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Urban & Renewables

Aviation Impact Assessment

Great Northern

GNW Developments Limited

November 2022







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ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	July 2022	Initial issue
2	November 2022	Second issue – minor amendments

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact of the proposed Great Northern building development upon aviation infrastructure in the surrounding area. The proposed development is located at Great Bridgewater Street, Manchester and will comprise three main towers, the tallest reaching a maximum altitude of 148.05 metres above mean sea level.

Conclusions

The proposed development will not infringe the Obstacle Limitation Surfaces associated with Manchester Airport (see Section 3).

Two of the three towers, including the tallest one, are predicted to be in partial radar line of sight to the Secondary Surveillance Radar at Manchester Airport. The operational impact is likely to be small because the development is partially screened and is located amongst existing obstructions with a greater technical impact. Nevertheless, any technical impact could be of concern to NATS, who safeguard the radar at Manchester Airport and technical mitigation may be required. The optimal solution would likely be a software upgrade funded by the developer and facilitated by NATS that ameliorates the effects of the development (see Section 4).

The proposed development is not predicted to affect any instrument flight procedures due to its height and position relative to these procedures and its size in the context of surrounding developments (see Section 5).

The proposed development is not predicted to significantly affect helicopter operations or other aerodromes including Manchester Barton (see Section 6). It is recommended that the Manchester Royal Infirmary is made aware of the development with reference to their helipad.

There is no mandatory requirement for aviation lighting due to the development's maximum height above ground being less than 150 metres. There is no apparent operational requirement for aviation lighting of the buildings themselves since they do not infringe any obstacle limitation surfaces nor do they represent the most significant obstruction in their immediate area.

Crane Use

The proposed cranes at the site will infringe the Outer Horizontal Surface at Manchester Airport at their maximum proposed height. Crane use will need to be subject to a Crane Operation Scheme agreed with the airport and aviation lighting for the cranes themselves.

Next Steps

The findings of this report should be shared with Manchester Airport and NATS with a view to understanding their position and agree the way forward.

LIST OF CONTENTS

Administration Page 2
Executive Summary 3
Report Purpose 3
Conclusions 3
Crane Use 3
Next Steps 3
List of Contents 4
List of Figures 5
About Pager Power 7
1 Introduction 8
1.1 Overview 8
1.2 Proposed Development Site Plan 8
1.3 Proposed Development Site Layout – Aerial Image 10
1.4 3D Building Representation 11
2 Manchester Airport Details 12
2.1 Overview 12
2.2 Aerodrome Chart 13
3 Obstacle Limitation Surfaces Assessment 14
3.1 Overview 14
3.2 Results 14
3.3 Aviation Lighting 14
4 Radar Impact Assessment 15
4.1 Manchester Airport SSR 15
4.2 Additional Screening Analysis 16
4.3 Impact Significance 22
5 Instrument Flight Procedures (High-Level Overview) 25
5.1 Description of Instrument Flight Procedures 25
5.2 IFPs at Manchester Airport 26

6 Other Aerodromes and Helicopter Operations (High-Level Commentary)..... 32
6.1 Helicopters..... 32
6.2 Other Aerodromes..... 32
7 Cranes..... 33
7.1 Crane Usage..... 33
7.2 Aviation Lighting..... 33
7.3 Crane Operation Scheme..... 33
8 Conclusions and Next Steps..... 34
8.1 Conclusions..... 34
Appendix A – Coordinate Data..... 35
Building Plot 1..... 35
Building Plot 2..... 35
Building Plot 3..... 35

LIST OF FIGURES

Figure 1 Proposed development site plan..... 9
Figure 2 Proposed development site layout (blue) – aerial image..... 10
Figure 3 3D building representation..... 11
Figure 4 Manchester Airport – aerial image..... 12
Figure 5 Manchester Airport - Aerodrome Chart..... 13
Figure 6 Radar line of sight chart for Building A..... 16
Figure 7 Relevant screening – Building A..... 17
Figure 8 Relevant screening – Building B..... 19
Figure 9 Relevant screening – Building C..... 21
Figure 10 Instrument Flight Procedure Minimum Obstacle Clearances..... 25
Figure 11 Instrument Approach Chart (AD 2-EGCC-8-9)..... 31

LIST OF TABLES

Table 1 Radar line of sight assessment summary 15
Table 2 Radar features for reducing interference 24
Table 3 IFP Assessment (high-level) 31

ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 54 countries internationally.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems.

Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 INTRODUCTION

1.1 Overview

Pager Power has been commissioned to investigate the potential impact of the proposed Great Northern building development upon aviation infrastructure in the surrounding area. The proposed development is located at Great Bridgewater Street, Manchester, and will comprise three tall building plots.

Building developments have the potential to affect aviation operations in numerous ways. The most common impacts relate to building developments as physical obstructions both to aircraft and wireless signals used for radar and radio systems. This assessment has identified and assessed all of the key aviation constraints for the proposed development. In detail the report includes:

- Proposed development details.
- Manchester Airport Details.
- Obstacle limitation surfaces (OLS) assessment for Manchester Airport.
- Radar impact assessment for the Manchester Airport Secondary Surveillance Radar (SSR).
- High-level assessment of Instrument Flight Procedures (IFPs).
- Commentary on helicopter use and other aerodromes.
- Commentary on crane usage and lighting requirements.
- Overall conclusions and recommendations.

1.2 Proposed Development Site Plan

The proposed site layout plan for the tall building plots is shown in Figure 1[1] on the following page.

[1] Source: GN Project Overview Crib Sheet 211022

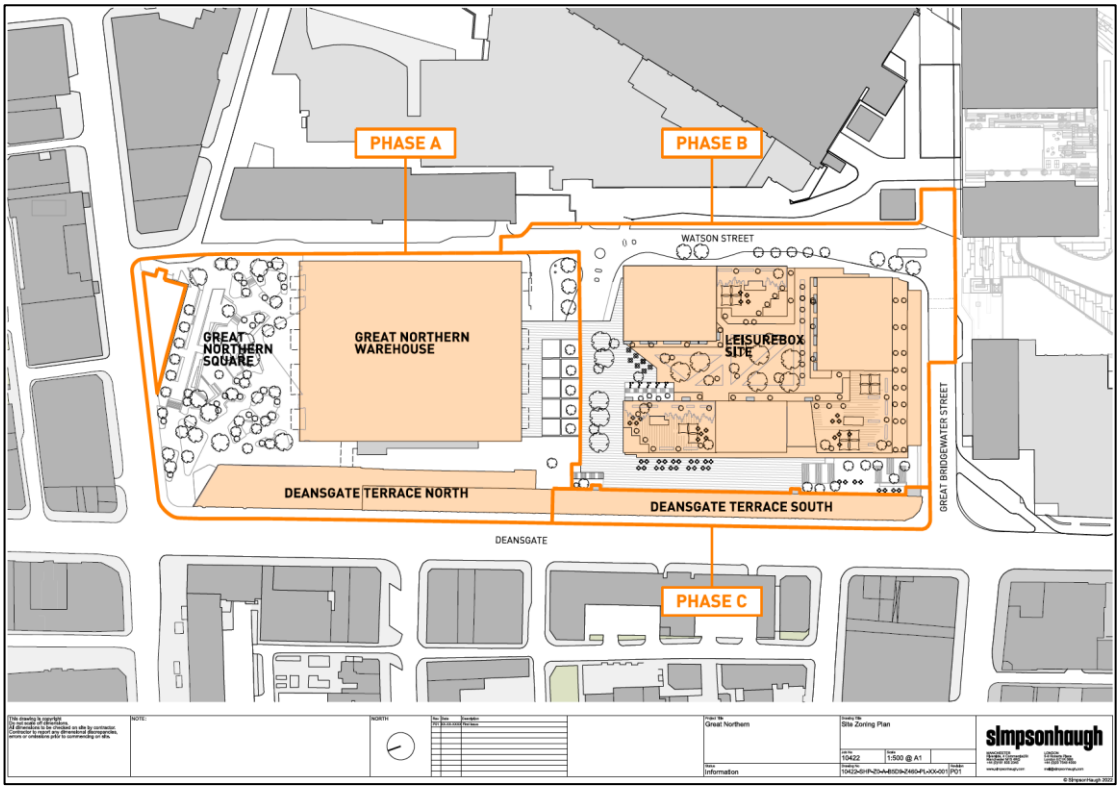


Figure 1 *Proposed development site plan*

1.3 Proposed Development Site Layout – Aerial Image

The approximate proposed development footprint overlaid on aerial imagery is shown in Figure 2 below. Building plot coordinates extrapolated from site drawings are presented in Appendix A.

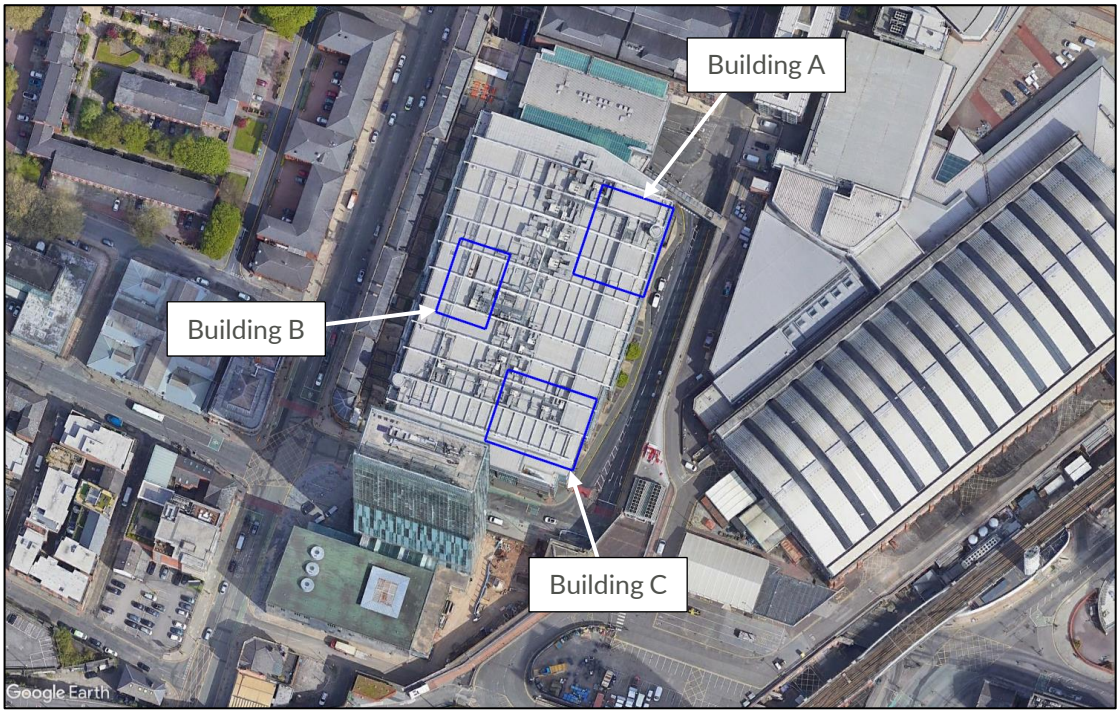


Figure 2 *Proposed development site layout (blue) – aerial image*

1.4 3D Building Representation

A 3D aerial image of the proposed development is shown in Figure 3 below.

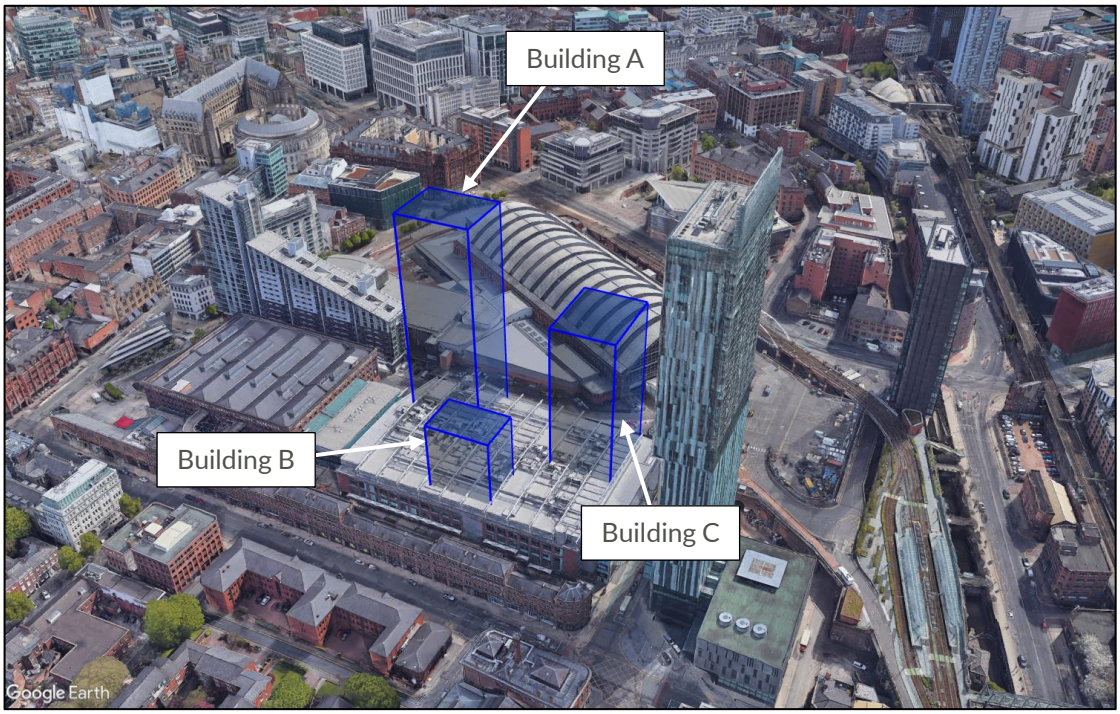


Figure 3 *3D building representation*

2 MANCHESTER AIRPORT DETAILS

2.1 Overview

The following section presents general details regarding Manchester Airport, shown in Figure 4 below.

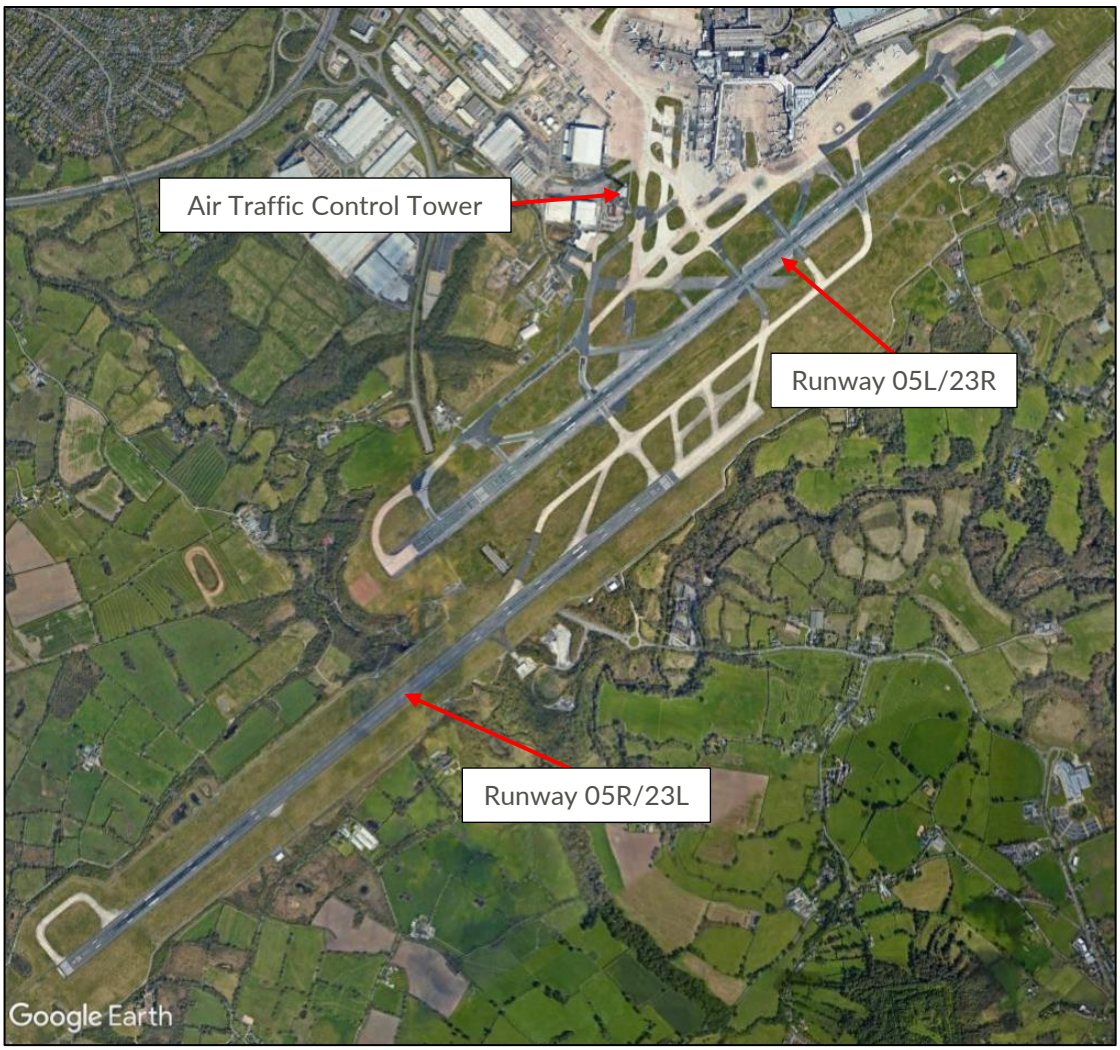


Figure 4 *Manchester Airport – aerial image*

2.2 Aerodrome Chart

The aerodrome chart for Manchester Airport is shown in Figure 5[2] below.

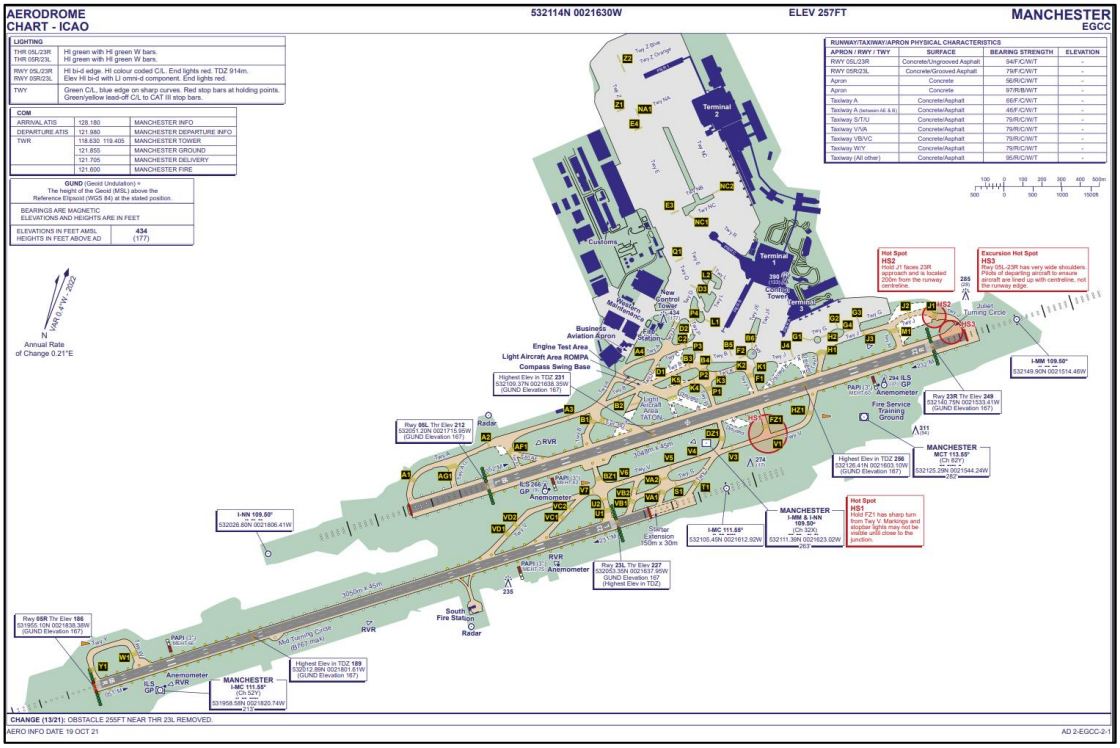


Figure 5 *Manchester Airport - Aerodrome Chart*

[2] Source: NATS AIP

3 OBSTACLE LIMITATION SURFACES ASSESSMENT

3.1 Overview

Obstacle Limitation Surfaces are imaginary planes defined in three dimensions for physical safeguarding purposes (i.e. ensuring that physical structures do not present a safety hazard at an airfield) and are defined around licensed airfields. The dimensions and geometry of the surfaces are constructed based on detailed rules defined in the UK Civil Aviation Authority's Civil Aviation Publication 168. The extent of the surfaces is dependent on the positioning of the runway(s), their dimensions and the elevation above sea level of key coordinates on the aerodrome.

3.2 Results

The OLSs for Manchester Airport have been modelled with respect to the three building plots. The site location is located beneath the Outer Horizontal Surface (OHS) associated with Manchester Airport.

The OHS is flat and has an altitude of 206.69 metres above mean sea level.

The maximum elevation of the proposed development is 148.05 metres above mean sea level.

This means the proposed development at its maximum height will be more than 58 metres below the OHS.

On this basis, no physical obstruction (collision risk) impacts are predicted for the proposed development[3].

3.3 Aviation Lighting

Aviation lighting is mandatory in the UK for obstructions (including buildings) that reach a height of 150 metres or more above ground level. Aviation lighting is also a de-facto requirement for obstructions that breach an OLS[4].

The proposed development does not meet either of these criteria, extending to a maximum of less than 150 metres above ground level and remaining below the relevant OLS.

There is no apparent need for the proposed development to be fitted with aviation lighting. Engagement with Manchester Airport is recommended to confirm their position regarding the development in general and with particular reference to lighting.

[3] This does not include cranes, which are discussed in Section 7.

[4] Alternatives can in principle be agreed if the aerodrome operator and the Civil Aviation Authority are satisfied they would be safe.

4 RADAR IMPACT ASSESSMENT

4.1 Manchester Airport SSR

Manchester Airport has an SSR, located to the south of the runways and safeguarded by NATS. A radar line of sight assessment was completed for each corner of each tower comprising the proposed building development.

The assessment process considers each corner point based on bare earth as a starting point, the presence of existing man-made screening (predominantly existing buildings), is then investigated separately.

Figure 6 on the following page shows the line-of-sight chart for a boundary point of Building A. Information regarding the methodology or the additional line of sight charts can be provided upon request. The box labelled 'certainty' in the figure provides the distance (in metres) by which the building is within line of sight/not within line of sight to the assessed radar (rounded to one decimal place).

Table 1 below summarises the analysis for each building.

Building	Summary of Radar Line of Sight Results (bare-earth)
A	The building is visible by a margin of 111-113 metres.
B	The building is visible by a margin of 56-57 metres.
C	The building is visible by a margin of 91-93 metres.

Table 1 *Radar line of sight assessment summary*

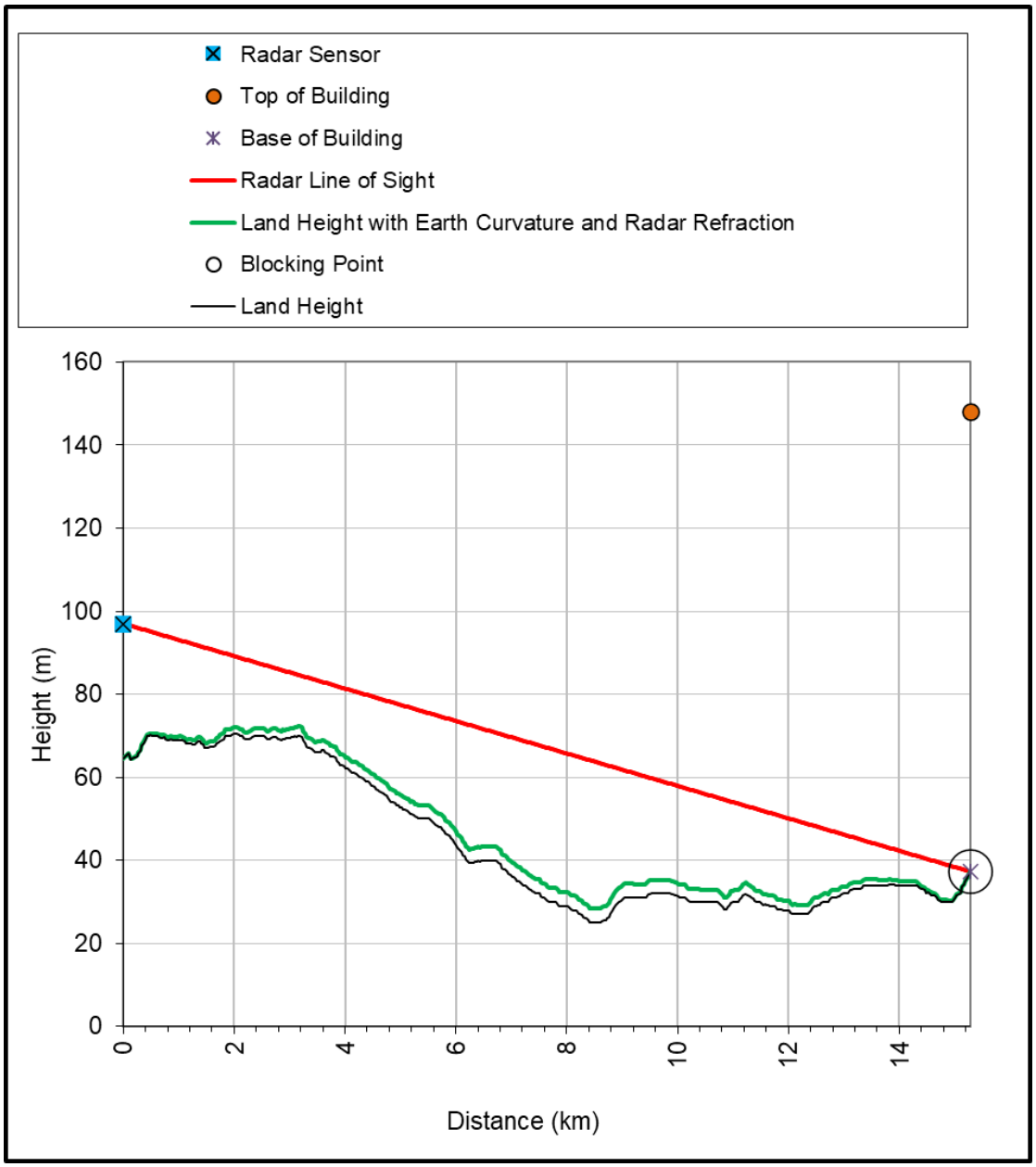


Figure 6 *Radar line of sight chart for Building A*

4.2 Additional Screening Analysis

The line-of-sight has been analysed in the context of existing developments for each building in turn.

Building A

Figure 7 on the following page illustrates the main screening that is applicable to Building A. The orange polygon shows the volume of airspace from the radar to the extents of the building in three dimensions. The extent to which this obstructed by the most prominent existing structures is illustrated in the insets.

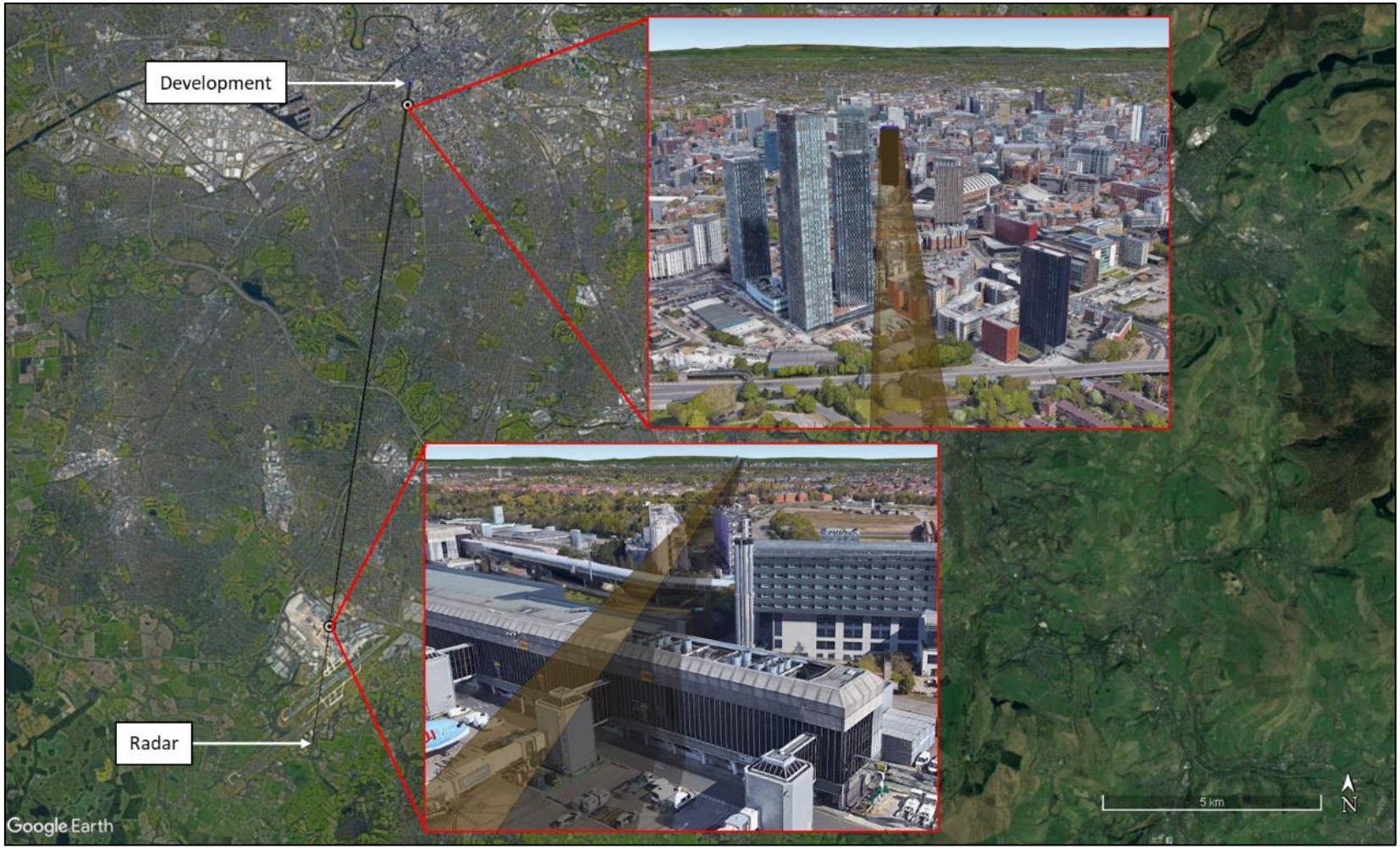


Figure 7 *Relevant screening – Building A*

The radar line of sight is significantly but not entirely obstructed by buildings at the airport itself, adjacent to the Radisson Hotel. The radar line of sight is not obstructed by the Owen Street development or the Beetham Tower.

Overall, whilst there is some screening present, Building A could have a technical impact on the radar (discussed in Section 4.3).

Building B

Figure 8 on the following page illustrates the main screening that is applicable to Building B. The orange polygon shows the volume of airspace from the radar to the extents of the building in three dimensions. The extent to which this obstructed by the most prominent existing structures is illustrated in the insets.

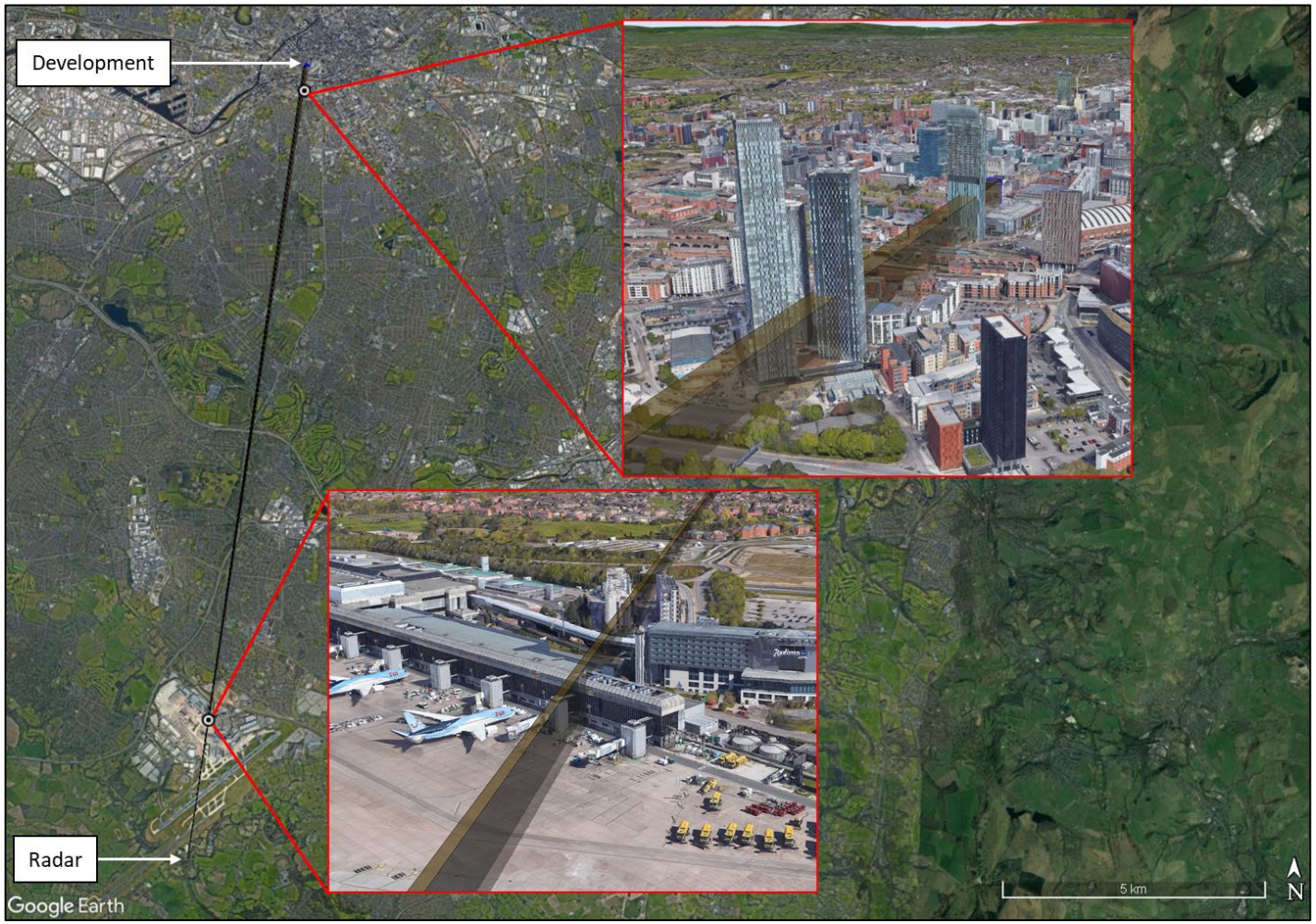


Figure 8 *Relevant screening – Building B*

The radar line of sight is significantly but not entirely obstructed by buildings at the airport itself, adjacent to the Radisson Hotel. The radar line of sight is entirely obstructed by the Owen Street development and the Beetham Tower.

Building B is not predicted to have a technical impact on the radar.

Building C

Figure 9 on the following page illustrates the main screening that is applicable to Building C. The orange polygon shows the volume of airspace from the radar to the extents of the building in three dimensions. The extent to which this obstructed by the most prominent existing structures is illustrated in the insets.

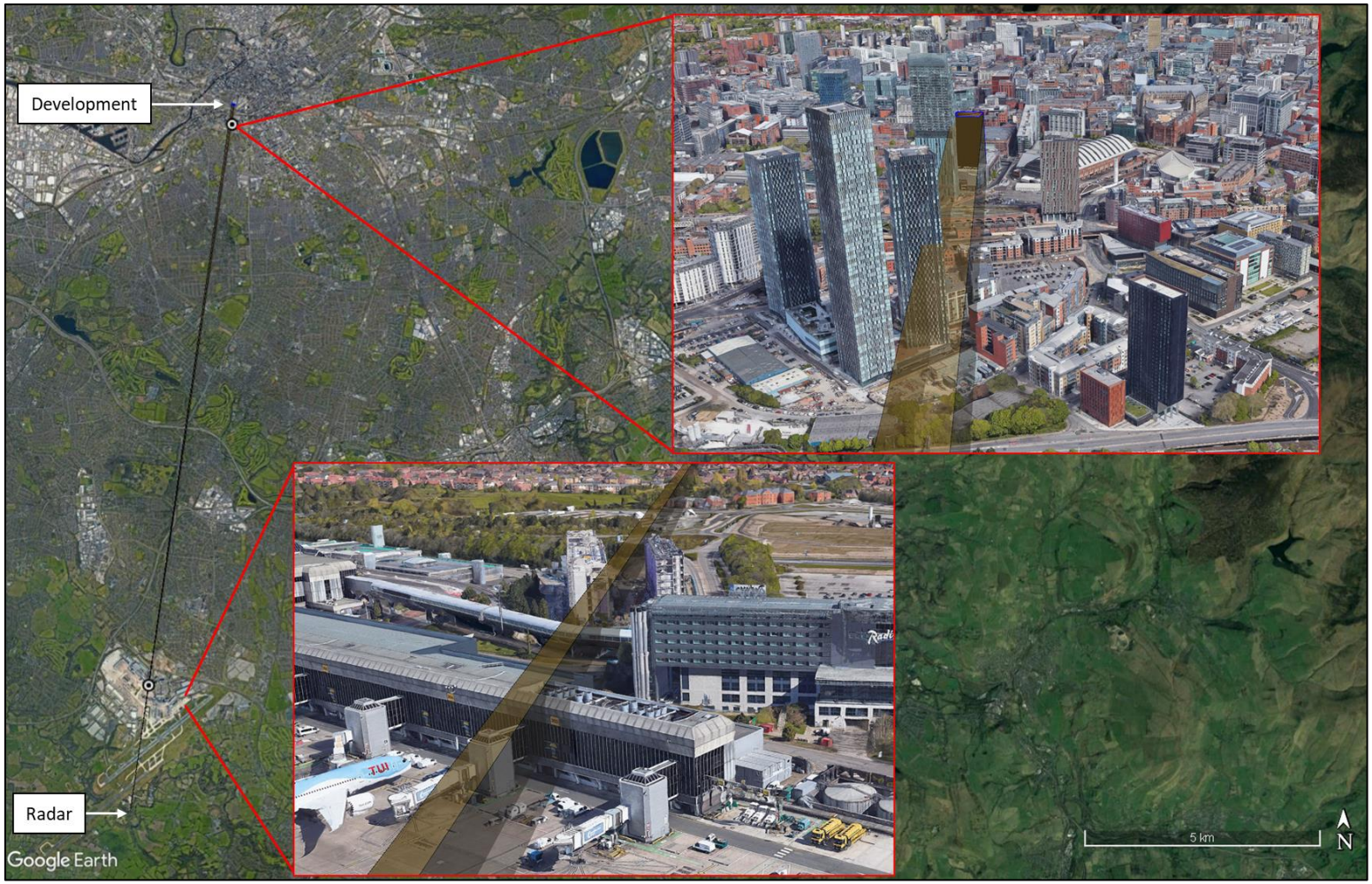


Figure 9 *Relevant screening – Building C*

The radar line of sight is significantly but not entirely obstructed by buildings at the airport itself, adjacent to the Radisson Hotel. The radar line of sight is partially but not entirely obstructed by the Owen Street development or the Beetham Tower.

Overall, whilst there is some screening present, Building C could have a technical impact on the radar (discussed in Section 4.3 below).

4.3 Impact Significance

Parts of Building A and Building C are predicted to be illuminated by the SSR beam, meaning they could interact with the signals.

There are two main ways in which a building can affect a radar. These are:

- Shadowing – whereby the radar signal is weakened by the physical presence of the building and detection is reduced in the shadow zone.
- Reflections – whereby the inbound or outbound radar signal is reflected via the building leading to aircraft being displayed at the wrong bearing or range.

Shadowing concerns are not common for SSR in the UK, and other developments in the centre of Manchester have greater potential to cause shadowing impacts due to their size.

Concerns are possible due to reflections. In practice, the effects from the Great Northern development are likely to be small. The radar is understood to be a Condor 300 dual channel system with Mode S capabilities. This radar has a range of advanced built-in capabilities for increasing its reliability and performance. Specific features that reduce the radar's susceptibility to interference from buildings are listed in Table 2 below.

Feature	Form of interference	How feature reduces interference	Additional information
Integral Tracking Function	Reflections	More likely to determine return is genuine if it moves as an aircraft return is expected to.	Ensures good false target suppression.
Refined Algorithms	Reflections and Shadowing	Experience on many sites used to enhance performance.	Ensures good performance in complex environments.
Identification and rejection of false replies	Reflections	False returns are rejected	If two or more replies are identified from the same source all but the first is rejected.

Feature	Form of interference	How feature reduces interference	Additional information
Side Lobe Suppression	Reflections	False returns arising from antenna sidelobes are rejected	P1 and P2 pulses are used. This is an encoding system which enables sidelobe signals to be detected by comparing pulse sizes.
Sensitivity Time Control (STC)	Reflections	Removes reflections	Removes relatively low amplitude replies
Minimum Detection Signal Level (MDS)	Shadowing	Maximises radar coverage whilst minimising noise detections	-
Dynamic Threshold	Shadowing	Weak signals stronger than any interference signals are detected.	-
Reply to Reply Correlation	Reflections	Multiple replies required for target processing	Single reply reports are rejected.
FRUIT5 Rejection	Reflections	Track initiation only allowed if report contains two or more correlating replies in the same SSR mode	e.g. two or more Mode A replies

[5] FRUIT – False Replies Unsynchronized in Time

Feature	Form of interference	How feature reduces interference	Additional information
Track Processing	Reflections and Shadowing	Improvements are made in target location using history of target position.	Improvements made when confidence in location information is low
False Target Processing	Reflections	Advanced processing that applies a series of tests to identify and reject false returns	Techniques include: 1: Check whether Mode A code is unique 2: Check "known" reflection zones 3: Use geometric analysis for checking reflection zones 4: Self adaptive processing

Table 2 *Radar features for reducing interference*

Whilst the impact is predicted to be small, the potential for some adverse effects on the radar cannot be conclusively ruled out. It is therefore possible that NATS would object to the development in the absence of mitigation.

The most common mitigation solution for building developments at this range from modern SSR is a software-based solution whereby the building information, specifically coordinates and altitudes of each building corner, are programmed into the radar system such that reflection effects can be ameliorated.

This agreement would be funded by the developer and commercially agreed with NATS via a contract ahead of starting development. Deployment of the solution is typically within six months of the final agreement between the developer and NATS, therefore it is recommended that engagement regarding the mitigation process is progressed with this timescale in mind.

It is likely that NATS would seek to limit any construction at the site to 5 metres above ground prior to installation of the mitigation solution (i.e. within six months of signing the mitigation agreement).

5 INSTRUMENT FLIGHT PROCEDURES (HIGH-LEVEL OVERVIEW)

5.1 Description of Instrument Flight Procedures

Instrument Flight Procedures (IFPs) are published documents that consist of defined three dimensional routes for aircraft arriving and departing airports.

In reality, aircraft do not necessarily fly these routes exactly due to limitations on the performance of aeronautical instruments, pilots and variations in wind and pressure conditions.

This means that an area around and beneath these three-dimensional routes must be kept clear of obstacles to ensure that there is no significant collision risk to aircraft flying these procedures as shown in Figure 10 below.

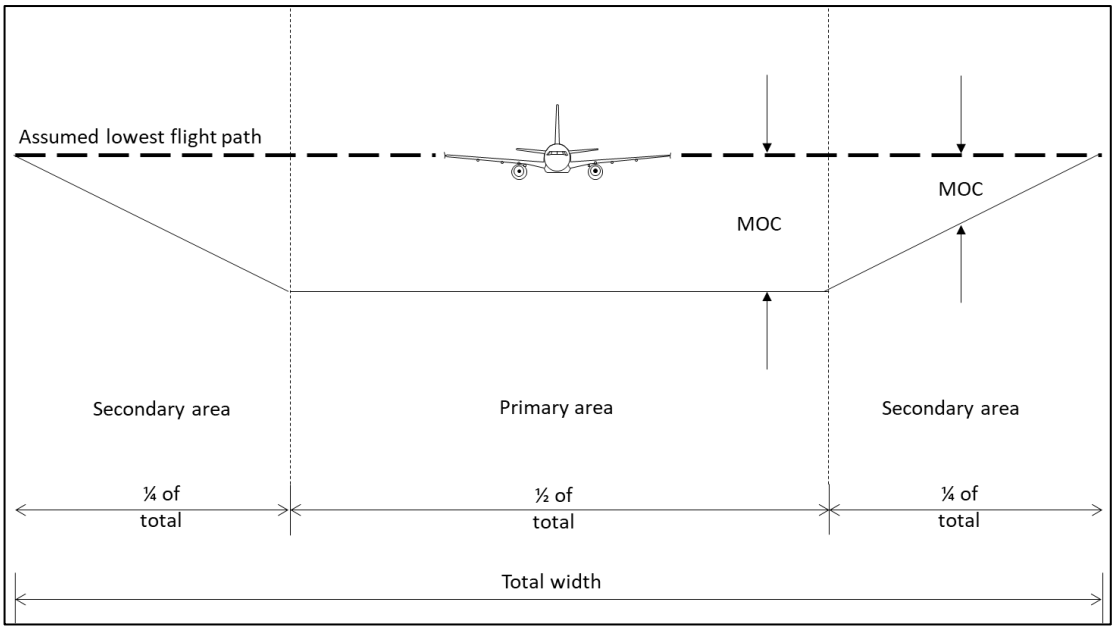


Figure 10 *Instrument Flight Procedure Minimum Obstacle Clearances*

These procedures also show Minimum Safe Altitudes (MSAs) for aircraft flying within 25 nautical miles of the associated airport.

5.2 IFPs at Manchester Airport

Table 3 below summarises the assessment of the relevant IFPs based on the published charts shown in the AIP.

Chart	Remarks	Conclusion
AD 2-EGCC-6-1 (ATC Surveillance Minimum Altitude Chart)	The development is in an area where the surveillance minimum altitude is 2,400 feet. The proposed development has a maximum altitude of 486 feet[6].	No impact on the surveillance minimum altitude is predicted.
AD 2-EGCC-6-1 (SID MONTY 1R 1S 1Y 1Z)	The proposed development is approximately 2.97 nautical miles from the nearest section of the procedure. Beetham tower is closer to this IFP and has a greater altitude than the proposed development.	No impact on this procedure is predicted.
AD 2-EGCC-6-2 (SID ASMM 1S 1Z/KUXEM 1R 1Y/EKLAD 1R 1Y)	The proposed development is approximately 2.97 nautical miles from the nearest section of the procedure. Beetham tower is closer to this IFP and has a greater altitude than the proposed development.	No impact on this procedure is predicted.
AD 2-EGCC-6-3 (SID LISTO 2S 2Z)	The proposed development is more than 6 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.

[6] Rounded up to the nearest foot.

Chart	Remarks	Conclusion
AD 2-EGCC-6-4 (SID LISTO 2R 2Y)	The proposed development is more than 7.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-6-5 (SID POL 5R 4S 1Y 1Z)	The proposed development is more than 5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-6-6 (SID SONEX 1R 1Y/DESIG 1S 1Z)	The nearest part of the procedure passes within 1 nautical mile laterally of the proposed development. The altitude of an aircraft flying this procedure at the point nearest the development will be between 2,500 feet and 5,000 feet above mean sea level, likely nearer the latter. This is more than 2,000 feet above the maximum altitude of the development.	No impact on this procedure is predicted.
AD 2-EGCC-6-7 (SID SANBA 1R 1Y)	The proposed development is more than 7.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-7-1 (STAR LAKEY 1M SETEL 1M TILNI 1M)	The proposed development is approximately 10 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-7-2 (STAR LIBSO 1M OTBED 1M)	The proposed development is approximately 10 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.

Chart	Remarks	Conclusion
AD 2-EGCC-7-3 (STAR MAKUX 1M MALUD 2M OKTEM 1M PENIL)	The proposed development is more than 10 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-7-4 (STAR ELVOS 1M LESTA 1M)	The proposed development is more than 10 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-1 (Instrument Approach Chart ILS/DME (I-MC) RWY 05R)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-2 (Instrument Approach Chart ILS/DME (MCT) RWY 05R)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-3 (Instrument Approach Chart LOC/DME (I-MC) RWY 05R)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-4 (Instrument Approach Chart VOR/DME RWY 05R)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-5 (Instrument Approach Chart ILS/DME (I-MM) RWY 05L)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-6 (Instrument Approach Chart ILS/DME (MCT) RWY 05L)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.

Chart	Remarks	Conclusion
AD 2-EGCC-8-7 (Instrument Approach Chart LOC/DME RWY 05L)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-8 (Instrument Approach Chart VOR/DME RWY 05L)	The proposed development is more than 5.5 nautical miles from the nearest section of the procedure.	No impact on this procedure is predicted.
AD 2-EGCC-8-9 (Instrument Approach Chart ILS/DME (I-NN) RWY 23R)	The proposed development is approximately 4.97 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted (see Figure 11).
AD 2-EGCC-8-10 (Instrument Approach Chart ILS/DME (MCT) RWY 23R)	The proposed development is approximately 4.97 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted.

Chart	Remarks	Conclusion
AD 2-EGCC-8-11 (Instrument Approach Chart LOC/DME RWY 23R)	The proposed development is approximately 4.97 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted.
AD 2-EGCC-8-12 (Instrument Approach Chart VOR/DME RWY 23R)	The proposed development is approximately 4.72 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted.
AD 2-EGCC-8-13 (Instrument Approach Chart VOR/DME RWY 23L)	The proposed development is more than 5 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted.

Chart	Remarks	Conclusion
AD 2-EGCC-8-14 (Instrument Approach Chart RNP RWY 23L)	The proposed development is more than 5 nautical miles from the nearest section of the procedure. Existing obstructions are marked at closer range to this procedure with an altitude of 516 feet, which is a greater altitude than the proposed development.	No impact on this procedure is predicted.

Table 3 *IFP Assessment (high-level)*

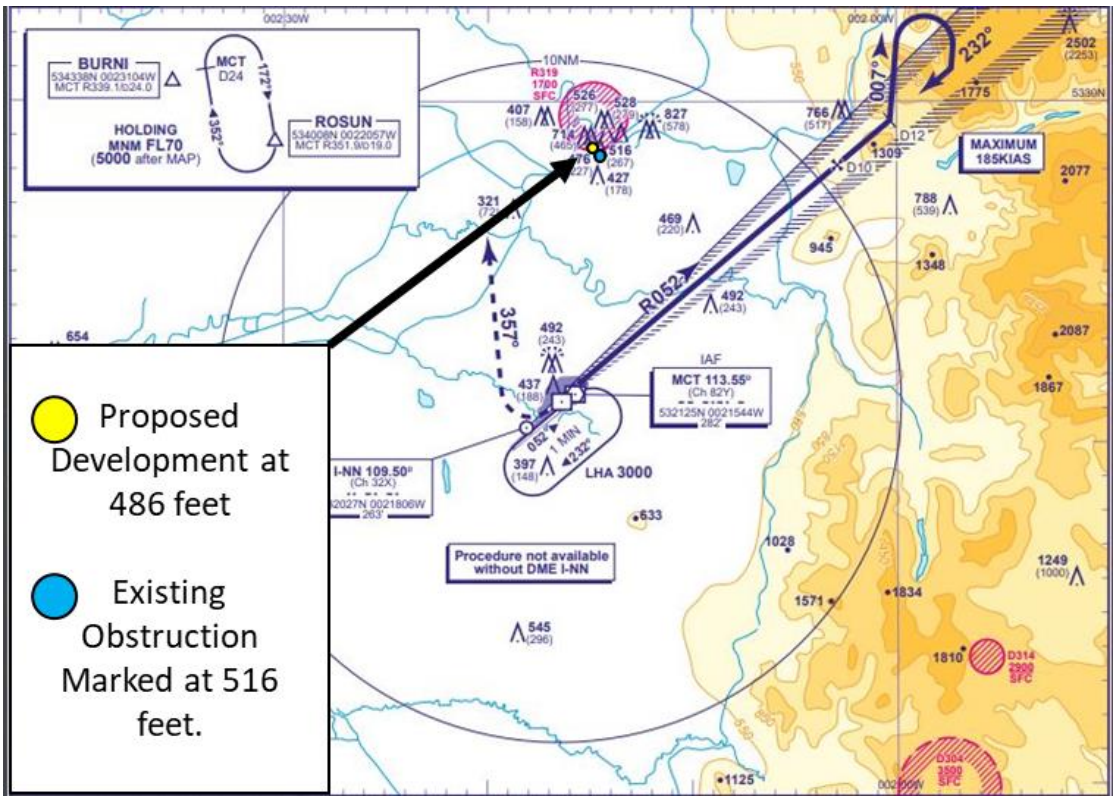


Figure 11 *Instrument Approach Chart (AD 2-EGCC-8-9)*

Overall, it is unlikely that the development would have an impact on IFPs associated with Manchester Airport. This is based on a review of the procedures and also on the basis that the proposed development is lower than others surrounding it, and will not infringe and Obstacle Limitation Surfaces.

6 OTHER AERODROMES AND HELICOPTER OPERATIONS (HIGH-LEVEL COMMENTARY)

6.1 Helicopters

Helicopter use in and around the city centre is most likely to be associated with the emergency services.

Any tall building in principle has the potential to present a hazard to helicopters, particularly if they were to be operating at low-level.

The Manchester Royal Infirmary in in the general area of the proposed development and has a helipad on the roof.

The development is unlikely to present a significant risk to helicopter operations because:

- The proposed development is located within the city centre where there is already significant urbanisation with many similar types of building development.
- The proposed development is immediately adjacent to Beetham Tower and in the vicinity of the Owen Street development, both of which have a greater altitude than any of the proposed towers.

The greatest risk to helicopters related to the proposed development is likely to be the use of cranes, because they will be at a greater altitude and are in general harder to see from the air than buildings are. Cranes are discussed in Section 7, but it is recommended that they are fitted with aviation lighting.

Concerns relating to helicopter use are not predicted. It is recommended that the Manchester Royal Infirmary is made aware of the proposed development.

6.2 Other Aerodromes

Generally speaking, Manchester Airport is the aerodrome that presents the most significant restrictions with regard to building developments in Manchester's city centre.

Manchester Barton is a licenced aerodrome located to the west of the centre, approximately 9.3 km from the proposed development location.

The aerodrome has multiple grass runways. Published charts associated with the aerodrome include an 'aerodrome chart' and an 'ATZ, Helicopter Entry/Exit Points and Circuits'.

These charts do not cover areas extending over the proposed development or the city centre itself. Furthermore, existing buildings that are taller than the proposed development are located closer to Manchester Barton Aerodrome than the Great Northern Site.

Significant impacts on Manchester Barton Aerodrome are not predicted.

7 CRANES

7.1 Crane Usage

During the construction phase, cranes will be present at the site that will reach elevations greater than the final building height. In principle, safeguarding concerns for cranes are the same as for building developments.

The proposed cranes will extend to a maximum of 67.3 metres above Building A which means a total altitude of 212.38 metres (697 feet).

At this altitude, the cranes will infringe the OHS at Manchester Airport.

7.2 Aviation Lighting

The CAA has clear aviation lighting requirements for any obstacles that are 150m or more above ground level. Specifically, they should be lit with medium intensity (generically 2000 candela) steady red lighting that is displayed at night and visible from all directions. The CAA generally recommends that lighting is displayed during the daytime as well.

The cranes will be more than 150 metres above ground level and will therefore require aviation lighting, both due to their height and due to their breaching the OHS at Manchester Airport.

7.3 Crane Operation Scheme

Since the cranes will breach an OLS at Manchester Airport, it is likely that the airport will require any crane operation to be in accordance with an agreed scheme.

Such a scheme would likely set out:

- Where the cranes are to be located and operated.
- What times the cranes will be operational.
- What the process is for the airport to contact the crane operator if needed.

Engagement with Manchester Airport is recommended to understand their position regarding the development in general and with specific reference to the proposed cranes.

8 CONCLUSIONS AND NEXT STEPS

8.1 Conclusions

The potential impacts associated with the proposed development that are likely to require mitigation / action are:

- Potential impacts on the Manchester Airport SSR. Whilst the level of impact is likely to be small in practice, some effects cannot be ruled out and a mitigation agreement with NATS may be required. Engagement with NATS to understand their position is recommended.
- The cranes at their proposed altitude would breach the OHS at Manchester Airport. Aviation lighting will be required for the cranes. A Crane Operation Scheme is likely to be required, this will be agreed between the developer and Manchester Airport.
- The Manchester Royal Infirmary should be made aware of the proposed development in the context of their helipad.

APPENDIX A – COORDINATE DATA

Building Plot 1

Boundary Point	Longitude (decimal degrees)	Latitude (decimal degrees)
1	-2.24899	53.47654
2	-2.24914	53.47626
3	-2.24951	53.47634
4	-2.24936	53.47661

Building Plot 2

Boundary Point	Longitude (decimal degrees)	Latitude (decimal degrees)
1	-2.24984	53.47640
2	-2.24997	53.47617
3	-2.25023	53.47622
4	-2.25010	53.47645

Building Plot 3

Boundary Point	Longitude (decimal degrees)	Latitude (decimal degrees)
1	-2.24939	53.47595
2	-2.24951	53.47572
3	-2.24998	53.47582
4	-2.24985	53.47604

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