

Aviation Safety Assessment

NOMA GP Ltd

2&3 Angel Square

June 2022

PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
- Railways
- Defence
- Buildings
- Wind
- Airports
- Radar
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ADMINISTRATION PAGE

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact of the proposed Angel Square 2&3 building development upon aviation infrastructure in the surrounding area, in particular with reference to Manchester Airport. The proposed development will comprise two towers (P2 and P3) with maximum altitudes above sea level of 105.9 metres and 102.3 metres respectively.

Conclusions

- Both towers are laterally outside and significantly below the Outer Horizontal Surface at Manchester Airport. No physical safeguarding (collision risk) impacts are predicted.
- Impacts on Instrument Flight Procedures are unlikely due to the development's location and lower altitude when compared to existing developments in Manchester City Centre.
- The proposed development would be in radar line of sight to the Secondary Surveillance Radar at Manchester Airport, which is safeguarded by NATS, based on bare-earth terrain. In practice, both towers are predicted to be entirely screened by existing intervening developments, such that impacts on the radar are not predicted (see Section 4).
- Cranes used during construction will not breach any Obstacle Limitation Surface provided they remain below 206.69 metres above sea level i.e. if they remain within 100 metres of the top of the building at all times (including when parked). If cranes extend above this altitude, it is likely that they will require aviation lighting and a crane operations scheme to coordinate their operation with Manchester Airport for safety reasons. Aviation lighting for cranes may not be required provided they do not exceed 150 metres in height and do not breach any Obstacle Limitation Surface. It is possible that aviation lighting for cranes would be preferred by Manchester Airport regardless.
- There is no mandatory requirement for aviation lighting on either tower, nor is there an apparent operational case for such lighting, particularly considering the surrounding buildings which are significantly more elevated.

Next Steps

The findings of this assessment should be made available to Manchester Airport and NATS for comment.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 51 countries within Europe, Africa, America, Asia and Australasia.

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 BACKGROUND

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact of the proposed Angel Square 2&3 building development upon aviation infrastructure in the surrounding area, in particular with reference to Manchester Airport.

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 aviation constraints for the proposed development. In detail the report includes:

- Proposed development details;
- Identification of relevant aviation infrastructure including:
 - Aerodromes (licensed, unlicensed and military);
 - Radar;
 - Radio navigation aids.
- Radar line of sight analysis;
- Obstacle Limitation Surfaces (OLS) assessment for Manchester Airport;
- High-level Instrument Flight Procedures assessment;
- High-level comments regarding aviation lighting and crane operations;
- Overall risk and key issues.

Following the technical analysis, the overall conclusions and recommendations are presented.

1.2 Coordinate System

Unless otherwise stated all coordinates used within this report are in British National Grid (OSGB36 datum) or WGS84 latitude and longitude.

1.3 Proposed Development Details

The proposed development site plan is shown in Figure 1¹ below. The overall altitudes² for Plot 2 and Plot 3 are 105.9 metres and 102.3 metres respectively.



Figure 1 Proposed development site plan

¹ Source: 947-CPA-ZZ-00-DR-A-SK200-P06-Lower Ground Floor GA Plan.pdf (copped)

² Top of lift shaft overrun (4.5m overrun allowed for, plus 250 slab and 150 insulation). Ground elevations for P2 and P3 are 43 metres and 42.3 metres respectively.

1.4 Proposed Development Boundary – Aerial image

The development boundary (red line) and site footprint (blue) for the proposed development overlaid on aerial imagery is shown in Figure 2 below.

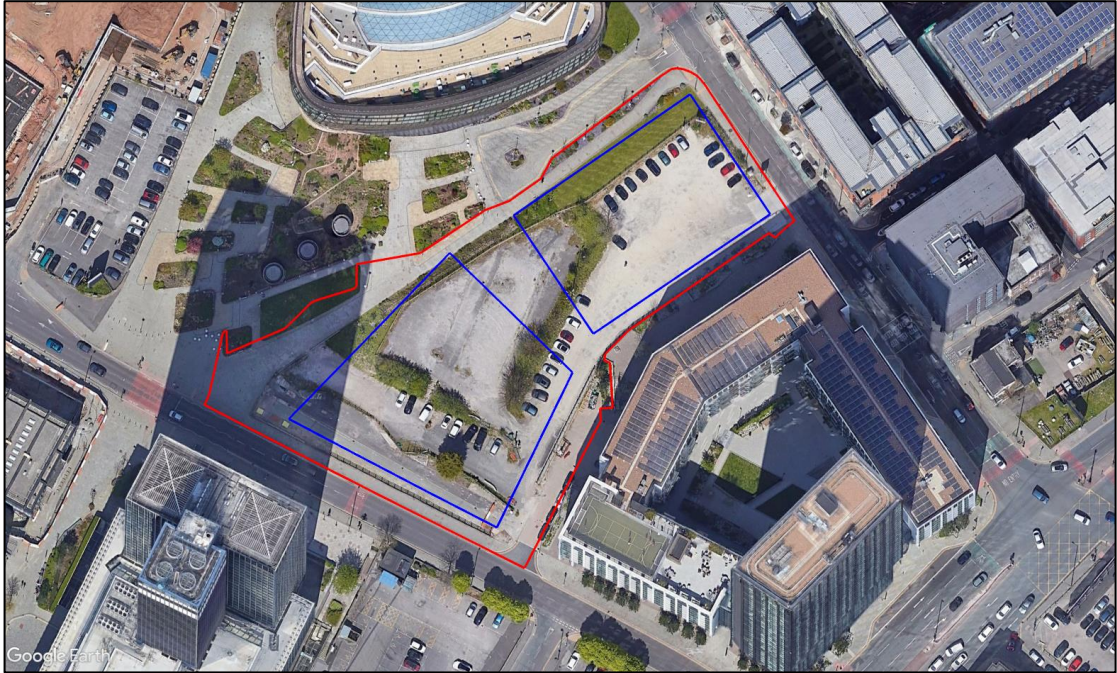


Figure 2 Proposed development boundary overlaid on aerial imagery

Figure 3 below shows the tower footprints in 3D at their maximum altitudes of existing buildings in the immediate area.

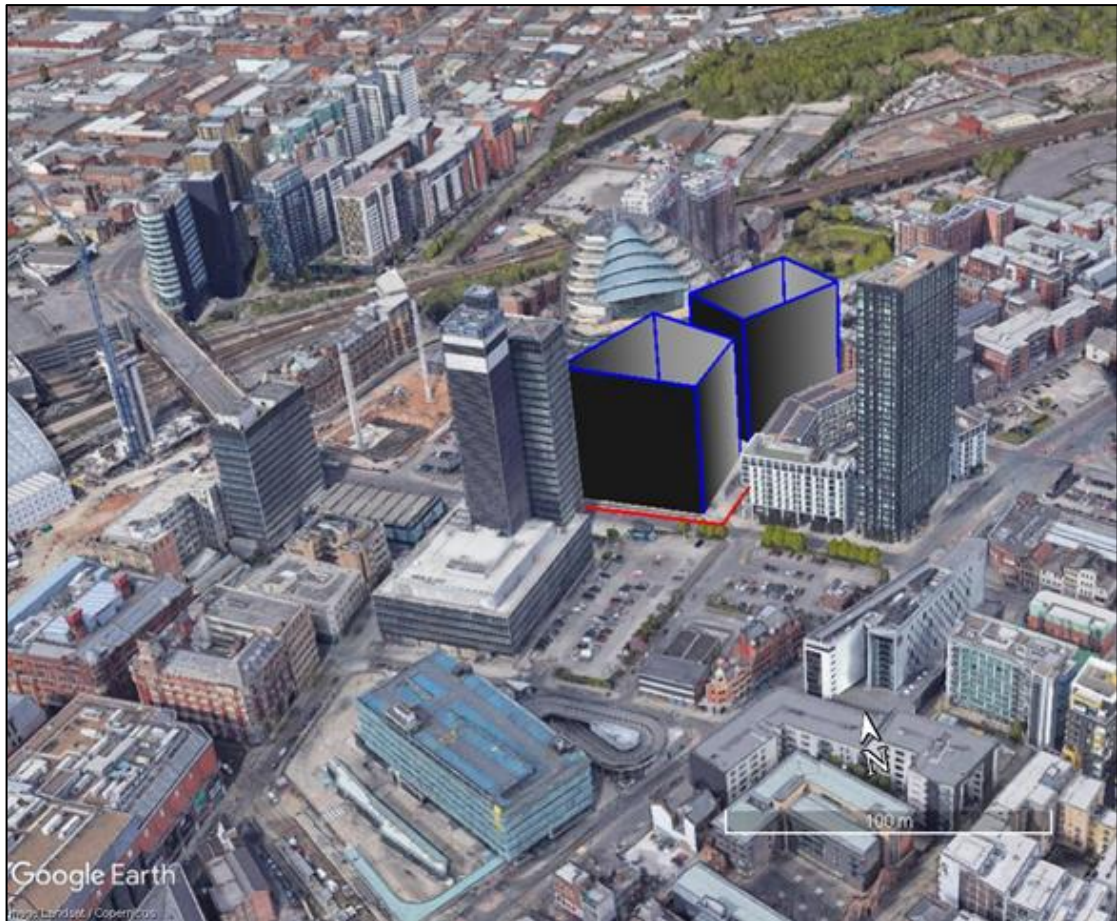


Figure 3 Proposed development in 3D context

2 KEY AVIATION RISKS

2.1 Identification

An aviation risk assessment was undertaken to identify the key aviation risk with respect to the proposed development. The results of the analysis are presented in the following sub-sections.

2.2 Civil Aerodromes and Aerodrome Radar

Aviation Risk	Distance	Risk Level
Manchester ³ Airport PSR	16.5 km	Low PSR concerns for buildings at this range are unlikely.
Manchester Airport SSR	16.5 km	Medium Potential concerns if radar line of sight is unscreened.
Manchester Airport	15.0 km	Medium Potential concerns regarding the Obstacle Limitation Surfaces (OLS).
Manchester Barton, Licensed	10 km	Low The aerodrome is located to the west of the city. The proposed development will not introduce significant new risks in the context of existing buildings in the city centre.

Table 1 Identified aerodrome and radar risks

³ Both radar at Manchester airport are safeguarded by NATS, however they have been grouped with 'airport radar' rather than 'en-route radar' within this report due to their band and function.

2.3 En-Route Radar

Aviation Risk	Distance	Risk Level
N/A	N/A	N/A

Table 2 Identified en-route radar risks

2.4 Meteorological Radar

Aviation Risk	Distance	Risk Level
N/A	N/A	N/A

Table 3 Identified meteorological radar risks

2.5 Ministry of Defence (MOD)

Aviation Risk	Distance	Risk Level
Low Flying System	N/A	Low Area with no military low flying concerns.

Table 4 Identified MOD risks

2.6 Key Risk Summary

The initial assessment identified two key risks, namely the SSR at Manchester Airport (safeguarded by NATS) and the OLS defined around the airport. These have been assessed in Sections 4 and 5.

Secondary risks that are not included within the tables include Instrument Flight Procedures (IFPs) with respect to Manchester Airport's operations and the requirements for aviation lighting. These have also been explored in Sections 6 and 7.

3 RADAR INTERFERENCE

3.1 Technical Overview

Buildings, structures and terrain can interfere with Secondary Surveillance Radar (SSR). The level of interference normally depends on the size of the interfering structure and its distance from the radar. A larger structure closer to the radar is more likely to interfere than a smaller structure that is further away. The two predominant forms of interference as it pertains to SSR are considered. These are described below.

3.2 Reflections

Reflections from a structure can potentially result in genuine aircraft returns being plotted in the wrong place as a result of the structure reflecting signals in a specular (mirror-like) way. This means that an air traffic controller could mis-manage aircraft, leading to safety implications. Both in-bound and out-bound signals are weakened due to reflections because they are reflected by a structure in both directions.

3.3 Shadowing

Radar signals are weakened by physical obstacles. The most significant signal blocking is often caused by terrain. Large obstructions within a radar's area of coverage can have a 'shadowing' effect, reducing the signal strength immediately behind them.

This effect is most pronounced immediately behind the structure and becomes less pronounced with distance. This is important because it means a structure's 'shadow' does not block radar coverage indefinitely, and the areas with the highest losses should be considered in an operational context.

Both in-bound and out-bound signals are weakened by shadowing because signals are attenuated by a structure in both directions.

3.4 SSR Capabilities

The radar is a Secondary Surveillance Radar (SSR) fitted with a Large Vertical Aperture (LVA) antenna. The radar is located to the south of Manchester Airport. It is a Mode S monopulse SSR supplied by Raytheon Systems Limited as part of a nationwide contract to upgrade NATS' national network of twenty sites.

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 5 on the following pages.

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.
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.

Feature	Form of interference	How feature reduces interference	Additional Information
FRUIT ⁴ 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
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 5 Radar features for reducing interference

⁴ FRUIT – False Replies Unsynchronized in Time

4 RADAR LINE OF SIGHT AND INTERFERENCE ANALYSIS

4.1 Methodology

The approach taken within this report is presented below:

- Radar line of sight assessment based on the representative centre tower co-ordinates assessed at their relative height above ground level;
- Screening assessment to determine whether existing buildings and/or landscape features would hide/shield the proposed development from the SSR;
- Consideration of the distance from the SSR.

4.2 Line of Sight Analysis

A radar line of sight assessment was completed for the proposed development – considering the location of each plot. Figure 4 on the following page shows the radar line of sight chart from the Manchester SSR to the approximate centre of Plot 3 without consideration of screening from existing building. The box labelled 'certainty' in the figure provides the distance (in metres) by which the Plot 3 tower is within line of sight to the Manchester SSR (rounded to one decimal place). The proposed development will be visible to the radar based on bare-earth terrain.

Radar Line of Sight Calculation

Prepared by Pager Power
Manchester Airport SSR

Bare-Earth Line of Sight

Turbine	P3
Result	VISIBLE
Certainty	58.4 metres

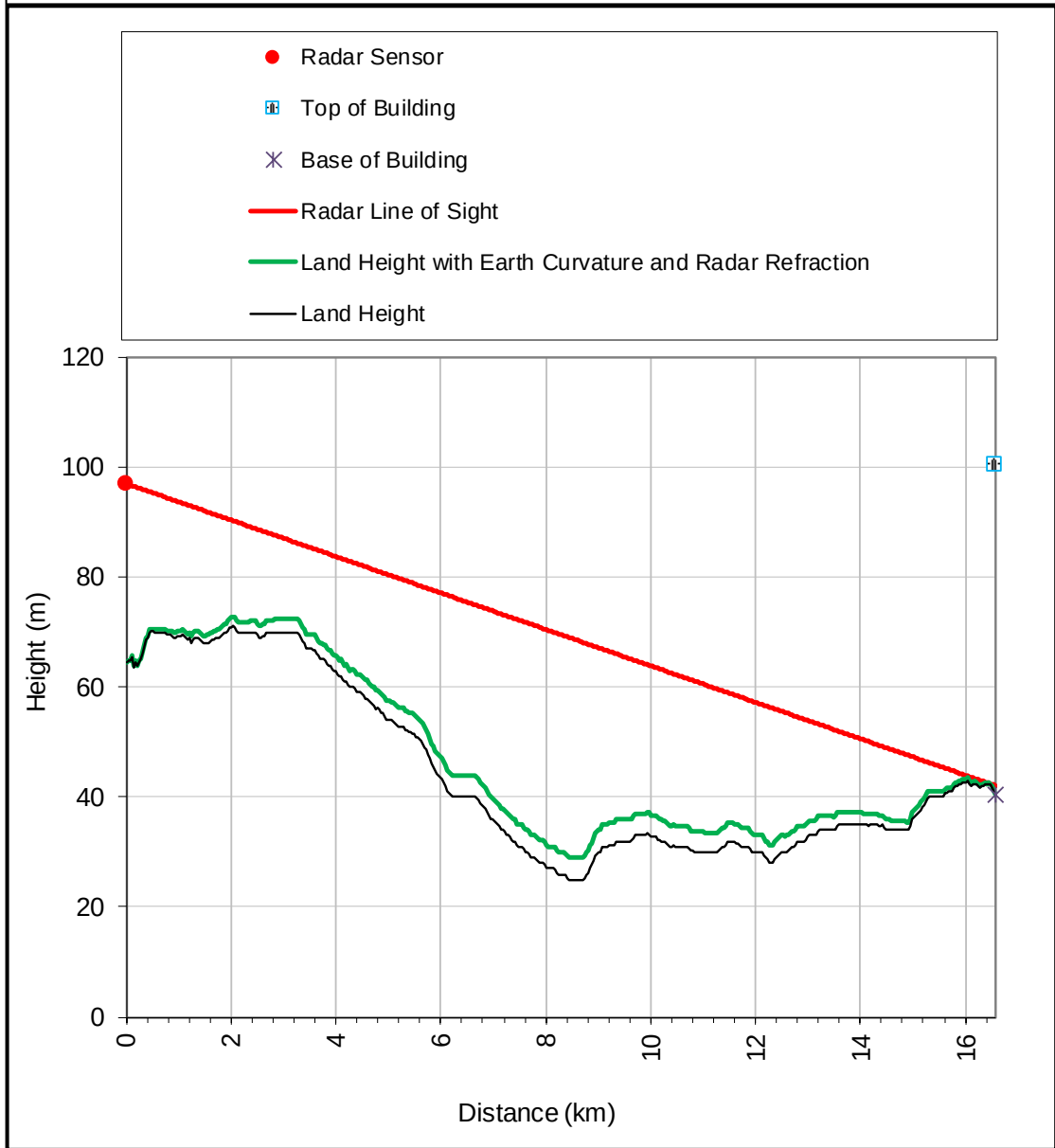


Figure 4 Radar line of sight chart (bare-earth) - P3

Table 6 below summarises the results for each plot⁵.

Plot	Margin of Visibility	Result
2	62 metres	Building significantly visible in the absence of screening (bare-earth case).
3	58 metres	Building significantly visible in the absence of screening (bare-earth case).

Table 6 Radar line of sight results (bare-earth)

4.3 Additional Screening

Consideration of the existing environment is crucial because radar coverage over and beyond Manchester City Centre is significantly obstructed by existing development. The extent to which a development is within radar line of sight is therefore dependent on the intervening terrain and the structures that have been constructed. Figure 5 below shows, in plan view, the cone that encompasses the radar line of sight between the Manchester SSR and the extremities of the proposed development.

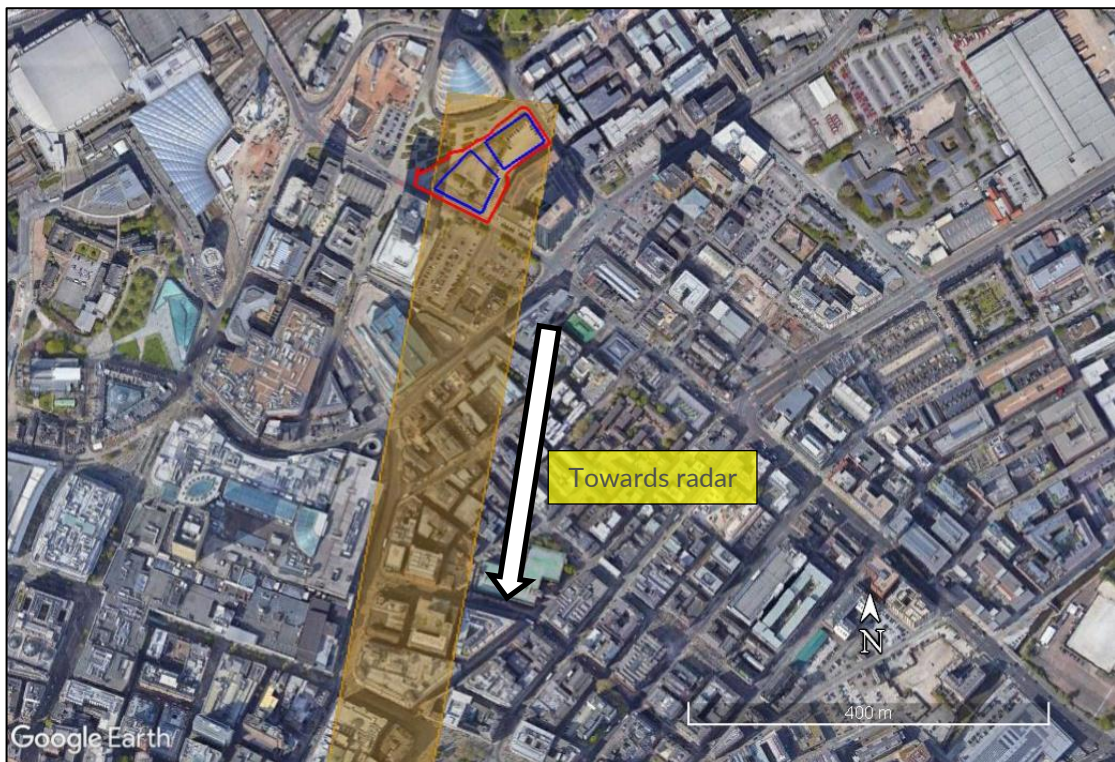


Figure 5 Coverage cone encompassing towers

⁵ Terrain elevations within the analysis are based on interpolated OSGB36 50m datum values. These differ marginally from the ground elevations provided by the developer for each plot, these variations do not affect the validity of the results.

Figures 6 – 8 below and on the following page show this cone in three dimensions, sloping from the altitude of the radar up to the maximum altitude of the development, as it is intersected by various existing buildings.



Figure 6 Screening from the Radisson building at Manchester Airport



Figure 7 Further (partial) screening from developments in the city centre

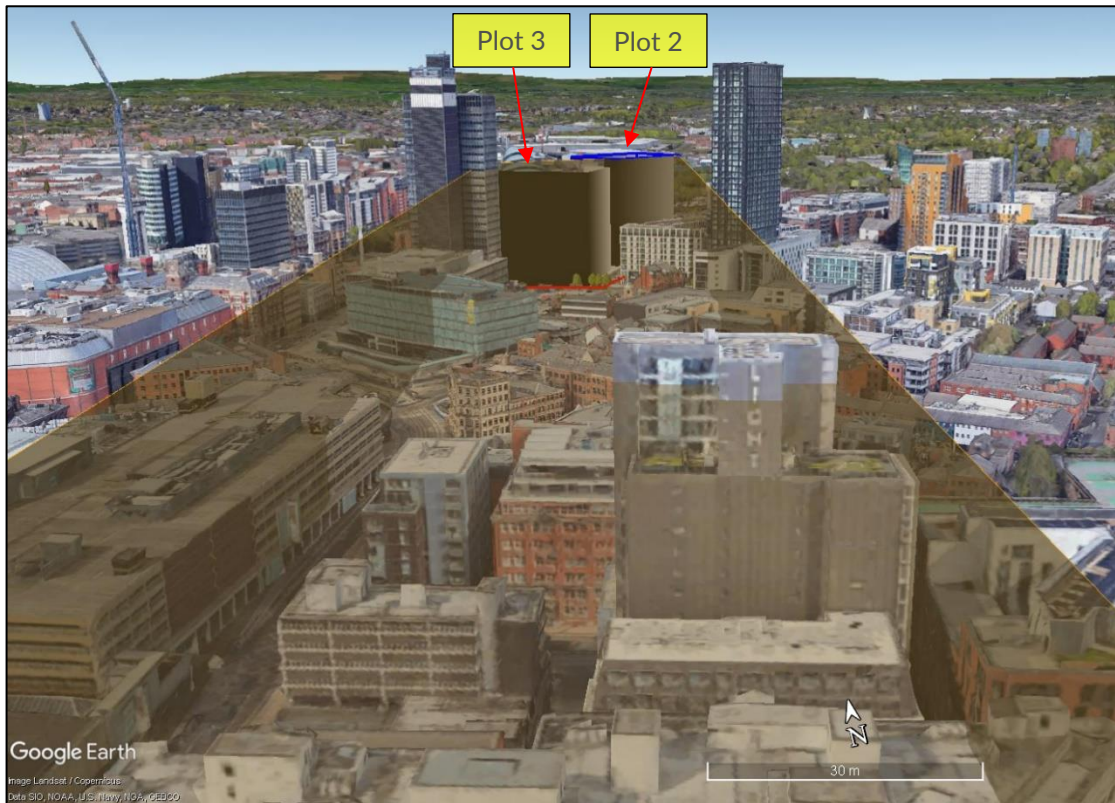


Figure 8 Coverage cone in context of proposed towers

4.4 Radar Line of Sight Conclusions

The level of screening is such that the proposed development is unlikely to be in radar line of sight, due to existing buildings including the Radisson at Manchester Airport which appears likely to fully obstruct both towers from the radar's direct view. Further partial screening is provided further along the radar line of sight, closer to the proposed development itself.

4.5 Interference Assessment

SSR radar broadcast interrogating radio signals that are detected by aircraft with on-board transponders. The transponder responds by broadcasting a radio reply which normally contains identification and altitude information. The SSR determines the aircraft's horizontal position from the orientation of the antenna and the time taken to receive a response from the interrogation. Buildings, structures and terrain can interfere with SSR. The level of interference normally depends on the size of the interfering structure and its distance from the radar. A larger structure closer to the radar is more likely to interfere than a smaller structure which is further away. Two forms of interference have been considered. These are:

1. Reflections – Either in-bound or out-bound signals are reflected off a structure;
2. Shadowing – Either in-bound or out-bound signals are weakened because they are attenuated by a structure.

It is predicted that the proposed development will be screened from the radar by existing developments. Consequently, significant impacts due to shadowing or reflections are not predicted.

4.6 Assessment Conclusions

The proposed development is not predicted to have a significant impact on the radar at Manchester Airport. No mitigation requirement has been identified.

Engagement with NATS to clarify their position regarding the development on the basis of the analysis presented within this report is recommended.

In the event that NATS raises and maintains radar concerns, technical mitigation in the form of a software upgrade is likely to be commercially available. The analysis presented here does not indicate that this is technically necessary. However, if this was to be pursued, the developer would need to enter into a contract with NATS at least six months ahead of starting construction to ensure that all required arrangements can be in place to facilitate the start of construction. A typical cost for such a solution is approximately £45,000. No requirement for this solution is predicted.

5 OBSTACLE LIMITATION SURFACES

5.1 Description

Obstacle Limitation Surfaces (OLS) 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 size of the surfaces is dependent on the number of runways, their dimensions and the procedures carried out at the airfield.

5.2 Relevant Surface

The Outer Horizontal Surface (OHS) extends the furthest from the airport – to a radius of 15 km from the Aerodrome Reference Point.

The nearest extrapolated point within the building footprint is outside this radius by a margin of approximately 11 metres⁶, which means that technically the proposed towers would not infringe this surface at any height.

The altitude of the OHS is 206.69 metres above mean sea level. This means the maximum altitude of the proposed development (the top of P2 with an altitude of 105.9 metres) will be more than 100 metres below this surface.

5.3 Cranes

Cranes that breach an OLS are, in principle, treated in the same manner as a permanent structure that causes an infringement. In practice, temporary infringements are more tolerable subject to coordination with the aerodrome.

If cranes associated with construction were to breach the OHS, including while parked, they would at a minimum require aviation safety lighting and a crane operation scheme to coordinate their movements with Manchester Airport. Cranes that remain entirely north of the site boundary would also be laterally clear of the OHS and in principle not subject to such restrictions.

Figure 9 on the following page shows the OHS relative to the site area. The orange line and hatched area shows the extent of the surface, anything in this area should remain below an altitude of 206.69 metres above mean sea level.

⁶ Based on a calculation of the separation between the published ARP at the time of writing and the extrapolated boundary point with coordinates -2.237171°, 53.486857°.

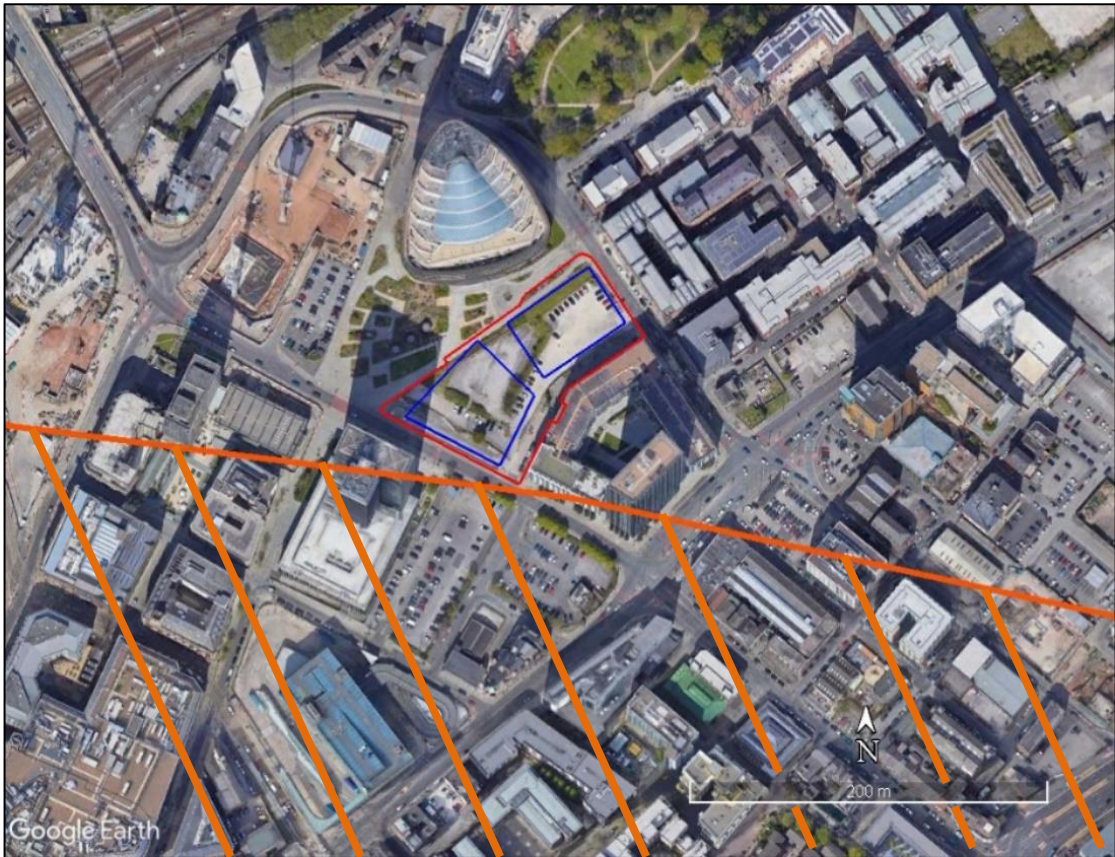


Figure 9 Extent of OHS at site boundary

It is possible that Manchester Airport would request a crane operation scheme and/or aviation safety lighting for the cranes as a matter of best-practice. There is no clear statutory requirement for either if the cranes remain outside or below the OHS and under 150 metres in height above ground. However, engagement with Manchester Airport to clarify their position is recommended.

6 INSTRUMENT FLIGHT PROCEDURES (HIGH-LEVEL)

6.1 Instrument Flight Procedures

Published procedures that are available to aircraft flying IFR (Instrument Flight Rules) have been assessed at a high-level by considering:

- Impact on the Area Minimum Altitude.
- Impact on Manchester Airport Surveillance Minimum Altitude Chart (SMAC).
- Impact on current Manchester Airport Standard Instrument Departures.
- Impact on current Manchester Airport Standard Arrival Charts.
- Impact on current Manchester Airport Instrument Approach Charts.

This has been undertaken to determine whether an impact upon Instrument Flight Procedures (IFP) is likely or whether further, more detailed, analysis is required.

6.2 Area Minimum Altitude

The Area Minimum Altitude provides the minimum obstacle clearance above all obstacles (terrain and structures) in a particular quadrangle of an aeronautical chart. The Area Minimum Altitude shown for the quadrangle in which the development is located is 3,400 feet amsl. The proposed development has a maximum altitude of 347.44 feet. The proposed development will therefore not affect the Area Minimum Altitude.

6.3 Surveillance Minimum Altitude Chart (SMAC)

Surveillance Minimum Altitude Charts (SMAC) are published to show the lowest altitude a pilot will be instructed to fly whilst receiving an air traffic control service. The Manchester Airport SMAC shows that the minimum altitude for the sector encompassing the site is 2,400 feet amsl. The proposed development has a maximum altitude of 347.44 feet. The vertical clearance between aircraft subject to a radar control service and the top of both towers will significantly exceed the specified clearance of 984 feet⁷ in the CAA publication (CAP 777) for designing SMACs. The development will have no impact on the SMAC.

6.4 High-level IFP Assessment – Obstacle Clearance Margins

As a general rule Instrument Flight Procedures (IFPs) are designed so that there are vertical and horizontal safety margins between the specified trajectory and surrounding terrain and obstacles. These margins vary depending on the phase of flight and whether UK, European or International rules are being considered. Nevertheless, the vertical margins are always 1,000 feet or less (except in particularly mountainous regions, which Manchester is not). This means that if the vertical clearance between an IFP route and the top of the proposed development exceeds

⁷ 300 metres

1,000 feet then it will not have a significant safety impact on aircraft flying the route. The maximum altitude of the proposed development is 348 feet⁸.

This means that aircraft subject to any IFP route or limit which is more than 1,348 feet is likely to have an acceptably low collision risk. A detailed IFP assessment is not recommended considering the results of this high-level assessment.

6.5 Standard Instrument Departures (SIDs)

Manchester Airport has seven published Standard Instrument Departure procedures (SIDs). Each of these has been assessed with respect to the proposed development⁹. Results of the assessment are shown in Table 7 below.

SID Name	Observations	Assessed Impact	Recommendation
MONTY 1R 1S 1Y 1Z	Passes more than 3.5 nm to southwest.	No impact due to horizontal and vertical clearance.	No further action.
ASMIM 1S 1Z/KUXEM 1R 1Y/EKLAD 1R 1Y	Passes more than 3.5 nm to the southwest.	No impact due to horizontal and vertical clearance.	No further action.
LISTO 2S 2Z	Southerly SID. Significantly clear.	No impact due to horizontal clearance.	No further action.
LISTO 2R 2Y	Southerly SID. Significantly clear.	No impact due to horizontal clearance.	No further action.
POL 5R 4S 1Y 1Z	Passes more than 4.5nm to east.	No impact due to horizontal and vertical clearance.	No further action.
SONEX 1R 1Y/DESIG 1S 1Z	Minimum altitude 5,000 feet over central Manchester.	No impact due to vertical clearance.	No further action.
SANBA 1R 1Y	South westerly SID. Significantly clear.	No impact due to horizontal clearance.	No further action.

Table 7 Standard Instrument Departure (SID) assessment results

The development is likely to present an acceptably low collision risk to aircraft flying all Standard Instrument Departure routes.

⁸ Rounded up to the nearest foot.

⁹ The results will be similar for all towers.

6.6 Standard Arrival Charts (STARs)

Manchester Airport has four published Standard Arrival (STARs) Charts. Each of these has been assessed with respect to the proposed development. Results of the assessment are shown in Table 8 below.

STAR Name	Observations	Assessed Impact	Recommendation
via ROSUN (north)	Minimum Altitude FL70	No impact due to vertical clearance	No further action
via ROSUN (east)	Minimum Altitude FL70	No impact due to vertical clearance	No further action
via MIRSI	Minimum Altitude 6,000 feet	No impact due to vertical clearance	No further action
via DAYNE	Minimum Altitude FL80	No impact due to vertical clearance	No further action

Table 8 *Standard Arrival Chart (STARs) Assessment Results*

Aircraft flying Manchester Airport's Standard Arrival Routes will be sufficiently clear vertically of the towers. This means that such aircraft are likely to have an acceptably low collision risk.

6.7 Standard Arrival Charts (STARs)

Manchester Airport has fourteen published Instrument Approach Charts. Each of these has been assessed with respect to the proposed development. For each, the following have been considered:

- The final approach phase;
- Earlier approach phases shown on the chart;
- Missed approach procedure;
- Decision heights and circling minima;
- Minimum Safe Altitude (MSA) within 25 nautical miles.

Results of the assessment are shown in Table 9 below. V= vertically and H= horizontally.

Name	Final Approach	Earlier Approach	Missed Approach	Decision and Circling	MSA	Assessed Impact	Recommended Action
ILS/DME (I-MC) RWY 05R	OK H	OK V,H	OK H	OK H	OK V	None	None
ILS/DME (MCT) RWY 05R	OK H	OK V,H	OK H	OK H	OK V	None	None
LOC/DME (I-MC) RWY 05R	OK H	OK V,H	OK H	OK H	OK V	None	None
VOR/DME RWY 05R	OK H	OK V,H	OK H	OK H	OK V	None	None
ILS/DME (I-MM) RWY 05L	OK H	OK V,H	OK V,H	OK H	OK V	None	None
ILS/DME (MCT) RWY 05L	OK H	OK V,H	OK V,H	OK H	OK V	None	None
LOC/DME RWY 05L	OK H	OK V,H	OK V,H	OK H	OK V	None	None
VOR/DME RWY 05L	OK H	OK V,H	OK V,H	OK H	OK V	None	None
ILS/DME (I-NN) RWY 23R	OK H	OK V	OK V, H	OK H	OK V	None	None
ILS/DME (MCT) RWY 23R	OK H	OK V	OK V, H	OK H	OK V	None	None
LOC/DME RWY 23R	OK H	OK V	OK V, H	OK H	OK V	None	None

Name	Final Approach	Earlier Approach	Missed Approach	Decision and Circling	MSA	Assessed Impact	Recommended Action
VOR/DME RWY 23R	OK H	OK V	OK V, H	OK H	OK V	None	None
VOR/DME RWY 23L	OK H	OK V	OK H	OK H	OK V	None	None
RNP RWY 23L	OK H	OK V,H	OK H	OK H	OK V	None	None

Table 9 Instrument Approach Charts assessment results

All towers are likely to present an acceptably low collision risk to aircraft flying all Instrument Approach Procedures. No further action is recommended.

6.8 High-level IFP Assessment – Obstacle Clearance Margins Conclusions

As a general rule, IFPs are designed so that there are vertical and horizontal safety margins between the specified trajectory and surrounding terrain and obstacles. It is likely that if an obstacle does not infringe the OLS it will not adversely affect the IFP. The OLS will not be affected by the proposed development. A high-level review of the IFPs relative to the proposed development indicates sufficient clearances. There are also taller existing buildings in the surrounding area that already co-exist with the current IFPs. Therefore, no impact upon the IFPs is predicted and no detailed IFP assessment is recommended. It is possible however that this could still be recommended by Manchester Airport.

7 HIGH-LEVEL AVIATION LIGHTING CONSIDERATIONS

7.1 Requirement

Aviation lighting is required where an object becomes a collision risk. This is most likely where there is an infringement of the OLS. It also becomes mandatory to have lighting where an object extends to 150m above ground level or more. The following section explores the requirement for aviation lighting at a high-level.

7.2 Requirements for Proposed Development

The proposed development is less than 150 metres above ground and clear of Manchester Airport's OLS both laterally (by a small margin) and vertically (by a large margin).

There is no apparent case for aviation safety lighting to be a requirement on either tower. Engagement with Manchester Airport to clarify their position regarding aviation lighting and the development as a whole is recommended.

7.3 Requirements for Cranes

If the cranes used during construction remain below 150 metres in height above ground and remain laterally or vertically clear of the OHS, there will be no mandatory lighting requirement for them.

It is possible that Manchester Airport would prefer aviation lighting to be applied to cranes as a matter of best-practice. Engagement with Manchester Airport is recommended to clarify their position.

8 CONCLUSIONS

8.1 Technical Summary

The proposed development is not predicted to have significant impacts on aviation safety. Specifically:

- Impacts on the radar at Manchester Airport are not predicted because the proposed development is screened by existing developments.
- Physical safeguarding concerns are not predicted because the development is clear of the OLS at Manchester Airport.
- Impacts on minimum safe altitudes or surveillance minima are not predicted due to the development's altitude.
- Impacts on instrument flight procedures are not predicted based on a high-level assessment and the relative size of the development in the context of the existing city centre.

8.2 Next Steps

Engagement with NATS and Manchester Airport to confirm their position regarding the development in light of the analysis within this report is recommended.



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