DRAFT REPORT

NESTLE CANTEEN

LONDON, UK

PEDESTRIAN LEVEL WIND DESK-BASED ASSESSMENT

RWDI #2204232

MAY 30TH, 2022

SUBMITTED TO

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TABLE OF CONTENTS

VERSION HISTORY

RWDI Project #2204232	Nestle Canteen London, UK		
Engineer	**Releases**	**Dated**	**Reviewed By**
Andrew Proud	Rev A Rev B	12/04/2022 30/05/2022	Zain Khan

1 EXECUTIVE SUMMARY

This is a qualitative assessment of the likely wind conditions around the proposed Nestle Canteen development in the London Borough of Hillingdon, UK. RWDI is familiar with the Site having previously assessed the Former Nestle Factory development. The report outlines the overall methodology and the use of the Lawson Comfort Criteria to describe the expected on-Site wind conditions. The assessment is based upon analysis of meteorological conditions for London, adjusted to the Site, and a review of the scheme drawings in the context of the meteorological data and surrounding area.

The Site description is used mainly to identify building massing and features that are pertinent to the wind microclimate on-Site. The expected main flow interactions around the Site are then described and categorised in terms of the Lawson Comfort Criteria.

The meteorological data for the Site indicates that prevailing winds blow from the south-west throughout the year, with secondary winds approaching the Site from the north-east, especially during the spring season. For the existing Site, the wind microclimate at ground level is expected to be suitable for sitting to standing use during the windiest season. Conditions are expected to be suitable for sitting use during the summer season.

The proposed Health Care Centre would be similar in height and form to the existing Nestle canteen building and therefore would be unlikely to substantially influence the surrounding wind environment. The six storey Block H would be sheltered from the prevailing wind by the Health Care Centre and the surrounding buildings of the Former Nestle Factory development. Wind conditions on pedestrian thoroughfares and at entrances to the Proposed Development would therefore be expected to be appropriate during the windiest season.

During the summer season, wind conditions in the Health Care Centre courtyard expected to be suitable for sitting use and Wallis Gardens, to the east of the Site, expected to have similar conditions to the existing Site and suitable for amenity use.

Block H private balconies would be expected to have appropriate wind conditions during the summer season. Communal terrace spaces would have similar wind conditions to balconies, however, as these would not be private spaces, should long-term occupant sitting be desired, additional shelter would be beneficial. Measures have been suggested which would be expected to improve wind conditions if sitting use conditions are desired.

Overall, wind conditions at the Proposed Development would be expected to be suitable for the intended uses and there would be no instances of winds exceeding the threshold for potential safety concerns for cyclists or more vulnerable pedestrians. Should long-term occupant sitting be desired at terrace levels, measures have been recommended to provide additional shelter to occupants.

2 INTRODUCTION

RWDI was retained by BDW Trading Ltd (Barratt London) to conduct a desk-based assessment of the proposed Nestle Canteen development (hereafter referred to as the 'Proposed Development') in the London Borough of Hillingdon. RWDI is familiar with the Site having undertaken wind microclimate assessments previously for the wider Former Nestle Factory Site. This report presents the background, objectives, results and recommendations from RWDI's assessment. A summary of the overall recommendations from the study are presented in Section 7, "Concluding Remarks".

3 SITE DESCRIPTION

3.1 Site and Surroundings

The Site is located in the London Borough of Hillingdon approximately 500 metres to the south-east of Hayes Town Centre at the south of the Former Nestle Factory Site and is occupied by the existing Nestle Canteen building, a locally listed building. The Site is bounded to the north by the Great Western Railway Line and Grand Union Canal, to the south by Nestles Avenue, to the west is the existing Squirrels Industrial Estate and to the east is North Hyde Gardens.

The immediate surrounding area to the south and south-west are predominantly existing low to mid rise residential buildings. The taller buildings of the Former Nestle Factory development would surround the development in all other directions. Block C will be located to the north-west, Block B to the north, Block F to the north-east and Wallis Gardens and Block G to the south-east. As such, the Site would be relatively exposed to the prevailing south-westerly winds throughout the year with higher mean wind speeds and lower levels of turbulence than if the Site were located in a dense urban environment.

The Ordnance Survey Landranger reference for the Site is TQ101791. Figure 1 below, shows an aerial view of the approximate Site location and surroundings.

Figure 1: Aerial photograph of the existing Site (approximate extent of the Site highlighted in yellow)

3.2 The Proposed Development

The Proposed Development comprises two buildings to the south of the Former Nestle Factory Site. A two storey Health Care Centre building would be located to the south of the plot in the location of the former Nestle canteen building. This would not be substantially taller than the existing development to the south. Block H would be a six storey residential building located between the north of the Health Care Centre and Block F of the Former Nestle Factory development. Block H would be taller than the surrounding existing buildings to the south, but would be sheltered from the west and north as the earlier plots come forward. Communal amenity spaces would be provided at fifth floor level of Block H, with private balconies for individual units. Wallis Gardens would be located to the east of the Proposed Development.

A ground floor plan and southern elevation of the Proposed Development is presented in Figure 2.

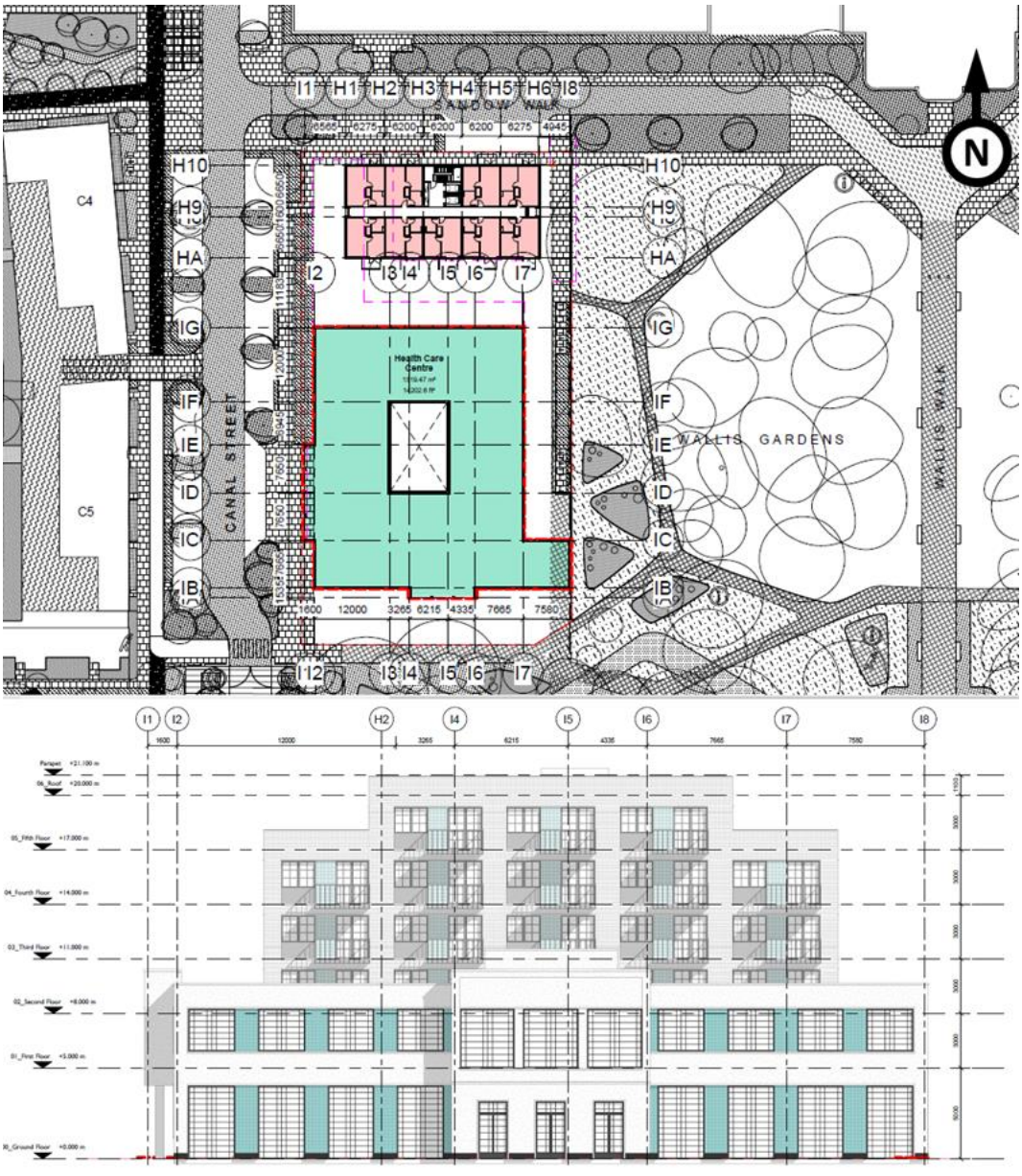


Figure 2: 3D view of the Proposed Development presented in the Updated DAS received by RWDI on 18/02/2022

4 METHODOLOGY AND ASSESSMENT CRITERIA

The wind conditions at the Proposed Development have been qualitatively assessed based on the metrological data for the area, a terrain assessment and, RWDI's extensive experience of wind flow in urban environment.

Knowledge of the prevailing wind direction focuses attention on the likely impact of these winds on the Site except where the proposed building massing / layout indicates that winds from other directions are likely to be important.

4.1 General Meteorological Data

Figure 3 shows the meteorological data derived from the meteorological stations at two London airports (London City and Heathrow Airports) which have been categorised by season and presented as wind roses. The radial axis indicates the percentage of hours per season that the wind speed exceeds the particular velocity range. The seasons are defined as spring (March, April and May), summer (June, July and August), autumn (September, October and November) and winter (December, January and February). The assessment will focus on the windiest season (typically the winter season), and the summer season, when amenity spaces are expected to be most frequently used.

The meteorological data indicate that the prevailing wind direction throughout the year is from the south-west, with a secondary peak for north-easterly winds during the spring season. Wind roses graphically depicting the distribution of wind frequency and directionality throughout the year are presented in Figure 3.

The combination of meteorological data, Site altitude and velocity ratios permits the percentage of time that wind speeds are exceeded on Site to be evaluated. The locations can then be assessed using 'comfort criteria', as described below.

4.2 Terrain Roughness

Another consideration is the terrain roughness in each wind direction because wide, open spaces permit the wind to flow smoothly at ground level generating conditions similar to those of open countryside even within a built-up area. An assessment of the terrain roughness for the Site was conducted using the ESDU methodology[1].

[1] ESDU International, Computer program for wind speeds and turbulence properties; flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001.

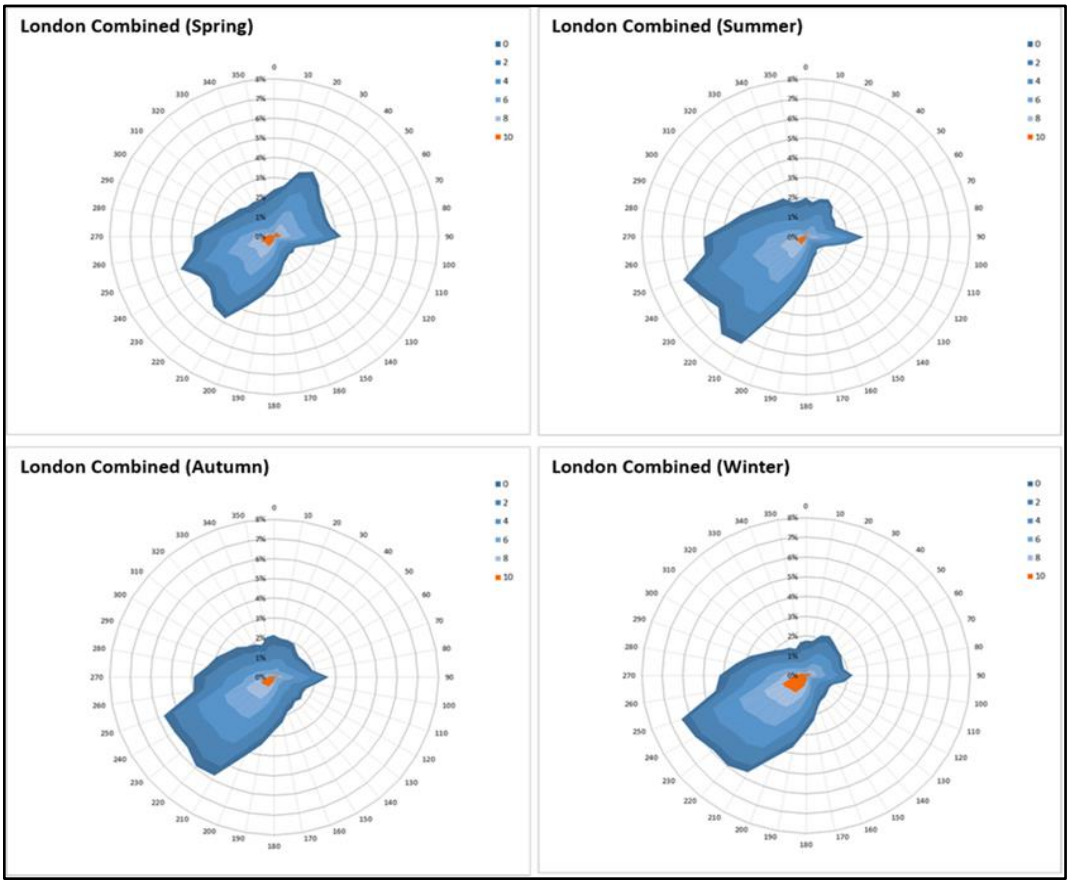


Figure 3: Seasonal wind roses for London City and Heathrow Airports Combined (radial axis indicates the percentage time for which the stated velocity range is exceeded)

Table 1 reports the mean factors at 2m and 10m above ground level

Wind Direction (N°)	0	10	20	30	40	50	60	70	80	90	100	110
Mean Factor at 2m	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.29	0.29
Mean Factor at 10m	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.61	0.61	0.61	0.63	0.63
Wind Direction (N°)	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**	**200**	**210**	**220**	**230**
Mean Factor at 2m	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.32
Mean Factor at 10m	0.63	0.63	0.62	0.62	0.64	0.64	0.65	0.65	0.65	0.65	0.66	0.68
Wind Direction (N°)	**240**	**250**	**260**	**270**	**280**	**290**	**300**	**310**	**320**	**330**	**340**	**350**
Mean Factor at 2m	0.32	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Mean Factor at 10m	0.68	0.65	0.65	0.65	0.66	0.65	0.65	0.65	0.65	0.64	0.64	0.64

4.3 Comfort Criteria

The assessment of the wind conditions requires a benchmark against which the measurements can be compared. This report uses the Lawson Comfort Criteria, which have been established for over thirty years. The Criteria, which seek to define the reaction of an average pedestrian to the wind, are described in Table 2. If the measured wind conditions exceed the threshold wind speed for more than 5% of the time, then they are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people will not use the area for its intended purpose.

The Criteria set out four pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. The four categories are sitting, standing, strolling and walking, in ascending order of activity level, with a fifth category for conditions that are uncomfortable for all uses. In other words, the wind conditions in an area for sitting need to be calmer than a location that people merely walk past. The distinction between strolling and walking is that in the strolling scenario pedestrians are more likely to take on a more leisurely pace, with the intention of taking time to move through the area, whereas in the walking scenario pedestrians are intending to move through the area quickly and are therefore expected to be more tolerant of windier conditions.

The Criteria are derived for open air conditions and assume that pedestrians will be suitably dressed for the season. Thermal comfort is discussed with reference to acceptable wind environments but not evaluated as part of the assessment.

Table 2: Lawson Comfort Criteria

Key	Comfort Category	Threshold	Description
	Sitting	0-4 m/s	Light breezes desired for outdoor restaurants and seating areas where one can read a paper or comfortably sit for long periods
	Standing	4-6 m/s	Gentle breezes acceptable for main building entrances, pick-up/drop-off points and bus stops
	Strolling	6-8 m/s	Moderate breezes that would be appropriate for window shopping and strolling along a city/town centre street, plaza or park
	Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

The coloured key in Table 2 corresponds to the presentation of assessment results described later in this report.

Generally, the target conditions are:

- Strolling use during the windiest season on pedestrian thoroughfares (with walking conditions potentially being tolerated in areas where pedestrians would not linger);

- Standing conditions at drop off areas or taxi ranks, bus stops and entrances throughout the year, with strolling use conditions acceptable at secondary entrances such as maintenance access; and
- Sitting use conditions at outdoor seating and amenity areas during the summer season when these areas are more likely to be frequently used by pedestrians. It is noted that in large mixed-use amenity spaces a mixture of sitting use and standing use can be considered acceptable as users can choose to sit in 'calmer' areas, with 'windier' locations such as play areas acceptable for more active pursuits.

4.4 Strong Winds

Lawson also specified a strong wind threshold when winds exceed 15m/s for more than 0.025% of the year (approximately two hours annually). Exceedance of this threshold may indicate a need for remedial measures or a careful assessment of the expected use of that location.

Strong winds are generally associated with areas which would be classified as acceptable for walking or as uncomfortable. In a mixed-use urban development scheme, walking and uncomfortable conditions would not usually form part of the 'target' wind environment and would usually require mitigation due to pedestrian comfort considerations. This mitigation would also reduce the frequency of, or even eliminate, any strong winds.

4.5 Typical Wind – Building Interactions

The wind conditions at the Proposed Development are expected to be due to the following generalised flow behaviour.

Channelling (Figure 4a) of the wind occurs between buildings of similar height when in close proximity to each other. Windy conditions occur at pedestrian level since the flow accelerated as it is "squeezed" between the buildings.

Corner acceleration (Figure 4b) around building corners may occur due to the difference in pressure on the upwind and downwind façades (low pressure zones on the leeward side and zones of higher pressure on the windward side of the building). This effect is particularly pronounced around sharp corners which create localised windy areas in the vicinity of the corner where the flow is accelerated around the building.

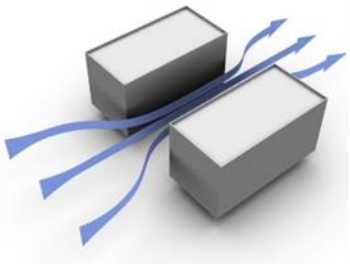


Figure 4a: Channelling

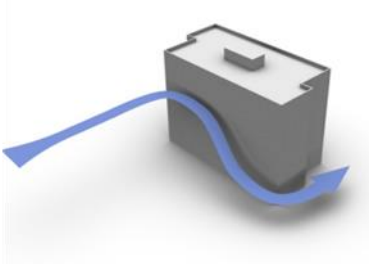


Figure 4b: Corner acceleration

5 BASELINE CONDITIONS

Often a new development will alter the pedestrian activity (i.e. intended use) on-Site. Occasionally, although wind conditions may not change after the Proposed Development is completed (e.g. stay suitable for walking), mitigation would still be required if, on the new development, the location of interest is intended for a critical activity (e.g. a main entrance) for which the wind condition would be unsuitable. Assessment in terms of the desired pedestrian activity on, or around, a site takes into consideration any change of use, and this is where the comfort criteria are particularly helpful.

5.1 Pedestrian Comfort

The baseline conditions at 2m above ground level at an idealised "empty" site would be suitable for standing use throughout the year.

The Site is currently occupied by the existing two-storey Nestle canteen building, which is sufficiently low rise such that it is unlikely to cause areas of localised acceleration, but would likely provide areas of calmer wind conditions to the north and east, which would be sheltered by the building massing. Therefore, the wind conditions around the existing Site are expected to be suitable for sitting to standing use during the windiest season. During the summer season sitting use conditions are likely to prevailing, with localised standing use conditions close to building corners.

5.2 Strong Winds

Winds in excess of 15 m/s are not expected to occur at and surrounding the existing Site for more than 2.2 hours yearly (the threshold specified by Lawson for potential safety concerns for more vulnerable pedestrians and cyclists).

6 WIND CONDITIONS AROUND THE PROPOSED DEVELOPMENT WITHOUT LANDSCAPING

Wind conditions suitable for strolling use or calmer are desirable on pedestrian thoroughfares during the windiest season for a residential development in a suburban area. Standing use wind conditions or calmer are generally required at main entrances throughout the year. Amenity spaces require sitting use conditions where seating provisions are located (or a mixture of sitting and standing use conditions in larger areas and more active locations such as play areas) during the summer season. Private balconies require standing use wind conditions or calmer during the summer season.

Occurrences of strong winds in excess of 15 m/s are expected to be limited when wind conditions meet the above criteria and are suitable for pedestrian comfort.

The results presented as contour plots in Figures 5 to 7 are appended to this report.

6.1 Pedestrian Comfort

The expected wind conditions are presented in Figures 5 and 6 at ground level for the windiest season and summer season respectively. Wind conditions at the balconies and terraces of Block H are shown in Figure 7 during the summer season.

Wind conditions at the Site have been considered in the context of the surrounding Former Nestle Factory development, which is expected to be completed prior to occupation of the Proposed Development. Block C would be expected to provide shelter to Block H from westerly winds. Block F would be expected to provide similar shelter from the north-easterly winds common during the spring season.

The shelter afforded to Plot H and similarity in height and form of the Heath Care Centre building to the existing Nestle canteen would be expected to result in wind conditions similar to the baseline. As such, during the windiest season wind conditions would be expected to range from suitable for sitting to standing use and suitable for sitting use at ground level during the summer season. Plot H balcony and terrace levels would be likely to be suitable for standing use conditions except in areas sheltered by Block H itself.

6.1.1 Thoroughfares (Figure 5)

Wind conditions on Nestles Street to the south of the Site would remain similar to the baseline due to the similar in form and height of the Health Care Centre to the existing Nestle canteen building.

Within the Former Nestle Factory site, wind conditions on Canal Street to the west of the Health Care Centre would generally be expected to be suitable for standing use during the windiest season. Windier conditions may be likely around the southern corner of Block C, however, these would occur regardless of the presence of the Proposed Development and would be anticipated to be improved with the implementation of the Block C landscaping scheme.

Plot H would be sheltered from the prevailing winds by the Health Care Centre and Block C and Block F of the Former Nestle Factory development. As such, Sandown Walk and the thoroughfare between the Health Care Centre and Block H would be expected to be suitable for standing use during the windiest season. Thoroughfares in Wallis Gardens would be expected to have standing use conditions during the windiest seating, which the sheltered area in the colonnade to the east of the Health Care Centre would be expected to have sitting use conditions.

Standing use conditions would be calmer than required for pedestrian thoroughfares and therefore wind conditions on thoroughfares surrounding the Proposed Development would be appropriate.

6.1.2 Entrances (Figure 5)

The main entrances to the Health Care Centre and Nursery would be within the colonnade on the western elevation of the Health Care Building. Additional entrances would access the Nursery from the southern elevation. Each of these entrances would be in areas expected to have standing use wind conditions during the windiest season, which would be appropriate for entrance locations.

The main entrance to the Block H residential lobby would be on the northern elevation from Sandow Walk. Entrances to the ground floor commercial unit would be located on the southern elevation of Block H. Standing use conditions would surround Block H, and therefore all Block H entrances would be appropriate.

6.1.3 Ground Floor Public Space (Figure 6)

Ground floor amenity would be provided within a courtyard at the centre of the Health Care Centre. No other ground floor amenity is proposed on-Site, however, Wallis Gardens would be located to the east of the Site and would be expected to be used for amenity purposes during the summer season.

As the courtyard is surrounded by the Health Care Centre on all sides, this space would be very calm, with sitting use conditions throughout the year.

Due to the Health Care Centre building being of similar height and form to the existing Nestle canteen, and Block H being located downwind, wind conditions in Wallis Gardens would be expected to be no worse than at the existing Site. Wind conditions during the summer season would be expected to be suitable for sitting use during the summer season. Sitting use conditions would be appropriate for ground level amenity spaces.

6.1.4 Balcony and Terrace Level Amenity Spaces (Figure 7)

Communal terraces are proposed at fifth floor level on the north-western and south-eastern elevations of Block H. These spaces would be higher than the Health Care Centre roof and the existing buildings to the south-west of the Site, and therefore exposed to the prevailing south-westerly winds. Standing use wind conditions would be expected on the north-western terrace and a mix of standing and sitting use conditions on the south-eastern terrace during the summer season. Provided occupants are not intended to sit for long periods (i.e. reading a book/newspaper, eating or drinking) standing use conditions would be appropriate.

Should long-term sitting be intended, then occupants would benefit from sitting use conditions during the summer season. These could be achieved through increasing the parapet/balustrade height to 1.5m though use of glazed or up to 50% porous panels, or by providing localised shelter to seating provision using screens or dense planting at least 1.5m in height.

Private balconies on the northern and southern elevations of Block H would be expected to have standing use conditions at fourth through sixth floor levels and sitting conditions at first through third floor levels during the summer season. Standing use conditions would be appropriate for private amenity spaces as occupants would be more tolerant of windier conditions due to the increased height and exposure. No additional measures would be necessary on the balconies.

6.2 Strong Winds

Winds in excess of 15 m/s are not expected to occur at and surrounding the existing Site for more than 2.2 hours yearly (the threshold specified by Lawson for potential safety concerns for more vulnerable pedestrians and cyclists).

7 CONCLUDING REMARKS

In conclusion:

1. The meteorological data for the Site indicates that the prevailing winds blow from the south-west throughout the year, with secondary winds blowing from the north-east especially during the spring season.

2. Wind conditions at the existing Site are expected to be suitable for standing use during the windiest season and sitting use during the summer season. The existing Nestle canteen building is unlikely to create areas of substantially windier conditions.

3. The Proposed Development would be comprised of two buildings, a Health Care Centre of similar height and form to the existing Nestle canteen and Block H, a six storey residential building. As the Health Care Centre would be of similar height and form to the existing building, and Block H would be sheltered from the prevailing winds by Block C of the Former Nestle Factory development and the Health Care Centre, no substantial change in wind conditions would be expected from the baseline conditions.

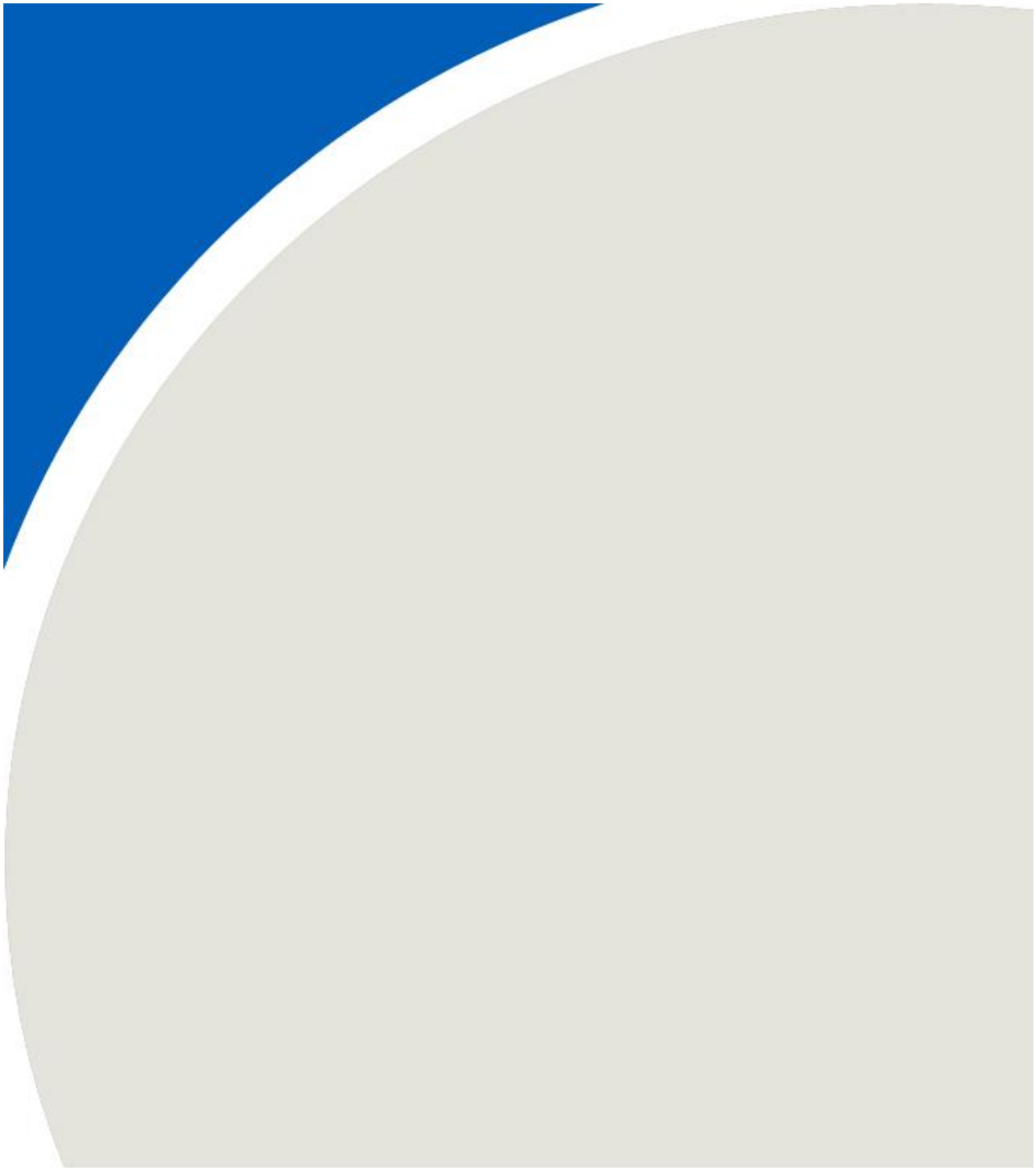
4. Wind conditions on pedestrian thoroughfares and at entrances to the Proposed Development would be anticipated to be suitable for the intended uses during the windiest season. Ground level amenity space in the Health Care Centre courtyard and off-Site in Wallis Gardens would be expected to be suitable for amenity use during the summer season.

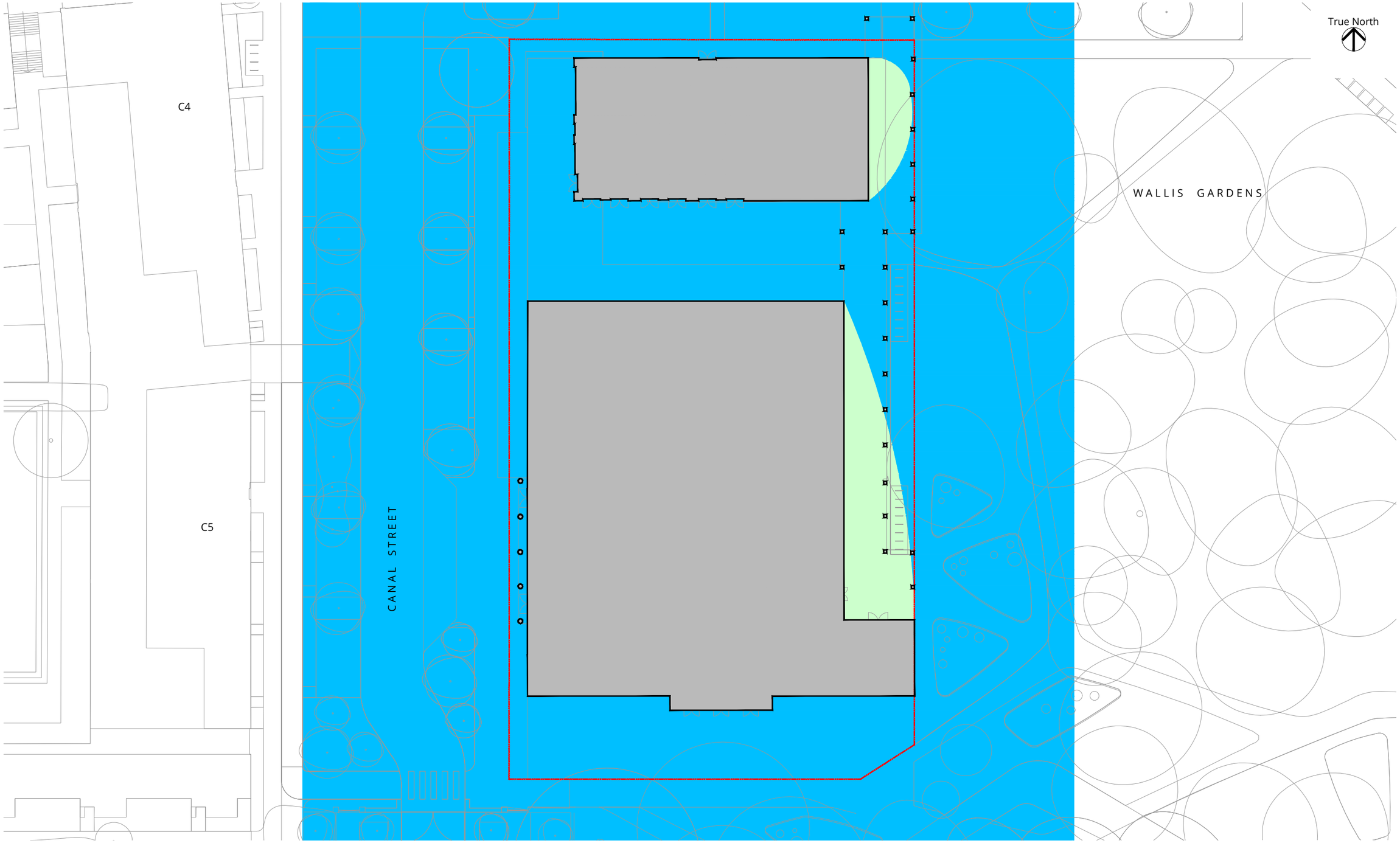
5. Block H communal terrace levels would be suitable provided no occupant long-term sitting was intended. Should this use be desired, additional shelter from glazed or up to 50% porous balustrades would be beneficial. Private balcony spaces would have appropriate wind conditions for occupant during the summer season.

6. No winds exceeding the threshold for potential safety concerns for cyclists or more vulnerable pedestrians would be likely at the Proposed Development.

7. In conclusion, wind conditions at the Proposed Development would be expected to be suitable for the intended uses throughout the year. Should long-term sitting be desired at Block H terrace levels, additional shelter has been suggested and would be beneficial for occupants. No mitigation measures would be required at ground level.

FIGURES





LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

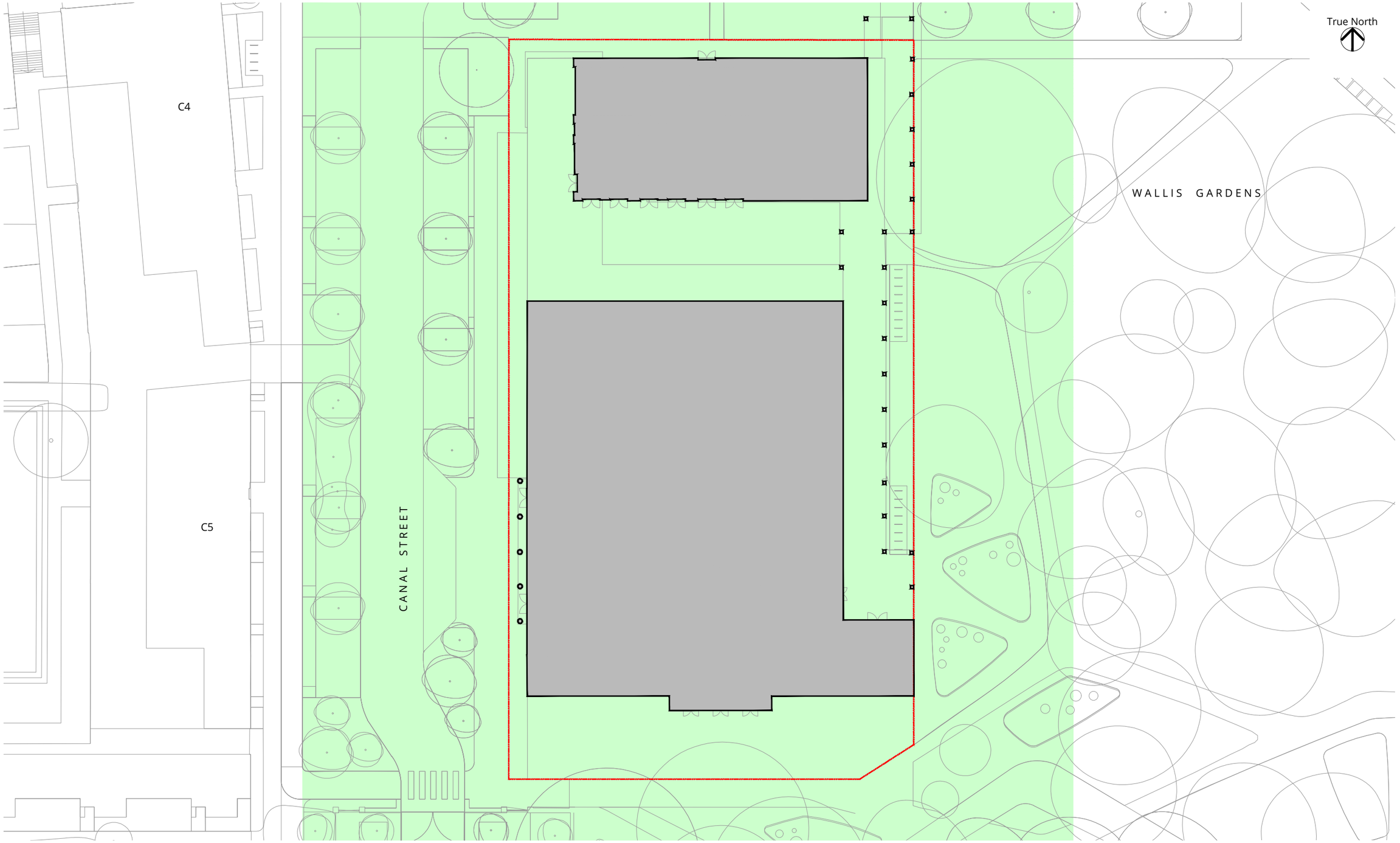
Pedestrian Comfort Desk- Expected Wind Conditions - Ground Floor

Proposed Development with the Existing Surrounding Buildings
(Including the Former Nestle Factory Development)

Windiest Season

2204232 Nestle Canteen - London, UK

Figure: 5



LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Comfort Desk- Expected Wind Conditions - Ground Floor

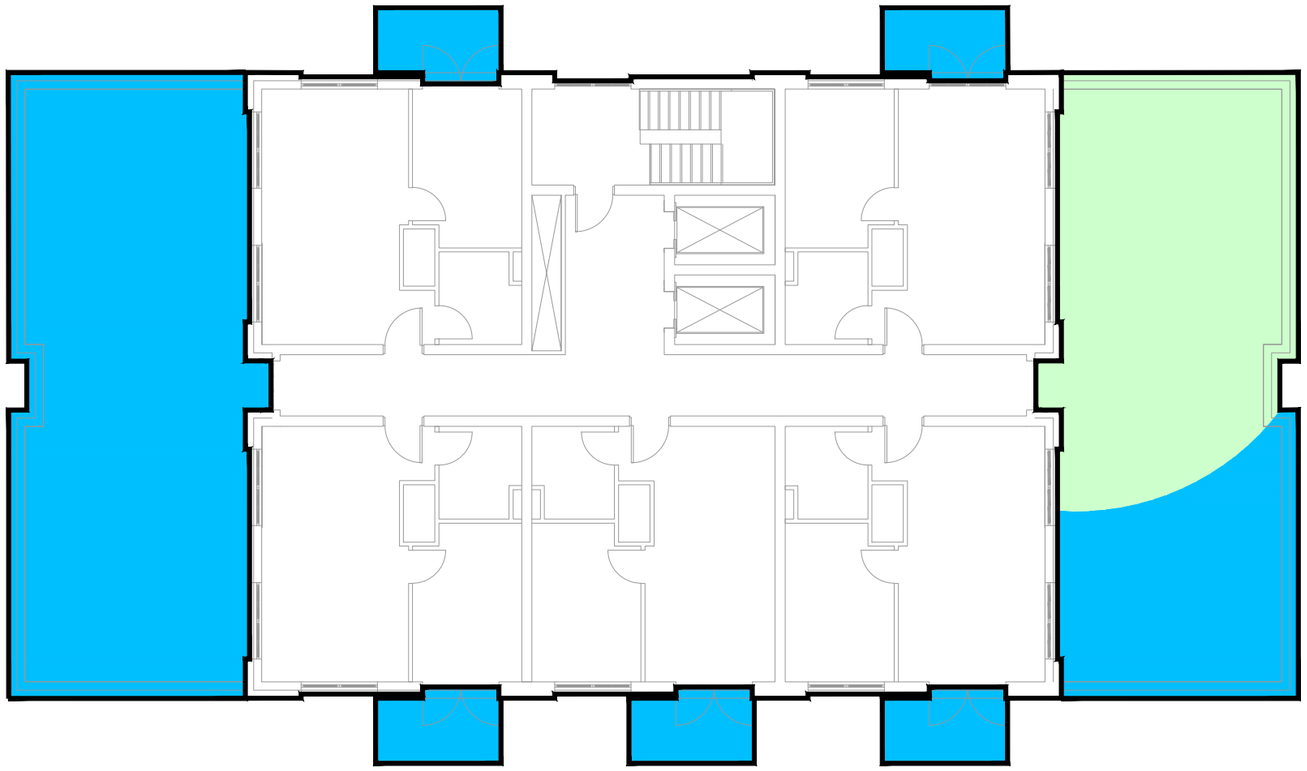
Proposed Development with the Existing Surrounding Buildings
(Including the Former Nestle Factory Development)

Summer Season

2204232 Nestle Canteen - London, UK

Figure: 6

True North



LDDC COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Comfort Desk- Expected Wind Conditions - Level 05
Proposed Development with the Existing Surrounding Buildings
(Including the Former Nestle Factory Development)
Summer Season

2204232 Nestle Canteen - London, UK

Figure: 7