Category	Mitigation Measures	
	Highly Recommended	Desirable
Operating vehicle/ machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles.	None
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable control measures provided, subject to the approval of the nominated undertaker with the agreement of the local authority, where appropriate).	
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	None
	Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	
	Used enclose chutes and conveyors and covered skips.	
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	
	Ensure equipment is readily available on site to clean and dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	
Waste Management	Avoid bonfires and burning of waste materials.	None

Table 7.2: Mitigation Measures Specific to Earthworks, Construction and Trackout

<table>
<tr><th rowspan="2">Category</th><th colspan="2">Mitigation Measures</th></tr>
<tr><th>Highly Recommended</th><th>Desirable</th></tr>
<tr><td rowspan="3">Earthworks
(High Risk Site)</td><td>Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.</td><td rowspan="3">None</td></tr>
<tr><td>Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.</td></tr>
<tr><td>Only remove the cover in small areas during work and not all at once.</td></tr>
<tr><td rowspan="3">Construction
(High Risk Site)</td><td>Avoid scabbling (roughening of concrete surfaces) if possible.</td><td rowspan="3">For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.</td></tr>
<tr><td>Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.</td></tr>
<tr><td>Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.</td></tr>
<tr><td rowspan="9">Trackout
(Medium Risk Site)</td><td>Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any materials tracked out of the site. This may require the sweeper being continuously in use.</td><td rowspan="9">None</td></tr>
<tr><td>Avoid dry sweeping of large areas.</td></tr>
<tr><td>Ensure vehicles entering and leaving the sites are covered to prevent escape of materials during transport.</td></tr>
<tr><td>Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.</td></tr>
<tr><td>Record all inspections of haul routes and any subsequent action in a site log book.</td></tr>
<tr><td>Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.</td></tr>
<tr><td>Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).</td></tr>
<tr><td>Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.</td></tr>
<tr><td>Access gates to be located at least 10m from receptors where possible.</td></tr>
</table>

Road Traffic Emissions

7.2 A Travel Plan was prepared for the development to encourage the use of sustainable transport means. The measures included will encourage future residents to walk, cycle and use of public transport.

7.3 Electric Vehicle (EV) charging points will be provided for every dwelling within the development. The inclusion of EV charging as mitigation for the development is not considered within the predicted concentrations of pollutants and the impact of the development is therefore expected to be reduced.

8. CONCLUSIONS

8.1 An air quality impact assessment was undertaken for the proposed residential development at land off Sandwich Road in Sholden, Kent.

8.2 A qualitative construction phase assessment was undertaken and measures were recommended for inclusion in a DMP to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions is considered to be 'not significant' in accordance with IAQM guidance[12].

8.3 A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance[11]. The development was not predicted to result in any new exceedances of the relevant air quality objectives and the impact of the development on local air quality was predicted to be 'negligible' overall in accordance with IAQM and EPUK guidance[13].

8.4 The assessment considers the development of 250 dwellings on Site. The planning application is seeking permission for 117 dwellings. With the reduction in dwelling numbers the impact of the development is considered to remain 'negligible' as the development will generate less road traffic movements than the scheme assessed within this report.

8.5 Pollutant concentrations were also predicted across the proposed development Site. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were all predicted to be below the relevant air quality objectives and therefore the Site was considered to be suitable for the proposed residential use with regard to air quality.

8.6 Electric Vehicle charging points will be provided for each dwelling and a Travel Plan was prepared for the development to encourage the use of sustainable transport methods.

APPENDICES

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between two years, which is useful for pollutants that have higher concentrations during the winter months.
AQAP	Air Quality Action Plan.
AQMA	Air Quality Management Area.
AQS	Air Quality Strategy.
Defra	Department for Environment, Food and Rural Affairs.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
HDV	Heavy Duty Vehicles, (HGVs + buses)
HGV	Heavy Goods Vehicles.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
LDV	Light Duty Vehicles (motorbikes, cars, vans and small trucks)
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
micrograms per cubic metre ($\mu g.m^{-3}$)	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g.m^{-3}$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UK-AIR	UK Air Information Resource – A source of air quality information provided by Defra.
UKAQS	United Kingdom Air Quality Strategy.

APPENDIX B: PROPOSED DEVELOPMENT MASTERPLAN

Do not scale from this drawing.

This drawing is for planning purposes only. It is not intended to be used for construction purposes. The accuracy of this drawing may be reliant upon survey information provided by third parties. Whilst all reasonable efforts are used to ensure drawings are accurate, **edge** Placemaking Group Ltd accept no responsibility or liability for any reliance placed on, or use of, this plan by anyone for purposes other than those stated above or for errors arising from third party information.

PLANNING

- Site Boundary *(4.99ha)*
- Land in same ownership

Rev.	Date	Description

Land South West of Sandwich Road, SHOLDEN

Illustrative Masterplan

Job ref:	Drawing number:	Revision:
275	P01	-

Scale:	Date:
1:1,500 @ A3	March 2021

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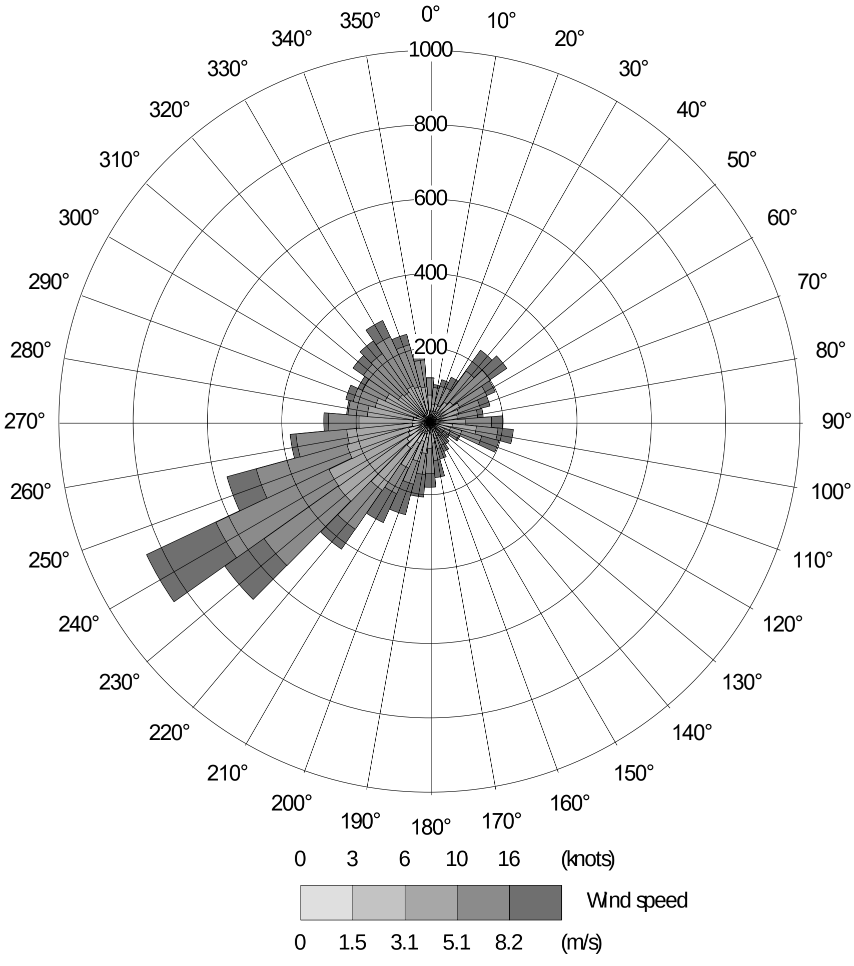
APPENDIX C: TRAFFIC DATA UTILISED IN THE AIR QUALITY ASSESSMENT

Traffic Data Utilised in the Air Dispersion Modelling Assessment

Road Link	Speed	Scenario 1: 2019 Verification Year		Scenario 2: 2020 Base Year		Scenario 3: 2024 Opening Year Without Development		Scenario 4: 2024 Opening Year Without Development	
	$Km.hr^{-1}$	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
Site Access	32	0	0	0	0	0	0	1,500	15
Sandwich Road	48	13,466	315	13,668	320	15,430	350	15,761	353
London Road (south of Site access)	48	13,466	315	13,668	320	15,697	353	16,866	364
Mongeham Road	48	4,617	108	4,686	110	5,337	120	5,567	123
London Road (south of Mongeham Road)	48	15,234	356	15,462	362	17,302	395	18,241	404
London Road (east of Manor Road)	48	13,592	318	13,796	323	15,123	349	15,537	353
Manor Road	48	9,669	253	9,814	257	10,892	279	11,417	284
Middle Deal Road	48	3,249	33	3,298	33	3,533	36	3,533	36
Park Avenue	48	5,020	28	5,124	28	5,489	30	5,489	30

APPENDIX D: WIND ROSE FOR 2019 FOR LANGDON BAY METEOROLOGICAL RECORDING STATION

Meteorological data for 2019 Verification Year scenario for the Langdon Bay recording station in Dover was obtained for use in the air dispersion modelling assessment. The wind rose for 2019 is detailed below and illustrates a predominant wind direction from the south west.



APPENDIX E: MODEL VERIFICATION

Whilst ADMS-Roads is widely validated for use in this type of assessment, model verification for the area around the Site will not have been included. To determine model performance at a local level, a comparison of modelled results with monitored results in the study area was done in accordance with the methodology provided by Defra[11]. This process of verification aims to minimise modelling uncertainty by correcting modelled results by an adjustment factor to give greater confidence to the results.

The model was run for Scenario 1: 2019 Verification Year to predict the 2019 annual mean road contribution of NOx at the monitoring locations in the study area. The model NOx outputs at this location were compared to the 2019 monitored concentrations to provide an adjustment factor. **Tables E1** presents the verification process for NOx.

Model verification was undertaken utilising diffusion tube DV36 outside Sholden Church of England Primary School. Monitoring at this location commenced in October 2019 and therefore results were annualised by DCC in accordance with Defra guidance[11]. This monitoring location was utilised in model verification at the request of DCC as the closest alternative monitoring locations to the Site were located in Dover within the AQMA. Dover is a major port and therefore not considered representative of conditions at the Site due to the high volume of traffic and HDV movements through the town in comparison to the village of Sholden.

No monitoring of PM_{10} or $PM_{2.5}$ is undertaken within the study area. Therefore the adjustment factor calculated during the NOx verification process was utilised to adjust predicted concentrations of PM_{10} and $PM_{2.5}$.

Table E1: NOx Verification Process

Model Verification Steps	Sholden Church of England Primary School (DV36)
2019 monitored total NO_2 ($\mu g.m^{-3}$)	18.5
2019 background NO_2 concentration ($\mu g.m^{-3}$)	9.0
Monitored road contribution NOx ($\mu g.m^{-3}$)	17.7
Modelled road contribution NOx ($\mu g.m^{-3}$)	3.8
Ratio of monitored road NOx to modelled road NOx	4.7
Adjustment factor for modelled road contribution NOx	**4.681**
Adjusted modelled road contribution NOx ($\mu g.m^{-3}$)	17.7
Modelled total NO_2 concentration ($\mu g.m^{-3}$)	18.5
Monitored total NO_2 concentration ($\mu g.m^{-3}$)	18.5
% difference between modelled and monitored total NO_2 concentration	0.0

Model Verification Steps	Sholden Church of England Primary School (DV36)
RMSE % (should be less than 25% and ideally less than 10%)	0.0

** Road-NOx component, determined from NOx to NO_2 calculator*

A road-NOx factor of **4.681** was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero. This factor was then applied to the modelled road-NOx concentration at each receptor, before conversion to NO_2 concentrations using the NO_x to NO_2 calculator[18] provided by Defra and the adjusted NO_2 background concentration.

Whilst the model output was identified to under-predict concentrations of the monitoring location, it was considered that the annual mean concentration recorded at the DV36 monitor was influenced by monitoring being undertaken for only three months and therefore being annualised. The use of the 4.681 verification factor was considered to represent a robust, conservative assessment and was therefore retained.

APPENDIX F: SENSITIVITY ANALYSIS

SENSITIVITY ANALYSIS

A sensitivity analysis was undertaken to consider a scenario where pollutant background concentrations do not decrease with future years. Therefore base year (2020) background concentrations, NOx to NO_2 calculator inputs and emission factors were utilised for the 2024 Opening Year with development scenario. The results of the assessment for the existing receptor locations and proposed receptor locations identified are provided in **Tables F1 – F4**.

Table F1: Predicted Annual Mean NO_2 Concentrations and Development Impact at Existing Receptor Locations

Existing Receptor	Predicted NO_2 Concentrations ($\mu g.m^{-3}$)			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R1	19.6	20.5	+0.9	Negligible
R2	17.0	17.1	+0.2	Negligible
R3	11.8	11.8	+0.1	Negligible
R4	14.3	14.7	+0.4	Negligible
R5	16.9	17.4	+0.5	Negligible
R6	16.7	17.2	+0.5	Negligible
R7	14.7	15.0	+0.3	Negligible
R8	22.5	23.3	+0.9	Negligible
R9	10.8	10.9	+0.1	Negligible
R10	16.2	16.6	+0.4	Negligible
R11	23.4	24.2	+0.8	Negligible
R12	12.6	12.7	+0.1	Negligible
R13	35.4	36.3	+0.9	Slight Adverse
R14	33.6	34.8	+1.1	Slight Adverse
R15	18.7	19.0	+0.2	Negligible
R16	23.6	23.9	+0.4	Negligible

Existing Receptor	Predicted NO_2 Concentrations (µg.m^{-3})			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R17	25.6	26.0	+0.4	Negligible
R18	16.8	17.0	+0.2	Negligible
R19	21.2	21.6	+0.5	Negligible
R20	22.5	23.0	+0.5	Negligible

** Discrepancies in changes due to rounding effects*

Table F2: Predicted Annual Mean PM_{10} Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted PM_{10} Concentrations (µg.m^{-3})			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R1	17.1	17.3	+0.2	Negligible
R2	16.6	16.6	0.0	Negligible
R3	14.9	14.9	0.0	Negligible
R4	15.9	15.9	+0.1	Negligible
R5	16.4	16.5	+0.1	Negligible
R6	16.4	16.5	+0.1	Negligible
R7	15.9	16.0	+0.1	Negligible
R8	17.7	17.9	+0.2	Negligible
R9	15.4	15.4	0.0	Negligible
R10	16.3	16.4	+0.1	Negligible
R11	17.9	18.1	+0.2	Negligible
R12	15.5	15.5	0.0	Negligible
R13	20.3	20.5	+0.2	Negligible

Receptor	Predicted PM_{10} Concentrations (µg.m^{-3})			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R14	19.9	20.2	+0.3	Negligible
R15	16.7	16.7	+0.1	Negligible
R16	17.8	17.9	+0.1	Negligible
R17	18.2	18.3	+0.1	Negligible
R18	16.4	16.4	0.0	Negligible
R19	17.2	17.3	+0.1	Negligible
R20	17.5	17.7	+0.1	Negligible

** Discrepancies in changes due to rounding effects*

Table F3: Predicted Annual Mean $PM_{2.5}$ Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted $PM_{2.5}$ Concentrations (µg.m^{-3})			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R1	10.6	10.7	+0.1	Negligible
R2	10.3	10.3	0.0	Negligible
R3	9.3	9.3	0.0	Negligible
R4	9.9	9.9	0.0	Negligible
R5	10.2	10.3	+0.1	Negligible
R6	10.2	10.2	+0.1	Negligible
R7	9.9	10.0	0.0	Negligible
R8	10.9	11.0	+0.1	Negligible
R9	9.7	9.7	0.0	Negligible

Receptor	Predicted $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$)			Impact
	Scenario 3: 2024 Without Development	Scenario 4: 2024 With Development	Change*	
R10	10.1	10.2	0.0	Negligible
R11	11.0	11.1	+0.1	Negligible
R12	10.1	10.1	0.0	Negligible
R13	13.2	13.4	+0.1	Negligible
R14	13.0	13.2	+0.2	Negligible
R15	11.2	11.2	0.0	Negligible
R16	11.8	11.8	0.0	Negligible
R17	12.0	12.1	+0.1	Negligible
R18	10.6	10.7	0.0	Negligible
R19	11.5	11.5	+0.1	Negligible
R20	11.7	11.7	+0.1	Negligible

** Discrepancies in changes due to rounding effects*

The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for Scenario 3: 2024 Opening Year without development (Sensitivity Analysis) and Scenario 4: 2024 Opening Year with development (Sensitivity Analysis) are below the relevant annual mean air quality objectives at all receptors.

The proposed development does not lead to any exceedances of the annual mean air quality objectives.

Predicted changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations are less than 5.0% of the relevant annual mean air quality objectives and total concentrations less than 75% of the annual mean air quality objectives at the majority of receptors. In accordance with IAQM and EPUK guidance[13], the impact of the proposed development at these receptors was considered to be negligible.

Annual mean NO_2 concentrations at receptors R13 and R14 were predicted to be 91% and 87% of the annual mean NO_2 objective respectively. Whilst the predicted change in annual mean NO_2 at these receptors was 2% and 3% respectively, and concentrations were below the annual mean NO_2 objective, the impact at these receptors was considered to be slight adverse in accordance with IAQM and EPUK guidance[13].

Taking into consideration the conservative nature of the sensitivity analysis, model input parameters and the predicted impact at all receptors, it was considered that the overall impact of the proposed development on local air quality was negligible.

With regard to short term air quality objectives for NO_2 and PM_{10}, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[11] it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in paragraph 3.15 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Table F4: Predicted Annual Mean NO_2 , PM_{10} and $PM_{2.5}$ Concentrations at Proposed Receptor Locations

Proposed Receptor	Scenario 4: 2024 Opening Year With Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$
PR1	12.5	15.5	9.7
PR2	13.2	15.6	9.7
PR3	13.5	15.7	9.8
PR4	12.3	15.4	9.6
PR5	10.0	15.0	9.4
PR6	9.8	14.9	9.3
PR7	10.4	15.0	9.4
PR8	10.6	15.1	9.4
PR9	9.8	14.9	9.3

The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for Scenario 4: 2024 Opening Year with development (Sensitivity Analysis) are below the relevant annual mean air quality objectives at all receptors.

With regard to short term air quality objectives for NO_2 and PM_{10} at the residential development, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[11] it may be assumed that exceedances of the 1-hour mean objective is unlikely. The calculation detailed in paragraph 3.15 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

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