Document 6.2

# The West Midlands Rail Freight Interchange Order 201X

## Technical Appendix 14.1 - Wind effects on sailing (desk study)

Regulation 5(2)(a)

RWDI - November 2017

West Midlands Interchange

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# MEMORANDUM

| | | |
|---|---|---|
| **DATE:** | 2017-11-07 | **RWDI REFERENCE #:** 1701716 |
| **TO:** | Matt Royall<br>Principal<br>Ramboll Environ<br>8 the Wharf<br>Bridge Street<br>Birmingham<br>B1 2JS | **EMAIL:** MRoyall@ramboll.com |
| **FROM:** | Krishan Jayyaratnam | **Email:** [redacted] |
| | Andy Gypps | **Email:** andy.gypps@rwdi.com |
| **RE:** | **Sailing Desk Study**<br>**West Midlands Interchange** | |

Dear Matt,

## Introduction

The following document contains a review of the potential implications of the proposed West Midlands Interchange development on the Calf Heath Reservoir to the north-east of the scheme [reference parameter plans when finalised] in regards to sailing.

The qualitative study is based on:

- A review of the massing and location of the proposed scheme (the parameter plans *"4049- 1031-11 Key Plan – Parameter Plan – Floor Levels & Height Plan.pdf"*) in relation to the Calf Heath Reservoir including the 7-8m earth bund which will surround the reservoir. This review will consider the existing scenario and when the proposed scheme is completed.

- Analysis of the background wind climate at the site (Order Limits), which includes a statistical analysis of historical weather data transposed to the site to account for the effects of local terrain.

- An understanding of the local wind effects generated by the proposed development based on RWDI's extensive experience of wind in the urban environment.

## Wind Effects on Sailing: The Key Issues

Any change in the terrain close to a sailing area would result in changes to the local wind flow in regards to the mean wind speed, direction and turbulence. Typical effects are: a local increase in mean wind speed (commonly occurring in the areas close to the corners of buildings or in constricted passages between adjacent buildings) and an increase in turbulence intensity (in the area down-wind from the building). Variable wind direction and turbulence has particular relevance for sailing as it can potentially limit the amount of sailable area. An area with high turbulence or where the wind direction changes significantly over a short distance will reduce the quality of sailing, or in extreme cases prevent sailing altogether.

It is therefore important to establish, in the case of the proposed West Midlands Interchange development, whether the new buildings will cause a significant change in wind direction and the level of turbulence compared to the existing conditions.

## Local Wind Climate

### *Local Climate and Terrain*

The local wind climate (taken from Birmingham International Airport – shown in Figure 1) shows that the majority of the oncoming winds originate from a broad westerly sector (ranging from the south through to the north west) throughout the year.

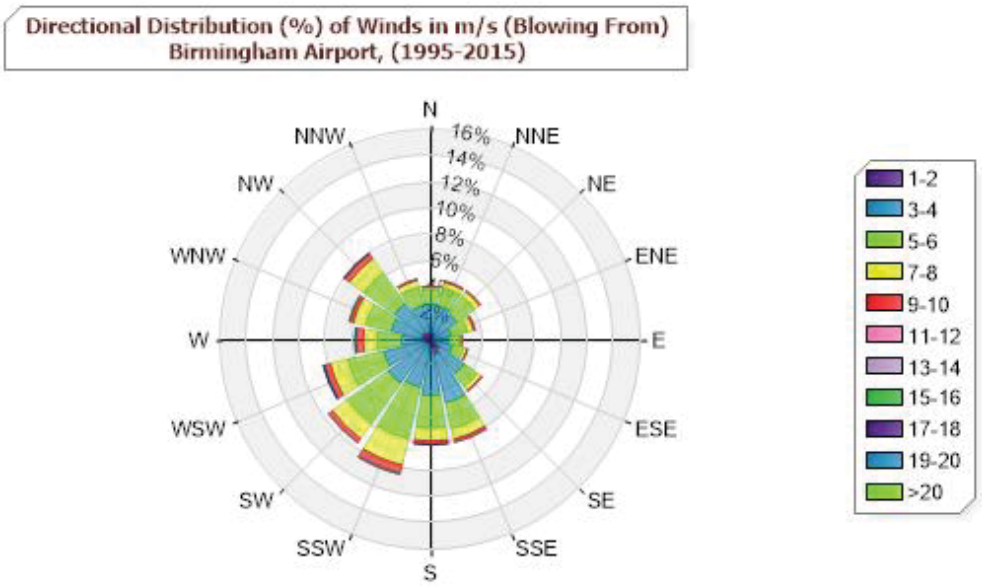


**Figure 1: Wind roses taken from Birmingham Airport**

The local terrain around the reservoir is relatively flat in the existing scenario; however, there is a noted dense existing treeline around the north-east through to the south-west (highlighted in yellow). These trees are approximately 9m tall (estimated from Google Earth) and are expected to shelter the reservoir from the prevailing south-westerly winds. As such, the main wind flow into the reservoir is through the west and north west (highlighted in blue) where there are limited obstructions to the oncoming flow (as shown in Figure 2). It is noted that the north-west corner of the reservoir is a few meters above ground level; however, as winds from the north-west are not expected to be affected by the proposed development. As such wind conditions from this direction will remain consistent with the existing scenario.

**Figure 2: Existing terrain (yellow) around the Calf Heath Reservoir and main contributing wind flow (blue)**

## South to South-Western Winds

When the proposed West Midlands Interchange development is complete, when winds from the south and south-west are considered, there is not expected to be a significant change in the wind flow from these directions. This is due to the existing tree line sheltering the reservoir and therefore the addition of the relatively low-rise buildings (up to 30m) and the 7-8m tall earth bund will have no additional shelter at ground level (shown in blue in Figure 3). As such, the additional shelter provided by the proposed scheme is for south-westerly winds (approximately 10% of the total 29% of winds from the south to south-west) towards the western edge of the reservoir (shown in yellow in Figure 3) and all other areas are expected to be unchanged in when considering south-westerly winds.

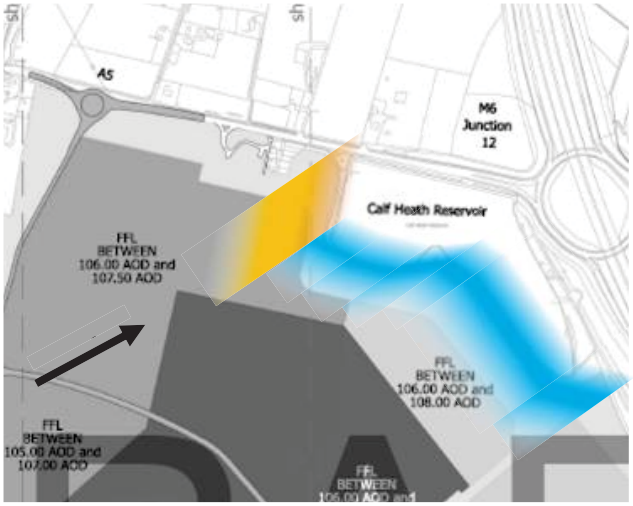



**Figure 3: Additional shelter provided by the proposed scheme (yellow)**

**West-South-Western to West-North-Western winds**

When considering winds approaching from the west, where in the existing case there is no shelter and therefore the oncoming flow is unimpeded; when the proposed scheme is in place, there will be sheltering provided by the warehouse (maximum height of 20m) and the 7-8m high earth bund in this direction (shown in yellow in Figure 4). As a result, this will create a significant change in wind flow from the westerly direction (which occurs approximately 20% of the time throughout the year) and affect sailing. It would be beneficial to minimise any landscaping atop the earth bund to limit the reduction in wind flow from these directions. As this part of the reservoir is in the wake of the proposed scheme, there is also likely to be increased turbulence which may cause issues to sailing compared to the relatively open, low turbulence flow expected at the existing site. It is noted that there are several existing small trees in this location; however, they are not expected to affect the general wind flow into the reservoir from these angles.

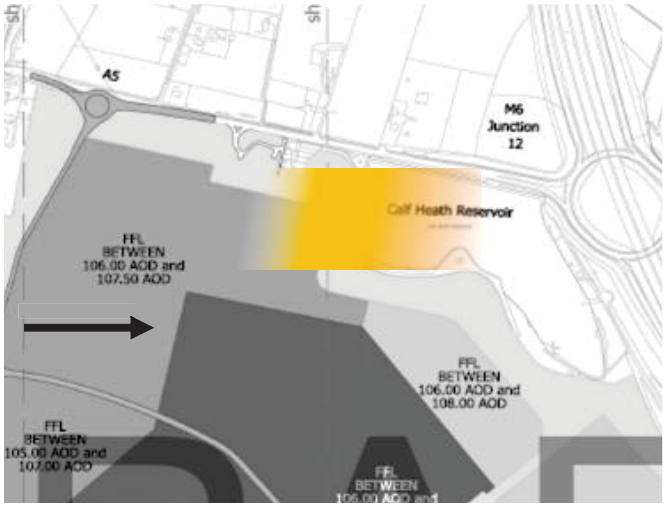



**Figure 4: Sheltering created by the proposed scheme from westerly winds (yellow)**

Winds from the other directions are expected to be unchanged and the buildings of the proposed scheme are only situated to the south and south-west. Winds from these other directions (north-west through to south-south-east) are expected to be consistent with the existing scenario; however, it should be noted that although winds from these directions occur for approximately 51% of the time annually, the wind speeds from these directions are generally lower.

**Conclusion**

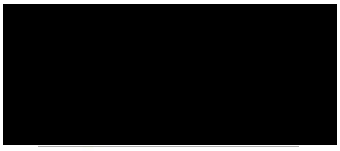
Sailing quality is unlikely to be changed when considering winds from the north-west to south-south-east as the reservoir will not affected by the wake of the proposed buildings (51% of the time throughout the year).

Sailing quality is likely to be reduced over the reservoir from a range of wind angles from south-west to west-north-west (winds from these angles typically occur for 30% of the time throughout the year). To minimise the effect created by the Proposed Development by minimising the height of the buildings in these directions and any intended landscaping should be limited.

There would be no impact from winds from the south to south-south-west (19% of time throughout the year) as the existing treeline reduces the amount of wind from these directions reaching the reservoir. Hence, the addition of the proposed scheme in this part of the site will have no additional effect on the reservoir.

Measures to reduce the effect of the Proposed Development on the sailing quality within the Calf Heath Reservoir would be to minimise landscaping along the south-west and west of the reservoir and limit the size and overall massing of the buildings from these directions. Following the DCO submission, when the massing has been determined, a wind tunnel test will be conducted in order to measure the changes in wind speed, direction and turbulence around the Calf Heath Reservoir due to the proposed scheme.

Yours truly,



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