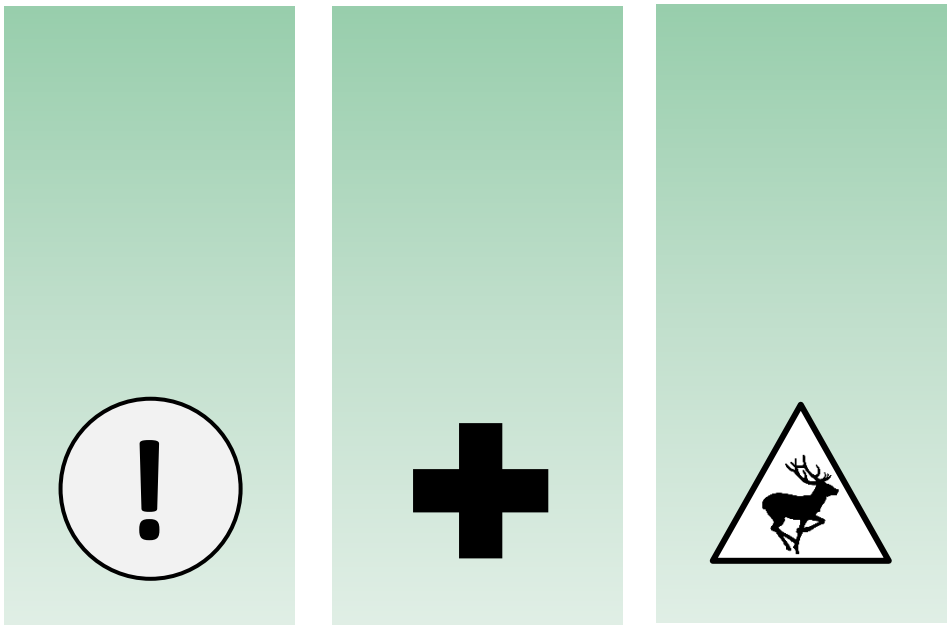
AIR QUALITY PROOF OF EVIDENCE
ABACUS SCHOOL, FORMER HAMPSTEAD POLICE STATION

ENSAFE PROJECT REFERENCE: AQ109324

PREPARED FOR: DEPARTMENT FOR EDUCATION (DFE)

DATE: AUGUST 2020



CHALLEN COMMERCIAL INVESTIGATIONS LIMITED T/A ENSAFE CONSULTANTS
2 BROWNS ROAD, DAVENTRY, NORTHAMPTONSHIRE, N11 4NS T: 01604 878190 www.ensafe.co.uk info@ensafe.co.uk
REGISTERED IN ENGLAND NO: 03426833, VAT NO: 669400520

TABLE OF CONTENTS

APPENDICIES

1. INTRODUCTION

1.1 Qualifications and Experience

My name is Conal Kearney and I am the Head of Noise and Air Quality at Ensafe Consultants (formerly known as Resource and Environmental Consultants). I have 24 years' experience in air quality assessment and management in both the public and private sectors. I have been employed by the Environment Agency, Local Government and private air quality consultancies. I hold a Master of Science in Environmental Pollution Control and I am a Member of the Institute of Air Quality Management (MIAQM) and Institute of Environmental Science (IEnvSc).

I have overseen numerous air quality assessments including school developments in the London area. I am familiar with the requirements of an air quality assessment, the development site and relevant policies and guidance.

This proof solely relates to air quality matters and addresses the first and third reasons for refusal. This statement is true to the best of my knowledge and belief. I can confirm that the views expressed are my true and professional opinion.

1.2 Context

Planning permission (LPA Ref: 2019/2375/P) was refused by notice dated 23 December 2019. The reasons for refusal included:

1. The proposed development by virtue of its use, location and catchment area is likely to result in an increase in trips by private motor vehicles, increased traffic congestion and excaberating air pollution and would fail to sufficiently prioritise sustainable modes of transport, contrary to policies T1 (Prioritising, walking, cycling and public transport) and C2 (Community facilities) of the Camden Local Plan 2017 and policies TT1 (Traffic volumes and vehicle size) and TT2 (Pedestrian environment) of the Hampstead Neighbourhood Plan.

[…]

3. The proposed development by virtue of its location on a main road with poor air quality, which could harm the health of pupils, would not be an appropriate location for a school, contrary to policies A1 (Managing the impact of development) and CC4 (Air quality) of the Camden Local Plan 2017 and policy S3 of the emerging London Plan December 2017.

It is considered that the evidence submitted with the application does not substantiate the reasons for refusal on air quality grounds in that:

- The proposed development would not exacerbate air pollution when considered in isolation and, indeed, could improve this relative to the current or alternative use;
- The location of the school, given the proposed mitigation measures, would not lead to adverse effects on pupils;
- Given the robust nature of the assessment, the proposed mitigation measures are considered as a cautious approach to ensure that acceptable air would be available for all site users.

It should be noted that as no evidence to the contrary has been put forward a rebuttal of any such evidence may be required.

This evidence builds on the information provided by the assessments submitted with the planning application.

1.1 Proof Summary

This proof of evidence considers:

- Relevant legislation and guidance
- Summary of previous assessment
- Assessment erratum
- Air Quality Impacts
- Air Quality Monitoring Discussion
- Further Sensitivity Assessments

2. RELEVANT LEGISLATION AND POLICY

2.1 Overview of UK Air Quality Legislation

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered relevant for this evidence.

Table 1 **Relevant Air Quality Objectives**

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year

Table 2 summarises the advice provided in DEFRA guidance LLAQM (TG16)[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building facades of properties including schools.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.
2 London Local Air Quality Management Technical Guidance 2016 LLAQM (TG16), DEFRA, 2016.

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
1-hour mean	In addition: Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access

The results of the dispersion modelling assessment are compared against the Air Pollution Exposure Criteria (APEC) contained within the London Councils Air Quality and Planning Guidance[3] from the London Air Pollution Planning and the Local Environment (APPLE) working group. These are outlined in **Table 3**.

Table 3 Air Pollution Exposure Criteria

Category	Applicable Range Annual Mean: NO_2	Recommendation
APEC - A	Below 5% of the annual mean AQO	No air quality grounds for refusal; however, mitigation of any emissions should be considered
APEC - B	Between 5% below or above the annual mean AQO	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g. maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised
APEC - C	Above 5% of the annual mean AQO	Refusal on air quality grounds should be anticipated, unless the LA has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures

It should be noted that a significant area of London would fall under APEC - C due to high NO_2 concentrations throughout the city. As such, a presumption against planning consent in these locations may result in large areas of land becoming undevelopable and prevent urban regeneration. The inclusion of suitable mitigation measures to protect future users is therefore considered a suitable way to progress sustainable schemes in these locations and has been considered.

Reference should be made to Section 4 for assessment input data and details of the verification process.

[3] London Councils Air Quality and Planning Guidance, London Councils, 2007.

2.2 Relevant National Planning Policy

2.2.1 National Planning Policy Framework 2018

The National Planning Policy Framework identifies that the planning system should aim to conserve and enhance the natural and local environment through reducing pollution (including air), and:

'Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement.

So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.' (Ministry of Housing, Communities & Local Government, 2018, p.52).

2.3 Relevant Local Planning Policy

2.3.1 The London Plan

The Minor Alterations to The London Plan[4] was published in March 2016 and sets out a fully integrated economic, environmental, transport and social framework for the development of the capital until 2031. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

The London Plan policies relating to air quality are outlined below:

> "***Policy 3.2 Improving health and addressing health inequalities***
>
> ***Strategic***
>
> - *The Mayor will take account of the potential impact of development proposals on health and health inequalities within London. The Mayor will work in partnership with the NHS in London, boroughs and the voluntary and community sector as appropriate to reduce health inequalities and improve the health of all Londoners, supporting the spatial implications of the Mayor's Health Inequalities Strategy.*
> - *The Mayor will promote London as a healthy place for all – from homes to neighbourhoods and across the city as a whole – by:*
> - *Coordinating planning and action on the environment, climate change and public health to maximise benefits and engage a wider range of partners in action*

[…]

[4] The London Plan, Minor Alterations to the London Plan, Greater London Authority, March 2016.

- *The impacts of major development proposals on the health and wellbeing of communities should be considered, for example through the use of Health Impact Assessments (HIA).*

Planning decisions

- *New developments should be designed, constructed and managed in ways that improve health and promote healthy lifestyles to help to reduce health inequalities.*

Policy 5.3 - Sustainable design and construction

Strategic

- *The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.*

Planning decisions

- *Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.*

- *Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:*

  […]

- *Minimising pollution (including noise, air and urban run-off)*

  […]

Policy 7.14 - Improving air quality

Strategic

- *The Mayor recognises the importance of tackling air pollution and improving air quality to London's development and the health and well-being of its people. He will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality and Transport strategies to achieve reductions in pollutant emissions and minimise public exposure to pollution.*

Planning decisions

Development proposals should:

- *Minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where*

development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3).

- *Promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Council's 'The control of dust and emissions from construction and demolition'.*

- *Be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs).*

- *Ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches."*

The Draft New London Plan sets out the proposed development strategy for London from 2019 to 2041. The Examination in Public on the London Plan was held between 15th January and 22nd May 2019. The Panel of Inspectors appointed by the Secretary of State issued their report and recommendations to the Mayor on 8th October 2019. The Mayor has considered the Inspectors' recommendations and, on the 9th December 2019, issued to the Secretary of State his intention to publish the London Plan". A review of the London Plan Intend to Publish[5] indicated the following policy in relation to air quality:

"*Draft Policy SI1 Improving air quality*

London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced:

- *Development proposals should not:*

  a) lead to further deterioration of existing poor air quality

  b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits

  c) reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality

  d) create unacceptable risk of high levels of exposure to poor air quality.

- *Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality. Particular care should be taken with developments that are in Air Quality Focus Areas or that are likely to*

[5] The London Plan Intend to Publish (clean version) Spatial Development Strategy for Greater London, Major of London (December 2019).

be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people.

- *I …developments should be at least Air Quality Neutral.*

- *Air Quality Assessments (AQAs) should be submitted with all major developments, unless they can demonstrate that transport and building emissions will be less than the previous or existing use.*

- *Development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated."*

This policy has been considered although as it has yet not been formerly adopted the policy should be considered guidance and carries limited weight in the determination of this application.

2.4 London Borough of Camden Local Plan

The Local Plan was adopted by LBoC in July 2017 and sets out the Council's planning policies and has replaced the Core Strategy and Camden Development Policies planning documents (adopted in 2010). It ensures that Camden continues to have robust, effective and up to-date planning policies that respond to changing circumstances and the borough's unique characteristics and contribute to delivering the Camden Plan and other local priorities. The Local Plan will cover the period from 2016-2031.

As such, the policies contained within the Local Plan provide the current basis for the determination of planning applications within the London Borough of Camden.

The following policy in relation to air quality is relevant to this evidence:

"Policy A1 Managing the impact of development

The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity.

We will:

a) *seek to ensure that the amenity of communities, occupiers and neighbours is protected;*
b) *seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;*
c) *resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and*
d) *require mitigation measures where necessary.*

The factors we will consider include:

e) visual privacy, outlook;
f) sunlight, daylight and overshadowing;
g) artificial lighting levels;
h) transport impacts, including the use of Transport Assessments, Travel Plans and Delivery and Servicing Management Plans;
i) impacts of the construction phase, including the use of Construction Management Plans;
j) noise and vibration levels;
k) odour, fumes and dust;
l) microclimate;
m) contaminated land; and
n) impact upon water and wastewater infrastructure."

"Policy CC4 Air quality

The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan."

It is considered that the assessments adhere to these policies and that the development would not lead to unacceptable exposure to or increase in air pollution.

3. SUMMARY AND DISCUSSION OF ASSESSMENTS

The purpose of these assessments were to assess potential impacts from the proposed development. These are detailed in the following sections.

3.1 Air Quality Assessment Summary (Ref. AQ106285r1)

Potential construction phase air quality from fugitive dust emissions were assessed as a result of earthworks, construction, and trackout activities from the site. These were assessed in accordance with the Greater London Authority methodology. Assuming appropriate mitigation measures are implemented, air quality impacts during the construction phase are considered to be acceptable for a development of this size and nature.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to assess the potential for future users to be exposed to poor air quality. This indicated that, predicted pollutant concentrations were predicted to be above relevant national objective for NO_2 at school classrooms on the ground floor. As such specific mitigation techniques will be required to prevent future users from elevated pollutant concentrations.

There were no exceedances of the AQOs for PM_{10} concentrations at the development site and all concentrations are categorized as APEC A for PM_{10}.

To provide specific mitigation the development will provided Mechanical Ventilation with Heat Recovery (MVHR) units within the lower ground, ground, 1st and 2nd floors. Air intake will be from the 1st floor roof area, though external weather louvre(s) around 8m above ground level, which will supply air to the lower ground, ground and 1st floor MHVR units. In line with the air quality assessment, modelling results at the location of the 1st floor supply louvre(s) are anticipated to have annual mean NO_2 concentrations between 34-36 µg/m^3 which is categorised as APEC-A or >5% below the national objective. Locating air supply intakes in this area removes the requirement to install NOx filtration technology into the intake ducting of the MHVR. In addition, the lower ground and ground floor windows along the Rosslyn Hill facade will be non-opening with no trickle ventilation and achieve a low air permeability. This combined with the slight negative pressure from MHVR will aid provision of air throughout the lower, ground and 1st floors. There is no provision to provide MHVR to additional floors as they are categorised at being APEC-A.

Therefore it is considered that this mitigation measure would ensure that children's or any other site user's health would not be damaged by air pollution.

LBoC Local Plan Policy CC4 states: "*developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.*" However, this development has been designed to mitigate any potential impact and further evidence indicates that the mitigation strategy is a cautious approach.

It should be noted that the national AQOs are determined at levels where the most vulnerable of the populations may become affected by adverse health effects. Therefore by ensuring that site users would not be exposed to such levels it can be assured that the health of children would not be affected.

Furthermore there are no predicted exceedances of the short term objective (hourly) for NO_2 and therefore such exposure times that may be experienced by pupils for activities such as, travelling to school, entering the school and playing in the school yard would not cause any harm to health and

therefore would not require mitigation as implied in LBoC's SoC (paragraph 3.30). Notwithstanding this, it is likely that alternative options for travelling to schools in the area would result in similar journey times.

Potential impacts during the operational phase of the development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. A screening assessment was therefore undertaken to determine the potential for trips generated by the development to affect local air quality. This indicated that impacts were anticipated to be **not significant** according to IAQM and EPUK methodology.

3.2 Assessment Erratum

For the sake of completeness and transparency, it has been noted that reporting errors have been printed in the text of assessment AQ1062985r1 in Appendix II. It is important to note that this is a written reporting error only and this does not alter any of the results or conclusions stated in the assessment or discussed in our evidence.

In Appendix II Assessment Inputs Table AII.1, and AII.2 for road links L2 and L3 should read:

Table AII.1 2016 Verification Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop (%)	Mean Vehicle Speed (km/h)
L2	Downshire Hill Slowdown	6.5	4,639	7.95	24.1
L3	Downshire Hill	5.5	4,639	7.95	32.2

Table AII.2 2022 Assessment Area Traffic Data

Road Link		24-hour AADT Flow	HDV Prop. (%)
L2	Downshire Hill Slowdown	4,878	7.95
L3	Downshire Hill	4,878	7.95

The derivation of this road link data is discussed in Section 3.3 of this evidence. Table AII.4 and the following paragraph should read as below:

Table AII.4 NO_x Verification Results

Site ID	Monitoring Location	Modelled Road NO_x Concentration ($\mu g/m^3$)	Monitored Road NO_x Concentration ($\mu g/m^3$)	Difference (%)
CA17	47 Fitzjohn's Avenue	27.64	69.89	152.88

The monitored and modelled NO_x road contribution concentrations indicated that a verification factor of **2.5288** was required to be applied to all NO_x modelling results, showing the model had a tendency to underestimate pollutant concentrations.

All the results as presented in the assessment were based on the above verification factor.

In addition, the labelling of diffusion tubes are not correct in the Air Quality Monitoring Report (Ref. AQ106257-2) in Figures 1 and 3. The correct labelling and average concentrations are shown on Figure P1 below.

3.3 Methodology Discussion

The methodologies used in the assessment were based on industry standard and accepted guidance, namely:

- Land-Use Planning & Development Control: Planning for Air Quality, EPUK and IAQM, January 2017;
- London Local Air Quality Management Technical Guidance 2016 LLAQM.TG (16), GLA, 2016;
- Local Air Quality Management Technical Guidance 2016 LAQM.TG (16), DEFRA, 2018; and
- The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance, GLA, 2016

LBoC's SoC claims that the AQA has not considered uncertainty within the assessment, however the assessment has considered this by assuming either worst case or robust assumptions. In addition, it should be noted that the APEC category system allows for a further margin of uncertainty in considering a 5% buffer in the AQOs when determining where mitigation should be implemented and this has been adhered to in this assessment.

The use of a robust method for future predictions allows for a sensitivity test in the uncertainties of future predictions, the following assumptions were used:

- Traffic growth is in line with previously expected increases (using local growth factor);
- Expected decreases in future road fleet exhaust emissions would not occur;
- Expected decreases in pollutant background levels would not occur;
- No inclusion of the potential impacts of the Ultra Low Emission Zone extension (ULEZ); and
- The site was assumed as open, i.e. no screening of roadside pollutants from the existing structure to the proposed playground at the rear of the proposed school was assumed.

Sections 3.3.2 and 3.3.3 of AQ1062985r1 present how this leads to a likely over prediction of concentrations at the development site and that the assessment can be considered as robust and valid. Therefore, it is considered that the proposed development, subject to the inclusion of the proposed mitigation measures through mechanical ventilation is acceptable from an air quality perspective.

3.3.1 Traffic Flows

Traffic flows were utilised from the London Atmospherics Emissions Inventory (LAEI), which is considered a suitable source of data in GLA guidance for dispersion modelling. Data was available for all modelled road sources with the exception of Downshire Hill. For this road link, data was estimated from a similar road in the vicinity of the development site.

Downshire Hill is a 2 way flow residential minor (unclassified) road running northwards from Rosslyn Hill. The north and south junctions of Downshire Hill are not signalised. Similarly, Parkhill Road is a 2 way flow residential minor (unclassified) road running northwards from Rosslyn Hill with no signalised junctions approximately 1km southeast from Downshire Hill. Given the similarities in the road type and geographical setting it was considered to be the most accurate estimate method available for Annual Average Daily Traffic (AADT) and Heavy Duty Vehicle (HDV) proportion.

The future increases in Traffic flows were based on the TEMPRO predictions and indicated that traffic would increase gradually from the baseline year to the estimated opening year (2022). However, as indicated in the Transport PoE, rather than a predicted increase in future traffic flows, there is predicted to be a downward trend in AADT traffic on the A502. Indeed, a recent survey of transport planners by Hive IT[6] found that:

> "The consistent overestimation of road traffic over time, and of trips in dense urban areas, were both mentioned repeatedly [by local and regional authority representatives".

For comparison an AADT 15,383 of was used for the A502 Rosslyn Hill whereas the Transport Consultant's AADT is predicted to be 13,713. Therefore a significant overestimate has been used here.

In addition, there are likely to be further reductions in traffic numbers and road traffic by the introduction of the geographical extension of the ULEZ in 2021 to include LBoC and the long term and lasting impacts on road traffic use following the COVID-19 outbreak.

Therefore it is clear that the traffic flows used in the assessment would be a significant overestimate in future traffic flows.

[6] https://www.transportxtra.com/publications/local-transport-today/news/66413/correct-model-s-trip-forecasting-errors-?etid=2412513&artid=66413

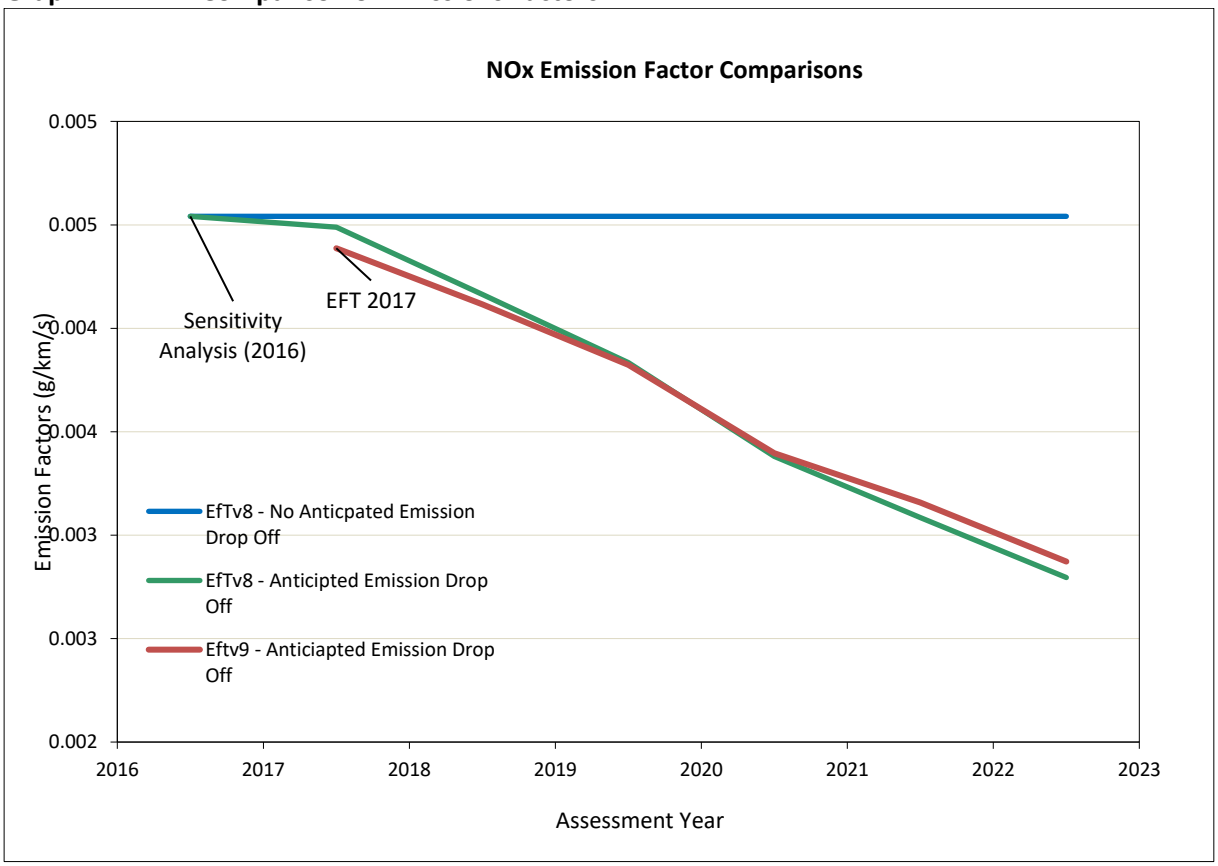
3.3.2 Emission Factors

Given the interim period between the baseline and future year scenarios it would be can be unreasonable not to assume any reduction to emission factors as a direct result of increasing EV fleets and future advancements to low emission technologies.

The assessment assumed no reduction in emissions (through vehicle emission factors) through using baseline year emission factors for future year predictions which is a worst-case assumption.

As detailed in Graph 1, this worst-case assumption produces a primary tailpipe NOx emission rate of 39% greater that in comparison to predicted future emission rates. The current Emissions Factors Toolkit (EFT) (version 9.0) provides a more realistic, worst case emission factors for diesels for future years which use recent real-world emissions test data. Subsequently, the original assessment approach over predicts modelled concentrations and ensures a sufficient level of confidence can be placed within the predicted pollution concentrations and conclusions as being a worst case scenario.

Graph 1 Comparison of Emissions Factors



Similar to traffic flows discussed in 3.3.1 these emissions do not take account of any potential emissions improvements delivered by the ULEZ measures or likely COVID-19 effects in the future traffic fleets.

3.3.3 Background Concentrations

As indicated in Table 13 of the AQA, nitrogen dioxide concentrations are predicted to decrease by 18%

between the baseline year of the assessment (2016) and the predicted opening year (2022).

3.3.4 Building Effects

Whilst the proposed site is not considered to be located in a true urban street canyon where the height of buildings flanking the street are typically greater than the canyon width. It is likely that there would be some entrapment of pollutants on the front facade causing increase in this location and a screening of pollutants for locations further from the roadside.

It is therefore likely that the original assessment may underestimate pollutant concentrations at the front facade but overestimate at locations such as the school yard and the proposed ventilation inlet. Given that it has been proposed the windows facing the road would be hermetically sealed it is the other locations where exposure to future site users is relevant and the reason that assuming an open site can be considered as an overestimate of potential exposure.

3.4 Verification

On verification, EPUK and IAQM Guidance states that

> "*Model verification involves a comparison of the predicted versus measured concentrations, and allows an adjustment to be made to account for systematic errors. Such errors may include uncertainties in traffic flow, vehicle emission factors and estimated background concentrations, as well as limitations of the model to represent dispersion in settings where air flow is affected by roadside buildings, trees etc..*"

Verification was performed by comparing modelled and monitored concentrations at 1 diffusion tube location (CA17). Whilst it is preferable to use more than one location and to include an automatic monitoring station, location CA17 is the only available 'roadside' monitor in the vicinity of the site, it is located at a similar distance from the road and urban setting as the proposed development site and is located on a road with similar traffic volumes and characteristics.

The closest automatic monitoring station is located at Swiss Cottage approximately 1.2km from the development site. The site is located at a kerbside location at a complex multi-armed road junction. This location is therefore not considered representative urban setting of the development site.

As DEFRA (TG16) guidance states:

> *"Kerbside sites are generally not recommended for the adjustment of road traffic modelling results as the inclusion of these sites may lead to an over-adjustment of modelling at roadside sites.*
>
> […]
>
> *In most cases, local authorities are concerned with the predictions closer to roadside sites as these are at more risk of exceeding the air quality objectives and model verification is generally based on these locations."*

Given the complexity of the Swiss Cottage junction and associated difficulties of modelling this area accurately, it was considered that including this monitoring location in the verification process would introduce a greater margin of error to the model than would be achieved by using a single diffusion

tube location in a similar setting.

In addition, the methodology of the verification process was agreed with the Environmental Health Officer at LBC.

3.5 Air Quality Construction Impacts

The AQA assessed impacts from construction activities and concluded that impacts would be not significant subject to good practice dust controls. It is understood that this has been accepted.

Notwithstanding this, the assessment should be used to inform the dust control and management plan associated with any development to ensure that the construction impacts would be negligible.

3.6 Air Quality Operational Impacts

The first reason for refusal states that the "*proposed development by virtue of its use, location and catchment area is likely to result in an increase in trips by private motor vehicles, increased traffic congestion and exacerbating air pollution"* however this is contrary to the evidence provided by the Transport Consultant for the appellant and subsequently reflected in the air quality assessment and in fact, the proposed development can be considered as an improvement on impacts in comparison to existing or other reasonable use.

In addition, the impacts from gross traffic associated with the proposed development can be considered as a significant overestimate.

The impacts from gross traffic associated with the proposed use at the site were assessed against screening criteria provided in EPUK and IAQM guidance. The assessment was based on a worst case prediction that 5% of associated trips would be due to car 'drop offs' resulting in an AADT of 44. This is well below the screening criteria of 100 AADT in an AQMA where a detailed assessed would be required. A more realistic drop off rate would be 4% resulting in an AADT of 32. In such circumstances, impacts are considered to be negligible and therefore not significant.

It should also be noted that the above AADT estimates are based on term time vehicles only and therefore the actual AADT would be less (estimated as 23 AADT in the air quality neutral assessment). In addition, school will have a travel plan with the aim to reduce vehicle trips to zero.

It is worth noting that even an assumed 10% drop off rate (88 AADT) would not result in an exceedance of the screening criteria.

The air quality neutral assessment showed that the proposed development transport (and energy based) emissions would be air quality neutral and therefore no mitigation measures were required to control emissions to make the development acceptable.

This is contrary to the statement in LBoC's SoC (paragraph 3.30) that "the proposals would increase private vehicle usage to the detriment of local air quality". It has been demonstrated that this would not be the case even when considering a gross traffic increase (nil baseline use).

In fact, when considering the current use, it has been shown that the proposed use would result in a net decrease in road traffic associated with this site. The Appellant's Transport Proof of Evidence in Chapter 6 shows that a survey at Kentish Police Station (operating local police station of similar size)

generates 168 two-way vehicles movements in a 12 hour period.

Even accounting for uncertainties in similarities of the 2 sites' traffic generations, this is a clear indication that the magnitude of traffic generation from the former site use would be much larger than the proposed use (and potential generation from alternative uses) and therefore there would likely to be a significant net decrease in traffic related emissions as a result of the proposed site use change.

The draft London Plan is not currently adopted however it proposes that larger schemes and plans should aim to be air quality positive. Whilst the proposed development is a single site scheme it should be noted the net reduction in traffic based on the former use would indicate that this development could be considered as air quality positive.

It is therefore considered clear that the proposed development would not lead to an unacceptable increase in pollution complies with local and national planning policies and that the first reason for refusal is not substantiated from an air quality perspective.

3.7 Air Quality Monitoring

Resource and Environmental Consultants Ltd (now known as Ensafe Consultants) was commissioned by the Department for Education to undertake three months of Air Quality Monitoring in support of the proposed development at the former Hampstead Police Station, London.

The diffusion tubes were located in triplicate at various positions on the development site and co-located in triplicate at the nearest DEFRA authorised Automatic Urban and Rural Network (AURN) site at Camden Kerbside (CD1). This was considered as the best option given:

- The duration of the survey; and
- The good QA/QC of the AURN monitoring site.

LLAQM and LAQM technical guidance states that where less than 9 months' data has been collected, it is necessary to perform annualisation. This allows the data to be extrapolated and compared with the annual mean AQO based on the ratio of the monitoring period and a full annual period at a local site.

EPUK and IAQM guidance states the ideally a monitoring period should be 6 months and at locations agreed with the local authority. However DEFRA LAQM(TG16) guidance states that a minimum of three months monitoring is required for annualisation to be completed. The monitoring duration and locations, including automatic monitor co-location were agreed with LBoC. The triplication of monitors at each location adds to the veracity of the measurements. Therefore it is considered that this data is valid and should form part of the evidence of current NO_2 concentrations at the development site.

The results support the air quality modelling evidence in that:

- Road facing facade concentrations are higher than at the yard at the building rear;
- The model is likely to have overestimated concentrations and can be seen as a robust assessment;
- The inclusion of mitigation measures can be considered as a cautious approach to ensure that no future site users would be exposed to unacceptable air pollution and the development complies with local and national policies; and
- The third reason for refusal on air quality grounds should not be upheld.

4. FURTHER SENSITIVITY ASSESSMENTS

Further modelled NO_2 scenarios have been undertaken to test the sensitivity for potential exposure across the site and at the proposed ventilation inlet located as shown in the Figures in Appendix P1 and at a proposed height of 8 metres. The scenarios considered are:

- Updated Verification Baseline model;
- Scenario 1 - Opening Year Do Something (DS) 2022 traffic flows, 2018 Baseline Emission Factors (EFs);
- Scenario 2 - DS 2022 traffic flows, 2018 Emissions Factors and Background Concentrations with Advanced Canyon (AC);
- Scenario 3 - DS 2022 traffic flows, 2022 Emission Factors and Background Concentrations; and
- Scenario 4 – DS 2022 traffic flows, 2022 Emission Factors and Background Concentrations with AC

This assessments also provides a further certainty by predicting air quality using a second year of meteorological data and monitoring results. A summary of the inputs for these scenarios is shown in Table 4. The full inputs are provided and discussed in Appendix P2.

Table 4 Summary of Assessment Inputs

Scenario	Modelling year	EFT dataset year	Background Pollutants	Met year	Road Traffic Dataset	Street Canyon Module
Original AQA Future Year Assessment	2022	2022 v 8.0.1	2016	2016	2022	N
New Verification	2018	2018 v 9	2018	2018	2018	N
1	2022	2018 v 9	2018	2018	2022	N
2	2022	2022 v 9	2018	2018	2022	Y
3	2022	2022 v 9	2022	2018	2022	N
4	2022	2022 v 9	2022	2018	2022	Y

Since the original assessment the Emissions Factor Toolkit (EfT) version 8.0.1 used to estimate speed related emission factors from vehicles has been updated. The current EfT (version 9.0) released in 2019 incorporates updated vehicle emissions factors for NO_x and vehicle fleet information. A comparison is shown in Graph1. DEFRA advises that the latest version is used in current assessments and this has been used for these scenarios.

The results of Scenarios 1, 2, 3 and 4 are summarised in Table 5 and discussed in the following sections.

Table 5 Modelling Results - Annual Mean NO_2 across the Development Site

Scenario		Predicted 2022 Annual Mean NO_2 Concentration (µg/m^3)		
	Related Figures	Height 1.5m: Range (APEC)	Height 4.7m: Range (APEC)	Proposed ventilation Inlet Height 8m (APEC)
Original Assessment		34.07 – **45.10** (A-C)	33.70 – 39.15 (A-B)	N/A
1	Figure 1, Figure 2	34.24 – **42.71** (A-C)	33.36 – **38.65** (A-B)	33.13 (A)
2	Figure 3, Figure 4	33.39 – **42.72** (A-C)	32.79 – **39.51** (A-B)	33.20 (A)
3	Figure 5, Figure 6	26.92 - 34.28 (A)	26.36 - 33.22 (A)	26.51 (A)
4	Figure 7	26.04 - 32.34 (A)		26.97 (A)

4.1 Updated Verification Baseline Model

To verify the further model studies a new baseline assessment has been calculated to verify the performance of the model following the methodology contained within DEFRA guidance LAQM (TG16) using:

- updated emissions factors (EfT version 9.0);
- 2018 NO_2 monitoring data;
- 2018 meteorological data;
- 2018 traffic flow data; and
- 2018 background data.

The sources of data were as for the original assessment with the exception of that data shown in Appendix P2 along with the verification data.

4.2 Scenario 1 - Opening Year 2022 Updated Model

Similar to the original assessment, this Scenario considers a worst case and unrealistic scenario where background concentrations and emissions factors would not decrease in the future opening year. This scenario is therefore a direct update of the original assessment based on the updates listed in Section 4.1.

Table 5 indicates that the 2018 updated data shows an improvement in predicted air quality across the development site based on NO_2 concentrations. Figures 1 and 2 shows that whilst there remains exceedances of the air quality objective for annual mean NO_2 concentrations at the front (road facing facade) of the development, critically there are no predicted exceedances at areas of potential exposure, that is, the rear yard and ventilation inlet.

In fact, these locations are categorised as being in the APEC A where planning permission should be granted. Areas located in the APEC B and C categories are provided with suitable mitigation in this proposed development.

This further indicates that the original assessment can be considered as a robust and valid assessment and the site is suitable for the proposed end use with the inclusion of the proposed mitigation. Therefore the third reason for refusal should not be upheld on air quality grounds.

4.3 Scenario 2 - Opening Year 2022 Update with the Advanced Street Canyon

As stated in Section 3.3.4 the site was assumed as open, i.e. no screening of roadside pollutants from the existing structure to the proposed yard at the rear of the proposed school was assumed.

This scenario uses the advanced street canyon module in ADMS to estimate the impact of the roadside buildings on the pollution dispersion across the development site and at the ventilation inlet location. Emission Factors and Background Concentrations remain as 2018

The following road link was identified as such and was modelled utilising the advanced street canyon modelling option within ADMS–Roads; Roslyn Hill (L4). This allows the model to modify the dispersion of pollutants from a road source to account for the presence and the properties of the canyon walls on either one or both sides of the road.

Table 5 indicates that as anticipated the inclusion of roadside buildings by using the advanced street canyon module in the model software predicts marginal increased NO_2 concentrations at the front (road facing facade) of the development and ventilation inlet in comparison to Scenario 1 and reduced concentrations at the rear yard (APEC Category A).

This is further indication that the original assessment can be considered as a robust and likely overestimated assessment of pollutant concentrations at areas of potential exposure and that, subject to the proposed mitigation measures, the development is suitable for the proposed end use.

4.4 Scenario 3 - Opening Year 2022 Update Using 2022 Emission Factors and Background Concentrations

This scenario rather than using 2018 emission factors for the predicted opening year utilises 2022 emissions factors and Background Concentrations – as recommended in DEFRA technical guidance.

Table 5 indicates that the use of 2022 emission factors for the expected opening year predicts that future air quality at all locations of the development site would be below the annual mean AQO for NO_2 and acceptable (APEC Category A) without the inclusion of mitigation measures. This reflects the anticipated decrease in road vehicle emissions in future years.

This further indicates the robust nature of the original assessment and the provision of mitigation measures would ensure that no unacceptable exposure of future users to air pollutants are likely as a result of this development.

4.5 Scenario 4 - Opening Year 2022 Update Using 2022 Emission Factors and Background Concentrations with the Advanced Street Canyon

This scenario is a combination of Scenarios 2 and 3 and considers anticipated reductions in future

emissions and background concentrations along with the use of the advanced canyon module. It is therefore considered as the most realistic representative of the future year scenarios.

Critically, as with all the scenarios, the predicted NO_2 concentration at the proposed ventilation inlet is 26.97mg/m^3, well below the annual mean AQO and shows that a guaranteed supply of clean air can be provided to future users of the site.

4.6 Summary of Sensitivity Results

The updated model and sensitivity scenarios all indicate that the original air quality assessment is considered robust and an in fact over prediction of air quality concentrations across the development site by a considerable margin. This is considered to provide sufficient evidence that the conclusions of the assessments are reliable.

The proposed mitigation of sealed facades, mechanical ventilation with an elevated inlet are considered robust measures to ensure that there would be no unacceptable exposure to air pollution for future users at the proposed development site.

It should be noted that these sensitivity tests do not take account of predicted local decreases in traffic flows (increases have been assumed) and the potential improvements brought by the ULEZ or COVID impacts.

This demonstrates that the health of future site users including children would not be adversely affected. Therefore the third reason for refusal should not be upheld on air quality issues.

5. SUMMARY

The original assessment used valid inputs, relevant guidance and the results were assessed against relevant policy and legislation.

The original assessment was based on robust and worst case assumptions would result in likely over prediction of concentrations at the development site and that the assessment can be considered as robust and valid. The results showed that whilst exceedances of the annual mean AQO for NO_2 could be expected at roadside facing facades, concentrations at higher elevations and in the rear yard were below in the AQO for all pollutants and metrics.

Therefore, it is considered that the proposed development, subject to the inclusion of the proposed mitigation measures through mechanical ventilation is acceptable from an air quality perspective and that the third reason for refusal should not be upheld on air quality grounds.

These results and conclusion are supported by the NO_2 monitoring in the vicinity of the site. Whilst over a relatively short period the results were annualised and bias corrected to provide a valid measure and comparison of concentrations at locations around the proposed development site.

This indicated that levels may have been overestimated by the modelling assessment and supported the evidence that concentrations to the rear of the existing building are significantly lower than those at the road facing building facades.

To further support the existing evidence the modelling exercise was updated for NO_2 using 2018 meteorological and monitoring data. This also used updated emissions factors and background concentrations. A number of scenarios were tested to consider the effects of expected road vehicle emissions and background concentration improvements in future years and also the potential for street canyon effects on roadside pollutant concentrations.

The results supported the conclusion that the original assessment can be taken as robust and valid and that pollutant concentrations can be expected to decrease by the expected development opening year. It also indicated that pollutant concentrations at the proposed mechanical ventilation inlet would be well below the AQO for NO_2 and by proxy for other pollutants. Therefore the proposed mitigation measures can be seen as a cautious but good approach to ensure that future users are not exposed to unacceptable concentrations of air pollution and therefore does not contravene LBoC planning policy CC4.

It is shown that the third reason for planning refusal is not justified on air quality grounds.

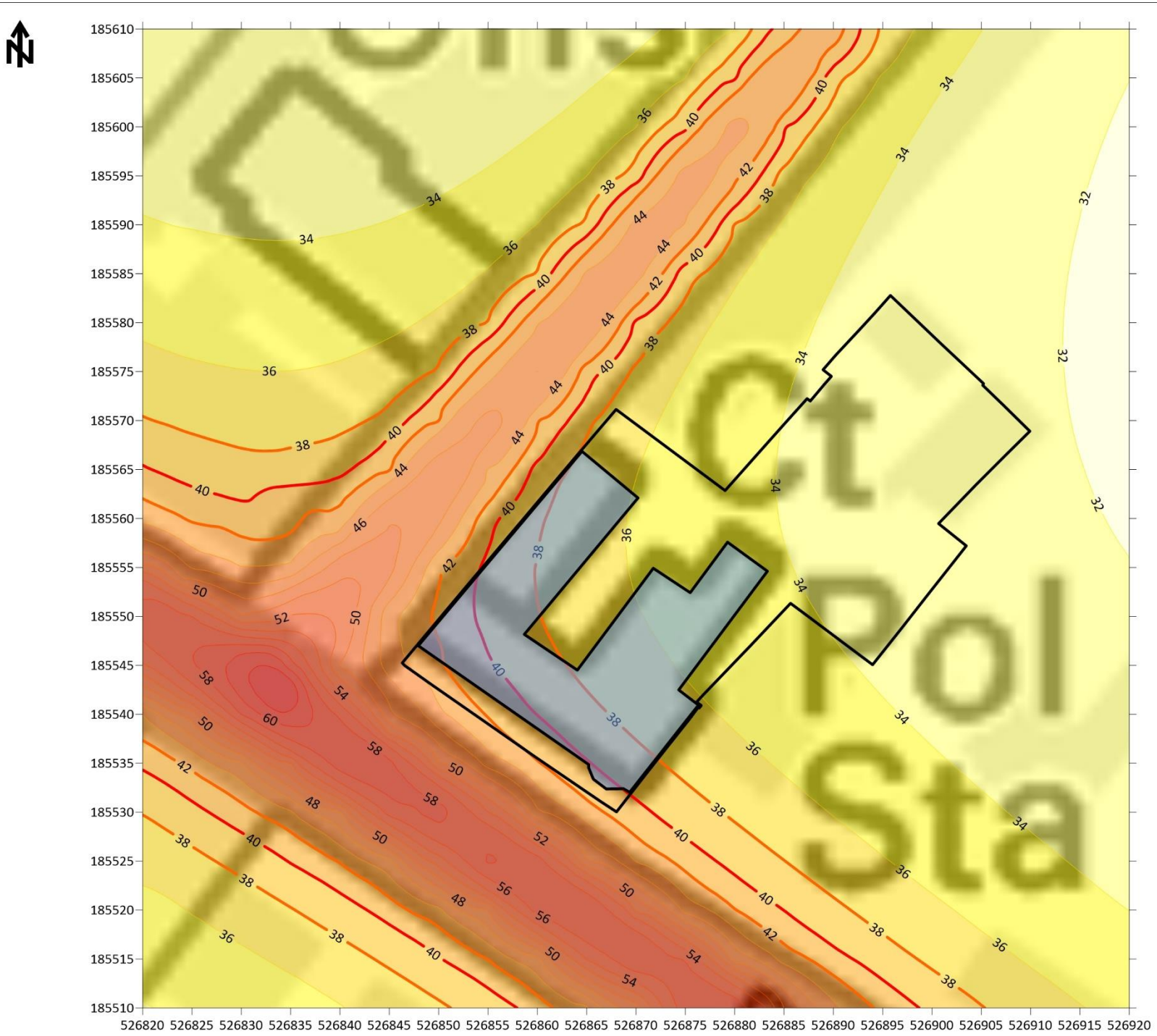
Similarly, when considering worst case potential emission generated by the proposal these have been shown to be below screening thresholds and are therefore shown to be not significant. The development can also be considered at least air quality neutral and therefore in line with the London Plan relevant policy.

It is shown that the first reason for planning refusal is not justified on air quality grounds

6. ABBREVIATIONS - TBC

AADT	Annual Average Daily Traffic
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EPUK	Environmental Protection UK
EU	European Union
GLA	Greater London Authority
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospherics Emissions Inventory
LAQM	Local Air Quality Management
LLAQM	London Local Air Quality Management
LA	Local Authority
LBoC	London Borough of Camden
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
PoE	Proof of Evidence
SoC	Statement of Case
TEMPRO	Trip End Model Presentation Program
z_0	Roughness Length

APPENDIX P1 - FIGURES



Legend

Site Boundary

Building Location

64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32

Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)

Title

Figure 1

Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2022
2018 Baseline Emission Factors
Z = 1.5m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

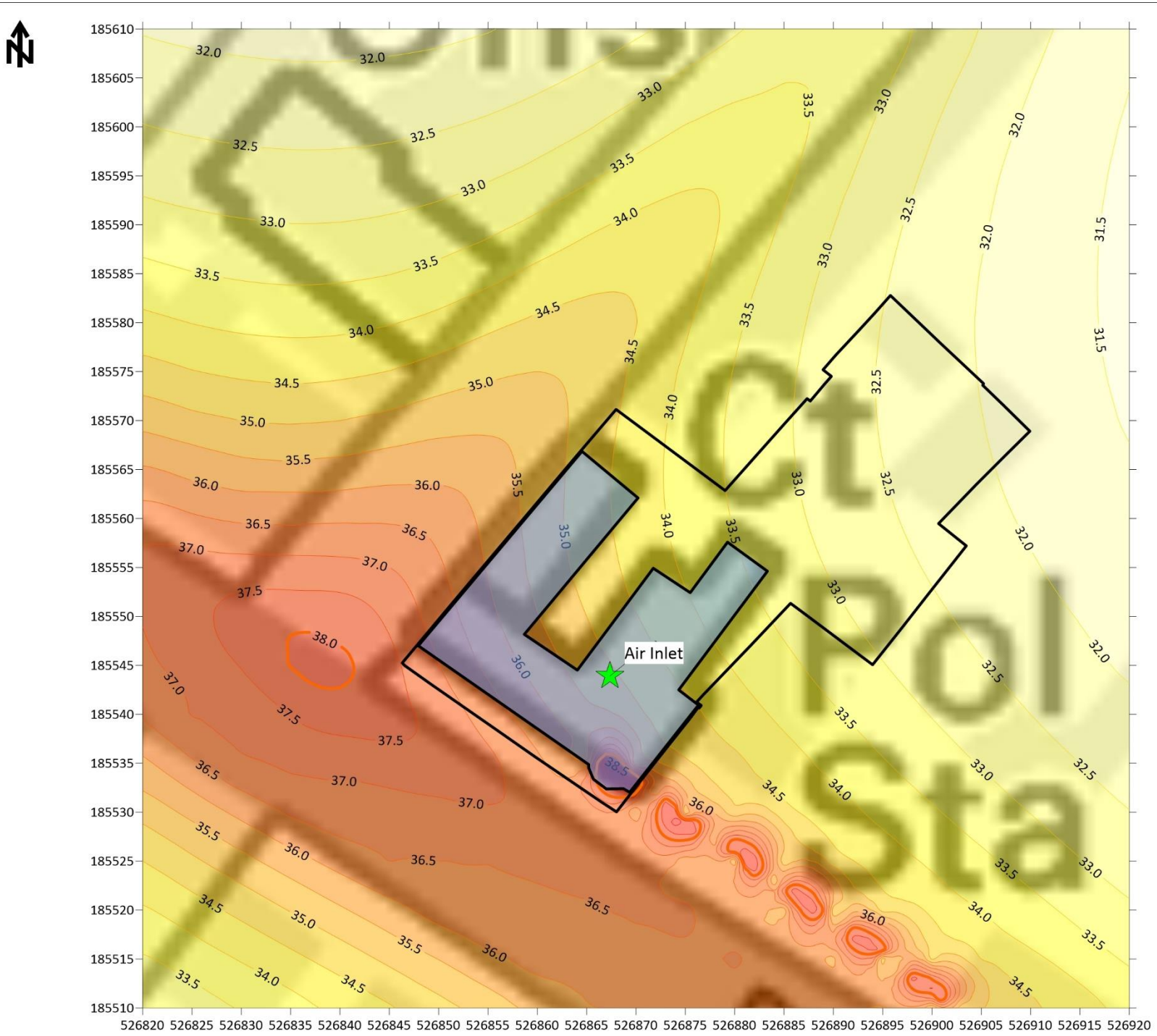
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

Predicted Annual Mean NO_2 Concentration (µg/m³)

39.5
39.0
38.5
38.0
37.5
37.0
36.5
36.0
35.5
35.0
34.5
34.0
33.5
33.0
32.5
32.0
31.5

Title

Figure 2

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2022
2018 Baseline Emission Factors
Z = 4.7m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

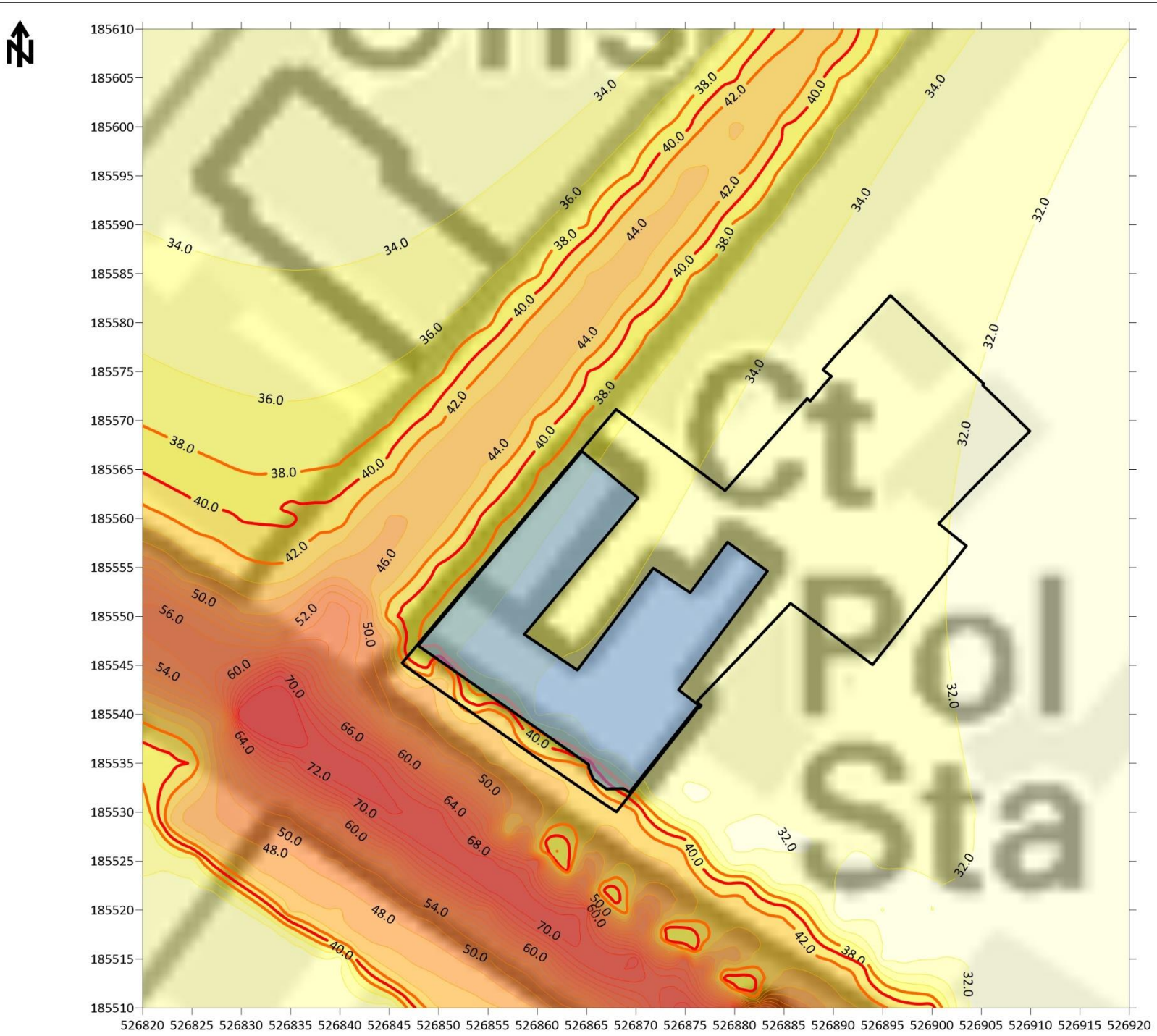
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

Predicted Annual Mean NO_2 Concentration (µg/m³)

72.0
68.0
64.0
60.0
56.0
52.0
48.0
44.0
40.0
36.0
32.0

Title

Figure 3

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2022
2018 Emission Factors
Z = 1.5m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

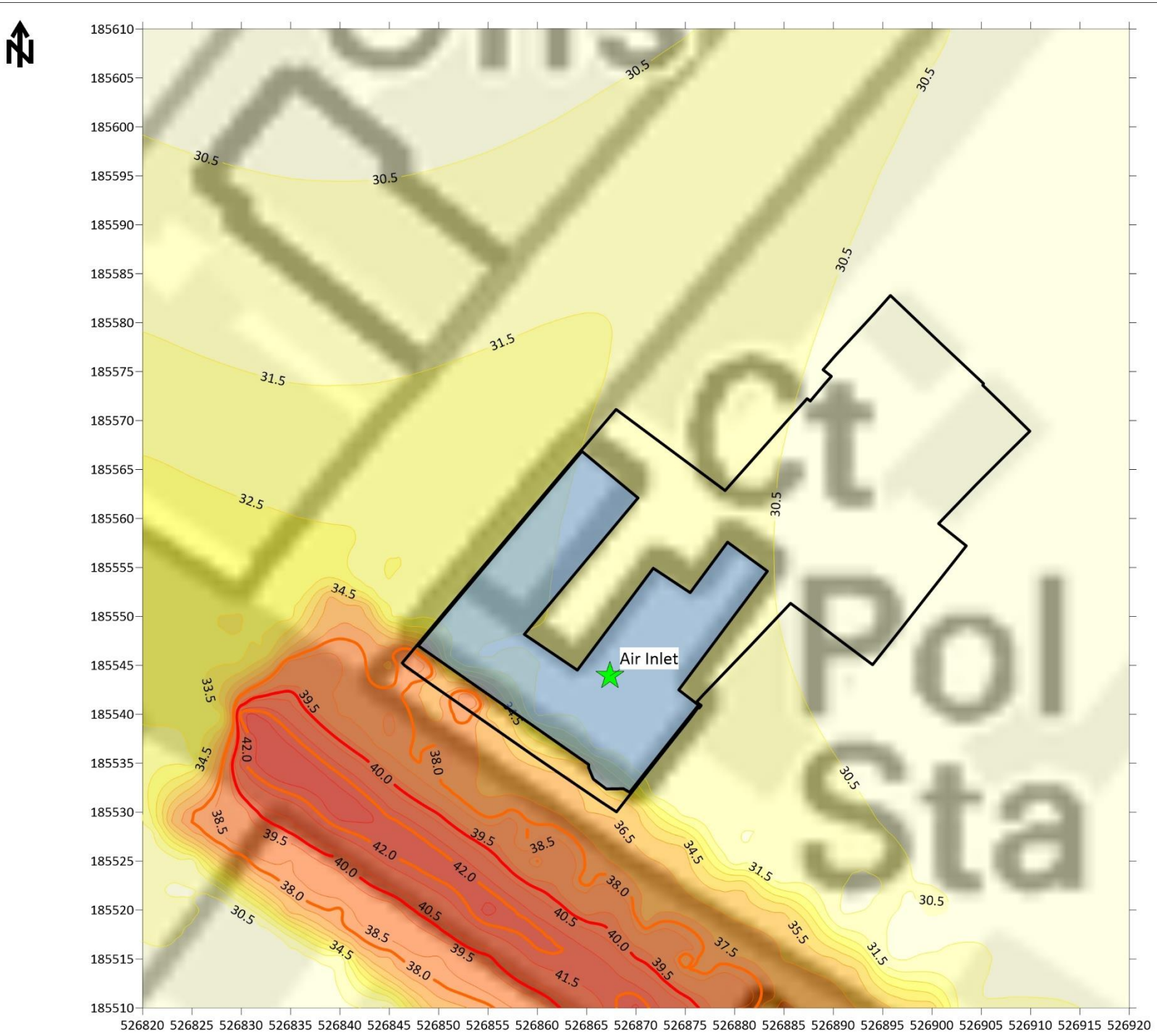
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

43.5
42.5
42.0
41.5
40.5
40.0
39.5
38.5
38.0
37.5
36.5
35.5
34.5
33.5
32.5
31.5
30.5

Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)

Title

Figure 4

Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2022
2018 Emission Factors
Z = 4.7m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

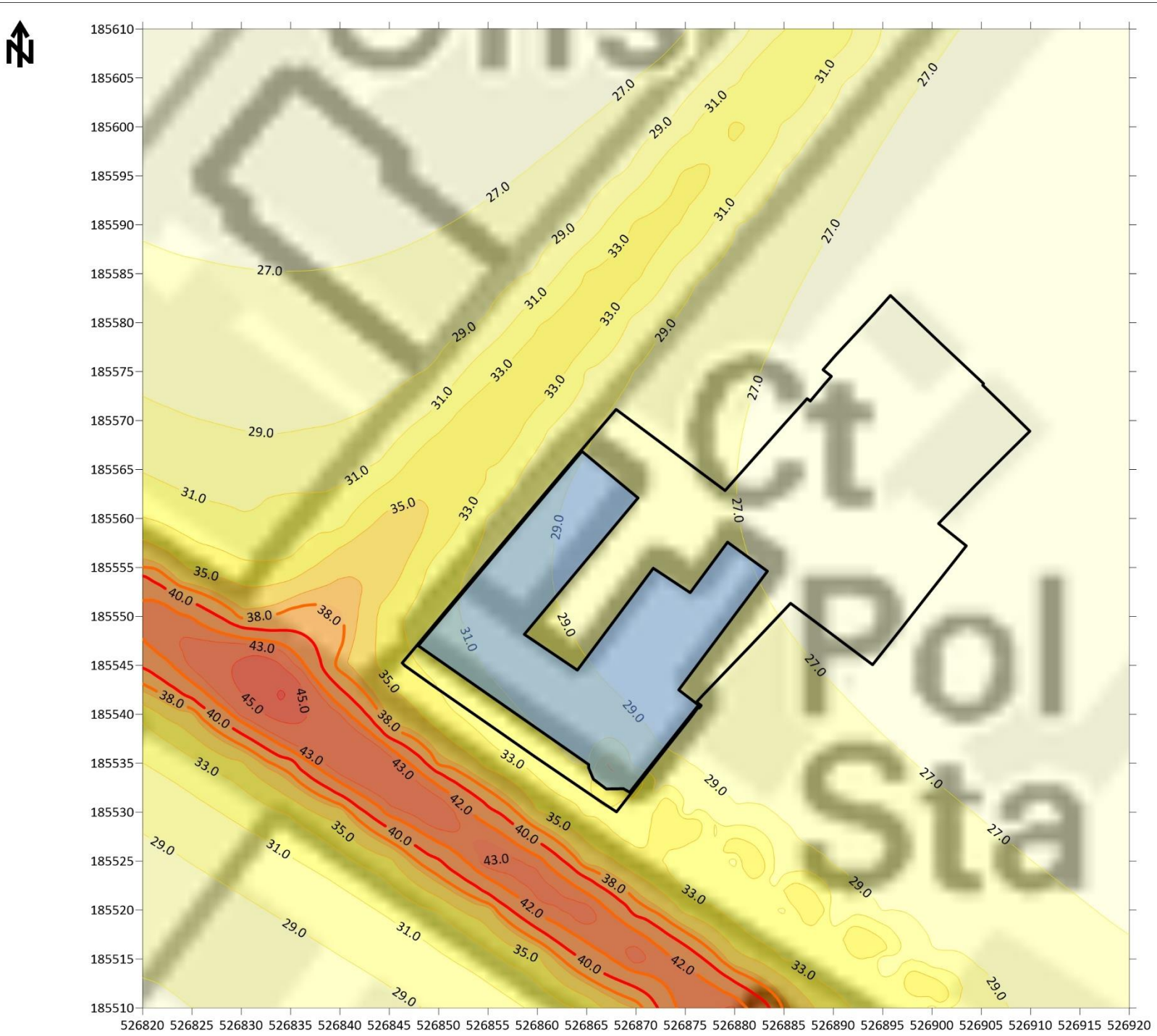
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

Predicted Annual Mean NO_2 Concentration (µg/m³)

47.0
45.0
43.0
42.0
40.0
38.0
37.0
35.0
33.0
31.0
29.0
27.0

Title

Figure 5

Predicted Annual Mean NO_2 Concentrations (µg/m³) 2022
2022 Emission Factors
Z = 1.5m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

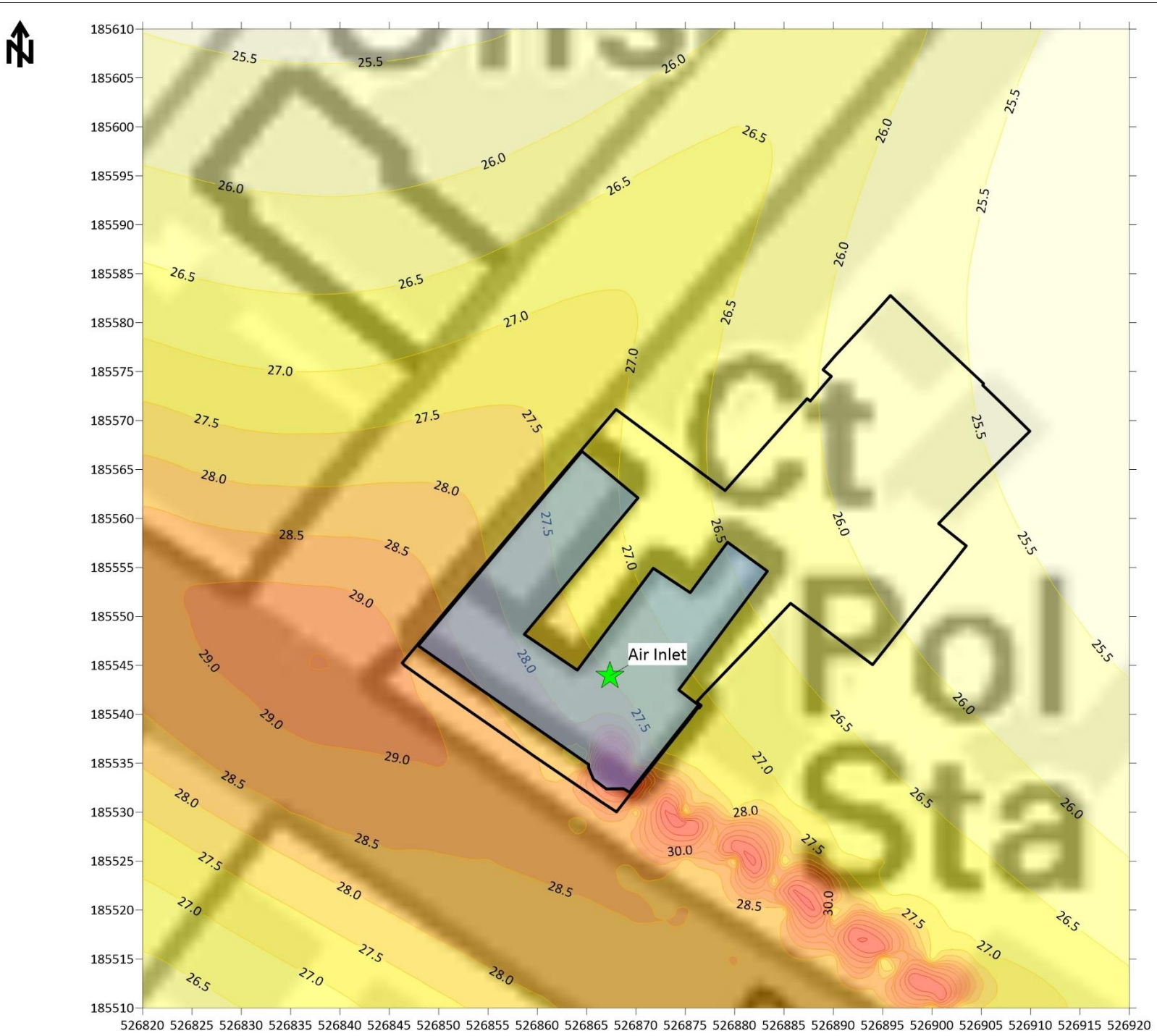
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)

35.0
34.0
33.0
32.0
31.0
30.0
29.5
29.0
28.5
28.0
27.5
27.0
26.5
26.0
25.5

Title

Figure 6

Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2022
2022 Emission Factors
Z = 4.7m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

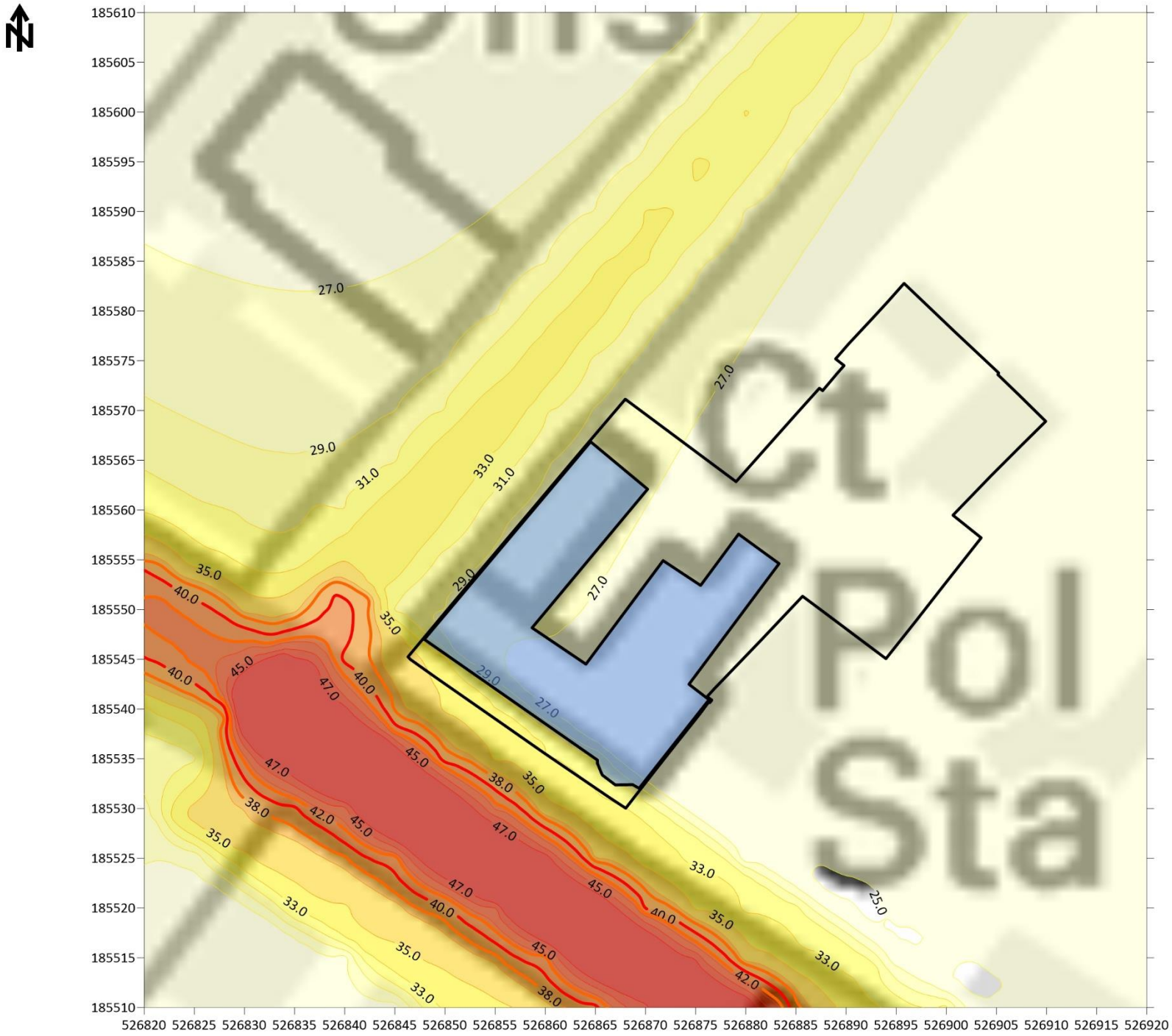
Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Building Location

47.0
45.0
43.0
42.0
40.0
38.0
37.0
35.0
33.0
31.0
29.0
27.0

Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)

Title

Figure 7

Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2022
2022 Emission Factors
Z = 1.5m

Project

Air Quality Proof of Evidence

Hampstead Police Station, London

Project Number

AQ106285

Client

JLL

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk

APPENDIX P2 – SENSITIVITY MODEL INPUTS

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

The parameters used for the model were the same as used in the original AQA (Ref. AQ106285) with the exception of the traffic flow data and use of 2018 meteorological data to reflect the use of 2018 monitoring data in the verification.

In addition to considering an assessment area across the development site, a single receptor location was added to represent the proposed mechanical ventilation input at a height of 8 metres. The location of this receptor is at NGR: 526867.4, 185543.9.

Traffic Flow Data

Similar to the original AQA, traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition, was obtained from the London Atmospheric Emissions Inventory (LAEI). The updated version of the LAEI (2013) was released by the Greater London Authority (GLA) in 2016 and provides information on emissions from all sources of air pollutants in the Greater London area.

The exception to use of the LAEI data is the AADT and fleet composition used for Downshire Hill where no LAEI data was available. The data used on this road link is discussed in this evidence in Section 3.3.1.

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2013 traffic flow year to 2018, for model verification, and to 2022 which was used to represent the operational year of the proposed development. Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the verification scenario is provided in Table A1.

Table A1 2018 Verification Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
L1	Hampstead High Street	8.9	15,383	4.82	32.2
L2	Downshire Hill Slowdown	6.5	4,639	7.95	24.1
L3	Downshire Hill	5.5	4,639	7.95	32.2
L4	Rosslyn Hill	7.2	15,383	4.82	32.2
L5	Hampstead High Street Slowdown	9.0	15,383	4.82	24.1
L6	Heath Street Slowdown	7.0	15,182	3.56	24.1
L7	Heath Street	6.6	15,182	3.56	32.2
L8	Heath Street Slowdown to Junction	9.8	15,182	3.56	40.2
L9	B511 Slowdown to Lights	7.9	25,755	7.50	24.1
L10	B511	7.5	25,755	7.50	32.2
L11	Fitzjohn's Avenue Slowdown	7.4	25,755	7.50	16.1
L12	Fitzjohn's Avenue	37.0	19,073	5.85	24.1
L13	Rosslyn Hill Slowdown	9.7	15,383	4.82	24.1
L14	Haverstock Hill	8.0	15,719	6.85	32.2
L15	Haverstock Hill Slowdown	9.1	15,719	6.85	24.1
L16	A502	9.5	15,489	5.47	32.2
L17	A502 Slowdown	9.4	15,489	5.47	24.1
L18	A502 Haverstock Hill	8.2	15,253	4.01	32.2

The road width and mean vehicle speed shown in Table AII.1 remained the same for the 2023 scenarios. A summary of the 2022 traffic data is shown in Table A2.

Table A2 2022 All Scenarios Traffic Data

Road Link		DS	
		24-hour AADT Flow	HDV Prop. (%)
L1	Hampstead High Street	16,175	4.82
L2	Downshire Hill Slowdown	4,878	7.95
L3	Downshire Hill	4,878	7.95

Road Link		DS	
		24-hour AADT Flow	HDV Prop. (%)
L4	Rosslyn Hill	16,175	4.82
L5	Hampstead High Street Slowdown	16,175	4.82
L6	Heath Street Slowdown	15,964	3.56
L7	Heath Street	15,964	3.56
L8	Heath Street Slowdown to Junction	15,964	3.56
L9	B511 Slowdown to Lights	27,082	7.50
L10	B511	27,082	7.50
L11	Fitzjohn's Avenue Slowdown	27,082	7.50
L12	Fitzjohn's Avenue	20,055	5.85
L13	Rosslyn Hill Slowdown	16,175	4.82
L14	Haverstock Hill	16,528	6.85
L15	Haverstock Hill Slowdown	16,528	6.85
L16	A502	16,287	5.47
L17	A502 Slowdown	16,287	5.47
L18	A502 Haverstock Hill	16,039	4.01

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 9.0) released in 2019, which incorporates updated COPERT 5 vehicle emissions factors for NO_x and vehicle fleet information.

Meteorological Data

Meteorological data used in this assessment was taken from Heathrow meteorological station over the period 1st January 2018 to 31st December 2018 (inclusive). Heathrow meteorological station is located at approximate NGR: 507060, 176500, which is approximately 22km west of the proposed development.

Background Concentrations

The annual mean NO_2 concentrations detailed in Table A3, was used in the dispersion modelling assessment to represent annual mean pollutant levels at the Site and local monitoring sites.

Table A3 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table A3 Predicted Background Pollutant Concentrations for Diffusion Tube and Site

Location	DEFRA Grid Square	Pollutant	2018 Predicted Background Concentration (µg/m^3)	2022 Predicted Background Concentration (µg/m^3)
(CA17) Diffusion Tube and Site	526500, 185500	NO_x	44.60	34.80
		NO_2	27.52	22.72

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM (TG16).

Verification

For the purpose of this sensitivity model verification was undertaken for 2018, using traffic data, meteorological data and monitoring results from this year.

As discussed in Section 3.3.2 LBoC undertakes periodic monitoring of NO_2 concentrations at one representative roadside monitoring location within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within GLA guidance LLAQM TG(16) and DEFRA Guidance LAQM (TG16). The monitored annual mean NO_2 concentration and calculated road NO_x concentration are summarise in Table A4.

Table A4 Monitoring Results

Site ID	Modelled Road NO_x Concentration (µg/m^3)	Monitored Road NO_x Concentration (µg/m^3)
CA17	15.98	48.10

The monitored and modelled NO_x road contribution concentrations indicated that a verification factor of **3.1850** was required to be applied to all NO_x modelling results, showing the model again had a tendency to underestimate pollutant concentrations.