AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement Addendum 2– Appendix 5 Clean Air Zone Sensitivity Testing - Air Quality

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Document Ref: 7.8.2.5

PINS Ref.: EN020022

AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement Addendum 2– Appendix 5 Clean Air Zone Sensitivity Testing - Air Quality

PINS REF.: EN020022

DOCUMENT: 7.8.2.5

DATE: 25 JANUARY 2021

WSP

WSP House

70 Chancery Lane

London

WC2A 1AF

+44 20 7314 5000

www.wsp.com

DOCUMENT

Document	**7.8.2.5 Environmental Statement Addendum 2– Appendix 5 Clean Air Zone Sensitivity Testing - Air Quality**
Revision	001
Document Owner	WSP UK Limited
Prepared By	L. Shelton
Date	21 January 2021
Approved By	S. Bennett
Date	25 January 2021

CONTENTS

TABLES

APPENDIX 5 - CLEAN AIR ZONE SENSITIVITY TESTING - AIR QUALITY

1.1. BACKGROUND

1.1.1.1. Chapter 23 (Air Quality) of the 2019 ES (APP-138) reports on the assessment and likely significant effects arising from the Proposed Development in relation to local air quality.

1.1.1.2. Additional air quality assessment work has been completed to address concerns raised by Portsmouth City Council (PCC) in response to item 4H at Issue Specific Hearing 2 (ISH2) (14th December 2020). The question raised by the Examining Authority was:

> *With reference to the answer to question ExQ1 AQ1.2.4 and the Works Plans, can Portsmouth City Council clarify whether there are particular areas of concern relating to potential exceedances of NO_2 within the Order limits and whether such areas are covered either by Air Quality Management Areas or within the Air Quality Local Plan?*[1]

1.1.1.3. In response, PCC requested *'more information on the impact of the development on the Clean Air Zone (CAZ) and diversion routes in areas of "near exceedance"' as identified in the PCC 2019 Air Quality Action Plan'.* A scope of works to provide this information was subsequently agreed between the Applicant and PCC following the Hearing.

1.1.1.4. The aim of the CAZ sensitivity testing work is to address the following concerns of PCC:

- Compliance with EU Directive 2008/50/EC on the Strategic Road Network (SRN). Although compliance on the SRN is ultimately the responsibility of Highways England, PCC is expected to communicate with Highways England as local plans are developed and to ensure local measures and approvals do not adversely impact on the SRN;
- Compliance with the National Air Quality Strategy objective for annual mean NO_2 on the local road network in the 'shortest time possible' as determined in the governments UK Plan for tackling nitrogen dioxide concentrations[2]; and

[1] Portsmouth City Council (2019). Portsmouth Local Air Quality Plan Outline Business Case (OBC).
[2] Defra (2017). UK Plan for Tackling Nitrogen Dioxide Concentrations. Detailed Plan. July 2017.

- Compliance with the National Air Quality Strategy objective as a result of the Covid-19 pandemic.

1.1.1.5. The specific locations of concern are locations where exceedances and near exceedance of the annual mean NO_2 objective ("areas of concern") were monitored in 2019 by PCC as reported in the 2020 Annual Status Report submission to Defra[3]: The areas of concern are:

- A3;
- A27/M27;
- Eastern Road Water Bridge;
- A2047; and
- Mile End Road.

1.1.1.6. The objective of this sensitivity assessment is to undertake atmospheric dispersion modelling to quantify pollutant concentrations at the areas of concern using traffic data from the Air Quality Local Plan ("Local Plan"), and the latest emissions (EFTv10.1) and monitoring data (2019). These pollutant concentrations will be used to assess the impact of the Proposed Development on compliance with the EU Directive 2008/50/EC in 2022 incorporating the effects of the Class B CAZ.

1.1.1.7. This appendix summarises the impact assessment, proposed mitigation, residual effects and conclusion as a result of the completion of this new assessment work.

1.2. SCOPE OF WORKS

1.2.1.1. The scope of works for the CAZ Sensitivity Testing has been agreed with PCC, and required additional detailed quantitative modelling using the following parameters:

- Traffic flows from the PCC CAZ modelling were used as the Do-Minimum scenario. Changes in traffic flows on the links due to the Proposed Development road closures and diversions were applied for two scenarios which are:
  - Do-Something scenario with road closures on the A2030 Eastern southbound (DS1); and
  - Do-Something scenario with road closures on the A2030 Eastern northbound (DS2);
- The Defra Emissions Factor Toolkit (EFT) v10.1 was used, as agreed between PCC and the Defra Joint Air Quality Modelling Unit;
- Background concentrations from the 2018-base year dataset for 2019 and 2022 were used for the assessment, with the associated use of the Defra NO_2 Adjustment for NO_x Sector Removal Tool v8;

- NO_x to NO_2 conversions were undertaken using the NO_x to NO_2 Calculator version 8.1; and
- Diffusion tube monitoring data from 2019, as presented in the Annual Status Report for 2020, were used to verify the performance of the model.

1.2.1.2. The scope of works also includes a narrative on the impact of Covid-19 on local air quality during the Construction Stage. This is supported by the completion of spreadsheet modelling using EFTv10.1, to show the road link specific impact on total emissions under theoretical fleet renewal scenarios representing the potential impact of the Covid-19 pandemic.

1.3. METHODOLOGY

1.3.1.1. The assessment developed to meet the scope of works has been completed with reference to information contained within the documents described in **Table 1**:

Table 1 – Reference documents

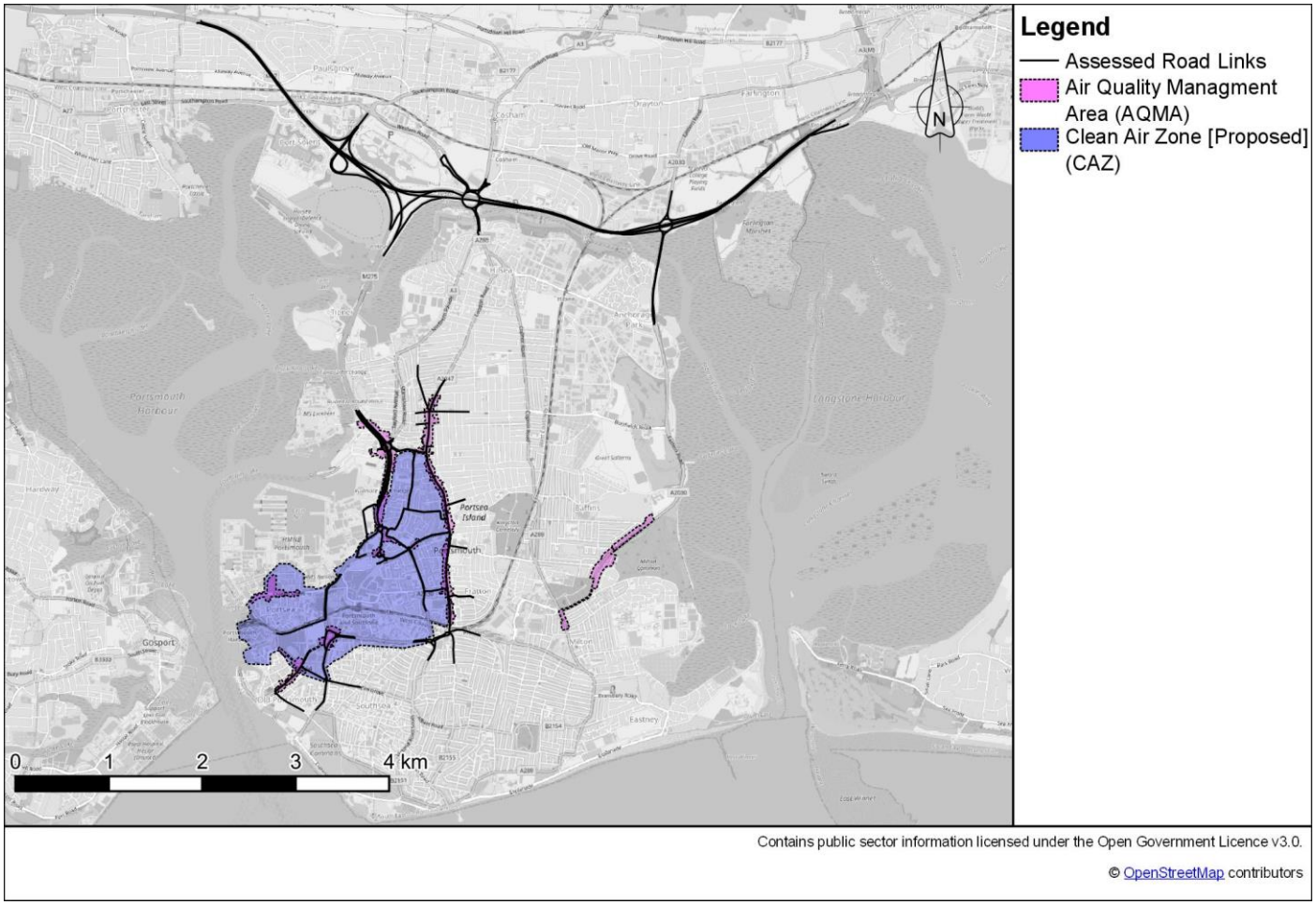
Document	Information
2020 Annual Status Report	2019 monitoring data
Portsmouth Local Air Quality Plan Outline Business Case (OBC)	High level OBC methodology and modelling results.
JAQU Air Quality Modelling Report (AQ3)[4]	Technical modelling methodology applied to the Local Air Quality Plan, including model parameters and vehicle class information
Portsmouth AQ Local Plan-COVID-19 impacts and scenarios[5]	Description of assumptions and results of sensitivity testing scenarios relating to the predicted impacts of COVID-19

1.3.2. STUDY AREA

1.3.2.1. **Figure 1** shows the study area consisting of the near exceedance areas, the Portsmouth CAZ, assessed road links, receptors and monitoring locations:

[4] Joint Air Quality Unit (2020). Air Quality Modelling Report (AQ3). December 2020.
[5] Atkins (2020). Portsmouth AQ Local Plan-Covid-19 impacts and scenarios. December 2020.

Figure 1 - CAZ Sensitivity Testing Study Area



1.3.2.2. For the purpose of the reporting of the sensitivity testing results, impacts at relevant human sensitive receptors in the study area corresponding to the areas of concern are presented.

1.3.3. TRAFFIC DATA

SATURN-based Southern Regional Transport Model (SRTM)

1.3.3.1. Traffic data used in the Local Air Quality Plan assessment for 2018 and 2022 are derived from the SATURN-based Southern Regional Transport Model (SRTM) provided by Systra.

1.3.3.2. The SRTM data were screened against criteria from the IAQM construction dust guidance (Institute of Air Quality Managment, 2016) and the IAQM Planning Guidance (Moorcroft, et al., 2017) in order to obtain an Affected Road Network (ARN). Where affected links were found to be within an AQMA, the more stringent screening criteria from the IAQM Planning Guidance were applied as in **Table 2**.

Table 2 - Indicative Traffic Screening Criteria

The development will:	Indicative criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.

1.3.3.3. This produced an affected road network that included contiguous and non-contiguous sections. Where non-contiguous sections were present, professional judgement was used to join up areas, e.g. between adjacent AQMAs, to produce a collection of contiguous road networks.

Limitations

1.3.3.4. There is risk in the application of raw SATURN based strategic model outputs to estimate traffic flows on local road networks. For example, in the Local Plan modelling, the SRTM was found to substantially over-estimate the flow on Church Street and Mile End Road as a result of the modelled link capturing movements on other local roads which are not represented in the strategic model network. On this basis, results are treated with caution in relation to Church Street and Mile End Road.

1.3.4. ASSESSMENT YEAR

1.3.4.1. To provide an update to the Local Plan modelling, validation was completed using synchronous traffic, meteorological and monitoring datasets. These datasets are:

- Traffic data for 2018 provided by Systra growthed to 2019 using a TemPRO growth factor;
- Meteorological data for Thorney Island (2019); and
- Monitoring data for 2019 from the 2020 ASR.

1.3.4.2. The impact assessment was completed using traffic data from the Local Plan Modelling and the Proposed Development for 2022.

1.3.5. VEHICLE EMISSIONS

1.3.5.1. The Local Plan Modelling Report describes an Automatic Number Plate Recognition (ANPR) camera survey completed during a week's study in March 2019 at a large number of locations across the air quality model domain area.

1.3.5.2. The survey yielded over 8 million validated vehicle captures which were collated and aggregated to generate a locally representative and domain-wide vehicle fleet composition. This enabled total vehicle journeys on all modelled links to be proportioned according to characteristics such as:

- Vehicle size and class distributions;
- Fuel splits (e.g. petrol, diesel, Liquid Petroleum Gas -LPG, hybrid, electric);
- Estimated Euro emission standard based on year of manufacture;
- Rigid and articulated Heavy Goods Vehicle (HGV) split; and
- Bus and coach split.

1.3.5.3. Using the ANPR data, the detailed input option within the EFTv10.1 was utilised (Alternative Technology'), in combination with the use of a bespoke 'simple User Euro' work tab for the 2019 scenario. Therefore, the local fleet Euro composition specific to the model domain was represented within the emissions inventory calculations and outputs.

1.3.5.4. For the Projected Base Year (2022), Alternative Technology within EFTv10.1 was utilised along with the 'Fleet Projection' tool tab. 'Option 1' of the projection tool was utilised within EFT, which assumed the future year 2022 Euro fleet composition has the same difference in Euro classes as observed between the default base year profile and the ANPR data.

1.3.5.5. EFTv10.1 incorporates an updated Petrol/Diesel Projection Tool for forecasting the fuel split of cars – as determined from the ANPR data – to future assessment years. The tool was used predict the relative proportions of conventional petrol and diesel cars, hybrid cars and electric cars in 2022.

1.3.5.6. The outputs from the EFT for each assessment scenario included the following:

- Link-specific NO_x emissions rates for air quality model input (g/km/s);
- Annual NO_x emissions total for each link within the modelled road network (kg/annum);
- Primary NO_2 (f-NO_2) emissions fraction for each link and, for the links included in the model, an average-domain wide f- NO_2 fraction; and
- Annual NO_x emissions split by vehicle type for source apportionment.

1.3.5.7. The link-specific emission rates output from each of the four EFT spreadsheets were added together to form the emissions dataset for input into ADMS-Roads. Annual total pollutant emissions for each link were aggregated in the same way. For f-NO_2, the EFT outputs were combined and emissions-weighted average f-NO_2 values were calculated.

1.3.6. MODEL PARAMETERS AND DATASETS

1.3.6.1. Once screened, the data for the affected road networks was loaded into Cambridge Environmental Research Consultants ('CERC') Atmospheric Dispersion Modelling System for Roads ('ADMS-Roads') version 5.0. Geographical data for the affected road network was extracted using QGIS v3.12 and loaded in the ADMS-Roads model.

1.3.6.2. Emissions factors for each of the links within the affected road network were obtained using the Defra Emissions Factor Toolkit v10.1 on the advice of PCC in consultation with the Governments Joint Air Quality Unit (JAQU).

1.3.6.3. The model parameters applied in the Local Plan modelling were replicated as far as practicable. These are summarised as follows:

- Surface roughness 0.5 m;
- Monin-Obhukov length 30 m;
- Meteorological data Thorney Island (2019);
- NO_x to NO_2 calculator v8.1;
- 2018 reference year background maps;
- Primary NO_2 emissions (f-NO_2) represented by an area-based link length weighted factor;
- Street canyons (not represented);
- Flyovers and tunnels (not represented);
- Road gradients (not represented); and
- Road links (not georeferenced and real-worlded).

1.3.6.4. The assessment scenarios for which NO_2 predictions were made are:

- Model verification (2019);
- Do-Minimum (2022) informed by the Local Plan modelling Do-Something scenario including traffic re-distribution caused by the operational CAZ; and
- Do-Something (2022) as the Do-Minimum scenario plus Proposed Development construction traffic.

1.3.7. RECEPTORS

1.3.7.1. Upwind and downwind receptors were placed along the ARN which included the Pollution Climate Mapping (PCM) road links for which the Government is required to report on compliance under EU Directive 2008/50/EC. This is consistent with the Local Plan modelling, where a suite of discrete receptor points was identified adjacent to each PCM link and local road link from the SRTM within the air quality model domain.

1.3.7.2. All PCM links have a unique Census ID and a grid reference typically describing the Department for Transport traffic count points on each link.

1.3.7.3. For consistency with the Local Plan modelling, each receptor was modelled at 4 m from the kerb at a height of 2 m above ground level on either side of the road link. The receptors adhered to the criteria referenced by Annex III of EU Directive 2008/50/EC, which state that the receptor should be:

- Representative of at least 100 m of road length;
- At least 25 m from the edge of a major junction (one that interrupts flow of traffic); and Within 10 m of the kerbside.

1.3.7.4. The locations of all the discrete receptors included in the air quality model are presented in **Figure 1**. The receptor results reported and used to assess the impact of the Proposed Development on local air quality in the presence of the CAZ are consistent with those reported in Table 3-1 of the Air Quality Local Plan as shown in **Table 3**. The exception is A3 Marketway (Hope Street Roundabout to Unicorn Road) because changes as a result of the Proposed Development did not meet the traffic screening criteria. As the impact of the Proposed Development on local air quality at this location will therefore be imperceptible, results are not reported.

Table 3 – Locations with modelled (or near) exceedances in the Air Quality Local Plan baseline

Receptor ID	Road Name
On road sections on the local network modelled as exceeding the EU limit in 2022	
573	A3 Alfred Road (Unicorn Road to Queen Street, s/b)
546	A3 Commercial Road (south of Church Street Roundabout, s/b)
Road sections on the local network modelled not exceeding the EU limit in 2022	
526	Church Street (east of Church Street Roundabout, n/b)
526	Church Street (sensitivity test) – described below
536	A3 Hope Street (south of Church Street Roundabout, s/b)
824	A2030 Eastern Road Water Bridge (s/b)
648	A2047 London Road (Stubbington Avenue to Kingston Crescent, s/b)
520	Mile End Road (north of Church Street Roundabout, s/b)
Road sections on the strategic road network exceeding the EU Limit in 2022	
986	A27 (north of Portsea Island, w/b)
1089	A27 (east of Portsea Island, w/b)
11	M27 (west of Portsea Island, w/b)
968	A27 (north of Portsea Island, e/b)

Receptor ID	Road Name
834	A27 (east of Portsea Island, w/b)

1.3.7.5. The magnitude of impacts predicted at the receptors is described according to the framework provided in DMRB LA105[6] which determines an 'imperceptible' impact (<0.4 µg/m^3), a 'small' impact (>0.4 and <2.0 µg/m^3) a 'medium' impact (>2.0 and <4.0 µg/m^3) and a large impact(>4.0 µg/m^3).

1.3.8. INTERIM AND FUTURE BASE YEAR INTERPOLATION

1.3.8.1. In the Local Plan modelling, ADMS-Roads model was used to predict NO_2 concentrations at sensitive receptor locations for the Base Year (2018) and Projected Base Year (2022). To interpolate concentrations to interim years, the approach for estimating roadside NO_2 concentrations as described on the Local Air Quality Management support website was initially used, but the use of these yearly factors resulted in a greater reduction in concentrations than predicted by the local modelling. Therefore, a set of yearly factors specific to each road link was calculated based on a linear change in concentration from 2018 to 2022.

1.3.8.2. The same approach is applied, with factors extrapolated beyond 2022, using the linear relationship between 2019 and 2022 to identify the year of compliance without any intervention up to 2030.

1.3.9. MODEL PERFORMANCE

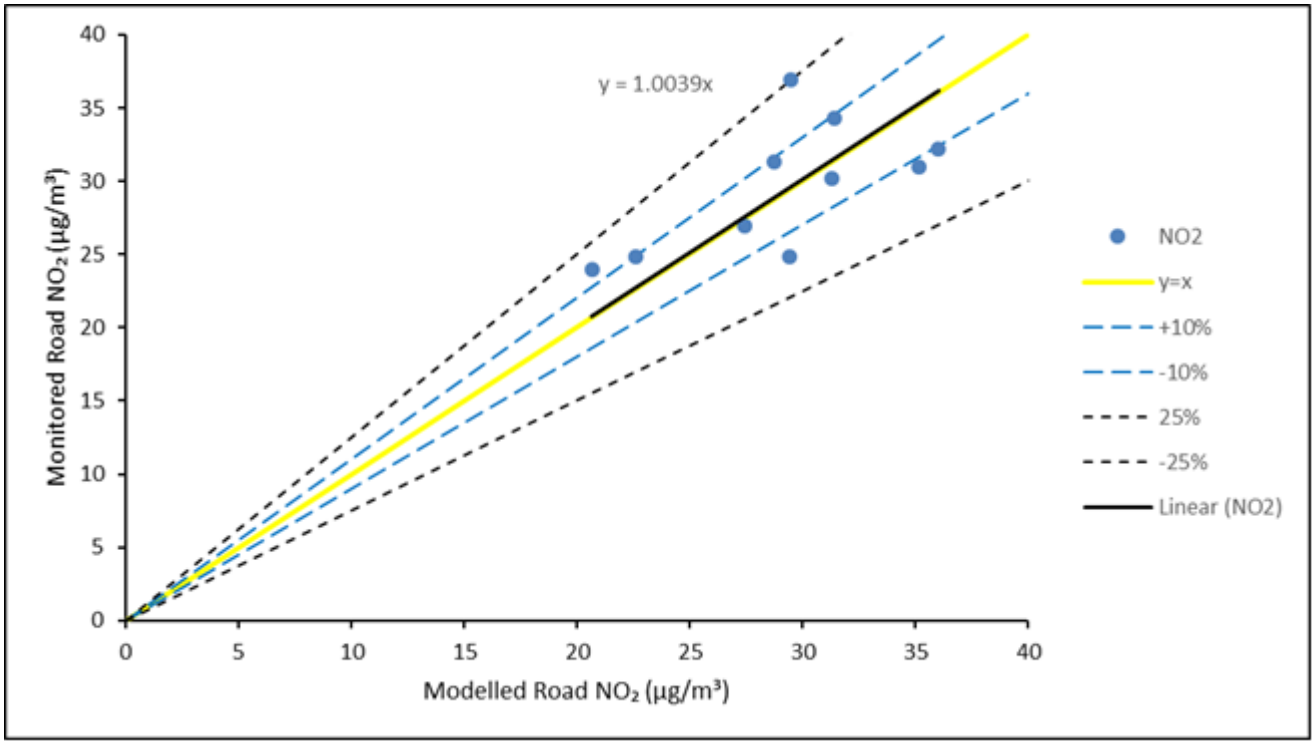
1.3.9.1. Model verification has been completed following the best practice Defra methodology reported in LAQM Technical Guidance document TG16[7]. Verification is the process by which uncertainties are investigated and minimised.

1.3.9.2. The modelled road-NOx values were plotted graphically versus the monitored road-NOx equivalent for the ten monitoring sites located in the study area. A road-NOx adjustment factor was derived for each zone based on a 'y=mx' line of best fit, forced through a zero intercept. The model was found to perform poorly at 1 monitoring site (DT25 Kingston Road) which lies outside the recommended ±25%. This poor performance may result from a number of factors. Here, the site was found to be located within 20 m of a bus stop which acts as a source of local pollution and so excluded on this basis.

1.3.9.3. A comparison of the resulting modelled NO_2 and monitored NO_2 before model verification and adjustment is shown in **Figure 2**.

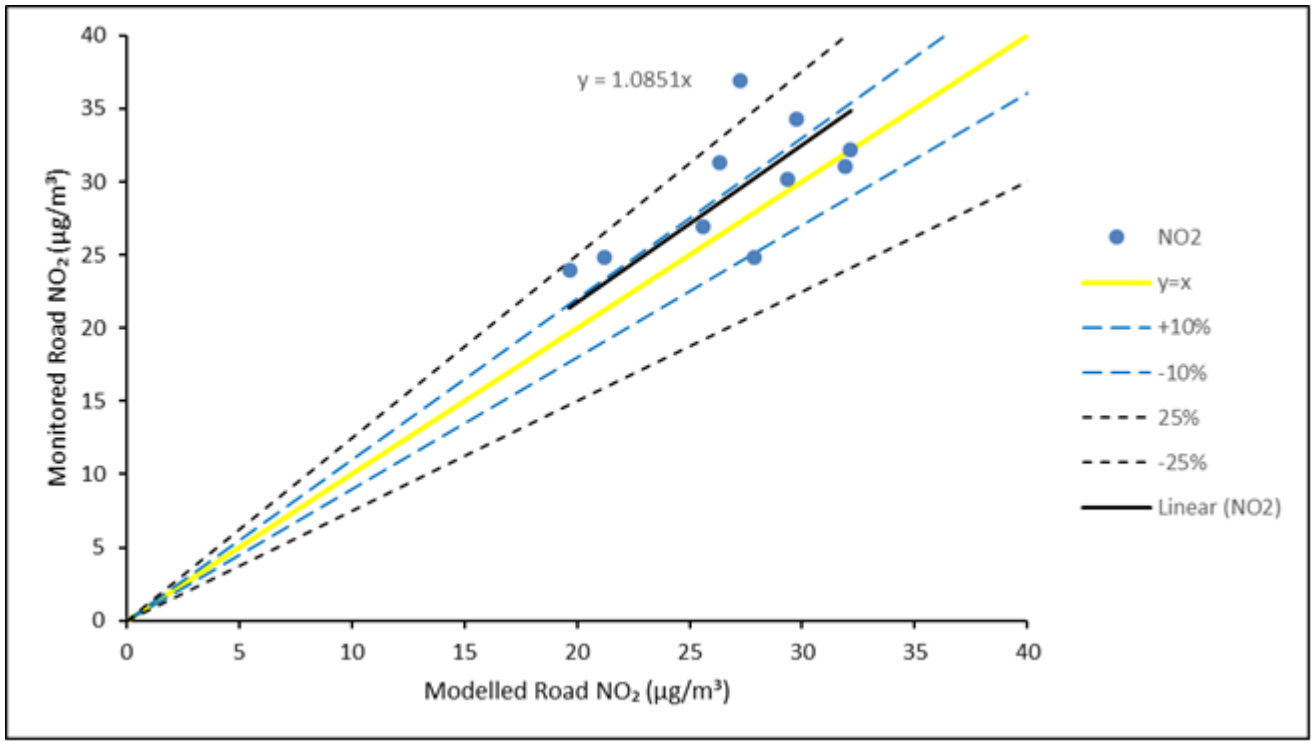
[6] Highways England (2019). Design Manual for Roads and Bridges. LA105 Air Quality.
[7] Defra (2016). Local Air Quality management. Technical Guidance (TG16)

Figure 2 - Modelled NO_2 versus monitored NO_2 before adjustment



1.3.9.4. A comparison of modelled NO_2 and monitored NO_2 after model verification and adjustment is shown in in **Figure 3**.

Figure 3 - Modelled NO_2 versus monitored NO_2 after adjustment



1.3.9.5. **Figure 3** shows that the model performs slightly worse after adjustment. Therefore road-NOx was not adjusted. Without adjustment, all ten receptors lie inside the recommended ±25% and 5 inside ±10%.

1.3.9.6. **Table 4** shows model performance metrics after the model verification and adjustment process as indicated by the Root Mean Square Error (RMSE) (the average difference between monitored and modelled concentrations), Fractional Bias (tendency of the model to under or over-predict) and the Correlation Coefficient.

1.3.9.7. The verification statistics for the verification are presented for comparison with the Local Plan modelling.

Table 4 – Sensitivity Testing Model Performance

Statistic	Air Quality Local Plan	CAZ sensitivity Study before verification and adjustment	CAZ sensitivity Study after verification and adjustment	Comments
Adjustment factor	1.6	1.0	0.8	Model marginally under-predicts after adjustment
RMSE	3.4	3.8	4.3	
Fractional Bias	0.0	0.2	0.1	
Correlation Coefficient	--	0.6	0.6	

1.3.9.8. The adjustment factor based on the line of best fit was derived to be 0.8 for the whole of Portsea Island. However, **Table 3** shows that the RMSE is slightly increased as a result of model adjustment, meaning that the model performs slightly worse. As a result, road-NO_x adjustment was not completed on the basis that an RMSE of 3.8 µg/m^3 lies inside the recommended 4.0 µg/m^3 threshold stipulated in the Defra TG16 guidance[7]. The positive fractional bias indicates that the model marginally under-predicts, and the correlation coefficient indicates that the model and monitors are positively correlated. We can therefore have confidence in the model results.

1.3.10. IMPACTS OF COVID-19

1.3.10.1. The air quality assessment presented in the 2019 ES was carried out prior to the COVID-19 pandemic impacting the UK population. As noted in the ES Addendum (REP1-139) a general view was included on COVID-19 considerations on the EIA and the assessments included in the 2019 ES. The COVID-19 pandemic has led to a major reduction in typical traffic flows during lockdown, and it is not known when traffic flows will return to pre-lockdown levels, or whether longer term changes in behaviour will permanently affect travel and traffic patterns.

1.3.10.2. Traffic related assessments, carried out before the COVID-19 pandemic arose, are robust and accurate. The baseline data and information used to inform the assessments remains valid, as well as the conclusions arrived at in terms of significant effects in relation to traffic and transport and air quality.

1.3.10.3. The CAZ sensitivity assessment work uses data from the SRTM (Local Plan modelling) and the Proposed Development which do not include assumptions on the impact of traffic flows as a result of the COVID-19 pandemic.

1.3.10.4. A methodology has been developed to quantify the impact of the COVID-19 pandemic on emissions based on work completed by Atkins[5]. In this work, road-NO_x emissions were estimated at proximate road links to Alfred Road and Commercial Road using EFT 9.1b. Comparisons to the Local Plan road-NO_x predictions were made with the following scenarios with the CAZ in place:

- Natural fleet renewal paused at 2021 levels and CAZ vehicle upgrades (83% HGV,100% buses and coaches and 90% taxis) (“JAQU Test 20”):
- JAQU Test 20 with 15% HGV AADT reduction;
- JAQU Test 20 with 95% HGV AADT reduction; and
- JAQU Test 20 with 15% HGV AADT reduction and 10% car AADT increase.

1.3.10.5. The road-NOx prediction comparison has been replicated using EFTv10.1 in a Do-Minimum scenario (with the CAZ) and the Do-Something scenario (with the CAZ and Proposed Development) at Alfred Road and Commercial Road. This information has been used to provide brief commentary on the potential impact of the Proposed Development having regard to the COVID-19 pandemic.

1.4. PREDICTED IMPACTS

1.4.1. CAZ SENSITIVITY TESTING RESULTS

1.4.1.1. During the construction stage a summary of the results for road closure and diversion traffic for the Do-Something 1 scenario (road closures south-bound on Eastern Road) is shown in **Table 5** and for the Do-Something 2 scenario (road closures south-bound on Eastern Road) **Table 6**.

Table 5 – Roadside receptor sites with modelled exceedances (and near exceedances) (based on emission factors toolkit v10.1) Do-Something Scenario 1

Rec. ID	Road Name	Modelled NO_2 (µg/m^3)-2022 Do-Minimum (Local Plan EFT9.1b)	Modelled NO_2 (µg/m^3)-2022 Do-Minimum (CAZ EFTv10.1)	Modelled NO_2 (µg/m^3)-2022 DS1 (CAZ + Aquind EFTv10.1)	Impact (µg/m^3)
Road sections on the local network modelled as exceeding the EU limit (40 µg/m^3) in 2022					
573	A3 Alfred Road (Unicorn Road to Queen Street, s/b)	41.7	41.5	42.0	+0.5
546	A3 Commercial Road (south of Church Street Roundabout, s/b)	41.1	43.0	43.3	+0.3
Road sections on the local network modelled not exceeding the EU limit but above 37 µg/m^3 in 2022					
526	Church Street (east of Church Street Roundabout, n/b)*	40.4	44.4	44.9	+0.5
536	A3 Hope Street (south of Church Street Roundabout, s/b)	38.7	38.8	38.9	+0.1
824	A2030 Eastern Road Water Bridge (s/b)	38.8	42.0	42.3	+0.3
648	A2047 London Road (Stubbington Avenue to Kingston Crescent, s/b)	38.5	39.0	39.3	+0.3
520	Mile End Road (north of Church St Roundabout, s/b)*	37.6	49.6	49.3	+0.3

Rec. ID	Road Name	Modelled NO_2 (µg/m^3)-2022 Do-Minimum (Local Plan EFT9.1b)	Modelled NO_2 (µg/m^3)-2022 Do-Minimum (CAZ EFTv10.1)	Modelled NO_2 (µg/m^3)-2022 DS1 (CAZ + Aquind EFTv10.1)	Impact (µg/m^3)
Road sections on the strategic road network exceeding the EU Limit (40 µg/m^3) in 2022					
986	A27 (north of Portsea Island, w/b)	48.5	52.7	53.0	+0.3
1089	A27 (east of Portsea Island, w/b)	46.1	47.6	47.3	-0.3
11	M27 (west of Portsea Island, w/b)	45.3	50.7	50.6	-0.1
968	A27 (north of Portsea Island, e/b)	43.7	51.7	51.9	+0.2
834	A27 (east of Portsea Island, w/b)	41.1	47.6	47.3	-0.3

* low confidence in traffic data in city centre (see section 1.3)

Table 6 – Roadside receptor sites with modelled exceedances (and near exceedances) (based on emission factors toolkit v10.1) Do-Something Scenario 2

Rec. ID	Road Name	Modelled NO_2 ($\mu g/m^3$)- 2022 Do-Minimum (Local Plan EFT9.1b)	Modelled NO_2 ($\mu g/m^3$)- 2022 Do-Minimum (CAZ EFTv10.1)	Modelled NO_2 ($\mu g/m^3$)- 2022 DS1 (CAZ + Aquind EFTv10.1)	Impact ($\mu g/m^3$)
Road sections on the local network modelled as exceeding the EU limit (40 $\mu g/m^3$) in 2022					
573	A3 Alfred Road (Unicorn Road to Queen Street, s/b) *	41.7	41.5	41.8	+0.3
546	A3 Commercial Road (south of Church Street Roundabout, s/b)	41.1	43.0	43.1	+0.1
Road sections on the local network modelled not exceeding the EU limit but above 37 $\mu g/m^3$ in 2022					
526	Church Street (east of Church Street Roundabout, n/b)*	40.4	44.4	44.6	+0.2
536	A3 Hope Street (south of Church Street Roundabout, s/b)	38.7	38.8	38.9	+0.1
824	A2030 Eastern Road Water Bridge (s/b)	38.8	42.0	42.7	+0.7
648	A2047 London Road (Stubbington Avenue to Kingston Crescent, s/b)	38.5	39.0	39.2	+0.2
520	Mile End Road (north of Church St Roundabout, s/b)*	37.6	49.6	49.7	+0.1

Rec. ID	Road Name	Modelled NO_2 ($\mu g/m^3$)- 2022 Do-Minimum (Local Plan EFT9.1b)	Modelled NO_2 ($\mu g/m^3$)- 2022 Do-Minimum (CAZ EFTv10.1)	Modelled NO_2 ($\mu g/m^3$)- 2022 DS1 (CAZ + Aquind EFTv10.1)	Impact ($\mu g/m^3$)
Road sections on the strategic road network exceeding the EU Limit (40 $\mu g/m^3$) in 2022					
986	A27 (north of Portsea Island, w/b)	48.5	52.7	51.9	+0.2
1089	A27 (east of Portsea Island, w/b)	46.1	47.6	47.3	-0.3
11	M27 (west of Portsea Island, w/b)	45.3	50.7	50.6	-0.1
968	A27 (north of Portsea Island, e/b)	43.7	51.7	52.1	+0.4
834	A27 (east of Portsea Island, w/b)	41.1	47.6	47.3	-0.3

* low confidence in traffic data in city centre (see section 1.3)

1.4.2. IMPACTS OF COVID-19

1.4.2.1. **Table 7** shows the predicted road-NOx emissions predicted using EFTv10.1 in comparison to the predictions made in the Local Plan modelling informing the Outline Business Preferred Option.

Table 7 – Road-NO_x predictions under theoretical COVID-19 scenarios (Do-Something Scenario 1) (g/km/s)

Rec. ID	Road Name	Local Plan EFTv9.1b	DM (CAZ and EFTv10.1)	Paused natural turnover with CAZ upgrade (Test 20)	Test 20 + -15% HGV AADT	Test 20 + -95% HGV AADT	Test 20 + -15% HGV AADT +10% Car AADT
573	A3 Alfred Road (Unicorn Road to Queen Street, s/b)	0.0847	0.1170	0.1313 (+12%)	0.1009 (-14%)	0.0992 (-15%)	0.1108 (-5%)
546	A3 Commercial Road (south of Church Street Roundabout, s/b)	0.0759	0.1674	0.1857 (+11%)	0.1447 (-14%)	0.1424 (-15%)	0.1589 (-5%)

1.4.2.2. **Table 8** shows the predicted road-NOx emissions predicted using EFTv10.1 in comparison to the predictions made in the Local Plan modelling informing the Outline Business Preferred Option.

Table 8 – Road-NO_x predictions under theoretical COVID-19 scenarios (Do-Something Scenario 2) (g/km/s)

Rec. ID	Road Name	Local Plan EFTv9.1b	DM (CAZ and EFTv10.1)	Paused natural turnover with CAZ upgrade (Test 20)	Test 20 + -15% HGV AADT	Test 20 + -95% HGV AADT	Test 20 + -15% HGV AADT +10% Car AADT
573	A3 Alfred Road (Unicorn Road to Queen Street, s/b)	0.0847	0.1170	0.1304 (+11%)	0.1251 (+7%)	0.0966 (-17%)	0.1346 (+15%)
546	A3 Commercial Road (south of Church Street Roundabout, s/b)	0.0759	0.1674	0.1840 (+10%)	0.1765 (+5%)	0.1364 (-19%)	0.1899 (+13%)

1.4.2.3. The adverse impacts predicted by the modelling should be considered in the context of the conservatism in the Proposed Development traffic flows used in the CAZ sensitivity testing work. Despite the removal of conservatism applied in the modelling reported in ES Chapter 23 by the use of EFTv10.1 and the latest 2018-base background maps, there remains aspects of conservatism in the CAZ modelling work namely :

- Traffic modelling is based on the worst-case scenario of six gangs working on the highway at any one time; and
- Traffic modelling is based on activities in progress for 52 weeks of the year as opposed to working within the restrictions in the Framework Traffic Management Strategy ('FTMS') (REP6-030) and the works being for temporary periods within those restrictions.

1.4.2..2 The remaining conservative elements within the traffic modelling mean that with the addition of the Proposed Development flows to the operational CAZ, the model is still more likely to over-predict adverse air quality impacts where predicted.

1.5. SUMMARY

1.5.1. EXCEEDANCE LOCATIONS (LOCAL ROAD NETWORK)

1.5.1.1. The Local Plan modelling indicated two local road sections in central Portsmouth where modelled NO_2 concentrations were predicted to exceed the EU limit of 40 µg/m^3 which are:

- A3 Alfred Road (Unicorn Road to Queen Street) 41.7 µg/m^3 with compliance estimated in 2023); and
- A3 Commercial Road (south of Church Street) 41.1 µg/m^3 with compliance estimated in 2023.

1.5.1.2. These road links are located in the city centre area, on the main A3 route in and out of the city. The year 2022 was the earliest year in which compliance was considered feasible as a result of implementing the CAZ and in the absence of any intervention, compliance was predicted to be achieved in 2023 at both A3 locations due to background changes in fleet composition.

1.5.1.3. **Table 5** and **Table 6** show A3 Alfred Road (Unicorn Road to Queen Street) NO_2 concentrations as a result of the implementation of the CAZ and use of EFTv10.1, are slightly lower by 0.2 µg/m^3 but still in excess of the 40 µg/m^3 objective. The Proposed Development would add 0.5 µg/m^3 with southbound closures on Eastern Road and 0.3 µg/m^3 with northbound road closures which are imperceptible and small increases.

1.5.1.4. At A3 Commercial Road (south of Church Street), the Do-Minimum predicted concentration in 2022 (43.0 µg/m^3) is higher than the Local Plan modelling (41.1 µg/m^3) with the CAZ and use of EFTv10.1 and is above 40.0 µg/m^3 objective. The Proposed Development is predicted to add 0.3 µg/m^3 with south-bound road closures on Eastern Road and 0.1 µg/m^3 with north-bound closures which are imperceptible increases.

1.5.1.5. The modelled 2022 Do-Minimum concentrations indicate that predicted compliance year 2023 may not be reached with the CAZ in place without the Proposed Development at A3 Alfred Road (Unicorn Road to Queen Street) and the A3 Commercial Road (south of Church Street). However, as the increases in NO_2 with the Proposed Development are only imperceptible to small at these exceedance locations, the Proposed Development would not be the reason for non-compliance in 2023.

1.5.2. NON-EXCEEDANCE LOCATIONS

1.5.2.1. At six road sections in the Local Plan modelling, NO_2 concentrations were predicted to be above >37.0 µg/m^3 in 2022 as described in **Table 3**.

1.5.2.2. At Church Street and Mile End Road, a comparison between the SRTM outputs and observed traffic counts in the Air Quality Local Plan shows that the SRTM substantially over-estimates flows as a result of the modelled link capturing movements on other local roads which are not represented in the strategic model network and this is noted in the Air Quality Local Plan report[1]. Therefore, at Church Street and Mile End Road, predictions without and with the Proposed Development are overestimated. The predicted magnitude of impact of the Proposed Development however still provides useful information.

1.5.2.3. **Table 5** and **Table 6** show at A3 Hope Street (south of Church Street Roundabout, s/b) and the A2047 London Road (Stubbington Avenue to Kingston Crescent, s/b) the CAZ and EFTv10.1 Do-Minimum scenarios are close to the Local Plan Do-Minimum predictions and expected to remain between 37.0 and 40.0 µg/m^3. At the A2030 Eastern Road Water Bridge (s/b) the CAZ and EFTv10.1 Do-Minimum is predicted to be above the objective by 2.0 µg/m^3.

1.5.2.4. **Table 5** and **Table 6** show at all locations the Proposed Development will reduce air quality by between 0.1 and 0.7 µg/m^3 which are imperceptible to small increases. At A3 Hope Street (south of Church Street Roundabout, s/b) and the A2047 London Road (Stubbington Avenue to Kingston Crescent, s/b), the additional NO_2 from the Proposed Development will not cause a new exceedance.

1.5.2.5. **Table 6** shows at the A2030 Eastern Road Water Bridge (s/b), the highest increase of 0.7 µg/m^3 is predicted with northbound road closures on Eastern Road in addition to the exceedance already predicted in the Do-Minimum using the CAZ traffic flows and EFTv10.1. This small increase does not cause this exceedance at the A2030 Eastern Road Water Bridge (s/b) which is likely to already exist.

1.5.2.6. The magnitude of increase in NO_2 as a result of the Proposed Development predicted at Church Street and Mile End Road in the city centre ranges from 0.1 to 0.5 µg/m^3, which is imperceptible to small in magnitude and is consistent with the impacts predicted at other city centre locations.

1.5.3. EXCEEDANCE LOCATIONS (STRATEGIC ROAD NETWORK)

1.5.3.1. There are five road sections on the A27/M27 Strategic Road Network (operated by Highways England) where NO_2 concentrations were forecast to exceed the EU limit in 2022 in the Local Plan modelling. The highest exceedance (48.5 µg/m^3) was predicted on the section of the A27 immediately north of Portsea Island (986) with compliance predicted in 2026.

1.5.3.2. With the implementation of the CAZ and modelling using EFTv10.1, **Table 5** and **Table 6** show all locations on the A27 and M27 are predicted to remain in exceedance of the 40.0 µg/m^3 objective and are higher than Local Plan modelling Do-Minimum without the Proposed Development.

1.5.3.3. The Proposed Development is predicted to provide a range of benefits and disbenefits to the SRN in 2022 which are all considered to be small in magnitude. The Proposed Development will improve air quality on the A27 (east of Portsea Island, w/b) by 0.3 µg/m^3 , on the M27 (west of Portsea Island, w/b) by 0.1 µg/m^3 and A27 (east of Portsea Island, w/b) by 0.3 µg/m^3 thereby contributing to air quality improvements. However, it will reduce air quality at A27 (north of Portsea Island, w/b) by 0.2-0.3 µg/m^3 and A27 (north of Portsea Island, e/b) by 0.2-0.4 µg/m^3.

1.5.3.4. In the context of the downward trend in monitoring data across Portsmouth and the imperceptible magnitude of the predicted changes in NO_2 concentrations, the Proposed Development is not a significant factor in compliance on the SRN.

1.5.4. IMPACTS OF COVID-19

1.5.4.1. The following observations are made in consideration of the results in **Table 7** and **Table 8** pertaining to the Proposed Development DS1 scenario:

- With the CAZ in place modelled with EFTv10.1, the delay in fleet upgrade increases emissions in both Proposed Development scenarios. This is consistent with pollutant concentration predictions for the CAZ sensitivity modelling at A3 Alfred Road (Unicorn Road to Queen Street, s/b) and A3 Commercial Road (south of Church Street Roundabout, s/b). However, these increases are exaggerated because of the overestimation of traffic flows in Portsmouth City Centre by the SRTM.
- **Table 7** shows in the Proposed Development DS1 (southbound closures on Eastern Road) scenario;
  - Reductions in HGV traffic, which will be encouraged by the presence of the CAZ, are likely to provide improvements in pollutant emissions at these locations; and
  - The assumed 10% increases in car traffic will not offset the benefit provided by the 15% reduction in HGV traffic.
- **Table 8** shows in the Proposed Development DS2 (northbound closures on Eastern Road) scenario;
  - A 15% reduction in HGV traffic, which will be encouraged by the presence of the CAZ, will not offset the increase in emissions caused by the delayed fleet upgrade but a 95% reduction will;
  - However, the 10% increases in car traffic will reduce the benefits of the 95% HGV reduction suggesting a higher proportion of car traffic in this area in the DS2 scenario.

1.6. CONCLUSION

1.6.1.1. The CAZ sensitivity testing has shown that the Proposed Development will provide both beneficial and adverse impacts to local air quality in Portsmouth in addition to the operational CAZ from 2021.

1.6.1.2. Where beneficial impacts are predicted, compliance will not be hindered by the Proposed Development.

1.6.1.3. Where adverse impacts are predicted on the local road network, concentrations will not increase in excess of 0.5 µg/m^3 where the objective is already exceeded or by 0.7 µg/m^3 where the concentration is close to the objective. Most increases will be imperceptible (<0.4 µg/m^3).

1.6.1.4. On the SRN, the Proposed Development will produce beneficial and adverse impacts which will all be imperceptible. Therefore, there is unlikely to be any implication for compliance with EU Directive 2008/50/EC on the SRN if the application is approved.

1.6.1.5. The adverse impacts predicted should be considered in the context of the conservatism in the Proposed Development traffic flows used in the CAZ sensitivity testing work. Despite the removal of conservatism applied in the modelling reported in ES Chapter 23 by the use of EFTv10.1 and the latest 2018-base background maps, there remains aspects of conservatism in the CAZ modelling work namely:

- Traffic modelling is based on the worst-case scenario of six gangs working on the highway at any one time; and
- Traffic modelling is based on activities in progress for 52 weeks of the year as opposed to working within the restrictions in the FTMS and the works being for temporary periods within those restrictions.

1.6.1.6. The remaining conservative elements within the traffic modelling mean that with the addition of the Proposed Development flows to the operational CAZ, the model is still more likely to over-predict adverse air quality impacts where predicted. Such is the magnitude of the impacts it is unlikely that the Proposed Development will inhibit the potential for the CAZ and Local Plan air quality measures to comply with the EU Directive in timeframes estimated in the Air Quality Local Plan.

1.6.1.7. Considering that the magnitude of impacts predicted in the modelling is based on conservative assumptions, it is judged that the Proposed Development will not inhibit compliance with EU Directive 2008/50/EC on the local road network and SRN in Portsmouth.

1.6.1.8. With respect to the impacts of COVID-19, with the CAZ in place modelled with EFTv10.1, the delay in fleet upgrade is likely to increase emissions without the Proposed Development and in both Proposed Development scenarios. However, it is not possible to determine the precise air quality impacts at this time due to the continued changes in government policy regarding movement restrictions on the population and the uncertain, and potentially highly variable, level of public adherence to such measures.