

CFD Analysis Methodology

The assessment of wind conditions was supported by a Computational Fluid Dynamics (CFD) study to confirm and quantify pedestrian level wind conditions.

The scope of the CFD study was to assess, using the Lawson LDDC criteria [1] for comfort and safety, the pedestrian level wind conditions for the following scenarios:

- Baseline (existing site)
- Proposed Development in existing surroundings.
- Proposed Development in future surroundings

The CFD analysis was carried out for 16 equally spaced wind directions (in 22.5° intervals).

A detailed 3D representation of the assessment scenarios was produced. Building surroundings within a distance of 500m from the Site perimeter were modelled for each assessment scenario. The surroundings were taken from Arup's Digital City Model of Manchester.

The modelled geometry of the site was based on the CAD model listed in Table 1. Prior to issue of the report, the architects identified that Phase 01 has increased in height by 1.5m and Phase 02 by 0.5m compared to this model. The impact of this height increase is expected to be negligible based on professional judgement.

File Name	Description	Date received
998-CPA-ZZ-ZZ-M3-A-2101-P02-Revit Model.ifc	3D architectural model of the Proposed Buildings. Issued by Turley	4th December 2024

Table 1: Received CAD files and information to produce 3D models for CFD analysis.

Small building details of less than 0.5m were not modelled, as they would not be expected to impact the localised wind conditions.

Conservatively, landscaping, such as trees and other planting, was not modelled. Landscaping is likely to provide a beneficial impact on the wind environment by dissipating local windiness.

The computational mesh was approximately 18.5 million cells. The building near wall regions were further refined using prism layers (up to 4 layers with first cell thickness ranging from 0.03m to 0.1m and expansion ratio of 1.2) with surface cell sizes of the order of 0.3m-0.6m. The ground was refined using prism layers (4 layers with first cell thickness of 0.3m).

A steady-state RANS based modelling approach was used for each of the 16 wind directions and for each assessment scenario. Turbulence was modelled using the k-Omega SST model. Simulations were run to convergence which was determined through monitoring of probes located within the Site as modelled for the assessment scenarios. Outputs shown in the Baseline Conditions and Operational Effects sections respectively are extracted from these converged results, and consist of Lawson contour plots, representing comfort and safety wind speeds at pedestrian-chest level (1.5m above ground) for the “worst” (winter) season and summer season. The Lawson comfort and safety contour plots are obtained by combining the

directional wind speed-up ratios with the Weibull statistics as obtained from the wind climate study.