



Environmental Statement – Volume 1
2&3 Angel Square, NOMA

July 2022

Contents

Figures	3
Volume 2: Appendices	4
1 Introduction	5
2 EIA Methodology	10
3 Site, Surroundings and Description of Proposals	17
4 Consideration of Alternatives and Design Evolution	29
5 Phasing Strategy and Construction Methodology	32
6 Sunlight, Daylight and Overshadowing	46
7 Wind Microclimate	65
8 Summary of Residual Impacts	80
9 Type 1 Cumulative Impacts	84

Important notice: This Environmental Statement has been prepared by Deloitte Real Estate, with technical input from Buro Happold, Cartwright Pickard, Planit-IE, and Gardiner and Theobald “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 6-9, Volume 1, nor Volume 2, nor the technical content of this associated Non-Technical Summary.

Figures

Chapter	Figure
1 Introduction	No Figures
2 EIA Methodology	No Figures
3 Site, Surroundings and Description of Proposals	Figure 3.1: Site Location Plan Figure 3.2: Listed Buildings within 300m of the Site
4 Consideration of Alternatives and Design Evolution	No Figures
5 Phasing Strategy and Construction Methodology	Figure 5.1: Construction Logistics where Construction of No 2 Angel Square occurs prior to No 3 Angel Square Figure 5.2: Construction Logistics where Construction of No 2 Angel Square occurs prior to No 3 Angel Square Figure 5.3: Sites adjacent to Angel Square in NOMA Ownership
6 Daylight, Sunlight and Overshadowing	No Figures
7 Wind Microclimate	No Figures
8 Summary of Residual Impacts	No Figures
9 Type 1 Cumulative Effects	No Figures

Volume 2: Appendices

Chapter	Figure
1 Introduction	No Appendix
2 EIA Methodology	2.1 EIA Scoping Report 2.2 Committed Developments
3 Site, Surroundings and Description of Proposals	No Appendix
4 Consideration of Alternatives and Design Evolution	No Appendix
5 Phasing Strategy and Construction Methodology	No Appendix
6 Daylight, Sunlight and Overshadowing	6.1 Detailed tables of daylight results 6.2 Detailed tables of sunlight results 6.3 Chapter Figures
7 Wind Microclimate	7.1 Wind Chapter Figures
8 Summary of Residual Impacts	No Appendix
9 Type 1 Cumulative Effects	No Appendix

1 Introduction

- 1.1 This Environmental Statement (“ES”) accompanies an application for Full Planning Permission for the construction of two office-led buildings (Use Class Egi) with commercial retail uses at lower levels and flexible restaurant / office space at Level 12 of 2 Angel Square, with associated car and cycle parking, public realm, and access arrangements (the “Proposed Development”) at NOMA.
- 1.2 The Applicant is NOMA (GP) Ltd (the “Applicant”).
- 1.3 The Site is circa 0.83 hectares and is located on the northern edge of Manchester City Centre. It is largely previously developed land comprising areas of a hardstanding for surface car parking alongside informal and formal areas of shrubbery and trees. The NOMA Marketing Suite (approved in May 2021 under temporary Planning Permission Ref. 129631/FO/2021) is currently under construction within and to the south of the Site adjacent to Miller Street.
- 1.4 A Strategic Regeneration Framework (SRF) and Masterplan for NOMA was originally endorsed by Manchester City Council (MCC) in 2009, updated in 2010, 2013, 2015 and most recently in 2020 (‘NOMA SRF’). The Site forms Plots M and N (to be known as 2 and 3 Angel Square) of the 20-acre NOMA Framework area.
- 1.5 The Proposed Development seeks full planning permission for the following description of development:
- “Erection of 2 Angel Square, a 14 storey building (excluding roof top plant) to form a mixed use office development (Use Class Egi) with two flexible commercial units at Upper Ground floor Level (Use Classes Ea, b, c, e, f, and / or Use Class Sui Generis (p) and (q)), and with a flexible office (Use Class Egi) and/or restaurant (Use Class Eb) space at Level 12, along with Lower Ground Level car and cycle parking, hard and soft landscaping and other associated works;*
- Erection of 3 Angel Square, a 13 storey building (excluding roof top plant) to form a mixed use office development (Use Class Egi) with two flexible commercial units provided over Lower and Upper Ground Floor Levels (Use Classes Ea, b, c, e, f, and / or Use Class Sui Generis (p) and (q)), a further flexible commercial unit at Upper Ground Floor Level only allowing for ancillary seminar space and / or Sui Generis Use Class (t) Cinema space, together with an ancillary gym space at Upper Ground Floor, as well as Lower Ground Level car and cycle parking, hard and soft landscaping and other associated works.”*
- 1.6 The Proposed Development, as outlined in detail at Chapter 3 of the ES, is hereafter referred to as the “Proposed Development”. The term Proposed Development used within this Statement refers to all stages of construction and the operation of the development.
- 1.7 This ES sets out the findings of an Environmental Impact Assessment (“EIA”) carried out in respect of the development of the Site.

Requirements for EIA

- 1.8 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.
- 1.9 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, 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.
- 1.10 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 4(2)).

- 1.11 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.
- 1.12 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.

Project Team

- 1.13 Deloitte LLP has significant experience and expertise in managing the EIA process and hold the IEMA EIA Quality Mark. Deloitte LLP has managed the EIA process and the production of the ES for the Proposed Development and has received technical input from suitably qualified and experienced technical consultees.
- 1.14 Details of the EIA Technical Team and qualifications are set out in Table 1.1 below.

Table 1.1: EIA Technical Team

Expertise / Role	Organisation	Qualifications
Town Planning, EIA Coordination	Deloitte Real Estate	RTPI, RICS, IEMA Quality Mark, PIEMA
Daylight, Sunlight and Overshadowing; and	Buro Happold	B.Eng. and Ph.D. qualifications Chartered Engineer with membership of the Chartered Institution of Building Services Engineers Over 15 years consulting experience in assessing daylight, sunlight and overshadowing impacts for several urban planning applications, including the preparation of Environmental Statement Chapters.
Wind Microclimate	Buro Happold	This Chapter has been prepared by Dr Bernardo Vazquez at Buro Happold.

Expertise / Role	Organisation	Qualifications
		B.Eng. in Chemical Engineering a MSc in Solar Energy and a PhD in Mechanical Engineering. He is Treasurer of the Wind Engineering Society in UK, and member of the board for several years, and has 22 years consulting experience in the wind engineering and 32 years on the built environment including environmental design and analysis of buildings.

Although we have read Buro Happold's reports ("the Consultant 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 6, 7 and 8.

Organisation of the Environmental Statement

- 1.15 This ES comprises 9 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.
- 1.16 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.
- 1.17 Table 1.2 sets out the structure of the ES:

Table 1.2: EIA Structure Volume 1

Chapter	Topic	Author
1.	Introduction	Deloitte
2.	EIA Methodology	Deloitte
3.	Site, Surroundings and Description of Proposals	Deloitte with input from Gardiner and Theobald.
4.	Consideration of Alternatives and Design Evolution	Deloitte with input from Cartwright Pickard and Planit
5.	Phasing Strategy and Construction Methodology	Gardiner and Theobald
6.	Sunlight, Daylight and Overshadowing	Buro Happold
7.	Wind Microclimate	Buro Happold
8.	Summary of Residual Impacts	Deloitte
9.	Type 1 Cumulative Impacts	Deloitte

Other Documents

- 1.18 A number of other documents have been submitted to Manchester City Council in support of the planning application. These include:
- Application Form – prepared by Deloitte LLP;
 - Site Location Plan, Existing Site Plans and Proposed Plans – prepared by Cartwright Pickard;
 - Design and Access Statement (DAS) – prepared by Cartwright Pickard;
 - Landscape DAS (Contained in DAS) – prepared by Planit-IE;
 - Planning and Tall Building Statement, including Blue and Green Infrastructure Statement – prepared by Deloitte LLP;
 - Statement of Community Consultation – prepared by Deloitte and Counter Context;
 - Heritage and Visual Impact Assessment – prepared by Stephen Levrant Heritage Architecture;
 - Environmental Standards Statement – prepared by Mainer with support from Buro Happold;
 - Energy Statement – prepared by Buro Happold;
 - BREEAM Pre-Assessment – prepared by Mainer Associates;
 - Noise Assessment – prepared by Buro Happold;
 - Ground Engineering Desk Study Report (May 2022) – prepared by Buro Happold;
 - 2 & 3 Angel Square and NOMA Marketing Suite Report on Ground Investigation – prepared by Structural Soils;
 - Archaeological Desk Based Assessment (August 2019) – prepared by Salford Archaeology;
 - Archaeological Excavation Report (October 2021) – prepared by Salford Archaeology;
 - Aviation Safety Assessment – prepared by Pager Power;
 - Television Baseline Survey – prepared by Pager Power;
 - Ecological Survey and Assessment – prepared by ERAP;
 - Arboricultural Impact Assessment – prepared by Bowland Tree Consultancy Limited;
 - Local Labour Agreement – prepared by NOMA (GP) Ltd;
 - Crime Impact Statement – prepared by Greater Manchester Police;
 - Ventilation Strategy – prepared by Buro Happold;
 - Serving and Waste Management Strategy – prepared by Curtins;
 - Flood Risk Assessment – prepared by Buro Happold;
 - Drainage Strategy – prepared by Buro Happold;

- Operational Management Strategy – prepared by Workman;
- Transport Statement – prepared by Curtins;
- Framework Travel Plan – prepared by Curtins;
- Air Quality Assessment – prepared by Buro Happold; and
- Outline Construction Management Plan – prepared by Gardiner and Theobald.

Environmental Statement Availability

- 1.19 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.
- 1.20 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.
 - Non-Technical Summary (NTS) - £15
 - Full Copy (Volumes 1, 2 and 3) of the ES on CD - £15.
- 1.21 For copies of any of the above, please contact the Manchester Planning Team at Deloitte LLP.
- 2&3 Angel Square Project Team – Planning and EIA
- Deloitte LLP
- Real Assets Advisory
- The Hanover Building
- Corporation Street
- M4 4AH

2 EIA Methodology

Introduction

- 2.1 This Chapter sets out the methodology used to prepare each Chapter of the ES and describes its structure and content. 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 3.

Legislation and Guidance

- 2.2 This 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 and entered into force on 17 May 2017. The EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation, under the control of the UK's Parliaments and Assemblies. The European Union (Withdrawal) Act 2018 introduced "retained EU law" which provides that EU-derived domestic legislation continues to have effect.
- 2.3 Reference has also been made to currently available good practice guidance in EIA including:
- Circular 02/99: Environmental Impact Assessment
 - The European Commission's numerous EIA guidance documents available here: <http://ec.europa.eu/environment/eia/eia-support.htm>
 - Guidance on EIA Scoping, European Commission, June 2001.
 - Guidance on Transport Assessment, DCLG and DfT, March 2007.
 - National Planning Practice Guidance – Department for Communities and Local Government (March 2014 and continuously updated as a 'live' resource)
 - Reference has been made to the Institute of Environmental Management and Assessment (IEMA) publications, including:
 - IEMA ES Review Criteria
 - IEMA Guidelines for Environmental Impact Assessment (2004)
 - IEMA Special Report into the State of Environmental Impact Assessment Practice in the UK (2011)
 - IEMA Shaping Quality Development (2015)
 - IEMA Delivering Quality Development (2016)
 - IEMA Delivering a Proportionate EIA (2017)
- 2.4 The ES has also had regard to the National Planning Policy Framework 2021 (NPPF). The NPPF sets out the Government's economic, environmental, and social planning policies for England, articulating the Government's aspiration for sustainable development. The NPPF has been considered where it is relevant to EIA.

Scoping and Consultation

Scoping

- 2.5 An EIA Screening and Scoping Opinion request was submitted to Manchester City Council on 16 June 2022, requesting confirmation as to the proposed scope of the EIA required in respect of the Proposed Development.
- 2.6 At the time of submission, no formal response has been received from Manchester City Council. 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.

- 2.7 The results of the screening and scoping exercise have determined the subject areas of the EIA, set out in Table 1.2 above.

Consultation

- 2.8 The application proposals have been prepared in consultation with Manchester City Council and a range of technical stakeholders (refer to Table 2.1).
- 2.9 At all stages of the design development process, the Applicant and design team sought to undertake early consultation with key stakeholders, building on the consultation completed in respect of the 2015 and 2020 Planning Permissions. A description of the pre-application consultation is provided in the Planning Statement and Statement of Consultation submitted in support of the application.

Table 2.1: Scope of EIA Consultation

EIA Consultation
Manchester City Council Planning Authority
Historic England
Greater Manchester Archaeological Advisory Service
Greater Manchester Police
Manchester City Council Environmental Health Officers
Lead Local Flood Authority
United Utilities

Non-Significant Effects

- 2.10 It is considered that the following disciplines will not give rise to likely significant effects on the environment and therefore do not require inclusion in the ES. An explanation for each discipline is provided in the EIA Scoping Report in Appendix 2.1.
- Agricultural Circumstances;
 - Air Quality;
 - Archaeology;
 - Aviation;
 - Climate Change;
 - Ecology;
 - Electronic Interference;
 - Ground Conditions;
 - Heritage and Visual Impact;
 - Human Health;
 - Light Spillage and Solar Glare;
 - Noise and Vibration;
 - Socio-Economic Issues;

- Transport;
- TV Reception; and
- Water Resources, Drainage and Flood Risk.

Approach to Technical Studies

- 2.11 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.
- 2.12 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. Meetings were also held with Manchester City Council as the Local Planning Authority, as well as pre-application discussions with technical consultees, as highlighted at Table 2.1.
- 2.13 The technical studies have been undertaken in accordance with current best practice. Specific guidance used is referenced within each of the respective assessment chapters.
- 2.14 Most assessments involved consultations with statutory and non-statutory bodies, desk-based research, site inspections and surveys, impact prediction and mitigation.
- 2.15 The assessment and conclusions of the ES are based on the description of the Proposed Development provided in Chapter 3.

Structure of Technical Chapters

- 2.16 Each technical chapter of the ES (Chapters 6 and 7) 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.
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

Technical Chapter Structure	
	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.

- 2.17 Chapter 5 provides information to allow the construction phase of the Proposed Development to be assessed by the disciplines set out in Chapters 6 and 7.

Magnitude

- 2.18 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 /

Magnitude of Impact	Criteria for Assessing Effect
	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

2.19 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

2.20 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

2.21 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'.

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

Baseline Conditions

- 2.23 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 and 7) includes a clear description of what is assumed as the baseline against which the assessment is being made.
- 2.24 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

- 2.25 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.
- 2.26 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.
- 2.27 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.
- 2.28 Mitigation to be implemented during the operational phase would be secured through planning conditions and obligations.

Residual Effects

- 2.29 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'.

Cumulative Effects

- 2.30 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').
- 2.31 A search of Manchester City Council's planning applications database and knowledge of the area has identified several schemes for which cumulative effects are considered likely. A full list, as of 20 June 2022, is contained at Appendix 2.2.
- 2.32 Each technical chapter (Chapters 6-7) has assessed the potential for likely significant effects on the environment because of the above committed developments, together with the Proposed Development.
- 2.33 In addition, Chapter 9 assesses the Type 1 Cumulative effects.

Assumptions and Limitations

- 2.34 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 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 2022 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 3.
- Construction methods and phasing will follow the timetable and methods set out in Chapter 5.
- Conditions will be attached to the Planning Permission that will control disturbance during the Proposed Development.
- Necessary off-site services infrastructure for the Proposed Development will be provided by statutory undertakers.

Objectivity

- 2.35 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.
- 2.36 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 Site, Surroundings and Description of Proposals

- 3.1 The Site is located to the northern edge of Manchester City Centre. It occupies a prominent plot within the NOMA Framework area, which provides the opportunity to establish improved connections between the City Centre, the NOMA historic estate and existing and future communities to the north.

Site Description

- 3.2 The Site has a combined site area of approximately 0.83ha and comprises Plots M and N of the NOMA Framework area as defined in the NOMA SRF 2020 and the Site Location Plan is shown in Figure 3.1.
- 3.3 It is bounded by Rochdale Road / Angel Street to the north and Miller Street to the south. To the east of the Site is Angel Mews which provides a north / south pedestrian link and public space between the Site and Angel Gardens. The Co-operative Group Headquarters, 1 Angel Square, is located to the west beyond Angel Square.
- 3.4 The Site comprises areas of hardstanding and has been used as surface car parking for several years alongside informal and formal areas of shrubbery and trees. The use as a car park detracts significantly from the quality of the environment in this area – a strategic regeneration priority and point of entry into Manchester City Centre.
- 3.5 The NOMA Marketing Suite as approved in May 2021 under temporary Planning Permission Ref. 129631/FO/2021 is currently under construction within and to the south of the Site adjacent to Miller Street. It is proposed this would be relocated to another Site within NOMA.
- 3.6 There is a significant change in levels across the Site, with the lowest part being in the west corner, rising to the north and east towards Angel Street. The difference in level across the Site between Angel Street and Miller Street is typically a storey, creating a lower and upper ground floor.
- 3.7 The Site is currently accessed from Angel Street to the north and from the south of Angel Mews off Miller Street.
- 3.8 Due to the current condition of the Site, there is no relationship with surrounding uses, and the expansive site provides little in the way of boundaries and does not contribute to the streetscape along the major aerial routes it lies adjacent to.

Site Context

- 3.9 The Site is located on the northern fringe of Manchester City Centre and is located within the North Manchester Area of the Regional Centre as defined in the MCC's Local Development Framework. The Site is also allocated for commercial / business uses under Unitary Development Plan (UDP) Saved Policy HC10b.
- 3.10 Such high level political and policy support provides a very clear mandate in terms of delivering development within NOMA, which will support the next phase of growth in Manchester and enhance the City's productivity in the process. In doing so, it should maximise the opportunities that NOMA presents in terms of delivering positive regeneration outcomes for the City's communities. This translates into supporting a new high quality urban neighbourhood at NOMA for a mix of uses that is employment-led but includes a component of residential development.
- 3.11 The Site is surrounded by a mix of city centre uses. It is immediately adjacent to several NOMA developments, including 1 Angel Square, the Co-operative Group Headquarters building, and Angel Gardens, a residential-led development that completed in 2020.

- 3.12 To the east of the Site is Angel Mews which provides a north / south pedestrian link and public space between the Site and Angel Gardens.
- 3.13 Angel Square public realm is located immediately to the west and adjoining the Site. It is a key element of public space within the NOMA Framework area that provides links between the area north of Angel Street and Angel Meadows through NOMA and into Manchester City Centre.
- 3.14 St Michael's Flags / Angel Meadow Park is a short walk to the north and would provide an attractive green open space – an 'oasis' in the city for employees.
- 3.15 4 Angel Square (as approved in July 2019 under Planning Permission Ref. 123437/FO/2019) is currently under construction at Plot P to the west of Angel Square and is scheduled to complete in 2023.
- 3.16 Beyond to the south is the NOMA historic estate, which includes several Grade II Listed Buildings, including CIS Tower, the newly refurbished New Century House and Hall, Redfern and Dantzic buildings.
- 3.17 Beyond Angel Street to the north is the Linx residential development and other 7/8 storey residential apartment buildings. Beyond these immediate frontage uses, the area to the north of Angel Street comprises further residential apartments blocks, both new build and conversions of existing buildings. These are a product of the demand for edge of City Centre apartment development generated during the last recent, pre-recession phase of significant economic growth in Manchester, principally fuelled by the expansion of business services in the city.
- 3.18 There is a myriad of uses along Rochdale Road, including the 20 storey Skyline Central residential tower, small scale commercial units, surface car parking operated by Euro Car Parks and small retail units.
- 3.19 The Site is extremely well-located within easy walking distance to employment opportunities and the services and facilities offered by Manchester City Centre and near the predominantly residential areas of New Cross and Ancoats to the east.

Transport and Accessibility

- 3.20 The NOMA Framework area has excellent accessibility to a range of modes of transport.
- 3.21 The Site is bound to the north and south by Manchester's Inner Ring Road (IRR). The reconfigured Rochdale Road (A664) and widened Angel Street (A664) runs adjacent to the Site and forms a key arterial route into the City Centre from the North. Previously, at four lanes, Miller Street had acted as a physical and psychological edge to the City Centre, creating a barrier to the continued expansion of the City Centre and disconnecting communities on the northern edge of the City Centre.
- 3.22 Road alterations were carried out to create two one-way routes through the Site – one along a narrowed Miller Street and the second along widened sections of Corporation and Angel Street. The new network opened to traffic in December 2012 and has significantly improved traffic flow and connectivity between the NOMA site and the rest of the City Centre.
- 3.23 The IRR connects all the major road routes into the City Centre (including Rochdale Road) and as a result carries a high volume of traffic at all times of the day.
- 3.24 The area also benefits from a high level of pedestrian and vehicular accessibility and offers exceptional linkages to a variety of multi-modal public transport connections.
- 3.25 Existing cycle infrastructure on Corporation Street and Dantzic Street allows cycle access into Manchester City Centre, with direct access to Manchester Victoria Station and the Printworks. There are two national cycle routes within proximity of the Site.
- 3.26 The local cycle network is also part of Greater Manchester's cycling and walking infrastructure proposal, named the "Bee Network", which comprises signed routes that mark the most direct and pleasant way to navigate an area on foot or by bike. The Site is located directly north of Bee Network improvements as part of the Manchester Northern / Eastern Gateway to the north of the Site, and improved crossing facilities adjacent to tramlines along Corporation Street and Shudehill.

- 3.27 As part of the Bee Network, a Bike Hire Scheme is being rolled out in Manchester as part of a public trial. There are currently no docking stations at NOMA, however it is envisaged that in summer 2022, there will be more than 200 stations, 1,200 pedal bikes and 300 e-bikes across Manchester, Salford and Trafford.
- 3.28 The Site is extremely well-located, near Shudehill Interchange, which provides access to Manchester's Metrolink network as well as local bus services. Manchester Metrolink offers high-frequency services (up to 10 per hour) across Greater Manchester.
- 3.29 The Site is within a short walking distance of Manchester Victoria Station, which is an important hub on the north-west railway network and serves destinations throughout Greater Manchester and the north of England.
- 3.30 Alongside station improvements, Ordsall Chord which opened in November 2017 provides a new viaduct connection between Manchester Victoria, Oxford Road and Piccadilly Stations enabling a faster and more efficient rail services within the city and across the north of England.
- 3.31 Further services to destinations across the UK are accessible from Manchester Piccadilly Station, located approximately 15–20-minute walk to the south-east of the Site.
- 3.32 Manchester Airport, the City's international gateway is within easy reach via road, Metrolink and rail, as are the City's motorway connections.

Historic Context

- 3.33 A significant amount of research and investigation has been undertaken to ascertain the historical and archaeological significance of the Site, both during the preparation of the wider NOMA Masterplan and through site assessments relating to the Proposed Development.
- 3.34 The Site itself is not located within a conservation area, nor are there listed buildings within the red line boundary. However, the Site is located within proximity to several conservation areas including Shudehill, Cathedral, Smithfield, and Ancoats Conservation Areas, and is located close to a number of listed buildings, principally associated with the NOMA historic estate.
- 3.35 The location of the listed buildings within 300m of the Site are shown within Figure 3.2.
- 3.36 These listed buildings include:
- New Century House and Hall, Grade II listed
 - Cooperative Wholesale Society, Corporation Street
 - CIS Tower, Grade II listed
 - Smithfield Market Hall, Grade II listed
 - Redfern Building, Grade II listed
 - Holyoake House, Grade II listed
 - 29 Swan Street, Grade II listed
 - Former Midland Bank, Grade II listed
 - Crown and Kettle, Grade II listed
 - Daily Express Building, Grade II* listed
 - Derros Building, Grade II listed
- 3.37 The Site also incorporates the footprint of the former Shudehill Mill, established by Richard Arkwright in 1780-3, and part of its associated engine houses. It sits across three NOMA development plots - the Site and Angel Gardens.
- 3.38 Whilst the Site is of immense historical importance, all physical remains were removed as part of a controlled and comprehensive archaeological excavation in 2015.

- 3.39 Further details on the historic environment and archaeological significance are contained within Section 7 of the Planning Statement, the Heritage Statement prepared by Stephen Levrant Heritage Architecture, and the Desk-Based Archaeological Assessment prepared by Salford Archaeology, submitted in support of the Planning Application.

Flood Risk

- 3.40 The Environment Agency has classified the Site as falling entirely within Flood Zone 1 (low probability), classified as a low risk of flooding from rivers and sea, with the land having between a 1 in 100 and 1 in 1,000-year annual probability of flooding (without mitigation).
- 3.41 The Site is currently used as a surface level car park and therefore produces no foul water discharge. It is understood that any previous connections to the combined sewers in Miller Street and Angel Street have been closed off.
- 3.42 The Site is not located within an area that has been identified as at risk of groundwater flooding.
- 3.43 The Site is not within a groundwater Source Protection Zone (SPZ) but is located within the Conurbation Core Critical Drainage Area.

Ecology

- 3.44 As confirmed by the supporting Ecological Survey prepared by ERAP Ltd in support of this application, there are no areas designated as being of ecological importance at the regional or national level on the Site or in the immediate locality. There are no sensitive areas located within the vicinity of the Site.
- 3.45 No records of protected or notable species are held for the Site.
- 3.46 The vegetation and habitats within the Site comprise areas of unmanaged vegetation (including unmanaged trees, scrub, and tall-herb vegetation), ornamental planting, and semi-improved neutral grassland.
- 3.47 The Site contains only common and widespread plant species. None of the habitats within the Site are of significant interest in terms of their plant species composition. None of the habitats present are representative of semi-natural habitat. No Priority Habitats are present.
- 3.48 There are 23 trees located on the Site including three individual trees and five groups of trees comprising:
- T1 - Common Ash (B – Moderate quality).
 - T2 – Sycamore (B – Moderate quality).
 - T3 – Leyland Cypress (C – Low quality).
 - G1 – x1 Goat Willow and x1 Sycamore (C – Low quality).
 - G2 – x2 Austrian Pines planted as part of the adjacent Angel gardens development (C – Low quality).
 - G3 – x3 Sweet Gum trees (C – Low quality).
 - G4 – x11 Apple trees (C – Low quality).
 - G5 – x2 Himalayan Birch trees (C – Low quality).

Planning History

- 3.49 A planning history search for the Site has been undertaken using MCC's Public Access system. The results of the search have identified the following planning permissions which are of relevance to the current application:

Table 3.1: Site Planning History

Reference No	Address	Description of Development	Status
129631/FO/2021	Land North Of Miller Street NOMA Manchester M4 4PR	<i>Erection of a single-storey marketing suite building (Sui Generis), including photovoltaics and related access, landscaping, bicycle parking, plant and servicing and associated works for a temporary period of up to 5 years.</i>	Approved 5 May 2021. Under construction.
124973/FO/2019	Land Bounded By Co-op Headquarters Miller Street And Angel Street Manchester	<i>Erection of an 11 storey building and a 12 storey building with plant rooms above to form a mixed use development comprising 39,184 sq.m (NIA) of Class B1a office use and commercial units of 1,286 sqm (NIA) (Use Classes A1, A2, A3, A4, B1a and D1) along with associated lower ground level car parking, hard and soft landscaping and associated works, including the creation of a new pedestrian route between Angel Street and Miller Street.</i>	Approved 12 Feb 2020. Not implemented. Permission expires 12 Feb 2023.
109865/FO/2015/N1	2 and 3 Angel Square, Ancoats, Manchester, M4 4FW	<i>Erection of a part 10 / part 11 storey, and a part 12 / part 13 storey building with plant rooms above to form a mixed use development comprising Class B1 office use (maximum of 49,622sqm) and commercial units maximum of 1,591sqm (Use Classes A1, A2, A3, B1 and D1) along with associated basement car parking, hard and soft landscaping and associated works, including the creation of a new pedestrian route between Angel Street and Miller Street.</i>	Approved 12 November 2015. Not implemented. Permission lapsed.

3.50 Evidently the Site benefits from an extant Planning Permission for the construction of an office-led development (Ref. 124973/FO/2019).

3.51 Aside from this, the results of the search have indicated that there are no relevant planning permissions on the Site, except for the temporary NOMA Marketing Suite which is currently under construction to the South of the Site, and which will be relocated upon construction of 3 Angel Square.

3.52 This reflects the long-term use of the Site as a temporary commercial surface car park; a use which detracts significantly from the quality of the environment in this area – a strategic regeneration priority and point of entry into Manchester City Centre.

The Proposals

Use and Amount

3.53 The Proposed Development is a mixed-use commercial-led scheme (Use Class Egi) comprising two buildings of lower and upper ground plus 11 and 12 storeys. It will comprise 44,525 sq. m (NIA) in total, including:

- 42,862 sq. m (NIA) of office floorspace including:
 - 176 sq. m (NIA) ancillary gym;

- 1,129 sq. m (NIA) of flexible office (Use Class Egi) and/or restaurant (Use Class Eb) space at Level 12;
- 592 sq. m (NIA) of flexible office and /or Sui Generis Use Class (t) Cinema space; and
- 1,663 sq. m (NIA) of flexible commercial retail floorspace across four units at lower and upper ground floor levels (Use Classes Ea, b, c, e, f, and / or Use Class Sui Generis (p) and (q)).

3.54 The proposals also include new public realm, car parking, cycle storage and changing facilities, and bin storage.

Scale

- 3.55 2 and 3 Angel Square have been designed to be in keeping with their surroundings including the nearby 1 Angel Square, the Linx Building on Angel Street and Angel Gardens. The buildings are of a scale that is appropriate to the City Centre context of the Site and surrounding developments, as well as the principles outlined within the endorsed NOMA Masterplan.
- 3.56 Given the level difference across the Site (from Angel Mews to Angel Square and from Miller Street to Angel Street) both buildings have a lower and upper ground floor plate.
- 3.57 2 Angel Square has a total of 14 storeys, which includes lower and upper ground floor levels and rises to 105.9 metres in height.
- 3.58 The roof for 2 Angel Square has been specifically designed to crown at the corner facing onto Angel Square, sloping down and dropping in scale towards Angel Street and the adjacent residential developments. The purpose of this is to minimise any potential amenity impacts, whilst retaining prominence alongside 3 Angel Square. This has also enabled the provision of an external terrace to the 12th floor. The roof has an internal and external plant room surrounded by a plant screen.
- 3.59 3 Angel Square has a total of 13 storeys, which includes lower and upper ground floor levels and rises to 102.3 metres in height. The roof of 3 Angel Square is proposed to be flat and has an internal and external plant room surrounded by a plant screen.
- 3.60 The upper ground floor of both buildings contains a covered inset plinth level, offering further amenity space and outdoor seating opportunities.

External Appearance and Materials

- 3.61 The external appearance for 2 and 3 Angel Square has been designed to be in keeping with its surroundings whilst providing a distinctive character that will stand out within Manchester City Centre and be seen as an attractive place for occupiers.
- 3.62 Critical to the design development of the two buildings has been ensuring that the best-in-class sustainability targets can be met, but without compromising on design quality. A key element of the façade treatment has therefore been managing the opportunities for solar gains through playing with the ratios of solid to glass across each elevation dependent on building orientation.
- 3.63 Winter Gardens add elements of relief into the façade and will include sliding glass panels which can be closed or opened to create interesting and likely seasonal variation in the façade.

Materials and Colour

- 3.64 The choice of materials proposed has also been carefully considered in terms of the site location and context, quality and their embodied carbon impact. The proposed material comprises high-quality terracotta tiles.
- 3.65 This material is not only high-quality and low in terms of embodied carbon but has an element of reflectivity which catches light and shadow and will create interesting movement across the façade dependent on how light will hit the buildings.
- 3.66 The two buildings have their own distinctive identity through the façade treatment and particularly through the colour of the proposed terracotta tiles chosen to echo the materiality of the adjacent neighbourhoods.

- 3.67 The façade for 2 Angel Square is proposed to comprise red terracotta tiles from 1st floor upwards, which reflects the red tones of buildings in the northern gateway neighbourhood and wider NOMA area.
- 3.68 In contrast, the façade for 3 Angel Square is proposed to comprise blue terracotta from 1st floor upwards, which reflects the materiality and tones of buildings within the listed NOMA estate to the south.
- 3.69 Following pre-application discussions with MCC, the project team have also considered how the horizontal elements are addressed on the façade to ensure that the terracotta tiles are the focus for the elevations. Options for the tone of the proposed sills are provided in the DAS in direct response to comments raised by MCC.
- 3.70 At Lower and Upper Ground Floor level, the concrete sub-structure is proposed to be exposed to soften the buildings into the adjacent landscaping to be delivered at the Site. The building entrances are proposed to be treated with terracotta tiles to match the façade.

Landscaping

- 3.71 The landscape proposals have been designed by Planit-IE and will form an integral part of the wider NOMA public realm. The landscape has been designed to feed seamlessly into the local green infrastructure, including the existing and proposed Angel Square public realm, Angel Meadow Park, the nearby Green Quarter, and further beyond to the Irk Valley.
- 3.72 There is a significant level change of circa 5.4m across the Site. The landscape design has therefore been developed in tandem with the architectural proposals to connect the landscaping seamlessly into the lower and upper ground floor levels. It has been designed to create clearly legible building entrances that address Angel Square.
- 3.73 The redline boundary has also been specifically drawn to ensure the provision of level access across the public realm and across towards the building entrances.
- 3.74 The significant level change between Angel Square and the Mews provides the opportunity to create a dynamic series of steps, pocket gardens and terraces that overlook the new square and create a desirable place for people to gather and meet. A series of green spaces with tree planting and a water feature will be woven through the terraces to provide an attractive setting, which better connects through from Angel Gardens to Angel Square.
- 3.75 An external lift is also proposed to provide access from the lower ground floor level to the upper ground floor level plinth to provide access for all between Angel Square and Angel Mews / Thread Street. This was considered the most feasible option as the gradient would necessitate an excessive level of ramped access.
- 3.76 Much of the landscaping on Thread Street / Angel Mews has already been delivered as part of the Angel Gardens development, alongside the first phase of archaeological interpretation.
- 3.77 Three further physical and one further digital node are proposed as part of this Proposed Development.
- 3.78 As part of this Proposed Development, landscaping to Thread Street proposes hard landscaping to tie seamlessly into that already delivered at Angel Gardens.
- 3.79 Thread Street will deliver a green corridor through the Site and forms an important part of the wider NOMA landscaping.
- 3.80 The address to Angel Street includes new proposed tree planting, which will provide a green boundary to the Site. Miller Street also comprises a range of tree planting, cycle storage, a smoking shelter, and decorative wind baffles designed sympathetically to provide an attractive street scene along Miller Street. A living wall is also proposed to the east of the elevation to soften the building edge to Miller Street.
- 3.81 The Trees to Angel Street and Miller Street are proposed within planters due to the location of below ground services that prevent tree planting in the ground.

- 3.82 The positioning of trees and planting throughout the public realm proposals has played a key role in providing mitigation to minimise wind impact across the Site as described further within the Chapter 7 of this Statement. Tree species in these key areas will contain wind tolerant evergreen species.
- 3.83 The Proposed Development incorporates a balance of high-quality hard and soft landscaping and throughout the design development of 2 and 3 Angel Square, consistency in materials, softworks and activity has been considered with the public realm around NOMA.
- 3.84 Further information about the proposed landscaping and materials can be found within the Landscape DAS submitted in support of the application.

Inclusive Access

- 3.85 The proposed scheme provides a safe, legible, high-quality environment that will be easily used by as wide a range of people as possible without undue effort, special treatment, or separation. The overall approach to the design will aim to meet the minimum access standards set by key regulatory and good guidance documents.
- 3.86 Further information on inclusive design can be found within the DAS submitted in support of the planning application.

Access and Servicing

- 3.87 The principle of providing a vehicular access point to the Site from Miller Street was defined in 2010 as part of the agreed highway works and Planning Permission for the realignment of the Inner Ring Road. The Angel Gardens development also utilises this access point.
- 3.88 There are separate servicing arrangements for 2 and 3 Angel Square. Servicing access to 2 Angel Square would be undertaken from the taxi pick-up / drop-off area for 1 Angel Square, accessed from Angel Street, whereas arrangements for 3 Angel Square would involve servicing taking place from the service yard to the south of Angel Mews, which is accessed from Miller Street.
- 3.89 The Applicant has confirmed that there are appropriate access rights in place to enable this.
- 3.90 Access to the buildings for pedestrians is provided from the existing Angel Square public realm and from the upper ground floor plinth level from Thread Street / Angel Mews.
- 3.91 Direct access to the cycle store within 3 Angel Square is provided directly from Miller Street, whilst access for the cycle store for 2 Angel Square is proposed from a door adjacent to the car access point through the car park.

Vehicle and Cycle Parking

- 3.92 The development will provide a total of 30 car parking spaces accommodated within 2 and 3 Angel Square, in the lower ground floor levels of the buildings. There will be 15 spaces within 2 Angel Square and 15 within 3 Angel Square.
- 3.93 Vehicular access to the car parking in 2 Angel Square will be from the existing 1 Angel Square taxi-drop-off and vehicular access to the car parking in 3 Angel Square will be from the servicing road accessed from Miller Street. This route will be shared with Angel Gardens.
- 3.94 Secure cycle parking will be provided across both buildings accommodating a total of 270 secure cycle spaces. There will be 122 cycle spaces within 2 Angel Square and 148 cycle spaces within 3 Angel Square. This is in addition to extensive facilities for cyclists and runners, including showers and changing areas.

Waste Management

- 3.95 The waste weekly arisings for the office uses have been calculated based on MCC's GD04 Guidance recommendations for offices of 2,600l per 1,000 sq. m of gross floor space. An initial recycling percentage of 60% has been estimated for calculation purposes. The recycling rate can be updated upon review of the actual recycling rates following occupation.
- 3.96 The retail uses have been assumed to be Food and Beverage (F&B) uses, as this typically generate more waste than any of the other retail and commercial classes. Therefore, the retail uses have

been based on the same local guidance, following the recommendations for Restaurants / Fast Food Outlets of 1,500l per 20 dining spaces.

2 Angel Square

3.97 The following bins would be accommodated for office use at 2 Angel Square:

- Non-recyclable Waste - 5 x 1100L
- Dry Mixed Recycling – 5 x 1100L + 1 x 660L
- Glass Recycling – 2 x 1100L

3.98 The following bins would be accommodated for commercial retail use at 2 Angel Square:

- Non-recyclable Waste - 3 x 1100L
- Dry Mixed Recycling – 3 x 1100L
- Glass Recycling – 1 x 1100 + 1 x 660L
- Organic Food Recycling - 1 x 1100L

3 Angel Square

3.99 The following bins would be accommodated for office use at 3 Angel Square:

- Non-recyclable Waste - 6 x 1100L
- Dry Mixed Recycling – 7 x 1100L
- Glass Recycling – 3 x 1100L

3.100 The following bins would be accommodated for commercial retail use:

- General Waste - 2 x 1100L
- Dry Mixed Recycling – 2 x 1100L
- Glass Recycling – 1 x 660L
- Organic Food Recycling – 1 x 660L

3.101 Waste collections have been calculated as 5 times a week for each building and both office and commercial retail uses as a worst case. Depending on final commercial retail use, this could be reduced to 3 times a week or less for the commercial retail uses. It is envisioned that this will be undertaken privately.

3.102 The management company would be responsible for moving the bins to the collection point on collection day. The waste operators will collect the bins and load them into the refuse vehicle. The collection point will be located along the proposed loading area for 2 Angel Square, as identified in the Waste Management Strategy.

Mitigating Against the Impacts on Climate Change

3.103 The revised proposals for 2 and 3 Angel Square are being brought forward to ensure the delivery of a scheme that is 'best-in-class' in terms of sustainability and net zero carbon. The vision for 2 & 3 Angel Square is for two highly sustainable, next generation commercial office buildings. As well as targeting Net Zero Carbon in both construction and operation, the design also conforms to the highest environmental targets and measurement criteria.

3.104 The Proposed Development goes beyond standard policy requirements, specifically those within the NPPF and Core Strategy, including Core Strategy Policies EN4 (Reducing Carbon Emissions by Enabling Low and Zero Carbon Development), EN6 (Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies), EN8 (Adaptation to Climate Change), EN14 (Flood Risk), and T1 (Sustainable Transport).

3.105 The key drivers for the revised proposals for 2 and 3 Angel Square comprise the following:

- BREEAM Outstanding as a minimum;

- NABERS 5 star as a minimum - This is ahead of the UKGBC's target on their Net Zero Carbon Pathway (which recommends targeting 4.5 stars);
 - FITWEL and Smart Tech enabled;
 - EPC A rating; and
 - Alignment with UKGBC pathway to Net Zero Carbon or better.
- 3.106 It is not considered that the Site or the proposal is particularly vulnerable to climate change. It is located within Flood Zone 1 and a Critical Drainage Area and so a standalone Flood Risk Assessment and Drainage Strategy will be submitted with the planning application, which will fully consider the impacts of climate change and present a proposed strategy for handling surface water drainage.
- 3.107 The baseline position of the site as a surface car park presents its own significant whole life net greenhouse gas emissions, with emissions from vehicle trips being much reduced as a direct result of the Proposed Development.
- 3.108 Nonetheless, from the outset, the project team have worked collaboratively to apply low carbon solutions (including technologies, materials, and products) to minimise resource consumption and embodied carbon during the construction and operation of the Proposed Development. A critical element of this has been the testing of construction options to ensure that the structure of the building is designed with full consideration of its potential impact on Climate Change.
- 3.109 The following measures are proposed to mitigate against the impacts of climate change:
- Reducing the environmental and social impact of the material used through BREEAM material, including using the Green Guide to Specification to compare the life cycle impacts of different façade options and undertaking material efficiency appraisal to explore opportunities to design out waste through the life of building.
 - The results from Building Regulations Part L calculations for the proposed buildings demonstrated that the design strategy has the potential to reduce the regulated carbon emissions by 42.9% for 2 Angel Square and 44.8% for 3 Angel Square over Part L2A 2013 utilising Low and Zero Carbon (LZC) technologies and so are sufficient to meet the planning requirements. This demonstrates that the scheme will easily meet the requirements set out in Core Strategy Policies EN4 and EN6.
 - The inclusion of roof-mounted photovoltaics (PV) to both 2 Angel Square and 3 Angel Square to generate electricity use for the buildings. The exact arrangement of the PV is subject to the detailed design stage, the details of which can be agreed through the condition discharge process.
 - The structural design of the building has been carefully assessed in terms of the impacts on embodied carbon, with the chosen solution representing the best option for minimising embodied carbon. All elements of the design, from the building structure, mechanical and electrical equipment down to the internal finishes, have been subject to extensive analysis to strip away unnecessary materials.
 - All externally exposed fabrics will be insulated to achieve U-Values surpassing the mandatory standards required by Part L. It is proposed that the building's envelope airtightness will be designed to high standards, minimising unintentional inward or outward leakage, and therefore reducing potential for excess heat losses during the winter months.
 - Thermal analysis has been undertaken and has informed the glazing percentage on each façade and orientation. The elevations subjected to higher solar gains have a lower glazing percentage, which allows:
 - more efficient mechanical plant;
 - less mechanical plant than comparable buildings with a larger glazing area (lower embodied carbon); and

- provision of double-glazed windows rather than triple-glazed windows (lower embodied carbon).
 - MEP systems have been selected using an options appraisal that considered embodied carbon and operational energy. Air Source Heat Pumps (ASHP) are proposed and provides heating and cooling at high efficiencies and ensures effectual delivery throughout the building distribution, minimising loss.
 - Energy Efficient LED lighting to incorporate automatic controls that respond to daylight and human presence to minimise the buildings electrical lighting load.
 - The buildings would be fully smart enabled using new technology. The design incorporates several innovative features to meet the highest standards of environmental performance and sustainability.
 - Minimal on-site car parking is proposed, with a net reduction in car parking on the Site because of the Proposed Development.
 - The Site is highly accessible by a range of sustainable transport options. 270 cycle parking spaces are proposed to be provided on the Site, with secure spaces, showers and lockers in the building and spaces in the public realm. The proposed landscaping will also improve linkages for pedestrians and cyclists across NOMA and through to the city centre and surrounding neighbourhoods.
 - The Proposed Development will introduce further initiatives to promote sustainable travel choices, including through the introduction of a Travel Plan. The Framework Travel Plan sets out a package of measures to reduce the transport and traffic impact of the Proposed Development, including the provision of public transport, walking, and cycling information.
 - The development seeks to reduce potable water demand by 40% against a baseline building through specification of water efficient sanitaryware. Construction site impacts will be managed through a construction management plan and BREEAM Policy EN17 (Water Quality).
 - An operational waste management strategy has been produced; waste streams and quantities have been estimated to ensure sufficient space for storage and collection, as well as opportunities to minimise waste and facilitate high recycling rates in line with Core Strategy Policy EN19 (Waste).
 - Construction impacts will be minimised through contractor compliance with BREEAM and using a detailed Construction Management Plan, required by a pre-commencement condition.
 - Ecosystems play an important role in regulating climate. They currently absorb roughly half of man-made carbon emissions. Biodiversity and ecosystem services help to adapt to and mitigate climate change. The provision of green infrastructure is integral to the Proposed Development and should improve biodiversity and enhance wildlife habitats in the urban area. There are opportunities for the green infrastructure to link to established wildlife corridors forming links between recent landscaping enhancement within the NOMA Framework Area and Angel Meadows, in line with Core Strategy Policy EN15 (Biodiversity and Geological Conservation).
- 3.110 The application is supported by an Energy Statement prepared by Buro Happold and an Environmental Standards Statement and a BREEAM Pre-assessment prepared by Mainer Associates. These documents set out in detail how the Proposed Development will incorporate sustainability measures, including energy efficiency and environmental design.
- 3.111 On the basis that significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050, the Proposed Development is envisaged to lead to negligible impacts on climate change.

Figure 3.1: Site Location Plan (Source: Cartwright Pickard)

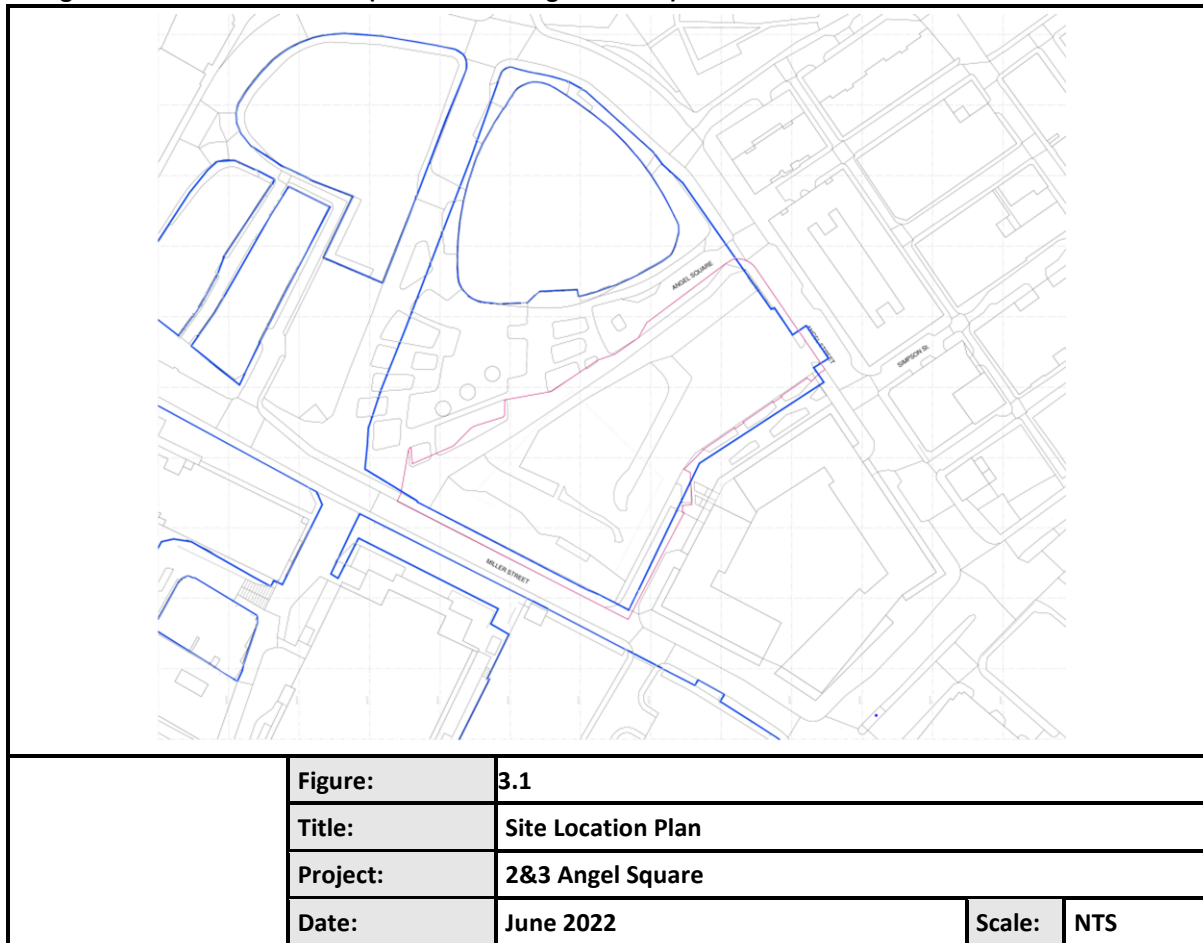
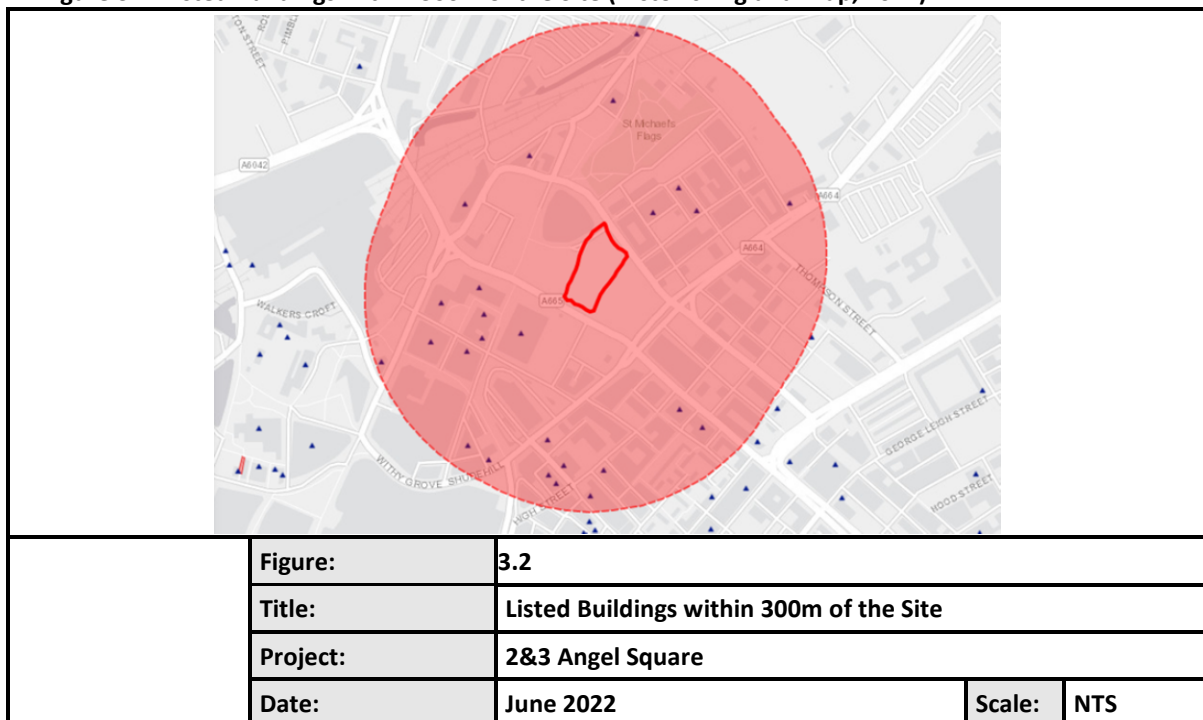


Figure 3.2: Listed Buildings within 300m of the Site (Historic England Map, 2022)



4 Consideration of Alternatives and Design Evolution

Introduction

- 4.1 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, considering the environmental effects.
- 4.2 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.
- 4.3 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.
- 4.4 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

- 4.5 The “do nothing” scenario refers to the option of leaving the Site in its current state, therefore a temporary surface car park.
- 4.6 The Site is subject to subject to the NOMA SRF, which was endorsed by Manchester City Council’s Executive Committee (most recently in 2020, having originally been endorsed in 2009 and updated in 2010, 2013 and 2015). The NOMA SRF identifies the Site as a strategic regeneration site for the delivery of new employment-generating uses.
- 4.7 It is also located in the City Centre Fringe, as referenced in the adopted Manchester Core Strategy which is identified as a focus for economic growth primarily for B1 Office use, in accordance with Policy CC1 (Primary Economic Development Focus: City Centre and Fringe).
- 4.8 The Site is also allocated for commercial / business uses under UDP Saved Policy HC10b.
- 4.9 Such high level political and policy support provides a very clear mandate in terms of delivering development within NOMA, which will support the next phase of growth in Manchester and enhance the City’s productivity in the process. In doing so, policy and guidance identifies that it should maximise the opportunities that NOMA presents in terms of delivering positive regeneration outcomes for the City’s communities. This translates into supporting a new high quality urban neighbourhood at NOMA for a mix of uses that is employment-led but includes a component of residential development and also enhancing physical connections between the city centre and existing communities to the north.
- 4.10 The principle of redeveloping the Site has been further established through the 2015 and 2020 planning permissions, which provided consent for office-led schemes of a similar scale and quantum. The 2020 permission remains extant until 30 September 2022.

- 4.11 The “do nothing” scenario has been discounted due to the established need for regeneration of the Site, and the potential socio-economic benefits it is anticipated to bring. The Site is considered suitable for the Proposed Development as it is brownfield land, strategically allocated, and suitable for commercial-led, mixed-use development in terms of its urban location and good transport links.

Consideration of Alternative Locations

- 4.12 The Site is an underutilised and large strategic site within a key area on the edge of Manchester City Centre. It is subject to the endorsed NOMA SRF (2020) (as noted at Paragraph 4.6).
- 4.13 In this context, alternative locations for regeneration within the city centre were considered at an earlier stage of the planning process, which has concluded that office use is an appropriate use for the Site.
- 4.14 The Site forms a natural extension to Manchester City Centre, providing space to support its continued growth, supporting new employment space and providing economic, regeneration, and employment benefits which will contribute to wider strategic aims of the region.
- 4.15 It is a highly accessible site located on brownfield land, previously in use for commercial purposes, and its selection for regeneration is supported by Manchester’s Development Plan and other planning guidance and policy documents at the national and local level, as discussed in the Planning and Tall Building Statement submitted in support of the planning application.
- 4.16 Therefore, this Chapter does not consider alternative sites within the context of the planning application, as the Site’s selection occurred beforehand through the policy-making processes.

Consideration of Alternative Uses

- 4.17 The Proposed Development will predominately be commercially led with the provision of Grade A office accommodation, which is in line with the requirements of the adopted NOMA SRF, the Manchester Core Strategy, and the Saved Policies of the UDP. The inclusion of retail, leisure and community units at ground floor level will serve existing and future occupiers of the Proposed Development and the wider area, contribute to the creation of a sense of community, and, will support wider place making objectives for the site. The NOMA Framework area promotes a mixed-use vision across the estate of which the commercial element within these proposals is an important part.
- 4.18 Given the size and strategic location of the Site, it was considered best to accommodate a mix of office (Use Class Egi) and commercial retail (Use Classes Ea, b, c, e, f, and / or Use Class Sui Generis (p) and (q)) uses that would increase the sustainability of the scheme, while also maximising wider social and economic benefits.
- 4.19 In its current use and density, the Site represents an underutilised site in a strategically important location.
- 4.20 Whilst there are high levels of demand for new residential use within the City Centre, the adjacent Angel Gardens site has recently delivered a significant number of new homes and provides an appropriate level of residential uses within the mix in this area, taking into account that it has always been envisaged as employment led through successive policy documents. There are also several residential-led schemes under construction in the wider area, including at Angel Meadows and New Cross and further planned residential development in the pipeline for the Northern Gateway.
- 4.21 For the reasons above, alternative uses were discounted as the proposed commercially led, mixed-use development contributes to the Site’s viability and deliverability. The employment uses and public realm provision will provide an important asset to the local and regional community.

Consideration of Alternative Designs

- 4.22 The design responds to the endorsed NOMA SRF, which identifies that the Site can accommodate two new office buildings that should provide an appropriate response to their surroundings, including 1 Angel Square, the Linx Building and Angel Gardens. The Proposed Development presents an appropriate layout for the Site, which will enable the objectives of the NOMA SRF and planning policy to be achieved whilst responding to the existing site and conditions.

- 4.23 It is also informed by the history of the Site as the former location of Arkwright’s Shudehill Mill and the need to provide an appropriate public realm design that allows for commemoration of this significant heritage consideration, including using archaeological interpretation measures.
- 4.24 The scale and massing of the design responds to the requirement to achieve large floorplates with an overall quantum of floorspace that will meet occupier demand and make a significant contribution towards the objectives of the NOMA Masterplan and Manchester Core Strategy, whilst being of a scale that responds sensitively to the existing context including nearby listed buildings and residential development.
- 4.25 The Angel Gardens development to the east and the protection of existing public realm to the west have informed the relationship of building edges that front Miller Street and Angel Street, along with the spatial arrangement of Angel Mews / Thread Street.
- 4.26 NOMA Framework area-wide infrastructure requirements have also influenced the final layout of the Proposed Development, through the establishment of perimeter corridors for buried services, which will also serve Angel Gardens.
- 4.27 The DAS submitted in support of the planning application provides the design justification for the Proposed Development and the design-options, particularly in relation to scale and height that were considered in the context of surrounding sensitive uses.
- 4.28 The revised scheme is largely consistent with the proposals approved under the 2015 and 2020 Planning Permissions. The key changes relate to design and offer enhancements in response to the changed market and occupier demands, particularly with regards to sustainability targets.
- 4.29 The updated proposal aims to meet the following key environmental standards:
- BREEAM Outstanding - the highest score for the measure of sustainability of a building, meaning that it will be in the top 1% of UK new non-domestic buildings in terms of sustainability.
 - NABERS 5 Star (Excellent Rating) as a minimum.
- 4.30 The design approach has also been improved to ensure that both 2 and 3 Angel Square are comparable in scale and prominence, whilst providing buildings of greater character and architectural merit. The challenge with which the design team have overcome is to address the Site levels effectively whilst providing active ground floor uses across the Site.
- 4.31 Overall, the Proposed Development proposes a slight increase to the overall quantum of development and comprises 56,732 sq. m (GIA), which compares to the previous 2015 scheme which proposed to deliver 55,257 sq. m (GIA) and the 2019 schemes which proposed to deliver 53,835 sq. m (GIA).
- 4.32 The Proposed Development will therefore allow the development of this underutilised site and represents an opportunity to continue the regeneration of this part of Manchester; with a particular emphasis on providing ‘best-in-class’ sustainable development.
- 4.33 Several design refinement options and proposals have been considered by the design team prior to settling on the final design presented within this application.
- 4.34 This includes a cut-back at roof level of 2 Angel Square, with the tallest element crowning to address Angel Square effectively. The refined massing has sought to minimise any potential impacts in terms of daylight and sunlight on nearby sensitive receptors, particularly the Linx building north of Angel Street.
- 4.35 Further information regarding the design evolution and justification for the Proposed Development is provided within the DAS and Landscape DAS, which accompanies this application.

5 Phasing Strategy and Construction Methodology

Introduction

- 5.1 The Construction Management Plan 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 the relevant sections of the ES and standalone technical reports.
- 5.2 The following text explains the proposed methodology and approximate timescales envisaged at time of planning application prior to developing more definitive proposals alongside a selected contractor. This will include preparation of detailed plans to incorporate construction management, construction phase health and safety, environmental management, site waste management and traffic management.

Phasing

- 5.3 At this stage it is not yet known how the delivery of the Proposed Development might be phased; there are several potential scenarios that could arise dependent on the requirements of future occupiers. These scenarios are outlined below:
- Scenario 1: 2 Angel Square delivered first; or,
 - Scenario 2: 3 Angel Square delivered first; or,
 - Scenario 3: Both buildings delivered concurrently.
- 5.4 A Phasing Plan has been prepared by Cartwright Pickard in conjunction with the Applicant and project team (Drawing Ref. 947-CPA-ZZ-00-DR-A-0150). The Phasing Plan identifies the extent of development, including public realm, which would be delivered in Scenario 1 and 2; it has been used to form the completion of the EIA and other technical assessments.
- 5.5 In Scenario 3, the public realm would be delivered in full.
- 5.6 The most likely scenario is that 2 Angel Square would be delivered first, and, in such scenario, a temporary public realm scheme has been developed that has been coordinated with the proposed underground tanks that are required as part of the Proposed Development (attenuation, sprinkler and wet riser).
- 5.7 It is proposed that there is a planning condition attached to any Decision Notice enabling the Proposed Development to be delivered in phases by reference to Drawing Ref. 947-CPA-ZZ-00-DR-A-0150 and that the wording of conditions is drafted to allow discharge in respect of each phase.
- 5.8 It is also proposed that there is a planning condition attached to any Decision Notice enabling an interim public realm and boundary treatment to be agreed with the LPA in the event of Scenario 1 or 2 being delivered; this may include temporary planting or hoarding, with the use of appropriately designed hoardings.

Programme

- 5.9 In anticipated construction programme for the most likely scenario, Scenario 1, is provided in Table 5.1 below. It is not yet possible to define a programme for the completion of both buildings.

Table 5.1 Anticipated Construction Programme for Scenario 1

Site Preparation and groundworks	Jan 2023
Piling	Feb 2023
Substructure	March 2023
Superstructure	October 2023

Site Preparation and groundworks	Jan 2023
Façade Construction	April 2024
Internal Fit-Out	May 2024
Completion of the Works & De-mobilisation	Jan 2025

- 5.10 This is based on normal working hours of 07:30 to 18:00 Monday to Friday, 08:30 to 14:00 on Saturday and with deliveries within the same period. Occasional weekend work is anticipated such as moving materials within the Site to create space to ease deliveries and traffic congestion on the following weekdays.
- 5.11 Where works are required to be completed which sit outside such working hours restriction, the main contractor will be required to seek approval from Manchester City Council and provide a mail shot to local residents explaining the need to work out of hours, the type of work to be completed and the likely duration of such works.
- 5.12 The main contractor will be required to produce and distribute a monthly newsletter to all adjacent residential and business properties updating on progress to ensure that the local community are kept up to date with the works.
- 5.13 It is noted that residential premises are sited close to the development site and this methodology will be followed by the appointed contractor to protect residential amenity.

Building Overview

- 5.14 The substructure for both 2 and 3 Angel Square will be confirmed at detailed design stage. It is likely the that the building will comprise a reinforced concrete frame with flat slabs forming the suspended floors. Reinforced concrete columns arranged in a regular grid pattern, along with reinforced concrete cores, support the slabs.
- 5.17 The core to 2 Angel Square is set against the eastern elevation of the building, whilst the concrete core for 3 Angel Square comprises a central core. For the construction of each building the cores which will be in-situ concrete erected via either slip or jump-form shutter systems. The core to 2 Angel Square rises to roof level at Level 12, whilst the core to 3 Angel Square rises to Level 11.
- 5.18 The exact nature of the superstructure will be confirmed at detailed design stage. It is likely the that the building will comprise a reinforced concrete frame with flat slabs forming the suspended floors. Reinforced concrete columns arranged in a regular grid pattern, along with reinforced concrete cores, support the slabs.
- 5.19 The details of the material of the building envelope have not yet been selected, but we assume this will comprise of terracotta tiling. Final materials will be agreed via the condition discharge process.

Site Logistics

Access / Egress / Compounds

- 5.20 There are several potential permutations of site boundaries and associated logistics depending on the sequence of delivery of the buildings. We have summarised these in the following section: indicating likely access / egress for site and location of compounds / site storage.
- 5.21 It is noted that these are subject to development by an appointed Main Contractor and agreement with relevant statutory bodies (where temporary pavement closures may be required). Once a contractor has been appointed a detailed Construction Environmental Management Plan will be submitted which will include a detailed final Construction Logistics Plan.

Option 1: Construction of No 2 Angel Square prior to No 3 Angel Square

- 5.22 The most likely construction scenario will be for the delivery of 2 Angel Square in advance of the commencement of construction of 3 Angel Square. Where No 2 is being built ahead of No 3 access and egress from the Site will be from Miller Street. The site designated for development of No 3 will form the site compound consisting of welfare, offices and storage for plant and materials. The gates into and out of the Site will require a banksman to control flow of deliveries and to prevent queuing

onto Miller Street. Given that this is the most likely scenario, a Construction Logistics Plan has been prepared as shown in Figure 5.1.

Option 2: Construction of No 3 Angel Square prior to No 2 Angel Square

- 5.23 Where No 3 is being built ahead of No 2 access and egress from the Site will be from Angel Street. The Site designated for development of No 2 will form the site compound consisting of welfare, offices and storage for plant and materials. The gates into and out of the site will require a banksman to control flow of deliveries and to prevent queuing onto Angel Street.

Option 3: Construction of No 2 Angel Square and No 3 Angel Square in Single Phase

- 5.24 Where No 2 and No 3 are both built under a single-phase access into the Site for material deliveries would require temporary pavement closures to either Angel Street or Miller Street (or Both) to allow vehicles to be able to pull into the Site (within the hoarding) for unloading / loading. Materials would be required to be delivered to an off-site holding area and taken to site on a 'just in time' manner. The main site compound for welfare, offices and storage would be off-site.

Option 4: Construction of No 3 Angel Square following completion of No 2 Angel Square

- 5.25 Where No 3 is built following the completion of No 2 access into the Site for material deliveries would require temporary pavement closures to Miller Street to allow vehicles to be able to pull into the Site (within the hoarding) for unloading / loading. Materials would be required to be delivered to an off-site holding area and taken to site on a 'just in time' manner. The main site compound for welfare, offices and storage would be off-site. Given that this is the most likely scenario, a Construction Logistics Plan has been prepared as shown in Figure 5.2.

Option 5: Construction of No 2 Angel Square following completion of No 3 Angel Square

- 5.26 No 2 is built following the completion of No 3 access into the Site for materials deliveries would require temporary pavement closures to Angel Street to allow vehicles to be able to pull into the Site (within the hoarding) for unloading / loading. Materials would be required to be delivered to an off-site holding area and taken to site on a 'just in time' manner.

Sites adjacent to Angel Square in NOMA Ownership

- 5.27 The areas shaded blue across in Figure 5.3 are areas of land that sit within the NOMA ownership and may be made available (subject to progress of adjacent developments) for off-site compounds and storage areas in consideration of options 3, 4 and 5 above.
- 5.28 In all options the site hoarding at the entrance into the Site will be set back such that wagons can be taken off the main highway into a holding area at the site entrance for booking in and vehicle checks. The Main Contractor will be required to provide wheel wash points at the exit station to prevent the spread of mud from the Site onto the public highway. In addition, regular road cleaning will be required from the main contractor to maintain the condition of the highway. All the above options would be subject to approval by the Highways Authority and a detailed proposal shall be submitted by the main contractor for consideration upon appointment.
- 5.29 In all options the Site will be secured by a closed boarded timber hoarding positioned at the Site perimeter. The hoarding will provide security to the Site with gated entrances manned during the working hours and locked out of working hours. The Site will operate an access permit system at both pedestrian and vehicular entrances policed by security staff. The Site will have a CCTV and/or utilise a fully monitored CCTV system back to a control room.

Summary of Key Works

- 5.30 The Site works will require a bulk excavation of the area where the offices will be located to reduce the levels and create basements.
- 5.31 Where the construction of 3 Angel Square is proposed to commence the temporary Marketing Suite will be dismantled and re-located elsewhere within the NOMA estate. The internal timber finishes, external timber CLT frame & cladding along with the MEP systems have been designed to be class leading in sustainability which includes the ability to be fully demountable for relocation at a future point in time.

- 5.32 The NOMA Marketing Suite will remain in place where 2 Angel Square commences construction in advance of 3 Angel Square.
- 5.33 No works will commence until the site has been fully secured and hoarded off from the public.
- 5.34 The appointed Main Contractor will carry out the following construction works for the Proposed Development:

Sub-structure

- 5.35 Subject to the detailed sequencing (to be confirmed upon Main Contractor appointment) the envisaged general construction sequence will typically be rock socketed CFA piles forming the foundations with a contiguous piled wall to address site levels. The following substructure activities are anticipated:
- Form piling mat at upper ground level for installation of contiguous piled retaining wall
 - Install contiguous piled wall, crop piles, fix capping beam reinforcement and cast capping beam
 - Undertake bulk excavation dig to reduce the levels in the location of the proposed development and remove any excess material from the excavation to a registered waste disposal site
 - Form lower ground piling matt for foundation piling
 - Undertake CFA piling forming the building foundations
 - Excavate the pile caps and crop the top of the piles, install the foundation formwork and steel reinforcement, and pour the concrete pile caps and core piled rafts.
 - Install below ground drainage, ductwork, and form any below ground builders works for cable routes

Super-structure

- 5.36 The exact nature of the superstructure will be confirmed at detailed design stage. It is likely the that the building will comprise a reinforced concrete frame with flat slabs forming the suspended floors. Reinforced concrete columns arranged in a regular grid pattern along with reinforced concrete cores support the slabs. The following superstructure activities are envisaged:
- Fix core wall reinforcement and Install formwork system to form the cores (likely to be either jump form or slip form rig)
 - Begin concrete pouring for the core, fixing reinforcement and moving the upwards as the lower sections are completed
 - Once core is well progressed, fix reinforcement for lowest level of columns, fix formwork, and cast
 - Install formwork for lowest suspended floor, fix reinforcement and cast slab
 - Continue moving up the floors, installing columns and floor slabs. Formwork to be stuck when concrete has cured and slabs to be propped until sufficient strength gain to span independently.

Envelope

- 5.37 The details of the material of the building envelope have not yet been selected, but we assume this
- 5.38 will comprise of terracotta tiling. The roof system is likely to be a monolithic, liquid applied, fully bonded membrane 'inverted' roof covering system with loose laid ballasted insulation, and the plant room and lift housing are anticipated to be constructed with insulated cladding panels.

5.39 The following methodology remain to be confirmed, but are anticipated to comprise:

- The concrete circulation core will be constructed in its entirety from basement level to the roof level.
- A tower crane will be erected on-site for duration of the superstructure and envelope works. A mobile crane may also be used to construct some parts of the structure.
- The building envelope units and glazing units are expected to be lifted into position using the tower crane and potentially a mobile crane at the lower section of the building. Operatives will fix.
- The roofing material will be lifted onto the roof via the tower crane, and operatives will complete the roof construction from at roof level.
- On completion of the roof and building envelope, the roof top plant will be lifted into place and the tower crane will be dismantled.

Building Services and Internal Finishes

5.40 The internal finishes will also be transported to each floor via the internal passenger lifts. The office building will be completed to a Grade A office specification.

Final Stages of the Works

- 5.41 The final element of the works will be the completion of the public realm works. Some of these works will have to be undertaken outside the site hoarding line. In these situations, a hedges fenced area will be required to safeguard the public from the work areas.
- 5.42 Testing and commissioning of the building services and snagging of works will be ongoing up until the practical completion of the project.
- 5.43 The site establishment will be de-mobilised following the practical completion of the building and the external works.

Infrastructure

- 5.44 Drainage Connection to mains outside the Site (subject to approvals from Environment Agency).
- Installation of all site attenuation and SuDS features in accordance with approved plans
 - Installation of sites foul sewer network.
 - Water, Gas and Power connections into new service corridor installed on Miller Street (spare manholes and spurs have been provisioned).
 - Telecommunications infrastructure connections into new existing and private supplies within the Miller Street service corridor. Provisions and boxes designed in to accommodate future developments.

Traffic Management

5.45 Traffic Management Plan will be prepared to address the following issues:

- Management procedures.
- Integration of traffic management with other projects on-going in the area (NOMA and MODA).
- Access, egress and turning points.

- Temporary or permanent alterations to local traffic routes (vehicle and cycle).
- Additions or alterations to signage and road markings (incl. pedestrian crossings).
- Temporary suspension of existing parking bays.
- Temporary re-location of existing bus stops.
- Safe maintenance of existing designated cycle lanes.
- Segregation of vehicles and pedestrians on site.
- Car parking.
- Loading bays.
- Any other measures to ensure the safe movement of pedestrians and vehicles, both on and off site.

5.46 In preparing the Traffic Management Plan, the Contractor will be required to consider:

- A site delivery booking system.
- Pre-fabrication to assist in reducing deliveries.
- A materials transportation plan to include a methodology for deliveries, unloading and distributing materials.

Deliveries

- 5.47 It is proposed that there will be a delivery vehicle gate for ingress and egress into the site compound area from Miller Street.
- 5.48 There will be a delivery vehicle and personnel gate into the construction area from Miller Street. This gate will be secured overnight.
- 5.49 Personnel routes to and from the Site will be via the existing public footpath on Thread Street or Angel Gardens.
- 5.50 All unloading of plant and material will generally take place inside the site hoarding line within the site compound area.
- 5.51 It is anticipated that there will be an average of approximately 15 deliveries per day (based on 10 hour working day), with deliveries taking place in a 'just-in-time' manner.
- 5.52 Delivery routes for the delivery of large items of construction plant (tower crane sections, piling rigs, etc.) and building components (steelwork, M&E plant, etc.), will be discussed and agreed with Manchester City Council Highways Department, with operations undertaken during agreed periods, to minimise disruption to local traffic, and the normal workings of the surrounding properties.

Parking

- 5.53 There will be no on-site parking available. Site personnel will instead be encouraged to utilise local public transport when travelling to site.
- 5.54 Site operatives will be required to park their vehicles at one of the several public car parks which are situated around the NOMA development. In addition, site operatives will also be encouraged to use the local public transport provision (such as Victoria Train Station, Shudehill Bus Station, and Shudehill Tram stop).

Health and Safety

Construction (Design and Management) Regulations

- 5.55 The project will be completed in accordance with the Construction (Design and Management) Regulations 2015 and all other relevant legislation.

- 5.56 The Client will appoint a Principal Contractor who can demonstrate adequate competency in the management of health and safety, and who also have the correct management procedures in place to control the activities of a complex construction project.
- 5.57 The Principal Contractor will be appointed early in the construction process so that he is involved in the planning of the project and could influence the detailed design to remove residual safety risks.
- 5.58 The Principal Contractor will be required to produce a Construction Phase Health and Safety Plan prior to work commencing on-site. 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

- 5.59 There have been no deleterious materials identified at this stage of the design process which are considered to generate a risk to construction personnel who will be unfamiliar to an experienced contractor. The hazards arising from the use of wet cement, epoxy resins, solvent based paints can be expected and appropriate measures to minimise any risk will be a requirement of the main contractor.

Site Security and Safety

- 5.60 Protecting members of the public from risks to their health or 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 the erection of perimeter fencing to a specified standard, will be taken.
- 5.61 Vandalism to plant, equipment, materials, and the works is possible. The Principal Contractor will be required to take appropriate action to ensure the site is always secure from unauthorised access. The site will be fully secured based on an access permit system and security staff at vehicular entrances. The site will have a CCTV system provided and will implement a mentoring regime. Proposals for site safety and security will form part of the Principal Contractors initial development of the Health and Safety Plan.

Community Engagement

- 5.62 Where it is necessary to carry out noisy activities these will be carried out in accordance with Local Authority requirements, and neighbouring residents and businesses will be given advance notice of any anticipated periods of increased noise levels.

Environmental Considerations

- 5.63 To ensure that suitable contractors are appointed, all potential contractors will have their environmental credentials vetted, and be asked to submit their company Environmental Policies and Procedures.
- 5.64 An Environmental Plan will be developed to address and monitor the following issues:
- Applicable environmental legislation
 - Pollution
 - Nuisance
 - Ecology
 - Archaeology
 - Public Relations

Applicable Environmental Legislation

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

Pollution

5.66 In conjunction with the Environment Agency, Manchester City Council and United Utilities, a plan will be prepared setting out mitigation strategies and controls to be adopted during construction for surface water disposal and protection of local water courses. The plan will be prepared with reference to the recommendations set out within the Environmental Statement. The plan will identify protection measures where there is a perceived direct risk to water courses due to a construction activity, such as:

- Piling.
- Earthworks (including stockpiling of spoil, and movement/storage of contaminated soils). Dewatering of excavations.
- Concrete works (including washing out concrete delivery vehicles).
- Storage and movement of fuels, oils, and chemicals.
- Cleaning (including plant/machinery and wheel washing).

Nuisance

Noise

5.67 All reasonable steps will be taken to minimise any noise disruption to adjacent businesses and residential properties. Where it is necessary to carry out noisy activities, these will be identified well in advance by the Main Contractor and the timing agreed prior to commencement.

5.68 The following procedures are expected to be followed by the appointed contractor.

- 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.
- Most 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 minimise disturbance to 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

5.69 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

5.70 It is considered that adopted measures such as this and using considerate construction techniques, the impacts of noise generated from construction activities can be reduced.

5.71 During the tender process, all contractors will be required to consider the impact of their proposed working methods on the neighbouring properties and will be asked to provide details of mitigation

proposals that they employ. Furthermore, the main contractors will be required to confirm their compliance with best practice as set out in section 72 of The Control of Pollution Act 1974 along with compliance as appropriate with BS 5228. Such documentation sets out control measures to minimise noise and vibration at source by using effective acoustic enclosures, temporary screens and barriers and ensuring regular maintenance of plant and equipment.

- 5.72 Where it is necessary to carry out noisy activities these will be carried out in accordance with Local Authority requirements, and neighbouring residents and businesses will be given advance notice of any anticipated periods of increased noise levels.

Vibration

- 5.73 The most likely source of vibration during the construction works will be piling. It is currently proposed the building has piled foundations.
- 5.74 It is usual to expect levels of vibration to fall between generally accepted limits for residential and commercial limits of 1 and 3mm /sppv respectively at the nearest buildings. This will need to be verified and suitable limits agreed with Manchester City Council before works commence.
- 5.75 It will be a requirement of the main contractor to comply with the guidance set out in BS 5225 Part 4 and to comply with the agreed levels. The main contractor will be required to demonstrate compliance to the agreed levels via site monitoring.

Air Quality

- 5.76 The sources of dust and emissions during construction will be via:
- Site excavations.
 - Vehicle movements to and around the site.
 - Dust blown from stockpiles of spoil / earth.
 - Materials handling during movement to and from stockpiles.
 - Site based crushing should this be required.
 - Construction operations – pouring concrete / screeds etc.
- 5.77 Due to the nature of construction site activities, the control of dust emissions will rely upon good management provisions, good site planning to provide (to the best of the contractor's ability) separation between source and receptors, the use of wetting agent applications to prevent dust from becoming airborne and the use of screens to limit the spread of dusty materials.
- 5.78 The weather conditions also contribute to the effects of dust emissions. As a result, it is difficult to predict accurately when dust emissions may be most problematic. It is rare to experience recurrent dust nuisance beyond 200m in urban locations. The prudent use of water application, screening and good site planning and management will ensure effective dust control consistent with good practice and the standards expected of a major construction site. The use of wheel wash facilities will be of particular importance in periods of wet weather to prevent mud transferred off-site drying and becoming a source of dust emission.
- 5.79 The following measures will be implemented:
- Using water sprays to maintain damp surfaces during dry weather.
 - Place dust raising equipment away from site boundaries and sensitive receptors.
 - Keep stockpiles for the shortest time possible and covered during dry spells where possible.
 - Minimise unnecessary handling of materials.
 - Seeding surfaces of completed mounds where applicable.
 - Sheeting of lorries during transportation of construction materials and spoil export.

- Enclosing or covering all containers to prevent escape of dust and waste materials during loading and transfer.
 - Providing wheel washing for all vehicles on leaving the site.
 - Construction of wind fences and/or hoardings at the site perimeter or around dust sources.
- 5.80 Considering the potential impacts of emissions from construction traffic and plant several mitigation methods could be applied to minimize the exhaust emissions, which include:
- Requiring the use of reasonably new vehicles which conform to Euro II standards as a minimum
 - Ensuring that all construction plant and equipment is maintained in good working order and not left running when not in use
 - The planning of deliveries to be outside the peak rush hour demands thereby reducing the amount of standing time and avoiding adding to congestion
 - Adopting off site assembly where possible to minimize the number of road miles by construction traffic
 - The use of local sub-contractors, suppliers, and labour where possible to minimise the distance travelled to site and hence the emissions produced
- 5.81 Construction traffic movements will be controlled by a Construction Traffic Management Plan to minimise the effects of traffic on the local highway network through appropriate routing of vehicles and delivery schedules.

Lighting

- 5.82 The use of artificial light during construction will be controlled to reduce the impacts on the surrounding residential properties.
- 5.83 All lighting relating to the construction works and site accommodation will be installed in locations/positions to avoid any light spillage/glare onto the public highway or into neighbouring properties. Any lighting to the site work areas will be switched off for the non-working hours, and the only lighting potentially left on overnight will be to fire evacuation routes and circulation routes.
- 5.84 The site hoarding line may require the inclusion of low lux level lighting in locations where the hoarding line may front onto the public highway. This lighting will only be illuminated in the dark autumn nights and overnight.

Ecology

- 5.85 The Site is currently used as a surface car park and no significant ecological value has been identified on the site. An Ecology Survey illustrating this has been completed and is submitted with the planning application. It is intended that all trees on the Site will be removed for the works to proceed; no trees on-site are subject to Perseveration Orders and the Site is not located within a Conservation Area.

Archaeology

- 5.86 The Applicant has completed detailed archaeological investigations and excavations on-Site in agreement with Manchester City Council, GMAAS and Historic England and a report containing recommendations is contained within the planning application supporting information.

Public Relations

- 5.87 The Contractor will make regular progress updates either as a leaflet drop to adjacent properties or via the 'NOMA Engage' online website. Under the Considerate Constructor's scheme, and in accordance with the target BREEAM standards, the contractor will be required to maintain regular dialogue with neighbours and provide regular updates on site progress and logistics.

- 5.88 Risks of noise, dust and air pollution will be considered for each proposed activity and associated mitigation measures will be implemented.

Construction Site Waste Management Strategy

General Provision

- 5.89 The Main Contractor appointed for the works will be responsible for the management of waste on the site. In general, the principles of the waste management hierarchy will priorities waste minimisation, re-use of materials and recycling over disposal to landfill.
- 5.90 The disposal of waste, including any surplus spoil, will be managed to maximise the environmental and development benefits from the use of surplus material and to reduce any adverse environmental effects of disposal.
- 5.91 Contractors will comply with the statutory requirements of the Environment Agency. They will obtain any necessary licenses for the storage, treatment and disposal of waste and will use registered waste carriers or seek registration as a waste carrier.
- 5.92 Producers of waste (the party doing work that gives rise to waste) are responsible for ensuring waste is properly classified as either inert, hazardous, or non-hazardous and is sent to a facility that has an appropriate license to deal with the waste.
- 5.93 Under the Environmental Protection Act 1990 and associated regulations, the Main Contractor and all trade contractors producing waste will have a Duty of Care to ensure waste is properly disposed. This means waste must be removed by a licensed carrier and disposed of at a facility which is licensed to accept the material.
- 5.94 A Site Waste Management Plan (SWMP) will be prepared as part of the condition discharge process and deals with the management of waste during the design and construction phases of the development. It will be a live document that will be initiated at the later pre-construction stage of development on instruction by the Client. This document will be maintained and updated by the Main Contractor as the project progresses and will be finalised within one month of the project's practical completion. The preparation of a SWMP will be completed prior to works commencing on site. However, the following approach will be applied:
- All construction waste will be segregated in separate recycling skips and will be stored in the locations indicated on the enclosed plan. A registered waste company will be employed to remove the recycle skips every 1-2 days to avoid the build-up of waste and thereby eliminating the risk of attracting vermin.
 - Bulk excavation material will be transported to an appropriate licensed disposal facility where the material can be re-used rather than sent to landfill. Litter will not be allowed to accumulate around the site perimeter.

Waste Minimisation and Monitoring

- 5.95 Waste producers will identify categories and quantities of waste generated. Opportunities for reuse, recycling or use by third parties will be investigated to maximise the environmental and development benefits and to reduce the adverse effects of disposal.
- 5.96 Waste will be segregated and clearly labelled to maximise these opportunities. Handling and Disposal of Waste will be segregated to maximize reuse, recycling, and opportunities for use by third parties. This is not an explicit requirement but represents good practice and therefore contractors working on the project will follow this principle except where space does not permit and where the contractor has obtained approval from the Principal Contractor to deviate from this policy. As a minimum, legal obligations to segregate waste into hazardous and non-hazardous waste will always be observed.
- 5.97 To encourage proper segregation of waste, signage / colour coding will be used. Control measures may be required for the storage of waste, which is contaminated. Liquid wastes will be stored within a bunded area and clearly labelled. Liquids of a hazardous nature should also be controlled in accordance with Control of Substances Hazardous to Health (COSHH) regulations.

- 5.98 Where hazardous materials such as asbestos and lead are encountered on site and require disposal, works will be undertaken in accordance with Health and Safety legislation and HSE guidance notes. The Contractor will ensure that the requirements of the Environmental Protection (Duty of Care) Regulations 2014 are met. A consignment note in accordance with the Hazardous Waste Regulations will accompany any hazardous waste. Waste transfer notes and consignment notes will be held by the Contractor for a minimum of three years and made available for inspection by the relevant authorities on request.

Worksite Housekeeping

- 5.99 Control measures will include:
- All contractors are to ensure that the Site is left in a clean and tidy state at the end of each day. All surplus materials and waste are to be transferred to the appropriate waste management area for processing.
 - The Principal Contractor will ensure that any worksite fencing, and hoardings will be maintained to comply with site conditions.
 - All contractors are to ensure that toilets, offices, and canteen areas are always kept clean and tidy.
 - All vehicles leaving the Site will not carry debris on to the public highway.
 - All contractors will ensure that building materials and equipment are stored and used in accordance with health and safety requirements and that chemical drums, fuels, oils, and the like are stored upright, and properly sealed when not in use in designated, properly bunded and protected storage areas.
 - In the event of any spillage of diesel, fuel, oil, or chemicals the sub-contractor will clean up the spillage immediately.

Figure 5.1: Construction Logistics where Construction of No 2 Angel Square occurs prior to No 3 Angel Square

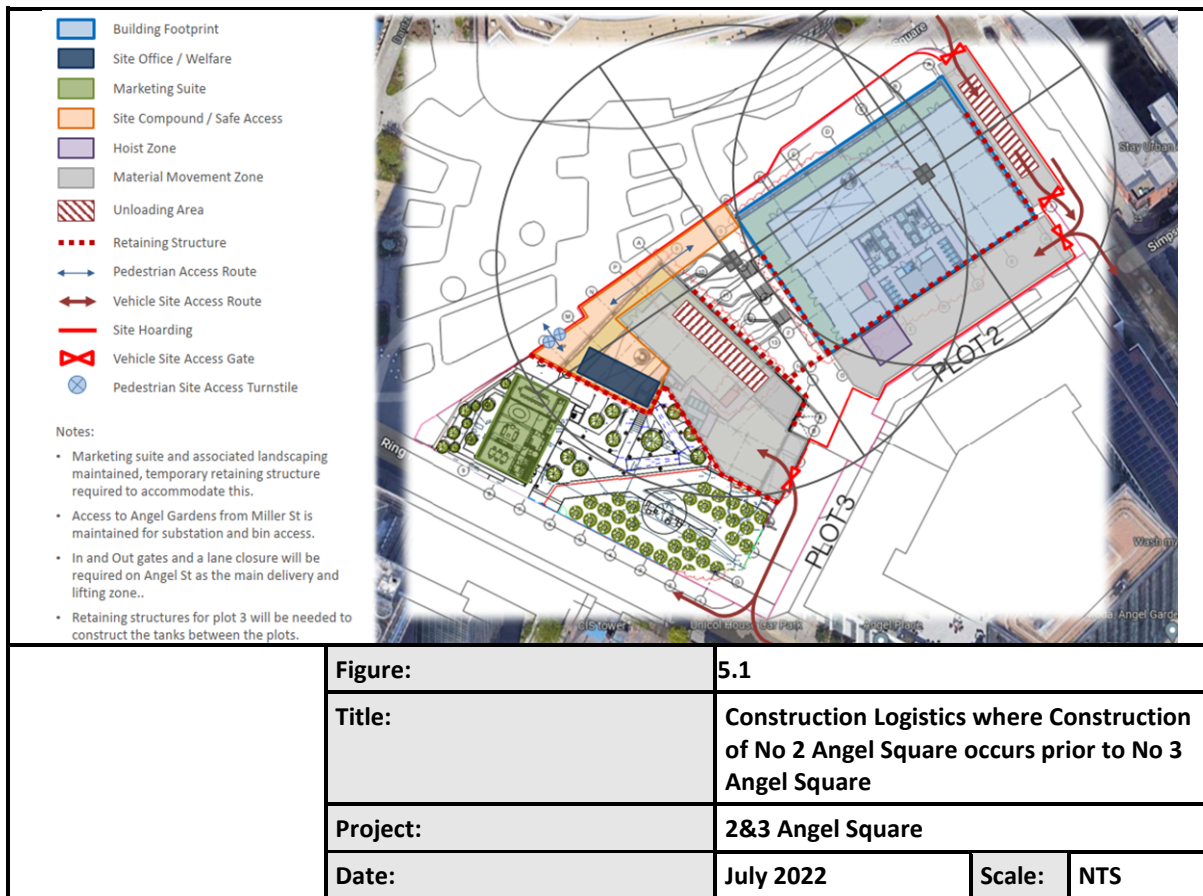
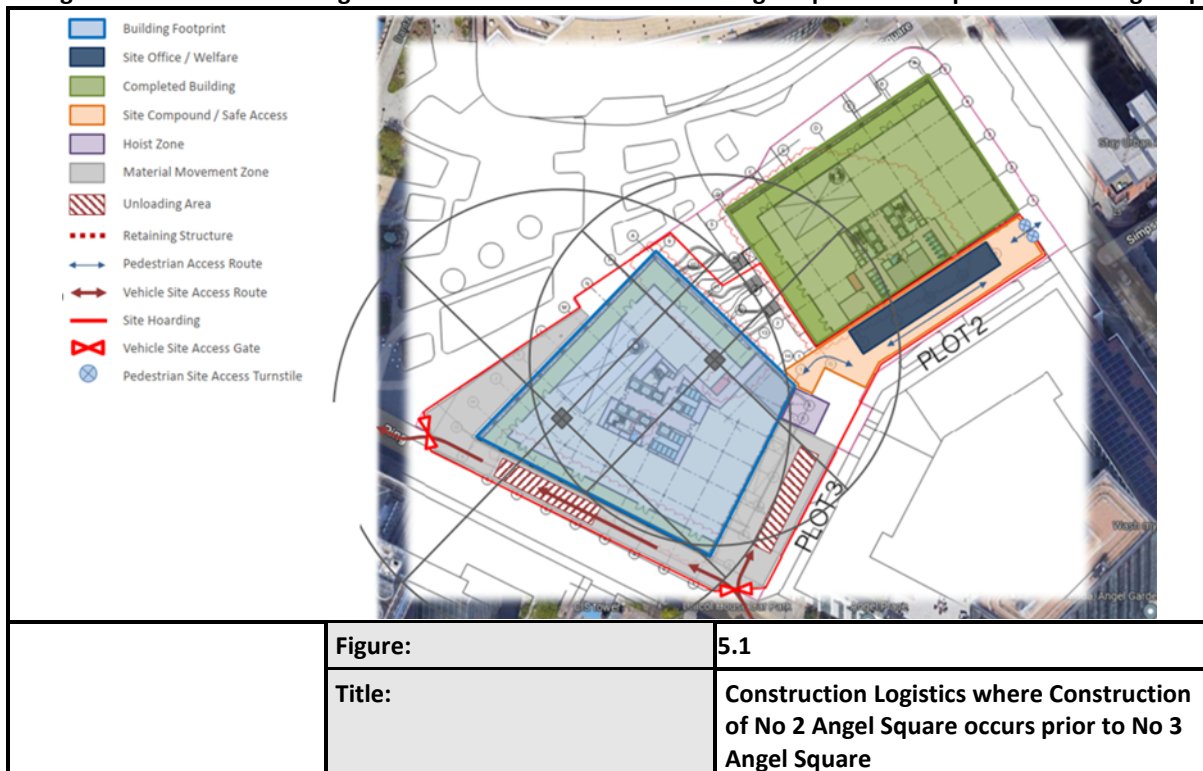


Figure 5.2: Construction Logistics where Construction of No 2 Angel Square occurs prior to No 3 Angel Square



	Project:	2&3 Angel Square		
	Date:	July 2022	Scale:	NTS

Figure 5.3: Sites adjacent to Angel Square in NOMA Ownership

Sites within NOMA ownership which could provide additional site compound / storage areas (subject to programme and status of adjacent developments).

Figure:

5.1

Title:

Construction Logistics where Construction of No 2 Angel Square occurs prior to No 3 Angel Square

Project:

2&3 Angel Square

Date:

July 2022

Scale:

NTS

6 Sunlight, Daylight and Overshadowing

Introduction

- 6.1 This Chapter of the ES has been prepared by Buro Happold and assesses the likely Daylight, Sunlight and Overshadowing effects of the Proposed Development upon the Site and surrounding area, including identified sensitive receptors. This Chapter also describes the methods used to assess the effects, the existing baseline conditions, the proposed mitigation measures required to prevent, reduce, or offset any significant negative impacts and the likely residual effects after these methods have been adopted.
- 6.2 The following pages review the impact, in terms of access to daylight and sunlight, of the Proposed Development on adjacent buildings and existing and proposed public realm and amenity spaces. Measures are outlined, where applicable, that are already implemented within the development of the proposals to mitigate against the effect of overshadowing from the Proposed Development on its surroundings.
- 6.3 The Chapter should be read in conjunction with the full details of the Proposed Development set out in the Design and Access Statement and relevant drawing information.
- 6.4 The Chapter is supported by analysis which has been carried out using modelling software to determine the impact of the Proposed Development on its surroundings by comparing a baseline condition to the post-development condition.
- 6.5 This Chapter is accompanied by three technical appendices, Detailed tables of daylight results (Appendix 6.1), Detailed tables of sunlight results (Appendix 6.2), and supporting Chapter figures (Appendix 6.3).

Legislative and Policy Context

Legislation

- 6.6 There is no legislation that directly affects the assessment contained within this chapter, with the criteria for assessment relating to daylight and sunlight covered by national and local policy in addition to BRE guidance as set out below.

National Planning Policy and Guidance (2021)

- 6.7 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.*”
- 6.8 The document also states that “...*planning policies and decisions should always seek to secure a good standard of amenity for existing and future occupants of land and buildings.*”
- 6.9 There is no specific guidance on daylight and sunlight access to new buildings within the National Planning Policy Framework (2021) (NPPF), however, section 11, ‘Making effective use of land’, paragraph 125(c) advises that Local Planning Authorities (LPAs) *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).”*
- 6.10 Section 12, ‘Achieving well-designed places’ paragraph 128 also advises that, with respect to the use of design guides and codes to create high quality buildings and places, “*their level of detail and*

degree of prescription should be tailored to the circumstances in each place, and should allow a suitable degree of variety.”

- 6.11 In this instance, BR209 (2022) and BS EN 17037: 2018 ‘Daylight in buildings’ (2018), referenced in BR209, provide relevant guidance.

Local Planning Policy

Manchester Core Strategy (2012 – 2027)

- 6.12 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 and recommends that building scale and massing should be considered. New developments should be appropriate to the character of the surrounding area.
- 6.13 Policy CC1 (Primary Economic Development Focus) - City Centre North will be a suitable location for consideration of high-density buildings and commercially led mixed use schemes, with a focus on high density offices.
- 6.14 Policy CC6 (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.’ Dense urban areas, City Centre developments for example, may often experience greater site constraints when compared to low-rise suburban areas, and thus a degree of obstruction is often unavoidable.
- 6.15 Policy EC1 (Employment and Economic Growth in Manchester) - The Regional Centre is the focus for employment and economic growth within Manchester, including for B1 Office Use, with key locations including the City Centre Fringe. The priorities for ensuring continued economic growth include: improving access to jobs for all; demonstrating that employment-generating development has fully considered opportunities to provide jobs for local people; improving the portfolio of business premises; creating business destinations by enhancing the primary business use with ancillary commercial facilities; and, ensuring the continued social, economic and environmental regeneration of the City. The Site falls within the Regional Centre and City Centre Fringe.

Guide to Development in Manchester Supplementary Planning Document and Planning Guidance (Adopted April 2007)

- 6.16 The SPD sets out a series of design principles which should be considered and implemented where necessary, those measures relevant to this assessment are:
- Minimise reliance on energy-using equipment for heating, cooling, lighting and natural ventilation.
 - Site layout and building design principles should maximise the capture and use of daylight and passive solar energy, whilst avoiding excessive solar gain in the summer.
 - Consider the impacts of overshadowing.
- 6.17 A key factor to the success of Proposed Development is the driver for protection of open amenity space. The analysis covering this aspect of the design is detailed further in this Chapter where overshadowing of the Proposed Development should not be excessive and should provide direct sunlight to amenity areas around buildings. MCC’s Guide to Development in Manchester Supplementary Planning Document and Planning Guidance Adopted April 2007, section 2.33 clearly indicates the importance of this. *“Successful open spaces plays a vital role within the City. Together these spaces should contribute to a cohesive network whilst at the same time creating a variety of environments.”*
- 6.18 Finally, the Guide to Development in Manchester Supplementary Planning Document indicates within the Environmental Standards section 4.5 that *“Site layout and building design principles should maximise the capture and use of daylight and passive solar energy, whilst avoiding excessive solar gain in summer”* and section 12.8 advises that overshadowing effects are a key criterion considered in the assessment of proposed schemes.

NOMA Masterplan and SRF

- 6.19 The Proposed Development will provide much-needed new high quality office floor space within the NOMA Masterplan area, which is allocated for commercial-led mixed-use development in accordance with the adopted NOMA Masterplan. As such, it will make an important contribution towards the delivery of the Core Strategy policies referenced above.

Guidance Documents and Standards

Building Research Establishment (BRE) 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice', Third Edition, 2022

- 6.20 The Building Research Establishment (BRE) Guidelines 'Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice 2022, Third edition' (released June 2022) 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."*
- 6.21 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).
- 6.22 In addition, the BRE Guidelines state (para. 1.3) that, *"it is intended to be read in conjunction with the interior daylighting recommendations in BS EN 17037 Daylight in buildings, and in the CIBSE publication LG10: Daylighting – a guide for designers"*.

British Standard BS EN 17037:2018: 'Daylight in buildings'

- 6.23 BS EN 17037:2018 specifies elements for achieving, by means of natural light, an adequate subjective impression of lightness indoors, and for providing an adequate view out. In addition, recommendations for the duration of sunshine exposure within occupied rooms are given.
- 6.24 Information is given on how to use daylighting to provide lighting within interiors, and how to limit glare and defines metrics used for the evaluation of daylighting conditions and gives principles of calculation and verification. It recognizes that the aims of good lighting go beyond achieving minimum illumination for task performance and contributes to the psychological well-being of occupants and beneficial exposure to sunlight.
- 6.25 The standard encourages building designers to assess and ensure successfully daylit spaces. It also allows building designers and developers to target ambitions with respect to daylighting, as well as addressing other issues related to daylight design, such as view out, protection against glare, and exposure to sunlight.

CIBSE Lighting Guide 10: Daylighting and Window Design (1999)

- 6.26 CIBSE Lighting guide 10: Daylighting – a guide for designers signals the need for designers, whether architects or engineers, to consider the interrelated aspects of window performance such as solar heat gain, winter heat loss, provision of view, acoustic performance, privacy, security and protection from fire and to determine priorities for their relative importance.

Assessment Methodology and Significance Criteria

- 6.27 This assessment indicates the potential effects of the Proposed Development on surrounding residential buildings and amenity areas and on amenity areas within the Site. Analysis has been

carried out, through software modelling, to understand the impact on surrounding properties. This ES chapter identifies sensitive receptors adjacent to the Site and gives an indication of the level of impact these receptors are likely to receive. Mitigation has been factored into the scheme where possible to minimise the impact.

The issues considered as part of the daylight, sunlight and overshadowing assessment for the EIA include the following:

- Identification of existing sensitive receptors, comprising residential buildings and public or private open amenity spaces, likely to be impacted by the Proposed Development with respect to a loss of daylight and direct sunlight, by reviewing the proximity of existing residential buildings to the Proposed Development against the BR209 25° obstruction angle criterion (see Figure 6.1 in Appendix 6.3).
- Where a potential reduction of daylight and sunlight to existing residential buildings was identified, detailed modelling of the metrics set out below has been undertaken to determine the level of reduction; and,
- Assessment of the extent of overshadowing to existing adjacent amenity spaces and future amenity areas created within the Site.

6.28 As outlined in section 6.21, the recommendations of BR209 are not necessarily applicable to densely built-up city locations. Therefore, this assessment applies a baseline condition that includes building massing on the Site considered to be representative of a typical urban setting. In this case, following the procedure set out in BR209, each assessed building was treated as having an existing mirror image of itself located opposite it on the Site in the baseline condition. This mirror baseline is described further in section 6.58.

Daylight assessments

6.29 The following assessments were conducted for the Site

- 25° obstruction angle criterion assessment of facades on existing and under-construction adjacent residential buildings (see section 6.33); and
- Vertical sky component (VSC) assessment of facades on existing and under-construction adjacent residential buildings (see section 6.34).

6.30 BR209 advises that in urban areas, particularly in areas of regeneration, the VSC numerical target may not be the most appropriate metric for assessment due to the spatial relationship between buildings, and the fact that VSC assessment criteria considers the difference between the existing and proposed condition. Therefore, where there is a clear site, or there are particularly low-rise buildings existing on the Site, as is the case in this instance, the results are skewed.

6.31 Where VSC values fall considerably short of BR209 guidance, analysis results have been considered against the alternative target set out in section 6.36, which is consistent with the Site's urban location, considering, e.g. massing and obstruction angles existing in the Site's surroundings or existing buildings that are particularly close to a site's boundary. This approach is consistent with BR209, which describes an appropriate methodology to assess cases where an existing building has windows that are unusually close to a Site's boundary.

Daylight to surrounding windows

6.32 The following describes each assessment and criteria that have been used for software analysis to determine the predicted overshadowing to existing and under-construction adjacent residential properties and to identify the potential to design in mitigation.

6.33 A plane is drawn at 25° from the horizontal, at the centre of an existing window. Figure 6.1, in Appendix 6.3, shows the implementation of the 25° line to determine the angle of visible sky. If a new development intersects this plane, the daylight availability at the window may be noticeably reduced. When an obstruction of the 25° plane occurs, a more detailed assessment to evaluate the VSC of the affected window is required.

VSC

- 6.34 The VSC is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The VSC does not include reflected light, either from the ground or from other buildings.
- 6.35 To maintain good levels of daylight, the VSC of a window is recommended in BR209 at 27% or greater, however within urban environments it is generally recognised that a lower VSC is acceptable given site constraints; 15% is typically considered to provide acceptable daylight in an urban setting and is adopted as an appropriate target value in this assessment.
- 6.36 This alternative target value is supported by the Greater London Authority (GLA) representation hearing report D&P/3067/03 – Appendix 1, which states that, *‘in an inner city urban environment, VSC values in excess of 20% should be considered as reasonably good and that VSC in the mid-teens should be acceptable. However, where the VSC value falls below 10% (so as to be in single figures), the availability of direct light from the sky will be poor.’*
- 6.37 Where windows affected by the Proposed Development achieve a VSC of less than 15% with the Proposed Development in place, a comparison of existing and proposed values of VSC should be made. Where possible, the post-development VSC should not be less than 80% of the pre-development baseline VSC.
- 6.38 Figure 6.2, in Appendix 6.3, demonstrates visually the VSC as a measure of light received on a vertical surface with external obstructions considered.

Sunlight assessments

- 6.39 The following assessments were conducted for the Site:
- Sunlight availability analysis at facades on existing and under-construction adjacent residential buildings based on Annual Probable Sunlight Hours (APSH) (see section **Error! Reference source not found.**).
 - Sunlight availability analysis at facades on existing and under-construction adjacent residential buildings based on the probability of APSH occurring during winter (WPSH) (see section 6.44).
 - Overshadowing analysis to assess sunlight on open spaces at existing properties and new amenity spaces created within the Site (see section **Error! Reference source not found.**5).
- 6.40 The following methodology was used to carry out the sunlight assessments. The methodology is based on the guidelines set out in BR209.
- 6.41 As noted in BR209, if a living room of an existing dwelling has a main window which faces within 90° of due south, and any part of a new development subtends an angle of 25° to the horizontal (measured from the centre of the window in a vertical section perpendicular to the window) then the sun lighting of the existing dwelling may be adversely affected.
- 6.42 The BRE guidance relates to living room and conservatory windows, although care should be taken to ensure kitchens with windows, and bedrooms receive reasonable amounts of sunlight as well.
- 6.43 Note that for the purpose of this assessment, living rooms include combined living/dining/kitchen areas.

Probable Sunlight Hours (PSH)

- 6.44 Probable Sunlight Hours relates to the long-term average of the total number of hours during the year in which direct sunlight reaches the unobstructed ground (when cloud cover is considered). A Probable Sunlight Hours (PSH) assessment is carried out when:
- There is an obstruction within the 25° line, calculated from the centre of the window; and,

- The Proposed Development is situated within 90° of south of the window.

6.45 Sunlighting of the existing dwelling may be adversely affected when a window:

- receives less than the 25% of Annual Probable Sunlight Hours (APSH);
- or less than 5% of the APSH during winter (21st of September and the 21st of March) (WPSH);
- and receives less than 0.8 times its former sunlight hours during either period; and,
- has a reduction in sunlight received over the whole year greater than 4% of APSH.

Sunlight to open spaces

- 6.46 Open spaces should retain a reasonable amount of sunlight throughout the year. BR209 recommends that to appear adequately sunlit throughout the year, at least 50% of a garden or amenity area should receive at least two hours of sunlight on the 21st of March.
- 6.47 If a detailed calculation cannot be carried out it is recommended that the centre of the area should receive at least two hours of sunlight on the 21st of March.
- 6.48 Existing open spaces should receive at least two hours of sunlight on the 21st of March on at least 50% of their area or at least 0.8 times the former area receiving two hours of sunlight.

Receptor sensitivity

- 6.49 The criteria used to assess receptor sensitivity are described in 6.1.

Table 6.1 Criteria for determining receptor sensitivity

Sensitivity	Criteria
High	Viewers likely to feel the immediate impact to their surroundings and notice a significant reduction in the amount of natural light to their environment. Such receptors would include areas where viewers spend a long amount of time and expect access to high levels of daylight such as living rooms of residential properties.
Moderate	Viewers with every day access to this environment but perhaps with less expectations as they are spending shorter periods of time in the space or are within an office environment. They may have previously used the space and therefore will be aware of the change but it would affect them less. Areas of residential properties that are not main living rooms and therefore less time is spent in these spaces.
Low	Small number or low sensitivity of viewers assumed. Viewers with a passing interest in their surroundings and momentary viewing periods. Infrequent users of open spaces around the Proposed Development.

Magnitude of change / impact

- 6.50 The criteria used to assess the impact of the Proposed Development on its surroundings, in terms of daylight and sunlight availability and magnitude of change from the baseline condition, are described in Table 6.2.

Table 6.2 Criteria for determining effect magnitude

Magnitude	Criteria
Negligible	BR209 numerical targets for daylight and sunlight met and a change in condition of no more than 20%
Small	Daylight and sunlight numerical values greater or less than BR209 targets by no more than 20% and a change in condition of between 20% and 36% (equivalent to a 20% change from a negligible magnitude).

Magnitude	Criteria
	In accordance with BR209, dual aspect rooms experiencing a reduction in daylight to one window are assigned a small effect magnitude.
Medium	Daylight and sunlight numerical values greater or less than BR209 targets by no more than 50% and a change in condition of between 36% and 50%
Large	Daylight and sunlight numerical values greater or less than BR209 targets by more than 50% and a change in condition of more than 50%

Effect significance

- 6.51 The significance of a potential effect is derived by considering both the sensitivity of the feature and the magnitude of change, as demonstrated in Table 6.3.

Table 6.3 Matrix for determining effect significance

		Receptor Sensitivity		
		High	Moderate	Low
Effect magnitude	Large	Major	Moderate	Minor
	Medium	Moderate	Moderate	Minor
	Small	Minor	Minor	Negligible

- 6.52 Applying professional judgement based on experience of similar types of assessment and knowledge of the various assessment criteria, only a Major effect significance is considered to be 'significant' in EIA terms. A Moderate effect significance is considered to result in levels of daylight and sunlight access that are in keeping with the urban nature of the Site's surroundings, e.g., a VSC threshold of 15% and shading from new developments that are consistent in scale and massing with existing surroundings.
- 6.53 Effects can also be described, for example, as:
- beneficial or adverse;
 - permanent or reversible; or
 - short, medium or long term.
- 6.54 Regarding impacts on daylight and sunlight, effects are considered to be long term due to the expected life of the Proposed Development buildings.

Assumptions and Limitations

- 6.55 This Chapter takes into consideration local and national planning policy, the context and NOMA masterplan and SRF, and Local Planning directive when considering the recommendations of BRE report 209, 'Site Layout Planning for Daylight & Sunlight, A Guide to Good Practice', 2022 (BR209), used in the assessment.
- 6.56 The guidance contained in BR209 is not mandatory and is intended to be interpreted flexibly, with consideration for a site's location and other factors that influence a site's layout. Of particular relevance to the Proposed Development under consideration is BR209's recognition that breaches of its recommendations may be unavoidable in urban settings where new developments are consistent with existing building heights and proportions. Additional factors resulting in breaches of BR209 guidance being considered acceptable include the expectation that levels of daylight and sunlight will be restricted within a densely built urban environment due to typical building heights and separations and that target densities imposed on developments will constrain designers' ability to minimise new developments' impact on their surroundings and maximise daylight and sunlight access within new developments.
- 6.57 Solar glare does not form part of the assessment as the Proposed Development is not expected to give rise to significant adverse impacts.

Baseline Conditions

- 6.58 The existing site condition as of 2022 is a ground level open car park, which offers very little in the way of obstruction to daylight and sunlight at existing adjacent buildings, as indicated in Figure 6.3, in Appendix 6.3. Angel Gardens (formerly known as Plot L), to the east of the Site, and 4 Angel Square (formerly known as Plot P), located to the west of the site and Angel Square, are part of the overall NOMA masterplan and are considered as part of the baseline.
- 6.59 In our assessment we have considered what would more typically be located within this type of site when assessing the results from the modelling analysis of the change between existing and proposed conditions. While there are several open areas which will be developed as part of the NOMA Masterplan, there are also some existing taller buildings that provide a more realistic context for this type of city centre development, including: the Crowne Plaza Hotel on the corner of Miller Street and Rochdale Road; Skyline Central and the CIS Tower on Miller Street. Following the guidance of BR209, the change between existing and proposed conditions has been assessed against a baseline condition in which each affected building elevation is treated as having an existing mirror image of itself located opposite it on the Site. Figure 6.3, in Appendix 6.3, illustrates the baseline condition considered in this assessment for each affected building elevation.
- 6.60 On reviewing residential buildings adjacent to the Site, those impacted lie to the north (Linx building) and south (Angel Gardens) of the Proposed Development (Figure 6.4, in Appendix 6.3). The nearby receptors that have been identified for assessment within the daylight, sunlight and overshadowing assessment are included in Table 6.4. This relates back to the receptor sensitivity criteria in Table 6.1.
- 6.61 In line with the mirror baseline approach, baseline conditions have been assessed separately for the Linx building and the two northwest facing facades of Angel Gardens, where each facade faces a mirror image of itself on the Site. The mirror baseline results for each facade were compared against the three scenarios of post-development condition considered below, i.e., 2 Angel Square only, 3 Angel Square only and both 2 and 3 Angel Square existing on Site.
- 6.62 The nearby receptors that have been identified for assessment within the daylight, sunlight and overshadowing assessment are included in Table 6.4. This relates back to the receptor sensitivity criteria in Table 6.1.
- 6.63 Existing/baseline amenity spaces consist of spaces 1, 5, 6 and 7 identified in Figure 6.15, in Appendix 6.3.
- 6.64 As there is an extant planning permission for 2 and 3 Angel Square, an alternative baseline including 3 Angel Square may apply to the separate assessment of 2 Angel Square and, likewise, an alternative baseline including 2 Angel Square may apply to the separate assessment of 3 Angel Square. This is considered in section 6.115.

Table 6.4 Receptor sensitivities

Receptor	Sensitivity	Justification
Existing residential properties on Angel Street (Linx Building). Affected windows are on the Angel Street elevation, with all other windows of the Linx building unaffected by the Proposed Development. 106 windows have been assessed	High	Main living rooms of residential units in the Linx building in relative proximity to the proposed buildings. Likely to perceive a reduction of light to the apartments.
	Moderate	Areas of residential properties that are not main living rooms.
Existing residential properties within the NOMA masterplan (Angel Gardens). Affected windows are on the northwest elevation, with all other windows of Angel Gardens	High	Main living rooms of residential units of Angel Gardens in relative proximity to the proposed buildings. Likely to

Receptor	Sensitivity	Justification
building unaffected by the Proposed Development. 210 windows have been assessed.	Moderate	perceive a reduction of light to the apartments. Areas of residential properties that are not main living rooms.
Public realm and amenity spaces 1, 6 and 7 (See Figure 6.15, in Appendix 6.3)	High	Public spaces intended to provide a pleasant environment for users.
Public realm and amenity spaces 2, 3, 4 and 5 (See Figure 6.15, in Appendix 6.3)	Low	Primarily used for circulation between building, with seating or landscaping included.

Identification and Evaluation of Significant Effects from the Proposed Development (2 Angel Square only)

- 6.65 An assessment of the individual impact of 2 Angel Square on sensitive receptors has been undertaken to understand the impact of the Proposed Development in line with the phasing strategy, i.e., that one or other of the buildings could come forward independently.
- 6.66 On reviewing the Site, the existing Linx Building to the north side of Angel Street and Angel Gardens, to the east of the Site receive the greatest impact given their proximity to the Proposed Development (refer to Figures 6.3 and 6.4, in Appendix 6.3, for a view of site). The sensitivity of receptors has been highlighted in Table 6.4.
- 6.67 The following results should be viewed in the context of access to daylight and sunlight at the receptors under the mirror baseline condition described in section 6.59.
- 6.68 A summary of daylight results can be found in Figure 6.5, in Appendix 6.3.

Daylight assessment

- 6.69 Initial 25° obstruction angle studies highlight that the Angel Street elevation of the Linx Building and the northwest facing elevations of Angel Gardens will be impacted by the Proposed Development, given their proximity. This indicates a requirement for a more detailed study of VSC values for both receptors and PSH values for the Linx building windows to determine the loss of light.
- 6.70 The results shown in Figure 6.9 indicate that all 24 windows tested on the bottom floors of the northwest facing elevation of the high-rise part of Angel Gardens will achieve BR209 targets.
- 6.71 Of the 186 windows tested on the low-rise part of Angel Gardens, 101 (54.3%) will achieve the BR209 target by either retaining a VSC of at least 15% or at least 0.8 times their baseline values. Of the remaining windows, 7 (3.8%) achieve a factor of baseline values between 0.6 and 0.8 - a minor adverse impact; 28 (15.1%) achieve a factor of baseline values between 0.4 and 0.6 - a moderate adverse impact and 50 (26.9%) achieve less than 0.4 factor of their baseline values - a major adverse impact. Figure 6.9 indicates the windows on the elevation of Angel Gardens and the expected level of impact.
- 6.72 Considering the northwest elevations of Angel Gardens as a whole, a major adverse impact, viewed as significant in this assessment, is seen on 50 of a total of 518 windows of habitable rooms, equivalent to 4% of sensitive receptors.
- 6.73 The results indicate that with the Proposed Development in place, 35 (33%) out of 106 of the

identified windows on the southwest elevation of the Linx building achieve the BR209 target for VSC by either retaining a VSC of at least 15% or at least 0.8 times their factor of baseline values. Of the remaining windows, 22 (20.8%) achieve between 0.6 and 0.8 times their factor of baseline values - a minor adverse impact; 27 (25.5%) achieve between 0.4 and 0.6 times their factor of baseline values - a moderate adverse impact and 22 (20.8%) achieve less than 0.4 times their factor of baseline values - a major adverse impact. Of 22 windows experiencing a major impact, 9 serve living rooms. Figure 6.10 in Appendix 6.3 indicates the windows on the elevation of the Linx building and the level of impact expected relative to the mirror baseline detailed in section 6.59.

- 6.74 Considering the geometry of the Linx building, it is observed that the upper two storeys have sizeable roof overhangs and setbacks from the main facade that contribute to shading of windows at these levels in the baseline condition. Similarly, windows on the corners of the Angel Street elevation are below projecting balconies that inherently shade the windows below. Without the presence of these architectural features on the Linx building, the impact of the Proposed Development on the Linx building would be considerably less noticeable to occupants.
- 6.75 For a city environment, below 15% VSC is a recognised threshold for a visibly perceived reduction in light to an apartment interior. This is experienced primarily on the lower floors of the Linx building and not all windows provide daylight to living areas of these apartments (see section 6.97). Internal layouts of these buildings accessed on MCC's planning application search map (<https://pa.manchester.gov.uk/online-applications/spatialDisplay.do?action=display&searchType=Application>) indicate that of a total of 518 windows of habitable rooms on the northwest elevations of Angel Gardens, 210 (41%) serve living rooms and of a total of 106 windows of habitable rooms on the Angel Street elevation of the Linx building 76 (72%) serve living rooms. The remainder serve bedrooms, which are identified by BR209 as having a lesser requirement for daylight than living rooms. The large windows at lower storeys in the middle of the Linx building Angel Street elevation and the high-rise part of Angel Gardens serve non-residential circulation space.
- 6.76 It is noted from planning drawings for the Angel Gardens (planning reference 111347/FO/2016/N1) and Linx (planning reference 070327/FO/2003/N1) developments that the effect of reduced daylight access at individual windows will be mitigated by the following internal layout features, resulting in living spaces receiving light from an elevation unobstructed by the Proposed Development in addition to the Angel Street elevation:
- 6.77 All living spaces on the Linx building are served by more than one window:
- Living spaces at the corners of the Linx building and the low-rise part of Angel Gardens are all dual aspect.
 - The three living spaces on each storey central to the Linx building Angel Street elevation are dual aspect to the courtyard behind.
 - All living spaces on the upper two storeys of the Linx building are dual aspect to the courtyard behind.

Sunlight assessment

- 6.78 Of the 106 windows on the Linx Building tested for sunlight, 39 (36.8%) will achieve BR209 targets by achieving at least 25% APSH and 5% WPSH with the Proposed Development in place; 11 (10.4%) will experience a minor adverse impact; 29 (27.4%) will experience a moderate adverse impact and 27 (25.5%) will experience a major adverse impact. The windows most affected by the Proposed Development are the windows at street level as might be expected for a city centre location, where buildings are in proximity. It should be noted that of the windows assessed, not all provide light to living rooms (see section 6.109). Figure 6.10, in Appendix 6.3, indicates the elevations of the Linx building and the expected level of impact, relative to the mirror baseline detailed in section 6.59.

- 6.79 Only windows facing with 90° of south are assessed for sunlight; the windows of Angel Gardens that are impacted by the Proposed Development are all north-facing and hence have not been assessed for sunlight.

Sunlight to Amenity Spaces

- 6.80 Results shown in Figures 6.5 and 6.16 indicate that BR209 guidance is met in all amenity spaces, except Area 2, with the Proposed Development in place. Area 2, which does receive some direct sunlight but falls significantly short of BR209 guidance, is seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 92.2% of the combined area receiving at least 2 hours of direct sunlight on the 21st of March.

Identification and Evaluation of Significant Effects from the Proposed Development (3 Angel Square only)

- 6.81 An assessment of the individual impact of 3 Angel Square on sensitive receptors has been undertaken to understand the impact of the Proposed Development in line with the phasing strategy, i.e., that one or other of the buildings could come forward independently.
- 6.82 On reviewing the Site, the existing Linx Building to the north of Angel Street and Angel Gardens, to the east of the Site receive the greatest impact given their proximity to the Proposed Development (refer to Figures 6.3 and 6.4 for a view of site). The sensitivity of receptors has been highlighted in Table 6.4.
- 6.83 The following results should be viewed in the context of access to daylight and sunlight at the receptors under the mirror baseline condition described in section 6.59.
- 6.84 A summary of daylight results can be found in Figure 6.6, in Appendix 6.3.

Daylight Results

- 6.85 Initial 25° obstruction angle studies highlight that the Angel Street elevation of the Linx Building and the northwest facing elevations of Angel Gardens will be impacted by the Proposed Development, given their proximity. This indicates a requirement for a more detailed study of VSC values for both receptors and PSH values for the Linx building windows to determine the loss of light.
- 6.86 On review of the 25° obstruction plane, only windows on the bottom 4 floors on the high-rise part of Angel Gardens are likely to be affected by the Proposed Development (Figure 6.8). All windows on higher floors are not likely to suffer any adverse impact. These bottom floor windows are predominantly shaded by the northern low-rise part of Angel Gardens, so we do not expect there to be an adverse impact from the Proposed Development.
- 6.87 The results shown in Figure 6.6 indicate that all 24 windows tested on the bottom floors of the northwest facing elevation of the high-rise part of Angel Gardens will achieve BR209 targets.
- 6.88 Windows on the northwest elevation of the low-rise section of Angel Gardens will suffer from a loss of daylight due to its proximity to the Proposed Development. Of the 186 windows tested, 121 (65.1%) will achieve the BR209 target by either retaining a VSC of at least 15% or at least 0.8 times their factor of baseline values. Of the remaining windows, 19 (10.2%) achieve a factor of former values between 0.6 and 0.8 – a minor adverse impact; 36 (19.4%) achieve a factor of former values between 0.4 and 0.6 – a moderate adverse impact and 10 (5.4%) achieve less than 0.4 factor of their former values – a major adverse impact. Figure 6.11 indicates the windows on the elevation of Angel Gardens and the expected level of impact.
- 6.89 Considering the northwest elevations of Angel Gardens as a whole, a major adverse impact, viewed as significant in this assessment, is seen on 10 of a total of 518 windows of habitable rooms, equivalent to 2% of sensitive receptors and of these, 5 serve living rooms.

- 6.90 The results indicate that with the Proposed Development in place, all but one of the windows tested on Linx building will achieve BR209 targets, which will experience a minor effect (Figure 6.12 in Appendix 6.3).
- 6.91 Considering the geometry of the Linx building, it is observed that the upper two storeys have sizeable roof overhangs and setbacks from the main facade that contribute to shading of windows at these levels in the baseline condition. Similarly, windows on the corners of the Angel Street elevation are below projecting balconies that inherently shade the windows below. Without the presence of these architectural features on the Linx building, the impact of the Proposed Development on the Linx building would be considerably less noticeable to occupants.
- 6.92 For a city environment, below 15% VSC is a recognised threshold for a visibly perceived reduction in light to an apartment interior. This is primarily on the lower floors of Angel Gardens and not all windows provide daylight to living rooms of these apartments (see section 6.101). Internal layouts of these buildings accessed on MCC's planning application search map (<https://pa.manchester.gov.uk/online-applications/spatialDisplay.do?action=display&searchType=Application>) indicate that of a total of 518 windows of habitable rooms on the northwest elevations of Angel Gardens, 210 (41%) serve living rooms and of a total of 106 windows of habitable rooms on the Angel Street elevation of the Linx building 76 (72%) serve living rooms. The remainder serve bedrooms, which are identified by BR209 as having a lesser requirement for daylight than living rooms. The large windows at lower storeys in the middle of the Linx building Angel Street elevation and the high-rise part of Angel Gardens serve non-residential circulation space.
- 6.93 It is noted from planning drawings for the Angel Gardens (planning reference 111347/FO/2016/N1) and Linx (planning reference 070327/FO/2003/N1) developments that the effect of reduced daylight access at individual windows will be mitigated by the following internal layout features, resulting in living spaces receiving light from an elevation unobstructed by the Proposed Development in addition to the Angel Street elevation:
- All living spaces on the Linx building are served by more than one window.
 - Living spaces at the corners of the Linx building and the low-rise part of Angel Gardens are all dual aspect.
 - The three living spaces on each storey central to the Linx building Angel Street elevation are dual aspect to the courtyard behind.
 - All living spaces on the upper two storeys of the Linx building are dual aspect to the courtyard behind.

Sunlight assessment

- 6.94 All the 106 windows on the Linx Building tested for sunlight will achieve BR209 targets by achieving at least 25% APSH and 5% WPSH with the Proposed Development in place.
- 6.95 Only windows facing with 90° of south are assessed for sunlight; the windows of Angel Gardens that are impacted by the Proposed Development are all north-facing and hence have not been assessed for sunlight.

Sunlight to Amenity Spaces

- 6.96 Results shown in Figure 6.6 and 6.16, in Appendix 6.3, indicate that BR209 guidance is met in amenity spaces 1, 2, 3, 6 and 7. Areas 4 and 5 receive some direct sunlight but fall significantly short of BR209 guidance, with only 19.2% and 18% of the spaces receiving 2 hours of sunlight on the 21st of March, respectively. These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public

realm space incorporating Areas 1 to 5, BR209 guidance is met with 84.5% of the combined area receiving at least 2 hours of direct sunlight on the 21st of March.

Identification and Evaluation of Significant Effects from the Proposed Development (both 2&3 Angel Square)

- 6.97 On reviewing the Site, the existing properties to the north of Angel Street and to the east of the Site receive the greatest impact given their proximity to the Proposed Development (refer to Figures 6.3 and 6.4, in Appendix 6.3, for a view of the site). The sensitivity of receptors has been highlighted in **Error! Reference source not found..**
- 6.98 During construction, the scheme will transition from the baseline to the fully operational state; the fully built scenario represents the worst case, so temporary construction effects have not been considered in this assessment.
- 6.99 The following results should be viewed in the context of access to daylight and sunlight at the receptors under the mirror baseline condition described in section 6.59.
- 6.100 Full detailed results of the VSC, APSH and WPSH are provided in Appendix 6.1 and Appendix 6.2. A summary of daylight and sunlight results can be found in Figure 6.7, in Appendix 6.3.

Daylight assessment

- 6.101 Initial 25° obstruction angle studies highlight that the Angel Street elevation of the Linx Building and northwest facing elevations of Angel Gardens will be impacted by the Proposed Development, given their proximity. This indicates a requirement for a more detailed study of VSC values for both receptors and PSH values for the Linx building windows to determine the loss of light. The detailed study is limited to the Angel Street elevation of the Linx building and the northwest elevations of Angel Gardens, with all other windows of both buildings unaffected by the Proposed Development.
- 6.102 On review of the 25° obstruction plane, it is apparent that the impact of the Proposed Development on Angel Gardens will be predominantly experienced by windows on the northwest facing elevation of the low-rise part of Angel Gardens and only windows on the bottom 4 floors of the high-rise part could potentially be affected (Figure 6.8, in Appendix 6.3, illustrates that above the 4th floor, the Proposed Development only slightly intersects a 25° obstruction plane). Windows on these bottom 4 floors are predominantly shaded by the northern low-rise parts of Angel Gardens, so we do not expect there to be an adverse impact from the Proposed Development. All windows on higher floors meet BRE guidance as they are negligibly obstructed by the Proposed Development.
- 6.103 The results shown in Figure 6.5 in Appendix 6.3 indicate that all 24 windows tested on the lower floors of the northwest facing elevation of the high-rise part of Angel Gardens will achieve BR209 targets.
- 6.104 Of the 186 windows tested on the low-rise part of Angel Gardens, 4 (2.2%) will achieve the BR209 target by either retaining a VSC of at least 15% or at least 0.8 times their baseline values. Of the remaining windows, 7 (3.8%) achieve a factor of baseline values between 0.6 and 0.8 - minor adverse impact; 61 (32.8%) achieve a factor of baseline values between 0.4 and 0.6 - a moderate adverse impact and 114 (61.3%) achieve less than 0.4 factor of their baseline values - a major adverse impact. Figure 6.13 indicates the windows on the elevation of Angel Gardens and the expected level of impact. The extent of the calculated impact is due to the difference in height between the Proposed Development and the assumed mirror baseline buildings producing an increased obstruction to light, which is exacerbated by the relatively proximity of the boundaries of Angel Gardens and the Site.
- 6.105 Considering the northwest elevations of Angel Gardens as a whole, a major adverse impact, viewed as significant in this assessment, is seen on 114 of a total of 518 windows of habitable rooms, equivalent to 22% of sensitive receptors and of these, 43 serve living rooms.

- 6.106 The results indicate that with the Proposed Development in place, 26 (24.5%) out of 106 of the identified windows on the west elevation of the Linx building achieve the BR209 target for VSC by either retaining a VSC of at least 15% or at least 0.8 times their factor of baseline values. Of the remaining windows, 28 (26.4%) achieve between 0.6 and 0.8 times their factor of baseline values - a minor adverse impact; 32 (30.2%) achieve between 0.4 and 0.6 times their factor of baseline values - moderate adverse impact - and 20 (18.9%) achieve less than 0.4 times their factor of baseline values - a major adverse impact. Of 20 windows experiencing a major impact, 9 serve living rooms. Figure 6.14 indicates the windows on the elevation of the Linx building and the expected level of impact.
- 6.107 Considering the geometry of the Linx building, it is observed that the upper two storeys have sizeable roof overhangs and setbacks from the main facade that contribute to shading of windows at these levels in the baseline condition. Similarly, windows on the corners of the Angel Street elevation are below projecting balconies that inherently shade the windows below. Without the presence of these architectural features on the Linx building, the impact of the Proposed Development on the Linx building would be considerably less noticeable to occupants.
- 6.108 As identified in sections **Error! Reference source not found.** and **Error! Reference source not found.** existing windows facing the Site experience an abnormally high level of access to daylight and sunlight for a city environment, where below 15% VSC is a recognised threshold for a visibly perceived reduction in light to a habitable room, as stated in section **Error! Reference source not found.** For this reason, 15% is adopted as an appropriate target value for existing windows and the mirror baseline conditions described in section 6.59 have been applied in this assessment. The largest reduction in daylight is primarily experienced on the lower floors of the Linx and Angel Gardens buildings, where not all windows provide daylight to living rooms of these apartments. Internal layouts of these buildings accessed on MCC's planning application search map (<https://pa.manchester.gov.uk/online-applications/spatialDisplay.do?action=display&searchType=Application>) indicate that of a total of 518 windows of habitable rooms on the northwest elevations of Angel Gardens, 210 (41%) serve living rooms and of a total of 106 windows of habitable rooms on the Angel Street elevation of the Linx building 76 (72%) serve living rooms. The remainder serve bedrooms, which are identified by BR209 as having a lesser requirement for daylight than living rooms. The large windows at lower storeys in the middle of the Linx building Angel Street elevation and the high-rise part of Angel Gardens serve non-residential circulation space.
- 6.109 It is also noted from planning drawings for the Angel Gardens (planning reference 111347/FO/2016/N1) and Linx (planning reference 070327/FO/2003/N1) developments that the effect of reduced daylight access at individual windows will be mitigated by the following internal layout features, resulting in living spaces receiving light from an elevation unobstructed by the Proposed Development in addition to the Angel Street elevation:
- All living spaces on the Linx building are served by more than one window.
 - Living spaces at the corners of the Linx building and the low-rise part of Angel Gardens are all dual aspect.
 - The three living spaces on each storey central to the Linx building Angel Street elevation are dual aspect to the courtyard behind.
 - All living spaces on the upper two storeys of the Linx building are dual aspect to the courtyard behind.

Sunlight assessment

- 6.110 Of the 106 windows on the Linx Building tested for sunlight, 36 (34%) will achieve BR209 targets by achieving at least 25% APSH and 5% WPSH with the Proposed Development in place; 12 (11.3%) will experience a minor adverse impact; 30 (28.3%) will experience a moderate adverse impact and 28 (26.4%) will experience a major adverse impact. The windows most affected by the Proposed

Development are the windows at ground floor level as might be expected for a city centre location, where buildings are in proximity. It should be noted that of the windows assessed, not all provide light to living rooms (see section 6.108). Figure 6.14, in Appendix 6.3, indicates the elevations of the Linx building and the expected level of impact.

- 6.111 Only windows facing within 90° of south are assessed for sunlight; the windows of Angel Gardens that are adjacent to the Proposed Development are all northwest facing and hence have not been assessed for sunlight.

Sunlight to Amenity Spaces

- 6.112 Sunlight availability has been reviewed for public realm amenity spaces, i.e., where leisure amenity use is expected, or outdoor seating is provided rather than hard landscaped areas intended for pedestrian circulation only. These comprise Angel Square to the northwest of the Proposed Development (Area 1), Angel Gardens amenity spaces (Areas 5,6 and 7) and within the Site of the Proposed Development (Areas 2 to 4). Amenity spaces are identified, and results shown in Figure 6.15 and Figure 6.16, in Appendix 6.3, which indicate that BR209 guidance is met in amenity spaces 1, 3, 6 and 7, with at least 50% of each area being receiving at least 2 hours by direct sunlight on the 21st of March or experiencing a reduction in hours of sunlight of no more than 20% of its baseline value. The expected level of impact from the Proposed Development on amenity spaces 1, 3, 6 and 7 is, therefore, negligible.
- 6.113 Proposed amenity spaces 2, 4 and 5 receive some direct sunlight but fall significantly short of BR209 guidance, with between 8.3% and 19.1% of the area of these spaces receiving 2 hours of sunlight on the 21st of March. These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. Area 4 will form a link between the Mews and Angel Square and will be designed to incorporate high quality materials and landscaping to achieve an attractive environment. Further details are provided within the Landscape Design and Access Statement. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 81.4% of the combined area receiving at least 2 hours of direct sunlight on the 21st of March.

Alternative Baseline

- 6.114 The above assessments consider the impacts of 2 Angel Square only, 3 Angel Square only and both together, however, there is an existing planning permission for 2 and 3 Angel Square, which could result in one building of 2 or 3 Angel Square being built out before the other. Alternative baseline conditions have, therefore, been considered, qualitatively, below.
- 6.115 Under the condition where 2 Angel Square is built out before 3 Angel Square, the impact of a Proposed Development comprising 3 Angel Square only would be negligible on the Linx building, as 3 Angel Square has a negligible individual effect on the Linx Building and would not affect the alternative baseline where 2 Angel Square is treated as already built. The impact on Angel Gardens would be lower than identified in the above mirror baseline results as the magnitude of change would be less when comparing a more obstructed alternative baseline against the mirror baseline considered in this assessment. The impact on amenity spaces would similarly be lower, due to comparison with a more obstructed alternative baseline.
- 6.116 Under the condition where 3 Angel Square is built out before 2 Angel Square, the impact of a Proposed Development comprising 2 Angel Square only would be unchanged from the above mirror baseline results on the Linx building, as 3 Angel Square has a negligible individual effect on the Linx Building. The impact on Angel Gardens would be lower than identified in the above mirror baseline results as the magnitude of change would be less when comparing a more obstructed alternative baseline against the mirror baseline considered in this assessment. The impact on amenity spaces would similarly be lower, due to comparison with a more obstructed alternative baseline.

Mitigation Measures

- 6.117 The Proposed Development has been designed to deliver natural light to the centre of the floor plates of the proposed office areas. The resulting transparency of the envelopes of the Proposed Development helps to preserve access to daylight for the opposite buildings. Following pre-application meetings with the local authority, the scale of 2 Angel Square was reduced to drop down in scale from Angel Square towards Angel Street, thus mitigating the impact on daylight and sunlight to neighbouring sensitive receptors.
- 6.118 The Proposed Development is in accordance with objectives and plots identified within the NOMA Masterplan and SRF, and on this basis the overall massing of the buildings has been optimised within the constraints of the Site. Early massing studies indicated that if the BR209 criteria were to be achieved for the adjacent Linx Building a significant reduction of the overall floor plan area would be needed. On this basis, the massing of the Proposed Development has not changed significantly from the schemes previously consented in 2015 and 2020, ensuring that the strategic objectives of the Manchester Local Plan policies CC1 and CC6 to maximise efficiency of developments, with a focus on high density offices, can be delivered.
- 6.119 Window sizes have been considered to provide as much daylight as possible to the interior areas of the commercial development.
- 6.120 Use of materials and glazing specifications have been adjusted to maximise daylight access while providing the required thermal specifications. A high proportion of glass is specified to make the buildings more translucent and reflective in appearance and performance.

Cumulative Effects

- 6.121 Committed developments identified elsewhere in the ES will not pose a combined impact to currently identified residential receptors (Linx and Angel Gardens) due to their separation distance from the Site.

Residual Effects

- 6.122 Further supplementary mitigation measures beyond those included and embedded within the scheme design would involve further changes to massing arrangements, these are not considered appropriate based on the existing site constraints, present design and to meet the accommodation brief for the Proposed Development and strategic objectives of the NOMA Masterplan and SRF.
- 6.123 Whilst moderate and major adverse effects are reported it should be noted that these effects are reported against numerical targets advised within BR209. It should be noted that dense urban areas and city centre developments such as this, may often experience greater site constraints when compared to low-rise suburban areas. Thus, a high degree of obstruction is often unavoidable, as is case for the Proposed Development in the context of the NOMA Masterplan and development brief.
- 6.124 The results are comparable to conditions and impacts that can be found arising from new development in other locations in the city, which have been deemed acceptable by MCC.
- 6.125 Measures have been put in place to minimise the overshadowing nature of the buildings, but given the narrow separation between the Proposed Development and the Linx Building and Angel Gardens, a level of impact on daylight and sunlight access would prevail from any development at a height above 10m (see section 6.119)
- 6.126 Residual effects are reported in Table 6.5.

Table 6.5 Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
During construction, the scheme will transition from the baseline to the fully	N/A	N/A	N/A

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
operational state; the fully-built scenario represents the worst case, so temporary construction effects have not been considered in this assessment.			
Operational Phase			
Noticeable reduction in light levels within residential properties due to reduction in access to daylight and direct sunlight.	Existing residential properties on Angel Street (Linx building): Main living rooms (72% of assessed windows) Not main living rooms (28% of assessed windows) Overall Angel Street elevation	N/A	Major - Moderate adverse, long term, on individual windows - mitigated by living rooms having more than one window and some living rooms being dual aspect. Note that upper storeys below roof overhangs and corner units below balconies experience considerable self-shading in the baseline condition. Moderate – Minor adverse, long term - these windows have a lesser requirement for daylight than living rooms, in the context of BR209 guidance Moderate adverse, long term: - Upper storeys and the northern end of the Angel Street elevation include a proportion of negligibly affected windows (24.5% of total). - Corner living rooms and upper storey apartments are dual aspect, lessening the impact of loss of light to the Angel Street elevation. 28% of affected windows are bedrooms, having a lesser requirement for daylight than living rooms and no specific requirement for sunlight.
Noticeable reduction in light levels within residential properties due to reduction in access to daylight.	Existing residential property (Angel Gardens): Main living rooms (57% of assessed windows) Not main living rooms (43% of assessed windows) Overall northwest facing elevations	N/A	Major adverse, long term - low-rise windows only are affected, all tower windows experience a negligible impact. Moderate adverse, long term - these windows have a lesser requirement for daylight than living rooms, in the context of BR209 guidance. Moderate adverse, long term:

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
			- The majority of northwest facing windows are on the high-rise part of Angel Gardens and are negligibly affected. - Corner living rooms are dual aspect, lessening the impact of loss of light to the Angel Mews elevation. 43% of affected windows are bedrooms, having a lesser requirement for daylight than living rooms and no specific requirement for sunlight.
Reduction in sunlight hours to existing amenity spaces	Existing amenity spaces 1, 6 & 7	N/A	Negligible
	Existing amenity space 5	N/A	Major adverse, long term - These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 81.4% of the combined area receiving at least 2 hours of direct sunlight on the 21 st of March.
Poor access to sunlight to proposed amenity spaces	Proposed amenity spaces 2 & 4	N/A	Moderate-major adverse, long Term - These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 81.4% of the combined area receiving at least 2 hours of direct sunlight on the 21 st of March.
	Proposed amenity space 3	N/A	Negligible

Human Health

- 6.127 Daylight and sunlight amenity are directly linked to human health. The Proposed Development will cause impacts on the daylight and sunlight levels to the adjoining residential properties, although it is not possible to quantify the reductions against potential impact on human health. Like the application of BR209 targets, it is important that the location and nature of the development site and surrounding is considered when determining the significance of any impacts identified.

Reference List

- 6.128 This ES Chapter has been prepared by reference to the following:
- BR209 (2022) Site Layout and Planning for Daylight and Sunlight: a guide to good practice; BRE Construction Research Communications, Garston, UK - Littlefair, P.J., et. al.;
 - British Standards Institution (2018). BS EN 17037: 2018 Daylighting in buildings;

- Chartered Institute of Building Services Engineers (2014). Lighting guide 10: Daylighting – a guide for designers;
- National Planning Policy Framework (MHCLG, 2021); and,
- Manchester Core Strategy 2012-2027 (MCC, 2012).

7 Wind Microclimate

- 7.1 This Chapter of the ES has been prepared by Buro Happold Engineering and assesses the likely Wind Microclimate effects of the Proposed Development upon the Site and the surrounding area, including in a future scenario where other committed developments are built out. This Chapter also describes the methods used to assess these effects, the existing baseline conditions, the proposed mitigation measures required to prevent, reduce, or offset any significant negative effects and the likely residual effects after these measures have been adopted.
- 7.2 The results of analysis which support this ES can be found at Appendix 7.1 and associated Figures 7.1 to 7.29.
- 7.3 Cumulative effects associated with Wind Microclimate have additionally been considered within this ES and can be found in the Cumulative Effects section below within this Chapter.

Legislative and Policy Context

Legislation

National Planning Policy

- 7.4 There are no national codes of practice or legislative policies relating to the assessment of environmental wind flows in the built environment. The effect of environmental wind on pedestrian spaces and the subsequent suitability of these spaces for planned usage are described by Lawson Comfort Criteria (LCC) (Ref 1), which are recognised by Local Planning Authorities (LPAs) as a suitable benchmark for wind assessments. LCC is applied in the wind assessment of the Proposed Development.
- 7.5 There is no specific national or regional legislation or policy guidance for the assessment of the local wind microclimate effect that a new development has on the comfort and safety of users.

Local Planning policy

- 7.6 Several local authorities provide planning guidance for tall buildings, recommending that a wind microclimate assessment be performed. Manchester City Council's (MCC) adopted Core Strategy (July 2012) contains guidance in its Policy EN2, advice on tall buildings; for buildings considered to be significantly higher than their neighbours. Policy EN 2 states that a tall building can have a significant effect on the local environment and microclimate. Policy EN 2 concludes that it is expected this effect should be modelled and that the application of tall buildings should include measures to create an attractive pedestrian friendly local environment.

Assessment Methodology and Significance Criteria

Impact Assessment Methodology

Enabling and Construction

- 7.7 A quantified assessment of the impacts of the Proposed Development during enabling and construction has not been included in this ES Chapter. This is because wind effects at pedestrian level are closely associated with the size and shape of the massing of buildings and during the enabling and construction stage this condition will be continuously changing. Therefore, during the enabling and construction stages the effects will be both varying and temporary. However, using professional experience, a qualitative assessment has been undertaken and is included in the Identification and Evaluation of Significant Effects section.
- 7.8 Cranes will be used on-site during construction; however, it can be noted that these are typically slender and relatively "open" structures. They would therefore not be expected to introduce any material microclimate effects to the Site or surrounding area that would require assessment in this ES.

Completed Development

- 7.9 The wind study includes a direct comparison between the baseline conditions and those created by the Proposed Development for 12 wind directions. The Chapter describes the quantitative assessment of the likely wind environment, and the qualitative judgements that are made to identify areas of potential concern. This analysis included an assessment of the relative forms, layouts and massing of the existing Site and the Proposed Development, as well as landscaping and topography.
- 7.10 Impacts of the likely wind conditions are judged based on the Computational Fluid Dynamics (CFD) modelling results and Buro Happold's extensive experience of wind assessments, full-scale testing, CFD and wind tunnel modelling of similar developments.
- 7.11 CFD simulations were used to quantify the local wind speeds within and in the vicinity of the Site of the Proposed Development at various street locations (e.g., pedestrian access routes, building entrances, outdoor seating areas) for a comprehensive range of wind directions. CFD, as a tool for pedestrian wind modelling, is well validated against wind tunnel tests and real-world data and is often considered advantageous due to its advanced visualisation and domain wide measurement capabilities. Also, CFD is performed at full scale with wind speeds calculated at tens of millions of discrete points, allowing for large amount of data to be used for the assessment of the wind microclimate conditions. Like any other tool, it has its own limitations - however good quality CFD is increasingly becoming an accepted tool in modern standards and guidance documents.
- 7.12 The results presented within this ES Chapter make use of the wind statistics obtained from the meteorological station at Manchester Airport, corrected for the Site (accounting for upwind terrain and reference height at the Site), to determine the probability of local wind speeds exceeding comfort and safety thresholds for a range of common pedestrian activities.
- 7.13 The assessment is supported by CFD modelling of the full range of wind speeds and directions for the eight configurations (which have been suggested to the Local Planning Authority through the EIA Scoping Process), as follows:
- Configuration 1: Existing site (baseline);
 - Configuration 2: Proposed 2 Angel Square with existing surroundings;
 - Configuration 3: Proposed 3 Angel Square with existing surroundings;
 - Configuration 4: Proposed 2&3 Angel Square with existing surroundings;
 - Configuration 5: Proposed 2&3 Angel Square with committed developments
 - Configuration 6: Proposed 2 Angel Square with existing surroundings with mitigation;
 - Configuration 7: Proposed 3 Angel Square with existing surroundings with mitigation; and
 - Configuration 8: Proposed 2&3 Angel Square with existing surroundings with mitigation.
- 7.14 Configurations 1 to 5 were run without any landscape in place. Existing and proposed hard and soft landscape was incorporated for configurations 6 to 8.

Assessment Criteria

- 7.15 The criteria used in this study were based on the LDDC version of the Lawson Criteria (henceforth referred to as 'LDDC Lawson Criteria') and have been reproduced in Table 7.1 Like most criteria used in assessments of pedestrian wind conditions, they relate to a threshold wind speed and a threshold frequency to the suitability of an activity.
- 7.16 Wind microclimate comfort strongly depends on an individual's activity and so has therefore been defined separately for each activity in terms of an average (mean) wind speed exceeded for a certain percentage of the year.
- 7.17 The pedestrian comfort criteria have been developed around the Beaufort scale (Lawson 2001), extending its applicability to environments in and around buildings.
- 7.18 The assessment has been undertaken to investigate the likely pedestrian conditions in and around the Proposed Development when it is subject to wind from different directions. An assessment of the appropriateness of different parts of the Site for their intended use has also been made.

- 7.19 A comfort map was created to illustrate the assessment results. This map includes a direct correlation between the calculated wind speeds by the CFD simulations and the wind frequency data near the Site for the last 10 years. It provides a complete picture of the likely wind conditions related to certain activities, indicating when suitable conditions can be achieved for carrying out such activities or if distress is likely to be experienced. The maps cover the whole Site on a plane 1.5 m above ground level, where wind speeds are measured.
- 7.20 The criterion is based on measured wind conditions to be above a threshold wind speed set at no more than 5% of the time. Given activities are then set for these velocity threshold as Sitting, Standing, Pedestrian walking/Strolling and Pedestrian walking through. There is a fifth category when conditions are likely to uncomfortable.
- 7.21 If conditions for a certain area are above those set for the activity for these areas, mitigation is likely to be required.
- 7.22 The Lawson criteria (Lawson 2001) is used to assess the wind speeds for different activities. The criteria that has been used to assess the unacceptable threshold for different activities as well as the distress criteria are listed in Table 7.1.
- 7.23 The frequency threshold for each criterion is 5% - or about two weeks and a half per year. It is also useful to assess frequency on a seasonal basis. For example, an outdoor seating area may require wind conditions suitable for sitting or standing in summer, but not in winter when the seating is unlikely to be used due to other factors, e.g., ambient temperature and precipitation. For season-specific results, the criteria are based on 5% of hours across the months in that season.

Table 7.1 Lawson 2001 Comfort Criteria thresholds for levels of wind speed

Comfort Scales		
Wind Speed Category	Wind Speed – not to be exceeded more than 5% of time (m/s)	Tolerable Activity
	0-4	Sitting
	4-6	Standing
	6-8	Pedestrian walking
	8-10	Pedestrian walk through
	>10	Uncomfortable

- 7.24 Additionally, criteria for safety have been defined based on 0.022% exceedance (~1.9 hours) per year. These are areas where someone could find walking difficult or even lose their footing. The criterion is reproduced in Table 7.2 below.

Table 7.2 Safety Rating and Threshold mean-hourly wind speed exceeded once per annum

Safety rating	Threshold mean-hourly wind speed exceeded once per annum (0.025%)	Description
S15 - Unsuitable for the general public	>15 m/s	Presents a safety risk for pedestrians, especially to more vulnerable members of the public.

Safety rating	Threshold mean-hourly wind speed exceeded once per annum (0.025%)	Description
S20 - Unsuitable for able-bodied	>20 m/s	Presents a safety risk for all pedestrians.

Methodology for Defining Effects

Significance Criteria

- 7.25 The magnitude of impact of existing / off-Site receptors has been categorised using professional judgement based on the change in velocity observed from the 'Baseline'.
- 7.26 A significant effect for the purposes of the EIA Regulations in this assessment is considered to be an effect of major significance, which would involve breaches of the distress criteria described in Table 7.1 above. These types of effects will require detailed and careful mitigation. Alternatively, a major beneficial effect would be identified where the Proposed Development resulted in the removal of a safety issue from the baseline condition.
- 7.27 Moderate and minor effects are not considered to be significant effects; however, where adverse effects are identified, to reduce the effects further and improve the comfort of receptors, mitigation measures to reduce the effects from moderate adverse to minor adverse will be specified as appropriate.

Table 7.3 Significance Criteria

Effect	Description	Mitigation Required?
Major	Any impact that affects safety (or distress)	Yes
Moderate	Any impact affecting pedestrian comfort where conditions change from suitable for existing activities to unsuitable for proposed activities is considered to be moderate and vice versa for positive impacts	No
Minor	Conditions that are marginal with respect to the criteria or criteria are met during key seasons only	No
Negligible	Represents the cases of minimal or no effect on wind conditions that is likely to be experienced.	No

- 7.28 Effects can be:
- **Adverse** – detrimental or negative effects to an environmental resource or receptor compared with the baseline condition; or
 - **Beneficial** – advantageous or positive effect to an environmental resource or receptor compared with the baseline condition.

Sensitive Receptors

- 7.29 The following sensitive receptors have been identified and assessed within the ES:
- All pedestrian circulation routes, building entrances, waiting areas (e.g., bus stops and pick-up/drop off points) leisure open areas and outdoor seating spaces within the Site

Categorising Likely Significant Effects

- 7.30 For on-site receptors, any adverse effect is a 'significant effect' because it implies that a location, or area, has a wind microclimate that is unsuitable in terms of pedestrian safety and / or comfort for the desired use of that area. On this basis, effects that are adverse need mitigating.
- 7.31 For off-site receptors, a major adverse effect is a 'significant effect' because it implies that a location, or area, which was previously suitable in terms of pedestrian comfort and / or safety, has become unsuitable for the desired use of that area. On this basis, only off-site effects that are major adverse need mitigating.
- 7.32 Beneficial effects that are moderate or major in scale are not considered to be 'significant' or a material consideration for planning, as they result in an improvement in the local wind environment.

Assumptions and Limitations

- 7.33 Future surrounding buildings are based on information available and current Planning Permissions, and the available information from previous assessments (for example, the 4 Angel Square model has been adopted from the Wind Microclimate Assessment carried out in May 2019). If these buildings are amended in the future, the effects could alter the cumulative scenario. However, any significant future changes will need to be subject to an appropriate wind assessment as part of any amendment planning application for each relevant scheme.

CFD Modelling Assumptions

- 7.34 CFD modelling involves the solution of the fundamental equations of fluid motion using numerical techniques. The area of interest is divided into numerous small volumes, or cells, and the equations are solved within each cell. Values of the variables that are solved in the model are determined in each cell and so a comprehensive assessment of pressure and velocity variation within the calculation domain is obtained. To improve the resolution of the results, the 'mesh' or collection of cells is refined in the areas of most interest. This ensures that the large gradients of pressure and velocity at every location within the domain are modelled accurately.

Model Extents and Detail

- 7.35 The geometry of the baseline and the Proposed Development was taken from a 3D model provided by the design team (Figure 7.1, 7.2, 7.3 and 7.4 in Appendix 7.1). Buildings close to the Site, which are likely to affect and be influenced by the presence of the Proposed Development, were modelled.
- 7.36 To account for the presence of buildings and terrain features, an aerodynamic roughness of 0.8 metres (m) was applied to the surface of neighbouring areas, which is typical for city centres.

Atmospheric Boundary layer

- 7.37 The upwind and downwind boundaries of the model are representative of the atmosphere surrounding the Site.
- 7.38 For each of the 12 wind directions, a single, steady-state URANS (Reynolds Average Navier Stoke) calculation was made using the commercial ANSYS CFX software. Turbulence was modelled using a 'SST model', with a production limiter used to ensure realistic flow predictions close to stagnation points. This method allows for the assessment of mean wind speeds of the Proposed Development. The effect of gusts and time dependent flow phenomena were considered qualitatively in this study.

Baseline Conditions

- 7.39 A quantitative assessment of the likely wind environment has been performed and judgements made to identify areas of potential concern. A CFD study was carried out to support the wind assessment; it provides an indication of the wind effects on-site.
- 7.40 Knowledge of the existing use of various parts of the Site and neighbouring buildings and open spaces was based on a site visit undertaken to assess the likely pedestrian activity. For the Proposed Development, the design team provided information regarding the intended usage of

different parts of the Site. This included streets and paths proposed for pedestrian walkways and areas where outdoor amenity space will be located.

Wind Conditions

- 7.41 The prevailing wind across Manchester is from the south and south-west, with some lesser contributions from all other directions. During the winter there are some contributions from the north-east. Good quality long-term weather data is available from MET data for Manchester Airport. This is the most appropriate data for use within this assessment and has been used for other applications in Manchester city centre.
- 7.42 Wind speeds are generally highest in the winter and spring with the seasonal pattern showing very similar range of directions for winter, spring, and autumn. Summer has southerly and westerly prevailing winds with the largest speeds from the south.
- 7.43 The data was translated to meteorological standard terrain (open country) and then to the Site. The method used was the method set out in The Designer's guide to wind loading of building structures, Part 1 (1985), N.J.Cooki. This allows for the sheltering effect of neighbouring terrain but does not allow for channelling of wind, for instance due to rivers and valleys. This effect is not expected to dominate conditions here.
- 7.44 The predicted site wind rose is shown in Figure 7.3 in Appendix 7.1. This shows the direction the wind is blowing from, with long bars representing frequent winds and colour representing magnitude of wind speeds. The seasonal wind roses plots are shown in Figure 7.4 in Appendix 7.1. South and south-westerly winds are the prevailing direction for all four seasons. The largest wind speeds occur during the winter.

Site exposure – Configuration 1

Comfort assessment

- 7.45 In the baseline condition, the Site is largely open to the east and south, resulting in possible exposure to winds from these directions. Significantly taller buildings found closest to the Site are the CIS Tower (25 storeys), Angel Gardens (36 storeys) and One Angel Square (14 storeys), located to the west and to the north. To the northeast is the Skyline Central building, with approximately 20 storeys. Other buildings ranging from 2 to 5 storeys can be found to the north. The tallest building found to the southeast is the Crown Plaza hotel with 10 storeys.
- 7.46 Comfort maps indicating the predicted pedestrian wind conditions are shown in Figures 7.6 and 7.7 in Appendix 7.1 for the baseline summer and winter conditions (worst season/near extreme scenario) respectively. The comfort map combines the calculated wind speeds from the CFD simulations and the wind frequency data for the last 10 years. The map provides an overall picture of the wind conditions relating to certain pedestrian activities, indicating when acceptable conditions are achieved for the proposed activities.
- 7.47 Analysis of wind speeds on site suggests that pedestrian level conditions in the exposed areas are suitable for "Pedestrian standing" for much of the year (see Figure 7.6 in Appendix 7.1). During the worst season it may feel uncomfortable with "pedestrian walking" conditions to the south and southwest of the site and "Pedestrian walk through" around the east corner of the CIS tower and west corner of Angel Gardens (see Figure 7.7 in Appendix 7.1), this is likely caused by the large wind façade downwash and wake created by the CIS Tower. This area is suitable for its intended activity, as it is mainly used for pedestrian walkthrough and is largely located over the highway.
- 7.48 The CIS Tower is quite exposed to prevailing southerly winds. In the summer, westerly winds are likely to bring cooling breezes to ground level. CIS Tower is likely to be exposed to other wind directions as there is little shelter offered by the surrounding buildings.
- 7.49 Current site activities are assumed to be "Pedestrian walking" and "Pedestrian walk through". Conditions are expected to be suitable for these activities; however, it is likely that pedestrians will feel exposed during any high wind conditions and will feel "uncomfortable" particularly in winter.
- 7.50 Towards the north of the site, closest to One Angel Square it is suitable for "Pedestrian sitting" during the summer. During winter, the same area is suitable for "Pedestrian Standing".

Safety assessment

- 7.51 The north and east corner of One Angel Square is exposed, and the results shown in Figure 7.8 in Appendix 7.1 indicate that conditions are likely to be above the safety criteria (more than 2 hours per year of wind speeds above 15m/s). The areas of safety exceedance are several meters in size.

Identification and the Evaluation of Significant Effects

Demolition and Construction

- 7.52 Where the construction of 3 Angel Square is proposed to commence the temporary Marketing Suite will be dismantled and re-located elsewhere within the NOMA estate. The internal timber finishes, external timber CLT frame & cladding along with the MEP systems have been designed to be class leading in sustainability which includes the ability to be fully demountable for relocation at a future point in time.
- 7.53 Where 2 Angel Square will be brought forward in advance of 3 Angel Square,
- 7.54 It is possible that as the buildings start rising from the ground, this will cause temporary localised wind acceleration across the Site. Since the effects are short-term and local, and the normal sheltering from standard site hoardings is expected to be sufficient, and therefore **negligible** effects are expected.
- 7.55 During construction, localised wind acceleration is likely to result in a gradual transition to the new conditions. Impacts from this will be negated at ground level through the provision of hoardings (causing **negligible** effects).

Operation – Configuration 2 (2 Angel Square alone)

Comfort assessment

- 7.56 The massing proposal can be seen in Figure 7.1, 7.2, 7.3 and 7.4 in Appendix 7.1. The proposed development comprises a new building that will incorporate commercial and mixed-used facilities together with public realm. The building has a lower and upper ground floor plus 12 storeys.
- 7.57 The predicted wind conditions created, because of the operational scenario have been assessed and are illustrated in Figures 7.9 to 7.10 in Appendix 7.1. These results present the predicted wind conditions of the Proposed Development for the whole year and the winter (worst season), based on the LDDC as listed in **Error! Reference source not found.**1 above. Safety is also assessed and shown in Figure 7.11 in Appendix 7.1.
- 7.58 The development was tested without landscape; this is a conservative (worst case) scenario.

Thoroughfares

- 7.59 The inclusion of the 2 Angel Square building helps to reduce the area of higher wind speeds east of the CIS Tower, a **minor beneficial** effect. However, the acceleration has been redirected to the west and southeast corners of 2 Angel Square, this is likely due to funnelling in-between 2 and One Angel Square, this is a **moderate adverse** effect.
- 7.60 The results in Figures 7.9 and 7.10 in Appendix 7.1 show an area of wind acceleration at the west of the building under the cantilever for winter and at the southeast corner at Angel Road.
- 7.61 The results show that the inclusion of the 2 Angel Square reduces the wind speeds around the west elevation of the Angel Gardens building this is **minor beneficial** effect.

Entrance doors

- 7.62 The main access door on the west orientation of the building has conditions that are appropriate for pedestrian access, due to the doors being located within a sheltered area.

Safety assessment

- 7.63 Figure 7.11 in Appendix 7.1 shows the results regarding safety exceedance (the 0.022% exceedance for 15 m/s) in this configuration, without mitigation. The results show that the area of safety exceedance present in the baseline is at the North corner One Angel Square. The safety exceedance

area to the southeast corner has been eliminated; therefore, it is considered that overall, the effect is balanced.

- 7.64 At the east corner of 2 Angel Square there is a safety exceedance which will require mitigation to be implemented this is a **Major adverse** effect.

Operation – Configuration 3 (3 Angel Square alone)

Comfort assessment

- 7.65 The massing proposal for Configuration 3 can be seen in Figure 7.1 and Figure 7.2 in Appendix 7.1. The Proposed Development comprises one building that will incorporate office and lower-level retail uses with a lower and upper ground floor plus 11 storeys together with public realm.
- 7.66 The predicted wind conditions created because of the operational scenario have been assessed and are illustrated in Figures 7.12 to 7.13 in Appendix 7.1. These results present the predicted wind conditions of the Proposed Development for the whole year and the winter (worst season), based on the Lawson criteria as listed in **Error! Reference source not found..** Safety is also assessed and shown in Figure 7.14 in Appendix 7.1.
- 7.67 The development was tested without landscape; this is a conservative (worst case) scenario.

Thoroughfares

- 7.68 The results show, when compared with the baseline (Figure 7.6 in Appendix 7.1), that the Proposed Development will create areas of shelter and areas of wind acceleration. All areas are suitable for their intended activity, indeed the most extreme areas are classified as tolerable for “Pedestrian walk through” along Miller Street. The significance of any effect on comfort levels is therefore **negligible to minor adverse**.
- 7.69 The results show that this configuration helps to reduce peak conditions or translate them to other locations within the Site, although this is of minor or equal magnitude to those observed in the baseline results shown in Figure 7.6 in Appendix 7.1.
- 7.70 The south-westerly façade is likely to direct winds down to ground level and increase wind acceleration on the west edge of the building, causing a **minor to moderate adverse** effect (winter – Figure 7.13 in Appendix 7.1).
- 7.71 The building reduces wind speeds to the east of the building; this is a **major to moderate beneficial** effect (summer and winter).
- 7.72 During the worst season (see Figure 7.13 in Appendix 7.1) conditions on Miller Street to the south become windier. However, this area is still classified as suitable for “Pedestrian walking through”, and thus **negligible** effects are predicted, when compared to the baseline scenario. This is a wind effect caused by the CIS tower.
- 7.73 Conditions along Angel Street (including areas further north of One Angel Square) are likely to benefit from the introduction of the Proposed Development. The effects are likely to be minor beneficial to negligible.
- 7.74 CFD simulations show that the orientation of 3 Angel Square is likely to increase the amount of facade downwash at ground level caused by the southerly winds.
- 7.75 The strongest local peak conditions are below those currently experienced on the existing site. The expected operational effects are summarised in Table 7.4.
- 7.76 In general terms it can be concluded that the Proposed Development has a **moderate to major adverse** effect to some of the areas to the west in between the CIS Tower and the 3 Angel Square building.

Entrance doors

- 7.77 The main access door on the west orientation of the building has conditions that are appropriate for pedestrian access, due to the doors being located within a sheltered area.

Public external areas

- 7.78 The publicly accessible landscaped areas to the west and northwest of the building are likely to be sheltered by the massing of 3 Angel Square for most of the year. These areas are likely to experience a **major beneficial** effect because of lower wind speeds.
- 7.79 For most of the wider areas of the development the significance is **major beneficial** for the public realm.

Safety assessment

- 7.80 Figure 7.14 in Appendix 7.1 shows the results regarding safety exceedances (0.022% exceedance for 15 m/s) for the Proposed Development. The results show that there are areas where the safety criteria has been exceeded at the north and southeast corner of One Angel Square.

Operation – Configuration 4 (2 Angel Square & 3 Angel Square)

Comfort assessment

- 7.81 The massing proposal can be seen in Figure 7.1 and Figure 7.2 in Appendix 7.1 and as described in Section 4 of the ES.
- 7.82 The predicted wind conditions created because of the operational scenario have been assessed and are illustrated in Figures 7.15 to 7.16 in Appendix 7.1. These results present the predicted wind conditions of the Proposed Development for the whole year and the winter (worst season), based on the Lawson 2001 criteria as listed in **Error! Reference source not found.** above. Safety is also assessed and shown in Figure 7.17 in Appendix 7.1.

Thoroughfares

- 7.83 Compared with the baseline results in Figure 7.6 and 7.7 in Appendix 7.1, the magnitude of change in wind microclimatic conditions is large in some areas as described below. All areas are suitable for their intended activity, with the most extreme areas classified as tolerable for “Pedestrian walk through” along Miller Street and particularly concentrated at the west corner of 3 Angel Square, this is the condition shown in the baseline and is mainly a wind effect caused by the CIS tower. The significance of any effect on comfort levels is therefore **negligible to minor adverse** for most of the development and major beneficial for the park and areas to the west of the Proposed Development.
- 7.84 In the winter the easterly façade of the 2 Angel Square building is likely to bring winds down to ground level and an increase of wind acceleration in between 2 and One angel square and on the north-east corner of the building, causing a negligible to **minor adverse** (winter).
- 7.85 In summer the significance is negligible effect.

Entrance doors

- 7.86 The main access door area on the west orientation of the 2 Angel Square are likely to be suitable for entrances, due to the doors being located within a sheltered area.

Public external areas

- 7.87 The publicly accessible landscaped areas to the northwest of 3 Angel Square are likely to be sheltered by the massing of the proposed buildings for most of the year. These areas are likely to create a major beneficial effect as they are suitable for sitting and standing and are likely to experience low wind speeds.
- 7.88 Conditions along Angel Street (including areas further north of One Angel Square) have changed, immediately east of the 2 Angel Square becoming windier. This is likely to be minor adverse.
- 7.89 During the worst season (see Figure 7.16 in Appendix 7.1) conditions on Miller Street to the south become windier. However, this area is still classified as suitable for “Pedestrian walk through”, and thus negligible effects are predicted, when compared to the baseline scenario. As we explained before, this is mainly cause by the CIS tower, once 3 Angel Square is in place the wind acceleration between the two buildings increases (due also to façade downwash from 3 Angel Square) a minor adverse effect as the areas is still classified as “Pedestrian walk through”.

Safety assessment

- 7.90 Figure 7.17 in Appendix 7.1 shows the results regarding distress for the whole year for the baseline and the proposed development. The results show the 0.022% exceedance for 15 m/s. The results show that there is a safety exceedance above the north corner of One Angel Square.
- 7.91 The safety map also shows that the inclusion of the Proposed Development is likely to remove the existing safety exceedance around the east corner of One Angel Square, compared to the C1 Baseline, a **major beneficial** effect.

Cumulative Effects – Configuration 5 (2 Angel Square & 3 Angel Square with Cumulative Committed Developments)

Demolition and Construction

- 7.92 There are no significant cumulative construction effects anticipated, as any construction period will be temporary. Therefore, no cumulative effects are anticipated, and no mitigation is required, however standard construction mitigation measures will be implemented including standard site hoardings to shelter neighbouring areas.

Operation

- 7.93 Potential cumulative effects have also been assessed from an operational perspective, which are those that may arise from a combination of the Proposed Development's effect in combination with those of other future committed schemes in the area.

Comfort assessment

- 7.94 The massing proposal can be seen in Figure 7.1, 7.2, 7.3 and 7.4 in Appendix 7.1 and as described in Section 4 of the ES.
- 7.95 The predicted wind conditions created because of the operational scenario and future cumulative developments have been assessed and are illustrated in Figures 9.18 to 9.20. These results present the predicted wind conditions of the Proposed Development with future cumulative developments for the summer and the winter (worst season), based on the Lawson criteria as listed in **Error! Reference source not found.** above. Safety is also assessed and shown in Figure 7.20 in Appendix 7.1.

Thoroughfares

- 7.96 Compared with the baseline results in Figure 7.6 and 7.7 in Appendix 7.1, the magnitude of change in wind microclimatic conditions is large in some areas as described below. All areas are suitable for their intended activity, with the most extreme areas classified as tolerable for "Pedestrian walk through" along parts of Miller Street and between One Angel Square and 2 Angel Square. Conditions are generally more sheltered than in the baseline, due to shelter provided by the 2 and 3 Angel Square buildings themselves. The significance of any effect on comfort levels is therefore negligible to minor beneficial for most of the development and major beneficial for some areas at the north of the CIS Tower and to the east of the Angel Gardens development.
- 7.97 In the winter wind acceleration is observed between the One Angel Square building and 2 Angel Square. However, conditions are still suitable for pedestrian walkthrough, therefore this is a negligible effect (winter).
- 7.98 In summer the significance is negligible to minor beneficial effects.

Entrance doors

- 7.99 The main access door areas on the west orientation of 2 Angel Square and the north and west orientations of 3 Angel Square are likely to be suitable for entrances, due to the doors being located within sheltered areas.

Public external areas

- 7.100 The publicly accessible landscaped areas between the two buildings, and to the to the northwest of 3 Angel Square are likely to be sheltered by the massing of the 2 and 3 Angel Square buildings for

most of the year. These areas are likely to create a major beneficial effect as they are suitable for sitting and are likely to experience low wind speeds.

- 7.101 Conditions along Angel Street (including areas further north of One Angel Square) have changed, with some area becoming calmer and some other immediately east of the 2 Angel Square becoming windier. The effects where conditions have improved (northeast of One Angel Square) are likely to be minor beneficial to negligible. To the east of 2 Angel Square are likely to be minor adverse.
- 7.102 During the worst season (see Figure 7.19 in Appendix 7.1) conditions on Miller Street to the south become less windy in some areas to the south and southeast of 3 Angel Square. Therefore, minor beneficial effects are predicted, when compared to the baseline scenario in these areas. As explained before, the effects along Miller Street are mainly caused by the CIS tower, once 3 Angel Square is in place the wind acceleration between the two buildings is 'squeezed' and moves further to the northeast. This is a minor adverse effect as the area is still classified as suitable for pedestrian walk through.

Safety assessment

- 7.103 Figure 7.20 in Appendix 7.1 shows the results regarding distress for the whole year for the proposed development and future cumulative developments. The results show the 0.022% exceedance for 15 m/s. The results show that there are no areas where the distress criteria has been exceeded within the perimeter of the site.
- 7.104 The safety map also shows that the inclusion of the Proposed Development is likely to remove the existing safety exceedance around the base of One Angel Square, a major beneficial effect. Table 7.5 shows the predicted effects for safety.

Mitigation Measures

Demolition and Construction

- 7.105 There are no significant construction effects anticipated, therefore no mitigation is required. However standard construction mitigation measures will be implemented including standard site hoardings to shelter neighbouring areas.

Operation Configuration 6 (2 Angel Square with Mitigation)

Details of Mitigation Measures incorporated in the Design Proposal

- 7.106 The landscape strategy has been developed in consultation with the design team and the wind modelling results at every stage of the project. This has allowed the deployment of soft and hard landscaping to specific locations within the Site. The CFD model includes the landscape proposal with tolerant evergreen species such as pine and cedar, which reflects the proposals by Planit-IE. The assessment includes the landscape to assess the 2 Angel Square building in isolation. This strategy changes depending on the phasing, and it's covered by the following sections.
- 7.107 The assessment includes the existing and agreed hard and soft landscape within the NOMA site and the surrounding streets within the assessment area.
- 7.108 Low and high landscape elements have been combined in some areas that allows for a continuous buffer zone from ground to canopy level. The Angel Mews area has been designed with a combination of hard and soft landscape surrounding key sitting areas. Further descriptions of the landscape can be found within the Public Realm section of the Design and Access Statement and on the drawings prepared by Planit-IE.
- 7.109 The landscape proposal as shown in Figure 7.5 in Appendix 7.1 within the redline boundary, was incorporated into the CFD modelling for the testing of the operational mitigated scenario. The landscape design has evolved to respond to the emerging proposals. The landscaping scheme has responded to the need to minimise façade downwash and wind acceleration at ground level.
- 7.110 No additional mitigation was found to be required.
- 7.111 The results of the tests carried out by incorporating these elements are shown in Figures 7.20 and 7.21 in Appendix 7.1. When comparing Figure 7.20 with Figure 7.6 and Figure 7.21 with Figure 7.7 we can observe the beneficial effect that the additional mitigation has brought by improving

conditions immediately to the south and east (along Angel Street) of 2 Angel Square. Also, the improvement can be seen along Miller Street and Angel Mews.

- 7.112 The safety map also shows that the inclusion of landscape (Figure 7.23 in Appendix 7.1) improves the safety condition around the north corner of the One Angel Square building, compared to Figure 7.11 in Appendix 7.1 providing a major beneficial effect. Table 7.5 shows the predicted effects for safety at each stage of the project. This allows the deployment of soft and hard landscape to specific locations within the site.

Operation Configuration 7 (3 Angel Square with Mitigation)

Details of Mitigation Measures incorporated in the Design Proposal

- 7.113 The landscape strategy has been developed in consultation with the design team and the wind modelling results at every stage of the project. This has allowed the deployment of soft and hard landscaping to specific locations within the Site. The CFD model includes the landscape proposal with tolerant evergreen species such as pine and cedar, which reflects the proposals by Planit-IE. The assessment includes the landscape to assess the 3 Angel Square building in isolation. This strategy changes depending on the phasing, and it's covered by the following sections.
- 7.114 The assessment includes the existing and agreed hard and soft landscape within the NOMA state and the surrounding streets within the assessment area.
- 7.115 Low and high landscape elements have been combined in some areas that allows for a continuous buffer zone from ground to canopy level. The Angel Mews area has been designed with a combination of hard and soft landscape surrounding key sitting areas. Further descriptions of the landscape can be found within the Public Realm section of the Design and Access Statement and on the drawings prepared by Planit-IE.
- 7.116 The landscape proposal within the redline boundary as shown in Figure 7.5 in Appendix 7.1, was incorporated into the CFD modelling for the testing of the operational mitigated scenario. The landscape design has evolved to respond to the emerging proposals. The landscaping scheme has responded to the need to minimise façade downwash and wind acceleration at ground level.
- 7.117 No additional mitigation was found to be required.
- 7.118 The results of the tests carried out by incorporating these elements are shown in Figures 7.24 and 7.25 in Appendix 7.1. When comparing Figure 7.24 with Figure 7.12 we can observe the beneficial effect that the additional mitigation has brought by improving conditions along Miller Street, were some conditions change from strolling to standing, to the north west (Angel Mews) of 3 Angel Square, were the areas for sitting have increase due to the inclusion of trees. As well as the improvement shown in between Plot 3 and the existing Angel Garden Building to the south, increasing size of the sitting area.
- 7.119 For the worst season Figure 7.25 with Figure 7.13 in Appendix 7.1, the incorporation of the landscape has improved the wind conditions along Miller Street and northeast of the 3 Angel Square building.
- 7.120 The safety map also shows that the inclusion of landscape (Figure 7.26 in Appendix 7.1) has removed the safety exceedance around the north and southeast corner of the One Angel Square building, providing a major beneficial effect. Table 7.6 in Appendix 7.1 shows the predicted effects for safety at each stage of the project. This allows the deployment of soft and hard landscape to specific locations within the site.

Operation Configuration 8 (2 Angel Square and 3 Angel Square with Mitigation)

Details of Mitigation Measures incorporated in the Design Proposal

- 7.121 The landscape strategy has been developed in consultation with the design team and the wind modelling results at every stage of the project. This has allowed the deployment of soft and hard landscaping to specific locations within the Site. The CFD model includes the landscape proposal with tolerant evergreen species such as pine and cedar, which reflects the proposals by Planit-IE. The assessment includes the landscape to assess the 2 Angel Square building in isolation. This strategy changes depending on the phasing, and it's covered by the following sections.

- 7.122 Low and high landscape elements have been combined in some areas that allows for a continue buffer zone from ground to canopy level. The public realm areas have been designed with a combination of hard and soft landscape surrounding key seating areas. Further descriptions of the landscape can be found within the main application document that narrates the evolution of the strategy for landscaping.
- 7.123 Figure 7.27 in Appendix 7.1 shows the result for Summer. The results show, when compared with the baseline (Figure 7.6 in Appendix 7.1), that the Proposed Development will create areas of shelter and areas of wind acceleration. In general terms it can be concluded that the Proposed Development has a moderate beneficial to negligible effect to some of the areas to the west and around the base of One Angel Square. It is also shown to help reduce peak conditions or translate them to other locations within the Site, being always of minor or equal magnitude of those observed on the baseline results shown in Figures 7.6 and 7.7 in Appendix 7.1.
- 7.124 The baseline conditions show areas of wind acceleration at Miller Street and Rochdale Road. These areas of wind acceleration are influenced by the One Angel Square, CIS, and Angel Gardens. All these existing conditions are outside the redline boundary of the building. The new development has a minor beneficial effect in reducing wind speeds at these areas; however, the conditions along Miller Street and the west former of 3 Angel square remain at “Pedestrian walk through” conditions this is a negligible effect as it remains suitable for the intended activity.
- 7.125 The Proposed Development has removed the safety exceedances found in the baseline conditions; this is a major beneficial effect.
- 7.126 The safety map in Figure 7.29 in Appendix 7.1, does not show safety failures - a major beneficial effect when compared with the baseline Figure 7.8 in Appendix 7.1.

Residual Effects

Demolition and Construction

- 7.127 There are no significant residual construction effects, therefore no mitigation is required. However, standard construction mitigation measures will be implemented including standard site hoardings to shelter neighbouring areas.

Operation

- 7.128 The residual effects including further mitigations measures recommended post planning can be seen in **Error! Reference source not found..**
- 7.129 The results show that there are no areas where the safety criteria has been exceeded within the Proposed Development and nearby perimeter areas, once landscape and mitigation measures have been implemented; in fact the inclusion of the Proposed Development reduces the areas where safety fails around the base the CIS tower and the One Angel Square building, improving the local environment, a major beneficial effect.

Table 7.4 Residual Effects

Receptor	Impact Before Design Evolution Mitigation	Scale	Design Evolution Mitigation	Further Mitigation	Residual Effect
Pedestrians surrounding the site during the demolition and construction phase	Negligible	Local	None required	None required	Negligible

Receptor	Impact Before Design Evolution Mitigation	Scale	Design Evolution Mitigation	Further Mitigation	Residual Effect
Pedestrians walking along Miller Street	Moderate beneficial to Negligible	Local	None required	None required	Moderate beneficial to Negligible
Pedestrians walking along Angel Street	Negligible	Local	None Required	None required	Negligible
Pedestrians walking at the corner of Angel Street and Rochdale Road	Minor adverse to Negligible	Local	Wind screens, perennial trees	None required	Minor adverse to negligible
Pedestrians walking along Angel Street– with 2 Angel Square delivered first and in isolation	Major adverse	Local	Trees and wind screens north of the building	None required	Moderate beneficial to Negligible
Pedestrians walking at the southwest corner of 3 Angel Square delivered first and in isolation	Moderate to Major adverse	Local	Trees and wind screens.	None required	Moderate beneficial to Negligible
Recreational use of areas within the masterplan area	Major beneficial to Negligible	Local	None required	None required	Major beneficial to Negligible

Table 7.5 Safety effects

Location	Baseline	Proposed Development	Cumulative	Landscape or Mitigated
NOMA, 2 Angel Square & 3 Angel Square	PASS (empty site)	PASS	PASS	PASS
NOMA, 2 Angel Square & 3 Angel Square perimeter areas – streets and highway, public realm	PASS (empty site)	PASS	PASS	PASS
CIS Tower	FAILS	FAILS	FAILS	PASS

Location	Baseline	Proposed Development	Cumulative	Landscape or Mitigated
One Angel Square	FAILS	PASS	PASS	PASS
NOMA, 2 Angel Square	PASS (empty site)	PASS	PASS	PASS
NOMA, 3 Angel Square	PASS (empty site)	PASS	PASS	PASS

- 7.130 A quantitative assessment of wind effects has been undertaken. Wind effects and mitigation measures have been discussed in the operation and mitigation measures sections.
- 7.131 The residual effects predicted are negligible for most parts of the Masterplan, with some major beneficial effects around the CIS Tower and the One Angel Square and associated public realm.
- 7.132 Wind conditions on site are tolerable for diverse activities in most areas, and no safety concerns/failures were found within the Proposed Development or nearby perimeter with mitigation.
- 7.133 The baseline conditions show areas of wind acceleration at Miller Street and Rochdale Road. These areas of wind acceleration are influenced by the One Angel Square, CIS, and Plot L (Angel Gardens) buildings. All these existing conditions are outside the redline boundary of the building. The new development has a minor beneficial effect in reducing wind speeds at these areas, however the conditions along Miller Street and Rochdale Road remain as shown in the existing baseline for comfort. The Proposed Development helps to remove the safety areas found in the baseline conditions; this is a major beneficial effect.
- 7.134 It is anticipated that wind conditions are likely to improve adverse effects from moderate to minor if mitigation is applied as described above, near to the base of the building and/or around areas affected by wind acceleration.
- 7.135 The addition of landscape within the street and towards the northeast of the development has proved to work in reducing wind speeds. However, adverse wind conditions are likely to remain minor adverse to negligible.

References

- T.V. Lawson. (2001). Building Aerodynamics, Imperial College Press (125-137).
- H. Holger Koss / J. (2006). Wind Engineering Industrial Aerodynamics 94 (781–797).

8 Summary of Residual Impacts

8.1 This section contains a summary of the residual effects of the Proposed Development.

Legislation, Policy and Guidance

Regulatory Requirement

8.2 The requirement for mitigation measures is specified in Schedule 4, Part 1 (5) of the EIA Regulations, which states that Environmental Statements should include:

“a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.”

Approach to Mitigation

8.3 The legislation does not specifically outline how mitigation measures should be incorporated into an EIA. Nonetheless, mitigation measures form an integral part of the EIA process. This is illustrated by the International Association for Impact Assessment’s definition of EIA as:

“the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.” [1]

8.4 Mitigation itself is defined by the United Nations Environment Programme (UNEP) as:

“the measures that are necessary to avoid, minimise or offset predicted adverse impacts and, where appropriate, to incorporate these into an environmental management plan or system.” [2]

8.5 In approaching mitigation, best practice guidance suggests a hierarchical approach. The UNEP EIA Training Resource Manual (2002) advises that impacts should ideally be:

- Avoided; if not
- Minimised; and/or
- Compensated.

Planning Policy

8.6 This chapter considers policy relating to the mitigation of impacts from the Proposed Development. It should be read in conjunction with technical chapters 6 - 7, where planning policy at the national, regional, county, and local level is discussed in greater detail for each topic.

Planning Guidance

8.7 The National Planning Practice Guidance (NPPG) does not provide specific advice regarding approaches to mitigation, however Paragraph 4 (Reference ID: 6-004-20140612), ‘How can adaptation and mitigation approaches be integrated?’, suggests particular attention be paid: “*to integrating adaptation and mitigation approaches and looking for ‘win-win’ solutions that will support sustainable development... Environmental Impact Assessment can be a useful (sic) for testing the integration of mitigation and adaptation measures and the long term implications of decisions.*”

Daylight, Sunlight and Overshadowing

Table 8.1 – Daylight, Sunlight and Overshadowing Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
Construction Phase			
During construction, the scheme will transition from the baseline to the fully operational state; the fully-built scenario represents the worst case, so temporary construction effects have not been considered in this assessment.	N/A	N/A	N/A
Operational Phase			
Noticeable reduction in light levels within residential properties due to reduction in access to daylight and direct sunlight.	Existing residential properties on Angel Street (Linx building): Main living rooms (72% of assessed windows) Not main living rooms (28% of assessed windows) Overall Angel Street elevation	N/A	Major - Moderate adverse, long term, on individual windows - mitigated by living rooms having more than one window and some living rooms being dual aspect. Note that upper storeys below roof overhangs and corner units below balconies experience considerable self-shading in the baseline condition. Moderate – Minor adverse, long term - these windows have a lesser requirement for daylight than living rooms, in the context of BR209 guidance Moderate adverse, long term: • Upper storeys and the northern end of the Angel Street elevation include a proportion of negligibly affected windows (24.5% of total). • Corner living rooms and upper storey apartments are dual aspect, lessening the impact of loss of light to the Angel Street elevation. • 28% of affected windows are bedrooms, having a lesser requirement for daylight than living rooms and no specific requirement for sunlight.
Noticeable reduction in light levels within residential properties due to reduction in access to daylight.	Existing residential property (Angel Gardens):	N/A	

Likely Significant Effect	Receptor(s)	Mitigation Measure	Residual Effect
	Main living rooms (57% of assessed windows) Not main living rooms (43% of assessed windows) Overall northwest facing elevations		Major adverse, long term - low-rise windows only are affected, all tower windows experience a negligible impact. Moderate adverse, long term - these windows have a lesser requirement for daylight than living rooms, in the context of BR209 guidance. Moderate adverse, long term: - The majority of northwest facing windows are on the high-rise part of Angel Gardens and are negligibly affected. - Corner living rooms are dual aspect, lessening the impact of loss of light to the Angel Mews elevation. 43% of affected windows are bedrooms, having a lesser requirement for daylight than living rooms and no specific requirement for sunlight.
Reduction in sunlight hours to existing amenity spaces	Existing amenity spaces 1, 6 & 7	N/A	Negligible
	Existing amenity space 5	N/A	Major adverse, long term - These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 81.4% of the combined area receiving at least 2 hours of direct sunlight on the 21 st of March.
Poor access to sunlight to proposed amenity spaces	Proposed amenity spaces 2 & 4	N/A	Moderate-major adverse, long Term - These areas are seen as an extension to Angel Square, which will be the focus for seating area, and which does meet BR209 guidance. When considered as a single public realm space incorporating Areas 1 to 5, BR209 guidance is met with 81.4% of the combined area receiving at least 2 hours of direct sunlight on the 21 st of March.
	Proposed amenity space 3	N/A	Negligible

Wind Microclimate**Table 8.2 – Wind Microclimate Summary of Receptors, Likely Significant Effects, Mitigation Measures, and Residual Effects**

Receptor	Impact Before Design Evolution Mitigation	Scale	Design Evolution Mitigation	Further Mitigation	Residual Effect
Construction Phase					
There are no significant residual construction effects, therefore no mitigation is required. However, standard construction mitigation measures will be implemented including standard site hoardings to shelter neighbouring areas.					
Operational Phase					
Pedestrians surrounding the site during the demolition and construction phase	Negligible	Local	None required	None required	Negligible
Pedestrians walking along Miller Street	Moderate beneficial to Negligible	Local	None required	None required	Moderate beneficial to Negligible
Pedestrians walking along Angel Street	Negligible	Local	None Required	None required	Negligible
Pedestrians walking at the corner of Angel Street and Rochdale Road	Minor adverse to Negligible	Local	Wind screens, perennial trees	None required	Minor adverse to Negligible
Pedestrians walking along Angel Street– with 2 Angel Square delivered first and in isolation	Moderate adverse	Local	Trees and wind screens north of the building.	None required	Moderate beneficial to Negligible
Pedestrians walking at the southwest corner of 3 Angel Square delivered first and in isolation	Moderate to Major adverse	Local	Trees and wind screen.	None required	Moderate beneficial to Negligible
Recreational use of areas within the masterplan area	Major beneficial to Negligible	Local	None required	None required	Major beneficial to Negligible

9 Type 1 Cumulative Impacts

- 9.1 This chapter assesses ‘Type 1’ cumulative effects, drawing on the results of the technical assessments contained at Chapters 6 and 7 and summarised in Chapter 8 of this ES.
- 9.2 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.
- 9.3 Type 2 cumulative effects are considered within the ES technical chapters.

Legislation, Policy and Guidance

Legislation

- 9.4 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’.
- 9.5 The EIA Regulations require ‘a description of the likely significant effects’, including cumulative effects.
- 9.6 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.

Guidance

- 9.7 Several 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.
- 9.8 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’.
- 9.9 Paragraph 24 of the 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

- 9.10 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.
- 9.11 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.

- 9.12 The assessment has primarily focused on sensitive receptors identified within proximity to the Site (e.g., local residents and businesses located near the Site), likely cumulative effects, and their capacity to accommodate changes that will occur because of the combined residual environmental effects.
- 9.13 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 to identify the potential for Type 1 cumulative effects.
- 9.14 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.
- 9.15 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

- 9.16 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.
 - Negligible: where no discernible effect is expected because of the proposed development cumulatively.
- 9.17 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, moderate, low, and negligible.

Limitations and Assumptions

- 9.18 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, which relies heavily upon quantitative data to inform the assessment.
- 9.19 As a result, several 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.
- 9.20 The scope of this ES is relatively limited to two specific chapters and therefore the in-combination effects set out in Chapters 6 and 7 are limited in terms of receptors.

Identification of Likely Significant Type 1 Cumulative Effects

Construction Phase

- 9.21 Based on the methodology detailed above and the results of the assessments presented in ES Chapter 6 Sunlight, Daylight and Overshadowing and Chapter 7 Wind Microclimate, it is not considered that there would be any Type 1 Cumulative Effects arising from the Proposed Development during the Construction Phase that would be worse than in the Operational Phase, as

the conditions of the Site would transition from the baseline to the fully operational state (representing the worst case scenario).

9.22 Table 9.1 presents the Type 1 Cumulative Effects for the Operational Phase.

Operational Phase

9.23 Based on the methodology detailed above, Table 9.1 presents the results of the review of the potential interactions of individual effects during the operational phase of the development.

Table 9.1: Type 1 Cumulative Effects - Operational Phase

Sensitive Receptor Group	Relevant Operational Phase Residual Effects	Likely Significant Cumulative Effects
Neighbouring Residential Properties	Moderate-Major Long-Term impact on a noticeable reduction of light levels	As per residual impact. No additional Type-1 Cumulative Effects identified.
Pedestrians	Moderate beneficial to Negligible impact on the wind microclimate	As per residual impact. No additional Type-1 Cumulative Effects identified.
Neighbourhood Amenity (microclimate effects)	Scenario 1: 2 Angel Square delivered first Moderate-major adverse impact on sunlight to proposed amenity space 2. Minor-adverse to negligible impact on wind to amenity areas 2 and 4 for delivery of 2 Angel Square only.	Likely moderate adverse impact to neighbourhood amenity to amenity area 2 as a result of the Type-1 Cumulative Effects from wind and daylight and sunlight.
	Scenario 2: 3 Angel Square delivered first Moderate-major adverse impact on sunlight to proposed amenity spaces 4 and 5. Moderate to major-adverse impact on wind to amenity area 3 for delivery of 3. Negligible wind impacts to amenity spaces 1, 2, 4, 5, 6 and 7.	Likely moderate adverse impact to neighbourhood amenity as a result of the Type-1 Cumulative Effects from wind and daylight and sunlight.
	Scenario 3: Both buildings delivered concurrently Negligible wind impacts where both buildings delivered concurrently. Major adverse impact on the daylight and sunlight to existing Amenity area 5.	Likely moderate adverse impact to neighbourhood amenity as a result of the Type-1 Cumulative Effects from wind and daylight and sunlight.

Moderate-major adverse impact
on sunlight to proposed amenity
spaces 2 and 4.



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