Belfast City Council

Subject:	Belfast City Ambient Air Quality Monitoring
Date:	9th November 2021
Reporting Officer:	Siobhan Toland, Director of City Services, City & Neighbourhood Services Department
Contact Officer:	Vivienne Donnelly, City Protection Manager, City & Neighbourhood Services Department

Restricted Reports				
Is this report restricted?	**Yes**		**No**	X
If Yes, when will the report become unrestricted?				
After Committee Decision				
After Council Decision				
Sometime in the future				
Never				

Call-in				
Is the decision eligible for Call-in?	**Yes**	X	**No**	

1.0	**Purpose of Report or Summary of main Issues**
1.1	At the meeting of the People and Communities Committee of 12th October 2021, and subsequent to consideration by Committee of a local air quality management update report, Members agreed that a further report would be submitted to a future meeting of the Committee providing a detailed breakdown of ambient air quality monitoring across the city, including specific detail regarding the west and outer west.
1.2	This report serves therefore to provide a background to the various statutory local air quality management requirements for ambient monitoring, established via the 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Volumes 1 and 2, local air quality management policy guidance documents including LAQM.PG(NI)09 and supporting technical guidance documents such as the April 2021 edition of LAQM.TG(16).

1.3	This report also serves to provide an overview of the approach to ambient air quality monitoring employed by Belfast City Council for those pollutants prescribed in the above-mentioned local air quality management documents, together with a detailed breakdown of current ambient air quality monitoring across the city, including specific detail regarding the west and outer west.
1.4	Members are reminded that in November 2020, the Department of Agriculture, Environment and Rural Affairs (DAERA) undertook a public discussion exercise into a Clean Air Strategy for Northern Ireland, advising that the discussion document formed part of a two-stage approach to developing the first Clean Air Strategy for Northern Ireland. The Department further advised that all of the stakeholder responses would be carefully considered and would be used to shape future policies for Ministerial consideration. Options for ambient air quality monitoring, including expansion of the existing monitoring network, targeted monitoring based on population size and the introduction of low-cost air quality monitoring equipment were considered as part of the public discussion exercise.
2.0	**Recommendations**
2.1	The Committee is asked to: • Note the contents of this local air quality monitoring report.
3.0	**Main report**
	<u>Key Issues</u>
3.1	The UK Government has previously advised that in relation to ambient air quality, the primary objective is to ensure that all citizens should have access to outdoor air without significant risk to their health, where this is economically and technically feasible.
3.2	The 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland therefore established a series of air quality objectives, which are policy targets, often expressed as a maximum ambient concentrations not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale. In setting these objectives to safeguard human health, the UK Government and devolved administrations took account of economic efficiency, practicability, technical feasibility and timescale for achievement. The Strategy document advises that the objectives do not have direct legal force, but their existence and attainment have to be borne in mind in designing and executing mitigation measures.
3.3	The Air Quality Regulations (Northern Ireland) 2003 do however establish a series of statutory short and longer term air quality objectives for Northern Ireland for those air

	pollutants identified within the abovementioned Strategy document, i.e. benzene (C_6H_6), 1,3-butadiene ($CH_2=CH)_2$, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter (PM_{10}). Moreover, Part III of the Environment (Northern Ireland) Order 2002 places a statutory duty on Northern Ireland councils to periodically review and assess ambient air quality within their districts against these objectives and to work with competent authorities in pursuit of the achievement of air quality standards and the objectives in designated areas of exceedance, i.e. within Air Quality Management Areas.
3.4	The Committee will note that fine particulate matter ($PM_{2.5}$) is not included within regulation for the purposes of district council local air quality management. The Air Quality Standards Regulations (Northern Ireland) 2010 do however place a duty on Northern Ireland Departments to ensure that all necessary measures not entailing disproportionate costs are taken in relation to Northern Ireland with a view to attaining the $PM_{2.5}$ national exposure reduction target by 2020 and ensuring that the average exposure indicator for 2015 does not exceed 20 mgm^{-3}. The Committee will be aware that the council has proactively appointed AECOM Consultants to undertake a detailed review and assessment for fine particulate matter ($PM_{2.5}$) for Belfast, that is scheduled to be completed in early 2023.
3.5	The government's local air quality management technical guidance document LAQM.TG(16), which provides technical guidance as to how review and assessments should be conducted, highlights the principle of public exposure, advising that for the purposes of LAQM, regulations state that exceedances of the objectives should be assessed in relation to "*the quality of the air at locations, which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present*". Accordingly, annual mean objectives are given to apply at the building façades of residential properties, schools, hospitals, care homes, etc. Annual mean objectives do not apply at building façades of offices or other places of work, hotels, gardens of residential properties and kerbside sites. 24 and 8-hour mean objectives apply at all annual mean objective locations, as well as at hotels and in the gardens of residential properties. 24 and 8-hour mean objectives do not however apply at kerbside sites or other locations where public exposure is expected to be short term. 1-hour mean objectives apply at all locations where 24 and 8-hour mean objectives apply, as well as at kerbside sites, car parks, bus stations and railway stations or any outdoor location where members of the public might reasonably expect to spend one hour or longer. 1-hour mean objectives do not apply at kerbside sites, where the public would not be expected to have regular access. 15-minute

	mean objectives apply at locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.
3.6	The ambient air pollutants detailed within the Air Quality Regulations (Northern Ireland) 2003 were considered through a combination of ambient monitoring and atmospheric dispersion modelling during the council's first detailed review and assessment of ambient air quality for Belfast, completed in 2004. At that time, it was concluded that all of the air quality objectives were being achieved for Belfast, with the exception of the annual and hourly mean objectives for nitrogen dioxide (NO_2) and the annual and 24-hour mean objectives for particulate matter (PM_{10}). These exceedances were noted to be principally associated with road transport and gave subsequent rise to the council's four Air Quality Management Areas, declared along the M1 Motorway / A12 Westlink corridor, the Ormeau Road, the Upper Newtownards Road and the area from Cromac Street to the Ravenhill Road and Short Strand. All of the 2004 detailed review and assessment documents were reviewed and accepted by the government's independent technical assessors. It should be noted that exceedances of the particulate matter (PM_{10}) objectives occurred only within the M1 Motorway / A12 Westlink corridor and that this AQMA was revoked for particulate matter (PM_{10}) exceedances in 2014, due to the relevant objectives being achieved over a number of preceding years.
3.7	The Committee is advised that exceedances of the annual and hourly mean objectives for nitrogen dioxide are commonplace across both the UK and Europe, with most major cities and conurbations now focusing on addressing nitrogen dioxide emissions from road transport sources. Indeed, the DAERA NI Air website highlights that of the 19 active AQMAs declared across Northern Ireland, 17 are associated with exceedances of nitrogen dioxide objectives, associated with road transport sources.
3.8	Accordingly, the council's current ambient monitoring programme for the city has been focused primarily on assessing nitrogen dioxide concentrations at, or near to roadside locations. Guidance as to roads of concern is provided in LAQM.TG(16). Given that the annual mean objective for nitrogen dioxide has to be assessed primarily at the façades of residential properties, LAQM.TG(16) advises that ambient monitoring should take place for: • Roads with a high flow of traffic, i.e. at least 10,000 vehicles per day, with public exposure within 10m from the kerb; • Roads with significantly increased flows, i.e. a 25% traffic increase in traffic on roads with a flow of at least 10,000 vehicles per day, and with public exposure within 10m of the kerb;

	• At road junctions, with a throughput of at least 10,000 vehicles per day, and with public exposure within 10m of the kerb; • Narrow congested streets with residential properties close to the kerb, at locations with at least 5,000 slow moving vehicles per day, frequent stop / start traffic activity and exposure within 2m of the kerb; • Roads with a high flow of heavy-duty vehicles, i.e. at least 2,500 HDVs per day and public exposure within 10m from the kerb and; • At bus or coach stations with at least 2,500 bus or coach movements per day and public exposure within 10m from kerb.
3.9	Monitoring for the nitrogen dioxide 1-hour mean objective should additionally take place for those roads and locations meeting the annual mean criteria, and in: • Busy streets where people may spend 1-hour or more, close to traffic, the qualifying criteria being 10,000 vehicles per day and public exposure within 5m of the kerb, for a duration of 1-hour or more.
3.10	Government has advised however, that exceedances of the 1-hour mean objective for nitrogen dioxide are unlikely to occur for those roads where the nitrogen dioxide annual mean is less than 60 mgm^{-3}.
3.11	The council has consequently developed and implemented its ambient air quality monitoring programme for the city following current and previous versions of the government's technical guidance, dating back to LAQM.TG(03), published in January 2003.
3.12	Accordingly, ambient monitoring is currently undertaken at the Belfast Centre site at Lombard Street within the city centre for carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), heavy metals, hydrocarbons and black carbon using a combination of 'real time' automatic reference analysers and passive analysers. Automatic 'real time' reference analysers are highly accurate and able to assess compliance with both short (down to a 15-minute mean in the case of sulphur dioxide (SO_2)) and longer-term (up to an annual mean) air quality objectives.
3.13	The council also operates 'real time' nitrogen dioxide (NO_2) analysers in three of our four Air Quality Management Areas; the Ormeau Road, Upper Newtownbreda Road, and at Stockmans Lane and Roden Street, both located within the M1 Motorway / A12 Westlink

	corridor AQMA. The Stockmans Lane site is additionally equipped with a 'real time' particulate matter (PM_{10}) analyser.
3.14	Data and details for all of our 'real time' analysers are available via the DAERA NI Air website via the following web link: https://www.airqualityni.co.uk/. Locations of our automatic monitoring sites have been presented within **Appendix A** to this report.
3.15	In addition to our 'real time' automatic analysers, we operate a significant number of passive type analysers for nitrogen dioxide (NO_2) across the city. Known as diffusion tubes, this type of monitoring equipment can be installed on lampposts or on the façades of homes to assess compliance with the annual mean objective for nitrogen dioxide. Diffusion tubes are exposed to ambient nitrogen dioxide pollution, typically for successive periods of four weeks, and then returned to an accredited laboratory for analysis. By aggregating successive four-week periods of monitoring data, a nitrogen dioxide annual mean concentration can be derived. Even when employing an accredited laboratory however, diffusion tubes have limited accuracy and so we also co-locate them with our automatic 'real time' analysers, enabling a local calibration or bias adjustment factor to be derived. Corrected nitrogen dioxide diffusion tube data for all of our monitoring sites is reported annually via either the council's Updating and Screening Assessment or Progress Reports. These reports, dating back to September 2005, are available on the DAERA NI Air website via this weblink: https://www.airqualityni.co.uk/laqm/district-council-reports#511
3.16	At present, we have installed nitrogen dioxide diffusion tubes at some 59 kerbside, roadside or background monitoring locations across the city. Maps of our various diffusion tube monitoring locations have also been presented at **Appendix A** to this report. The Committee is advised however that nitrogen dioxide monitoring using diffusion tubes has been undertaken by the council since significantly before the first formal detailed review and assessment for ambient air quality was completed for the city in 2004. Accordingly, when ambient monitoring data indicates sustained compliance with the nitrogen dioxide annual mean objective of 40 mgm^{-3} over a number of years, monitoring at that site may typically be discontinued and the diffusion tube relocated. The council continues to apply this iterative approach to its nitrogen dioxide and other ambient air quality monitoring for the city.
3.17	In requesting this report, the Committee has asked for specific detail regarding monitoring in the west and outer west of the city. Accordingly, the Committee is advised that monitoring for nitrogen dioxide is currently undertaken at Ardmore Park, Blacks Road, at the junction of

	the Falls and Andersonstown Roads, in Poleglass, at the Royal Victoria Hospital on the Falls Road, at Dunmurry Lane, at Andersonstown Road and at the Monagh By-Pass, the specific monitoring locations having been chosen with regard to the various qualifying and siting criteria detailed within LAQM.TG(16).
3.18	The Committee will be aware that nitrogen dioxide monitoring data has been influenced significantly by the Covid-19 pandemic and associated lockdowns. We have consequently noted that 2020 nitrogen dioxide annual mean monitoring concentrations at some locations has been reduced by approximately up to 1/3 when compared to 2019 annual mean data. We have therefore provided 2019 and 2020 corrected nitrogen dioxide diffusion tube annual mean monitoring data for the above-mentioned west and outer west monitoring locations within **Appendix B** to this report. It should be noted that the only recent exceedance of the nitrogen dioxide annual mean objective for west and outer west sites was recorded at the Blacks Road site during 2019.
3.19	Moreover, within Section 3.4 of this report, the Committee has been advised that the council has proactively appointed AECOM Consultants to undertake a detailed review and assessment for fine particulate matter ($PM_{2.5}$) for Belfast City, scheduled to be completed in early 2023. As part of this project and as highlighted to Members during a presentation by AECOM (*Agenda item 13 Presentation on the Air Quality Detailed Assessment work - AECOM in attendance*) at the 11th May 2021 Remote Meeting of the People and Communities Committee, a limited number of additional small sensor air quality monitoring systems have been installed by AECOM across the city, in locations reflective of the principal sources of $PM_{2.5}$ emissions for the city. Monitoring data from these additional monitoring systems will be used to augment the council's existing particulate matter and other monitoring data for the city, in the calibration of the atmospheric dispersion modelling component of the detailed assessment project. The Committee is advised that one of these small sensor air quality monitoring systems has been located in the Mount Eagles area in order to characterise local concentrations of fine particulate matter, associated with local domestic and other combustion activities.
3.20	The additional small sensor air quality monitoring systems are scheduled to be operated by AECOM for a period one year from their dates of installation as part of the detailed review and assessment project in order to help determine compliance with the annual mean standards and guidelines for fine particulate matter ($PM_{2.5}$), whereupon the equipment will revert to the council so that, where necessary, it can be relocated to characterise particulate

	matter (PM_{10}), fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) concentrations in other areas of the city. The Committee will be consulted about any revisions to the existing monitoring locations or any new monitoring locations via a subsequent paper presented in Spring 2022. <u>Financial & Resource Implications.</u>
3.21	None <u>Equality or Good Relations Implications /Rural Needs Assessments.</u>
3.22	None
4.0	**Appendices – Documents Attached**
	Appendix A – Locations Maps of Continuous Automatic Monitoring and Nitrogen Dioxide Diffusion Tube Monitoring Sites Across Belfast. Appendix B – 2019 and 2020 Nitrogen Dioxide Annual Mean Monitoring Data for Sites Located in the West and the Outer West of the City.