



Environmental Statement: Volume 1 - Addendum

Crown Street Phase 2, Manchester

April 2022

Important notice: This Environmental Statement has been prepared by Deloitte Real Estate, with technical input from Ensafé (REC Ltd), GIA, Chris Burnett Associates, Vectos, WSP, and Fisher Acoustics "the Consultants". Chapter 1, Volume 1 of this Environmental Statement sets out the parties responsible for preparing each Chapter and associated figures and appendices.

Although we have read the Consultants' reports for consistency and provide our observations based on our knowledge and experience, we accept no liability or responsibility for the Consultant's Reports and will not be responsible for the technical content of Chapters 7-13, Volume 1, nor Volumes 2 – 3, nor the technical content of the associated separate Non-Technical Summary.

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A handwritten signature in blue ink, appearing to read 'Ed Britton'.

Ed Britton, Assistant Director

Date: 23-03-22

A handwritten signature in blue ink, appearing to read 'John Cooper'.

John Cooper, Partner

Date: 31-03-22

A handwritten signature in blue ink, appearing to read 'Mark Underwood'.

Mark Underwood, Partner

Date: 30-03-2022

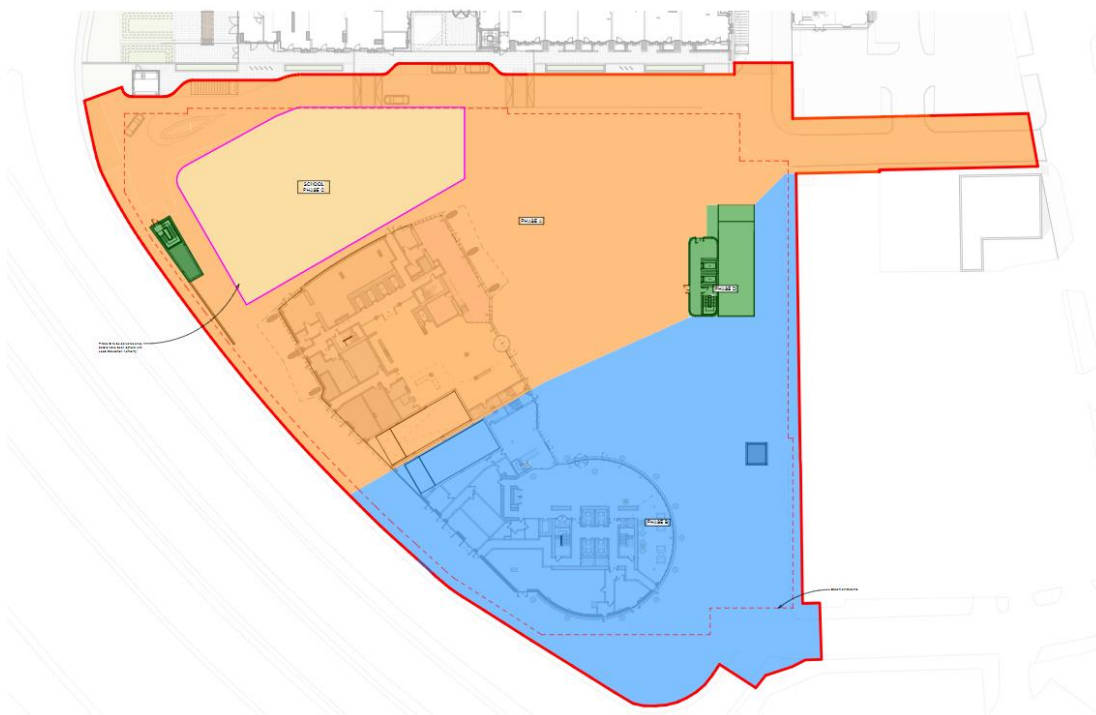
Preface to Addendum

- 0.1. This Environmental Statement Addendum ("the ES Addendum") has been prepared on behalf of Renaker Build Ltd ('the Applicant') in respect of detailed reserved matters proposals for Phase C (education facility) of Crown Street Phase 2.
- 0.2. This ES Addendum has been prepared to consider and re-assess, where required, any environmental impacts following the design development of Phase C and is submitted in respect of the associated Reserved Matters application.
- 0.3. The original Crown Street Phase 2 'Hybrid Planning Permission' was granted for in August 2020, under planning application 126668/FO/2020 ('the hybrid permission').
- 0.4. The hybrid permission comprises the following:
- Full Planning Permission (with no Reserved Matters) for three Phases, comprising:
 - Phase A: One residential building (building C4), a perimeter servicing and access route, public realm (including partial delivery of public park and landscaping), and private residential basement car park. *(Implemented and under construction)*
 - Phase B: One residential building (building C5), a perimeter servicing and access route, public realm (including delivery of remaining area of public park and landscaping), and private residential basement car park. *(Implemented and under construction)*
 - Phase D: A three storey, publicly accessible, basement Multi Storey Car park with vehicular access. *(Implemented and under construction)*
 - Outline Planning Permission with all matters reserved for the Education Facility (Building C3), for Phase C.
- 0.5. Planning Permission 126668/FO/2020 has been subject to a couple of amendment applications, namely:
- 128226/NMC/2020 (approved 22 October 2020) - NMA for the variation of Condition 19 (Phase A - Noise Insulation for Residential Accommodation) and Condition 57 (Phase B - Noise Insulation for Residential Accommodation).
 - 131955/NMC/2021 (approved 5 January 2022) - NMA for alterations to the layout of the Penthouse Level (Level 49 Duplex Lower and Level 50 Duplex Upper) of building C5, resulting in an increase of 2 units (0.2% increase) from 855 units to 857 units.
- 0.6. As required by the hybrid permission, this reserved matters application relating to Phase C provides full details of the following reserved matters:
- Access
 - Appearance
 - Landscaping
 - Layout
 - Scale
- 0.7. The hybrid planning permission established the principle of development, with a number of parameters for the outline phase (Phase C – School) to adhere to.
- 0.8. The approved Phase C outline details are identified in the following plans, which identify maximum heights and widths.
- Phasing Plan – Basement Level 1 (Drawing ref. 10292-Z1-SHP-G000-PL-B1-B5D801)

- Phasing Plan – Ground Level (Drawing ref. 10292-Z1-SHP-G000-PL-00-B5D802)

0.9. The Hybrid Application site measures approximately 1.1 ha and is bound by Silvercroft Street and Crown Street to the north, and the Mancunian Way to the south and west. This is commonly referred to as 'Crown Street Phase 2'.

Figure 1.1: Extract of Phasing Plan – Ground Level (source: SimpsonHaugh and Partners) with phases labelled.



Crown Street Phase 2 – Approved ES (April 2020)

0.10. An environmental impact assessment was prepared and submitted as part of the hybrid permission for Crown Street Phase 2. The EIA comprising Environmental Statement ('ES') Volume 1, ES Volume 2 (Appendices) and ES Volume 3 (Non-Technical Summary) was submitted and approved under planning permission 126668/FO/2020 in August 2020. The approved ES Volume 1 forms the basis of this addendum report.

Environmental Statement Addendum

ES Addendum Scope

- 0.11. The reserved matters proposals for Phase C are within the approved outline parameters and the approach has been therefore to augment the approved EIA Chapters rather than replace chapters. This has been undertaken via the preparation of additional technical assessments, as necessary, and these have been provided in the form of an EIA chapter addendum where updates are more significant and supplementary technical notes where updates are minimal or not required. In some instances where the discipline is unaffected by the reserved matters proposals neither a chapter addendum nor an EIA technical note has been provided.
- 0.12. Table 0.1 identifies the scope of the EIA submitted and approved as part of the hybrid permission ('Approved ES') against where ES Chapter Addendums and EIA Technical Notes (ES

Appendix – Volume 2) have been prepared and submitted as part of the reserved matters application for Phase C of Crown Street Phase 2.

Table 0.1 Scope of Approved ES and ES Addendum

EIA Discipline	Responsibility	Approved ES	ES Addendum
Construction Management, Programme, Methodology and Phasing	Renaker Build Ltd	✓	Tracked changes (RBL)
Air Quality	Ensae (formerly Rec Ltd)	✓	EIA Technical Note (ES Volume 2 Appendix 6.3)
Noise and Vibration	Ensae (formerly Rec Ltd) – approved ES Fisher Acoustics – ES Addendum	✓	ES Chapter Addendum (Chapter 7B) Noise Report prepared by Fisher Acoustics (2022) ES Volume 2 Appendix 7.2
Solar Glare	GIA	✓	EIA Technical Note (ES Volume 2 Appendix 8.2)
Sunlight, Daylight and Overshadowing	GIA	✓	✗
Townscape and Visual Impact	Chris Burnett Associates	✓	✗
Traffic and Transport	Vectos	✓	✗
Wind Microclimate	WSP	✓	EIA Technical Note (ES Volume 2 Appendix 12.3)

ES Addendum Format

- 0.13. The ES Addendum has been formatted to ensure it is fully transparent and accessible to the Local Planning Authority and third parties seeking to understand what effect the reserved matters details of Phase C (the education facility) will have on the environmental impacts arising from Crown Street Phase 2.
- 0.14. Updates have been made to ES Volume 1, Volume 2: Technical Appendices and Volume 3: Non-Technical Summary. Any additional technical report addendums have been included as additional appendices and referenced as such.
- 0.15. Where a chapter addendum (ES Volume 1) or EIA technical note (submitted as an appendix – ES Volume 2) has been prepared in support of the ES addendum for the Phase C reserved matters application this is indicated at the beginning of each chapter. Where the chapter is unaffected by the reserved matters proposals and neither a chapter addendum nor an EIA technical note has been provided this is also indicated. This is shown as follows:

1 Introduction

▲ **A1 ES Addendum Alterations**

The following changes have been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase C which received outline consent as part of the hybrid planning permission:

- Inclusion of information regarding the submission of a reserved matters application for Phase C, the education facility at Crown Street Phase 2.

Text added into existing paragraph and table

0.16. When text has been added to an existing paragraph it has been identified through tracked changes using underlined and red font, as follows:

<u>REC Limited)</u>	<u>on quality</u>	
<u>Ensafe (formerly known as REC Limited)</u>	Noise & Vibration <u>(Chapter 7A)</u>	BSc (Hons), AMIOA
<u>Fisher Acoustics</u>	<u>Noise and Vibration (Chapter 7B)</u>	<u>BEng</u>
	Davlight, Sunlight and	BSc, MSc, CIHT, CIIT

New Paragraphs

0.17. When new paragraphs have been added the paragraph numbering has been updated, using strikethroughs, underlined and red font, as follows:

- 1.7 Renaker Build Ltd is submitting a reserved matters application for Phase C (the education facility) of the Proposed Development. This ES addendum has been prepared to support the reserved matters application. The ES addendum considers the reserved matters (detailed) design of the education facility and where required supporting statements and additional assessments have been prepared by the relevant EIA consultants.
- ~~1.7~~1.8 The proposed Site plan is included at Figure 1.2.
- ~~1.8~~1.9 This ES sets out the findings of an Environmental Impact Assessment ("EIA") carried out in respect of the Proposed Development of the Site.

New Chapter(s)

0.18. When a new chapter has been added a letter 'A' has been added to the numbering of the previous chapter (of the same EIA discipline) and the letter 'B' included to denote the new chapter. This has been done using underlined and red font, as follows:

7 (A)Noise and Vibration

Introduction

- 7.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Noise & Vibration. This Chapter also describes the methods used to assess the

7 (B) Noise and Vibration

Introduction

7.208 This Chapter of the ES discusses the likely significant effects of the Proposed Development with respect to noise and vibration. This Chapter also describes the methods used to assess the

New Appendix

- 0.19. When a new Appendix has been added the chapter, number has been used as a prefix followed by the number of the Appendix following on from those included within the original submission. All new Appendices have been clearly referenced within the text.

1 Introduction

A1 ES Addendum Alterations

The following changes have been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updated to reflect that the hybrid planning application for Crown Street Phase 2 has been submitted and approved (under planning application ref: 16668/FO/2020) and subsequent amendment applications, including most recent NMA which approved alterations to the layout of the penthouse level of building C5, increasing residential units from 855 to 857.
- Update to the description of development for Crown Street Phase 2 to ensure consistency with the decision notice (ref: 16668/FO/2020) for the hybrid permission.
- Inclusion of information regarding the submission of a reserved matters application for Phase C, the education facility at Crown Street Phase 2.
- Updates to the form of application and impact on EIA to reflect hybrid planning permission and reserved matters application for Phase C.
- Updates to the EIA technical team (Table 1.1).
- Updates to the text in relation to EIA scenarios to reflect construction progress, and updates to the Summary of EIA scenarios (Table 1.2) to reflect scenarios tested in EIA Chapter Addendum (Chapter 7B – Noise and Vibration).
- Updates to the Structure of the ES (Table 1.3).
- Updates to the planning application supporting documents (Table 1.4) to reflect updates in respect of Phase C reserved matters application.
- Update to Deloitte address.

- 1.1 This Environmental Statement ('ES') has been prepared in support of a planning application submitted to Manchester City Council (MCC) for a residential led, mixed-use development on land at Crown Street, Manchester.
- 1.2 Renaker Build Ltd ~~is submitting~~ submitted a hybrid planning application. The Applicant ~~is seeking~~ secured Full Planning Permission for two new residential tall buildings with ground floor commercial uses, a multi-storey basement car park and a park. Outline Planning Permission ~~is sought~~ was also secured for a new educational facility with all matters reserved (the 'Proposed Development'). The Environmental Statement Addendum therefore relates to the Reserved Matters application.
- 1.3 The CSPH2 Site measures approximately 1.1 ha and is bound by Silvercroft Street and Crown Street to the north, and the Mancunian Way to the south and west ('the Site'). This is commonly referred to as 'Crown Street Phase 2'. The Site location is set out in Figure 1.1. The part of the Site to which the Reserved Matters relate is referred to as Phase C.

- 1.4 The Planning ~~Application seeks consent for the following~~ Permission has the following description of development:

~~"Full planning permission for the erection of two 51-storey residential buildings (Use Class C3) each incorporating a podium accommodating residential amenity facilities and ground floor and first floor commercial units (Use Classes A1, A2, A3, & D1), basement car parking, landscaping and a public park, servicing and access arrangements, highways improvements, and associated works (Phases A, B, and D as defined on Drawing Reference: 10292-Z1-SHP-G000-PL-00-B5D802 and 10292-Z1-SHP-G000-PL-B1-B5D801). Outline planning permission (with all matters reserved) for an educational facility (Use Class D1) (Phase C as defined on Drawing References: 10292-Z1-SHP-G000-PL-00-B5D802 and 10292-Z1-SHP-G000-PL-B1-B5D801)."~~

"Full planning permission for the erection of two 52-storey residential buildings (Use Class C3) each incorporating a podium accommodating residential amenity facilities and ground floor and first floor commercial units (Use Classes A1, A2, A3, or D1), private and public basement car parking, landscaping and a public park, servicing and access arrangements, highways improvements, and associated works (Phases A, B, and D as defined on Drawing Reference: 10292Z1SHPG000PL00 B5D802 and 10292Z1SHPG000PLB1B5D801). Outline planning permission (with all matters reserved) for an educational facility (Use Class D1) (Phase C as defined on Drawing References: 10292Z1SHPG000PL00B5D802 and 10292Z1SHPG000PLB1B5D801)."

- 1.5 Planning Permission 126668/FO/2020 has been subject to a couple of amendment applications, namely:

- 128226/NMC/2020 (approved 22 October 2020) - NMA for the variation of Condition 19 (Phase A - Noise Insulation for Residential Accommodation) and Condition 57 (Phase B - Noise Insulation for Residential Accommodation).
- 131955/NMC/2021 (approved 5 January 2022) - NMA for alterations to the layout of the Penthouse Level (Level 49 Duplex Lower and Level 50 Duplex Upper) of building C5, resulting in an increase of 2 units (0.2% increase) from 855 units to 857 units.

~~1.51.6~~ Full details of the Proposed Development are provided at Chapter 4 of this ES.

~~1.61.7~~ A detailed description of the proposals is provided in Section 5 of the Planning and Tall Building Statement and within the Design and Access Statement submitted in support of this Application.

1.8 Renaker Build Ltd is submitting a reserved matters application for Phase C (the education facility) of the Proposed Development. This ES addendum has been prepared to support the reserved matters application. The ES addendum considers the reserved matters (detailed) design of the education facility and where required supporting statements and additional assessments have been prepared by the relevant EIA consultants.

~~1.71.9~~ The proposed Site plan is included at Figure 1.2.

~~1.81.10~~ This ES sets out the findings of an Environmental Impact Assessment ("EIA") carried out in respect of the Proposed Development of the Site.

Requirements for EIA

~~1.91.11~~ The EIA process is the mechanism by which development proposals are appraised in terms of their likely environmental effects, in addition to engineering and technical considerations.

~~1.10~~1.12 The purpose of the EIA is to establish the nature of the Proposed Development and the environment in which it is likely to take place, during both construction and operational phases, so as to identify the likely significant effects on the environment. The assessment compares the existing situation at the start of the work (baseline) with the situation during demolition and construction, and when the Proposed Development is operational.

~~1.11~~1.13 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the "EIA Regulations") require that any Proposed Development falling within the description of a 'Schedule 2 development' (as defined within the meaning of the EIA Regulations), will be subject to an EIA where such development is likely to have 'significant' effects on the environment by virtue of such factors as its nature, size or location (Regulation 2(b)).

~~1.12~~1.14 The Proposed Development is considered likely to fall under the category of "urban development projects" (Schedule 2, 10, (b)) where:

- The development includes more than 1 hectare of urban development which is not dwelling house development; or
- The development includes more than 150 dwellings; or
- The overall area of the development exceeds 5 hectares.

~~1.13~~1.15 A formal EIA scoping request was submitted to Manchester City Council on 19 December 2019 requesting formal confirmation as to the proposed scope of the Environmental Impact Assessment required in respect of the Proposed Development. The technical chapters are based on a scope of assessment that has been agreed with the relevant statutory consultees where possible. A copy of the scoping report is included in Appendix 2.1.

~~1.14~~1.16 At time of submission, no formal EIA Scoping Opinion was received.

~~1.15~~1.17 In accordance with the EIA Regulations, this ES sets out the following information:

- A description of the Proposed Development comprising information on the site, design, size and other relevant features of the development;
- A description of the likely significant effects of the Proposed Development on the environment;
- A description of any features of the Proposed Development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- A description of the reasonable alternatives studied by the developer, which are relevant to the Proposed Development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;
- A non-technical summary of the information, of the information specified above; and
- Any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

Form of Application and Impact on EIA

~~1.16~~ **1.18** As described in Paragraph 1.2, the original proposals ~~will be~~were submitted as part of a Hybrid multi-phase Planning application. Full details ~~will be~~were provided for the residential, park, and car parking elements of the Site and the educational facility ~~will be~~was in outline only with all matters reserved. ~~The Outline element is required because the details of the educational facility are yet to be confirmed by Manchester City Council in their role as Local Education Authority (LEA) and will not be available at the point of submission. The Reserved Matters details for Phase C have been considered by the technical team and amendments have been made to ES where necessary.~~

~~1.17~~ As a result, parameter plans have been submitted for the outline element and the maximum parameters of this phase have informed the basis of the EIA consultants' assessment

~~1.18~~ At this stage, it is anticipated that the following minimum and maximum parameter plans will be prepared as part of the application:

- ~~• Development Use (including quantum of development);~~
- ~~• Height; and,~~
- ~~• Horizontal building footprint extent.~~

Project Team

1.19 Deloitte Real Estate has significant experience and expertise in managing the EIA process and hold the IEMA EIA Quality Mark. Deloitte Real Estate has managed the EIA process and the production of the ES for Crown Street Phase 2 and has received technical input from a range of suitably qualified and experienced technical consultees. Details of the EIA Technical Team and qualifications are set out in Table 1.1 below.

Table 1.1: EIA Technical Team

Organisation	Expertise	Qualifications
Renaker Build Ltd	The Applicant	N/A
Deloitte Real Estate	Town Planning, EIA Coordination	RTPI, RICS, IEMA EIA Quality Mark
SimpsonHaugh and Partners	Architect	RIBA
<u>Ensafe (formerly known as REC Limited)</u>	Air Quality	IAQM, IES
<u>Ensafe (formerly known as REC Limited)</u>	Noise & Vibration <u>(Chapter 7A)</u>	BSc (Hons), AMIOA
<u>Fisher Acoustics</u>	<u>Noise and Vibration (Chapter 7B)</u>	<u>BEng</u>
GIA	Daylight, Sunlight and Overshadowing,	BSc, MSc, CIHT, CILT
GIA	Solar Glare	MSc
WSP	Wind Microclimate	MEng, CEng, FICE
Vectos	Transport	BSc (Hons), MSc, CMILT, MCIHT
Chris Burnett Associates	Townscape & Visual Impact	BSc BLD CMLI

Phasing and EIA Scenarios

1.20 The Proposed Development will be phased in order to facilitate delivery process of each part of the scheme.

1.21 The sequence of phased delivery is proposed as follows:

- **Phase A** – C4¹, private car parking for C4, and public realm associated with C4.
- **Phase D** - Public car park.
- **Phase C** – C3 (School), associated highways and public realm.
- **Phase B** – C5, private car parking for C5, and public realm associated with C5.

1.22 Final public realm (for example, reinstating highway post construction and landscaping around the perimeter of the Site) and Section 278 Highways works will take place after completion of the final Phase.

1.23 For further details, please refer to the Phasing Plans that have been included within Appendix 1.1 and Paragraph 5.5 of this ES.

1.24 Given the form of application, the EIA considered a number of scenarios, reflecting the sequence of phased delivery outlined in paragraph 1.21. These have been devised so that environmental affects arising from the phasing of the development are robustly considered.

1.25 The proposed EIA scenarios for ~~the original this~~ planning application ~~were~~are:

- **Scenario A:** Existing baseline
- **All other scenarios consider the existing baseline, plus:**
- **Scenario B:** C3, C4, basement car park (C4 Private only), highways, public realm
- **Scenario C:** Scenario B + Committed Developments
- **Scenario D:** C3, C4, C5, basement car park (entirety), highways, public realm
- **Scenario E:** Scenario D + Committed Developments

~~1.26 It has been considered whether the above scenarios require an additional sub-scenario to test the proposals without the school (C3). This is outlined in the table below. For the purpose of this ES Addendum, only Scenarios D and E have been considered, as Phases A, B and D have been implemented and are under construction.~~

~~1.26~~
~~1.27 It is also relevant to note that Scenario E is unchanged from the original ES, as any developments that have come forward since permission was granted for the 'hybrid permission' will have been required to test the hybrid application (including Phase C maximum parameters), as part of their cumulative scenarios.~~

~~1.27~~
~~1.28~~ The EIA scenarios proposed by each consultant are summarised below:

¹ Please refer to Paragraph 4.29 for a description of which building is identified as C3, C4, C5 etc.

Table 1.2: Summary of EIA scenarios

Chapter	Consultant	Scenarios Tested	Justification from consultant
Townscape and Visual Impact	Chris Burnett Associates	Scenario A: Existing Baseline Scenario D: C3, C4, C5, basement car park (entirety), highways, public realm Scenario E: Scenario D + Committed Developments	This represents the worst-case scenario. Other scenarios have been discounted as the effects from construction of one tower on the Site are predicted to be more or less the same as two towers, hence it is appropriate to test the worst case scenario.
Daylight, Sunlight and Overshadowing	GIA	Scenario A: Existing Baseline NOTE: This also includes Scenario E – cumulative assessment – in accordance with BRE Guidance Scenario D: C3, C4, C5, basement car park (entirety), highways, public realm	This represents the worst-case scenario. Schemes under construction and with planning consent but not under construction have been included in the baseline scenario, in line with the BRE Guide. As the proposed school is low rise, there is no potential for this to cause any additional daylight and sunlight impact. No separate analysis without the school is necessary as the 'with school' scenario this represents the worst-case.
Solar Glare	GIA	Scenario D: C4, C5 only. NOTE: C3 is excluded as Solar Glare assessments are only applicable for detailed proposals. Other features – for example; basement car park (entirety), highways, public realm, do not need to be tested.	This represents the worst-case scenario. Due to the hybrid nature of the Proposed Development, only the façades of the detailed elements will be assessed for solar glare. As such, Scenario D (buildings C4 and C5 in detail, building C3 in outline) is the most appropriate in terms of solar glare effects within this application, which portrays the worst-case condition. However, as full façade design on C3 are not known at this stage due to its outline nature, it will be excluded. Where necessary, subject to the discretion of the Local Planning Authority outlining this requirement through separate EIA Screening and potentially EIA scoping at Reserved Matters stage, the outline element would be assessed for solar glare effects as part of a

Chapter	Consultant	Scenarios Tested	Justification from consultant
			future Reserved Matters application when the façade details are known. Based on a common practice approach to portray the worst-case scenario, the cumulative effect will not be considered as neighbouring schemes can block sunlight reaching the facades of the Proposed Development and/or obscure the Proposed Development from the viewpoints to be assessed.
Wind Microclimate	WSP	All Scenarios A-E	This represents the worst-case scenario. Based on WSP's experience, the inclusion of C3 (the proposed school) in each configuration will represent the worst-case scenario from a wind microclimate perspective. The proximity of C3 with the podium of the Proposed Development is in fact likely to create funnelling conditions which are, by their own nature, windy. Therefore, the scheme will be analysed with C3 in scenarios B, C, D and E, and mitigation will be considered where appropriate.
Air Quality	<u>Ensafe</u> <u>(formerly</u> <u>REC)</u>	Scenario A: Existing baseline, for verification purposes against latest 2018 MCC and SCC ratified Air Quality Monitoring data; Scenario E: Anticipated Do something 2025 Opening Year baseline plus, predicted traffic flows associated with C3, C4, C5, basement car park (entirety), highways, public realm plus any relevant committed developments.	With regards to associated Air Quality impacts, the worst case scenario presented in this table provides an assessment of maximum anticipated development traffic generation and thus a worse-case scenario will be assessed. Please see Paragraph 6.65 for further details.
Noise and Vibration (Chapter 7A)	<u>Ensafe</u> <u>(formerly</u> <u>REC)</u>	Scenario A: Existing Baseline Scenario D: C4, C5, basement car park (entirety), highways, public realm. NOTE: C3 is excluded from Scenario D as above as, from a Noise perspective, this is considered the worst case scenario.	This represents the worst-case scenario. An assessment will be undertaken in order to show the façade levels at the proposed buildings without the screening provided by the other phases. REC would propose to test Scenarios A, D (without C3), and E. In terms of noise the main impact is that of road traffic sound on the Mancunian Way and surrounding

Chapter	Consultant	Scenarios Tested	Justification from consultant
		Scenario E: Scenario D (as above) + Committed Developments and development trips.	road network. In terms of changes in traffic levels there would need to be a 25% change in traffic volumes due to the different scenarios in order to have a perceptible change in the noise levels, this is unlikely to happen given the high volume of traffic on the surrounding road network.
Noise and Vibration Addendum (Chapter 7B)	<u>Fisher Acoustics</u>	<u>Scenario D: C3, C4, C5, basement car park (entirety), highways, public realm.</u> <u>Scenario E: Scenario D (including C3) + Committed Developments and development trips.</u> <u>NOTE: C5 has been excluded from Scenario D and Scenario E as it is at a greater distance from C3 than C4.</u>	<u>Chapter 7A provides the appropriate assessment of noise impact relating to construction noise and vibration and should be referred to accordingly. The additional methodology (Chapter 7B) has been adopted in order to assess the potential environmental noise effects of the proposed school following design development.</u> <u>C4 and C5 are identified as nearby sensitive receptors, however as C5 is at a greater distance from C3 than C4 the inclusion and testing of C4 represents the worst-case scenario.</u>
Traffic and Transport	Vectos	Scenario A: Existing Baseline which for the transport assessment work is the 2032 Future Year Baseline Scenario D: C3, C4, C5, basement car park (entirety), highways, public realm Scenario E: Scenario D + Committed Developments and development trips.	This represents the worst-case scenario. Considering the traffic implications of development traffic there is very little difference between the interim scenarios. This is because the initial development scenarios have a reduction in traffic flows compared to the Existing Baseline Scenario as the car park is replaced with a smaller car park. Therefore, there is no notable adverse environmental impact due to traffic until the final phase of development is complete.

Organisation of the Environmental Statement

1.281.29 This ES comprises 14 chapters and is supported by figures (located at the back of each chapter within Volume 1) and technical appendices (within a separate Volume 2). A Non-Technical Summary (NTS) of the full ES is provided as a separate standalone document (Volume 3).

1.291.30 Figures have been referenced using the chapter number as a prefix followed by the number of the figure within a given chapter. Appendices have been referenced in the same way but due to their size they are contained separately in Volume 2. Table 1.3 sets out the structure of the ES.

Table 1.3: Structure of this Environmental Statement

Chapter No.	Chapter Title	Description
VOLUME 1	Following chapters	
1	Introduction	Introduction to the ES, EIA requirements, details of the project team, ES organisation and availability.
2	EIA Methodology	Methods used to prepare each chapter, description of ES structure and content, generic significance criteria, scoping and consultation.
3	Alternatives and Design Evolution	Outline of the main alternatives considered by the Applicant.
4	Site and Development Description	Site description and details of the Proposed Development. Summary of effects with respect to climate change, energy and sustainability.
5	Construction Phasing and Methodology	Details of anticipated programme for development and construction methodology are also included.
6	Air Quality	Provide an assessment of existing air quality surrounding the Proposed Development in addition to the likely impacts on air quality during construction and subsequent operation.
7A & 7B	Noise and Vibration	Consider the effect of the Proposed Development (construction and operation) on the nearest noise sensitive receptors e.g. nearby hotel and residential developments.
8	Solar Glare	Assessment of effects relating to solar glare.
9	Sunlight, Daylight and Overshadowing	Assess the effects of the Proposed Development on sunlight and daylight as well as overshadowing impacts on amenity areas/public spaces.
10	Townscape and Visual Impact Assessment	Potential impacts and likely effects of the Proposed Development on the townscape character and visual amenity of the Site and the surrounding area.
11	Traffic and Transport	Assessment of impacts of the Proposed Development on surrounding transport infrastructure and highways.
12	Wind Microclimate	Assess impacts on pedestrian comfort and safety as a consequence of wind effects.
13	Type 1 Cumulative Effects	Review of inter project effects, which are combined effects arising from the Proposed Development on defined sensitive receptors.
14	Summary of Residual Effects	Summary of the effects that remain after mitigation.

Chapter No.	Chapter Title	Description
VOLUME 2	Technical Appendices	Technical data and reports to support the chapters in Volume 1.
VOLUME 3	Non-Technical Summary	Summary of the ES in non-technical language.

Other Documents

~~1.301.31~~ Together with this ES, the following documents will be submitted to Manchester City Council in support of the planning application. These include:

Table 1.4: Planning Application Supporting Documents ([hybrid planning application / permission](#))

Document	Prepared By	<u>Updated in respect of Phase C Reserved Matters</u>
Existing Site Plan	SimpsonHaugh and Partners (SHP)	<u>Yes – new existing site plan prepared in support of the Phase C Reserved Matters Application.</u>
Proposed plans, sections and elevations	SHP	<u>Proposed plans, sections and elevations prepared in support of the Phase C Reserved Matters Application.</u>
Application Form	Deloitte Real Estate	<u>New application form prepared in support of the Phase C Reserved Matters Application.</u>
Verified Views (located principally within the Heritage and TVIA deliverables)	Ambiente	<u>No</u>
Statement of Consultation	Deloitte Real Estate	<u>No updates - please refer to Reserved Matters Planning Statement</u>
Planning and Tall Building Statement	Deloitte Real Estate	<u>Yes</u>
Green and Blue Infrastructure Statement	Deloitte Real Estate	<u>No</u>
Design and Access Statement	SHP	<u>No updates – please refer to Reserved Matters Design and Access Statement prepared by Arkilab</u>
Archaeological Desk Based Report	Salford Archaeology	<u>No</u>
Environmental Standards Statement including an Energy Statement	Element Sustainability	<u>No updates – please refer to Reserved Matters ESS prepared by Element Sustainability</u>
Ventilation Strategy	MEP Design	<u>No updates – please refer to Reserved Matters Ventilation Strategy by MEP Design</u>

Document	Prepared By	<u>Updated in respect of Phase C Reserved Matters</u>
Ecology Report	ERAP	<u>No</u>
Crime Impact Statement	Greater Manchester Police (GMP) Design for Security	<u>No updates – please refer to Reserved Matters Crime Impact Statement</u>
Framework Travel Plan	Vectos	<u>No</u>
Site Waste Management Strategy	Vectos / SHP	<u>No – please refer to Reserved Matters Design and Access Statement</u>
TV Reception Survey	Pager Power	<u>No</u>
Broadband Connectivity Report	Pager Power	<u>No</u>
Viability Assessment	Renaker	<u>No</u>
Residential Management Strategy	Zenith	<u>No</u>
Safety Assessment (Manchester Airport)	Pager Power	<u>No</u>
Ground Conditions Phase 1 Report and Phase 2 Report	WSP	<u>No</u>
Flood Risk and Drainage Strategy	WSP	<u>No - please refer to flood risk and drainage information submitted as part of the Reserved Matters Application</u>
Landscape Design Statement	TPM	<u>No</u>
Landscape Management Report	TPM	<u>No</u>
Heritage Statement	Stephen Levrant Heritage Architecture	<u>No</u>
Socio-economics Report	Ekosgen	<u>No</u>
Local Labour Agreement – Statement of Intent	Renaker	<u>No</u>

Environmental Statement Availability

~~1.31~~1.32 The ES is available for public viewing on Manchester City Council's Public Access website at the following address: <http://pa.manchester.gov.uk/online-applications/> once the application has been submitted and validated.

~~1.32~~1.33 The ES may be purchased in volumes, the costs for which are set out below:

- Volume 1: ES Main Text and Figures - £150.
- Volume 2: ES Appendices - £150.
- Volume 3: Non-Technical Summary (NTS) - £15
- Full Copy (Volumes 1, 2 and 3) of the ES on CD - £15.

~~1.33~~1.34 For copies of any of the above, please contact the Manchester Planning Team at Deloitte Real Estate.

Crown Street Phase 2 Project Team – Planning and EIA
Deloitte Real Estate
The Hanover Building
Corporation Street
Manchester
M4 4AH
~~Hardman Street~~
~~Manchester~~
~~M3 3HF~~

2 EIA Methodology

A2 ES Addendum Alterations

The following changes have been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Inclusion of information on informally agreeing the scope of the ES addendum with the Local Planning Authority.
- Consultation undertaken with Local Ward Councillors and the agreement that no further public consultation required in relation to the Phase C Reserved Matters details.

No further alterations have been made to this chapter as part of the ES addendum.

Introduction

- 2.1 This Chapter sets out the methodology used to prepare each Chapter of the ES and describes its structure and content. In particular, it sets out the process of identifying and assessing the likely significant effects of the Proposed Development on the environment as defined in Chapter 1 and described in detail in Chapter 4.

Legislation and Guidance

- 2.2 The ES has been prepared to comply with EIA Regulations, which implement European Council Directive No. 85/337/EEC as amended by Directive 2014/52/EU which entered into force on the 17 May 2017.
- 2.3 Reference has also been made to currently available good practice guidance in EIA including:
- National Planning Practice Guidance – Department for Communities and Local Government, March 2014.
 - Impact Assessment Guidelines and ES Review Criteria, Institute of Environmental Management and Assessment (IEMA), 2004.
 - Tower Hamlets Council EIA Scoping Guidance, January 2012.
 - Guidance on EIA, EIS Review, European Commission, June 2001.
 - Guidance on EIA Scoping, European Commission, June 2001.
 - Guidance on Transport Assessment, DCLG and DfT, March 2007.

Screening and Scoping and Consultation

Scoping

2.4 An EIA scoping request was submitted to Manchester City Council on 19 December 2019. It should be noted that no formal response had been received prior to the submission of this ES; however, every effort has been made to agree the scope of studies and methodology of assessments with statutory consultees where possible. The Author of each technical Chapter has sought the opinion from relevant officers at Manchester City Council and statutory consultees as necessary. Compliance with the scope is detailed with the 'Assessment Methodology and Significance Criteria' section of each Technical Chapter.

2.5 The results of the scoping exercise have determined the subject areas of the EIA, set out in Table 1.2 above.

2.52.6 A proposed EIA scope was informally submitted to the Local Planning Authority on 1 March 2022 and was agreed with the Case Officer at a pre-application meeting on 3 March 2022.

Consultation

2.62.7 The Proposed Development has been prepared in consultation with Manchester City Council and a range of technical stakeholders (refer to Table 2.1).

Table 2.1: Scope of Stakeholder Consultation

Stakeholder Consultation
Manchester City Council Planning Authority
Manchester City Council – Local Education Authority
Manchester City Council Highways
Historic England
Greater Manchester Archaeological Advisory Service
Greater Manchester Police
Manchester City Council Environmental Health Officers
Places Matter! Design Review Panel
Environment Agency
Manchester Airport Safeguarding Team

Public Consultation

2.72.8 A pre-application consultation exercise has been undertaken with local residents and businesses, in the form of a public exhibition, held on 27 November 2019 at the Deansgate Square Marketing Suite, Great Jackson Street, Manchester.

2.82.9 Prior to this exhibition, leaflets were delivered to c. 2,500 properties in the vicinity of the Site.

2.92.10 The purpose of this event was specifically to provide an opportunity for potentially affected areas of the local community to find out more about the Proposed Development, ask questions and speak to members of the project team, as well as to provide feedback. The scope of the consultation exercise was informed by discussions with the Local Planning Authority in advance of being carried out.

2.102.11 Six exhibition boards were displayed at the event to provide introductory information about the Proposed Development and the latest visual representations of the building design, public realm and landscaping proposals.

~~2.11~~2.12 Representatives of the project team were present at the exhibition to provide support and deal with any queries raised. Representatives included:

- Renaker Build Ltd – Applicant;
- SimpsonHaugh and Partners – Architects;
- Vectos – Transport Consultants; and
- Deloitte Real Estate – Planning and EIA Consultants.

~~2.12~~2.13 A separate briefing pack was sent to Elected Ward Members inviting them to a separate briefing session ahead of the Public Exhibition.

2.14 A Statement of Consultation is provided in support of the application. It does not form part of the ES but should be read in conjunction with this Statement. It explains in more detail the feedback received and how that has been taken into account in the formalisation of the application submission proposals.

2.15 A briefing email was sent to Councillor Johns, Councillor Jeavons and Councillor Davies outline the detailed proposals and inviting local Ward Councillors to a briefing session.

2.16 A briefing session subsequently took place with Councillor Jeavons on 24 February 2022 via Teams, which was attended by representatives from Arkilab, Deloitte and Renaker Build Ltd. Councillor Jeavons expressed his support for the detailed proposals being brought forward. The scope and requirement for additional public consultation was also discussed with Councillor Jeavons, whereby it was agreed that further public consultation was not required in respect of the reserved matters application for the school, particularly given that:

- The principle of the proposals for education facility is already established by the outline planning permission;
- The hybrid planning permission was subject to an extensive public consultation exercise, as referenced above; and
- The detailed proposals for the education facility are within the parameters approved as part of the hybrid planning permission.

Non-Significant Effects

~~2.13~~2.17 It is considered that the following disciplines will not give rise to likely significant effects on the environment and would therefore not require inclusion in the Environmental Statement. An explanation for each discipline is provided in the EIA Scoping Report in Appendix 2.1.

- Agricultural Circumstances
- Aviation
- Archaeology
- Arboriculture
- Human Health and Climate Change
- Ecology
- Water Resources
- Electronic Interference
- Ground Conditions
- Heritage
- Socio-Economic

Approach to Technical Studies

2.142.18 Various technical studies were commenced at an early stage in the development process. The findings of the baseline environmental studies have played an important role in the design of the Proposed Development by defining the environmental sensitivities, constraints and opportunities associated with the Site.

2.152.19 Design team reviews, attended by members of the project team, were held throughout the pre-application process. These reviews provided a valuable forum for the exchange of information and ensured that the design team was fully aware of the environmental constraints and opportunities and of the interactions between disciplines. Pre-application engagement was also undertaken with Manchester City Council as the Local Planning and Highway Authority.

2.162.20 The technical studies have been undertaken in accordance with current best practice. Specific guidance used is referenced within each of the respective assessment chapters.

2.172.21 The majority of assessments involved consultations with statutory and non-statutory bodies, desk-based research, site inspections and surveys, impact prediction and mitigation.

2.182.22 The assessment and conclusions of the ES are based on the description of the Proposed Development provided in Chapter 4.

Structure of Technical Chapters

2.192.23 Each technical chapter of the ES (Chapters 6-12) has been set out broadly in line with Table 2.2.

Table 2.2: Structure of ES Technical Chapters

Technical Chapter Structure	
Introduction	Each of the technical chapters begins with an introduction providing context to the EIA completed.

Technical Chapter Structure	
Policy Context	This section includes a summary of legislation and of national and local policies relevant to the environmental discipline and explains its purpose in the context of the Proposed Development and the ES.
Assessment Methodology & Significance Criteria	This section describes the method or approach employed in the assessment of impacts, the criteria against which the significance of effects has been evaluated, the sources of information used and any technical difficulties encountered. Relevant legislation is also identified.
Baseline Conditions	This section describes and evaluates the baseline environmental conditions i.e. the current situation and anticipated changes over time assuming the Site remains unchanged. This is a critical part of the EIA process as it provides a measure against which potential environmental effects can be assessed.
Identification and Evaluation of Key Impacts	This section identifies the likely significant effects on the environment resulting from the Proposed Development. A description of the likely effects of the Proposed Development and an assessment of their predicted significance is provided. The assessment of effect significance has been undertaken using appropriate national and international quality standards. Where no such standards exist, the judgments that underpin the attribution of significance are described. The guidelines, methods and techniques used in the process of determining significance of effects are contained within each of the technical chapters presented.
Mitigation Measures	One of the main aims of the EIA process is to develop suitable mitigation measures to avoid, reduce or compensate for any significant adverse effects of a project. This section of each technical chapter describes the measures which would be implemented to mitigate potential adverse effects. Where possible, enhancement measures have also been proposed.
Cumulative Effects	This section considers the cumulative effects of the Proposed Development identified within the vicinity of the Site. Any likely significant effects on the environment arising in this respect are set out in this section. There are two distinct types of cumulative effects: Type 1 - Cumulative effects are the interactions between effects of the Proposed Development on a single receptor. Type 2 - Cumulative effects are those that arise from incremental changes caused by other consented or reasonably foreseeable activities ('committed developments') together with the Proposed Development.
Residual Effects	The residual effects, i.e. the remaining effects of the Proposed Development assuming implementation of the proposed mitigation measures, have been estimated and presented. The methods used to make these estimates are described and proposed methods of treatment for any residual effects have been identified and quantified where possible.
Summary	Each technical chapter concludes with a brief summary outlining the potential residual effects of the Proposed Development.

2-202.24 Chapter 5 provides information to allow the construction phase of the Proposed Development to be assessed by the disciplines set out in Chapters 6-12.

Magnitude

~~2.21~~2.25 The methodology for determining the scale, or magnitude, of effect is set out in Table 2.3.

Table 2.3: Methodology for Assessing Magnitude

Magnitude of Impact		Criteria for Assessing Effect
Major		Total loss or major/substantial alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed.
Moderate		Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of the baseline will be materially changed.
Minor		A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character / composition / attributes of the baseline condition will be similar to the pre-development circumstances/situation.
Negligible		Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Sensitivity

~~2.22~~2.26 The sensitivity of a receptor is based upon the relative importance of the receptor using the scale in Table 2.4.

Table 2.4: Methodology for Assessing Sensitivity

Sensitivity	Examples of Receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Medium	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

Significance

~~2.23~~2.27 The significance of an environmental effect is determined by the interaction of magnitude and sensitivity, whereby the impacts can be positive or negative. Table 2.5 below shows how magnitude and sensitivity interact to derive effect significance.

Table 2.5: Methodology for Assessing Significance

Magnitude		Sensitivity	
	High	Medium	Low
Major	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial

Moderate	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

2.242.28 The above magnitude and significance criteria have been provided as a guide for technical specialists to assess impact significance. Where discipline specific methodology has been applied that differs from the generic criteria above, this has been clearly explained within the given chapter under the heading of 'Assessment Methodology and Significance Criteria'.

2.252.29 For the purposes of this Environmental Statement, an effect will be considered to be 'significant' if it is classed as either 'moderate' or 'major'.

Baseline Conditions

2.262.30 Each technical chapter includes a section which describes and evaluates the baseline environmental conditions (i.e. the current situation and anticipated changes over time assuming the Site remains unchanged). Baseline data has been obtained from a variety of sources, including published documents, maps, historical information and site survey data. Given the complex nature of the Site and surroundings, each technical chapter (Chapters 6 to 12) includes a clear description of what is assumed as the baseline against which the assessment is being made.

2.272.31 The method used to obtain baseline information, where relevant and possible, has been clearly identified within each technical chapter and agreed in advance with statutory consultees.

Mitigation

2.282.32 Any adverse environmental effects have been considered for mitigation at the design stage and, where practicable, specific measures have been put forward. Measures have been considered based on the following hierarchy of mitigation:

- Avoidance.
- Reduction.
- Compensation.
- Remediation.
- Enhancement.

2.292.33 Where the effectiveness of the mitigation proposed has been considered uncertain, or where it depends upon assumptions of operating procedures, data and/or professional judgement has been introduced to support these assumptions.

2.302.34 Mitigation recommended during the construction phase would be set out in the Construction Management Plan (CMP) to be agreed with MCC prior to the commencement of work and implemented throughout the duration of the works. Outline mitigation measures to be included in a future CMP are set out in Chapter 5: Construction Methodology and Programme.

~~2.31~~2.35 Mitigation to be implemented during the operational phase would be secured through planning conditions and obligations.

Residual Effects

~~2.32~~2.36 The likely significant effects on the environment, assuming the successful implementation of mitigation measures proposed, have been estimated within each chapter. These are termed 'residual effects' and are considered in Chapter 14 of this Statement.

Cumulative Effects

~~2.33~~2.37 The ES considers the potential for likely significant effects on the environment resulting from consented or reasonably foreseeable activities or developments in the area, which could lead to potentially significant cumulative effects in conjunction with the Proposed Development ('Committed Developments').

~~2.34~~2.38 A search of Manchester City Council's planning applications database and knowledge of the area has identified a number of schemes for which cumulative effects are considered more likely. A full list, as of December 2019, is contained at Appendix 2.2, for which agreement was sought from the Local Planning Authority as part of the Scoping Opinion process.

~~2.35~~2.39 Each technical chapter (Chapters 6-12) has assessed the potential for likely significant effects on the environment, as a result of the above committed developments, together with the Proposed Development.

~~2.36~~2.40 In addition, Chapter 13 assesses the Type 1 Cumulative effects.

Assumptions and Limitations

~~2.37~~2.41 The principal assumptions that have been made and any limitations that have been identified in preparing the ES are set out in each technical chapter. General assumptions include the following:

- All of the principal land uses adjoining the Site remain. Where redevelopment proposals have been granted Planning Permission, the effect of those proposals are considered as part of the Cumulative Impacts;
- Baseline conditions have been established in 2019 from a variety of sources, including historical data, but due to the dynamic nature of certain aspects of the environment, conditions will change during the Proposed Development;
- Information received from third parties is complete and up to date;
- The various stages of the Proposed Development will satisfy minimum environmental standards, consistent with contemporary legislation, practice and knowledge;
- Assessments are based upon, and conclude, the "worst case" effects that would arise from the application as defined by the description of development set out in Chapter 4, Site Surroundings and Description of the proposals;
- Construction and demolition methods and phasing will follow the timetable and methods set out in Chapter 5, Construction Management and Phasing.
- Conditions will be attached to the Planning Permission that will control disturbance during the Proposed Development; and

- Necessary off-site services infrastructure for the Proposed Development will be provided by statutory undertakers.

Objectivity

~~2.382.42~~ The technical studies undertaken within the ES have been progressed in a transparent, impartial and unbiased way with equal weight attached, as appropriate, to beneficial and adverse effects. Where possible, this has been based upon quantitative and accepted criteria together with the use of value judgements and expert interpretations.

~~2.392.43~~ The assessment has been explicit in recognising areas of limitation within the ES and any difficulties that have been encountered, including assumptions upon which the assessments are based. Where appropriate, the assessment of significance has been given confidence levels.

3 Alternatives and Design Evolution

A3 ES Addendum Alterations

No alterations have been made to this chapter as part of the ES addendum prepared in support of the reserved matters application for Phase C of Crown Street Phase 2, which received outline consent as part of the hybrid permission.

Introduction

- 3.1 Regulation 18(3) and Paragraph 2 of Schedule 4 of the EIA Regulations requires the Applicant to provide an outline of the main alternatives studied and an indication of the main reasons for the choice made, taking into account the environmental effects.
- 3.2 The form of the Proposed Development has been influenced by a range of factors, including location, surrounding land use and input from Manchester City Council, Statutory and Non-Statutory Consultees and other stakeholders.
- 3.3 This chapter reviews the principal land use and siting options explored and the reasoning for the selection of the current design for the Proposed Development which forms the subject of assessment within the ES.
- 3.4 This chapter considers the following four options in the context of the existing Development Brief:
 - The 'do nothing' alternative where the Proposed Development is not progressed.
 - Alternative locations for the Proposed Development.
 - Alternative uses for the Site.
 - Alternative design/layout for the Proposed Development in the context of the design evolution.

The "do nothing" Alternative

- 3.5 The "do nothing" scenario refers to the option of leaving the Site in its current state. The Site is currently used as a site compound for construction works on an adjacent development. However, prior to this its permanent use was as a surface level car park.
- 3.6 The principle of the Site's redevelopment to deliver a residential led, mixed-use scheme is supported through Manchester City Council's Great Jackson Street Development Framework (2018).
- 3.7 The "do nothing" scenario would result in the continued underutilisation of a City Centre, brownfield site, located within a strategic regeneration area (Great Jackson Street Development Framework). The regeneration strategy for this area acknowledges its huge economic potential and the need therefore to fully utilise finite land supply for appropriate uses through development that supports the City's social, economic and environmental objectives.

- 3.8 The “do nothing” scenario has been discounted due to the established need for the regeneration of the Site and the benefits it will bring. The Site is considered suitable for high-density development given its highly accessible location within the City Centre and the Great Jackson Street Development Framework area. The Site is considered suitable for residential use in terms of its urban location, close proximity to established neighbourhoods, transport links and connections with Manchester City Centre.

Consideration of Alternative Locations

- 3.9 The Site is located within the Great Jackson Street Development Framework (2018) area, and is identified as being part of Crown Street Plot C. The Framework was originally endorsed in 2007 and was updated in 2015. Most recently, the Framework was updated in 2018 to reflect the potential for further growth in this part of Manchester City Centre.
- 3.10 The Site is situated at a key gateway into Manchester City Centre. The City Centre is expanding to the south towards the Inner Ring Road. This Site, and the whole Great Jackson Street Development Framework area, has been largely underutilised for many years. The proposed re-use of the Site for residential use positively contributes towards the ongoing regeneration of Manchester and the expansion of the City Centre.
- 3.11 The Site is clearly in need of regeneration and provides the opportunity to directly contribute towards the identified need for housing in this part of the City Centre and, alongside Deansgate Square and Crown Street Phase 1, will support the creation of a new neighbourhood. The Proposed Development will provide valuable social infrastructure with the addition of the school and the public park, which will bring vitality to the local area, strengthen the local community and enhance connections with the existing nearby neighbourhoods.
- 3.12 Within this context, alternative locations have been discounted given the Site’s current underutilisation within the City Centre and being specifically identified by Manchester City Council as being an appropriate location for high density residential development.

Consideration of Alternative Uses

- 3.13 The Site’s proposed use is for residential led development. Other reasonable alternative uses, considering its City Centre location, have been discussed below:
- **Retail** - The Site falls outside Manchester City Centre’s Primary Shopping Area and a large-scale standalone retail development on this Site would require extensive justification. The retail sector within the UK is volatile and there are a number of out of centre retail destinations in close proximity to the Site, namely Regent’s Road Retail Park in Salford. Delivering a retail development on the Site has therefore been discounted.
 - **Hotel** - The size of the application Site would present challenges in terms of the scale of demand for hotels and therefore ultimately the viability of securing delivery. In addition, the Site is located in close proximity to a number of established residential communities. Therefore, given the Site’s context and location a hotel development on the Site has been discounted.
 - **Office** - The Site is not located near to any existing commercial cluster and would therefore be unattractive location for investors in commercial development or occupiers. Furthermore, it is located within a part of the City Centre that is developing an established residential character and the introduction of a large commercial building would not support the vision set out within the Great Jackson Street Development Framework. Whilst there is a need for more commercial development to be brought forward within the City Centre, it is considered that such development will be better located closer to the City core alongside other mixed commercial uses.

- 3.14 For the reasons outlined above, alternative uses have been discounted. The principle of a residential led development this location is consistent with planning policy and the Great Jackson Street Development Framework. The residential use will complement emerging development proposals in the area and will support the wider regeneration of this part of Manchester City Centre.

Design Evolution

- 3.15 A wide range of specialist consultants and other stakeholders have provided valuable input into the evolving scheme which has served to inform the design process and assist the team in arriving at an appropriate solution.
- 3.16 The Site's surrounding regeneration and has provided an important guide which underpins the final design scheme.
- 3.17 The Site's location within the Great Jackson Street Development Framework, its position adjacent to the Crown Street Phase 1 development and its close proximity to the Deansgate Square development have also informed the Proposed Development in terms of scale, density, quality and materiality.
- 3.18 The design concept seeks to respond to the opportunities and constraints established in the Site's context analysis so as to contribute to the ongoing development and enhancement of the surrounding area.
- 3.19 All design iterations were assessed by the design team from a number of differing aspects - from an aesthetic point of view, the need to mitigate against any environmental effects and the need to create a high quality scheme. Following initial testing of the scheme comments received from key stakeholders, the main aspects of the design testing and iteration are as follows:

Consideration of Alternative Scale and Massing

- 3.20 The design evolution of the Proposed Development has developed by responding to the Site's setting adjacent to Crown Street Phase, its proximity to Deansgate Square and its location within the Great Jackson Street Development Framework.
- 3.21 The Great Jackson Street Development Framework (2018) sets a precedent for this Site to deliver three tall buildings (Building C3, C4 and C5 in the Framework), at 31, 39, and 46 storeys.
- 3.22 The Proposed Development has carefully considered the principles contained within the Development Framework and the outcome of the design development process it is to deliver two taller towers (Building C4 and C5), both 51 storeys in height. The Proposed Development is still supported by the Frameworks proposals to deliver tall buildings on the Site. The revised approach of delivering two towers, as opposed to three is considered to be the most suitable design solution for the following reasons:
- It allows more light to penetrate into the park, due to wider spacing between the towers;
 - In partnership with Manchester City Council, the Applicant has since agreed to deliver a new single form entry primary school (Building C3) as part of the proposals which needs to be accommodated in a separate parcel of land within the Site; and
 - Building C4 and C5 at 51 storeys in height will relate better to the taller tower being delivered as part of the Crown Street Phase 1 development (also 51 storeys in height). This prominent clustering signals the entrance to the Framework area and Southern Gateway to the City Centre and thus it demands high quality buildings of scale to reflect this.

- 3.23 Following consultation with key stakeholders a number of layout and massing options were considered, the aim of which was to maximise the sustainable use of the Site whilst minimising any negative impacts on adjacent land uses. In addition to the above, a planning and urban design appraisal has been undertaken to inform the suitability of the Site in design and townscape terms to accommodate the proposed building.
- 3.24 Lower density development was not considered suitable for the currently underutilised Site, as it would not maximise the benefits of a highly accessible, City Centre location. In line with MCC policy, City Centre development will generally be high density and it is considered a location where land should be used to maximise its efficiency.
- 3.25 The Design and Access Statement submitted with the application sets out the options appraisal for the development which details how design of the Proposed Development has been formulated. The options considered for the development were considered within the context of the Site and the final design is considered to respond most appropriately to the context.
- 3.26 On this basis, it is considered that alternative scale and massing has been considered and reasonably discounted.

4 Site, Surroundings and Description of the Proposals

A4 ES Addendum Alterations

The following changes have been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to the Great Jacksons Street Development Framework Area, to reflect progress.
- Updates to Planning History to reflect Crown Street Phase 2 planning permission (ref: 126668/FO/2012)
- Updates to Table 4.1 (Crown Street Phase 2 Quantum of Development), reworked into Table 4.1(a) and 4.1(b) to reflect quantum of development for Phase C (education facility)
- Updates to reflect more recent engagement with the Local Education Authority, as part of the reserved matters detailed design process.
- Additional information on design details relating to Phase C, which have been developed as part of the more detailed design process in support of the reserved matters application for Phase C, the education facility.

For details on the reserved matter proposals for Phase C (education facility) please refer to Chapter 4 (Proposed Development) of the Planning Statement prepared by Deloitte and the Design and Access Statement prepared by Arkilab, both submitted as part of this reserved matters application.

- 4.1 This Chapter includes a description of the Site, its surrounding context, a more detailed description of the Proposed Development as well as the Site's suitability for the Proposed Development.

Site Description and Surrounding Uses

- 4.2 The Site has been historically underutilised, currently used as site compound for construction works on an adjacent development. However, previous to this, its permanent use was as a private surface level car park providing approximately 333 spaces that are understood to have been predominantly used by commuters.
- 4.3 The Site measures approximately 1.1ha and is bound by Silvercroft Street and Crown Street to the north and the Mancunian Way to the south and west. North of the Site, lies the Grade II Listed former Bridgewater Canal Offices. This heritage asset is in the ownership of Renaker Build Ltd, although the future design proposals for this building have not yet been progressed.
- 4.4 The Site is situated within the Deansgate Ward, with Hulme Ward located on the southern edge of the Mancunian Way.
- 4.5 The Site is currently accessed from Silvercroft Street and Crown Street, the latter of which forms a slip road off Mancunian Way. The part of Crown Street that runs along the north east boundary of the Site has been stopped up and is therefore no longer adopted highway.

- 4.6 The Site is in close proximity to the neighbourhoods of Hulme, just beyond the inner ring road; Castlefield across Chester Road; and Knott Mill across the River Medlock.
- 4.7 The adjacent land uses are predominantly residential to the north of Chester Road and west of the Chester Road Roundabout. To the south beyond the Ring Road (Mancunian Way) is Hulme Park. The remainder of the Great Jackson Street area to the east is characterised by light industrial units and car parking, the exception being Gaddum House which is an office building at the corner of Silvercroft Street and Great Jackson Street.

Great Jackson Street Development Framework Area

- 4.8 The Site sits within the Framework area and is situated on a key gateway into Manchester City Centre. The Development Framework was originally endorsed in 2007 and was updated in 2015. Most recently, the Framework was updated to reflect the potential for further growth in this part of Manchester City Centre. Following public consultation organised by MCC, the Final Framework was endorsed by the Executive Committee in January 2018 and forms a material consideration in the determination of planning applications within its boundary.
- 4.9 Existing uses within the Framework area include light industrial units and commuter surface car parking, although a number of key plots are now under construction to deliver new residential-led schemes.
- 4.10 Recently completed developments within the masterplan area, include Deansgate Square and Crown Street Phase 1. Of particular note, Deansgate Square is located to the east of the Site and comprises with 1,508 apartments with a mix of 1, 2 and 3 bedroom apartments, across four towers of 62, 50, 44 and 37 storeys (plus a four storey amenity building). Retail units have been provided on the ground floor to serve the new residents and visitors, whilst also complementing the surrounding communities immediately to the north and those in Castlefield.
- 4.11 Crown Street Phase 1, located directly adjacent to the Site, has delivered two residential towers of 21 and 51 storeys. It comprises of 664 residential units with a mix of 1, 2 and 3 bedroom apartments, as well as townhouses and duplex apartments. Residential amenity space is provided in each building, as well as a communal terrace and a Doctor's Surgery is to be provided.
- ~~4.10 Deansgate Square, to the east of the Site comprises four towers that are under construction and nearing completion (Planning Ref: 111719/FO/2016/C1). Deansgate Square, once complete will comprise 1,508 apartments with a mix of 1, 2 and 3 bedroom apartments, across four towers of 62, 50, 44 and 37 storeys (plus a three storey amenity building). Retail units will also be provided on the ground floor to serve the new residents and visitors, whilst also complementing the surrounding communities immediately to the north and those in Castlefield.~~
- ~~4.11 A second key development under construction which has recently been completed, is Crown Street Phase 1, located directly adjacent to the Site, which will deliver two residential towers of 21 and 51 storeys. Once completed Crown Street Phase 1 will comprise of 664 residential units with a mix of 1, 2 and 3 bedroom apartments, as well as townhouses and duplex apartments. Residential amenity space is provided in each building, as well as a communal terrace and a Doctor's Surgery will also be provided.~~
- 4.12 Planning Permission was also approved in February 2018 on land bounded by Great Jackson Street for the demolition of existing buildings and the construction of three residential buildings which range in height of 32, 26 and 18 storeys to deliver 399 residential units, 50 retirement units and 675 sq. m of commercial floorspace (Planning Ref: 116850/FO/2017). At present, the planning permission remains extant, but construction has not commenced.

~~4.13 In addition, Planning Permission was granted in March 2016 on land at the junction of Chester Road/ Bridgewater Viaduct (A56) and Deansgate for the erection of a 13-storey residential building to deliver 53 residential units, a commercial unit, associated car parking, landscaping and vehicular and pedestrian access (Planning Ref: 110730/FO/2015/C1).~~

4.13 In July 2021, resolution to grant Planning Permission was secured for Plot G of the Great Jacksons Street framework area (Planning Ref: 129273/FO/2021), located to the south east of the Site that area on land bound by Trinity Mancunian Way to the south, Garwood Street to the east and Great Jackson Street to the north. The Plot G proposals comprises the demolition of existing structures and the construction of two residential towers of 56-storeys (plus basement and roof plant) with ground floor commercial uses, car parking, cycle provision, landscaping and access. The development will deliver 1,037 residential units across a mix of 1-bed, 2-bed and 3-bed homes, alongside a communal residential external rooftop garden, gym and lounge areas. The proposals also include high-quality public realm including an upgraded pedestrian link from Hulme Bridge to Great Jacksons Street, which will enhance connectivity.

4.14 In March 2022, Planning Permission was granted for Plot F of Great Jacksons Street (Planning Ref: 132199/FO/2021), located to the east of the Site, on land bound by Great Jackson Street to the south, Deansgate Square to the north, the Boatmans apartments to the east, and by industrial units to the west. The Plot F proposals comprises two 51 storey buildings, which will deliver 988 new residential homes in two phases. The development will deliver a mix of 1-bed, 2-bed and 3-beds homes, in addition to internal and external residential amenity spaces comprising a gym, residents' gardens, basement car parking to provide 296 spaces and 988 secure cycle parking spaces and access. The proposals also include extensive high-quality public realm, which will substantially enhance pedestrian and cycle connections through and around the site.

Transport and Accessibility

4.14.15 The Site is in a sustainable and accessible location to the south of the City Centre, being close to transport hubs including the Deansgate/Castlefield tram stop and Deansgate Train Station. There are also a number of bus services that run along Chester Road. Manchester is a compact and walkable City Centre and the Site also therefore has excellent access to the services and facilities it has to offer.

4.15.16 The Site is well connected to key destinations by a comprehensive network of pedestrian routes, typical of a City Centre location. Key leisure, cultural, business and retail facilities on Deansgate, First Street and Castlefield are within easy reach of the Site. These include two Sainsbury's Locals, one on Medlock Street (next to First Street – 8 minute walk from the Site) and one on Quay Street (by Spinningfields – 10 minute walk) as well as a Tesco Express on Quay Street (10 minute walk). A large Sainsbury's supermarket can be found at Regent Retail Park (20 minute walk).

4.16.17 Deansgate joins onto the Bridgewater Canal cycleway which links the Site to Old Trafford, Stretford, Sale, Altrincham, Trafford Park and Media City. The Ashton Canal Cycleway is also accessible from Manchester City Centre, which links through to East Manchester through a dedicated cycle route to this part of the City Centre. In addition, the National Cycling Route 6 can be accessed from the Liverpool Road junction of Deansgate, which links the Site to Bury as well as onto Route 55 to Wigan and Route 85 to Wilmslow.

4.17.18 A number of existing and proposed Beelines cycleways are in close proximity to the Site and provide connections to Old Trafford, Oxford Road Hulme, Ordsall and beyond.

~~4.184.19~~ Deansgate Train Station (7 minute walk from the Site) and Deansgate-Castlefield Metrolink (7 minute walk) stop lie just 0.3 miles to the north of the Site providing access to a range of destinations across Greater Manchester. These include cross-city links to Manchester Oxford Road, Manchester Piccadilly and Manchester Victoria Stations.

~~4.194.20~~ The Deansgate-Castlefield Metrolink stop is approximately 7 minutes' walk from the Site. Existing Metrolink services provide direct high-frequency services on the Altrincham, Eccles, East Didsbury, Media City, Ashton, Rochdale, Bury lines and connecting services to a wider range of destinations including Manchester Airport.

~~4.204.21~~ The Castlegate bus stop is located opposite the Site which provides links to Piccadilly Gardens.

~~4.214.22~~ The Oxford Road Corridor is located approximately 15 minutes' walk from the Site, and provides services across Greater Manchester. In addition, the Manchester Piccadilly Gardens Bus Station and tram stop is situated approximately 22 minutes' walk from the Site.

~~4.224.23~~ A Free Bus service is run by Transport for Greater Manchester, which has three different routes serving most of the City Centre. The Free Bus Route 2 has a stop outside of Deansgate Train Station, which provides a route to through to Piccadilly Train Station via Deansgate and Church Street in the Northern Quarter.

~~4.234.24~~ The Site is therefore well served by public transport both in terms of connectivity within Greater Manchester further afield.

~~4.244.25~~ For access by car, the Site is well placed for access to the City's arterial ring road with the Mancunian Way and Deansgate Interchange roundabout adjacent to the Site. The road is a two-lane, two-way dual carriageway which provides access to other major arterial routes and to the wider motorway network.

Environmental Designations

Flood Risk

~~4.254.26~~ The Site is located within Flood Zone 1 which is land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

~~4.264.27~~ The Site is located within the Manchester Conurbation Core Critical Drainage Area.

~~4.274.28~~ Full details and other facets of the Site in relation to drainage and flood risk are contained in the Flood Risk Assessment and Drainage Strategy submitted with the application.

Ecology

~~4.284.29~~ There are no Environmental Designations with respect to Ecology within the Site. Furthermore, there are no identified sites with ecological designations within the vicinity of the Site.

~~4.294.30~~ For further details, please refer to the Ecological Assessment submitted with the Application.

Conservation and Heritage

~~4.304.31~~ The Site is not within a Conservation Area and there are no Listed Buildings on the Site. The Castlefield Conservation Area boundary is on the opposite side of the A56 (Chester Road) to the north. The Grade II Listed Former Bridgewater Canal Offices are located to the north of the Site and the Grade II* Church of St George Located approximately 280m to the west.

~~4.31~~4.32 For further details, please refer to the Heritage Statement submitted with the Application.

Planning History

~~4.32~~ The Site's planning history relates to its former use as a temporary car park and the Crown Street Phase 1 development, directly adjacent to the Site, which achieved planning permission in July 2018. Details are set below:

Application Reference	Description	Notes
119806/FO/2018	Erection of two tall buildings (51 storeys and 21 storeys) comprising 664 no residential units (use class C3) and commercial space (A1, A3 or D1); provision of two levels of basement parking, alterations to surface level car park, landscaping, highway alterations, access and associated works.	Crown Street Phase 1 is currently under construction. Approved in July 2018 —
088564/FO/2008/C1	Temporary (two years) use of site for public car parking including erection of additional fencing.	Temporarily Approved 9 December 2009.
080311/RO/2006/C3	Extension of permission for temporary parking use (ref 068508/FU/2003/C3) by an additional 18 months.	Approved 28 August 2007.
068508/FU/2003/C3	Change of use to temporary car park.	Approved 18 August 2003.

~~4.33~~ In addition, there have been a number of historic applications, which relate to previous uses on the Site, including as a showroom, offices, and warehousing.

~~4.33~~ The Site is currently under construction in respect of the on-going delivery of Phases A, B and D of the Crown Street Phase 2 planning permission (Ref: 126668/FO/2020).

~~4.34~~ Planning Permission 126668/FO/2020 has been subject to a couple of amendment applications, namely:

- ~~• 128226/NMC/2020 (approved 22 October 2020) - NMA for the variation of Condition 19 (Phase A - Noise Insulation for Residential Accommodation) and Condition 57 (Phase B - Noise Insulation for Residential Accommodation).~~
- ~~• 131955/NMC/2021 (approved 5 January 2022) - NMA for alterations to the layout of the Penthouse Level (Level 49 Duplex Lower and Level 50 Duplex Upper) of building C5, resulting in an increase of 2 units (0.2% increase) from 855 units to 857 units.~~

Proposed Development

~~4.34~~4.35 The Proposed Development is for the redevelopment of the Site to provide a high quality scheme comprising residential uses within two tall buildings connected by a two storey podium, a new public park and additional public realm enhancements, public and private car parking within a

multi-storey basement, and a single form entry primary school. This will include residential amenity and commercial uses at the podium level on the ground, first and second floors.

~~4.35~~4.36 The development comprises the following buildings:

- C3 – Education Facility;
- C4 – a residential building with associated commercial and residential amenity uses at podium level and a three level, multi-storey private basement car parking; and
- C5 – a residential building with associated commercial and residential amenity uses at podium level and a three level, multi-storey private basement car parking.

~~4.36~~4.37 In addition, a three level, multi-storey basement public car park will be delivered. This will be located under the park.

~~4.37~~4.38 The Proposed Development forms the second phase of a wider phased delivery for Crown Street as set out within the Great Jackson Street Development Framework. The follows on the planning permission approved for Crown Street Phase 1 in July 2018 and will facilitate delivery of the Framework masterplan. The proposals will derive substantial public benefits by delivering a single form entry primary school and new public park.

~~4.38~~4.39 The Proposed Development includes:

- ~~85~~75 residential units as a mix of 1, 2 and 3 bedroomed apartments;
- 244 residents' car parking spaces over a three level basement car park, which includes 24 accessible spaces (10%) and 24 electric charging points (10%);
- 389 public car parking spaces over a three level basement car park, which includes 19 accessible spaces (5%). The Applicant will consider incorporating will consider incorporating electric vehicle charging into the proposals and any car park operator will monitor demand for this as the technology becomes more prevalent in motor vehicles. Should demand increase then the provision can be adjusted accordingly.
- 855 cycle spaces (Building C4 – 414 spaces, Building C5 – 441 spaces);
- Two retail units providing 490 sq. m. (NIA) of commercial space;
- Ancillary residential amenity space including a private roof terrace, gym and sauna;
- A single form entry primary school, including nursery and private day care;
- A new 0.5ha (hectare) public park; and
- Additional public realm enhancements.

~~4.39~~4.40 The quantum of development is set out in the Tables 4.1(a) and 4.1(b).

Table 4.1(a): Quantum of development for Crown Street Phase 2 (Full Planning Permission).

Measurement	Proposed Development
Proposed Site Area	1.1 ha (hectares)

Measurement	Proposed Development
Proposed Development	<u>Residential (Full)</u> 857⁵ residential units as a mix of: 278 x 1 bed apartments (33%) 514 x 2 bed apartments (60%) 54 x 3 bed apartments (6%) 11⁹ x Duplex (1%) - Ancillary residential amenity space including, private roof terrace and gym. <u>Public Realm (Full)</u> 0.5ha (hectare) public park <u>Commercial (Full)</u> - Two retail units providing 490 sq. m. (NIA) of commercial space <u>Education Facility (Outline)</u> - Single form entry primary school <u>and nursery</u>
Proposed Development Height	Building C3 - 2-3 storeys (Outline) - Tower C4 - 51 storeys / +187.15 AOD (Full) - Tower C5 - 51 storeys / +187.40m AOD (Full) - Tower C4 and C5 connected by a 2 storey podium (Full)
Car Parking	244 residents car parking spaces, including 24 accessible spaces and 24 electric vehicle charging points. 389 public car parking spaces, including 19 accessible spaces. The Applicant will consider incorporating will consider incorporating electric vehicle charging into the proposals and any car park operator will monitor demand for this as the technology becomes more prevalent in motor vehicles. Should demand increase then the provision can be adjusted accordingly.
Cycle Spaces	855 residential cycle storage spaces

Table 4.1(b): Proposed Uses and Quantum of the Proposed Development, Phase C.

Parameter	Quantum
<u>Phase C Site Area</u>	<u>1,168 sqm</u>
<u>Building Footprint (sqm)</u>	<u>701 sqm</u>
<u>Height (storeys)</u>	<u>3 storeys + rooftop play space</u>
<u>Height (m)</u>	<u>15.3m (maximum)</u>
	<u>+48.600m (AOD)</u>

<u>Parameter</u>	<u>Quantum</u>
<u>Floorspace (Internal)</u>	<u>Total GIA: 1,798 sqm</u>
-	<u>Total GEA: 2,299 sqm</u>
	<u>PRIMARY SCHOOL</u>
	• <u>Ground Floor: 468 sqm (GIA) – including 117 sqm (GIA) of basic teaching floorspace</u> • <u>First Floor: 631 sqm (GIA) – including 180 sqm (GIA) for main hall, and 127 sqm (GIA) of basic teaching floorspace.</u> • <u>Second Floor: 454 sqm (GIA) – including 267 sqm (GIA) of basic teaching floorspace.</u> • <u>Third Floor: 89 sqm (GIA) – storage, toilets, M&E, circulation.</u>
	<u>DAYCARE</u>
	• <u>Ground Floor: 165 sqm (GIA) – including 69 sqm (GIA) of basic teaching floorspace</u>
<u>External (Play) Space</u>	<u>Ground Floor (daycare): 41 sqm</u> <u>Ground Floor (primary school): 100 sqm</u> <u>First Floor (primary school): 20 sqm</u> <u>Third Floor/ Rooftop (primary school): 486 sqm</u>
<u>School and Nursery Capacity:</u>	<u>The intended capacity of the school is 210 places, alongside a 26 place nursery</u>

Layout and Form

4.404.41 Building C3, the single form entry primary school, is situated between the residential buildings of the Proposed Development and Crown Street Phase 1. ~~Only outline planning permission is sought for.~~ Building C4 and Building C5 are only visually linked by a podium, to create an attractive entrance for residents as well as private residential amenity space. Each building has a separate entrance via this podium level, with entrances facing onto the park which leads into the lifts to access the floors to each of the buildings. The 24-hour concierge for both buildings are present on this level.

4.414.42 There is space on the ground floor and first floor which will be used for a variety of uses, such as commercial and other residential facilities, including a gym and sauna.

4.424.43 The podium connecting the two towers has a roof terrace proposed on level 2. The roof terrace will provide private amenity space for residents and the terrace will incorporate a landscaped buffer to create space for each tower (Building C4 and Building C5).

4.434.44 Building C4 is a slender blade shape in plan and is equidistant between tower C2 (Crown Street Phase 1) and tower C5. The orientation and shape of the C4 tower floorplate ensures there are no solely north facing apartments. The buildings have a very generous 32m separation distance between facing elevations (at the closest point).

4.444.45 Building C5 is circular in plan and is situated on axis with building C1 (Crown Street Phase 1). The circular nature of the plan form has created sizeable apartments with living spaces which open up towards the perimeter giving generous frontages and maximising views and daylight. The dimension of the plan form allow for an efficient floorplate to be created which provides an incredibly slender massing proposition.

4.454.46 Apartments are arranged around a central linear core. The linear arrangement allows for a generous landing within the lift lobby and inviting arrival experience at ground floor level.

4.464.47 The Proposed Development includes a three level, multi-storey basement car park with public parking spaces and private residents' parking spaces.

4.474.48 Silvercroft Street provides access to the residential car park, via a private access road that provides a route past the Crown Street Phase 1 site, past the school before heading south east behind the residential towers. The public car park entrance is on the spur of Silvercroft Street at the northern corner of the park.

4.484.49 Between the landscape zone and the buildings will be a single direction service route with resident access to the below ground car parking. Refuse and recycling collections will take place using the service bays adjacent to the back of house area and a layby area to accommodate two refuse vehicles will also be provided.

Scale and Massing

4.494.50 The Great Jackson Street Development Framework (2018) sets a precedent for this Site to deliver three tall buildings (Building C3, C4 and C5 in the Framework), one at 31 storeys, one at 39 storeys and one at 46 storeys, all set on a two storey podium level.

4.504.51 The Proposed Development has carefully considered the principles contained within the Framework and the outcome of the design development process it is to deliver two taller towers (Building C4 and C5), both 51 storeys in height. Therefore, the Proposed Development deviates from the Great Jackson Development Street Framework (2018) principles in this instance. This approach is considered to be the most suitable design solution for the following reasons:

- Allows more light to penetrate into the park, due to wider spacing between the towers;
- In partnership with Manchester City Council, the Applicant has agreed to deliver a new single form entry primary school (Building C3) as part of the proposals; and
- Building C4 and C5 at 51 storeys in height will relate better to the tall tower being delivered as part of the Crown Street Phase 1 development (51 storeys in height). This prominent clustering signals the entrance to the Framework area and the City Centre and demands a quality building of scale to reflect this.

4.514.52 The strength of the plan form in providing a distinctive massing arrangement is felt to provide adequate variety to the composition of the three towers with the constant height datum used to unify the cluster.

4.524.53 The development of the Crown Street Phase 2 scheme is in the spirit of the Great Jackson Street Development Framework (2018) in that it increases the separation between the building, provides larger apartments albeit in a taller more elegant forms.

~~4.53 In partnership with Manchester City Council, the Applicant has agreed to deliver a new single form entry primary school as part of the proposals. This will be delivered to shell and core and will be 2-3 storeys in height. Due to the need to coordinate a detailed design with the Education Authority it has been decided that the Application will only seek Outline Planning Permission for the school. Further details will be resolved during future Reserved Matters Applications.~~

~~4.54 The Applicant has received a Letter of Support from the LEA, regarding the new school. The letter states that the Council is committed to working in partnership with Renaker to bring forward an appropriate design to achieve development of the proposed school.~~

4.54 During the detailed design development process, the Applicant and project team has undertaken on-going consultation with the Local Education Authority (LEA). The detailed proposals for the school have responded to LEA requirements and comments, with the proposals having been reviewed and signed off by the LEA in March 2022.

4.55 The final operator for the school has not yet been agreed however discussions are ongoing. The detailed proposals for the school have the strategic support of the LEA and local planning authority officers. The progress to date on the detailed design of the school represents the Applicant's commitment to deliver in the school, in consultation with the LEA. As discussions develop and agreement is sought with the final operator, everything continues to progress and be in place to enable the delivery of the school. Based on the current construction programme, work is anticipated to start on-site for the school in Q3 2022.

4.56 The LEA agreed that a three-storey educational facility with external play facilities located on the roof, would provide the most appropriate arrangement and that the internal design provided an acceptable layout to meet the requirements of BB103 as well as accommodating the required flow and curriculum adjacencies. On this basis the LEA provided a letter of support, which has been included at Appendix A of the Reserved Matters Phase C Planning Statement prepared by Deloitte.

Landscaping

~~4.55~~4.57 The Proposed Development contains significant new elements of landscaped space and public realm which will support delivery of the wider Framework vision. A Public Realm Strategy has been submitted in support of this application, prepared by TPM Landscape Architects. The landscape proposals for Crown Street Phase 2 includes a new informal public park.

~~4.56~~4.58 The Public Realm Strategy has been prepared in accordance with the Public Realm Guidance Document prepared by TPM Landscaping for information purposes as part of the Crown Street Phase 1 development. The Guidance Document informs the comprehensive approach to landscaping across the Great Jackson Street Development Framework (2018) area.

~~4.57~~4.59 Further detail is provided in the Landscape Design Statement (PR-TPM-G710-RP-GRD-3442 501).

Public Park

~~4.58~~4.60 In line with the Great Jackson Street Development Framework, the Proposed Development, Crown Street Phase 2 incorporates a large amount of public realm, namely a new public park that will serve future and existing residents as well as adjacent neighbourhoods. This public space links the large waterside public realm provision being brought forward as part of the Deansgate Square scheme, currently on site, and will also link through to Hulme Park. The Proposed Development provides a key pedestrian route, along Crown Street and Silvercroft Street that connects these three key public spaces.

~~4.59~~4.61 The new public park provides an informal green space with areas of open lawn located to

benefit from the sunny aspect and changing sun patterns between the two towers. Informal pathways lead users through the space where people are encouraged to stop and play within the park. Naturalistic style planting with tree groves and swathes of grasses and herbaceous planting will help to create seasonal interest within the park.

~~4.604.62~~ A small natural play space is proposed along the route between Silvercroft Street and the school.

~~4.614.63~~ Replacement tree planting is proposed on a 3:1 basis to ensure that there is a net increase in tree cover post-development. In total, 31 trees will be removed to facilitate the Proposed Development and so on this basis 93 new trees are proposed within the public park and around the perimeter of the Site.

Residents (Podium) Roof Terrace

~~4.624.64~~ A podium connects Building C4 and Building C5, with a roof terrace proposed on level 2 of the podium. The roof terrace will provide private amenity space for the residents. The roof terrace will incorporate a landscaped buffer to create a space for each tower (C4 and C5) and benefit from southern aspect.

Highway Re-Alignment and Access

~~4.634.65~~ Improvements are proposed to the highways in order to create a clear circulation hierarchy with pedestrian priority where possible. Any highways work on the public highway will be subject to appropriate sign-offs from the Highways Authority, most likely via a S278 Agreement.

Silvercroft Street / Crown Street

~~4.644.66~~ Silvercroft Street is currently cobbled and has a number of tarmac patch repairs. It is intended to repair the road with cobblestones from within the development boundary. The junction between Silvercroft Street, the car park entrance, phase 1 access road and the cycle route will then benefit from a contrasting paving arrangement.

~~4.654.67~~ The proposed paving will ensure that drivers to the car park slow down and priority will be given to pedestrians and cyclists.

Melbourne Street

~~4.664.68~~ Works are also proposed to improve the junction at Melbourne Street / Crown Street as part of the cycle route. A dropped kerb and tactile paving will be introduced to allow cyclists to cross Melbourne Street safely.

5 Construction Methodology and Programme

A5 ES Addendum Alterations

The following changes have been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to the delivery programme for Crown Street Phase 2, to account for C4 and C5 being under construction. It should be noted that the updated programme still reflects the approved delivery programme.
- Updates to reflect location of new surface water main.
- Minor updates to 'Traffic Management Plan' section.

Introduction

- 5.1 This Chapter of the ES has been prepared by Renaker Build Ltd and describes the proposed construction programme and key activities that will be undertaken. Detailed consideration of potential impacts during the construction process and any necessary mitigation measures are provided in each relevant chapter of the ES.
- 5.2 The following figure is included with this Chapter:
- Figure 5.1 – Logistics plan
- 5.3 The main aim throughout the construction period is to minimise the impact on the surrounding properties and roadways for the duration of the work. Close collaboration with all project teams of all construction projects will be maintained at all times to achieve this aim.
- 5.4 The following narrative explains this methodology and timescales envisaged at the time of the planning application. More detailed proposals will be developed once contractors are appointed and prior to commencement on site. This will include preparation of detailed plans to incorporate Construction Management, Construction Phase Health and Safety, Environmental Management as well as Site Waste Management, Logistics and Traffic Management.

Programme

- 5.5 The total construction programme will span a period of approximately ~~eight~~four years within which there will be elements of ground works, foundations, frame construction, façade cladding and internal fit out. Whilst there are several issues that will determine the final programming and sequencing at the Proposed Development the target plan is to split the development into phases subject to Planning Permission being granted the proposed key dates and durations are shown below. This assumes the Applicant obtains planning permission during Q2 2020, noting the on-going effects of Covid-19 on the planning process.

- **Phase A – Tower C4 and residents car park and part public realm**– ~~construction estimated to take four years; commencing in June 2020 and completing in September 2024. on-site and due to complete September 2023.~~
- **Phase D – Public underground car park** - ~~construction on-site and due to complete September 2023 commencing in June 2020 and completing in September 2024~~ (opening ties in with the completion of C4).
- **Phase C – Primary school** – ~~interior design of school by others June 2020–2021 & shell and core delivered by Sept 2023. Fit out of the school by other parties proposed for completion September 2024. construction to commence in August 2022 and is due to complete in June 2024.~~
- **Phase B – Tower C5 and residents’ car park and remaining public realm**– construction ~~estimated to take four years; commencing in October 2024 and completing in October 2028~~onsite and due to complete September 2024.
- **Final public realm (for example, reinstating highway post construction and landscaping around the perimeter of the Site) and Section 278 Highways works** – completion targeted for ~~December 2028~~September 2024.

- 5.6 This is an indicative construction programme and the Applicant highlights that there are multiple risks involved in the development process. The Applicant notes that this programme may ultimately be extended in the event delays caused by sustained periods of poor weather, unexpected ground conditions or other abnormalities, volatility in economic and housing markets, political uncertainty, and the availability of funding.
- 5.7 The proposed school construction dates (C3) rely on the Local Education Authority (LEA) providing the internal and external play provision design layouts to the Applicant to enable the shell and core design to respond to/incorporate their design. This needs to take place during June 2020 to June 2022 to maintain programme. The programme also assumes that the LEA have entered into and completed a lease (between the LEA & the Applicant) to progress with the construction of the school between June 2020 and June 2022.
- 5.8 The programme is based upon normal working hours in line with Manchester City Council Guidance of 7.30hrs to 1800hrs Monday to Friday and 0800hrs to 1400hrs on Saturdays.
- 5.9 On Sundays and Bank holidays noisy working will generally not be planned. On some occasions there are certain operations that maybe required to proceed during these periods, for example tower crane erection and dismantling. These will be infrequent and will be agreed with the Environmental Health Officer (EHO) and local residents through a series of neighbourly engagements. The frequency of these will vary and respond to demand. Access to the Site will be permitted 30 minutes prior to working day commencing with noise being kept to a minimum for the first half hour of each day.
- 5.10 We acknowledge the close proximity of the neighbouring residents and as such will endeavour at all times to ensure the working hours are adhered to in order to protect this residential amenity.

Construction Methodology

- 5.11 The following is a brief overview of the methodology to be adopted for the construction and fit out of the Proposed Development. The section also considers general logistics as well as traffic management for the movement of material to the disposal of waste.

Site Logistics

- 5.12 The Site has been cleared of previous buildings and obstructions and currently operates as a construction compound for the on-going Crown Street Phase 1 works. Initially during the archaeological investigation a 'Heras' open mesh hoarding will be erected. This will be followed by a permanent solid hoarding around the full perimeter of the Site prior to the start of the construction works proper.
- 5.13 There will be gates erected on Silvercroft Street at the junction of Crown Street, a turning circle will be formed within the Site to allow construction vehicles to enter site, load/unload, turn and leave the Site via the same gate or through the construction gate located at the junction of Melbourne Street and Crown Street. A detailed traffic plan will be agreed with the Highways Authority in advance of starting works on site.
- 5.14 It is envisaged that the temporary site establishment and welfare space will consist of good quality temporary cabins branded with the Renaker Build Ltd logo. The welfare facilities will be suitably sized to suit the anticipated number of operatives. The welfare facilities will be located close to the Site.
- 5.15 Material storage will be generally contained within the Site & compound boundary with access through the site entrance gates for deliveries. When the concrete frame reaches podium level, small low height fork lift trucks will be employed to store materials both within the below ground floor car parking provision for the façade construction and fit out elements of the works.
- 5.16 Any temporary public road or footpath closures associated with the construction phase will be agreed with Manchester City Council highways department and relevant diversion signage put in place.
- 5.17 Access to the site entrances will be controlled by biometric scanner through a secure metal turnstile. This will monitor Renaker operative's movements and prevent unauthorised public access to the Site. The main gates will be locked secured at all times with the exception of when a delivery is being made. The gates will be manned by qualified banksmen who will co-ordinate traffic, bank deliveries as well as ensure the road and pavement areas are kept clean.
- 5.18 Where required, appropriate wheel and vehicle wash facilities will be in place to ensure delivery wagons leave the Site clean and tidy with regular cleaning of Silvercroft Street and Great Jackson Street using road sweepers.
- 5.19 Loading and unloading of material deliveries will occur within the site boundary unless exceptional circumstances require special measures to be instigated.
- 5.20 Waste materials will be placed in skips and these will be removed on a regular basis. Food waste from canteens and eating areas will be contained within a smaller covered skip to prevent vermin.
- 5.21 The Site will employ security guards as appropriate to prevent and discourage nuisance. Regular patrols will take place throughout the shift. As an additional measure, CCTV will be installed to elements of the Site and compound to aid early identification of potential issues.

Construction

- 5.22 The works generally comprise of the following:

- Creation of piling mat substrate and formation of tower crane bases.
- CFA & bored piling to the site perimeter with associated temporary propping.
- Bearing pad construction, ring beams and basement car park slab and drainage.
- Installation of tower crane(s).

- Construction of in-situ concrete frame, concrete stair cores and floors to roof level by concrete pump and jump-form construction.
- Roof coverings.
- Installation of unitised facades including windows and MVHR grilles.
- Installation of internal mechanical and electrical systems including main lifts.
- Fit out of apartments including walls, floors, ceilings, bathrooms kitchens and final finishes.
- Installation of BMU
- Removal of Tower crane.
- Completion of internal finishes to communal space.
- Phased completion of communal external space and links.
- Removal of permanent hoardings and temporary gates.
- Phased completion of public realm and S.278 works
- Phased decant from site leading to the full opening of the development.

Infrastructure

5.23 The works generally comprise of the following:

- Drainage connections to a new UU main foul drain in the Mancunian way slip road.
- Rainwater drainage, via approved attenuation system, to a new surface water drain in the ~~Mancunian way slip road~~ Silvercroft Street.
- Electrical supply entering at the Melbourne St /Crown St junction and following a designated service route around the perimeter service road adjacent to the Mancunian way slip road which will serve both residential buildings, the public car park and the school
- Mains water ~~and Gas (for the school)~~ will be laid in the same combined service route as the electrical supply.
- Telecoms and data infrastructure as above.

Traffic Management Plan

5.24 The Site is served well from Great Jackson Street and Melbourne Street. The Mancunian Way is well connected and linked by a short distance to these roads. It is envisaged that deliveries will traverse from the Mancunian Way A57(M) via River Place and Great Jackson Street, then into Melbourne Street~~the slip road onto Melbourne Street,~~, and then enter the Site at the junction of Crown St and Silvercroft Street. An alternative access and egress point will be along Great Jackson St, then along Silvercroft Street. Traffic will return to the Mancunian Way via Silvercroft Street, Great Jackson Street and Chester Road. Flexibility in the access/egress points from site will minimise congestion on the neighbouring roads.

5.25 This approach negates the need for traffic to access via the city centre.

5.26 A full traffic management plan will be developed to address the following issues:

- Integration of traffic management scheme with surrounding construction developments and calming measures.
- Access, egress, drop off and turning areas.
- Temporary and/or permanent alterations to local traffic routes (both vehicular and pedestrian).
- Additions, alterations and positions of any temporary signage, road markings or protection barriers.
- Pedestrian access around site and relevant protection, lighting and signage schemes.
- Temporary suspension / relocation of any parking bays or bus stops.
- Segregation of plant, materials and pedestrians on site and safe access routes between welfare and site areas.
- The provision of car parking, off and on site, and public transport strategy for staff and operatives
- Loading bays, hoist positions and tower crane areas.

- Any other measures to ensure the safe integration of pedestrians, cyclists and road users both on, off and surrounding the development.
- 5.27 In preparation of the above document, Renaker Build Ltd Protocol of timed and booked deliveries, off peak deliveries and pre fabrication will be incorporated.

Deliveries

- 5.28 Delivery routes for the major materials and items of plant will be as per the section above, they will access from the south of Crown Street and will endeavour to deliver outside of peak traffic hours to minimise local disruption and the normal workings of the surrounding properties. The concrete supply will be from our Great Jackson St batching plant which due to its very close proximity to the site, minimises disruption to the road network.

Parking

- 5.29 There will be a limited number of visitor and key staff parking within the compound area. Site personnel will be encouraged to utilise the extensive public transport options available to them. Any personnel who have to attend by car will be asked to avoid parking in residential areas and instead utilise formal surface car parks within the Great Jackson Street area.

Health and Safety

- 5.30 The project will be carried out in accordance with the Construction, (Design and Management) Regulations 2015, and all other relevant legislation and guidance.
- 5.31 Renaker Build Ltd will be the Principal Contractor. Their track record demonstrates their competency in the management and execution of Health and Safety. Renaker Build Ltd have the appropriately trained management resource and procedures in place to oversee the activities of a complex, high rise city centre construction project.
- 5.32 As demonstrated by the appointment prior to the planning application, the Principal Contractor will work closely with the Principal Designer at this early stage of the project and will influence the detailed design to remove construction and residual safety risks.
- 5.33 The Principal Contractor will produce a Construction Phase Health and Safety Plan prior to works commencing on site that will be reviewed and signed off by the client and their Principal Designer. This document will form the basis of the procedure for managing health and safety during the construction phase and will be periodically reviewed as the work progresses.

Construction Materials

- 5.34 The materials selected at this stage of the design process do not generate a risk to construction personnel using the appropriate PPE and following manufacturers guidance.

Site Security and Safety

- 5.35 Protecting the public from risks to their health and safety arising from the construction work is a high priority. Every care will be exercised to prevent risk to members of the public and appropriate action, including dust & noise control & the erection of perimeter fencing to a specified standard, will be taken.
- 5.36 Vandalism and theft of plant, equipment, materials and fuel is possible throughout the duration of the development. Renaker Build Ltd will take appropriate action, as described in previous

sections, to ensure the site is secure at all times from unauthorised access. As described previously, the site will have metal turnstile access system controlled by an individual proximity fob system. In the event of a lost or stolen data the system can be updated to prevent fraudulent use.

- 5.37 The provision of CCTV would be considered if required to main site points and compound areas to assist in the prevention of unauthorised activities.

Environmental Management

- 5.38 An Environmental Plan, in line with the Renaker Build Ltd environmental management system, will be developed to address and monitor the following issues:

- Applicable environmental legislation.
- Pollution.
- Nuisance (Noise, vibration, dust, emission and light).
- Public relations.

Environmental Legislation

- 5.39 Applicable environmental legislation will be identified in a register, to ensure that appropriate systems are put in place in order to comply with the legal requirements in question.

Pollution

- 5.40 Renaker Build Ltd will establish procedures, to ensure the prevention of water and ground pollution, relating to the following risk activities:

- De-watering of the site (if required).
- Soil contamination remediation.
- Earthworks (including piling, spoil movement and removal, and movement of contaminated soils).
- Concrete works (including washing out of concrete delivery vehicles and pumps).
- Storage and movement of fuels, oils, chemicals and other such fluids.
- Cleaning (including plant, machinery and wheel washing).

Nuisance (Noise, Vibration & Dust)

Noise & Vibration

- 5.41 The principle concerns relating to the nuisances of noise and vibration come from construction activities such as demolition, excavation, cutting, breaking out and plant movements. Mitigation measures will be considered to include low noise options, noise attenuation techniques and carrying out certain activities during agreed hours of the day.
- 5.42 In order to minimise the noise, Renaker Build Ltd will provide the following:
- Any compressors brought on to the Site to be silenced or sound reduced models fitted with acoustic enclosures;
 - All pneumatic tools to be fitted with silencers or mufflers where available;
 - Care to be taken when erecting or striking scaffolds to avoid impact noise from banging steel. All operatives undertaking such activities to be instructed on the importance of handling the scaffolds to reduce noise to a minimum;
 - The majority of deliveries to be programmed to arrive during normal working hours only. Care to be taken when unloading vehicles to minimise noise. Delivery vehicles to be routed so as to minimise

disturbance to local residents. Delivery vehicles to be prohibited from waiting within or in the vicinity of the Site with their engines running;

- All plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise;
- Where possible, all plant to be sited so that the noise impact at nearby noise sensitive properties is minimised;
- Local hoarding, screens or barriers to be erected as necessary to shield particularly noisy activities; and,
- Problems concerning noise from construction works can often be avoided by taking a considerate and neighbourly approach to relations with the local residents. Where possible, works should only take place during given periods, e.g. during normal construction hours and not at night.

5.43 In order to minimise the vibration, Renaker Build Ltd will provide the following;

- Adoption of low vibration working methods. Consideration should be given to use of the most suitable plant;
- Where processes could potentially give rise to significant levels of vibration, on - site vibration levels should be monitored regularly by a suitably qualified person;
- Where piling is to take place, any obstructions should first be removed;
- The provision of cut-off trenches in order to interrupt the direct transmission path of vibrations; and,
- Application of piling techniques aimed at reducing resistance to penetration e.g. pre-boring for driven piles and adding water to the hole for impact bored piles.

Dust

5.44 The principal concerns relating to air quality and emissions from construction activities are in the form of dust and fumes. The degree of dust deposition is usually dependant on the nature of the works. Increased levels of dust are most likely to occur during site activities related to demolition (of which there are none planned on site) piling, moving construction traffic and ground works.

5.45 In order to minimise the dust and fumes, Renaker Build will provide the following:

- Providing a hard surface where vehicle movements occur;
- Control measures and dust suppression techniques;
- Minimising stock piling and positioning in a manner that reduces risk of dust arising through wind action;
- Measures such as screening and covering;
- Installation of appropriate wheel and body wash facilities;
- Keeping of adjacent roads and pavements clean;
- Ensure plant is turned off and not left running when not in use; and,
- Selection of electrically powered plant where possible in lieu of diesel or petrol plant.

Public Relations

5.46 The contractor will ensure that regular contact is made with local residents and community groups to ensure they are kept up to date with general progress on the site. This is especially important for major work elements such as piling and tower crane erection due to our close proximity to adjacent residential schemes. Renaker Build will display a contact number on hoardings which will be operational 24/7.

Waste Management Strategy

5.47 In line with the "Site Waste Management Plan Regulations 2008", a site waste management plan (SWMP) ~~will be~~ has been developed by the principal contractor and agreed with Manchester City Council.

Operational-Construction Waste Removal

- 5.48 Waste generated during the construction phase is to be cleared on a daily basis to a main holding skip. Each floor plate will have a designated waste area that will see bins located within it that can be emptied at the end of each shift. During high waste activities, such as dry lining, this waste removal may need to occur several times a day via the hoists and as such general operatives will be employed to ensure this will occur. Hazardous waste will be stored and disposed of separately but main waste will enter a common skip where our supplier will sort at their transfer station before issuing us recycling percentages and data.
- 5.49 To reduce the volume of waste sent to landfill, waste from site will be segregated at the waste transfer station into the following categories.
- CAT A: Hazardous waste – Paint tins, mastic etc
 - CAT B: Metal
 - CAT C: Timber
 - CAT D: Plasterboard
 - CAT E: General Waste
- 5.50 All carriers of waste will hold a valid waste transfer licence and provide certification to the main contractor for all elements of the process.

Summary

- 5.51 The Construction (Design and Management) Regulations 2015 will apply to this project and all appropriate controls and systems will be in place to comply with the standards of the Regulations and associated guidance.
- 5.52 Every stage of the project will be pre risk assessed and appropriate controls applied, sub-contractors will be pre vetted and will be subject to extensive pre contract requirements of information transfer and risk assessment.
- 5.53 A fundamental aspect of the Principal Contractor's role is the development of a Construction Management Plan, which will take account of all known risks, which have been identified at pre-construction stage by the Principal Designer/CDM Consultant, the Design Team and also through site investigations.
- 5.54 The Construction Management Plan will describe arrangements and procedures for managing these key risk areas in more detail, as well as any future risk, and also the resources, including personnel, which will be applied to the scheme and which will ensure the Health and Safety of all those working on or affected by the project works.
- 5.55 Renaker Build Ltd will have an on-going process of monitoring health and safety standards throughout its organisation. This is normally done directly (on site) by the site management team through regular inspections, toolbox talks etc. and also via the risk assessment process both during the completion of risk assessments and then by monitoring the effectiveness of risk control measures, which have been implemented. Site managers will also undertake regular reviews of safety on site, including any accidents or incidents and any matters raised will be dealt with accordingly.
- 5.56 Health and safety is also incorporated as a fundamental aspect of the overall project review, the Applicant has appointed Renaker Build Ltd as Principal Contractor, Renaker Build Ltd can demonstrate competency in the management and execution of Health and Safety. The Principal Contractor will work closely with the Principal Designer at this early stage of the project and will influence the detailed design to remove construction and residual safety risks.

- 5.57 The Main Contractor will at the earliest possible stage of the project enter into dialogue with all relevant parties, including neighbours to ensure there is effective coordination throughout all stages of construction.



Crown St Ph 2 -
logistics overlayed on

6 Air Quality

A6 ES Addendum Alterations

The following change has been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to reflect the publishing of the revised NPPF (July 2021).

An EIA Technical Note is included at Appendix 6.3 (ES Volume 2) has been prepared by Ensafé (formerly REC Ltd) to consider the environmental impacts arising from the detailed reserved matters proposals for Phase C (education facility). The EIA Technical Note confirms that the conclusions of the previous assessment (below) remain valid.

Introduction

- 6.1 This Chapter of the ES, prepared by Resource and Environmental Consultants (REC) Limited (Ltd), assesses the likely significant effects of the Proposed Development with respect to Air Quality. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding areas; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 6.2 The chapter has been prepared with due regard to the requirements of Manchester City Council (MCC) Environmental Health Department. Reference should be made to Appendix 6.1 (AQ107792 Air Quality) for the details of the proposed methodology consultation, and the utilised assessment inputs including ADMS-Roads parameters, utilised traffic data and model verification process. Reference should be made to Appendix 6.2 which provides the relevant assessment figures.
- 6.3 Due to the scale of the Proposed Development, there is the potential for impacts to arise at nearby sensitive receptors during the construction and operational phases. These may include fugitive dust emissions generated by construction processes, as well as additional road vehicle exhaust emissions generated during operation.
- 6.4 Additionally, the Site is located within the Greater Manchester Air Quality Management Area (AQMA), designated due to elevated Nitrogen Dioxide (NO₂) concentrations, and situated adjacent to the A57 ring road and Deansgate Interchange, a considerable source of road vehicle exhaust emissions. As such, the Proposed Development may introduce future sensitive receptors (residents) to an area experiencing elevated pollutant levels.
- 6.5 An Air Quality ES Chapter is therefore required in order to define baseline conditions, assess Site suitability for the proposed end-use and consider effects as a result of the development in accordance with the requirements of the National Planning Policy Framework (NPPF).
- 6.6 The Air Quality Chapter was directed by Josh Davies, Senior Air Quality Consultant at REC and member of the Institute of Air Quality Management (IAQM) and Institute of Environmental Science (IES). He has over 5 years' experience in the air quality sector. His role includes the production and project management of Air Quality Assessments in support of planning applications for a wide range of UK and international clients and sectors. He also has detailed knowledge of the LAQM process and annual reporting to DEFRA, Environmental Impact Assessment (EIA), co-ordination of multi-disciplinary environmental assessment work in support of planning applications and dispersion modelling studies.

Legislative and Policy Context

European Legislation

- 6.7 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5}). The relevant consolidated Directives include:
- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);

National Planning Policy

- 6.8 The National Planning Policy Framework (NPPF)² - was published on 24th July 2018, updated on 19th February 2019 and a revised version was subsequently published in July 2021, and sets out the Government's core policies and principles with respect to land use planning, including air quality. The implications of the NPPF have been considered throughout this assessment where relevant.
- 6.9 The National Planning Practice Guidance (NPPG)³ - launched by the Department for Communities and Local Government on 1st November 2019 to support the NPPF. The NPPG will be reviewed and the relevant guidance considered as necessary throughout the undertaking of the air quality assessment.

UK Legislation

- 6.10 The Air Quality Standards (Amendment) Regulations (2016) - these Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.
- 6.11 Air Quality Strategy ((AQS) 2007) - Sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. It also sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems
- 6.12 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 2007⁴. The AQS sets out Air Quality Objectives (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.

UK Guidance

- 6.13 The Chapter was undertaken in accordance with a number of guidance documents as detailed below:

² National Planning Policy Framework, Department for Communities and Local Government, 2018.

³ <https://www.gov.uk/government/collections/planning-practice-guidance>

⁴ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007

- Department for Environment Food and Rural Affairs (DEFRA) (2016): Local Air Quality Management Technical Guidance TG(16)⁵;
- IAQM (2014): Guidance on the Assessment of Dust from Demolition and Construction⁶; and
- IAQM & Environmental Protection UK (EPUK) (2017): Land-use Planning & Development Control: Planning for Air Quality⁷.

6.14 Table 6.1 presents the AQOs for pollutants to be considered within this Chapter.

Table 6.1 – Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM₁₀	40	Annual mean
PM_{2.5}	25	Annual Mean

6.15 Table 6.2 summarises the advice provided in DEFRA guidance LAQM (TG16)⁴ on where the AQOs for pollutants considered within this report apply.

⁵ Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, 2016.

⁶ Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016

⁷ Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2017.

Table 6.2 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 façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. 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 be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

Local Air Quality Management

- 6.16 Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

Dust

- 6.17 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2018) are those provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

- 6.18 Enforcement of the Act, in regard to nuisance, is currently under the administration of the local Environmental Health Department, whose officers are deemed to provide an independent

evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

Local Planning Policy

- 6.19 The Manchester Local Development Framework (LDF) Core Strategy was formally adopted in 2012 and provides a framework for development within the city. The LDF comprises a number of documents which set out Manchester City Council's (MCC's) spatial policy framework for delivering a number of policies contained within the Core Strategy which have been saved in accordance with the Planning and Compulsory Purchase Act (2004) and therefore provide the basis for the determination of planning applications prior to the finalisation of the local development framework.
- 6.20 A review of the Core Strategy indicated the following policy in relation to air quality that relevant to this assessment:

Policy EN16 - Air Quality

The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.

When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas.

Policy DM1 – Development Management

All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:

Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.

- 6.21 Reference has been made to these policies during the preparation of this Air Quality Assessment by assessing pollutant concentrations across the Site and determining potential air quality impacts as a result of the Proposed Development.

Greater Manchester Air Quality Action Plan

- 6.22 The Greater Manchester Air Quality Action Plan (AQAP) has involved a review of the strategies, policies and plans which tackle or are in some way related to air quality, to develop a clear, robust and meaningful set of actions which will deliver real changes in terms of air quality, whilst supporting the sustainable economic growth of the region.
- 6.23 The primary objectives of the AQAP are to improve air quality across Greater Manchester and to embed low-emission behaviours into the culture of our organisations and lifestyles by 2025, whilst supporting the UK Government in meeting all EU thresholds for key air pollutants. The Plan identifies 'Key Priority Areas' which are generally locations near to major roads and heavily trafficked areas in Manchester city centre, and other major urban centres across the other nine districts.

- 6.24 The AQAP comprises a single document including actions that will be ratified by Transport for Greater Manchester (TfGM) and district authorities to tackle air quality in Key Priority Areas, whilst supporting the sustainable economic growth of the region. This plan will allow councils to carry out their statutory duties under Part IV of the Environment Act 1995, as its implementation will help mandatory EU limit values to be met. Consideration to the action plan has been made throughout the preparation assessment.
- 6.25 Reference has been made to this policy during the undertaking of this Air Quality Assessment by assessing pollutant concentrations across the development Site.

Assessment Methodology and Significance Criteria

- 6.26 The Proposed Development has the potential to cause air quality impacts during the construction and operational phases in addition to exposing future Site users to elevated pollution levels. The chapter assess the impacts of Proposed Development of the detailed submission of Zone 2. In summary, the proposals include the following elements for which full planning permission is sought:
- Erection of two 51-storey residential buildings (Buildings C4 and C5) each incorporating a podium accommodating residential amenity facilities and ground floor commercial units
 - Each building has separate private car and cycle parking within a three-storey basement.
 - A three-storey basement public car park with access on to Silvercroft Street.
 - A new public park
 - Landscaping and public realm works; and
 - A highways and servicing route.
- 6.27 In addition, the proposals also include the following elements for which outline planning permission (with all matters reserved) is sought:
- A single-form entry primary school (Building C3)
- 6.28 There are two methods of assessing potential impacts associated with the Proposed Development, these include:
- Construction Phase Assessment; and
 - Operational Phase Assessment.

Assessment Methodology

Construction Methodology

- 6.29 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'⁸.
- 6.30 Activities on the proposed construction Site have been divided into three types to reflect their different potential impacts. These are:
- Earthworks
 - Construction
 - Trackout

⁸ Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2014.

6.31 The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects.

- Annoyance due to dust soiling
- Harm to Ecological receptors; and
- The risk of Health effects due to a significant increase in exposure to PM_{10}

Step 1

6.32 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the Site boundary or 50m from the construction vehicle route up to 500m from the Site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary Site or 50m from the construction vehicle route up to 500m from the Site entrance, then the assessment should also proceed to Step 2.

6.33 Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2

6.34 Step 2 assesses the risk of potential dust impacts. A Site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

6.35 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

6.36 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 6.3

Table 6.3 Construction Dust – Magnitude of Emissions

Magnitude	Activity	Criteria
Major	<i>Earthworks</i>	• Total Site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	<i>Construction</i>	• Total building volume greater than 100,000m³ • On Site concrete batching • Sandblasting
	<i>Trackout</i>	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Moderate	<i>Earthworks</i>	• Total Site area 2,500m² to 10,000m² • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes

Magnitude	Activity	Criteria
Minor	<i>Construction</i>	- Total building volume 25,000m³ to 100,000m³ - Potentially dusty construction material (e.g. concrete) - On Site concrete batching
	<i>Trackout</i>	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
	<i>Earthworks</i>	- Total Site area less than 2,500m² - Soil type with large grain size (e.g. sand) - Less than 5 heavy earth moving vehicles active at any one time - Formation of bunds less than 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	<i>Construction</i>	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	<i>Trackout</i>	- Less than 10 HDV trips per day - Surface material with low potential for dust release - Unpaved road length less than 50m

6.37 Step 2B defines the sensitivity of the area around the development Site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 6.4.

Table 6.4 Examples of Factors Defining Sensitivity of the Area

Sensitivity	Receptor	
	Human	Ecological
High	- Users expect of high levels of amenity - High aesthetic or value property - People expected to be present continuously for extended periods of time - Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes	Internationally or nationally designated Site e.g. Special Area of Conservation
Moderate	- Users would expect to enjoy a reasonable level of amenity - Aesthetics or value of their property could be diminished by soiling - People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	Nationally designated Site e.g. Sites of Special Scientific Interest
Low	- Enjoyment of amenity would not reasonably be expected - Property would not be expected to be diminished in appearance - Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing	Locally designated Site e.g. Local Nature Reserve

Sensitivity	Receptor	Ecological
	Human	
	fields, farmland, footpaths, short term car park and roads	

6.38 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

6.39 These factors were considered in the undertaking of this assessment.

6.40 The sensitivity of the area to dust soiling effects on people and property is shown in [Table 6.5](#).

Table 6.5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	<i>More than 100</i>	Major	Major	Moderate	Minor
	<i>10 - 100</i>	Major	Moderate	Minor	Minor
	<i>1 - 10</i>	Moderate	Minor	Minor	Minor
Moderate	<i>More than 1</i>	Moderate	Minor	Minor	Minor
Low	<i>More than 1</i>	Minor	Minor	Minor	Minor

6.41 [Table 6.6](#) outlines the sensitivity of the area to human health impacts.

Table 6.6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	<i>Greater than 32µg/m³</i>	More than 100	Major	Major	Major	Moderate	Minor
		10 - 100	Major	Major	Moderate	Minor	Minor
		1 - 10	Major	Moderate	Low	Minor	Minor

	28 - 32 $\mu\text{g}/\text{m}^3$	More than 100	Major	Major	Moderate	Minor	Minor
		10 - 100	Major	Moderate	Minor	Minor	Minor
		1 - 10	Major	Moderate	Minor	Minor	Minor
	24 - 28 $\mu\text{g}/\text{m}^3$	More than 100	Major	Moderate	Minor	Minor	Minor
		10 - 100	Major	Moderate	Minor	Minor	Minor
		1 - 10	Moderate	Minor	Minor	Minor	Minor
	Less than 24 $\mu\text{g}/\text{m}^3$	More than 100	Moderate	Minor	Minor	Minor	Minor
		10 - 100	Minor	Minor	Minor	Minor	Minor
		1 - 10	Minor	Minor	Minor	Minor	Minor
Moderate	Greater than 32 $\mu\text{g}/\text{m}^3$	More than 10	Major	Moderate	Minor	Minor	Minor
		1 - 10	Moderate	Minor	Minor	Minor	Minor
	28 - 32 $\mu\text{g}/\text{m}^3$	More than 10	Moderate	Minor	Minor	Minor	Minor
		1 - 10	Minor	Minor	Minor	Minor	Minor
	24 - 28 $\mu\text{g}/\text{m}^3$	More than 10	Minor	Minor	Minor	Minor	Minor
		1 - 10	Minor	Minor	Minor	Minor	Minor
	Less than 24 $\mu\text{g}/\text{m}^3$	More than 10	Minor	Minor	Minor	Minor	Minor
		1 - 10	Minor	Minor	Minor	Minor	Minor
	-	More than 1	Minor	Minor	Minor	Minor	Minor

6.42 [Table 6.7](#) outlines the sensitivity of the area to ecological impacts.

Table 6.7 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	Major	Moderate
Medium	Moderate	Minor
Low	Minor	Minor

6.43 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

6.44 [Table 6.8](#) outlines the risk category from earthworks and construction activities.

Table 6.8 Dust Risk Category from Earthworks and Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Major	Moderate	Minor
High	Major	Moderate	Minor
Moderate	Major	Moderate	Minor
Low	Minor	Minor	Negligible

6.45 [Table 6.9](#) outlines the risk category from trackout activities.

Table 6.9 Dust Risk Category from Trackout Activities

Sensitivity of Area	Dust Emission Magnitude		
	Major	Moderate	Minor
High	Major	Moderate	Minor
Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible

Step 3

- 6.46 Step 3 requires the identification of Site specific mitigation measures within the IAQM guidance⁶ to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For Sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

- 6.47 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'. This has been described as negligible within this report to provide continuity between assessment terminologies.
- 6.48 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Operational Phase Assessment Methodology

- 6.49 Without appropriate mitigation, the operational phase of the Proposed Development is likely to introduce new residents to poor air quality, as predicted from the review of baseline Air Quality conditions. Additionally, traffic generated by the proposals may cause increases in pollutant concentrations as a result of additional road vehicle exhaust emissions. Potential air quality effects across the Proposed Development and at sensitive receptors within close proximity to the Site will therefore be assessed on a quantitative basis. This will be undertaken by calculating NO₂, PM₁₀ and PM_{2.5} levels across the Proposed Development and at sensitive locations with and without the development using the ADMS-Roads dispersion modelling software. It should be noted that the ADMS modelling software is widely accepted within the UK by the Local Authorities, the Environment Agency and DEFRA.
- 6.50 The assessment of operational phase impacts will therefore consider the following development scenarios
- Scenario A: 2018 Baseline year, for verification purposes against latest 2018 MCC and SCC ratified Air Quality Monitoring data;
 - Scenario E: Anticipated Do something 2025 Opening Year baseline plus, predicted traffic flows associated with C3, C4, C5, basement car park (entirety), highways, public realm; inclusive of all committed developments listed in Appendix 2.2 (should the proposal be completed).
- 6.51 Please note the future year scenario will be considered in conjunction with the anticipated 2025 baseline opening year conditions (should the proposal not be completed).
- 6.52 With regards to associated Air Quality impacts, a worst-case operational scenario has been undertaken through the assessment of Scenarios E, which assess the combined impact of all developable aspects as well as specific committed developments listed in Appendix 2.2. The

choice of Scenario E, not only ensures that all development phases are considered in conjunction with baseline committed development traffic flows, but moreover provides a worst-case assessment of development related road vehicle exhaust emissions and takes account of anticipated future traffic generation in the vicinity of the Site.

- 6.53 It should be noted that air quality is predicted to improve in the future (due to the current shift towards a greater production and uptake of low emission vehicles, supported by national government targets). However, in order to provide a robust assessment, emission factors for 2018 were utilised within the dispersion model. Subsequently, the use of 2025 operational traffic data, together with 2018 emission factors is considered to provide a worst-case scenario which overestimates potential impacts. Therefore, a sufficient level of confidence can be placed within the predicted emission levels and conclusions regarding impact significance.
- 6.54 NO_x and PM factors emission factors were calculated using the Emission Factor Toolkit (version 9.0.1) produced by DEFRA Reference should be made to Appendix 6.1 for the assessment input data, including ADMS-Roads parameters, utilised traffic data and model verification process.
- 6.55 The Proposed Development includes the provision of basement level car parking which is to be served by ventilation units in order to provide suitable extraction of pollutants. Emissions extracted and released by a number of ventilation units which may have the potential to increase pollutant concentration in the vicinity of the proposed residential locations. The impacts associated with the ventilation systems, are considered further throughout the preparation of this Chapter.

Significance Criteria

- 6.56 Receptors potentially sensitive to changes in NO₂ and PM₁₀ concentrations were identified within 200m of the affected highway network. LAQM (TG16)⁵ provides the following examples of where annual mean AQOs should apply:
- Residential properties;
 - Schools;
 - Hospitals; and,
 - Care homes.
- 6.57 The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in [Table 6.10](#)~~Table 6.10~~. These are based upon the guidance provided within the EPUK and IAQM guidance⁷.

Table 6.10 Operational Traffic Exhaust Emissions – Significance of Impact

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Minor	Moderate
76 - 94% of AQO	Negligible	Minor	Moderate	Moderate
95 - 102% of AQO	Minor	Moderate	Moderate	Major
103 - 109% of AQO	Moderate	Moderate	Major	Major
110% or more of AQO	Moderate	Major	Major	Major

- 6.58 The criteria shown in [Table 6.10](#)~~Table 6.10~~ is EPUK and IAQM guidance⁷ with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that

changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance

- 6.59 Following the prediction of impacts at discrete receptor locations utilising the criteria in [Table 6.10](#)~~Table 6.10~~, the EPUK and IAQM⁷ document states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for.
- 6.60 Whilst impacts might be determined as 'minor', 'moderate' or 'major' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:
- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
 - Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
 - The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
 - Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a major increase or decrease; and,
 - Duration of the potential impacts, either temporary or permanent; and
 - The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less significance than an annual mean of 51µg/m³.
- 6.61 These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Limitations and Assumptions

Operational Phase

- 6.62 For the operational phase assessment, it should be noted that there is current uncertainty over NO₂ concentrations within the UK not reducing as previously expected due to the shifts towards a greater production and uptake of electric and hybrid vehicles. In order to provide a robust assessment, emission factors for 2018 were utilised within the dispersion model for the prediction of pollution levels for all scenarios. As such, the use of 2025 traffic data, together with 2018 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted emission levels.
- 6.63 Similarly, it has been assumed that background concentrations will not improve in line with current predictions and therefore 2018 background concentrations have been utilised for the assessment of the opening year of the 2025 Proposed Development. This further provides a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the Proposed Development.
- 6.64 Although the full scheme is projected to open during 2028 it is not a simple task to accurately extrapolate 2025 traffic data to 2028. From an Air Quality perspective, the Proposed Development traffic forms the main body assessment and crucially this will remain unchanged with the utilised base year.
- 6.65 Regarding committed developments it was not possible for the Transport Consultant to provide individual scheme flows given the nature of the agreed TfGM SATURN model. It has been confirmed by Vectos that the dataset fully accounts for planned growth in line with all committed developments listed in Appendix 2.2 and is considered to be a robust base upon to assess Proposed Development trips. For this reason, it was not possible to provide individual analysis of

Scenarios B, C or D. It should again be noted that Scenario E, assesses the combined impact of all developable aspects as well as specific committed developments listed in Appendix 2.2. The choice of Scenario E, not only ensures that all development phases are considered in conjunction with baseline committed development traffic flows, but moreover provides a worst-case assessment of development related road vehicle exhaust emissions and takes account of anticipated future traffic generation in the vicinity of the Site.

- 6.66 It is therefore considered that the assessment is considered robust and provides an appropriate analysis of associated impacts.

Baseline Conditions

- 6.67 Existing air quality conditions in the vicinity of the Proposed Development were identified in order to provide a baseline for assessment. These are detailed in the following sections.

Local Air Quality Management

- 6.68 As required by the Environment Act (1995), MCC has undertaken Review and Assessment of air quality within their area of administration. This process concluded that annual mean concentrations of NO₂ are above the relevant AQO within the city. As such, one AQMA has been declared, which is described as:

Greater Manchester Combined Authority AQMA (Manchester City Council Council) - This is the part of the Greater Manchester Combined Authority AQMA located within the Manchester City Council area.

- 6.69 The Site is located within the Greater Manchester Combined Authority (GMCA) AQMA, as such, there is the potential for the Proposed Development to introduce future Site users to elevated pollutant concentrations as well as cause adverse impacts to air quality within the designated AQMA. Potential impacts at sensitive receptor locations within the AQMA have therefore been considered further within this report.
- 6.70 MCC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have designated.

Air Quality Management

- 6.71 Monitoring of pollutant concentrations is undertaken by MCC using continuous and periodic methods throughout their area of administration. A review of MCC's most recent Air Quality data available⁹ indicated that there are currently three automatic analysers operated by MCC. The closest automatic monitoring station is the Manchester Oxford Road (Urban traffic analyser), located approximately 1km east of The Site at the NGR: 384233, 397287. The monitoring location is classified as a Kerbside site and as such has not been considered further in the context of the assessment or within the verification process. This is in accordance with LAQM (TG16)⁵ which suggests that the inclusion of Kerbside sites within the verification procedure may lead to an over-adjustment of modelling at roadside sites. This may then lead to inaccuracies during the modelling of potential exposure across the Proposed Development and potential impacts at nearby sensitive receptor locations.
- 6.72 MCC also utilises passive diffusion tubes to monitor NO₂ concentrations throughout their area of administration. A review of MCC's most recent Air Quality data available indicated that there is currently one diffusion tube located in the vicinity of the Proposed Development which is suitable for use within the verification procedure. Recent monitoring results are summarised in [Table 6.11](#). Exceedances of the relevant AQO are shown in **bold**.

⁹ <https://cleanairm.com/air-quality-data/diffusion-tubes>

Table 6.11 MCC Diffusion Tube Monitoring Results

ID	Site Name	Site Type	NGR		Distance to Site (m)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
			X	Y		2016	2017	2018
29A	Oxford Street	Urban Traffic	384117	397505	1,010	66.2	58.4	58.8
77	Hewitt Street	Urban Centre	383602	397488	520	44.2	39.2	41.0
82	Oxford Road	Urban Traffic	384233	397287	1,100	61.6	56.6	52.8

- 6.73 The neighbouring Salford City Council (SCC) also undertake Air Quality monitoring within the vicinity of the Site. A review of the latest data⁹ indicated two representative diffusion tube monitoring locations. Recent results from these locations are shown in [Table 6.12](#)~~Table 6.12~~. Exceedances of the relevant AQO are highlighted in **bold**.

Table 6.12 SCC Diffusion Tube Monitoring Results

ID	Site Name	Site Type	NGR		Distance to Site (m)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
			X	Y		2016	2017	2018
SA59	West Crown Avenue	Urban Traffic	381822	397895	1,470	-	36.66	33.33
SA60	Regent Road	Urban Traffic	382445	397724	840	-	40.70	40.20

- 6.74 As shown in [Table 6.11](#)~~Table 6.11~~ and [Table 6.12](#)~~Table 6.12~~ there were exceedances of the annual mean AQO for NO₂ at all but one monitoring location in recent years. Exceedances are likely due to their kerbside and roadside locations within AQMAs.
- 6.75 A review of 2018 monitoring results detailed in [Table 6.11](#)~~Table 6.11~~ and [Table 6.12](#)~~Table 6.12~~ provide an indication that pollutant concentrations adjacent to the Site may exceed the annual mean AQO for NO₂.
- 6.76 Similar to the Oxford Road analyser, both Oxford Street (29A) and Oxford Road (82) are of kerbside classification and will only be considered further in context of the baseline assessment. Monitoring of particulate matter with an aerodynamic diameter of less than 10 μm (PM10) and 2.5 μm (PM2.5) is not currently undertaken by MCC in the vicinity of the Site.
- 6.77 Reference should be made to Figure 6.1 for geographical representation of diffusion tube monitoring locations.

Baseline Pollutant Concentrations

- 6.78 The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.
- 6.79 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist Local Authorities (LAs) in their Review and

Assessment of air quality. The Proposed EIA Development is located in the background grid square:

- 383500, 397500.

- 6.80 Data for this location was downloaded from the DEFRA website for the purpose of this assessment and is summarised in [Table 6.13](#)~~Table 6.13~~; for the baseline year (2018) and Opening year (2025). In order to avoid 'double-counting' of road vehicle exhaust emissions of NO₂ and NO_x, the proportion of the relevant background concentrations from A-roads was removed in accordance with the methodology outlined in DEFRA guidance LLAQM.TG(16)⁵. The background concentrations before and following the adjustment, utilised the "NO_x Removal Calculator" are presented in [Table 6.13](#)~~Table 6.13~~. Both PM₁₀ and PM_{2.5} background concentrations remain unaffected.

Table 6.13 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)	
	2018	2025
NO_x	36.21	26.21
NO₂	23.37	17.90
PM₁₀	12.71	12.01
PM_{2.5}	8.42	7.82

- 6.81 As shown in [Table 6.13](#)~~Table 6.13~~, background concentrations do not exceed the relevant AQOs. Comparison with the monitoring results provided in Table 6.11 and [Table 6.13](#)~~Table 6.13~~ indicate the influence of road vehicle exhaust emissions have upon roadside pollutant concentrations at roadside locations within an AQMA.

Sensitive receptors

- 6.82 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a Proposed Development. These have been defined for fugitive dust and road vehicle exhaust emission impacts associated with the construction and operational phases. These are summarised in the following Sections.

Construction Phase Sensitive Receptors

- 6.83 There are no nationally or European designated ecological receptors within 50m of the Site boundary, or within 50m from a route used by construction vehicles on the public highway (up to 500m from the Site entrance). Therefore, the risk of dust effects at a nationally or European designated ecological receptor site from construction impacts is not considered further in the assessment.
- 6.84 Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the Site boundary. These are summarised in [Table 6.14](#)~~Table 6.14~~

Table 6.14 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Sensitivity
Less than 20	10 - 100	High
20 - 50	More than 100	
50 - 100	More than 100	
100 - 350	More than 100	

- 6.85 Reference should be made to Figure 6.2 for a graphical representation of earthworks and construction dust buffer zones.
- 6.86 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the Site access route. These are summarised in [Table 6.15](#)~~Table 6.15~~. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. It has been confirmed that construction traffic would likely access the Site from a slip road off of the Mancunian Way or from the west of Great Jackson Street. This will ensure that a maximum potential trackout distance is considered.

Table 6.15 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Sensitivity
Less than 20	More than 100	High
20 - 50	More than 100	

- 6.87 Reference should be made to Figure 6.3 for a graphical representation of trackout dust buffer zones.
- 6.88 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in [Table 6.16](#)~~Table 6.16~~.

Table 6.16 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The Site is located within a residential area undergoing significant regeneration. As such, historical dust generation may have occurred as a result of windblown emissions from regeneration, specifically as a result of construction phase processes
The likelihood of concurrent dust generating activity on nearby sites	As provided in <i>Appendix 2.2: Committed Developments</i> , a review of the MCC planning portal indicated that there are a series of planning applications are within 500m of the Proposed Development boundary. A full list of committed developments within 500m of the Site are provided in Appendix 2.2. Due to the size and nature of the committed developments, there is a risk of concurrent dust generating activity should the construction phases overlap

Guidance	Comment
Pre-existing screening between the source and the receptors	There is sparse vegetation present along all boundaries of The Site. As such, pre-existing protective screening is limited
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south of the Proposed Development, as shown in Figure 6.4. As such, properties to the north would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The Crown Street Phase 2 development is anticipated for full completion during 2028, additionally the adjacent Crown Street Phase 1, situated immediately north, is currently under construction. Given the duration and overlapping of nearby construction phases receptor sensitivity could increase over time.
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline.

Operational phase Sensitive Receptors

6.89 Receptors sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in [Table 6.17](#)~~Table 6.17~~.

Table 6.17 Vehicle Exhaust Emissions Sensitive Receptors

Receptor	NGR (m)		Height (m)
	X	Y	
R1 Residential - Chester Road	382654	397099	1.5
R2 Residential - Chester Road	382887	397207	1.5
R3 Residential - Chester Road	382936	397225	4.5
R4 Residential - Chester Road	382854	397237	1.5
R5 Residential - Chester Road	382912	397297	1.5
R6 Residential - Egerton Street	382973	397347	4.5
R7 Residential - Egerton Street	382912	397396	5.5
R8 Residential - Egerton Street	382786	397441	0.5
R9 Residential - Mancunian Way	383251	397127	1.5
R10 Residential - Chester Road	383216	397424	1.5
R11 Residential - City Road East	383502	397254	5.5
R12 Residential - City Road East	383556	397281	3
R13 Residential - City Road East	383588	397372	1.5
R14 Residential - Albion Street	383610	397476	4.5
R15 Residential - Albion Street	383652	397543	4.5
R16 Residential - Old Deansgate	383357	397450	2.5

Receptor		NGR (m)		Height (m)
		X	Y	
R17	Residential - Bridgewater Viaduct	383306	397447	0.5
R18	Residential - Deansgate Square	383317	397401	1.5
R19	Residential - Deansgate Square	383341	397415	1.5
R20	Residential - Whitworth Street East	383715	397519	4
R21	Commercial - Great Jackson Street	383281	397197	1.5
R22	Commercial - Great Jackson Street	383360	397176	1.5
R23	Commercial - Egerton Street	382865	397438	1.5
R24	Commercial - Gaddum House	383237	397313	1.5
R25	Residential - Crown Street Phase 1	383100	397287	1.7
R26	Residential - Crown Street Phase 1	383145	397307	1.7
R27	Residential - Crown Street Phase 1	383100	397287	5.1
R28	Residential - Crown Street Phase 1	383129	397325	5.1
R29	Residential - Crown Street Phase 1	383161	397307	5.1

- 6.90 The sensitive receptors identified in [Table 6.17](#) represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the Site that may experience air quality impacts as a result of the Proposed Development that have not been individually identified above. Reference should be made to Figure 6.5 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Identification and Evaluation of Significant Effects

- 6.91 There is the potential for air quality impacts as a result of the construction and operational phases of the Proposed Development. Additionally, there is the potential for future Site users to be exposed to elevated pollutant concentrations. These are assessed and quantified in the following Sections.

Construction Phase

Step 1 – Screening

- 6.92 The undertaking of on Site activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-Site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.
- 6.93 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.
- 6.94 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the Site boundary. As such, a detailed assessment of potential dust impacts was required.

Step 2A – Magnitude

- 6.95 The scale and nature of the works was determined to assess the magnitude of dust arising from each construction phase activity. The determination of magnitude was based upon the criteria detailed in Table 6.3, with the outcome of Step 2A summarised below in Table 6.18

Earthworks

- 6.96 As confirmed by WSP, the ground investigation consultant, the on-Site made ground consists of gravelly fine to coarse sand with slightly gravelly sandy clay. Based on this information the soil type was considered to be moderately dusty given the mix of larger grain sands and clay, which will be prone to suspension when dry due to small particle size.
- 6.97 Given the area of the Proposed Development Site (11,000m²) combined with the made ground the magnitude of potential dust emissions related to earthwork activities is therefore considered **major**.

Construction

- 6.98 Given the scale of the Proposed Development, the magnitude of potential dust emissions related to construction activities is considered **major**.

Trackout

- 6.99 Based on the Site area, it is anticipated that the unpaved road length is likely to be greater than 100m. The magnitude of potential dust emissions from trackout is therefore **major**.
- 6.100 A summary of the magnitude of construction phase activities is provide in Table 6.19.

Table 6.18 Dust Emissions Magnitude

Magnitude of Activities		
Earthworks	Construction	Trackout
Major	Major	Major

Step 2B – Sensitivity

- 6.101 The next step (Step 2B) is to determine the sensitivity of the surrounding area, based on general principles such as amenity and aesthetics, as well as human exposure sensitivity.

Dust Soiling

- 6.102 As shown in Table 6.14 and Table 6.15 the desk top study indicated are **More than 100** sensitive receptors within 50m of the Proposed Development boundary, and of the anticipated trackout routes. Based on the IAQM assessment criteria the sensitivity of the receiving environment to potential dust soiling impacts was considered to be **high** for earthworks, construction and trackout activities. This is because users would expect to enjoy a reasonable level of amenity and residents would be expected to be present for extended periods of time.

Human Health

- 6.103 The annual mean concentration of PM₁₀ is less than 24 µg/m³ as detailed in Table 6.13
- 6.104 Based on the IAQM assessment criteria and given the presence of **more than 100** sensitive receptors within 50m of the Proposed Development boundary and within 20m of the anticipated

trackout routes, the sensitivity of the area is considered to be **low** for earthworks and construction phase activities and **moderate** trackout.

- 6.105 The sensitivity of the receiving environment to specific potential dust impacts is summarised in [Table 6.19](#)

Table 6.19 Sensitivity of Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Moderate

Step 2C – Risk

- 6.106 Both the magnitude and sensitivity factors are combined in Step 2C to determine the risk of dust impacts without the application of best practice mitigation measures.
- 6.107 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location, as well as the duration of potential impacts. Risk was predicted based on a worst-case scenario of works being undertaken at the Site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase. A summary of the risk from each dust generating activity is provided in Table 6.20.

Table 6.20 Sensitivity of Potential Unmitigated Dust Risk

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Moderate Adverse on a temporary basis	Major Adverse on a temporary basis	Major Adverse on a temporary basis
Human Health	Minor Adverse on a temporary basis	Minor Adverse on a temporary basis	Moderate Adverse on a temporary basis

- 6.108 It is important to note that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the Site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Step 3 – Mitigation

- 6.109 The IAQM⁸ guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development Site as summarised in Table 6.28. The mitigation measures outlined can be reviewed prior to the commencement of construction works incorporated into the existing strategies as applicable.

Step 4 – Residual Impacts

- 6.110 Assuming the relevant mitigation measures outlined in Table 6.28 are implemented, the residual effect from all dust generating activities is predicted to be negligible on a temporary basis given the duration of the construction phase. Subsequently, residual impacts are considered **not significant**, in accordance with the IAQM guidance⁸.

Operational Phase

- 6.111 Additional vehicle movements associated with the operation of the Proposed Development will generate exhaust emissions, such as NO₂ and PM₁₀, on the local and regional road networks. Additionally, the Proposed Development has potential to expose future users to elevated concentrations. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity and across the Site. Reference should be made to Figure 6.5 for a graphical representation of road vehicle exhaust emission sensitive receptor locations and ADMS- Roads inputs.
- 6.112 The Assessment considered the following scenarios:
- 2018 Verification;
 - 2025 DM;
 - 2025 DS (Scenario E)
- 6.113 The DM (i.e. without Proposed Development) scenario is representative of anticipated traffic data for 2025 should the Proposed Development not proceed. The DS (i.e. with Proposed Development) scenarios are representative of anticipated traffic data for 2025 should the Proposed Development be completed, with the addition of recent and committed developments, and predicted traffic flows generated by the operation of the Proposed Development.
- 6.114 Reference should be made to Appendix 6.1 for full assessment input details, including ADMS- Roads parameters, utilised traffic data and model verification process.
- 6.115 Annual mean NO₂ and PM₁₀ concentrations were predicted across the application Site during the 2025 DS scenario to represent exposure across the Site. Reference should be made to Figures 6.6 to 6.10 for a graphical representation of annual mean pollutant concentrations.

Nitrogen Dioxide - NO₂

Predicted Annual Mean Concentrations across the Development Site.

- 6.116 Annual mean NO₂ concentrations were predicted across the Site for the DS scenarios at the following building heights to represent exposure in 2025 across the ground to sixth floor levels of the Proposed Development:
- Ground Floor (1.5m)
 - First Floor (6.0m)
 - Second Floor (9.0m)
 - Third Floor (12.35m)
- 6.117 Reference should be made to Figures 6.7 to 6.10 for a graphical representation of contour plots for the predicted annual mean NO₂ concentrations.
- 6.118 Predicted annual mean NO₂ concentrations across The Site during the 2025 DS scenario summarised in Table 6.21. Exceedances of the relevant AQO are highlighted in bold.

Table 6.21 Annual Mean NO₂ Modelling Results

Area	Predicted 2025 Annual Mean NO ₂ Concentration Range (µg/m ³)		
Ground (1.5m)	37.56 – 47.52	37.19 – 46.26	37.61 – 47.46

Area	Predicted 2025 Annual Mean NO ₂ Concentration Range (µg/m ³)		
First Floor (6.0m)	35.85 – 41.09	35.86 – 40.96	36.12 – 40.95
Second Floor (9.0m)	33.71 – 35.70	33.48 – 35.13	33.29 – 34.43
Third Floor (12.3m)	31.86 – 32.43	31.44 – 32.06	31.00 – 31.53

6.119 As indicated in Table 6.22 predicted NO₂ concentrations exceeded the annual mean AQO across ground to first floor levels of Buildings C3, C4 and C5. Based on the results of the dispersion model the implementation of appropriate mitigation measures is required to protect future occupants from elevated pollutant concentrations across affected floor levels.

6.120 Predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. However, as stated in LAQM (TG16)⁵ if annual mean NO₂ concentrations are below 60µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such based on the results in Table 6.21, it is not predicted that concentrations will exceed the 1-hour mean AQO for NO₂ across the development Site in the opening year scenario.

C3 Facades and Internal Areas

6.121 It should be noted that only outline planning permission is sought for the first form entry primary school and exact details on the design and ventilation strategies from an air quality perspective will be submitted within a detailed assessment during the subsequent reserved matter application.

6.122 Given the highly sensitive use of the primary school there is a responsibility to ensure further occupier are not exposed to unacceptable pollutant concentrations. Based on the current understanding of Air Quality conditions across the Site it is recommended to incorporate specialised ventilation systems with NO_x filtration units across the entire school development. Additionally, it is recommended that a sealed façade is to be incorporated into the building design to ensure that the building is supplied with a clean supply of air via the mechanical ventilation systems.

C3 External Areas

6.123 In accordance with LAQM (TG16) the 1-hour mean AQO is applicable to outdoor locations where members of the public might reasonably be expected to spend one hour or longer. In context of the proposed primary school this averaging period relates to proposed play areas in which pupils would be present during recreational times which are not critically expected to last over 1 hour.

6.124 Based on the assessment result it is not anticipated in accordance with LAQM TG(16)⁵ that 1-hour NO₂ concentrations would exceed the relevant AQO of 200 µg/m³ at any location across the primary school. Subsequently, play areas are considered to be suitable for proposed use without the implementation of mitigation measures, assuming that recreational times are reduced to less than 1-hour.

C4 and C5 Towers

6.125 Buildings C4 and C5 comprise of commercial floorspace and residential amenity facilities. Although the annual mean AQO does not apply at commercial or short-term transient land use types, it is necessary to implement non-passive ventilation systems across the amenity areas to limit future pollutant exposure. Further details on the mitigation strategy is provided in Sections 6.146 to 6.159

6.126 Based on the results of the dispersion modelling assessment and worst case assumptions, the Site is considered to be suitable for proposed end use with the implementation of mitigation techniques to protect future Site users from elevated NO₂ concentrations.

Predicted Annual Mean Concentration at the Sensitive Receptors

6.127 Annual mean NO₂ concentrations were predicted for the 2025 DM and DS scenarios and are summarised in [Table 6.22](#)

Table 6.22 Predicted Annual Mean NO₂ Concentrations

Sensitive Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Chester Road	31.83	31.85	0.02
R2	Chester Road	33.84	33.92	0.08
R3	Chester Road	33.59	33.75	0.16
R4	Chester Road	55.22	55.28	0.06
R5	Chester Road	41.85	42.09	0.24
R6	Egerton Street	52.82	53.35	0.53
R7	Egerton Street	44.80	45.09	0.29
R8	Egerton Street	33.32	33.38	0.06
R9	Mancunian Way	33.54	33.64	0.10
R10	Chester Road	37.07	37.39	0.32
R11	City Road East	32.19	32.39	0.20
R12	City Road East	32.21	32.46	0.25
R13	City Road East	35.84	36.44	0.60
R14	Albion Street	37.58	37.67	0.09
R15	Albion Street	34.58	34.62	0.04
R16	Old Deansgate	30.30	30.38	0.08
R17	Bridgewater Viaduct	33.04	33.14	0.10
R18	Deansgate Square	30.28	30.40	0.12
R19	Deansgate Square	30.14	30.23	0.09
R20	Whitworth Street East	32.71	32.75	0.04
R21	Great Jackson Street	45.19	45.59	0.40
R22	Great Jackson Street	51.11	51.30	0.19
R23	Egerton Street	57.19	57.41	0.22

Sensitive Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R24	Gaddum House	32.70	33.04	0.34
R25	Crown Street Phase 1	40.62	41.05	0.43
R26	Crown Street Phase 1	35.14	35.43	0.29
R27	Crown Street Phase 1	38.76	39.12	0.36
R28	Crown Street Phase 1	35.47	35.81	0.34
R29	Crown Street Phase 1	33.61	33.85	0.24

6.128 As indicated in Table 6.22, predicted annual mean NO₂ concentrations exceeded the relevant AQO at 8 sensitive receptor locations during both the DM and DS scenarios. This is likely due to their roadside locations within an AQMA, at areas within close proximity to arterial junctions where slow speeds and idling vehicles are often present, particularly during peak hours.

6.129 Critically, no new exceedances of the AQO are anticipated to arise as a result of the Proposed Development. The remaining 21 receptor locations were predicted to experience NO₂ concentrations below the relevant AQO.

6.130 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in [Table 6.23](#)~~Table 6.23~~.

Table 6.23 Predicted Annual Mean NO₂ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Chester Road	0.05	76-94% of the AQO	Negligible on a permanent basis
R2	Chester Road	0.20	76-94% of the AQO	Negligible on a permanent basis
R3	Chester Road	0.40	76-94% of the AQO	Negligible on a permanent basis
R4	Chester Road	0.15	110+% of the AQO	Negligible on a permanent basis
R5	Chester Road	0.60	103-109% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R6	Egerton Street	1.33	110+% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R7	Egerton Street	0.73	110+% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R8	Egerton Street	0.15	76-94% of the AQO	Negligible on a permanent basis
R9	Mancunian Way	0.25	76-94% of the AQO	Negligible on a permanent basis
R10	Chester Road	0.80	76-94% of the AQO	Negligible on a permanent basis
R11	City Road East	0.50	76-94% of the AQO	Negligible on a permanent basis

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R12	City Road East	0.63	76-94% of the AQO	Negligible on a permanent basis
R13	City Road East	1.50	76-94% of the AQO	<i>Minor Adverse</i> on a permanent basis
R14	Albion Street	0.23	95-102% of the AQO	Negligible on a permanent basis
R15	Albion Street	0.10	76-94% of the AQO	Negligible on a permanent basis
R16	Old Deansgate	0.20	75% or Less of the AQO	Negligible on a permanent basis
R17	Bridgewater Viaduct	0.25	76-94% of the AQO	Negligible on a permanent basis
R18	Deansgate Square	0.30	76-94% of the AQO	Negligible on a permanent basis
R19	Deansgate Square	0.23	75% or Less of the AQO	Negligible on a permanent basis
R20	Whitworth Street East	0.10	76-94% of the AQO	Negligible on a permanent basis
R21	Great Jackson Street	1.00	110+% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R22	Great Jackson Street	0.47	110+% of the AQO	Negligible on a permanent basis
R23	Egerton Street	0.55	110+% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R24	Gaddum House	0.85	76-94% of the AQO	Negligible on a permanent basis
R25	Crown Street Phase 1	1.08	103-109% of the AQO	<i>Moderate Adverse</i> on a permanent basis
R26	Crown Street Phase 1	0.72	76-94% of the AQO	Negligible on a permanent basis
R27	Crown Street Phase 1	0.90	95-102% of the AQO	<i>Minor Adverse</i> on a permanent basis
R28	Crown Street Phase 1	0.85	76-94% of the AQO	Negligible on a permanent basis
R29	Crown Street Phase 1	0.60	76-94% of the AQO	Negligible on a permanent basis

6.131 As indicated in [Table 6.23](#)~~Table 6-23~~, impacts on annual mean NO₂ concentrations as a result of road vehicle exhaust emissions associated with the Proposed Development are predicted to be **negligible** on a permanent at 21 sensitive receptor locations, **minor adverse** on a permanent at 2 locations and **moderate adverse** on a permanent at 6 sensitive receptor locations.

6.132 With regards to associated Air Quality impacts and those predicted in [Table 6.23](#)~~Table 6-23~~, a worst-case operational scenario has been undertaken, assessing the combined impact of Phase 2 development aspects, including C3, C4, C5, basement car park (entirety), highways and public realm in conjunction with appropriate cumulative traffic flows.

6.133 Further worst case sensitivity analysis has also been provided in the impacts predicted in [Table 6.23](#), in the form of emission factors. The use of 2025 operational traffic data, together with 2018 emission factors is considered to provide a worst-case scenario which overestimates potential impacts and does not consider future improvement due to a shift towards a greater production and uptake low emission and electric vehicles.

Particulate Matter – PM₁₀

Predicted Annual Mean Concentrations across the Development Site

6.134 Annual mean PM₁₀ concentrations were predicted across the Site for the DS scenarios at the following building heights to represent exposure in 2025 across the ground to sixth floor levels of the Proposed Development:

- Ground Floor (1.5m)

6.135 Reference should be made to Figure 6.10 for a graphical representation of contour plots for the predicted annual mean PM₁₀ concentrations.

6.136 Predicted annual mean PM₁₀ concentrations across The Site for the DS scenario are summarised in Table 6.24.

Table 6.24 Annual Mean PM₁₀ Modelling Results

Area	Predicted 2025 Annual Mean PM ₁₀ Concentration Range (µg/m ³)		
Ground (1.5m)	15.42 – 17.62	15.39 – 18.77	15.57 – 18.57

6.137 As indicated in Table 6.24, there are no predicted exceedances of the annual mean PM₁₀ AQO across the entire Proposed Development. Based on the results of the dispersion modelling assessment, the Site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future Site users from elevated PM₁₀ concentrations.

6.138 Predicted annual mean PM₁₀ concentrations are likely to reduce at elevated heights due to increased distance from emission sources, such as roads. This has been directly represented within the NO₂ results and therefore predicted PM₁₀ concentrations at heights above ground floor level have not been included within this report. This is because ground floor concentrations are considered to be acceptable without the inclusion of mitigation measures.

Predicted Annual Mean Concentrations at the Development Site

6.139 Annual mean PM₁₀ concentrations were predicted for each scenario and are summarised in [Table 6.25](#).

Table 6.25 Predicted Annual Mean PM₁₀ Concentrations

Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	Chester Road	14.54	14.54	0.00
R2	Chester Road	14.46	14.48	0.02
R3	Chester Road	14.50	14.53	0.03

Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R4	Chester Road	17.42	17.43	0.01
R5	Chester Road	15.83	15.87	0.04
R6	Egerton Street	17.84	17.94	0.10
R7	Egerton Street	16.64	16.70	0.06
R8	Egerton Street	14.32	14.33	0.01
R9	Mancunian Way	14.71	14.73	0.02
R10	Chester Road	15.09	15.14	0.05
R11	City Road East	14.32	14.35	0.03
R12	City Road East	14.30	14.35	0.05
R13	City Road East	14.83	14.93	0.10
R14	Albion Street	15.05	15.06	0.01
R15	Albion Street	14.60	14.61	0.01
R16	Old Deansgate	13.94	13.95	0.01
R17	Bridgewater Viaduct	14.40	14.42	0.02
R18	Deansgate Square	13.95	13.97	0.02
R19	Deansgate Square	13.92	13.94	0.02
R20	Whitworth Street East	14.17	14.18	0.01
R21	Great Jackson Street	17.33	17.42	0.09
R22	Great Jackson Street	18.98	19.02	0.04
R23	Egerton Street	19.99	20.04	0.05
R24	Gaddum House	14.43	14.49	0.06
R25	Crown Street Phase 1	15.95	16.03	0.08
R26	Crown Street Phase 1	14.86	14.90	0.04
R27	Crown Street Phase 1	15.57	15.64	0.07
R28	Crown Street Phase 1	14.85	14.91	0.06
R29	Crown Street Phase 1	14.58	14.62	0.04

6.140 As indicated in [Table 6.25](#)~~Table-6.25~~, annual mean PM₁₀ concentrations were below the relevant AQO at all sensitive receptor locations for both scenarios considered.

6.141 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in [Table 6.26](#)~~Table-6.26~~.

Table 6.26 Predicted Annual Mean PM₁₀ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Chester Road	0.00	75% or Less of the AQO	Negligible on a permanent basis

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R2	Chester Road	0.05	75% or Less of the AQO	Negligible on a permanent basis
R3	Chester Road	0.07	75% or Less of the AQO	Negligible on a permanent basis
R4	Chester Road	0.02	75% or Less of the AQO	Negligible on a permanent basis
R5	Chester Road	0.10	75% or Less of the AQO	Negligible on a permanent basis
R6	Egerton Street	0.25	75% or Less of the AQO	Negligible on a permanent basis
R7	Egerton Street	0.15	75% or Less of the AQO	Negligible on a permanent basis
R8	Egerton Street	0.02	75% or Less of the AQO	Negligible on a permanent basis
R9	Mancunian Way	0.05	75% or Less of the AQO	Negligible on a permanent basis
R10	Chester Road	0.13	75% or Less of the AQO	Negligible on a permanent basis
R11	City Road East	0.07	75% or Less of the AQO	Negligible on a permanent basis
R12	City Road East	0.12	75% or Less of the AQO	Negligible on a permanent basis
R13	City Road East	0.25	75% or Less of the AQO	Negligible on a permanent basis
R14	Albion Street	0.02	75% or Less of the AQO	Negligible on a permanent basis
R15	Albion Street	0.02	75% or Less of the AQO	Negligible on a permanent basis
R16	Old Deansgate	0.02	75% or Less of the AQO	Negligible on a permanent basis
R17	Bridgewater Viaduct	0.05	75% or Less of the AQO	Negligible on a permanent basis
R18	Deansgate Square	0.05	75% or Less of the AQO	Negligible on a permanent basis
R19	Deansgate Square	0.05	75% or Less of the AQO	Negligible on a permanent basis
R20	Whitworth Street East	0.02	75% or Less of the AQO	Negligible on a permanent basis
R21	Great Jackson Street	0.23	75% or Less of the AQO	Negligible on a permanent basis
R22	Great Jackson Street	0.10	75% or Less of the AQO	Negligible on a permanent basis
R23	Egerton Street	0.13	75% or Less of the AQO	Negligible on a permanent basis

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R24	Gaddum House	0.15	75% or Less of the AQO	Negligible on a permanent basis
R25	Crown Street Phase 1	0.20	75% or Less of the AQO	Negligible on a permanent basis
R26	Crown Street Phase 1	0.10	75% or Less of the AQO	Negligible on a permanent basis
R27	Crown Street Phase 1	0.18	75% or Less of the AQO	Negligible on a permanent basis
R28	Crown Street Phase 1	0.15	75% or Less of the AQO	Negligible on a permanent basis
R29	Crown Street Phase 1	0.10	75% or Less of the AQO	Negligible on a permanent basis

6.142 As indicated in [Table 6.26](#)~~Table 6.26~~, impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the Proposed Development were predicted to be **negligible** on a permanent basis at all 29 receptor locations considered

6.143 Based on the worst-case impact assessment, the overall significance on annual mean PM₁₀ concentrations was determined to be **not significant**. Further justifications on the significance of potential impacts is provided in Table 6.27.

Particulate Matter - PM_{2.5}

6.144 PM_{2.5} has not been modelled within the assessment as the predicted concentrations relating to annual mean PM₁₀ remain below the AQO for PM_{2.5} (25 µg/m³). Since PM₁₀ contains all particulate matter with an aerodynamic diameter of less than 10µm, PM_{2.5} is effectively accounted for within these predictions; and at worst could be considered that PM_{2.5} concentrations would be equal to the predicted PM₁₀ concentrations.

Significance Impact

6.145 The overall significance of operational phase road traffic emission impacts was determined as **negligible** on a permanent basis and therefore considered **not significant**. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in the assessment methodology. Further justification is provided in [Table 6.27](#)~~Table 6.27~~.

Table 6.27 – Overall Road Traffic Exhaust Emission Impact Significance

Guidance	Comment
<i>Number of properties affected by minor, moderate or major air quality impacts and a judgement on the overall balance</i>	Impacts on annual mean NO₂ concentrations were predicted to be negligible on a permanent basis at 21 receptor location, minor adverse on a permanent basis at 2 locations, and moderate adverse on a permanent basis at 6 receptor locations. Impacts on PM₁₀ concentrations were predicted to be negligible on a permanent basis at all sensitive receptors. The receptor locations at which moderate adverse impacts were predicted are isolated within two distinct areas. One area adjacent to A57 Egerton Street and Dawson Street contains 4 of the 6 moderately affected receptor locations. The second area, immediately adjacent to the A57(M) includes proposed locations

Guidance	Comment
	across Great Jackson Street Framework, specifically locations within the Crown Street Phase 1 and Plot G developments. Although, these 6 locations represent a number of properties the overall balance of associated impacts is considered not significant. Critically, no new exceedance of the relevant AQOs were predicted as a result of the Proposed EIA Development. Associated impacts were also based on worst case sensitivity analysis in the form of emission factors. The use of 2025 operational traffic data, together with 2018 emission factors does not consider future improvements (due to the current shift towards a greater production and uptake low emission vehicles) and significantly overestimate actual pollutant concentrations within the modelling domain. Therefore, a sufficient level of confidence can be placed within the predicted emission levels and conclusions regarding impact significance. The overall balance on air quality impacts as a result of the Proposed EIA Development is therefore deemed not significant.
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	There were predicted exceedances of the annual mean AQO for NO₂ at sensitive locations across the Proposed Development, with exceedances ranging across ground to first-floor levels of Buildings C3, C4 and C5 respectively. As a result, operational phase mitigation is to be implemented to reduce the annual mean NO₂ exposure throughout the Site. Reference should be made to Section 6.146 to 6.155 for further information regarding recommended protective mitigation techniques. Subject to the implementation of the suitable mitigation measures, exposure to elevated NO₂ concentration at sensitive locations across the Site can be considered as negligible on a permanent basis and therefore not-significant
<i>The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors</i>	The change in concentrations relative to the annual mean AQO for NO₂ was predicted to range between 0.05% and 1.5%. Resultant permanent impacts were therefore described as either negligible, minor adverse or moderate adverse on a permanent basis in accordance with the EPUK and IAQM criteria. 21 of the 29 receptor locations were predicted to experience negligible NO₂ impacts on a permanent basis, and therefore the overall balance is considered not significant. The change in concentrations relative to the AQO for PM₁₀ was predicted to range from 0.00% to 0.25%. Resultant impacts were therefore described as negligible impacts on a permanent basis at all sensitive receptors considered
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a major increase or decrease	There were exceedances of the AQOs for NO₂ at 8 sensitive receptor locations within the modelling extents for the 2025 DM and DS scenarios. The overall magnitude of change was considered to be negligible on a permanent basis and therefore not significant. Conversely, there were no predicted exceedances of both the annual mean AQO for PM₁₀ at any location within the modelling extents
<i>The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less</i>	As stated above there were exceedances of the annual mean AQO for NO₂ at 8 sensitive locations, of which 4 locations exceeded an annual mean concentration of 51µg/m³, with a maximum of 57.41µg/m³ (R23) Critically, all exceedances were predicted during both the DM and DS and therefore cannot be directly accounted to the operation of

Guidance	Comment
<i>significance than an annual mean of 51µg/m³</i>	the Proposed EIA Development. Furthermore, the magnitude of change relative to pollutant concentrations at the most significantly affected receptor locations was considered negligible on a permanent basis and as such in the overall context of the assessment was considered not-significant It should be noted that the remaining 21 receptor locations are predicted to experience NO₂ concentrations below the annual AQO. Therefore, the overall magnitude of predicted impacts is judged to be negligible on a permanent basis and therefore considered not significant in the context of this assessment

Mitigation Measures

- 6.146 There are a number of air quality mitigation options available to ensure negligible air quality exposure or impacts occur as a consequence of the Proposed Development. Additionally, mitigation measures may be required to protect future Site users from elevated pollutant as a result of fugitive dust emissions and road vehicle exhaust emissions generated by the construction and operational phase of the Proposed Development. Measures relevant to the operational and construction of The Site are outlined in the following Sections.

Operational Phase Assessment

- 6.147 Detailed dispersion modelling undertaken at heights equivalent to the proposed elevations of buildings C3, C4 and C5 indicated that residential (C4 and C5) and educational (C3) units across ground and first floor level may be exposed to elevated annual mean concentrations of NO₂.

C3 Facades and Internal Areas

- 6.148 As indicated in [Table 6.21](#)~~Table 6.21~~, predicted NO₂ concentrations exceed the AQO of 40.0µg/m³ across developable areas of the Site adjacent to arterial road links. Subsequently the inclusion of appropriate mechanical ventilation is recommended to all internal areas ground and first floor levels where proposed educational sensitive use is situated.
- 6.149 The implementation of proven systems would ensure future occupants are not be exposed to unacceptable NO₂ concentrations. Additionally, it is recommended that a sealed façade option is incorporated into the building design to ensure that internal areas are sufficiently ventilated by clean air from the mechanical NO_x filtration systems. As stated previously, only outline planning permission is sought for the first form entry primary school and exact details on the design and ventilation strategies from an air quality perspective will be submitted within a detailed assessment during the subsequent reserved matter application.
- 6.150 The annual mean AQO for PM₁₀ was not exceeded at any location within the modelling domain, as such no further consideration is necessary for exposure to this pollutant.

C4 and C5 Facades and Internal Areas

- 6.151 As indicated in [Table 6.21](#)~~Table 6.21~~, predicted NO₂ concentrations exceed the AQO of 40.0µg/m³ across the ground and first floor levels of the C4 and C5. It is therefore proposed that the inclusion of mechanical ventilation should be implemented to all habitable and amenity areas throughout the ground to first floor levels of Building C4 and C5.
- 6.152 As confirmed by the contractor it is proposed to install dedicated air inlets to each floor level of the Proposed Development. As a result of this design it is not possible to draw clean air from elevated levels to serve the affected lower levels. Subsequently, it will be required to incorporate individual NO_x filtration units to each ventilation system across all ground and first floor levels of

Buildings C4 and C5. The installation of the NOx filtration units will ensure the supply of clean air within all residential dwellings from the ground to first floor levels across the Proposed Development, the positioning of the filtration unit should be positioned, where feasible, at the highest possible point of each floor level.

6.153 It should be noted that according to the IAQM and EPUK Guidance⁷ highlighted in [Table 6.2](#) the annual mean objective does not apply at the proposed commercial floorspace within the Building C4 or C5. This is due to the intermittent nature of access to this land use, in which users are present for intermittent and irregular periods. However, in the interests of a thorough mitigation strategy it would be recommended to provide mechanical NOx filtration to all ground and first floor commercial areas.

6.154 A high specification of air tightness on the windows and doors should be incorporated at all habitable and commercial units on the ground to first floors of C4 and C5. This provides freedom of choice over whether natural ventilation is preferable during certain periods. The key to reducing exposure using this method is to ensure occupants are informed over the potential impacts associated with prolonged exposure to elevated pollution levels. As such, it may also be possible to provide residents with a welcome pack containing air quality information which will allow them to follow appropriate advice on protection against high concentrations during certain periods.

6.155 These proposed mitigation options discussed above are considered a suitable solution for a Proposed Development this size and nature.

Construction Phase Assessment

6.156 The IAQM guidance⁸ provides a number of potential mitigation measures to reduce potential impacts from the construction phase. The Site has been classified as a **major** risk in regards to the potential of unmitigated dust soiling and **moderate adverse** risk in regards to human health resulting from unmitigated construction phase activities. It was identified that mitigation measures are required to reduce the associated risk to an acceptable level. Such mitigation measures have therefore been adapted for the Site, and summarised in [Table 6.28](#). It will be required to review these measures prior to the commencement of construction works and incorporated into existing strategies. It should be noted that some or all of these measures may be used, dependent on the circumstances that arise.

Table 6.28 – Fugitive Dust Mitigation Measures

Guidance	Comment
Communications	- Display the name and contact details of person(s) accountable for air quality and dust issues on the Site boundary - Develop and implement a stakeholder communications plan that includes community engagement - Display the head or regional office contact information - Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	- Record all dusty and air quality complaints - Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation - Hold regular liaison meetings with other high-risk construction Sites that are within 500m of the Site boundary. Ensuring plans are co-ordinated and dust and particulate matter emission are minimised - Make complaints log available to LA when asked
Monitoring	Undertake daily on- Site and off- Site inspection, where receptors are nearby, to monitor dust, record inspection results, and make the log

Guidance	Comment
	available to the LA when asked • Carry out regular Site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out
Preparing and Maintaining the Site	• Plan Site layout so that machinery and dust causing activities are located away from receptors • Erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on Site. • Fully enclose Site or specific operations where there is a high potential for dust production and the Site as active for an extensive period • Avoid Site runoff of water or mud • Use water as dust suppressant where applicable • Keep Site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from Site as soon as possible • Cover, seed or fence stockpiles to prevent wind whipping
Operating Vehicle/ Machinery and Sustainable Travel	• All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol-powered generators where practicable • Impose a signpost a maximum-speed limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas • Produce a Construction Logistics Plan to manage sustainable deliveries • Cover, seed or fence stockpiles to prevent wind whipping.
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the Site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on Site to clean any spillages
Waste Management	• Avoid bonfires and burning of waste materials
Earthworks and Construction	• Re-vegetate earthworks and exposed areas • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate • Only remove the cover in small areas during work and not all at once • Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process • Ensure bulk cement and other fine powder materials are delivered and stored to prevent escape • For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving the Site are covered to prevent escape of materials • Inspect on- Site haul routes for integrity, instigate necessary repairs and record in Site log book • Install hard surfaced haul routes which are regularly damped down

Guidance	Comment
	- Implement a wheel washing system at a suitable location near Site exit - 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 - Access gates to be located at least 10m from receptors, where possible

Best Practice Measures

Construction Phase

6.157 The Proposed Development has access to an off-site concrete batching plant situated immediately adjacent to the Site. Given the proximity to the plant it is assumed that both HGV movements associated with concrete deliveries, and fugitive dust emission generated by trackout activities will be significantly reduced. It has been assumed that the adjacent batching plant will be operated in accordance with industry standards and relevant IAQM dust control measures.

Operational Phase

6.158 Although overall associated operational impacts have been deemed **negligible** on a permanent basis **not-significant** there is still a requirement to secure a reduction in pollution concentrations associated with road vehicle exhaust emissions. The following best practice measures are therefore proposed and will be implemented within the design of the Proposed Development:

- Up to 63 Electric Vehicle Charging Points; and
- 855 Cycle Parking Spaces.

6.159 It is considered that the above measures are proportional to the nature and scale of the Proposed Development, and will secure a reduction in development associated road vehicle exhaust emissions.

Cumulative Effects

6.160 Cumulative effects are defined as those that occur as a result of combined past, current and future activities that may impact collectively over time. Cumulative effects on air quality at the Proposed Development are outlined in the following Sections. These sections consider the effect of the Proposed Development in conjunction with traffic associated with the identified committed developments and the wider Great Jackson Street Framework.

Construction Phase

6.161 As stated previously a review of the MCC Planning Portal indicated that there are several approved large-scale development schemes within 500m of the Site. As such, the likelihood of concurrent dust generating activity is major. It is assumed that the implementation of standard industry best practice measures detailed in [Table 6.28](#), required for the Proposed Development as well as mitigation measures proposed as part of the planning applications for other committed developments will ensure that concurrent Construction Phase impacts are **negligible** on a temporary basis and therefore construction phase impacts are considered **not significant**.

Operational Phase

6.162 The assessment has considered the effect of the Proposed Development in conjunction the identified committed developments with Volume 2. Associated traffic generation from the appropriate and available applications were factored into the modelled traffic data to consider the combined risk of committed developments and the Proposed Development.

Residual Effects

6.163 Residual effects are defined as those that remain following the implementation of mitigation. Residual effects on air quality for the Proposed Development are outlined in the following Sections.

Construction Phase

6.164 Assuming the relevant mitigation measures outline in [Table 6.28](#) ~~Table 6.28~~ are implemented, the residual effect from all dust generation activities is predicted to be **not significant**.

Operational Phase

6.165 Overall impacts on NO₂ and PM₁₀ concentrations as a result of the operational phase were predicted to be **not significant** within the vicinity of The Site. Consequently, the residual effects resulting from road vehicle exhaust emissions associated with traffic generated by the Proposed Development are predicted to be **not significant**.

Table 6.29 – Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Pre-mitigation Effect	Mitigation Measure	Residual Effect
Construction Phase				
Dust Soiling/Health	Human – Existing	Major adverse on a temporary basis	Table 6.28: The Proposed Development will incorporate the specific construction phase mitigation measures outlined in the IAQM guidance.	Negligible dust impacts to property and people on a temporary basis
Operational Phase				
Existing Road Vehicle Pollutant Concentrations – Health	Human – Future Site Users	Major adverse on a permanent basis	Sections 6.146 to 6.155: Proposed Development will be required to incorporate mechanical ventilation system to each affected floor level that has been predicted to be subjected to exceedances of the AQO for NO ₂ . The ventilation systems will include individual NO _x filtration units which will effectively remove NO _x pollutants, reducing the concentrations to acceptable and safe levels.	Negligible exposure to elevated pollutant concentrations on a permanent basis

Likely Significant Effect	Receptor(s)	Pre-mitigation Effect	Mitigation Measure	Residual Effect
Additional Road Vehicle Pollutant Concentrations – Health	Human – Existing Sensitive Locations	Negligible impacts upon existing sensitive uses on a permanent basis	The Proposed Development will consider best practice measures in the form of sustainable transport principles. The provision of high-level cycle parking facilities as well as availability of Electric Vehicle Charging Points will secure a reduction in development related road vehicle exhaust emissions.	Negligible impacts upon existing sensitive uses on a permanent basis

6.166 As mentioned previously in Section 6.55 the Proposed Development includes the provision of basement level car parking. The extraction units associated with this aspect of the Site has potential to impact upon existing air quality as a result of additional exhaust emissions.

6.167 The EPUK and IAQM guidance⁷ provides screening criteria in regards to basement extraction systems and whether to proceed with a full assessment. The guidance states a detailed assessment may be required if:

"The ventilation extract for the car park will be within 20m of a relevant receptor"

6.168 Although the ventilation extracts associated with the C4, C5 and Public Car Parks are located within 20m of relevant receptors the implementation of NO_x filtration systems to all habitable areas from ground to first floor level, will suitably protect future Site users from elevated pollutant concentrations generated by the car park extraction.

6.169 Following the implementation of operational phase mitigation measures, in the form of NO_x filtration units, the residual impact of car parking emissions associated with the basement ventilation system will be deemed **negligible** on a permanent basis and therefore considered **not significant**.

6.170 As such this aspect of the Proposed Development has not been assessed further in the preparation of this Chapter.

Summary

6.171 The Proposed Development has the potential to cause air quality impacts during both the construction and operational phases.

6.172 During the construction phase of the Proposed Development there is potential for air quality impacts at human receptors as a result of fugitive dust emissions from The Site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **negligible** on a temporary basis and therefore **not significant**.

6.173 Dispersion modelling was undertaken in order to quantify pollutant concentrations at The Site and assess potential exposure of future users. Concentrations of NO₂ and PM₁₀ were predicted across the ground to third floor level of buildings C3, C4 and C5, and were subsequently verified using local monitoring results. Exceedances of annual mean NO₂ concentrations were predicted at proposed sensitive uses on the ground to first floor levels of the Proposed Development. In order

to protect residents from poor air quality, appropriate protective mitigation measures have been recommended.

- 6.174 In addition, dispersion modelling was undertaken in order to predict air quality impacts at sensitive receptor locations within the vicinity of the Site as a result of the additional road vehicle exhaust emission generated by the operation of the Proposed Development.
- 6.175 This indicated that the impacts at sensitive receptor locations ranged from negligible, minor adverse and moderate adverse on a permanent basis. However, whilst considering the overall significance in conjunction with worst case assessment assumptions and best practice offsetting measures residual impacts were determined to be **negligible** on a permanent basis and therefore **not significant**, in accordance with the relevant guidance.

7 (A)Noise and Vibration

A7 ES Addendum Alterations

No alterations have been made to this chapter (7A) as part of the ES addendum. However, an ES chapter addendum has been prepared by Fisher Acoustics (Chapter 7B) which considers the environmental impacts of the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid permission.

For details please refer to Chapter 7B of this Statement.

Introduction

- 7.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Noise & Vibration. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted. The assessment also accounts for the committed developments within the area.
- 7.2 The assessment has been undertaken by Resource & Environmental Consultants Limited (REC). The author of the chapter is Martyn Parker (BSc (Hons) & AMIOA) who has 6 years' experience in Noise and Vibration Assessments and is an Associate Member of the Institute of Acoustics.
- 7.3 Appendix 7.1 show the Figures and Tables reference within the assessment. The Appendix includes:
- Figure 7.1 – Noise & Vibration Sensitive Receptors;
 - Figure 7.2 – Daytime Grid Noise Map for Residential;
 - Figure 7.3 – Night-Time Grid Noise Map Residential;
 - Figure 7.4 – Daytime Grid Noise Map for School Building;

Legislative and Policy Context

National Planning Policy

National Planning Policy Framework

- 7.4 To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or Proposed Development to adverse effects from pollution, should be taken into account.
- 7.5 The Framework states that planning policies and decisions should aim to:
- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
 - Mitigate and reduce to a minimum other adverse impact on health and quality of life arising from noise from new development, including through the use of conditions;
 - Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and

- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Noise Policy Statement for England

- 7.6 The Noise Policy Vision is to “*promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*”.
- 7.7 Through effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, there are the following aims:
- Avoid significant adverse impacts on health and quality of life;
 - Mitigate and minimise adverse impacts on health and quality of life; and
 - Where possible, contribute to the improvement of health and quality of life.

National Planning Practice Guidance

- 7.8 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.
- 7.9 Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:
- Whether or not a significant adverse effect is occurring or likely to occur;
 - Whether or not an adverse effect is occurring or likely to occur; and
 - Whether or not a good standard of amenity can be achieved.
- 7.10 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.
- 7.11 The Observed Effect Levels are as follows:
- Whether Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
 - Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.
 - No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.
- 7.12 Table 7.1 summarises the noise exposure hierarchy, based on the likely average response.

Table 7.1 PPV Guidance Criteria – Human Perception

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No observed effect	No specific measures required

Perception	Examples of Outcomes	Increasing Effect Level	Action
Noticeable and not intrusive	Noise can be heard but does not cause any changes in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest observed adverse effect level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant observed adverse effect level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	Prevent

7.13 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

7.14 These factors include:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause greater adverse effect at night if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; and
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

7.15 More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and
- If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

Local Planning Policy

Manchester Publication Core Strategy

7.16 Manchester City Core Strategy Publication mainly relates to airport noise, the following text is the most relevant for the assessment:

7.17 Policy DM1 – Development Management.

7.18 All development should have regards to the following specific issues for which more detailed guidance may be given within a supplementary planning document: -

- Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.

Assessment Methodology and Significance Criteria

Assessment Methodology

Scoping and Consultation

7.19 A scoping opinion was sought from Manchester City Council (MCC) and direct communication was sought with Laura Miller, Environmental Health Officer (EHO) at MCC. The Officer was consulted and the proposed methodology and assessment criteria, which are detailed in the following sections for construction and operational effects:

7.20 The following noise criteria levels are considered appropriate in relation to those initially agreed for the assessment of road traffic noise on the proposed residential units and in accordance with most recent relevant guidance:

- Effects The external noise level within any external amenity areas from road traffic noise shall not exceed 55dB $L_{Aeq,16hr}$, where practicable;

- The internal noise levels within habitable rooms (bedrooms and living rooms) shall not exceed the BS8233 internal target noise levels, which are:
For bedrooms: 30dB $L_{Aeq,8hr}$
45dB $L_{Amax,fast}$
For living rooms: 35dB $L_{Aeq,16hr}$
- The noise rating level generated by any fixed Mechanical and Electrical (M&E) plant shall be more than 5dB below the lowest measured background noise level at the closest residential receptor ($L_{A,r} = L_{A90,t}$ dB).

Assessment of different scenarios

- 7.21 It is understood that the development will be phased and as a result, a number of scenarios will be assessed in the EIA, as described in Chapter 1 of the ES.
- 7.22 In terms of noise the main impact is that of road traffic sound on the Mancunian Way and surrounding road network. The main concern regarding the different phasing scenarios would be the screening provided by the other phases such as the school building (C3) for the NW façade of building C4.
- 7.23 Therefore, a worst-case assessment will be undertaken in order to show the façade levels at the proposed buildings without the screening provided by the other phases. The assessment has included Scenarios A, D (without C3), and E for the noise modelling to show the worst-case façade levels at the tower block.
- 7.24 In terms of changes in traffic levels there would need to be a 25% change in traffic volumes due to the different scenarios in order to have a perceptible change in the noise levels, this is unlikely to happen given the high volume of traffic on the surrounding road network.

Standards and Guidance

- 7.25 This section considers the noise and vibration effects that will occur during the site preparation, construction and operational phases of the Proposed Development as summarised below:

Site Preparation, Earthworks and Construction Phase

- Construction noise at existing local sensitive receptors;
- Increase in noise at existing local noise-sensitive receptors; and,
- Ground-borne vibration levels at existing local sensitive receptors.

Operational Phase

- Construction noise at existing local sensitive receptors; and,
- Increase in noise at existing local noise-sensitive receptors.

- 7.26 The following documents have been referenced in this assessment:

Calculation of Road Traffic Noise 1988

- 7.27 The Calculation of Road Traffic Noise (CRTN) memorandum, produced by the Department of Transport for the Welsh Office, describes the procedures for calculating noise from road traffic. Section III of this memorandum details the shortened measurement procedure whereby measurements of the L_{10} parameter are made over any three consecutive hours between 10:00 and 17:00. From the arithmetic average of the three 1-hour values, the $L_{10,18hr}$ noise levels is derived before derivation of the $L_{Aeq,16hr}$ value.

Transport Research Laboratory – Converting the UK Traffic Noise Index LA10,18hr to EU Noise Indices for Noise Mapping

7.28 This document provides a method for converting the $L_{A10,18hr}$ level to the L_{night} level using the following formula, applicable to non-motorway roads;

7.29 $L_{night} = 0.90 \times L_{A10,18hr} - 3.77dB.$

British Standards BS4142:2014: Methods for rating and assessing industrial and commercial sound

7.30 This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

7.31 The procedure detailed in the standard compares the measured or predicted noise level 'the specific noise level' from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.'

7.32 The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 – 23:00): 1 hr; and,
- Night-time (23:00 – 07:00): 15 minutes.

7.33 There are a number of 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows:

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and,
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and,
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment

7.34 In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment.

7.35 BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

7.36 Assessment of the rating level relative to the background noise level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

7.37 With the above in mind, it is common that a Local Planning Authority will specify their own criteria for the rating level relative to the background sound level and, where this is the case, this criterion usually takes precedence over a simple comparison of the rating level against the background sound level.

7.38 MCC's criteria for the noise rating level generated by any fixed Mechanical and Electrical (M&E) plant shall be more than 5dB below the lowest measured background noise level at the closest residential receptor ($L_{A,r} = L_{A90,t}$ dB).

British Standard BS 8233:2014: Guidance on sound insulation and noise reduction for buildings

Noise Criteria Limits

7.39 The scope of this standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

7.40 The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in the below Table:

Table 7.2 BS8233 Recommended Internal Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting/sleeping conditions	Living Room	35
	Bedroom	30

For a Reasonable standard in bedrooms at night, individual noise events (measured with fast time weighting) should not exceed 45dB L_{max}

7.41 BS8233 goes on to recommend noise levels for gardens. According to BS8233;

"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted".

7.42 BS8233 goes on to say:

"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

Ventilation Requirements

7.43 Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

7.44 Section 7.7.2 states:

"NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

World Health Organisation's (WHO) 'Guidelines for Community Noise'

7.45 The WHO 'Guidelines for Community Noise' offers advice with regard to setting noise criteria applicable to sleep disturbance. Section 4.2.3 specifies:

'If the noise is not continuous, L_{Amax} or SEL are used to indicate the probability of noise-induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB.'

7.46 The guidelines go on to state:

'At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} , so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.'

7.47 The sound insulation performance value of 15dB for a façade containing a partially open window accords with the guidance offered in BS8233:2014.

7.48 The guidelines reference a study by Vallet & Vernet, 1991, which concluded that:

'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB $L_{AF,max}$ more than 10-15 times per night.'

7.49 Accordingly, this assessment has utilised the 10th highest measured maximum noise level from the night-time period and allows for an assessment of a typical maximum noise level in determining façade sound insulation performance.

Design Manual for Roads & Bridges Volume 11

7.50 The Highways Agency's document Design Manual for Roads and Bridges (DMRB) provides a method for evaluating both the immediate and long-term noise effects on receptors of changes in traffic flows on public highways, assessed using 18-hour traffic flow (06:00 – 24:00) data.

British Standard 5228: Noise and Vibration Control on Construction and Open Sites – Part 1: Noise: 2009+A1 2014 (BS 5228-1)

- 7.51 This British Standard sets out techniques required to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant being used, their location, and the length of time they are in operation.
- 7.52 The noise prediction method is used to establish likely noise levels in terms of the $L_{Aeq,T}$ over the core working day.
- 7.53 This British Standard also documents a database of information, comprising previously measured sound power levels for a variety of different construction plant undertaking various common activities.
- 7.54 Example criteria are presented for the assessment of the significance of noise effects. Such criteria may be concerned with fixed noise limits and/or ambient noise level changes. With respect to fixed noise limits, BS 5228-1 presents the following noise limits which are taken as an average over a 10-hour working day:
- 7.55 70.0dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise; and,
- 7.56 75.0dB (A) in urban areas near main roads and heavy industrial areas.

British Standard 5228: Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration: 2009+A1 2014 (BS 5228-2)

- 7.57 This standard provides recommendations for basic methods of vibration control relating to construction and open sites. The legislative background to vibration control is described and guidance is provided concerning methods of measuring vibration and assessing its effects on the environment.
- 7.58 Guidance criteria are suggested for the assessment of the significance of vibration effects; such criteria are provided in terms of Peak Particle Velocities (PPV) and are concerned with both human and structural responses to vibration. Those applicable to human perception and disturbance are presented within the below table.

Table 7.3 PPV Guidance Criteria – Human Perception

Vibration Level (PPV)	Effect
0.14mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3mm/s	Vibration might be just perceptible in residential environments
1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

- 7.59 The Standard goes on to present guidance criteria applicable to the vibration response limits of buildings in terms of the component PPV, these are presented within the below Table.

Table 7.4 PPV Guidance Criteria – Buildings

Type of Buildings	Peak Component of Velocity Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	50mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Note 1: Values referred to are at base of the building

Note 2: At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.

- 7.60 It should be noted that the values presented within the above Table are applicable to cosmetic damage only. It is stated within BS 5228-2 that minor damage is possible at vibration magnitudes which are greater than twice those given in the Table. It can be seen that the guide values for building damage are an order of magnitude higher than for human disturbance.

Building Bulletin 93: The Acoustics Design of Schools – A Design Guide (BB93)

- 7.61 Building Bulletin 93 (BB93) stipulates maximum indoor ambient noise levels in critical spaces, internal partition sound insulation and reverberation time limits in rooms. The latter of these only become critical at the design stage. However, at the planning stage it is prudent to take account of indoor ambient noise levels as they, together with existing external noise levels, determine the building envelope and required means of ventilation.
- 7.62 BB93 outlines maximum indoor ambient noise levels in teaching spaces, expressed in terms of $L_{Aeq,30min}$ (dB) which is the average 30-minute L_{Aeq} .
- 7.63 For new schools, BB93 recommends that 60dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas. However, under some circumstances it is possible to meet the specified indoor ambient noise levels on Sites where external noise levels are as high as 70dB $L_{Aeq,30min}$, but this will require considerable building envelope sound insulation, screening or barriers.
- 7.64 BB93 recommends that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB $L_{Aeq,30min}$. If this is not possible due to a lack of suitably quiet Sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of predicted noise levels and of options for reducing these should be carried out.
- 7.65 Playgrounds outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from busy roads where necessary.

Establishing Baseline Conditions

7.66 In order to establish the existing baseline noise environment for the Site the following noise surveys have been undertaken:

- Road Traffic Noise Survey for Mancunian Way to the south west of the; and
- Background Sound Measurements.

7.67 The following noise and vibration sensitive receptors will be considered with regards the construction and development impacts upon existing receptors.

Table 7.5 Noise and Vibration Sensitive Receptors

Receptor	Address	X	Y	Use
R1	Great Jackson St - East	383265	397368	Residential
R2	Melbourne St – South East	383286	397208	Commercial
R3	New Your Street - South West	383053	397127	Residential
R4	Jackson Crescent South	383231	397128	Residential
R5	Blantyre Street – North East	383142	397405	Residential
R6	North of Chester Road (A56) - North	383040	397361	Residential
R7	Beattock Street - West	382936	397201	Residential
R8	Crown Street Phase 1	383128	397306	Residential

Significance Criteria - Construction Noise & Vibration

7.68 With respect to hours of work, BS 5228 makes reference to the fact that noise levels generated during the evening (19:00 to 23:00) may need to be lower than the daytime (07:00 to 19:00) period (a figure of 10dB is quoted) and also that for any night-time operations (23:00 to 07:00) levels should be quieter still. The Standard does not, however, offer guidelines with respect to acceptable levels.

7.69 Following the fixed noise level limits presented in BS 5228-1 for urban areas and regions close to main road traffic, where it is calculated that construction noise levels will exceed 75dB $L_{Aeq,T}$ (facade) applicable to the core working day, it is considered that a noise impact of 'major' magnitude could arise. Noise levels which are calculated to fall below this criterion are considered to give rise to a 'minor' magnitude of impact. An exceedence of less than 3dB is considered minor and an exceedence of more than 3dB is considered moderate and 5dB more is considered major.

7.70 The significance of vibration effects has been assessed drawing upon the guidance criteria presented within BS 5228-2 as outlined in Table 7.6.

Table 7.6 Magnitude of Impact Criteria Applicable to Construction Vibration

Vibration Level (PPV)	Effect	Magnitude of Impact
<0.3mm/s	Unlikely to be perceptible in residential environments	Negligible
0.3	Onset of perceptibility in residential environments	Minor
1.0	Onset of complaints in residential environments	Moderate
>10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level	Major

7.71 The above table has been generated based upon the guidance on effects of vibration levels as presented within BS 5228-2, the corresponding vibration ranges and associated magnitude ratings adopted for the purpose of this assessment.

7.72 With regards the significance, a moderate or major adverse impact is considered significant.

Significance Criteria – Operational Phase

Road Traffic Impact Existing Receptors

7.73 The assessment of noise impact due to changes in road traffic will be undertaken drawing upon the suggested classification of effect provided within the Design Manual for Roads & Bridges (DMRB). The DMRB classification of effects has been adapted to produce a set of magnitude criteria ranging from no effect to major as presented within the below table for the short term and for the long term.

Table 7.7 Classification of Magnitude of Noise Impacts for Comparison for Future Noise Against Existing Noise – Short Term.

Noise Level Change, $L_{A10,18hr}$ (dB)	Magnitude of Impact
0	No Effect
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0+	Major

Table 7.8 Classification of Magnitude of Noise Impacts for Comparison for Future Noise Against Existing Noise – Short Term.

Noise Level Change, $L_{A10,18hr}$ (dB)	Magnitude of Impact
0	No Effect
0.1 – 2.9	Negligible
3.0 – 4.9	Minor

Noise Level Change, $L_{A10,18hr}$ (dB)	Magnitude of Impact
5.0 – 9.9	Moderate
10.0+	Major

7.74 Any impact of moderate adverse and over, in the short term, is considered significant and any change categorised as minor or more is considered significant in the long term.

Road Traffic Impact upon receptors within the Proposed Development

7.75 During the baseline noise survey, it was noted that noise generated by road traffic dominated the noise climate across the Site.

7.76 For the assessment of internal noise levels, the BS8233 30dB $L_{Aeq,8hr}$ and 45dB L_{AFmax} applicable to bedrooms and 35dB $L_{Aeq,16hr}$ applicable to living rooms have been adopted for the night-time and daytime periods respectively. Where these criteria are exceeded, without mitigation in place, a major adverse impact will be observed.

7.77 For external amenity area, such as gardens, the BS8233 upper guideline value of 55dB $L_{Aeq,16hr}$ will be aimed for but it is clear from the location of the Site and surrounding noise sources that this may not be achievable, in accordance with the guidance. Therefore, the lowest practicable levels will be achieved. Where noise levels are predicted to range between below 5 and 58dB, in garden areas, as a change of 3dB is only just perceptible to the human ear and so a level of 58dB should not be discernibly different to a level of 55dB. A level of 58 to 60dB would be categorised as a moderate adverse impact and anything over 60dB would be categorised as major adverse impact. However, this is relative to the context of the Site and it will be harder to achieve a level below 58dB close to the main roads and, as such, the significance of impact will be addressed accordingly for each parcel.

Commercial Noise Impact upon Proposed & Existing Residential Development

7.78 There is potential for noise associated with the operation of M&E plant forming part of the commercial area to impact upon existing and proposed noise sensitive receptors as well as existing commercial impacting upon the Proposed Development. At this stage, however, the precise details of any M&E plant & flexible commercial units associated with the Proposed Development are unknown. In this situation it is appropriate to set plant noise emission limits based on the existing measured background noise levels and the criteria agreed with MCC.

7.79 The assessment of future noise generated by the various sources within the commercial area and existing commercial sound will be undertaken drawing upon the guidance contained within BS4142. The difference between the measured background sound level and the calculated rating level has been assessed in accordance with the following:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and

7.80 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

7.81 For industrial noise, and with reference to the established methods provided in BS 4142, the following specific magnitude criteria are proposed as shown in the below Table.

Table 7.9 Magnitude of Impact of Plant and Commercial Sound

Rating Level Relative to Background Sound Level	Magnitude of Impact
More than 5dB below	No Effect
Equal	Negligible
up to 3dB above	Minor
5dB above	Moderate
10dB above	Major

Sensitivity of Receptor

7.82 The sensitivity of local receptors depends upon their nature. Where the sensitivity of a receptor is greater, identified impacts could be more significant, and vice versa. For instance, it is commonly considered that heavy industrial installations are not particularly sensitive to noise whilst residential dwellings are. Between these two receptor types are other locations and places of work such as offices.

7.83 In determining the significance criteria, it is necessary to consider the sensitivity of the receptor in conjunction with the predicted noise and vibration levels / level changes. The below table presents the criteria used to define the sensitivity of receptors in relation to noise and vibration impacts.

Table 7.10 Criteria Used to Describe Sensitivity of Receptor

Sensitivity	Description	Example Receptor
High	Receptors where people or operations are particularly sensitive to noise/vibration	Internal and external living areas associated with residential dwellings, quiet outdoor areas used for recreation, conference facilities, auditoria/studios, schools in the daytime, hospitals/residential care homes
Medium	Receptors moderately sensitive to noise/vibration where it may cause some distraction or disturbance	Offices, community facilities, scheduled Ancient Monuments/Listed Buildings
Low	Receptors with a low sensitivity to noise/vibration where it may in extreme cases cause some disturbance	Restaurants, commercial Installations
Negligible	Receptors where distraction or disturbance from noise/vibration is minimal	Factories, storage centres, Industrial sites

Impact Significance

7.84 The significance of noise and vibration impacts has been assessed against the magnitude of change and sensitivity of the receptor according to the impact matrix presented in the below

Table. The significance of the impact is dependent on the context and nature of the noise and will be approached individually for each assessment/source.

Table 7.11 Matrix for Determining the Significance of Impact

		Sensitivity of Receptor			
		High	Medium	Low	Negligible
Magnitude of Impact	Major	Major	Major to Moderate	Moderate	Negligible
	Moderate	Moderate	Moderate	Minor	Negligible
	Minor	Minor	Minor	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

Limitations and Assumptions

- 7.85 Whilst basic information regarding machinery and plant to be used during the construction phase of the development has been supplied, assumptions will be made for any additional plant items used during construction. Accordingly, the calculations performed are accurate to a reasonable level based on knowledge of other urban re-development schemes completed in the past.
- 7.86 At the time of writing and due to the nature of the application, any layout of the Site or potential for the proposed School is unknown at this stage and, as such, recommendations will be made on potential layouts, etc. Any recommendations and mitigation measures will be indicative only and will need to be reassessed and re-evaluated at the reserved matters stage.
- 7.87 The road traffic data provided by Vectos have been used as the basis for the road traffic noise assessment. This focuses on roads immediately surrounding the Site before the development generated traffic is dispersed across the wider network. The year 2032 have been used which also accounts for the committed developments within the area. This is considered robust as the noise model represents the traffic flow on the road with the development and the committed development operational.

Baseline Conditions

Baseline Noise Survey

- 7.88 In order to establish the existing baseline noise environment for the Site the following noise survey have been undertaken:
- Road Traffic Noise Survey for Mancunian Way to the south west of the Site; and
 - Background Sound Measurements.

Road Traffic Survey – Mancunian Way

7.89 REC has conducted a Road Traffic Noise Survey in order to measure the level of noise generated by vehicles using the Mancunian Way. A continuous unattended measurement was undertaken over a period of 7 days between the dates below in order to assess a typical period:

- 10:00 Thursday 14th November 2019 and 11:00 Thursday 21st November 2019.

7.90 The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located to the south west of the Site, approximately 10m from kerb of the link road that leads on to Mancunian Way. The microphone was located 3m above ground level and in free-field conditions. Noise sources at this location consisted predominately of vehicle pass-bys on the Mancunian Way.

7.91 A summary of the measured sound pressure levels from the Road Traffic Noise Survey are presented in Table 7.12.

Table 7.12 Summary of Measured Noise Levels for NMP1

Date	Description	Measured Sound Pressure Levels, free field (dB)	
		$L_{Aeq,T}$	$L_{Amax,fast}$
Thursday 14th November 2019	Daytime (10:00 – 23:00)	76.5	-
	Night-Time (23:00 – 07:00)	73.0	83.7
Friday 15th November 2019	Daytime (07:00 – 23:00)	76.7	-
	Night-Time (23:00 – 07:00)	73.6	86.1
Saturday 16th November 2019	Daytime (07:00 – 23:00)	76.0	-
	Night-Time (23:00 – 07:00)	73.7	83.5
Sunday 17th November 2019	Daytime (07:00 – 23:00)	76.0	-
	Night-Time (23:00 – 07:00)	72.1	83.2
Monday 18th November 2019	Daytime (07:00 – 23:00)	76.5	-
	Night-Time (23:00 – 07:00)	72.4	83.6
Tuesday 19th November 2019	Daytime (07:00 – 23:00)	77.3	-
	Night-Time (23:00 – 07:00)	72.0	84.0

Date	Description	Measured Sound Pressure Levels, free field (dB)	
		$L_{Aeq,T}$	$L_{Amax,fast}$
Wednesday 20th November 2019	Daytime (07:00 – 23:00)	76.3	-
	Night-Time (23:00 – 07:00)	72.2	82.6
Thursday 21st November 2019	Daytime (07:00 – 23:00)	76.3	-

7.92 Through using online weather searches the weather conditions were suitable i.e. low wind speed and dry for the majority of the survey period.

Background Sound Survey

7.93 REC has used undertaken an unattended Background Sound measurement prior to the construction of Phase 1 and the roadwork on Chester road to establish the prevailing noise environment that currently exists across the Site. This consisted of noise measurement over the following periods:

- 12:00 Tuesday 18th July 2017 to 16:00 Friday 21st July 2017.

7.94 The following noise measurement position was chosen for the Background Sound Survey:

- Noise Monitoring Position 2 (NMP2): Located to the west of the Site, approximately 50m from the nearside kerbstone of the Mancunian Way at the existing car park prior to the construction of Phase 1.

7.95 A summary of the lowest measured 1-hour daytime and 15-minute night-time sound pressure levels are presented in Table 8.14.

Table 7.13 Summary of Measured Noise Levels for NMP2

Date	Description	Range of Measured Sound Pressure Levels, free field (dB)	
		$L_{Aeq,T}$	$L_{A90,T}$
Tuesday 18th July 2017	Daytime (12:00 – 23:00)	65.4 – 67.8	60.3 – 64.1
	Night-Time (23:00 – 07:00)	59.3 – 66.6	50.8 – 62.9
Wednesday 19th July 2017	Daytime (07:00 – 23:00)	56.6 – 69.2	51.3 – 63.3
	Night-Time (23:00 – 07:00)	50.4 – 56.3	42.3 – 50.0
Thursday 20th July 2017	Daytime (07:00 – 23:00)	58.2 – 69.1	42.3 – 63.4
	Night-Time (23:00 – 07:00)	61.0 – 67.6	54.1 – 63.6

Friday 21st July 2017	Daytime (07:00 – 23:00)	68.1 – 69.8	63.6 – 64.7
Tuesday 18th July 2017	Night-Time (23:00 – 16:00)	65.4 – 67.8	60.3 – 64.1

7.96 Strong winds and rain were noted during Tuesday and Wednesday afternoon into Thursday morning therefore this period has been discounted from the assessment

7.97 The following noise measurement equipment was used at the time of the survey.

Table 7.14 Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacture & Type No.	Serial No	Calibration Due Date
NMP1	Sound Level Meter	01dB-Metravib Fusion	10819	27 th November 2020
	Pre-amplifier	01dB-Metravib	Internal	
	Microphone	GRAS 40CE	217637	
	Calibrator	01dB-Metravib CAL-21	34554787	10 th June 2020
NMP2	Sound Level Meter	01dB-Metravib Fusion	10819	24 th November 2018
	Pre-amplifier	GRAS 40CE	10714	
	Microphone	01dB-Metravib	217637	
	Calibrator	01dB-Metravib CAL-21	34554787	27 th June 2018

7.98 The sound level meters were field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.

Background Sound Survey

Demolition and Construction

7.99 It is assumed that best practicable means would be followed by the contractor/s such as those detailed in the mitigation section.

Completed Development

7.100 No mitigation measures for the development have been embedded.

7.101 Therefore, the assessment is not based on an embedded mitigation measures as this Chapter aims to recommend mitigation measures later in the Chapter.

Identification and Evaluation of Significant Effects

Demolition and Construction

7.102 This section will detail the potential effects of the construction and operational phases of the development.

Construction Noise

7.103 It is inevitable with any major development that there will be some disturbance caused to those nearby during the clearance and construction phases of the Site. However, disruption due to construction is only temporary, limited to the Site and is of medium-term duration.

7.104 The predictions have followed the methodology contained within BS 5228-1 and are in terms of the $L_{Aeq,T}$ over the core working day, which is 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 on Saturdays. The predictions assume all plant being located at the approximate centre of the Site to represent an average case scenario.

7.105 Table 8.16 sets out the typical plant type, number and assumed utilisation (percentage 'on-time') used in the prediction of noise levels during the key construction activities.

Table 7.15 Assumed Construction Plant Details

Plant Type	Measured L_{Aeq} at 10m	Number Operating	Assumed % on-time
Truck mounted concrete pump & boom	80.0	2	60
Mobile telescopic crane	77.0	2	40
Telescopic handler	79.0	1	50
Dump truck	86.0	1	80
Tracked excavator	88.0	2	60
Fork lift truck	88.0	3	70
Wheeled excavator with hydraulic breaker	78.0	1	70
Diesel generator	94.0	1	80
Rotary Piling	83.0	2	60
Tower Crane	76	2	80

7.106 Predictions have been carried out to determine noise levels likely to be generated during the construction phase for the development. For the purpose of these predictions, it was assumed that the intervening ground between the construction noise sources and the receivers will be acoustically hard such that there will be no additional attenuation of sound due to ground absorption, and that no acoustic barriers such as local buildings will be present, thus informing a worst case assessment.

7.107 Noise predictions have been undertaken for the seven off-Site noise sensitive receptors R1 to R8.

7.108 Table 7.16 sets out the average predicted unmitigated earthworks and construction noise levels for the construction stage of the works. A 75dB assessment criterion has been adopted in accordance with guidance contained in BS 5228 for urban areas. Any exceedances are highlighted in bold.

7.109 The average assessments are based on the average position to the centre of the closest phase/development plot to that receptor. Any works that take place closer to the receptor will be for a short period and an average, central position is considered robust.

Table 7.16 Noise and Vibration Sensitive Receptors

Receptor	Average Earthworks Noise Levels, $L_{Aeq, 10hr}$ (dB)	Average Construction Noise Levels
R1 Great Jackson St - East	67.0	72.0
R2 Melbourne St – South East	64.8	69.9
R3 New Your Street - South West	64.4	69.4
R4 Jackson Crescent South	64.1	69.2
R5 Blantyre Street – North West	69.1	74.1
R6 North of Chester Road (A56) - North	69.9	75.0
R7 Beattock Street - West	63.1	68.1
R8 Crown Street Phase 1	77.3	82.8

7.110 A review of Table 7.16 identifies that the calculated unmitigated construction noise level is exceeded at receptors R8 Crown Street Phase 1. Therefore, mitigation measures will be required for these receptors during the construction phase, as well as the earthworks phase. The remaining receptors fall below the 75dB $L_{Aeq, 10hour}$ criterion adopted for this assessment.

7.111 It is worth noting that the receptors at Crown street Phase 1 would be located internally during the construction works, and upgraded glazing and alternative ventilation have been included as part of Crown Street Phase 1 development. With a partially open window (-15dB) the 75dB criterion would not be exceeded therefore the impact is categorised as **minor**.

7.112 The sensitivity of receptor R8 is categorised as **high** and the magnitude of impact is categorised as **minor**. Accordingly, there is predicted to be an adverse temporary short-term impact categorised as **minor to moderate** significance prior to the implementation of mitigation measures. This is not considered significant considering the temporary nature of the construction works.

7.113 It should be noted that these predictions are worst case in that it is assumed that any mitigation measures, or screening afforded by site hoardings have not been implemented. Furthermore, it should be noted that it is unlikely that operations are to be conducted on the sections of the Site closest to each of the identified receptors for significant periods of time. For the majority of the construction phase it is expected that activities will be conducted at greater distances from the receptors.

Construction Vibration

7.114 Groundborne vibration calculations have been performed for typical construction activities / machinery based on the empirical prediction procedures and historical measurement data presented within BS 5228-2 and the TRL RR 246. Such predictions have been performed in order to determine the possible distances at which the adopted significance criteria may be registered based on a specified confidence limit (where applicable). In this regard, the groundborne vibration levels and associated distances have been identified for a sample of typical construction vibration sources as shown in Table 7.17.

Table 7.17 Sample of Construction Vibration Sources

Plant Type	Confidence Limit	Distance	PPV (mm/s)
Vibratory rollers – start & end	95	60	0.3
	95	23	1.0
Vibratory rollers – steady state¹	95	3.3	10
Piling – driven cast in place	95	215	0.3
	95	85	1.0
	95	15	10
Rotary bored piling - Auguring	N/A	20	≤0.3
	N/A	6	≤1.0
	N/A	0.6	≤10
Rotary bored piling – Auger hitting base	N/A	45	≤0.3
	N/A	14	≤1.0
	N/A	1.4	≤10
Rotary bored piling – Driving casing	N/A	75	≤0.3
	N/A	23	≤1.0
	N/A	2.3	≤10
HGV's²	N/A	50	≤0.3
	N/A	17	≤1.0
	N/A	2.5	≤10.0

1. Assumes 2 rollers, 0.4mm amplitude, drum width of 1.3m, e.g. heavy-duty ride on roller

2. Assumes max height / depth of surface defect of 50 mm, max speed of 30 km/h, and that surface defect occurs at both wheels.

Note: Where alluvium soils are present, higher vibration levels can be expected.

7.115 It should be noted that the data presented within Table 7.17 is general in nature and is not specific to the Site, however the vibration levels and associated distances can be used to determine the typical distances at which specific impacts are likely to be registered.

7.116 As receptors are located close to Site boundaries, a nominal distance of 20m is considered worst case to the majority of receptors. In this regard, Table 7.18 presents the predicted magnitude of impact at these dwellings. It should be noted that the magnitude ratings presented within the table, in some cases, have been generated based on a 95% confidence limit, in reality, it is likely that lower vibration levels will prevail for the majority of activities.

Table 7.18 Predicted Magnitude of Effects at 20m from Activities – Ground Bourne Vibration

Activity	Magnitude of Impact
Vibratory Rollers	Moderate
Piling – Driven cast in place	Major
Rotary bored piling – Driving casing	Moderate
HGV's	Minor

7.117 During the use of vibratory rollers, the sensitivity of the receptors are categorised as high and the magnitude of impact is categorised as moderate. Accordingly, there is predicted to be an adverse temporary short-term impact categorised as moderate significance prior to the implementation of mitigation measures. This is not considered significant given the short operational duration of piling operations close to the receptors.

7.118 During piling operations, assuming this takes place within 20m of the closest receptors, the sensitivity of the receptors are categorised as high and the magnitude of impact is categorised as major. Accordingly, there is predicted to be an adverse temporary short-term impact categorised as major significance prior to the implementation of mitigation measures. This is subject to the location of the piling operations and implementation of mitigation measures discussed further on.

7.119 It should be noted that this is a worst-case assessment based on the minimum possible distances at which construction activities could reasonably take place from existing vibration sensitive receptors. In reality, for the large majority of the earthwork / construction phase, it is expected that activities will take place at greater distances from such properties thus leading to lesser significance of effects. Furthermore, it should be noted that the vibration predictions have utilised a large data set covering a range of measured levels applicable to each operation. It is evident from this dataset that, for the majority of operations (approximately 95% in most cases), predicted levels will be lower than those presented within Table 7.18.

7.120 It should be noted that the above assessment has been undertaken based on vibration levels associated with a small range of groundborne vibration generative construction activities. It is possible that activities other than those presented may take place. Similarly, some of those presented may not be applicable to the construction activities specific to the Site. The conclusions drawn from this assessment should therefore be used for indicative purposes only.

Construction Generated Road Traffic Noise

7.121 It is anticipated that in order to complete the preparation and construction phases of the development, it will be necessary to move a significant amount of material to and from the Site, thus resulting in a number of construction generated road traffic movements.

7.122 It should be noted that relatively large increases in road traffic movements would need to prevail in order for noticeable increases in road traffic noise levels to occur as a result of construction generated road traffic. As a general guide, although not accounting for changes in the percentage of HGV's, a 25% increase in traffic movements will only result in a 1dB increase in noise levels. Similarly, a 58% increase would be required for 2dB and 100% increase for a 3dB increase. It should be noted that a 3dB increase in noise levels is generally barely perceptible to the average human.

7.123 The sensitivity of the residential receptors is categorised as **high** and the magnitude of impact is categorised as **negligible**. Accordingly, there is predicted to be a **negligible** impact at all receptors. Furthermore, it should be noted that any increase in noise levels associated with construction generated road traffic is expected to be limited to the daytime hours only and will only take place a temporary period of time.

7.124 Given the predicted effect on local receptors it is not necessary to consider mitigation measures.

Completed Development

Change in Road Traffic Levels on Existing Receptors

7.125 Upon completion of the proposals, it is anticipated that local road traffic noise levels may change as a result of development generated vehicle movements. Therefore, it is appropriate to consider the magnitude of any impacts that might arise.

7.126 The results of the Transport Assessment undertaken by Vectos have been used as the basis for the road traffic noise assessment. This focuses on roads immediately surrounding the site before the development generated traffic is dispersed across the wider network. The traffic data supplied in the form of 18-hour AAWT flows was used in the calculations.

7.127 Where road traffic route alignments are to remain unchanged, road traffic noise calculations have been carried out in accordance with CRTN, being undertaken for a notional receptor location 10m from the edge of the carriageway of each road considered and 0.5m above ground level. A notional receptor has been used because the change in noise level adjacent to any given road will be the same at all locations where noise from this route is dominant.

7.128 The predicted changes in short term road traffic noise are shown in Table 7.19. This Table shows the difference between the assumed opening year without development (2032 Do Min) and with the development (2032 Do Som).

Table 7.19 Predicted Change in Road Traffic Noise Between 2032 Do Min and 2032 Do Som

Road	Opening Year (2032) Without Development (Do-Min) L _{A10,18hr} (dB)	Opening Year (2032) with Development (Do-Som) L _{A10,18hr} (dB)	Change in Noise Level +/- (dB)	Corresponding Magnitude of Impact
A - Link North to Roundabout from A57	63.9	64.1	+0.2	Negligible
B - Link North from round to A57	69.4	69.7	+0.3	Negligible
C -Roundabout north	70.7	70.9	+0.2	Negligible

Road	Opening Year (2032) Without Development (Do-Min) L_{A10,18hr} (dB)	Opening Year (2032) with Development (Do-Som) L_{A10,18hr} (dB)	Change in Noise Level +/- (dB)	Corresponding Magnitude of Impact
D - A5067 - Chorlton Road	67.9	67.9	0.0	No Change
E - Roundabout South/west	68.7	68.8	+0.1	Negligible
F -Link onto from A57 to Chester Road	67.2	67.2	0.0	No Change
G - Mancunian Way West	72.9	72.9	0.0	No Change
H - Roundabout east	68.1	68.4	+0.3	Negligible
I - Link onto A57 from Chester Road	66.4	66.8	+0.4	Negligible
J - Chester Road West	66.5	66.8	+0.3	Negligible
K - Chester Road West	64.9	64.9	0.0	No Change
L - Chester Road East	69	69	0.0	No Change
M - Great Jackson Street	59.3	60.6	+1.3	Minor
N - Mancunian Way East	75.5	75.6	+0.1	Negligible
O - Mancunian Way East	75.5	75.5	0.0	No Change
P - City Road East	62.8	63.2	+0.4	Negligible
Q - Mancunian Way Link Road	68.1	68.1	0.0	No Change
R - Medlock street south	69.8	69.8	0.0	No Change
S - Medlock Street North	69.4	69.4	0.0	No Change
T - Deansgate	59.7	59.7	0.0	No Change
U - Roundabout west	73.2	73.3	+0.1	Negligible
Mancunian Way East	73.3	73.3	0.0	No Change

7.129 It can be seen from Table 7.19 that the greatest predicted short-term road traffic noise level change is expected along Great Jackson Street, with increases between 1.3dB. The remaining roads all fall within the negligible to not change magnitude.

7.130 Comparing this increase in road traffic noise levels as a result of the Proposed Development with the guidance contained in the DMRB, it can be shown that the magnitude of impact is categorised as **minor**. The sensitivity of the existing noise sensitive receptors is categorised as **high** and the magnitude of impact is categorised as **minor** given the locality of the road within a city centre environment.

7.131 Therefore, specific measures are not required and this level of increase is considered acceptable.

Road Traffic Noise Impact Assessment upon Proposed Development

7.132 For the purposes of this assessment, REC has used the noise modelling software CadnaA 2018 to determine the impact of noise from the Mancunian Way, Chester Road and the surrounding roads across the Site.

7.133 A noise model has therefore been constructed in order to calculate façade noise levels and external noise levels due to road traffic noise. The noise modelling is based on worst case scenario A, D (without C3), and E, as the inclusion of the school building that provides screening is not included.

7.134 The following inputs have been included in the model:

- Site Layout Plan (drawing no. 10292-Z1-SHP-G100-PL-00-Sk01) produced by Simpson Haugh Architects;
- Site elevations have been taken using 1m DTM LiDAR data;
- A floor height of 3m has been assumed for the school building and tower blocks;
- Existing buildings that provide shielding from any of the noise sources have been included in the model;
- The calculated daytime noise levels at a distance of 10m as shown in Table 3 below have been used to calibrate the noise model;
- A reflection order of 2 has been used in all calculations; and
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

7.135 Table 7.20 below shows traffic data provided by Vectos, which has been included within the noise model. Also, the predicted 16-hour daytime level which has been calculated using methods given in CRTN and the TRL Document.

7.136 The traffic data used accounts for the opening year traffic flows attributable to the growth in the baseline vehicle numbers, together with the growth caused by the committed developments for the 2032 Baseline.

Table 7.20 Traffic data & Predicted Noise Levels

Link Reference From Traffic Data	Road	18hr Flow (2032, Baseline)	Road Speed (Km/h)	Predicted Road Traffic Levels at 10m $L_{A10,18hr}$ (dB)	Calculated Daytime Noise Level $L_{Aeq, 16hr}$ (dB)	Calculated Night-Time Noise Level $L_{Aeq, 8hr}$ (dB)
C	Roundabout north	16074	4	12	70.7	68.7
E	Roundabout South	18916	3	17	68.7	66.7
F	Western bound Link Road from A57 to Roundabout	10945	3	54	67.2	65.2
G	Mancunian Way (A57) West	30656	5	69	72.9	70.9
H	Roundabout East	17340	4	36	68.1	66.1
I	Eastern bound Link Road from roundabout to A57	9300	5	46	66.4	64.4
J	Chester Road West	11518	4	21	66.5	64.5
K	Chester Road East	7966	4	39	64.9	62.9
U	Roundabout west	15480	4	8	73.2	71.2
V	Mancunian (A57) Way East	26618	7	56	73.3	71.3

Internal Noise Impact for Proposed Dwellings

7.137 In order to accurately determine the noise level within habitable rooms, it has been necessary to calculate the external noise level immediately outside the façade. Accordingly, the noise model has been used in order to calculate façade noise levels due to the impact of road traffic noise. Tables A1 and A2 within Appendix 7.1 detail the predicted levels and compares the internal noise levels with the criteria assuming a closed window and open window. In order to take account for the facades facing different directions, the assessment has divided building C4 into 3 blocks (Block 1 -south, Block 2 central & Block 3 - north) and building C5 has also been divided into 3 blocks.

7.138 With regards internal noise levels, BS8233:2014 suggest that a glazing unit with configuration 6mm glass/12mm air space/6mm glass affords sound insulation performance in the order of 33dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 30dB and so this value has been used to calculate internal noise levels. It is also goes on to recommend that a partially open window provides approximately 15dB attenuation.

7.139 Tables A1 and A2 of Appendix 7.1 detail the external façade levels at each apartment façade and details the internal noise assessment with windows closed and open for the daytime and night-time period respectively. Exceedances are highlighted in bold. Only facades that include window units have been assessed.

7.140 The assessment has shown that upgraded glazing will be needed in certain living rooms overlooking the roads. The following Living rooms will be required upgraded glazing:

- Building C4 – Block 1 – 2nd to 5th Floors - South East facing facades;
- Building C5 – SW Block – 2nd to 7th Floors – South West facing facades; and
- Building C5 – SE Block - Ground to 9th Floors – South East facing facades.

7.141 With regards alternative ventilation, it has been assumed that Purge vents would be required for fresh air flow and background ventilation. If windows are opened, it has been shown, that the internal criteria would be exceeded for all habitable rooms. Therefore, a system is required that provides fresh air flow and background ventilation to the habitable rooms with windows remaining openable for purge ventilation. The exact requirements are shown in Mitigation Section. Details of the proposed ventilation scheme can be found within the M&E report which forms part of the application.

7.142 Without mitigation in place, the LOAEL is achieved which would be noticeable and disruptive resulting in the following:

"Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance".

7.143 With regards the maximum instantaneous noise levels at night, considering the distance from the Mancunian Way, the impact is considered negligible. Indeed, the 10th highest measured level at 50m at NMP1 was 86.7dB, when corrected to the closest façade, this results in a level of 78dB. Accordingly, standard glazing is sufficient to control bedroom noise levels. A sound reduction index of 30dB has been applied for standard thermal double glazing as the maximum noise level is does not include any features of the tonal nature of road traffic sound.

Primary School – External Amenity Area

7.144 In order to make sure the location of the school in the outline application is appropriate, a check on the noise levels has been undertaken. A grid noise map has been used to predict the noise levels at the proposed Primary School. It is understood that as part of the development the play area could be located on the roof of the building, therefore the grid noise map has been created at a height of 8.5m, assuming the primary school is 7m tall. A taller school will only improve the situation. Figure 7.4 of Appendix 7.1 details this grid noise map which is based on a worst-case scenario without any mitigation in place.

7.145 For new schools, BB93 recommends that 60dB L_{Aeq,30min} should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas. Figure 7.4 of Appendix 7.1 shows that the noise levels at roof level range between 61dB and 68dB, therefore mitigation measured are required in order to reduce the noise levels to an acceptable level. Given the steady state noise from the road, the 30_{minute} L_{Aeq} was not dissimilar to the L_{Aeq,16hr}.

7.146 Playgrounds, outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from busy roads where necessary. Therefore, including the playground on the south western part of the roof would ensure a buffer zone for any proposed outdoor teaching areas that could be located on the norther eastern area.

7.147 BB93 recommends that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB $L_{Aeq,30min}$. It is understood from the proposals that certain outdoor teaching areas are to be located to the rear of the building on the north eastern façade, this would provide sufficient screening as can be seen the façade level on the north eastern area falls to below 50dB.

Primary School – Internal Habitable Rooms

7.148 In order to accurately determine the noise level within the classrooms, it has been necessary to calculate the external noise level immediately outside the façade. Accordingly, the noise model has been used in order to calculate façade noise levels due to the impact of road traffic noise.

7.149 With regards internal noise levels, BS8233:2014 suggest that a glazing unit with configuration 6mm glass/12mm air space/6mm glass affords sound insulation performance in the order of 33dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 30dB and so this value has been used to calculate internal noise levels. It is also goes on to recommend that a partially open window provides approximately 15dB attenuation.

7.150 Table 7.21 determines whether the internal noise criteria can be achieved with standard thermal double glazing for each building façade. The purpose of the assessments is to determine whether the internal noise criteria can be achieved with or without mitigation.

Table 7.21 Calculation of Internal Noise Levels and Comparison with Criteria - Glazing

Receptor	Façade	Highest Predicted Sound Pressure Level, $L_{Aeq,T}$ (dB)	Internal Sound Pressure Level with Standard Double Glazing (-30dB)	Relevant Criteria	Difference
School Classroom	North West	65	35	30	+5
	South West	68	38	30	+8
	South East	61	31	30	+1
	North East	48	18	30	-12
School Offices/ Staff Rooms/ Open Plan Rooms	North West	65	35	40	-5
	South West	68	38	40	-2
	South East	61	31	40	-9
	North East	48	18	40	-22

7.151 Table 7.21 shows that upgraded glazing would be required for any classrooms located on the NW, SE & SW. Additionally, standard thermal double glazing should be sufficient for any offices or uses with a lower sensitivity across the School Building, in relation to road traffic noise.

7.152 During summer months it may be necessary to open a window to allow fresh air flow. This will result in a reduction of the attenuation provided. Table 7.22 details the worst affected facades for each use for the daytime where applicable, and determines whether the internal noise criteria can be achieved with a partially open window.

Table 7.22 Calculation of Internal Noise Levels and Comparison with Criteria – Partially Open Window

Receptor	Façade	Highest Predicted Sound Pressure Level, $L_{Aeq,T}$ (dB)	Internal Sound Pressure Level with Partially Open Window (-15dB)	Relevant Criteria	Difference
School Classroom	North West	65	50	30	+20
	South West	68	53	30	+23
	South East	61	46	30	+16
	North East	48	33	30	+3
School Offices/ Staff Rooms/ Open Plan Rooms	North West	65	50	40	+10
	South West	68	53	40	+13
	South East	61	46	40	+6
	North East	48	33	40	-7

7.153 Table 7.22 determines that the all classrooms and offices/other uses will require alternative ventilation in order to negate the need to open the widows with the exception of North East facing offices and similar uses.

Plant Emission Limits Assessment

7.154 At the time of producing this report, the proposed M&E plant items associated with the Proposed Development had not been confirmed. Accordingly, it is necessary to set plant noise emission limits for which any plant items shall not exceed, when measured or calculated at the closest proposed residential receptors.

7.155 MCC have stipulated the following criteria:

- $L_{Ar} = L_{A90} - 5\text{dB}$

7.156 This indicates that the Rating Level, from any single or combined plant items, shall fall below the existing background noise level by at least 5dB, when measured or calculated at the façade of the closest proposed residential receptor. With regards applying the feature penalties given in BS4142:2014, in our opinion the fixed plant items, such as, air conditioning units and extractor fans will have a tonal aspect to them. Therefore, a penalty of 4dB has been applied as the tones would be clearly perceptible but due to the dominance of road traffic noise across the Site, the tones should not be highly perceptible.

7.157 The proposed operating periods for M&E plant had not been finalised at the time of producing this assessment, as such Table 7.23 details the calculated plant noise emission limit based on the typical measured 1-hour daytime and 15-minute night-time background sound levels.

Table 7.23 Calculated Plant Noise Emission Limits

Proposed Element	Period	Lowest Average Measured Background Sound Level $L_{A90,1hr}$ (dB)	Criteria	Calculated Plant Noise Emission Limits, L_{Ar} (dB)
Fixed Plant Items	Daytime (07:00 – 23:00)	45	$L_{Ar} = L_{A90} - 5dB$	40
	Night -Time (23:00 – 07:00)	42		37

7.158 For the avoidance of doubt, it is recommended that the plant noise emission limits set for the proposed dwellings are adhered to as these are marginally lower. Table 7.23 indicates the plant noise emission limits which should be adhered to at the nearest habitable/sensitive façade for any fixed M&E plant which may form part of the Proposed Development.

7.159 As long as the derived rating levels are not exceeded at the receptors, a negligible impact should be observed due to fixed plant noise. The sensitivity of the existing noise sensitive receptors is categorised as high and the magnitude of impact is categorised as negligible. Accordingly there is predicted to be a negligible impact at the noise sensitive receptors.

Mitigation Measures

Demolition and Construction

7.160 This Section details the mitigation measures required in order to reduce the significance of impacts predicted in the previous section.

Mitigation from Earthworks and Construction Noise Effects

7.161 Accepted safeguards exist to minimise the effects of construction noise, these include:

- The various EC Directives and UK Statutory Instruments that limit noise emissions from a variety of construction plant;
- Guidance set out in BS5228-1 which covers noise control on construction sites; and,
- The powers that exist for local authorities under Sections 60 and 61 of the Control of Pollution Act 1974 to control noise from construction application sites.

7.162 The adoption of Best Practicable Means, as defined in Section 72 of the Control of Pollution Act 1974 is usually the most effective means of controlling noise from construction sites. Such measures where appropriate may include the following:

- Any compressors brought on to the Site to be silenced or sound reduced models fitted with acoustic enclosures;
- All pneumatic tools to be fitted with silencers or mufflers;
- Care to be taken when erecting or striking scaffolds to avoid impact noise from banging steel. All operatives undertaking such activities to be instructed on the importance of handling the scaffolds to reduce noise to a minimum;
- The majority of deliveries to be programmed to arrive during normal working hours only. Care to be taken when unloading vehicles to minimise noise. Delivery vehicles to be routed so as to minimise disturbance to local residents. Delivery vehicles to be prohibited from waiting within or in the vicinity of the Site with their engines running;
- All plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise;
- All plant to be sited so that the noise impact at nearby noise sensitive properties is minimised;
- Local hoarding, screens or barriers to be erected as necessary to shield particularly noisy activities; and,
- Problems concerning noise from construction works can often be avoided by taking a considerate and neighbourly approach to relations with the local residents. Works should only take place during given periods, e.g. during normal construction hours and not at night.

7.163 It is recommended that the above measures be included in any Construction Environmental Management Plan (CEMP) that may be issued to and agreed with the contractor(s) conducting the works.

7.164 Experience from other sites has shown that by implementing the above measures, typical noise levels from construction works can be reduced by approximately 5dB to 10dB. Therefore, any impact from construction activities is not considered significant.

Construction

7.165 In light of the predicted significance of effects it is recommended that a vibration monitoring programme be put in place in the event that activities are conducted at distances at which effects of major adverse significance may occur. Where vibration levels exceed 10mm/s PPV, works within such areas should cease and alternative methods / working practices should be considered.

7.166 It is possible to employ a number of physical and operational measures in order to reduce the potential effects resulting from construction generated vibration. These may include:

- Adoption of low vibration working methods. Consideration should be given to use of the most suitable plant;
- Where processes could potentially give rise to significant levels of vibration, on - site vibration levels should be monitored regularly by a suitably qualified person;
- Where piling is to take place, any obstructions should first be removed;
- The provision of cut-off trenches in order to interrupt the direct transmission path of vibrations;
- Reduction of energy input per blow (applicable to piling); and,
- Application of piling techniques aimed at reducing resistance to penetration e.g. pre-boring for driven piles and adding water to the hole for impact bored piles.

7.167 It is expected that mitigation measures and operational considerations such as these would be incorporated within the development of the site construction methodologies in order that the effects of groundborne construction vibration can be controlled wherever practically possible. Therefore, any impact from construction activities is not considered significant

Construction Generated Road Traffic Noise

7.168 As there is unlikely to be any significant increase in noise levels on the local road network as a result of construction generated traffic, the implementation of mitigation measures is not required.

Cumulative Effects**Construction**

7.169 Should the construction phase programmes of any other proposed or committed developments as set out in Appendix 2.2 in the vicinity of the Proposed Development overlap then there is the potential for significant cumulative noise and vibration impacts at sensitive locations (as detailed in Table 7.16). However, implementation of suitable mitigation options, as outlined within this chapter, and employed at the other development sites will ensure that there is no significant cumulative effect.

Completed Development**Road Traffic Sound – Proposed Residential**Glazing Requirements

7.170 The previous section has indicated that habitable rooms in certain apartments with line of sight to the Mancunian Way will exceed the internal target noise criteria with standard thermal double glazing, as detailed in Tables A1 and A2. Table 7.24 details the required specification of upgraded glazing in order to achieve the performance. As the glazing units are associated with living rooms and bedrooms, the highest exceedance has been used to determine the required performance.

7.171 The following Living rooms will be required higher specification glazing:

- Building C4 – Block 1 – 2nd to 5th Floors - South East facing facades;
- Building C5 – SW Block – 2nd to 7th Floors – South West facing facades; and
- Building C5 – SE Block - Ground to 9th Floors – South East facing facades.

Table 7.24 Higher Specification Glazing Requirements – Residential

Plot	Floors	Orientation	Exceedance +/- (dB)	Minimum Required Glazing Performance, R _w + C _{tr} (dB)
Building C4 Block 1	2 nd to 5 th Floors	South East	+1	31
Building C5 – SW Block	2 nd to 7 th Floors	South West	+1	31
Building C5 – SE Block	Ground, 6 th to 9 th Floors	South East	+1	31
	1 st to 5 th Floors		+2	32

Alternative Ventilation

7.172 The previous Section determined that, with a partially open window, the internal noise levels for the all habitable rooms will exceed the internal target criteria.

7.173 Accordingly, it is recommended that an alternative ventilation system is installed to provide background ventilation and fresh air flow.

7.174 It is understood that Renaker are to install a Mechanical Ventilation with Heat Recovery (MVHR) system within all apartments. Purge venting will be provided by opening purge vents within the unitised façade. This system will provide a constant supply of fresh filtered air whilst also maintaining thermal comfort and is more than sufficient. As no vents are required within the habitable rooms to provide the background ventilation and fresh air flow, i.e. trickle vents, the acoustic performance of the façade are not compromised.

Road Traffic Sound – School Building

External Play Area

7.175 The assessments determined that the noise level within the proposed play area will range from 61dB to 68dB without any mitigation and as such are not considered the lowest practicable noise levels.

7.176 Accordingly, an additional noise model has been run with a 2.5m high barrier around the proposed play area overlooking the roads on the south western area. With barrier in place, noise levels reduce to 55dB in the central area up to 58dB in the worst affected areas Accordingly, 2.5m high barriers are considered acceptable and the vast majority of the roof area in order to achieve the BB93 criteria.

7.177 The grid noise map can be seen in Figure 7.4 of Appendix 7.1.

7.178 The barriers proposed for the Site can be of wooden fence or brick wall construction and should be of close boarded construction, be free from holes, sealed at the base and have a minimum mass of 10kg/m².

7.179 With mitigation in place, the No Observed Adverse Effect Level (NOAEL) which would be Noticeable and not intrusive would be achieved, resulting in:

"Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."

Internal

7.180 The previous section determined that any classrooms located on the NW, SW & SE will require higher specification glazing above and beyond the minimum 30dB $R_w + C_{t,r}$. Accordingly, Table 7.24 below details the rooms and façade orientations and minimum performance required.

Table 7.24 Higher Specification Glazing Requirements – School Building

Plot	Floors	Orientation	Exceedence +/- (dB)	Minimum Required Glazing Performance, $R_w + C_{t,r}$ (dB)
School Building	Classroom	North West	+5	35

Plot	Floors	Orientation	Exceedence +/- (dB)	Minimum Required Glazing Performance, R _w + C _{tr} (dB)
		South East	+8	38
		South West	+1	31

7.181 The assessments determined that with a partially open window, the internal noise levels for majority of the room uses will exceed the internal target criteria due to road traffic sound. Accordingly, it is necessary to consider an alternative ventilation scheme which does not require the opening of windows to provide fresh air flow and background ventilation. Windows should remain openable for purge ventilation. The exact system used is dependent on the developer, and must also address other considerations such as Air Quality and ventilation requirements.

Proposed Commercial Sound

7.182 This Chapter has set plant noise emission limits for any proposed fixed plant items associated with the proposed commercial premises in order to protect the amenity of proposed and existing receptors.

7.183 As the exact details of the fixed plant are unknown, mitigation measures may be required for certain areas due to certain activities associated with the proposed commercial and will need to be assessed individually at the detailed planning stage.

7.184 It is worth considering appropriate site design for the commercial premises to lessen any potential impact at the receptors. Such as:

- Siting plant items away from receptors, i.e. on the shadow side of the commercial;
- Any service areas should be suitably screened from the receptors; and
- Where night time workings are required, these should be located within the commercial area and shielded by other premises that may only operate during the daytime.

Residual Effects

7.185 The residual impacts assume that the mitigation and recommendations described above have been implemented in order to achieve the criteria or the lowest practicable levels.

7.186 Therefore, impacts should be described as, e.g. minor beneficial in the long term at the local level.

Construction Phase

Construction Noise

7.187 If a CEMP is followed and adhered to and best practicable means are followed there should be a short term **minor adverse impact** at local level during the duration of the construction phase at existing and any proposed receptors. The impacts are not considered significant.

Construction Vibration

7.188 It is assumed that best practicable means are followed which should result in a short term **minor adverse** impact at local level during the duration of the construction phase at existing and any proposed receptors. The impacts are not considered significant.

Construction Generated Traffic

7.189 There is predicted to be a **short-term negligible** impact at all receptors at the local level. Furthermore it should be noted that any increase in noise levels associated with construction generated road traffic is expected to be limited to the daytime hours only.

Operational Phase

Change in Road Traffic Noise Levels

7.190 Comparing the changes, as a whole, in road traffic noise levels as a result of the Proposed Development with the guidance contained in the DMRB, it can be shown that the magnitude of impact is categorised as short term **negligible** at the local level.

Existing Road Traffic Noise Impact

7.191 Within internal habitable rooms, a **negligible long term** permanent impact at the local level can be achieved through the use of higher specification glazing and alternative ventilation, where required.

Proposed Commercial Sound

7.192 At this stage, any residual impacts are unknown as the exact use of the units is not known. However, as long as the BS4142:2014 and MCC's criteria are achieved at the detailed planning stage, there should be a negligible to minor adverse long term impact at any existing or proposed receptors at the local level.

Table 7.25 – Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
Construction Noise & Vibration	R1 to R8	Ensuring best practicable (BPM) means are undertaken during Site works. Undertaking a Construction Environmental Management Plan.	Short term Minor adverse at the local level (Non-significant)
Operational Phase			
Change in Road Traffic Noise	R1 to R8	Appropriate site layout and mitigation measures	Potential for Negligible to Minor long term impact at the local level. (Non-significant)
Existing road traffic noise	Proposed Receptors	Appropriate site design and acoustic glazing	Potential for Negligible to Minor long term impact at the local level. (Non-significant)

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Proposed Commercial	Proposed Receptors & R8	Appropriate site design and acoustic glazing	Unknown – Can achieve Negligible long term impact at the local level (Non-significant)

Summary

- 7.193 This Report assesses the impact of the Proposed Development on Noise and Vibration. In particular, it considers the potential effects of construction noise and vibration and changes in road traffic noise levels on existing receptors as well as existing and proposed sources of noise upon the proposed and existing receptors.
- 7.194 The Report describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development arising from the proposed commercial development and changes in road traffic levels, the mitigation measures required to prevent, reduce, or offset the impacts and the residual impacts.
- 7.195 In order to determine baseline noise levels at existing and proposed receptors, a Baseline Noise Survey has been carried out around the Site. The Baseline Noise Survey consisted of Road Traffic Noise Surveys and Background Sound Surveys.
- 7.196 If a Construction Environment Management Plan (CEMP) is followed and adhered to and best practicable means are followed there should be a short term minor adverse impact at local level during the duration of the construction phase at existing and any proposed receptors due to construction noise and vibration. The impacts are not considered significant. Additionally, there is predicted to be a short term negligible impact at all receptors at the local level due to construction generated traffic.
- 7.197 Comparing the changes, as a whole, in road traffic noise levels as a result of the Proposed Development with the guidance contained in the Design Method for Roads and Bridges (DMRB), it can be shown that the magnitude of impact is categorised as long term negligible at the local level.
- 7.198 The Noise Impact Assessment has identified that the key sources of noise that have the potential to impact upon the proposed residential receptors and School are road traffic using Chester Road and the Mancunian Way and noise associated with the proposed commercial units, such as fixed mechanical and electrical plant items.
- 7.199 Noise modelling software has been used in order to predict the incident noise levels upon the proposed facades.
- 7.200 The assessment has recommended that upgraded glazing is will be required for certain bedrooms and living rooms overlooking the roads. The following Living rooms will require updated glazing:
- 7.201 The following Living rooms will required upgraded glazing:
- Building C4 – Block 1 – 2nd to 5th Floors - South East facing facades;
 - Building C5 – SW Block – 2nd to 7th Floors – South West facing facades; and
 - Building C5 – SE Block - Ground to 9th Floors – South East facing facades.

- 7.202 A Mechanical Ventilation with Heat Recovery system will be a requirement for the apartments and purge venting will be provided by opening purge vents within the unitised façade.
- 7.203 This assessment has set M&E plant noise emission limits based on the existing measured background noise level and the adopted criteria given in BS4142:2014 for any proposed fixed plant items.
- 7.204 Subject to the incorporation of the identified mitigation measures and compliance with the specified plant noise emission limits, it is anticipated that a commensurate level of protection can be provided against development-generated noise for the closest residential receptors.
- 7.205 With regard to the internal areas of the school, mitigation measures in the form of upgraded glazing may be required depending on the location of the classrooms within the school building. Therefore, it is advised that classrooms are not located on south western faced in order to negate the need for high specification glazing and less sensitive uses such as offices or kitchens are located within the south western area of the building.
- 7.206 The Noise Impact Assessment has determined that with mitigation measures in place, the NOAEL with noise being noticeable and not intrusive and with the following advice:
- "Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."*
- 7.207 The assessment has been based on robust and worst case assumptions. This assessment has shown that, in principle, there should be no adverse impact at the closest receptors as a result of the existing or proposed noise sources.

7 (B) Noise and Vibration

Introduction

7.208 This Chapter of the ES discusses the likely significant effects of the Proposed Development with respect to noise and vibration. In particular, the Chapter assesses the impact of Phase C only, as Phases A and B have been assessed previously as part of the hybrid application and have now been implemented. This Chapter also describes the methods used to assess the effects of the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

7.209 This Chapter supplements and refers to the Noise and Vibration Chapter of the Environmental Statement submitted and approved as part of the hybrid permission for Crown Street Phase 2 (planning reference 126668/FO/2020) ('the approved Noise and Vibration Chapter'). The approved Noise and Vibration Chapter forms Chapter A of this Environmental Statement Addendum).

7.210 This Chapter forms an addendum to the approved Noise and Vibration Chapter, previously prepared by Ensaf (formerly REC Ltd).

7.211 This Chapter has been compiled by Fisher Acoustics Ltd. Fisher Acoustics has extensive experience in the acoustic design of large-scale residential and commercial developments. The Director of Fisher Acoustics is a Chartered Engineer, holds a First Class Bachelor of Engineering in applied acoustics and has 30 years' post-graduate experience in acoustic consultancy.

7.212 The Appendix to this Chapter is as follows:

- Appendix 7.2: Crown Street School, Environmental Noise Assessment, report reference C3-FAC-A180-Rp-XX-001

Legislative and Policy Context

Legislation

7.213 The Control of Pollution Act 1974 contains powers for local authorities to deal with noise and vibration from construction and demolition sites. Prior consent for demolition and construction activities can be granted under Section 61 of the Act.

7.214 The Planning and Compulsory Purchase Act 2004 requires local authorities to draw up local development plans, setting the broad framework for acceptable development in their area and reconciling any potential conflicts. Under the Town and Country Planning Act 1990, and in their development management role, local planning authorities may attach conditions to Planning Consents which may include controls on the emission of noise. Advice on the use of these powers is given to English authorities in the light of the Governments Noise Policy Statement for England in the National Planning Policy Framework (July 2021).

7.215 The Environmental Protection Act 1990 provides the principal controls over so-called 'statutory nuisances', including noise emitted from premises so as to be prejudicial to health or a nuisance. Under the Act, local authorities have a duty to inspect their areas from time-to-time to detect nuisances and, subject to a discretion to defer for seven days, when satisfied that a statutory

nuisance exists or is likely to occur or recur, to serve an abatement notice on the person responsible. They also have a duty to investigate any complaint made by a person living within their area.

National Planning Policy Framework (NPPF)

7.216 The National Planning Policy Framework (NPPF), published in July 2021 by the Ministry of Housing, Communities and Local Government 'sets out the Government's planning policies for England and how these should be applied'.

7.217 Clause 174 of the National Planning Policy Framework states that 'Planning policies and decisions should contribute to enhance the natural and local environment **by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.**

7.218 Clause 185 of the National Planning Policy Framework states that: **Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.**

7.219 The National Planning Policy Framework document cross references the 'Explanatory Note to the Noise Policy Statement for England'. The 'Noise Policy Statement for England' (NPSE) was published by the Department for Environment Food and Rural Affairs in March 2010. The NPSE states that the long term vision of Government noise policy, is to '**promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development**'. The NPSE also states that '**This long term vision is supported by the following aims:**

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- **avoid significant adverse impacts on health and quality of life;**
- **mitigate and minimise adverse impacts on health and quality of life; and**
- **where possible, contribute to the improvement of health and quality of life.**

7.220 The NPSE does not give suggested external noise criteria for Developments. In the absence of specific criteria, reference shall be made in this document to established guidance and principles, as established in British Standards and the local Planning policy.

National Planning Practice Guidance – Noise

7.221 'Planning Practice Guidance – Noise' is a web-based resource provided by the Ministry of Housing, Communities and Local Government (last revision date 22 July 2019) which gives guidance on Planning considerations in relation to noise.

7.222 The document identifies the subjective grading of noise and the recommended actions and different effect levels, as reproduced in Table 7.1A.

Table 7.1A: Summary of noise exposure hierarchy based on average response

Perception	Examples of Outcomes	Increasing Effect Level	Action
<u>Not noticeable</u>	<u>No Effect</u>	<u>No Observed Effect</u>	<u>No specific measures required</u>
<u>Present and not intrusive</u>	<u>Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.</u>	<u>No Observed Adverse Effect</u>	<u>No specific measures required</u>
<u>Lowest Observed Adverse Effect Level</u>			
<u>Present and intrusive</u>	<u>Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.</u>	<u>Observed Adverse Effect</u>	<u>Mitigate and reduce to a minimum</u>
<u>Significant Observed Adverse Effect Level</u>			
<u>Present and disruptive</u>	<u>The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.</u>	<u>Significant Observed Adverse Effect</u>	<u>Avoid</u>
<u>Present and very disruptive</u>	<u>Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g.</u>	<u>Unacceptable Adverse Effect</u>	<u>Prevent</u>

Perception	Examples of Outcomes	Increasing Effect Level	Action
	<u>regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.</u>		

Local Planning Policy and Guidance

Manchester's Local Development Framework – Core Strategy Development Plan 2012-2027

7.223 The local planning context is provided by Manchester's Local Development Framework, Core Strategy, Development Plan Document. The Document was adopted on 11th July 2012.

7.224 With regard to noise, Policy DM1, Development Management, states that '**all development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document: 'effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.'**

7.225 Saved policy DC26.1 from the Unitary Development Plan states '**New noise-sensitive developments (including large-scale changes of use of existing land or buildings), such as housing, schools, hospitals or similar activities, will be permitted subject to their not being in locations which would expose them to high noise levels from existing uses or operations, unless the effects of the noise can realistically be reduced. In giving effect to this policy, the Council will take account both of noise exposure at the time of receiving a planning application and of any increase that may reasonably be expected in the foreseeable future'**.

'Planning & Noise, Technical Guidance' issued by Manchester City Council, December 2015

7.226 'Planning & Noise, Technical Guidance', dated December 2015 has been issued by the Environmental Protection, Environmental Health and The Neighbourhoods Service sections of Manchester City Council. The document provides guidance to applicants and consultants concerning the assessment and prediction of environmental noise associated with a particular development. Reference is also made in the document to the relevant supporting information and guidance documents that Developers are expected to refer to when submitting a planning application.

7.227 Planning & Noise, Technical Guidance' refers to the following guidance documents:

- BS 7385 (1990) Evaluation and measurement of vibration in buildings
- BS 4142 (2014) Methods for rating and assessing industrial and commercial sound
- BS 8233 (2014) Guidance on sound insulation and noise reduction for buildings
- BS 6472 (2008) Guide to the evaluation of human exposure to vibration in buildings
- BS 5228 (2009+A1:2014) Code of practice for noise and vibration control on construction and open sites
- BS 7445-1 (2003) The description and measurement of environmental noise: Guide to quantities and procedures

- BS 717-1 (2013) Acoustics. Rating of sound insulation in buildings and of building elements. Airborne sound insulation
- National Planning Policy Framework (2012) (now on 2019 update)
- National Planning Policy Guidance (2014)
- WHO (1999) Guidelines for Community Noise

Manchester City Council – Noise from construction and demolition sites

7.228 Manchester City Council provides outline information on the control of noise pollution from construction sites in an undated guidance document entitled 'Guidance on completing an application for prior consent; Noise from construction and demolition sites'.

7.229 The document sets out the steps that should be taken when completing a Section 61 application. Where a Section 61 application is not to be made, the document provides a useful reference document, as it highlights the construction noise assessment method that Manchester City Council are likely to employ when assessing planning applications.

7.230 The document states that:

'The assessment should be completed as per British Standard 5228 (Parts 1 & 2) and usually takes the form of the ABC Method. To assess the impact of noisy work, baseline levels of ambient noise and vibration on the site boundary should be established. These data / details may be available from work carried out for the planning application stage of the development. The measured noise and vibration data should include results for periods during which the works will be carried out. Predictions of construction noise should be calculated at one metre, free field, from the facades of the worst affected (generally the nearest) sensitive receptors, thus allowing for a 'worst case scenario' noise assessment to be made'.

British Standards

BS 4142: 2014+A1:2019

7.231 BS4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound noise' details assessment methods to determine the likely effects on people inside or outside residential buildings of noise of an industrial nature such as fixed building services plant.

BS 5228: 2009+A1: 2014

7.232 BS 5228: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' provides guidance on significance criteria for construction noise.

BS 6472: 2008

7.233 BS6472-1: 2008 'Guide to evaluation of human exposure to vibration in buildings - part 1: Vibration sources other than blasting' provides guidance on typically acceptable limits for vibration within residential and office buildings during the day and night.

BS 8233: 2014

7.234 BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings' provides appropriate criteria for acceptable levels of noise within different building types. In relation to schools, the document advises that guidance is available in Building Bulletin 93 issued by the Department for Education.

Other Guidance

Design Manual for Roads and Bridges

7.235 LA 111 'Noise and Vibration' of the Design Manual for Roads and Bridges (DMRB), issued May 2020 highlights methods for the assessment of traffic noise levels and advises on the impact magnitude of changes in noise levels.

7.236 The DMRB advises that the threshold criteria used for traffic noise assessment during the day is a permanent change in magnitude of 1.0 dB LA10,18h in the short term (i.e. on opening) or a 3.0 dB LA10,18h change in the long term (15 years after project opening).

Building Bulletin 93 'Acoustic design of schools: performance standards'

7.237 Building Bulletin 93 'Acoustic design of schools: performance standards' (BB93) was published by the Department for Education in February 2015. It sets out minimum performance standards for the acoustics of school buildings, and describes the normal means of demonstrating compliance with the Building Regulations. The stated objective of BB93 is to ensure that the design and construction of school buildings provide acoustic conditions that enable effective teaching and learning.

Assessment Methodology and Significance Criteria

7.238 The approved Noise and Vibration Chapter provides the appropriate assessment of noise impact relating to construction noise and vibration and should be referred to accordingly. The following additional methodology has been adopted in order to assess the potential environmental noise effects of the proposed school following design development:

- Identification of significant existing noise sources and existing sensitive receptors and baseline monitoring locations;
- The carrying out of a noise survey at the Site and subsequent acoustic modelling to quantify the environmental noise levels at the Site and at selected existing noise sensitive residential properties;
- Calculation of required sound insulation of the School building envelope to achieve appropriate noise levels within the various internal spaces;
- Review of measured noise climate at the Site in order to derive appropriate environmental noise limits for potential activity noise egress from within the School;
- Calculation and assessment of allowable internal activity noise levels within the School to comply with the external noise limits;
- Review of measured noise climate at the Site in order to derive appropriate environmental noise limits for stationary building services plant serving the Proposed Development;
- Assessment of noise propagation from the school playground

7.239 The existing nearby noise sensitive premises are described below.

- a. Dwellings at Crown Street Phase 1
- b. Dwellings Crown Street Phase 2 (currently under construction)

7.240 Whilst there are other receptors around the Site, these other receptors are at greater distances from the Site than the receptors identified above and with similar exposure to the existing noise sources in the areas. Therefore, the achievement of acceptable noise levels at the assessed receptors would lead to acceptable noise level at receptors at a further distance from the Site.

7.241 There are no notable existing sources of potential vibration at or around the Site. Road traffic generates insignificant levels of groundborne vibration.

7.242 The results of environmental noise surveys around the Site and the determination of the likely environmental noise effect of the Proposed Development on the surrounding residential areas are presented.

Operation Environmental Noise Impact

Building Services Noise

7.243 For noise of an industrial nature such as fixed building services plant, an assessment of the likely effects on people inside or outside residential buildings due to noise can be carried out using BS4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

7.244 The following acoustic parameters are described within BS4142: 2014+A1:2019:

- Specific Noise Level – the equivalent continuous A-weighted sound pressure level measured over a specified time period, T_r , at the assessment position with the specific noise source contribution, LA_{eq, T_r} (i.e. the noise level due to the new noise source).
- Rating Level – the Specific Noise Level plus an adjustment for any characteristic noise features, L_{Ar, T_r} .
- Residual Noise Level – the equivalent continuous A-weighted sound pressure level measured when the specific noise does not contribute to the ambient noise.
- Background Noise level – measured for a specific duration, T , in the absence of the specific noise source, $LA_{90, T}$.

7.245 To complete a BS4142 assessment of potential noise effects upon residential properties, it is necessary to obtain the Rating Level due to the sound source in question. The Rating Level is derived by adding corrections to the measured Specific Noise Level, if the noise source:

- is tonal (correction of 0dB to +6dB, depending on severity)
- contains distinct impulses (correction of 0dB to +9dB, depending on severity)
- is intermittent (correction of +3dB if applicable)
- is otherwise distinctive against the residual acoustic environment (correction of +3dB)

7.246 Where a sound source is strongly tonal and impulsive over the duration of the appropriate assessment period, a correction of +15 dB may apply.

7.247 The Rating Level can then be used in order to ascertain the likelihood of complaints due to industrial noise disturbance by subtracting the measured background noise level. The greater the positive difference, the greater the likelihood of complaints. Table 7.2B summarises the assessment method.

Table 7.2B: BS4142: 2014+A1:2019 Assessment Method

<u>Difference between Rating Level and Measured Background Level</u>	<u>Assessment</u>
<u>+10 dB or greater</u>	<u>Significant adverse impact</u>
<u>+5 dB</u>	<u>Indication of adverse impact, depending on context</u>
<u>0 dB or less</u>	<u>Indication of low impact, depending on context</u>

7.248 Where a new noise source has not yet been introduced, a recommended specific noise level can be determined based on a knowledge of the existing background noise level.

7.249 BS 4142: 2014+A1:2019 recognises that where background and rating levels are low, the potential absolute noise levels at the sensitive receptor might be more relevant in assessing potential impact than a simple comparison of the rating level and background noise level.

7.250 In such instances, reference can be made to BS 8233: 2014+A1:2019 in order to determine appropriate external noise levels due to buildings services plant, such that acceptable noise levels are achieved inside buildings.

7.251 'Planning & Noise, Technical Guidance' issued by Manchester City Council in December 2015 gives guidance on the preferred approach to environmental noise assessments. With regard to external noise due to building services plant, Section 3.6.1.5.1 of the document states:

- 'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

Noise from School Hall

7.252 Noise egress from the proposed School Hall must be controlled to appropriate levels so as to avoid noise nuisance to existing sensitive receptors. As music replay may be employed in the Hall, an assessment of 'entertainment' (music) noise must be carried out. With regard to entertainment venues, 'Planning & Noise, Technical Guidance' published by Manchester City Council states:

- 'When considering the potential impact of a proposal for an entertainment venue, consultants should consider the overall noise level (LAeq) and the 63 Hz and 125 Hz octave band noise levels (Leq). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it.
- A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:
- Entertainment noise (LAeq) should be controlled to 10dB below the background noise level (LA90) without the entertainment noise present, in each octave band at the nearest noise sensitive location.

Intrusive Noise within School areas

7.253 Internal noise levels within the proposed School must be appropriate for the intended use. BB93 'Acoustic design of schools: performance standards' identifies the applicable internal criteria for various room uses. Appendix 7.2 identifies the applicable criteria.

Sensitivity of receptors

7.254 Table 7.3B presents the sensitivity criteria for receptors during the construction phase and the operational phase of the Proposed Development.

Table 7.3B: Criteria to Determine Receptor Sensitivity

Sensitivity of Receptor	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise or vibration	Residential dwellings, schools (during the daytime), hospitals, places of worship
Medium	Receptors of moderate to low sensitivity to noise or vibration, where it may cause some distraction or disturbance.	Conference facilities, hotels, offices
Low	Receptors of low sensitivity to noise or vibration, where it may cause mild distraction or disturbance.	Bars, cafes, restaurants, sports grounds
Negligible	Receptors where distraction or disturbance from noise or vibration is minimal	Un-occupied buildings, factories and working environments with existing high levels of noise, night clubs

Significance Criteria

7.255 In line with the guidance presented in Guidelines for Environmental Noise Impact Assessment, published by the Institute of Environmental Managements and Assessment in November 2014, the significance of an impact can be determined with reference to the impact significance matrix detailed in Table 7.4B.

Table 7.4B: Impact Significance Matrix

Magnitude	Sensitivity		
	High	Medium	Low
Major	Major Adverse/Beneficial	Major – Moderate Adverse/Beneficial	Moderate Adverse/Beneficial
Moderate	Major – Moderate Adverse/Beneficial	Moderate -Minor Adverse/Beneficial	Minor - Adverse/Beneficial
Minor	Moderate - Minor Adverse/Beneficial	Minor - Adverse/Beneficial	Minor - Adverse/Beneficial
Negligible	Negligible	Negligible	Negligible

7.256 A description of the magnitude terms given in Table 7.4B is given below:

- **Major:** Causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area;
- **Moderate:** Noise impact can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life;

- **Minor:** Noise impact can be heard, but does not cause any change in behaviour or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life
- **Negligible:** no discernible effect on noise or in the character of the area.

Baseline Conditions

Noise

7.257 Reference should be made to the approved Noise and Vibration Chapter (approved under planning permission 126668/FO/2020) for the baseline conditions prevailing at the time of the original assessments.

7.258 Appendix 7.2 identifies the baseline conditions determined for the Reserved Matters application for Phase C (the education facility/ school). The prevailing levels of road traffic noise at the Site determined for the current assessment are greater than those determined for the original hybrid permission. As a consequence, the construction and operational noise limits recommended in the hybrid permission are expected to be more onerous than would be required to avoid significant effects.

Vibration

7.259 There are no major pre-existing sources of vibration in proximity to the Site. No adverse comment would be expected in any area of the Proposed Development due to existing levels of vibration due to prevailing sources such as road vehicles.

Identification and Evaluation of Likely Significant Effects

7.260 The approved Noise and Vibration Chapter (Chapter 7A of this Statement) identifies and evaluates the likely significant effects due to the Proposed Development and should be referred to accordingly.

Noise Egress from School Hall

7.261 In order to avoid potential noise nuisance to existing noise sensitive receptors, activity noise egress from the proposed (multi-purpose) School Hall must be controlled. As the proposed space may potentially employ music replay, suitable limits relating to music noise egress from the proposed areas must be established.

7.262 Appendix 7.2 identifies and evaluates the recommended maximum allowable external noise levels due to noise egress from the School Hall.

Noise from Rooftop Playground and External Areas for Daycare, Nursery and Reception

7.263 Appendix 7.2 identifies and evaluates the recommended maximum allowable external noise levels due to noise propagation from the rooftop playground, daycare, nursery and reception.

Noise Affecting the Proposed Development

7.264 The sensitive areas of the Proposed Development that could be affected by pre-existing external noise are the various school classrooms and other rooms used for teaching and ancillary activities. An intrusive noise study is included in Appendix 7.2. This study identifies the minimum recommended sound insulation performance of the building facades to achieve the applicable internal noise criteria.

Mitigation Measures

Construction

7.265 Reference should be made to the approved Noise and Vibration Chapter (Chapter 7A of this Statement) for details of the proposed mitigation measures in relation to construction noise.

Operation

Building Services noise

7.266 Appendix 7.2 identifies appropriate environmental noise limits in relation to building services plant serving the Proposed Development.

7.267 Compliance with the building services noise limits identified in Appendix 7.2 would lead to **negligible** noise impact from plant, such that no mitigation would be required.

Noise from School Hall

7.268 Appendix 7.2 provides an assessment of noise egress from the School Hall.

7.269 Compliance with the external music noise limits identified in Appendix 7.2 is expected such that the noise impact of the School Hall is expected to be **negligible**. Therefore no mitigation is required.

Noise from Rooftop Playground and External Areas for Daycare, Nursery and Reception

7.270 Appendix 7.2 provides an assessment of potential noise propagation from the rooftop playground, and external areas for Daycare, Nursery and Reception.

7.271 As identified in Appendix 7.2, the impact of noise from the rooftop playground is expected to be **negligible**. Therefore no mitigation is required.

Cumulative Effects

Construction

7.272 There is expected to be an overlap of construction works at the Site and at other buildings within the Great Jackson Street Strategic Development Framework area. However, the other developments sites are at a greater distance from many of the closest buildings to the Site and are expected to be at a difference stage in their build programmes such that the noisier construction activities including demolition and excavation may have ceased at the time that these activities commence at the Site. In addition, these other development sites will be controlled by approved Construction Environmental Management Plans, which will limit noise through implementation of mitigation. In addition, the major external works at Phases A, B and D of the Crown Street development are expected to be complete by the time of the school opening. It is therefore expected that the cumulative construction noise levels at the nearby noise-sensitive buildings will be principally determined by the construction activities at the proposed Site. With reference to the approved Noise and Vibration Chapter, there is expected to be no significant cumulative effect due to construction noise.

Operation

7.273 Operational noise due to the Proposed Development and the committed developments in the surrounding area would include mechanical services noise, noise egress due to leisure activities and changes in road traffic noise levels due to changes in traffic flows.

7.274 The cumulative impact of noise due to changes in road traffic flows is expected to be negligible. This result takes into account the predicted changes in traffic flow relating to the committed

developments in the surrounding area. Traffic and Transport was scoped in to the Environmental Impact Assessment submitted and approved as part of the hybrid planning permission (please refer to Chapter 11 of this Statement), alongside this a Transport Statement was included at Appendix 11.1 (ES Volume 2).

7.275 Operational noise limits due to mechanical services at the Proposed Development have been derived using the methodology and assessment criteria given in BS4142: 2014. Operational noise limits for any mechanical services systems at the buildings of the committed developments in the surrounding area would also be derived using the methodology and assessment criteria given in BS4142: 2014. The Planning Conditions for the committed developments in the surrounding area include a requirement for the building and any externally mounted ancillary equipment to be acoustically insulated in accordance with a scheme submitted to and approved in writing by the City Council in order to secure a reduction in the level of noise emanating from the equipment. The applicable noise limits will tend to be governed by the need to minimise noise levels at the buildings within the Proposed Development, as these are the closest sensitive receptors in the majority of cases. Therefore, given the relative distances of the sensitive receptors applicable to each development, cumulative impact of building services noise will be **negligible**.

Residual Effects

7.276 Table 7.5B summarises the post-mitigation residual effects.

Table 7.5B – Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

<u>Likely Significant Effect</u>	<u>Receptor(s)</u>	<u>Mitigation Measure</u>	<u>Residual Effect</u>
<u>Construction Phase</u>			
<u>Minor to Moderate adverse construction noise</u>	<u>Local residents</u>	<u>Refer to approved Noise and Vibration Chapter (Chapter 7A of this Statement).</u>	<u>Minor Adverse construction noise effects</u>
<u>Operational Phase</u>			
<u>Negligible building services plant noise effects</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for plant</u>	<u>Negligible building services plant noise effects</u>
<u>Negligible activity noise effects from school hall</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for amenity spaces</u>	<u>Negligible activity noise effects from amenity spaces</u>
<u>Negligible activity noise effects from rooftop playground and other external areas</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for amenity spaces</u>	<u>Negligible activity noise effects from amenity spaces</u>
<u>Moderate adverse noise effects from road traffic</u>	<u>Internal school areas</u>	<u>Appendix 7.2: Adherence to recommended sound insulation performance of façade elements</u>	<u>Negligible adverse noise effects from road traffic</u>

Summary

7.277 At Crown Street Phase 2, Manchester, a primary school and day care centre is proposed.

7.278 A noise survey has been conducted at the Site to establish the pre-existing conditions at the Site.

7.279 Noise levels as a result of construction work during the construction period are expected to lead to minor to moderate adverse impact if no mitigation measures are in place. Therefore,

construction impact will be minimised by the mitigation methods described in BS 5228. For instance, low noise and vibration construction methods will be used wherever practicable and appropriate acoustic screening will be implemented where necessary and practicable. If the identified mitigation methods are employed, the impact of the construction work during the construction period is expected to be minor adverse.

7.280 The impact of construction vibration on existing sensitive receptors is expected to be negligible.

7.281 The principal long-term potential environmental noise source due to the operation of the Proposed Development is building services plant. Building services plant noise emissions from the Proposed Development will be controlled through careful design and specification of building services plant and by provision of acoustic screens and attenuators where required, to meet the noise emissions criteria at each noise sensitive receptor at and around the Site. As such, negligible impact is expected.

7.282 The minimum required sound insulation performance of the school façade elements has been identified. Compliance with the performance criteria should ensure that the impact of environmental noise levels at the Site on the school uses is negligible.

7.283 External and internal noise limits have been determined in relation to the allowable levels of activity noise egress from the proposed school hall. Compliance with the criteria would lead to negligible noise effects at sensitive receptors.

7.284 The potential levels of noise propagation from the proposed rooftop playground have been identified. The expected impact of playground noise on the closest residential apartments is negligible.

8 Solar Glare

A8 ES Addendum Alterations

No alterations have been made to this chapter as part of the ES addendum prepared in support of the reserved matters application for Phase C of Crown Street Phase 2, which received outline consent as part of the hybrid permission.

An EIA Technical Note, included at Appendix 8.2 (ES Volume 2) has been prepared by GIA to consider the environmental impacts arising from the detailed reserved matters proposals for Phase C (education facility). The EIA Technical Note confirms that the conclusions of the previous assessment (below) remain valid.

Introduction

- 8.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Solar Glare. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 8.2 This Chapter is accompanied by one technical appendix, Solar Glare Assessments (Appendix 8.1) and the following figures:
- Figure 8.1 – Typical Stopping Distances for a car
 - Figure 8.2 – Field of Vision Diagram
 - Figure 8.3 – Viewpoints assessed for solar glare assessment
- 8.3 This Chapter has been prepared by Krystle Stewart of GIA. GIA is an independent firm of chartered surveyors and technical specialists, regulated by RICS and with over 150 members of staff is the largest specialist advisor in the UK. GIA have extensive experience in providing expert advice on daylight, sunlight, overshadowing, solar glare and light pollution. Krystle Stewart is a graduate of Victoria University of Wellington, NZ with a Masters in Building Science, she has over 4 years of UK experience in the technical assessments, consultancy and EIA works in relation to solar glare.

Legislative and Policy Context

National Planning Policy

National Planning Policy Framework (2019)

- 8.4 Paragraph 123, part C of the National Planning Policy Framework stipulates that,

"...local planning authorities should refuse applications which they consider fail to make efficient use of land, taking into account the policies in this Framework. In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site."

Local Planning Policy

Manchester City Council Core Strategy (2012)

8.5 There are no relevant policies in relation to solar glare.

Saved Policies of the Unitary Development Plan for the City of Manchester (1995)

8.6 There are no relevant policies in relation to solar glare.

Guide to Development in Manchester Supplementary Planning Document and Planning Guidance (Adopted April 2007)

8.7 There are no relevant policies in relation to solar glare.

Other Relevant Policy, Standards and Guidance

Commission Internationale de L'Eclairage (CIE) 146:2002 & CIE 147:2002 Collection on glare (2002)

8.8 The CIE 146:2002 Collection on glare states:

"Disability glare is glare that impairs vision (CIE, 1987). It is caused by scattering of light inside the eye [...]. The veiling luminance of scattered light will have a significant effect on visibility when intense light sources are present in the peripheral visual field and the contrast of objects to be seen is low."

"Disability glare is most often of importance at night when contrast sensitivity is low and there may well be one or more bright light sources near to the line of sight, such as car headlights, streetlights or floodlights. But even in daylight conditions disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty viewing paintings hanging next to windows."

Assessment Methodology and Significance Criteria

Baseline characterisation

Scenarios Assessed

8.9 The following scenario has been assessed and is reported within this chapter of the ES:

- Baseline with Proposed Development (Scenario D).

8.10 The solar glare assessment is undertaken on the worst-case scenario. Solar Glare is not a comparative assessment; the fact it may occur in the baseline does not necessarily justify its occurrence as a result of the Proposed Development. Therefore, the assessment considers the effect of the Proposed Development in absolute terms.

8.11 The solar glare effects of neighbouring schemes are expected to be assessed in isolation and reported in absolute terms as part of their application. Cumulative solar glare effects do not portray a worst-case scenario as the inclusion of neighbouring scheme may block sunlight from reaching the facades of the Proposed Development or obstruct the Proposed Development from viewpoints assessed. Solar glare effects are therefore assessed in isolation to portray the worst-case scenario and reported in absolute terms only.

Proposed Development

- 8.12 This scenario consists of the Proposed Development in the context of the surrounding existing environment. Scenario D comprises the detailed Plots C4 and C5 schemes however owing to Plot C3 (the school) being submitted as outline only it has not been assessed.
- 8.13 Solar Glare effects can only be quantitatively assessed where the façade details of a proposed building are known. Typically, only highly glazed buildings are considered which are visible from sensitive receptors like road junctions. As such, the solar glare assessment only considers the potential effects of the detailed Plot C4 and C5 within the Proposed Development. Plot C3 is being submitted in outline, thus the façade details are not yet known and potential solar glare effects cannot be assessed yet.

Methodology for Determining Demolition and Construction Effects

- 8.14 Owing to the evolving and changing nature of demolition and construction activities, the assessment of potential effects during demolition and construction of the Proposed Development on solar glare has not been modelled. Instead, a qualitative assessment has been undertaken using professional judgement and experience.
- 8.15 The potential solar glare effects relating to demolition and construction works will vary throughout the construction programme and gradually increase to the potential effects identified for the completed Proposed Development. It is therefore considered that the completed Proposed Development represents the worst-case assessment in terms of likely solar glare effects.

Methodology for Determining Sensitive Receptors

- 8.16 Identified road junctions are considered most sensitive in relation to solar glare due to a combination of the nature of the use and proximity to the site, and therefore consideration has been given to several viewpoints at traffic junctions from which the Proposed Development will be visible. The viewpoints assessed are indicated in Figure 8.3.

Methodology for Determining Operational Effects

- 8.17 The technical analyses carried out to inform the assessments and identify possible solar glare effects on road users have been undertaken by creating a digital three dimensional (3D) model of the existing Site and Proposed Development, based on photogrammetry survey data.

Solar Glare

- 8.18 The BRE Guidelines includes the following statement with regard to the potential for reflected solar glare from a new development:

"Glare or solar dazzle can occur when sunlight is reflected from a glazed façade. This can affect road users outside and the occupants of adjoining buildings. The problem can occur either when there are large areas of reflective glass or cladding on the façade, or when there are areas of glass or cladding which slope back so that high altitude sunlight can be reflected along the ground. Thus solar dazzle is only a long term problem only for some heavily glazed (or mirror clad) buildings..."

Viewpoints for Road Users

- 8.19 As indicated previously, the assessment considers potentially sensitive viewpoints for road users surrounding the Site. The viewpoints are generally located at the minimum stopping distance and at the driver's eye level. The focal point is a relevant traffic element, such as signals or incoming traffic.

- 8.20 Identifying the viewpoints based on the stopping distance is calculated as the combination of thinking and braking distances, using the following formula:

$$D_{\text{total}} = D_{\text{thinking}} + D_{\text{braking}} = V \cdot T + V^2 / (2\mu \cdot g)$$

- 8.21 Where each component is:

- V = Relevant vehicle speed, typically the road speed limit.
- T = Thinking time (0.67 sec)
- μ = Braking effort (considered 0.65 for cars and 0.5 for buses)
- g = Gravity acceleration.

- 8.22 The height of the viewpoint is considered to be 1.5m for cars and 2.0m for buses. Figure 8.1 identifies the typical stopping distance range for a car travelling at different speeds. Therefore, a viewpoint for a car driving at 30 mph (i.e. speed limit for a dense urban location) would be placed at 23m from a traffic light and 1.5m above the ground.

- 8.23 The assessment also considers a driver's field of vision which takes the angular extent seen at any given time, which for humans facing forwards is approximately 180 degrees.

Solar Glare Technical Assessment

- 8.24 The potential for reflected solar glare or dazzle from the glazed or reflective façades of the Proposed Development has been assessed using specialist lighting software. The assessment shows the path of the sun for the entire year around the Proposed Development. From this, two computer generated angular images have been produced for each selected viewpoint, indicating the area which sees the reflection of the sunpath at any point during the year. A modified diagram portraying a standardised extent of human vision is then overlaid onto the image.
- 8.25 The fovea centralis (also generally known as the fovea) is a part of the eye, located in the centre of the macula region of the retina. The fovea is responsible for sharp central vision (also called foveal vision), which is necessary in humans for reading, watching television, driving, and any activity where visual detail is of primary importance. The macula corresponds to the central 13° of the visual field; the fovea to the central 3°.
- 8.26 Figure 8.2 highlights the degrees of vision corresponding to the foveal view, with a red circle of 3° of angle in order to identify the area most sensitive to reflected solar glare. Another red circle represents the incidence of the 30° radius of our typical field of view in order to identify a secondary area of sensitivity to potential reflected glare instances.
- 8.27 The degrees of vision provide a reference from which potential concerns can be judged. At 3°, the potential for the reflected glare to cause a hazard is high and mitigation would be required. Between 3° and 30°, there is the potential that there could be an issue and mitigation may be necessary.
- 8.28 As stated in the CIE 146:2002, occurrences at angles beyond 30° would be of little significance in most situations, but may be relevant in exceptional circumstances. When seated in a driving seat of a typical car, for example, the limits of the windscreen would generally obstruct the driver's view at angles beyond 30° from the line of sight. Therefore, the risk of reflective solar glare causing a hazard is reduced.
- 8.29 The initial assessment identifies the times of day and year when the reflective elements of the façade have the potential to reflect sunlight within 30° of a driver's line of sight, however do not indicate how intense the potential reflection would be and if they are great enough to cause a significant instance of glare. As such, a supplementary assessment has been undertaken for viewpoints where potential reflections would occur within a 10° radius, this being the most sensitive to glare.

- 8.30 Recommendations on acceptable limits for solar glare are limited, whereby the only document dealing with the subject is Hassall's 'Dealing with Rogue Solar Reflections' from 1996. Although published in Australia, the theory, methodology and recommendations it introduced are equally applicable in other countries such as the UK.
- 8.31 The severity of glare can be calculated as the equivalent veiling luminance which is caused by the excess light being scattered in the eye thereby creating a 'veil' through which objects are seen. If the brightness of the veil is sufficiently high compared to that of the actual object, the latter becomes less visible. In very severe cases of disability glare, the object cannot be seen at all.
- 8.32 The veiling luminance can be calculated with a simple empirical formula first proposed by Holladay:
- $$L_{seq} [cd/m^2] = K * E_{gl} / Q^n < \text{threshold}$$
- 8.33 The Holladay glare formula depends on four variables, namely:
- K, which is a factor accounting for the observer's sensitivity to glare (eg. age);
 - E_{gl} , which is the illuminance from the glare source, measured at the eye of the observer;
 - Q, the angle between the line of sight and the glare source;
 - n, indicating the power with which Q affects the outcome.
- 8.34 An individual's sensitivity to glare is affected primarily by age. We used a K factor of 17.5 in our calculations, which represents a 65-year old driver.
- 8.35 According to CIE 146:2002, the n power in Holladay's equation has three angular domains:
- Q3 for angles between 0.1° and 1°;
 - Q2 for angles between 1° and 30°; and
 - Q for angles beyond 30°.
- 8.36 This angular dependency means that a glare source close to the object being looked at has a much more severe impact upon the visibility of that object than a glare source at the periphery of the observer's visual field.
- 8.37 Hassall in his paper proposes a threshold value of 500 cd/m², which has been adopted as a threshold in the supplementary assessment.

Significance Criteria

Evaluating Effects and Significance – Solar Glare

- 8.38 The key terminology used to describe the magnitude of effects is as follows and is further described in the below sections of this chapter:
- Major;
 - Moderate;
 - Minor; and
 - Negligible.
- 8.39 The nature of the effects may be either adverse (negative) or beneficial (positive).
- 8.40 There are no quantitative criteria within the BRE Guidelines or elsewhere regarding acceptable levels of solar glare. Generally, however, solar reflections at high altitudes are less likely to cause nuisance or distraction.

- 8.41 Professional judgement has therefore been applied to assign the significance of solar glare arising from the Proposed Development and to determine the criteria for assessing the significance of solar glare set out in Table 8.1.
- 8.42 Multiple viewpoints may be chosen for each of the traffic lanes or signals affected. In terms of significance criteria however, professional judgement has been used to determine the effect at the location rather than the individual perspectives at a signal traffic junction. Factors that could influence the significance of effect may include:
- Sunlight availability probability;
 - Area of façade off which reflections are visible;
 - Period of time reflections are visible;
 - Angle at which reflections are visible from line of sight;
 - Views of the development being obscured; and
 - The time of day at which the solar reflection will occur for example during peak traffic times.
- 8.43 Initially, the following guide will be used to ascertain the possible significance for each view and the factors listed above will then be taken into consideration to determine the overall significance for the designated viewpoint.

Table 8.1: Criteria Used for Determining the Effect of Solar Glare

Significance Guidance	Possible Factors
Negligible	No reflections are visible or if visible all occur at angles greater than 30° from the driver's line of sight and so, as stated by the CIE, will be of "little significance".
Minor	Solar reflections are visible within 30° to 10° or between 10° to 5° of the driver's line of sight for a short period of time.
Moderate	Solar reflections are visible within 10° and 5° of the driver's line of sight occurring for a long period of time.
Major	Solar reflections are visible within 5° of a driver's line of sight.
Note – mitigating factors such as alternative and unaffected signals/traffic lights and car visor angle may result in the assignment of significance which differs from the above.	

- 8.44 Solar Glare is not a comparative assessment; the fact it may occur in the baseline does not necessarily justify its occurrence as a result of a Proposed Development. Therefore, the assessment considers the effect of the Proposed Development in absolute terms, by reference to the above criteria.
- 8.45 Following the magnitude of an effect, using this methodology a clear statement is then made as to whether the effect is significant or not significant. As a general rule, the following criteria is applied:
- 'Moderate' or 'major' effects are deemed to be 'significant';
 - 'Minor' effects are considered to be 'not significant', although they may be a matter of local concern; and
 - 'Negligible' effects are considered to be 'not significant' and not a matter of local or wider concern.

Limitations and Assumptions

- 8.46 For Solar Glare, although great care is taken in identifying typical viewpoints, this does not guarantee that there are no additional sensitive locations where reflected solar glare could present a particular risk. This assessment is based on the assumption that in an urban

environment moving traffic represents the biggest risk factor and so viewpoints and focus points are selected accordingly. For practical reasons the area of the assessment is limited to the area surrounding the Proposed Development. The occurrence of reflected solar glare at greater distances is not the subject of this assessment.

- 8.47 It is also to be noted that the hours presented reflect solar time and therefore do not take Daylight Saving Hours into account.
- 8.48 A limitation of the methodology is that it can flag false positives when the reflector, i.e. a window, is too small to actually reflect the full extent of the solar disc. As a result of this, even a single bright pixel in the computer image is capable of producing a peak veiling luminance equivalent to that of the full solar disc. For the 60° images, which are rendered out at a resolution of 1,000 x 1,000 pixels, the sun's disc has a diameter of 8 pixels.
- 8.49 To account for such situations, an additional study provides a visual assessment of the solar reflections. This is done by rendering out computer images which are then post-processed to mimic how a human observer might perceive the scene. In addition to the visual appraisal, the veiling luminance values can be determined without potentially highlighting false positives from very bright, but individual pixels within the image. This study is however limited to a specific time of day, and day of the years, as informed by the initial veiling luminance results.
- 8.50 Assessing static viewpoints portrays a worst-case scenario, whereby a view is assessed from one specific viewpoint (minimum stopping distance), looking at one set of traffic lights specifically. When in reality, owing to the dynamic nature of traffic movement, the precise view being assessed would occur for an instant of a second and any potential effects would therefore be of a temporary nature. A dynamic assessment has been provided for the Deansgate Interchange junction (DGI2) to assess the temporary nature of the significant effects.

Baseline Conditions

- 8.51 As the solar glare assessment is not comparative, and the fact it may occur in the baseline does not necessarily justify its occurrence as a result of a Proposed Development, there are no baseline conditions. However, it should be noted that the Proposed Development will be located on a Site where its existing state is a car park thus there is limited opportunity for instances of solar glare from the Site to be experienced. Solar glare from surrounding buildings is not assessed.

Sensitive Receptors

- 8.52 Road junctions are considered highly sensitive in relation to solar glare and therefore consideration has been given to several viewpoints at traffic junctions from which the Proposed Development will be visible.
- 8.53 The viewpoints assessed are presented in Figure 8.3, where arrows indicate position and direction of travel of travel.
- 8.54 Further details showing the road junctions and specific viewpoints can be found in Technical Appendix 8.1.
- 8.55 Following further review of the sensitive receptors following the scoping, one additional view was added, this being the junction between Chester Road Eastbound and Deansgate Interchange.
- 8.56 Views DG1 (showing traffic merging from Deansgate onto Chester Road Westbound) and DGI1 (traffic turning left onto Chester Road at the Deansgate Interchange) were identified as sensitive receptors within the scoping however further investigation has found that they do not face towards the site and therefore did not require assessment for potential solar glare effects.

8.57 Where multiple viewpoints have been assessed at one road junction, an overall significance is given for the junction as whole. Please note that for solar glare assessment, a road junction is considered one road travelling in one direction approaching an intersection with another road or pedestrian crossing. It does not consider the flow of traffic in the opposite direction or intersecting roads.

Identification and Evaluation of Significant Effects

8.58 The full solar glare assessment is provided in Technical Appendix 8.1.

8.59 The assessment has been undertaken from the sensitive road junctions surrounding the site where the Proposed Development is visible:

- Chester Road Eastbound junction with Deansgate Interchange (CHE1A and CHE1B);
- Chester Road Eastbound pedestrian crossing between Lower Moss Lane and Angela Street (CHE2A and CHE2B);
- Chester Road Eastbound pedestrian crossing between Manson Avenue and Cleworth Street (CHE3A and CHE3B);
- Chorlton Road Northbound pedestrian crossing following the Jackson Road junction (CHO1a and CHO1b);
- Chorlton Road Northbound junction with Royce Road (CHO2a and CHO2b);
- Chester Road Westbound junction with Deansgate (DG2);
- Dawson Street Southbound junction with Deansgate Interchange (DS1);
- Dawson Street Southbound divides from Ring Road (DS2); and
- Deansgate Interchange Southbound junction with Chester Road (DGI2).

8.60 Whilst not a road junction, an assessment of viewpoints along Mancunian Way has also been provided owing to its close proximity to the site and the arterial nature. Viewpoints along Mancunian Way that have been assessed are:

- Mancunian Way Northbound (MW1, MW2, MW3); and
- Mancunian Way Southbound (MW4 and MW5).

8.61 All sensitive receptors are discussed in detail below.

Chester Road Eastbound junction with Deansgate Interchange (CHE1a and CHE1b)

8.62 Two viewpoints have been considered for this junction, each viewpoint assesses the potential solar glare effect 23m (typical breaking distance at 30mph) from the junction with Deansgate Interchange for a set of traffic lights controlling three lanes of traffic. CHE1a serves as the primary set of lights for the left lane and CHE1b serves as the primary set of lights for the right lane, the central lane could use either set of traffic lights assessed, or the secondary lights through the intersection.

View CHE1a

8.63 The Proposed Development is not visible from this viewpoint; therefore, this viewpoint experiences a negligible effect in terms of solar glare.

View CHE1b

8.64 Instances of solar reflection may be visible from a very small area of the western façade of the Proposed Development approximately 25° from the driver's line of sight in the late evenings (19:00 GMT until sunset) during the summer (mid-May until mid-July).

- 8.65 Potential reflections may also occur from a small area of the podium between 07:00 and 08:00 GMT in early and late winter months (mid-October until mid-November and mid-January until mid-February) at approximately 28° from the driver's line of sight.
- 8.66 Further potential reflections occur from the C5 tower however owing to the glancing angles of these reflections, they would not have the potential to cause instances of glare.
- 8.67 Taking into consideration the very small areas of reflection and their location 25° or greater from the driver's line of sight, the solar effect to this viewpoint is considered Negligible.

Chester Road Eastbound junction with Deansgate Interchange Overall

- 8.68 Based on professional judgement and owing to both viewpoints assessed having Negligible effects in terms of solar glare; overall the Chester Road Eastbound junction with Deansgate Interchange is of high sensitivity, and the overall effect is considered **Negligible** and not significant.

Chester Road Eastbound pedestrian crossing between Lower Moss Lane and Angela Street (CHE2a and CHE2b)

- 8.69 Two viewpoints have been considered for this junction, each viewpoint assesses the potential solar glare effect for a set of traffic lights controlling two lanes of traffic. CHE2a serves as the primary set of lights for the left lane and CHE2b serves as the primary set of lights for the right lane. A third set of traffic lights are located after the pedestrian crossing that would control stationary traffic at the pedestrian crossing.

View CHE2a

- 8.70 The Proposed Development is visible from this viewpoint however no reflections would occur within the driver's line of sight; as such, this viewpoint experiences a Negligible effect in terms of solar glare.

View CHE2b

- 8.71 Very small areas of potential reflections from the C4 tower, one glazed panel wide, have the potential for reflections to fall between 10° and 20° of the driver's line of sight, above the driver's 5° visor cut-off, between 13:00 and 14:00 GMT during the winter months (mid-October until mid-February).
- 8.72 Instances of solar reflection may be visible from the C5 tower between 4° and 9° of the driver's line of sight, these would occur in the mornings (07:00-10:00 GMT) from the mid-seasons through winter (mid-September until mid-March). The veiling luminance of these reflections would be in excess of the recommended 500 cd/m², however they would be at glancing angles and are less than 8 pixels in diameter so cannot reflect the full sun disc, they would therefore be low intensity and would be unlikely to cause a significant instance of glare.
- 8.73 Potential reflections would occur from the upper portion of the C5 tower between 9° and 18° throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and are therefore less than 8 pixels in diameter so do not have the potential to reflect the full sun disc. In addition, all potential reflections are located above the drivers 5° visor cut-off angle.
- 8.74 The solar glare effect to this viewpoint has been determined taking into consideration the following:
- The small areas of façade with the potential to reflect sunlight within 10° of the driver's line of sight;

- The location of the majority of potential reflections falling outside 10° of the driver's line of sight and well above the driver's visor cut-off;
- The glancing angles of potential reflections from the C5 tower;
- The potential reflections being broken up by the shading devices or perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in summer;
- The size of potential reflections being less than 8 pixels;
- An alternative, unaffected, set of traffic lights serving this junction; and
- The probability of the sun shining being 50% or less.

8.75 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

Chester Road Eastbound pedestrian crossing between Lower Moss Lane and Angela Street Overall

8.76 Whilst CHE2b experiences a Minor Adverse effect in terms of solar glare, taking into consideration the ability to utilise alternative traffic lights that are not affected, CHE2a, and the low intensity nature of the potential reflections, overall the Chester Road Eastbound pedestrian crossing between Lower Moss Lane and Angela Street is of high sensitivity and the overall effect is considered **permanent, Minor Adverse and not significant**. Given the dynamic nature of traffic movement, the potential effects would only occur momentarily when looking directly at the affected traffic light, approximately 23 m from the pedestrian crossing and would occur on sunny days throughout the day and year, with a maximum probability of the sun shining being 40%.

Chester Road Eastbound pedestrian crossing between Manson Avenue and Cleworth Street (CHE3a and CHE3b)

8.77 Two viewpoints have been considered for this junction, each viewpoint assesses the potential solar glare effect for a set of traffic lights controlling one lane of traffic. CHE3a is located on the left side of the road and CHE3b is located on the right side. A third set of traffic lights are located after the pedestrian crossing that would control slowing or stationary traffic at the pedestrian crossing.

View CHE3a

8.78 Instances of solar reflection may be visible from the top of the southern façade of the C4 tower at approximately 17-18° from the driver's line of sight and would occur between 11:00-12:00 GMT during mid-winter (mid-November until mid-January). These reflections would be significantly broken up by the proposed shading on the southern façade and therefore are not expected to lead to an instance of solar glare.

8.79 Potential reflections would occur from the C5 tower between 17° and 21° of the driver's line of sight, these would throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc.

8.80 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of the potential reflections falling outside 15° of the driver's line of sight and half being above the driver's visor cut-off;
- The glancing angles of potential reflections from the C5 tower;
- The potential reflections being broken up by the shading devices or perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in mid-seasons and summer months;
- The size of potential reflections being less than 8 pixels;

- An alternative set of traffic lights serving this junction; and
- The probability of the sun shining being 50% or less.

8.81 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

8.82 Taking into consideration the size of potential reflections and their occurrence outside 10° of the driver's line of sight, the solar glare effect to this viewpoint is considered Minor Adverse.

View CHE3b

8.83 Instances of solar reflection may be visible from the C5 tower between 5° and 10° of the driver's line of sight, these would occur throughout the day and year owing to its cylindrical nature.

8.84 The maximum veiling luminance of 4,691 cd/m², which occurs on a glancing angle where it would not be possible for the full sun disc to be reflected thus the true intensity would be much lower. Whilst the veiling luminance of the potential reflections are in excess of 500 cd/m², the reflections would only occur from one panel vertically at any one instance and are therefore less than 8 pixels in diameter. As a result, they do not have the potential to reflect the full sun disc and would not lead to a significant instance of solar glare. It is also worth noting that a deciduous tree is located behind the traffic lights that would obscure the Proposed Development in the summer months.

8.85 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of the majority of potential reflections falling above the driver's visor cut-off;
- The glancing angles of potential reflections from the C5 tower;
- The potential reflections being broken up by the shading devices or perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in summer;
- The size of potential reflections being less than 8 pixels;
- An alternative set of traffic lights serving this junction;
- A deciduous tree that obscures the Proposed Development in the summer months; and
- The probability of the sun shining being 50% or less.

8.86 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

Chester Road Eastbound pedestrian crossing between Manson Avenue and Cleworth Street Overall

8.87 Both viewpoints assessed experience a Minor Adverse effect in terms of solar glare, therefore, overall the Chester Road Eastbound pedestrian crossing between Manson Avenue and Cleworth Street is of high sensitivity and the overall effect is considered **permanent, Minor Adverse and not significant**. Given the dynamic nature of traffic movement, the potential effects would only occur momentarily when looking directly at the affected traffic lights, approximately 23 m from the pedestrian crossing and would occur on sunny days throughout the day and year, with a maximum probability of the sun shining being 50%.

Chorlton Road Northbound pedestrian crossing following the Jackson Road junction (CHO1a, CHO1b, CHO1c and CHO1d)

8.88 Four viewpoints have been considered for this pedestrian crossing, each viewpoint assesses the potential solar glare effect 23m from the pedestrian crossing for a set of traffic lights controlling two lanes of traffic. CHO1a serves as the primary set of lights for the left lane and CHO1c shows the view of drivers in the left lane relying on the right-hand set of lights, which would serve as secondary set of lights. CHO1d serves as the primary set of lights for the right lane,

with CHO1b showing the view of drivers relying on the left-hand set of lights as a secondary set of lights. There is a secondary set of lights on the right after the pedestrian crossing to control traffic slowing or stationary at the pedestrian crossing.

View CHO1a

8.89 The Proposed Development is not visible from this viewpoint; therefore, this viewpoint experiences a negligible effect in terms of solar glare.

View CHO1b

8.90 The Proposed Development is not visible from this viewpoint; therefore, this viewpoint experiences a negligible effect in terms of solar glare.

View CHO1c

8.91 Instances of solar reflection would occur between 21° and 31° of the driver's line of sight from the southern façade of the C4 tower. Potential reflections would occur between 13:00 and 16:00 GMT from the mid-seasons through the winter months (mid-September until mid-March). Almost all reflections would occur above the driver's visor cut-off and the reflections would be broken up by the shading designed for the southern façade.

8.92 Potential reflections would occur from the C5 tower; however, these are located outside 30° of the driver's line of sight.

8.93 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 20° of the driver's line of sight and mostly above the driver's visor cut-off;
- The potential reflections being broken up by the shading devices;
- An alternative, unaffected, set of traffic lights serving this junction; and
- The probability of the sun shining being 50% or less.

8.94 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

View CHO1d

8.95 Instances of solar reflection would occur outside 27° of the driver's line of sight from the southern façade of the C4 tower. Potential reflections within 30° of the driver's line of sight would occur between 14:00 and 15:00 GMT from the mid-seasons through the winter months (late-October until early-February). All reflections would occur above the driver's visor cut-off and the reflections would be broken up by the shading designed for the southern façade.

8.96 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 27° of the driver's line of sight and mostly above the driver's visor cut-off;
- The potential reflections being broken up by the shading devices;
- An alternative, unaffected, set of traffic lights serving this junction; and
- The probability of the sun shining being 40% or less.

8.97 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

Chorlton Road Northbound pedestrian crossing following the Jackson Road Junction Overall

8.98 Owing to viewpoint CHO1a and CHO1b not experiencing any solar glare effects drivers would be able to view one set of traffic lights not effected by the Proposed Development. Whilst both CHO1c and CHO1d experience a Minor Adverse effect in terms of solar glare. Based on professional judgement and the factors outlined above, overall Chorlton Road Northbound pedestrian crossing following the Jackson Road junction is of high sensitivity and the overall effect is considered **permanent, Minor Adverse** and **not significant**. Given the dynamic nature of traffic movement, the potential effects would only occur momentarily when looking directly at the affected traffic lights, approximately 23 m from the pedestrian crossing and would occur on sunny days for up to three hours for up to six months of the year, with a maximum probability of the sun shining being 50%.

Chorlton Road Northbound junction with Royce Road (CHO2a, CHO2b, CHO2c and CHO2d)

8.99 Four viewpoints have been considered for this road junction, each viewpoint assesses the potential solar glare effect 23m from the junction for a set of traffic lights controlling two lanes of traffic. CHO2a serves as the primary set of lights for the left lane and CHO2c shows the view of drivers in the left lane relying on the right-hand set of lights, which would serve as a secondary set of lights. CHO2d serves as the primary set of lights for the right lane, with CHO2b showing the view of drivers relying on the left-hand set of lights as a secondary source of signalling. There is an additional set of lights through the intersection to control traffic slowing or stationary traffic waiting at the junction.

View CHO2a

8.100 Instances of solar reflection would occur between 23° and 27° of the driver's line of sight from the southern façade and eastern façade of the C4 tower. Potential reflections from the southern façade would occur between 14:00 and 17:00 GMT from the mid-seasons through the winter months (mid-September until mid-March). Over half of the potential reflections are located above the 5° drivers visor cut-off and any reflections would be broken up by the shading designed for the southern façade.

8.101 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of the potential reflections falling outside 23° of the driver's line of sight and mostly above the driver's visor cut-off;
- The potential reflections being broken up by the shading devices;
- An alternative set of traffic lights serving this junction; and
- The probability of the sun shining being 50% or less.

8.102 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

View CHO2b

8.103 The Proposed Development is not visible from this viewpoint; therefore, this viewpoint experiences a negligible effect in terms of solar glare.

View CHO2c

8.104 Instances of solar reflection would occur from approximately 1° to 14° of the driver's line of sight from the southern and eastern facades of the C4 tower.

8.105 Potential reflections from the southern façade would occur between 14:00 and 17:00 GMT from the mid-seasons through the winter months (late-October until early-February). Reflections would be partially broken up by the shading designed for the southern façade.

- 8.106 Potential reflections from the eastern façade would occur from sunrise until approximately 06:00 GMT in the summer months (mid-May until mid-July). The reflections would be at glancing angles and are less than 8 pixels diameter, therefore do not have the potential to reflect the full sun disc.
- 8.107 Potential reflections would also occur from the C5 tower between 5° and 15° of the driver's line of sight, these would occur throughout the day and year owing to its cylindrical nature. Whilst the veiling luminance of the potential reflections are in excess of 500 cd/m², the reflections would only occur from one panel vertically at any one instance and are therefore less than 8 pixels in diameter. As a result, they do not have the potential to reflect the full sun disc and would not lead to a significant instance of solar glare. The majority of occurrences in excess of 500 cd/m² are above the drivers 5° visor-off.
- 8.108 Owing to potential reflections falling marginally above the traffic lights and within the most critical 3° foveal view, an intensity assessment was prepared to identify the exact time of day in a year when the peak veiling luminance would occur. The peak veiling luminance of 11,249 cd/m² would occur at 15:43 GMT on 31st October. The probability of the sun shining at this time would be approximately 20%.
- 8.109 From the peak veiling luminance visualisation, the left-hand set of lights is visible at approximately 25° from the driver's line of sight and as this view represents drivers in the left lane viewing the right-hand set of lights, drivers in the left lane would be most likely rely on the left-hand set of lights for signalling, with the right-hand lights being one of two secondary sets of light for drivers.
- 8.110 In the instance that a driver was to rely solely on the secondary set of lights to safely stop at this junction, given the dynamic nature of traffic approaching the junction, the peak veiling luminance would occur momentarily when drivers are approximately 23m from the junction, in the left lane, looking at the centre of the right-hand set of traffic lights, prior to 23 m, visibility would be unlikely to be affected.
- 8.111 The solar glare effect to this viewpoint has been determined taking into consideration the following:
- The occurrence of potential to reflect sunlight within 10° of the driver's line of sight;
 - The majority of reflections being above the driver's visor cut-off;
 - The glancing angles of potential reflections from the C5 tower;
 - The potential reflections being broken up by the shading devices or perforated panels;
 - The size of some potential reflections being less than 8 pixels;
 - An alternative, unaffected, set of traffic lights serving this junction;
 - This set of traffic lights predominantly serving as secondary controls for the assessed lane of traffic;
 - The peak veiling luminance occurring outside peak traffic hours; and
 - The probability of the sun shining being 50% or less when the majority of reflections occur and approximately 20% when the peak veiling luminance would occur.
- 8.112 This viewpoint is considered to experience a Moderate to Major Adverse and significant effect in terms of solar glare. Owing to the dynamic nature of traffic flow, the significant effects would only occur momentarily at this precise viewing angle, thus representing a worst-case scenario.

View CHO2d

- 8.113 Instances of solar reflection would occur from approximately 8° to 17° of the driver's line of sight from the southern and eastern facades of the C4 tower.

- 8.114 Potential reflections from the southern façade would occur between 14:00 and 17:00 GMT from the mid-seasons through the winter months (late-October until early-February). Reflections would be partially broken up by the shading designed for the southern façade. The veiling luminance of the southern façade is less than 500 cd/m² and therefore do would not lead to a significant instance of glare.
- 8.115 Potential reflections from the eastern façade would occur from sunrise until approximately 06:00 GMT in the summer months (mid-May until mid-July). Whilst the maximum veiling luminance of the reflections from this façade exceed 500 cd/m², the reflections would be at glancing angles and are less than 8 pixels diameter, therefore do not have the potential to reflect the full sun disc.
- 8.116 Potential reflections would also occur from the C5 tower between 15° and 22° of the driver's line of sight, these would occur throughout the day and year owing to its cylindrical nature. The veiling luminance of the potential reflections from the C5 tower are less than 500 cd/m² and therefore do not have the potential to cause a significant occurrence of glare.
- 8.117 The solar glare effect to this viewpoint has been determined taking into consideration the following:
- The occurrence of potential to reflect sunlight within 10° of the driver's line of sight;
 - The majority of reflections being above the driver's visor cut-off;
 - The glancing angles of potential reflections from the C5 tower;
 - The potential reflections being broken up by the shading devices or perforated panels;
 - The low veiling luminance levels falling within 10° of the driver's line of sight;
 - The size of some potential reflections being less than 8 pixels;
 - An alternative, unaffected, set of traffic lights serving this junction; and
 - The probability of the sun shining being 50% or less when the majority of reflections occur.
- 8.118 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

Chorlton Road Northbound junction with Royce Road Overall

- 8.119 The viewpoint for the primary traffic lights serving the left lane experiences a Minor Adverse effect, however the secondary traffic lights on the right-hand side of the road experience a Moderate to Major Adverse effect. The right lane experiences a Minor Adverse effect to its primary set of lights, whilst the secondary set of light on the left-hand side of the road would experience a negligible effect. Owing to the secondary nature of the viewpoint experiencing a Moderate to Major Adverse effect and the low probability of the sun shining when the peak veiling luminance would occur, the Chorlton Road Northbound junction with Royce Road is of high sensitivity and is the overall effect is considered **permanent, Minor to Moderate Adverse** and **significant**.
- 8.120 Given the dynamic nature of traffic movement, the potential effects would only occur momentarily when looking directly at the affected traffic lights, approximately 23 m from the junction and would occur on sunny days throughout the day and year, with a maximum probability of the sun shining being 50%, the significant instance of glare would occur for up to three hours in the afternoons for three months of the year, when the probability of the sun shining is less than 40%.

Chester Road Westbound junction with Deansgate (DG2)

- 8.121 One viewpoint has been considered for this road junction, the viewpoint assesses the glare effect 23m from the junction for a driver looking forward, where traffic from Deansgate merges with Chester Road. There are no signals controlling this junction.

- 8.122 A slither of the western façade of the C4 tower has the potential to reflect sunlight from 5° to 30° of the driver's line of sight at approximately 15:00 – 16:00 GMT for the mid-seasons (mid-August through mid-November and again mid-January through mid-April). The potential reflections would occur above the driver's visor cut-off and would be at glancing angles and cannot reflect the full sun disc. As such, the potential reflections would not lead to a significant instance of glare.
- 8.123 A slither of the eastern façade of the C4 tower has the potential to reflect sunlight from 16° to 30° of the driver's line of sight at approximately 11:00 – 12:00 GMT for the winter months (mid-September until mid-March). The potential reflections would occur above the driver's visor cut-off and would be at glancing angles and cannot reflect the full sun disc. As such, the potential reflections would not lead to a significant instance of glare.
- 8.124 Potential reflections would occur from the C5 tower outside 19° of the driver's line of sight throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc.
- 8.125 The solar glare effect to this viewpoint has been determined taking into consideration the following:
- The small areas of façade with the potential to reflect sunlight within 10° of the driver's line of sight;
 - The location of the majority of potential reflections falling outside 15° of the driver's line of sight and above the driver's visor cut-off;
 - The glancing angles of potential reflections;
 - The potential reflections being broken up by perforated panels;
 - The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the afternoons in the mid-seasons and winter months;
 - The size of potential reflections being unable to reflect the full sun disc;
 - No signals controlling this junction; and
 - The probability of the sun shining being 50% or less.
- 8.126 The solar glare effect to this viewpoint is considered high sensitivity, and the effect is **Minor Adverse** and **not significant**.

Dawson Street Southbound junction with Deansgate Interchange (DS1)

- 8.127 Two viewpoints have been considered for this junction, each viewpoint assesses the potential solar glare effect 23m from the junction with Deansgate Interchange for traffic approaching the roundabout. DS1a is the view of drivers looking forward in the left lane and DS1b is the view of drivers looking forward in the right lane. There are no signals controlling this junction.

View DS1a

- 8.128 Potential reflections would occur from the western façade of the C4 tower between 10° and 30° of the driver's line of sight. The reflections would occur in the evenings (between 17:00 GMT until sunset) from the mid-seasons through summer months (early-April until late-August). The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.
- 8.129 Additionally, the Proposed Development sits within the sun's path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.130 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 10° of the driver's line of sight and the majority above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the late mornings in throughout the year;
- No signals controlling this junction;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.131 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

8.132 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DS1b

8.133 Potential reflections would occur from the western façade of the C4 tower between 6° and 26° of the driver's line of sight. The reflections would occur in the evenings (between 17:00 GMT until sunset) from the mid-seasons through summer months (early-April until late-August). The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion, meaning that shorter stopping distance could be accommodated.

8.134 The maximum veiling luminance of the reflections would be 966 cd/m² however is located well 10° of the driver's line of sight. All reflections falling below the driver's visor cut-off would be less than 500 cd/m².

8.135 Additionally, the Proposed Development sits within the suns path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.136 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 5° of the driver's line of sight and the majority above the driver's visor cut-off;
- Those potential reflections falling below the driver's visor cut-off being of low intensity;
- The potential reflections being broken up by perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- No signals controlling this junction;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.137 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

8.138 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

Dawson Street Southbound junction with Deansgate Interchange Overall

8.139 Whilst the potential reflections at this junction occur during peak traffic times, there are no signals controlling this junction and both lanes are considered to experience a Minor Adverse effect, therefore the overall effect in terms of solar glare is at the Dawson Street Southbound junction with Deansgate Interchange is of high sensitivity and the overall effect is considered **permanent, Minor Adverse** and **not significant**.

8.140 Given the dynamic nature of traffic movement, the potential effects would only occur for a short section of road approaching the junction, and would occur on sunny days for up to three hours for up to four months of the year, with a maximum probability of the sun shining being 40%.

Dawson Street Southbound divides from Ring Road/Mancunian Way (DS2)

8.141 One viewpoint has been considered for this road junction, the viewpoint assesses the potential solar glare effect 35m from the junction for a driver looking forward where traffic divides from Mancunian Way. There are no signals controlling this junction.

8.142 Potential reflections would occur from the western façade of the C4 tower between 25° and 30° of the driver's line of sight. The reflections would occur in the evenings (between 17:00 - 18:00 GMT) during the summer months (mid-April until mid-August). All reflections are located far above the driver's visor cut-off.

8.143 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 25° of the driver's line of sight and the well above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in the mid-seasons;
- No signals controlling this junction;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being approximately 40%.

8.144 In consideration of the above, this viewpoint is of high sensitivity and the overall effect is considered **permanent, Minor Adverse** and **not significant**. Given the dynamic nature of traffic movement, the potential effects would only occur for a short section of road approaching the junction, and would occur on sunny days for up to one hour for up to four months of the year, with a probability of the sun shining being 40%.

Deansgate Interchange Southbound junction with Chester Road (DGI2a, DGI2b, DGI2c, DGI2d, DGI2e, DGI2f and DGI2g)

8.145 Four sets of traffic lights serve three lanes approaching the Deansgate Interchange junction with Chester Road. Seven viewpoints have been assessed for this junction, each viewpoint assesses the potential solar glare effect for a set of traffic lights from one of the three lanes:

- DGI2a assesses the left lane of traffic looking at the first set of traffic lights on the left-hand side of the road at approximately 23m (typical stopping distance at 30mph) from the junction. This would be the primary traffic lights controlling the left lane as it approaches the junction.
- DGI2b assesses the left lane of traffic looking at the second set of traffic lights on the left-hand side of the road at approximately 23m (typical stopping distance at 30mph) from the junction. This set of traffic lights would predominantly control stationary traffic at the junction.
- DGI2c assesses the central lane of traffic looking at the first set of traffic lights on the left-hand side of the road at approximately 23m from the junction. This would be the primary traffic lights controlling the left lane as it approaches the junction.

- DGI2d assesses the central lane of traffic looking at the second set of traffic lights on the left-hand side of the road at approximately 23m from the junction. This would be a secondary set of traffic lights for the central lane as it approaches the junction and would control stationary traffic at the junction.
- DGI2e assesses the central lane of traffic looking at the second set of traffic lights on the right-hand side of the road at approximately 23m from the junction. This would be a secondary set of traffic lights for the central lane as it approaches the junction and would control stationary traffic at the junction.
- DGI2f assesses the right-hand lane of traffic looking at the first set of traffic lights on the right-hand side of the road at approximately 23m from the junction. This would be the primary traffic lights controlling the right lane as it approaches the junction.
- DGI2g assesses the right-hand lane of traffic looking at the second set of traffic lights on the right-hand side of the road at approximately 23m from the junction. This would be a secondary set of traffic lights for the right lane as it approaches the junction and would control stationary traffic at the junction.

View DGI2a

8.146 Potential reflections would occur from a small area of the western façade that fall outside 22° of the driver's line of sight. The potential reflections occur in the late afternoons (approximately 16:30- 18:00 GMT) from the mid-seasons through summer (mid-March until mid-September). The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.

8.147 Additionally, the Proposed Development sits within the sun's path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.148 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 22° of the driver's line of sight and the majority above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;
- The Proposed Development's location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.149 The solar glare effect to this viewpoint is considered Minor Adverse and not significant.

8.150 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DGI2b

8.151 Potential reflections would occur from a small area of the western façade that fall outside 15° of the driver's line of sight. The potential reflections occur in the late afternoons (approximately 16:30- 18:00 GMT) from the mid-seasons through summer (mid-March until mid-September).

8.152 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 15° of the driver's line of sight and the majority above the driver's visor cut-off;

- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.153 The potential effect of solar glare to this viewpoint is considered Minor Adverse.

8.154 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DGI2c

8.155 Potential reflections would occur from a small area of the western façade that fall outside 25° of the driver's line of sight. The potential reflections that would occur within 30° of the driver's line of sight would occur in the evenings (between 18:00 and 17:00 GMT) during the mid-seasons (April and August).

8.156 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 25° of the driver's line of sight and the majority above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 30% or less.

8.157 The potential effect of solar glare to this viewpoint is considered Negligible to Minor Adverse.

8.158 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DGI2d

8.159 Potential reflections would occur from a small area of the western façade that fall outside 20° of the driver's line of sight. The potential reflections occur in the late afternoons/early evenings (approximately 16:45- 18:30 GMT) from the mid-seasons through summer (mid-March until mid-September). The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.

8.160 The majority of potential reflections occur above the driver's visor cut-off.

8.161 Additionally, the Proposed Development sits within the sun's path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.162 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 20° of the driver's line of sight and the majority above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;

- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.163 The potential effect of solar glare to this viewpoint is considered Minor Adverse.

8.164 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DGI2e

8.165 Potential reflections would occur from an area of the western façade that falls sits in the driver's line of sight when viewing the traffic lights 23m prior to the junction. The potential reflections falling within 10° of the driver's line of sight occur in the late afternoons/early evenings (approximately 17:30 - 18:30 GMT) during the mid-seasons (mid-March until early-May and again from early-August until mid-September). Potential reflections would also occur between 10° and 30° of the driver's line of sight from 16:30 - 18:00 GMT, from mid-March until mid-September. The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.

8.166 The intensity of reflections at this viewpoint are greater than the recommendation of 500 cd/m² owing to their location within the most sensitive foveal view (within 3° of the driver's direct line of sight) and are thus considered significant. The veiling luminance of 22,893 cd/m² would occur at 18:12 GMT on 9th April when the probability of the sun shining is 10%.

8.167 Three other sets of traffic lights are visible within the field of view. Owing to this junction being within a roundabout, and drivers approaching the traffic lights around a bend, the two sets of lights on the left-hand side of the road would appear first within a driver's field of view. This set of traffic lights would be most relied upon by stationary traffic waiting at the lights or those slowing to stop at the lights.

8.168 The additional dynamic assessment of drivers travelling towards the junction from Dawson Street confirmed that at the time when the greatest reflections would occur, the main view of drivers approaching the junction looking forward would not be affected, and drivers could rely on other sets of lights to safely stop. Whilst the veiling luminance of potential reflections is considered a significant instance of glare (in excess of 500cd/m²) when the instance of glare occurs, it would be for an instant of a second when looking precisely at the traffic lights.

8.169 Additionally, the Proposed Development sits within the suns path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.170 The façade has been designed to include perforated aluminium panels that break up potential reflections, reducing the likelihood that the full sun disc can be reflected.

8.171 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling within 10° of the driver's line of sight;
- The majority of potential reflections occur above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;
- The dynamic nature of traffic movement whereby the viewpoints' location on a bend results in potential reflections that would be momentary when a driver is approximately 23 m from the junction looking specifically at this set of traffic lights;

- The predominantly stationary nature of traffic relying on this traffic light;
- The intensity of potential reflections;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less however when the peak veiling luminance occurs, the probability of the sun shining is 10%.

8.172 Taking into consideration the above, the potential effect of solar glare to this viewpoint is considered Major Adverse and significant. Given the dynamic nature of traffic movement, the potential effects would only occur momentarily when looking directly at the affected traffic lights, approximately 23 m from the junction and would occur on sunny days during the summer months, with a maximum probability of the sun shining being 40%, the significant instance of glare would occur for up to three hours in the evenings for six months of the year, when the probability of the sun shining is less than 40%.

8.173 It is worth noting that the assessment of this viewpoint has been undertaken for the worst-case scenario, this being the school, which is proposed in outline, not having been implemented. The school (Building C3) is however intended to be implemented alongside the C4 tower. Considering the school having been implemented, the lower two floors of the C4 tower and the podium would be obscured, these are the elements that sit directly behind the affected traffic lights. As such, the veiling luminance of this viewpoint reduces to 3,236 cd/m². In addition, reflections would no longer occur within the 3° of the driver's direct line of sight and a smaller area is visible below the driver's visor cut-off. Therefore, provided the school is implemented at the same time as the C4 tower, as intended, the potential effects would reduce from Major Adverse and significant to Moderate Adverse and significant.

View DGI2f

8.174 Potential reflections would occur from an area of the western façade that mostly falls outside 10° of the driver's line of sight. The potential reflections occur in the late afternoons/early evenings (approximately 16:45- 19:00 GMT) from the mid-seasons through summer (mid-March until mid-September). The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.

8.175 The veiling luminance of reflections falling within 30° of the driver's line of sight at this viewpoint are greater than the recommendation of 500 cd/m², however most instances in excess of 500 cd/m² are above the driver's visor cut-off. Those reflections falling within 10° are too small to reflect the full sun disc and therefore would not lead to a significant instance of glare.

8.176 Additionally, the Proposed Development sits within the sun's path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.177 The façade has been designed to include perforated aluminium panels that break up potential reflections, reducing the likelihood that the full sun disc can be reflected.

8.178 It is also worth noting that three other sets of traffic lights would be visible to drivers affected at this viewpoint.

8.179 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of the majority of potential reflections falling outside 10° of the driver's line of sight;

- The majority of potential reflections occur above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Potential reflections occurring within 10° if the driver's line of sight being too small to reflect the full sun disc;
- Alternative sets of traffic lights serving this junction;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.180 Taking into consideration the above, the potential effect of solar glare to this viewpoint is considered Minor Adverse.

8.181 It is also worth noting that the school, proposed in outline, has not been included within this assessment however once implemented, it would obscure the lower two floors and the podium.

View DGI2g

8.182 Potential reflections would occur from an area of the western façade between 6° and 30° of the driver's line of sight. The potential reflections falling within 10° of the driver's line of sight occur in the evenings (approximately 18:00 - 19:00 GMT) during the mid-seasons (mid-March until mid-May and mid-July until mid-September). The intensity of these reflections would be greater than the recommended 500 cd/m² however the probability of the sun shining during these times is 20%.

8.183 The potential reflections falling between 10° and 30° of the driver's line of sight occur late afternoons/early evenings (approximately 16:45- 18:30 GMT) from the mid-seasons through summer (mid-March until mid-September). The intensity of these reflections are greater than 500 cd/m² however the majority of reflections would occur above the driver's visor cut-off. The occurrence of reflections would therefore fall during peak traffic flow through this junction, however at these times it is also likely that drivers would be travelling at lower speeds due to congestion meaning that shorter stopping distance could be accommodated.

8.184 Additionally, the Proposed Development sits within the sun's path, therefore the Proposed Development would not cause significantly worse effects when compared with the direct view of the sun.

8.185 The façade has been designed to include perforated aluminium panels that break up potential reflections, reducing the likelihood that the full sun disc can be reflected.

8.186 Three other sets of traffic lights are visible within the field of view. Owing to this junction being within a roundabout, and drivers approaching the traffic lights around a bend, the alternative sets of lights would appear first within a driver's field of view. This set of traffic lights would be most relied upon by stationary traffic waiting at the lights or those slowing to stop at the lights.

8.187 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of the majority of potential reflections falling within 5° of the driver's line of sight;
- The majority of potential reflections occur above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- Alternative sets of traffic lights serving this junction;
- The dynamic nature of traffic movement whereby the viewpoints' location on a bend results in potential reflections that would be momentary when a driver is approximately 23 m from the junction looking specifically at this set of traffic lights;
- The predominantly stationary nature of traffic relying on this traffic light;
- The intensity of potential reflections;

- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less however the probability of the sun shining when potential reflections occur below the driver's visor cut-off would be 20%.

8.188 Taking into consideration the above, the potential effect of solar glare to this viewpoint is considered Moderate Adverse.

8.189 It is worth noting that the assessment of this viewpoint has been undertaken for the worst-case scenario, this being the school, which is proposed in outline, not having been implemented. The school (Building C3) is however intended to be implemented alongside the C4 tower. Considering the school having been implemented, the lower two floors of the C4 tower and the podium would be obscured. This sees a smaller area visible below the driver's visor cut-off.

Deansgate Interchange Junction Overall

8.190 Overall, one of the viewpoints serving this junction experience a Negligible to Minor Adverse effect (DGI2c), four experience a Minor Adverse effect (DGI2a, DGI2b, DGI2d and DGI2f), one experiences a Moderate Adverse and significant effect (DGI2g), and one experiences a Major Adverse and significant effect (DGI2e). The one viewpoint that experiences a Major Adverse and significant effect would reduce to Moderate Adverse and significant with the implementation of the proposed school (plot C3).

8.191 As such, driver's approaching the Deansgate Interchange junction with Chester Road have the potential to experience significant solar glare effects at two of the seven viewpoints, however the significance of the junction overall takes into consideration the following factors:

- The dynamic nature of drivers a bend when approaching the junction, therefore the viewing angle changes with every metre travelled and thus the reflections would be momentary, unless traffic is stationary, at which point drivers can use mitigating sets of lights.
- The two affected sets of traffic lights would be mostly secondary sets of lights for vehicles approaching the junction but would predominantly serve stationary or slowing vehicles waiting at the junction.
- All views would have multiple traffic lights that drivers could make use of to mitigate any traffic signal sighting issues. The dynamic assessment of drivers travelling towards the junction from Dawson Street confirmed that at the time when the greatest reflections would occur, the main view of drivers would not be affected, and drivers could rely on other sets of lights to safely stop.
- Traffic is likely to be travelling at lower speeds owing to the roundabout nature and the merging of traffic.
- The probability of the sun shining when potential reflections are expected to occur below the driver's visor cut-off is low (10-30%).
- The façade has been designed to include perforated aluminium panels that break up potential reflections, reducing the likelihood that the full sun disc can be reflected.
- The greatest effects will reduce with the school implemented.

8.192 Therefore, based on professional judgement and the factors outlined above, the overall effect of solar glare on drivers approaching the Deansgate Intersection (Southbound) junction with Chester Road is of high sensitivity and is considered **permanent, Moderate Adverse and significant**.

Mancunian Way Northbound (MW1)

8.193 One viewpoint has been considered for this section of road, the viewpoint assesses the solar glare effect approximately 53m (typical stopping distance for drivers travelling at 50mph) from the traffic dividing onto the slip road towards Deansgate Interchange. There are no signals controlling this junction.

8.194 Potential reflections would occur from the eastern façade of the C4 tower from 18° of the driver's line of sight between 09:00 – 11:00 GMT for the mid-seasons and winter months (mid-September through mid-March). The potential reflections would occur above the driver's visor cut-off.

8.195 Potential reflections would also occur from the C5 tower outside 17° of the driver's line of sight throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc. In addition, the majority of reflections occur above the driver's visor cut-off.

8.196 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 15° of the driver's line of sight and the majority above the driver's visor cut-off;
- The glancing angles of potential reflections;
- The potential reflections being broken up by perforated panels;
- No signals controlling this section of road; and
- The probability of the sun shining being 50% or less.

8.197 In consideration of the above, this viewpoint is of high sensitivity and is considered to experience a **permanent, Minor Adverse** and **not significant** effect in terms of solar glare.

Mancunian Way Northbound (MW2)

8.198 One viewpoint has been considered for this section of road, the viewpoint assesses the solar glare effect of drivers travelling northbound in the central lane between the slip road from Medlock Street Junction and the slip road to Deansgate Interchange. There are no signals within this section of road.

8.199 Potential reflections would occur from the C5 tower outside 11° of the driver's line of sight throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc. In addition, the majority of reflections occur above the driver's visor cut-off.

8.200 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 11° of the driver's line of sight and the majority above the driver's visor cut-off;
- The glancing angles of potential reflections;
- The potential reflections being broken up by perforated panels;
- No signals controlling this section of road; and
- The probability of the sun shining being 50% or less.

8.201 In consideration of the above, this viewpoint is of high sensitivity and is considered to experience a **permanent, Minor Adverse** and **not significant** effect in terms of solar glare.

Mancunian Way Northbound (MW3)

8.202 One viewpoint has been considered for this section of road, the viewpoint assesses the solar glare effect approximately 53m from the traffic merging from the Medlock Street Junction slip road. There are no signals controlling this junction.

8.203 Potential reflections would also occur from the C5 tower outside 6° of the driver's line of sight throughout the day and year owing to its cylindrical nature. The reflections would only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc. In addition, the majority of reflections occur above the driver's visor cut-off.

8.204 The maximum veiling luminance of the reflections would be 1,920 cd/m² however is located outside 10° of the driver's line of sight. All reflections falling below the driver's visor cut-off would be less than 500 cd/m² and those falling above the visor cut-off would be less than 8 pixels in diameter, therefore would not reflect the full sun disc.

8.205 Potential reflections would occur from the eastern façade of the C4 tower from 12° of the driver's line of sight between 09:00 – 10:00 GMT during the mid-seasons (mid-February through mid-April and again during mid-August through mid-October). The potential reflections would be from a small slither of the façade and would mostly occur above the driver's visor cut-off. All reflections falling below the driver's visor cut-off would be less than 500 cd/m² and those falling above the visor cut-off would be less than 8 pixels in diameter, therefore would not reflect the full sun disc.

8.206 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 15° of the driver's line of sight and the majority above the driver's visor cut-off;
- The glancing angles of potential reflections;
- The potential reflections being broken up by perforated panels;
- The size of potential reflections being less than 8 pixels;
- The low intensity of potential reflections below the driver's visor cut-off;
- No signals controlling this section of road; and
- The probability of the sun shining being 50% or less.

8.207 In consideration of the above, this viewpoint is of high sensitivity and is considered to experience a **permanent, Minor Adverse** and **not significant** effect in terms of solar glare.

Mancunian Way Southbound (MW4)

8.208 One viewpoint has been considered for this section of road, the viewpoint assesses the solar glare effect of drivers travelling southbound in the left lane after passing under the Deansgate Interchange. There are no signals within this section of road.

8.209 Potential reflections would occur from the C5 tower outside 27° of the driver's line of sight in the mornings (between 09:00 and 11:00 GMT) during the mid-seasons (mid-February through mid-April and again during mid-August through mid-October). The reflections would be of a glancing nature and only occur from one panel vertically at any one instance and therefore do not have the potential to reflect the full sun disc. In addition, all reflections occur above the driver's visor cut-off.

8.210 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 27° of the driver's line of sight and above the driver's visor cut-off;
- The glancing angles of potential reflections;
- The size of potential reflections being less than 8 pixels; and
- No signals controlling this section of road.

8.211 In consideration of the above, this viewpoint is of high sensitivity and is considered to experience a **Negligible** and **not significant** effect in terms of solar glare.

Mancunian Way Southbound (MW5)

8.212 One viewpoint has been considered for this section of road, the viewpoint assesses the solar glare effect of drivers travelling southbound prior to passing under the Deansgate Interchange. There are no signals controlling this section of road.

8.213 Potential reflections would occur from the western façade of the C4 tower between 11° and 28° of the driver's line of sight. The reflections would occur in the evenings (between 17:00 and sunset) during the mid-seasons through summer months (early-April until late-August). The majority of reflections are located far above the driver's visor cut-off. The probability of the sun shining during these times is 30%.

8.214 The solar glare effect to this viewpoint has been determined taking into consideration the following:

- The location of potential reflections falling outside 10° of the driver's line of sight and the majority above the driver's visor cut-off;
- The potential reflections being broken up by perforated panels;
- The Proposed Developments location within the sun path, hence reducing the direct view of the sun in the mornings in throughout the year;
- No signals controlling this section of road;
- The occurrence of potential reflections at peak travel times; and
- The probability of the sun shining being 40% or less.

8.215 In consideration of the above, this viewpoint is high sensitivity and is considered to experience a **permanent, Minor Adverse** and **not significant** effect in terms of solar glare.

Mitigation Measures

8.216 The design has evolved with solar glare effects in mind through the inclusion of shading on the southern façade of the C4 tower and the distribution of perforated panels to break up potential reflections. As such, potential effects have been mitigated by design and there are no further planned mitigation measures for solar glare from the Proposed Development.

8.217 Whilst significant adverse effects are predicted to occur, it should be noted that the assessment considers a scenario whereby the sun shines on every day of the year to consider all potential circumstances in which reflections will occur. According to the sunlight availability protractor, based on UK weather data, the sunshine probability will be significantly reduced and therefore the likelihood of the instances of reflections are considerably reduced. The probability of the sun shining during the times of the year when potential reflections are expected to occur ranges from 10% in the early mornings/late afternoons from the mid-seasons through winter months, up to 50% in the summer months from mid-morning until early-afternoon.

8.218 Furthermore, the assessment does not include any direct viewpoints of the sun itself which would also cause very intense glare to drivers at these respective viewpoints. For the majority of viewpoints, the sun would be directly visible at other times of the day if the Proposed Development were not present as seen in the solar glare assessment in Appendix 8.1. In comparison, the reflections from the Proposed Development would appear less intense and would not cause significantly worse effects when compared with a direct view of the sun.

8.219 The one viewpoint that experiences a Major Adverse and significant effect (DGI2e) would reduce to Moderate Adverse and significant with the implementation of the school which is yet to be designed in detail and thus not included within the assessment. This would alter the overall effect and significance of the Deansgate Interchange junction with Chester Road.

Cumulative Effects

8.220 Cumulative schemes are not assessed as the solar glare assessment is a worst-case scenario. Additional developments could obscure the view of the Proposed Development from certain viewpoints and therefore reduce instances of solar reflections.

Residual Effects

8.221 The likely significant effects of solar glare from the Proposed Development described above are considered a worst-case scenario. All solar glare effects to road junctions are considered high sensitivity and the effects are permanent and long term, therefore the residual effects are the same as during the operational stage.

Table 8.1 – Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
Negligible to Moderate adverse and significant effects on Solar Glare	Road users	None	Negligible to Moderate adverse and significant effects on Solar Glare
Operational Phase			
Negligible to Moderate adverse and significant effects on Solar Glare	Road users	Embedded in the design	Negligible to Moderate adverse and significant effects on Solar Glare

Summary

8.222 Solar glare assessments are considered necessary when a Proposed Development has sections of glazed façade that may reflect sunlight and obstruct the vision of road users.

8.223 The assessment is conducted using a 3D computer model of the area created using photogrammetry and architectural models as a reference. Viewpoints are then chosen surrounding the development in order to give a realistic representation of potential instances of solar reflections. Viewpoints are located at a focal point such as traffic signal, pedestrian crossing or incoming traffic.

8.224 The assessment results show the time period and months in which potential solar reflections can occur. Where solar reflections occur close to the centre of vision when viewing traffic light, supplementary studies have been undertaken that establish the intensity of the reflections and whether these could impair visibility of drivers approaching the intersection.

8.225 The assessment shows a worst-case scenario, as a clear sky is necessary for solar reflections to occur, which in the UK is often not the case.

8.226 In terms of solar glare, potential significant effects have been identified at several of the locations assessed.

8.227 Overall, 12 locations are considered not significant. Two of the 12 locations are considered to be Negligible and not significant as no instances of solar glare are evident from any of the viewpoints within 30° of the driver's line of sight. 10 locations of the 12 are considered to be Minor Adverse and not significance due to potential instances of solar reflections occurring within 30° of the driver's line of sight however these would not impair visibility of signals.

- 8.228 Two locations would be significant, one would be considered Minor to Moderate Adverse, Chorlton Road Northbound junction with Royce Road. The second junction, Deansgate Interchange Southbound junction with Chester Road, has one Moderate Adverse (DGI2g) and one Major Adverse (DGI2e) viewpoint however the overall effect in terms of solar glare to driver's approaching this junction would be considered Moderate Adverse.
- 8.229 The design has evolved with solar glare effects in mind through the inclusion of shading on the southern façade of the C4 tower and the distribution of perforated panels to break up potential reflections. As such, potential effects have been mitigated by design and there are no further planned mitigation measures for solar glare from the Proposed Development.

Typical Stopping Distances



Figure:	8.1		
Title:	Typical Stopping Distances for a car		
Project:	Crown Street Phase 2		
Date:	27/01/2020	Scale:	N/A

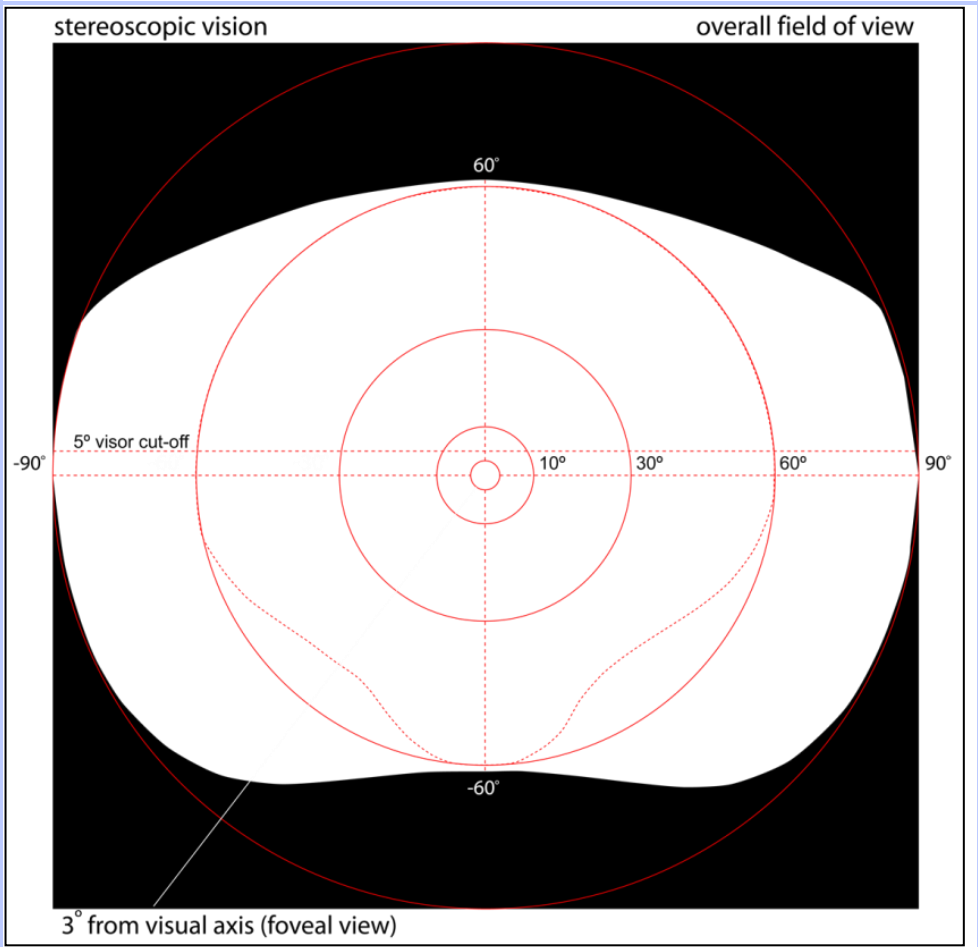


Figure:	8.2		
Title:	Field of Vision Diagram		
Project:	Crown Street Phase 2		
Date:	27/01/2020	Scale:	N/A

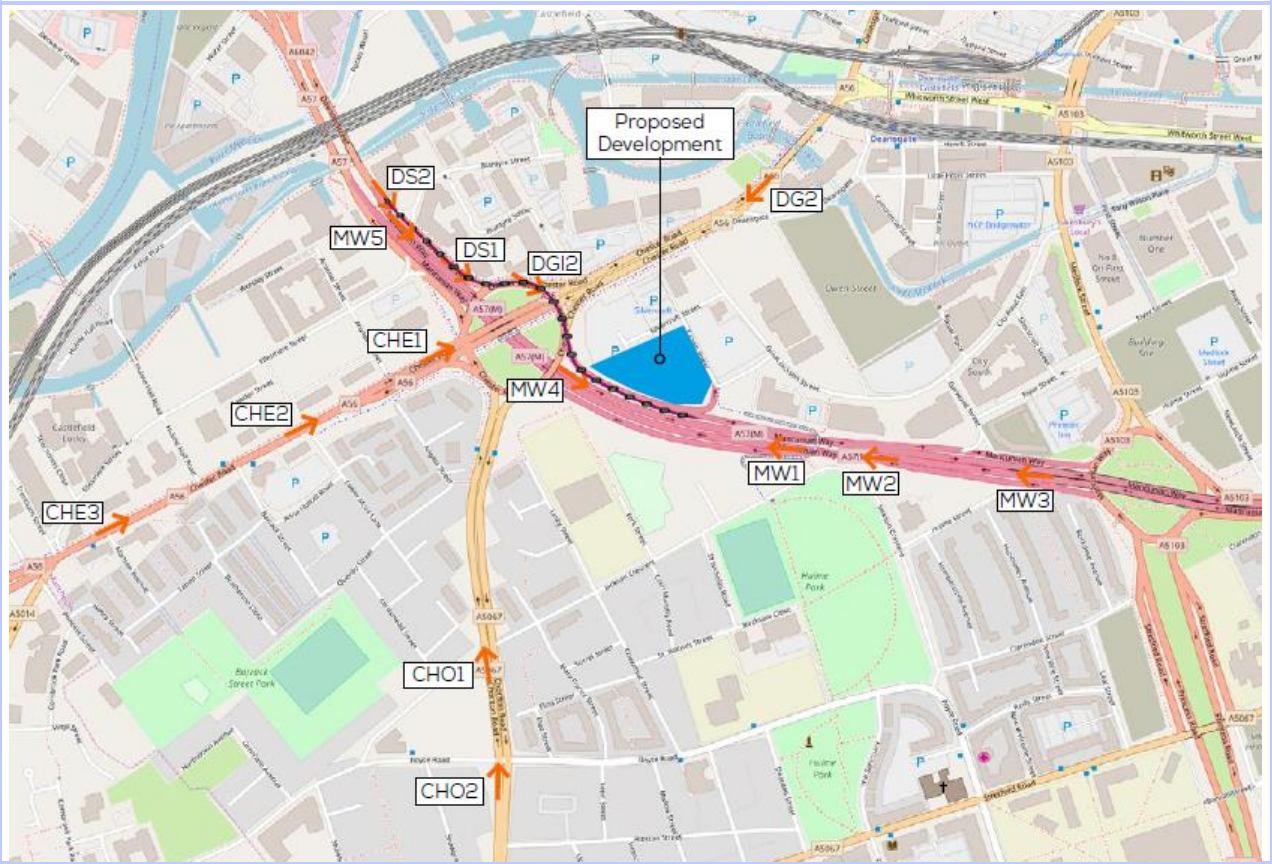


Figure:	8.3		
Title:	Viewpoints assessed for solar glare assessment		
Project:	Crown Street Phase 2		
Date:	27/01/2020	Scale:	N/A

9 Daylight, Sunlight and Overshadowing

A9 ES Addendum Alterations

The following change has been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to reflect the publishing of the revised NPPF (July 2021).

No EIA Technical Note nor Chapter Addendum has been prepared in relation to Daylight, Sunlight and Overshadowing. GIA have confirmed that the conclusions of the approved Daylight, Sunlight and Overshadowing ES chapter (below) remain valid and are unchanged by the detailed design development for Phase C, the education facility which have been progressed as part of this reserved matters application.

Introduction

- 9.1 This Chapter of the ES has been prepared by GIA and assesses the likely significant effects of the Proposed Development with respect to daylight and sunlight. This chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 9.2 This Chapter of the ES was written by Sam Wallis BSc (Hons) MRICS. Sam is a chartered surveyor with 15 years' experience specialising in daylight and sunlight. GIA are the largest specialist daylight and sunlight advisor in the UK, with over 25 years of specialisation and expertise, having advised on some of the largest developments within Greater Manchester.
- 9.3 This assessment and ES chapter has been produced by GIA and is supported by the following technical results within Appendix 9:
- Appendix 9.1 – Drawings of the Baseline and Proposed Scenario; and
 - Appendix 9.2 – Daylight and Sunlight Results for Baseline v Proposed.

Legislative and Policy Context

Legislation

- 9.4 There is no legislation which governs daylight and sunlight.

National Planning Policy

Revised National Planning Policy Framework 2019

- 9.5 The National Planning Policy Framework stipulates that "...*Planning policies and decisions should ensure that developments....create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users.*"

9.6 The National Planning Policy Framework (NPPF) adopted on the 27 March 2012, and updated on 19 February 2019, and subsequently a revised version was published in July 2021 which stipulates that "...planning policies and decisions should ensure that developments:... create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users~~always seek to secure a good standard of amenity for existing and future occupants of land and buildings."~~

9.7 Paragraph 12~~5~~3 further states:

"Where there is an existing or anticipated shortage of land for meeting identified housing needs, it is especially important that planning policies and decisions avoid homes being built at low densities, and ensure that developments make optimal use of the potential of each site. In these circumstances:

[...]

c) In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site (as long as the resulting scheme would provide acceptable living standards)."

The National Planning Practice Guidance (NPPG) 2019

9.8 The National Planning Practice Guidance (NPPG) – Making Efficient Use of Land, published on 22 July 2019, Paragraph: 006 Reference ID: 66-006-20190722 states that:

"Where a planning application is submitted, local planning authorities will need to consider whether the Proposed Development would have an unreasonable impact on the daylight and sunlight levels enjoyed by neighbouring occupiers, as well as assessing whether daylight and sunlight within the development itself will provide satisfactory living conditions for future occupants."

9.9 Paragraph 007 Reference ID: 66-007-20190722 also states:

"All developments should maintain acceptable living standards. What this means in practice, in relation to assessing appropriate levels of sunlight and daylight, will depend to some extent on the context for the development as well as its detailed design. For example in areas of high-density historic buildings, or city centre locations where tall modern buildings predominate, lower daylight and daylight and sunlight levels at some windows may be unavoidable if new developments are to be in keeping with the general form of their surroundings."

Local Planning Policy

Manchester Core Strategy (2012 – 2027)

9.10 Policy DM1 – Development Management – States that all developments should have regard to the effects on amenity including privacy, light, noise, vibration, air quality and odours.

9.11 Policy EN2 – Tall Buildings – States that, by their very size, tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment.

Guidance Documents and Standards

Building Research Establishment (BRE) 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice', Second Edition, 2011

9.12 The Building Research Establishment (BRE) Guidelines 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice 2011, 2nd edition' (released October 2011) provides advice on site layout planning to achieve good sunlighting and daylighting within buildings,

and in the open spaces between them. It is intended for use by building designers, developers, consultants and Local Planning Authorities (LPAs). The advice it gives is not mandatory and should not be used as an instrument of planning policy, it states:

"This guide is a comprehensive revision of the 1991 edition of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

9.13 It also states:

"The advice is given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. In special circumstances the developer or planning authority may wish to use different target values... in an area with modern high rise buildings, a higher degree of obstruction maybe unavoidable if new developments are to match the height and proportions of existing building" (para.1.6).

9.14 In addition, the BRE Guidelines state (para. 1.3) that, *"it is intended to be read in conjunction with the interior daylighting recommendations in the British Standard 8206-2 Code of practice for daylighting, and in the CIBSE publication Lighting guide: daylighting and window design"*.

British Standard (BS) 8206-2:2008: 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'

9.15 The British Standard 8206 part 2 provides recommendations regarding the design for daylight in buildings and sets out various methods for assessing daylight. The document states:

"Daylighting gives to a building a unique variety and interest. An interior which looks gloomy, or which does not have a view to the outside when this could reasonably be expected, will be considered unsatisfactory by its users."

Assessment Methodology and Significance Criteria

Methodology for Determining Baseline Conditions and Sensitive Receptors

9.16 The BRE Guidelines suggest that residential properties have the highest requirement for daylight and sunlight and states that:

"the guidelines are intended for use for rooms in adjoining dwellings where light is required, including living rooms, kitchens and bedrooms."

9.17 The scope of residential properties that have been assessed has been determined through professional judgement, considering their orientation and proximity to the Proposed Development.

9.18 The following properties are defined as receptors and will be considered due to their proximity to the Site, and their use:

- Elizabeth Tower
- Castlegate
- Castle Quay
- Citygate
- Transition

9.19 These properties are identified in the drawings contained at Appendix 9.1.

The assessment has considered other adjacent residential properties and, due to the distance and orientation from the Proposed Development, they are unlikely to be affected, and they have not been assessed in detail. These properties are:

- Deansgate South – approximately 200m west of the Site
- Chester Road development – approximately 175m north west of the Site
- Thomas Court – approximately 150m east of the Site
- St Georges Church – approximately 180m north east of the Site

9.20 As Hulme Park is located to the south of the Proposed Development, there is no potential for overshadowing and so it will not be assessed.

Scenarios Assessed

9.21 The following scenarios have been assessed and are reported within this Chapter of the ES:

- Baseline; and
- Proposed Development.

9.22 Where consented schemes have the potential to be affected by the Proposed Development, these have included in the baseline scenario and assessed individually in detail, so no separate technical assessment of the cumulative impact is required. This approach is in line with the BRE Guidelines.

Baseline

9.23 This scenario considers the current baseline condition (as can be seen December 2019). This scenario is depicted on drawings 0953/001-003 (Appendix 9.1).

Proposed Development

9.24 The Proposed Development scenario consists of the Proposed Development in the context of the surrounding existing environment. This scenario assesses the potential daylight and sunlight effects of the Proposed Development on the surrounding residential receptors.

9.25 The Proposed Development scenario is illustrated on drawing no. 0953/004-006 (Appendix 9.1). Although the proposals comprise separate Phases, this assessment has assessed all Phases together as the 'worst case' scenario.

Methodology for Determining Demolition and Construction Effects

9.26 Owing to the evolving and changing nature of demolition and construction activities, the assessment of potential effects during demolition and construction of the Proposed Development on daylight and sunlight to surrounding properties has not been modelled.

9.27 Since the potential daylight and sunlight effects relating to demolition and construction works will vary throughout the construction programme and gradually increase to the potential effects identified for the completed Proposed Development, the interim construction effects are not assessed quantitatively as it is considered that the completed Proposed Development represents the worst case assessment in terms of likely daylight and sunlight.

Methodology for Determining Operational Effects

9.28 The following approaches are undertaken to assess the effect on the sensitive receptors of surrounding properties when the Proposed Development is completed and operational:

- Daylight;
 - Vertical Sky Component (VSC);
 - No Sky Line (NSL) Method.
- Sunlight
 - Annual Probable Sunlight Hours (APSH).

Outline Approach for Daylight and Sunlight Assessments

9.29 The technical analyses carried out to inform the daylight and sunlight assessment have been undertaken by creating a digital three-dimensional (3D) model of the existing Site and Proposed Development, based on measured survey data.

9.30 The 3D model uses Waldram Diagrams to establish the VSC and 3D geometric calculations for daylight distribution. This model (which is orientated to north by the use of Ordnance Survey (OS) information) enables the path of the sun to be tracked throughout the year to establish the shadow cast by the existing and proposed buildings and thus calculate the sun hours on ground in each scenario.

9.31 In accordance with the BRE Guidance, only those surrounding properties which have windows facing towards the Site were included in the assessment. If a nearby property has no windows facing the Site, these properties would not be affected by the Proposed Development in terms of light.

Daylight

Vertical Sky Component (VSC) Method

9.32 The VSC method of assessment is defined in the BRE Guidelines as the:

"ratio of that part of illuminance at a point on a given vertical plane that is received directly from a CIE standard overcast sky, to illuminate on a horizontal plane due to an unobstructed hemisphere of this sky".

9.33 This ratio is the percentage of the total unobstructed view that is available, once obstructions (e.g. the Proposed Development), are placed in front of the point of view.

9.34 The assessment is calculated from the centre of a window on the outward face and measures the amount of light available on a vertical wall or window following the introduction of visible barriers, such as buildings. The VSC has been calculated using a 'Waldram Diagram'.

9.35 The Waldram Diagram is effectively a snapshot taken from that point of the sky in front of the window, together with all relevant obstructions to it, i.e. the buildings. For calculation purposes, trees may be ignored unless they form dense continuous belts.

9.36 Due to the limitations of peripheral vision, the maximum VSC value is almost 40% for a completely unobstructed vertical wall or window. In terms of assessment criteria, the BRE Guidelines state that:

"if the VSC, with the development in place, is both less than 27% and less than 0.8 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window may appear more gloomy and electric lighting will be needed more of the time".

No Sky Line (NSL) Method

- 9.37 The BRE Guidelines provide that where room layouts are known, the effect on the daylight distribution can be calculated by plotting the NSL. In terms of the surrounding receptors, it has not been possible to obtain room layouts for all of the properties and therefore layouts have been assumed where information is not available.
- 9.38 The NSL method is a measure of the distribution of daylight at the 'working plane' within a room. The 'working plane' means a horizontal 'desktop' plane 0.85m in height for residential properties. The NSL divides those areas of the working plane which can receive direct sky light from those which cannot. If a significant area of the working plane lies beyond the NSL (i.e. it receives no direct sky light), then the distribution of daylight in the room will be poor and supplementary electric lighting may be required.
- 9.39 The potential effects of daylighting distribution in an existing building can be found by plotting the NSL in each of the main rooms. For houses, this will include living rooms, dining rooms and kitchens. Bedrooms should also be analysed, although the BRE state that they are less important. The BRE Guidelines identify that if the area of a room that does receive direct sky light is reduced to less than 0.8 times its baseline value, then this would be noticeable to its occupants.
- 9.40 BS 8206 Part 2 states (para 5.7) that the:

"uniformity of daylight is considered to be unsatisfactory if a significant part of the working plane (normally more than 20%) lies behind the no-sky line".

- 9.41 Therefore, it is implied that an NSL of at least 80% would be considered satisfactory.

- 9.42 In regard to deep rooms which are lit by windows on one side, the BRE Guidelines state (para. 2.2.10):

"If an existing building contains rooms lit from one side only and greater than 5m deep, then a greater movement of the no sky line may be unavoidable."

Sunlight

Annual Probable Sunlight Hours

- 9.43 Sunlight is measured using a sun indicator which contains 100 spots, each representing 1% of APSH. Therefore, where no obstruction exists the total annual probable sunlight hours would amount to 1486, and each spot equates to 14.86 hours of the total annual sunlight hours.
- 9.44 The number of spots is calculated for the Baseline and Proposed Development scenarios during the year and also during the winter period, and a comparison made between the two. This provides a percentage of APSH for each of the time periods for each window assessed.
- 9.45 The BRE Guidelines note that:

- *"In housing, the main requirement for sunlight is in living rooms, where it is valued at any time of day, but especially in the afternoon."*
- *"all main living rooms of dwellings...should be checked if they have a window facing within 90° of due south. Kitchens and bedrooms are less important, although care should be taken not to block too much sun".*
- *"If the main living room to a dwelling has a main window facing within 90° of due north, but a secondary window facing within 90° of due south, sunlight to the secondary window should be checked."*
- *"...a south facing window will, in general, receive most sunlight, while a north facing one will receive it only on a handful of occasions. East and west facing windows will receive sunlight only at certain times of day".*

9.46 In regards to existing surrounding receptors, the BRE Guidelines provide that a window may be adversely affected if a point at the centre of the window receives less than 25% of the APSH, including at least 5% of the APSH during the winter months (21st September to 21st March), or less than 0.8 times its baseline sunlight hours during either period, or if there is a reduction in total APSH which is greater than 4%.

9.47 BS 8206 Part 2 (section 5.2) states that:

"Provided that the entry of sunlight is properly controlled, it is generally welcome in most buildings in the UK. Dissatisfaction can arise as much from the permanent exclusion of sunlight as from its excess. The provision of sunlight is important in dwellings, particularly during winter months. Sunlight is especially valued in habitable rooms used for long periods during the day."

"Interiors in which the occupants have a reasonable expectation of direct sunlight should receive at least 25% of probable sunlight hours (see 2.10.2). At least 5% of probable sunlight hours should be received during the winter months, between 21 September and 21 March. Sunlight is taken to enter an interior when it reaches one or more window reference points."

9.48 As is often the case, it is not possible to determine the room uses within each of the neighbouring properties, nor is it clear which window should be considered as the 'main windows'. Therefore, regardless of use, all the rooms with windows facing the Site and within 90 degrees of due south have been considered in the assessment. Windows that do not face within 90 degrees of due south do not have a realistic expectation of direct sunlight, due to their orientation and the sunlight path in the northern hemisphere.

Summary of Criteria for Daylight and Sunlight

9.49 The following table provides a summary of the criteria set out within the BRE Guidelines for daylight and sunlight.

Table 9.1 – Summary of Daylight and Sunlight Assessment Criteria

Method	BRE Criteria
VSC	A window may be adversely affected if its VSC measured at the centre of the window is less than 27% and less than 0.8 times its former value.
NSL	A room may be adversely affected if the daylight distribution (NSL) is reduced beyond 0.8 times its existing area.

APSH	A window may be adversely affected if a point at the centre of the window received for the whole year, less than 25% of the APSH including at least 5% of the APSH during the winter months (21st September to 21st March) and less than 0.8 times its former sunlight hours during either period, and for existing neighbouring buildings, if there is a reduction in total APSH which is greater than 4%.
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Significance Evaluation Methodology

Daylight and Sunlight Magnitude of Effect

9.50 For daylight and sunlight, the BRE Guidelines outline the approach within the accompanying appendix, in terms of assigning criteria to assess the effects:

"Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required...The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied."

"Where the loss of skylight or sunlight fully meets the guidelines, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines and a larger number of windows or open space are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space."

- *"Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:*
- *Only a small number of windows are affected;*
- *The loss of light is only marginally outside the guidelines;*
- *An affected room has other sources of skylight or sunlight; and*
- *The affected building only has a low level of requirement for skylight or sunlight."*

9.51 The classification of major adverse is documented within Paragraph 7 of the BRE Guidelines:

"Factors tending towards a major adverse impact include:

- *a large number of windows are affected;*
- *the loss of light is substantially outside the guidelines;*
- *all the windows in a particular property are affected; and*
- *the affected indoor spaces have a particular strong requirement for skylight or sunlight, e.g. a living room in a dwelling".*

Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building. Beneficial impacts should be worked out on the same principals as adverse impacts."

9.52 The BRE Guidelines do not provide any Guidance on what constitutes a moderate adverse impact.

9.53 Therefore, best practice guidance and professional judgment will be used to determine any impacts based on the guidance set out in Appendix I of the BRE Guidelines. Potential effects will be identified as beneficial, adverse or negligible, and their magnitude of effects will be set out as Minor, Moderate and Major.

9.54 The initial numerical criteria for determining the magnitude of effect is based on percentage alterations, as follows:

Table 9.2 – Daylight & Sunlight Magnitude of Effect

Magnitude of Effect	Percentage Alteration from Baseline
Negligible	0-20%
Minor	20-29.9%
Moderate	30-39.9%
Major	40%+

Sensitivity of Identified Receptor

- 9.55 It is important that the location and nature of the Site and surrounding is considered when determining the significance of any impacts identified. The BRE Guide is very clear that the targets provided are not mandatory. The location of the development could be deemed to be special circumstances in which the planning authority may wish to use different target values. This scope and view should also be followed through to the sensitivity of the surrounding receptors. There should be an expectation that a higher degree of obstruction is inevitable in an area with modern high-rise buildings. This point is also made in the NPPF and NPPG.
- 9.56 For these reasons, the surrounding receptors may have a lower sensitivity to change in an urban location than those located in sub-urban, less dense areas. Sensitivity classification is assigned on how the proposed receptor is able to accommodate or adapt to the effect of the development. The existing residential receptors surrounding the Site reside in a city centre location where there is an expectation for a higher density of development, these receptors are therefore deemed to have a medium to low sensitivity. The committed residential receptors are deemed to have a low sensitivity given that there are no residents within these blocks yet to receive any impact and future residents will be able to consider the daylight levels received by units in advance of occupation
- 9.57 The following existing receptors are defined as having a medium sensitivity:
- Castlegate
 - Castle Quay
 - Citygate
- 9.58 The following committed receptors are yet to be occupied and are therefore defined as having a low sensitivity:
- Elizabeth Tower
 - Transition – construction has not started on this receptor yet

Significance of Effects

- 9.59 The significance of any identified environmental effects is determined by the assessment of their magnitude against their sensitivity. The table below illustrates how the sensitivity of the receptors and the magnitude of any effect combine to confirm significance.

Table 9.4 – Significance of Effect

Magnitude	Sensitivity		
	High	Medium	Low
Major	Major Adverse / Beneficial	Major Adverse / Beneficial	Moderate-Minor Adverse / Beneficial
Moderate	Moderate Adverse / Beneficial	Moderate Adverse / Beneficial	Minor Adverse / Beneficial
Minor	Moderate – Minor Adverse / Beneficial	Minor Adverse / Beneficial	Minor – Negligible
Negligible	Negligible	Negligible	Negligible
Key		Significant in terms of EIA regulations	
Not significant			

- 9.60 When assigning significance criteria for daylight and sunlight effects, professional judgement has been used. Consideration has been given to the proportion of rooms/windows affected, as well as the percentage alterations, absolute changes, sensitivity of the receptor, and any other relevant factors, such as there may be mitigating factors such as location and nature of development, balconies, overhangs or design features which may also affect the determination of assigning the criteria.
- 9.61 When assigning significance criteria for sun hours on ground effects, consideration has been given to the nature of the adjoining amenity space, as well as the percentage alterations, absolute changes, sensitivity of the receptor, and any other relevant factors.

Assumptions and Limitations

- 9.62 Where actual room layouts were available on the planning portal, these have been considered in regard to the modelling of the internal layouts within the existing surrounding properties. Where layout information was not available, assumptions have been made as to the use and internal configuration of the rooms (from external observations during a site inspection) behind the fenestration observed. In such cases a standard 4.2 metre (m) (14ft) room depth has been assumed, unless the building form dictated otherwise. This is common practice where access to buildings for surveying is unavailable. Obtaining these room layouts enables precise evaluation of the diffuse levels of daylight within each of the rooms via the NSL).
- 9.63 Floor levels have been assumed for adjoining properties assessed, where access has not been obtained. This dictates the level of the working plane which is relevant for the NSL assessments.

Baseline Conditions

Daylight and Sunlight

- 9.64 The full Baseline Daylight and Sunlight results can be found in Appendix 9.2 and are summarised in Table 9.5 below.

- 9.65 A total of 2235 windows facing the Site serving 1015 rooms within five buildings were assessed for VSC and NSL for daylight and 550 rooms were assessed for APSH for sunlight within five buildings.
- 9.66 Out of the 2235 windows assessed for daylight, 1267 (57%) meet the BRE guidelines for VSC. For NSL, 925 (91%) of the 1015 rooms assessed meet the BRE criteria.
- 9.67 For sunlight, 506 (92%) out of the 550 rooms assessed meet the BRE criteria for both Winter and Annual APSH.
- 9.68 Overall, this is considered a moderate level of compliance due to the city centre context of the Site. The site is currently vacant, and so the surrounding receptors will be receiving more light than is potentially reasonable for a city centre location.

Table 9.5 – Baseline Daylight and Sunlight results to surrounding sensitive receptors

Address	Total No. Windows That Meet VSC Criteria		Total No. of Rooms That Meet NSL Criteria		Total no. of Rooms That Meet APSH Criteria	
	Pass	Total	Pass	Total	Pass	Total
Elizabeth Tower	746	1034	524	538	189	195
Castlegate	18	133	71	94	63	88
Castle Quay	222	152	55	78	72	78
Citygate	20	238	102	131	126	129
Transition	461	678	173	174	56	60
Total	1267	2235	925	1015	506	550

Identification and Evaluation of Significant Effects

Daylight to Surrounding Sensitive Receptors

- 9.69 The full Proposed Development daylight results can be found within Appendix 9.2 and are summarised in Tables 9.7 and 9.8 below.
- 9.70 A total of 2235 windows serving 1015 rooms were assessed for daylight within five buildings considered sensitive receptors.
- 9.71 The buildings are discussed in more detail below.

Table 9.7 – Summary of VSC Daylight Results

Address	VSC				
	Below BRE Guidelines				
	Total No. of Windows	No. of Windows That Meet BRE	Minor Adverse	Moderate Adverse	Major Adverse
Elizabeth Tower	1034	353	76	292	313

VSC					
Address	Below BRE Guidelines				
	Total No. of Windows	No. of Windows That Meet BRE	Minor Adverse	Moderate Adverse	Major Adverse
Castlegate	133	118	15	0	0
Castle Quay	152	135	3	5	9
Citygate	238	238	0	0	0
Transition	678	610	59	5	4
Total	2235	1565	153	302	326

Table 9.8 – Summary of NSL Daylight Results

NSL					
Address	Below BRE Guidelines				
	Total No. of Rooms	No. of Rooms That Meet BRE	Minor Adverse	Moderate Adverse	Major Adverse
Elizabeth Tower	538	400	136	2	0
Castlegate	94	94	0	0	0
Castle Quay	78	69	1	3	5
Citygate	131	131	0	0	0
Transition	174	165	9	0	0
Total	1015	1565	146	5	5

Elizabeth Tower

- 9.72 A total of 1034 windows serving 353 rooms were assessed for daylight within this property.
- 9.73 For VSC, 353 (34%) of the 1034 windows assessed will meet the BRE criteria.
- 9.74 76 of the affected windows will experience an alteration between 20-30%, 292 of the affected windows will experience an alteration between 30-40% from the Baseline value, and the remaining 313 windows will experience alterations in excess of 40% from the Baseline value.

- 9.75 347 of these affect windows serve bedrooms, which the BRE recognise as having a lower requirement for daylight. 355 of these affected windows serve 156 living kitchen diners. The BRE states that where a room is served by more than one window of equal size, the average VSC can be considered. Of these 156 living kitchen diners with some windows that fall short of the BRE target, 72 will have an average VSC which meets the BRE targets. As such, only 84 living kitchen diners will fall short of the BRE targets.
- 9.76 For NSL, 400 (74%) of the 538 rooms assessed will meet the BRE criteria.
- 9.77 136 of the affected rooms will experience an alteration between 20-30% from the Baseline value and two of the affected rooms will experience an alteration between 30-40% from the Baseline value.
- 9.78 The property is currently under construction, and so there are no residents in occupation. Any future residents will be aware of the future Proposed Development prior to occupation, and so the building is deemed to have a low sensitivity to change. We have only considered the windows overlooking the Site, and so the other elevations of Elizabeth Tower will be unaffected by the development.
- 9.79 Overall, considering the expectation in the BRE Guide, NPPF and NPPG that daylight and sunlight levels will be lower in a city centre, the high proportion of bedrooms and low proportion of living kitchen diners affected, and the low sensitivity of the property, the effect on daylight is considered to be **minor adverse** in significance.

Castlegate

- 9.80 A total of 133 windows serving 94 rooms were assessed for daylight within this building.
- 9.81 For VSC, 118 (89%) of the 133 windows meet the BRE criteria. Fifteen of the affected windows will experience an alteration between 20-30%.
- 9.82 For NSL, 94 (100%) out of the 94 rooms assessed will meet the BRE criteria.
- 9.83 Overall, considering the city centre location and the sensitivity of the property, the effect on daylight is considered to be **negligible** in significance.

Castle Quay

- 9.84 A total of 152 windows serving 78 rooms were assessed for daylight within this property.
- 9.85 For VSC, 135 (89%) of the 152 windows assessed will meet the BRE criteria.
- 9.86 Three of the affected windows will experience an alteration between 20-30% from the Baseline value, five of the affected windows will experience an alteration between 30-40%, and the remaining nine windows will experience alterations in excess of 40%.
- 9.87 For NSL, 69 (89%) of the 78 rooms assessed will meet the BRE criteria.
- 9.1.1.1 **One of the affected rooms will experience an alteration between 20-30% from the Baseline value, three of the affected rooms will experience an alteration between 30-40%, and the remaining five rooms will experience alterations in excess of 40%.**
- 9.88 Overall, considering the city centre location, the relatively limited number of windows/rooms affected in the property and the medium sensitivity of the property, the effect on daylight is considered to be **minor adverse** in significance.

Citygate

- 9.89 A total of 238 windows serving 131 rooms were assessed for daylight within this property.
- 9.90 For VSC, 238 (100%) of the 238 windows assessed will meet the BRE criteria.
- 9.91 For NSL, 131 (100%) of the 131 rooms assessed will meet the BRE criteria.
- 9.92 The effect on daylight is considered to be **negligible** in significance.

Transition

- 9.93 A total of 678 windows serving 174 rooms were assessed for daylight within this building.
- 9.94 For VSC, 610 (90%) of the 678 windows meet the BRE criteria.
- 9.95 59 of the affected windows will experience an alteration between 20-30%, five of the affected windows will experience an alteration between 30-40%, and the remaining four windows will experience alterations in excess of 40%.
- 9.96 For NSL, 165 (95%) out of the 174 rooms assessed will meet the BRE criteria.
- 9.97 Nine of the affected rooms will experience an alteration in between 20-30%.
- 9.98 Overall, considering the city centre location, the low sensitivity of the property, and the minor impact to limited windows/rooms, the effect on daylight is considered to be **negligible** in significance.

Sunlight to Surrounding Sensitive Receptors

- 9.99 The Full Proposed Development Sunlight results can be found within Appendix 9.2 and are summarised in Tables 9.9 and 9.10 below.
- 9.100 A total of 318 living room windows were assessed for sunlight within five buildings considered sensitive receptors. Windows that are not with 90 degrees of due south, or do not serve living rooms, were excluded from the assessment.
- 9.101 The buildings are discussed in more detail below.

Table 9.9 – Summary of Annual Sunlight Results

Address	APSH				
	Below threshold for Total APSH				
	Total No. of Rooms	No. of Rooms That Meet BRE	Minor Adverse	Moderate Adverse	Major Adverse
Elizabeth Tower	195	193	0	1	1
Castlegate	88	86	2	0	0
Castle Quay	78	78	0	0	0

Citygate	129	129	0	0	0
Transition	60	50	1	1	1
Total	550	536	3	2	2

Table 9.10 – Summary of Winter Sunlight Results

Address	Winter PSH				
	Below threshold for Total APSH				
	Total No. of Rooms	No. of Rooms That Meet BRE	Minor Adverse	Moderate Adverse	Major Adverse
Elizabeth Tower	195	193	0	0	0
Castlegate	88	86	0	0	0
Castle Quay	78	78	0	0	0
Citygate	129	129	0	0	0
Transition	60	50	0	0	9
Total	550	536	0	0	9

Elizabeth Tower

- 9.102 A total of 195 rooms were assessed for sunlight within this building.
- 9.103 193 (99%) out of the 195 rooms assessed will meet the BRE criteria for both Winter and Annual PSH.
- 9.104 One affected room will experience an alteration in Annual PSH between 30-40% and one affected room will experience alterations in excess of 40%.
- 9.105 Overall, considering the city centre location, the fact that only a small number of rooms are affected and the low sensitivity of the property, the effect to sunlight on this building is considered to be **negligible** in significance.

Castlegate

- 9.106 A total of 88 rooms were assessed for sunlight within this building.
- 9.107 86 (98%) out of the 88 rooms assessed will meet the BRE criteria for both Winter and Annual PSH.
- 9.108 Two of the affected rooms will experience an alteration in Annual PSH between 20-30%.
- 9.109 Overall, considering the city centre location, and the medium sensitivity of the property, the effect to sunlight on this building is considered to be **negligible** in significance.

Castle Quay

- 9.110 A total of 78 rooms were assessed for sunlight within this building.
- 9.111 78 (100%) out of the 78 rooms assessed will meet the BRE criteria for both Winter and Annual PSH.
- 9.112 The effect to sunlight is considered to be **negligible** in significance.

Citygate

- 9.113 A total of 129 rooms were assessed for sunlight within this building.
- 9.114 129 (100%) out of the 129 rooms assessed will meet the BRE criteria for both Winter and Annual PSH.
- 9.115 The effect to sunlight is considered to be **negligible** in significance.

Transition

- 9.116 A total of 60 rooms were assessed for sunlight within this building.
- 9.117 50 (83%) out of the 60 rooms assessed will meet the BRE criteria for both Winter and Annual PSH.
- 9.118 One affected room will experience an alteration in Annual PSH between 30-40% and one affected room will experience an alteration in excess of 40%.
- 9.119 Nine rooms will experience an alteration in Winter PSH in excess of 40%. This is to be expected as lower winter sun tends to be blocked more easily in urban areas, where higher buildings are present.
- 9.120 Overall, considering the city centre location, the fact that only a small number of rooms are affected, the impact is predominantly to the Winter PSH and due to the low sensitivity of the property, the effect to sunlight on this building is considered to be **negligible** in significance.

Cumulative Effects

- 9.121 Where consented schemes have the potential to be affected by the Proposed Development, these have included in the baseline scenario and assessed individually in detail, so no separate technical assessment of the cumulative impact is required. This approach is in line with the BRE Guidelines.

Mitigation Measures

Demolition and Construction

- 9.122 The potential daylight and sunlight effects during demolition and construction have been scoped out, as per paragraph 1.24 and 1.25.

Completed Development

- 9.123 Overall, the impact on daylight impacts to the surrounding properties is considered **negligible to minor adverse** and the impact on sunlight is also considered **negligible adverse** to all properties. Overall, this is considered to result in non-significant effects. Given the small scale of these effects and the context of the Site, no further mitigation is considered necessary.

Residual Effects

Table 9.11 – Summary of residual effects

Likely Significant Effect	Receptor	Mitigation	Residual Effect
Construction Phase			
Daylight	Scoped Out	-	-
Sunlight	Scoped Out	-	-
Operational Phase			
Daylight	Surrounding Residential Properties	None required	Negligible to Minor Permanent Adverse (Non-Significant Effect)
Sunlight	Surrounding Residential Properties	None required	Permanent Negligible (Non-Significant Effect)

Summary

- 9.124 An assessment has been undertaken to establish the likely significant effects of the Proposed Development upon the amount of daylight and sunlight received by properties adjacent to the Site.
- 9.125 Following demolition of the existing buildings, daylight and sunlight levels at the Site and the immediate surrounds are likely to steadily increase in magnitude as the superstructure is built. As the construction works continue the levels of daylight and sunlight received by neighbours for the Site would trend towards those of the completed Development which are set out below.
- 9.126 To assess the surrounding existing properties, the BRE Guidelines provide two main methods for assessing daylight: 'Vertical Sky Component' (VSC) and 'No Sky Line' (NSL). The VSC method measures the amount of light available on a vertical wall or window following the introduction of barriers such as buildings. The NSL method is a measure of the distribution of daylight at the 'working plane' within a room (i.e. a horizontal 'desktop' plane of 0.85 metres (m) in height). The NSL divides those areas of working plane in a room which receive direct sky light through the windows from those areas of the working plane which cannot. Where all of the windows meet the VSC and all of the rooms meet the NSL criteria within a property the effect is considered to be negligible.
- 9.127 For the assessment of sunlight, the approach considers the 'Annual Probable Sunlight Hours' (APSH) for a reference point on a window (i.e. if a window point can receive at least 25% APSH, then the room should still receive enough sunlight). Windows are checked to see if they are facing 90° due south, with the emphasis on main living rooms and other rooms such as the kitchen and bedrooms being of less importance.

- 9.128 A total of 2235 windows serving 1015 rooms within five surrounding properties have been assessed for daylight and 550 rooms have been assessed for sunlight within five residential properties.
- 9.129 In the Baseline Scenario, out of the 2235 windows assessed for daylight, 1267 (57%) meet the BRE guidelines for VSC. 925 (91%) of the 1015 rooms assessed meet the BRE criteria. For sunlight, 506 (92%) out of the 550 rooms assessed meet the BRE criteria for both Winter and Annual PSH.
- 9.130 In the Proposed Scenario, in regard to daylight, out of the total 2235 windows assessed 1454 (65%) meet the BRE criteria for VSC, whereas 859 (85%) out of the 1015 rooms assessed meet the BRE criteria for NSL. The effects identified are **negligible** to **minor adverse** in nature and therefore are not considered to be significant. Given the context of the site, no further mitigation is considered necessary.
- 9.131 For sunlight, out of the total 550 windows assessed (within five residential properties), 536 (98%) meet the BRE criteria for both Winter and Annual PSH. The effects identified are **negligible** in nature and therefore are not considered to be significant. As previously stated, given the small scale of these effects and the context of the site no further mitigation is considered necessary.

10 Townscape and Visual Impact Assessment

A10 ES Addendum Alterations

The following change has been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to reflect the publishing of the revised NPPF (July 2021).

No EIA Technical Note nor Chapter Addendum has been prepared in relation to Townscape and Visual Impact Assessment. Chris Burnett Associates have confirmed that the conclusions of the approved Townscape and Visual Impact Assessment ES chapter (below) remain valid and are unchanged by the detailed design development for Phase C, the education facility which have been progressed as part of this reserved matters application.

Introduction

- 10.1 This Chapter of the ES has been prepared by Chris Burnett Associates and assesses the likely significant effects of the Proposed Development with respect to Townscape and Visual amenity. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant adverse effects; cumulative effects and the likely residual effects. The TVIA will assess the worst case scenario only which is when all development phases are complete. Other scenarios have been discounted as the effects construction of one tower on this site are predicted to be more or less the same as two towers, hence it is appropriate to test the worst case scenario. Technical appendices also support this assessment and consist of the following:
- Appendix 10.1: Maps
 - Appendix 10.2: Viewpoint and townscape photographs including AVR images.
- 10.2 Chris Burnett BSC BLD CMLI, is principal partner of Chris Burnett Associates, a registered practice of landscape architects, who specialises in tall building Townscape and Visual Impact Assessments, as part of Environmental Statements, for many tall building developments throughout the UK since 2002. This includes 21 tall buildings all of which have received planning consent, in Manchester and Salford including Beetham Hilton, Deansgate Square and New Wakefield Street and others UK wide in Brighton, London, Leicester, Reading and Liverpool.

Legislative and Policy Context

Legislation

- 10.3 The European Landscape Convention (ELC, 2000)¹⁰ provides a foundation for closer co-operation on landscape issues across Europe and was ratified in the UK on the 21 November 2006 and became binding on 1 March 2007. The convention identifies the need to recognise landscape in law, to develop and promote landscape policies dedicated to the protection, management and creation of landscapes, and to establish procedures for the participation of the general public and other stakeholders in the evolution and implementation of landscape policies. It also encourages the integration of landscape into all relevant areas of policy, including cultural, economic and social policies.
- 10.4 The ELC defines landscape under Article 1 as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. It recognises that landscape has important cultural, ecological, environmental and social dimensions and is a key element of achieving sustainable development. Article 3 states that the aims of the Convention are to promote landscape protection, management and planning and to organize European co-operation on landscape issues.

National Planning Policy

- 10.5 The National Planning Policy Framework¹¹ sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.
- 10.6 Key aspects of the NPPF, revised in 2021¹⁹, which apply to the Townscape and Visual Impact Assessment are the paragraphs 124 and 127 below:

Paragraph 126 –

The creation of high quality, beautiful and sustainable buildings and places is fundamental to what the planning and development process should achieve. Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities. Being clear about design expectations, and how these will be tested, is essential for achieving this. So too is effective engagement between applicants, communities, local planning authorities and other interests throughout the process.

Paragraph 130 – Planning policies and decisions should ensure that developments:

- a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
- b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;*
- c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);*
- d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;*

¹⁰ The European Landscape Convention (ELC 2000)

¹¹ Ref 10.2 National Planning Policy Framework 2019 Department Communities and Local Government

e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users⁴⁶; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.

Local planning policy

10.7 The following relevant policies are set out below as extracts from Manchester City Council's Core Strategy¹²:

Policy EN 1 - Design Principles and Strategic Character Areas

"All development in Manchester will be expected to follow the seven principles of urban design, as identified in national planning guidance and listed above and have regard to the strategic character area in which the development is located. Opportunities for good design to enhance the overall image of the City should be fully realised, particularly on major radial and orbital road and rail routes. Design and Access Statements submitted with proposals for new development must clearly detail how the Proposed Development addresses the design principles, reinforces and enhances the local character of that part of the City and supports the achievement of the Core Strategy Strategic Objectives."

Policy CC6 High Density Development

"City Centre High Density Development City Centre development will generally be high-density. It is a location where land should be used to maximise its efficiency. The appropriate scale, massing and height of development in the City Centre will significantly exceed what is appropriate elsewhere in the City. Development will need to have regard to the Council's approach to tall buildings (policy EN2), but any proposals which do not reflect the importance of maximising the development opportunities in the City Centre will only be supported where this accords with wider Core Strategy objectives"

Policy CC 9 Design and Heritage

"Design of new buildings will need to be of the highest standard in terms of appearance and function. The standards and guidance explained in other LDF policies should be the basis for the approach to design, with particular attention to be given to the City Centre context and character. Development in Manchester City Centre should preserve or enhance the heritage assets that have been identified, including listed buildings, conservation areas and scheduled ancient monuments. The Council will support high density and mixed use development in the City Centre, but developers must recognise the specific design challenges that must be overcome to ensure complementarity of function and form. New development must support the range of uses the Council expects in the City Centre and contribute to a coherent and integrated physical environment."

10.8 The City Centre Character Area is of relevance to the Proposed Development. This area has been broken down into distinct townscape character zones by Manchester City Council and the extent and nature of the impact of the Proposed Development on these zones is described in more detail later in this chapter. The Core Strategy also refers to tall buildings:

Policy EN2 - Tall Buildings

Tall buildings are defined as buildings which are substantially taller than their neighbourhoods and/or which significantly change the skyline.

Proposals for tall buildings will be supported where it can be demonstrated that they

- Are of excellent design quality,*
- Are appropriately located,*
- Contribute positively to sustainability,*
- Contribute positively to place making, for example as a landmark, by terminating a view, or by signposting a facility of significance, and*

¹² Manchester City Council Core Strategy 2012

- *Will bring significant regeneration benefits.*

A fundamental design objective will be to ensure that tall buildings complement the City's key existing building assets and make a positive contribution to the evolution of a unique, attractive and distinctive Manchester, including to its skyline and approach views.

Suitable locations will include sites within and immediately adjacent to the City Centre with particular encouragement given to non-conservation areas and sites which can easily be served by public transport nodes.

Elsewhere within Manchester tall building development will only be supported where, in addition to the requirements listed above, it can be shown to play a positive role in a coordinated place-making approach to a wider area. Suitable locations are likely to relate to existing district centres. The height of tall buildings in such locations should relate more to the local, rather than the City Centre, urban context.

By their very size tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment.

It will be necessary for the applicant/developer to demonstrate that proposals for tall buildings are viable and deliverable"

10.9 Significantly, the Core Strategy offers further guidance in relation to the development of tall buildings as follows:-

Tall Buildings can provide a sense of place and distinctiveness, however as high development can have a substantial impact on an area careful consideration should be given to each proposal.

The NPPF requires local authorities to have regard to best practice in design, such as "By Design - Urban Design in the Planning System: Towards better practice" and "By Design – Better places to live". Policies are not to be overly prescriptive but, amongst other things, should concentrate on guiding height in relation to neighbouring buildings and the local area in general. Innovation should not be stifled but local distinctiveness should be reinforced. PPS4 directs planning authorities to set flexible policies for their centres which can respond to changing economic circumstances and encourage where appropriate high density development accessible by public transport, walking and cycling.

In the context of ensuring sustainable development, the City Centre is clearly a location that requires the prudent use of scarce land resources. It is generally well served by public transport and one where a high density of development is consistent with its distinctive character. The City Centre is, in general, considered an appropriate area for tall buildings. The growth of the City Centre is still evolving, particularly in relation to the development of fringe sites, and proposals need to be considered having regard to the character of the places in which they are proposed. Therefore, whilst some parts of the City Centre are more or less likely to be suitable for tall buildings, the Council does not consider a site specific policy that identifies detailed locations for a tall building to be appropriate. The Council is aware that over the 15 year plan period there is a need to be flexible and to be able to respond to changing economic conditions. The above criteria based policy is therefore set out, which will together with other design policies, form the policy context against which all proposals for tall buildings will be considered.

Elsewhere across the City, District Centres may be appropriate locations for "tall" buildings. Being generally accessible to the local population and well served by public transport, they are natural foci for developments that attract a larger number of people. The definition of tall as being in relation to neighbouring buildings should be noted, however, as the scale of development acceptable within a District Centre is unlikely ever to match that within the City Centre.

Tall buildings by their very nature can dominate the street scene and be highly visible over long distances. They can also have an impact on the local micro-climatic conditions, for example, by creating wind tunnels. It

is for these reasons that it is considered particularly important that they are designed to the highest quality, both in terms of appearance and their impact on the functioning of surrounding space.

Policy EN3 - Heritage

Throughout the City, the Council will encourage development that complements and takes advantage of the distinct historic and heritage features of its districts and neighbourhoods, including those of the City Centre.

New developments must be designed so as to support the Council in preserving or, where possible, enhancing the historic environment, the character, setting and accessibility of areas and buildings of acknowledged importance, including scheduled ancient monuments, listed buildings, registered parks and gardens, conservation areas and archaeological remains.

Proposals which enable the re-use of heritage assets will be encouraged where they are considered consistent with the significance of the heritage asset.

Assessment Methodology and Significance Criteria

10.10 This assessment has been undertaken alongside a Heritage Statement which has been prepared by Stephen Levrant Heritage Architecture and is submitted as part of the application. The Heritage Statement assesses the impact of the Proposed Development on the heritage assets and the surrounding built environment. This chapter assesses the impact of the Proposed Development over a wider area and assesses it against townscape character and visual amenity.

Study Area

10.11 The study area for this assessment comprises an area of approximately 1km in radius focussed on the Proposed Development Site. This area is judged to be appropriate given the height of the Proposed Development, the prevailing topography of surrounding area and its location. Outside this zone townscape and visual effects are unlikely to be significant due to distance, the effects of urban grain and street pattern and also the proximity of a number of intervening tall buildings.

Baseline Surveys

Desk Based Research

10.12 Research included establishing a Zone of Theoretical Visibility (ZTV) (Figure 10.1 Maps in Appendix 10.1) and examining appropriate guidance and policies on tall buildings issued by Manchester City Council (MCC) and relevant authorities such as Historic England.

Field Surveys

10.13 Field surveys were undertaken to explore the current baseline of Manchester City Centre. The survey was based on zones using the template set out in Manchester Residential Quality Guidance¹³. Broad Townscape Character Zones were also defined which lie outside the City Centre. During the field survey the ZTV was confirmed and a series of Representative Viewpoints established for assessment, all subsequently subject to Accurate Visual Representation (AVR).

¹³ Manchester Residential Quality Guidance MCC 2017

Consultations

10.14 Although MCC were not consulted on the precise location of viewpoints a set of viewpoints was included in the EIA Screening and Scoping report issued to MCC in December 2019. Furthermore, the viewpoint locations were largely based on Crown Street Phase 1 and augmented following consultation with planning and heritage colleagues. At the time of this Chapter's preparation, the Scoping Opinion has not been received from MCC.

Method of Assessing Significance

10.15 The Townscape and Visual Impact Assessment (TVIA) was undertaken in accordance with the methodology and approach set out in the 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA) Third Edition' (2013) – produced by the Landscape Institute (LI) and IEMA.¹⁴

"The GLVIA requires that a clear distinction is drawn between landscape (which includes the urban townscape) and visual effects:

- Townscape effects relate to the degree of change to characteristics or physical components of an urban area, which together form the character of that townscape, e.g. topography, buildings and vegetation.*
- Visual effects relate to the degree of change to an individual receptor's or a receptor group's view of that townscape, e.g. local residents, users of public footpaths or motorists passing through the area."*
- The relationship between the effects of the Proposed Development on Townscape and Visual Issues are interdependent but not exclusively so. The effects will therefore be examined in terms of:*
- Effects on Townscape character. For the purposes of this study the area immediately around the Proposed Development is examined on a character area basis based on the zonal template used by Manchester City Council. Character areas are shown on Fig 14.2, which is located at Appendix 14.1.*
- Effects on visual receptors. This is examined through the Representative Viewpoint Approach in which the effects of the Proposed Development are assessed in short, medium and long distance views from variety of key locations.*

10.16 In addition the following guidance documents have been also been consulted:

- Guidance on tall buildings published by Historic England: Advice Note 4¹⁵ 2015
- History in the View prepared for English Heritage by LUC in 2011
- Manchester Residential Quality Guidance ¹⁶

10.17 The guidance contained in Historic England's advice note on Tall Buildings is particularly relevant:

"Tall buildings need to set exemplary standards in design because of their scale, mass, wide impact and likely longevity. Good design will take the opportunities available for improving the character and quality of an area and respond to local character and history (NPPF paragraphs 58 and 64). It is important that the required high standard of architectural quality is maintained throughout the process of procurement, detailed design, and construction, through the use of conditions and reserved matters.

¹⁴ Guidelines for Landscape and Visual Impact Assessment 3rd Edition 2013 landscape Institute and Institute of Environmental Management and Assessment

¹⁵ Historic England note on Tall Buildings 2015

¹⁶ Manchester Residential Quality Guidance MCC 2017

Given their likely impact on a wide area, it is important that social and environmental effects are also assessed. Consideration needs to be given to a tall building's contribution to public space and facilities. This applies both internally and externally, including the provision of a mix of uses (especially on the ground floor of towers), as part of a well-designed public realm. Consideration of the impact on the local environment is also important, including microclimate, overshadowing, night-time appearance, light pollution, vehicle movements, the environment and amenity of those in the vicinity of the building, and the impact on the pedestrian experience. Well-designed tall buildings provide an inclusive environment, both internally and externally, taking opportunities to offer improved permeability, accessibility and, where appropriate, the opening up or effective closure of views to improve the legibility of the wider townscape."

Townscape Character Effects

10.18 The assessment of the Proposed Development on Townscape Character has been based on Manchester City Centre Zones, revised in Manchester Residential Quality Guidance as Neighbourhood Zones, and supplemented by those which lie outside the City Centre. It includes an assessment of the elements which comprise it such as built form and styles, urban grain and street pattern, soft elements such as green spaces and trees and a sense of place and effect that the Proposed Development is judged to have on them. The following zones are affected:

Manchester City Centre Neighbourhood and Townscape Character Zones

- Great Jackson Street
- First Street
- Castlefield
- St Johns
- Petersfield
- Hulme
- Civic Quarter
- Corridor Manchester
- Water Street

10.19 Their extent is defined on Figure 10.2: City Neighbourhood Zones and Viewpoints (Appendix 10.1) and they are described in more detail in the corresponding baseline condition section.

10.20 Townscape effects can be characterised as the changes in the urban grain, character and condition of the townscape as a result of the impact of a development. Specifically, the assessment will examine:

- Direct effects on specific townscape elements
- Effects that are more subtle in nature which affect the character of the townscape
- Effects on a designated asset such as a World Heritage Site, Listed Building or Conservation Area or tourist landmark.

Visual Effects

10.21 The Zone of Theoretical Visibility (ZTV), in the context of the surrounding topography and the height of the Proposed Development, has been established initially through 3D modelling using current Lidar DSM data combined with 10K base mapping to produce a Zone of Theoretical Visibility (ZTV) or Viewshed map, Figure 10.1 Appendix 10.1, and then confirmed as part of the field work exercise. Taking into account the scale and height of the Proposed Development, it covers the area with a focus to the south of the city centre and provides a quick guide as to the Proposed Development's visibility in the immediate vicinity. The Proposed Development consists of two 51 storey towers, C4 189.4m and C5 190.6m in height and also a 2 storey educational facility.

10.22 As with other Townscape and Visual Impact Assessments, and in accordance with guidance issued in GLVIA, the usual, and accepted, practice of selecting and assessing a range of "Representative Viewpoints", all publicly accessible, has been adopted as being the most appropriate and practical method of assessing and understanding the visual impact of the Proposed Development from a range of viewpoints surrounding the Proposed Development Site. These viewpoint locations are marked in Appendix 10.1 on Figure 10.1 ZTV and viewpoints and Figure. 10.2 City Neighbourhood Areas and Viewpoints and are illustrated by way of photographs taken from these viewpoints, represented in Appendix 10.2.

10.23 Representative Viewpoints are, by their very nature, representative and not necessarily site specific, unless a townscape or visual effect from an important regional landmark i.e. Albert Square, is predicted. In each case a view was sought where the Proposed Development was visible, guided by the results of the ZTV. Viewpoints were selected to cover a number of different locations and varying distances, to reflect the experience of different types of visual receptor and viewing distance. Accordingly, viewpoints ranged from immediate proximity to the Site and included residential streets, public parks, footpaths and main approach roads.

10.24 During the main field assessment process which occurred in August 2019, baseline viewpoint photographs were taken using a DSLR camera in accordance with the Landscape Institutes Advice most recent guidance note 06 /1917. The advice note also offers the following guidance on field of view:

"The tilt shift lens is increasingly being used in architectural photography in urban locations. It can also be employed for taking photographs up or down slope. The lens comes in a range of focal lengths including 17mm, 24mm, 45mm and 90mm. The 24mm tilt shift is typically used for visualisation work where viewpoints are located close to a development and the normal range of prime lenses will not capture the proposed site."

10.25 This guidance has been taken into account in and in order to illustrate as much of the surrounding context as possible in the context of visualizing a tall building. Photographs were taken at 1.7m height. A technical appendix accompanies the TVIA which sets out in detail the camera and lens used together with information on coordinates and field of view. The viewing distance for all photographs when printed at A3 should be a comfortable arms length.

10.26 The effect of the Proposed Development is then assessed from each of the viewpoints using the information on the height of the buildings provided by Simpson Haugh architects and the accurate interpretation of this information by Ambiente in the form of Accurate Visual Representation (AVR) images.

Defining Significance of Effect

10.27 The significance of townscape and visual effects can broadly be determined by the interaction of the sensitivity of the receptor and the magnitude of effect with professional judgement playing an important part in identifying the overall significance values for each receptor.

Townscape: Sensitivity of Receptor

10.28 The sensitivity of a townscape receptor is an expression of its ability to accommodate the Proposed Development. Sensitivity is a judgement based on a combination of the susceptibility of the type of change or development proposed and the value attached to the townscape, as set out below.

¹⁷ Landscape Institute Advice Note 06 /19 Visual Representation of Development Proposals 9/19 Landscape Institute

10.29 Susceptibility indicates the ability of a defined townscape receptor to accommodate the Proposed Development “without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies.” (GLVIA, 3rd version, para 5.40). A description of how susceptibility would be evaluated for each receptor type is included below:

Table 10.1 Susceptibility of Townscape Receptor

Susceptibility	Criteria
High	Little ability to accommodate the Proposed Development without undue harm.
Medium	Some ability to accommodate the Proposed Development without undue harm.
Low	Substantial ability to accommodate the Proposed Development without undue harm.

10.30 Townscape Value is “the relative value that is attached to different landscapes by society”. It is assessed on the following scale along with assessment of various undesignated townscape attributes:

Table 10.2 Townscape Value

Value	Description
High	Sites, features or areas of national or international importance with settings of high quality such as World Heritage Site, AONB, National Parks, Grade I and Grade II* Listed buildings or Registered Parks and Gardens.
Medium	Sites, features or areas of local or regional importance with intact character such as Grade II* and Grade II Listed Buildings or Registered Parks and Gardens, Conservation Areas, Scheduled Monuments, local nature site, long distance recreational routes. Tree Preservation Orders (TPO) and local designations that exhibit wider geographic, cultural or townscape significance.
Low	Areas or features of local importance such as Tree Preservation Orders (TPO), Public Right of Way (PROW) and locally listed buildings.

10.31 The overall sensitivity of each townscape receptor would be rated within the range of High-Medium-Low and would be informed by combining the susceptibility and value as described above.

Townscape: Magnitude of Effect

10.32 The magnitude of a townscape effect is assessed in terms of its size or scale, the geographical extent of the area influenced by that effect, and its duration and degree of reversibility and would be rated within the range of Major-Moderate-Minor-Negligible-No Change set out below:

Table 10.3 Magnitude of Townscape Effect

Category	Criteria
Major adverse townscape effect	The proposals will result in a total change in the key characteristics of townscape character; will introduce elements totally uncharacteristic to the attributes of the

Category	Criteria
	receiving townscape; and/or will result in a substantial or total loss, alteration or addition of key elements/features/characteristics.
Moderate adverse townscape effect	The proposals will result in a partial change in the key characteristics of townscape character; will introduce elements partially uncharacteristic to the attributes of the receiving townscape; and/or will result in partial loss, alteration or addition of key elements/features/characteristics.
Minor adverse townscape effect	The proposals will result in a small change in the key characteristics of townscape character; will introduce elements that are not uncharacteristic to the attributes of the receiving townscape; and/or will result in a minor loss, alteration or addition of elements/features/characteristics.
Negligible townscape effect	The proposals will result in a just discernible change to townscape character/elements/features/characteristics.
Negligible townscape benefit	The proposals will result in a just discernible improvement to the townscape character/elements/features/characteristics.
Minor townscape benefit	The proposals will achieve a degree of fit with the townscape character/elements/features/characteristics and go some way towards improving the condition or character of the townscape.
Moderate townscape benefit	The proposals will achieve a good fit with the townscape character/elements/features/characteristics, or would noticeably improve the condition or character of the townscape.
Major townscape benefit	The proposals will totally accord with the townscape character/elements/features/characteristics, or would restore, recreate or permanently benefit the condition or character of the townscape.
No Change	The proposals will not cause any change to the townscape character/ elements/ features/ characteristics.

10.33 The size and/or scale of change in the townscape takes into consideration the following factors:

- The extent/proportion of townscape elements lost or added;
- The contribution of that element to townscape character and the degree to which aesthetic/perceptual aspects are altered; and
- Whether the effect is likely to change the key characteristics of the townscape, which are critical to its distinctive character.

10.34 The geographical extent of effects relates to:

- The area over which townscape effects are likely to be experienced, i.e. This could be at the site level, the immediate setting of the site, or townscape character type or area;

- The area over which visual effects are likely to be visible; and duration.

Visual receptors: Sensitivity of Receptor

10.35 In terms of assessing the baseline visual sensitivity, key factors to consider are the type of view and the likely numbers and types of viewers (the visual receptors). The type of view and the number of viewers are described in the following terms:

- Glimpsed (i.e. in passing) / Filtered / Oblique / Framed / Open Views; and Few / Moderate / Many Viewers

10.36 The value attached to views has regard to a number of factors, including:

- Recognition through planning designations or heritage assets; and
- The popularity of the viewpoint, its appearance in guidebooks, literature or art, on tourist maps and the facilities provided for its enjoyment.

10.37 The GLVIA identifies that the susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

10.38 The assessment of receptor sensitivity is rated on the scale High-Medium-Low, and combines judgements on the susceptibility of the receptor to the specific type of development proposed and the value attributed to that receptor, determined from the criteria below.

Table 10.4 Visual Receptor Susceptibility

Susceptibility	Type of Receptor
High	• Users of public space, including users of public rights of way, whose attention is likely to be focused on the townscape and on particular views; • Visitors to heritage assets or other attractions where views of the surroundings are an important part of the experience; • Communities where views contribute to the townscape setting enjoyed by residents; and • Travellers on scenic routes.
Medium	• Travellers on road, rail or other transport routes, where the view is moderately important to the quality of the journey; and • Users of public space, where the view is part of the wider experience of the place.
Low	• People at their place of work, where the setting is not important to the quality of working life; • Travellers on road, rail or other transport routes, where the view is fleeting and incidental to the journey; and • People engaged in outdoor sport or recreation, or users of a public space, which does not involve appreciation of views.

Table 10.5 Visual Receptor value

Value	Criteria
High	Views from townscapes/viewpoints of national importance, or highly popular visitor attractions where the view forms an important part of the experience, or with important cultural associations. An example may be where the viewpoint features a nationally important designated asset as the main focus of the view.
Medium	Views from townscapes/viewpoints of regional/district importance or moderately popular visitor attractions where the view forms part of the experience, or with local cultural associations. The viewpoint may be a good location to view a designated asset of regional/ local importance, or where a nationally important designated asset is not the main focus of the view.
Low	Views from townscapes/viewpoints with limited designations, not particularly popular as a viewpoint and with minimal or no cultural associations. The viewpoint may include designated assets of regional/local importance which do not form the main focus of the view.

Visual: Magnitude of Effect

10.39 The magnitude of a visual effect is assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and degree of reversibility and will be rated within the range of Major-Moderate-Minor-Negligible-No Change set out below.

Table 10 .6 Magnitude of visual effect

Category	Criteria
Major adverse or beneficial visual effect	The proposals will cause a dominant or complete change or contrast to the view, resulting from the loss or addition of substantial features in the view and will substantially alter the appreciation of the view.
Moderate adverse or beneficial visual effect	The proposals will cause a clearly noticeable change or contrast to the view, which would have some effect on the composition, resulting from the loss or addition of features in the view and will noticeably alter the appreciation of the view.
Minor adverse or beneficial visual effect	The proposals will cause a perceptible change or contrast to the view, but which would not materially affect the composition or the appreciation of the view.
Negligible adverse or beneficial visual effect	The proposals will cause a barely perceptible change or contrast to the view, which would not affect the composition or the appreciation of the view.
No change	The proposals will cause no change to the view.

10.40 The size or scale of change in the view relates to the degree of contrast or integration likely to result from the Proposed Development and is influenced by the relative time over which a view is experienced and whether it is a full, partial or glimpsed view.

Duration of Effect

10.41 Both Townscape and Visual effects may be experienced over a range of timescales. For this assessment, the following timescales are considered appropriate:

- Short-term: 1 year or below
- Medium-term: Between 1 and 10 years in duration
- Long-term: Greater than 10 years in duration

Significance of Effect

10.42 The objective of the assessment process is to identify and evaluate the likely significant effects arising from the Proposed Development for both Townscape and Visual Receptors. Significance indicates the importance or gravity of the effect. The table below, Table 10.7 is offered in support of professional judgement in determining the Significance of effect and is used as a guide to the narrative explanation of the nature and significance of both townscape and visual effects brought about by the Proposed Development.

Table 10.7: Significance of Effect

		Magnitude of Effect				
Sensitivity of Receptor		Major Effect	Moderate Effect	Minor Effect	Negligible Effect	No Change
	High	Major Significance	Moderate Significance	Moderate Significance	Minor Significance	Negligible
	Medium	Moderate Significance	Moderate Significance	Minor Significance	Negligible	Negligible
	Low	Moderate Significance	Minor Significance	Negligible	Negligible	Negligible

10.43 The effects on both townscape and visual receptors is examined in each case. All viewpoints have been subjected to the insertion of an Accurate Visual Representation (AVR) into a baseline photograph so that the extent of both townscape and visual effects can be judged more accurately. In each case the effect of the Proposed Development is compared with the baseline condition or view and an assessment made in terms of receptor susceptibility, value of townscape setting or view, receptor sensitivity and magnitude of effect. A judgement is then made as to whether the effect is of major to negligible significance of effect using the Effect Significance Matrix in Table 10.7 and then a judgement made as to whether the effect is significant or not significant in EIA terms. For the purposes of this Townscape and Visual Impact Assessment, effects of Moderate Significance and above are considered to be Significant. Those values of Minor and below are therefore deemed to be Not Significant. A professional judgement is then made as to whether the effect is of an adverse or beneficial nature. The effects below are primarily concerned with the effects on townscape character and visual receptors.

10.44 This process has been applied to provide a robust assessment in similar townscape settings, including Manchester City Centre, and is considered to be the most suitable approach in this context.

- 10.45 The visual impact of the Proposed Development will demonstrably change as it is constructed. As the construction phase is likely to be a relatively short period in the context of the lifecycle of the Proposed Development, the impact of the building upon completion, or operational phase, is the principal focus of this study although the construction effects are also examined below. Similarly, the impact pathway is direct. The building is either visible or it is not.

Mitigation Methodology

- 10.46 In terms of mitigation for the Proposed Development this has been derived by the architects Simpson Haugh as the design of the building has developed in consultation with interested parties. Mitigation for the Construction Phase Effects is described in the relevant section below.

Residual Impact Methodology

- 10.47 Residual Impacts are described based on the assumption that all mitigation measures have been fully deployed.

Baseline Conditions

Townscape Baseline

- 10.48 A summary set out below describes the main attributes and characteristics of each of the Townscape Zones and Representative Viewpoints that may be potentially affected by the Proposed Development as existing at the time of this assessment in December 2019. Each character area is referenced on Figure 10.2: City Neighbourhood Areas and Viewpoint Locations (Appendix 10.1). Only those areas which have the potential to be significantly affected by the Proposed Development are included.
- 10.49 Manchester, and the area surrounding Great Jackson Street in particular is currently going through a major phase of development with construction of many tall buildings which affect most of the townscape character zones in some form or other. Some development, but not all, will have the capacity to alter the visual and townscape baseline more significantly than others. In terms of the baseline assessment the GLVIA advises that 'existing schemes and those under construction should be included in the baseline for both landscape (townscape in this case) and visual effects baseline' and that 'the baseline for assessing cumulative landscape (townscape) effects should include those schemes, and in addition potential schemes, that are not yet present in the landscape but are at various stages in the development and consenting process.'
- 10.50 For the purposes of this assessment therefore, the baseline conditions that prevail at the current time (December 2019) in terms of townscape character and views are described below and include relevant schemes under construction, which are predicted to be complete when the Proposed Development is due to have been completed. The effects on the baseline together with the Proposed Development and any committed development is dealt with in the Cumulative Effects section.

Petersfield

10.51 Several of the landmark buildings in this zone have been developed as high quality conference and leisure and facilities including Manchester Central, Bridgewater Hall and the Great Northern Warehouse (Grade II*). Squares and plazas exist alongside these facilities which include the open space enclosed by Manchester Central and the Midland Hotel, Barbirolli Square and the plaza in front of the Great Northern at the junction of Peter Street and Deansgate. These spaces, together with large buildings, provide an open, spacious quality to the area, which is in direct contrast to the narrow tightly knit street patterns that characterise much of the city centre. The varied forms of the buildings ranging from the angularity of the new Bridgewater Hall to the curve of the Manchester Central's roof contribute positively to the irregular and eclectic visual character of this zone. This has been further enhanced with the construction of the Beetham Tower (47 storey), previously Manchester's highest building but now eclipsed by the Deansgate Square, and Axis developments which are nearing completion.

Representative Viewpoints 1, 11, 14, 15, 16, 17

St Johns

10.52 The area comprises a variety of buildings associated with the former ITV Quay Street estate but which is now the focus of a major scheme of redevelopment: The St Johns Masterplan which has many varied components including several tall buildings. The area contains one Listed structure (the Grade II Listed Manchester and Salford Junction Canal tunnel, which is underground); the Grade II Listed Colonnaded Railway Viaduct also falls partially within the area. The area contains a number of non-designated heritage assets, many of which are proposed to be retained and re-used as part of the St. John's Masterplan. It also lies adjacent to a number of listed structures, including the Grade I Liverpool Road Station and 1830s Warehouse. The area contains a number of natural assets, including riverside frontages and a mature garden that faces the existing St. John Street public gardens.

10.53 The central part of the area comprises the Granada Studios and associated car park as part of the former ITV Quay Street estate. This area is undergoing a major renaissance with several notable schemes under construction which include The Factory, Enterprise City, Globe and Simpson, the Bonded Warehouse, now complete and OGS.

10.54 To the south of the zone a range of high quality heritage buildings which line Liverpool Road, including the original Liverpool Road Station Buildings, the first passenger transport terminal that received Stephenson's Rocket (Grade I Listed), and various industrial buildings, which have now been utilised for the Museum of Science and Industry. These buildings have extremely fine architectural quality and Liverpool Road forms an important perspective vista. The area at the junction of Water Street and Liverpool Road is dominated by several viaducts and bridges over different periods (Grade I to Grade II Listed).

10.55 A major new scheme, the Ordsall Chord an elegant bridge and viaduct, carries a railway line north towards Salford Central adjacent to the inner ring road.

10.56 Immediately to the north of Liverpool Road, and to the west of Deansgate, is an area of high townscape quality consisting of the low rise Georgian streets of the St Johns quarter, home to the chambers and practices of Manchester's legal and medical professions. The quiet oasis of St Johns gardens occupies a small tranquil green space in the centre of this district, a welcome contrast to the busy and noisy Deansgate which is a short distance away.

Representative Viewpoint 22

Civic Quarter

10.57 At the core of this Zone is Manchester Town Hall (Grade I Listed), the spire of which is one of Manchester's most prominent skyline features, and also Albert Square which is an important civic space. Enclosed on all sides by buildings of similar scale and mass, trees have been introduced to soften the architecture and add to the ambience. Other important historic civic buildings include the City Art Gallery (Grade II* Listed) and Central Library (Grade II* Listed). The latter a neo classical masterpiece by Vincent Harris and hemmed in by the neo-Gothic splendour of the Town Hall on one side and the Edwardian baroque red bricks of the Midland Hotel (Grade II Listed) on the other. St Peter's Square is a major tram stop and contains the city's war memorial, which extends to form the Peace Garden to the rear of the Town Hall. The St Peter's Square Conservation Area covers the central part of this zone and key elevated views down Oxford Street can be obtained from the southern corner of the square.

Representative Viewpoints 12, 13

Castlefield

10.58 This zone forms Britain's first Urban Heritage Park and is one of Manchester's key tourist destinations. It is the terminus for the world's first industrial canal: the Bridgewater Canal and the world's first passenger railway terminated nearby in 1830. Its historic interest is therefore very much linked with the historic transport networks formed by the railways and canals. It also includes the remaining sections of a Roman fort. In addition, the area provides a highly attractive location for offices, apartments, cafes, bars and hotel developments and includes public spaces and an events area. Castlefield Conservation Area covers this area.

10.59 The visual character of the area is varied. The many viaducts that pass through the zone provide the opportunity for panoramic views of the city but also visually enclose the spaces below. These strongly horizontal features contrast with the chimneys and towers all associated with the industrial development of the area. The historic fabric is well represented in Castlefield and the older buildings tend to assert themselves in defiance of more recent development.

10.60 The enclosed canal basins dominated by its restored heritage with an influx of new residential and leisure development are a particular characteristic feature of the zone. Here the public spaces and towpaths provide a very human scale and intimacy to the area. Throughout the canal system the views are constantly changing, even slight distances creating very different juxtapositions and views. The Mancunian way passes through this area and links with the inner ring road affording occasional interrupted views of the City centre. New development is coming forward with 20 storey development overlooking the basin on 2- 4 Chester Road.

Representative Viewpoints 18, 19

Great Jackson Street

10.61 Situated between Oxford Road and Chester Road, this area has been and is the focus of considerable regeneration in recent years. Notably, tall buildings have become key components of the townscape character of this zone and include Deansgate Square, Crown Street Phase 1 and River Street. It is bounded by the inner ring road, the Mancunian Way, to the south and the river Medlock to the north.

Representative Viewpoint 5

First Street

10.62 This zone is the focus of a major scheme of regeneration in Manchester. Populated by a mixture of commercial, cultural and residential development it has become a busy and thriving area with many restaurants and bars and home to one of Manchester's newest theatres: Home. Student accommodation is also a feature of the many tall buildings which are located in this neighbourhood.

Corridor Manchester

10.63 Embracing the area between Oxford Road and Cambridge Street as a main approach into Manchester City Centre this zone is characterised by its dense fabric of educational establishments focused on Manchester Metropolitan University but with elements of Manchester University and their associated teaching facilities and halls of residence. Liberty Living, a 34 storey tower, is a principal landmark in close proximity to Oxford Road station and construction of the 32 storey tower on New Wakefield Street has just commenced. A busy and bustling zone this is an area of constant activity. It also includes the Whitworth Street Conservation Area. The urban grain is orientated on a north west – south east axis and occasionally provides good views of the Proposed Development although the Circle Square development on the old BBC site is having an ever increasing impact on both townscape character and views as multiple tall buildings emerge.

Representative Viewpoint 2

Water Street

10.64 A pocket of urban Manchester defined by transport connections which include the river Irwell, tram and railway lines, much of which is located on viaducts, and through which the inner ring road A57 runs. Recent development includes the tall building development of Water Street itself. Vacant land, earmarked for the Trinity Island development lies in this zone.

Representative Viewpoints 20, 21

Hulme

10.65 This zone has also been subject to a considerable amount of regeneration in recent years and a large area of recent mostly low rise housing has emerged as a result. In addition this zone contains one of the largest public open spaces close to the city centre: Hulme Park. The principal southern approach road: Princess Road cuts through this zone and although the road is sunken, the footbridges that cross over it offer some of the best views of central Manchester. The zone is predominantly residential.

Representative Viewpoints 3, 4, 6, 7, 8, 9, 10

Assessment of Effects

Limitations and Assumptions

10.66 The principal limitation as far as the field survey work was concerned has been that photography was undertaken in the winter months when the extent of foliage on trees is at the minimum and therefore reflects a worst case scenario.

Embedded Mitigation

10.67 Mitigation in terms of visual and townscape effects has been incorporated into the Proposed Development as part of the design process by the scheme architects Simpson Haugh and has evolved through consultation with the Local Planning Authority and others.

Sources of Effect

Demolition and Construction Phases

10.68 The construction of these buildings on a site on the outskirts of Manchester City Centre will clearly involve procedures and processes that are unsightly and intrusive consistent with operations on most large scale construction sites. However, this process is comparatively short lived in nature when considered in the context of the lifespan of the Proposed Development concerned and will also be screened from the north by existing tall buildings. The demolition and construction programme will commence as a single operation at the start of the project. The key physical activities will include:

- i) Site clearance.
- ii) Construction plant such as cranes etc.
- iii) Mobile construction plant.
- iv) Delivery and stockpiling of materials.
- v) Protective fencing and hoardings.
- vi) Unfinished appearance of the Proposed Development and its core for the majority of the construction period.
- vii) Traffic movements associated with the above.

Assessment of Construction Phase Effects

10.69 The construction phase effects, as with the Operational Phase effects are assessed against the Baseline. The townscape character area most affected by the demolition and construction operations are the two Townscape Character Zones in and around the Proposed Development Site namely: Great Jackson Street, Castlefield and Hulme. The effects of such construction activity on the character of this zone in the immediate vicinity is predicted to be **moderate adverse** for the duration of the construction period due to site clearance works, stockpiling of demolition and construction materials, the use of construction equipment such as cranes and temporary fencing. The effects, however, should be relatively localised and temporary and will not affect other Townscape Character zones in any measurable way apart from St Johns, Petersfield, First Street and Corridor Manchester where the effects are predicted to be **minor adverse** for the same period.

Effects of demolition, clearance and construction on Views

10.70 The effects of demolition and clearance on the Representative Viewpoints will also be readily visible in the immediate area surrounding the Proposed Development, as the ZVT demonstrates, but less so within the core of the city centre. Nonetheless, there is little doubt that the construction phase of any building of any scale, until it is fully clad, will involve processes that are visually unsightly and are likely, in visual effect terms to be largely adverse in nature. This period, however, is only likely to be transitional and will be of short duration in relation to the lifespan of the Proposed Development itself. In view of the scale of the Proposed Development, the magnitude of effect, and significance of effect is therefore judged to be **moderate adverse** during the construction period in the following Zones: Great Jackson Street, Castlefield and Hulme but **minor adverse** over the same time period in St Johns, Petersfield, First Street and Corridor Manchester where views are limited.

Operational phases

10.71 The source of the effect during the operation phase is concerned with the physical impact that the Proposed Development will have on views, visual and townscape receptors.

10.72 The townscape and visual effects of the Proposed Development are considered to be long term in terms of their duration.

Assessment of Operational Phase Effects

Effects of completed Development on Townscape Character and Views

10.73 The visual and townscape effects of the completed Proposed Development are now summarized with respect to the effects of the Proposed Development on the Townscape Character through a narrative description of the nature of the effect on each of the Representative Viewpoints which lie within each character area.

10.74 The ZTV confirms that the Proposed Development will be widely visible to the south but less so to the north. This is because of the large number of tall buildings which are in close proximity to the Proposed Development and lie to the north and east. This is confirmed by Figure 10.2 (Appendix 10.2) Cumulative Viewshed analysis and Viewshed locations which assesses the theoretical visibility when all the baseline and cumulative schemes have been completed.

Petersfield

Viewpoint 1 Whitworth Street west

10.75 The modelled AVR view confirms that the Proposed Development will have no impact from this viewpoint. This is not significant in EIA regulation terms.

Viewpoint 11 Deansgate

10.76 This viewpoint is located on one of Manchester's landmark streets Deansgate which is orientated towards the Proposed Development. The susceptibility of the townscape receptor at this junction is judged to be low in the context of so much tall building development which includes Beetham Hilton and Deansgate Square. Townscape sensitivity is raised to medium however by the presence of the listed buildings on the east side of the street which contribute so much to its townscape character at this point. Visual receptor sensitivity is judged to be low here however as this is a busy junction with most receptors in transit. In terms of magnitude of effect, the two towers form important well spaced components of the horizon that are subservient in scale and form to their neighbours at Deansgate Square. They do not overwhelm the scale, form and pattern of development at street level and therefore values of moderate beneficial are recorded for both categories of receptor here. This translates to **significance** of effect values of **moderate beneficial** for townscape which is **significant and minor beneficial** for visual receptors which is **not significant**.

Viewpoint 14 Lower Moseley Street

10.77 The modelled AVR image confirms that there will be no impact from this Viewpoint. This is not significant in EIA regulation terms.

Viewpoint 15 Whitworth Street West

10.78 This viewpoint is located at a busy traffic node which incorporates road, rail and tram networks in the view. The completed and emerging towers of Deansgate Square are prominent features of the view rising above the historic City Road inn. Townscape sensitivity is judged to be low here as the focus of the view is away from the Castlefield Conservation area and susceptibility to accommodate change is low in the context of the abundant supply of new tall buildings in close proximity. Visual receptor sensitivity is equally low as most receptors will be drawn from the category of travellers and visual receptor value is not high at this location. Magnitude of change is judged to be negligible for both townscape and visual receptors as the Proposed Development is scarcely visible behind the City Road Inn and merges seamlessly with the Deansgate Square development. Accordingly, significance of effect values of negligible beneficial is registered for both townscape and visual receptors which is not significant in EIA terms.

Viewpoint 16 Deansgate Station

10.79 This viewpoint is located on the upper stairwell platform from Deansgate Castlefield to Deansgate stations above Whitworth St West. It offers an excellent elevated open, middle distance view of the Great Jackson Street framework. It allows the Proposed Development to be placed in context across a broad urban horizon rapidly being dominated by tall buildings such as Deansgate Square in the foreground. Townscape sensitivity is higher here than in most areas of Manchester due the concentration of historic assets and the fact that the area to the north of Chester Road has been designated a Conservation Area. A value of medium is therefore ascribed to this viewpoint. Visual receptor sensitivity is low, however, as receptors are likely to be travellers where views are fleeting and incidental to their journey. The two towers form background elements in the cluster and will be framed by the emerging Crown Street Phase 1 and to a lesser extent 2-4 Chester Road developments. Values of minor beneficial are registered therefore for both categories for magnitude of effect and in terms of significance of effect values minor beneficial is set for townscape receptors and negligible beneficial for visual receptors both of which is not significant.

Viewpoint 17 Deansgate

10.80 Located on the busy Chester Road just north of the major traffic junction this viewpoint affords an excellent view of the Proposed Development which lies directly on the axis of this principal approach road. The baseline character is being affected in a significant degree by Deansgate Square, Crown Street Phase 1 and the emerging 2-4 Chester Road. There is little doubt that the Proposed Development will fit into this emerging townscape seamlessly. In townscape receptor sensitivity terms this viewpoint lies on the edge of the Castlefield Conservation Area. The adjacent Castlefield Congregational Chapel, to the north of the road and bridge over Chester road in the foreground, are part of the historical context at street level and contribute to a value of medium townscape sensitivity for this viewpoint. Visual receptor sensitivity is variable, high in the numerous residential properties characteristic of this area, low for users of the Chester Road, and medium overall. The two towers once again form background elements in the cluster and are framed by the emerging Crown Street Phase 1 and to a lesser extent 2-4 Chester Road, developments. Values of minor beneficial are registered therefore for both categories for magnitude of effect and also for significance of effect which is not significant in EIA regulation terms.

Viewpoint C Deansgate

10.81 Located just to the north of Viewpoint 17 this viewpoint is located on Deansgate with most values replicated. In townscape receptor sensitivity terms a value of medium is registered for this viewpoint. Visual receptor sensitivity is variable, high in the numerous residential properties characteristic of this area, low for users of the Chester Road, and medium overall. The two towers once again form background elements in the cluster and are framed by the emerging Crown Street 1 and to a lesser extent 2-4 Chester Road, developments. Values of minor beneficial are registered therefore for both categories for magnitude of effect and also for significance of effect which is not significant in EIA regulation terms.

St Johns

Viewpoint 22 Museum of Science and Industry

10.82 Located deep on the heart of the Castlefield Conservation Area this viewpoint is situated at the entrance to the Museum of Science and Industry. Townscape sensitivity is high here as the area has low susceptibility to change and is of high townscape value. In terms of visual receptor sensitivity this is also a sensitive location with the majority of receptors focussed on a heritage asset of high value and historic context so a value of high is recorded here also. Magnitude of change for both categories is judged to be negligible and neutral as the Proposed Development does neither add or detract from the view or townscape or setting of the historic buildings that comprise the Museum of Science and Industry in the context of Crown St Phase 1 which dominates. The fit with the existing townscape character is complementary and visually the two towers are separate and fit with the pattern of development. This confers values of negligible significance of effect to both category of receptor which is not significant in EIA regulation terms.

Civic Quarter

Viewpoint 12 Albert Square

10.83 The modelled AVR image confirms that the Proposed Development will have no impact from this viewpoint. This is not significant in EIA regulation terms.

Viewpoint 13 St Peter's Square

10.84 This viewpoint, located at the junction of Lower Moseley Street with Oxford Street, in the corner of St Peter's Square offers a niche view of the Proposed Development Site. Townscape susceptibility, value and consequently sensitivity are judged to be high. Similarly, visual receptor sensitivity is medium with a number of receptors drawn from users of a public space where the view is part of the wider experience and the viewpoint is of regional importance in terms of visual receptor value. The Proposed Development completes the sense of enclosure provided by the Midland Hotel in the foreground, which dominates this view and which is such a prominent and positive feature of the townscape at this location, and the background elements of the Axis and Deansgate Square developments. Although visual interest is diminished somewhat as the spaces that separate the existing towers dissolve, this is not serious factor as this is very much a niche view of the Proposed Development and the Midland Hotel remains the strongest feature of it.. A value of negligible beneficial is recorded here for magnitude of effect for both categories of receptor which translates as negligible significance of effect for townscape and visual receptor also, which is not significant in EIA regulation terms.

Castlefield

Viewpoint A Castlefield Basin

10.85 This viewpoint explores the relationship that the Proposed Development will have on the elevated parts of Castlefield Basin. Major tall buildings developments that are affecting the baseline are prominent from this viewpoint. Susceptibility to change is therefore judged to be low, although townscape value remains high and townscape sensitivity medium overall. Visual receptor sensitivity is medium also reflecting its the status of one of Manchester's principal historic attractions. The Proposed Development will achieve a good fit with the emerging baseline and be partially concealed behind Crown Street Phase 1 As a result, the magnitude of effect is now judged to be minor beneficial. For this reason, with medium, receptor sensitivity in both townscape and visual terms the significance of effect is judged to be minor beneficial which is not significant in EIA terms.

Viewpoint B Chester Road

10.86 The former Bridgewater Canal Offices which is Grade II Listed building sit within this view which is dominated by the development of Crown Street Phase 1. Receptor sensitivity for townscape is affected to some extent here by its proximity to the Castlefield Conservation Area but the character of the Conservation Area is not strongly represented at this location. As a consequence, townscape receptor sensitivity is judged to be medium both in terms of susceptibility and value. Visual receptor sensitivity is variable, high for the inhabitants of the apartments that line Chester Road and low for users of the busy approach road medium overall. In terms of magnitude of effect the forms of the two towers match the scale of Crown Street Phase 1 tower and consolidate the cluster well recording magnitude of effect values of moderate beneficial for both categories of receptor. Accordingly, the significance of effect value is judged to be moderate beneficial which is significant in EIA regulation terms.

Viewpoint D Ellesmere Street

10.87 A close up viewpoint which explores the effect of the Proposed Development on the church of St George, a Grade II* listed building in particular. Receptor sensitivity, in townscape terms, is judged to be medium acknowledging its status as a viewpoint within the Castlefield Conservation Area but also acknowledging its ability to accommodate some development manifest in the schemes on both side of the street and also the Deansgate Square and Crown Street Phase 1 development. Visual receptor sensitivity is judged to be high as this is now largely a residential district. In terms of magnitude of change, the Proposed Development will have a marginal effect on the character of the local townscape, and on visual receptors as it combines successfully with Crown Street 1. As a result the magnitude of effect is judged to be minor beneficial for both townscape and visual receptors as it fits in with the pattern of the emerging townscape well. The significance of effect therefore is judged to be minor beneficial for both categories which is not significant in EIA regulation terms.

Viewpoint 18 Castlefield Basin

10.88 Castlefield basin sits within Castlefield Conservation Area and has a strong sense of townscape character derived for the most part by its large collection of historic buildings and features such as the Bridgewater canal. However, in recent years the emergence of a cluster of tall buildings in close proximity to Castlefield basin such as Deansgate Square, Crown Street Phase 1 and 2 – 4 Chester St has changed the townscape and visual baseline to a significant degree. Townscape sensitivity is therefore judged to be medium as a result. Visual receptor sensitivity is medium also in this quiet basin where the focus of the view remains within the confines of the enclosed townscape and where the focus remains on quiet enjoyment of the surroundings which are of high quality and value. The twin towers of the Proposed Development consolidate the tall building cluster especially the contribution made by Crown Street Phase 1, adds depth to the composition but importantly leaves the space between it and Deansgate square intact. The fit with the baseline character is good and magnitude of effect is judged to be minor beneficial for both categories of receptor. The significance of effect is registered as minor beneficial as a result which is not significant.

Viewpoint 19 Egerton Street

10.89 This viewpoint is situated in close proximity to the Proposed Development close to the Chester Road roundabout. Views of the emerging Crown Street Phase 1 development dominate the view. Receptor sensitivity in townscape terms is judged to be low here given the proximity of the roundabout and Mancunian Way which is located in an underpass at this point despite it being on the edge of the Castlefield Conservation Area. Susceptibility is also low as the area has a substantial ability to accommodate change. Visual receptor sensitivity is also judged to be low allowing for the dominating influence of the roundabout. The two towers coalesce into one in this view and merge seamlessly into Crown Street Phase 1. Magnitude of effect is therefore judged to be minor beneficial and significance of effect negligible beneficial as a result for both categories of receptor which is not significant in EIA regulation terms

Great Jackson Street

Viewpoint 5 Mancunian Way

10.90 The Proposed Development mirrors the scale of Crown Street Phase 1 and consolidates the tall building cluster in this close up view. Receptor sensitivity is low for visual receptor categories as this a major, noisy thoroughfare with most people in transit and no pedestrian walkway in an area of low value in terms of designation and townscape character. The value is judged to be low for townscape also as Crown Street 1 now dominates the baseline townscape character to a significant degree and susceptibility to accommodate development without harm is judged to be substantial. Magnitude of effect is judged to be moderate beneficial for both categories as the Proposed Development achieves a good fit with the existing baseline and adds depth to the Crown Street cluster. This translates to values of minor beneficial significance of effect for both categories which is not significant in EIA regulation terms.

Corridor Manchester

Viewpoint 2 Stretford Road

10.91 The Stretford Road crosses Princess Road at this point on a bridge and the urban grain becomes more open as a result. Townscape sensitivity is judged to be low here as this area has been the subject of much regeneration in recent years, which increased its capacity to absorb change. Visual receptor susceptibility is judged to be high here as much of the area is residential but reduced to medium in the absence of any designation of value. The twin towers of the Proposed Development will add to the skyline in a consistent way, achieving a good fit with the existing baseline character in the process The view will also improve as the cluster of tall buildings is extended westwards adding more visual interest as a result. In both cases the magnitude of effect is judged to be minor beneficial which translates to negligible significance for townscape receptors and minor beneficial significance for visual receptors both of which are not significant in EIA regulation terms.

Water Street

Viewpoint 20 A57 Regent Rd

10.92 The Proposed Development will have a minor impact on this view in the context of the numerous tall buildings which are emerging in this view and are now part of the baseline. These include Deansgate Square, Crown Street Phase 1, Water Street and the emerging 2 -4 Chester Road. Receptor sensitivity is low here in visual receptor term as this viewpoint is located on the busy traffic interchange of Regent Street and the Inner Ring Road. Townscape receptor values are higher conversely as the viewpoint is located in the Castlefield Conservation Area although the area is judged to be able to accommodate change substantially without undue harm and is judged to be medium low as a result. In terms of magnitude of effect, the Proposed Development increases visual interest and assists in the consolidation of the tall building cluster on the horizon. As such it has a minor beneficial magnitude of effect for both townscape and visual receptors which translates into significance of effect values of negligible significance for both categories which is not significant in EIA regulation terms.

Viewpoint 21 Trinity Way

10.93 A view taken to demonstrate the long distance effects of the Proposed Development on the emerging skyline of Manchester from one of the city's busiest routes: Trinity Way or the Inner Ring Road. Deansgate Square, Crown Street 1, 2-4 Chester Road all now notable parts of the baseline. Receptor sensitivity is mixed here, high associated with the residential apartments of Wilburn Street close by and low at ground level as this a major and constantly busy road so medium overall. Townscape sensitivity is low and has a good capacity to accommodate change. The two towers coalesce behind Crown Street Phase 1 and will have a negligible effect in terms of magnitude of effect from this viewpoint. Accordingly, values of negligible beneficial can be ascribed to this viewpoint for significance of effect for both categories which is not significant in EIA regulation terms.

Hulme

Viewpoint 3 The Sanctuary

10.94 The Sanctuary is a small area of open green space off the Stretford Road that is heavily enclosed by trees and provides a contrast to the dense urban fabric that surrounds it. The horizon is free from development at this point screened as the Deansgate Square is by the trees that surround this small park. Townscape susceptibility, combined with a high community value, suggest that townscape sensitivity is high also. Visual receptor sensitivity is medium as most receptors will be users of a public space where the view is part of the wider experience of the place. The Proposed Development however, screened as it is by mature trees, in similar fashion to Deansgate Square, will have only a **negligible** magnitude of effect for both categories. Significance of effect is registered as **minor beneficial** significance for townscape and **negligible** significance for visual receptors both of which are **not significant** in EIA regulation terms.

Viewpoint 4 Hulme Park

10.95 Hulme Park is a popular green space south of the city centre deep in the centre of Hulme. Because of its wide and open aspect it offers views of the city centre skyline above a ring of enclosing trees. This viewpoint taken in the middle of the park offers expansive views across the park and also illustrates the manner in which the view is changing dramatically as Crown Street Phase 1 emerges on the right of the view. Receptor sensitivity is judged to be medium here for townscape as it has some capacity to accommodate change. The park is the largest park in Hulme and, as such, is a protected green space of district value. Visual receptor sensitivity is judged to be medium as the view is part of the experience but not focussed on a feature of special significance. The footprint occupied by Crown Street Phase 1 will be replaced by the Proposed Development with C4 obscuring the tallest part of Crown Street Phase 1 and the circular C5 rising short distance above it. Deansgate Square lies to the right. In townscape terms the fit is consistent and **beneficial**. In terms of visual receptors the view is enhanced with the introduction of variable shapes and forms. Although the buildings coalesce the circular profile of C5 softens the impact of the development and deflects the view to C4 and increases visual interest. Magnitude of effect is therefore judged to be minor beneficial for both categories. This translates to **minor beneficial** significance of effect for both categories which is **not significant** in EIA regulation terms.

Viewpoint 6 St Wilfred's Park

10.96 A small pocket park within the residential district of Hulme housing encloses the park on all sides but many tall buildings populate the horizon notably Deansgate Square and Crown Street. Townscape susceptibility is low as a result in this context and townscape value is low also as the park is of local importance. Townscape sensitivity is therefore low for this viewpoint. Visual receptor sensitivity is higher however, a function of the fact that most receptors will be occupiers of residential dwellings or users of this pocket park. Visual receptor value is high also as this is a valuable well used green space in the centre of Hulme. Visual receptor sensitivity is therefore judged to be high as it is a densely built up residential neighbourhood. The two towers of the Proposed Development are clearly identifiable from this Viewpoint and continue the pattern of development established by Crown Street 1 and Deansgate Square. Both towers are the same height so visual conflict and tension is avoided and sufficiently distant to avoid conflict with the domestic scale of housing surrounding St Wilfred's Park. As a consequence, magnitude of effect is judged to be **minor beneficial** for both categories. This translates into significance of effect values of **negligible beneficial** for townscape which is **not significant** and **moderate beneficial** recorded for visual receptors which is **significant** in EIA regulation terms.

Viewpoint 7 Chorlton Road

10.97 One of the busy roads through Hulme and broadly aligned with the Proposed Development this viewpoint demonstrates the contribution the Proposed Development will make to the horizon at this point where the urban grain becomes more open. Townscape susceptibility is low in the context of the emerging Crown Street Phase 1 and Deansgate Square developments and, in the absence of any designations, townscape value is low. Townscape sensitivity is therefore low also. Visual receptor sensitivity is mixed with a combination of residential dwelling occupants and receptors in transit so medium overall. The two towers of the Proposed Development will fit in well with Crown Street Phase 1 and Deansgate square. Both the slender 'blade' form of C4 and the C5 circular tower offering contrasting forms which enlivens the horizon and adds visual interest. Magnitude of effect is judged to be **minor beneficial** for both category of receptor which assumes that values of **negligible beneficial** significance for townscape and **minor beneficial** significance for visual receptors which are **not significant** in EIA regulation terms.

Viewpoint 8 St George's Park

10.98 This viewpoint is located in a small area of residential green space in the centre of Hulme. Low rise housing defines the edge of the park but some high rise blocks are also a feature of the view. Mature trees soften the edges and reinforce the character of this quiet recreational space. As a result, townscape sensitivity is judged to be medium for the immediate curtilage to the park but decreasing in the areas beyond and clearly is of local value despite not being designated in any way. Visual receptor sensitivity is high also as the area is residential and receptors will also be drawn from users of a public space where the view is part of the experience. The two towers group together with Crown Street Phase 1 and Deansgate Square to consolidate the tall building cluster in a logical way that fits well with existing townscape character on the horizon. The slender 'blade' form of C4 and the C5 circular tower add visual interest to the horizon. Magnitude of effect is therefore judged to be **minor beneficial** for both categories which translate into **minor beneficial** significance for townscape receptors which is **not significant** and moderate **beneficial significance** for visual receptors which is significant.

Viewpoint 9 Chester Road

10.99 These viewpoints, 9 and 10, explore the dynamic views of the Proposed Development along one of the principal approach roads into Manchester: the A56 Chester Road. Emerging development which is now part of the baseline is strongly evident in this view. It includes the De Trafford development in the immediate foreground and Axis, Deansgate Square and Crown Street Phase 1 towers in the middle distance. This viewpoint lies outside the Castlefield Conservation Area and in townscape terms the area has a medium susceptibility to change in the context of so much incomplete development which is under construction. The area is judged to be of low value, without designation but recent development has raised the quality and character of the townscape along the approach road. Townscape sensitivity is judged to be medium as a result. Visual receptor sensitivity is mixed raised to high by the emerging residential development but generally low at pavement level in the context of this busy approach route, medium overall. The twin towers of the Proposed Development join the tower of Crown Street Phase 1 to consolidate the tall building cluster and frame the approach into Manchester adding depth and substance to the composition. The fit with existing townscape character is good and magnitude of effect for both townscape and visual receptors is judged to be minor beneficial. Consequently, a value of **minor significance** of effect is registered for this viewpoint which is **not significant**.

Viewpoint 10 Chester Road

10.100 This viewpoint explores a more distant view which sets the Proposed Development in the context of the Great Jackson Street along one of the principal approach roads into Manchester: the A56 Chester Road. Emerging development which is now part of the baseline is strongly evident in this view. It includes the towers of Axis, Deansgate Square and the emerging Crown Street Phase 1 towers on the east side of Chester Road and the recently completed Trilogy development in the foreground to the west. The view is more balanced and softened by trees and the tall buildings are making a significant and positive contribution to the townscape character by increasing visual and townscape interest. As a result townscape sensitivity is judged to be medium. Visual receptor sensitivity is mixed, raised to high by the emerging residential development but generally low at pavement level in the context of this busy approach route, medium overall. The twin towers of the Proposed Development. The fit with existing townscape character is good and the composition of the view improved. Magnitude of effect for both townscape and visual receptors is therefore judged to be minor beneficial. Consequently, a value of **minor significance** of effect is registered for this viewpoint which is **not significant**.

Assessment of Cumulative Effects

10.101 The cumulative effect of the Proposed EIA Development is now examined in relation to intra-project and inter-project cumulative effects.

Inter-project cumulative effects

10.102 In terms of inter- project cumulative effects, or effects arising from similar developments that are either consented or are coming forward in the planning process in close proximity to the Proposed EIA Development Site, there are developments that cumulatively, are considered to affect the significance values for townscape and views. Table 10.9 summarises these schemes. Details of the Cumulative schemes are outlined in the ES Appendices and appear as different coloured wirelines in the AVRs in Appendix 10.2.

Table 10.9 Cumulative schemes

Planning reference	Cumulative Scheme	No of storeys
111003/FO/2016/C1	10-12 Whitworth Street	35
115872/LO/2017	Viadux	40
115591/FO/2017	Plot H, Great Jackson Street Framework (Deansgate South)	13
116850/FO/2017	De Trafford Transition	32, 26 and 18
120113/FO/2018	1 Alpha Place	7
123261/FO/2019	Arundel Street	11 and 23

10.103 The developments listed above will not have a universal effect on all of the selected viewpoints and the townscape character of the affected city centre zones of Salford and Manchester. The baseline schemes have already been assessed under the Operational Effects section earlier in this chapter. An assessment of cumulative schemes is necessary to understand the manner in which the Proposed Development fits in with neighbouring developments in the future. Table 10.10, has been compiled to facilitate this process by first summarizing the effect of the Proposed Development on its own, using the values resulting from the Operational Effects section, and then reassessed the effect in respect of the relevant committed cumulative scheme on a viewpoint by viewpoint basis. Where a cumulative scheme is predicted to have an effect on views or townscape character then the significance of effect values are reassessed and adjusted accordingly to take the scheme or schemes into account in each case.

10.104 In addition, height and footprint data that relate to the relevant cumulative schemes have been modelled and inserted into the ZTV map to gauge how they affect the visibility of the Proposed Development on the assumption that all cumulative schemes are complete. The results are shown on Figure 10.2 ZTV Viewpoints and Cumulative Schemes in Appendix 10.2.

10.105 Of course, as the cumulative schemes come forward then, in certain cases, visual receptor sensitivity is likely to increase as many of the developments contain apartments. However, by the same token, the magnitude of effect is likely to decline as the Proposed Development will now be seen in the context of a greater number of similar developments of equivalent scale. As a result, the net effect, where the effect is deemed to be significant, is generally a lowering of the significance of effect value in cumulative terms. This is exacerbated to a value of not significant if the cumulative building obscures the view of the Proposed Development completely which occurs in a few cases.

Table 10.10 TVIA Committed Cumulative Schemes Impact Assessment summary table

(Note. Where townscape (T) and visual receptor (VR) significance of effect values are the same, one shared value is provided. Where they are different, a value is provided for both categories)

Location	Development Only (included Residual Impact)	EIA significance	Relevant Cumulative Scheme	Cumulative Effect
1 Whitworth Street West				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	No Impact	Not Significant	None	None
2 Stretford Road				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR) Significance of effect (T)	Medium Low Minor Beneficial Minor Beneficial Minor Beneficial Negligible Beneficial	Not Significant	None	None
3 The Sanctuary				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium High Negligible Negligible Minor Beneficial	Not Significant	None	None
4 Hulme Park				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium Medium Minor Beneficial Minor Beneficial Minor Beneficial	Not Significant	De Trafford Transition	Minor Beneficial
5 Mancunian Way				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Low Low Minor Beneficial Moderate Beneficial Minor Beneficial	Not Significant	De Trafford Transition	Minor Beneficial
6 St Wilfred's Park				
Sensitivity (VR)	High			

Location	Development Only (included Residual Impact)	EIA significance	Relevant Cumulative Scheme	Cumulative Effect
Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR) Significance of effect (T)	Low Minor Beneficial Minor Beneficial Moderate Beneficial Negligible Beneficial	Significant	De Trafford Transition	Minor Beneficial
7 Chorlton Road				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR) Significance of effect (T)	Medium Low Minor Beneficial Minor Beneficial Minor Beneficial Negligible Beneficial	Not Significant	None	None
8 St George's Park				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR) Significance of effect (T)	High Medium Minor Beneficial Minor Beneficial Moderate Beneficial Minor Beneficial	Not Significant Significant	None	None
9 Chester Road				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium Medium Minor Beneficial Minor Beneficial Minor Beneficial	Not Significant	Deansgate South De Trafford Transition Viadux Whitworth St West	Minor Beneficial
10 Chester Road				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium Medium Minor Beneficial Minor Beneficial Minor Beneficial	Not Significant	Deansgate South De Trafford Transition Viadux Whitworth St West	Minor Beneficial
11 Deansgate				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR)	Low Medium Moderate Beneficial Moderate Beneficial Minor Beneficial	Not Significant	Deansgate South De Trafford Transition	Minor Beneficial

Location	Development Only (included Residual Impact)	EIA significance	Relevant Cumulative Scheme	Cumulative Effect
Significance of effect (T)	Moderate Beneficial	Significant		Moderate Beneficial
12 Albert Square				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	No Impact	Not Significant	None	None
13 St Peter's Square				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium High Minor Beneficial Minor Beneficial Minor Beneficial	Not Significant	Whitworth Viadux	No Impact
14 Lower Moseley St				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	No Impact	Not Significant	None	None
15 Whitworth St West				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Low Low Negligible Negligible Negligible Beneficial	Not Significant	Whitworth St West	No Impact
16 Deansgate Station				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Low Medium Minor Beneficial Minor Beneficial Negligible Beneficial	Not Significant	Deansgate South De Trafford Transition Viadux Whitworth Street West	Negligible Beneficial
17 Deansgate				
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	Medium Medium Minor Beneficial Minor Beneficial Minor Beneficial	Not Significant	Deansgate South De Trafford Transition	Minor Beneficial

Location	Development Only (included Residual Impact)	EIA significance	Relevant Cumulative Scheme	Cumulative Effect
18 Castlefield Basin				
Sensitivity (VR)	Medium	Not Significant	De Trafford Transition	Minor Beneficial
Sensitivity (T)	Medium			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Minor Beneficial			
19 Egerton Street				
Sensitivity (V)	Low	Not Significant	None	None
Sensitivity (T)	Low			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Negligible Beneficial			
20 A57 Regent Road				
Sensitivity (VR)	Low	Not Significant	De Trafford Transition	Negligible Beneficial
Sensitivity (T)	Medium Low			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Negligible Beneficial			
21 Trinity Way				
Sensitivity (VR)	Medium	Not Significant	De Trafford Transition	Negligible Beneficial
Sensitivity (T)	Low			
Magnitude (VR)	Negligible			
Magnitude (T)	Negligible			
Significance of effect	Negligible Beneficial			
22 Museum of Science & Industry				
Sensitivity (VR)	High	Not Significant	None	None
Sensitivity (T)	High			
Magnitude (VR)	Negligible			
Magnitude (T)	Negligible			
Significance of effect	Negligible Beneficial			
Viewpoint A				
Sensitivity (VR)	Medium	Not Significant	None	None
Sensitivity (T)	Medium			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Minor Beneficial			

Location	Development Only (included Residual Impact)	EIA significance	Relevant Cumulative Scheme	Cumulative Effect
Viewpoint B				
Sensitivity (VR)	Medium	Significant	None	None
Sensitivity (T)	Medium			
Magnitude (VR)	Moderate Beneficial			
Magnitude (T)	Moderate Beneficial			
Significance of effect	Moderate Beneficial			
Viewpoint C				
Sensitivity (VR)	Medium	Not Significant	Deansgate South	Minor Beneficial
Sensitivity (T)	Medium			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Minor Beneficial			
Viewpoint D				
Sensitivity (VR)	High	Not Significant	None	None
Sensitivity (T)	Medium			
Magnitude (VR)	Minor Beneficial			
Magnitude (T)	Minor Beneficial			
Significance of effect	Minor Beneficial			

Mitigation Measures

Mitigation of effects during the construction phase.

10.106 Mitigating the effects of the construction phase will involve high quality hoardings that will be used to limit unsightly visual impacts during the construction phase at street level. These will secure and protect the Proposed EIA Development Site and prevent views of an unsightly construction site.

Mitigation of effects during operational phase

10.107 Mitigation measures for the operational phase are focussed on embedded mitigation measures which are an integral part of the design of the building and fully described in the Design and Access Statement which accompanies the planning application and summarized earlier in this chapter. These mitigation measures deal with the Proposed EIA Development's relationship to neighbouring buildings and its location.

Residual Effects

10.108 The visual impact assessment has been carried out based on the assumption that all the necessary mitigation measures have been accounted for in the design process. The images for selected viewpoints illustrated in Appendix 10.2 represent the accurate definition of the location and mass of the component parts of the Proposed EIA Development. The predicted significance of effect values during the operational phase are therefore the same for each representative viewpoint and Townscape Character Area as the residual effect values and are illustrated in Table 10.10 above.

10.109 With regards to the construction stage assessment, the only mitigation measures possible during the construction phase involve the deployment of hoardings to screen, and secure, the

site at ground level. Allowing for the scale of the build this is unlikely to have any effect on the townscape and visual effect values recorded for the construction phase. Consequently, the moderate adverse values registered for both townscape and visual effects for the townscape character zones immediately surrounding the site, and minor adverse for those further afield, will remain the same and are therefore the residual effects that relate to the construction phase.

Summary

- 10.110 This Townscape and Visual Impact Assessment examines the impact Development will have on the townscape of Salford and Manchester City Centre and on the townscape character of the city centre zones immediately surrounding the Proposed Development in particular. It does so in a systematic, rational and objective way using established methodologies and practices contained in GLVIA 3. The impact of the Proposed Development is explored on its own and then in conjunction with consented and committed development in a Cumulative Assessment.
- 10.111 A computer modelling process, carried out by Ambiente, was employed to provide an accurate series of verified images, which illustrate and inform the nature of the impact that the Proposed Development will have on a series of selected Representative Viewpoints, and on the surrounding townscape, on a 360 degree basis from a variety of distances.
- 10.112 Although it is not possible to provide one single summary value that the impact the Proposed Development will have on Manchester City Centre and its surrounding neighbourhoods, it is possible to summarise the effects in general terms.
- 10.113 In this regard, Table 10.10 records that in most cases, the Proposed Development has a negligible or minor significance of effect which is not significant. Only in a few cases, largely those viewpoints which are in close proximity to the Proposed Development, does the value rise to moderate.
- 10.114 The principal reason for this lies with the fact that the Proposed Development sits amongst a cluster of tall buildings, some of which such as Crown Street Phase 1, are in close proximity. The fit with the baseline townscape character and most views is complementary and visual interest is increased as a result.
- 10.115 In terms of cumulative effects, the effects of the Proposed Development are expected to be reduced further as more tall buildings, in close proximity, such as Whitworth Street West or De Trafford Transition come forward and are constructed. In a few cases they obscure views of the Proposed Development altogether.

11 Traffic and Transport

A11 ES Addendum Alterations

The following change has been made to this chapter to take into account the detailed reserved matters proposals for Phase C of Crown Street Phase 2 which received outline consent as part of the hybrid planning permission:

- Updates to reflect the publishing of the revised NPPF (July 2021).

No EIA Technical Note nor Chapter Addendum has been prepared in relation to Traffic and Transport. Vectos have confirmed that the conclusions of the approved Traffic and Transport ES chapter (below) remain valid and are unchanged by the detailed design development for Phase C, the education facility which have been progressed as part of this reserved matters application.

Introduction

- 11.1 Vectos (North) Ltd have prepared this chapter of the ES. This has been undertaken by Tom Reader (Principal Consultant) BA (Hons), MSc, MCIHT who has over 8 years experience as a Transport Planner and Gareth Davis (Director), BSc (Hons), MSc, CMILT, MCIHT who has over 25 years as a Transport Planner. Both have advised on many projects similar to this proposed at Crown Street.
- 11.2 This Chapter of the ES assesses the likely significant effects of the Proposed Development on the environment with respect to Transport. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 11.3 This Transport Chapter is supported by a Transport Assessment (TA) as Appendix 11.1
- 11.4 The assessment has considered implications during the operational phase but also during the short term construction phase. The traffic flows from the Operational Phase are forecast in the TA and the potential effects of this traffic on sensitive receptors in the vicinity have been considered. The traffic during the Construction Phase is less predictable but it is possible to state that construction traffic flows will be of a relatively low level and last for a relatively short period of time limiting the implications. It is expected that the flows will be similar to the construction traffic flows for Crown Street Phase 1.

Legislative and Policy Context

- 11.5 An environmental impact can arise through the extra vehicle trips that might arrive at a site and from any new transport infrastructure. The potential implications that may arise from additional traffic have been described in the Institute of Environmental Assessment (IEA) Guidelines for the Environmental Assessment of Road Traffic (1993) and include;
- Noise;
 - Vibration;
 - Visual Impact;
 - **Severance;**
 - **Driver Delay;**
 - **Pedestrian Amenity;**
 - **Accidents and Safety;**

- **Hazardous Loads;**
- Air Pollution;
- **Dust and Dirt;**
- Ecological Impact;
- Heritage and Conservation Areas.

11.6 The environmental implications in bold above are addressed as part of this section whilst those arising from Noise/Vibration, Visual Impact, Air Quality, Ecology and Heritage matters are dealt with in other sections of this document.

National Planning Policy

Revised National Planning Policy Framework (~~2019~~2021)

- 11.7 The revised NPPF was published in ~~February 2019~~ July 2021 by the Ministry of Housing, Communities and Local Government, and sets out the government's planning policies for England and how these are expected to be applied. At the heart of the Framework is a presumption in favour of sustainable development.
- 11.8 As part of promoting sustainable transport, paragraph 1~~1008~~ of the revised NPPF states that in assessing applications for development, it should be ensured that:
- *appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location.*
 - *safe and suitable access to the site can be achieved for all users; ~~and~~*
 - *the design of streets, parking areas, other transport elements and the content of associated standards reflects current national guidance, including the National Design Guide and the National Model Design Code; and*
 - *any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.*

11.9 Paragraph 1~~1109~~ goes on to state that,

Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.

11.10 Finally, the NPPF notes that travel plans can form an important part of development, and a Framework Travel Plan has been prepared in support of this application, to form the basis of a long-term management strategy for the site delivering sustainable transport objectives and promoting opportunities.

Local Planning Policy

11.11 Relevant transport planning policy and guidance at the local level is contained within the Manchester Core Strategy document, the Guide to Development in Manchester SPD and Planning Guidance and the Greater Manchester Transport Strategy and the Manchester Residential Quality Guidance (2017). The specific planning guidance for this site is presented in the Great Jackson Street Development Framework.

Manchester Core Strategy

11.12 The Core Strategy forms the key document in Manchester's Local Development Framework and was adopted in 2012. It sets out a number of strategic policies that will guide the development

of the city. Policy SP1 sets out the spatial principles that will guide development to 2027. One of these principles is as follows:

New development will maximise the potential of the City's transport infrastructure, in particular promoting walking, cycling and the use of public transport.

11.13 In addition, the policy goes on to state that developments in all parts of the city should 'improve access to jobs, services and education and open space by being located to reduce the need to travel and provide good access to sustainable transport provision'.

11.14 This is reinforced through **Policy DM 1** of the Core Strategy, which concerns development management. This states that all developments should have regard to specific issues including the access to new development by sustainable transport modes and vehicular access and car parking.

11.15 **Policy T1** of the Core Strategy concerns sustainable transport. It states that the Council will support proposals that:

- *Improve choice by developing alternatives to the private car.*
- *Take account of the needs of road users according to a broad hierarchy consisting of, in order of priority:*
 1. *Pedestrians and disabled people,*
 2. *Cyclists, public transport,*
 3. *Commercial access,*
 4. *General off peak traffic,*
 5. *General peak time traffic.*

11.16 The development proposals are in line with these policy objectives, ensuring that the site will be accessible to all users by a range of different transport modes.

11.17 **Policy T2** states that the Council will actively manage the pattern of development to ensure that new development:

- *Is located to ensure good access to the City's main economic drivers, including the Regional Centre, the Oxford Road Universities and Hospitals and the Airport and to ensure good national and international connections*
- *Is easily accessible by walking, cycling and public transport; connecting residents to jobs, centres, health, leisure, open space and educational opportunities.*

11.18 With regards to parking standards, the Core Strategy states that the 'maximum standards for car parking do not apply to the City Centre as each development in the City Centre will be considered on a case by case basis.'

Guide to Development in Manchester SPD & Planning Guidance

11.19 This document brings together the development principles that will apply to new developments in Manchester. Paragraph 2.22 of the document states that:

In order to reduce reliance on the car, residents and workers should be within easy walking distance of facilities such as clinics, corner shops, newsagents and public transport.

11.20 The Proposed Development is well aligned with this goal, being located close to a range of different facilities. The guidance goes on to describe the need for Travel Plans in new developments, stating:

A Travel Plan is a package of measures and actions aimed at reducing the need to travel by car by providing alternative choices and encouraging walking, cycling, and public transport use. At the planning stage consideration should be given to the proximity of the development to existing travel facilities and services, site layout, suitable density, cycling, pedestrian facilities and potential for parking restraint.

Greater Manchester Transport Strategy 2040

11.21 Transport for Greater Manchester (TfGM) has developed a 2040 Transport Strategy that sets out ambitions for a radical new approach to planning Manchester's transport system in support of long-term needs and aspirations.

11.22 The vision is for Greater Manchester to have 'World class connections that support long-term, sustainable economic growth and access to opportunity for all. The Transport Vision aims are as follows:

- *Supporting Sustainable Economic growth*
- *Protecting Our Environment*
- *Improving Quality of Life for All*
- *Developing an Innovative City Region*

11.23 The 2040 Vision is supported by policies and proposals for improving the transport network in the medium term up to 2025 structured around spatial themes.

11.24 The Delivery Plan of Transport measures to 2025 is wide ranging package, includes reformation of the bus market, further expansion of the Metrolink network and its capacity, Rail Capacity improvements including improving the capacity on the Castlefield Corridor, Princess Parkway/Mancunian Way roundabout improvements, Cycle Improvements on the Chorlton-Manchester Corridor among a wider package of cycle and pedestrian improvements as part of the Mayors Challenge Fund.

11.25 The development proposals aspire to conform to the vision and goals as set out within the 2040 Vision Document by ensuring that the site is accessible by a variety of sustainable transport modes in order to deliver a quality development that enhances the environment.

Revised City Centre Transport Strategy

11.26 A report was presented to the MCC Executive in October 2019 that set out proposals for a revised City Centre Transport Strategy (CCTS), aligned to the Greater Manchester Transport Strategy 2040.

11.27 The new strategy is considered necessary to take account of the predicted growth of the city centre, changes in the policy context since the previous strategy in 2010, and the outcomes of the City Centre Transport Strategy Conversation that took place in 2018.

11.28 It will set out ambitious targets for the city centre in the wider context of the GMSF, emerging Local Plan, Climate Change Policy and Clean Air proposals, including the ambition to be a zero-carbon city by 2038 at the latest. The focus is upon significant shifts to sustainable transport modes, which will require enhancements to the walking and cycling networks, providing additional Metrolink capacity in the city centre and increasing electric vehicle charging points. Additionally, the ambition is for a shift in car parking spaces over time from the centre to the periphery.

Manchester Residential Quality Guidance

11.29 The Manchester Residential Quality Guidance was adopted in March 2017 and is a material consideration in the determination of planning applications. This document outlines the considerations, qualities, and opportunities that will help to deliver high quality residential

development as part of successful and sustainable neighbourhoods across Manchester. It contains guidance for developers in relation to design standards, and new proposals are expected to comply with the guidance.

- 11.30 The guidance states that 'residential development within Manchester should aim to offer true modal choice, prioritising walking and cycling in the first instance as a key component in developing sustainable neighbourhoods and healthy communities.'
- 11.31 It goes on to state that the sustainable development of Manchester depends on reducing dependence on the car, suggesting that residential development should consider the manner in which they encourage access to the wider public transport network.
- 11.32 In relation to parking, the guidance states that 'there is no one size fits all approach to car parking and it should be considered on a site by site basis.' It also goes on to note that car parking demand will be influenced by the availability of public transport. Whilst the guideline parking provision for city centre apartment sites is identified at 30-40%. The level of residential parking provision is at the lower end of that guidance at 29% which reflects the accessibility of the site by public transport. The public parking provision of 389 spaces serves the Great Jackson Street area and effectively replaces previous public car parks on the site.
- 11.33 The guidance therefore promotes residential development in sustainable locations, such as the application site, where the excellent accessibility to public transport will result in a low demand for parking.

Great Jackson Street Development Framework (2018)

- 11.34 The Great Jackson Street Development Framework was updated in May 2018, with the revised document representing an evolution to the original framework (2007) and 2015 update, building upon the continued successful delivery in the area. The 2018 update provides a further refinement of the vision for Great Jackson Street in order to enhance the quality of the neighbourhood and maximise the regeneration outcomes of future development.
- 11.35 The 2018 Framework maintains the importance of creating "*a vibrant, safe, secure and sustainable community*", however the 2018 update aims to further refine and improve the quality of the residential environment and public spaces. The key areas of change to the updated framework are as follows:
- *Reinforcing previously identified opportunities for height;*
 - *Greater separation between buildings;*
 - *Increased quantum and variety of public space.*
- 11.36 The fullest range of transport modes are available to the Great Jackson Street site, including tram, train, bus, cycle and walking. The Framework recognises the importance of permitting car access to the site. However, the plan seeks to mitigate vehicular impacts by prioritising and improving pedestrian and cycle access and connectivity wherever possible and minimising the dominance of the private car.
- 11.37 However, within the development site and as per the Framework, the displacement of the surface car park will be replaced with modern basement parking facilities for commuters.
- 11.38 To summarise, local, regional and national planning policy and guidance has been carefully considered as part of this planning application, and the Proposed Development is considered to align with the key transport policy objectives that prioritise sustainable development.

Assessment Methodology and Significance Criteria

11.39 The assessment methodology is based on the IEA Guidelines which states that in Scoping out the extent of the assessment it suggests that 'two broad rules of thumb could be used to delimit the scale and extent of the assessment. Those Rules are:

- *Rule 1 Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)*
- *Rule 2 Include any other specifically sensitive areas where traffic flows have increased by 10% or more.*

11.40 These thresholds will be used to indicate the level of significance of impact.

Methodology for Determining Sensitivity

11.41 The sensitivity of a receptor is based on the relative importance of the receptor using the scale in **Table 11.1**.

Table 11.1 - Methodology for Determining Sensitivity

Sensitivity	Examples of receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character or is of international or national importance.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

11.42 The receptors that are considered sensitive in this assessment are:

- Local residents namely those who will be occupying apartments as part of the Great Jackson Street Framework area and those to the east off City Road.
- Pedestrians using local roads and those accessing Gaddum House
- Cyclists using local roads and those accessing Gaddum House

11.43 As the **Local Residents** are (or will be) living in a City Centre environment adjacent to roads and traffic, they are considered to have a **Moderate Sensitivity** to change as a result of changes in road traffic.

11.44 Similarly, **Pedestrians** and **Cyclists** are used to the City environment with road traffic present and are considered reasonably tolerant of changes in road traffic and again we would place these receptors in the **Moderate Sensitivity** category.

Methodology for Determining Impact Magnitude

11.45 The Environmental Assessment has quantified the magnitude of impact, and has taken account of the following factors:

- The value of the resource (international, national, regional and local level importance);
- The magnitude of the impact;
- The duration involved;
- The reversibility of the effect; and
- The number and sensitivity of receptors.

11.46 The Significance of the impact has been determined according to the criteria as described in **Table 11.2**.

Table 11.2 - Methodology for Determining Impact Magnitude

Magnitude of Impact	Criteria for assessing impact
Major	Total loss or major/substantial alteration to key elements/features of the baseline (pre-demolition) conditions such that the post demolition character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post demolition character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-demolition circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

11.47 The significance of an environmental effect is determined by the interaction of magnitude and sensitivity, whereby the impacts can be positive or negative. The Impact Significance Matrix is set out in **Table 11.3**.

Table 11.3 - Impact Significance Matrix

Magnitude	Sensitivity		
	High	Moderate	Low
Major	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial
Moderate	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

11.48 In consideration of this impact, a moderate impact is considered significant, a minor impact is considered not significant.

Cumulative Effects

11.49 There are two types of cumulative effect which could arise in this assessment. The first could arise from multiple developments which individually might be insignificant, but when considered together could create a significant cumulative effect. This has accounted for in the trip forecasting process.

11.50 The second factor could arise from a combination of individual effects (for example, driver delays from congestion coinciding with air pollution and noise impacts). The assessment has shown that the highway would operate efficiently with development, so the implications of driver

delay, severance or pedestrian amenity are applicable. The issues relating to Noise and Air Quality have been considered elsewhere in the Statement.

Baseline Conditions

11.51 The baseline peak hour traffic conditions are described in the TA describing the existing highway layout, its operation and road safety characteristics. The baseline traffic flows are also described and in summary this analysis for Phase 2 uses the same traffic assumptions used for the Crown Street Phase 1 development. That assessment was based on survey data with committed development forecast to a 2022 baseline. These traffic flow figures for the peak hours are given in **Figure 11.1** for the AM peak and **Figure 11.2** for the PM Peak period.

Committed Development

11.52 The committed developments as set out in **Appendix 2.X** have all been reviewed to determine the traffic forecasts that arise from those developments and where they are forecast to enter the area of study for the Crown Street development, they are included in the Baseline Flows.

Forecast to Future Year Assessment

11.53 Those 2022 peak hour Baseline Flows are then factored to the 2028 future year of opening using a Temprow growth factor of 1.0789. In this process, for robustness, all the baseline traffic flows including the committed development trips have been growthed to the year of opening.

11.54 For clarification, the Noise and Air Quality Assessments require Average Annual Daily Traffic flows and Annual Average Weekday Traffic flows. These daily traffic flows have been derived using a different methodology from the TfGM traffic model for the city which accounts for the Regent Road highway improvements. These model flows have a 2025 future year scenario. The difference in the year of opening scenarios is not significant as in fact traffic flows in Manchester City Centre have either been falling steadily or maintaining their levels over the last decade.

Future Year Baseline Flows

11.55 The 2028 Baseline traffic flows in the AM peak period are given in **Figure 11.3** and for the PM peak in **Figure 11.4**.

11.56 To give context for the Baseline Conditions, the site previously operated as a 333 space public car park which increased to 401 spaces when it was surveyed in 2015. This survey showed that the site generated 1012 arrivals and 916 departures in a 12-hour period with a two-way flow of 306/307 vehicles in the respective peak hours. The development includes a public car park and the trips from that use are largely offset by the existing car park trips.

Identification and Evaluation of Significant Effects

11.57 The assessment on the significance of impacts on sensitive receptors is based on the increases in traffic flow during construction and during its operational phase. We present below the forecast traffic changes and identify whether they result in a significant change in flow when compared to the IEA assessments criteria.

Construction Phase

Future Construction Trips

11.58 There has not been a specific forecast of the construction traffic flows as these are variable depending on the nature of type of activity at the time and are dependent on the contractors programme. Construction vehicle delivery movements are timed to stagger deliveries arriving and to avoid peak traffic periods. Typically, a construction site might expect 2-6 articulated

HGV deliveries per day, plus 16-30 Rigid HGVs per day increasing to up to 100 movements per day during concrete pours or around 50 per day with cladding work. On the busiest periods we might see around 10 HGV movements per hour. There would then be construction workers cars and light goods vehicles arriving on site which may bring around 30-50 Light vehicle movements per day. This construction traffic activity would be just temporary up to the completion of the works in 2028.

- 11.59 Alongside the relatively modest traffic flows, if there is no mitigation then there may also be implications associated with Dust and Dirt on the wheels transferring to the local roads and potentially vulnerable road users may be intimidated by the HGV movements such as vehicles reversing. The footways around the site may also be affected by hoarding coming onto the footway. In this construction phase we do not expect the movement of particularly hazardous loads.
- 11.60 The estimated levels of construction traffic described above will result in very low changes in traffic flow when compared to the Baseline Flows described in Figures 11.1. and 11.2. Therefore, the and the percentage change will in fact be marginal and in fact contractors will often time their deliveries to avoid the peak traffic periods. Therefore, in terms of the traffic volumes the environmental implications are only minor and are just for a temporary period. However, without mitigation the consequences of dust and dirt on the road and drivers reversing or turning without due care has lead to an assessment that there could be a moderate impact on vulnerable road users in the immediate vicinity of the site on Silvercroft Street, Melbourne Street and the junctions of these roads with Great Jackson Street.
- 11.61 Given the above consideration the environmental implications of construction traffic before mitigation is given in Table 11.4. The potential implications for vulnerable road users is considered moderate without mitigation. The implications for future residents in the area is considered time limited and most would be living away from the construction site.

Table 11.4 – Construction Traffic Environmental Impact

Effect Description		Pre-mitigation Significance, Temporary Implications up to 2028
Local Residents	Pedestrian Amenity Severance	Minor Adverse for pedestrians accessing Crown Street Phase 1.
Pedestrians	Pedestrian Amenity Severance Road Safety	Moderate Adverse on pedestrians on Silvercroft Street / Melbourne Street and their immediate junctions with Gartside Street.
Cyclists	Severance Road Safety	Moderate Adverse on cycle users on Silvercroft Street / Melbourne Street and their immediate junctions with Gartside Street.

Mitigation

Mitigation Measures Construction Phase

- 11.62 The Contractor will employ a number of mitigation measures to offset the potential temporary environmental impacts arising from Construction traffic. A Construction Management Plan would be conditioned and employ best practice to mitigate the environmental impacts of construction traffic movements.

11.63 The CMP would ensure drivers and the logistics companies employ best practice for HGV drivers on Road Safety to protect vulnerable road users. In addition, a Banksman would be employed to protect any pedestrians on the highway should a vehicle need to reverse into the site. The potential dust and dirt arising from construction traffic will be mitigated by wheel washing facilities and road sweeping. As the development is part of a wider area development there are economies of scale that reduce vehicle movements such as a concrete batching plant located off Melbourne Street which minimises traffic movements thereby reducing traffic on the wider network.

Residual Effect – Construction Phase

11.64 With good site practices the residual effect of construction traffic will remove much of the potential issues of dust and dirt and road safety. These implications are just for a temporary period and for each of the sensitive receptors the Post Mitigation implications are a Minor Adverse level of significance and in practical terms are comparable to that which currently occurs on due to the Crown Street Phase 1 Development.

11.65 The Assessment of the residual impacts are given in **Table 11.5** below.

Table 11.5 – Residual Impact Table

Receptor	Effect Description	Post-Mitigation (Residual) Significance
Local Residents	Pedestrian Amenity Severance	Minor Adverse not significant effect on new residents of Crown Street Phase 1 of off Great Jackson Street opposite site.
Pedestrians	Pedestrian Amenity Severance Road Safety	Minor Adverse not significant effect on pedestrians on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.
Cyclists	Severance Road Safety	Minor Adverse not significant effect on cycle users on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.

Operational Phase

Future Operational Development Trips

11.66 The residential development trips were forecast using the same Trip Rate Information Computer System (TRICS) forecasts used in the Crown Street Phase 1 assessment. Onto this we have added the school trips. The public car park trips are based on the survey data for the existing car park of 401 spaces factored to the new provision of 389 spaces, a small reduction in trips.

11.67 The development trip forecasts combined with the Baseline flows at the 2028 year of opening are given in Figure 11.5 for the AM peak and Figure 11.6 for the PM peak period.

11.68 It can be seen from Figures 11.5 and 11.6 that there are significant increases in traffic flow in the immediate vicinity around the site. This is notable on Silvercroft Street, Melbourne Street

and on Great Jackson Street between Silvercroft Street and Melbourne Street. To make this more readable these flow changes are shown in Table 11.6 below.

Table 11.6 Traffic Flow Changes with Development

Link	Name	AM		PM		% Change	
		2028 Base	2028 Base + Dev	2028 Base	2028 Base + Dev	AM	PM
A	A56 Chester Rd West of Gt Jackson	2557	2613	2490	2563	2%	3%
B	A56 Chester Rd East of Gt Jackson	2101	2103	1974	1975	0%	0%
C	Gt Jackson St North of Silvercroft	281	338	319	394	20%	24%
D	Silvercroft St	63	360	101	424	471%	320%
E	Gt Jackson St South of Silvercroft	306	652	378	518	113%	37%
F	Melbourne St	25	291	3	105	1064%	3400%
G	Gt Jackson St South of Melbourne	275	317	378	421	15%	11%
H	City Road East	283	332	230	270	17%	17%
I	Medlock St North of City Road East	1719	1723	1692	1696	0%	0%
J	Medlock St South of City Road East	1717	1762	1570	1605	3%	2%

11.69 To undertake this assessment of environmental impact the percentage change in traffic flow are compared against the IEA guidelines to see if they result in change in flow in excess of 30%, where an environmental impact may be perceptible.

11.70 It can be seen that there are just three links where the change in traffic flows is greater than 30%, Silvercroft Street, Melbourne Street and the section of Great Jackson Street between those two roads. These links provide the immediate access into the site.

11.71 On these links the large percentage change in flow are due to the very low Baseline flows rather than particularly high development trips and the resultant flows are typical of roads in the local area.

11.72 To consider the implications of these traffic flows, the highway operation with development has been tested in the Transport Assessment at both the junctions of Silvercroft Street and Melbourne Street with Great Jackson Street. The results of this assessment show that the highway is forecast to operate at no more than 55% of its capacity and with no more than 2 vehicles queuing in any of the peak hours. In practice the forecast flows passing through the network is easily accommodated on the local highway network.

11.73 Further away from the immediate vicinity of the site the change in traffic flows is much more modest. Great Jackson Street north of Silvercroft Street sees a 24% increase in traffic flow in the PM peak and south of Melbourne Street Great Jackson Street sees a 15% change. City Road East sees a 17% change in traffic flow. The main road links of Medlock Street and Chester Road see only a small change in traffic volume of 2-3%.

11.74 From this analysis and with comparison with the IEA guidelines, the links that are away from the immediate vicinity of the site will not experience a noticeable environmental impact due to road traffic. The Streets of Silvercroft Street, Melbourne Street and Great Jackson Street between these two junctions will experience noticeable change and the impact on sensitive receptors in this area are considered next.

11.75 Considering the changes in traffic flows described above and the implications on the sensitive receptors the environmental implications have been assessed. The environmental implications are very localised to the immediate vicinity of the site and this is given in Table 11.7.

Table 11.7 – Operational Traffic Environmental Impact

Receptor	Effect Description	Pre-mitigation Impact
Local Residents	Pedestrian Amenity Severance	Minor Adverse effect on new residents of Crown Street Phase 1 of off Great Jackson Street opposite site.
Pedestrians	Pedestrian Amenity Severance Road Safety	Minor Adverse effect on pedestrians on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.
Cyclists	Severance Road Safety	Minor Adverse effect on cycle users on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.

Mitigation

Mitigation Measures Operational Phase

11.76 A package of measures is incorporated in the scheme to ensure that the development is sustainable and mitigate the effects of traffic movements. The main mitigation measures are the limits on parking for the Great Jackson Street Framework area compared to the pre-development scenario when much of the area was used as commuter parking space. The site location is very sustainable for occupiers so they can access the local amenities, employment and leisure opportunities of the area and the City Centre without the need for a car. In addition, the co-location of the Primary School will provide education facilities for families of the local area.

11.77 Further mitigation measures to promote sustainable modes of transport for every day use includes the high levels of cycle parking, electric vehicle charging points a share car club and the promotion of sustainable travel behaviours with a Travel Plan. There is also a quality pedestrian and cycling environment with the public realm and landscape improvements on the site and the immediate vicinity.

Residual Effect – Operational Phase

Operational Phase

11.78 Following mitigation, the remaining impact on receptors has been assessed. The issues relating to Noise/Vibration and Air Quality are considered in other chapters of this report. The initial impact was originally assessed as having a Minor Adverse impact reflecting that there are some traffic increases but the nature of the site being located in an urban area and as it previously

operated as a former commuter car park. The mitigation measures are considered useful in helping occupiers to live without relying on the car however it is assumed that the potential environmental change will mitigation is marginal leaving the environmental impact as Minor Adverse during the Operational Phase. The assessment of the residual implications during the Operational Phase of development are indicated in Table 11.8.

Table 11.8 – Residual Impact Table

Receptor	Effect Description	Post-Mitigation (Residual) Significance
Local Residents	Pedestrian Amenity Severance	Minor Adverse not significant effect on new residents of Crown Street Phase 1 or off Great Jackson Street opposite site.
Pedestrians	Pedestrian Amenity Severance Road Safety	Minor Adverse not significant effect on pedestrians on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.
Cyclists	Severance Road Safety	Minor Adverse not significant effect on cycle users on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.

Summary

Summary of Assessment

11.79 The Traffic and Transport implications of the Proposed Development has been assessed according the environmental factors as set out by the Institute of Environmental Assessment (IEA) during the Construction and Operational Phases. The potentially sensitive receptors include existing and new residents living off Great Jackson Street/City Road and potentially vulnerable road users of cyclists and pedestrians.

Construction Phase

11.80 The Construction Phase will give rise to additional traffic movements for a temporary period and will include HGV movements which are relatively modest in volume and will be timed to arrive spaced over the course of a day and to avoid peak periods.

11.81 Such traffic activity may affect the amenity of the local environment, give rise to the potential of dust and dirt from the site and the road safety implications of HGV movements. These implications could result in a minor adverse implications for residents or a moderate adverse impact on vulnerable road users. However, the contractor will employ the Best Practices for site management in a Construction Management Plan that will include commitments for Wheel Washing and managing potentially Hazardous Waste movements. The CMP also includes Road Safety training for drivers to reduce the risk for cyclists and pedestrians. With these measures in place the implications on the potentially sensitive environmental receptors is reduced to a minor adverse impact.

11.82 In practice, the environmental implications during construction are similar to that which currently occurs on due to the neighbouring Phase 1 Development and the effects are in fact an extension of the construction activity in the area rather than the generation of new traffic.

Operational Phase

11.83 The development site was formerly a car park generating significant traffic flows so the net increase in traffic with development is less than would be otherwise. The traffic forecasts show that there will be noticeable increase in traffic movement in the immediate vicinity of the site such as on Silvercroft Street, Melbourne Street and Great Jackson Street immediately adjacent to the site.

11.84 The potentially sensitive receptors such as potentially new residents living close to the site, pedestrians and cyclists in the area may experience a minor-adverse environmental impact. Mitigation is provided by the limits on parking for the Great Jackson Street area which are lower than existing. This then supports a car free or low car lifestyle by the site location being very sustainable for occupiers so they can access the local amenities, employment and leisure opportunities of the area and the City Centre by modes other than the car. In addition, the co-location of the Primary School will provide education facilities for families of the local area.

11.85 Further mitigation measures to promote sustainable modes of transport for every day use includes the high levels of cycle parking, electric vehicle charging points and the promotion of sustainable travel behaviours with a Travel Plan. There is also a quality pedestrian and cycling environment with the public realm and landscape improvements on the site and the immediate vicinity.

11.86 The Proposed Development in its Operational Phase will have a minor-adverse environmental impact on sensitive receptors in the local vicinity of the site and are summarised as below in Table 11.9.

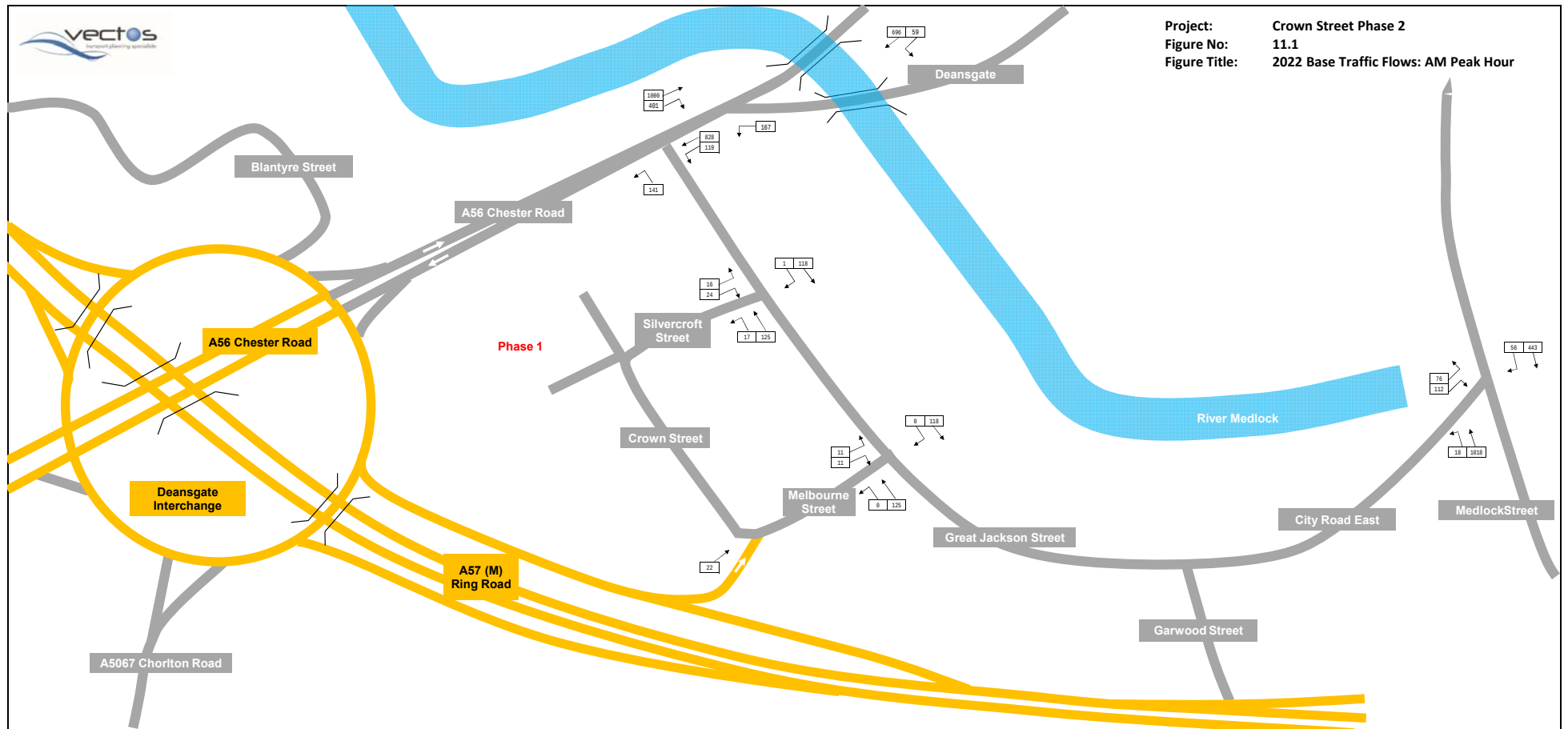
Table 11.9 – Summary Assessment

Receptor	Impact	Potential Effect
<i>During Construction</i>		Short Term effects
Local Residents	Hazardous Loads Dust & Dirt Pedestrian Amenity	Increased Intimidation Reduced Amenity Potential increased road safety risk These short terms effects are marginal and will be similar to the current traffic volumes associated with the Neighbouring Crown Street Phase 1 Development. These impacts can be mitigated by a CMP employing best industry practice relating to wheel washing and good site practice.
Pedestrians	Hazardous Loads Dust & Dirt Pedestrian Amenity Highway Safety	Increased Intimidation Reduced Amenity Potential increased road safety risk These short terms effects are marginal and will be similar to the current traffic volumes associated with the neighbouring Crown Street Phase 1 Development. These impacts can be mitigated by CMP employing best practice for drivers on road safety, wheel washing and good site practice.
Cyclists	Hazardous Loads Dust & Dirt Pedestrian Amenity Highway Safety	Increased Intimidation Reduced Amenity Potential increased road safety risk These short terms effects are marginal and will be similar to the current traffic volumes associated

Receptor	Impact	Potential Effect
<i>During Construction</i>		Short Term effects
		with the neighbouring Crown Street Phase 1 development. These impacts can be mitigated by CMP employing best practice for drivers on road safety, wheel washing and good site practice.
Operational Phase		Long Term effects
Local Residents	Severance Driver Delay Pedestrian Amenity Highway Safety	Small increase in traffic flows would not be perceptible by road users and would be within the daily variation of flow.
Pedestrians	Pedestrian Amenity Highway Safety Severance	There are some small increases in traffic movements that would result in a marginal adverse implications for pedestrians on the general highway. This would be mitigated by pedestrian footway/crossing improvements on Melbourne Street and Silvercoft Street.
Cyclists	Highway Safety	The small increase in traffic movements on the highway would give rise to a marginal adverse impact for cyclists. While not associated with the scheme cyclists will benefit from cycle improvements at the Chester Road Roundabout.

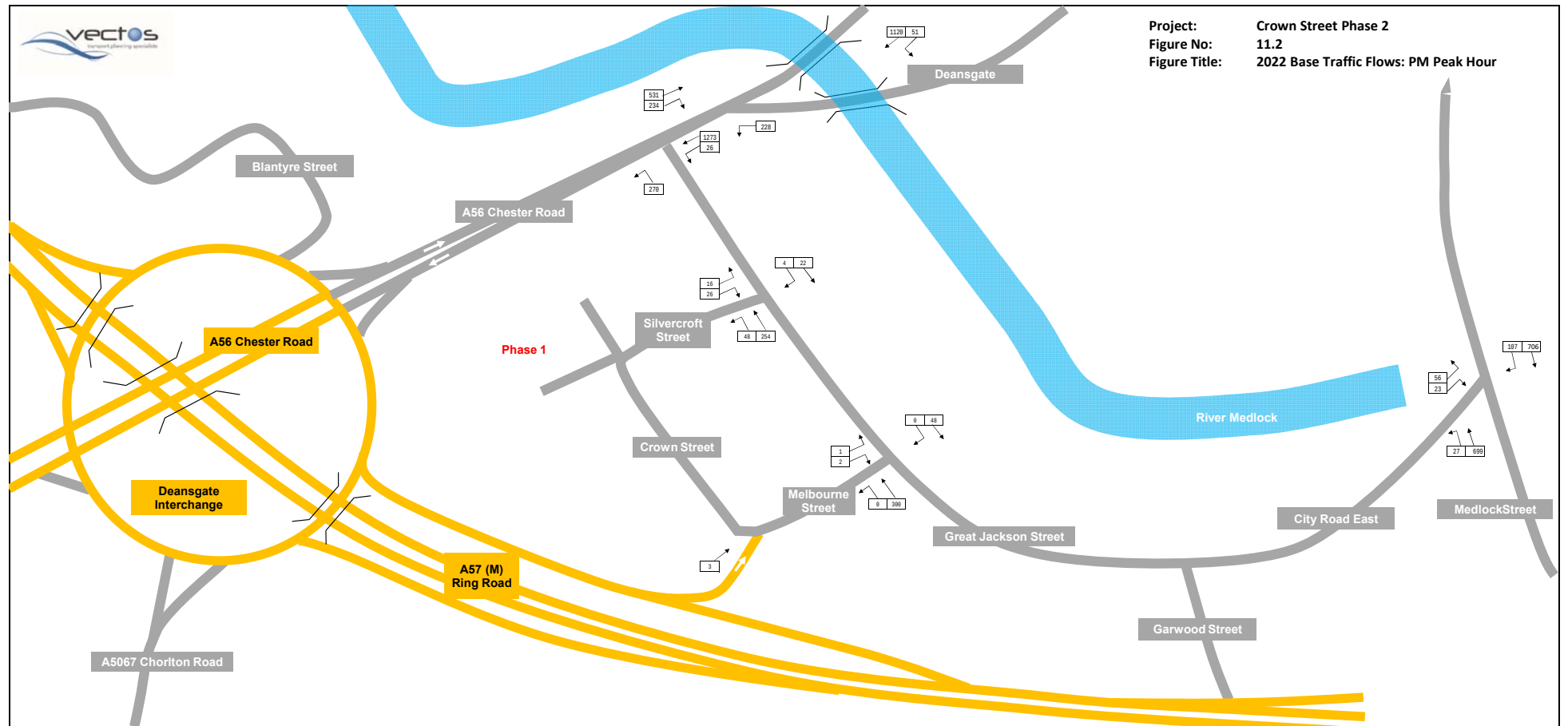


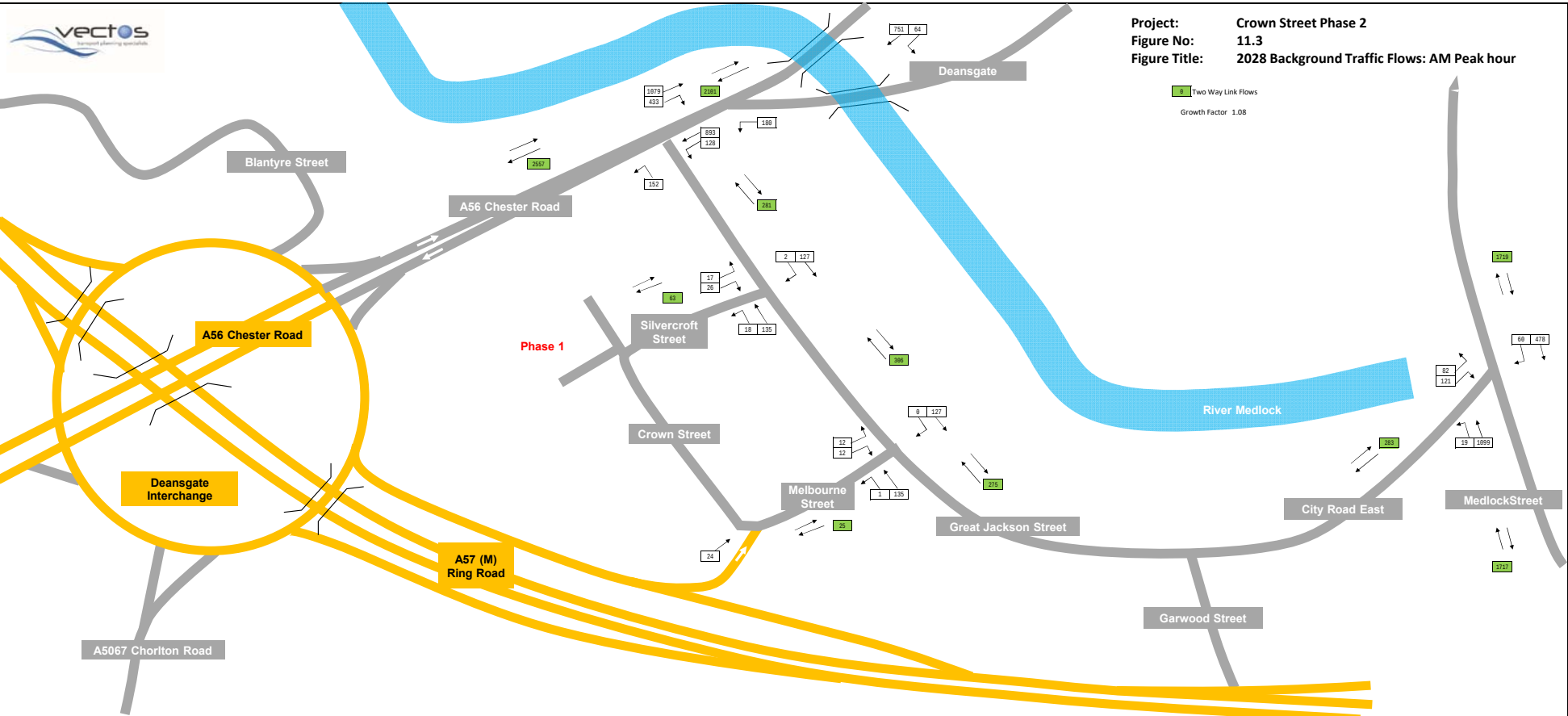
Project: Crown Street Phase 2
Figure No: 11.1
Figure Title: 2022 Base Traffic Flows: AM Peak Hour





Project: Crown Street Phase 2
Figure No: 11.2
Figure Title: 2022 Base Traffic Flows: PM Peak Hour

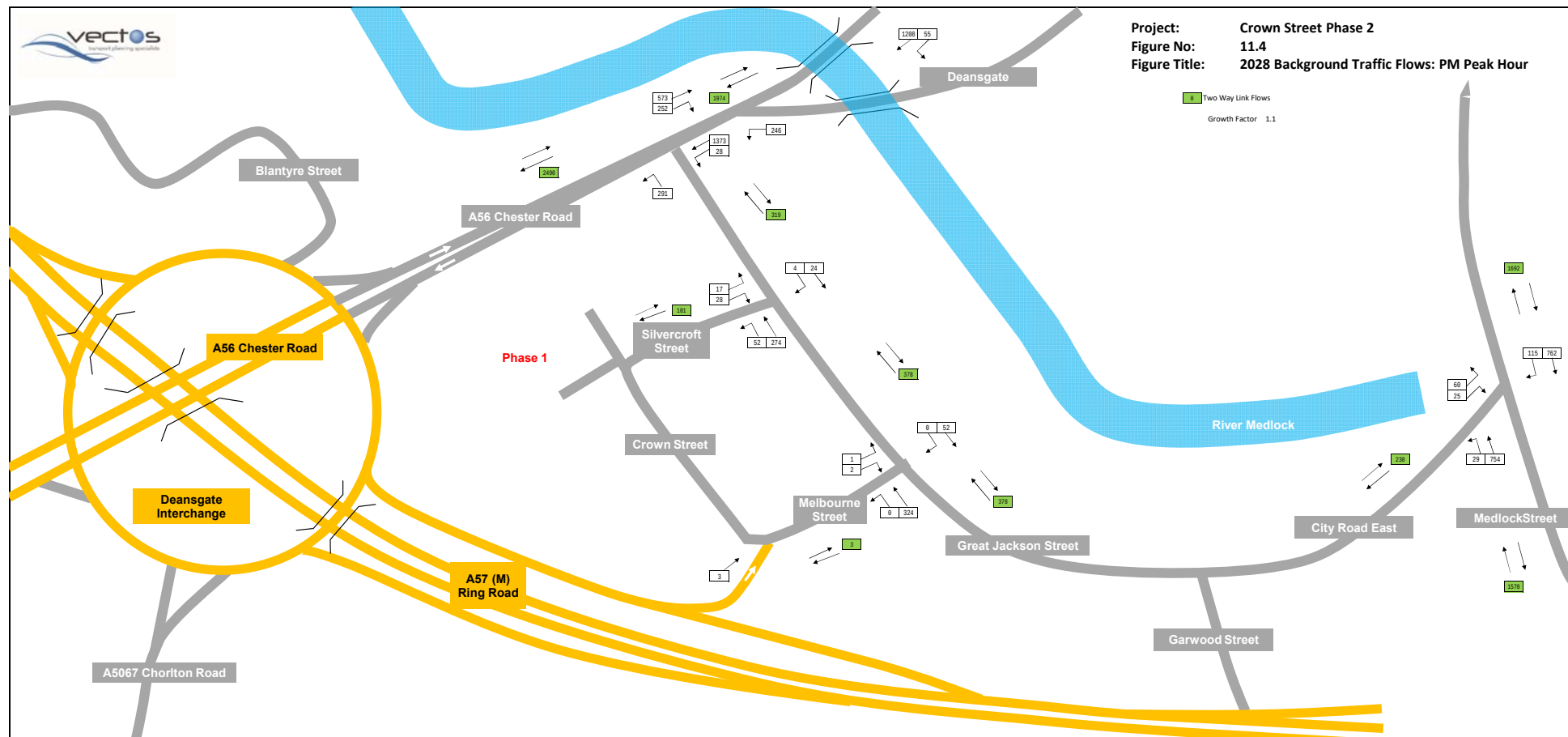






Project: Crown Street Phase 2
Figure No: 11.4
Figure Title: 2028 Background Traffic Flows: PM Peak Hour

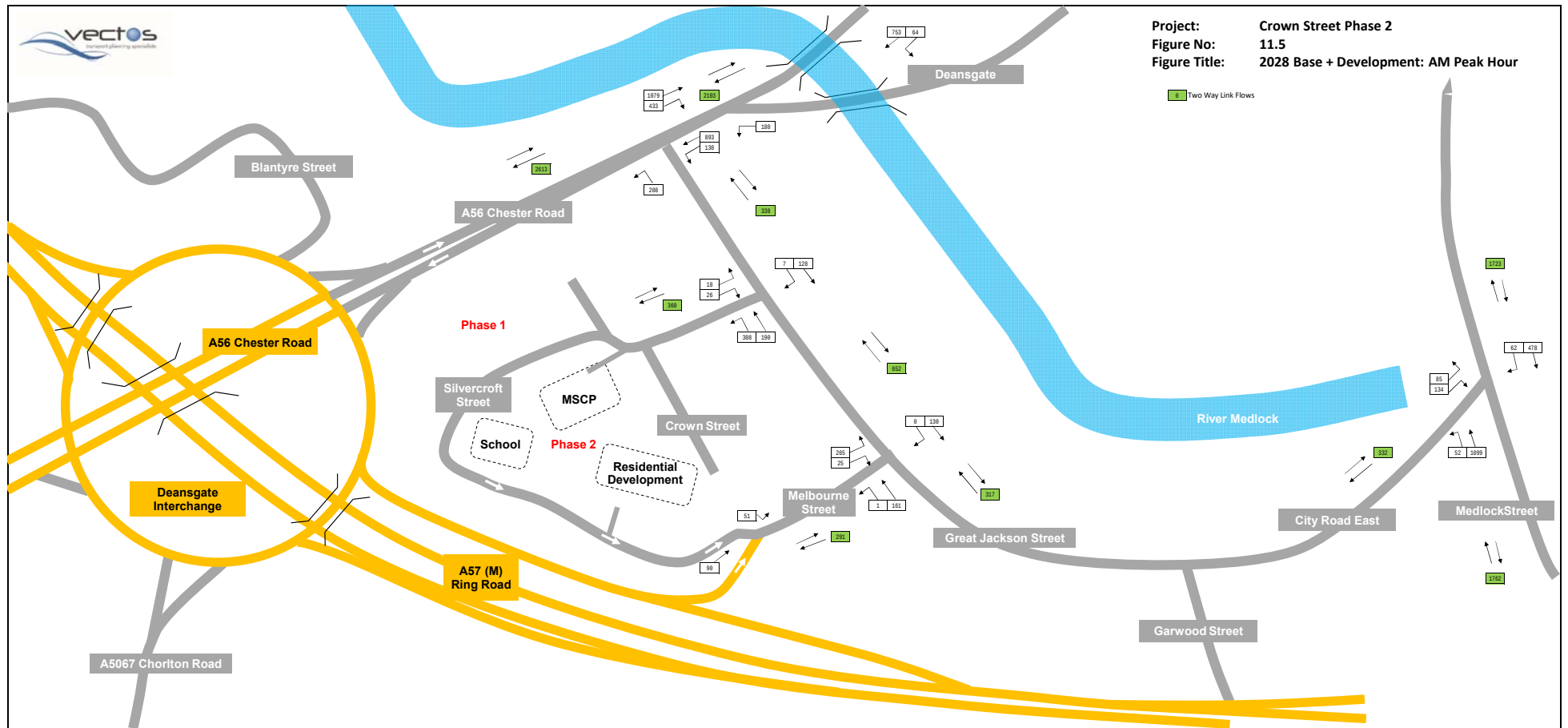
Two Way Link Flows
Growth Factor 1.1





Project: Crown Street Phase 2
Figure No: 11.5
Figure Title: 2028 Base + Development: AM Peak Hour

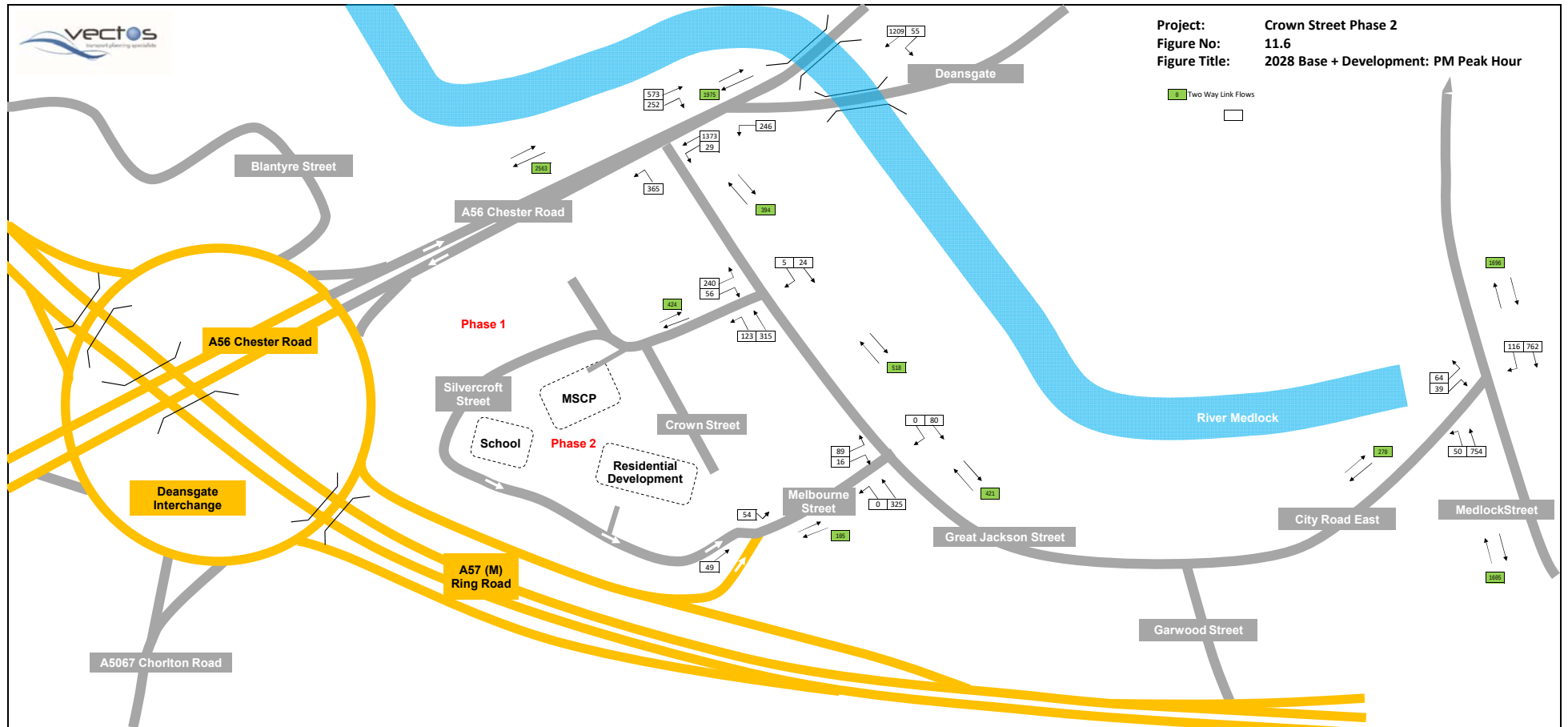
Two Way Link Flows





Project: Crown Street Phase 2
Figure No: 11.6
Figure Title: 2028 Base + Development: PM Peak Hour

Two Way Link Flows



12 Wind Microclimate

A12 ES Addendum Alterations

No alterations have been made to this chapter as part of the ES addendum prepared in support of the reserved matters application for Phase C of Crown Street Phase 2, which received outline consent as part of the hybrid permission.

An **EIA Technical Note**, included at **Appendix 12.3 (ES Volume 2)** has been prepared by Ensafé (formerly REC Ltd) to consider the environmental impacts arising from the detailed reserved matters proposals for Phase C (education facility). The EIA Technical Note confirms that the conclusions of the previous assessment (below) remain valid.

Introduction

- 12.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development with respect to Wind. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 12.2 This chapter has been prepared by WSP. WSP is one of the leading experts in the field of Microclimate in the UK. WSP has an in-house team of microclimate experts, who have extensive experience in undertaking such assessments. As part of our commitment to technical excellence, WSP has a team of full-time specialist modelling engineers who provide Wind Engineering services. We work with teams to understand and realize unique project requirements. WSP's assessments are based on the latest best practice guidance that are relevant for each technical subject and which are recognised by local planning authorities in the UK. WSP offers microclimate assessment services of the highest standards to property clients both in the UK and overseas. We have been successful in assisting our clients through the design and planning process of numerous high-profile developments across the UK and abroad.
- 12.3 This Chapter is intended to be read along with the following Appendices:
- Appendix 12.1 – CFD Technical Note
 - Appendix 12.2 – Wind Contour Plots

Legislative and Policy Context

Legislation

- 12.4 There is no specific national legislation or planning policy guidance dealing with wind microclimate in terms of pedestrian comfort. However, the Lawson Criteria (Ref. 1) are used to benchmark the pedestrian wind microclimate as they are well-established in the UK.

National Planning Policy

- 12.5 The National Planning Policy Framework (Ref. 2) was re-issued in February 2019 by the Ministry of Housing, Communities and Local Government. The relevant paragraphs are as follows:
- 12.6 Paragraph 127 of the National Planning Policy Framework states that:

"Planning policies and decisions should ensure that developments:

a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;

b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;

c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;

e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience."

Local Planning Policy

12.7 Manchester's Local Development Framework – Core Strategy Development Plan (Ref. 3) was adopted by Manchester City Council on 11th July 2012. It is the key document in Manchester's Local Development Framework and covers a period of 15 years from 2012 to 2027. It describes Manchester today and outlines the Council's vision for Manchester in 2027 along with the planning policies which will be used to deliver that vision.

12.8 Policy EN 2 on Tall Buildings states that:

"By their very size tall buildings can have a significant impact on the local environment and its micro-climate. It is therefore expected that this impact be modelled and that submissions for tall buildings also include appropriate measures to create an attractive, pedestrian friendly local environment."

12.9 Paragraph 12.14 of the Policy EN 2 on Tall Buildings states that:

"Tall buildings by their very nature can dominate the street scene and be highly visible over long distances. They can also have an impact on the local micro-climatic conditions, for example, by creating wind tunnels. It is for these reasons that it is considered particularly important that they are designed to the highest quality, both in terms of appearance and their impact on the functioning of surrounding space."

Guidance

12.10 The following guidance documents have been used during the preparation of this Chapter.

Best Practice Guideline for The CFD Simulation

12.11 Best Practice Guideline for The CFD Simulation of Flows in The Urban Environment (Ref. 4) have been used as a technical reference for this assessment. This is the most comprehensive set of technical guidance for the application of computer fluid dynamics for wind flows in the urban environment.

The Lawson Criteria

12.12 The Lawson Criteria (Ref. 1) are well-established in the UK for quantifying wind conditions in relation to build developments and, although not a UK 'standard', the criteria are recognised by local authorities as a suitable benchmark for wind assessments. The Lawson Criteria have been adopted for this assessment.

The Sustainable Design and Construction Supplementary Planning Guidance

12.13 The Sustainable Design and Construction Supplementary Planning Guidance (Ref. 5) have been used as a reference for this assessment.

12.14 Section 2.3.1 Site Layout and Building Design, Key Guidance Areas of Chapter 2: Resource Management states that:

"...The design of the site and building layout, footprint, scale and height of buildings as well as the location of land uses should consider: "New design of development... the potential to take advantage of natural system such as wind, sun and shading..."

12.15 Section 2.3.6 Site Layout of Chapter 2: Resource Management states that:

"... Developers should ensure the layout of their site and buildings maximises the opportunities provided by natural systems, such as light and wind and the potential for sustainable drainage systems."

12.16 Section 2.3.7 Micro-climate of Chapter 2: Resource Management states that:

"Large buildings have the ability to alter their local environment and affect the micro-climate. For example, not only can particularly tall buildings cast a long shadow effecting building several streets away, they can influence how wind travels across a site, potentially making it unpleasant at ground level or limiting the potential to naturally ventilate buildings. One way to assess the impact of a large building on the comfort of the street environment is the Lawson Comfort Criteria. This tool sets out a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence. It sets out a range of pedestrian activities from sitting through to crossing the road and for each activity defines a wind speed and frequency of occurrence. Where a proposed development is significantly taller than it's surrounding environment, developers should carry out an assessment of its potential impact on the conditions at ground level, and ensure the resulting design of the development provides suitable conditions for the intended uses."

The Historic England Advice Note

12.17 The Historic England Advice Note 4 (Ref. 6), updates previous guidance by English Heritage and the Commission for Architecture and Built Environment (CABE), produced in 2007. It seeks to guide people involved in planning for and designing tall buildings so that they may be delivered in a sustainable and successful way through the development plan and development management process. The relevant paragraphs states that:

4.7 "Planning applications for tall buildings are likely to require an environmental impact assessment (EIA), which would be expected to address matters in respect of both the proposed building and its cumulative impact, including: ...

e. Other relevant environmental issues, particularly sustainability and environmental performance, e.g. the street level wind environment"

4.10 "...Consideration of the impact on the local environment is also important, including microclimate, overshadowing, night-time appearance, light pollution, vehicle movements, the environment and amenity of those in the vicinity of the building, and the impact on the pedestrian experience."

Relevant Elements of the Proposed Development

12.18 The full extent of the building massing, including roof terraces, of the Proposed Development has been used as the basis for the assessment of the effects of environmental wind.

12.19 The Proposed Development includes inherent mitigation to improve the wind environment within and surrounding the Site. Various tests have been carried out during the design process in order to optimise the efficiency of this mitigation.

12.20 For the purpose of the wind assessment all elements potentially influencing the wind conditions within the Site and its surroundings, such as existing and proposed landscaping, hedges, screens, pergolas etc., have been included in the 3D model in order to accurately represent the wind environment. The list of drawing sets used to construct the 3D model is presented within the Appendix 12.1 (CFD Technical Note).

12.21 The Proposed Development has been created with the wind impact in mind and therefore, landscaping as well as additional measures listed below, have been embedded in the design in order to minimise wind effects (Figures 12.1 and 12.2).

12.22 Within the Site the following has been considered based on the proposed landscape:

- 86 trees are located at the ground plane and surround the buildings of the Proposed Development. Their height/width varies, from 3m/3m, 3.5m/3m, 4.5m/3m to 6m/3m accordingly.
- On terraces of Blocks C4 and C5, 16 trees of 3m height and 3m width have also been included.

12.23 Additionally, the following mitigation measures were added within the Site (shown in detail in Figure 12.2):

- Three 1m wide, 3m tall screens (50% open) to the north of C3, staggered on the footpath.
- Two 1.5m wide, 3.2m tall screens (75% open) in the eastern part of the passage between C3 and C4.
- One 6m wide, 2m tall screen (50% open) in the western part of the passage between C3 and C4.

12.24 The landscape mitigation around Crown Street Phase 1, designed by BMT, consists of:

- Trees of 4.5m height and 3m width, located at the west and south part of Elizabeth Tower
- Two screens of 50% porosity at the east part of the scheme

12.25 Around Deansgate Square different types of mitigation have been included as designed by BMT, consisting of:

- Various trees around the Deansgate Square's buildings of varying height/width, from 3m/2.5m, 4.5m/2.5m, to 6m/4.5m.
- Pergolas of 25% porosity are placed on the north corner of the scheme.
- Screens of 50% porosity are placed to the east and at the north corner of the scheme, while screens of 25% porosity are located at the north and west parts of Deansgate Square.
- Hedging of 1.5m height is placed at the north-west and south parts of the scheme, as well as at the east part of Deansgate Square (near Receptor 30).

Figure 12.1: Mitigation - Landscape and additional features

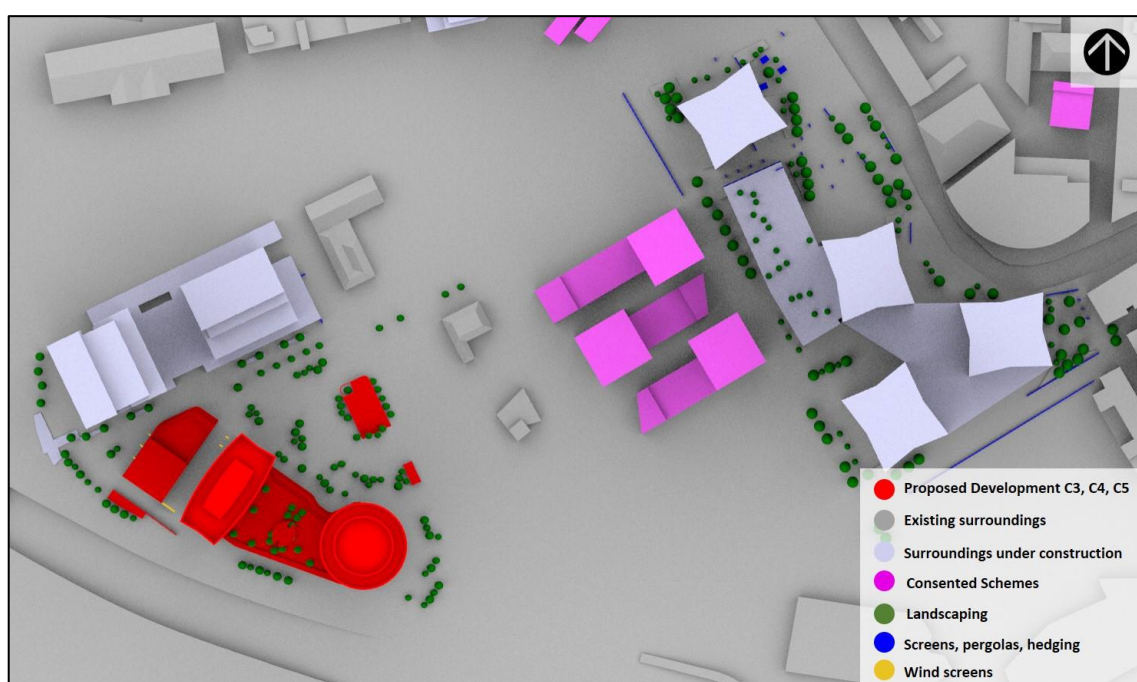
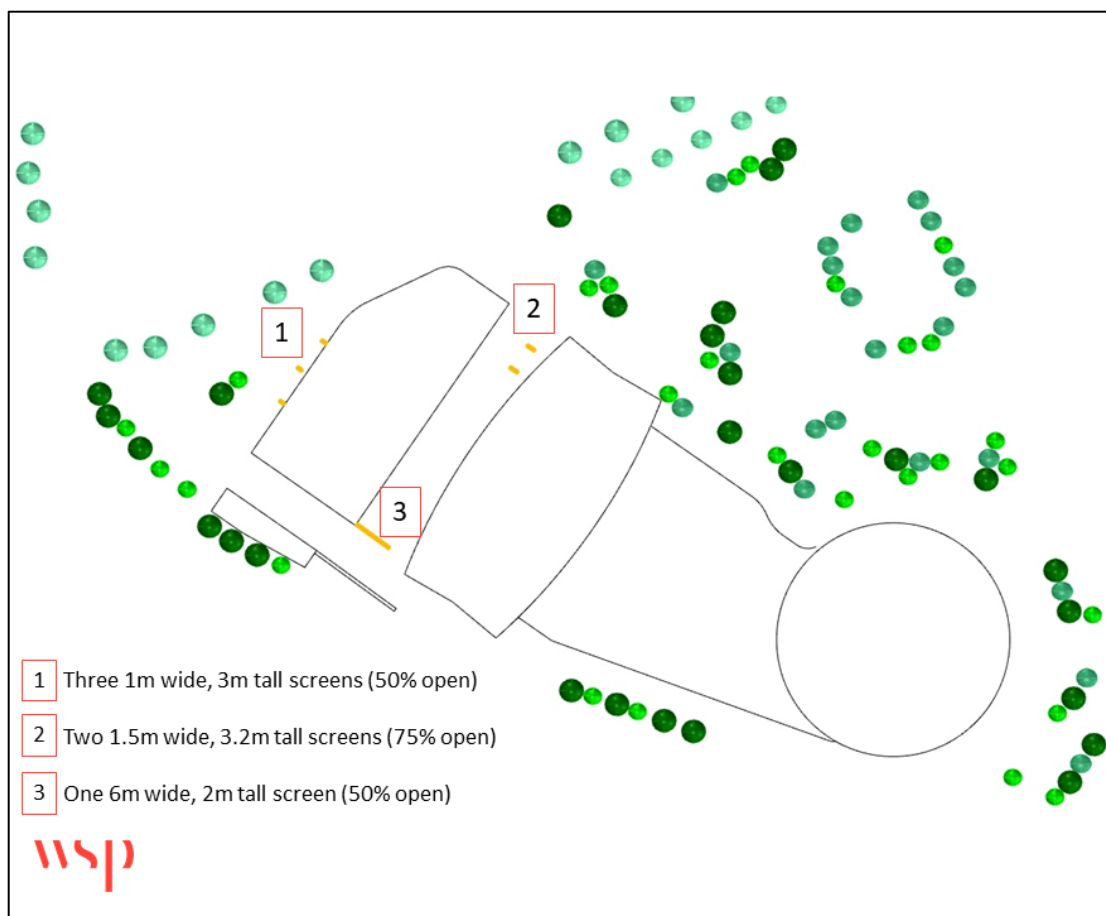


Figure 12.2: Detailed description of the mitigation on the Proposed Development



Assessment Methodology and Significance Criteria

Summary of Consultation

12.26 EIA Screening & Scoping was issued in December 2019 with no response at time of submission. as presented as Appendix 2.1 which constitute the consultation undertaken prior to the assessment. The scope is based on best practice and applied on other comparable schemes. The content of the Scoping Report is described in the next section.

Scope of the Assessment

12.27 The scope of the assessment presented within this Chapter comprise the following content:

Insignificant Effects

12.28 The following insignificant effects were identified as part of the EIA Scoping Report and are not considered further in this Chapter. The effects and evidence to support this are represented and updated as below.

Changes to wind conditions during construction

12.29 The effects on the wind microclimate on Site are a function of the massing of the Project which would progressively vary during the construction phase.

12.30 As construction develops, the potential effects during various stages of construction will vary, although are likely to be of lesser magnitude than those that will be experienced once the Proposed Development has been completed. Any undesirable wind conditions during construction are temporary. Therefore, changes in wind conditions during construction are not considered significant and any effects associated with the emerging Proposed Development will be assessed as part of the operational phase assessment. Therefore, effects during construction have not been quantitatively assessed within the ES.

Likely Significant Effects

12.31 The following effects (Table 12.1) are considered significant and are reported within this Chapter:

Table 12.1 – Likely Significant Effects

Likely Significant Effect	Applicable Phase
Long-terms effects on the relative pedestrian comfort on completion of the Proposed Development	Operation
Long-term effects on pedestrian safety on completion of the Proposed Development	Operation

Extent of the Study Area

- 12.32 The study area comprises the Site and its immediate surroundings within an approximately 500m radius (Figure 12.3). The flow around these buildings and terrain is explicitly modelled within this radius, whilst outside this region obstructions are accounted for using mathematical models which assign a ‘roughness’ depending on the terrain type.
- 12.33 Based on the study area a 3D model was constructed. The existing Site, the Proposed Development as well as the existing developments in the surrounding area of wind influence, have been included in appropriate scenarios, and quantitatively assessed as part of the study.

Figure 12.3 – Study Area



Assessment Methodology

- 12.34 The pedestrian-level wind environment in an urban setting will depend on the general wind conditions, as well as on the effects of the urban environment itself. Therefore, the assessment consists of three main parts: calculation of the urban environment’s aerodynamic effect on the wind; which is then combined with historical wind data; and, finally, compared against criteria to quantify the discomfort and/or level of distress caused by the wind.
- 12.35 The methodology adopted for the study incorporates Computational Fluid Dynamics (CFD) modelling to predict air flows and wind velocities around the Proposed Development.

Assessment Scenarios

12.36 CFD has been used to compute the aerodynamic effect for five scenarios:

- Scenario A - Assessment of the existing site (Baseline) with the existing surrounding context.
- Scenario B – Assessment of the Proposed Blocks C3 and C4 with the existing surrounding context.
- Scenario C – Assessment of the Proposed Blocks C3 and C4 with the existing and consented surrounding context.
- Scenario D – Assessment of the Proposed Blocks C3, C4 and C5 with the existing surrounding context.
- Scenario E – Assessment of the Proposed Blocks C3, C4 and C5 with the existing and consented surrounding context.

12.37 These scenarios have been developed with the planning team and based on our experience, the inclusion of Block C3 (the Proposed School) in each configuration will represent the worst-case scenario from a wind microclimate perspective. The proximity of C3 with the podium of the proposed development is in fact likely to create funnelling conditions which are, by their own nature, windy. A scenario without the presence of the school is likely to create more amenable wind conditions. Therefore, the scheme will be analysed with C3 in Scenarios B, C, D and E.

12.38 As outline planning permission is being sought for Block C3 (the Proposed School), the outline massing of Block C3 is tested at this stage. Further details may be requested at the discretion of the LPA via an appropriate condition.

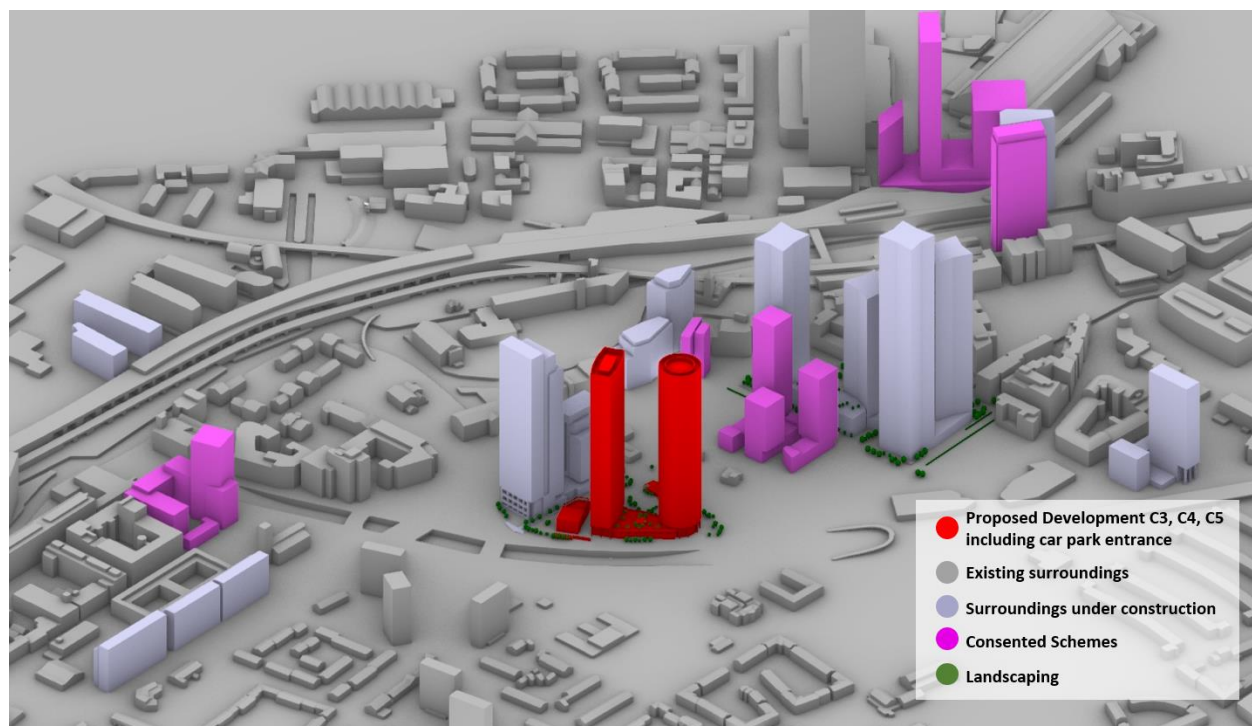
Assessment Modelling

12.39 A three-dimensional CAD model of the site and surrounding buildings (Figure 12.4) has been constructed using the desk-based research of existing models and drawings provided by the design team and supplemented with from the mapping database ArcGIS and available aerial photographic data for the area. All the schemes under construction, at the time of modelling, have been assessed in their completed form within the Baseline conditions.

12.40 The 3D model used for the study includes the built area within a radius of approximately 500 metres (Figure 12.4) from the Site, to account for the influence of the surrounding context on the incoming winds as they reach the Site. The flow around these buildings and terrain is explicitly modelled within this radius, whilst outside this region obstructions are accounted for using mathematical models which assign a 'roughness' depending on the terrain type. Buildings beyond this radius are only represented in the model if their distance from the Site is less than 6 times their height, in line with best practice guidelines.

12.41 The detail of the CAD model increases from approximately 1m for the surrounding buildings to 0.2m around the site, as shown in Figure 12.4.

Figure 12.4 – Screenshot of the CAD model for the Proposed Development.

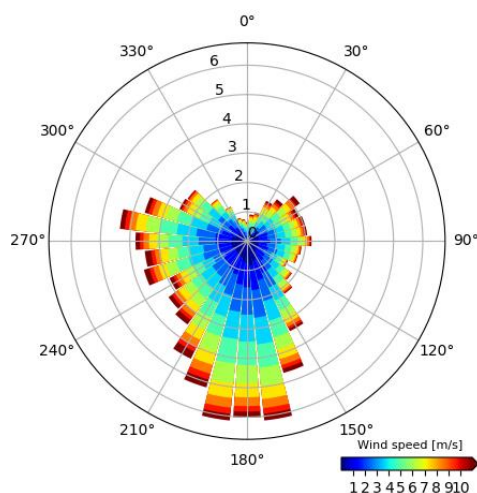


Wind Climate Analysis

12.42 Wind data was collected from the meteorological station at Manchester Airport, which is approximately 12 km from the Site. The data consisted of mean hourly wind speeds and directions over the last 20 years. The data was discretised into 36 bins, representing 10° sectors. The nomenclature adopted in this report assigns 0° to winds coming from North and increases clockwise such that 90° refers to winds blowing from East, 180° from South and 270° from West.

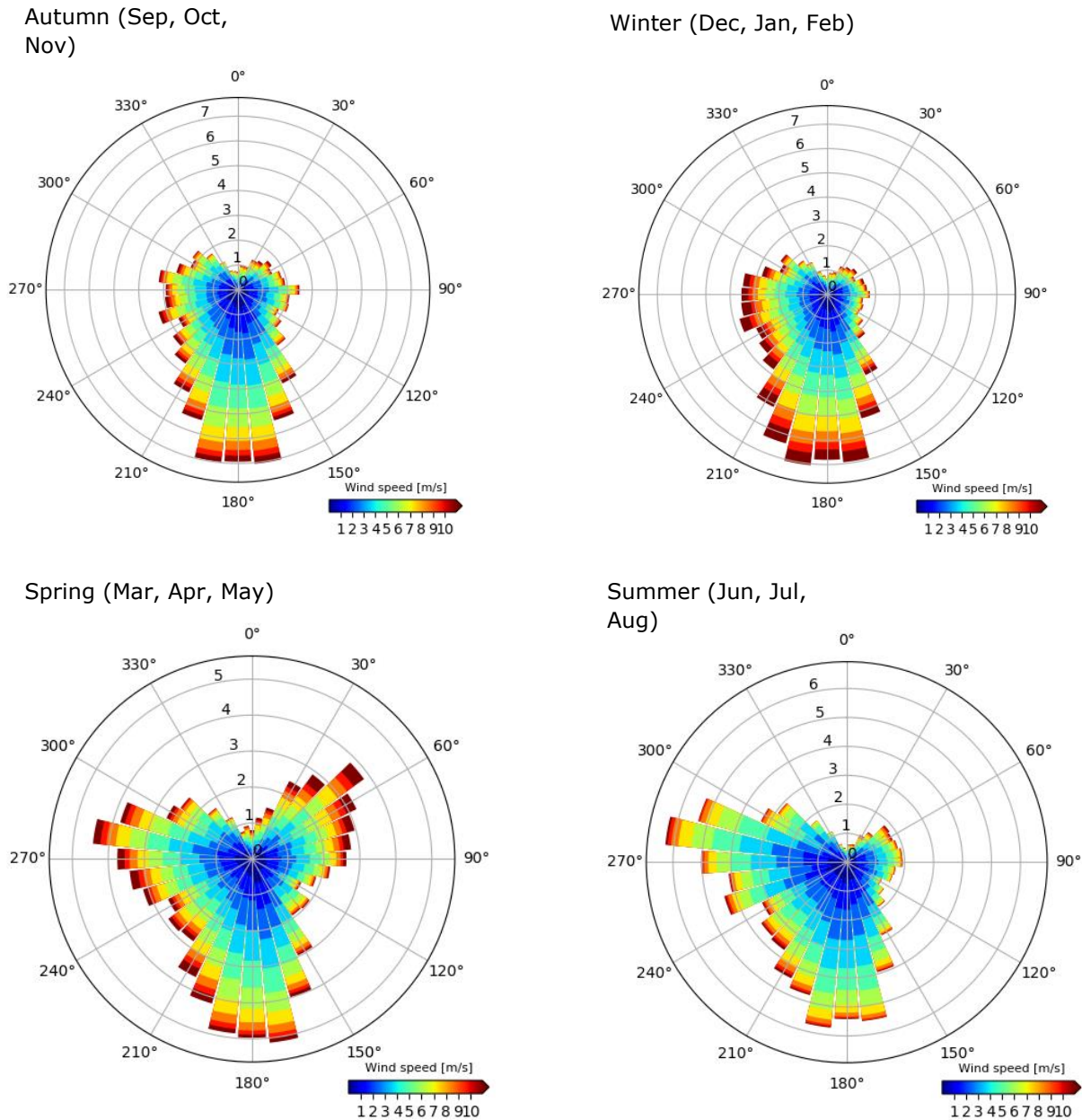
12.43 Figure 12.5 shows a summary of the wind data at the project site for the whole year in the form of a wind rose. Wind direction is shown on the angular axes, with percentage of hours on the radial axes. From this plot, it is possible to observe the prevailing southerly winds with north-easterly and north-westerly winds increasing in Spring time.

Figure 12.5 – Annual wind rose at Manchester open country, showing the frequency and magnitude of mean-hourly wind speeds.



12.44 Figure 12.6 shows similar wind roses split into three-month seasons. It shows that during spring, the north-easterly sector provides additional strong and frequent winds while during summer, westerly winds are frequent.

Figure 12.6 – Annual wind rose at Manchester open country, showing the frequency and magnitude of mean-hourly wind speeds.



12.45 Linear regression methods were used to fit the data to a Weibull probability distribution, i.e.:

$$P(U) = pe^{-\left(\frac{U}{c}\right)^k}$$

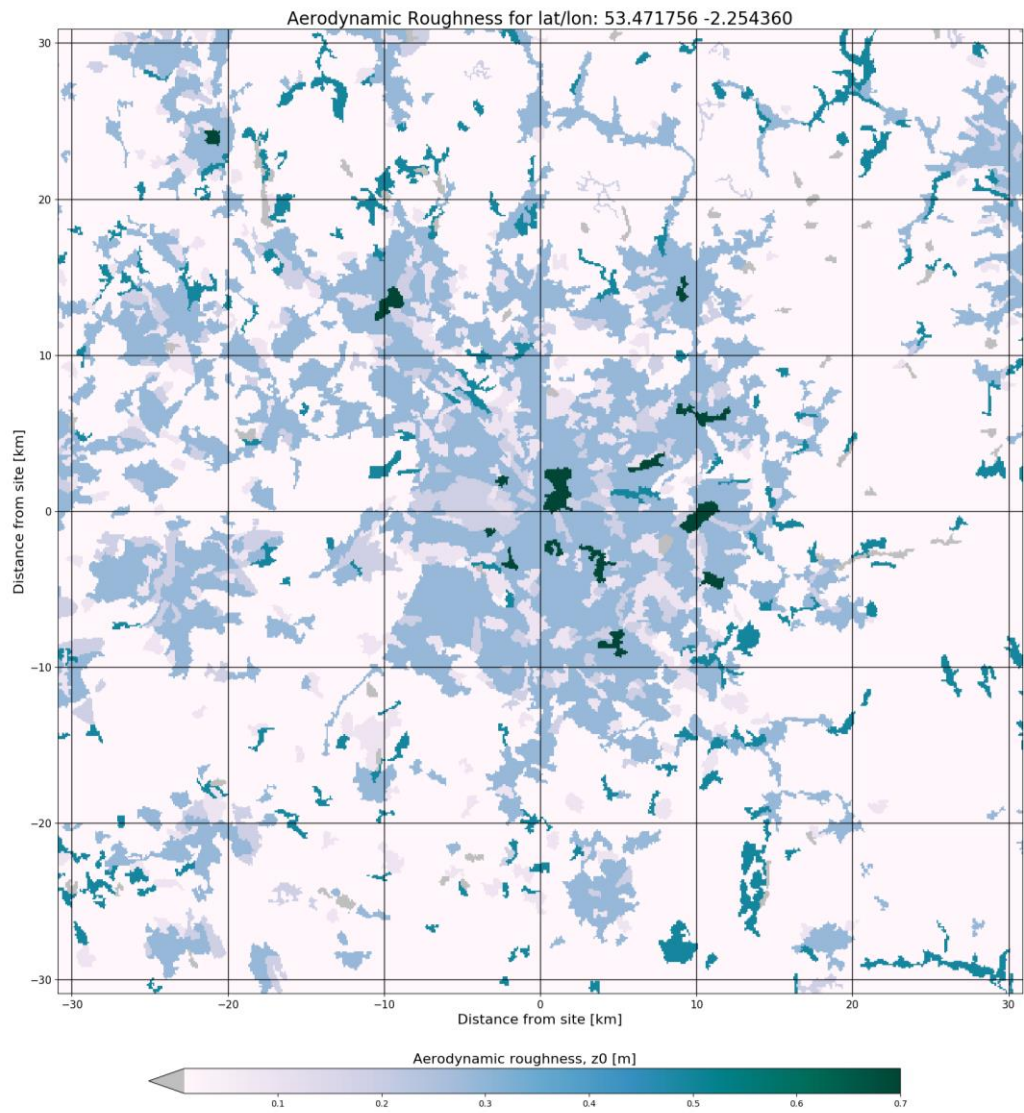
where the p, c and k coefficients are the probability of the wind direction occurring, the dispersion parameter and the shape parameter respectively.

12.46 To account for the differences in terrain surrounding the weather station and the project site, adjustments were made using the wind model proposed by ESDU, an engineering advisory organisation based in the UK (Ref. 7). This method assigns transposition factors to the 'c' term in the Weibull distribution of the data at the meteorological site, based on upwind aerodynamic roughness of the terrain. The weather centre data was initially transposed to open country terrain and subsequently transposed to a reference height of 150m at the site of the proposed development, accounting for upwind terrain and topographical features. This terrain analysis was based on the CORINE Land Cover (CLC) dataset which is shown in Figure 12.7. This resulted in the transposition factors shown in Table 12.2.

Table 12.2 – Transposition factors from 10m open country to 150 m reference height at the Site.

0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
1.362	1.333	1.334	1.345	1.341	1.338	1.355	1.343	1.376	1.381	1.352	1.360

Figure 12.7 – Categorisation of the terrain surrounding the site.



12.47 The aerodynamic effect from all wind directions must be accounted for and, as the weather data has an azimuthal resolution of 10°, 36 simulated directions will provide the best possible resolution. However, this can be computationally expensive and infrequent wind directions will not contribute significantly to the final outcome. Therefore, some adjacent infrequent directions have been grouped together such that each simulated direction has a similar frequency of occurrence. The grouping methodology is such that the frequency of grouped wind directions should generally not exceed that of the most frequent (prevailing) wind directions. Based on the internal studies performed as part of the climate analysis it was established that the Lawson results are the same for 22 directions compared to 36.

12.48 According to the selection criteria from the wind climate analyses described above a total of 22 wind directions were explicitly simulated, as shown in Table 12.3 below.

Table 12.3 – Wind directions simulated

Simulated direction [°]	Bins included [°]	Combined frequency [%]
0	350,0,10	2.3
30	20,30,40	4.3
55	50,60	4.2
75	70,80	4.1
95	90,100	4.1
120	110,120,130	5.2
145	140,150	5.6
160	160	4.7
170	170	6.2
180	180	6
190	190	6.2
200	200	5.2
210	210	4.5
220	220	3.5
235	230,240	6.2
250	250	3.7
260	260	3.5
270	270	3.8
280	280	4.4
290	290	3.6
305	300,310	5
330	320,330,340	3.9

Simulation Details and Assumptions

12.49 A CFD numerical simulation has been performed for each of the directions shown in Table 12.3. Relative wind speeds were sampled at a plane 1.5m from the ground. These values were then combined with the weather data shown in Figure 12.6 and compared against criteria discussed in Tables 12.4 and 12.5

12.50 Each simulation uses numerical methods to solve the governing equations of fluid mechanics around the site of interest. The site of interest in this case is the geometry discussed in Figure 12.4 surrounded by a volume which extends 3km in the horizontal directions and 800m in the vertical direction. The CFD method employed requires this volume to be split into smaller volumes or 'cells'. These cells are nominally hexahedral and reduce in size from approximately 25m in the far field to 0.1m near the building in order to sufficiently resolve the fluid flow. Thin prismatic layers of cells were added to the ground and buildings to resolve the large gradients in the flow near the solid obstructions. In this case, the total number of cells was ~47 million.

12.51 As time-averaged results are of interest, the equations in the model have been time-averaged using Reynolds averaging to produce the Reynolds-Averaged Navier-Stokes (RANS) equations. The realizable version of the $k - \epsilon$ model has been used to describe the statistical effect of turbulence by solving transport equations for the turbulent kinetic energy (k) and turbulent dissipation rate (ϵ).

12.52 The velocity magnitude output from the CFD is a mean velocity defined as

$$\bar{U} = (\bar{u}^2 + \bar{v}^2 + \bar{w}^2)^{\frac{1}{2}}$$

12.53 where the overbar represents a time-averaged quantity and u, v, w are the velocity components in the x, y, z directions, respectively. However, a pedestrian's perception to the wind does not depend on direction; a wind from any direction is equally as uncomfortable. Therefore, the velocity of interest is actually

$$\bar{U} = \overline{(u^2 + v^2 + w^2)^{\frac{1}{2}}}$$

these scalar values are different because $u = \bar{u} + u'$ and $\bar{u'}^2 = 0$ but $\overline{u'^2} \neq 0$, where u' is the fluctuating part of the instantaneous velocity, u . Using the fact that $k = \frac{1}{2}(\overline{u'^2} + \overline{v'^2} + \overline{w'^2})$, the velocity used of interest from the RANS equations is

$$\bar{U}_{scalar} = (\bar{U}^2 + 2k)^{\frac{1}{2}}$$

12.54 A non-slip condition was applied to the ground and buildings. Buildings and ground within the 500m radius had a rough wall function with an assigned roughness of $z_0 = 0.02m$; the far-field (>500m radius) ground and heavily forested areas had a rough wall function with varying roughness heights depending on their terrain classification (ESDU). The outlet had a zero-gradient boundary condition, side and top walls had free slip conditions. A logarithmic velocity profile was applied to the inlet whereby the velocity varies with height through:

$$U(z) = \frac{u_\tau}{\kappa} \ln \left(\frac{z + z_0}{z_0} \right)$$

where

$$u_\tau = \frac{\kappa U_{ref}}{\ln \left(\frac{z_{ref} + z_0}{z_0} \right)}$$

and $\kappa = 0.41$ is the Von Karman constant, z is the height above the ground, $z_{ref} = 150m$, z_0 is the upstream roughness which varies by direction and $U_{ref} = 10m/s$.

12.55 The SIMPLE algorithm as implemented in OpenFOAM (Engys version HELYX Core-3.0.0) was used to iteratively solve the equations. The solution was considered to be converged when the residuals (i.e. the relative change from one iteration to the next) were 10^{-5} for momentum and 10^{-4} for pressure.

The Lawson Criteria

12.56 The Lawson Criteria have been applied to determine the acceptability of wind conditions for pedestrian safety and comfort. The Lawson Criteria stipulates that for the comfort and safety assessment of wind effects, it is not only the velocity of wind that is considered but also the frequency of occurrence of these velocities. The frequency of occurrence is used as an indicator of the likely duration of wind speeds. The criteria provide ranges of acceptability to maintain pedestrian comfort for different activities and relate frequency of occurrence to the hourly average wind speed ranges. The criteria ranges are set out in Table 12.4 below.

Table 12.4 – Lawson's Comfort Assessment Criteria

Comfort Category	Speeds not to be exceeded by more than 5% of the time	Description
Sitting	4 m/s	Light breezes desired for outdoor restaurants and seating areas where one can read a paper or comfortably sit for long periods.
Pedestrian Standing	6 m/s	Gentle breezes suitable for main building entrances, pick-up/drop-off points and bus stops.
Pedestrian Leisure Walking	8 m/s	Moderate breezes that would be appropriate for strolling along a city/town centre street, plaza or park.
Business Walking	10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering.
Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended.

12.57 The Lawson method also identifies a safety criterion to identify those areas where someone could find walking difficult, or even stumble and fall. The Lawson criteria define threshold wind speeds not to be exceeded for more than 0.025% of the year. These are particularly strong winds that could cause people to have difficulties while walking and also stumble or fall. The safety criterion is set out in Table 12.5 below.

Table 12.5 – Lawson's Safety Assessment Criteria

Safety Rating	Threshold Mean-hourly Wind Speed Exceeded Once Per Annum (0.025%)	Potential effects	Development Constraints
S15 - Unsuitable for the general public	>15 m/s	Less able and cyclists find conditions physically difficult.	S15 threshold not to be exceeded in areas accessible to the general public: sitting areas, standing areas, leisure walking areas. Mitigation required
S20 - Unsuitable for able-bodied	>20 m/s	Able-bodied persons find conditions difficult. Physically impossible to remain standing during gusts.	Threshold not to be exceeded in areas with limited public access, e.g. maintenance areas and car parks.

General Target Wind Conditions

12.58 The wind assessment for each of these criteria has been tested taking into account the season and expected activity on the site based on the following general target wind conditions:

- Outdoor amenity and seating areas: Sitting during the summer season
- Building entrances, bus stops, drop off areas: Standing throughout the year;
- Pedestrian circulation routes: Leisure walking during windiest season; and
- Pedestrian thoroughfares (minor pedestrian routes: Business walking during windiest season

12.59 Areas reporting winds within uncomfortable classification are preferably to be avoided because of their association with occasional strong winds.

Reporting of the Environmental Effect and Significance Criteria

12.60 The assessment of likely significant environmental effects as a result of the Proposed Development has taken into account the operational phase.

12.61 The duration of the effect has been assessed as either 'short-term', 'medium-term' or 'long-term'. Short-term is considered to be up to 1 year, medium-term is considered to be between 1 and 10 years and long-term is considered to be greater than 10 years.

12.62 The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Proposed Development. The sensitivity of the affected receptor is assessed on a scale of **very high, high, medium, low or negligible**, and the magnitude of impact is assessed on a scale of **major, moderate, minor, negligible or Neutral**.

12.63 In order to determine the significance of the effect of the Proposed Development on the wind environment, an assessment of the change in magnitude between the baseline and conditions with the Proposed Development is made for each receptor. However, because the pedestrian use of the Site may change between the baseline and proposed scenarios, the assessment should also be based upon the suitability of the pedestrian use according to the Lawson Criteria. Therefore, the methodology for determining the significance of impact follows the sequence below:

- Identify the sensitive receptors around the Site;
- Identify their current use and sensitivity of each receptor;
- Identify the magnitude of change between the baseline conditions and conditions with the Proposed Development;
- Assess each receptor's compliance with Lawson Criteria for their relevant proposed uses;
- Determine the significance of effect for each receptor;
- Propose and assess mitigation measures, if required; and
- Determine the residual effect

Determining Sensitivity of Receptor

12.64 The sensitivity of affected receptors has been considered on a scale of **very high, high, medium, low or negligible**.

12.65 The sensitivity of receptors reflects the fact that different activities will expose pedestrians differently to winds. For instance, during sedentary activities such as sitting pedestrians will be highly sensitive to variations to wind speeds while more transient activities, such as walking, would tolerate stronger winds. In line with these considerations, Table 12.6 illustrates the criteria used to assign levels of sensitivity to receptors.

Table 12.6 – Defining Sensitivity of Receptors

Sensitivity	Definition
Very High	Areas intended for long-term sitting (e.g. benches, restaurant and bar external seating areas)
High	Areas intended for standing (e.g. building entrances, bus stops, courtyards)
Medium	Areas intended for walking (e.g. pavements, walkways and pedestrian circulation routes)
Low	Areas intended for business walking (e.g. streets with no entrances or leading to back-of-house, thoroughfares, maintenance entrances only)
Negligible	Areas intended for car parks, high speed roads and railways

Determining the Magnitude of Impact for Existing Receptors

12.66 Tables 12.7 and 12.8 present the influence of each parameter in categorising the magnitude levels of potential impacts. The aim has been to take both the compliance and magnitude of impact parameters into account, while also keeping a balance between the frequency of extreme/infrequent wind conditions. The magnitude of impact has been categorised as **major, moderate, minor, negligible or Neutral** using professional judgement based on the change in velocity observed from the 'Baseline Scenario'.

Table 12.7 – Matrix for Determining the Existing Receptors Magnitude of Impact for Pedestrian Comfort

Change in Lawson Comfort Criteria Category	Suitable for Intended Use	Unsuitable for Intended Use
Wind Conditions increase/decrease by 3 categories	Minor /Moderate	Major
Wind Conditions increase/decrease by 2 categories	Minor	Moderate/Major
Wind Conditions increase/decrease by 1 category	Negligible	Minor/Moderate
Wind Conditions remain within the same comfort category	Neutral	Neutral

Table 12.8 – Matrix for Determining the Existing Receptors Magnitude of Impact for Pedestrian Safety

Change in Lawson Safety Criteria Category	Suitable for all pedestrians	Unsuitable for general public (S15)	Unsuitable for all pedestrians (S20)
Wind conditions remain within same safety category	Neutral	Minor	Minor
Wind conditions increase/decrease to a new safety category	Negligible	Major	Major

Determining the Magnitude of Impact for New Receptors within the Site

12.67 The wind microclimate conditions of the new receptors created as part of the Proposed Development have been assessed on the basis of their level of adherence to the Lawson Criteria only. This is because the magnitude of change from a baseline position does not apply, as it does to an existing receptor, since there is no baseline. The criteria for determining the impact of the proposed Development on the new receptors both for pedestrian safety and comfort within the site are listed in Tables 12.9 and 12.10.

Table 12.9 – Matrix for Determining the New Receptors Magnitude of Impact for Pedestrian Comfort

Lawson Comfort Criteria Category	Suitable for Intended Use	Unsuitable for Intended Use
Wind conditions are 3 categories windier/calmer than desired	Minor /Moderate	Major
Wind conditions are 2 categories windier/calmer than desired	Minor	Moderate/Major
Wind conditions are 1 category windier/calmer than desired	Negligible	Minor/Moderate
Wind conditions within desired category	Neutral	Neutral

Table 12.10 – Matrix for Determining the New Receptors Magnitude of Impact for Pedestrian Safety

Lawson Safety Criteria Category	Suitable for all pedestrians	Unsuitable for general public (S15)	Unsuitable for all pedestrians (S20)
Wind conditions at new receptor	Neutral	Major	Major

Determining the Impact Significance

12.68 The impact significance attributed to each effect has been assessed based on the magnitude of impact due to the Proposed Development and then sensitivity of the affected receptor. The significance of impact has been categorised as **major, moderate, minor, negligible** or **neutral**. The impact significance of effect has been based on of professional judgement and Table 12.11 has been a tool which has assisted with this process.

12.69 The impact significance of effects reflects the sensitivity of the affected receptor(s) and the nature and magnitude of the predicted impacts as detailed in Table 12.9 and Table 12.10. For instance, a moderate impact magnitude on an area of minor sensitivity will be of lesser significance than the same impact magnitude on a feature or site of high sensitivity.

Table 12.11 – Matrix for Determining the Impact Significance

Magnitude of Impact	Sensitivity of Receptors				
	Very High	High	Medium	Low	Negligible
Major	Major	Major	Moderate	Moderate	Minor
Moderate	Major/Moderate	Moderate	Moderate	Moderate / Minor	Minor/Negligible
Minor	Moderate	Moderate / Minor	Moderate / Minor	Minor	Negligible/Neutral
Negligible	Moderate / Minor	Minor	Minor/Negligible	Negligible/Neutral	Neutral
Neutral	Negligible / Neutral	Neutral	Neutral	Neutral	Neutral

12.70 Whilst Table 12.11 provides ranges, the significance of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'.

12.71 The following terms have been used to define the significance of the impact identified as either 'beneficial' or 'adverse'. The 'moderate' and 'major' effects are considered to be Significant.

Table 12.12 –Methodology for Determining Impact Magnitude

Significance of Impact	Criteria for assessing impact
Major (Significant)	Total loss or major/substantial alteration to key elements/features of the baseline conditions such that the character/composition/attributes will be fundamentally changed.
Moderate (Significant)	Loss or alteration to one or more key elements/features of the baseline conditions such that character/composition/attributes of the baseline will be materially changed.
Minor (Insignificant)	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-demolition circumstances/situation.
Negligible (Insignificant)	Very little change from baseline conditions.
Neutral (Insignificant)	Neutral.

Sensitive Receptors

12.72 The following sensitive receptors have been identified and assessed within the ES:

- All pedestrian circulation routes, building entrances, leisure open areas within the Proposed Development Site and in neighbouring adjacent areas
- Roof terraces where occupants are expected to use as outdoor spaces are also considered sensitive receptors, as presented in Figure 12.9.

Figure 12.8: Sensitive Receptors – Ground Level

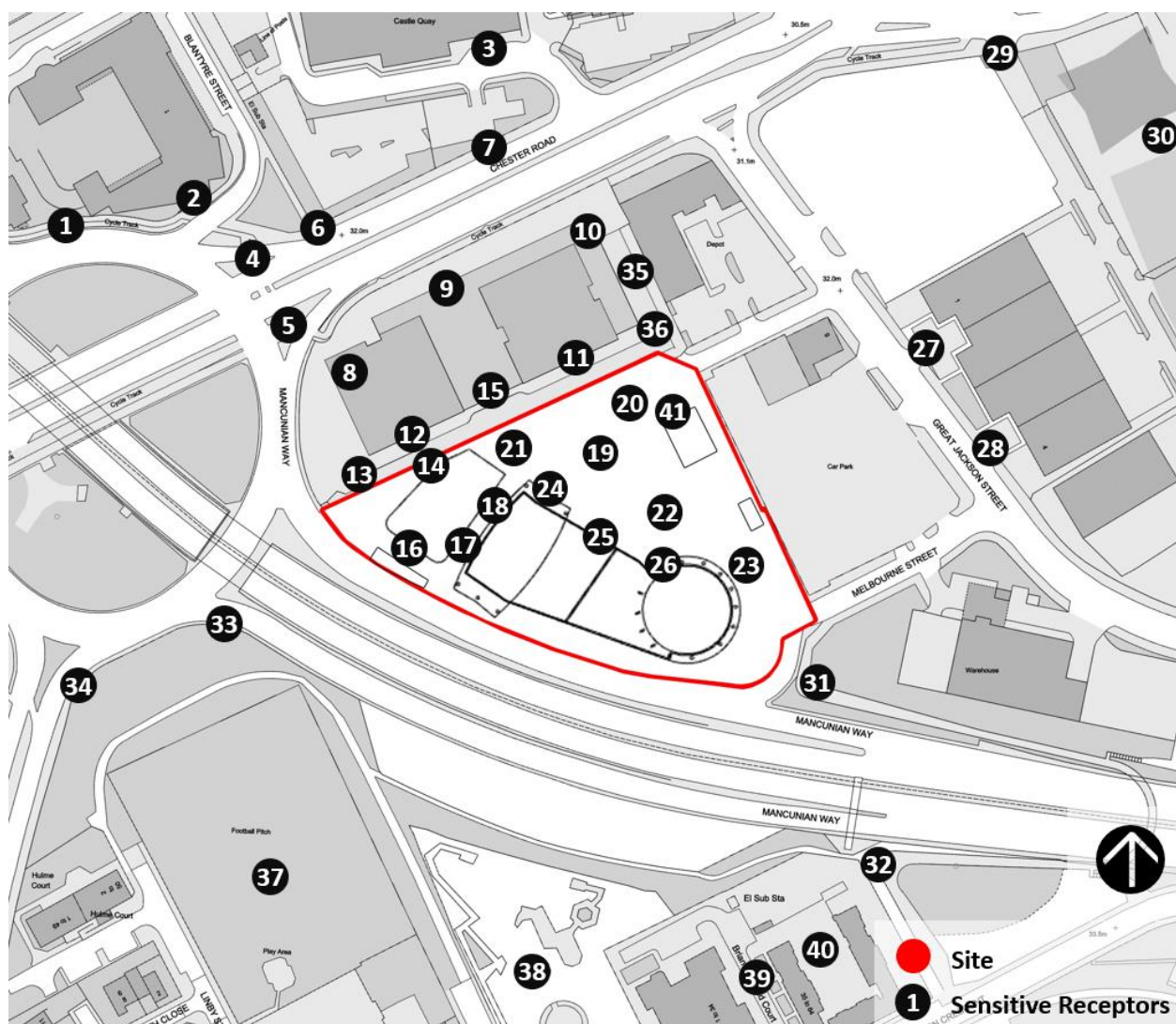


Table 12.14: Sensitive Receptors – Ground Levels

Receptor Number	Description	Use	Sensitivity	Receptor Location Type	Target Conditions
1	Chester Road Roundabout North	Thoroughfare	Low	Existing	Business walking during windiest season
2	City Gate, 1 Blantyre Street	Residential Entrance	High	Existing	Standing during windiest season
3	Castle Quay	Residential Entrance	High	Existing	Standing during windiest season
4-5	Chester Road Roundabout North-east	Pedestrian Cycling Crossing / Thoroughfare	Low	Existing	Business walking during windiest season
6-7	Chester Road	Thoroughfare	Low	Existing	Business walking during windiest season
8	Elizabeth Tower	Commercial Entrance	High	Existing	Standing during windiest season

Receptor Number	Description	Use	Sensitivity	Receptor Location Type	Target Conditions
9	Elizabeth Tower	Residential Entrance	High	Existing	Standing during windiest season
10	Elizabeth Tower	Walkway	Medium	Existing	Leisure walking during windiest season
11-12	Elizabeth Tower Townhouses	Residential Entrance	High	Existing	Standing during windiest season
13-14	Elizabeth Tower South-west	Walkway	Medium	Existing	Leisure walking during windiest season
15	Elizabeth Tower	Residential Entrance	High	Existing	Standing during windiest season
16	Proposed Development, School	Potential School Entrance	High	Proposed Development	Standing during windiest season
17-19	Proposed Public Park Pedestrian Routes	Potential Walkways	Medium	Proposed Development	Leisure walking during windiest season
20-23	Proposed Public Park Sitting Areas	Potential Amenity Area	Very High	Proposed Development	Sitting during warmer season
24	Proposed Development, Block C4 Amenity Area	Amenity Area	Very High	Proposed Development	Sitting during warmer season
25-26	Proposed Development, Block C4	Commercial Entrance	High	Proposed Development	Standing during windiest season
27	We Wrap Kitchens Entrance	Industrial Entrance	High	Existing	Standing during windiest season
28	Great Jackson Street	Walkway	High	Existing	Standing during windiest season
29	Owen Street and Deansgate	Thoroughfare	Low	Existing	Business walking during windiest season
30	Owen Street to Deansgate Square	Walkway	Medium	Existing	Leisure walking during windiest season
31	Melbourne Street	Thoroughfare	Low	Existing	Business walking during windiest season
32	Gadum Building	Commercial Entrance	High	Existing	Standing during windiest season
33-34	Chester Road Roundabout South	Thoroughfare	Low	Existing	Business walking during windiest season
35-36	Elizabeth Tower North-east	Cycling Path/Thoroughfare	Low	Existing	Business walking during windiest season
37	Former Football Pitch	Potential Amenity Area	Very High	Proposed Development	Sitting during warmer season
38	Former Playground	Potential Amenity Area	Very High	Proposed Development	Sitting during warmer season
39-40	Brian Redhead Court	Residential Entrance	High	Existing	Standing during windiest season
41	Car Park Entrance	Entrance	High	Proposed Development	Standing during windiest season

Figure 12.9: Sensitive Receptors – Terrace Levels

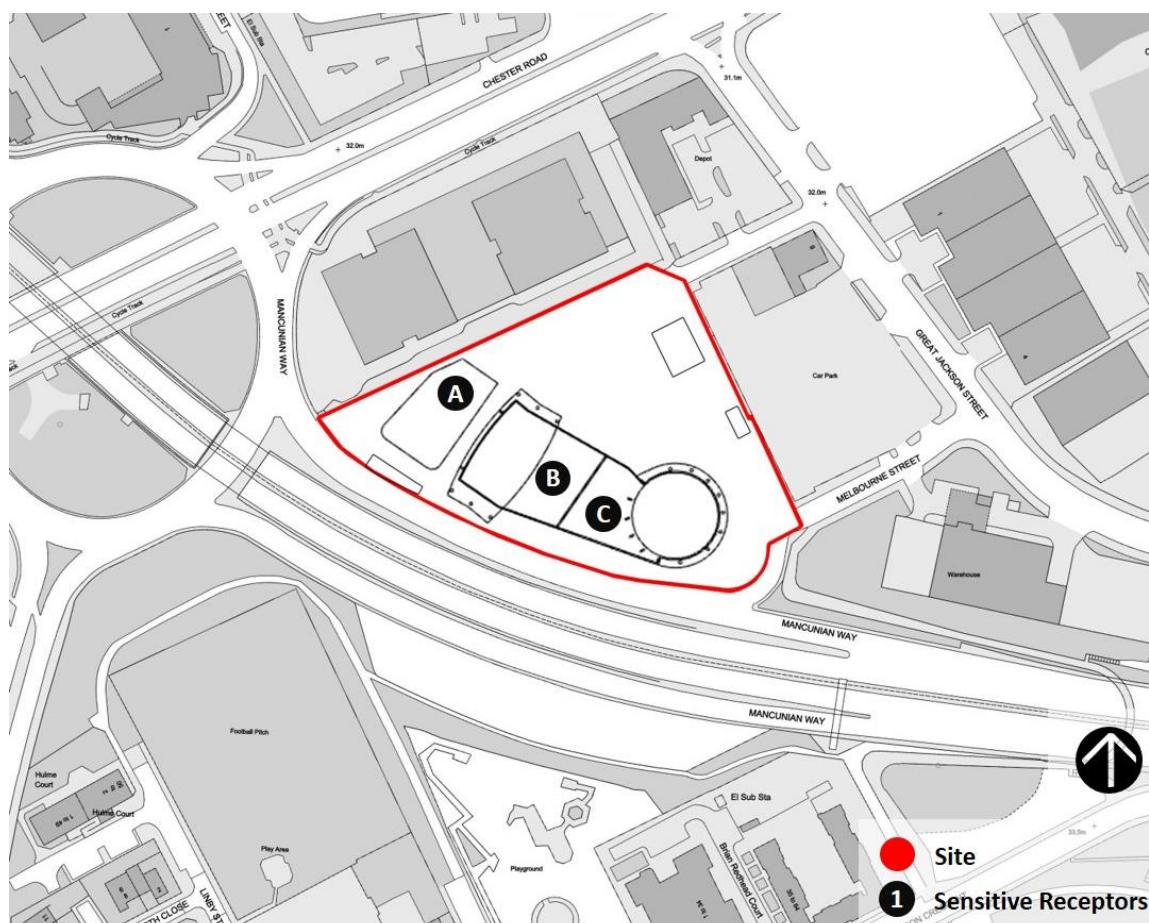


Table 12.15: Sensitive Receptors – Terrace Levels

Receptor Number	Description	Use	Sensitivity	Receptor Location Type	Target Conditions
A	Proposed Development, School	Accessible Terrace at roof level	Very High	Proposed Development	Sitting during warmest season
B	Proposed Development, Block C4 Podium West	Accessible Terrace at podium level	Very High	Proposed Development	Sitting during warmest season
C	Proposed Development, Block C5 Podium East	Accessible Terrace at podium level	Very High	Proposed Development	Sitting during warmest season

Limitations and Assumptions

12.73 To ensure transparency within the EIA process, the following limitations and assumptions have been identified:

- The models and calculations for the wind assessment have been based on the drawings and models of proposed and existing properties provided by the project design team and supplemented with the available satellite images of the existing surroundings.
- The Lawson Criteria for pedestrian comfort focuses on the effect of wind force on people's activities but do not factor in other environmental variables such as air temperature, solar radiation and relative humidity which also affect people's perception of comfort. Overlaying all these climatic factors would be a complex process and Lawson's criteria presents the best available methodology for anticipating wind effects in the built environment.

- The wind study focused on pedestrian level wind environment only and excluded the effect of / considerations on façade wind pressures; wind pressures on doors in the context of their operation; stack effect and internal airflow movement inside the buildings; and the impact of urban flows on vehicles or waterways.

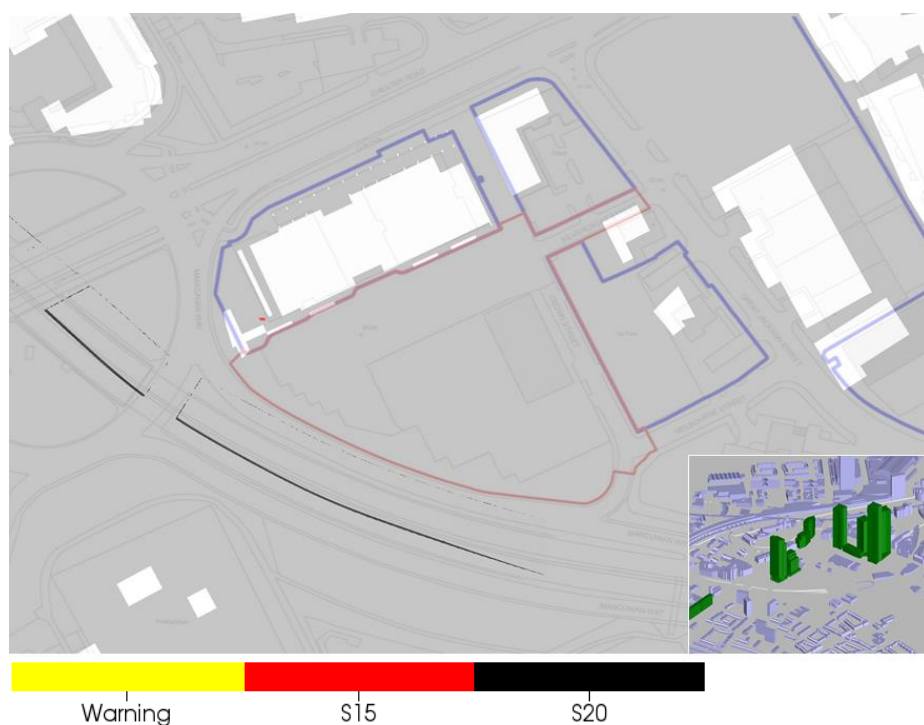
Baseline Conditions

12.74 A 'Baseline Conditions' has been modelled to represent the conditions around the Site prior to the introduction of the Proposed Development. The results of the wind environment assessment of the 'Baseline Conditions' are presented in full in the form of CFD plots in Appendices 12.2.

Pedestrian Safety

12.75 The Results of the Baseline safety assessment (Figure 12.10) indicate that the wind environment of the Site and its surroundings is largely within the recommended criteria for safety, with the exception of a small area around the Elizabeth Tower (Receptor 13). It is understood that measures will be put in place to ensure that pedestrian access to this area is denied during high winds.

Figure 12.10: Pedestrian Safety – Baseline Conditions



Pedestrian Comfort

12.76 The results of the Baseline comfort assessment (Figure 12.11 and 12.12) indicate relatively moderate wind conditions in the Baseline, which vary from season to season. The existing wind environment within the Site is largely suitable for standing throughout the year, while during Summer almost half of the north-east part of the Site is suitable for sitting. However, in the north and east corner of the Site there are areas of increased windiness during Winter that are suitable for leisure walking only.

12.77 The comfort conditions around the Site are mostly suitable for standing and sitting, with larger areas of leisure walking comfort conditions appearing during winter between the Elizabeth Tower and Chester Road Roundabout (Receptors 4-6); at the north part of Chester Road Roundabout (Receptor 1) and Blantyre Street; to the east of the Bridgewater Canal Offices; and to the north-west and south-east of Deansgate Square development (Receptor 29, 30).

12.78 The results indicate that the windiest Winter comfort conditions around the Site, suitable for business walking, occur locally to the east (Receptors 35,36) of Victoria Tower. Nevertheless, as these areas are used as thoroughfares the wind environment remains suitable for the existing uses.

12.79 The results indicate that the majority of receptors are suitable for the existing uses, except for the Commercial Entrance at Elizabeth Tower (Receptor 8) where the wind comfort conditions are one category windier than recommended.

Figure 12.11: Pedestrian Comfort Winter – Baseline Conditions

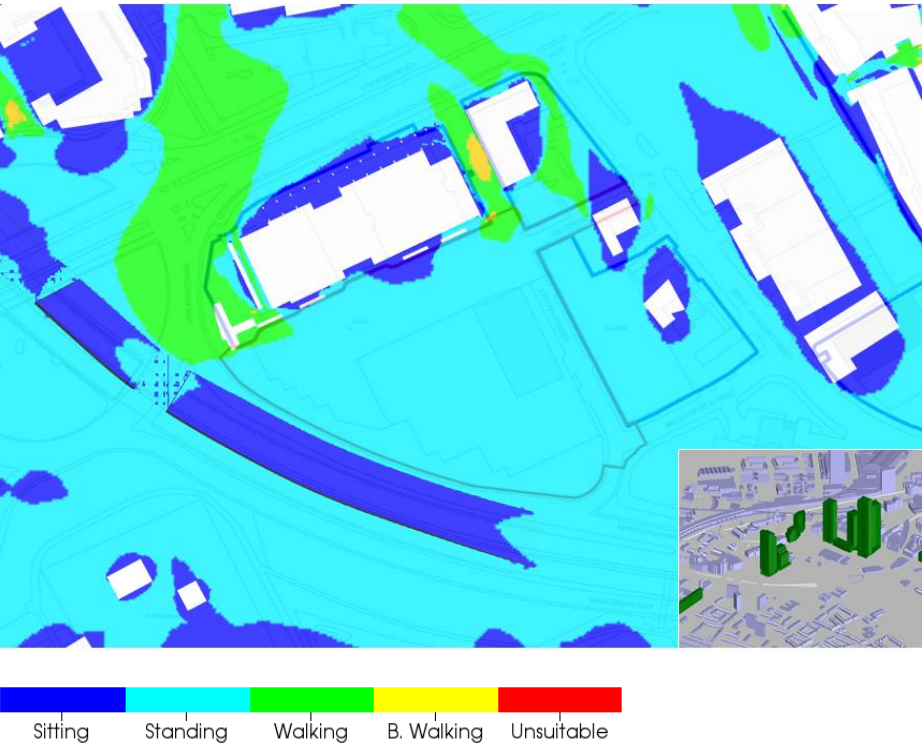
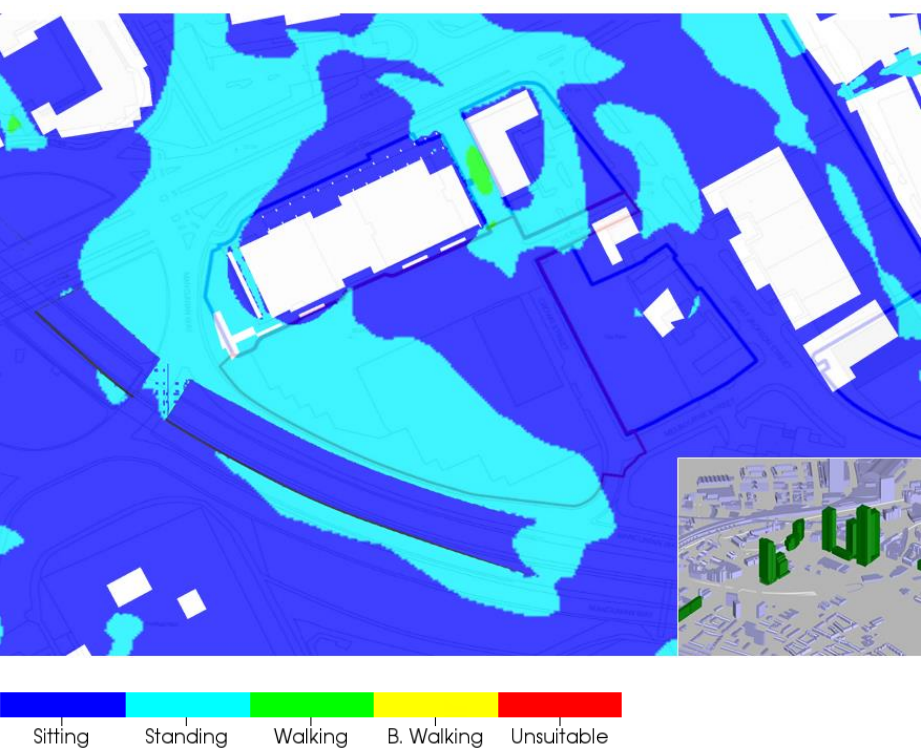


Figure 12.12: Pedestrian Comfort Summer – Baseline Conditions



Identification and Evaluation of Significant Effects – Scenario B

12.80 The results of the wind environment assessment of the Proposed Development Scenario B (Proposed Blocks C3 and C4 within the existing surroundings), including the developed and inherited mitigation measures as described in Relevant Elements of the Proposed Development section, are presented in full in the form of CFD contours plots in Appendix 12.2.

Pedestrian Safety at Pedestrian Level within the Site and at the surrounding areas (Scenario B)

12.81 The results (Figure 12.13) indicate that, following construction of the Blocks C3 & C4, the wind environment of the Site and its surroundings is considered to be within the safety criteria.

12.82 The sensitivity of thoroughfares, walkways, entrances and amenity spaces (as identified in the Section above) is considered to be low, medium, high and very high respectively. The magnitude of impact is considered to be of Neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be Neutral.

Pedestrian Safety at Terrace Levels Accessible to Residents within the Site (Scenario B)

12.83 The results (Figure 12.14) indicate that the wind environment does not exceed the threshold of 15m/s for more than 0.025% hours per year and therefore, it is within the recommended criteria for safety.

12.84 The sensitivity of amenity spaces (as identified in the Section above) is considered to be very high. The magnitude of impact is considered to be Neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be Neutral.

Figure 12.13: Pedestrian Safety – Scenario B – Pedestrian Level

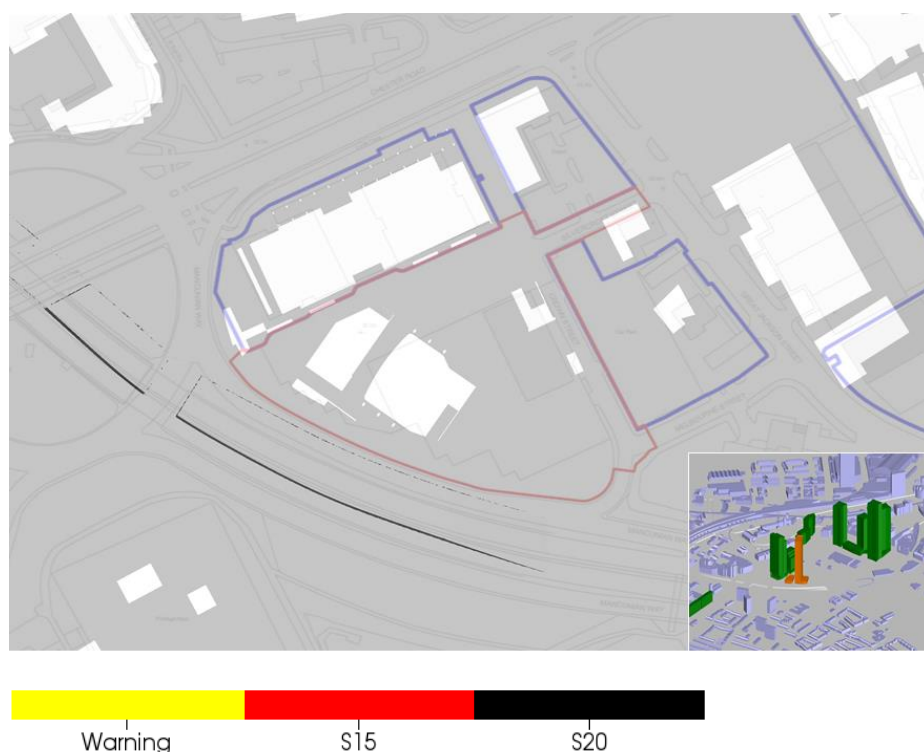
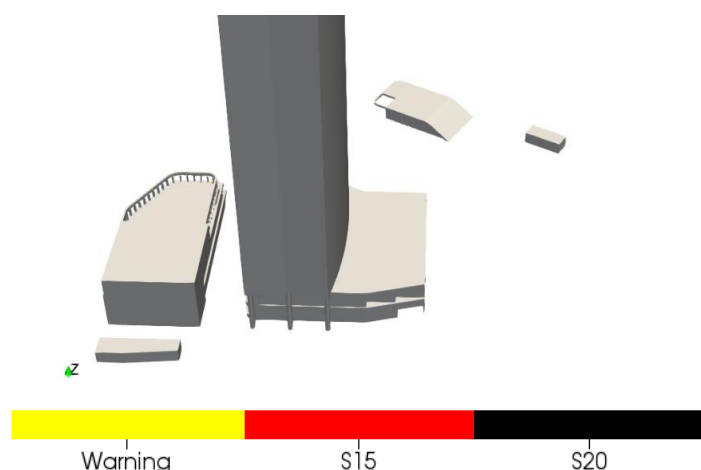


Figure 12.14: Pedestrian Safety – Scenario B – Terrace Level



Pedestrian Comfort at Thoroughfares within the Site and at the surrounding areas (Scenario B)

12.85 Figure 12.15 shows the Winter comfort criteria at Pedestrian Level, within the Site and at the surrounding areas, following the construction of Blocks C3 and C4 of the Proposed Development.

12.86 The results indicate that the wind environment at all thoroughfares within the Proposed Site and in the surrounding area is suitable, at worst, for business walking and therefore suitable for the existing and intended uses.

12.87 The sensitivity of thoroughfares (as identified Table 12.6) is considered to be low. The magnitude of impact is considered to be Neutral or negligible. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be neutral.

Pedestrian Comfort at Walkways within the Site and at the surrounding areas (Scenario B)

12.88 Figure 12.15 shows the Winter comfort criteria at Pedestrian Level, within the Site and at the surrounding areas, following the construction of Blocks C3 and C4 of the Proposed Development.

12.89 The results indicate that the wind environment at all walkways within the Proposed Site and in the surrounding area is suitable, at worst, for leisure walking and therefore suitable for the existing and intended uses.

12.90 The sensitivity of walkways (as identified Table 12.6) is considered to be medium. The magnitude of impact is considered to be Neutral or negligible. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

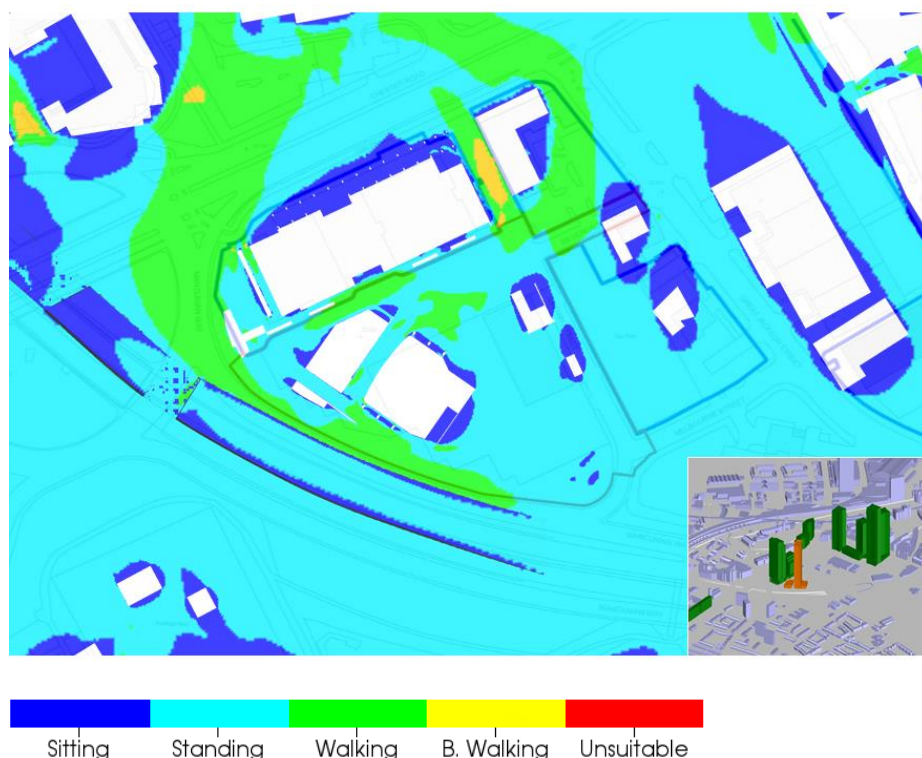
Pedestrian Comfort at Entrances within the Site and at the surrounding areas (Scenario B)

12.91 Figure 12.15 shows the Winter comfort criteria at Pedestrian Level, within the Site and at the surrounding areas, following the construction of Blocks C3 and C4 of the Proposed Development.

12.92 The results indicate that the wind environment at building entrances within the Site (Receptors 25, 26, 16, 41) and in the surrounding area (Receptors 2, 3, 11, 12, 32, 39 and 40) is suitable for sitting or standing and therefore, suitable for the intended use, except for the commercial entrance of Elizabeth Tower (Receptor 8). Nevertheless, as this exceedance is present in Baseline, prior to introduction of the Proposed Development, no mitigation is required.

12.93 The sensitivity of entrances (as identified Table 12.6) is considered to be high. The magnitude of impact is considered to be of Neutral. Therefore, there is likely to be a direct, permanent, long-term, effect which is considered to be neutral.

Figure 12.15: Pedestrian Comfort Proposed Development Scenario B – Pedestrian Level - Winter



Pedestrian Comfort at Pedestrian Level Amenity Areas within the Site (Scenario B)

12.94 Figure 12.16 shows the Summer comfort criteria at Pedestrian Level, within the Site and at the surrounding areas, following the construction of Blocks C3 and C4 of the Proposed Development.

12.95 The results indicate that, following the construction of Blocks C3 and C4, the wind environment at all potential amenity spaces within the Site is suitable for sitting and standing during Summer. Therefore, provided that the potential sitting areas are allocated within the zones identified as suitable for sitting, the wind environment is considered suitable for the intended use.

12.96 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of change is considered to be Neutral. Therefore, there is likely to be a direct, permanent, long-term, effect which is considered to be neutral.

Summer Comfort at the School's Terrace Level (Receptor A) (Scenario B)

12.97 Figure 12.17 shows the Summer comfort criteria at Terrace Levels accessible to residents within Blocks C3 and C4 of the Proposed Development

12.98 The results indicate that the wind environment at the School's Terrace Level (Receptor A) is mostly suitable for sitting while the north-west part is suitable for standing. Therefore, given that the potential sitting areas are allocated within the zones identified as suitable for sitting, the wind environment is considered suitable for the intended use.

12.99 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of change is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Summer Comfort at the Block C4 Podium (Receptor B) (Scenario B)

12.100 Figure 12.17 shows the Summer comfort criteria at Terrace Levels accessible to residents within Blocks C3 and C4 of the Proposed Development.

- 12.101 The results indicate that the wind environment at the Block C4 Podium (Receptor B) is suitable for standing, while the north-east part is also suitable for sitting. Therefore, given that the potential sitting areas are allocated within the zones identified as suitable for sitting, the wind environment is considered suitable for the intended use.
- 12.102 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of change is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Figure 12.16: Pedestrian Comfort Proposed Development Scenario B – Pedestrian Level – Summer

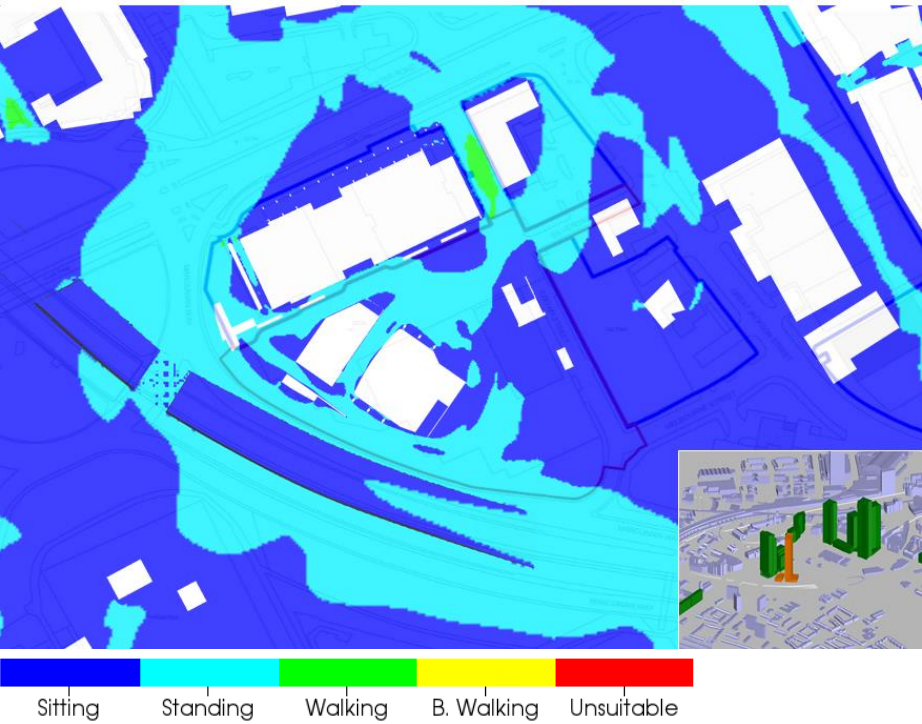
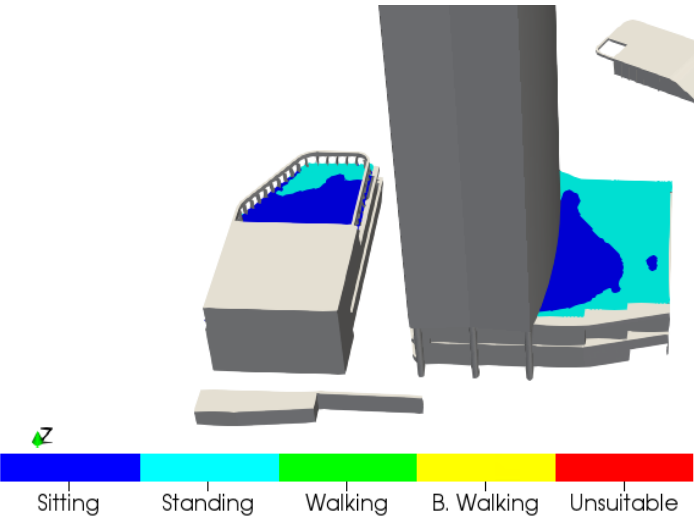


Figure 12.17: Pedestrian Comfort Proposed Development Scenario B –Terrace Level – Summer



Identification and Evaluation of Significant Effects – Scenario D

12.103 The results of the wind environment assessment of the Proposed Scenario D (Proposed Blocks C3, C4 and C5 within the existing surrounding context), including the developed and inherited mitigation measures as described in Relevant Elements of the Proposed Development section, are presented in full in the form of CFD contours plots in Appendix 12.2.

12.104 The results indicate that the construction of Block C5 providing additional shelter from prevailing southerly winds results in generally calmer wind environment, especially to the north-east of the Proposed Site, in comparison to scenario B, decreasing the previously identified areas of wind acceleration.

Pedestrian Safety at Pedestrian Level within the Site and at the surrounding areas (Scenario D)

12.105 The Results indicate that, following construction of the Block C5, the wind environment of the Site and its surroundings, at both Pedestrian (Figure 12.18) and Terrace (Figure 12.19) Levels, is considered to be safe for all users.

12.106 The sensitivity of thoroughfares, walkways, entrances and amenity spaces (as identified in the Section above) is considered to be low, medium, high and very high respectively. The magnitude of impact is considered to be of neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be neutral.

Figure 12.18: Pedestrian Safety – Scenario B – Pedestrian Level

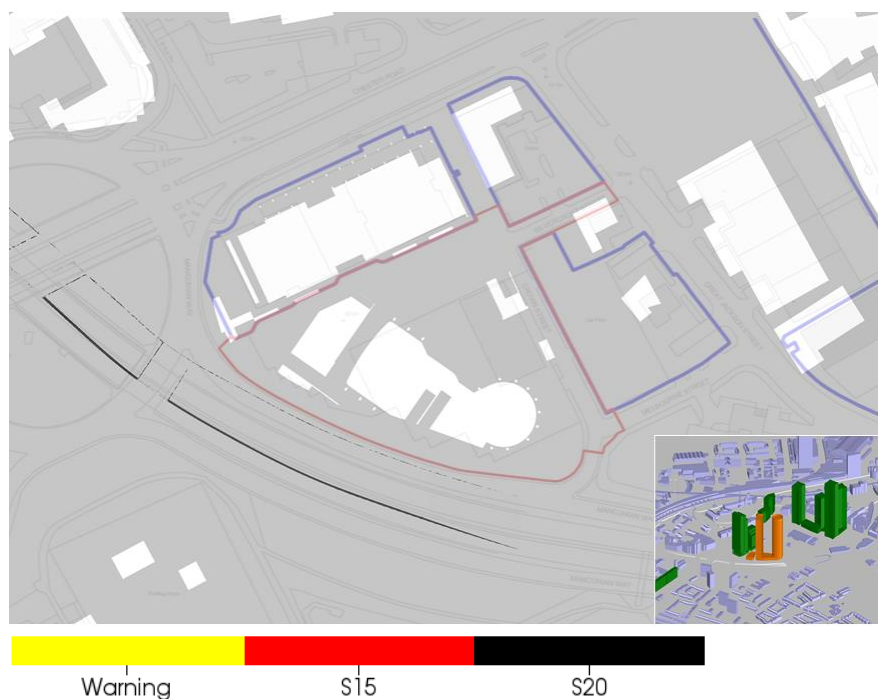
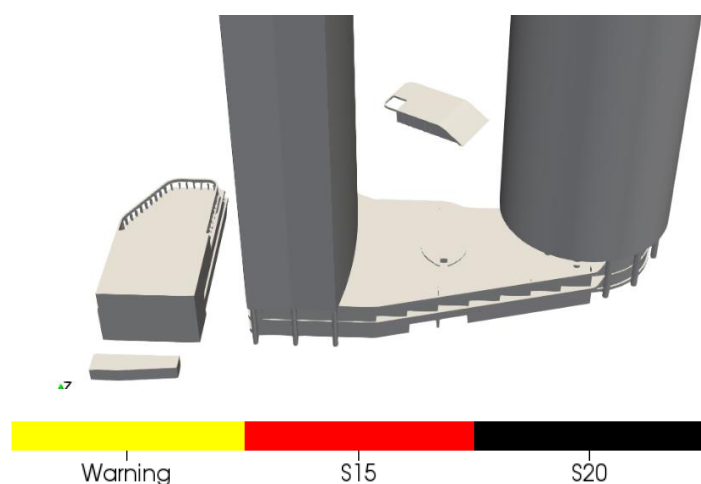


Figure 12.19: Pedestrian Safety – Scenario B – Terrace Level



Pedestrian Comfort at Thoroughfares within the Site and at the surrounding areas (Scenario D)

12.107 Figure 12.20 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Winter, following the construction of Block C5 of the Proposed Development.

12.108 The previously identified areas of wind acceleration at the thoroughfares decrease in size at the north-east of Elizabeth Tower (Receptors 35 and 36), at the east part of Bridgewater Canal Offices and where Mancunian Way abuts the Site but increase in size at Blantyre Street (north of Receptors 6). Nevertheless, the comfort conditions remain suitable for the intended use.

12.109 The results indicate that, following the construction of Block C5, the wind environment at all thoroughfares within the Site and its surroundings is suitable, at worst, for business walking during winter, and therefore suitable for the existing and intended uses.

12.110 The sensitivity of thoroughfares (as identified Table 12.6) is considered to be low. The magnitude of impact is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be neutral.

Pedestrian Comfort at Walkways within the Site and at the surrounding areas (Scenario D)

12.111 Figure 12.20 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Winter, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.112 The results indicate that, following the construction of Block C5, the wind environment at all walkways within the Site and its surroundings remain unchanged from Scenario B and thus suitable, at worst, for leisure walking during winter, and therefore suitable for the existing and intended uses.

12.113 The sensitivity of walkways (as identified Table 12.6) is considered to be medium. The magnitude of impact is considered to be Neutral or negligible. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Pedestrian Comfort at Entrances within the Site and at the surrounding areas (Scenario D)

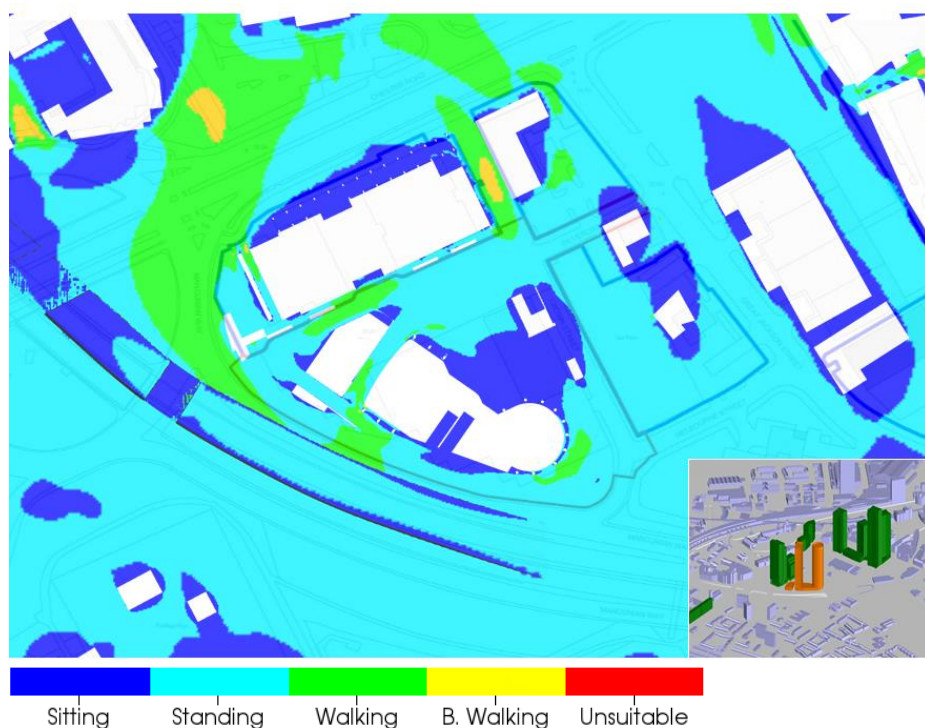
12.114 Figure 12.20 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Winter, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.115 The previously identified wind exceedance at the Elizabeth Tower Entrance (Receptor 8) remains unchanged from the Baseline Conditions with comfort conditions unsuitable for the existing use. Nevertheless, as this exceedance is present in Baseline, prior to introduction of the Proposed Development, no mitigation is suggested.

12.116 The results indicate that, following the construction of Block C5, the wind environment at all other entrances within the Site and its surroundings remain unchanged (near Receptors 2, 3, 11, 12, 32 and 41) or improve (near Receptors 16, 25, 26) and therefore suitable for the existing and intended uses.

12.117 The sensitivity of entrances (as identified Table 12.6) is considered to be high. The magnitude of impact is considered to be negligible or neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Figure 12.20: Pedestrian Comfort Scenario D - Winter – Pedestrian level



Pedestrian Comfort at Pedestrian Level Amenity Areas within the Site (Scenario D)

12.118 Figure 12.21 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Summer, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.119 The results indicate that, following the construction of Block C5, the wind environment at all potential amenity spaces within the Site improves from Scenario B and thus remain suitable, at worst, for sitting during Summer, and therefore suitable for the existing and intended uses.

12.120 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of impact is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, beneficial effect which is considered to be negligible.

Summer Comfort at the School's Terrace Level (Receptor A) (Scenario D)

12.121 Figure 12.22 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Summer, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.122 The results indicate that, following the construction of Block C5, the wind environment at the Receptors A remains unchanged from Scenario B. Thus, the wind environment remains suitable, at worst, for sitting and standing during Summer, and therefore suitable for the intended uses, given that the potential sitting areas remain allocated within the zones identified as suitable for sitting.

12.123 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of impact is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Summer Comfort at the Block C4 Podium (Receptor B) (Scenario D)

12.124 Figure 12.22 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Summer, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.125 The results indicate that, following the construction of Block C5, the wind environment at the Receptors B remains unchanged from Scenario B. Thus, the wind environment remains suitable, at worst, for sitting and standing during Summer, and therefore suitable for the intended uses, given that the potential sitting areas remain allocated within the zones identified as suitable for sitting.

12.126 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of impact is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Summer Comfort at the Block C4 Podium East (Receptor C) (Scenario D)

12.127 Figure 12.22 shows the comfort criteria, at Pedestrian Level, within the Site and its surrounding areas during Summer, following the construction of the Blocks C3, C4 and C5 of the Proposed Development.

12.128 The results indicate that, following the construction of Block C5, the wind environment at the terrace of Block C5 (Receptor C) is suitable for sitting or standing. Thus, the wind environment remains suitable, at worst, for sitting and standing during Summer, and therefore suitable for the intended uses, given that the potential sitting areas remain allocated within the zones identified as suitable for sitting.

12.129 The sensitivity of amenity spaces (as identified Table 12.6) is considered to be very high. The magnitude of impact is considered to be neutral. Therefore, there is likely to be a direct, permanent, long-term, adverse effect which is considered to be negligible.

Figure 12.21: Pedestrian Comfort Scenario D - Summer – Pedestrian level

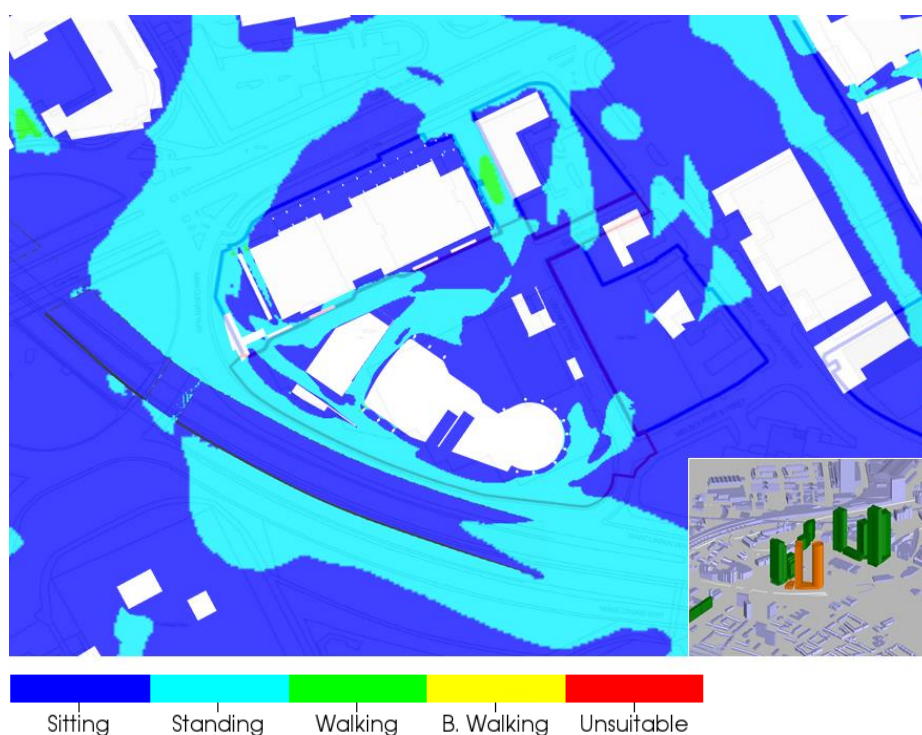
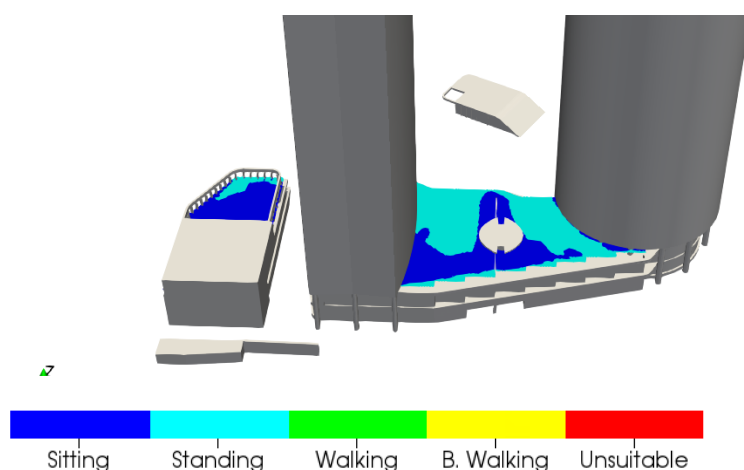


Figure 12.22: Pedestrian Comfort Scenario D - Summer – Terrace Level



Secondary Mitigation Measures

12.130 As the assessment does not identify any exceedances and the effects on all Receptors are considered to be negligible or neutral, no additional mitigation is considered necessary.

Cumulative Effects

12.131 As presented in the Technical CFD Note (Appendix 12.1), the inclusion of cumulative surrounding buildings, in Scenarios C and E, has a negligible impact on the wind microclimate around the Site when compared to the existing surrounds scenarios. Off-site wind conditions to the north of Elizabeth Tower marginally worsen with the inclusion of the cumulative surrounding buildings, while wind conditions improve around Deansgate Square due to shielding by the 'Transition' development. At elevated levels, wind conditions slightly improve with the inclusion of the cumulative surrounding buildings.

12.132 Therefore, as the inclusion of cumulative buildings results in very similar conditions to those in the Proposed Scenarios, the conclusions drawn for the existing surrounds scenarios B and D remain valid for the cumulative scenarios C and E.

Residual Effects

12.133 In the absence of secondary mitigation, the residual effects for all Receptors (as identified in the Sections above) remain the same as that reported in the pre-mitigation scenarios.

Table 12.16 – Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
n/a as the Construction Phase was scoped out.			
Operational Phase			
No Significant effects were identified.			

Summary

12.134 This report presents the results of the wind microclimate assessment carried out for the Proposed Development of Crown Street Phase 2 in Manchester.

- 12.135 The Proposed Development is likely to modify the local wind environment and create both improvements and some minor localised wind acceleration at pedestrian level. Nevertheless, the suitability of the existing sensitive receptors' uses is either the same or improved and therefore, the effects on all assessed receptors are considered Insignificant.
- 12.136 The Results of the Baseline safety assessment indicated that the wind environment of the Site and its surroundings is largely within the recommended criteria for safety, with the exception of a small area around (Receptor 13). It is understood that measures will be put in place to ensure that pedestrian access to this area is denied during high winds. The model included the mitigation around Crown Street Phase 1, designed by BMT, consisting of: trees of 4.5m height and 3m width, located at the west and south part of Elizabeth Tower; and two screens of 50% porosity at the east part of the scheme. The results of the Baseline comfort assessment indicate relatively moderate wind conditions in the Baseline, which vary from season to season. Within the Site the wind comfort conditions are largely suitable for standing throughout the year, while during Summer almost half of the north-east part of the Site is suitable for sitting. The results indicated that the majority of receptors are suitable for the existing uses, except for the Commercial Entrance at Elizabeth Tower (Receptor 8) where the wind comfort conditions are one category windier than recommended.
- 12.137 The Results indicate that, following construction of the Blocks C3 and C4, the wind environment of the Site and its surroundings including the surrounding landscape is considered to be safe. The results indicate that the majority of receptors are suitable for the existing and intended uses, except for the Commercial Entrance at Elizabeth Tower (Receptor 8) where the wind comfort conditions remain one category windier than recommended. Nevertheless, as this exceedance is present in Baseline, prior to introduction of the Proposed Development, no mitigation is required.
- 12.138 The addition of Block C5 and extended podium improves the wind conditions within the site when compared to Scenario B (Blocks C3 & C4) in terms of safety and comfort. The results indicate that the construction of Block C5 providing additional shelter from prevailing southerly winds results in generally calmer wind environment, especially to the north and east of the Proposed Site, with the "sitting" suitable area increasing in size.
- 12.139 In both Scenarios B and D, the results indicated that the wind environment of terrace levels of the Proposed Development is safe and suitable for the intended use. Additionally, in both scenarios the terraces are suitable for sitting and standing and therefore, the wind environment is considered to be suitable for the intended use given that the potential seating areas are allocated within the zones identified as suitable for sitting.
- 12.140 The inclusion of cumulative surrounding buildings results in slightly windier conditions to the north of Elizabeth Tower and calmer wind conditions around Deansgate Square with an overall negligible impact on wind conditions within the Site and its surroundings.
- 12.141 In conclusion, all receptors assessed throughout all considered configurations were either found to be safe for the general public and suitable for their intended and existing uses or remain unchanged or improved when compared to the baseline conditions with negligible or neutral effect.

References

1. T.V. Lawson (2001) Building Aerodynamics, Imperial College Press
2. Ministry of Housing, Communities and Local Government (February 2019) National Planning Policy Framework
3. Manchester City Council, Manchester's Local Development Framework – Core Strategy Development Plan, July 2012, Available online at:
https://secure.manchester.gov.uk/downloads/download/4964/core_strategy_development_plan
4. COST, Best Practice Guideline for The CFD Simulation of Flows in The Urban Environment, 2007, Available online at: <http://theairshed.com/pdf/COST%20732%20Best%20Practice%20Guideline%20May%202007.pdf>
5. Mayor of London, Sustainable Design and Construction, Supplementary Planning Guidance, April 2014
6. Historic England (December 2015) Tall Buildings, Historic England Advice Note 4
7. ESDU 2010 Item 01008 'Computer program for wind speeds and turbulent properties: flat or hilly sites in terrain with roughness changes'.

13 Type 1 Cumulative Effects

A13 ES Addendum Alterations

No alterations have been made to this chapter as part of the ES addendum in considering the environmental impacts arising from the detailed reserved matters proposals for Phase C (education facility) of Crown Street Phase 2, which received outline consent as part of the hybrid permission.

Introduction

- 13.1 This section gives consideration to 'Type 1' cumulative effects.
- 13.2 The assessment is informed by the results of the technical assessments as set out in Chapter 6 - 12 of the ES.
- 13.3 Type 1 cumulative effects are also known as 'inter-project' effects, which are the combined effects arising from the Proposed Development upon a set of defined sensitive receptors.
- 13.4 Type 2 cumulative effects are considered within the ES technical chapters. The technical chapters also had regard to the potential for Type 1 cumulative effects, however for robustness the results of a standalone assessment of these is provided below.

Legislation, Policy and Guidance

Legislation

- 13.5 There is no legislation outlining how cumulative effects should be assessed or determined as significant. However, there is a requirement in Part 1, Schedule 4 of the EIA Regulations to consider cumulative effects. Cumulative is not defined in the EIA Directive or Regulations however a dictionary definition is 'increasing by one addition after another'.
- 13.6 The EIA Regulations require 'a description of the likely significant effects', including cumulative effects.
- 13.7 In the context of this assessment, 'cumulative effects' refers to the interactions between different likely residual effects resulting from the Proposed Development (Type 1). Both positive and negative effects are considered across the construction and operational phases.

Policy

- 13.8 As this chapter considers the cumulative effects of the technical areas within the ES, all relevant policy has already been reviewed within the individual technical chapters.

Guidance

- 13.9 A number of guidance documents which relate to assessing cumulative effects have been used to inform the assessment and include:
- European Commission (EC) Environment DG (May 1999), 'Study on the Assessment of Indirect and Cumulative Impacts as well as Impact Interaction', Hyder Consulting; and
 - Institute of Environmental Management and Assessment (1992), Guidelines for the Environmental Assessment of Road Traffic.
- 13.10 The EC guidelines 'are not intended to be formal or prescriptive, but are designed to assist EIA practitioners in developing an approach which is appropriate to a project'.

13.11 Paragraph 24 of the National Planning Practice Guidance (NPPG) (Reference ID: 4-024-20170728) outlines the consideration to be given to cumulative effects in the context of EIA:

"Each application (or request for a screening opinion) should be considered on its own merits. There are occasions, however, when other existing or approved development may be relevant in determining whether significant effects are likely as a consequence of a Proposed Development. The local planning authorities should always have regard to the possible cumulative effects arising from any existing or approved development."

Assessment Methodology and Significance Criteria

Methodology

- 13.12 This assessment is primarily concerned with where there is a likelihood of significant Type 1 cumulative effects occurring, in accordance with EIA practice and the NPPG guidance.
- 13.13 The assessment is based on experience and professional judgement, drawing upon relevant guidance set out above and the residual environmental effects identified within the results of the EIA technical assessments. The assessment has been undertaken by suitably qualified and experienced EIA practitioners.
- 13.14 The assessment has primarily focused on sensitive receptors identified within close proximity to the Site (e.g. local residents and businesses located in close proximity to the Site), likely cumulative effects, and their capacity to accommodate changes that will occur as a result of the combined residual environmental effects.
- 13.15 Relevant guidance has been reviewed, and an approach has been developed which uses the residual environmental effects identified within the ES. An exercise which tabulates the residual effects against receptors or receptor groups has then been carried out in order to identify the potential for Type 1 cumulative effects.
- 13.16 Negligible or neutral residual effects have been excluded from the assessment as, by their nature, they are considered to be imperceptible. Therefore, only minor, moderate or major effects have been given consideration during the assessment.
- 13.17 For the purposes of the assessment, receptor groups have been identified as those surrounding the Site and those identified within the individual technical assessments.

Significance Criteria

- 13.18 The following terms have been used to define the significance of the effects identified:
- Major effect: where the Proposed Development could be expected to have a very significant effect (either positive or negative) cumulatively;
 - Moderate effect: where the Proposed Development could be expected to have a noticeable effect (either positive or negative) cumulatively;
 - Minor effect: where the Proposed Development could be expected to result in a small, barely noticeable effect (either positive or negative) cumulatively; and
 - Negligible: where no discernible effect is expected as a result of the Proposed Development cumulatively.
- 13.19 The significance level attributed to each effect has been assessed based on the magnitude of change due to the combination of residual effects and the sensitivity of the affected receptor/receiving environment to change, as outlined in Chapter 2 of the ES. Magnitude of change is assessed on a scale of major, moderate, minor and negligible and the sensitivity of the affected receptor/receiving environment is assessed on a scale of high, medium, low and negligible.

Limitations and Assumptions

- 13.20 Due to the reliance on qualitative data and subjective opinion, there are limitations related to the range and depth in which the cumulative effects have been investigated. It must be realised that analysing the

cumulative effects of developments is often speculative and cannot be predicted as clearly as individual effects such as the effects upon traffic of a development, which relies heavily upon quantitative data to inform the assessment. As a result, a number of assumptions have been made throughout in terms of the outcome of the accumulation of effects and based upon professional judgement. This section and the assessment process of identifying the likely significant Type 1 cumulative effects have, however, provided a reasoned consideration of and insight into the potentially significant Type 1 cumulative effects of the Proposed Development.

Identification of Likely Significant Type 1 Cumulative Effects

Construction Phase

13.21 Based on the methodology detailed above, Table 13.1 presents the results of the review of the potential for interactions of individual effects during the construction phase of development. The potential effect interactions are then discussed further.

Table 13.1: Type 1 Cumulative Effects – Construction Phase

Sensitive Receptor Group	Construction Phase Residual Effects	Likely Significant Cumulative Effects
Construction site workers	Potential minor adverse noise, vibration on construction workers during construction works	No likely significant Type 1 cumulative effects
Neighbouring residential properties	Short term minor adverse impacts arising from construction noise and vibration, and transport	Temporary in-combination effects of construction phase noise and dust impact and transport. Minor adverse, temporary
Local highway, public transport, pedestrian, and cycle networks	Negligible to moderate adverse effects on road users from Solar Glare Minor adverse on pedestrians and cyclists from increased intimidation, reduced amenity, severance and potential increased road safety risk from transport	Temporary in-combination effects of construction phase solar glare and dust impact and transport. Moderate adverse, temporary
Views, visual setting, and townscape	Minor to moderate adverse impacts on townscape character	No likely significant Type 1 cumulative effects

13.22 Table 13.1 shows that there is the potential for in-combination construction phase Type 1 cumulative effects to arise in relation to the following receptor groups:

- Local highways, public transport, and cycle networks

- Neighbouring residential properties;

13.23 Individual residual effects with the potential to give rise to a Type 1 cumulative effect are predominantly expected to relate to the interaction between temporary adverse transport impacts (due to construction), noise, and vibration (nuisance) impacts.

13.24 The combined effects are not considered likely to pose a significant risk to health or wellbeing due to the use of best practice construction measures and the temporary nature of the works.

13.25 The adverse Type 1 cumulative effect arising from the interaction of transport, noise and vibration, and solar glare impacts would occur throughout the construction phase. However, as the works progress then the location and severity of the cumulative effect will be varied in magnitude and duration. The initial development phases where piling is undertaken is the most likely to have a more adverse cumulative effect, though will be limited in duration. The most sensitive receptors are considered to be the residents of nearby residential properties to the west, east and north of the Site. Impact in relation to solar glare will increase as the construction phase advances to completion.

13.26 Although the potential for a Type 1 cumulative effect arising from dust, noise and vibration, and solar glare impacts has been identified, this will be temporary and limited to certain elements of the construction phase. This is aside from Solar Glare which is also an operational phase cumulative impact. The identified effect is typical of an urban construction project and the ES has identified a number of key mitigation measures to be employed during the construction phase to mitigate and minimise construction impacts. These mitigation measures are expected to be secured by a Demolition and Construction Method Plan, which is standard construction best practice, to be agreed between the applicant and MCC as a planning condition.

Operational Phase

13.27 Based on the methodology detailed above, Table 13.2 presents the results of the review of the potential for interactions of individual effects during the operational phase of development. The potential effect interactions are then discussed further.

Table 13.2: Type 1 Cumulative Effects – Operational Phase

Sensitive Receptor Group	Operational Phase Residual Effects	Likely Significant Cumulative Effects
Neighbouring residential properties	Negligible to Minor Permanent Adverse on impacts on daylight. Negligible to minor adverse noise impact on nearby sensitive receptors through changes in road noise and existing road noise	In-combination effects of sunlight and daylight and noise impacts on future residents and properties neighbouring the Site. Minor adverse impact, permanent.
Local highway, public transport, pedestrian, and cycle networks	Negligible to moderate adverse impacts on road users from Solar Glare Minor adverse impact on pedestrians from an amenity, highways safety, and severance perspective from small	In-combination effects of solar glare, noise, and transport impacts on the local highway network, public transport, pedestrians, and cycle networks. Moderate adverse impact, permanent.

Sensitive Receptor Group	Operational Phase Residual Effects	Likely Significant Cumulative Effects
	increases in traffic movements. Minor adverse impact on cyclists from a highways safety and severance perspective from small increases in traffic movements.	
Views, visual setting, and townscape	Minor beneficial impacts.	No likely significant Type 1 cumulative effects

13.28 Table 15.2 shows that there is the potential for in-combination operational phase Type 1 cumulative effects to arise in relation to the following receptor groups:

- Neighbouring residential properties.
- Local highway, public transport, pedestrian, and cycle networks

13.29 For neighbouring residential properties, the interactions are limited to impacts from noise and sunlight and daylight. When considering sunlight and daylight, it should be noted that the impact is only on 'daylight' rather than both elements. In addition, there should be an expectation that a higher degree of obstruction is inevitable in an area with modern high-rise buildings. In this respect, the surrounding receptors may have a lower sensitivity to change in an urban location, than those located in sub-urban, less dense areas. Sensitivity classification is assigned on how the proposed receptor is able to accommodate or adapt to the effect of the development.

13.30 The existing residential receptors surrounding the development Site reside in a City Centre location where there is an expectation for a higher density of development and, consequently to this, a higher tolerance for less daylight. The identified receptors are therefore deemed to have a medium sensitivity, rather than a high sensitivity, which would relate more closely to the sub-urban model described above. The minor adverse noise impact arises from additional vehicle movements, however it should be noted that many of the nearby sensitive receptors in this regard are already on major roads.

13.31 For the local highway, public transport, pedestrian, and cycle networks receptor group, the interactions are from solar glare and increased vehicle movements leading to changes in amenity, highways safety, and severance. The increased vehicle movements only lead to minor adverse impacts on these groups. The Transport chapter highlights that trips from the Site will likely be distributed across the highways network, potentially reducing the impact on any one part of it. Conversely, Solar Glare impacts are restricted to particular parts of the highway network where there is an interaction between the building and existing traffic signals.

13.32 Although the potential for a Type 1 cumulative effect does arise, it is considered that the impacts affect in different ways so any cumulative impact is less likely to arise. Therefore, a moderate adverse impact on a permanent basis is seen as reasonable.

Mitigation Measures

13.33 Where relevant, the individual residual effects which contribute to the potential cumulation have been considered within the ES and mitigated where necessary and feasible.

13.34 No mitigation is proposed for the identified Type 1 cumulative effects.

14 Summary of Residual Effects

A14 ES Addendum Alterations

The following change has been made to this chapter to consider the environmental impacts arising from the detailed reserved matters proposals for Phase C (education facility):

- Inclusion of Noise and Vibration (ES Addendum) Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects (Table 14.2B).

14.1 This section contains a summary of the residual effects of the Proposed Development.

Air Quality

14.2 Predicted impacts on NO2 and PM10 concentrations as a result of the operational phase were predicted to be not significant at all sensitive receptor locations considered, within the vicinity of the Site. Consequently, the residual effects resulting from road vehicle exhaust emissions associated with traffic generated by the Proposed EIA Development are predicted to be not significant.

Construction Phase

14.3 Assuming the relevant mitigation measures outline in Table 6.28 are implemented, the residual effect from all dust generation activities is predicted to be **not significant**.

Operational Phase

14.4 Overall impacts on NO2 and PM10 concentrations as a result of the operational phase were predicted to be **not significant** within the vicinity of The Site. Consequently, the residual effects resulting from road vehicle exhaust emissions associated with traffic generated by the Proposed Development are predicted to be **not significant**.

Table 14.1 Air Quality Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects

Receptor(s)	Likely Significant Effect	Mitigation Measure	Residual Effect
Construction Phase			
Human – Existing Dust Soiling/Health	Major adverse on a temporary basis	Table 6.28: The Proposed Development will incorporate the specific construction phase mitigation measures outlined in the IAQM guidance.	Negligible dust impacts to property and people on a temporary basis
Operational Phase			

Receptor(s)	Likely Significant Effect	Mitigation Measure	Residual Effect
Human – Future Site Users Existing Road Vehicle Pollutant Concentrations – Health	Major adverse on a permanent basis	Sections 6.146 to 6.155: Proposed Development will be required to incorporate mechanical ventilation system to each affected floor level that has been predicted to be subjected to exceedances of the AQO for NO ₂ . The ventilation systems will include individual NO _x filtration units which will effectively remove NO _x pollutants, reducing the concentrations to acceptable and safe levels.	Negligible exposure to elevated pollutant concentrations on a permanent basis
Human – Existing Sensitive Locations Additional Road Vehicle Pollutant Concentrations – Health	Negligible impacts upon existing sensitive uses on a permanent basis	The Proposed Development will consider best practice measures in the form of sustainable transport principles. The provision of high-level cycle parking facilities as well as availability of Electric Vehicle Charging Points will secure a reduction in development related road vehicle exhaust emissions.	Negligible impacts upon existing sensitive uses on a permanent basis

Noise and Vibration

14.5 The residual impacts assume that the mitigation and recommendations described in Chapter 7 have been implemented in order to achieve the criteria or the lowest practicable levels.

14.6 Therefore, impacts should be described as, e.g. minor beneficial in the long term at the local level.

Table 14.2A – Noise and Vibration Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
Construction Noise & Vibration	R1 to R8	Ensuring best practicable (BPM) means are undertaken during Site works. Undertaking a Construction Environmental Management Plan.	Short term Minor adverse at the local level (Non-significant)
Operational Phase			
Change in Road Traffic Noise	R1 to R8	Appropriate site layout and mitigation measures	Potential for Negligible to Minor long term impact at the local level. (Non-significant)
Existing road traffic noise	Proposed Receptors	Appropriate site design and acoustic glazing	Potential for Negligible to Minor long term impact at the local level. (Non-significant)

Proposed Commercial	Proposed Receptors & R8	Appropriate site design and acoustic glazing	Unknown – Can achieve Negligible long term impact at the local level (Non-significant)
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Table 14.2B – Noise and Vibration (ES Addendum) Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects

<u>Likely Significant Effect</u>	<u>Receptor(s)</u>	<u>Mitigation Measure</u>	<u>Residual Effect</u>
<u>Construction Phase</u>			
<u>Minor to Moderate adverse construction noise</u>	<u>Local residents</u>	<u>Refer to approved Noise and Vibration Chapter (Chapter 7A of this Statement).</u>	<u>Minor Adverse construction noise effects</u>
<u>Operational Phase</u>			
<u>Negligible building services plant noise effects</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for plant</u>	<u>Negligible building services plant noise effects</u>
<u>Negligible activity noise effects from school hall</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for amenity spaces</u>	<u>Negligible activity noise effects from amenity spaces</u>
<u>Negligible activity noise effects from rooftop playground and other external areas</u>	<u>Residential properties</u>	<u>Appendix 7.2: Adherence to environmental noise limits for amenity spaces</u>	<u>Negligible activity noise effects from amenity spaces</u>
<u>Moderate adverse noise effects from road traffic</u>	<u>Internal school areas</u>	<u>Appendix 7.2: Adherence to recommended sound insulation performance of façade elements</u>	<u>Negligible adverse noise effects from road traffic</u>

Solar Glare

14.7 The likely significant effects of solar glare from the Proposed Development are considered a worst-case scenario. All solar glare effects to road junctions are considered high sensitivity and the effects are permanent and long term, therefore the residual effects are the same as during the operational stage.

Table 14.3 – Solar Glare Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
<u>Construction Phase</u>			
Negligible to Moderate adverse and significant effects on Solar Glare	Road users	None	Negligible to Moderate adverse and significant effects on Solar Glare
<u>Operational Phase</u>			

Negligible to Moderate adverse and significant effects on Solar Glare	Road users	Embedded in the design	Negligible to Moderate adverse and significant effects on Solar Glare
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Daylight, Sunlight and Overshadowing

14.8 The visual impact assessment has been carried out based on the assumption that all the necessary mitigation measures have been accounted for in the design process. The images for selected viewpoints illustrated in Appendix 10.2 represent the accurate definition of the location and mass of the component parts of the Proposed EIA Development. The predicted significance of effect values are therefore the same for each representative viewpoint and Townscape Character Area as the residual effect values.

Table 14.4 – Sunlight, Daylight and Overshadowing Summary of Receptors, Significant Effects, Mitigation Measures and Residual Effects

Receptor(s)	Likely Significant Effect	Mitigation Measure	Residual Effect
Construction Phase			
Daylight	Scoped Out	-	-
Sunlight	Scoped Out	-	-
Operational Phase			
Daylight	Surrounding Residential Properties	None required	Negligible to Minor Permanent Adverse (Non-Significant Effect)
Sunlight	Surrounding Residential Properties	None required	Permanent Negligible (Non-Significant Effect)

Townscape and Visual Impact Assessment

14.9 The visual impact assessment has been carried out based on the assumption that all the necessary mitigation measures have been accounted for in the design process.

(Note. Where townscape (T) and visual receptor (VR) significance of effect values are the same, one shared value is provided. Where they are different, a value is provided for both categories)

Location	Development Only (included Residual Impact)	EIA significance
1 Whitworth Street West		
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect	No Impact	Not Significant
2 Stretford Road		
Sensitivity (VR) Sensitivity (T) Magnitude (VR) Magnitude (T) Significance of effect (VR) Significance of effect (T)	Medium Low Minor Beneficial Minor Beneficial Minor Beneficial Negligible Beneficial	Not Significant

Location	Development Only (included Residual Impact)	EIA significance
3 The Sanctuary		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	High	
Magnitude (VR)	Negligible	
Magnitude (T)	Negligible	
Significance of effect	Minor Beneficial	
4 Hulme Park		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
5 Mancunian Way		
Sensitivity (VR)	Low	Not Significant
Sensitivity (T)	Low	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Moderate Beneficial	
Significance of effect	Minor Beneficial	
6 St Wilfred’s Park		
Sensitivity (VR)	High	Significant
Sensitivity (T)	Low	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect (VR)	Moderate Beneficial	
Significance of effect (T)	Negligible Beneficial	
7 Chorlton Road		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Low	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect (VR)	Minor Beneficial	
Significance of effect (T)	Negligible Beneficial	

Location	Development Only (included Residual Impact)	EIA significance
8 St George's Park		
Sensitivity (VR)	High	
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	Not Significant
Significance of effect (VR)	Moderate Beneficial	Significant
Significance of effect (T)	Minor Beneficial	
9 Chester Road		
Sensitivity (VR)	Medium	
Sensitivity (T)	Medium	Not Significant
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
10 Chester Road		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
11 Deansgate		
Sensitivity (VR)	Low	
Sensitivity (T)	Medium	
Magnitude (VR)	Moderate Beneficial	
Magnitude (T)	Moderate Beneficial	Not Significant
Significance of effect (VR)	Minor Beneficial	Significant
Significance of effect (T)	Moderate Beneficial	Significant
12 Albert Square		
Sensitivity (VR)		
Sensitivity (T)	No Impact	Not Significant
Magnitude (VR)		
Magnitude (T)		
Significance of effect		
13 St Peter's Square		
Sensitivity (VR)	Medium	
Sensitivity (T)	High	
Magnitude (VR)	Minor Beneficial	Not Significant
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
14 Lower Moseley St		
Sensitivity (VR)		
Sensitivity (T)		Not Significant
Magnitude (VR)	No Impact	
Magnitude (T)		
Significance of effect		

Location	Development Only (included Residual Impact)	EIA significance
15 Whitworth St West		
Sensitivity (VR)		
Sensitivity (T)	Low	
Magnitude (VR)	Low	
Magnitude (T)	Negligible	Not Significant
Significance of effect	Negligible	
	Negligible Beneficial	
16 Deansgate Station		
Sensitivity (VR)	Low	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Negligible Beneficial	
17 Deansgate		
Sensitivity (VR)	Medium	
Sensitivity (T)	Medium	Not Significant
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
18 Castlefield Basin		
Sensitivity (VR)	Medium	
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	Not Significant
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
19 Egerton Street		
Sensitivity (V)	Low	
Sensitivity (T)	Low	Not Significant
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Negligible Beneficial	
20 A57 Regent Road		
Sensitivity (VR)	Low	
Sensitivity (T)	Medium Low	
Magnitude (VR)	Minor Beneficial	Not
Magnitude (T)	Minor Beneficial	Significant
Significance of effect	Negligible Beneficial	
21 Trinity Way		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Low	
Magnitude (VR)	Negligible	
Magnitude (T)	Negligible	
Significance of effect	Negligible Beneficial	

Location	Development Only (included Residual Impact)	EIA significance
22 Museum of Science & Industry		
Sensitivity (VR)		Not Significant
Sensitivity (T)	High	
Magnitude (VR)	High	
Magnitude (T)	Negligible	
Significance of effect	Negligible	
	Negligible Beneficial	
Viewpoint A		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
Viewpoint B		
Sensitivity (VR)	Medium	Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Moderate Beneficial	
Magnitude (T)	Moderate Beneficial	
Significance of effect	Moderate Beneficial	
Viewpoint C		
Sensitivity (VR)	Medium	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	
Viewpoint D		
Sensitivity (VR)	High	Not Significant
Sensitivity (T)	Medium	
Magnitude (VR)	Minor Beneficial	
Magnitude (T)	Minor Beneficial	
Significance of effect	Minor Beneficial	

Traffic and Transport

14.10 The Traffic and Transport implications of the Proposed Development has been assessed according the environmental factors as set out by the Institute of Environmental Assessment (IEA) during the Construction and Operational Phases. The potentially sensitive receptors include local residents and potentially vulnerable road users of cyclists and pedestrians.

Table 14.5 – Traffic and Transport Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects (Construction)

Receptor	Effect Description	Post-Mitigation (Residual) Significance
Local Residents	Pedestrian Amenity Severance	Minor Adverse not significant effect on new residents of Crown Street Phase 1 of off Great Jackson Street opposite site.

Receptor	Effect Description	Post-Mitigation (Residual) Significance
Pedestrians	Pedestrian Amenity Severance Road Safety	Minor Adverse not significant effect on pedestrians on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.
Cyclists	Severance Road Safety	Minor Adverse not significant effect on cycle users on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.

Table 14.6 – Traffic and Transport Summary of Receptors, Significant Effects, Mitigation Measures, and Residual Effects (Operational)

Receptor	Effect Description	Post-Mitigation (Residual) Significance
Local Residents	Pedestrian Amenity Severance	Minor Adverse not significant effect on new residents of Crown Street Phase 1 or off Great Jackson Street opposite site.
Pedestrians	Pedestrian Amenity Severance Road Safety	Minor Adverse not significant effect on pedestrians on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.
Cyclists	Severance Road Safety	Minor Adverse not significant effect on cycle users on Silvercroft St/Melbourne St and their immediate junctions with Gartside St.

Wind Microclimate

Table 14.7 – Wind Microclimate Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
n/a		n/a	n/a
Operational Phase			
Minor adverse effects on summer comfort at terrace level (Scenario B)	Receptors A and B	The wind environment is considered suitable for the intended function given that the potential sitting areas are allocated within the zones identified as suitable for sitting.	Direct, permanent, long-term, adverse, minor, insignificant effect
Minor adverse effects on summer comfort at terrace level (Scenario D)	Receptors A, B and C	The wind environment is considered suitable for the intended function if the potential sitting areas are allocated within the zones identified as suitable for sitting.	Direct, permanent, long-term, adverse, minor, insignificant effect



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