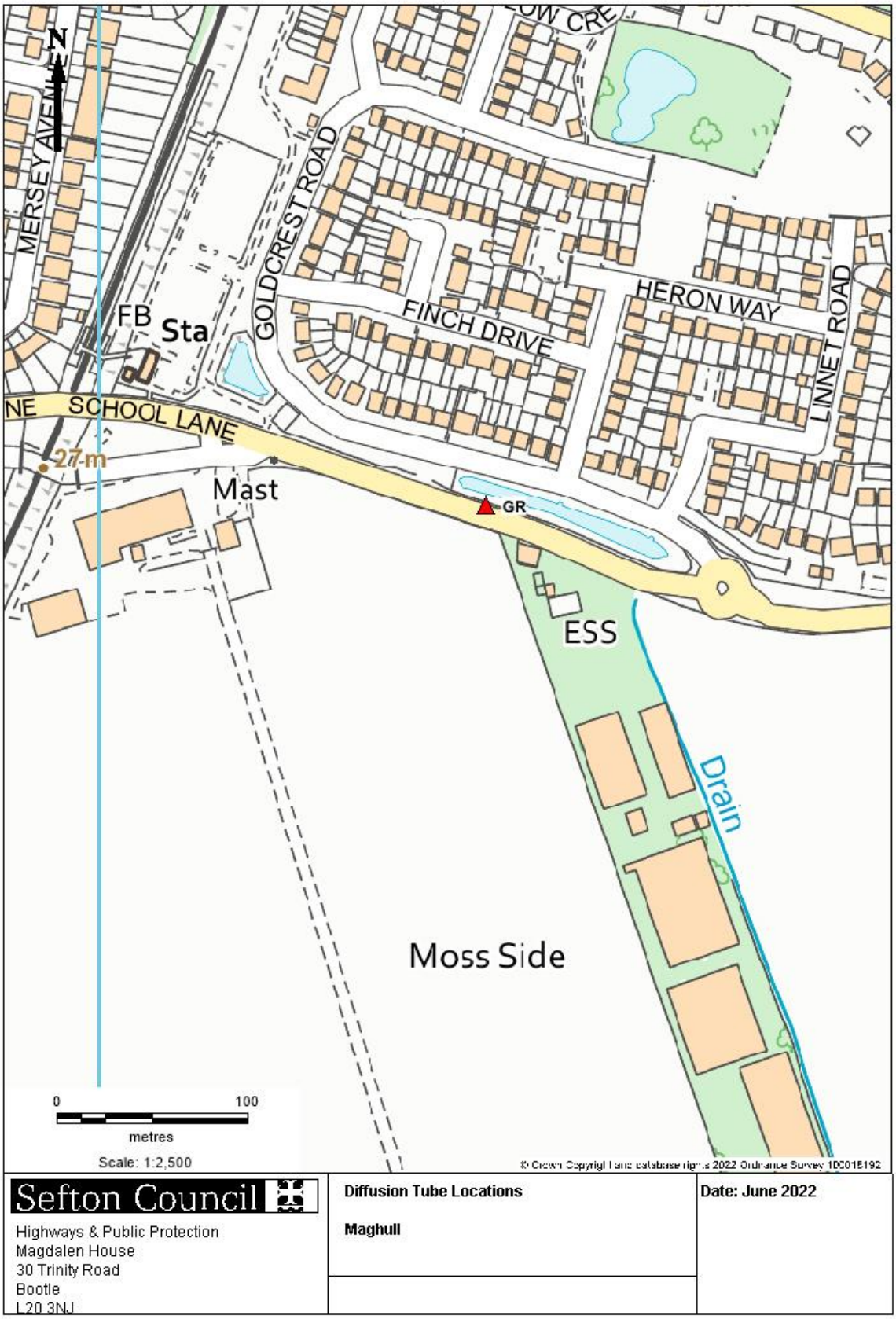


Sefton Council Highways & Public Protection Magdalen House 30 Trinity Road Bootle L20 3NJ	Regent Road Monitoring Station	Date: June 2022

Diffusion Tube Location Maps




N
ORCHARD HEY
Whinny
POVERTY LANE
GS
Drain
Drain
Sch
GRANGE PARK
ASHLEIGH ROAD
MOLYNEUX ROAD
0
100
metres
Scale: 1:2,500
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Maghull
Date: June 2022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MERSEY AVENUE
GOLDCREST ROAD
FINCH DRIVE
HERON WAY
LINNET ROAD
FB
Sta
NE SCHOOL LANE
27m
Mast
GR
ESS
Drain
Moss Side
0
100
metres
Scale: 1:2,500
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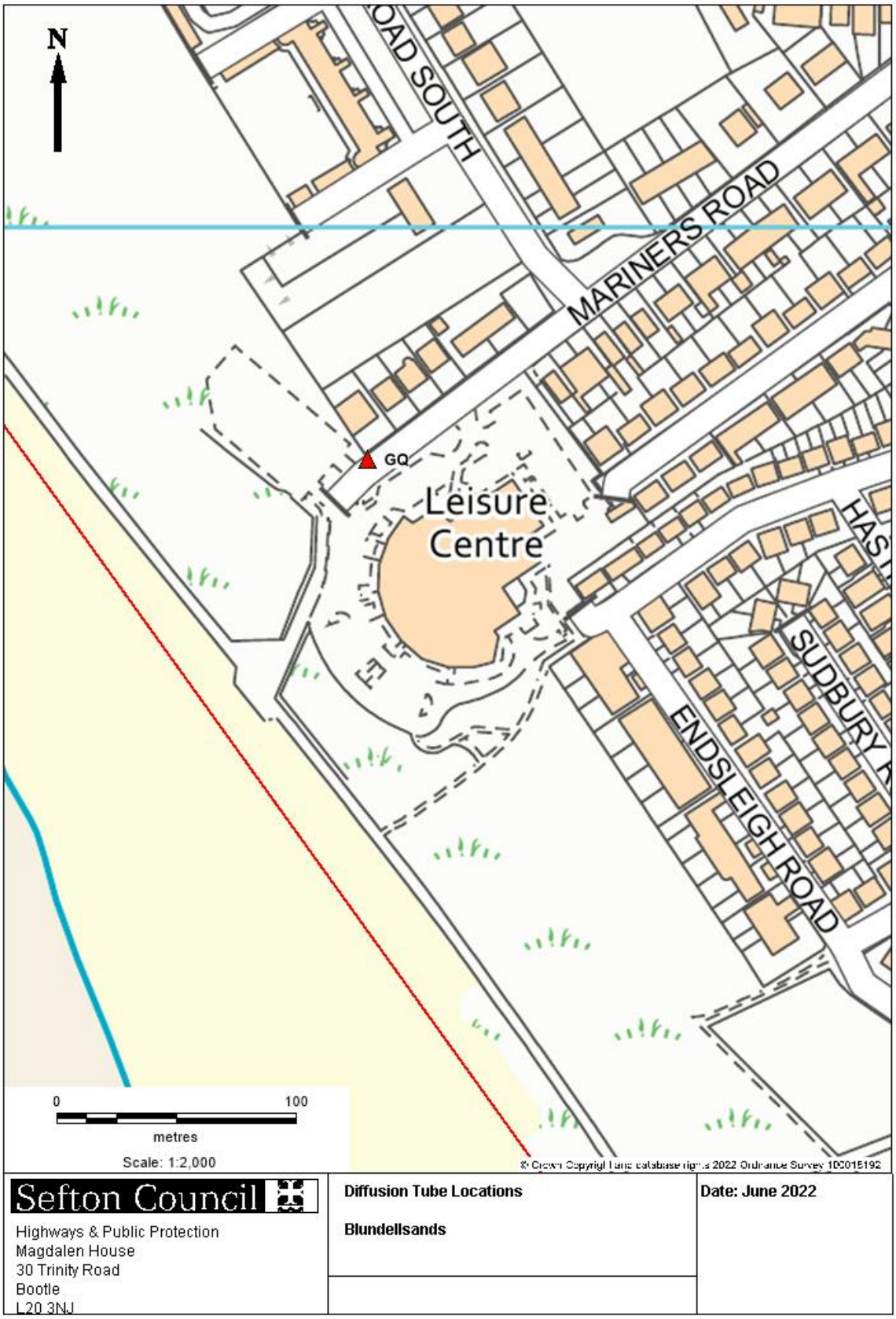
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Maghull
Date: June 2022


N
OAD SOUTH
MARINERS ROAD
GQ
Leisure
Centre
SUDBURY R
ENDSLEIGH ROAD
0
100
metres
Scale: 1:2,000
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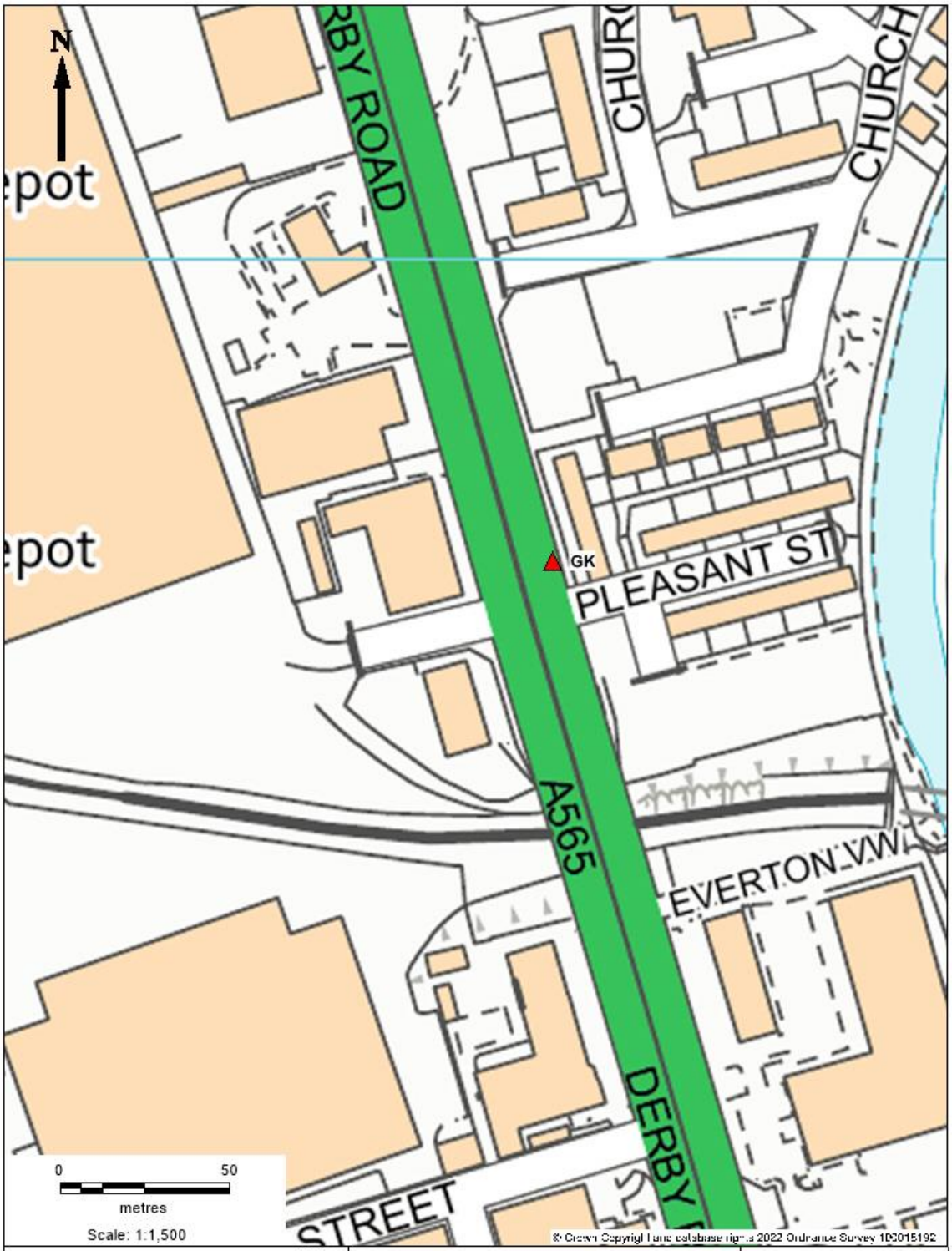
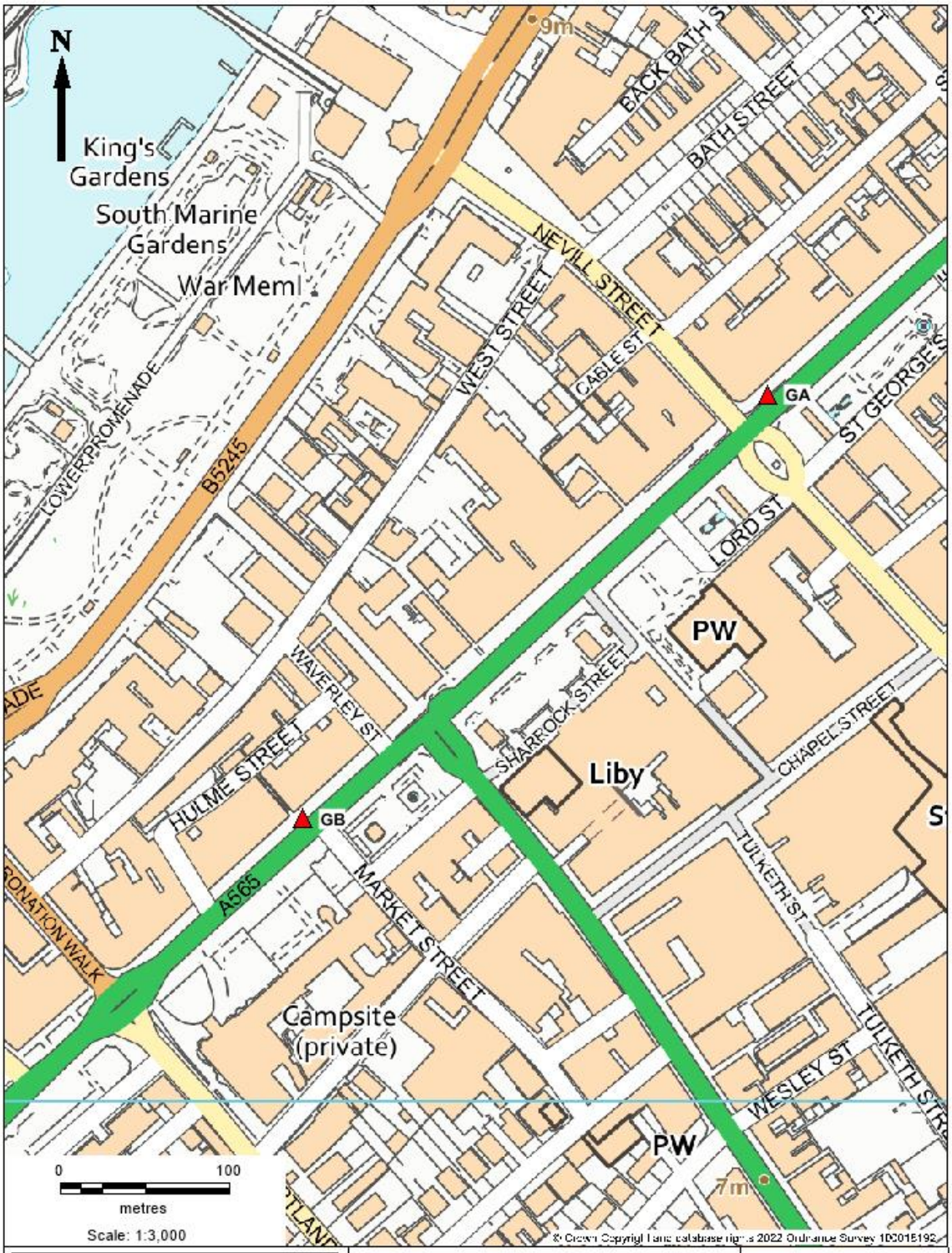
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Blundellsands
Date: June 2022



Sefton Council Highways & Public Protection Magdalen House 30 Trinity Road Bootle L20 3NJ	**Diffusion Tube Locations** **Bootle**	**Date: June 2022**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King's Gardens
South Marine Gardens
War Meml
LOWER PROMENADE
B5245
WEST STREET
NEVILL STREET
CABLE ST
BACK BATH ST
BATH STREET
GA
ST GEORGE'S
LORD ST
PW
SHARROCK STREET
CHAPEL STREET
Liby
WAVERLEY ST
HULME STREET
GB
A565
MARKET STREET
TULKETH ST
WESLEY ST
Campsite (private)
9m
7m
0
100
metres
Scale: 1:3,000
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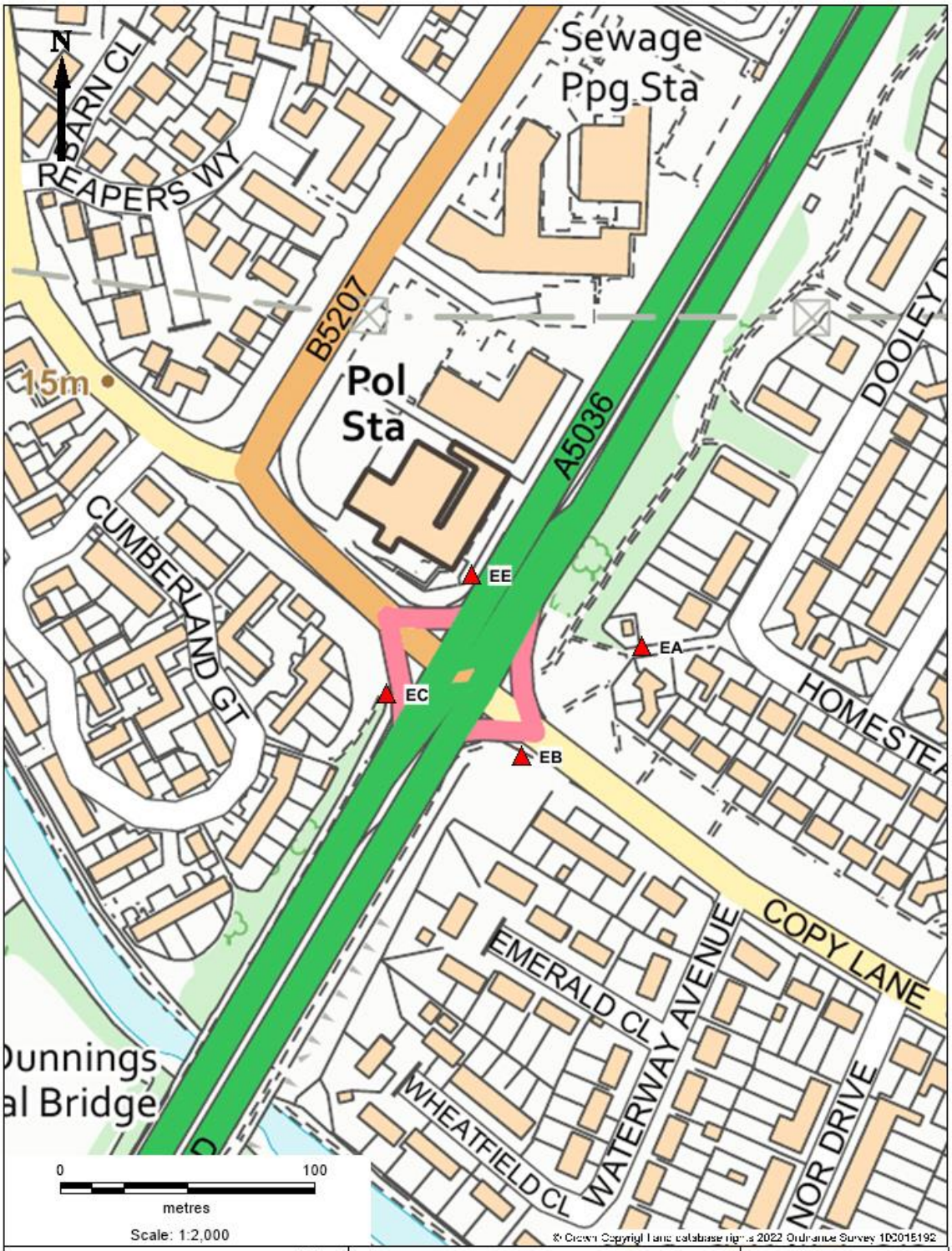
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Southport
Date: June 2022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REAPERS WY
Sewage
Ppg Sta
B5207
Pol
Sta
A5036
DOOLEY
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CUMBERLAND GT
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HOMESTE
COPY LANE
EMERALD CL
WATERWAY AVENUE
WHEATFIELD CL
NOR DRIVE
unnings
al Bridge
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metres
Scale: 1:2,000
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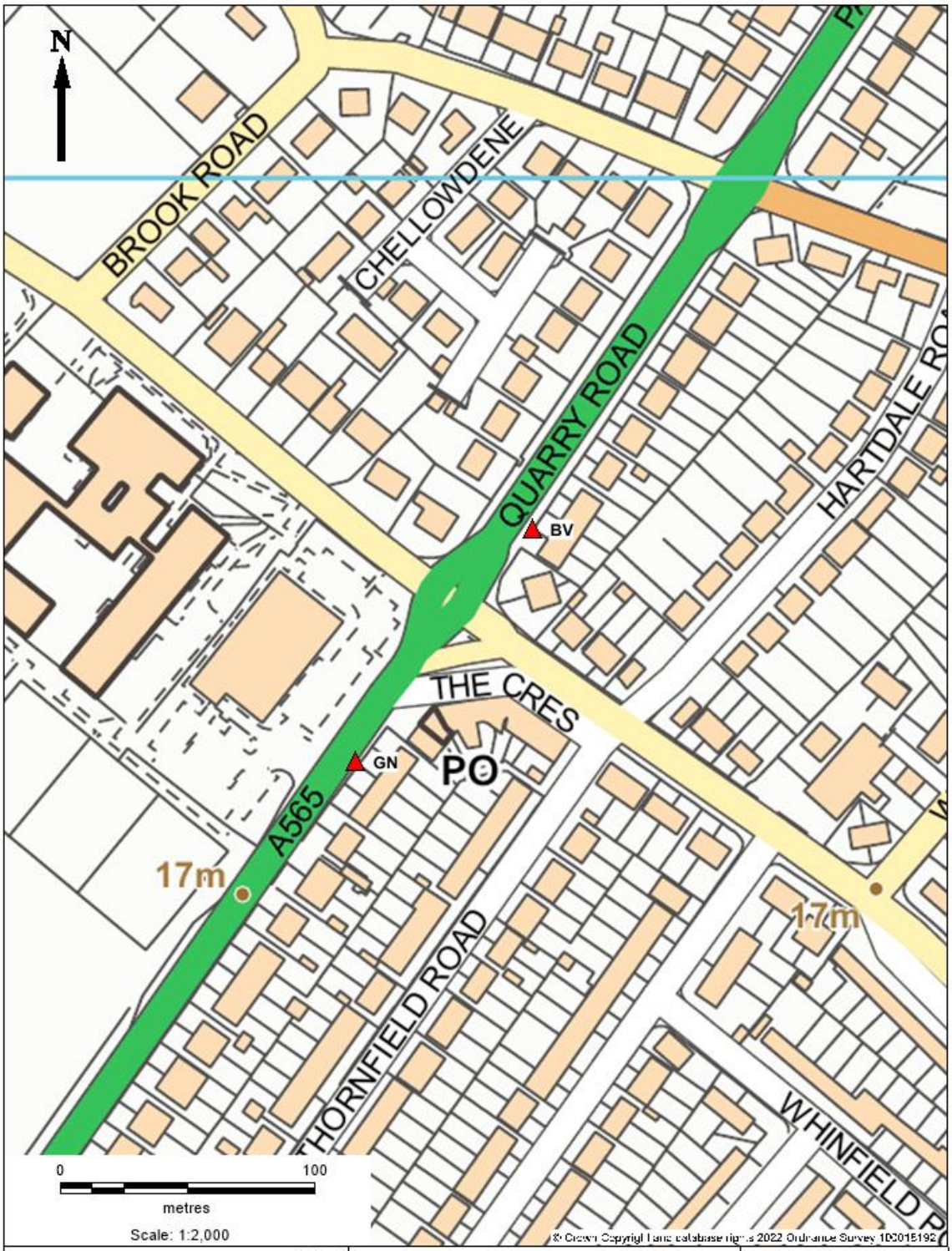
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Netherton
Date: June 2022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CHELLOWDENE
QUARRY ROAD
HARTDALE RO
BV
THE CRES
GN
PO
A565
17m
17m
THORNFIELD ROAD
WHINFIELD P
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100
metres
Scale: 1:2,000
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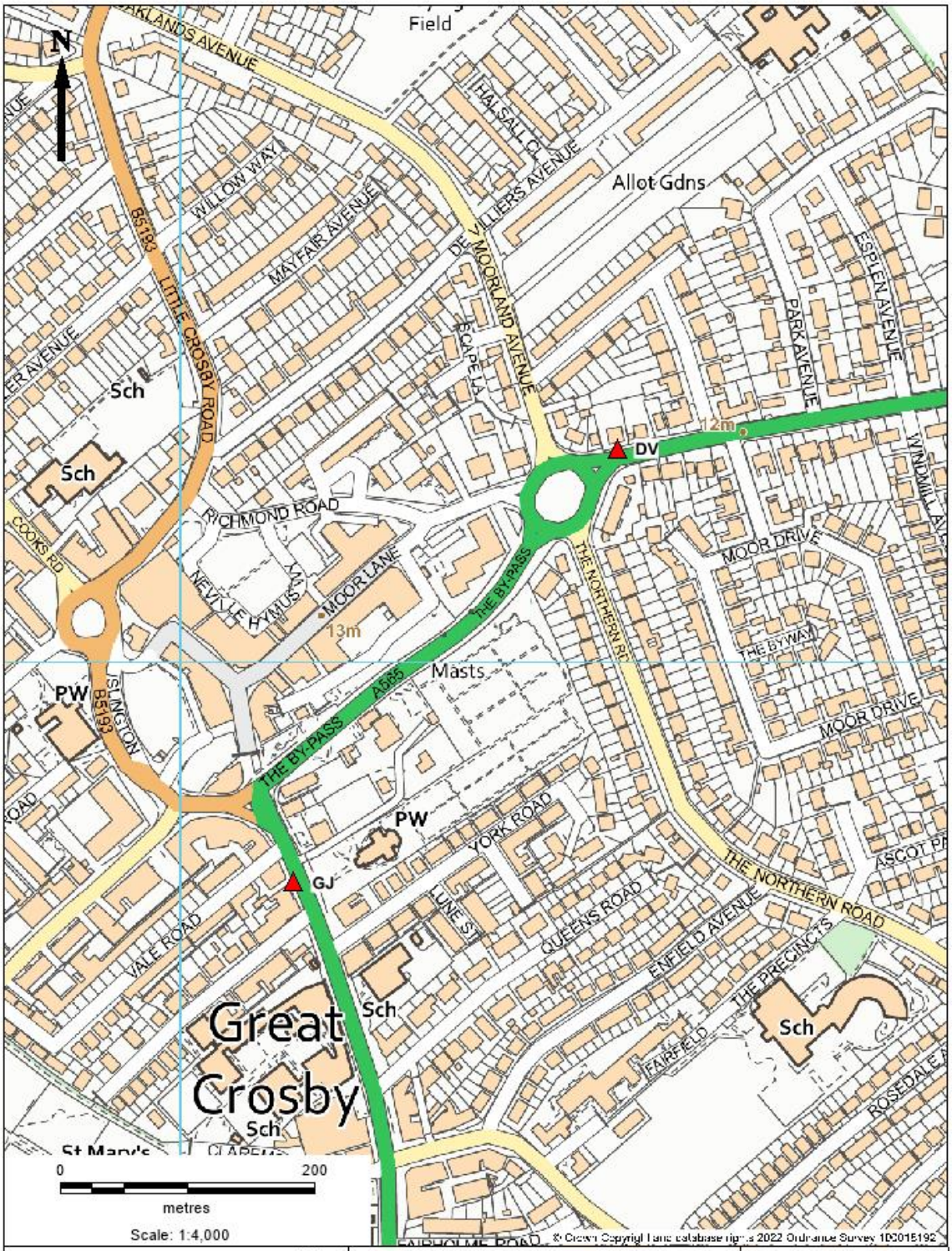
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Thornton
Date: June 2022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MAYFAIR AVENUE
B5193
LITTLE CROSBY ROAD
DE VILLIERS AVENUE
Allot Gdns
HALSALL CL
DE MOORLAND AVENUE
ESCAPE LA
PARK AVENUE
ESPLEN AVENUE
Sch
Sch
2m
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RICHMOND ROAD
COOKS RD
NEVILLE HYMUS
MOOR LANE
13m
THE BY-PASS
THE NORTHERN RD
MOOR DRIVE
THE BYWAY
Masts
A565
PW
ISLINGTON
B5193
THE BY-PASS
PW
YORK ROAD
GJ
LUNE ST
QUEENS ROAD
ENFIELD AVENUE
THE NORTHERN ROAD
VALE ROAD
Great
Crosby
Sch
Sch
Sch
FAIRFIELD
THE PRECINCTS
ROSEDALE
0
200
metres
Scale: 1:4,000
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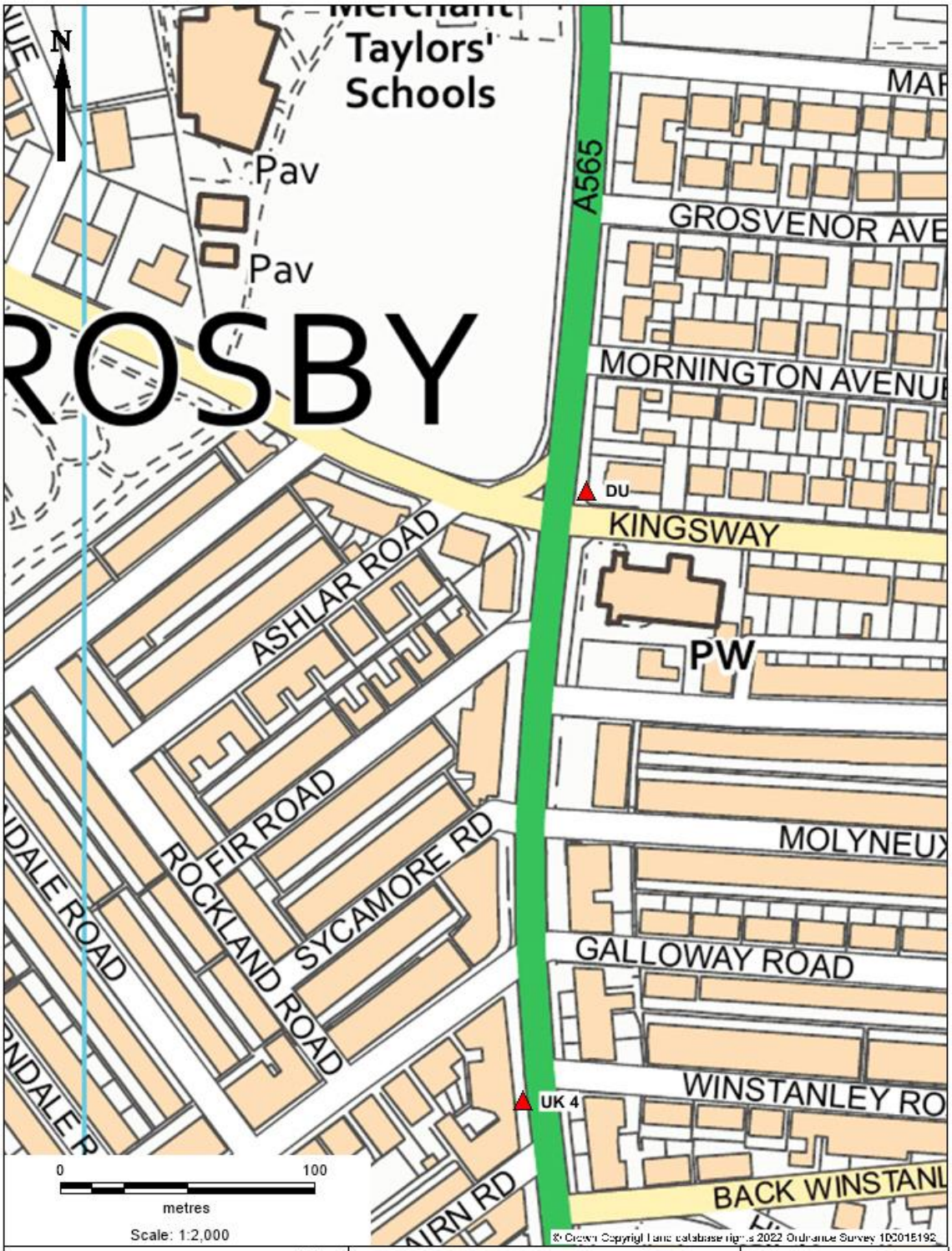
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Crosby
Date: June 2022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Schools
Pav
Pav
ROSBY
A565
GROSVENOR AVE
MORNINGTON AVENUE
DU
KINGSWAY
PW
ASHLAR ROAD
FIR ROAD
ROCKLAND ROAD
SYCAMORE RD
MOLYNEUX
GALLOWAY ROAD
WINSTANLEY RO
UK 4
BACK WINSTANL
0
100
metres
Scale: 1:2,000
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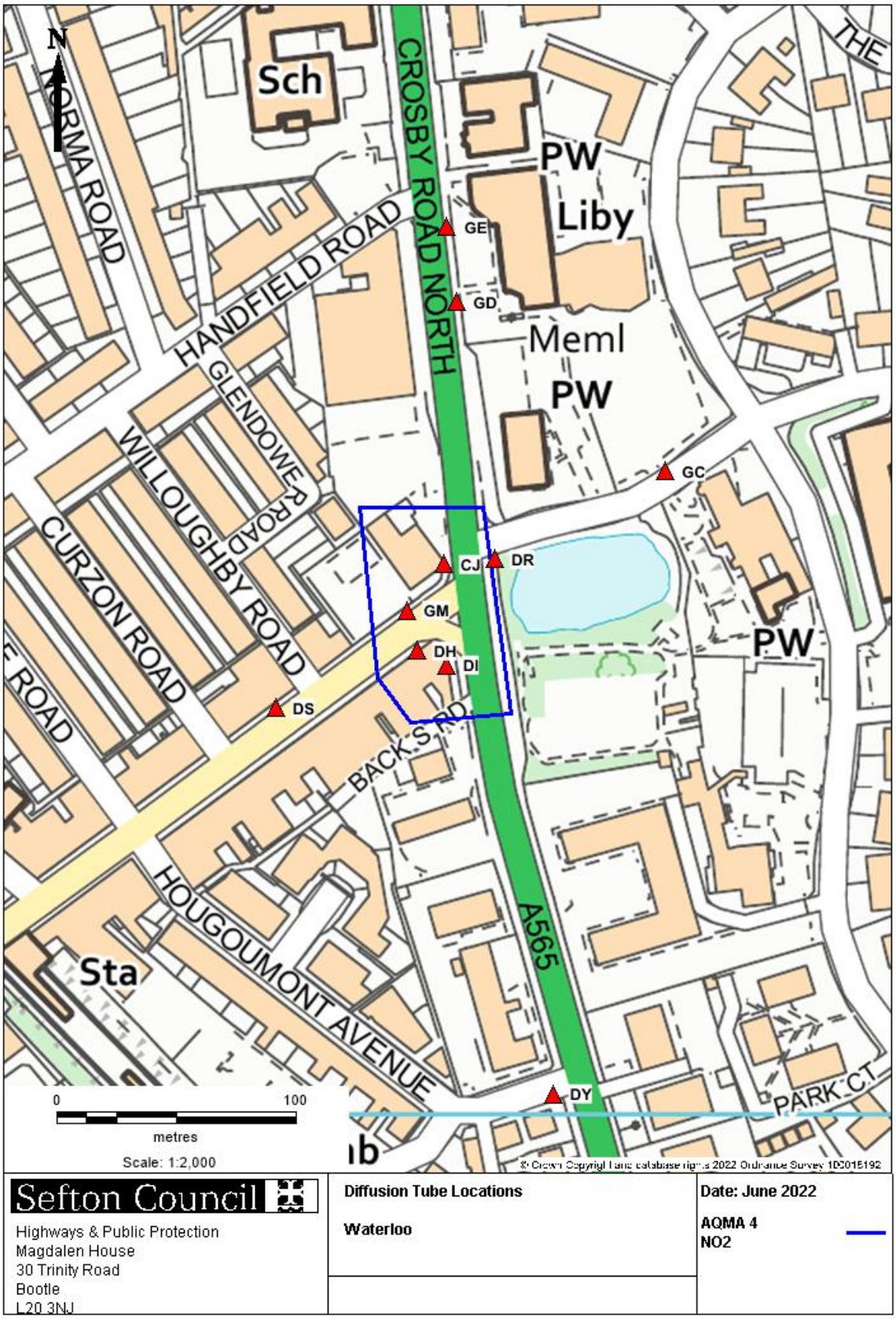
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Crosby and Waterloo
Date: June 2022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Sch
CROSBY ROAD NORTH
THE
PW
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GD
HANDFIELD ROAD
NORMA ROAD
Meml
PW
GLENDOWER ROAD
WILLOUGHBY ROAD
CURZON ROAD
GC
CJ
DR
GM
DH
DI
PW
DS
BACK S RD
HOUGOUMONT AVENUE
A565
Sta
DY
PARK CT
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metres
Scale: 1:2,000
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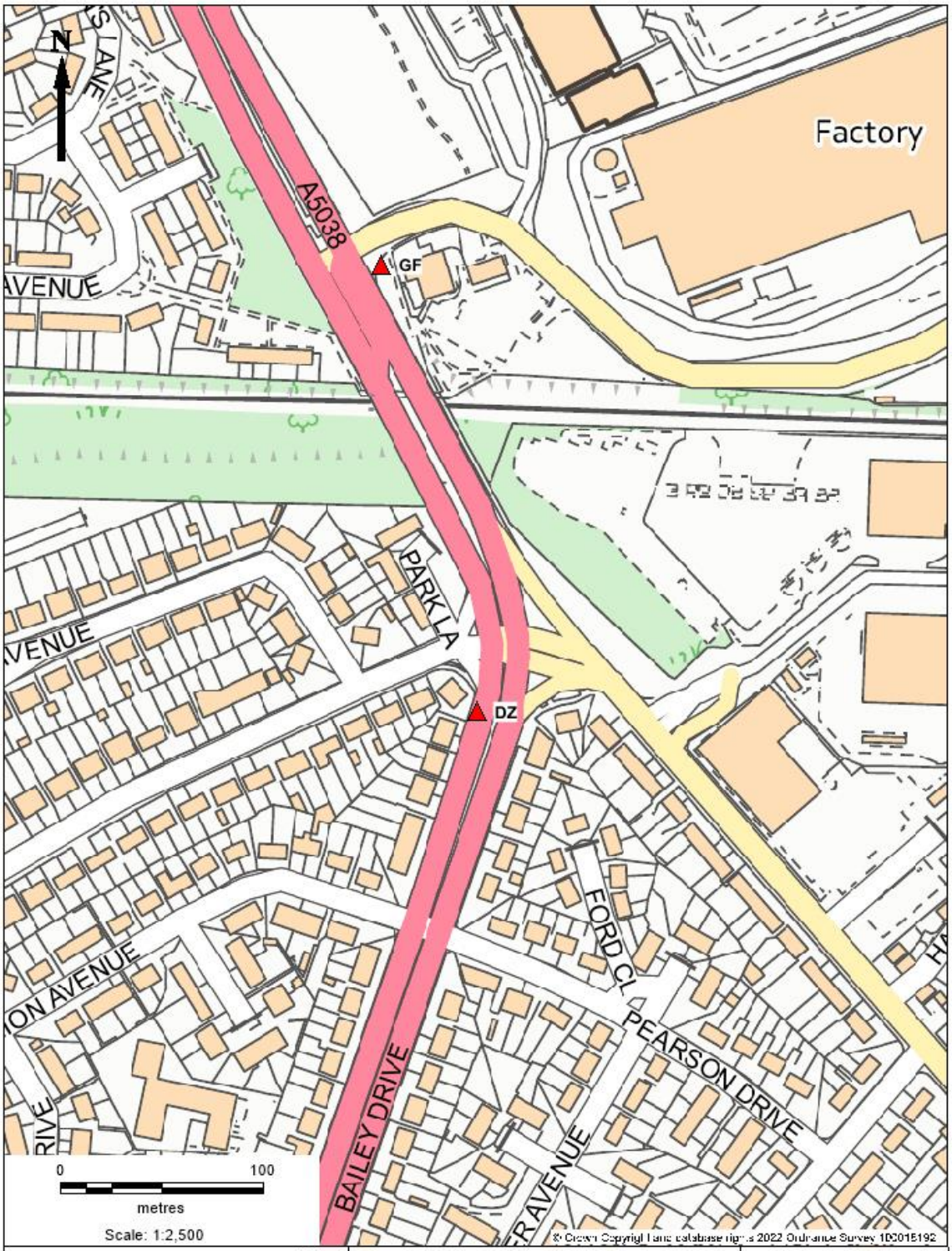
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Waterloo
Date: June 2022
AQMA 4
NO2



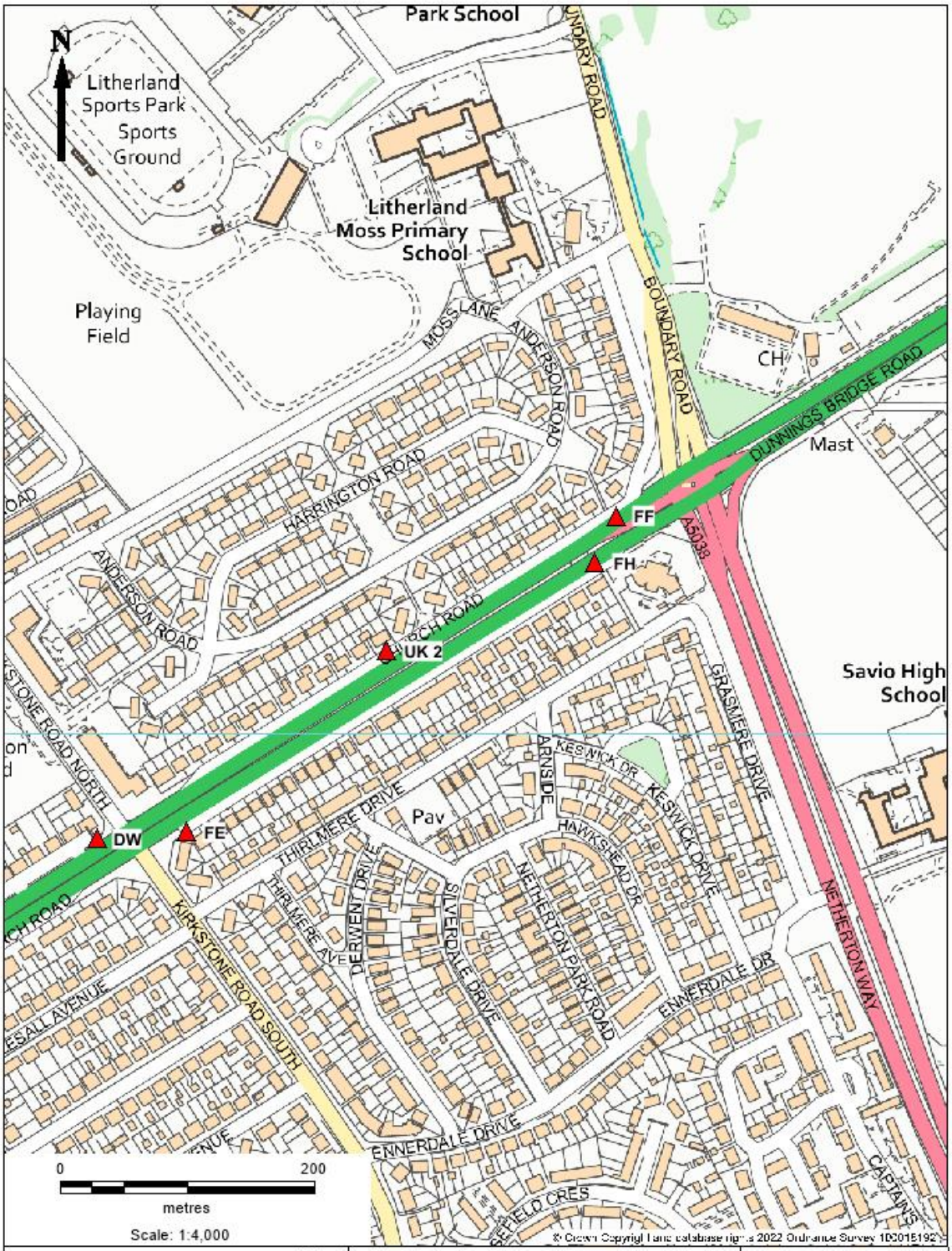
Sefton Council

Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

Diffusion Tube Locations

Bootle and Netherton

Date: June 2022

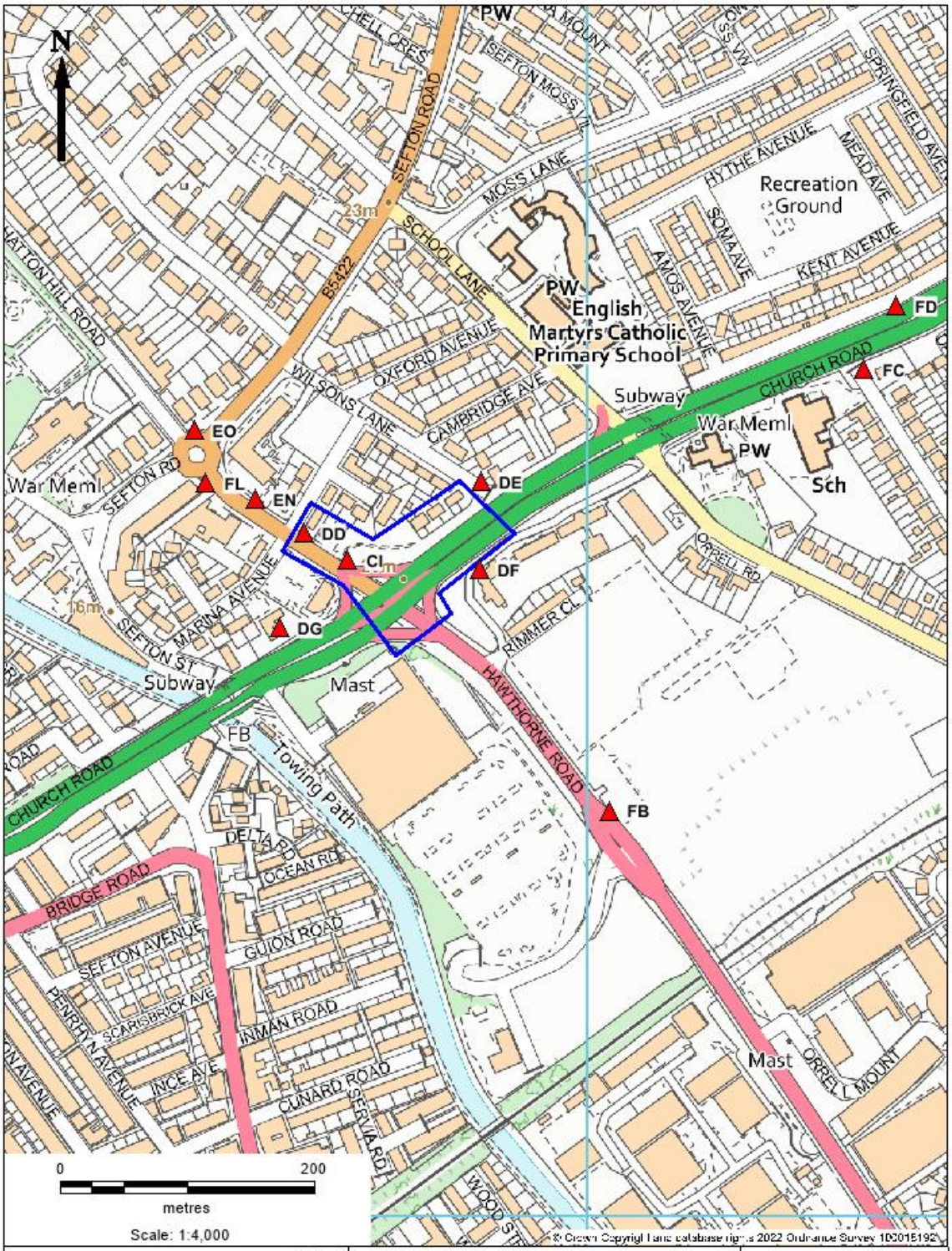


Sefton Council

Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

Diffusion Tube Locations
Litherland

Date: June 2022



Sefton Council

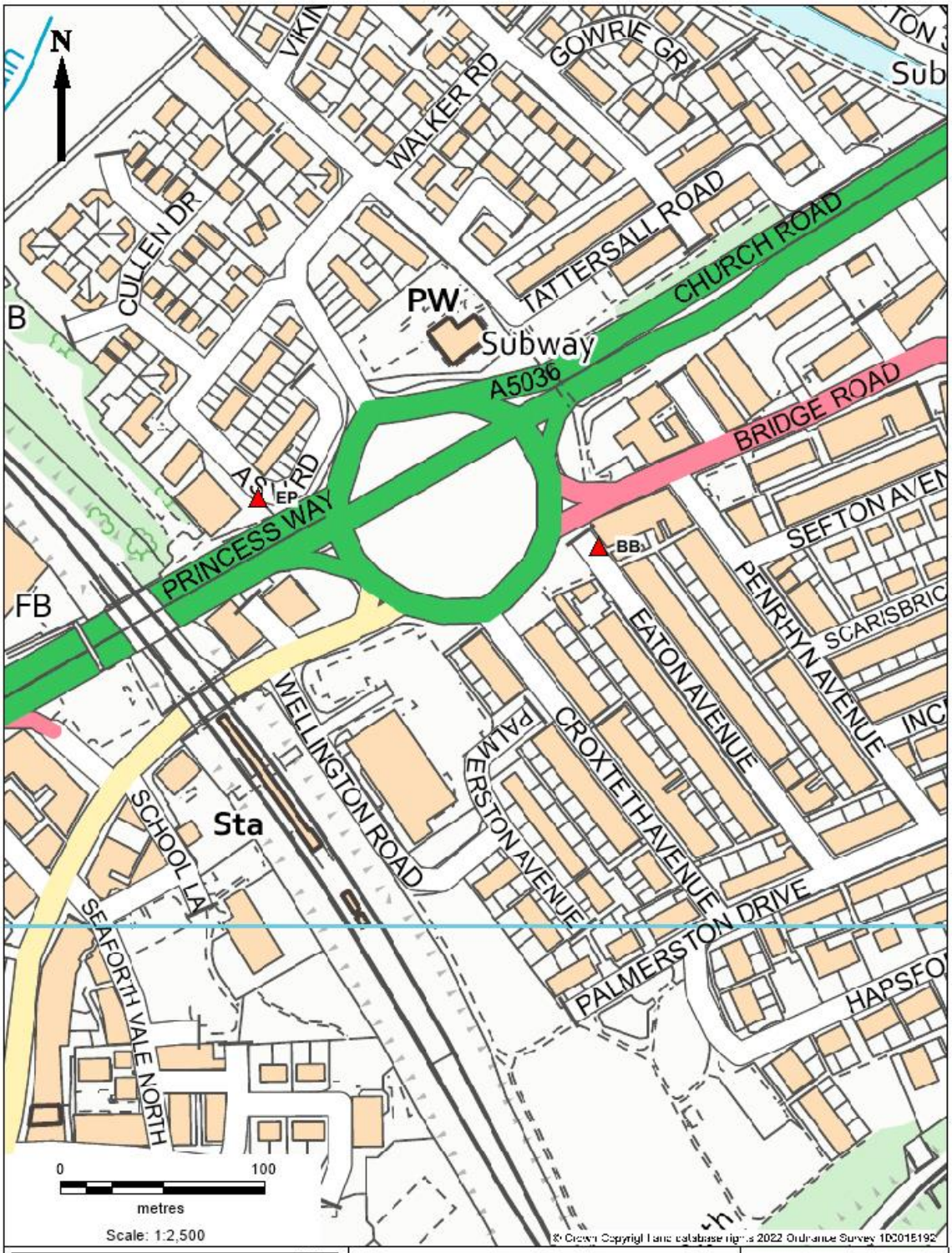
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

Diffusion Tube Locations

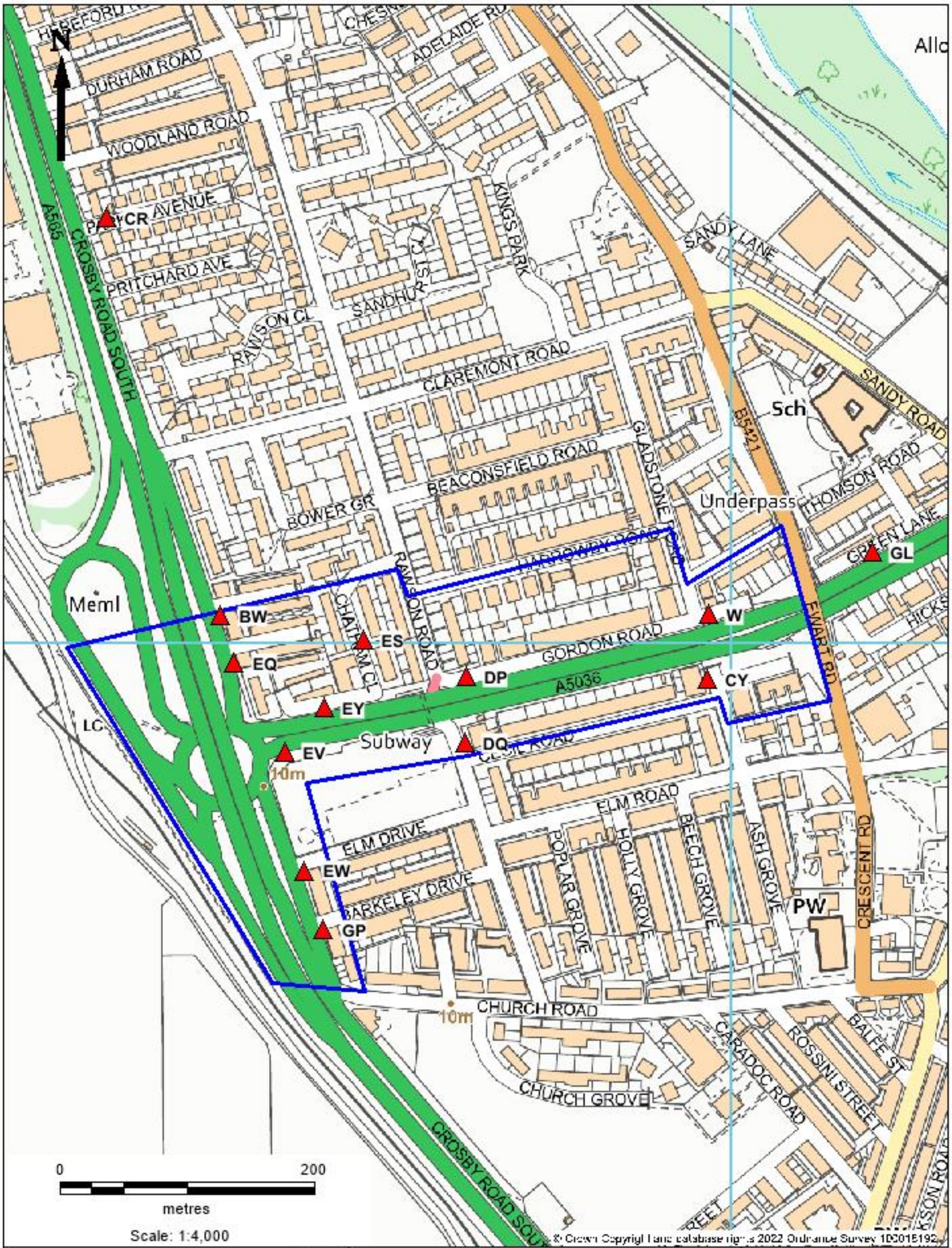
Litherland

Date: June 2022

AQMA 5
NO2



Sefton Council Highways & Public Protection Magdalen House 30 Trinity Road Bootle L20 3NJ	**Diffusion Tube Locations** **Litherland and Seaforth**	**Date: June 2022**



Sefton Council

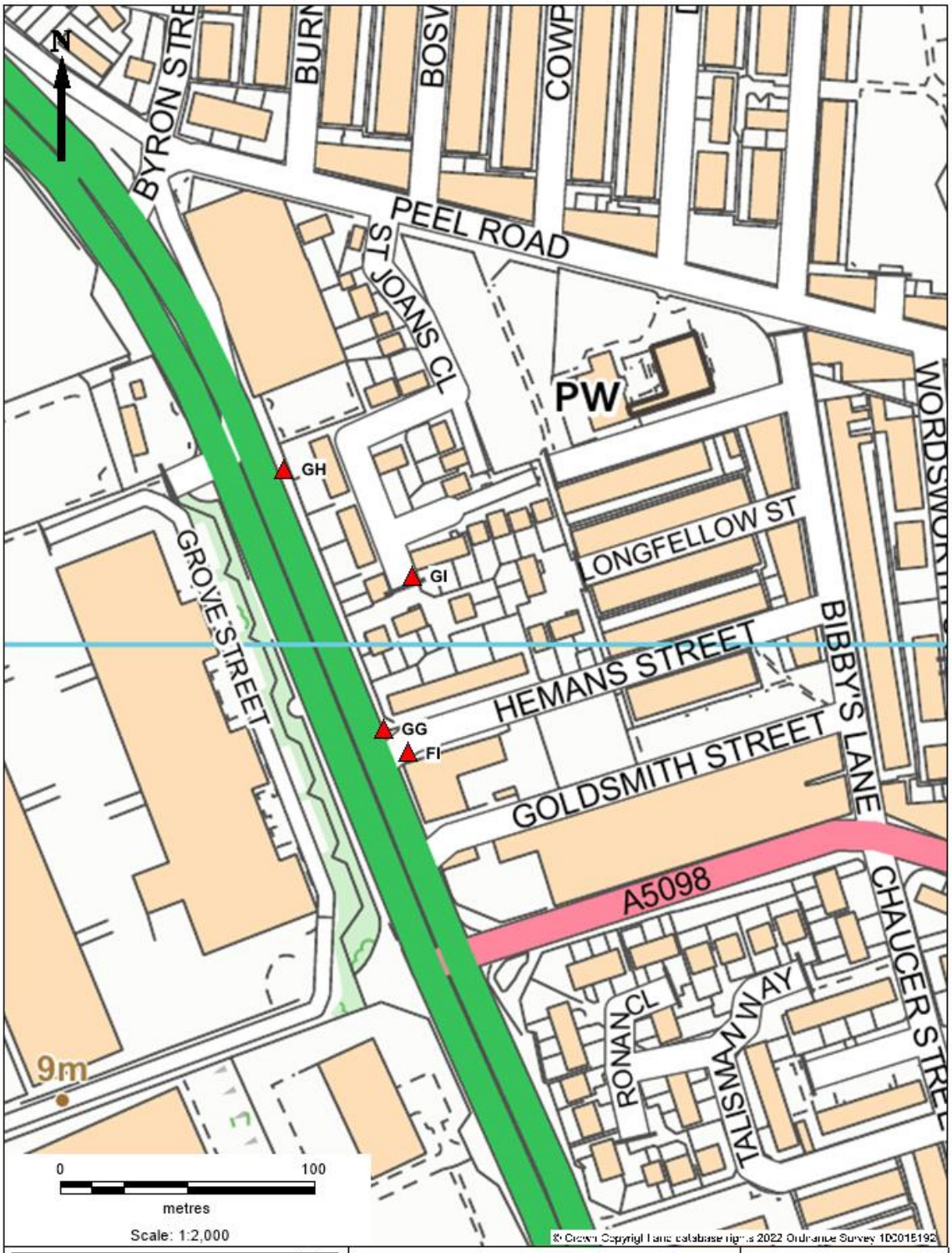
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

Diffusion Tube Locations

Seaforth

Date: June 2022

AQMA 2
NO2


N
BYRON STRE
BURN
BOSW
COWP
PEEL ROAD
ST JOANS CL
PW
WORDSWORTH
GH
LONGFELLOW ST
GROVE STREET
GI
HEMANS STREET
BIBBY'S LANE
GG
FI
GOLDSMITH STREET
A5098
CHAUCER STREET
RONAN CL
TALISMAN WAY
9m
0
100
metres
Scale: 1:2,000
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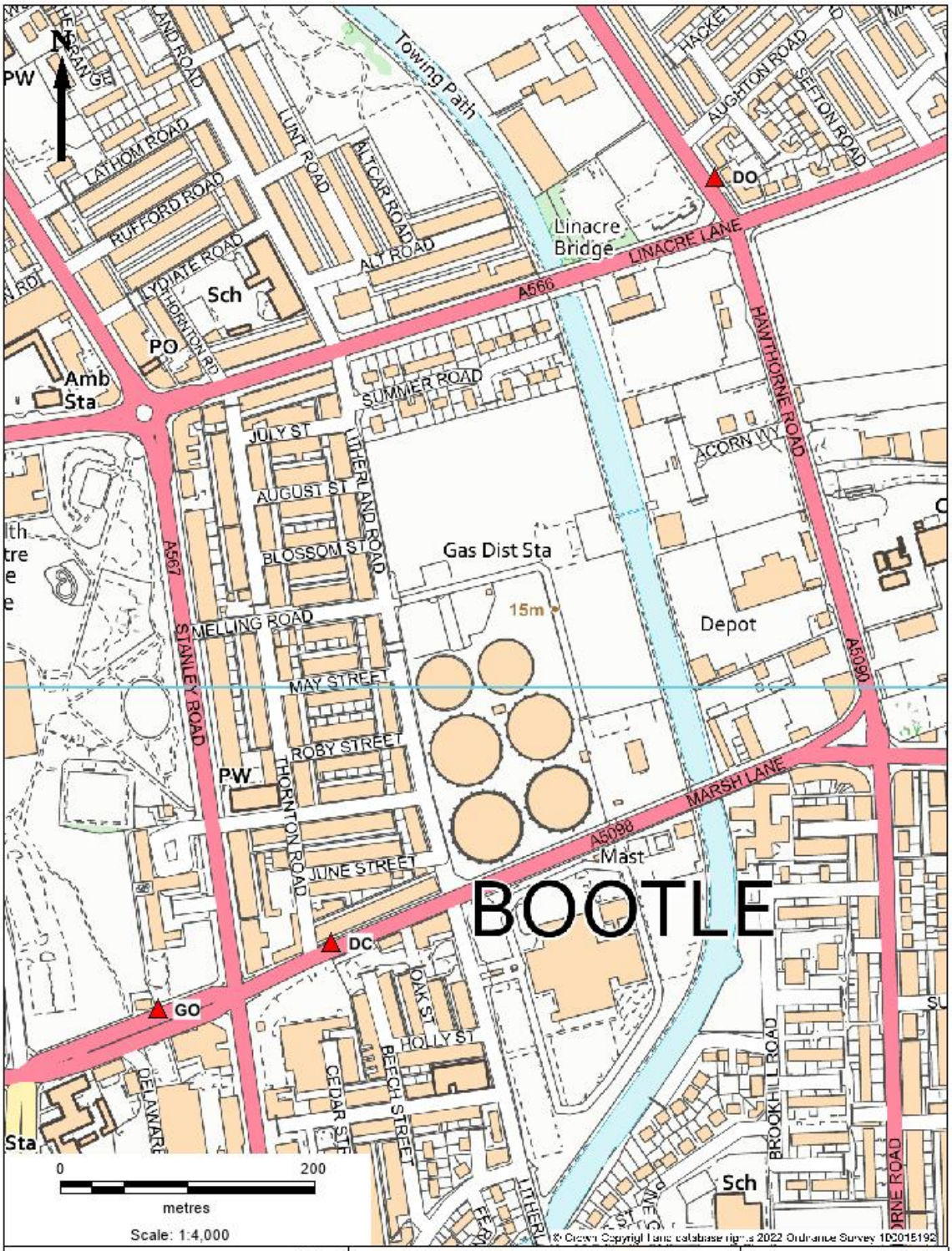
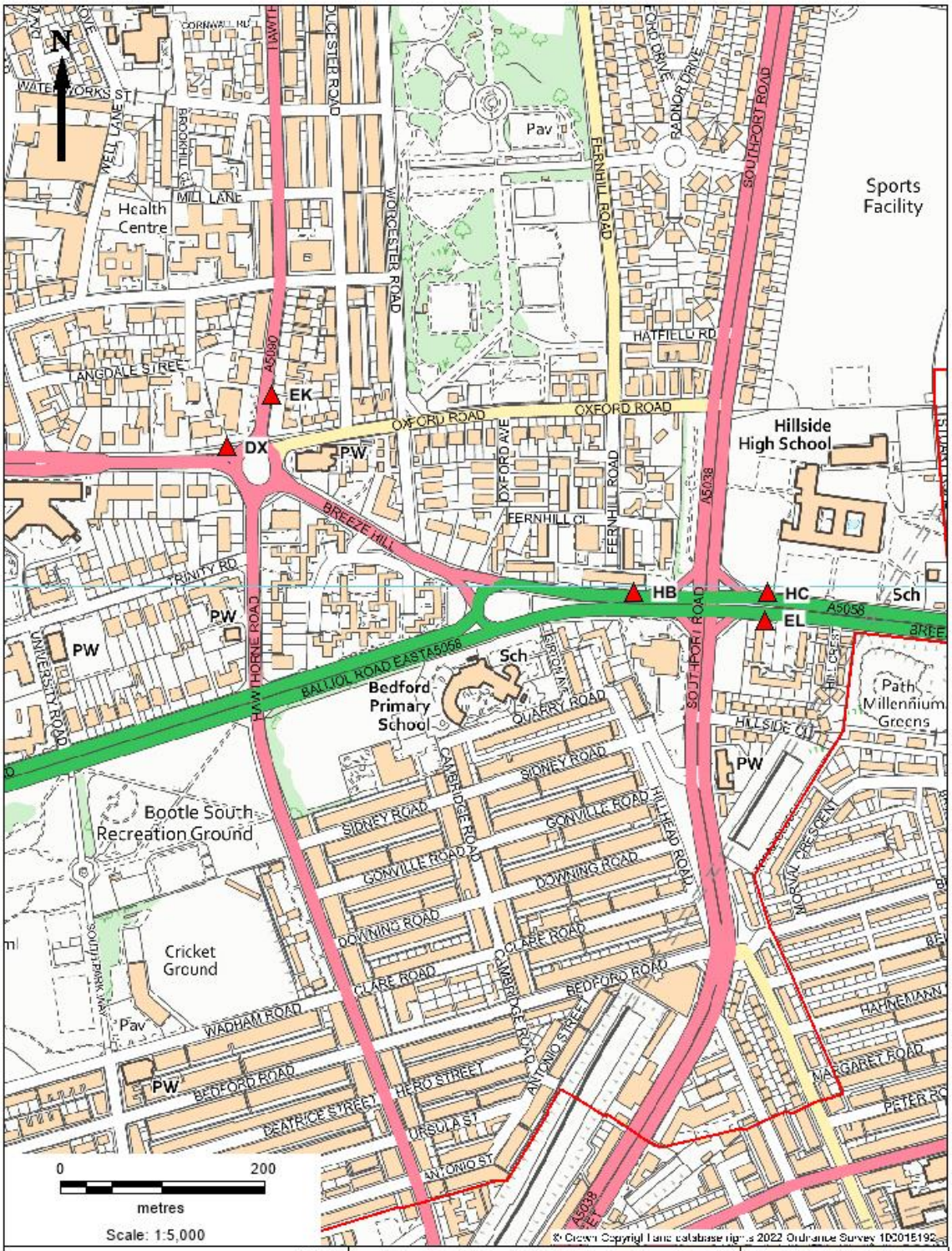
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle
Date: June 2022



Sefton Council Highways & Public Protection Magdalen House 30 Trinity Road Bootle L20 3NJ	**Diffusion Tube Locations** **Bootle**	**Date: June 2022**



Sefton Council

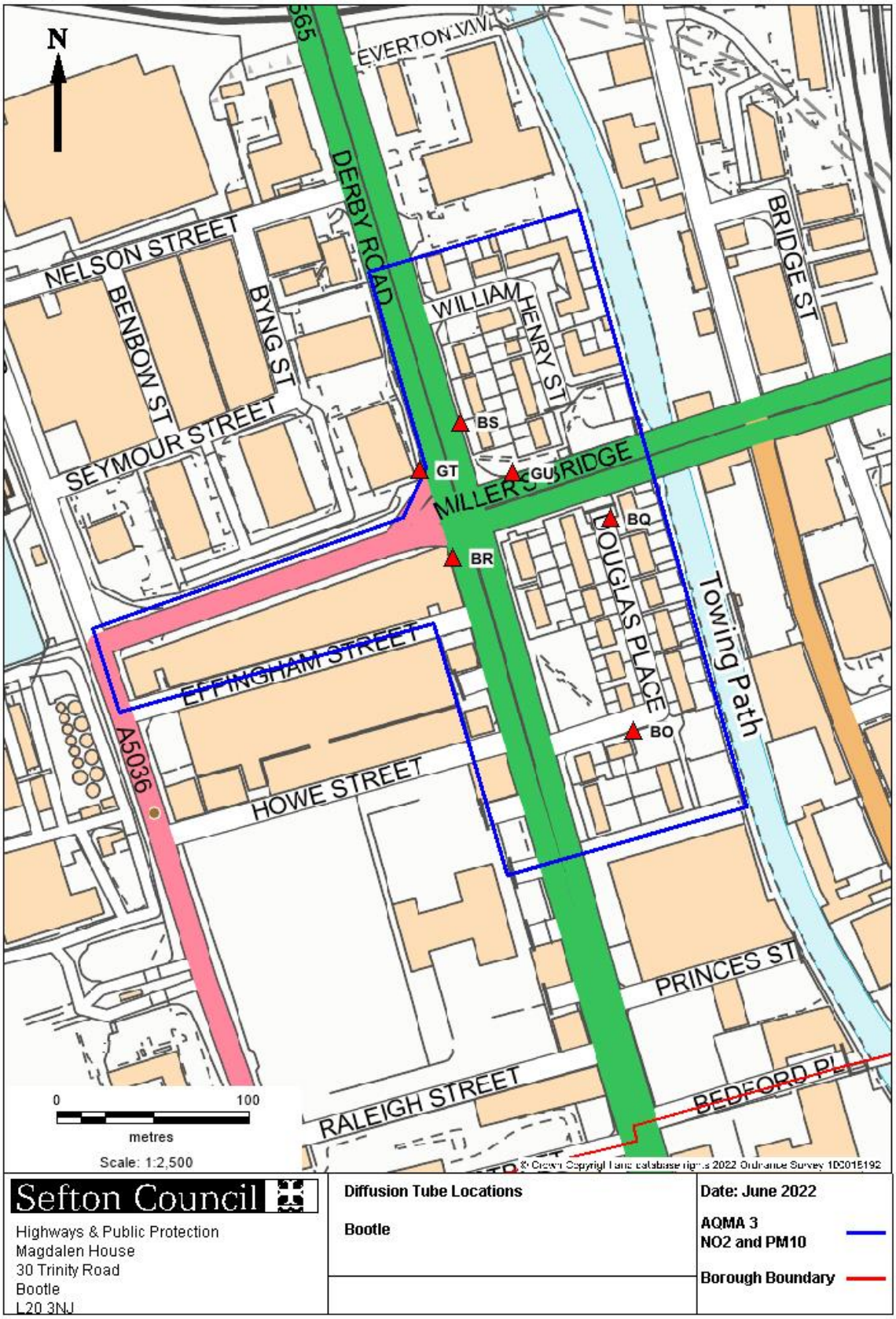
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ

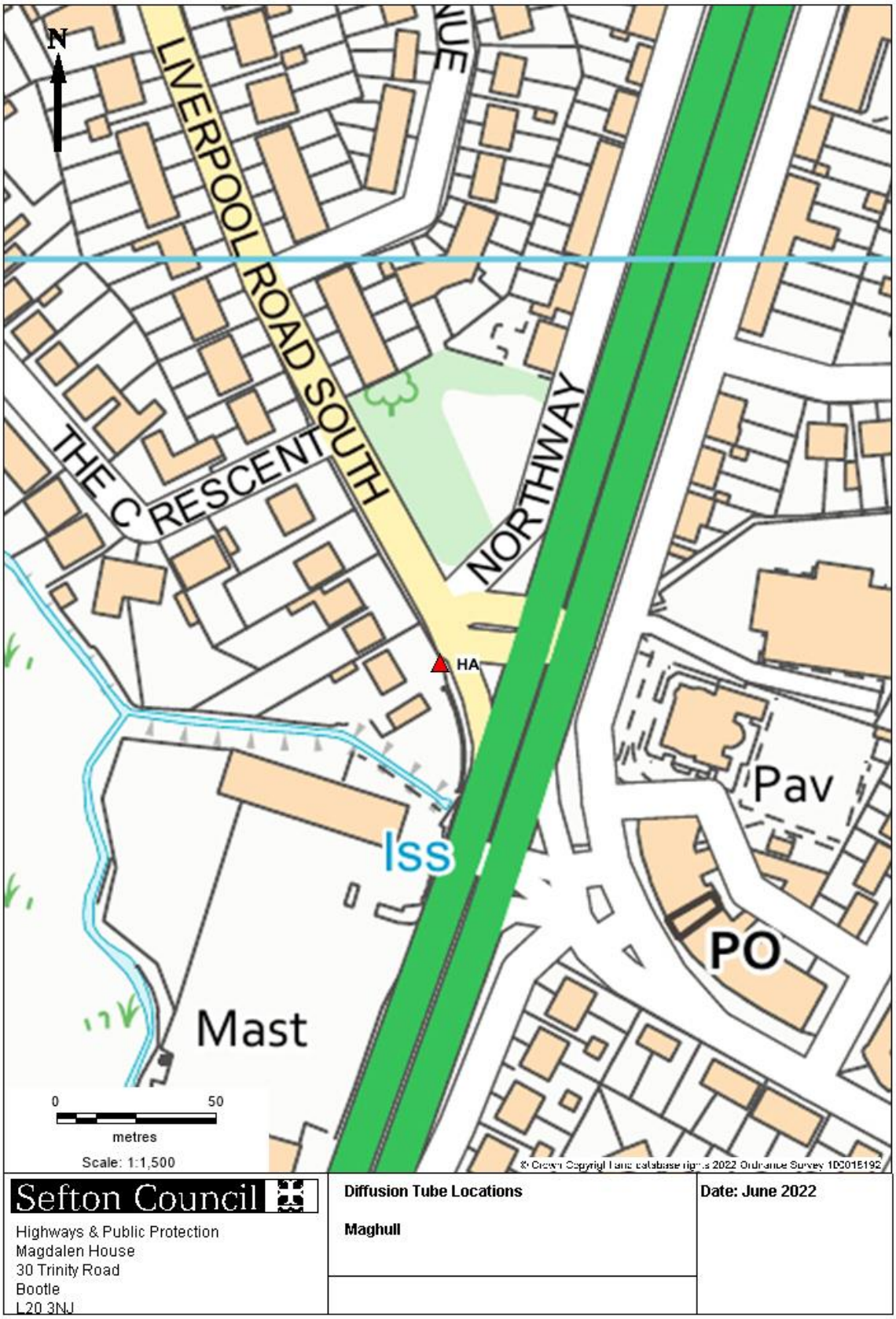
Diffusion Tube Locations

Bootle

Date: June 2022

Borough Boundary


N
EVERTON VW
DERBY ROAD
NELSON STREET
BENBOW ST
BYNG ST
SEYMOUR STREET
WILLIAM HENRY ST
BRIDGE ST
BS
GT
GU
MILLERS BRIDGE
BQ
BR
LOUGLAS PLACE
Towing Path
EFFINGHAM STREET
A5036
HOWE STREET
BO
PRINCES ST
RALEIGH STREET
BEDFORD PL
0
100
metres
Scale: 1:2,500
Sefton Council
Highways & Public Protection
Magdalen House
30 Trinity Road
Bootle
L20 3NJ
Diffusion Tube Locations
Bootle
Date: June 2022
AQMA 3
NO2 and PM10
Borough Boundary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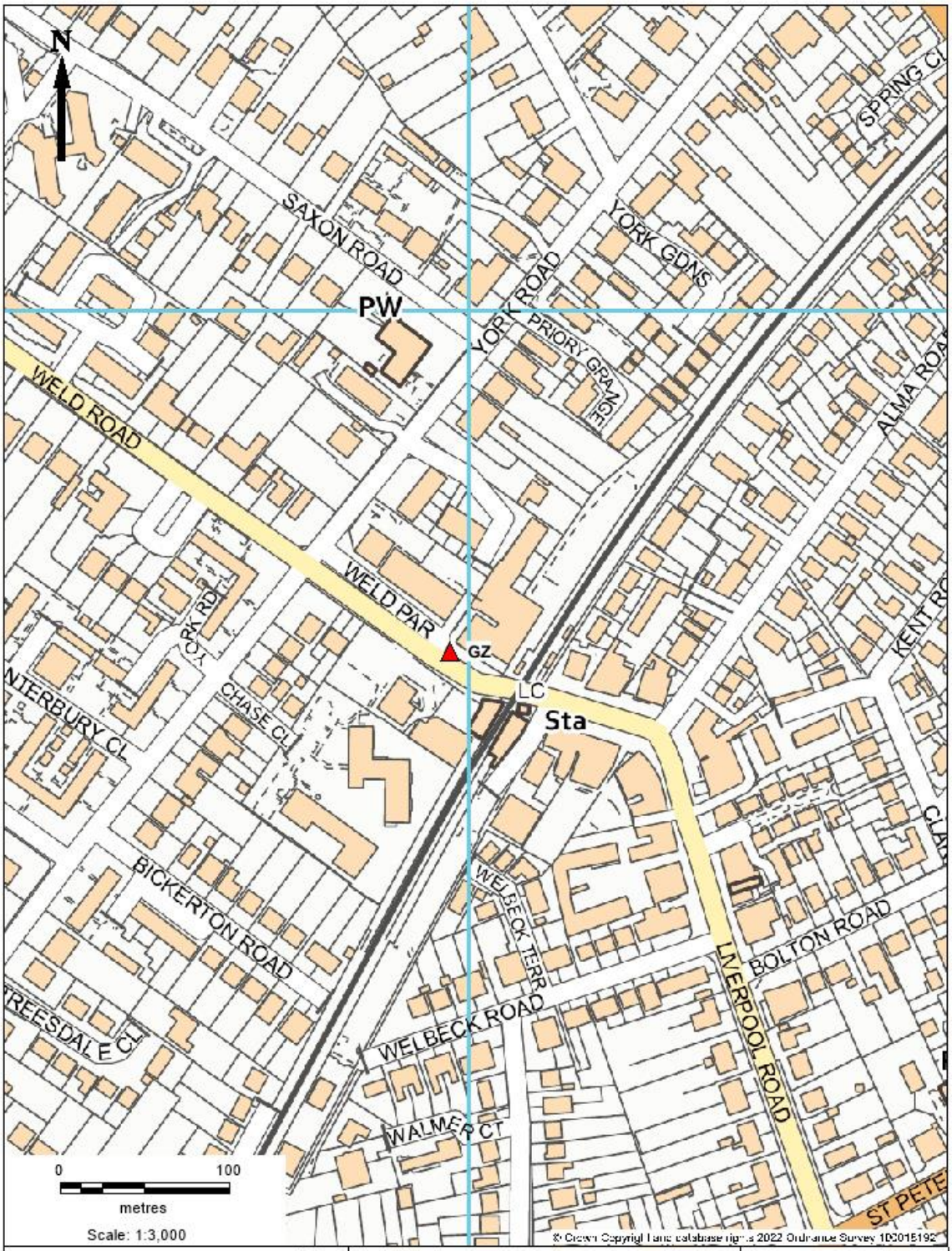

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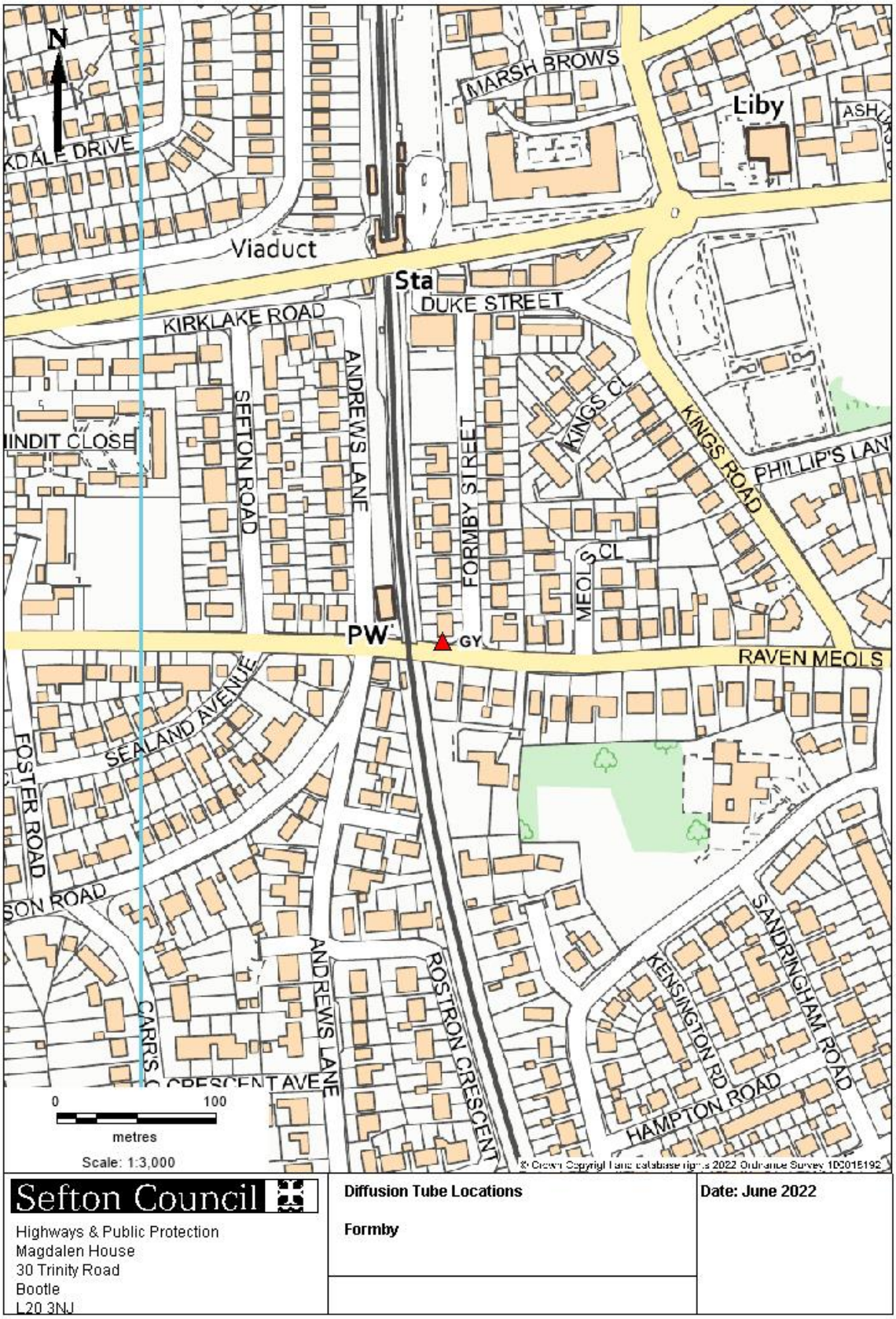
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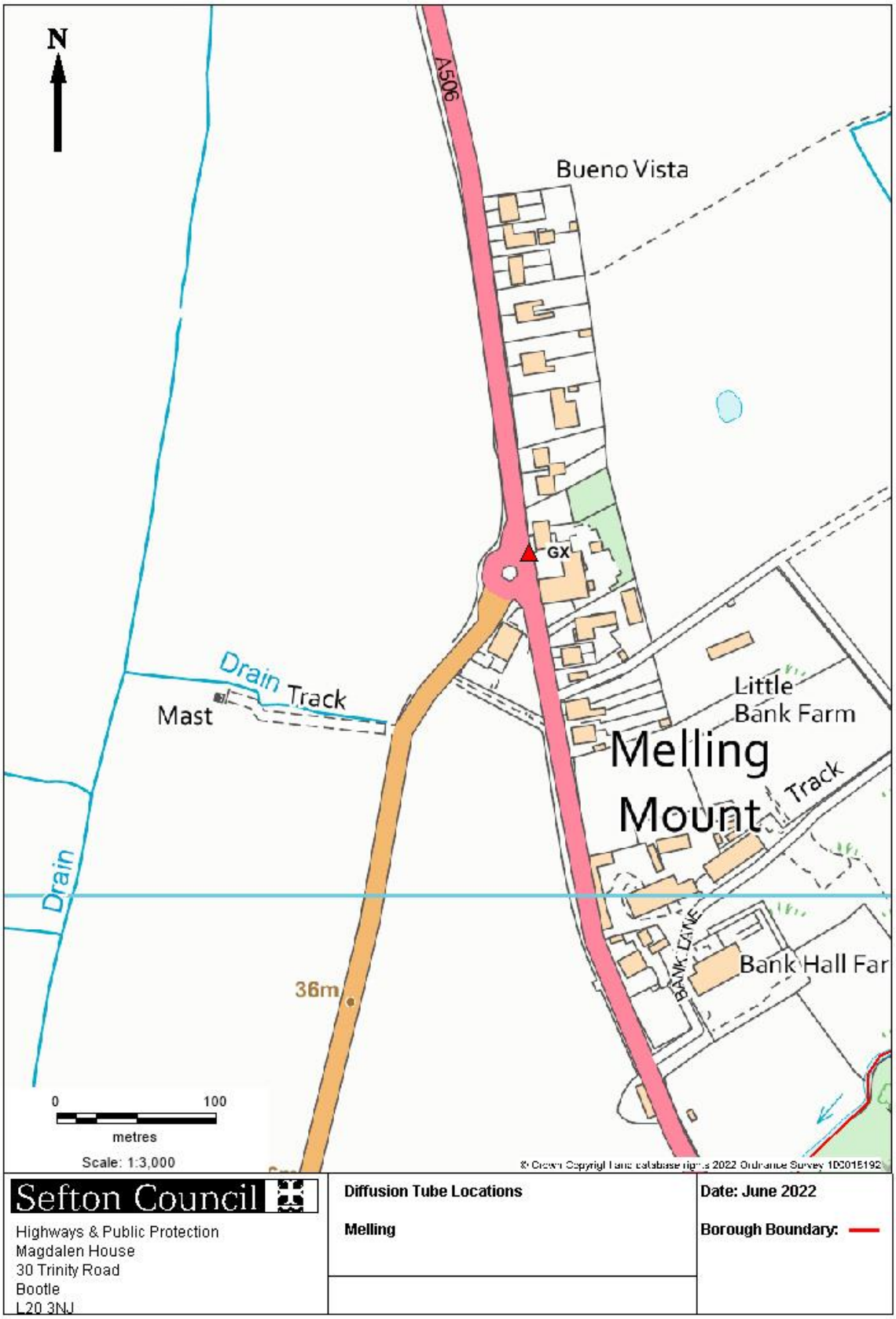
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Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[12]

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

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

Glossary of Terms

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

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.