

Prepared for

Urban Renewal Authority

Prepared by

Ramboll Hong Kong Limited

FEASIBILITY STUDY FOR CBS-2: KC

QUANTITATIVE AIR VENTILATION ASSESSMENT

Date **3 March 2023**

Prepared by **Echo Cao**
Environmental Consultant

Signed 

Approved by **Tony Cheung**
Senior Manager

Signed 

Project Reference **URACBS02EI00**

Document No. **R6917_V2.0e.docx**

No part of this document may be reproduced or transmitted, in any form or by any means electronic, mechanical, photographic, recording or otherwise, or stored in a retrieval system of any nature without the written permission of Ramboll Hong Kong Ltd, application for which shall be made to Ramboll Environ Hong Kong Ltd, 21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong.

Disclaimer: This report is made on behalf of Ramboll Hong Kong Ltd. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any third party relying on it accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

Ramboll Hong Kong Limited

21/F, BEA Harbour View Centre
56 Gloucester Road, Wan Chai, Hong Kong

Tel: (852) 3465 2888
Fax: (852) 3465 2899
Email: hkinfo@ramboll.com

Q:\Projects\URACBS02EI00\04 Deliverables\03 AVA Report\20230223\R6917_V2.0e.docx

CHAPTERS

	Page
1. INTRODUCTION	4
1.1 Background	4
1.2 Subject Site and its Environs.....	4
1.3 Proposed Development.....	4
1.4 Objectives	5
1.5 Future/ Committed Development.....	5
1.6 Baseline Scheme	5
1.7 Proposed Scheme	5
1.8 Comparison of the Baseline Scheme and Proposed Scheme	6
2. SITE WIND AVAILABILITY.....	8
2.1 Site Wind Availability Data.....	8
2.2 Topography and Building Morphology.....	9
3. QUANTITATIVE ASSESSMENT METHODOLOGY	10
3.1 Atmospheric Conditions	10
3.2 CFD Code and Major Parameters	10
3.3 Important Areas	11
3.4 Test Point Location	11
4. KEY FINDINGS.....	12
4.1 Spatial Average Wind Velocity Ratios	12
4.2 Annual and Summer Weighted Average Contour.....	14
4.3 Discussion on Air Ventilation Performance.....	16
4.4 Wind Enhancement Features.....	16
4.5 Directional Analysis.....	17
5. CONCLUSION	39

TABLES

Table 1.1	Development Parameter of the Baseline Scheme and Proposed Scheme	6
Table 2.1	Summary of RAMS Data and Wind Direction	8
Table 2.2	Surrounding Development	9
Table 4.1	Summary of Spatial Average Wind Velocity Ratios (VR) – Annual and Summer Condition.....	12

FIGURES

Figure 1	Location of Site and Its Environs
Figure 2	Location of Surrounding Future/ Committed Development
Figure 3	Building Blocks of Surrounding Future/ Committed Development Assumed in the CFD Model
Figure 4	Building Height of Existing Development in the Immediate Vicinity of the Subject Site (a: Northern Part; b: Southern Part)
Figure 5	Assessment Area and Surrounding Area of the CFD Model
Figure 6	Windrose Diagram representing V_{∞} of the Area under Concern
Figure 7	Wind Profile Curve
Figure 8	Test Points Selected for Quantitative Air Ventilation Assessment
Figure 9	Nil
Figure 10	Wind Velocity Ratios of Individual Test Points for Baseline Scheme (a: Annual, b: Summer)
Figure 11	Wind Velocity Ratios of Individual Test Points for Proposed Scheme (a: Annual, b: Summer)

APPENDICES

Appendix 1	Master Layout Plan for Baseline Scheme
Appendix 2	Master Layout Plan for Proposed Scheme
Appendix 3	Captured Pictures of the CFD Model
Appendix 4	Contour and Vector Plot for CFD Simulation
Appendix 5	Detailed CFD Simulation Result for Selected Test Points
Appendix 6	Master Layout Plan of Future/Committed Development

1. INTRODUCTION

1.1 Background

- 1.1.1 The Urban Renewal Authority (URA) commenced the Kau Pui Lung Road / Chi Kiang Street Development Scheme (the Scheme) (CBS-2:KC) on 22 May 2020, as a development scheme under section 25 of the Urban Renewal Authority Ordinance (URAO). An Air Ventilation Assessment (AVA) is required to be prepared to support the submission of the draft Development Scheme Plan (DSP) of the Scheme to the Town Planning Board (TPB) for consideration.
- 1.1.2 Ramboll Hong Kong Limited has been commissioned to undertake this AVA for the Scheme. This AVA contains a quantitative Computational Fluid Dynamics (CFD) assessment to evaluate the potential ventilation impact of the proposed development on the surrounding future pedestrian wind environment.
- 1.1.3 A draft DSP together with planning proposal and technical assessments were submitted to the TPB at commencement of the Scheme in May 2020. During public consultation, most of the comments and concerns were related to CBS issues, especially on the land matters of the undissolved CBS. The URA, after consultation with different Government Bureaux / Departments, has addressed the related comments and concerns. In this connection, the URA has taken the opportunity to review the draft DSP to respond to the new policy directives of entrusting the URA to provide more Starter Home (SH) units. Opportunity is also sought to enhance the Scheme to achieve wider planning gains to the community.
- 1.1.4 With the above consideration and changes, a revised Draft DSP, with revised notional design of providing private housing units and about 950 SH units (the "Revised Design 2022") are prepared and its necessary TAs are updated for TPB consideration.

1.2 Subject Site and its Environs

- 1.2.1 The site is bounded by Ma Tau Wai Road to the east, Chi Kiang Street to the south, Kau Pui Lung Road to the west and Lok Shan Road to the north.
- 1.2.2 The Scheme area remains unchanged as commenced in May 2020 and will be considered as one site to be developed by the URA or its joint venture partner(s) (**Figure 1**). Under the current notional design, the Scheme area will be divided into two sites, i.e. the Northern Site and the Southern Site, for private housing development and provision of SH units respectively. The site boundary between the Northern Site and the Southern Site is indicative and the location of the SH units are subject to change.

1.3 Proposed Development

- 1.3.1 The site covers a Scheme Area of approximately 16,500m². Under the revised draft DSP, the existing structure will be demolished for redevelopment. The site will be redeveloped for high-density residential development with the provision of Government, Institution or Community (GIC) facilities, commercial use, and underground public vehicle park.
- 1.3.2 Under notional layout of the Revised Design 2022, the Northern Site consists of five residential towers providing 1374 residential units, clubhouses (about 3,435m²), retail (about 8,587m²) and community facilities (about 500m²). The Southern Site consists of two residential towers providing 950 residential units, clubhouses (about 2,755m²), retail (about 6,888m²) and community facilities (about 2,000m²). A block plan of the notional layout is provided in Appendix A.

- 1.3.3 The population intake year for the proposed development is planned to be in year 2033.

1.4 Objectives

- 1.4.1 To address the above changes in the draft DSP, it is considered necessary to revise the AVA to support the re-submission to TPB for consideration. In this AVA, apart from the proposed development parameters, internal boundary between the sites and the types of housings, the methodology adopted in the last AVA (ref. no.: R6917_v1.5 dated February 2022) remain unchanged.

1.5 Future/ Committed Development

- 1.5.1 It is noted that there are several future/ committed developments in the nearby area. Furthermore, referring to the GeoInfo Map from Lands Department and site visit on 02 September 2022, there are several “work-in-progress” (WIP) sites in the area. **Figure 2** illustrated the locations of these future/ committed development and **Figure 3** shows the building block with building height assumed in the CFD simulation.
- 1.5.2 Following sites are under construction and almost completed. Therefore, building bulk could be observed during site visit or from the sale brochure.
1. No. 10 Maidstone Road
 2. 41, 43 and 45 Pau Chung Street
 3. Public Housing Development at Ko Shan Road
 4. Proposed Residential Redevelopment at 470-478 Chatham Road North
- 1.5.3 Following are future re-development site for Urban Renewal Authority (URA), the building information was provided by URA.
- | | |
|-----------|------------|
| 5. KC-016 | 9. DL-8KC |
| 6. KC-010 | 10. KC-013 |
| 7. KC-011 | 11. KC-012 |
| 8. KC-014 | 12. KC-009 |
- 1.5.4 The East Kowloon Corridor is the major elevated structure within the surrounding area.
- 1.5.5 There are two To Kwa Wan Station entrances/ exits located on Kiang Su Street and Lok Shan Road for MTR Tuen Ma Line, respectively. One storey structure for both entrances/ exits is included in the assessment.

1.6 Baseline Scheme

- 1.6.1 **Appendix 1** shows that the layout of the Baseline Scheme for assessment purposes. The Baseline Scheme comprises of 7 residential towers on top of three storeys podium. The main roof level is not more than 120 mPD. It is noted that the Baseline Scheme complies with the stipulated OZP development restrictions and SBD guidelines. The assumption of development follows the market practice.
- 1.6.2 The following mitigation measures have been identified in the Baseline Scheme.
- 15m building separation at grade along Maidstone Road;
 - 31m building separation between towers T1 and T5; and
 - 18m breezeway along Kiang Su Street at the direction of E-W.

1.7 Proposed Scheme

- 1.7.1 The Proposed Scheme comprises of 7 residential towers on top of 2 storeys podium and 4 storeys basement of carpark and retail. The main roof level is not more than 140

mPD. All the towers are located along the eastern and western boundary. However, it must be noted that this Proposed Scheme is for indicative purpose only that the notional layout is subject to detailed design upon DSP approval.

1.7.2 The following are the podia separation proposed in the Proposed Scheme (i.e. wind enhancement features).

- At least 17m podia separation at grade along the N-S pedestrianised avenue (i.e. existing Maidstone Road);
- 23m breezeway between the podia along Kiang Su Street at the direction of E-W;

1.7.3 On top of the 2 wind enhancement features, the proposed building height of 140mPD can reduce the bulkiness of buildings, number of blocks, and size of podia, which can facilitate wider building/podia separation in the notional design to further enhance wind flow environment. Under the notional design of the Proposed Scheme, the following wider building/podia separation can be achieved:

- over 50m building separation at Tower between T1 and T5;
- about 13m podia separation between T2 and T3;
- over 20m building separation at Tower between T4 and T5; and
- over 30m building separation at Tower between T4 and T6 at the direction of E-W.

1.7.4 In addition, there are several permeable elevated footbridges on the podium level at about 20.1 mPD to connect among different towers in both Northern Site and Southern Site.

1.7.5 **Appendix 2** shows the MLP of the Proposed Scheme.

1.8 Comparison of the Baseline Scheme and Proposed Scheme

1.8.1 The building height and GFA are higher in the Proposed Scheme compared to the Baseline Scheme. The building height of each building of both the Baseline Scheme and the Proposed Scheme has been indicated on the MLPs in **Appendix 1 and 2**. Comparison table of the development parameter proposed for two schemes is listed in **Table 1.1** below.

1.8.2 In both schemes, there is a N-S building separation; and the effective width is ~15m and 17m for the Baseline Scheme and the Proposed Scheme respectively.

1.8.3 In addition, the podia separation aligned with Kiang Su Street is 23m for the Proposed Scheme, which is much larger than that of 18m in the Baseline Scheme.

1.8.4 The building separation between T1 and T5 has been enlarged from about 30m to above 50m.

1.8.5 Compared with the continuous bulky podia between T2 and T3 as well as T1 and T5 in the Baseline Scheme, smaller podia with additional separation of 13m width between T2 and T3 can be achieved in the design of the podia under the Proposed Scheme. In addition, the podium under T6 is reduced, and the podia separation between it and Ming Fat Building is increased from 3m to 11m in the Proposed Scheme.

1.8.6 The footprint of T6 has been reduced and T7 has been moved to the southwest corner of the Subject Site in the Proposed Scheme, namely T6 and T7 in Southern Site.

Table 1.1 Development Parameter of the Baseline Scheme and Proposed Scheme

	Baseline Scheme			Proposed Scheme		
Building Height Restriction	120 mPD			140 mPD		
Towers Height	Varies from 105 -120 mPD			140 mPD		
Net Site Area	11,369 sqm *			15,475 sqm		
Proposed Total GFA	102,321 sqm			123,800 sqm		
	Northern	Southern	Overall	#Northern	#Southern	Overall
Proposed Domestic PR	7.5	7.5	7.5	8.0	8.0	8.0
Proposed Non-domestic PR	1.5	1.5	1.5	1.0	1.0	1.0
Proposed Total PR	9.0	9.0	9.0	9.0	9.0	9.0

* All the public road like Kiang Su Road and Maidstone Road are excluded in the site area under the Baseline Scheme.

The Site boundaries between Northern Site and Southern Site in the Proposed Scheme is indicative and subject to change.

2. SITE WIND AVAILABILITY

2.1 Site Wind Availability Data

- 2.1.1 According to the Planning Department's website, a meso-scale Regional Atmospheric Modeling System (RAMS) has been used to produce a simulated 10-year wind climate at the horizontal resolution of 0.5 km x 0.5 km covering the whole territory of Hong Kong. The simulated wind data represents the annual, winter and summer wind condition at various levels, i.e. 200 m, 300 m, and 500 m above terrain.
- 2.1.2 It is considered acceptable to use the simulated RAMS data for site wind availability. The use of RAMS data (grid: 083, 042) is preferred over measurement data at Waglan Island as it can reflect the effect of topography on wind availability.
- 2.1.3 The relevant annual windrose for the concerned district has been extracted from the Planning Department's website for site wind availability data. Figure 4 shows the relevant windrose diagram (at 500 m) representing the frequency and wind speed distribution of the concerned district for both summer and annual conditions.
- 2.1.4 The windroses results illustrate the wind environment is affected by topography and buildings. Table 2.1 below sets out a summary of the simulated site wind availability data including the probability of occurrence. In this quantitative AVA a CFD software has been used. According to the Technical Guide, simplification of wind data for the initial study has been adopted. The wind directions with highest probability of occurrence are selected for AVA purpose. A total of 11 wind directions has been selected (as highlighted in Table 2.1) with overall frequency of occurrence equivalent to 78.8 % and 81.9 % respectively of the time in a year (for both annual and summer conditions).

Table 2.1 Summary of RAMS Data and Wind Direction

Wind Direction	Probability for Annual Condition (%)	Probability for Summer Condition (%)
N	2.3	0.9
NNE	6.4	1.1
NE	7.8	1.4
ENE	12.3	2.6
E	22.3	9.1
ESE	11.8	9.9
SE	5.9	8.1
SSE	4.1	7.3
S	4.4	9.1
SSW	6	13.5
SW	6.3	15.1
WSW	3.9	9.8
W	2.6	5.7
WNW	1.4	2.8
NW	1.2	2.3
NNW	1.2	1.2

2.2 Topography and Building Morphology

Topography

- 2.2.1 The waterfront is located 500m to the east of the Subject Site. The topography close to the Subject Site is generally flat to the east. The ground elevation increases gradually to about 80 mPD from the Kau Pui Lung Road towards west. The Ho Man Tin area with elevation up to 70 mPD is located to 150m to the southwest of the Subject Site.

Building Morphology

- 2.2.2 The Subject Site is immediately surrounded by mid- to high- rise developments. The building height information of these identified developments is extracted from Geo-Reference Database (BG1000) provided by Survey and Mapping Office/ Lands Department.
- 2.2.3 **Table 2.2** highlights the building height of the surrounding developments.

Table 2.2 Surrounding Development

Name of Development	Building Height mPD	Location relative to the Application Site
324 – 354 Ma Tau Wai Road	~31 - ~40	East
Mai Lok Building	~48	East
Kong Yiu Mansion	~64	East
Braemar Court	~84	East
Lucky Building	~70	East
Wah On Court	~43	East
Hau Hing Mansion	~31	East
Pak Kin Building	~58	East
278 – 286 Ma Tau Wai Road	~25	East
On Chun Mansion	~56	East
Seng Cheong Building	~45	East
Ming Fat Building	~78	South
C.C.C. Wanchai Church Kei To Primary School	~36	Southwest
Lok Man Sun Chuen	~62 - ~81	South and West
Fu Yu Court	~47	North
Maxim Mansion	~46	North
1A – 1C Lok Shan Road	~32	North
356 Ma Tau Wai Road	~31	Northeast

3. QUANTITATIVE ASSESSMENT METHODOLOGY

3.1 Atmospheric Conditions

- 3.1.1 Simulated wind profile curves are extracted from the Planning Department's website using RAMS site wind availability data and is directly adopted for this quantitative AVA. Figure 5 shows the wind profile curves for grid X:083, Y:042.
- 3.1.2 Wind profile curves 0, 1 and 2 would be utilized for quantitative AVA according to the selected wind directions in Table 2.1.
- 3.1.3 For elevation from 0 to 10 m where wind profile information is not available, the wind speed is assumed based on fitted Log Law and measured wind speed value at 10 m from the RAMS site wind availability data for each wind profile curve.
- 3.1.4 The wind profile of 0 m to 10 m is interpolated and then combined with the wind profile curves on RAMS site wind availability data.

3.2 CFD Code and Major Parameters

- 3.2.1 A quantitative assessment based on requirement for Initial Study stipulated in the relevant Technical Guide has been conducted for the purpose of comparing the air ventilation performance between the Proposed and the Baseline Schemes.
- 3.2.2 The quantitative assessment is conducted by using a commercial CFD code, FLUENT. FLUENT model had been widely applied for various AVA research and studies worldwide. The accuracy level of the FLUENT model is well-accepted by the industry for AVA application.
- 3.2.3 Realizable K-epsilon turbulence providing better prediction of separation and vortexes has been adopted for air ventilation assessment as recommended in COST action C14.
- 3.2.4 Generally, the assessment area is determined by the height ($H = 160\text{m}$) of the highest building within the surrounding area. The domain covers the model area of over 320m. The surrounding area is determined by 2 times of the assessment area from the project site boundary. It is confirmed that all major noise barriers, elevated structures, and planned / committed / existing developments as discussed in section 1.3 and 2.2 have been modelled in the simulation. Figure 6 indicated the assessment area and surrounding area of the CFD model.
- 3.2.5 The domain dimension is about 5500m x 5700m and with an elevation of 1500m. More than 11,900,000 grid cells has been defined to simulate the air flow. Given the large domain adopted in this assessment and the physical limitation on the computational resources of the CFD model, the horizontal and vertical grid size employed in the CFD model in the vicinity of the Project Area is taken as a global minimum size of 2m and increase for the grid cells further away from the Project Area at a growth ratio of 1.3. The global maximum size of cells is 32m and smaller cell size up to 0.5m was used. Besides, four layers of prism cells (each layer of 0.5m thick) are employed above the terrain of Subject Site. The blockage ratio is less than 3%.
- 3.2.6 The windward boundary is defined as inflow with the wind profile defined. The leeward boundary is defined as outflow. The sky and lateral boundaries are defined as symmetric boundary condition.
- 3.2.7 Appendix 3 shows the domain size and the CFD model in different views. Figure 5 shows the wind profile curve adopted.
- 3.2.8 The advection terms of the momentum and viscous terms are resolved with the second order numerical schemes. The scaled residuals are converged to an order of magnitude of at least 1×10^{-4} as recommended in COST action C14.

3.3 Important Areas

3.3.1 The important surrounding areas that the public would often access have been identified as follows:

(1)	Lok Man Sun Chuen	(14)	Anhui Street
(2)	Kau Pui Lung Road	(15)	Ko Shan Road Park
(3)	Maidstone Road	(16)	Kau Pui Lung Road Playground
(4)	Lok Shan Road	(17)	C. C. C. Wanchai Church Kei To Primary School (Kowloon City)
(5)	Ma Tau Wai Road	(18)	Po Leung Kuk Madam Chan Wai Chow Memorial School
(6)	Sheung Heung Road	(19)	Po Leung Kuk Lam Man Chan English Primary School
(7)	Pau Chung Street	(20)	E.L.C.H.K. Hung Hom Lutheran Primary School
(8)	Kowloon City Road	(21)	S.K.H. Good Shepherd Primary School
(9)	Sze Chuen Street	(22)	Ball Court on rooftop of To Kwa Wan Market
(10)	Ha Heung Road	(23)	Kiang Su Street
(11)	Chi Kiang Street	(24)	Ma Tau Wai Road/ To Kwa Wan Road Garden
(12)	Ko Shan Road	(25)	To Kwa Wan Road
(13)	Kiang His Street		

3.4 Test Point Location

3.4.1 A total of 176 test points (including 30 numbers of perimeter test points defined along the boundary of the Application Site, 139 numbers of overall test points and 7 numbers of special test points) have been selected for quantitative air ventilation assessment. The overall test points generally representing important pedestrian areas are listed in section 3.3. All test points are located at 2 m above ground level.

3.4.2 **Figures 8** shows the location of test points for quantitative air ventilation assessment.

4. KEY FINDINGS

4.1 Spatial Average Wind Velocity Ratios

- 4.1.1 The velocity ratio under a specific wind direction at a test point is calculated by dividing the simulated wind speed at the test point under this wind direction with the velocity at gradient height under the same wind direction. All test points are located at 2 m above ground level.
- 4.1.2 Table 4.1 shows the Site spatial average velocity ratio (SVR), local spatial average velocity ratio (LVR) and average wind velocity ratio along surrounding air sensitive area during annual condition and summer condition (for the Baseline Scheme (BS) and Proposed Scheme (PS)).
- 4.1.3 The wind velocity ratios of individual test points are shown in **Figure 10a** and **Figure 11a** for annual condition of the Baseline Scheme and Proposed Scheme respectively, and **Figure 10b** and **Figure 11b** for summer condition of the Baseline Scheme and Proposed Scheme respectively. **Appendix 4** shows detailed simulation results of the Baseline Scheme and the Proposed Scheme respectively.

Table 4.1 Summary of Spatial Average Wind Velocity Ratios (VR) – Annual and Summer Condition

Location	Tests Point	Annual Condition		Summer Condition	
		BS	PS	BS	PS
SVR	P01-P30	0.09	0.10	0.09	0.10
LVR	P01-P30, T01-T145	0.11	0.11	0.12	0.12
Lok Man Sun Chuen	T01-T13, T105-T111, T125-T132	0.09	0.10	0.11	0.11
Kau Pui Lung Road	T14-T24, P17, P19, P21, P23, P25	0.16	0.16	0.18	0.17
Maidstone Road	T27-T31, S01-S05, P01, P14-P15, P30	0.09	0.10	0.09	0.11
Lok Shan Road	P01, T32-T38	0.08	0.09	0.09	0.10
Ma Tau Wai Road	T39-T50, T33-T34, T77, T116-T119	0.10	0.10	0.10	0.10
Sheung Heung Road	T40, T52-T53	0.08	0.09	0.07	0.07
Pau Chung Street	T35, T53-T55	0.09	0.08	0.07	0.07
Kowloon City Road	T37, T56-T61	0.10	0.10	0.08	0.07
Sze Chuen Street	T59, T62-T63	0.08	0.09	0.06	0.07
Ha Heung Road	T63-T66	0.11	0.12	0.08	0.09
Chi Kiang Street	P15-P17, T66-T70, T48	0.11	0.13	0.11	0.12
Ko Shan Road	T67, T71-T75	0.12	0.13	0.17	0.18
Kiang Hsi Street	T74, T76-T77	0.18	0.18	0.22	0.22
Anhui Street	T50, T72, T78	0.17	0.17	0.15	0.15
Ko Shan Road Park	T79-T87	0.12	0.12	0.19	0.19
Kau Pui Lung Road Playground	T25-T26, T51, T140-T145	0.13	0.11	0.14	0.13
C.C.C. Wanchai Church Kei To Primary School (Kowloon City)	T88-T91	0.06	0.06	0.11	0.10

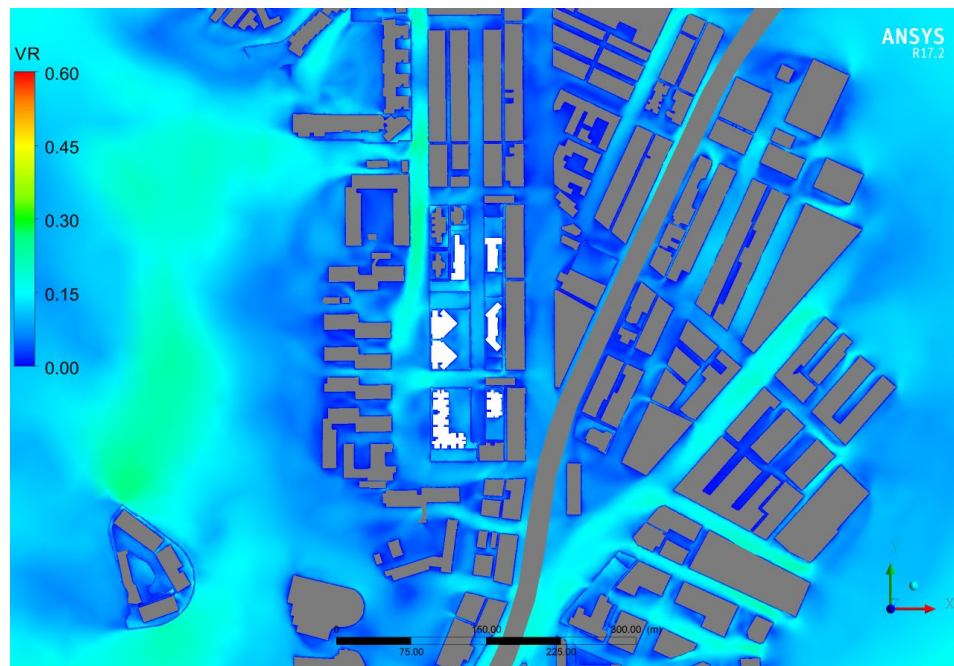
Location	Tests Point	Annual Condition		Summer Condition	
		BS	PS	BS	PS
Po Leung Kuk Madam Chan Wai Chow Memorial School	T92-T94	0.07	0.07	0.08	0.08
Po Leung Kuk Lam Man Chan English Primary School	T95-T97	0.05	0.05	0.05	0.05
E.L.C.H.K. Hung Hom Lutheran Primary School	T42, T98-T100	0.06	0.06	0.07	0.07
S.K.H. Good Shepherd Primary School	T101-T104	0.05	0.05	0.06	0.06
Ball Court on rooftop of To Kwa Wan Market	T112-T115	0.08	0.08	0.05	0.05
Kiang Su Street	P10, P11, P21, S04, S06, S07	0.13	0.11	0.12	0.11
Ma Tau Wai Road/ To Kwa Wan Playground	T120-T124	0.13	0.13	0.16	0.15
To Kwa Wan Road	T70, T124, T133-T139	0.18	0.18	0.19	0.19
Pedestrianised Avenue	S01-S05	0.10	0.11	0.09	0.12

Note: Highlighted in **red** where VR is higher in the Proposed Scheme

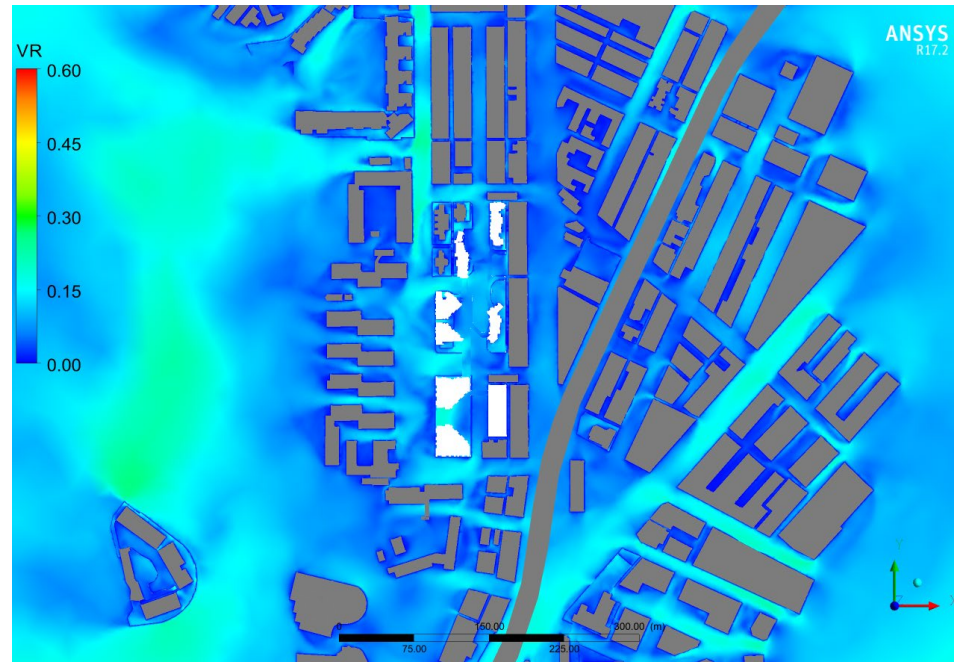
Highlighted in **blue** where VR is higher in the Baseline Scheme

4.2 Annual and Summer Weighted Average Contour

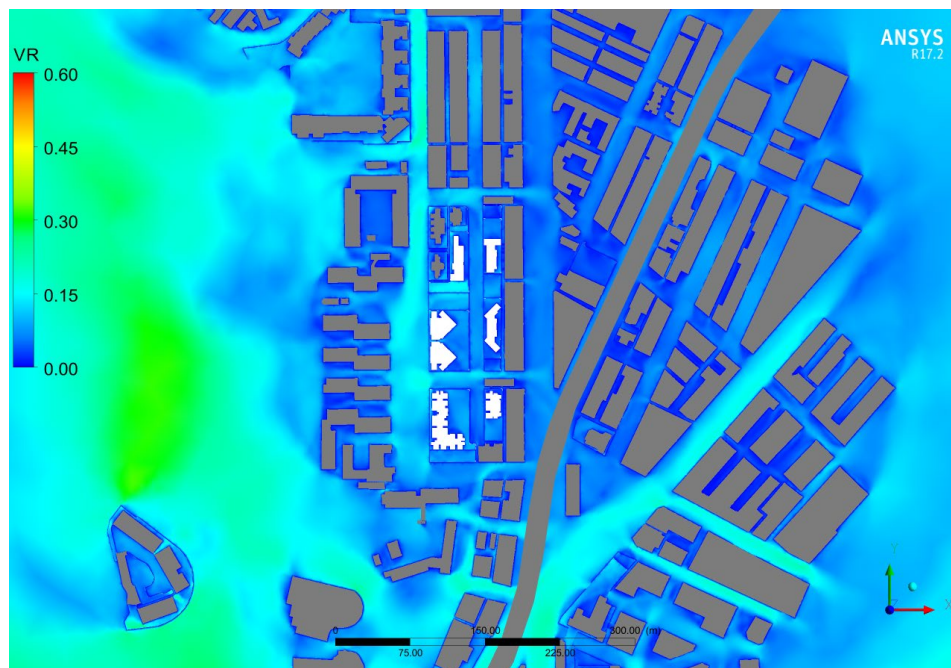
4.2.1 The annual and summer weighted average contour extracted below.



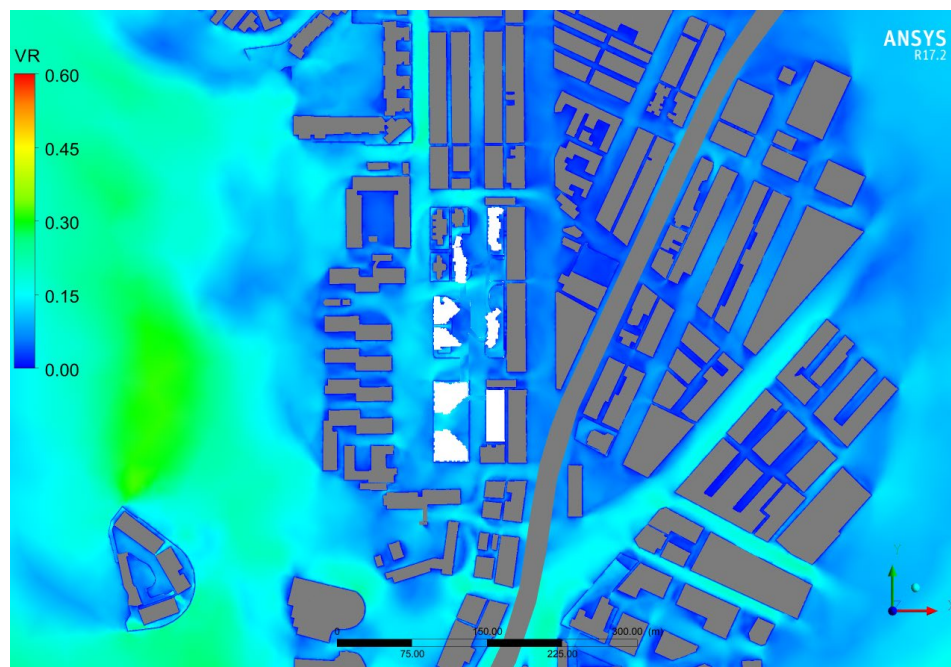
Annual Weighted Average Contour plot for Baseline Scheme



Annual Weighted Average Contour plot for Proposed Scheme



Summer Weighted Average Contour plot for Baseline Scheme



Summer Weighted Average Contour plot for Proposed Scheme

4.3 Discussion on Air Ventilation Performance

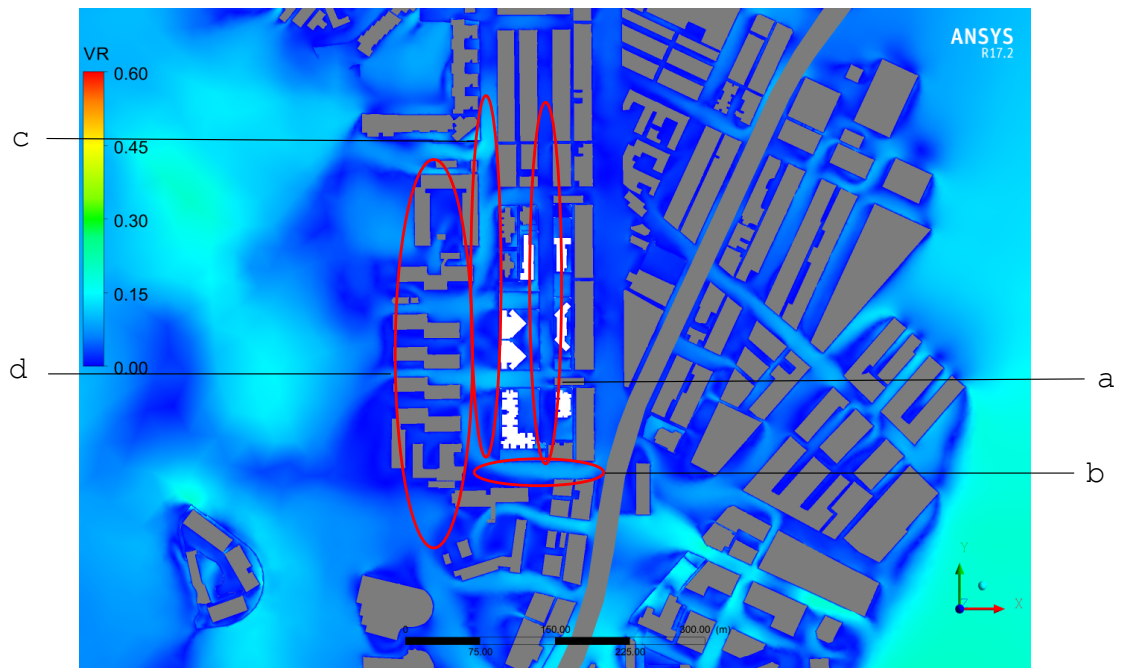
- 4.3.1 According to Table 4.1 and the weighted average contour above, it is noted that the LVR is similar between the Proposed Scheme and Baseline Scheme under both annual and summer condition. The SVR is slightly better in the Proposed Scheme, compared to the Baseline Scheme, under both annual and summer condition. Based on the result, the increase in building height would not induce a significant impact to the nearby area in air ventilation term under both annual and summer condition.
- 4.3.2 There are some variations in VR between two schemes. Under the annual condition, the VR of some areas is higher under the Proposed Scheme, including Lok Man Sun Chuen, Maidstone Road, Lok Shan Road, Sheung Heung Road, Sze Chuen Street, Ha Heung Road, Chi Kiang Street and Ko Shan Road. However, VR is lower at Pau Chung Street, Kau Pui Lung Road Playground and Kiang Su Street under the Proposed Scheme.
- 4.3.3 Under the summer condition, the areas with higher VR under the Proposed Scheme are Maidstone Road, Lok Shan Road, Sze Chuen Street, Ha Heung Road, Chi Kiang Street and Ko Shan Road. However, the areas with higher VR under the Baseline Scheme are Kau Pui Lung Road, Kowloon City Road, Kau Pui Lung Road Playground, C.C.C. Wanchai Church Kei To Primary School (Kowloon City), Kiang Su Street and Ma Tau Wai Road/ To Kwa Wan Playground.

4.4 Wind Enhancement Features

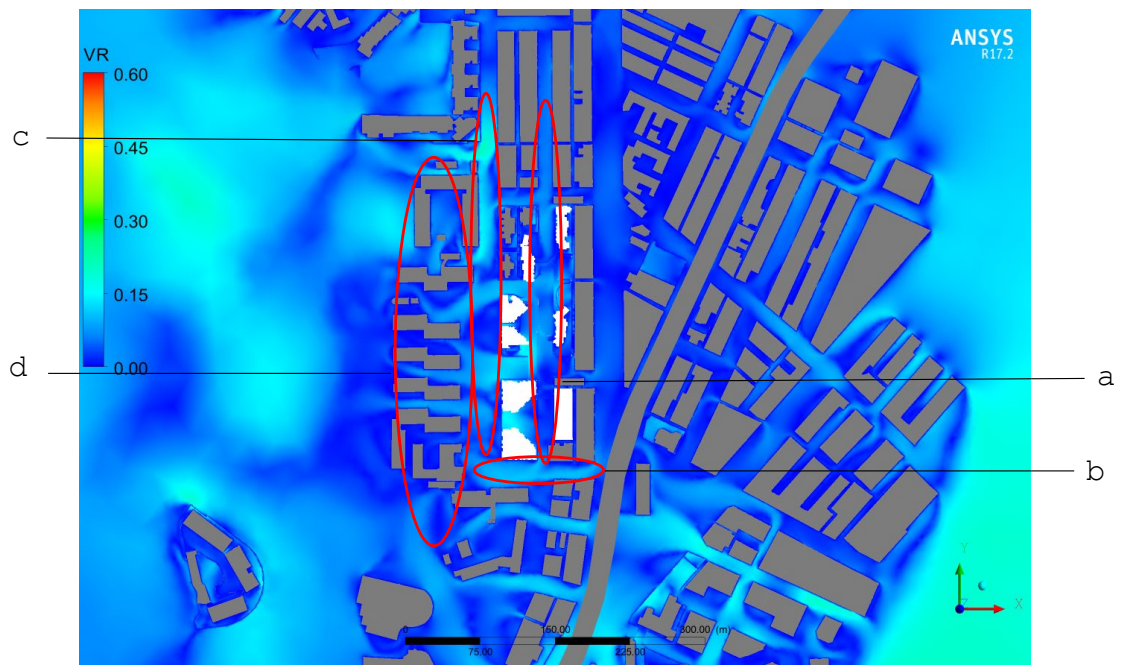
- 4.4.1 Overall speaking, the Proposed Scheme and Baseline Scheme are comparable in performance in air ventilation terms.
- 4.4.2 The Proposed Scheme offers one north-south building separation along Maidstone Road at the Subject Site. Also, the reduced podium extent under the Proposed Scheme improved the east-west wind penetration. Thus, it enhanced the internal ventilation and the immediate nearby area.

4.5 Directional Analysis

Wind performance under wind direction of NNE

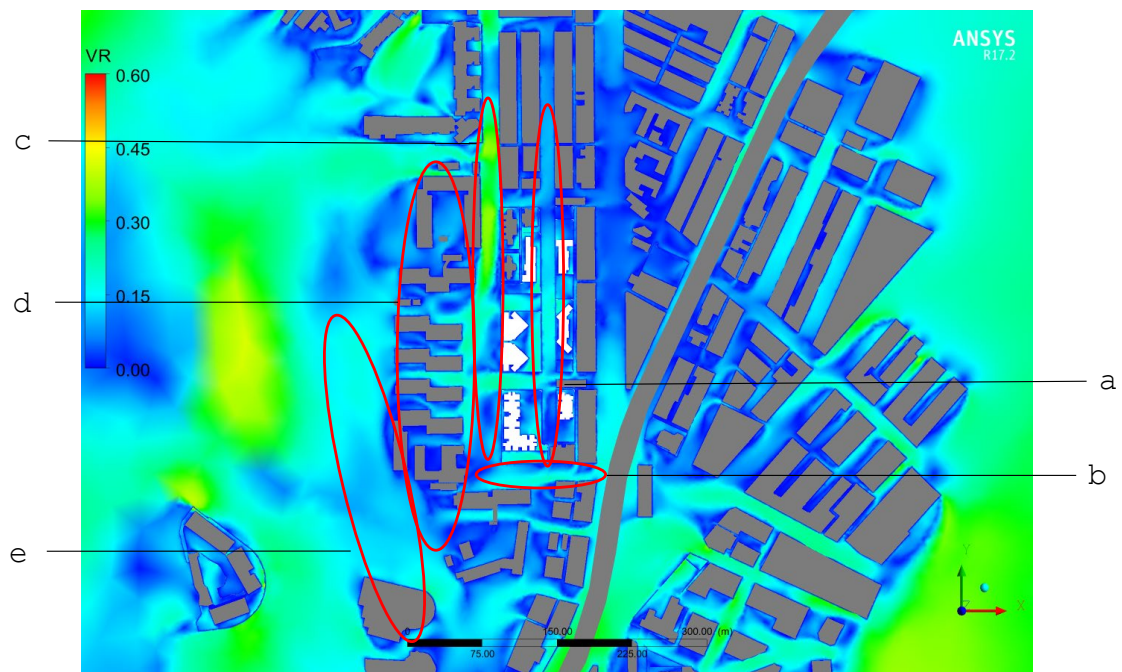
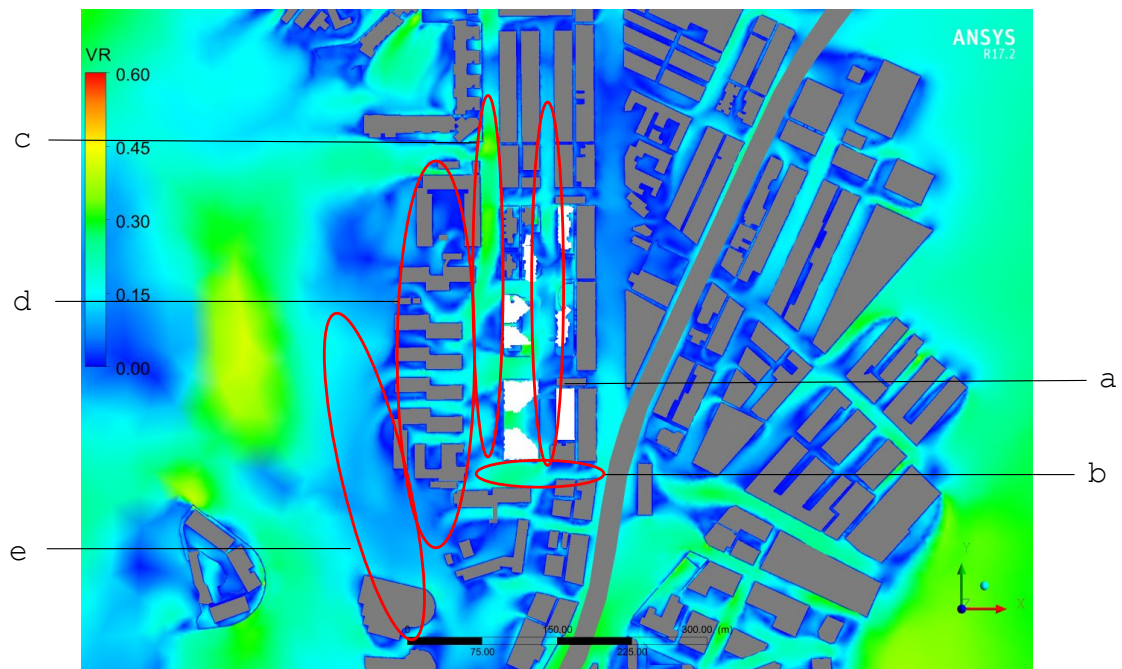


Contour plot for Baseline Scheme

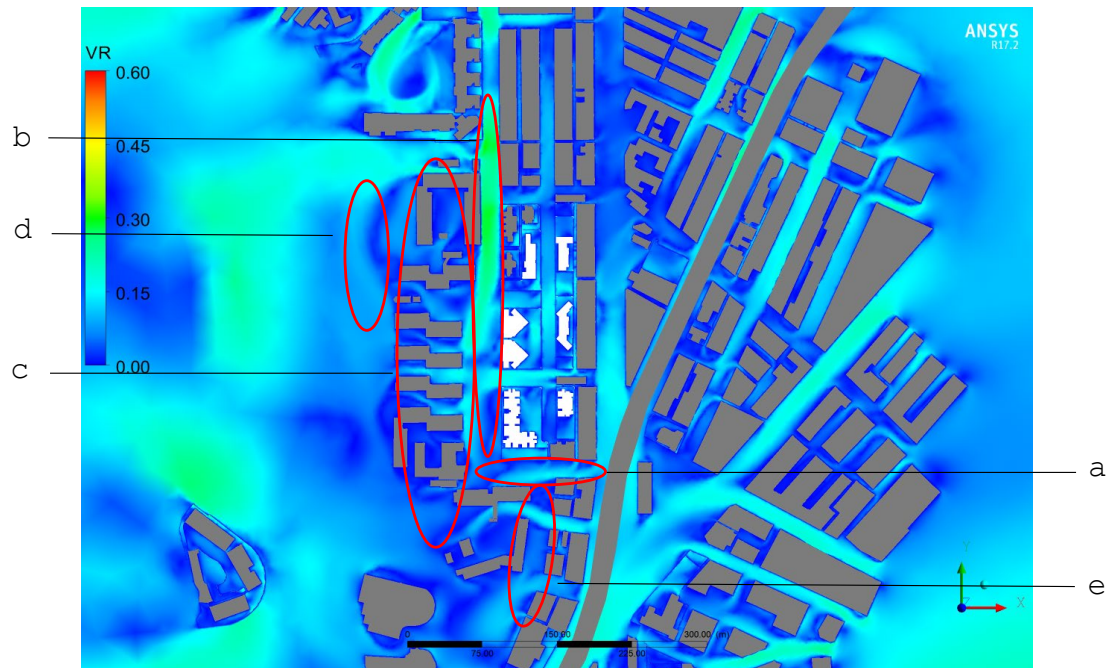
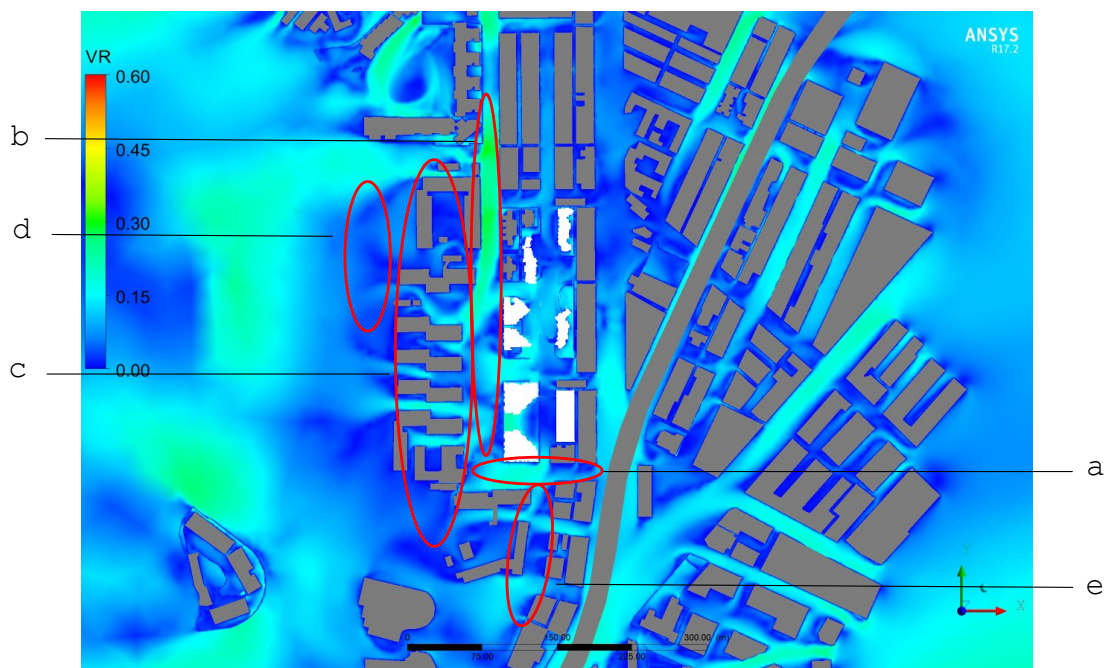


Contour plot for Proposed Scheme

-
- 4.5.1 Under NNE wind, the wind would mainly flow from Ma Tau Wai Road and To Kwa Wan Road to reach the Subject Site.
- a. The wider building separation along Maidstone Road/ future pedestrianised avenue within the Subject Site in the Proposed Scheme enhanced the north-south wind penetration. Therefore, the VR is slightly higher at Maidstone Road/ future pedestrianised avenue.
 - b. The upcoming wind flows along Chi Kiang Street from east to west. Since the building disposition of T7 in Southern Site of the Proposed Scheme is closer to the southern boundary, the air flow at part of Chi Kiang Street to the south of the Subject Site is accelerated due to the channelling effect.
 - c. The wider building separation along Kiang Su Street and the split podia between T2 and T3 at ~13m distance in the Proposed Scheme enhanced the east-west wind penetration in the area. The same wind enhancement is created between T4 and T6 with about 33m building separation and 23m gap between podia in the Proposed Scheme. The enhanced wind flows continuous toward west and benefit Kau Pui Lung Road under the Proposed Scheme.
 - d. Better E-W direction flows within the Subject Site and Kau Pui Lung Road continuously flows towards west and benefits Lok Man Sun Chuen under the Proposed Scheme.

Wind performance under wind direction of NE**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

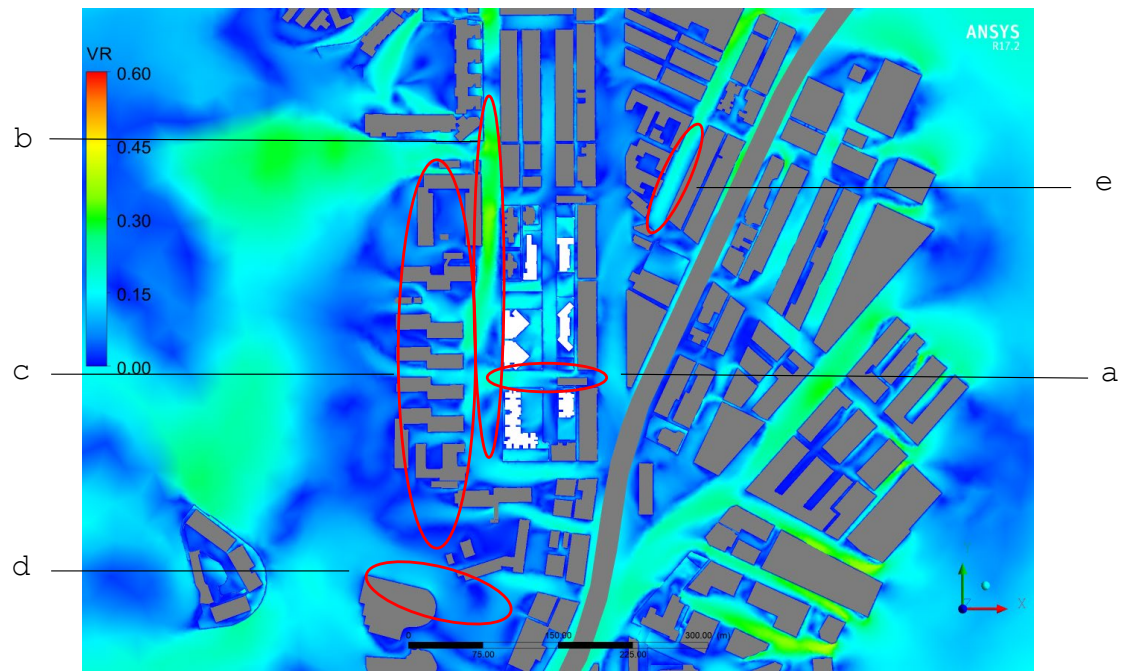
- 4.5.2 Under NE wind, the wind would mainly flow from Ma Tau Wai Road and To Kwa Wan Road to reach the Subject Site.
- a. The larger podium separation along Maidstone Road/ future pedestrianised avenue within the Subject Site from north to south direction in the Proposed Scheme enhances the north-south wind penetration. Therefore, the VR is higher at Maidstone Road/ future pedestrianised avenue under the Proposed Scheme.
 - b. On the other hand, the upcoming wind flows along Chi Kiang Street from east to west. Since the building disposition of T7 in Southern Site of the Proposed Scheme is closer to the southern boundary, the air flow at part of Chi Kiang Street to the south of the Subject Site has better wind performance due to the channelling effect.
 - c. The wider building separation along Kiang Su Street and the split podia between T2 and T3 at ~13m distance in the Proposed Scheme enhanced the east-west wind penetration in the area. The same wind enhancement is created between T4 and T6 with about 33m building separation and 23m gap between podia in the Proposed Scheme. The enhanced wind flows continuous toward west and benefit Kau Pui Lung Road under the Proposed Scheme.
 - d. The more diverted wind flow from Kiang Su Street and the wider building separation of about 58m between T1 and T5 in the Proposed Scheme continuously flows toward the west and benefits the Lok Man Sun Chuen.
 - e. Upcoming NE wind flows along the private road to the north of Lok Seen Lau and continuously flows towards south due to the slope to the immediate west of Lok Man Sun Chuen. The stronger wind flow within Lok Man Sun Chuen from east to west along the building separations counter with the abovementioned flow which leads to lower VR in Ko Shan Road Park and the hillside to the west of the Subject Site under the Proposed Scheme.

Wind performance under wind direction of ENE**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

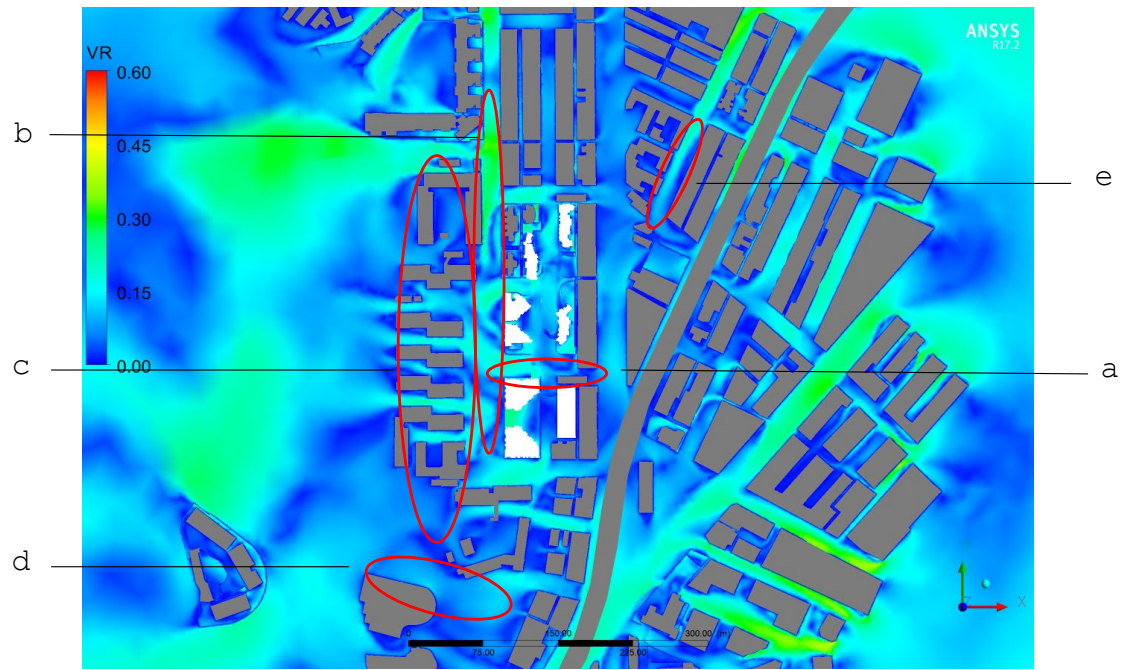
4.5.3 Under ENE wind, the wind would mainly flow from To Kwa Wan Road to reach the Subject Site.

- a. The upcoming wind flows along Chi Kiang Street from east to west. Since the building disposition of T7 in Southern Site of the Proposed Scheme is closer to the southern boundary, the air flow at part of Chi Kiang Street to the south of the Subject Site is accelerated due to the channelling effect.
- b. The building separation at tower level between T1 and T5 is much larger than that of the Baseline Scheme. In addition, podium between T2 and T3 is split with ~13m width in the Proposed Scheme, which allows more wind penetration through the Subject Site. While the podium at this location is continuous in the Baseline Scheme which would block the wind passing via the site, the smaller podia with separation in between would facilitate better wind flow to the inner area of the Site as well as passing through via the site towards hillside. Furthermore, the gap between the podia of Northern Site and Southern Site in the Proposed Scheme is larger than that in the Baseline Scheme, which also facilitates more wind flowing from east to west. Thus, the VR in Kau Pui Lung Road is higher under the Proposed Scheme.
- c. The diverted wind flow from Kiang Su Street and the building separation between T1 and T5 in the Proposed Scheme continuously flows toward the west and benefits the Lok Man Sun Chuen.
- d. The upcoming ENE wind flows along the private road to the north of Lok Seen Lau and diverts towards south along the area between Lok Man Sun Chuen and the slope to the immediate west. The stronger wind flow within the building separations aligned to E-W direction counters with the diverted wind. Thus, the VR is lower at Kau Pui Lung Road Playground under the Proposed Scheme.
- e. The stronger wind along Chi Kiang Street to the south of the Subject Site due to channelling effect continuously flows towards south at Ko Shan Street. Therefore, the VR at Ko Shan Road is higher under the Proposed Scheme.

Wind performance under wind direction of E



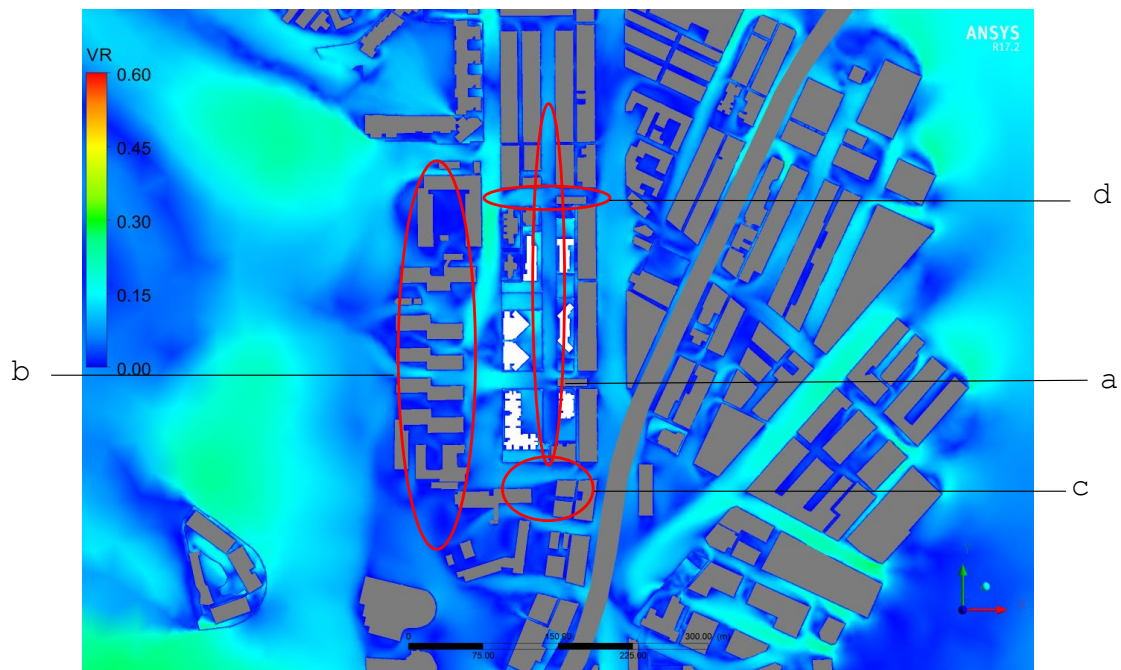
Contour plot for Baseline Scheme



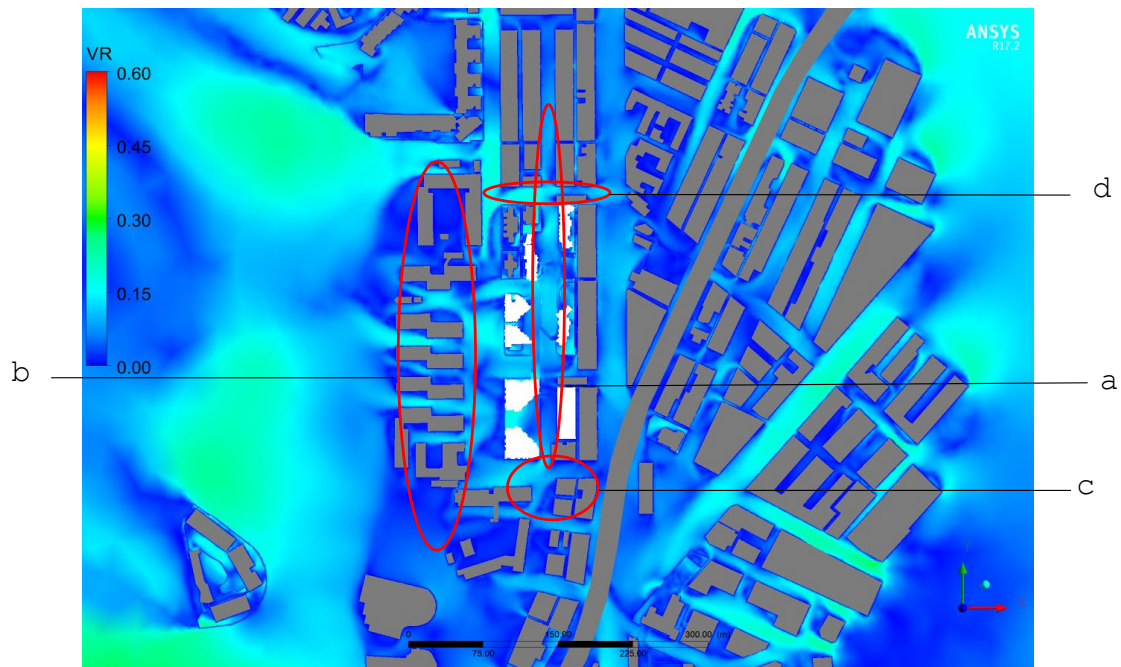
Contour plot for Proposed Scheme

- 4.5.4 Under E wind, the wind penetrates through the building clusters in To Kwa Wan area and reach the Subject Site.
- a. The upcoming E wind skims over the building clusters to the east of Ma Tau Wai Road and passes through Kiang Su Street. Although the podium gap between the podia of Northern Site and Southern Site is wider, the building outline of T6 in Southern Site is shifted towards north, which means it is closer to Kiang Su Street. Thus, the VR is slightly lower in Kiang Su Street under the Proposed Scheme.
 - b. Despite the lower wind speed along Kiang Su Street, there is additional at grade gap between the podium under T2 and T3, and the original T6 in the Baseline Scheme is split into two blocks with 15m separation, there are more wind penetration via the Subject Site from east to west. The more penetrated air counters with the flow along Kau Pui Lung Road, which leads to lower VR at Kau Pui Lung Road under the Proposed Scheme.
 - c. However, the abovementioned more wind flow from east to west allows the wind to flow continuously to Lok Man Sun Chuen.
 - d. The E wind passes through the private road to the north of Lok Seen Lau and was diverted towards south along the slope to the west of Lok Man Sun Chuen. The higher penetration among the blocks under the Proposed Scheme counters with the diverted wind and reduces the air to flow towards Ko Shan Road Park. However, Kiang Hsi Street is one important path to facilitate E wind to reach the downwind area Ko Shan Park. The stronger diverted air flow from north under the Baseline Scheme counters the flow from Kiang Hsi Street, thus, the VR at Ko Shan Road Park is slightly higher under the Proposed Scheme.
 - e. It is noted the disposition of T1 is closer to the northern boundary of the Subject Site. Not only the disposition but also the additional building height cause the downwash effect and slows down the wind speed of part of Pau Chung Street.

Wind performance under wind direction of ESE

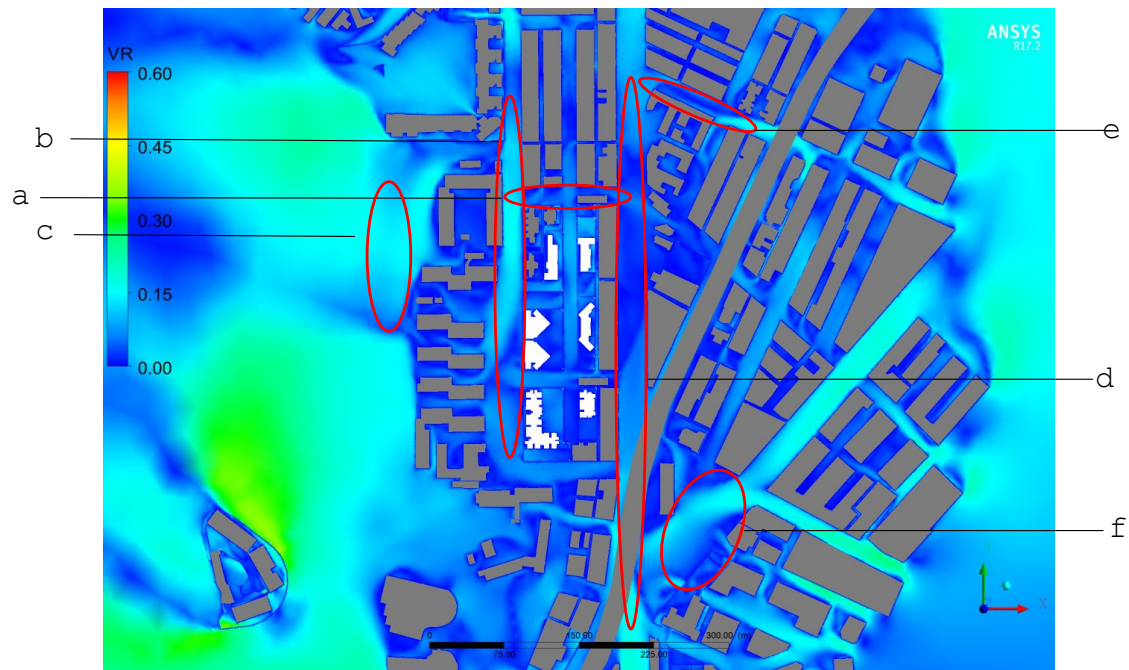
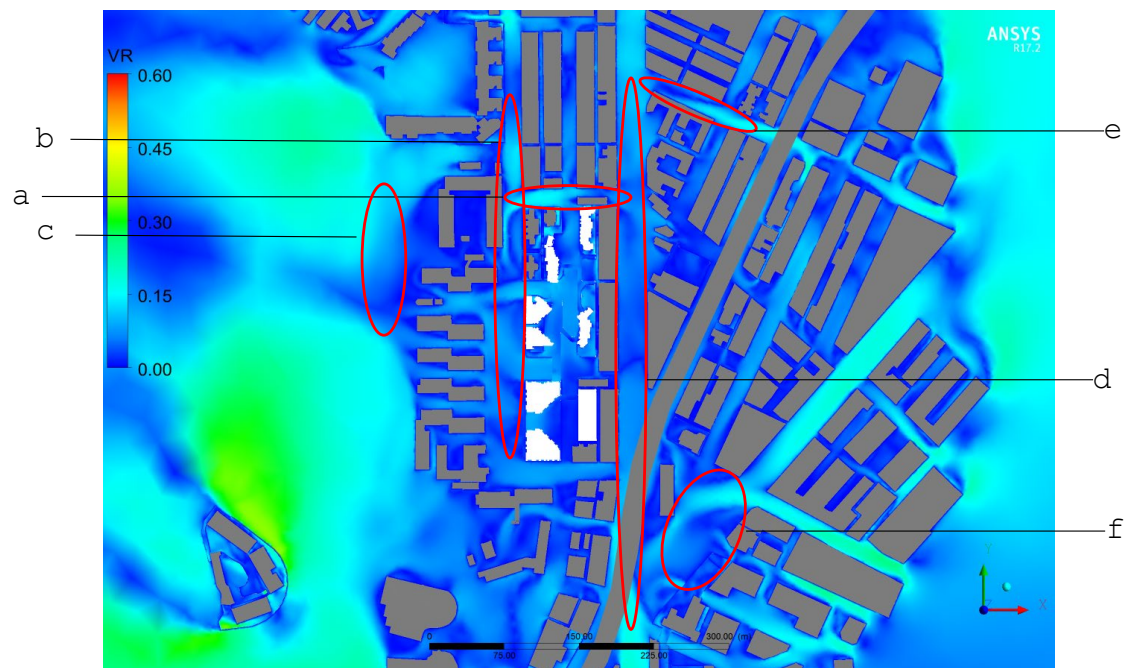


Contour plot for Baseline Scheme

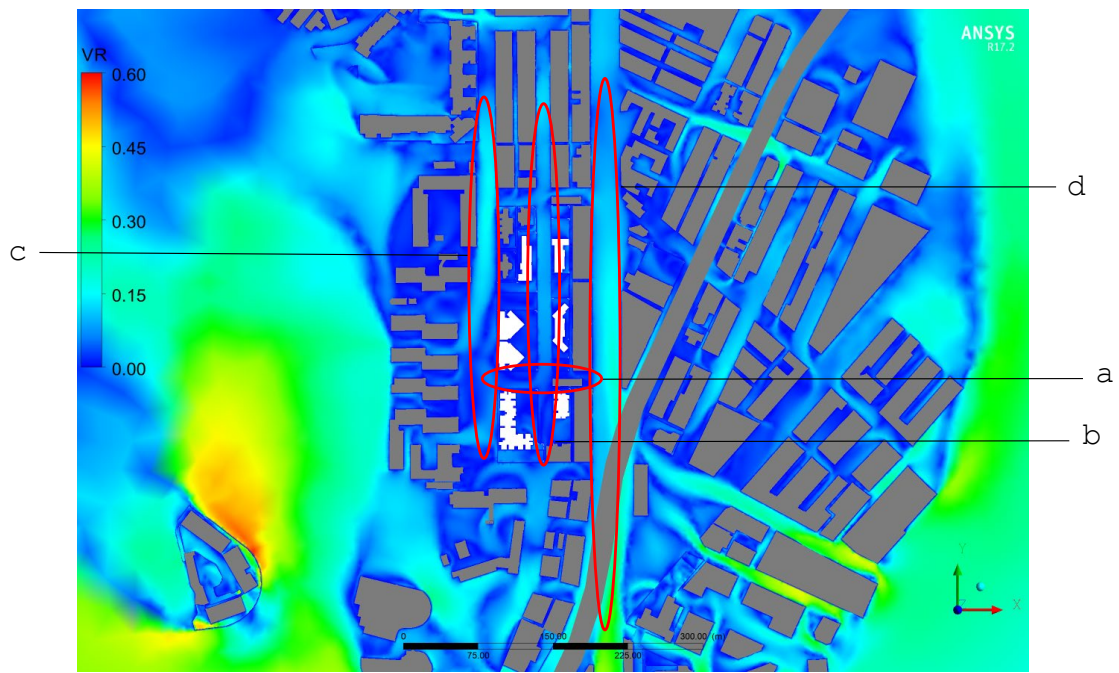
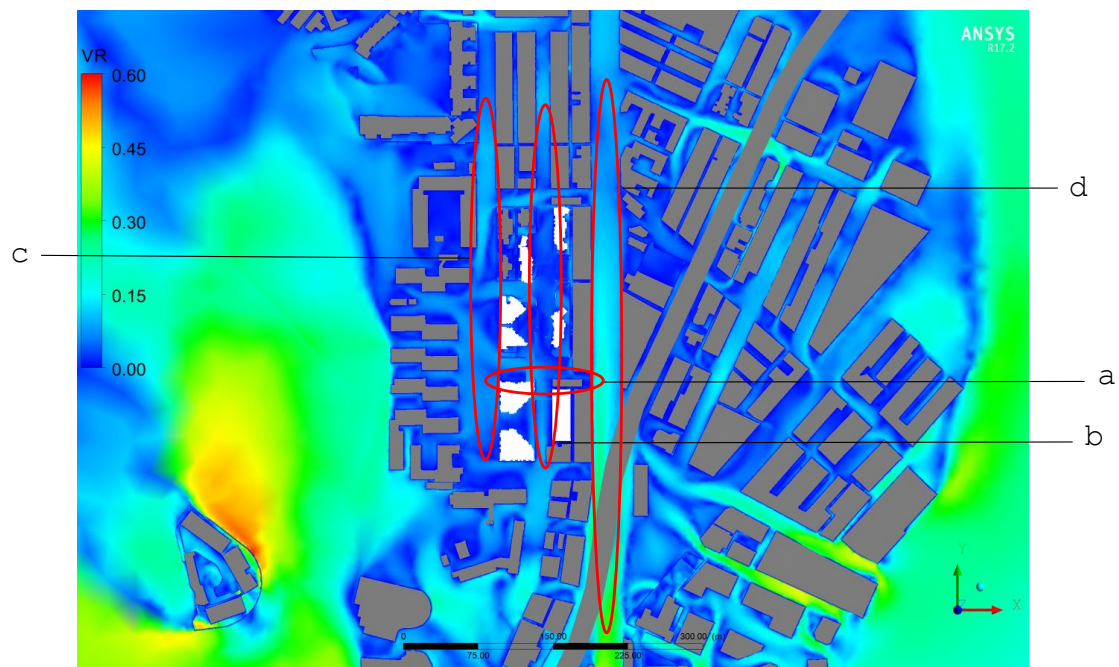


Contour plot for Proposed Scheme

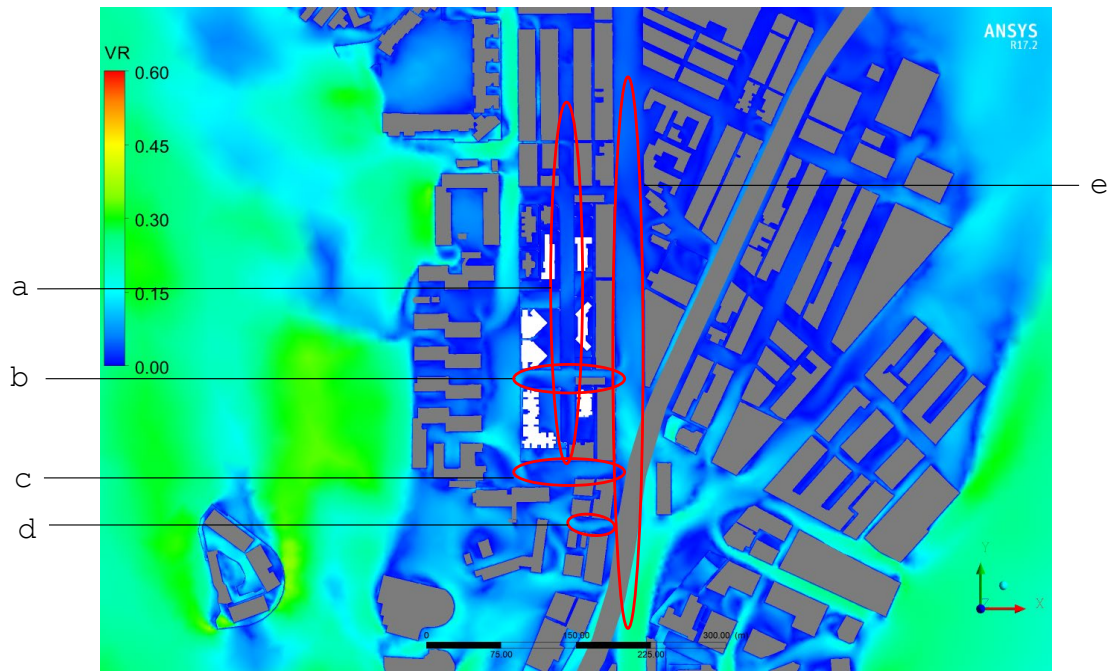
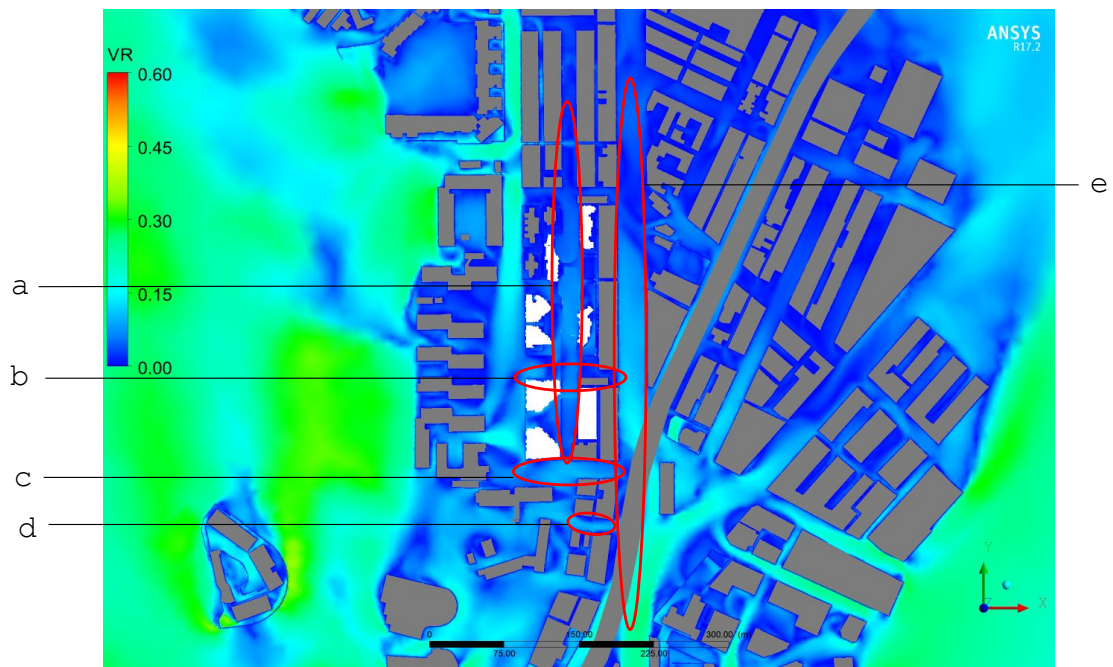
- 4.5.5 Under ESE wind, the wind penetrates through the building clusters in To Kwa Wan area and reach the Subject Site.
- a. Under the Baseline Scheme, the high-level ESE wind flows from east to west along Kiang Su Street, hits the high-rise tower and flows to the pedestrian level due to the downwash effect. While for the Proposed Scheme, the building separation at tower level between T1 and T5 is much larger and allows much wind to penetrate. Also, the building height of the Proposed Scheme is taller. More high-level wind is captured and diverted to the pedestrian level. The air flow along Maidstone Road / future pedestrianised avenue within the Subject Site is thus stronger under the Proposed Scheme.
 - b. The larger building separation along Kiang Su Street, between T1 and T5 and the additional at grade separation between podia under T2 and T3 in the Proposed Scheme enhanced the east-west wind penetration in the area. The enhanced wind flows continuously towards the west and benefits Lok Man Sun Chuen in the Proposed Scheme.
 - c. The stronger air flow towards south along Maidstone Road under the Proposed Scheme continuously moves and benefits Chi Kiang Street. Therefore, the VR at Chi Kiang Street is slightly higher under the Proposed Scheme.
 - d. The taller building height and closer distance between Tower 1 and the northern site boundary in the Proposed Scheme induces a stronger channelized wind along the northern boundary. Thus, the VR is slightly higher along Lok Shan Road under the Proposed Scheme.

Wind performance under wind direction of SE**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

- 4.5.6 Under SE wind, the wind penetrates through the building cluster in To Kwa Wan area and Chi Kiang Street to reach the Subject Site.
- a. Due to the different disposition of T1 under the two schemes, the upcoming SE wind skims over the podium under T1 in Baseline Scheme near the northern site boundary and hits on the high-rise of 80 Maidstone Road, then the downwash air flows towards south along Maidstone Road. On the other hand, since the T5 under the Proposed Scheme has been moved towards north, the upcoming SE wind pass through the separation and hit on T2, the downwash wind splits to two directions, in which one is towards north along Maidstone Road, together with the flow from east to west along Lok Shan Road, causes air acceleration at Lok Shan Road to the immediate north of the site boundary.
 - b. The additional separation between podia under T1 and T5, together with the wider separation along Kiang Su Road, enhance the wind penetration within the site along E-W direction. The stronger penetrated wind flow counters with the wind along Kau Pui Lung Road from north to south and reduces the wind velocity along Kau Pui Lung Road under the Proposed Scheme.
 - c. The upcoming wind flows along the private road to the north of Lok Seen Lau and was diverted to south along the hillside to the immediate west of Lok Man Sun Chuen. Under the Proposed Scheme, better penetration on E-W direction due to the larger building separations causes some counter flow towards north direction at the west of Lok Seen Lau. The turbulence slows down the wind speed at Kau Pui Lung Road Playground.
 - d. The taller building height in the Proposed Scheme induce a stronger downwash wind at Ma Tau Wai Road. Therefore, the VR is slightly higher under the Proposed Scheme at Ma Tau Wai Road.
 - e. The stronger flow along Pau Chung Road joins the upcoming wind along Sheung Heung Road and accelerates the velocity at Sheung Heung Road under the Proposed Scheme.
 - f. The stronger downwash wind towards south along Ma Tau Wai Road counters with the upcoming wind from Chi Kiang Street and Kai Ming Street, slows down the wind speed at Ma Tau Wai Road/ To Kwa Wan Playground and To Kwa Wan Road as well.

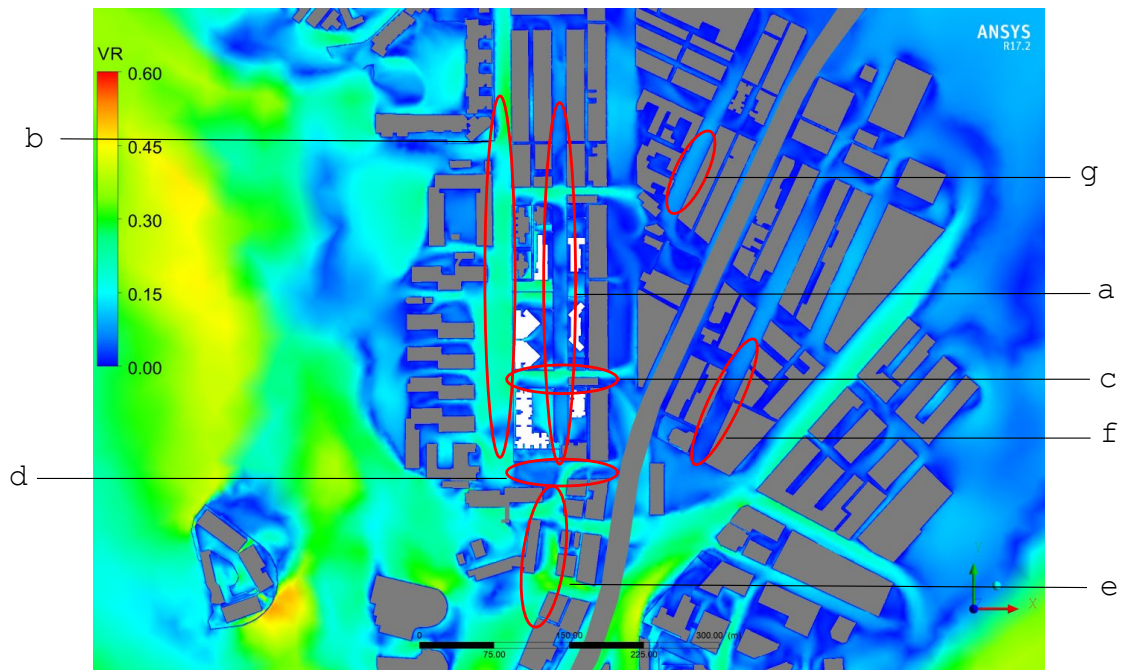
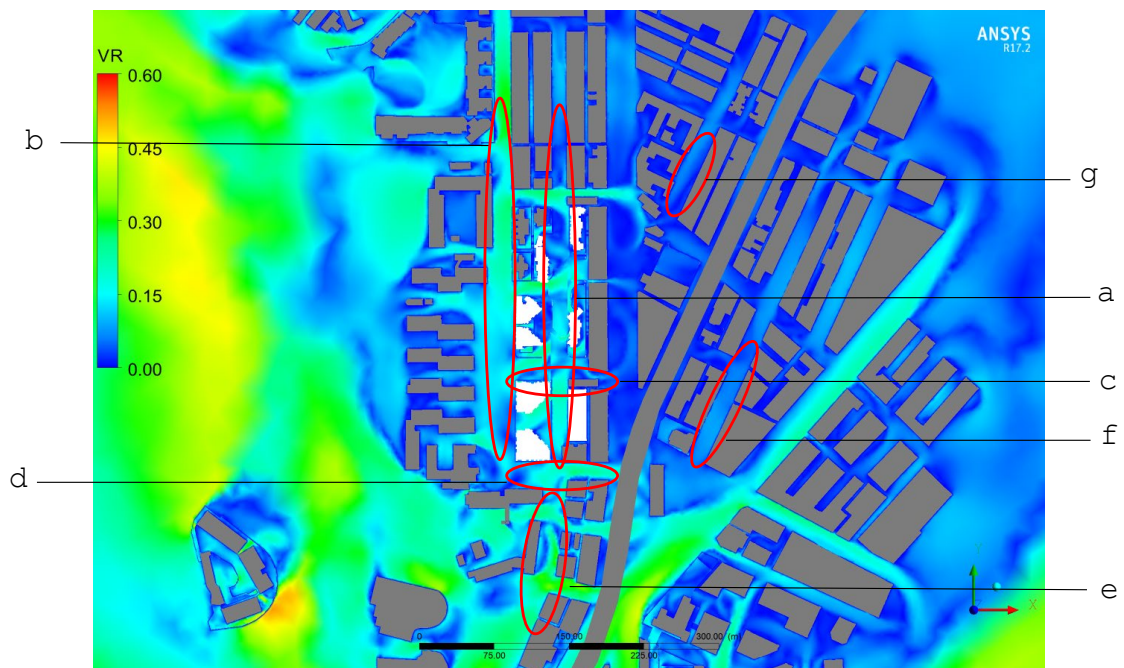
Wind performance under wind direction of SSE**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

- 4.5.7 Under SSE wind, the building cluster in To Kwa Wan area reduce the wind flow to reach the Subject Site.
- a. The podium under T6 and T7 is reduced so that the separation between the podium and Ming Fat Building is widened in the Proposed Scheme. It allows the wind to penetrate into the site. Therefore, the VR at Kiang Su Street is slightly higher under the Proposed Scheme.
 - b. The upcoming SSE wind skims over the clusters in To Kwa Wan area, hits on the high-rise buildings and induces the downwash effect to the pedestrian level from north to south along Maidstone Road. However, under the Proposed Scheme, due to the wider separation of the podium and Ming Fat Building, more wind could penetrate into the site along N-S direction, which counters with the downwash flow. Thus, the VR is lower at Maidstone Road / future pedestrianised avenue within the Subject Site under the Proposed Scheme.
 - c. The additional separation between podia under T1 and T5, together with the wider separation along Kiang Su Road, enhances the wind penetration within the site along E-W direction. The stronger penetrated wind flow counters with the wind along Kau Pui Lung Road from north to south and reduces the wind velocity along Kau Pui Lung Road under the Proposed Scheme.
 - d. The upcoming wind flows from south to north along Ma Tau Wai Road. Since the podium T6 in the Baseline Scheme is larger and closer to Ming Fat Building than the Proposed Scheme, part of the upwind from Ko Shan Road was diverted to east and west along Chi Kiang Road. The diverted wind to east would reach and counter with the upcoming flow at Ma Tau Wai Road, which slows down the wind velocity on Ma Tau Wai Road. Moreover, T7 in the Baseline Scheme is moved to the southwest corner of the site, which is less unlikely to cause downwash effect and affect the wind flow on Ma Tau Wai Road. Thus, the VR is slightly higher on Ma Tau Wai Road under the Proposed Scheme.

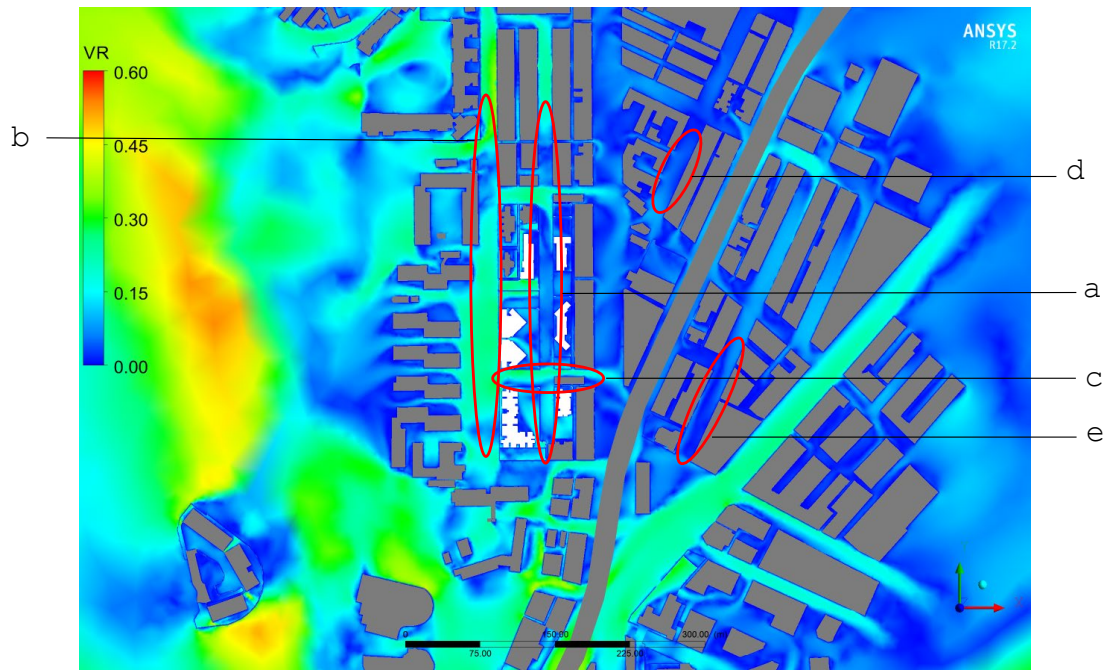
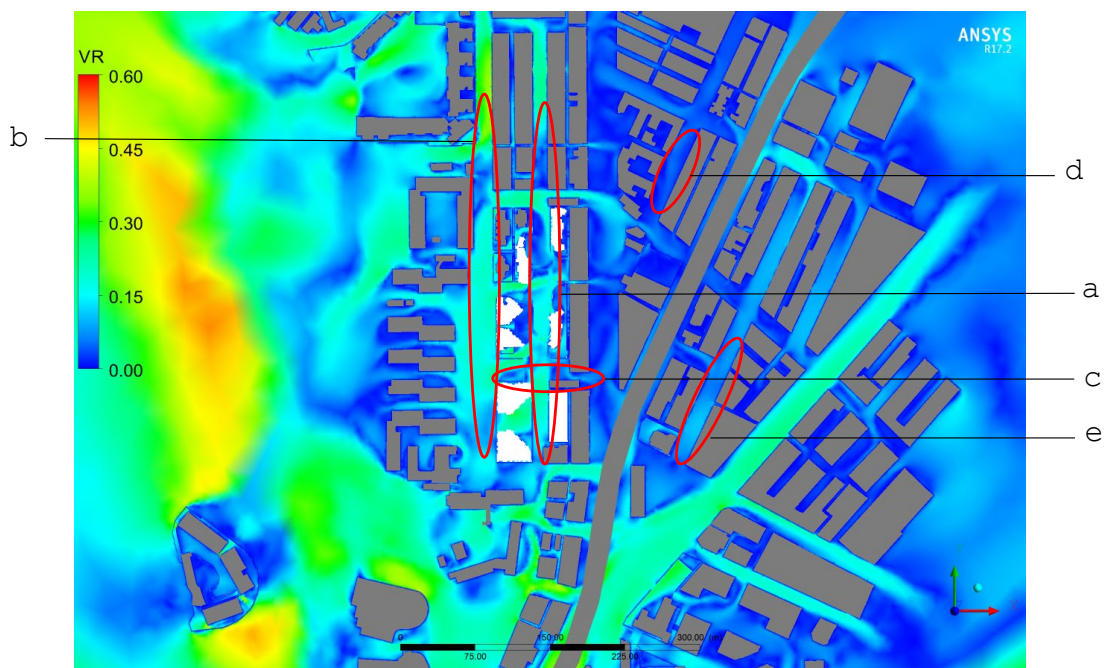
Wind performance under wind direction of S**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

4.5.8 Under S wind, the wind would mainly flow from Ma Tau Wai Road to reach inland area.

- a. The wider separation between the podium under T6 & 7 and Ming Fat Building in the Proposed Scheme allows more wind to penetrate from south to north inside the Subject Site. Therefore, the VR is higher at Maidstone Road under the Proposed Scheme.
- b. Although the building separation between Northern Site and Southern Site is enlarged, Lucky Building which abuts Kiang Su Street would still block parts of the flow penetration at E-W direction. In addition, compared with T6 in the Baseline Scheme, T6 of Southern Site in the Proposed Scheme is shifted towards north and closer to Kiang Su Street. Thus, the VR is slightly lower at Kiang Su Street.
- c. The upcoming S wind passes through the building gap between Lok Kei Lau and The Church of Christ in China Wanchai Church Kei To Primary School (Kowloon City) and hits on the high-rise building of the Subject Site. Part of the downwash air flows along Chi Kiang Street. Due to the taller building height and the disposition of T7 under the Proposed Scheme, the VR along Chi Kiang Road under the Proposed Scheme is slightly higher.
- d. The stronger downwash wind continuously flows along Ko Shan Road, reaches Anhui Street and benefits Anhui Street.
- e. The taller buildings in the Proposed Scheme would induce stronger downwash wind and benefit Ma Tau Wai Road.

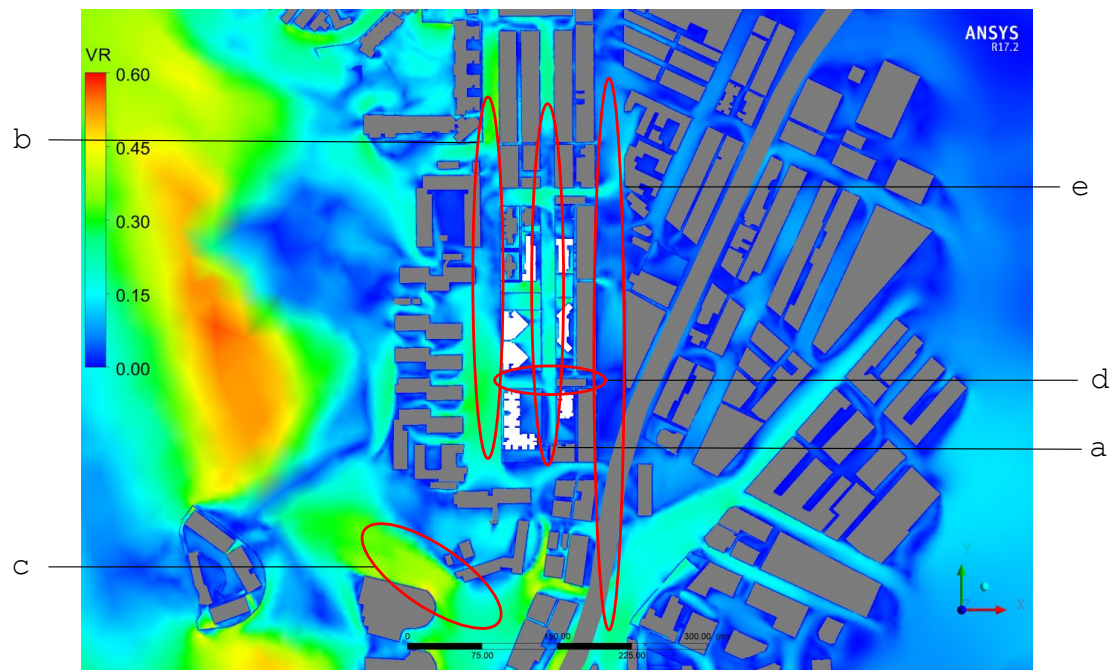
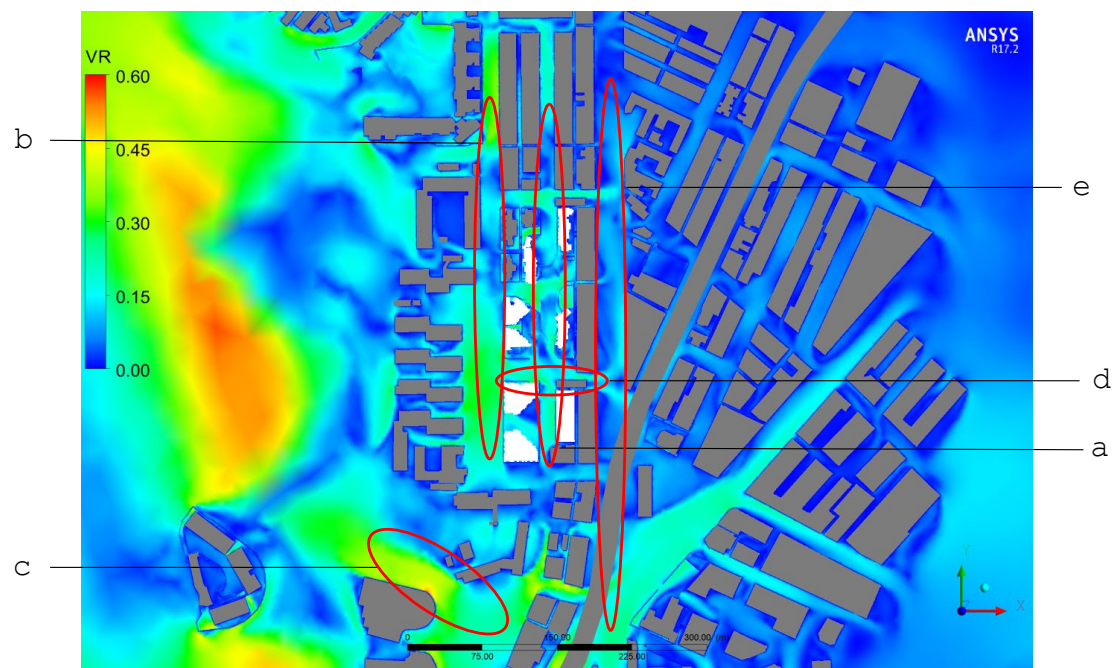
Wind performance under wind direction of SSW**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

- 4.5.9 Under SSW wind, the wind would mainly flow from Ho Man Tin Area to reach inland area.
- a. The wider separation at pedestrianised avenue in the Proposed Scheme allows more wind to penetrate from south to north inside the Subject Site. Therefore, the VR is higher at Maidstone Road / future pedestrianised avenue within the Subject Site under the Proposed Scheme.
 - b. The upcoming SSW wind skims over Lok Man Sun Chuen and flows along Kau Pui Lung Road to north. Due to the taller building height of the Proposed Scheme, stronger downwash wind would be induced and creates wake area to the west of the Subject Site. Thus, the VR at Kau Pui Lung Road is lower under the Proposed Scheme.
 - c. Although the building separation between Northern Site and Southern Site is enlarged, Lucky Building which abuts Kiang Su Street would still block parts of the flow penetration at E-W direction. In addition, compared with T6 in the Baseline Scheme, T6 of Southern Site in the Proposed Scheme is shifted and closer to Kiang Su Street. Thus, the VR is slightly lower at Kiang Su Street.
 - d. The upcoming SSW wind passes through the building gap between Lok Chee Lau and Lok Oi Lau and channelized along Ko Shan Road to reach Chi Kiang Road and Anhui Street. Part of the downwash air flows along Chi Kiang Street. On the other hand, the air flows from the south of Lok Kei Lau hits on the high-rise building of the Subject Site and channelized to the Chi Kiang Road effected by downwash effect. Due to the taller building height in the Proposed Scheme, the wind speed is higher along Chi Kiang Road under the Proposed Scheme.
 - e. The reduced podium under T7 & B widens the separation between the podium and Ming Fat Building. More upcoming wind from Ko Shan Road could be penetrate into the Subject Site along Maidstone Road. Thus, the VR at Ko Shan Road is better under the Proposed Scheme.
 - f. The accelerated air flow along Chi Kiang Road continuously moves towards east and joins the upcoming wind from Ma Tau Wai Road. Therefore, the VR at Ha Heung Road is higher under the Proposed Scheme.
 - g. The disposition of T1 is shifted to the northern site boundary, the building separation between T1 and T5 is much wider in the Proposed Scheme. This allows more wind to penetrate along the building separation towards east and reach Ma Tau Wai Road. This flow would counter with the upcoming wind from north along Pau Chung Street, so slightly lower VR is observed along under the Proposed Scheme at Pau Chung Street.

Wind performance under wind direction of SW**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

4.5.10 Under SW wind, the wind would mainly flow from Ho Man Tin Area to reach inland area.

- a. The wider separation at pedestrianised avenue in the Proposed Scheme allows more wind to penetrate from south to north inside the Subject Site. Therefore, the VR is higher at Maidstone Road under the Proposed Scheme.
- b. The upcoming SSW wind skims over Lok Man Sun Chuen and flows along Kau Pui Lung Road to north. Due to the taller building height of the Proposed Scheme, stronger downwash wind would be induced and creates wake area to the west of the Subject Site. Thus, the VR at Kau Pui Lung Road is lower under the Proposed Scheme.
- c. Although the building separation between Northern Site and Southern Site is enlarged, Lucky Building which abuts Kiang Su Street would still block parts of the flow penetration at E-W direction. In addition, compared with T6 in the Baseline Scheme, T6 of Southern Site in the Proposed Scheme is closer to Kiang Su Street. Thus, lower VR is observed at Kiang Su Street.
- d. The disposition of T1 is much closer to the northern site boundary, which may accelerate the wind speed of air flowing along part of Lok Shan Road near the site boundary. Part of this flow would counteract with the coming flow from north along Pau Chung Street, so the VR is slightly lower along under the Proposed Scheme at Pau Chung Street.
- e. The taller building height and the tower disposition of T7 in the Proposed Scheme causes stronger downwash effect at part of Chi Kiang Street near the southern boundary. As such, the wind velocity is higher along Chi Kiang Street towards east. This stronger flow joints the SW wind from upwind area, i.e. Ma Tau Wai Road and benefits part of Ha Heung Road under the Proposed Scheme.

Wind performance under wind direction of WSW**Contour plot for Baseline Scheme****Contour plot for Proposed Scheme**

4.5.11 Under WSW wind, the wind would mainly flow from Ho Man Tin Area to reach inland area.

- a. The upcoming WSW wind skims over Lok Man Sun Chuen, hits on the high-rise buildings in the Subject Site and diverted to south and north along Kau Pui Lung Street. Under the Baseline Scheme, the wind could penetrate to the site through Kiang Su Street and reaches Maidstone Street. On the other hand, under the Proposed Scheme, the wider gap between T4 and T6 and the split podium under T2 and T3 could facilitate more wind to penetrate into the site. Thus, the VR is slightly higher at Maidstone Road / future pedestrianised avenue within the Subject Site under the Proposed Scheme.
- b. Lok Man Sun Chuen which is located to the upwind side would block most of the wind to reach Kau Pui Lung Road. On the other hand, the upcoming wind from hillside is diverted to north and south direction along Kau Pui Lung Road due to the downwash effect caused by City 151 as well as T3 and T4 of the Subject Site. The increased building height of the Proposed Scheme induces stronger downwash flow and accelerate the wind speed along Kau Pui Lung Road.
- c. The wind coming from hillside flows along the east side of Ko Shan Theatre and passes through the building separation between Lok Oi Lau and Ko Shan Theatre New Wing. Larger wake area is generated as stronger wind flows from north along Kau Pui Lung Road. Therefore, the VR of Ko Shan Road Park is slightly lower under the Proposed Scheme.
- d. The enlarged building separation between the Northern Site and Southern Site at both tower and ground level allows more wind to flow through Kiang Su Street. Thus, it is observed that the VR of Kiang Su Road is higher under the Proposed Scheme.
- e. Not only Kiang Su Road, but also the split podia under T2 and T3 enhance the air penetration at E-W direction. Ma Tau Wai Road, which is located at the downwind area of the Subject Site, also is benefited and thus shows higher VR under the Proposed Scheme.

5. CONCLUSION

- 5.1.1 The proposed development located in To Kwa Wan area has been evaluated from an air ventilation perspective.
- 5.1.2 To enhance the wind flow circulation of the Proposed Scheme, the following 2 enhancement features are provided:
- (a) 17m podia separation along the N-S pedestrianised avenue for N-S wind flow; and
 - (b) 23m breezeway between podia along Kiang Su Street for E-W wind flow.
- 5.1.3 Apart from the two ventilation corridors, the following wider building/ podia separation can be achieved under notional design:
- (a) over 50m building separation at Tower between T1 and T5;
 - (b) about 13m podia separation between T2 and T3;
 - (c) over 20m building separation at Tower between T4 and T5; and
 - (d) over 30m building separation at Tower between T4 and T6 at the direction of E-W.
- 5.1.4 According to Section 4.3, it is noted that the LVR is similar between the Proposed Scheme and Baseline Scheme under both annual and summer condition. The SVR is slightly better in the Proposed Scheme, compared to the Baseline Scheme, under both annual and summer condition.
- 5.1.5 There are some variations in VR between two schemes. Under the annual condition, the VR of some areas is higher under the Proposed Scheme, including Lok Man Sun Chuen, Maidstone Road, Lok Shan Road, Sheung Heung Road, Sze Chuen Street, Ha Heung Road, Chi Kiang Street and Ko Shan Road. However, VR is lower at Pau Chung Street, Kau Pui Lung Road Playground and Kiang Su Street under the Proposed Scheme.
- 5.1.6 Under the summer condition, the areas with higher VR under the Proposed Scheme are Maidstone Road, Lok Shan Road, Sze Chuen Street, Ha Heung Road, Chi Kiang Street and Ko Shan Road. However, the areas with higher VR under the Baseline Scheme are Kau Pui Lung Road, Kowloon City Road, Kau Pui Lung Road Playground, C.C.C. Wanchai Church Kei To Primary School (Kowloon City), Kiang Su Street and Ma Tau Wai Road/ To Kwa Wan Playground.
- 5.1.7 It is observed that the increase in building height would not induce significant impact to the To Kwa Wan area in air ventilation term under both annual and summer condition. With the two wind enhancement features discussed in Section 4.4, the Proposed Scheme could slightly enhance the wind flow in the Subject Site and nearby area.

Figures

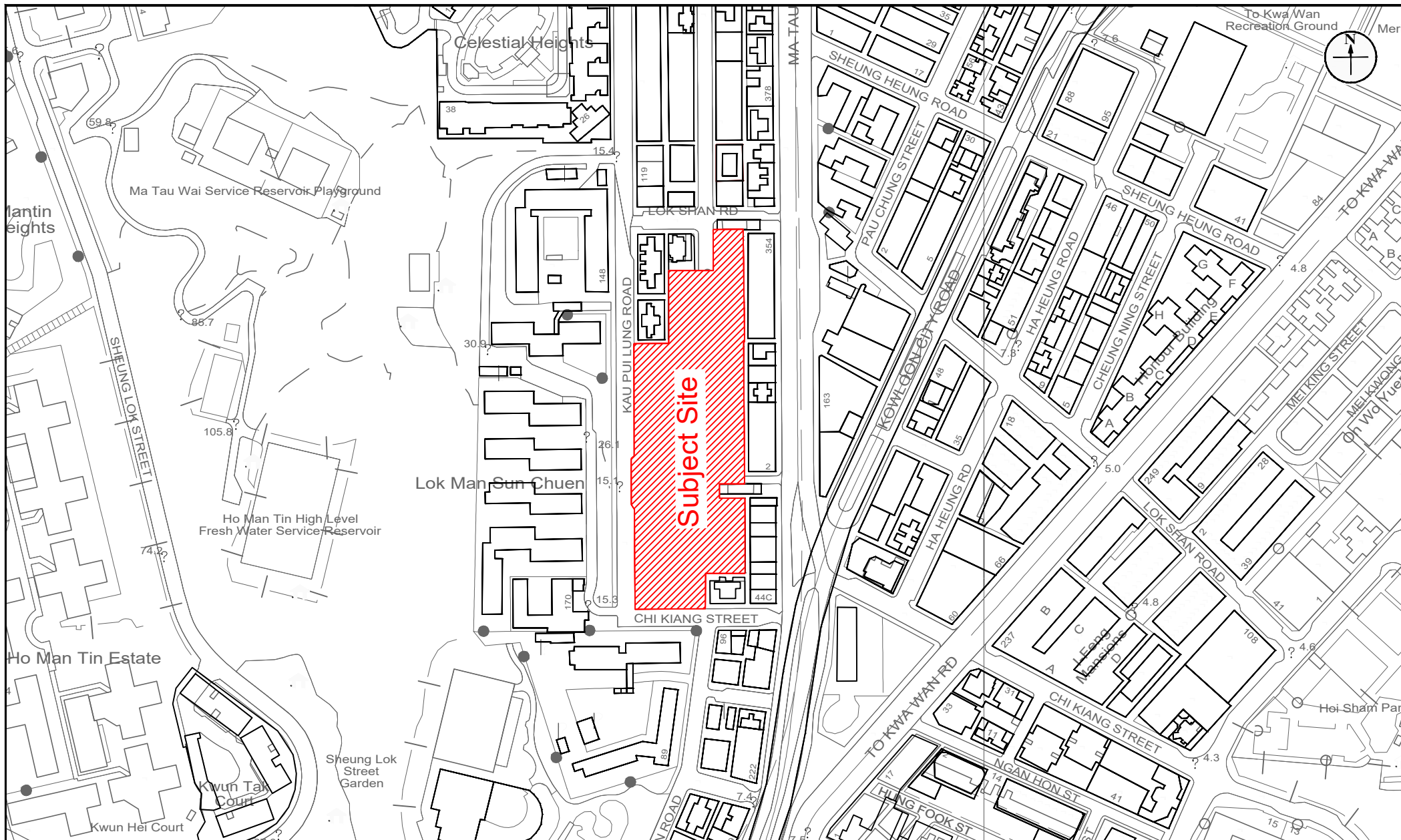


Figure: 1

Title: Location of Site and its Environs

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2: KC) Development Scheme

RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.3

Date: Sept 2022

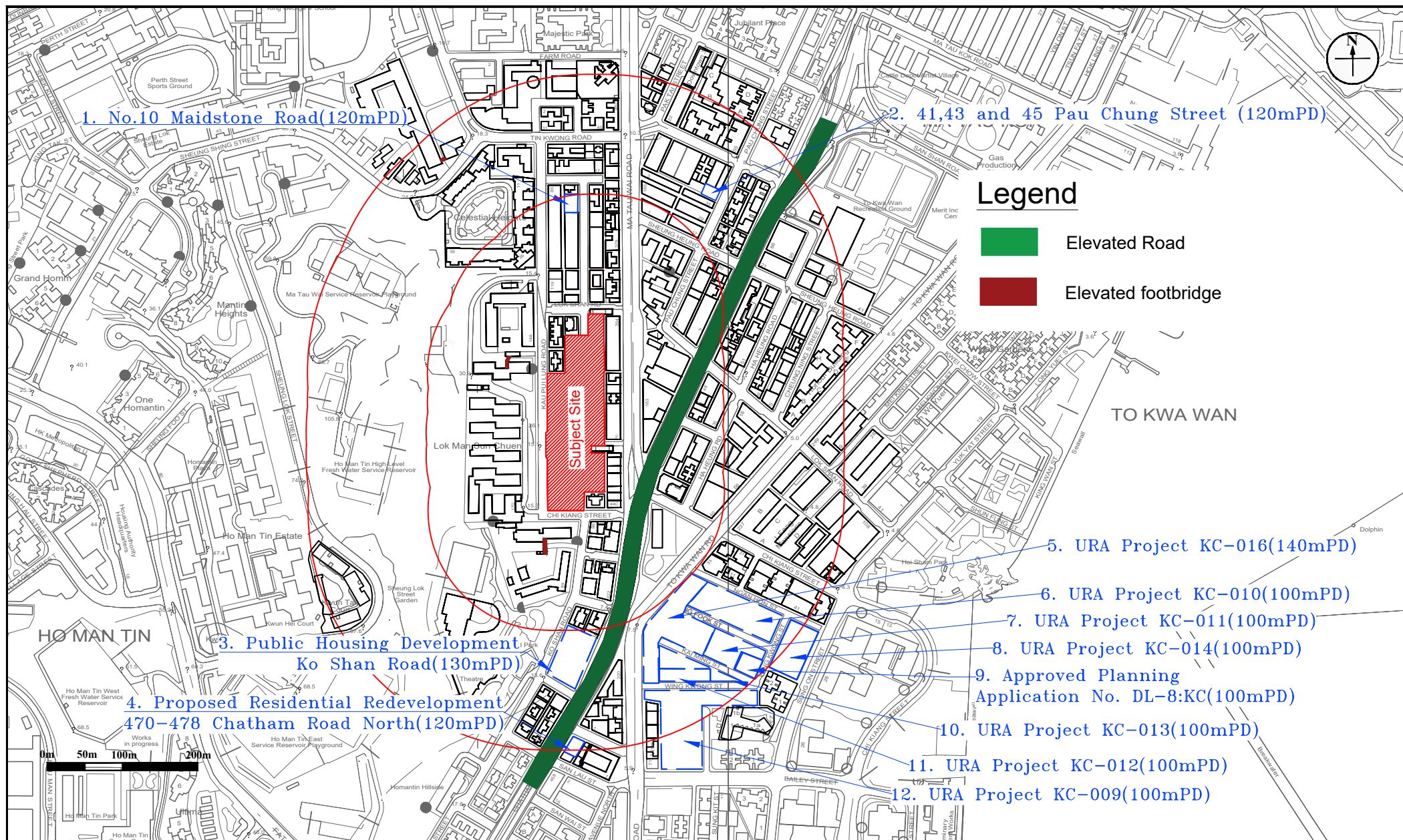


Figure: 2

Title: Location of Surrounding Future/ Committed Development

Project: URA Kau Pui Lung Road/ Chi Kinang Street (CBS-2:KC) Development Scheme

RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.0

Date: Oct 2022

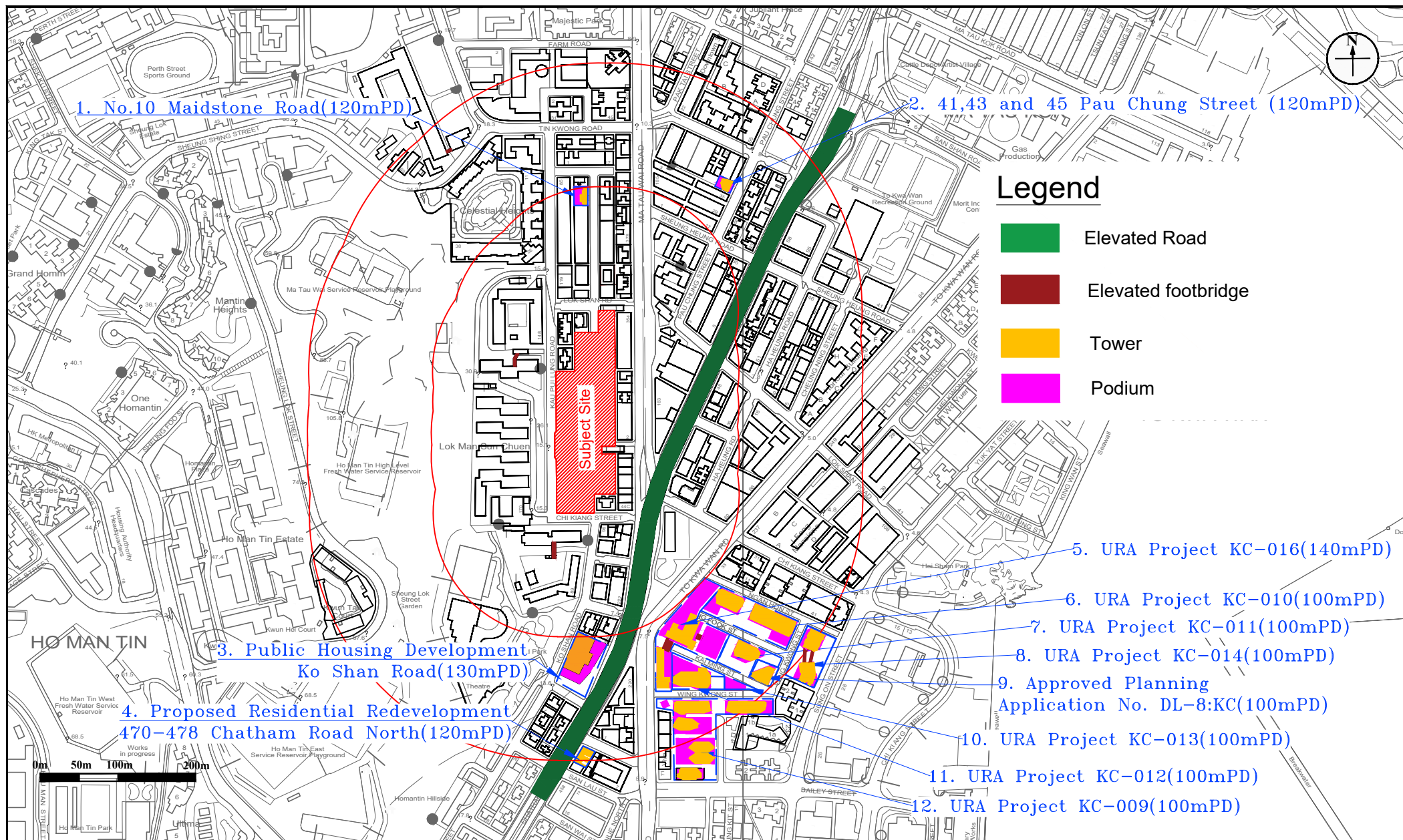


Figure: 3

Title: Building Blocks of the Surrounding Future/ Committed Development Assumed in the CFD Model

Project: URA Kau Pui Lung Road/ Chi Kinang Street (CBS-2:KC) Development Scheme

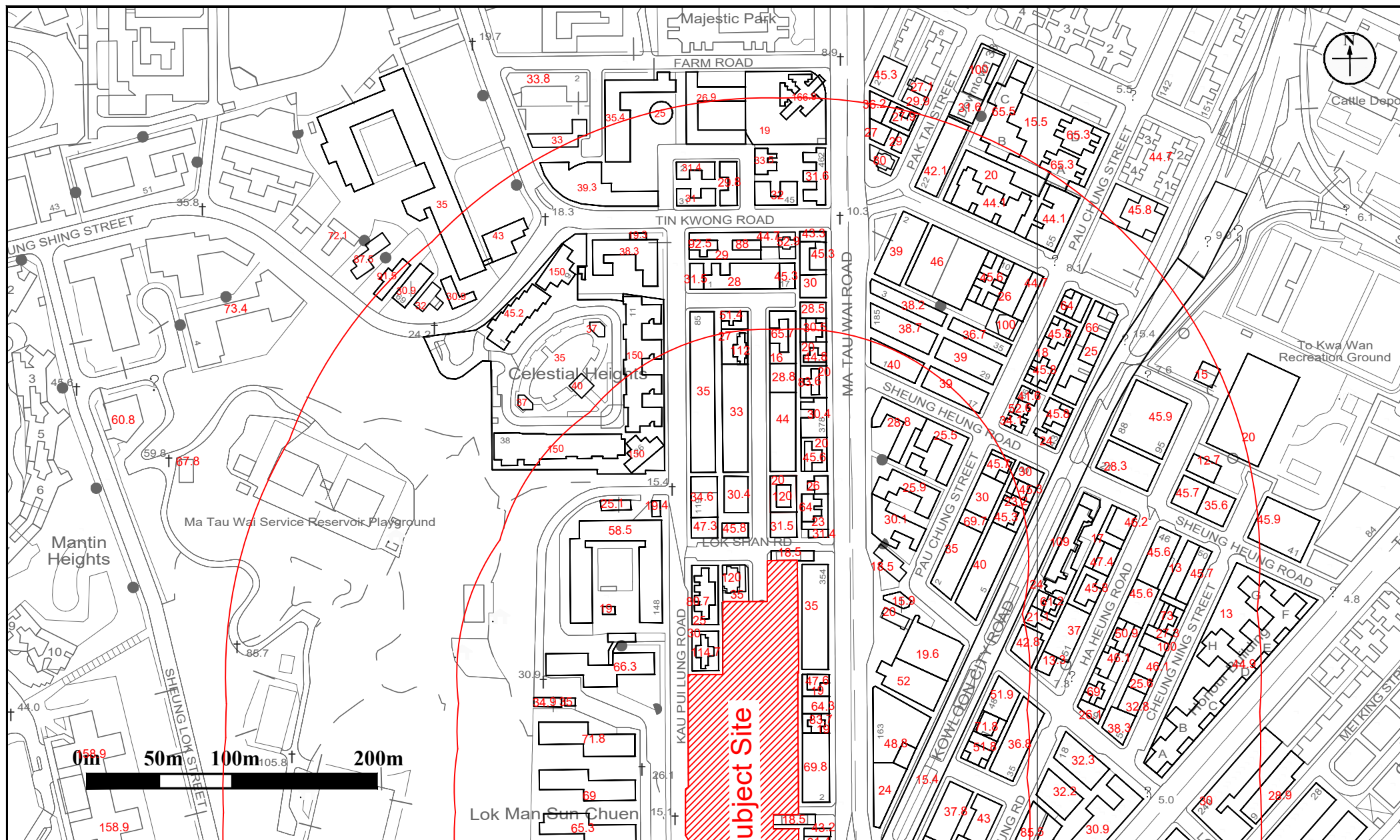
RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.0

Date: Oct 2022



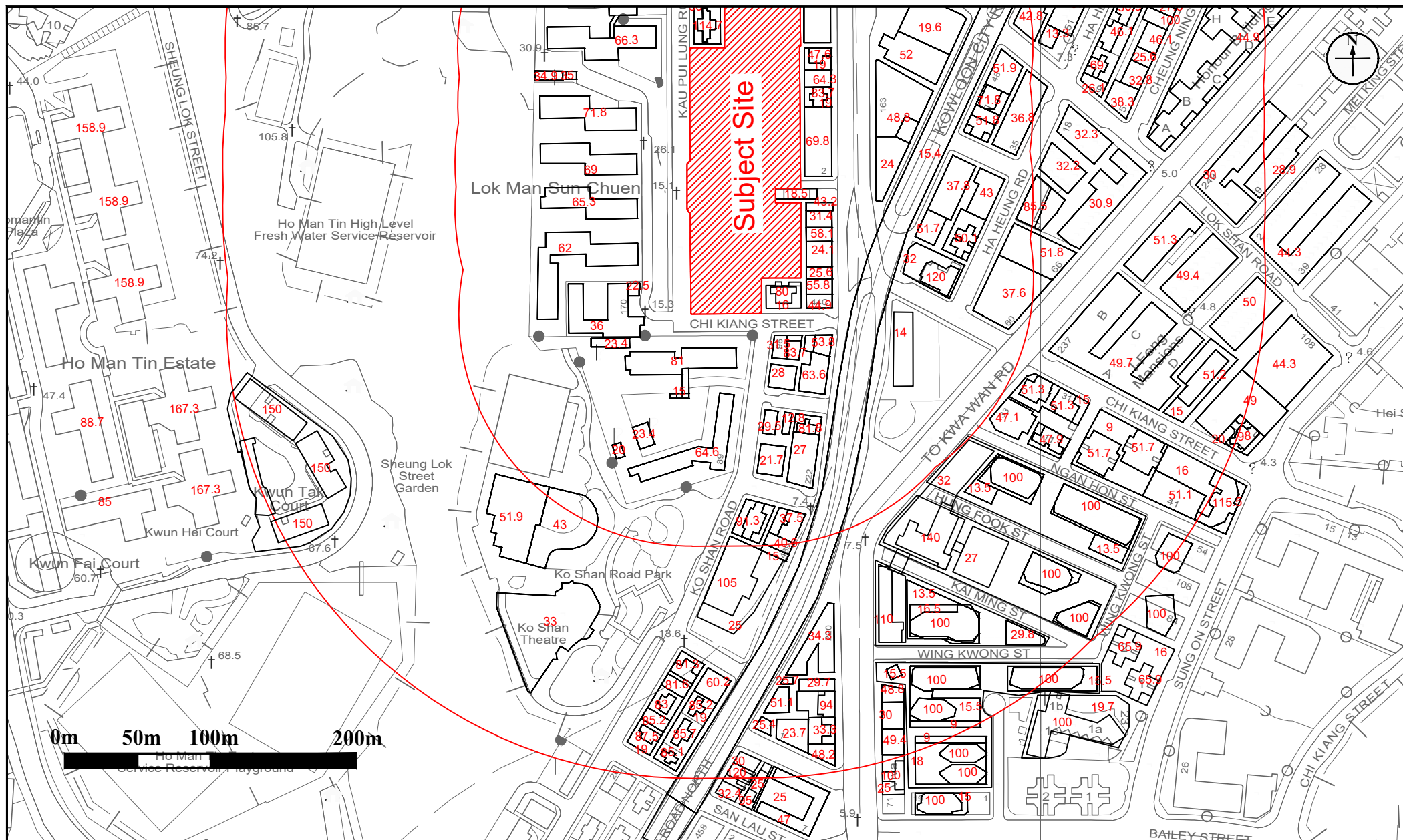


Figure: 4b

Title: Building Height of the Existing Buildings within the Surrounding Area (Southern Part)

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2:KC) Development Scheme

RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.0

Date: Dec 2022

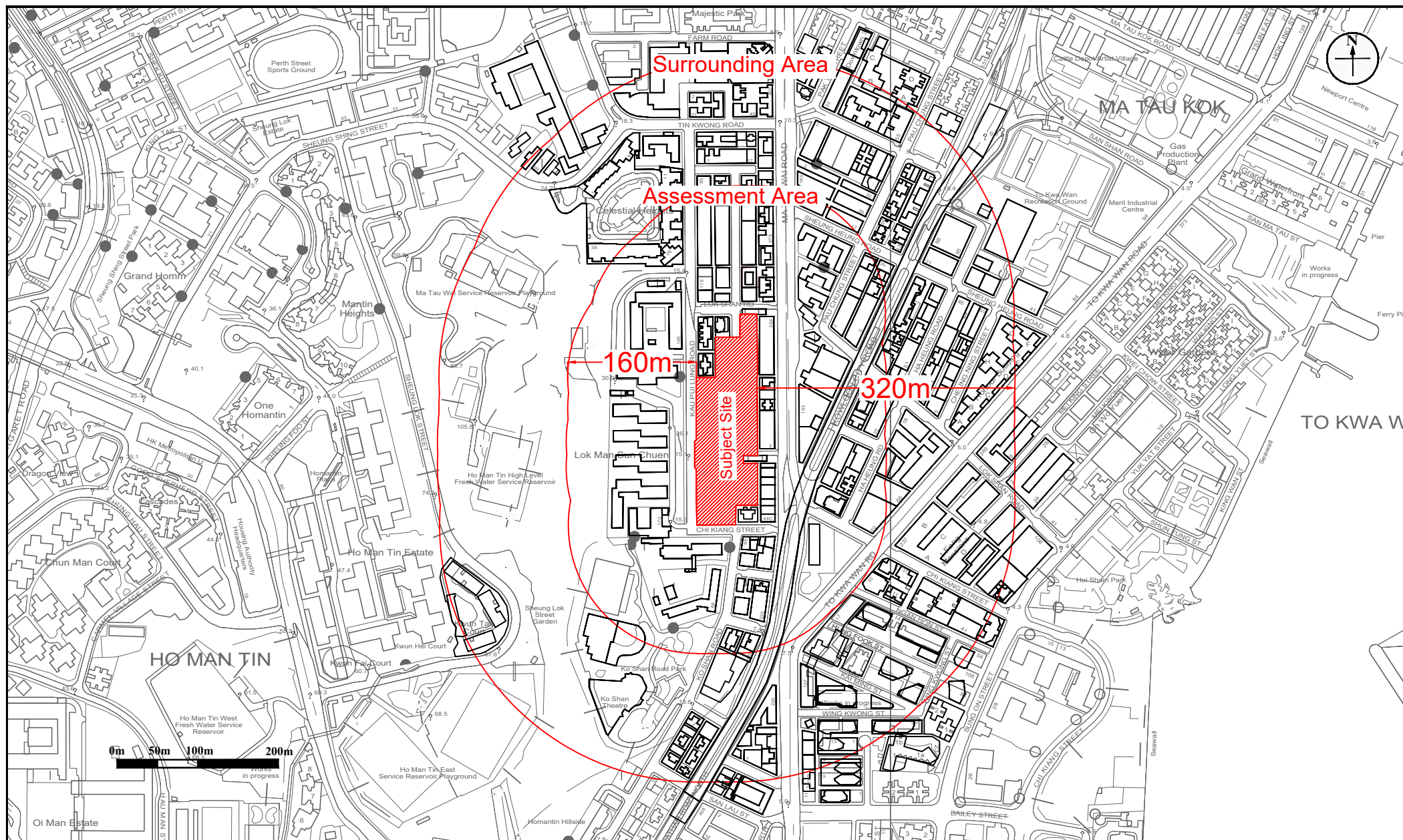


Figure: 5

Title: Assessment Area and Surrounding Area of the CFD model

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2: KC) Development Scheme

RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.3

Date: Sept 2022

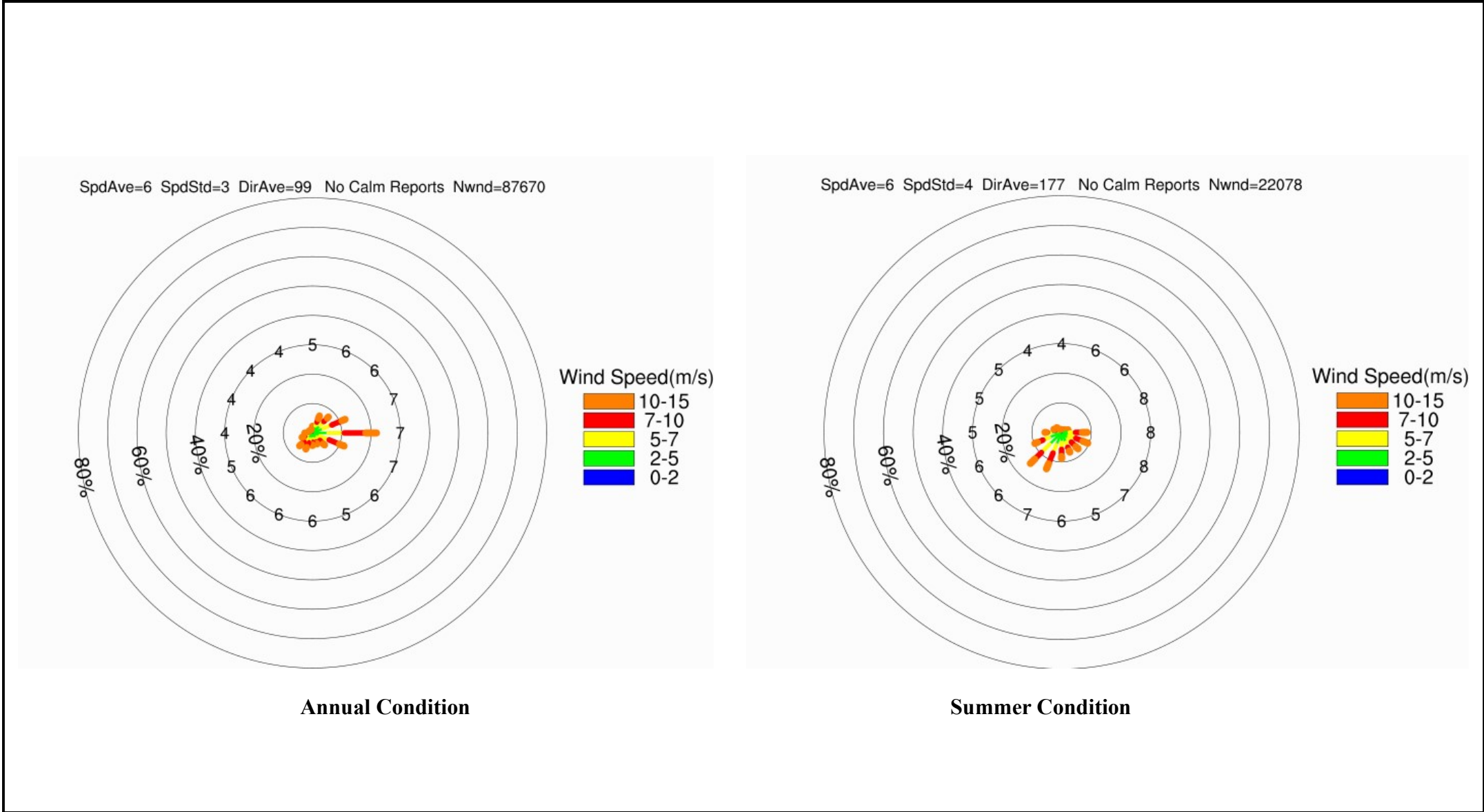


Figure: 6		
Title: Windrose Diagram representing V∞ of the Area under Concern	Drawn by:	EC
	Checked by:	SL
Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2:KC) Development Scheme	Rev.:	1.2
	Date:	Sept 2019

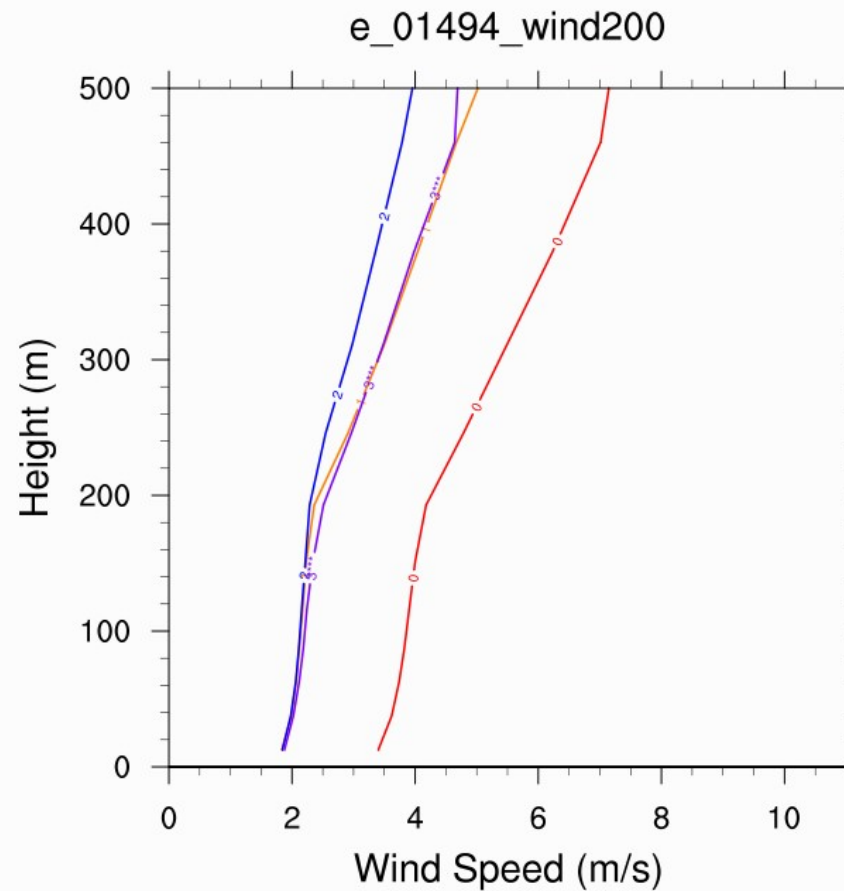


Figure: 7

Title: Wind Profile Curve for Grid X:083, Y:042

Project: URA Kau Pui Lung Road/Chi Kiang Street (CBS-2:KC) Development Scheme

RAMBOLL

Drawn by: EC

Checked by: SL

Rev.: 1.2

Date: Sept 2019

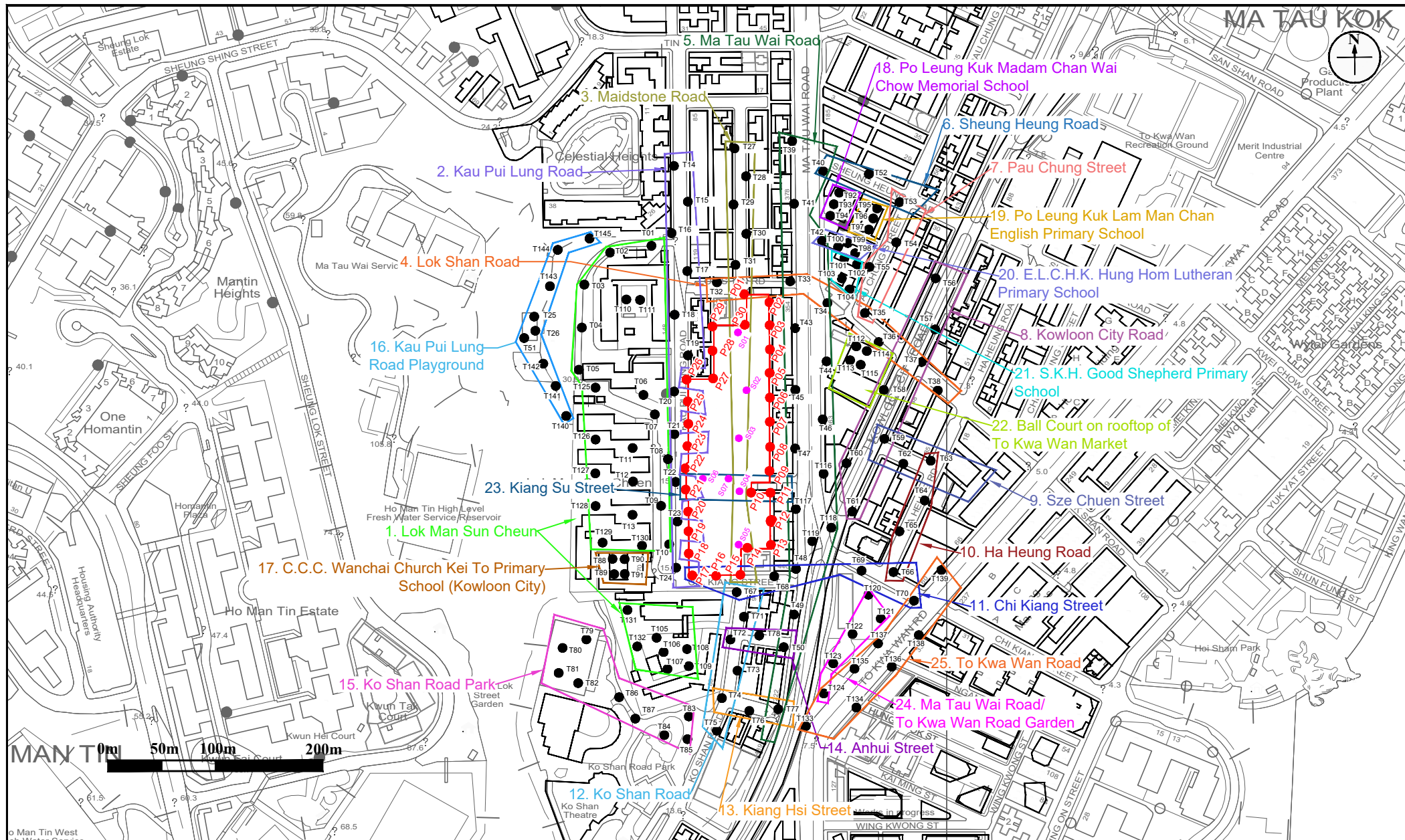


Figure: 8

Title: Test Points Selected for Quantitative Air Ventilation Assessment

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2:KC) Development Scheme

RAMBOLL

Drawn by: WT

Checked by: EC

Rev.: 1.1

Date: Feb 2023

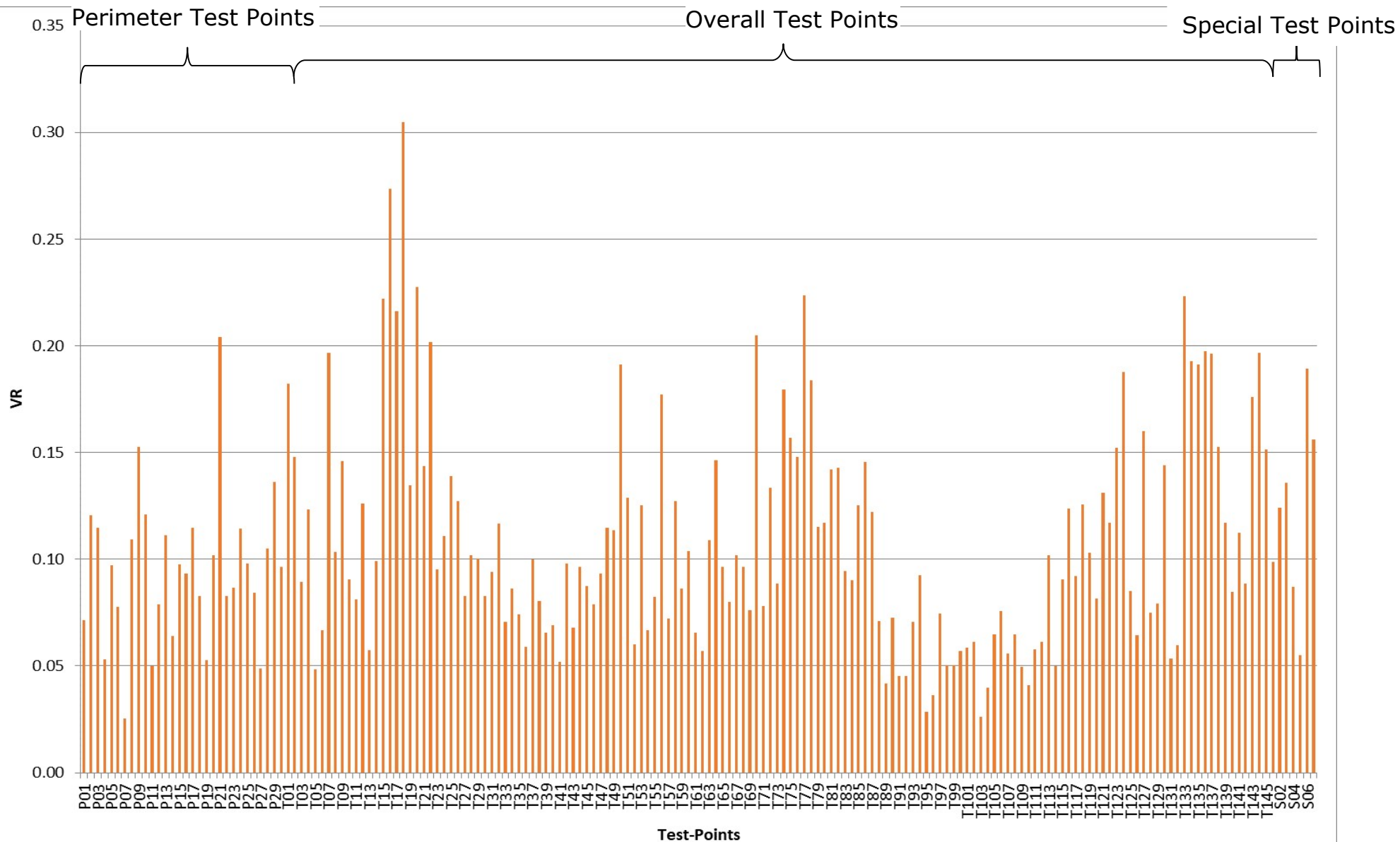


Figure: 10a



Title: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Annual)

Drawn by: WT

Checked by: EC

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2: KC) Development Scheme

Rev.: 1.0

Date: Feb 2023

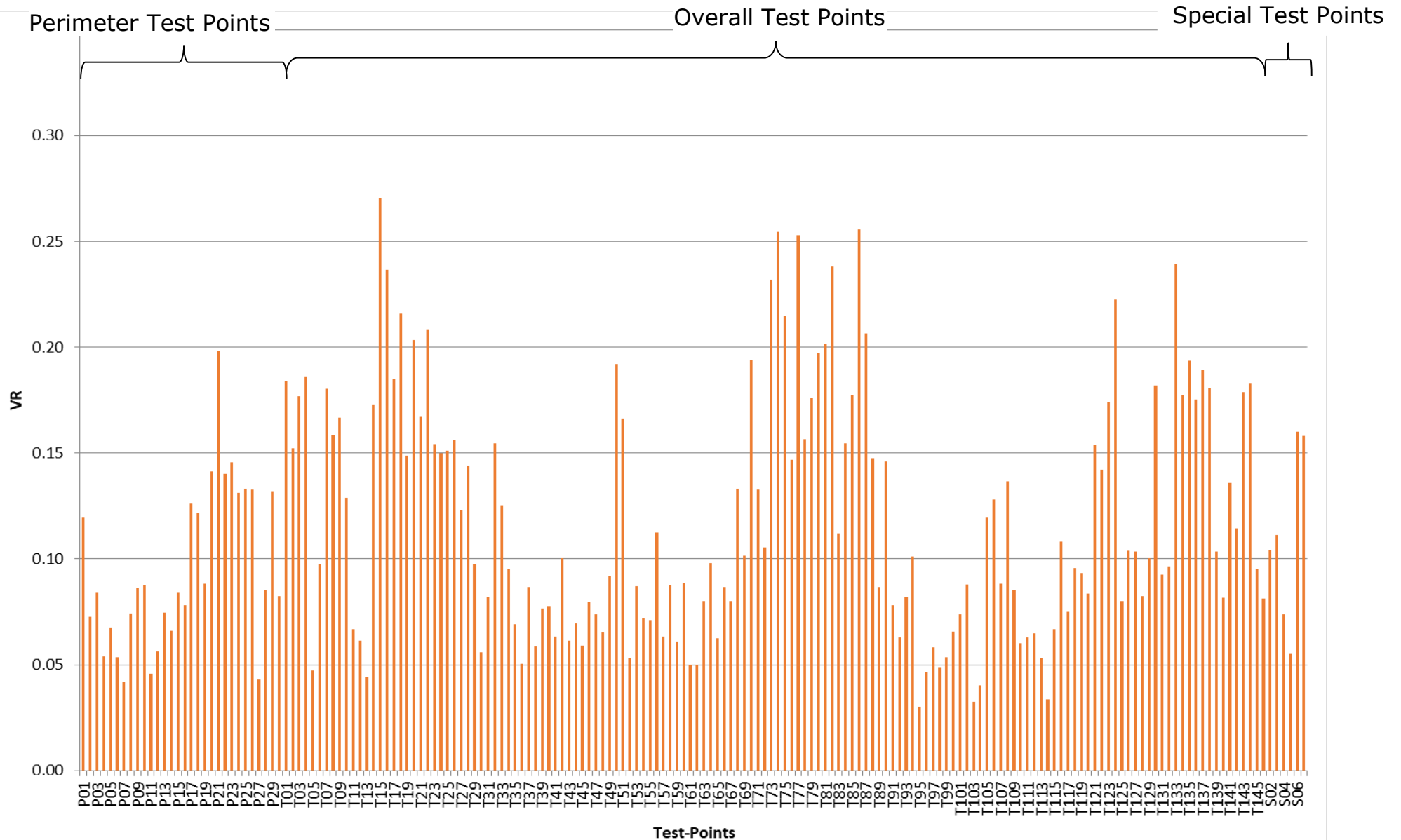


Figure: 10b



Title: Wind Velocity Ratios of Individual Test Points for Baseline Scheme (Summer)

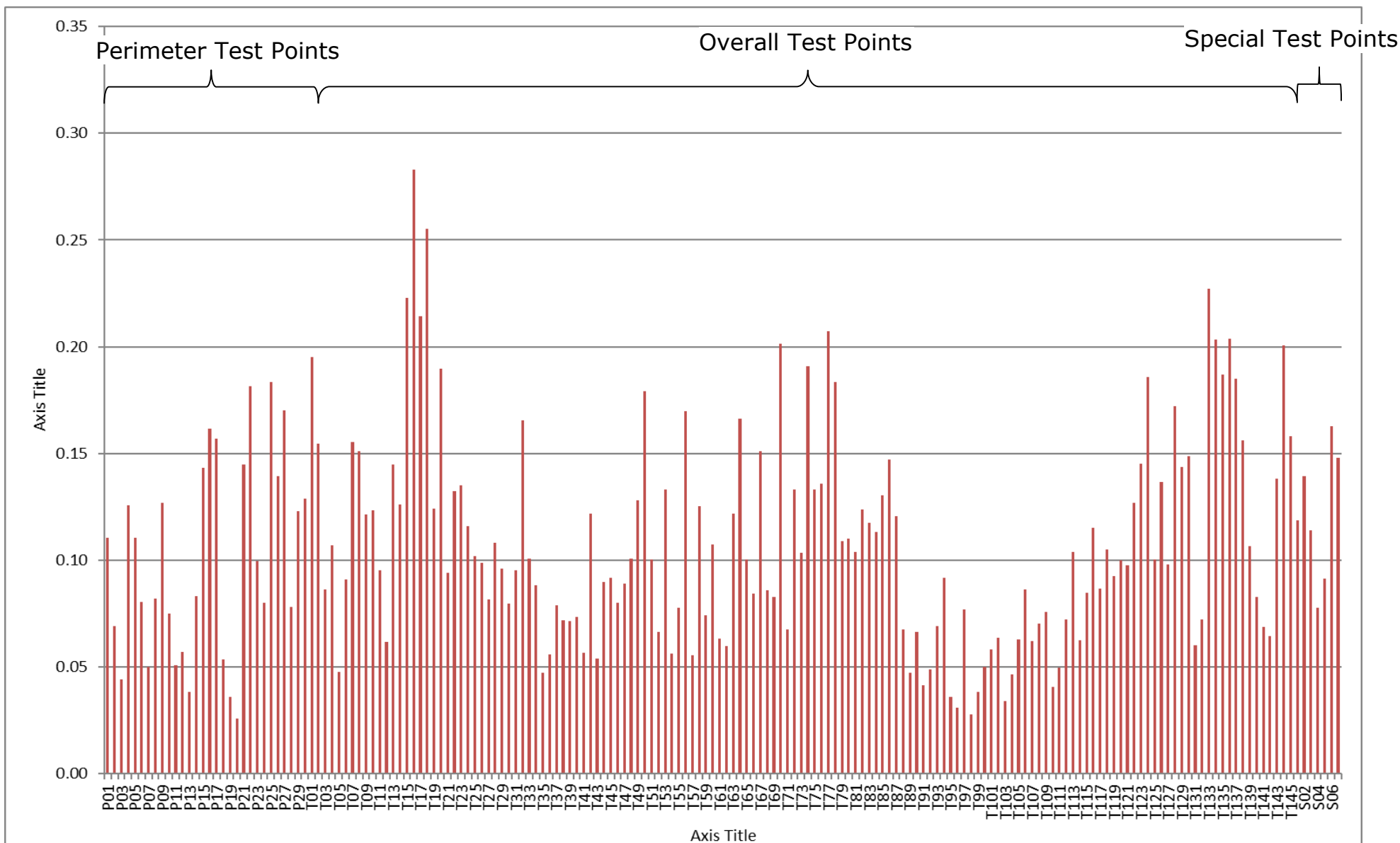
Drawn by: WT

Checked by: EC

Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2: KC) Development Scheme

Rev.: 1.0

Date: Feb 2023



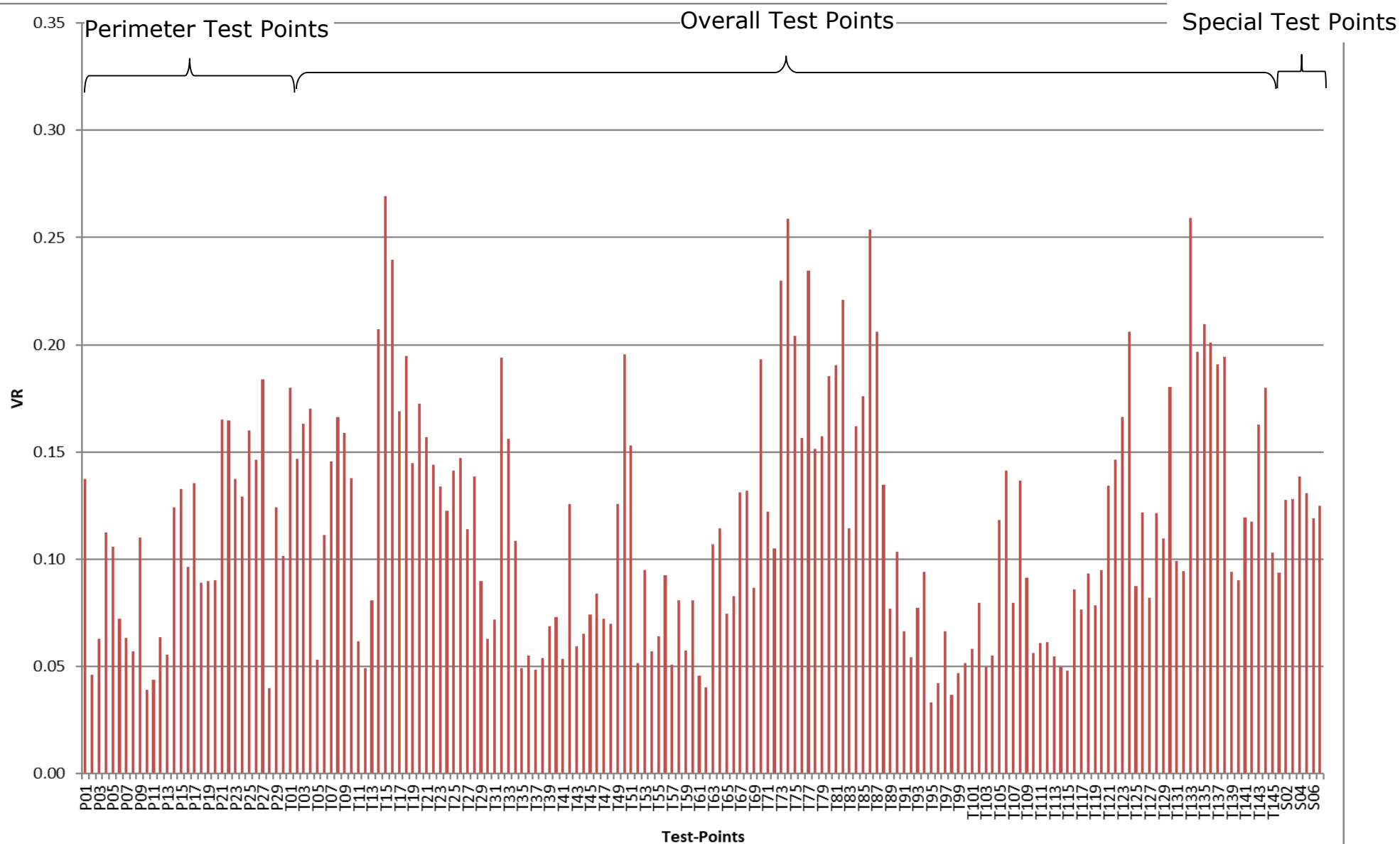


Figure: 11b

RAMBOLL

Title: Wind Velocity Ratios of Individual Test Points for Proposed Scheme (Summer)

Drawn by: WT

Checked by: EC

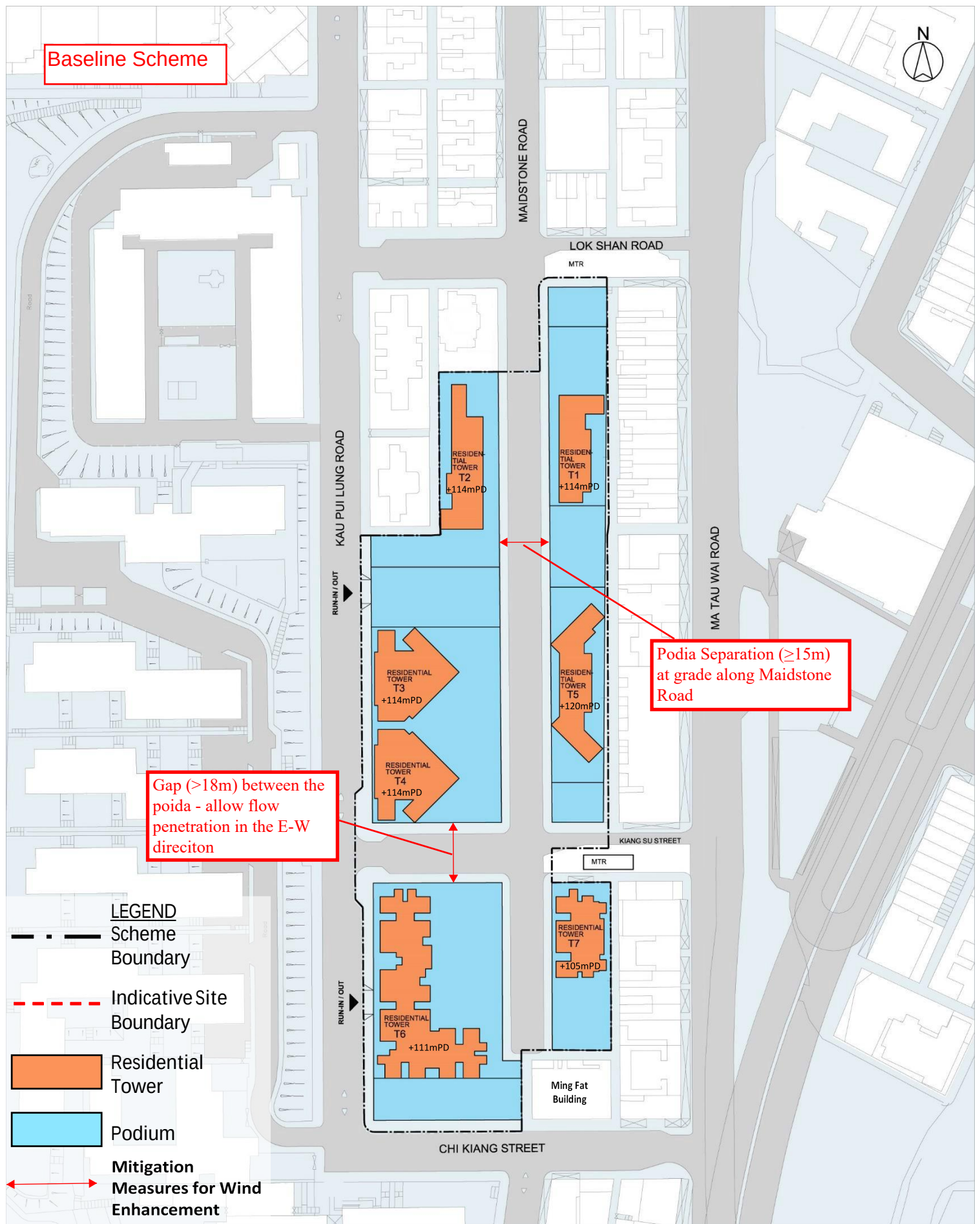
Project: URA Kau Pui Lung Road/ Chi Kiang Street (CBS-2: KC) Development Scheme

Rev.: 1.0

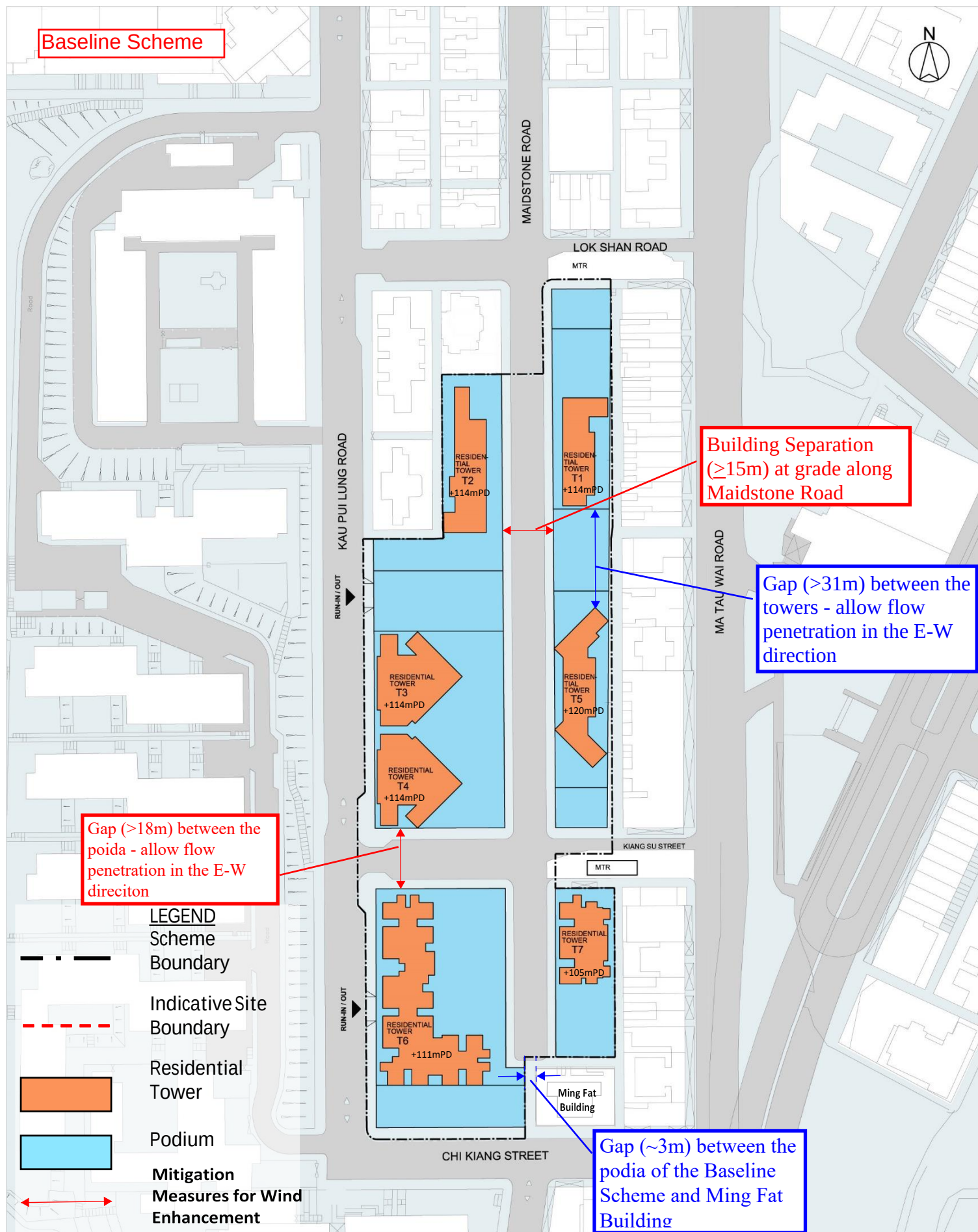
Date: Feb 2023

Appendix 1

Master Layout Plan for Baseline Scheme

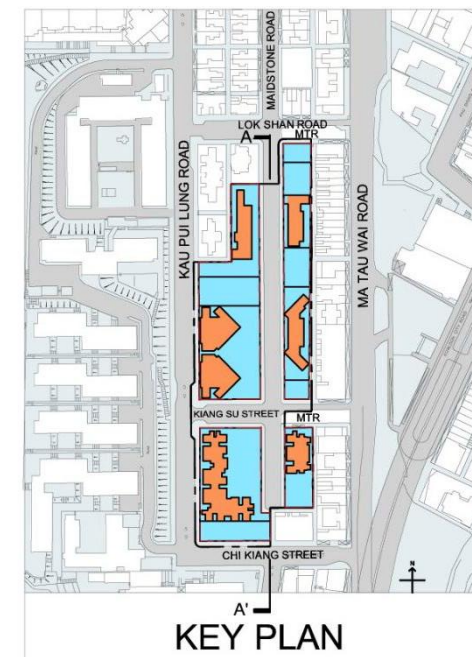
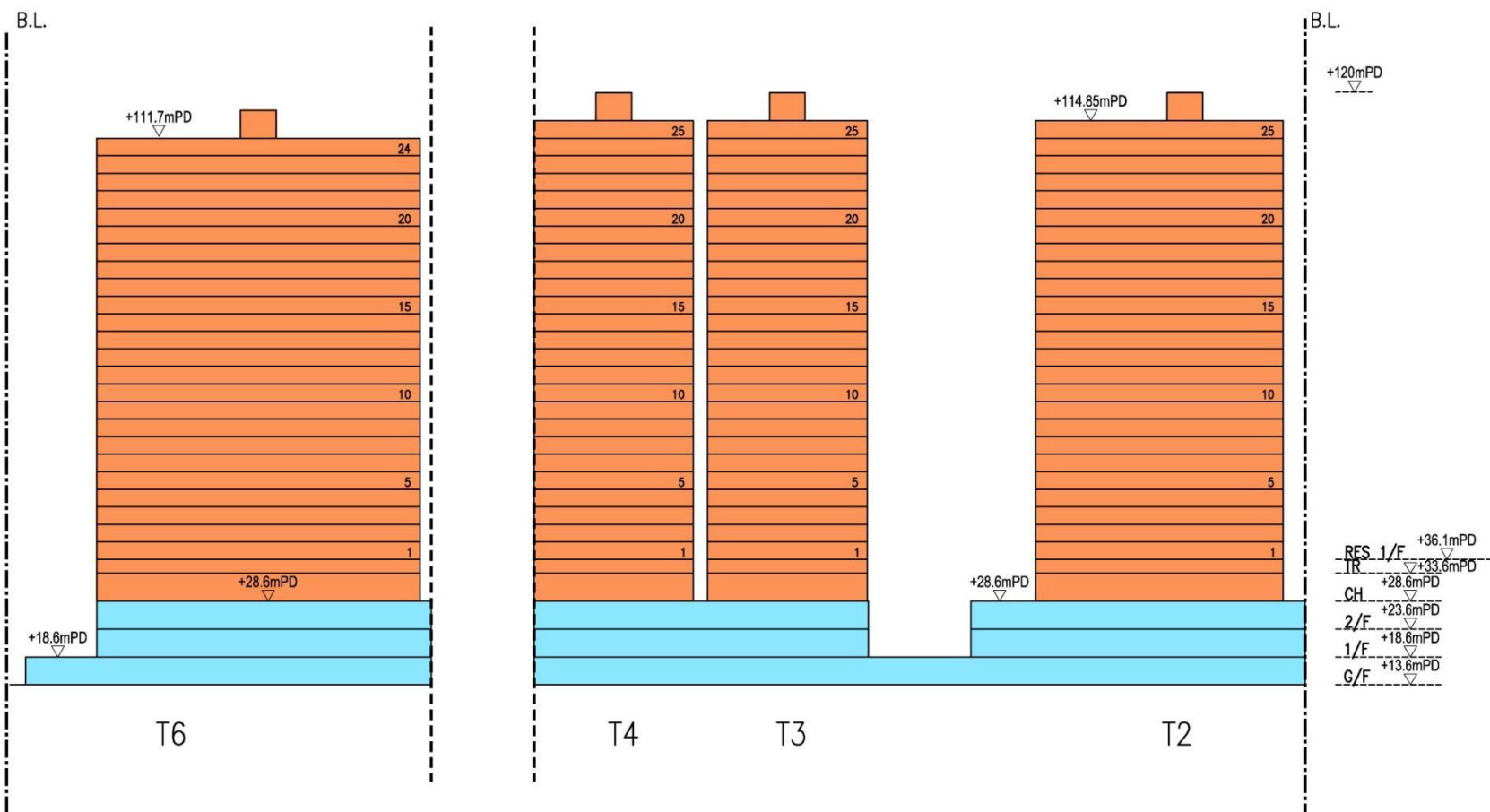


(Notional layout subject to detailed design upon DSP approval.)



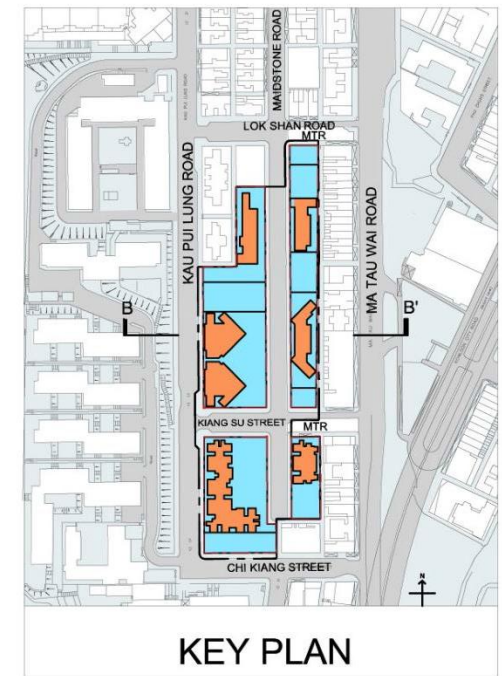
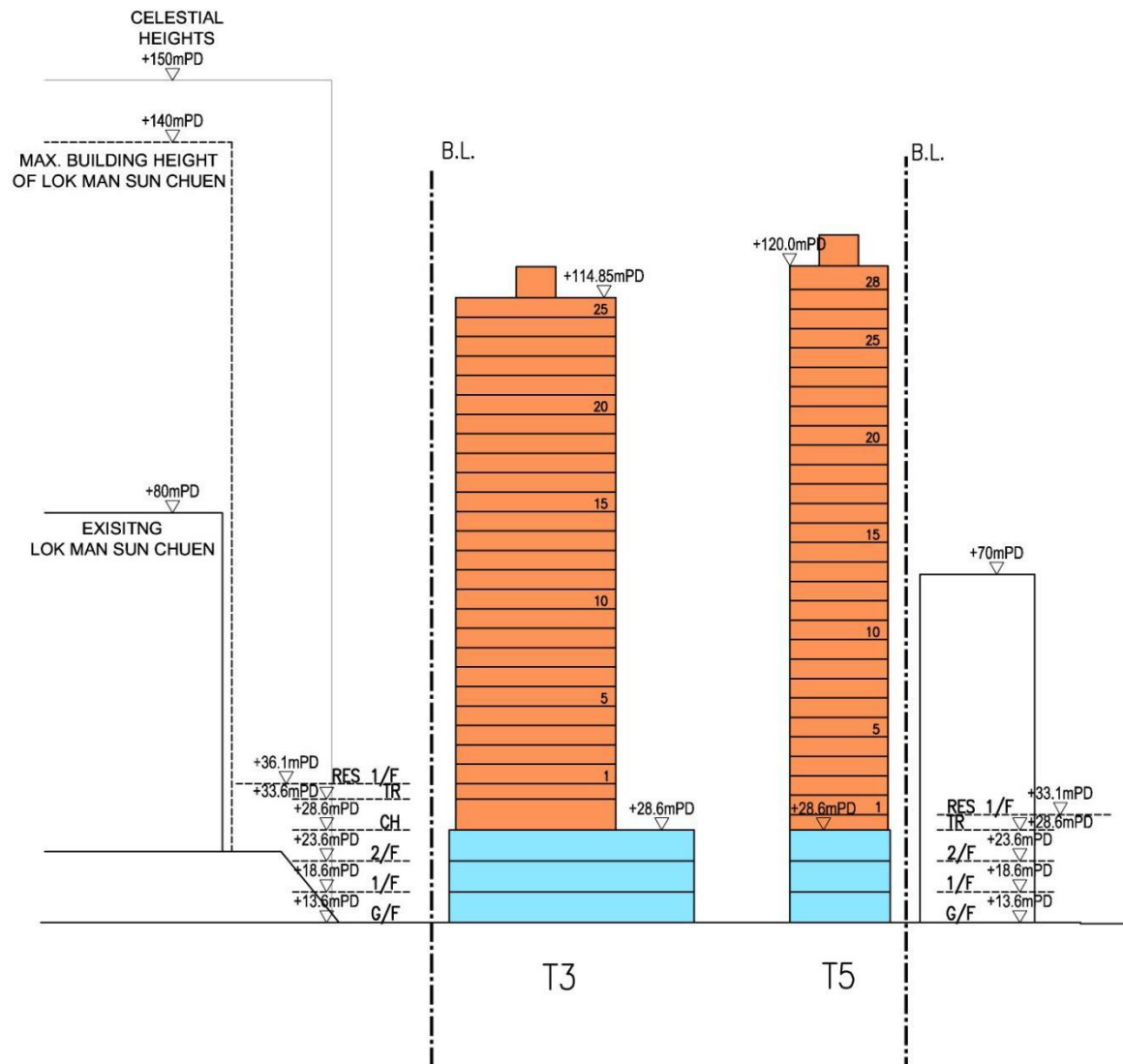
(Notional layout subject to detailed design upon DSP approval.)

Baseline Scheme



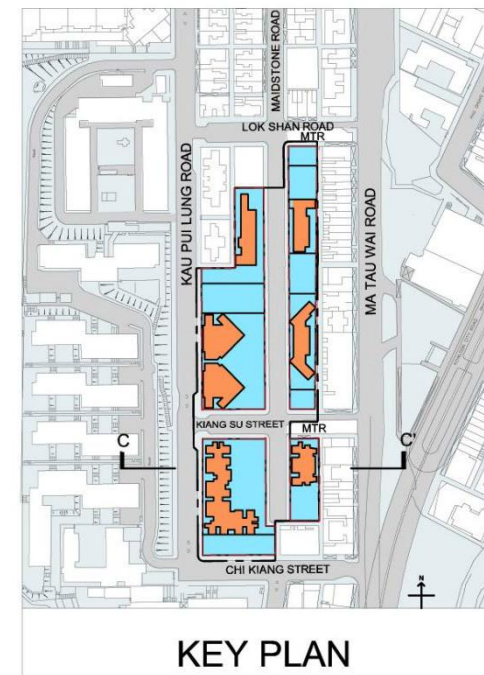
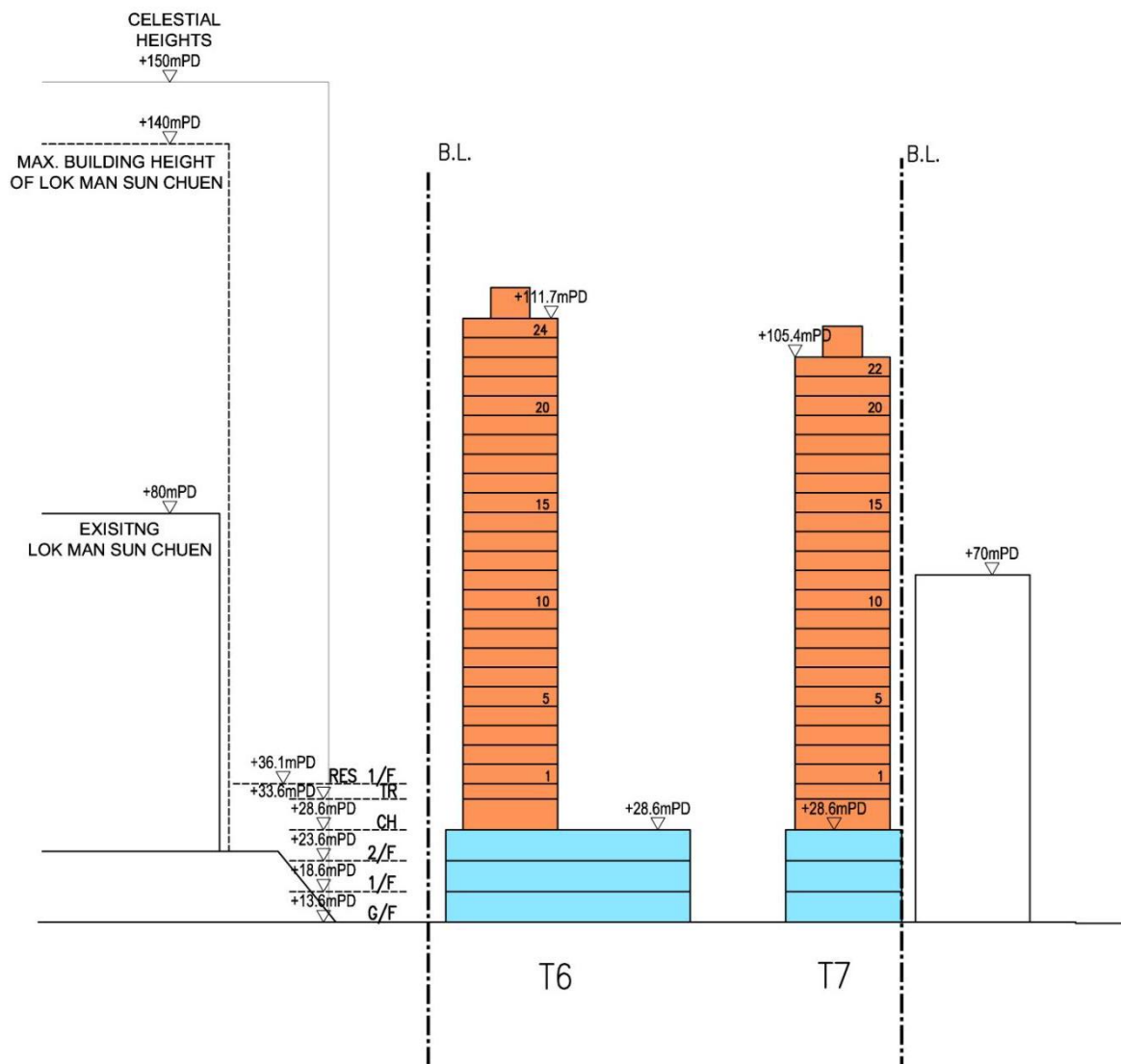
(Notional layout subject to detailed design upon DSP approval.)

Baseline Scheme



(Notional layout subject to detailed design upon DSP approval.)

Baseline Scheme

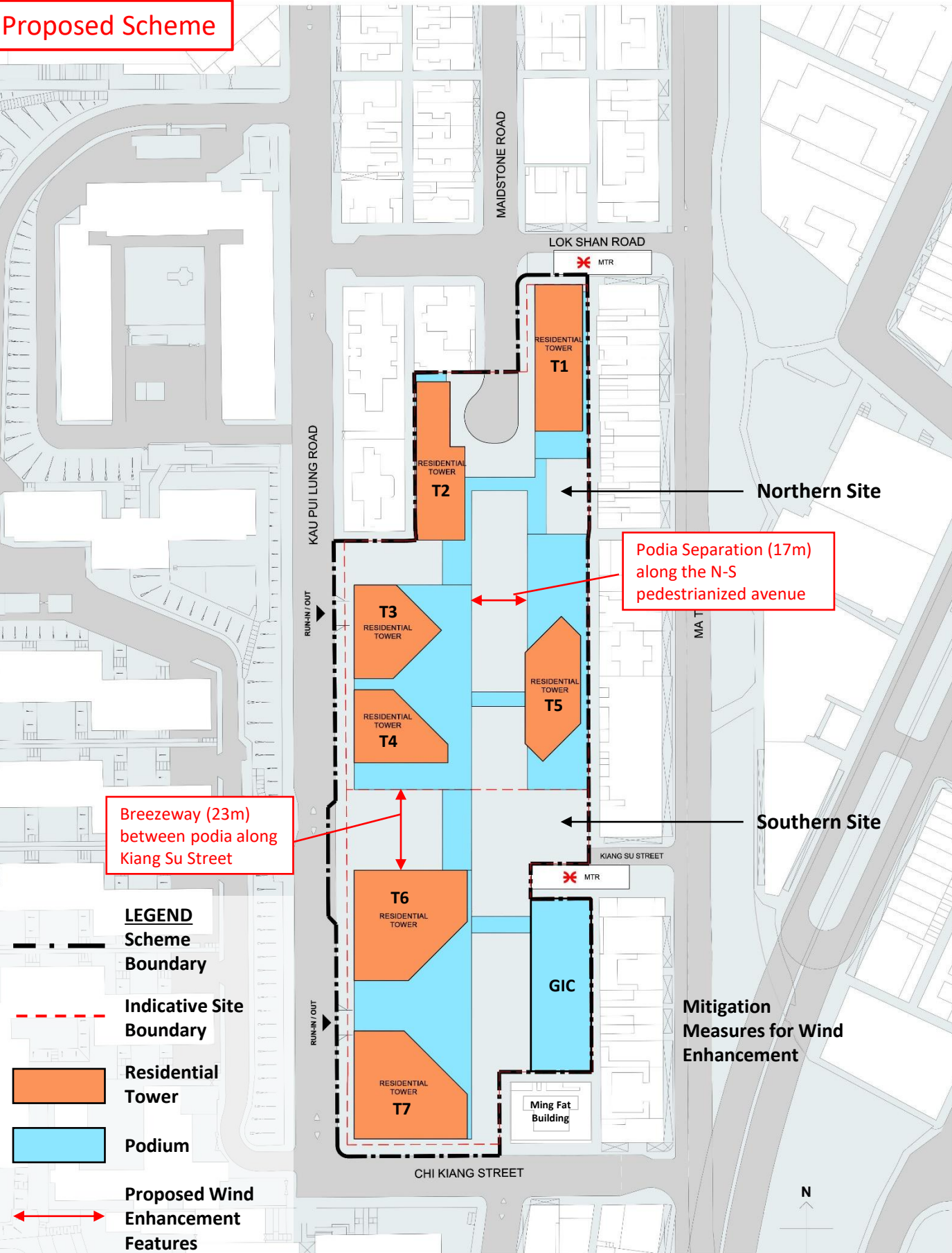


(Notional layout subject to detailed design upon DSP approval.)

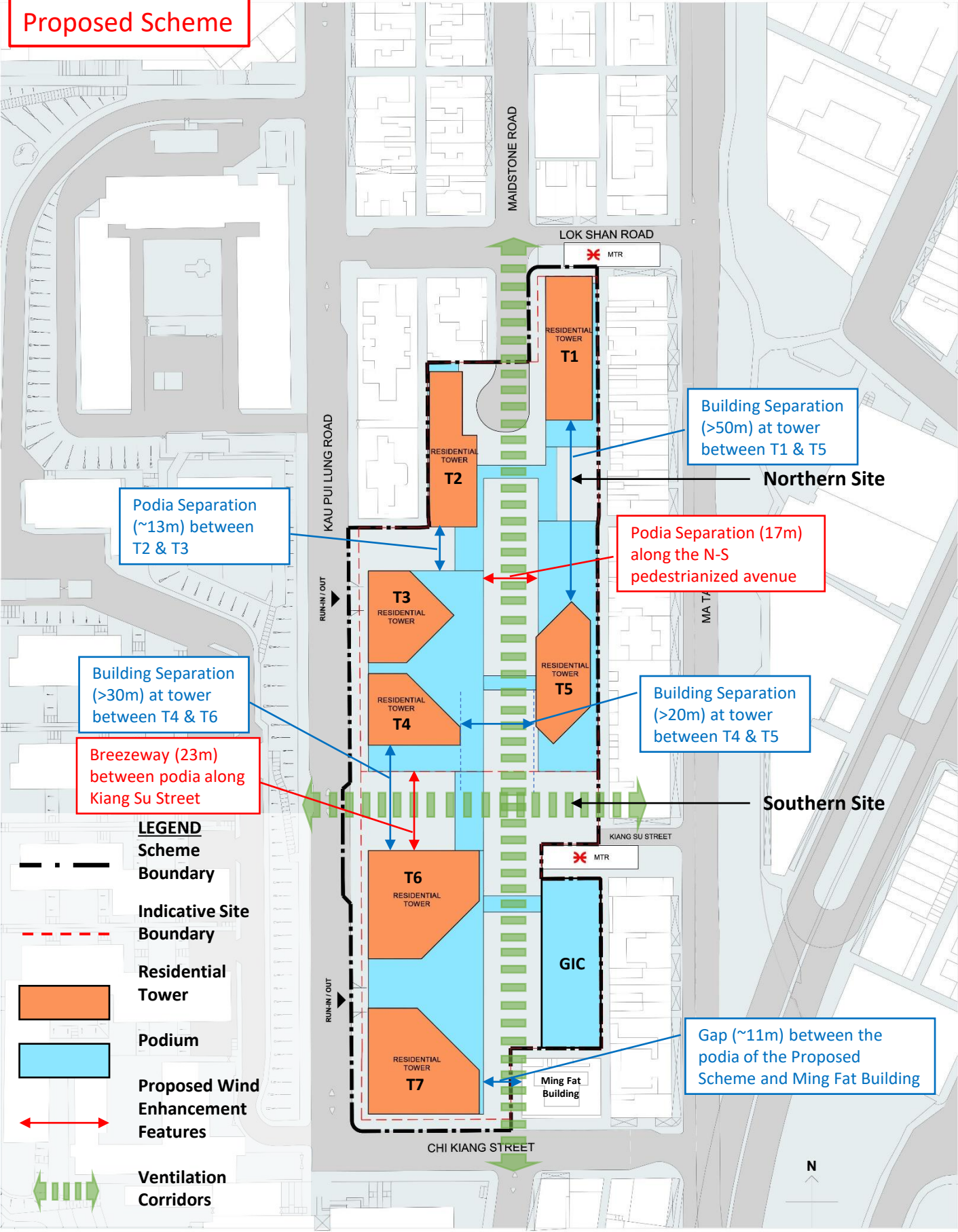
Appendix 2

Master Layout Plan for Proposed Scheme

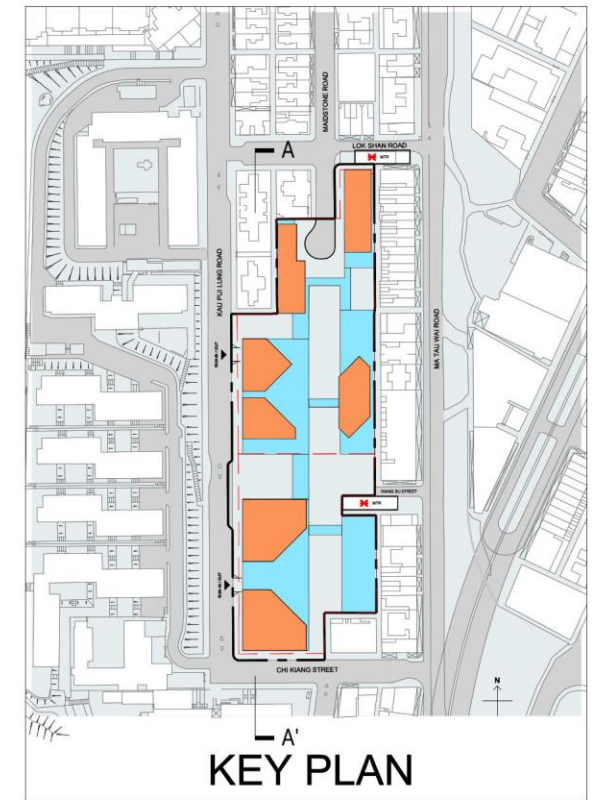
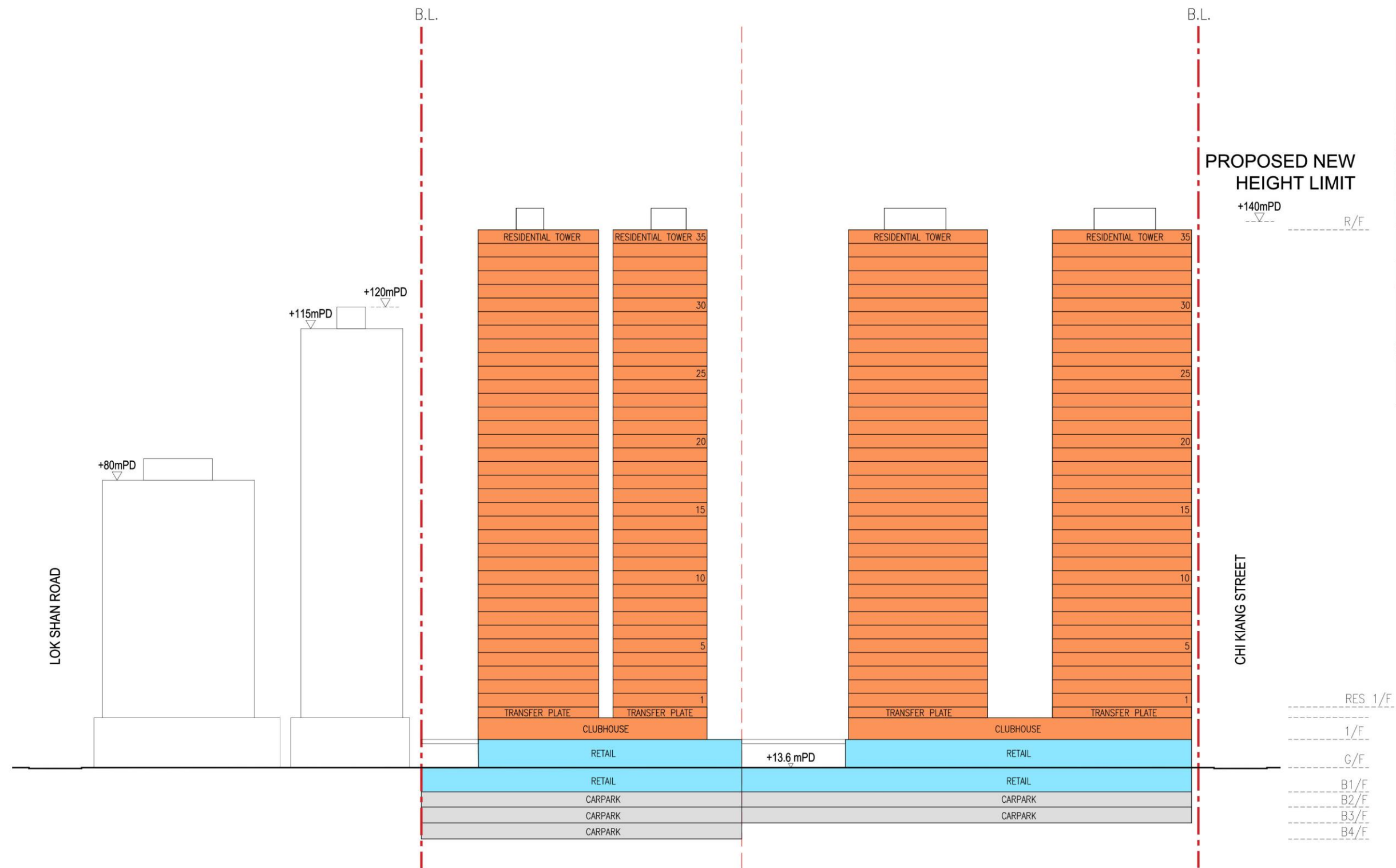
Proposed Scheme



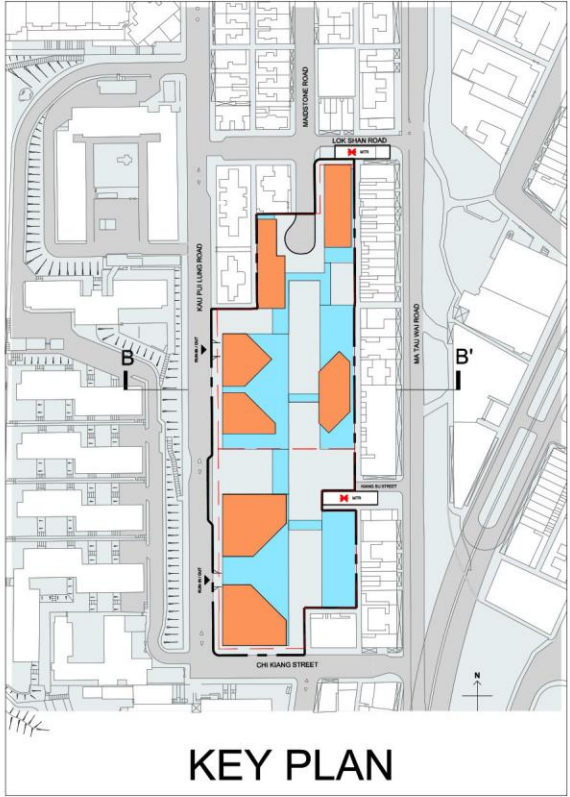
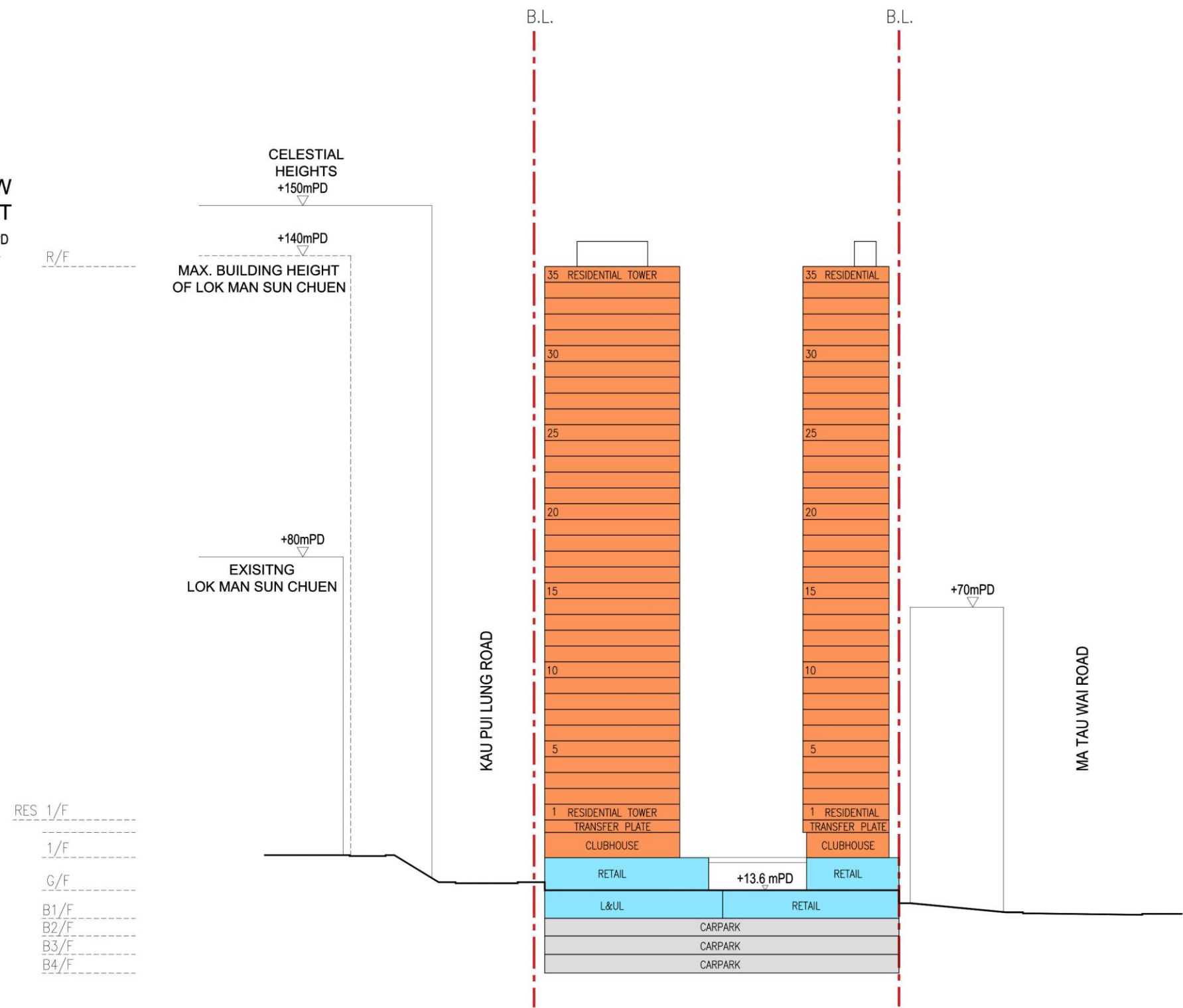
(Remarks: For indicative purpose only. Notional layout subject to detailed design upon DSP approval.)



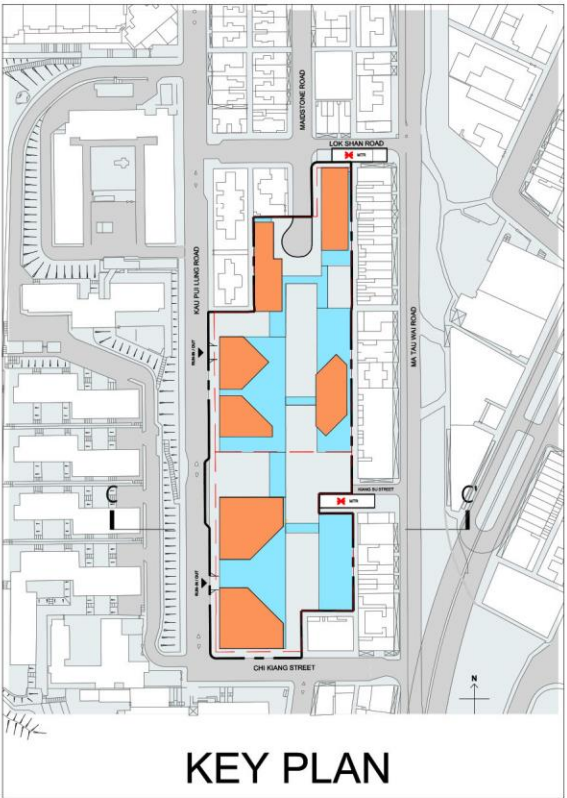
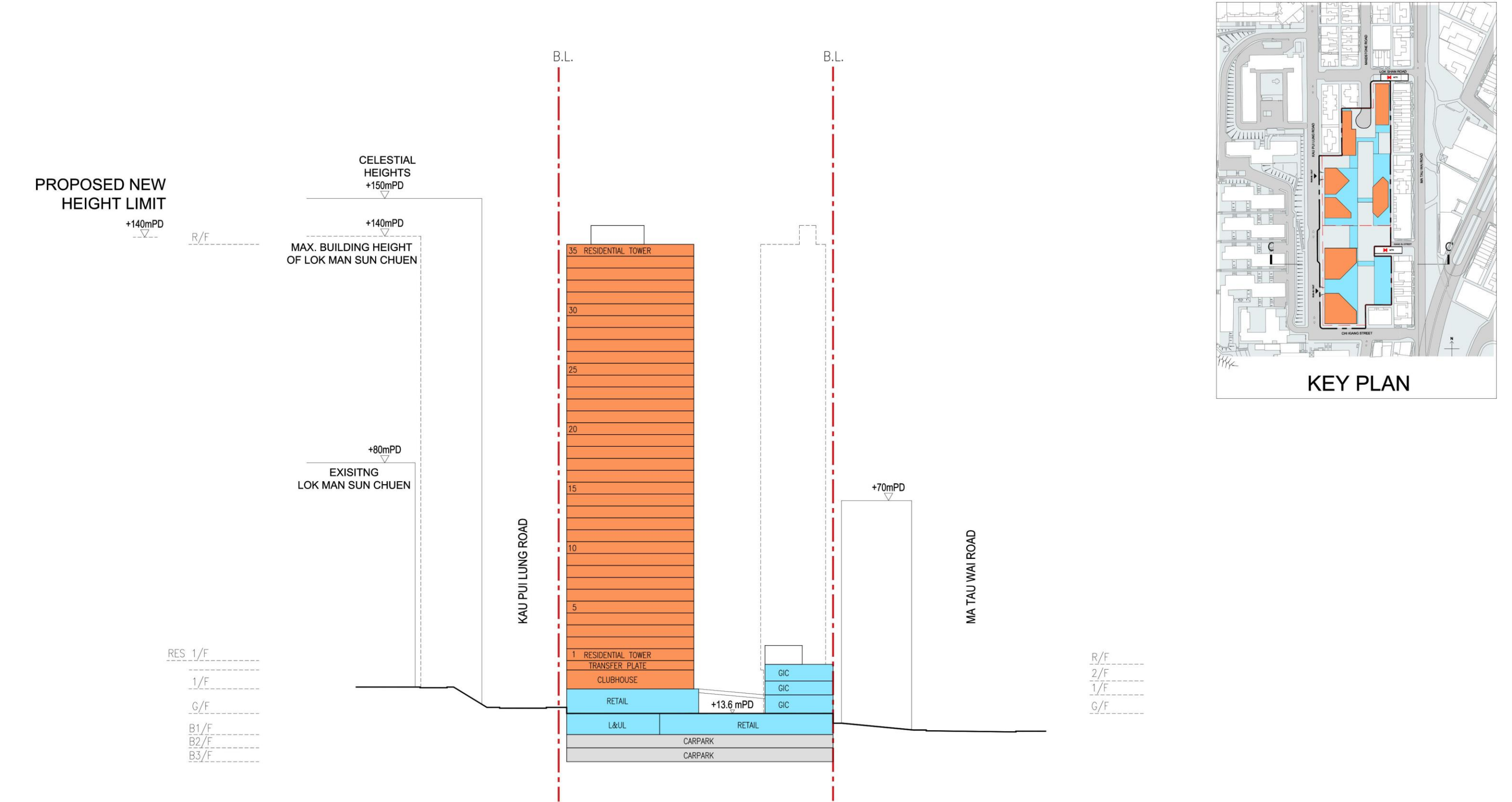
(Remarks: For indicative purpose only. Notional layout subject to detailed design upon DSP approval.)



(Remarks: For indicative purpose only. Notional layout subject to detailed design upon DSP approval.)



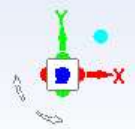
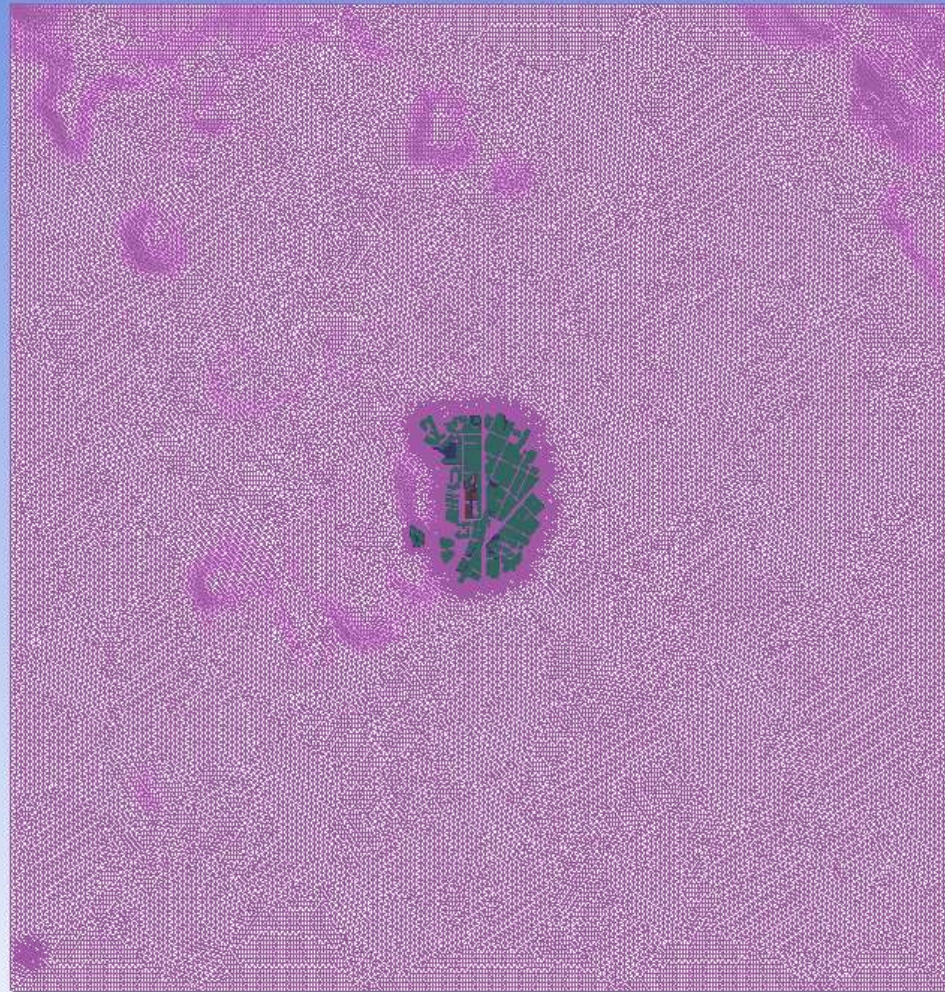
(Remarks: For indicative purpose only. Notional layout subject to detailed design upon DSP approval.)



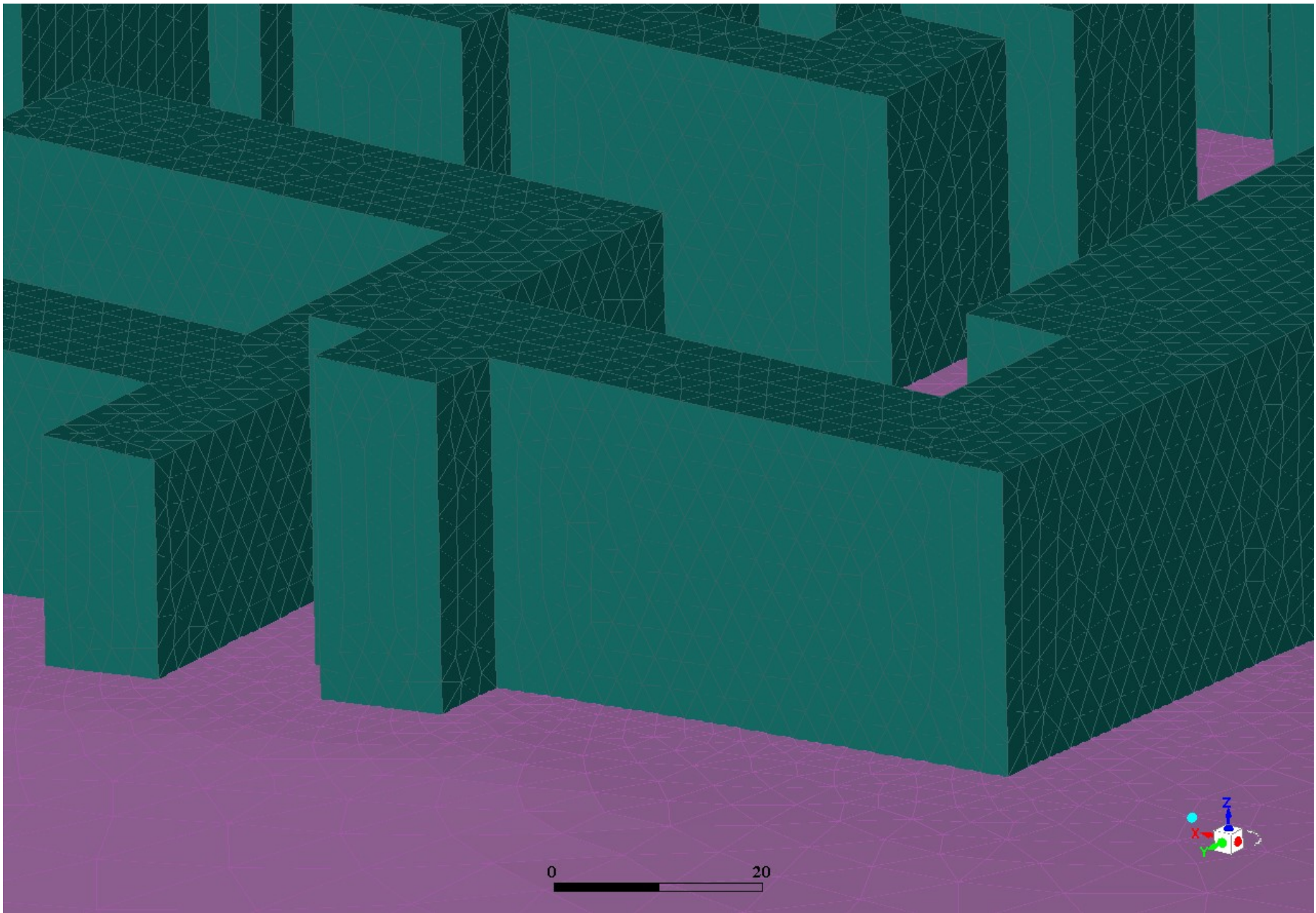
(Remarks: For indicative purpose only. Notional layout subject to detailed design upon DSP approval.)

Appendix 3

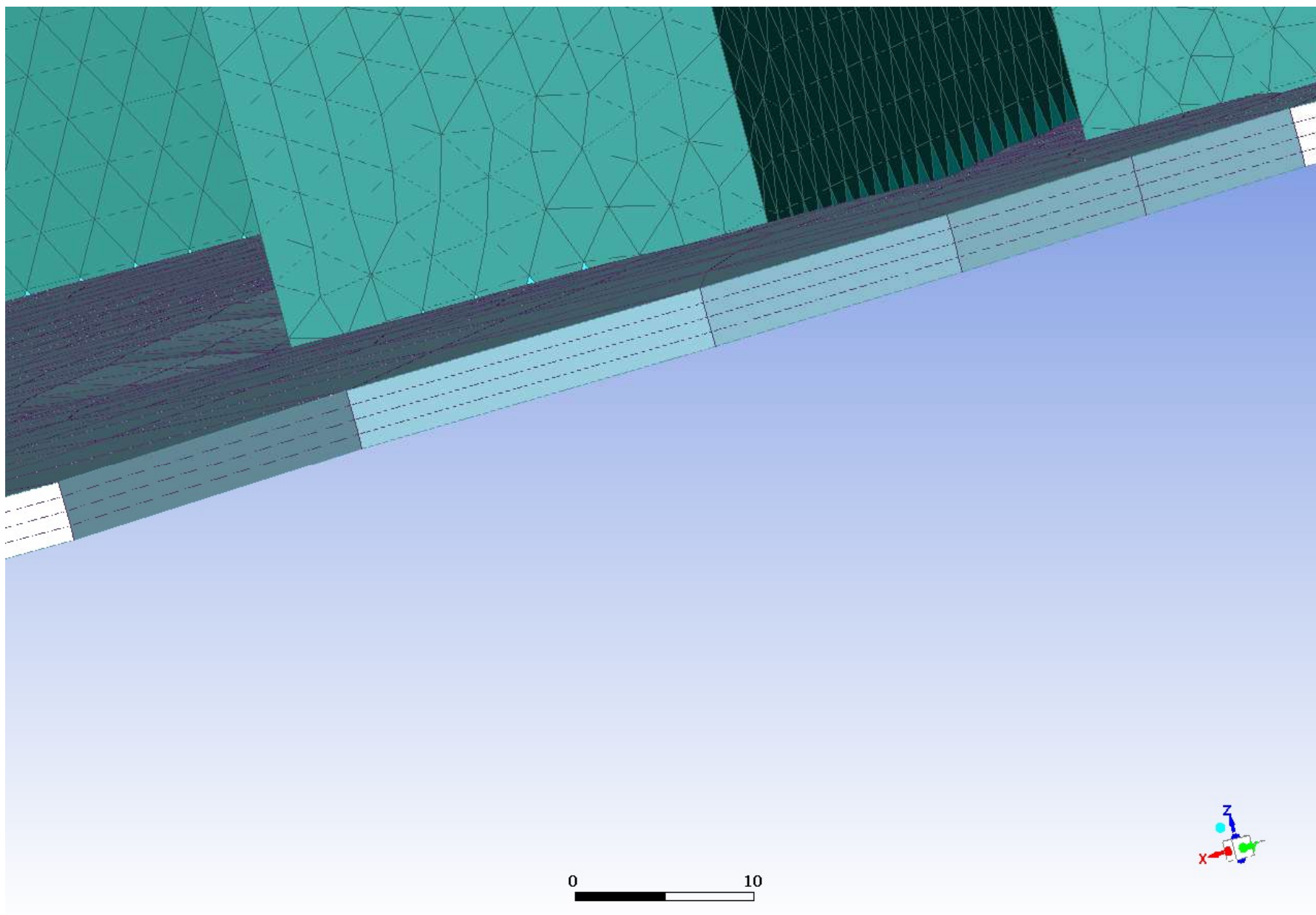
Captured Pictures of the CFD Model



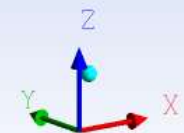
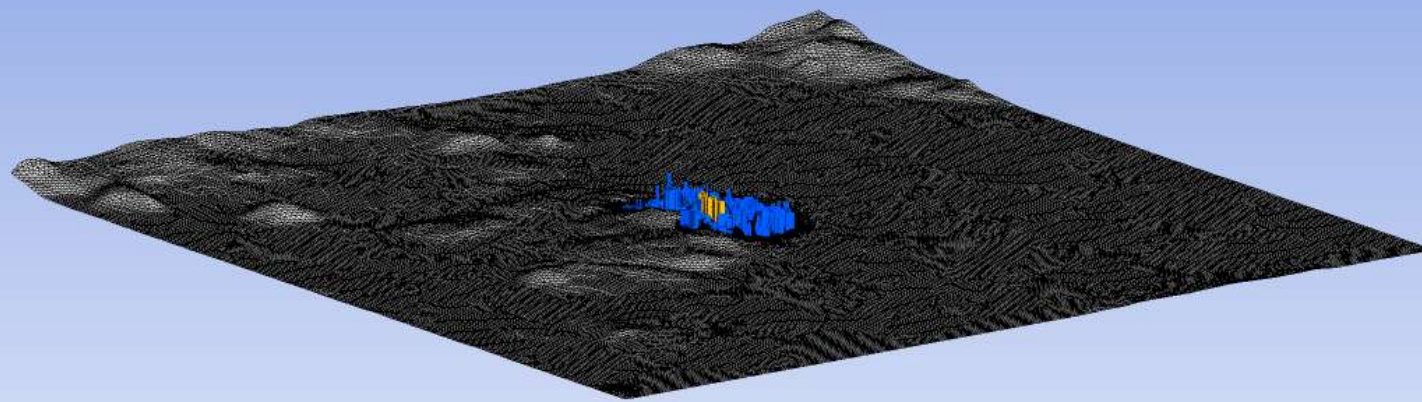
Domain



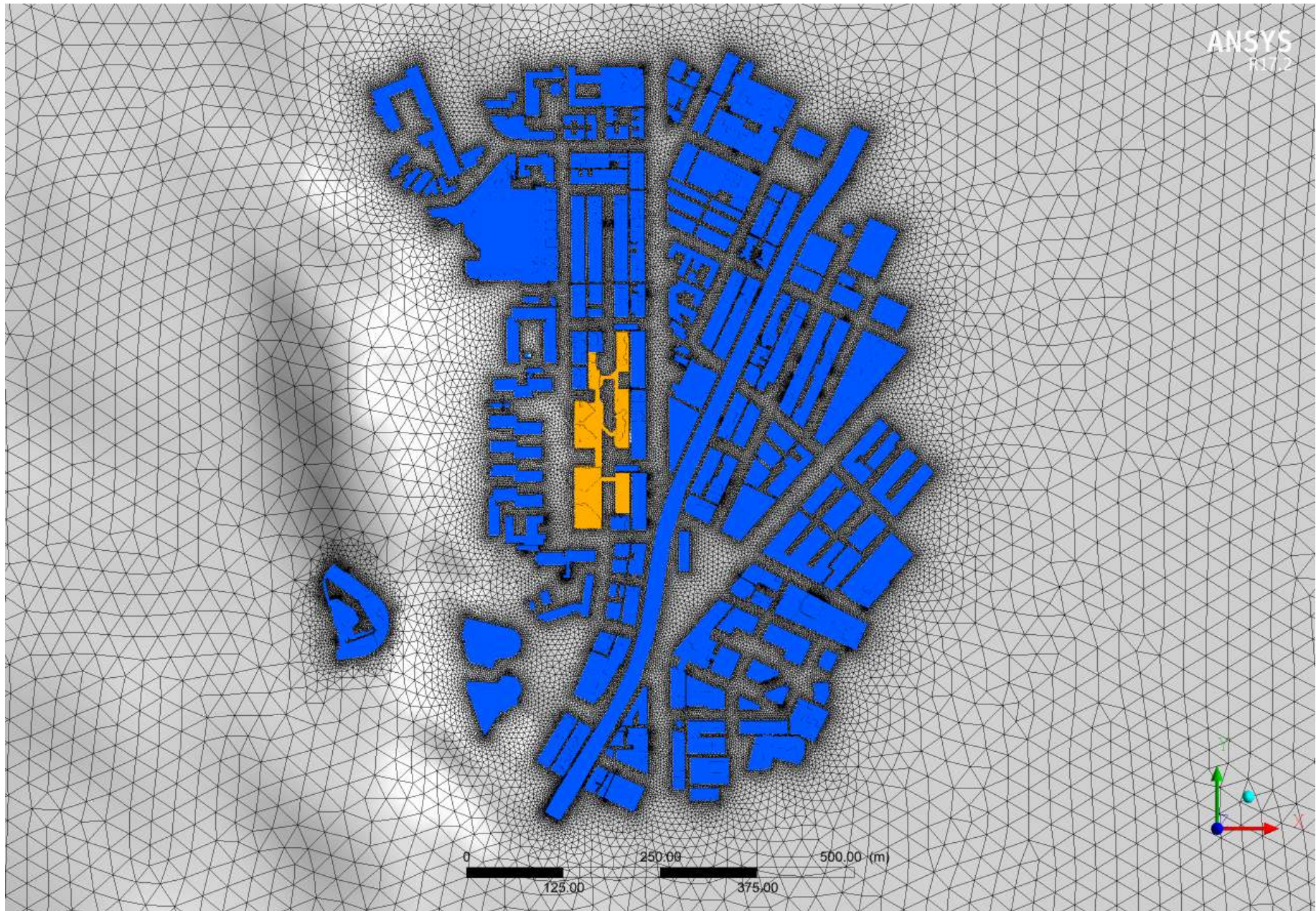
Surface Mesh in the Model



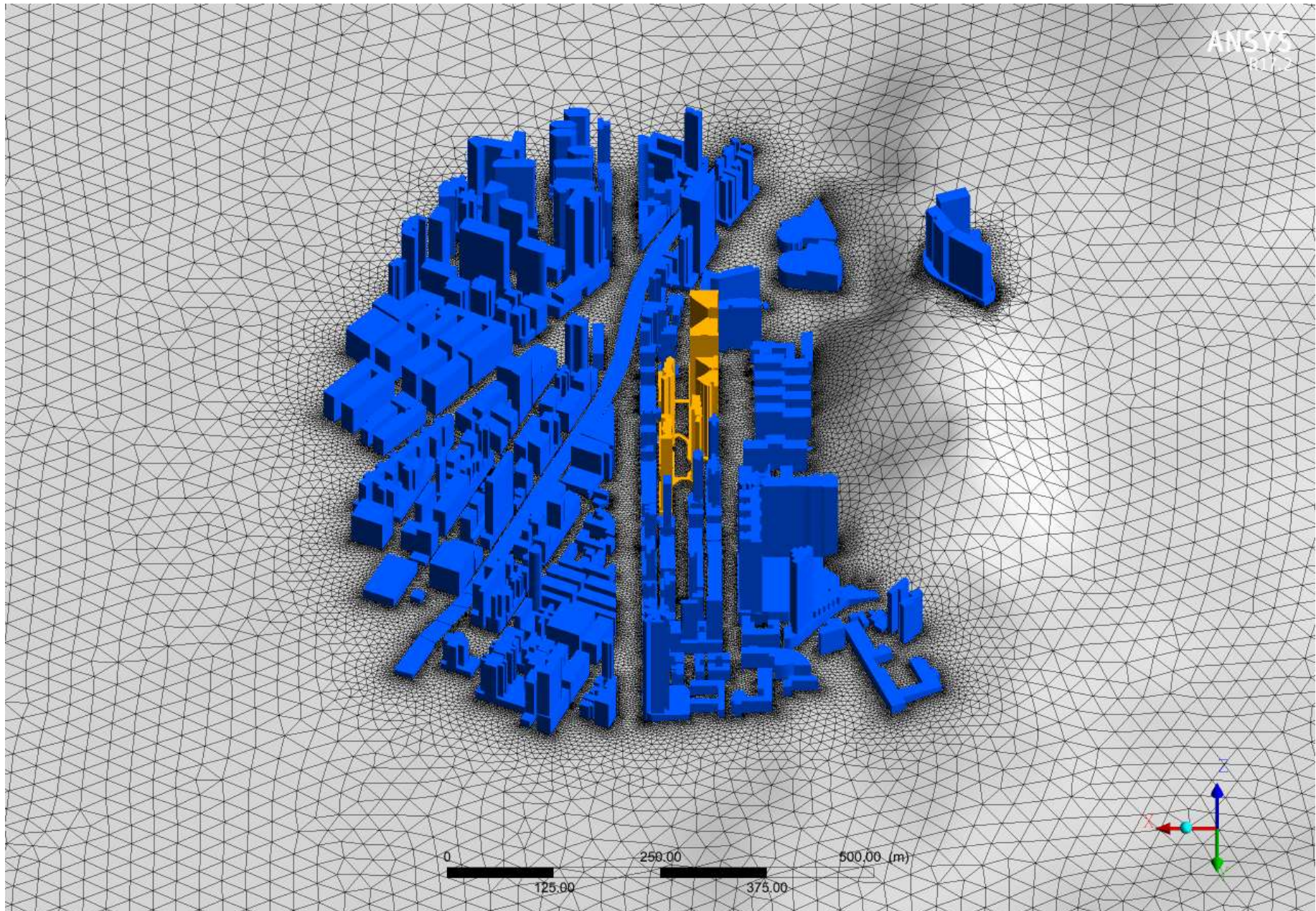
4 Layers Prism



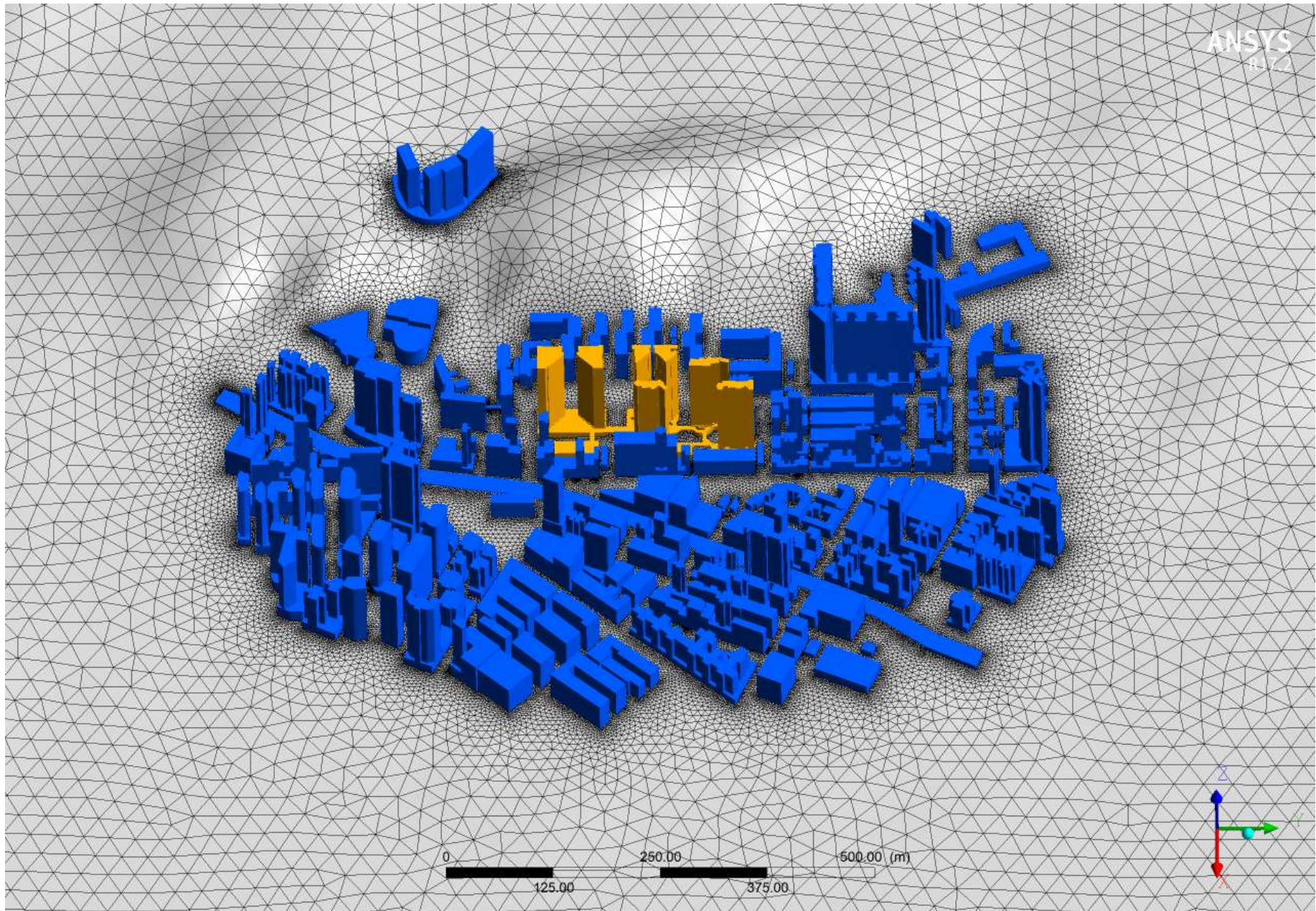
Topography



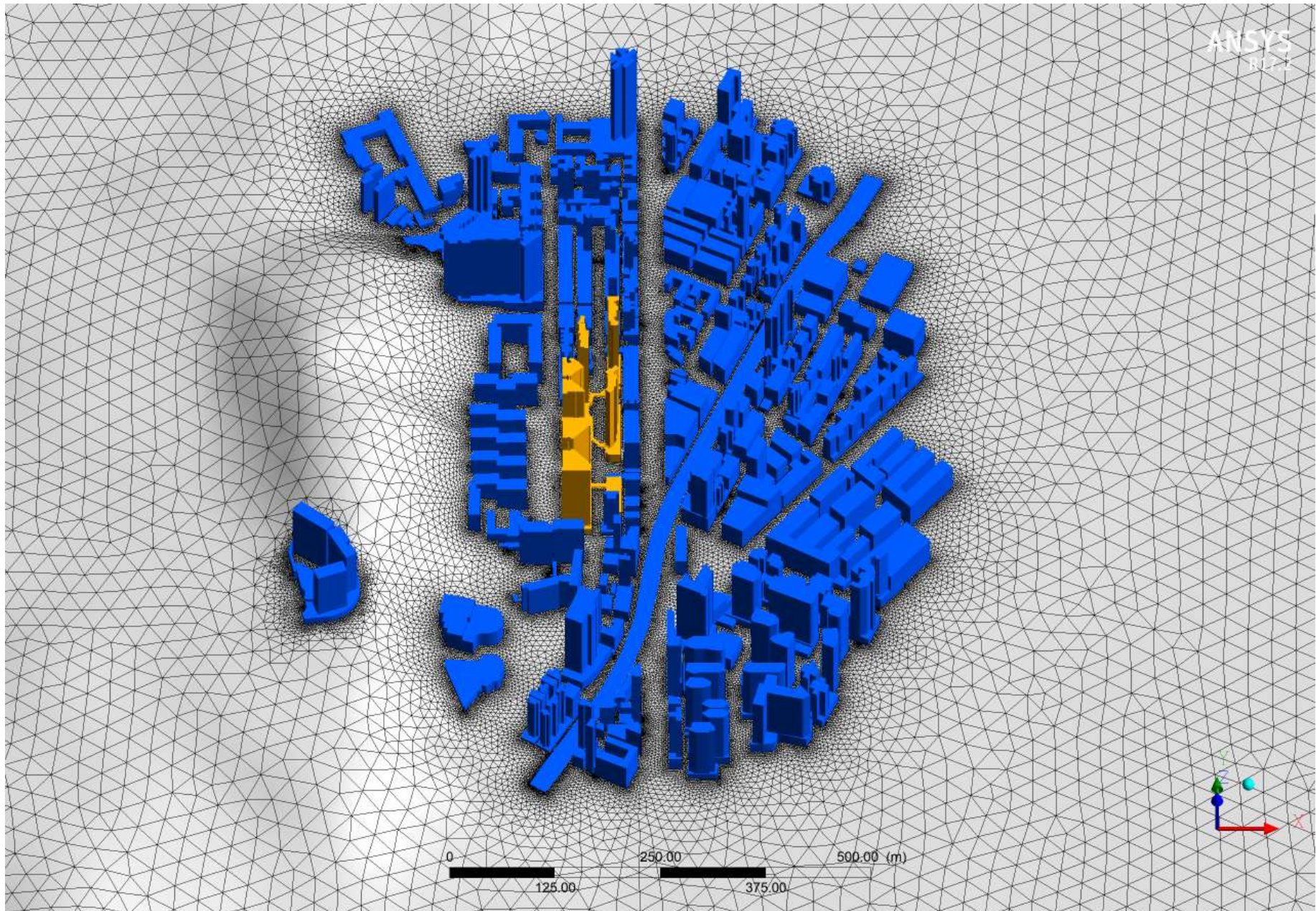
Surroundings - Top View



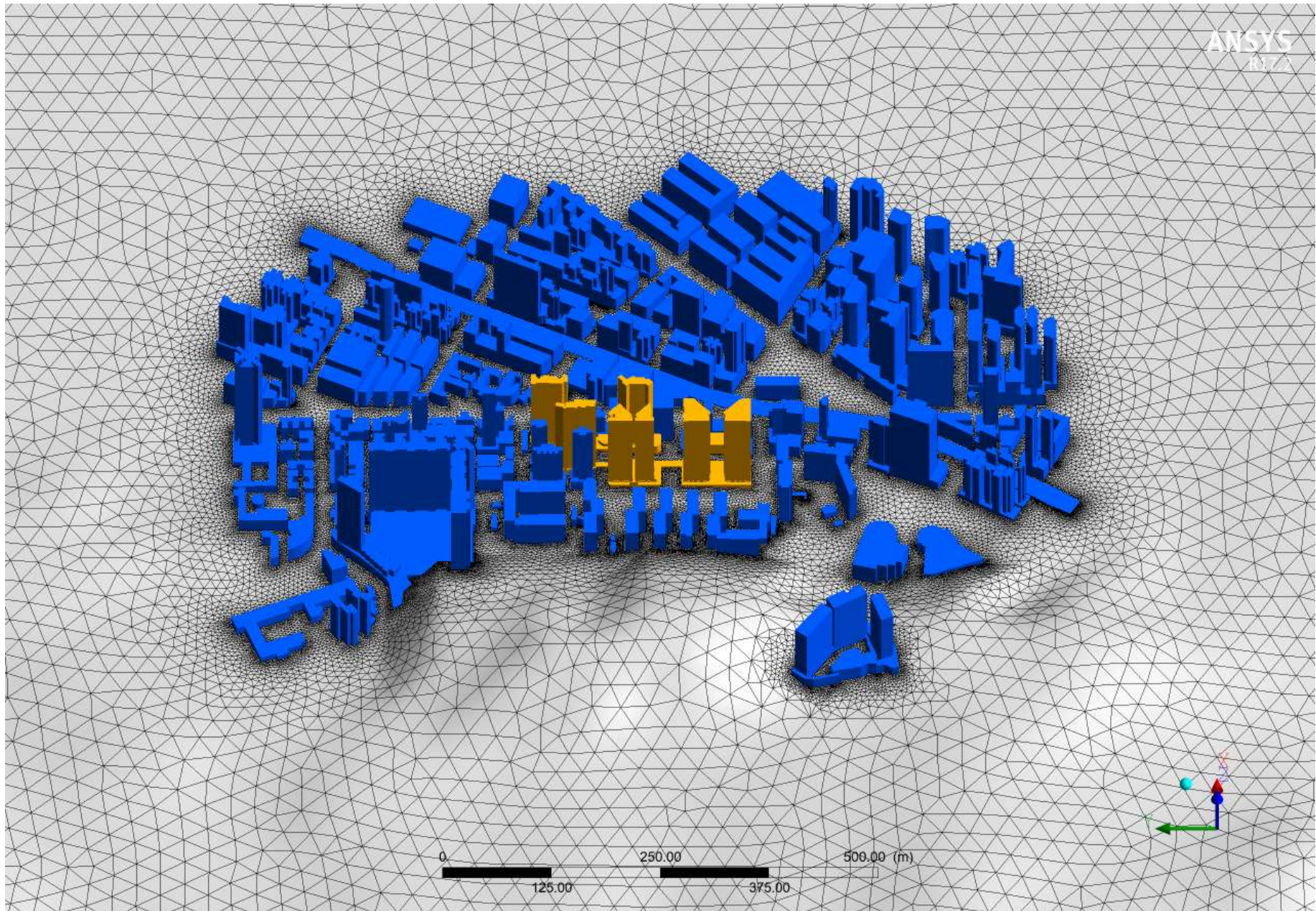
Surroundings - North View



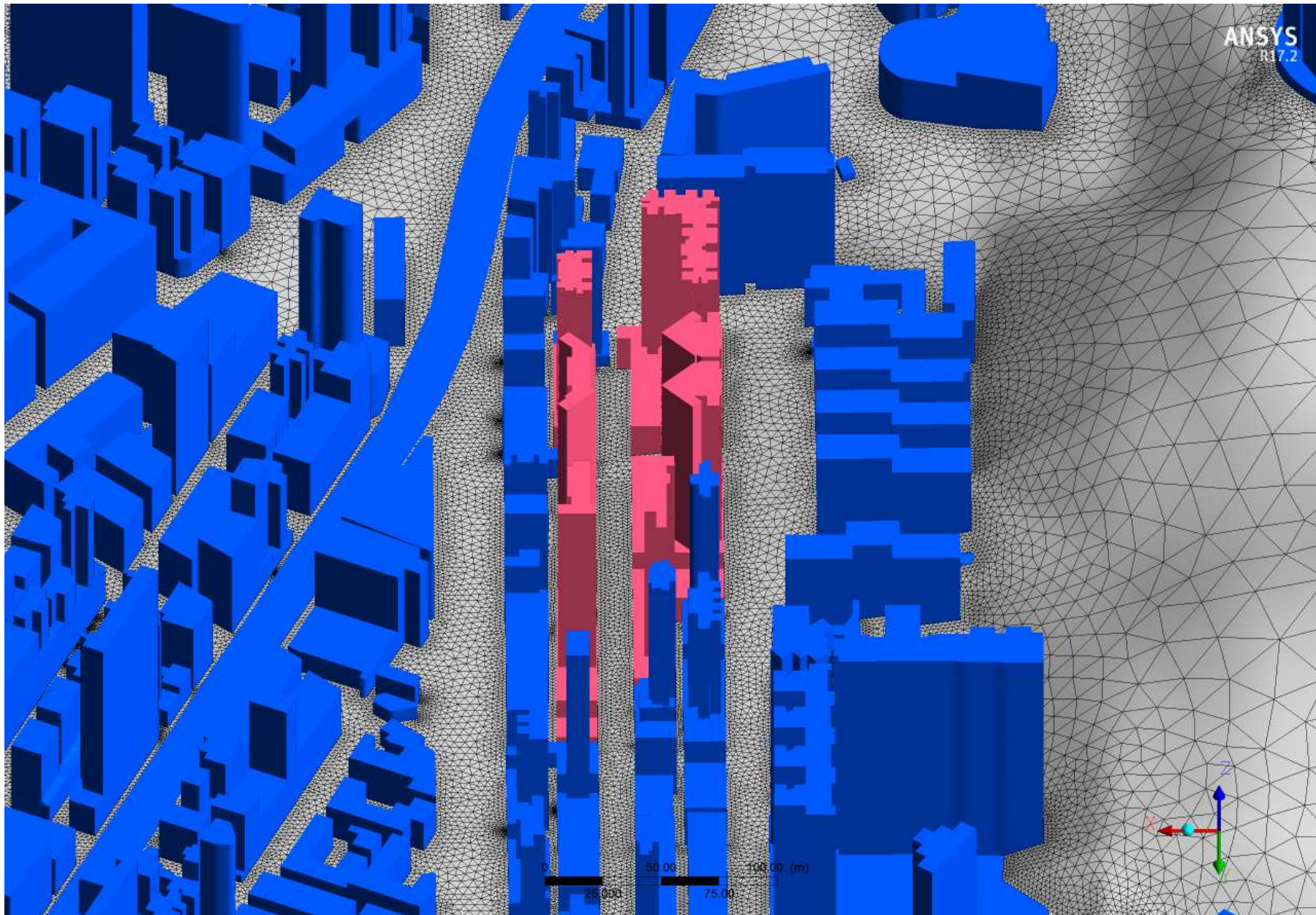
Surroundings - East View



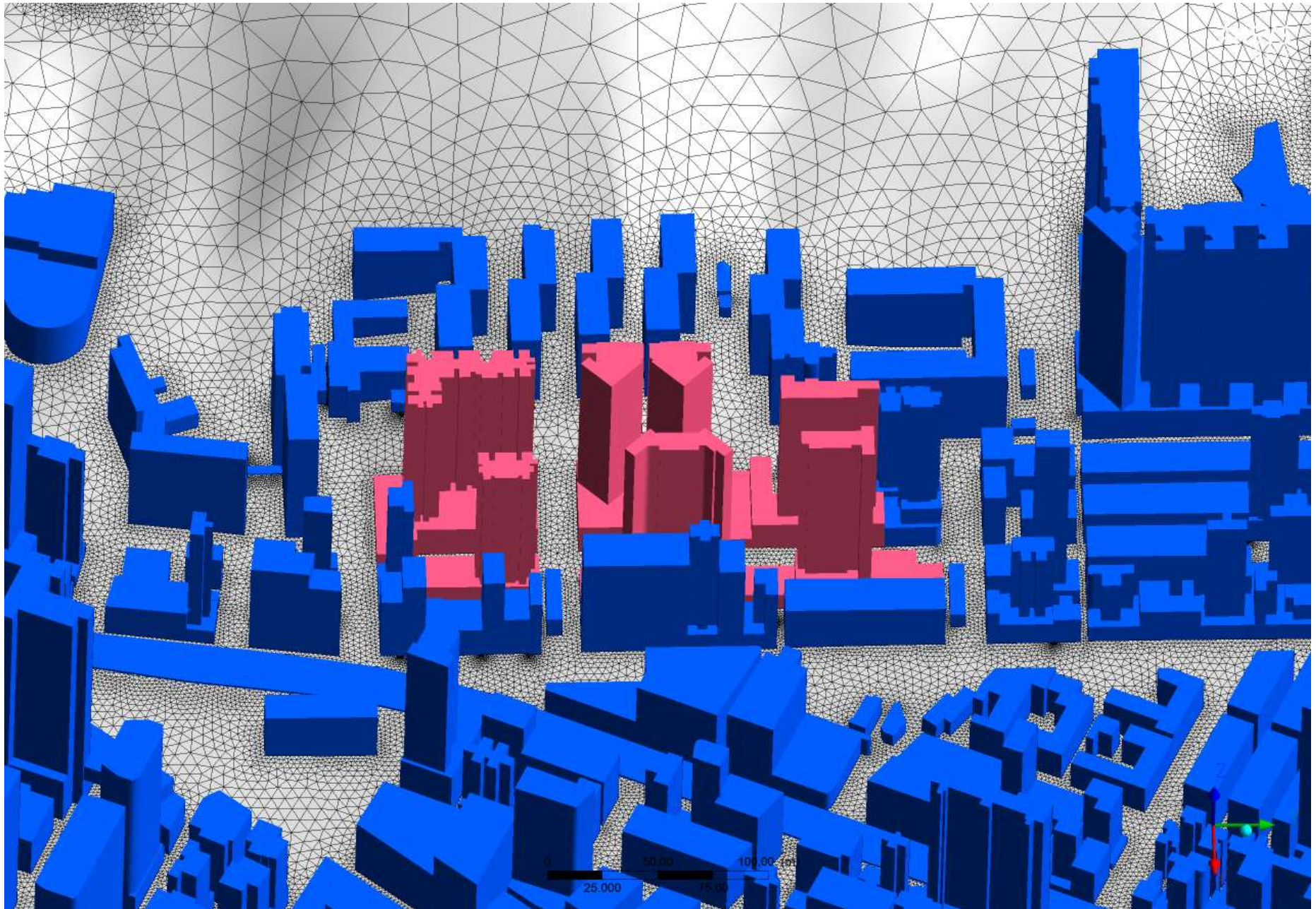
Surroundings - South View



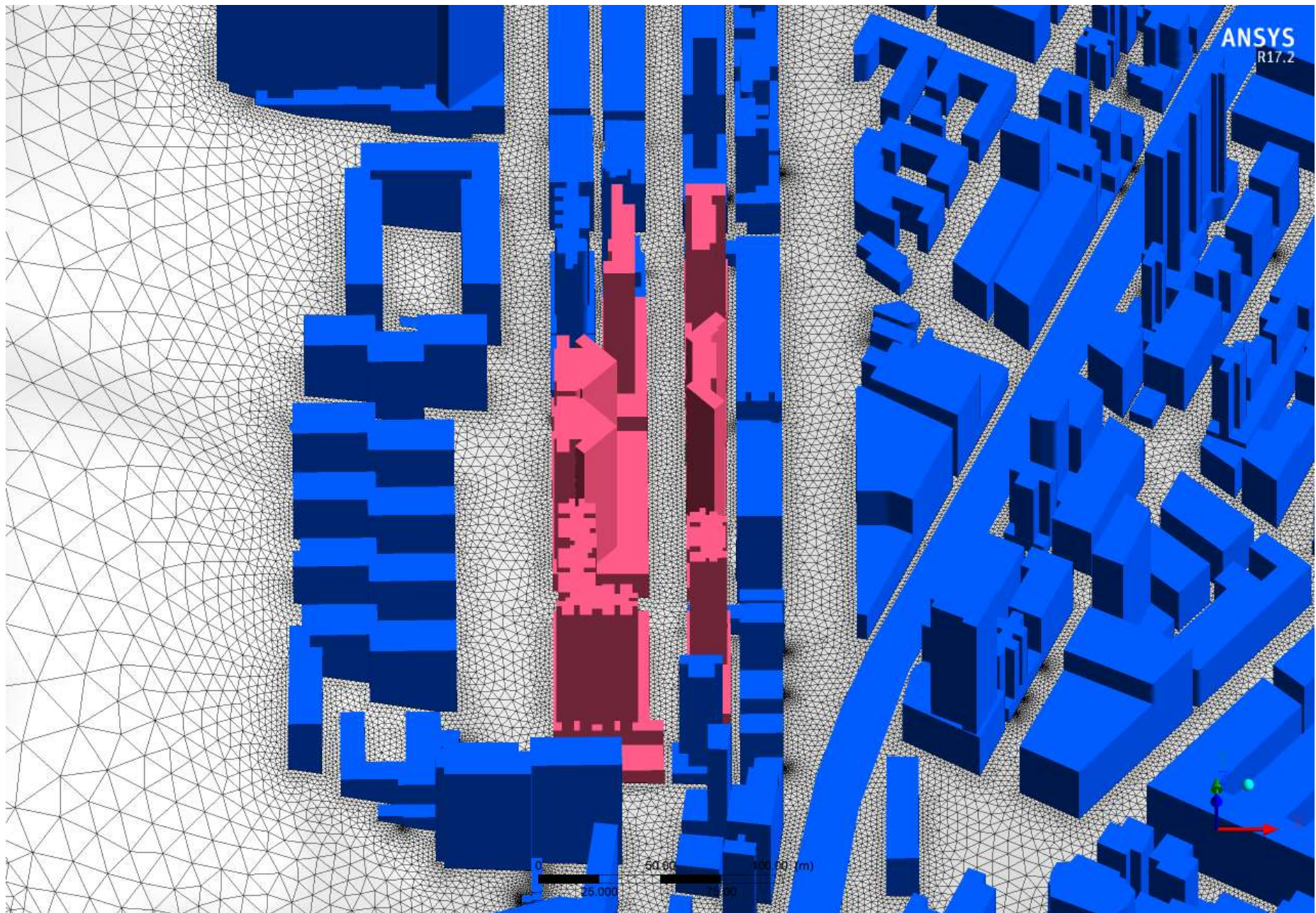
Surroundings - West View



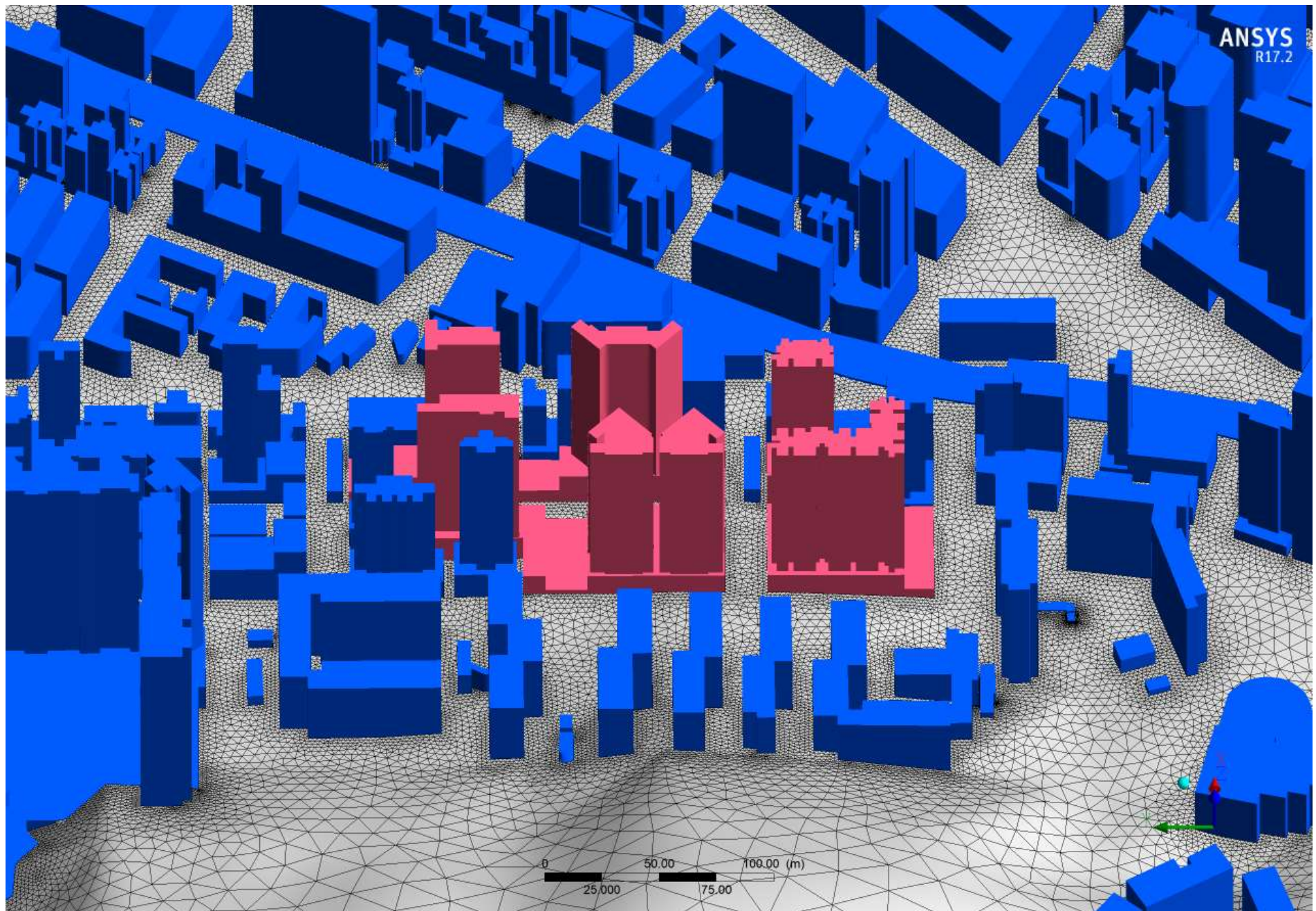
Baseline Scheme - N



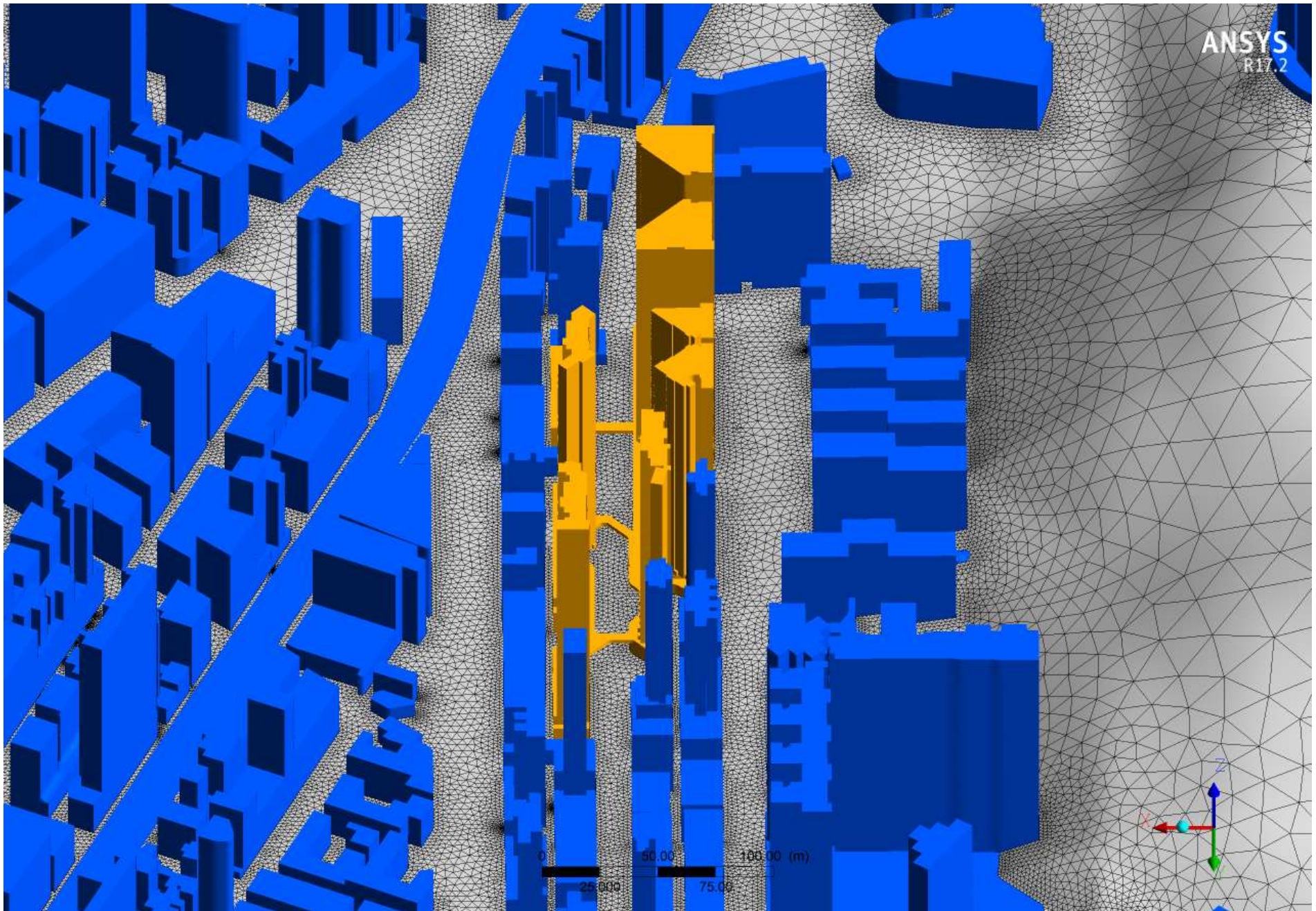
Baseline Scheme - E



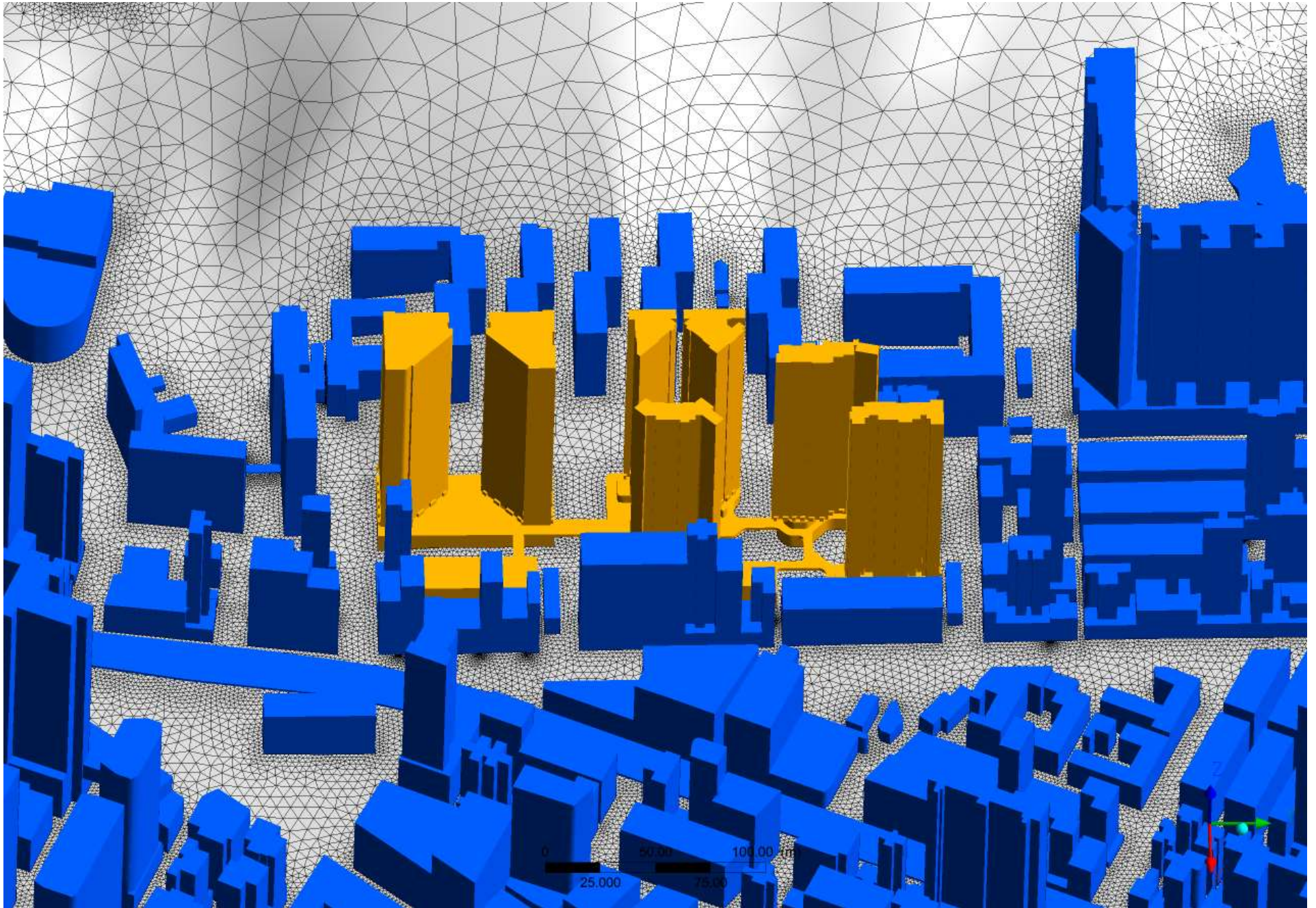
Baseline Scheme - S



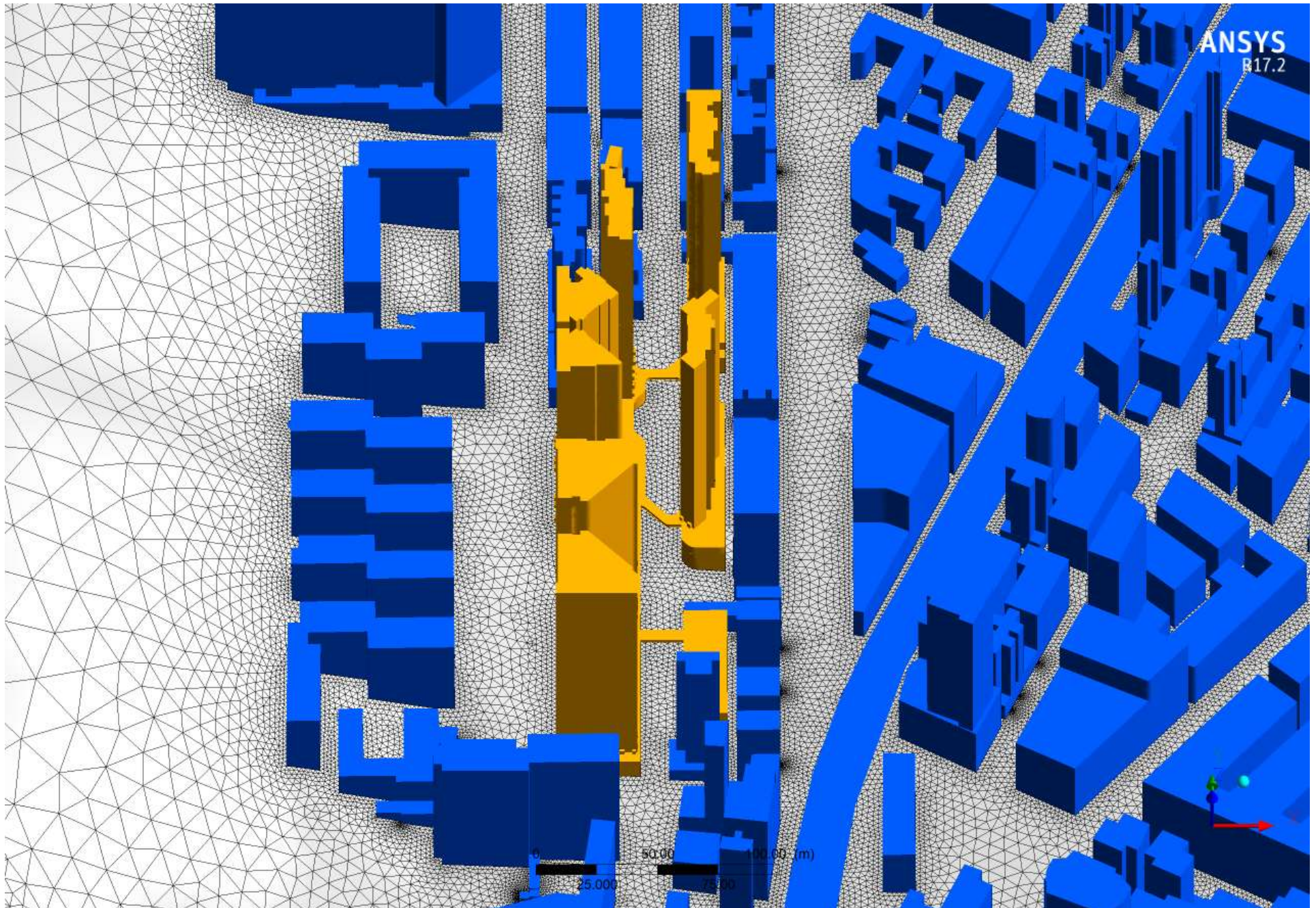
Baseline Scheme - W



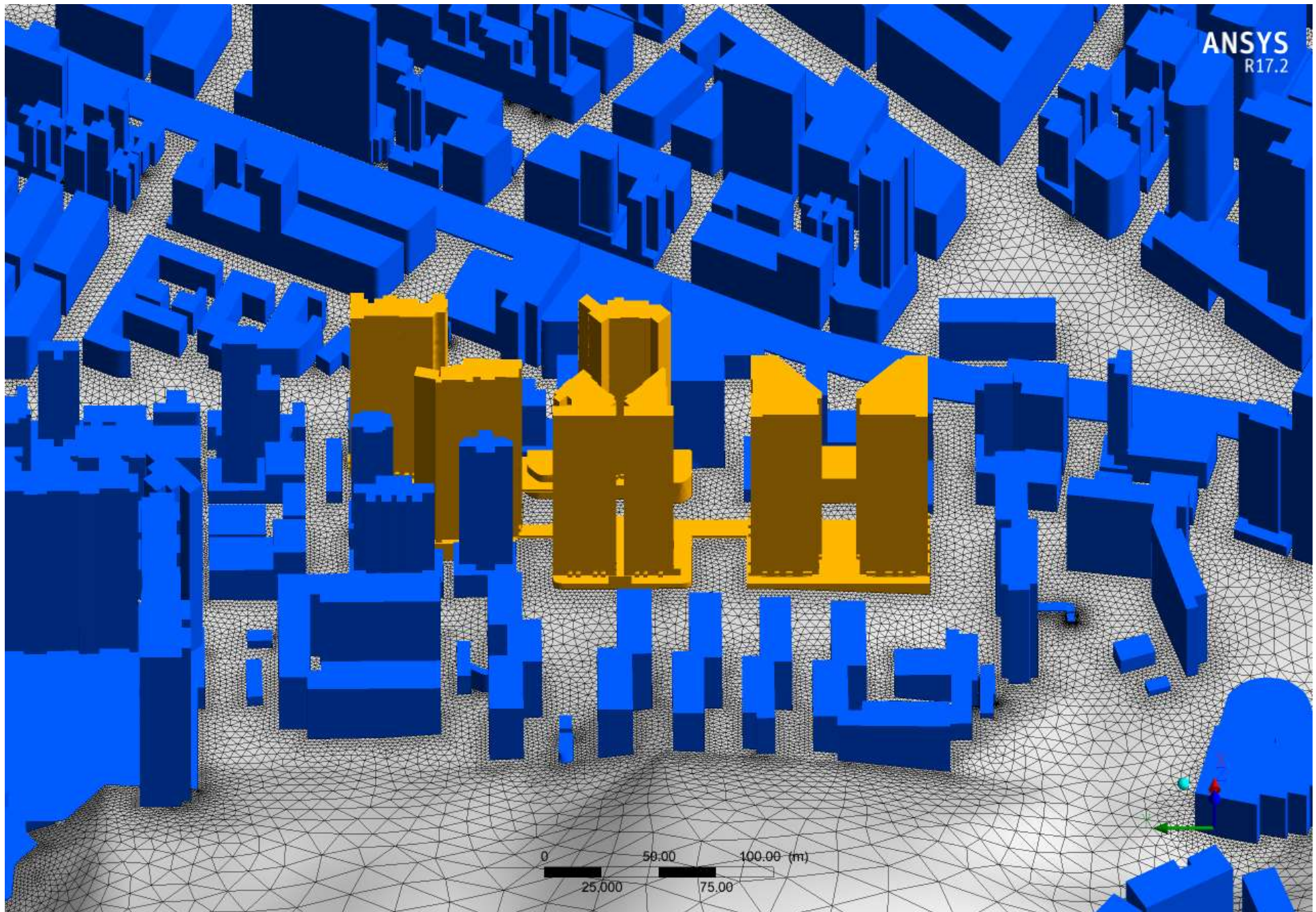
Proposed Scheme - N



Proposed Scheme - E



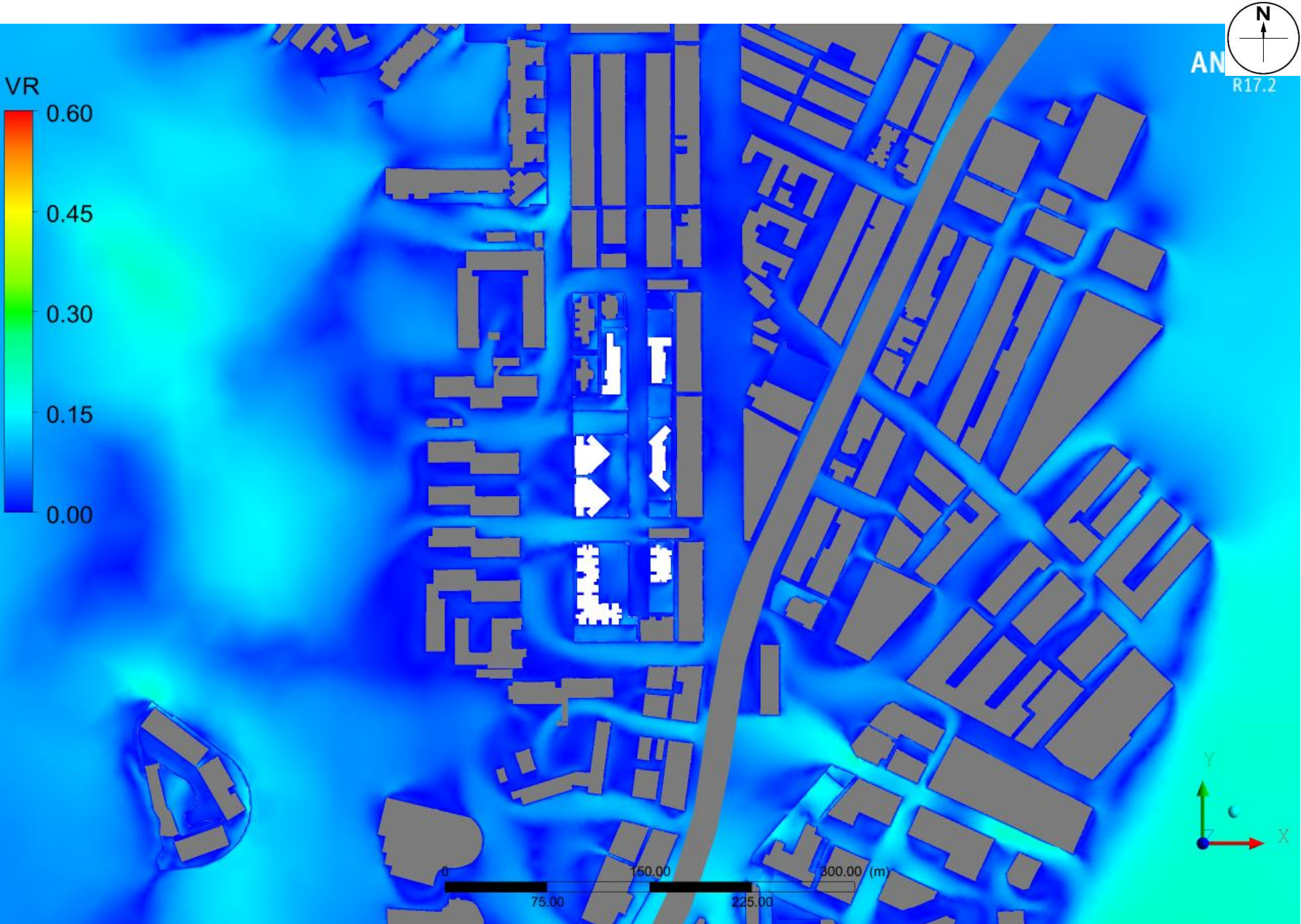
Proposed Scheme - S



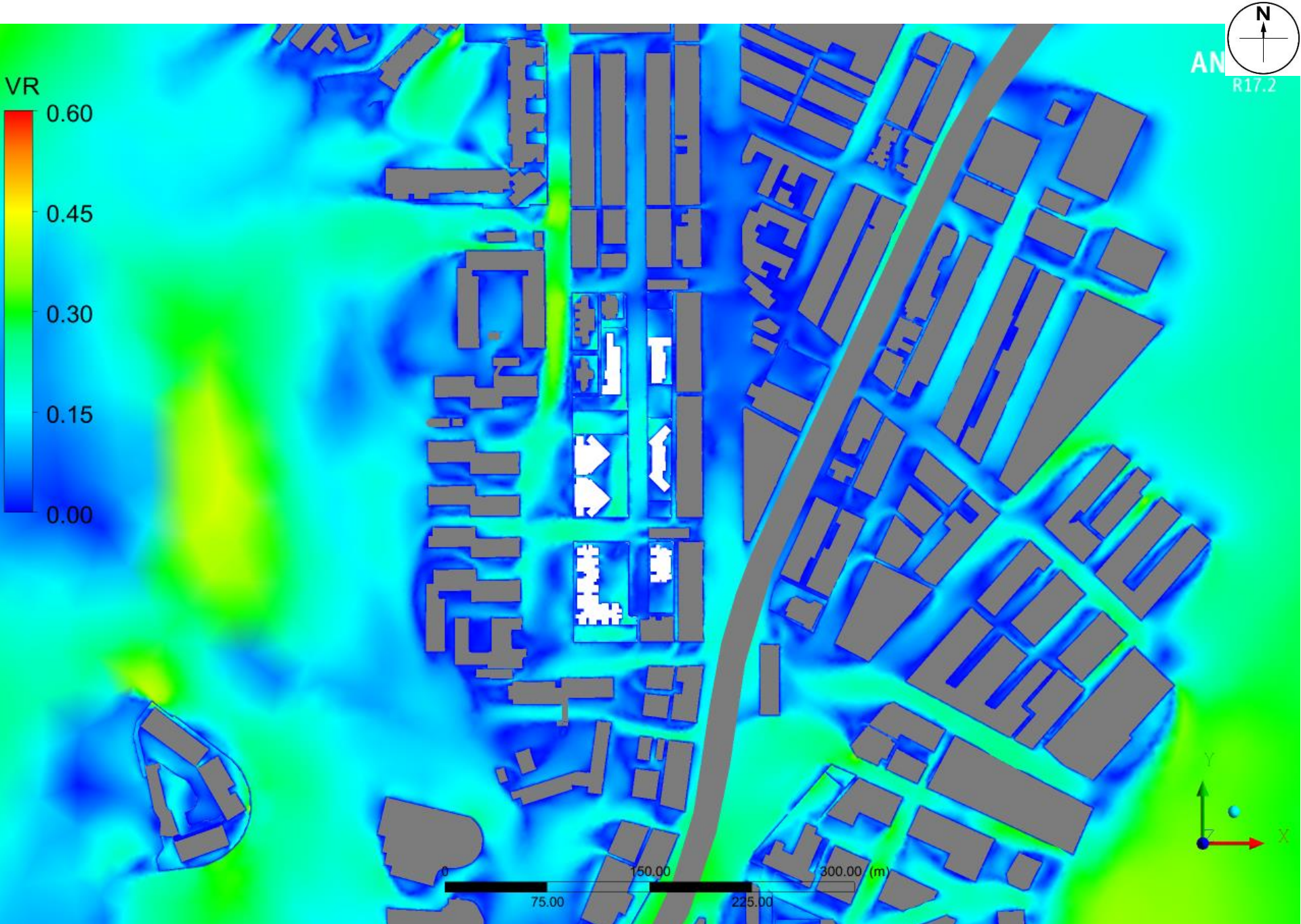
Proposed Scheme - W

Appendix 4

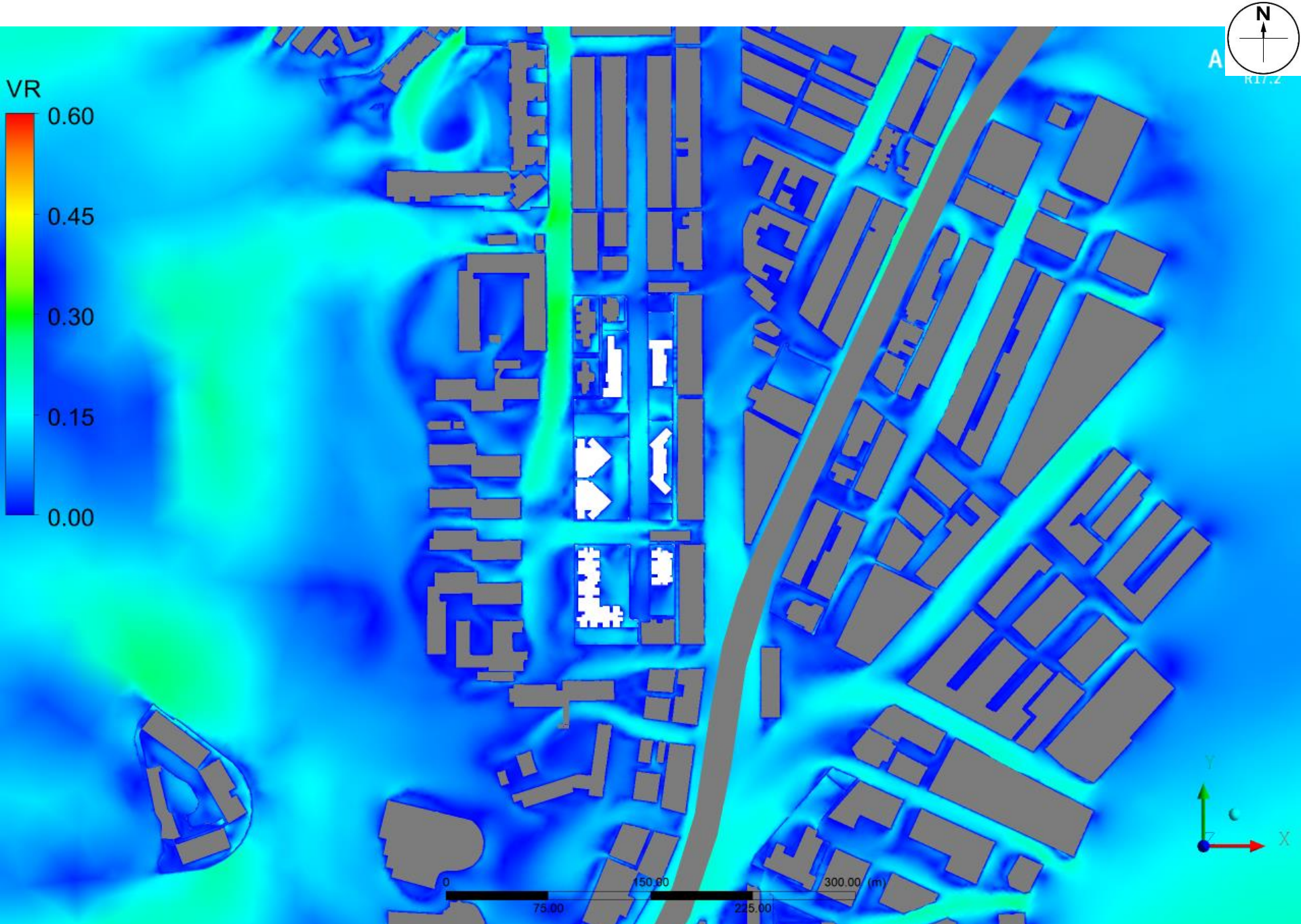
Contour and Vector Plot for CFD Simulation



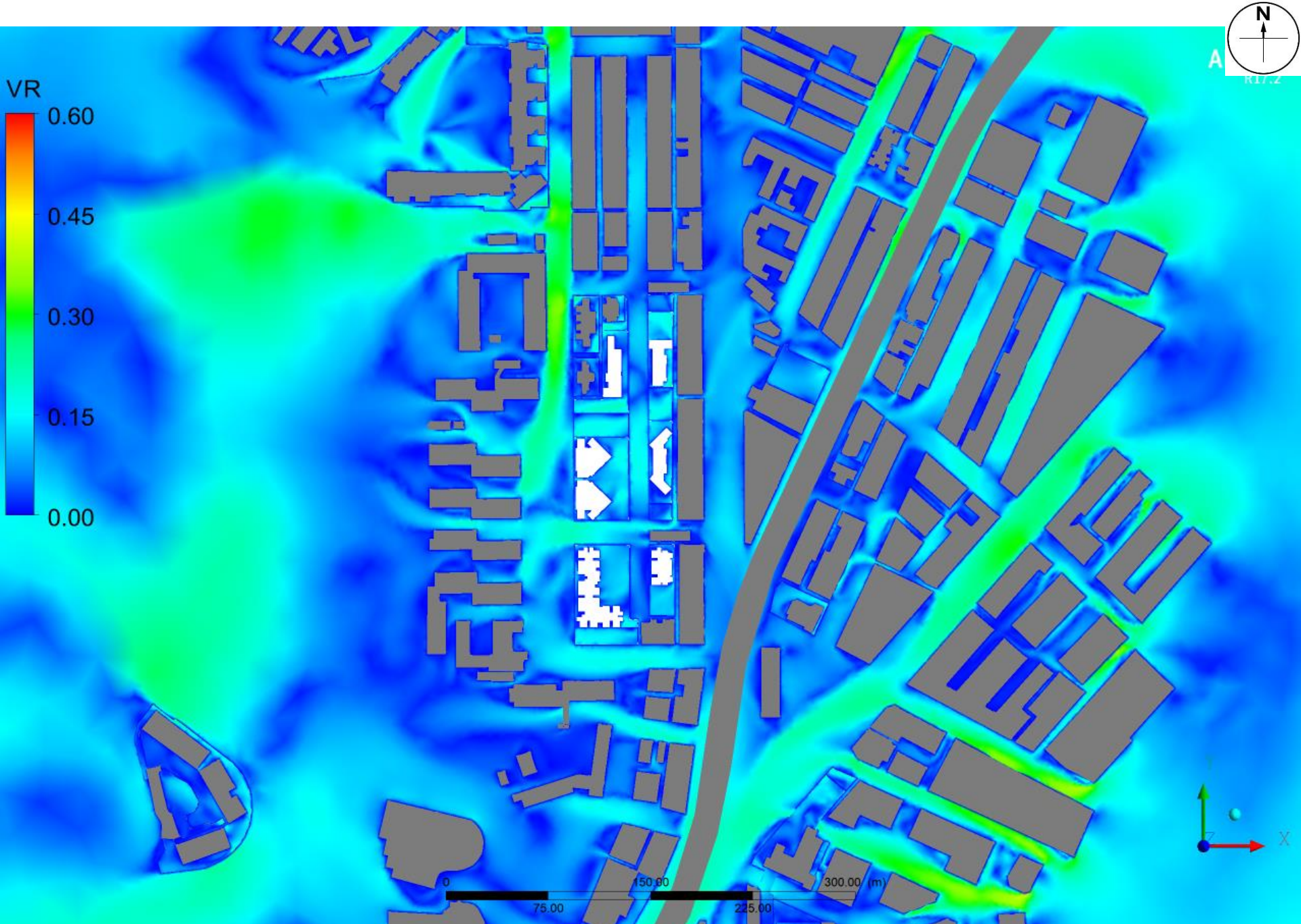
Baseline Scheme - Contour plot at pedestrian level under NNE Wind



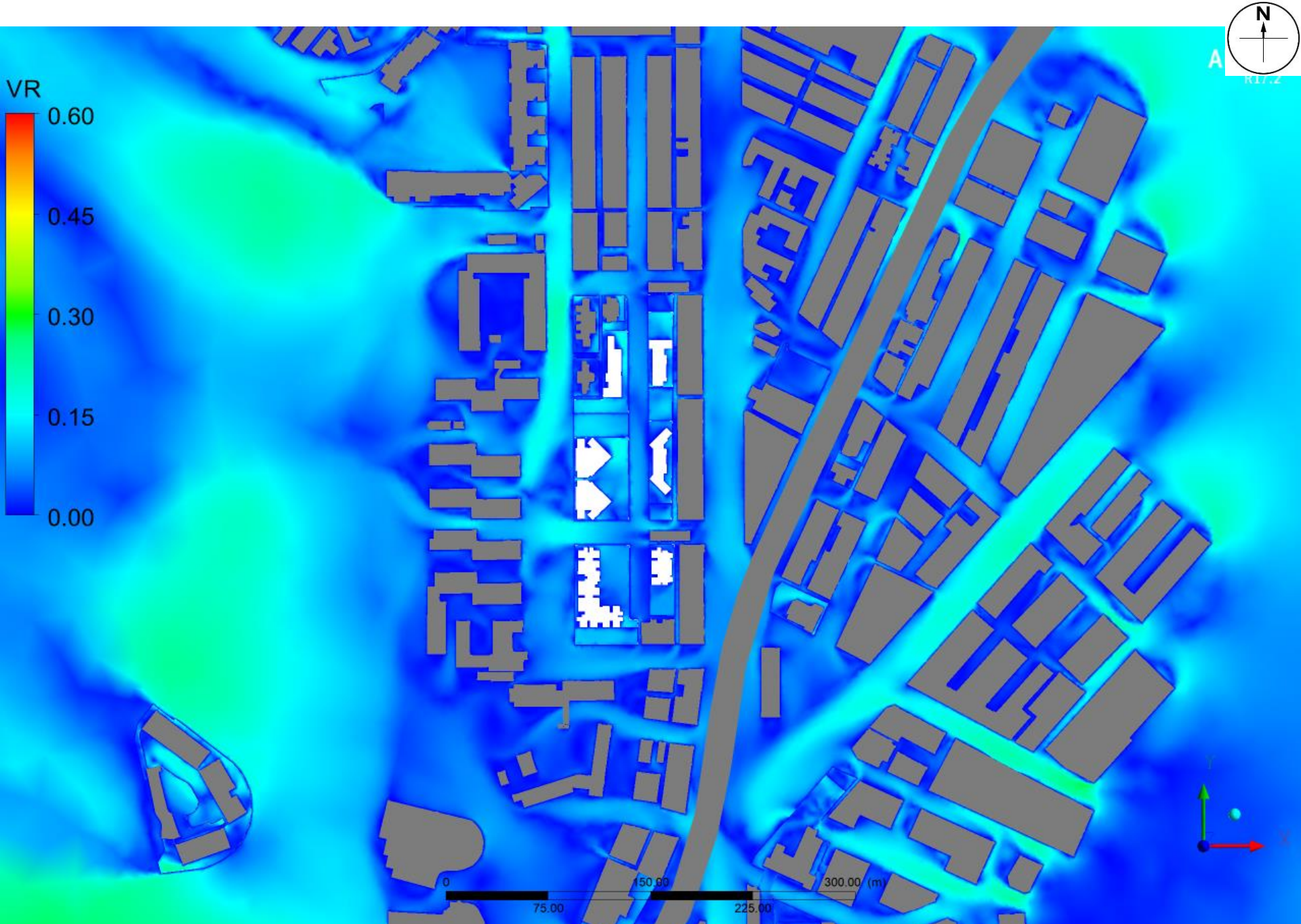
Baseline Scheme - Contour plot at pedestrian level under NE Wind



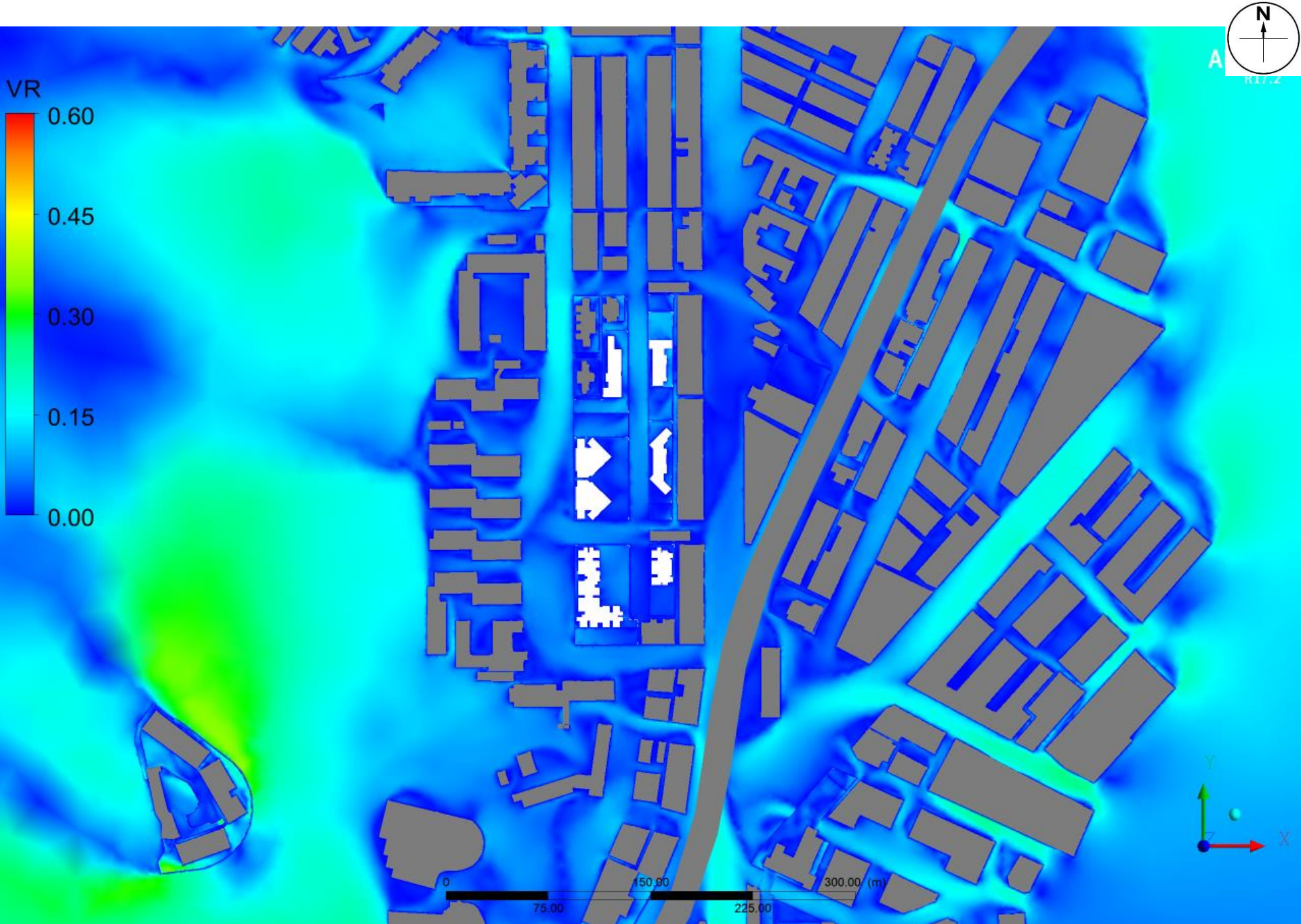
Baseline Scheme - Contour plot at pedestrian level under ENE Wind



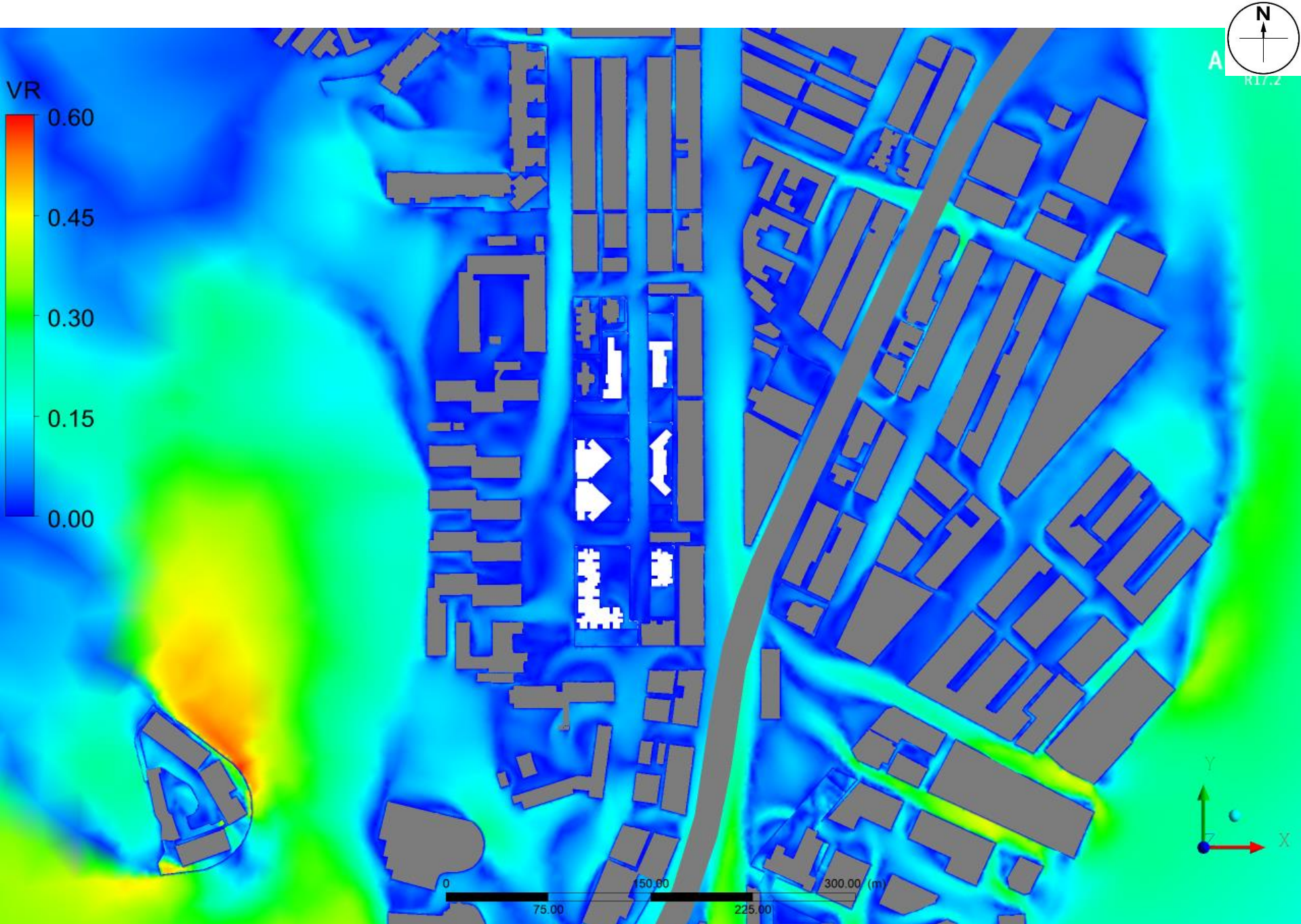
Baseline Scheme - Contour plot at pedestrian level under E Wind



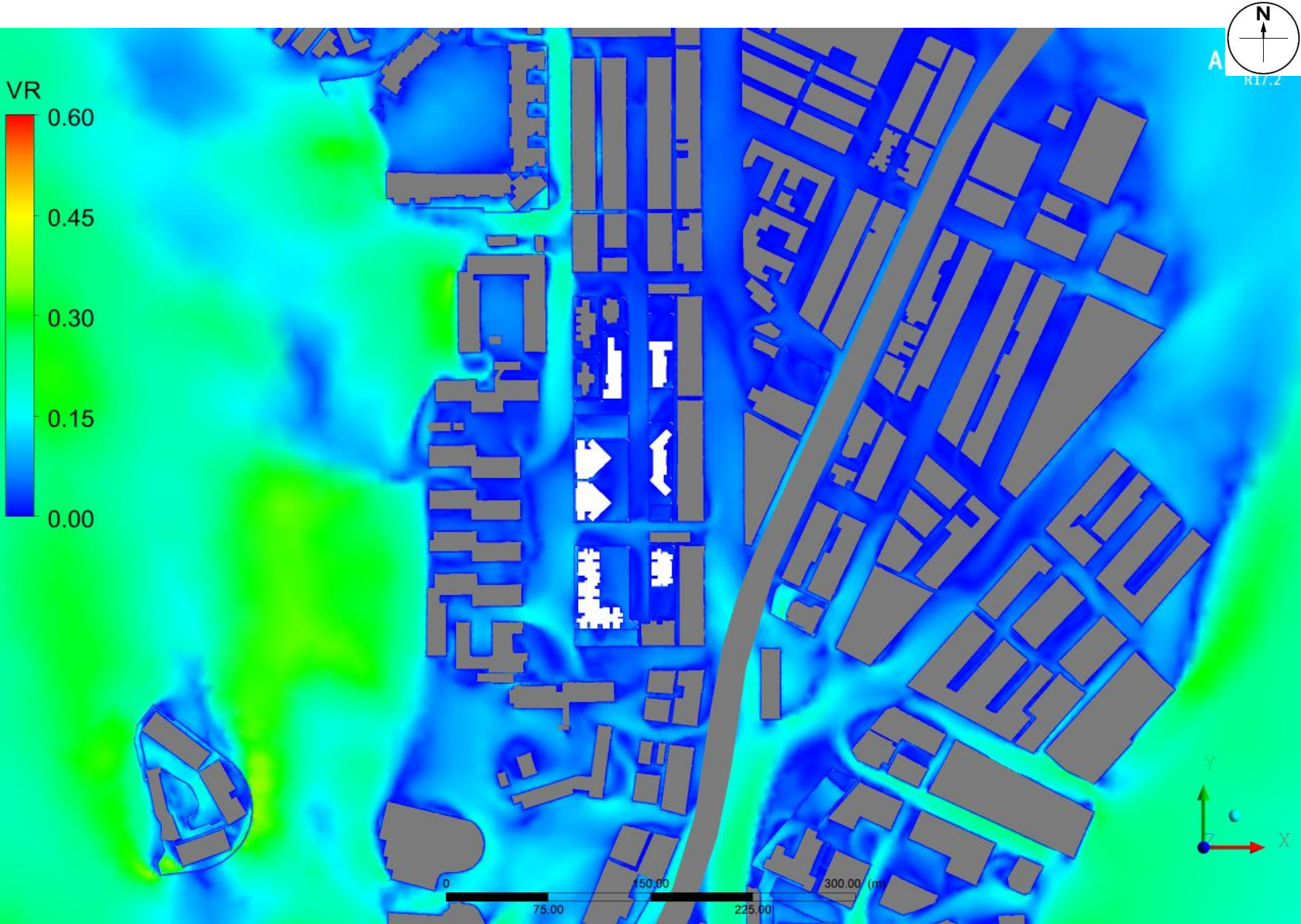
Baseline Scheme - Contour plot at pedestrian level under ESE Wind



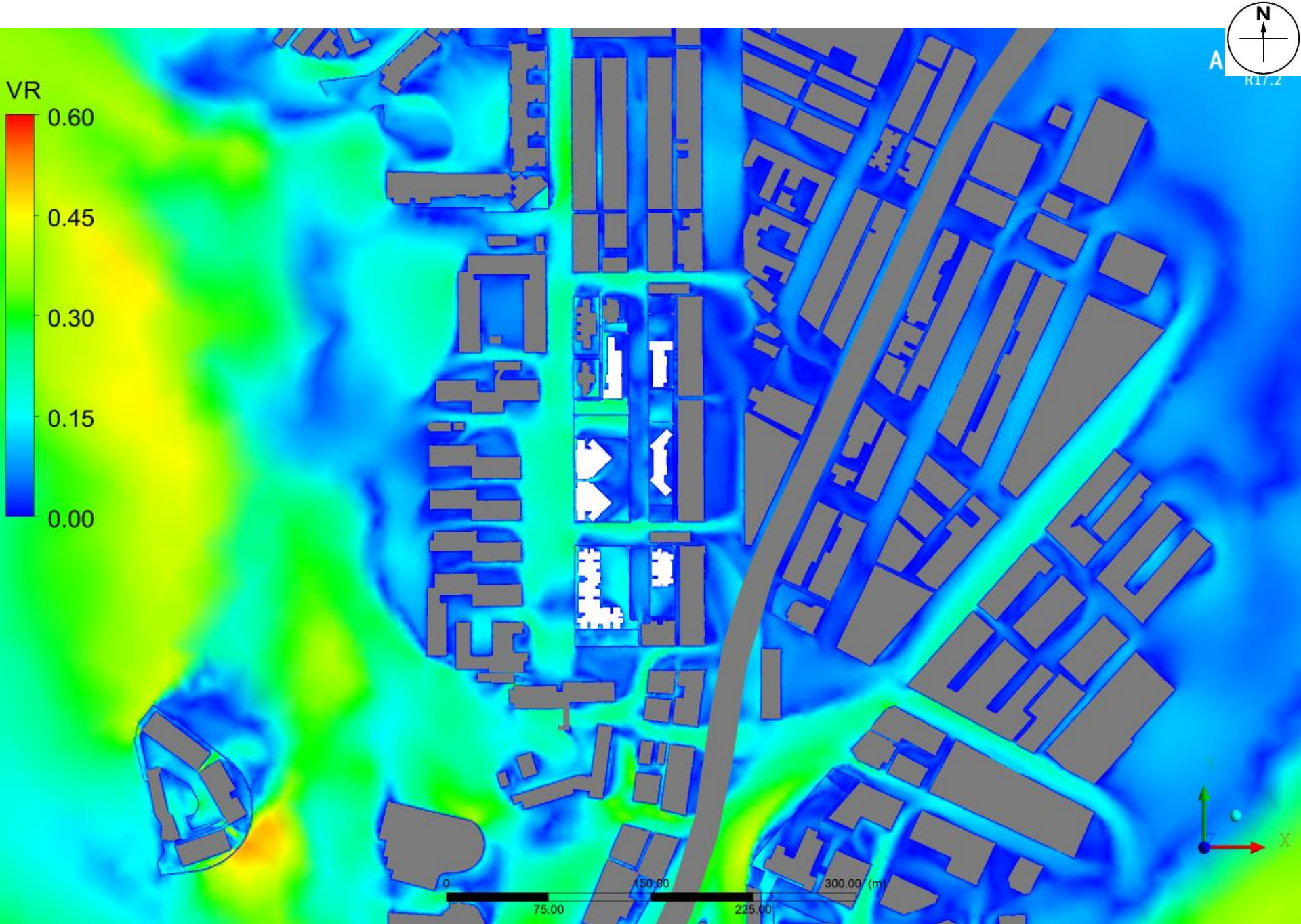
Baseline Scheme - Contour plot at pedestrian level under SE Wind



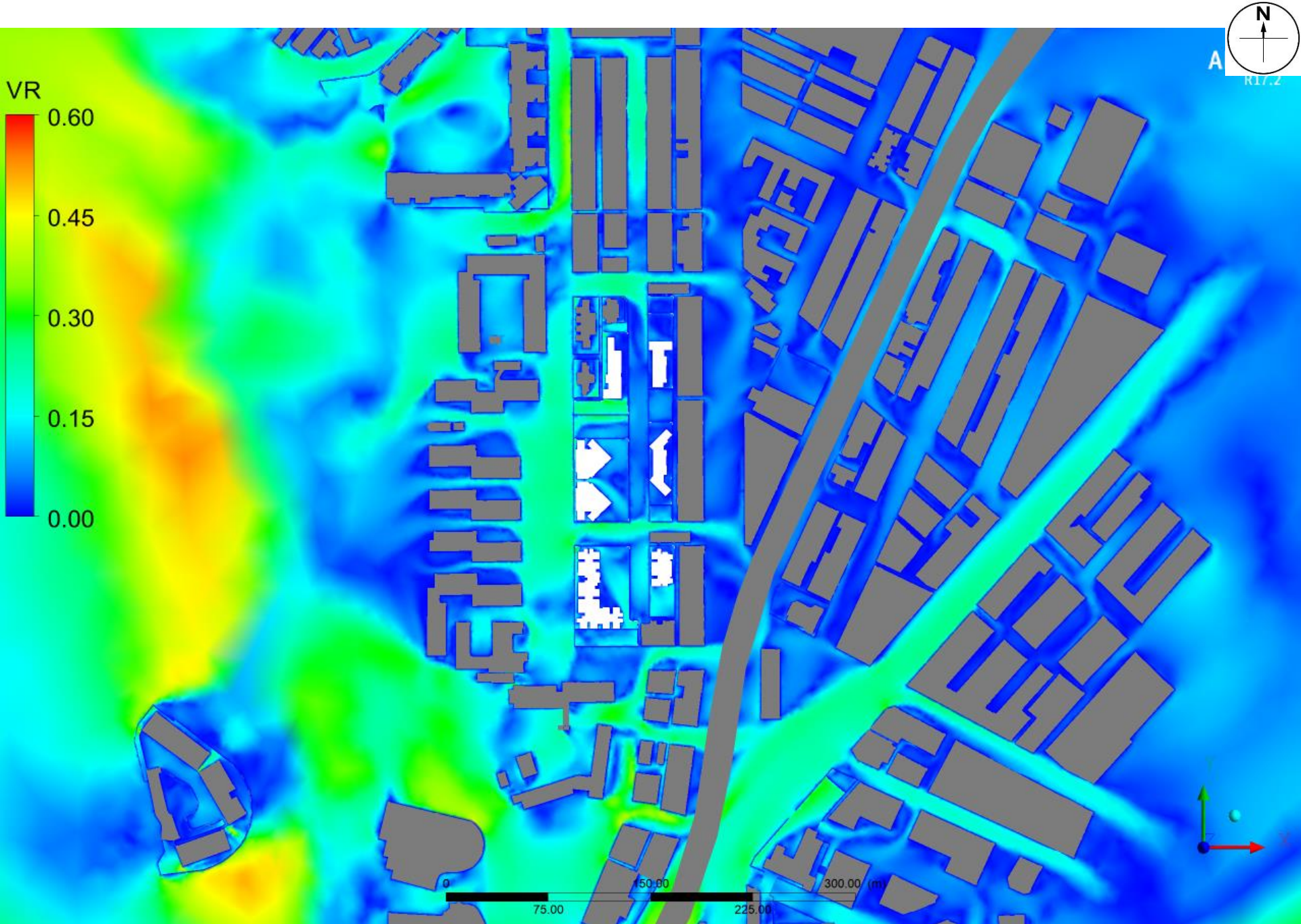
Baseline Scheme - Contour plot at pedestrian level under SSE Wind



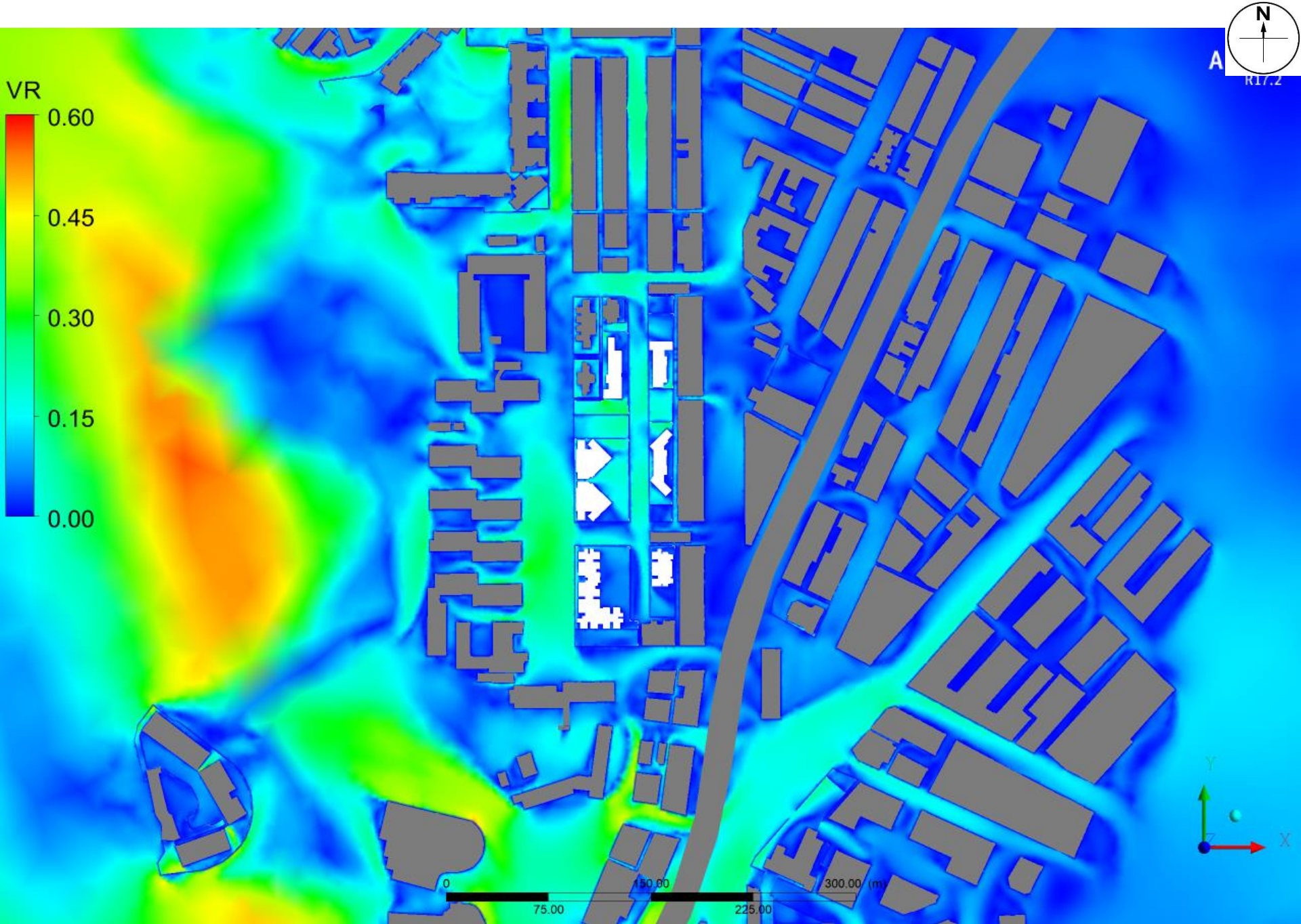
Baseline Scheme - Contour plot at pedestrian level under S Wind



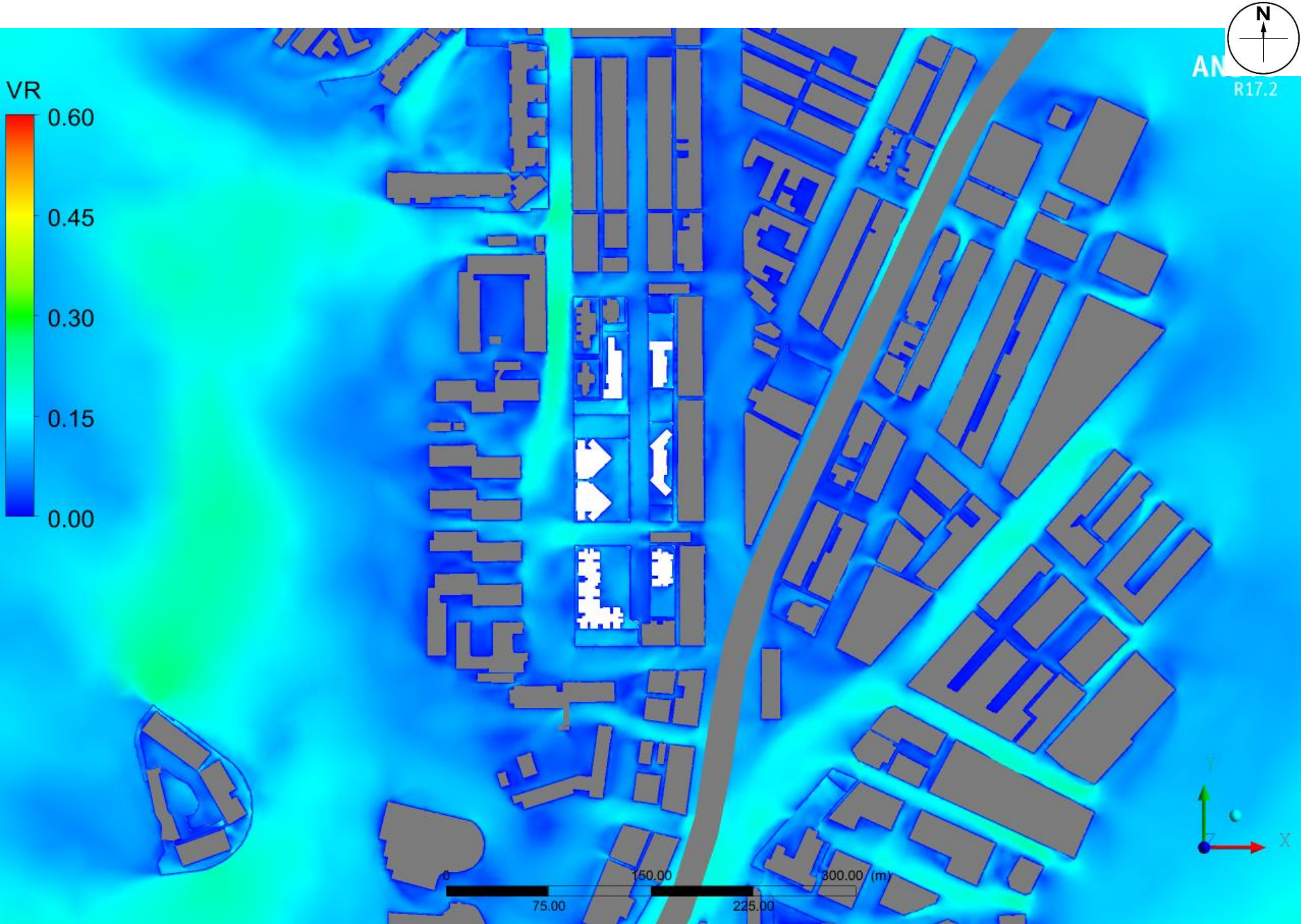
Baseline Scheme - Contour plot at pedestrian level under SSW Wind



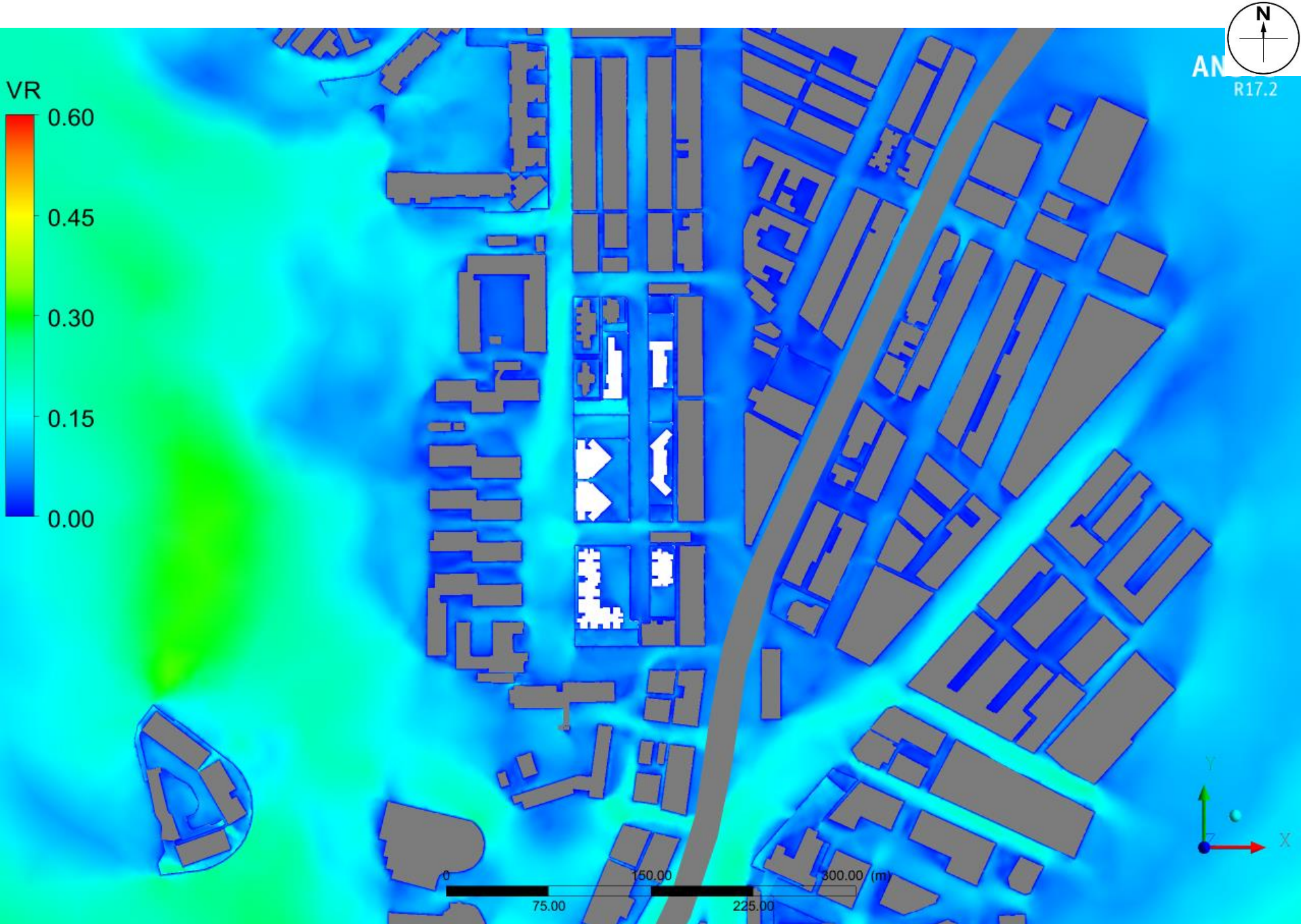
Baseline Scheme - Contour plot at pedestrian level under SW Wind

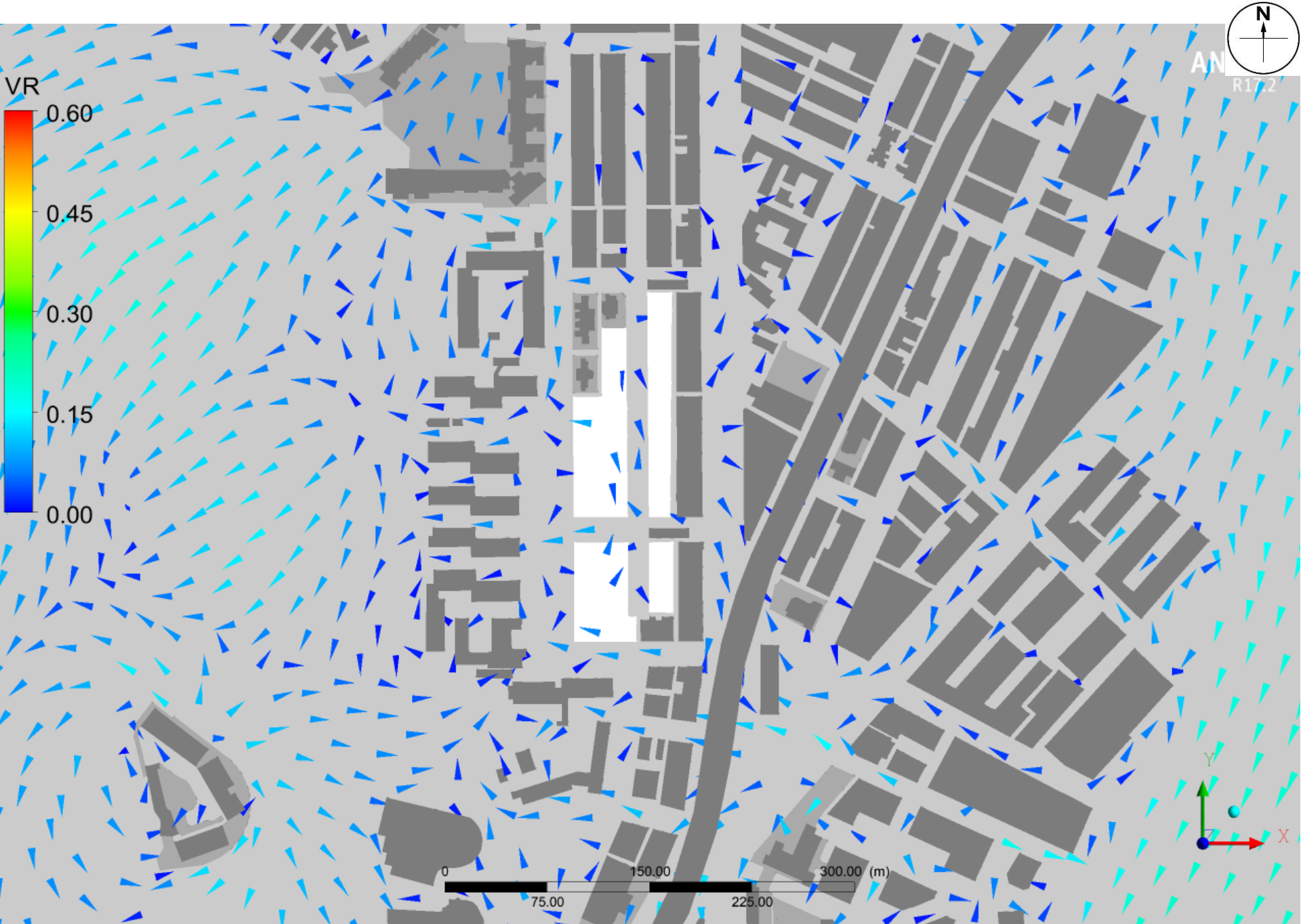


Baseline Scheme - Contour plot at pedestrian level under WSW Wind

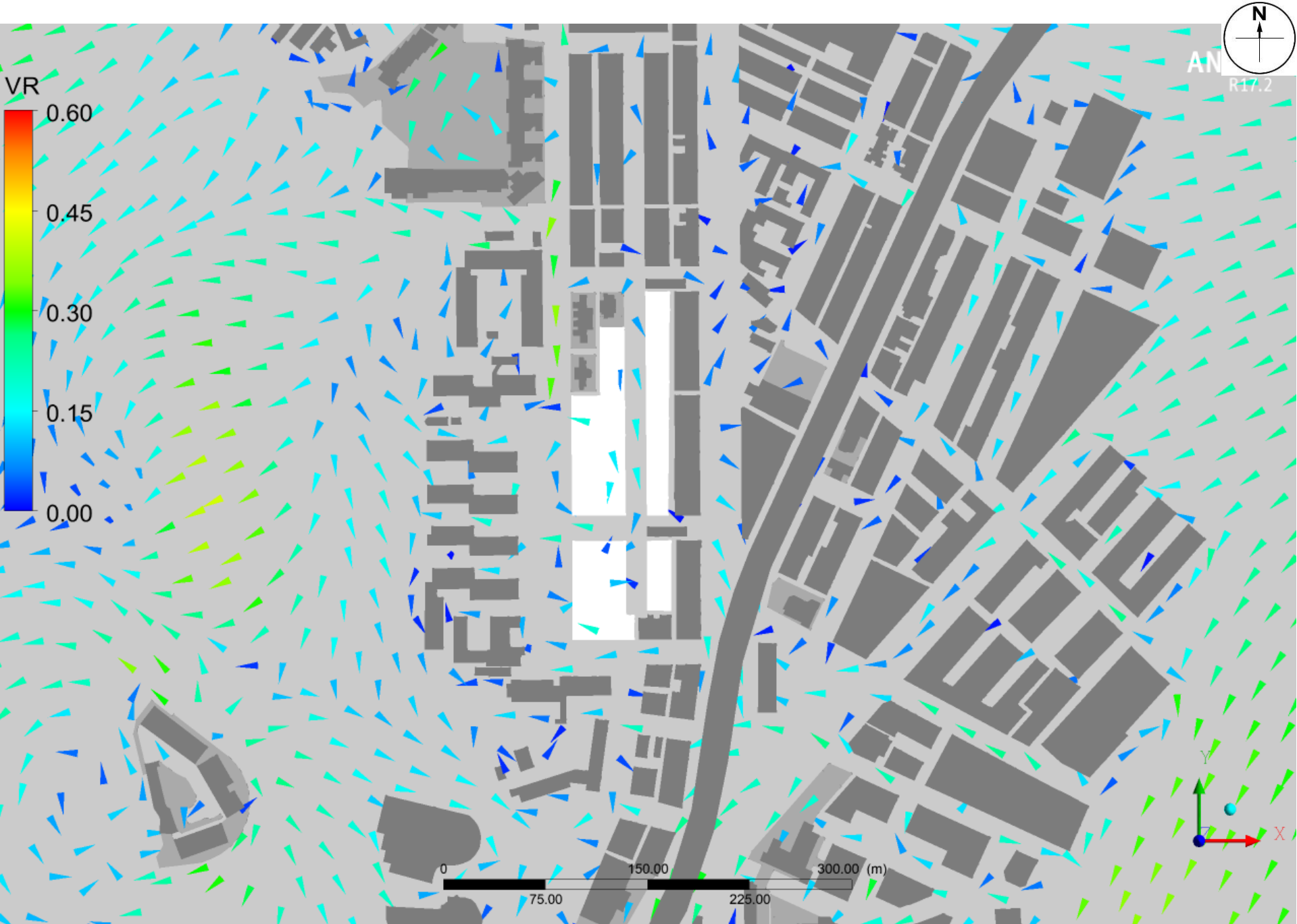


Baseline Scheme - Annual weighted wind speed colour at pedestrian level

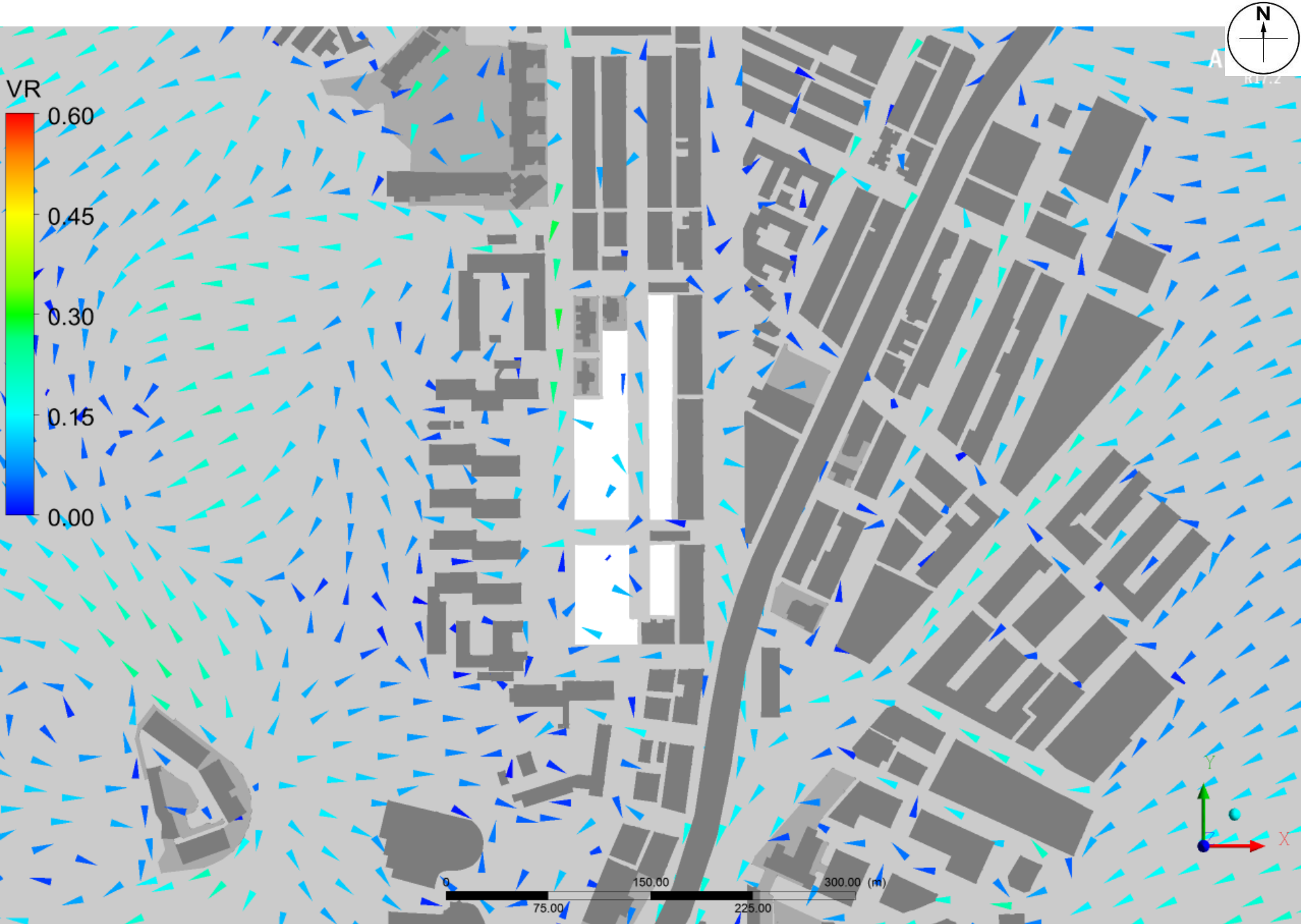




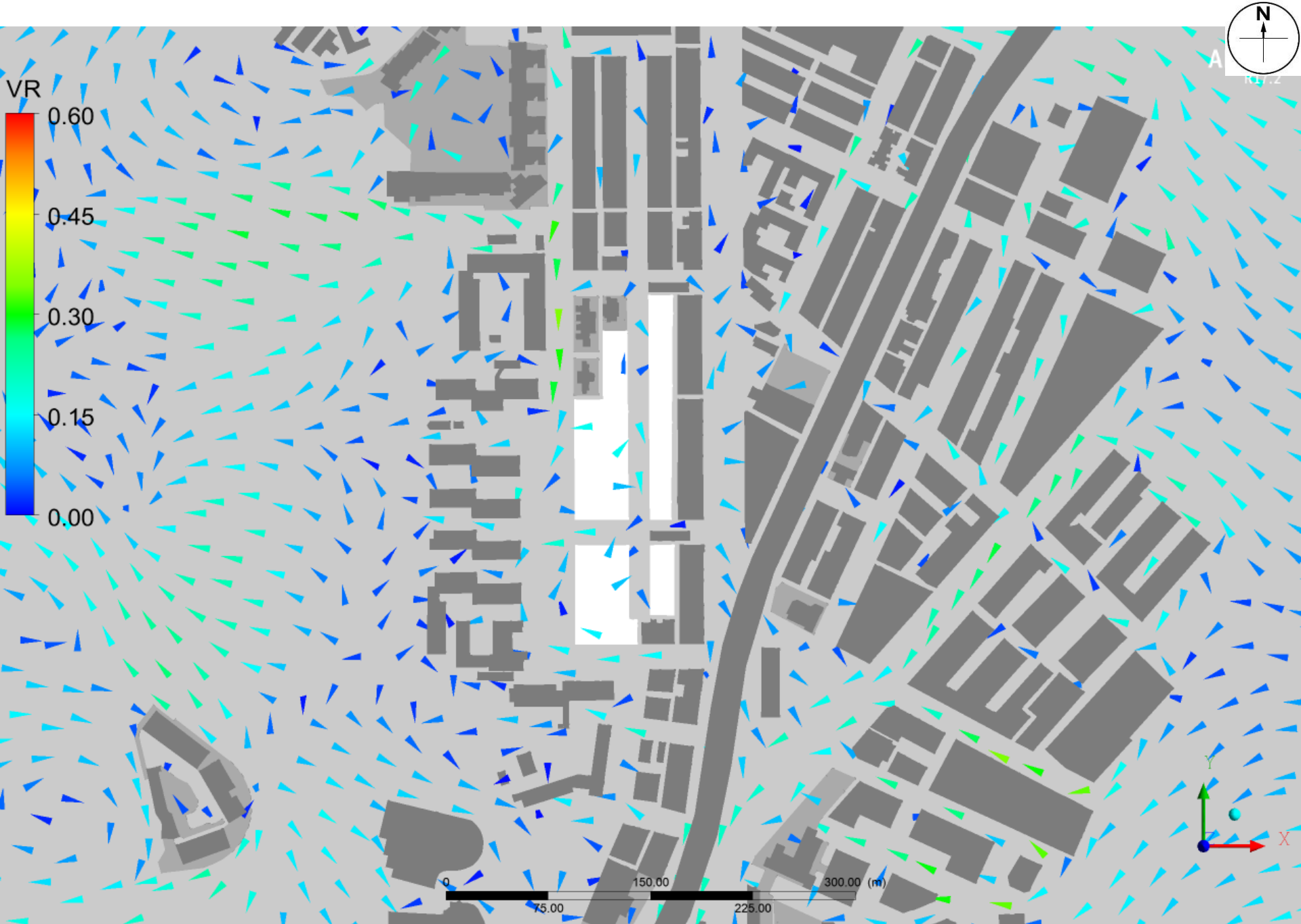
Baseline Scheme - Vector plot at pedestrian level under NNE Wind



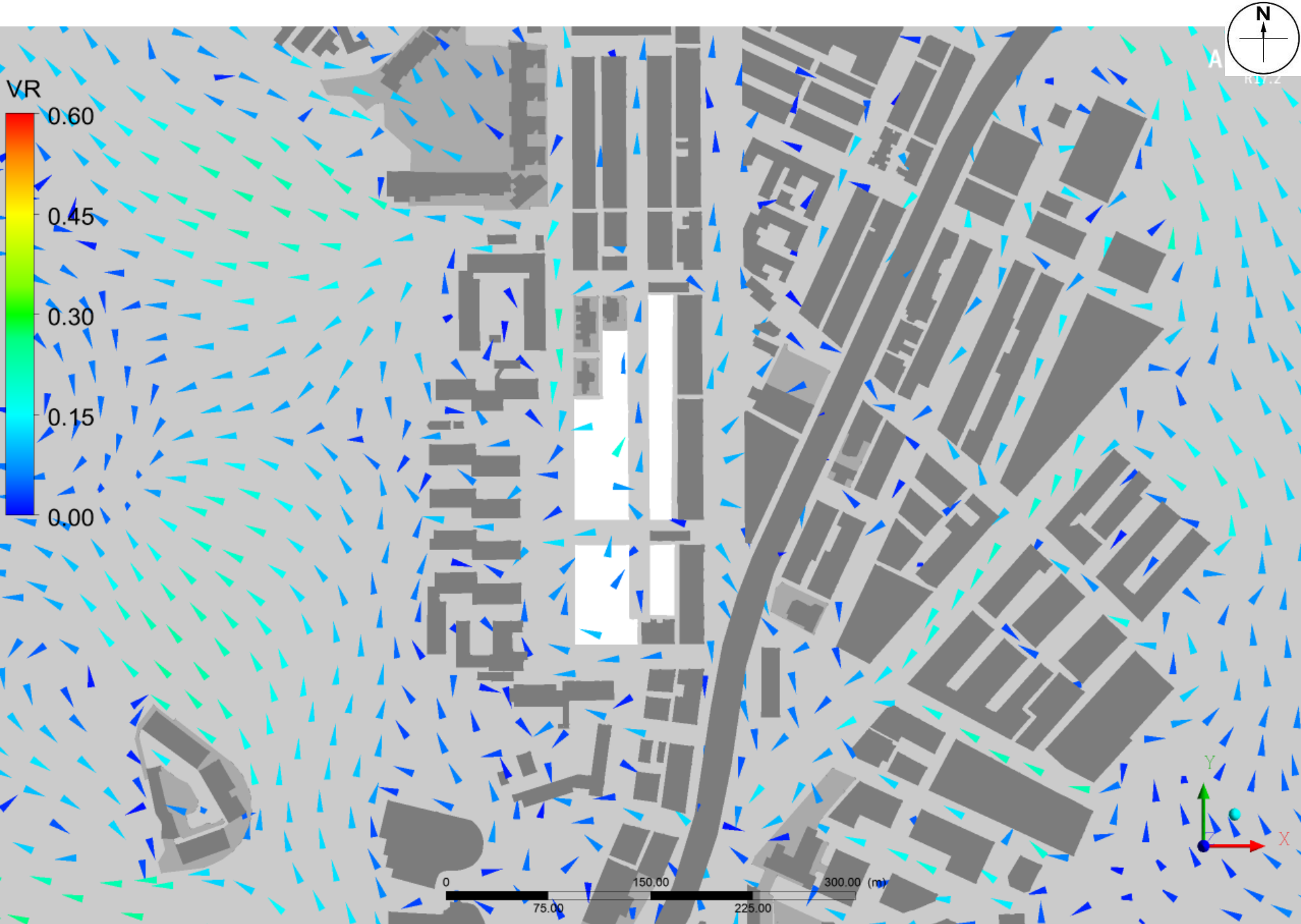
Baseline Scheme - Vector plot at pedestrian level under NE Wind



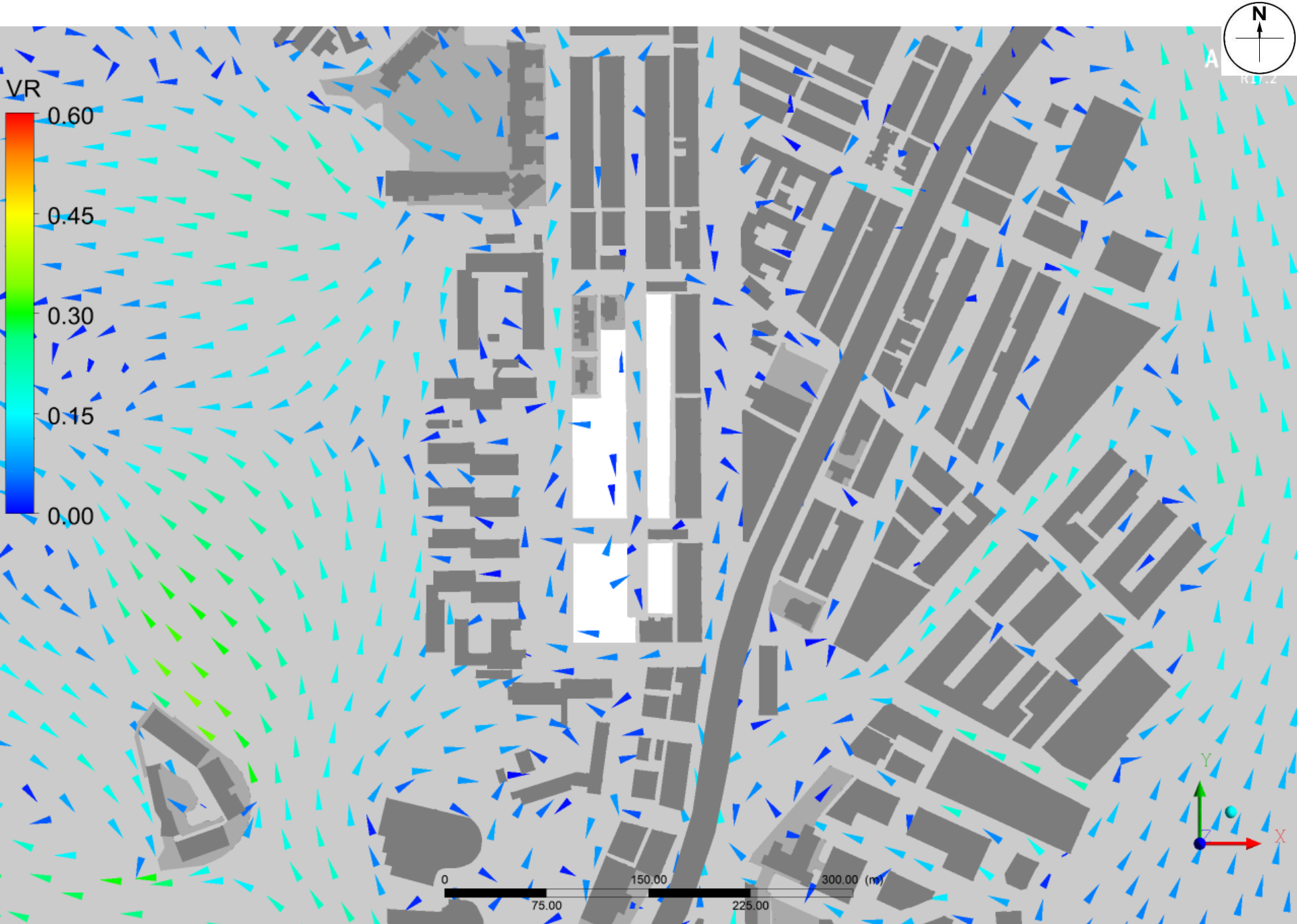
Baseline Scheme - Vector plot at pedestrian level under ENE Wind



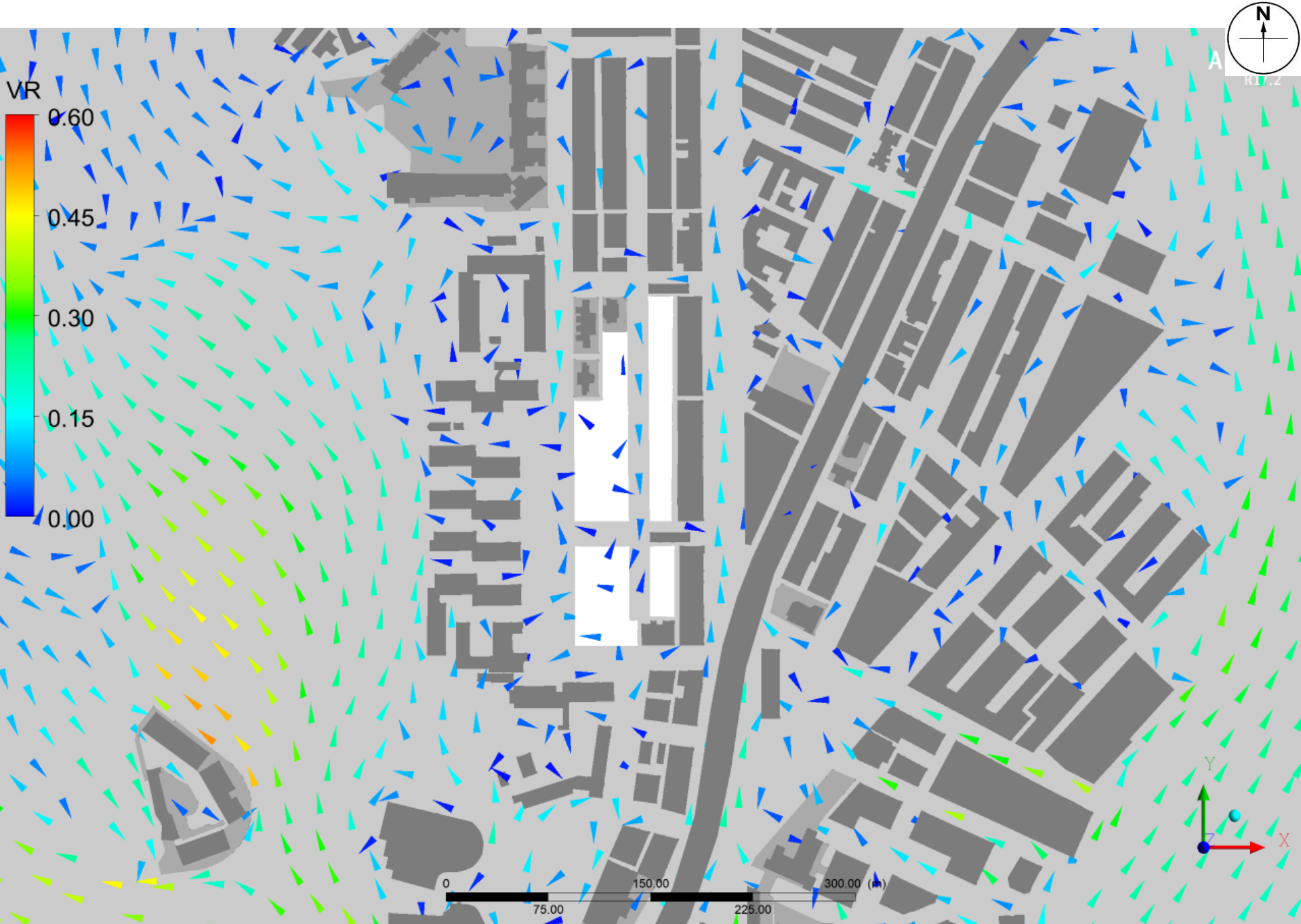
Baseline Scheme - Vector plot at pedestrian level under E Wind



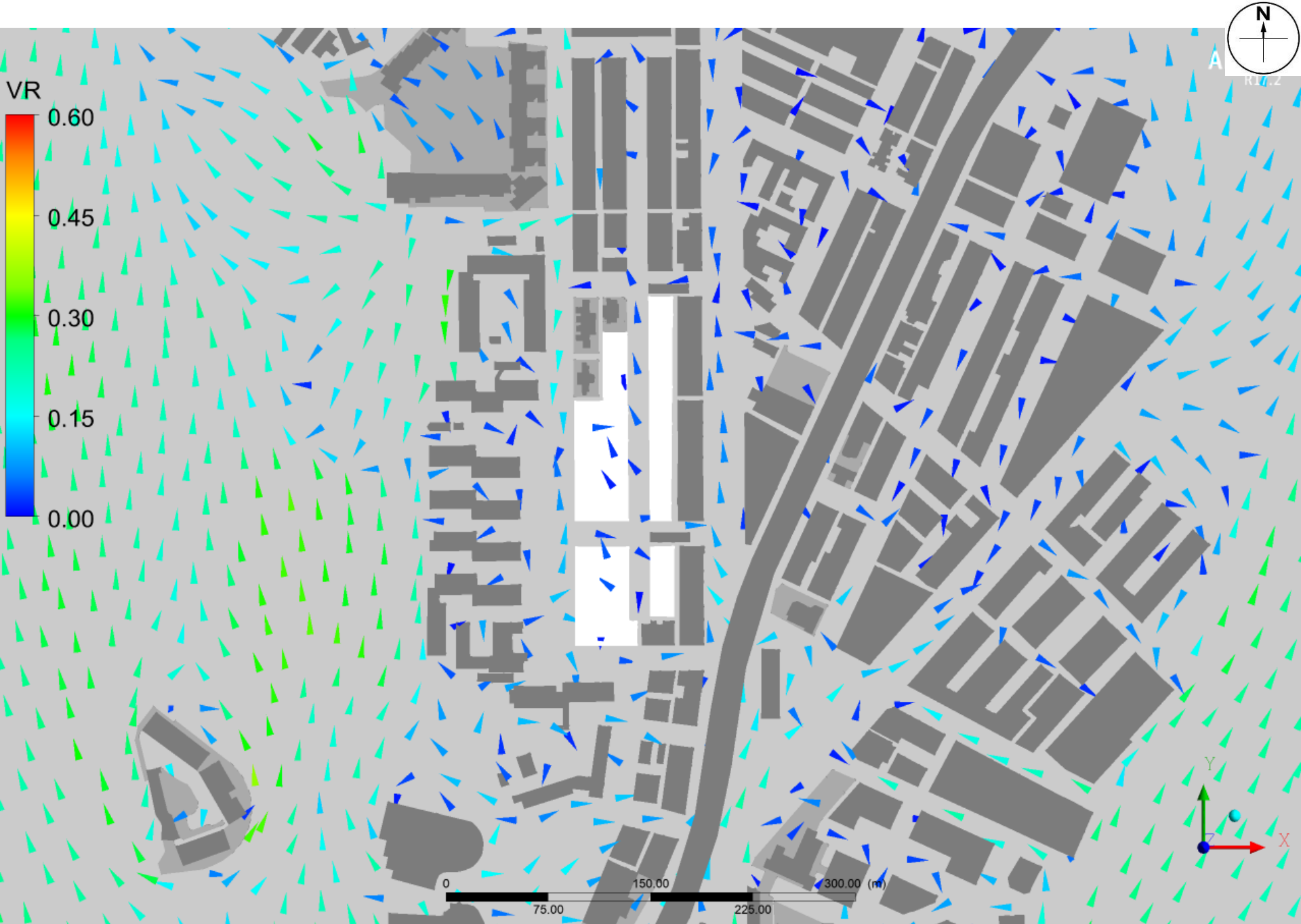
Baseline Scheme - Vector plot at pedestrian level under ESE Wind



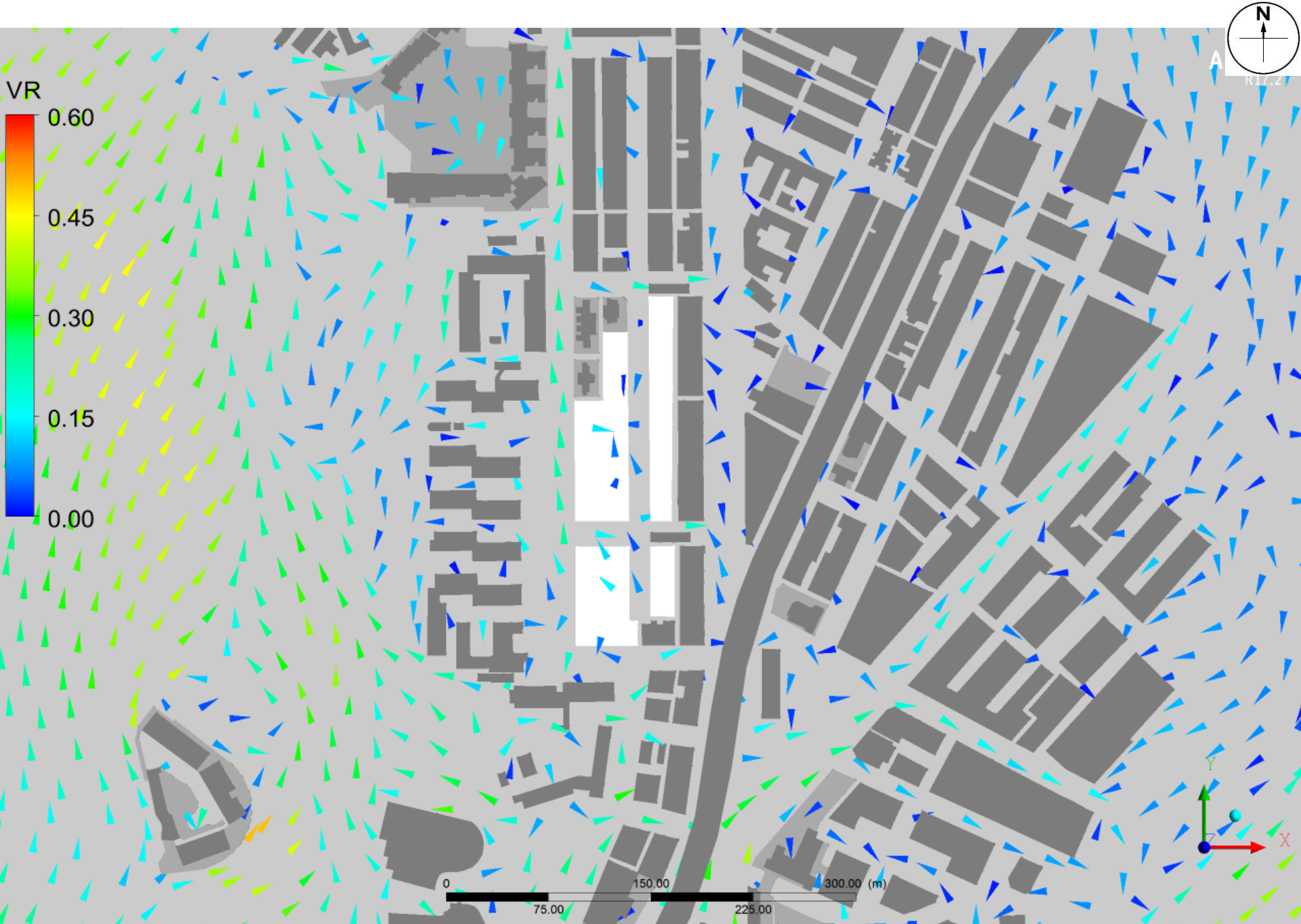
Baseline Scheme - Vector plot at pedestrian level under SE Wind



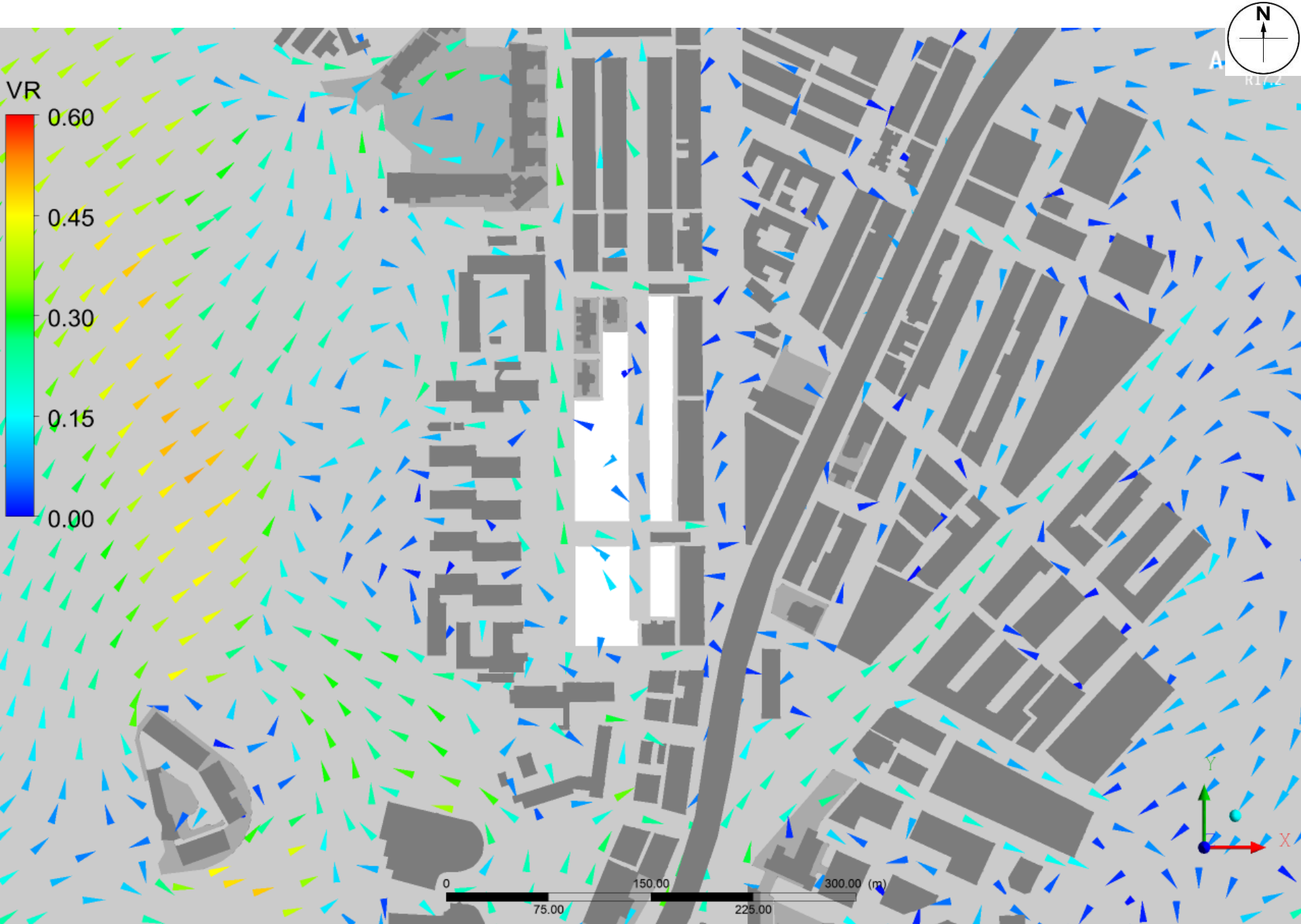
Baseline Scheme - Vector plot at pedestrian level under SSE Wind



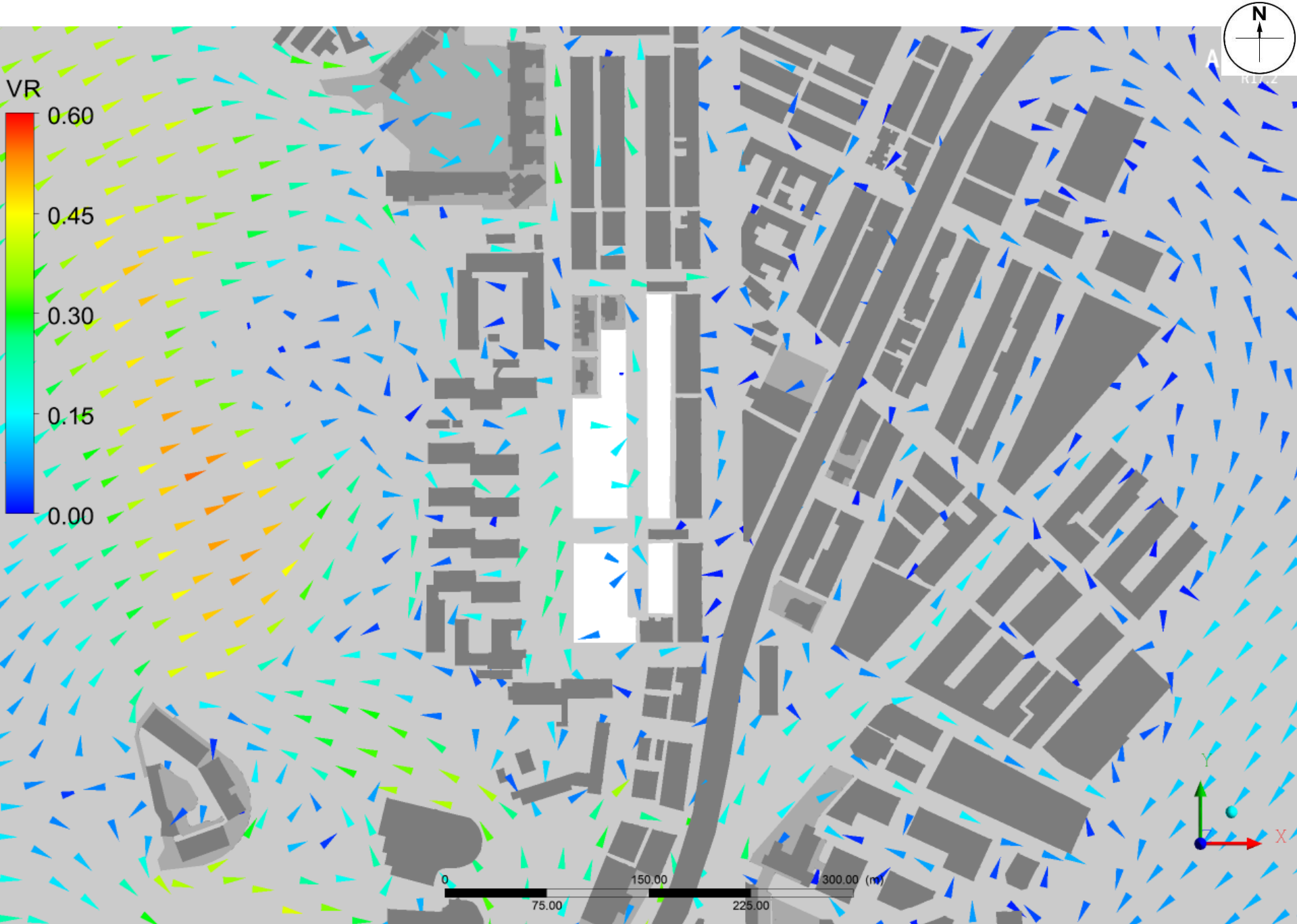
Baseline Scheme - Vector plot at pedestrian level under S Wind



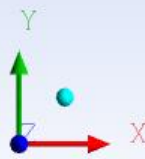
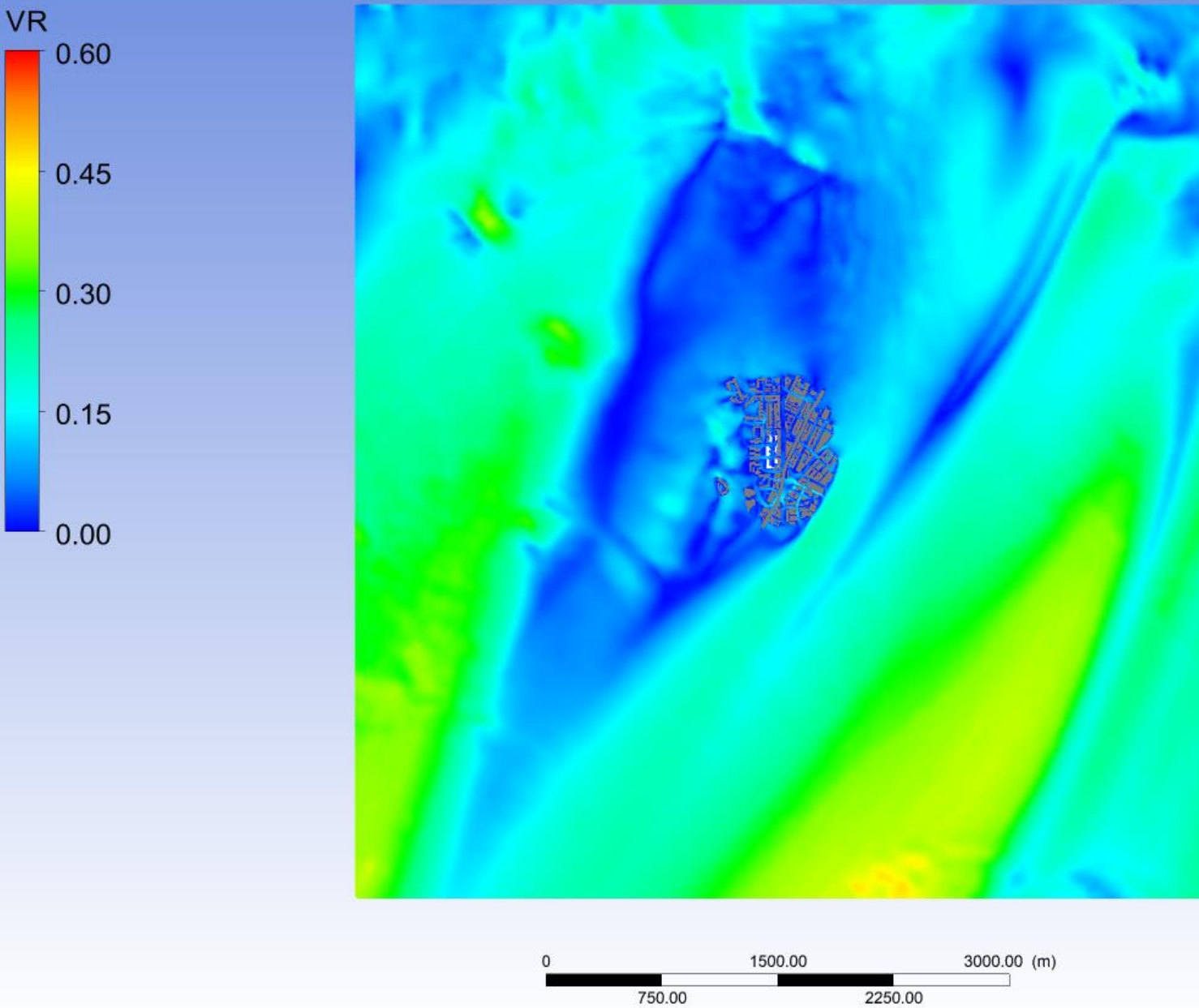
Baseline Scheme - Vector plot at pedestrian level under SSW Wind



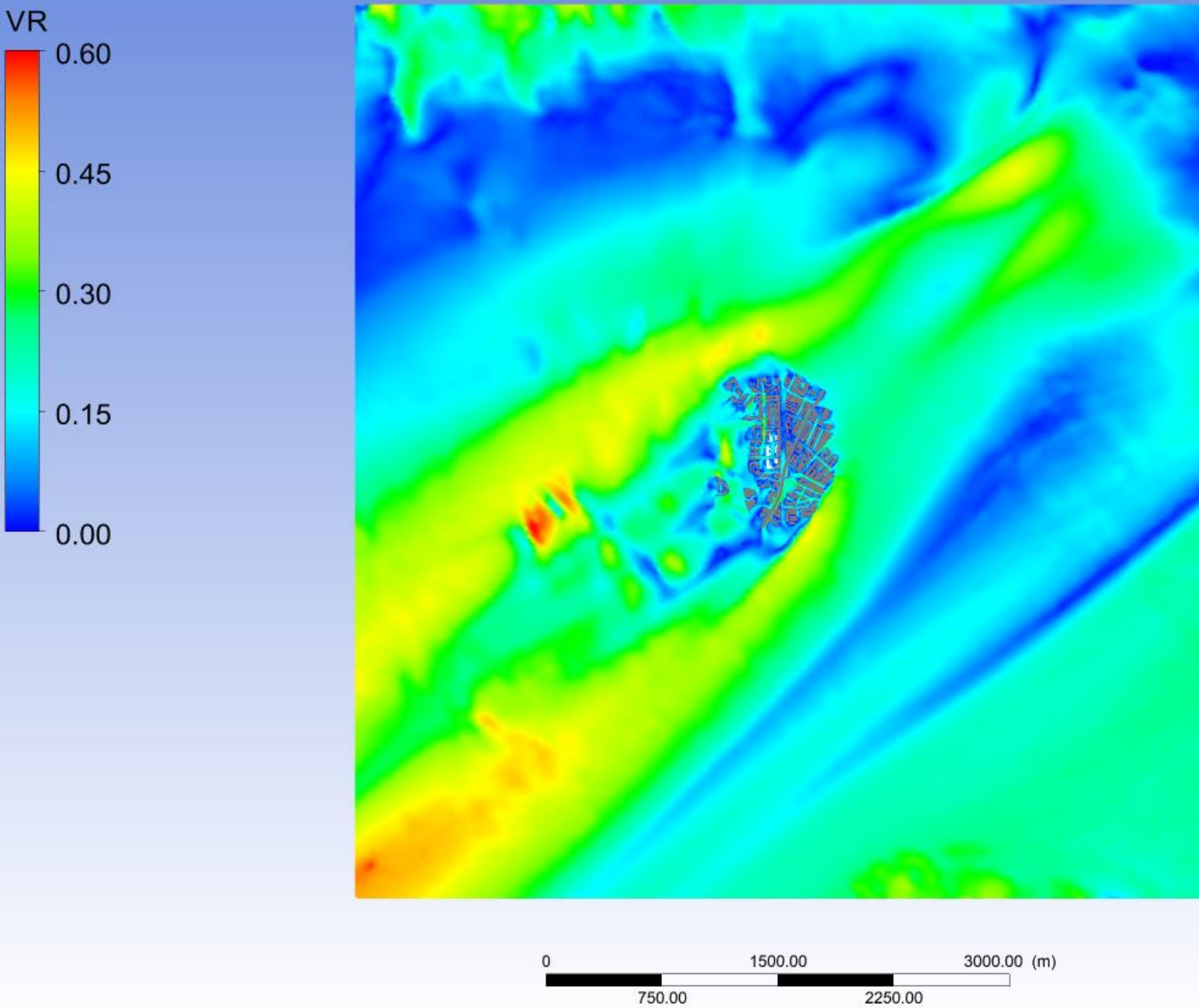
Baseline Scheme - Vector plot at pedestrian level under SW Wind



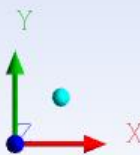
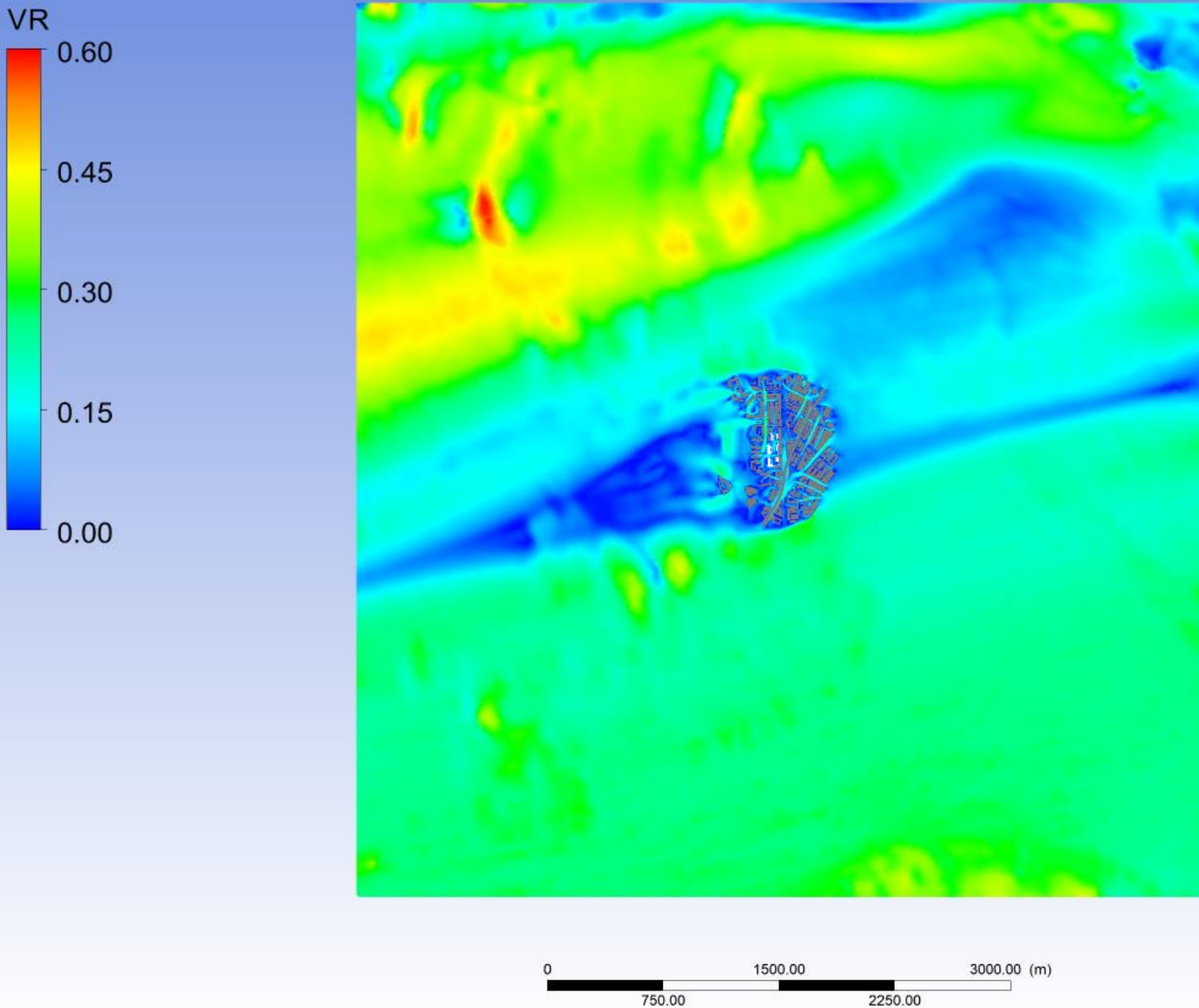
Baseline Scheme - Vector plot at pedestrian level under WSW Wind



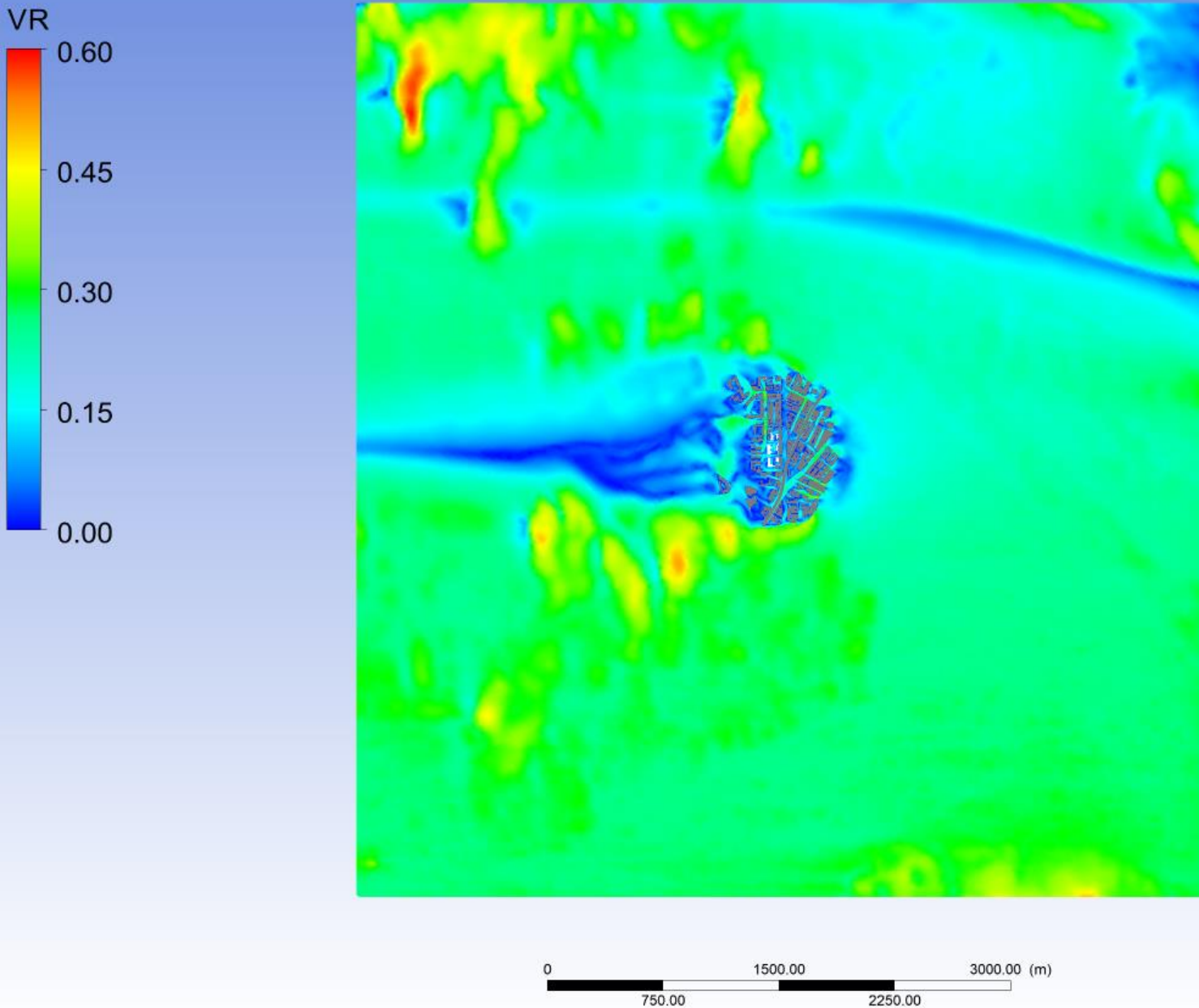
Baseline Scheme - Domain Contour plot at pedestrian level under NNE Wind



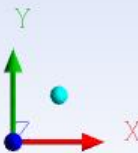
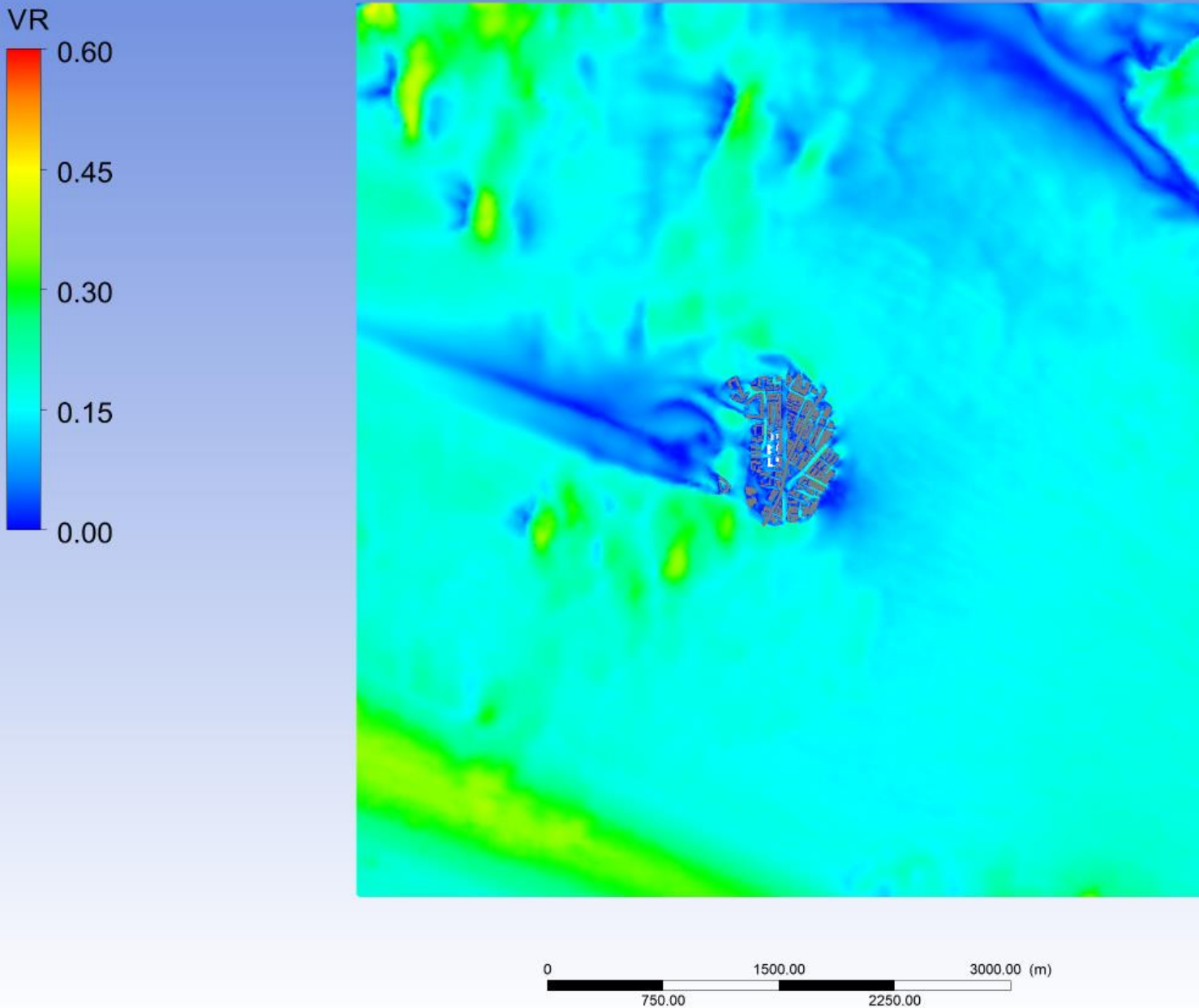
Baseline Scheme - Domain Contour plot at pedestrian level under NE Wind



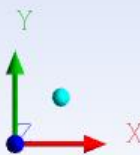
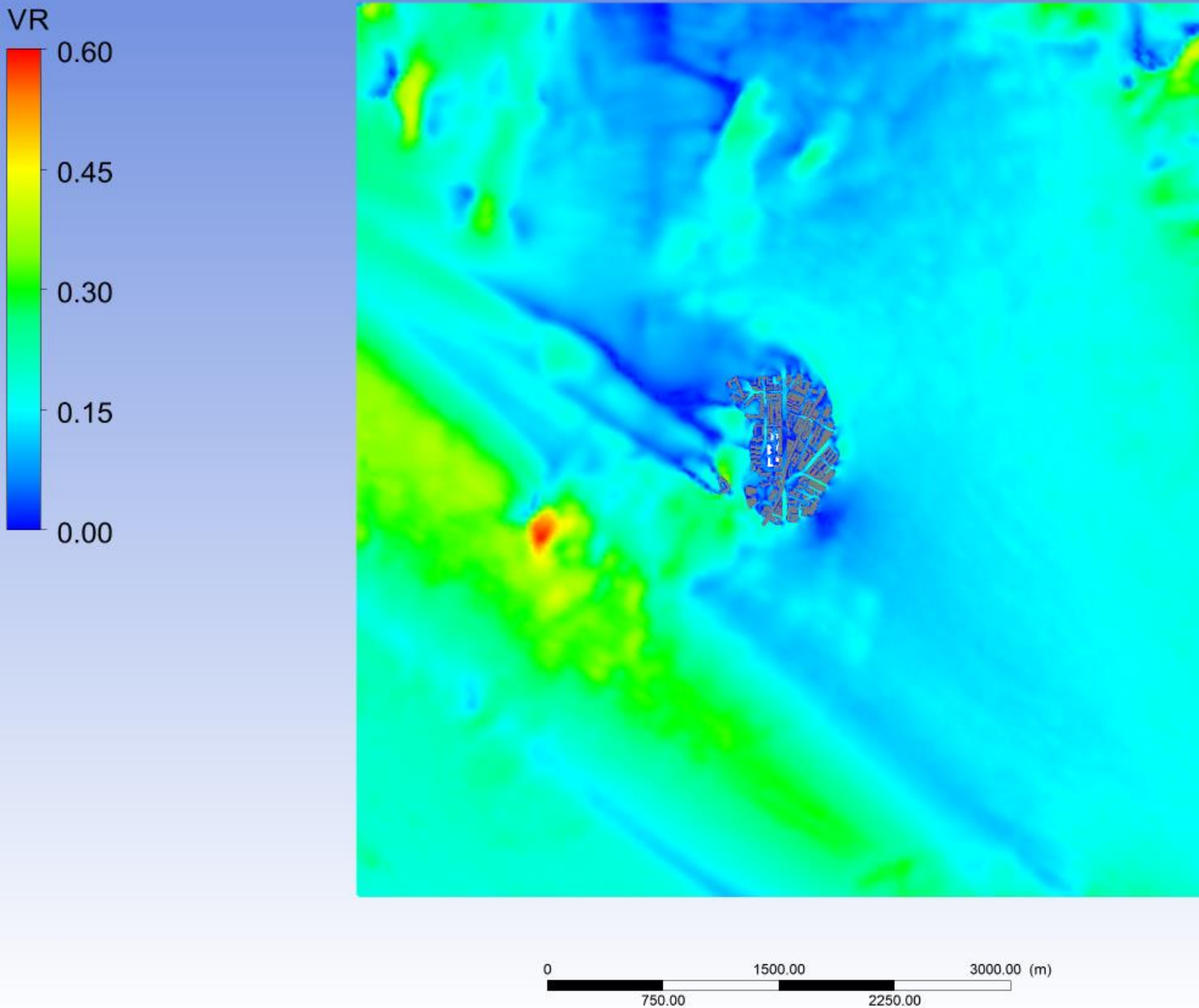
Baseline Scheme - Domain Contour plot at pedestrian level under ENE Wind



Baseline Scheme - Domain Contour plot at pedestrian level under E Wind

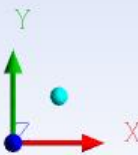
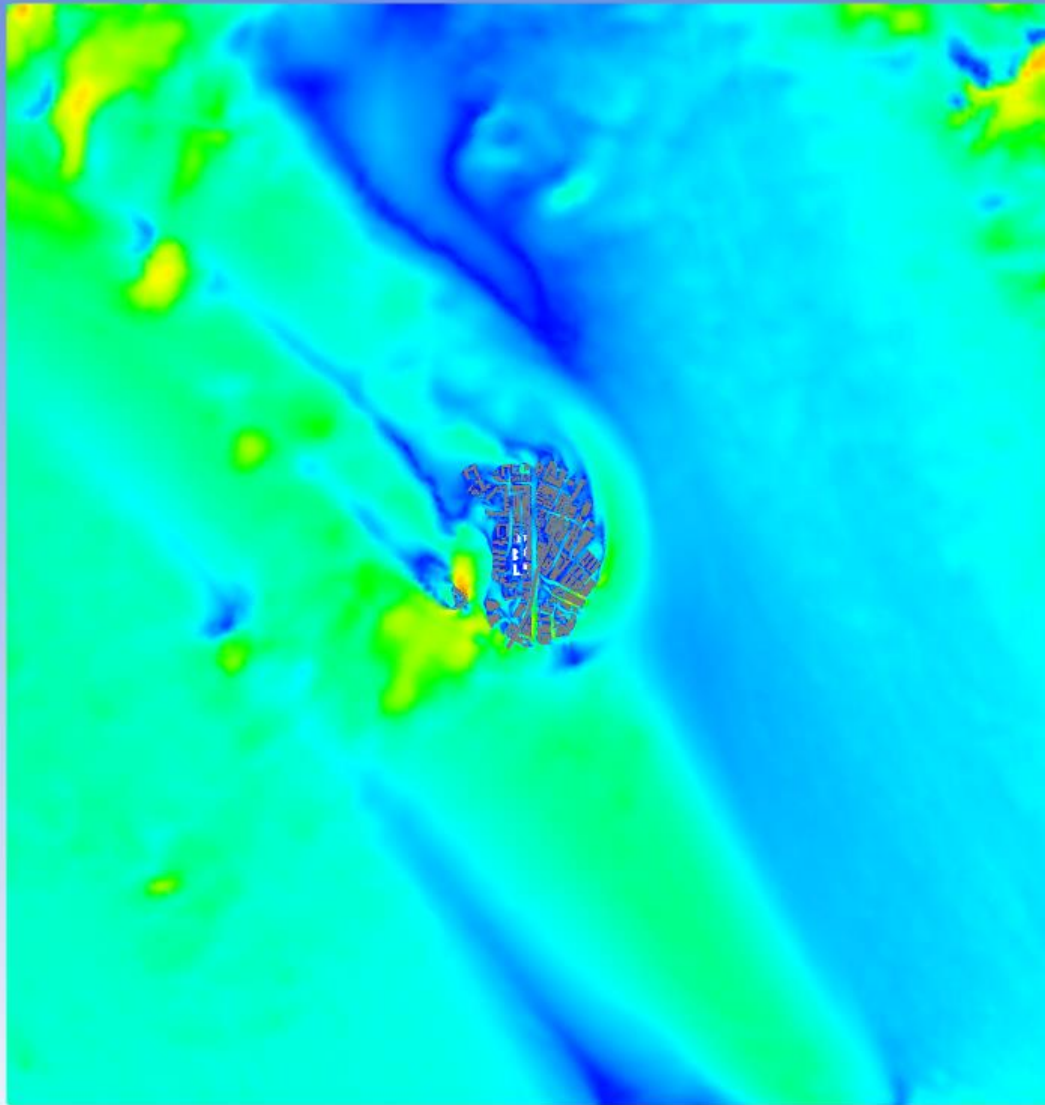
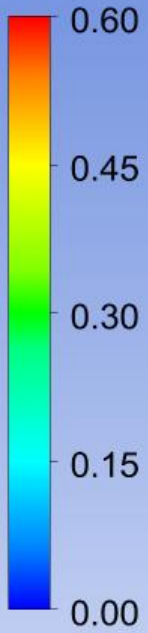


Baseline Scheme - Domain Contour plot at pedestrian level under ESE Wind



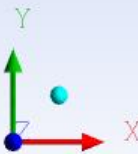
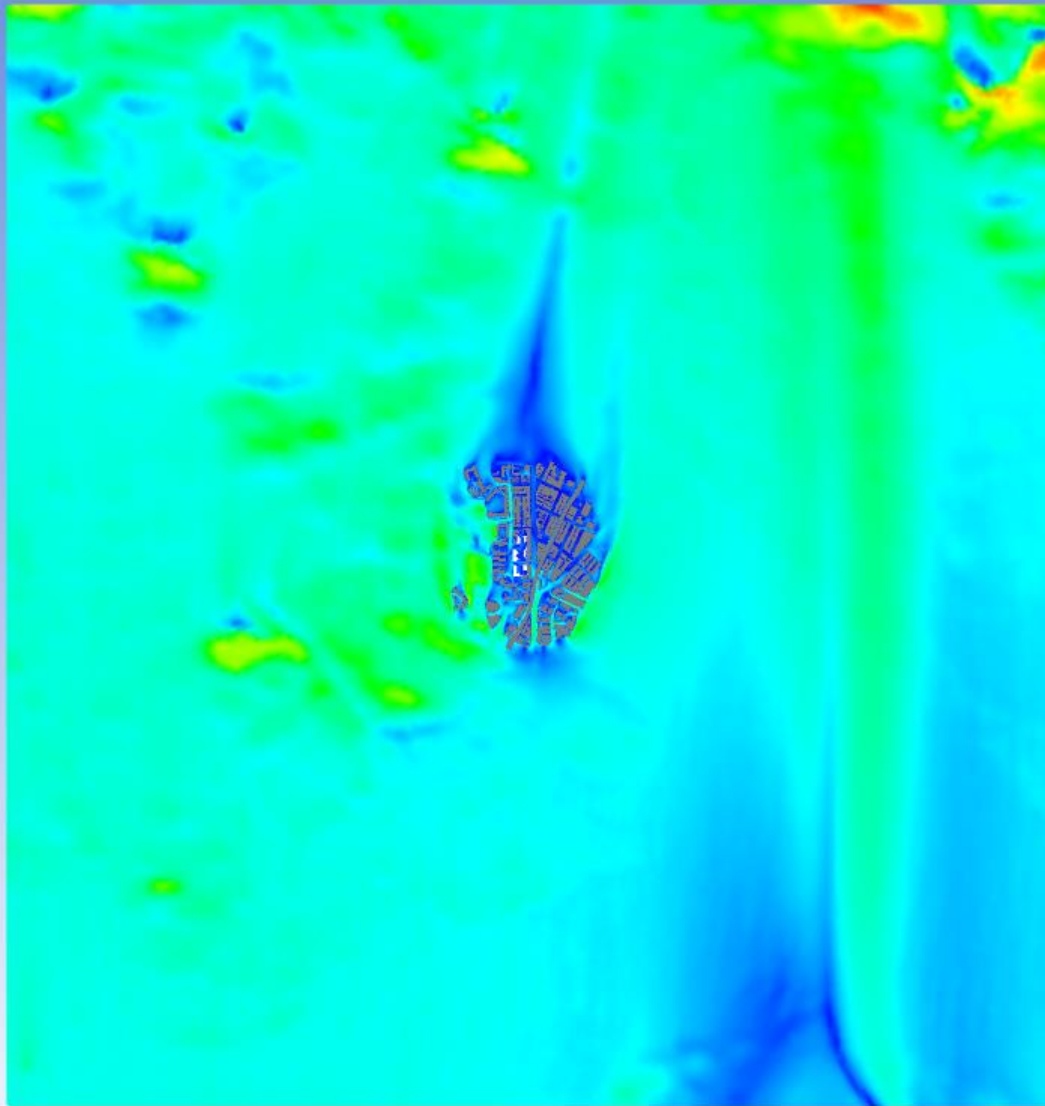
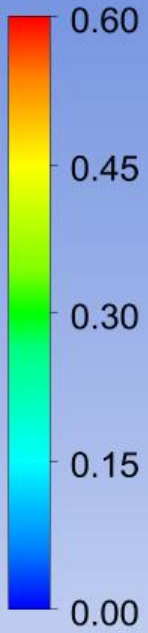
Baseline Scheme - Domain Contour plot at pedestrian level under SE Wind

VR



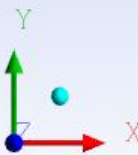
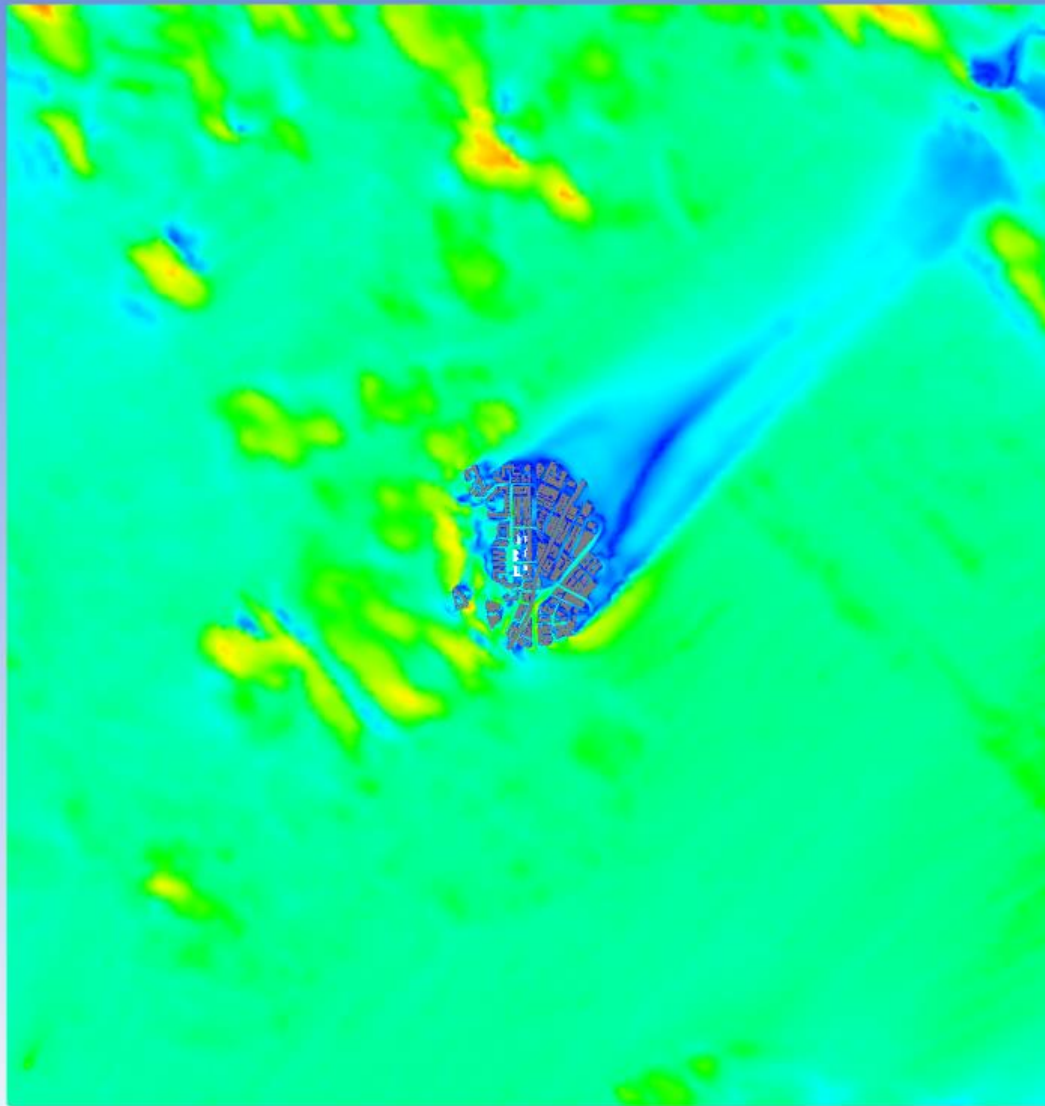
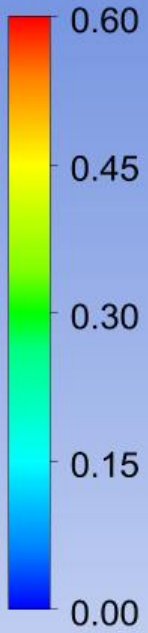
Baseline Scheme - Domain Contour plot at pedestrian level under SSE Wind

VR



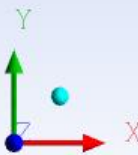
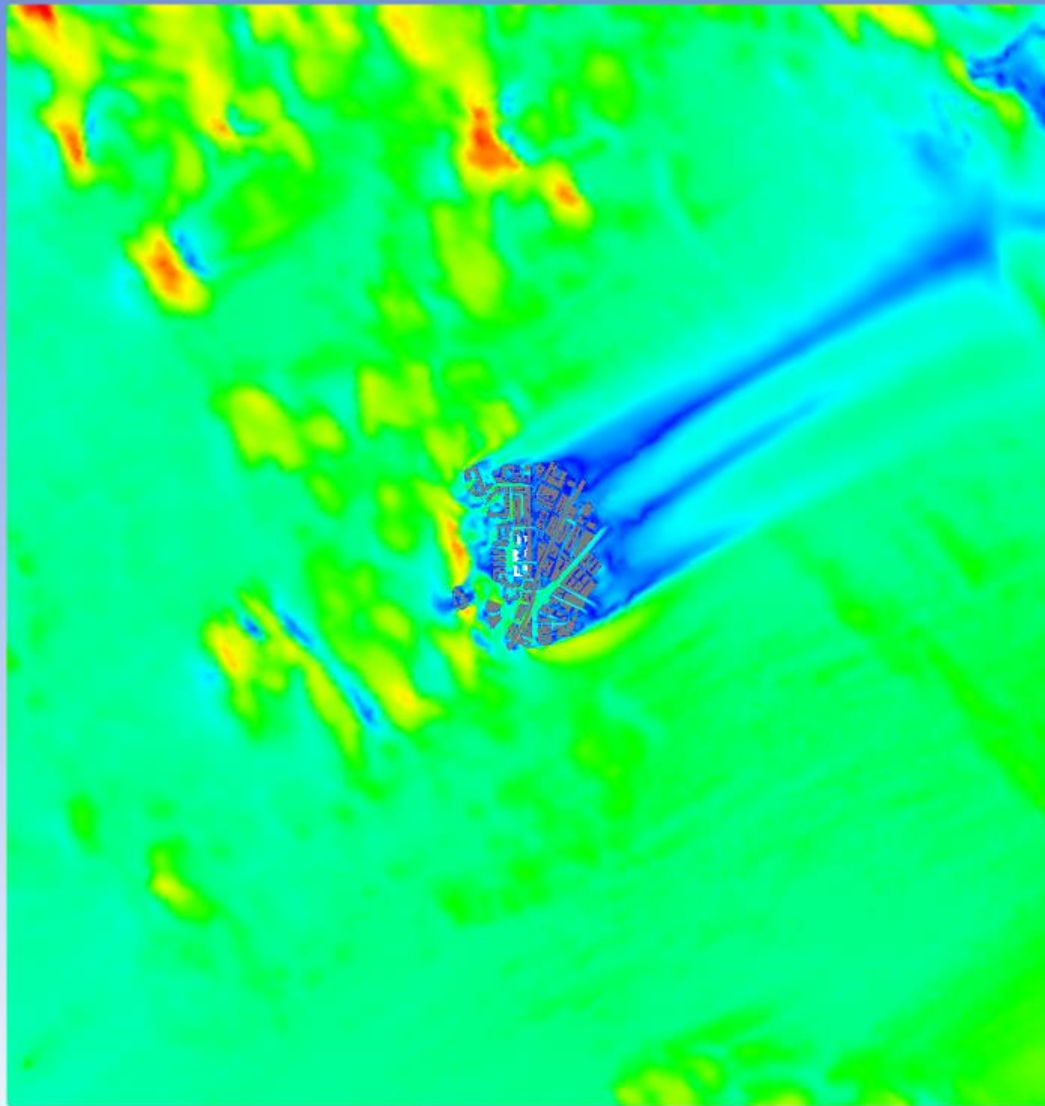
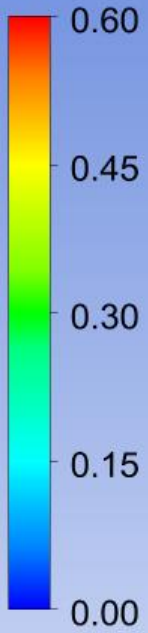
Baseline Scheme - Domain Contour plot at pedestrian level under S Wind

VR



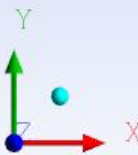
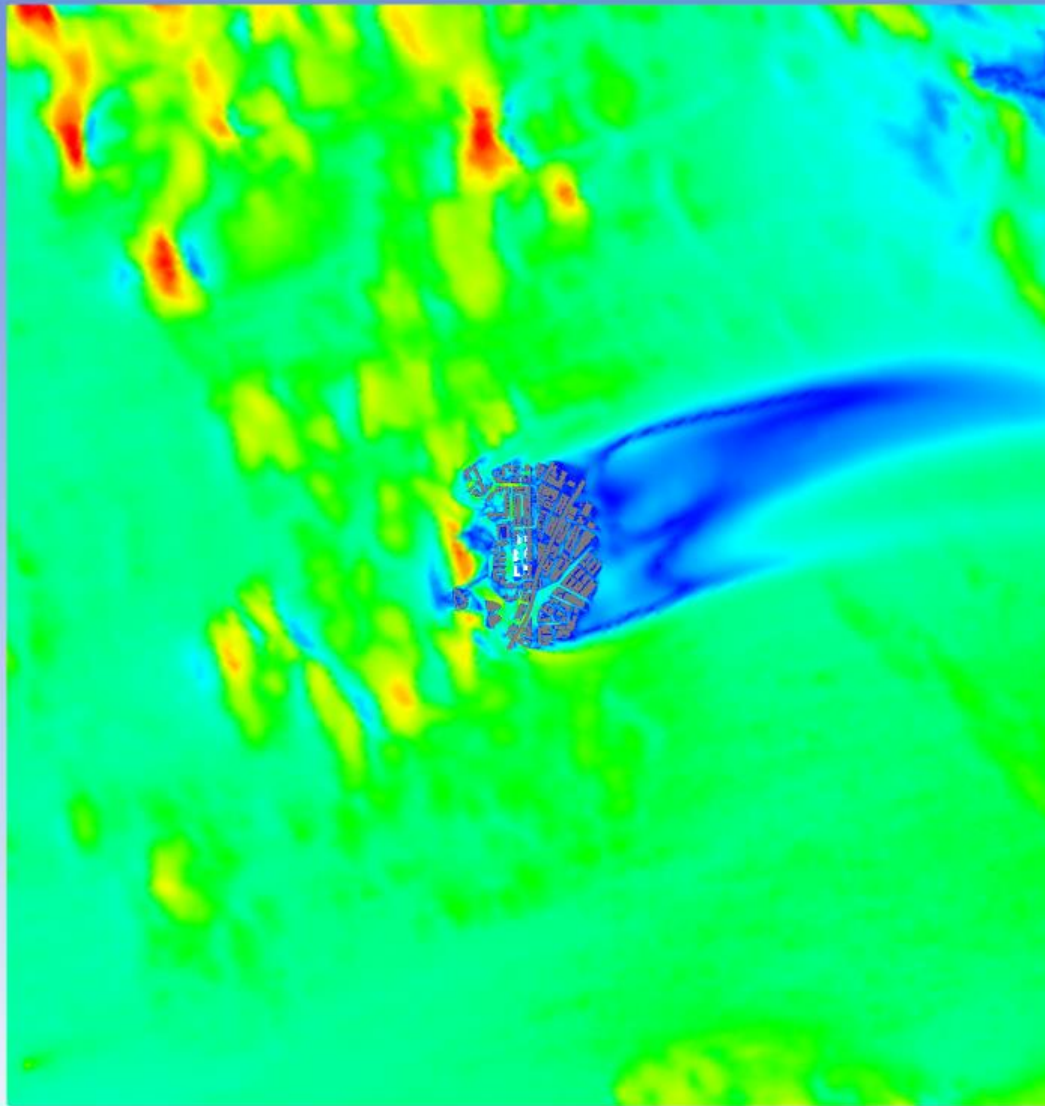
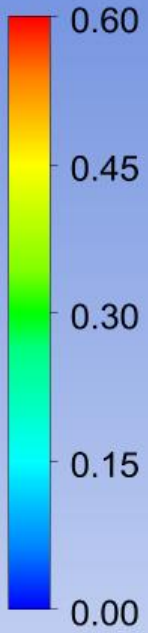
Baseline Scheme - Domain Contour plot at pedestrian level under SSW Wind

VR

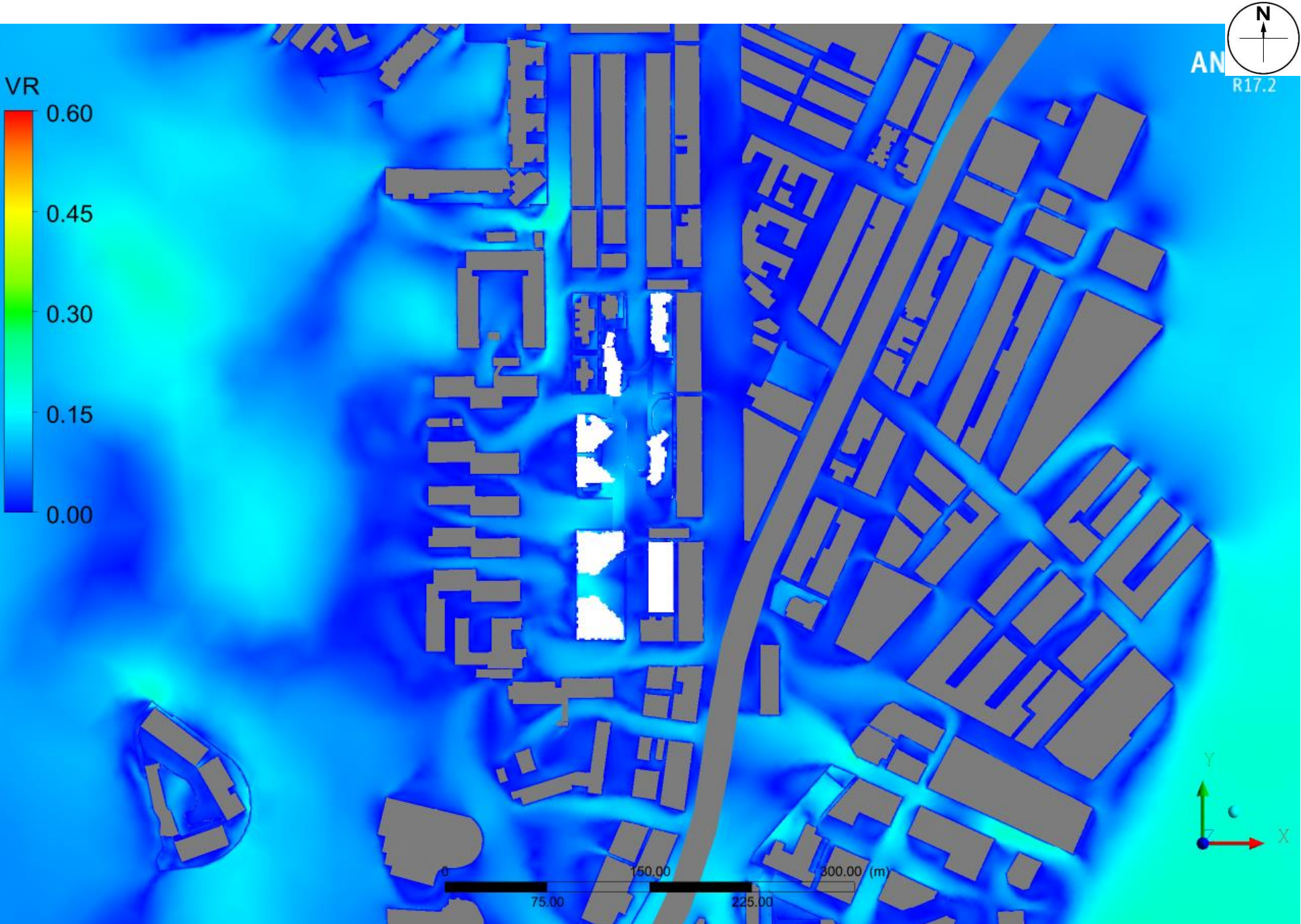


Baseline Scheme - Domain Contour plot at pedestrian level under SW Wind

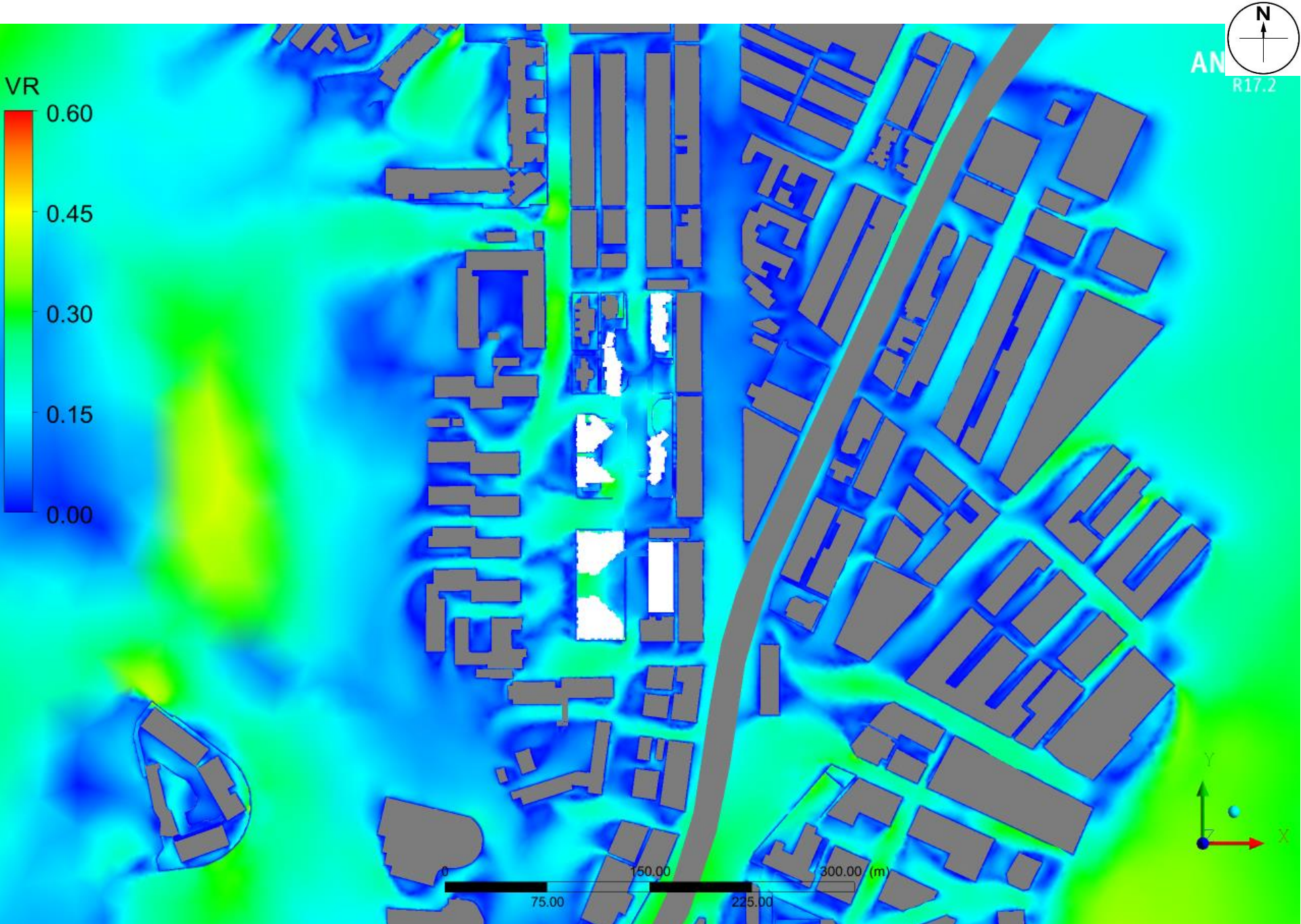
VR



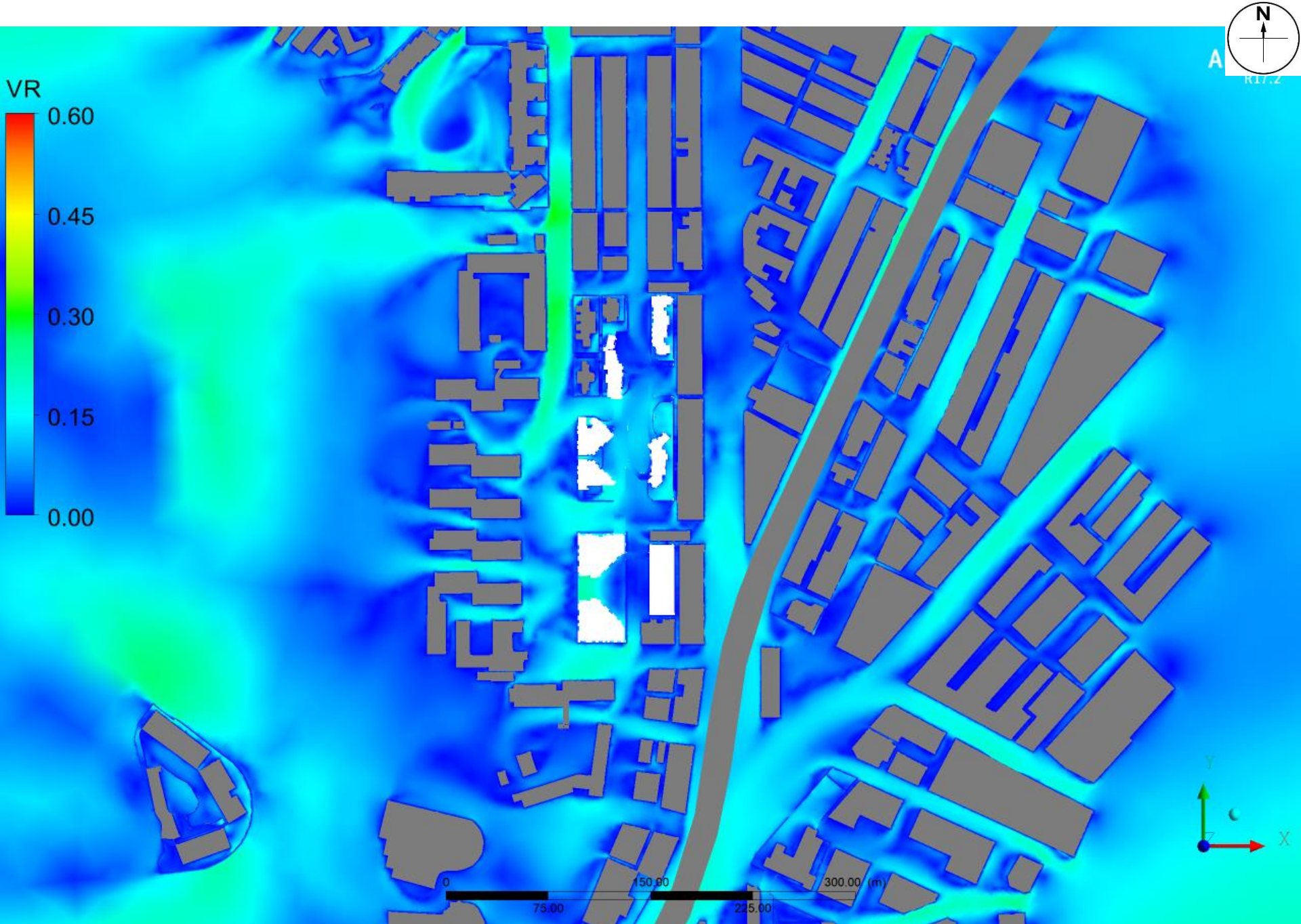
Baseline Scheme - Domain Contour plot at pedestrian level under WSW Wind



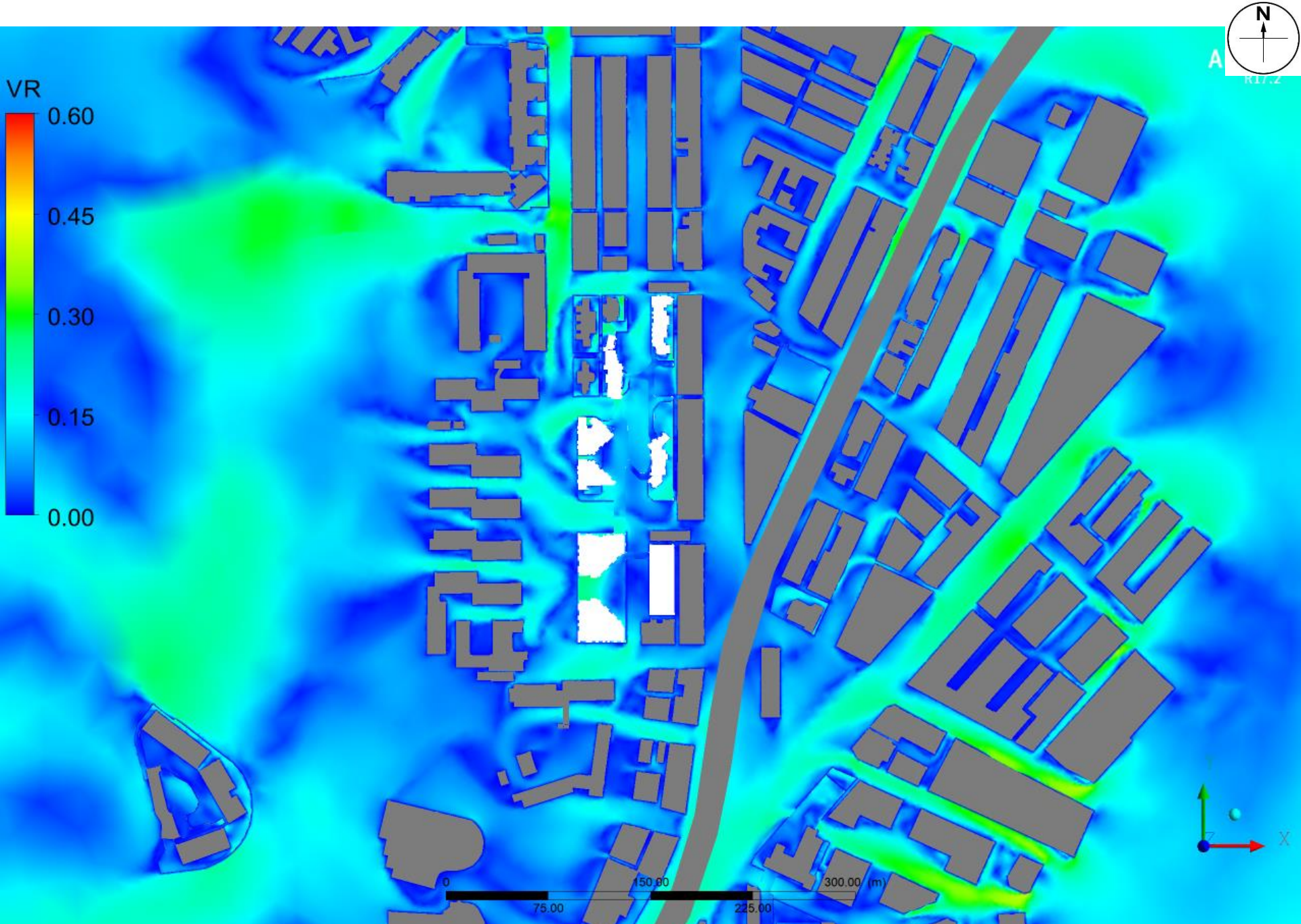
Proposed Scheme - Contour plot at pedestrian level under NNE Wind



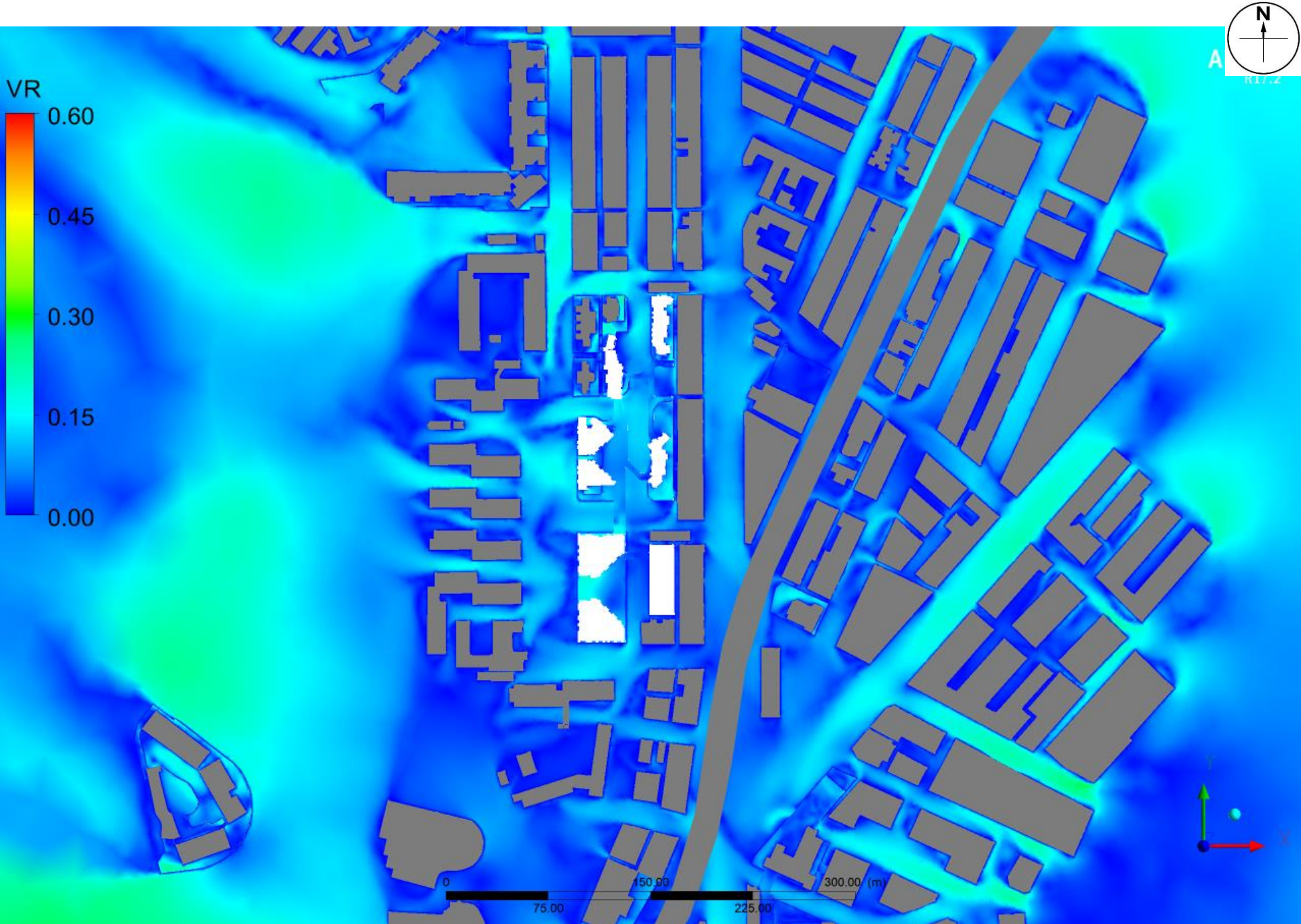
Proposed Scheme - Contour plot at pedestrian level under NE Wind



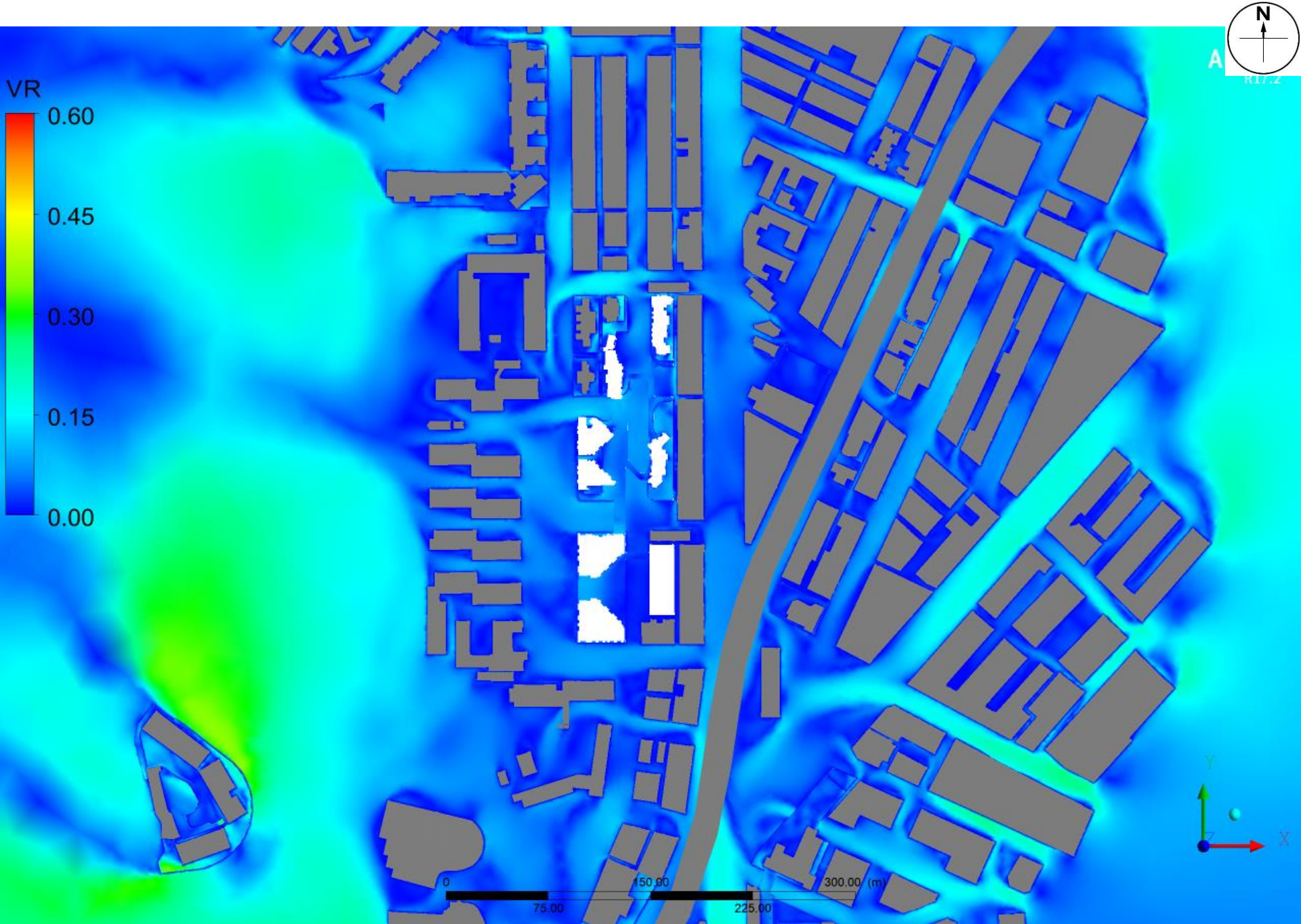
Proposed Scheme - Contour plot at pedestrian level under ENE Wind



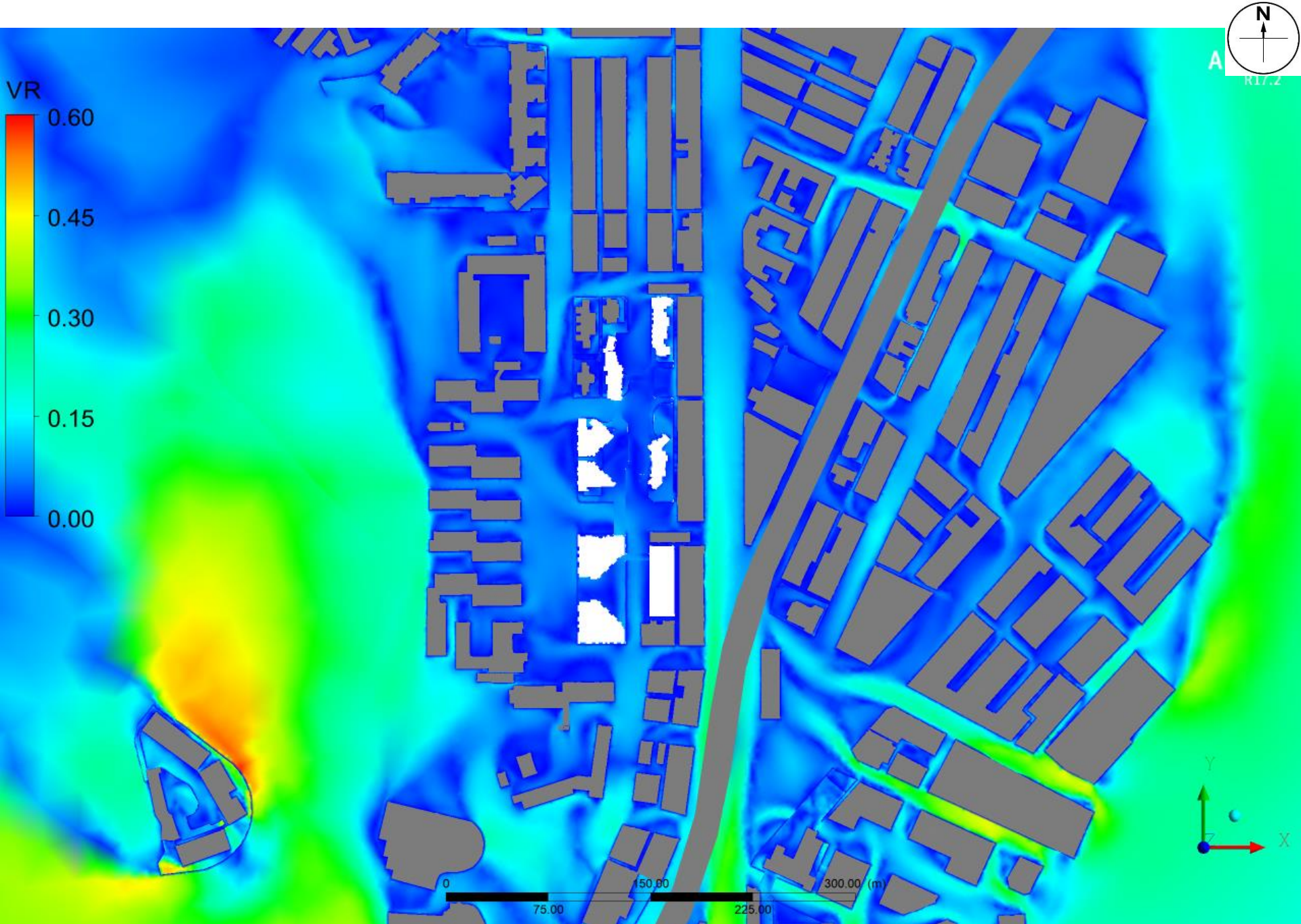
Proposed Scheme - Contour plot at pedestrian level under E Wind



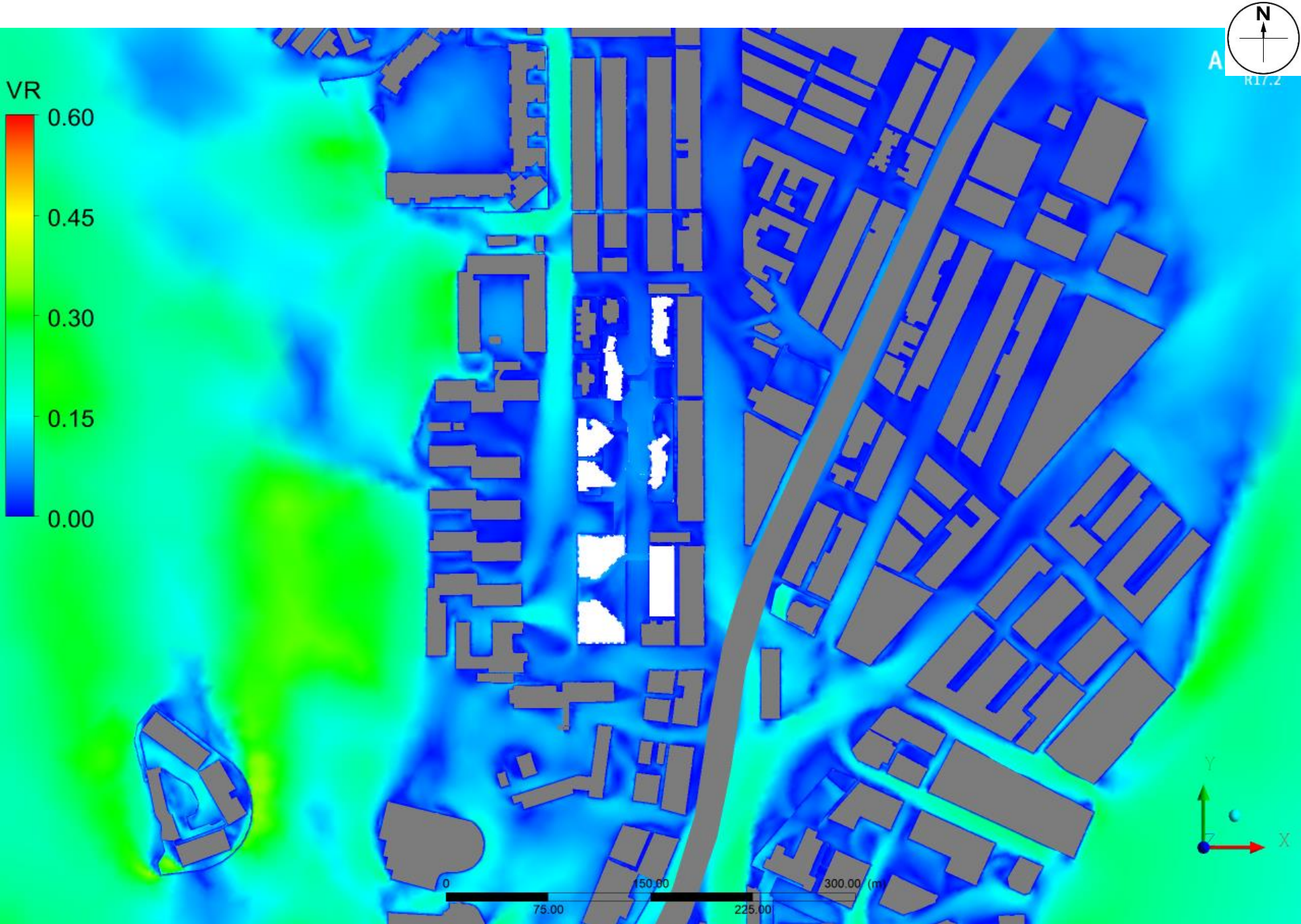
Proposed Scheme - Contour plot at pedestrian level under ESE Wind



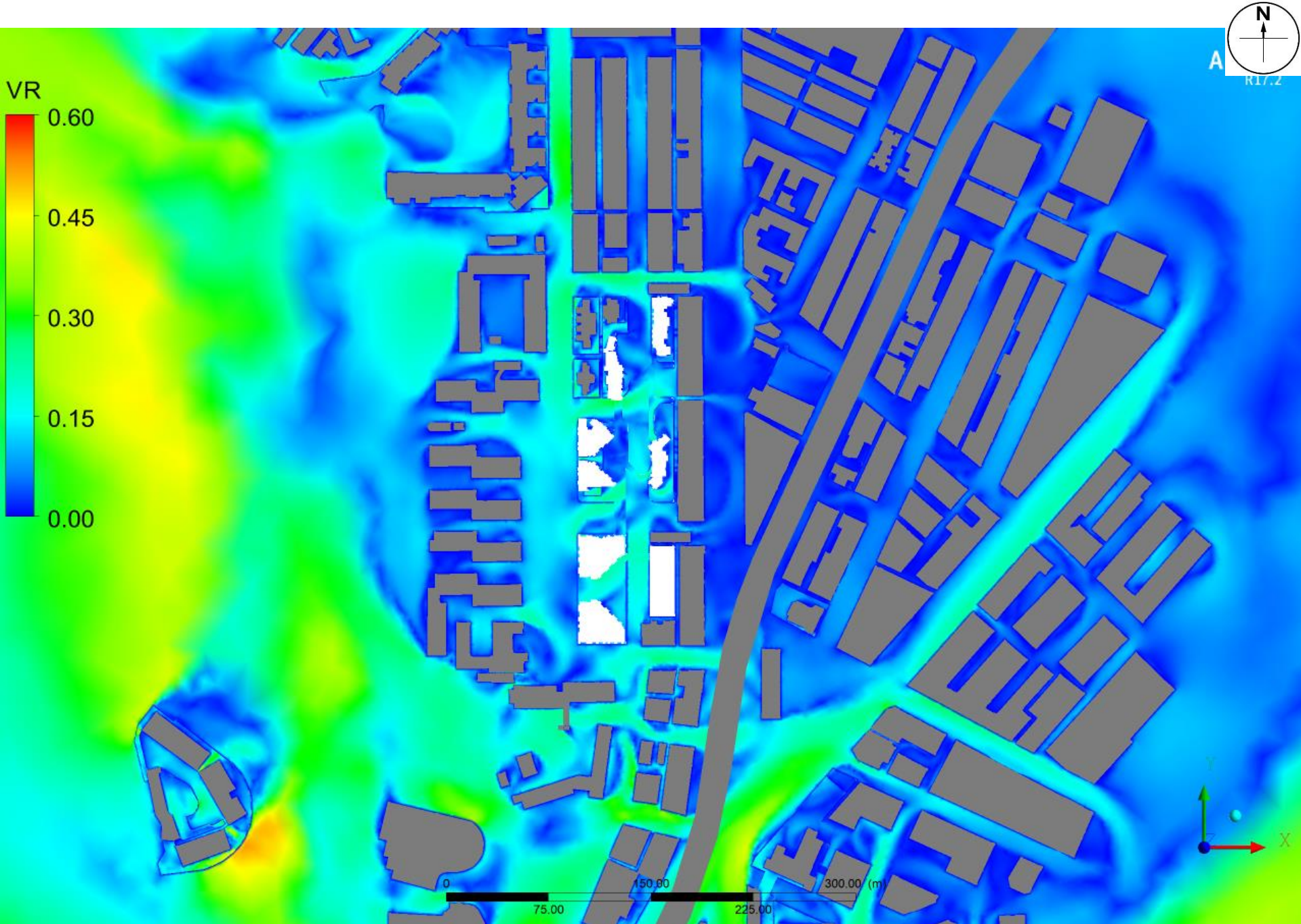
Proposed Scheme - Contour plot at pedestrian level under SE Wind



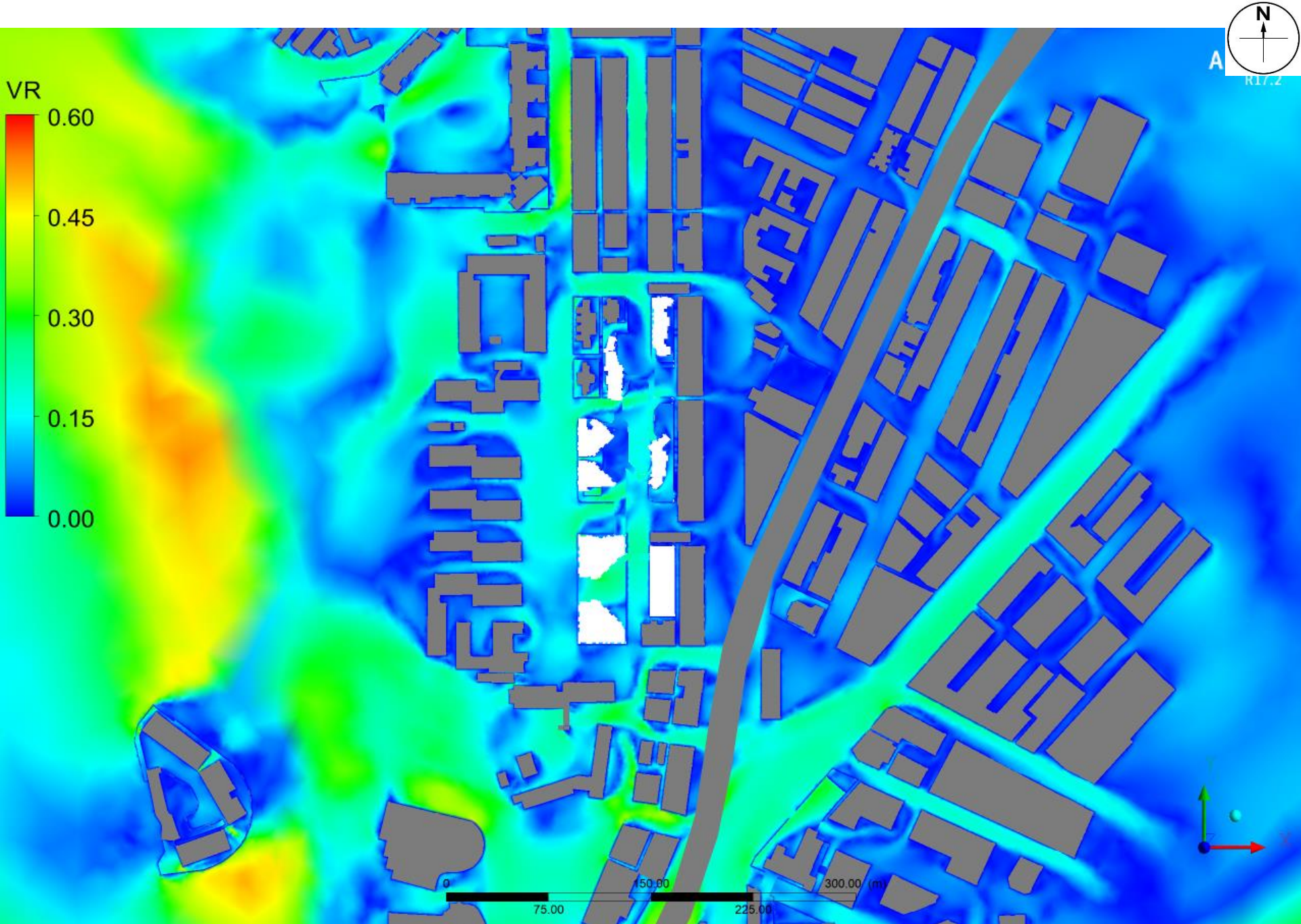
Proposed Scheme - Contour plot at pedestrian level under SSE Wind



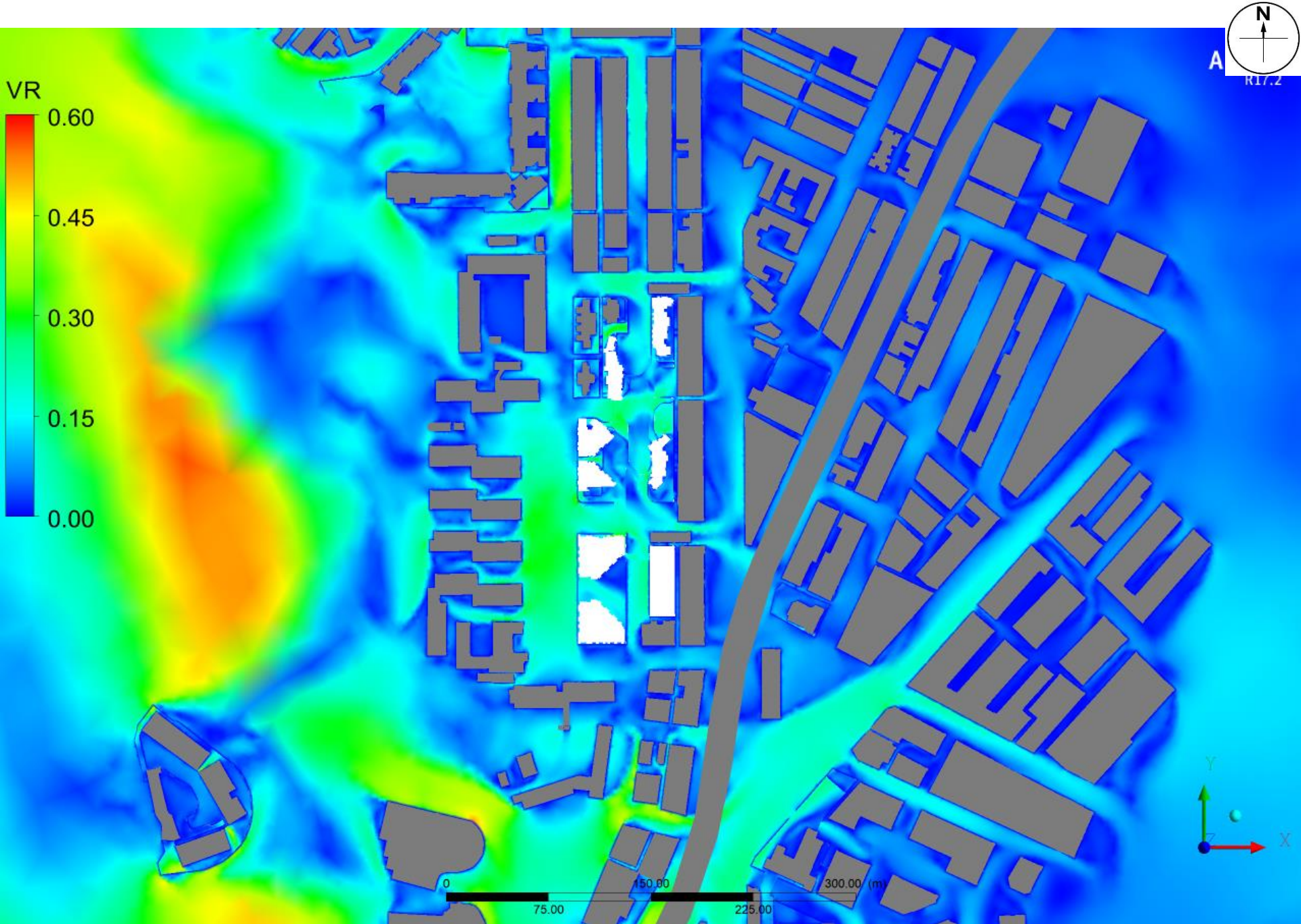
Proposed Scheme - Contour plot at pedestrian level under S Wind



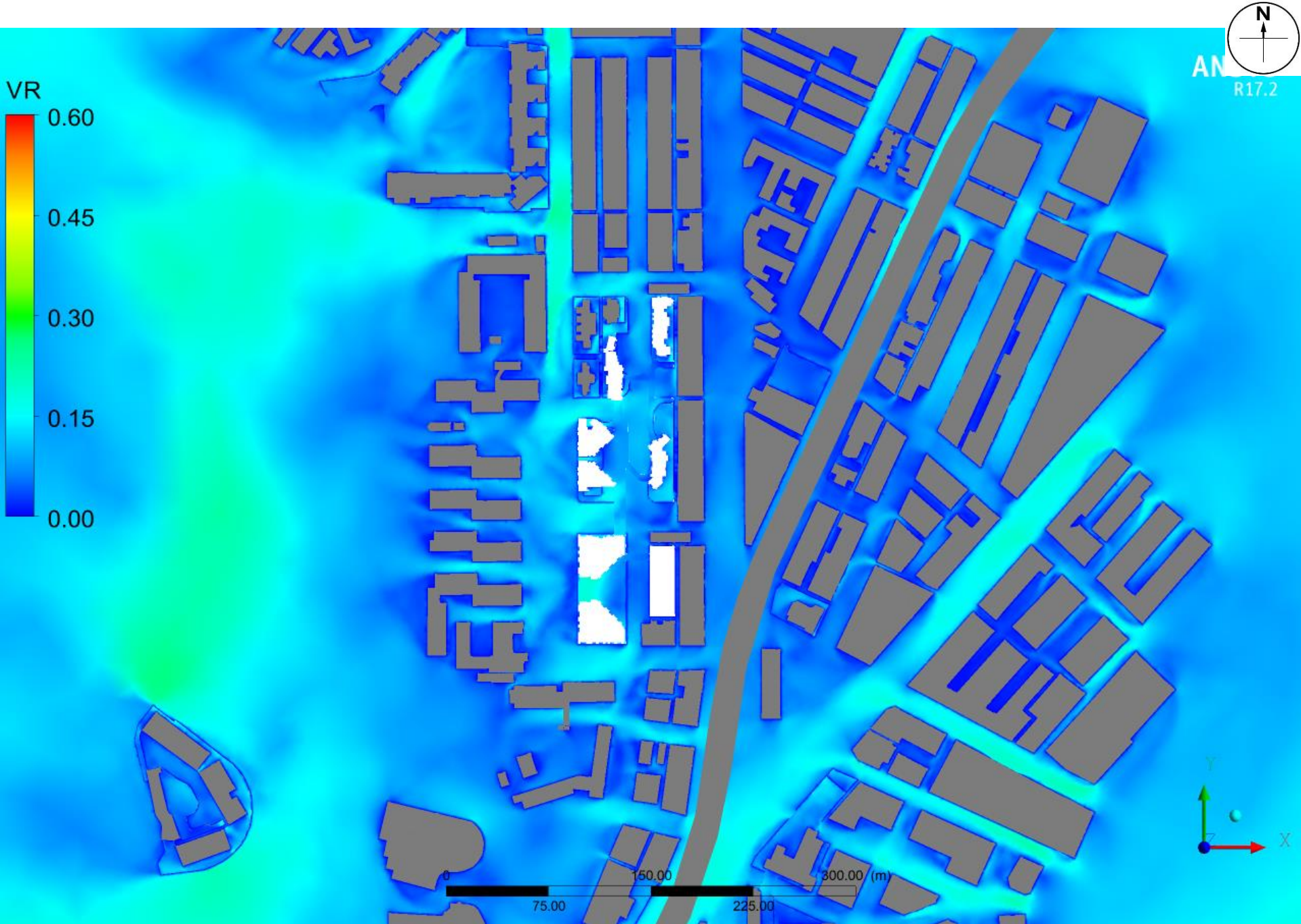
Proposed Scheme - Contour plot at pedestrian level under SSW Wind



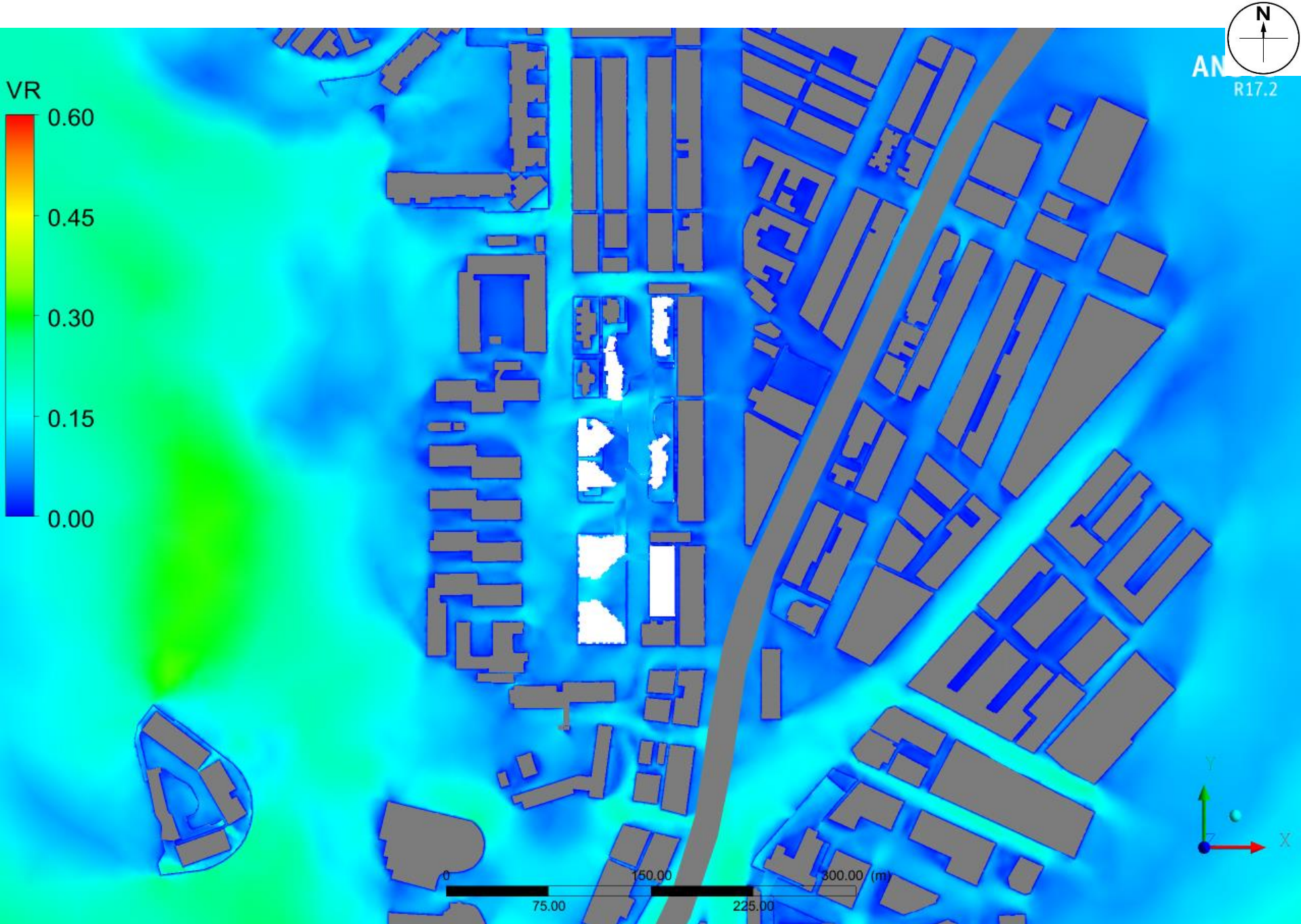
Proposed Scheme - Contour plot at pedestrian level under SW Wind

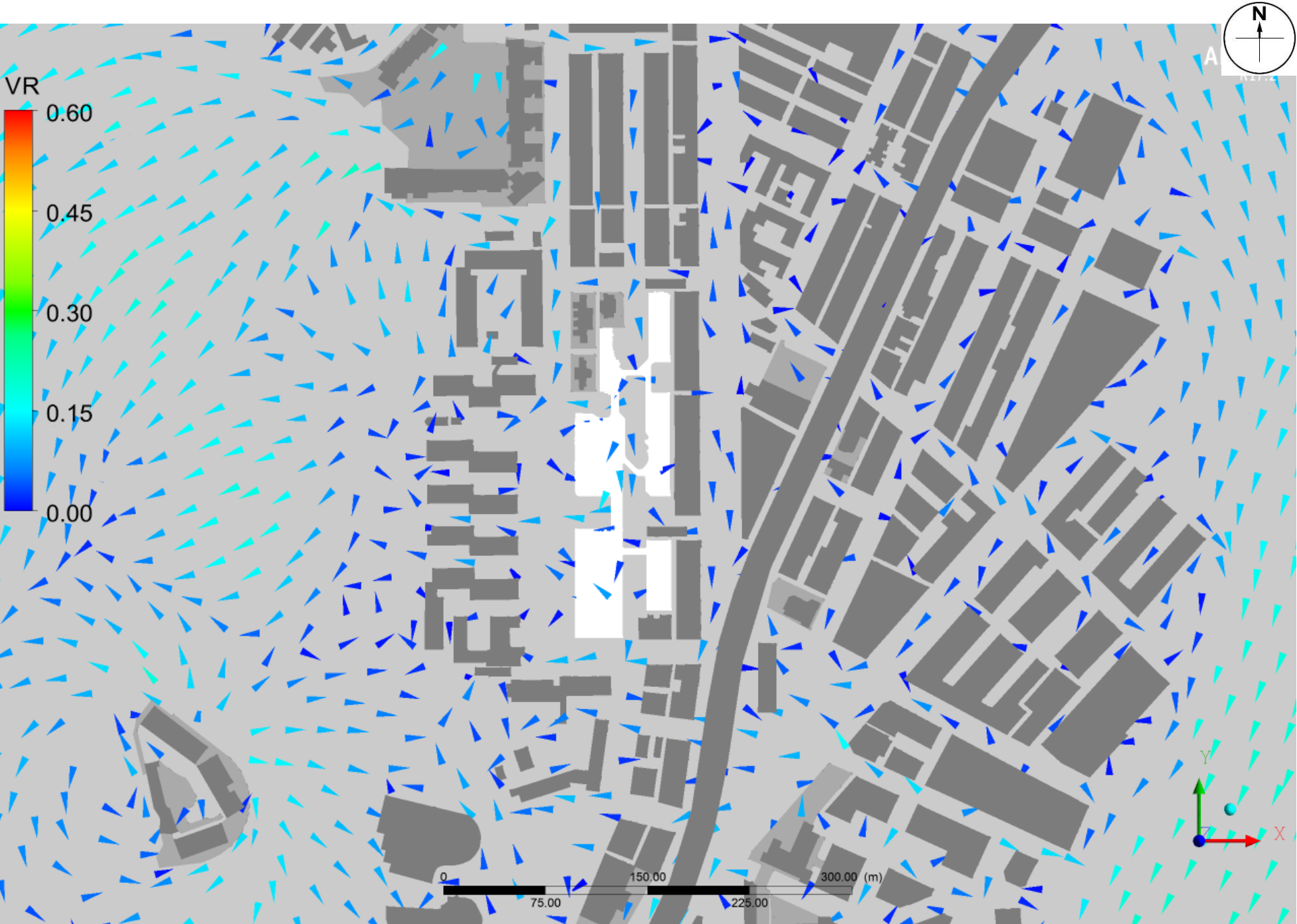


Proposed Scheme - Contour plot at pedestrian level under WSW Wind

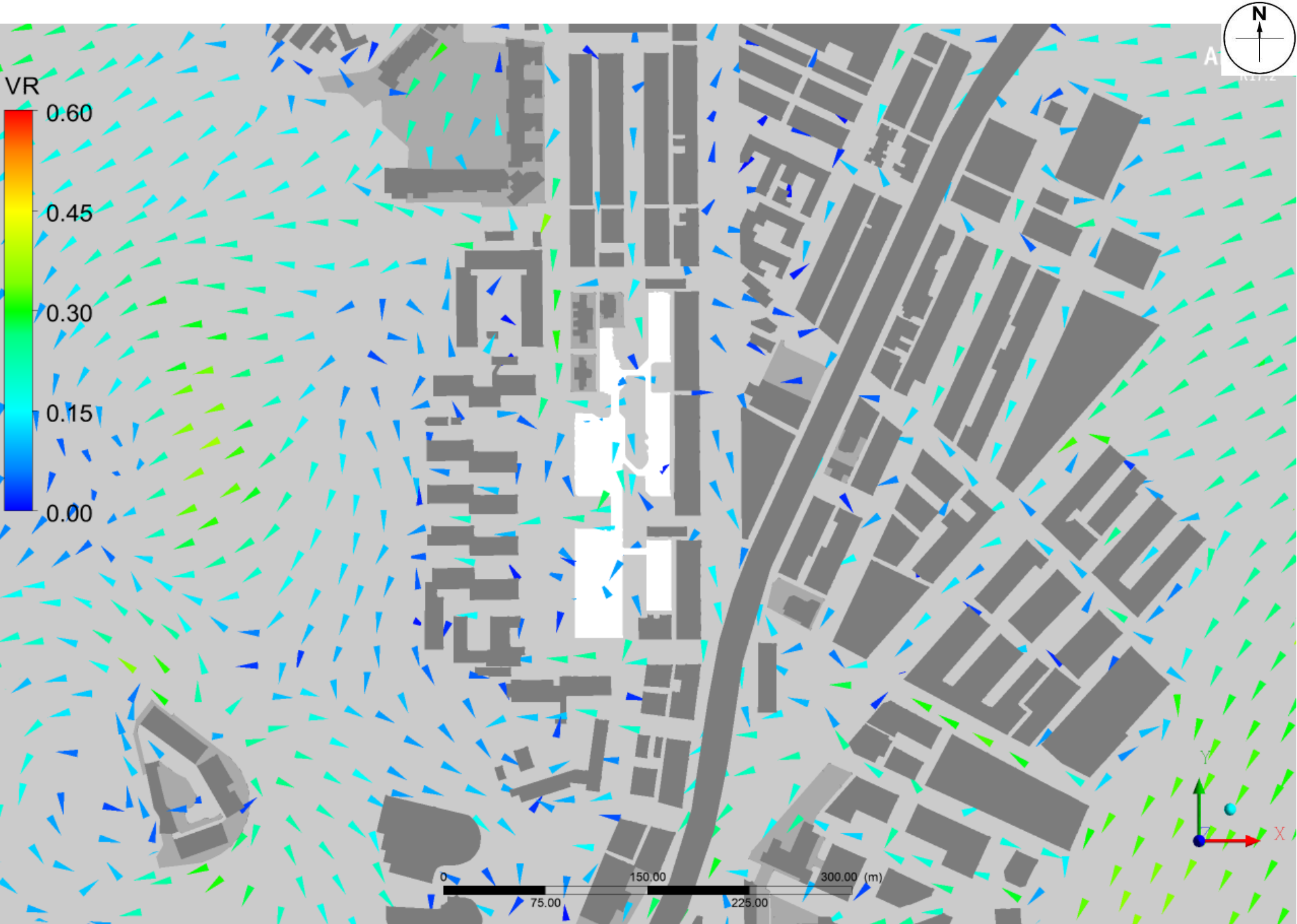


Proposed Scheme - Annual weighted wind speed colour at pedestrian level

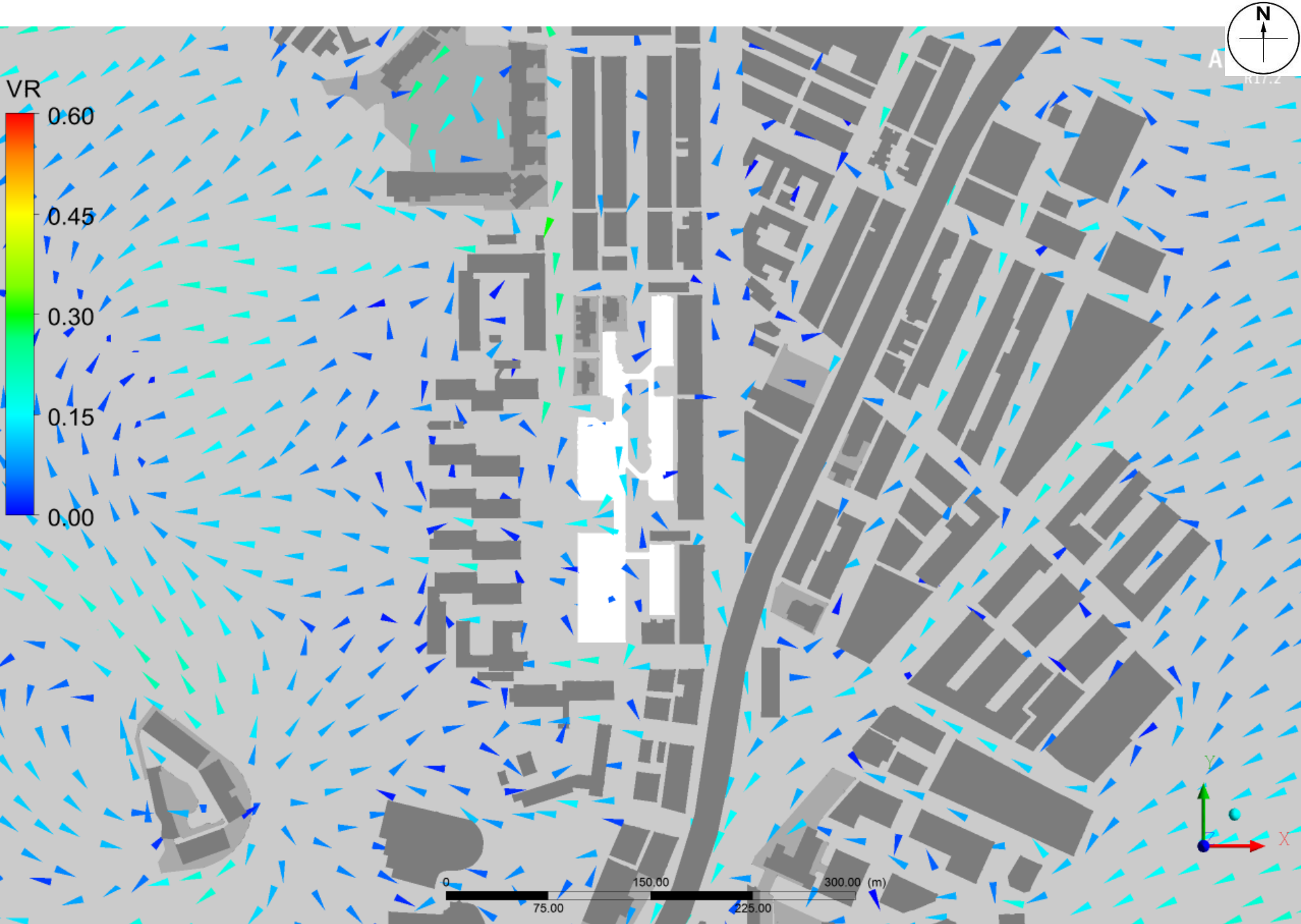




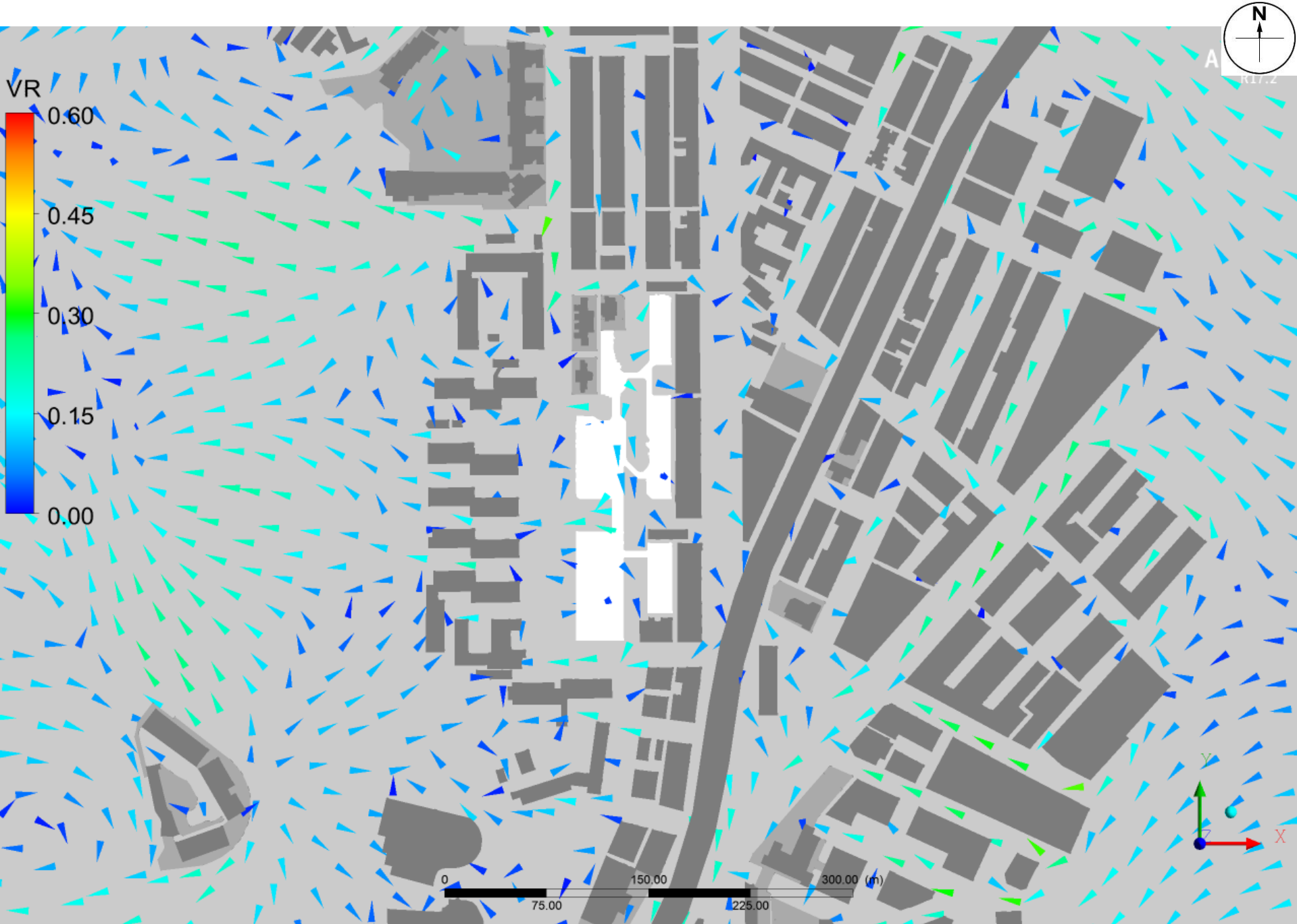
Proposed Scheme - Vector plot at pedestrian level under NNE Wind



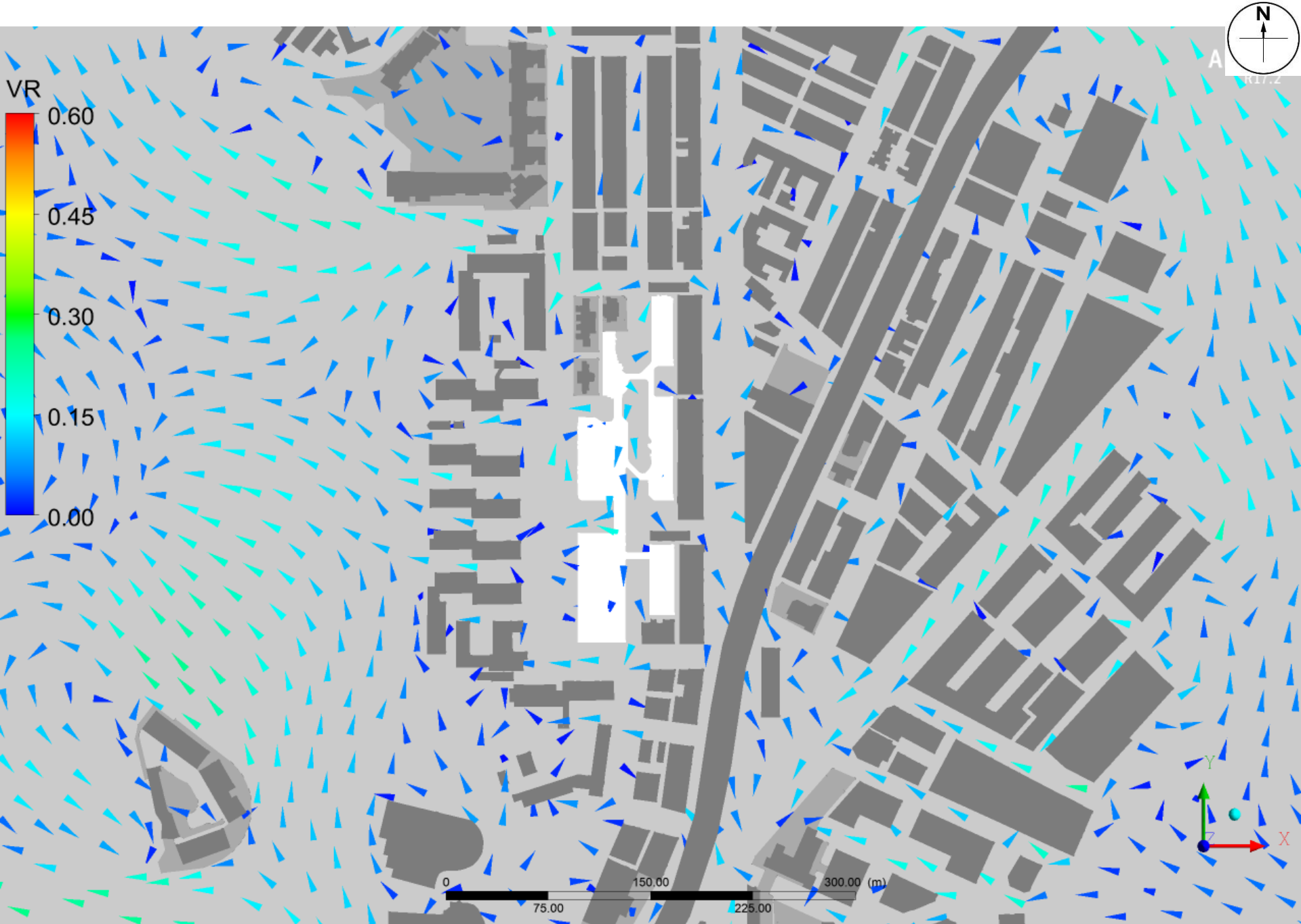
Proposed Scheme - Vector plot at pedestrian level under NE Wind



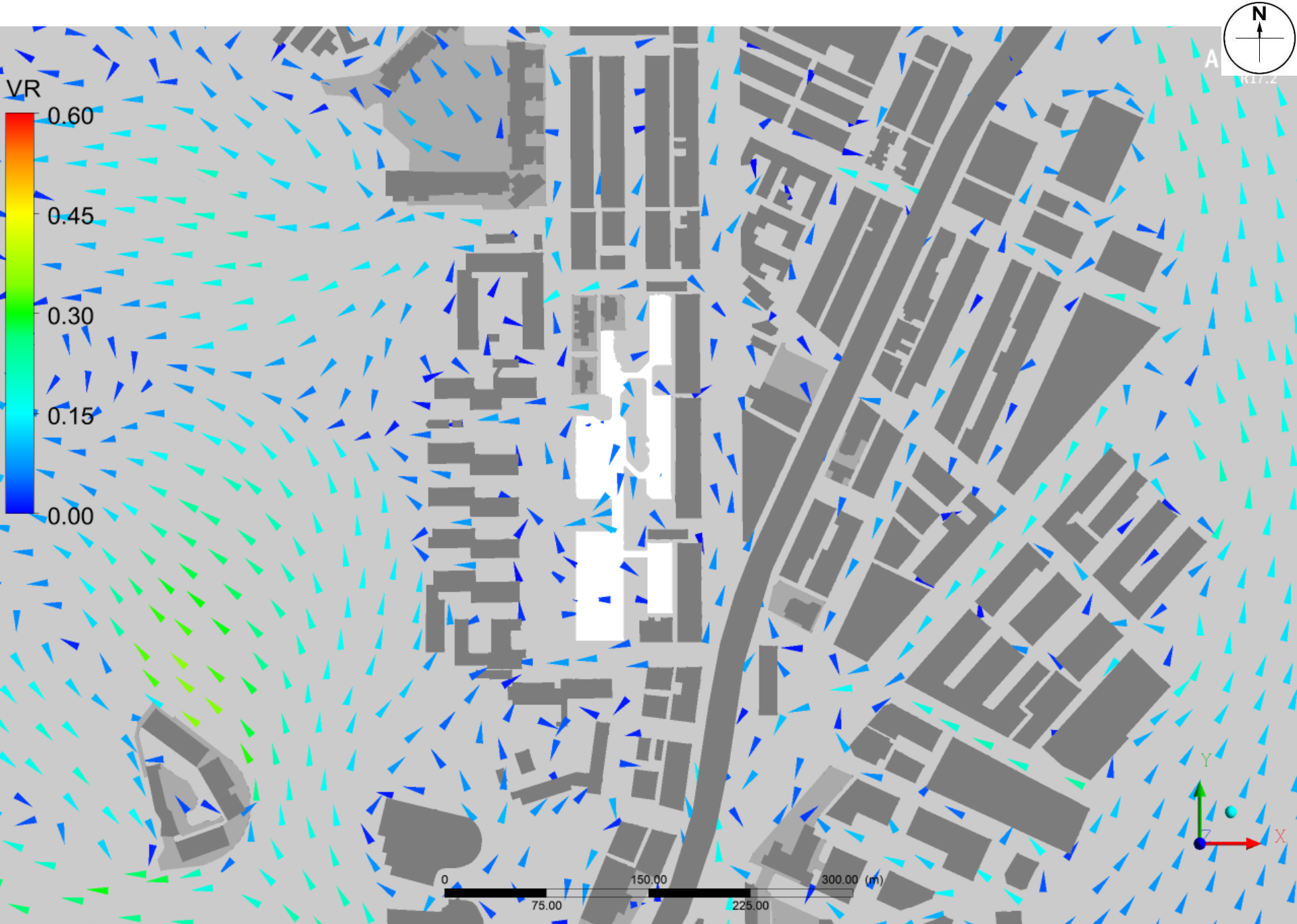
Proposed Scheme - Vector plot at pedestrian level under ENE Wind



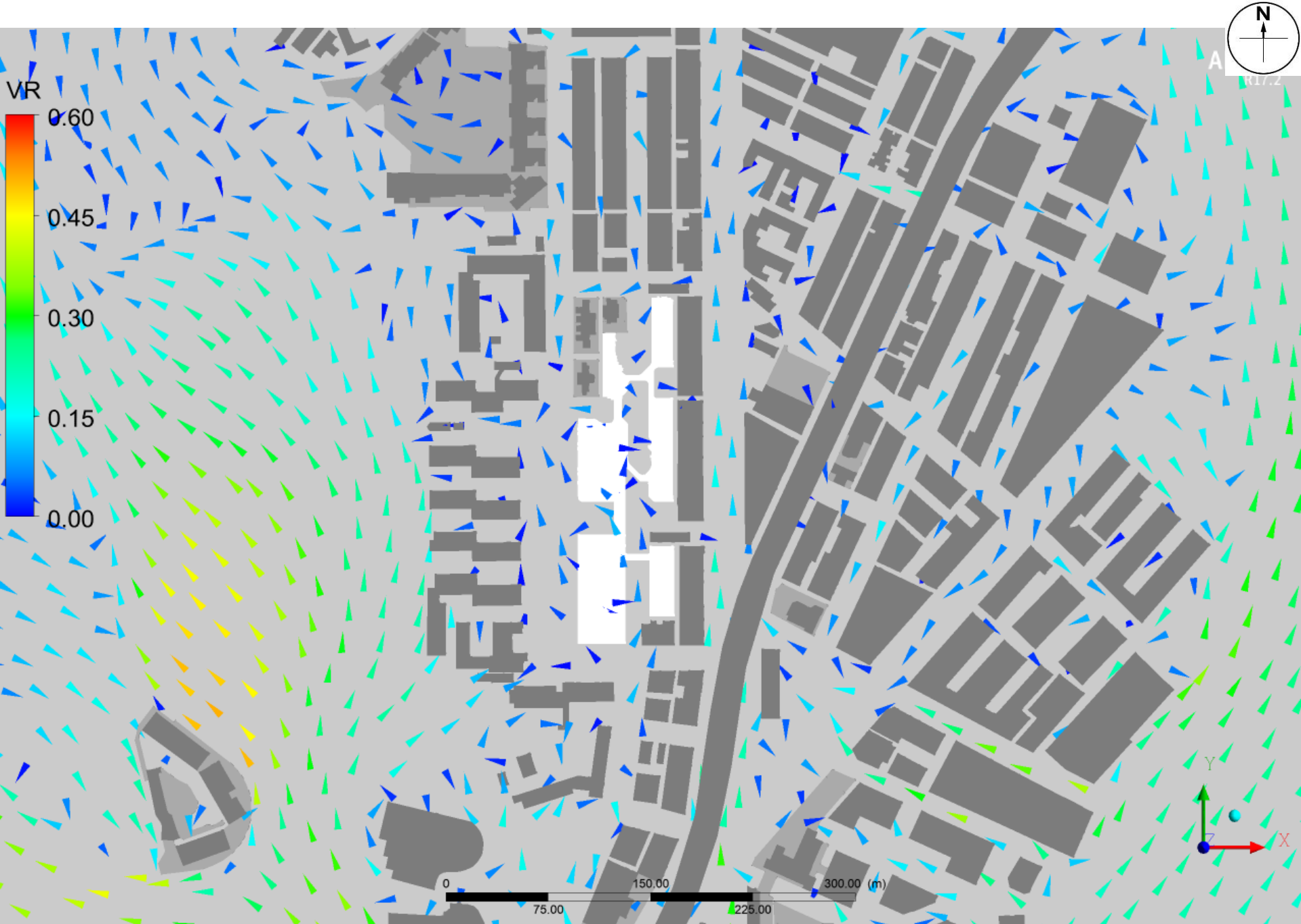
Proposed Scheme - Vector plot at pedestrian level under E Wind



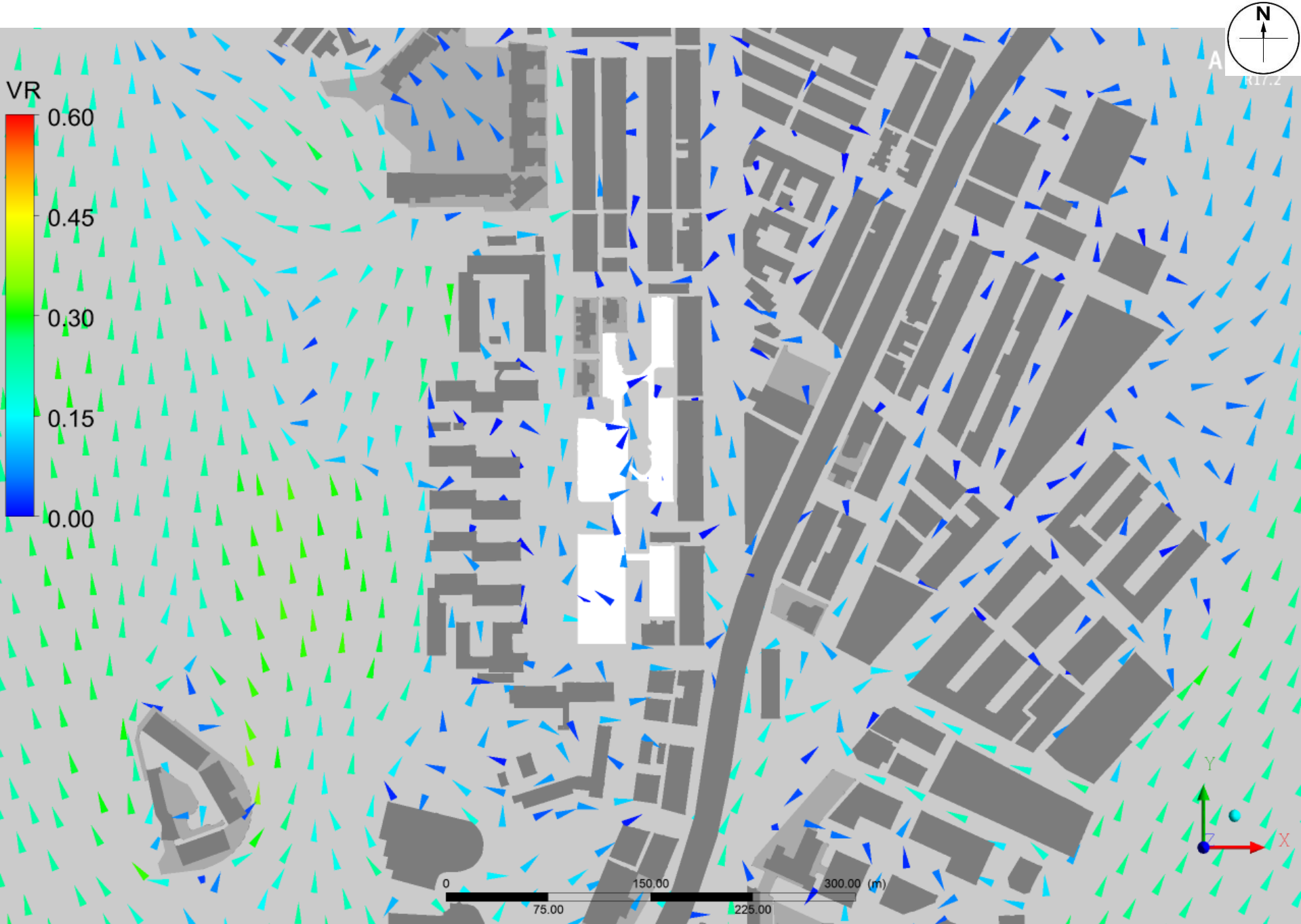
Proposed Scheme - Vector plot at pedestrian level under ESE Wind



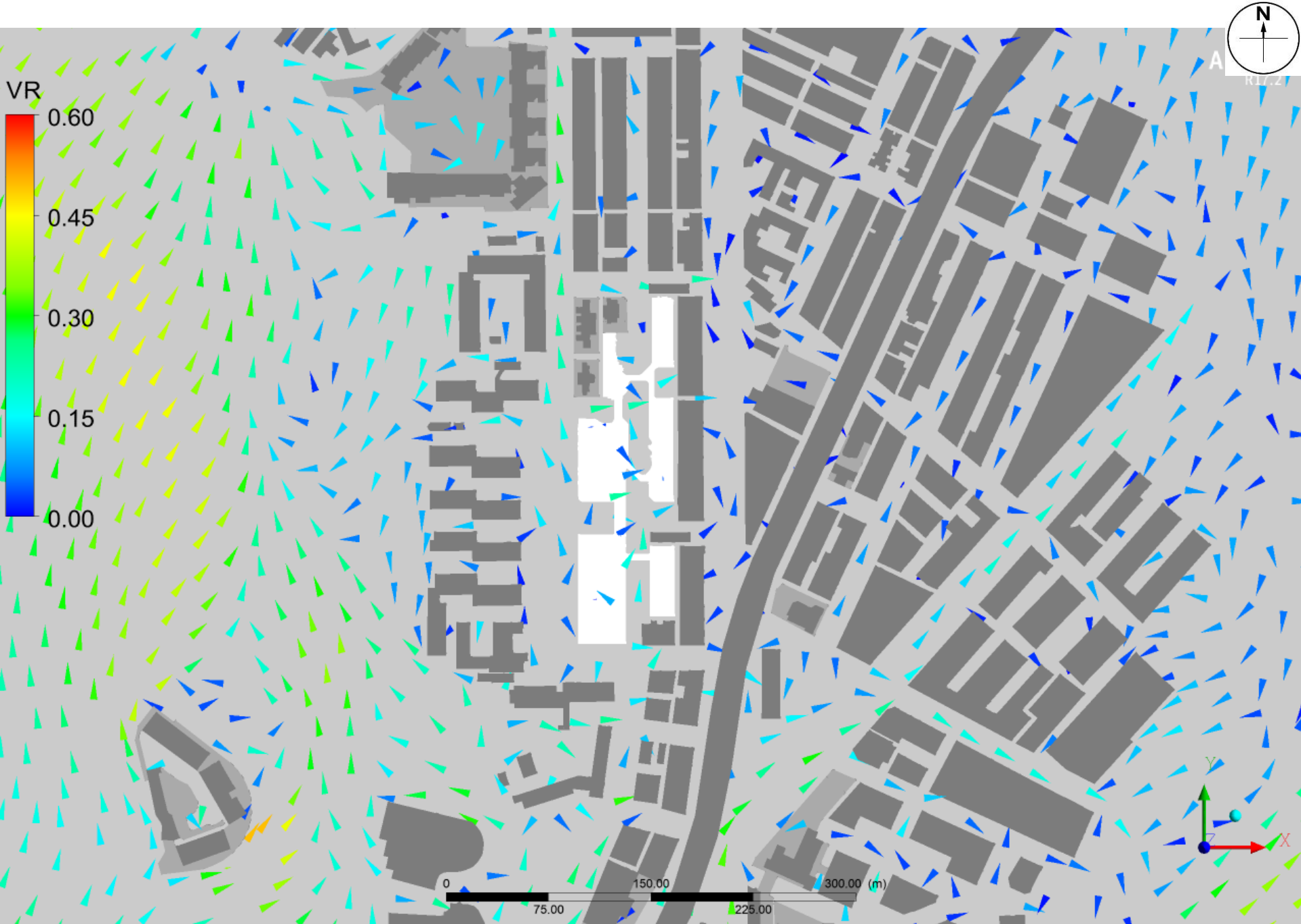
Proposed Scheme - Vector plot at pedestrian level under SE Wind



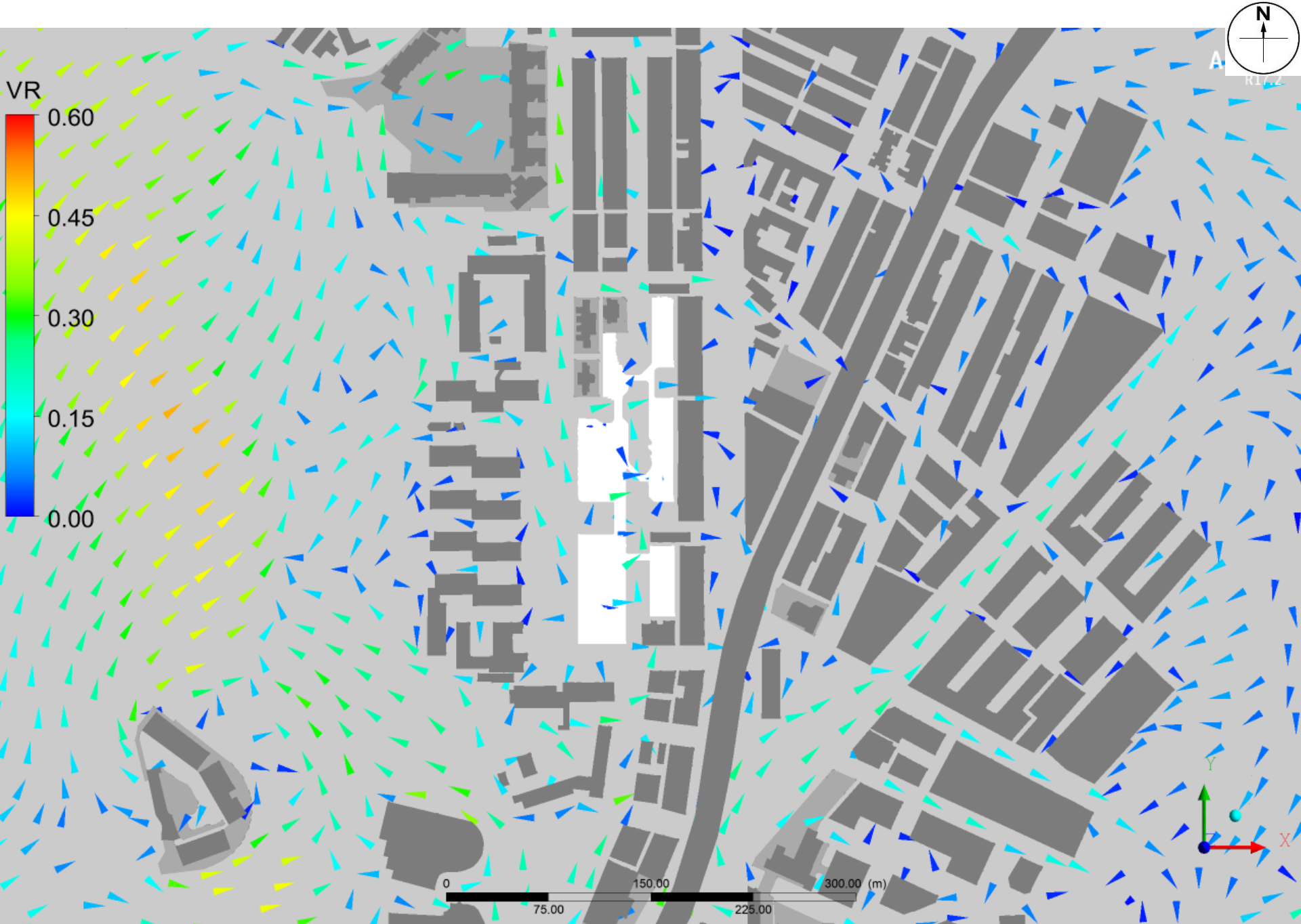
Proposed Scheme - Vector plot at pedestrian level under SSE Wind



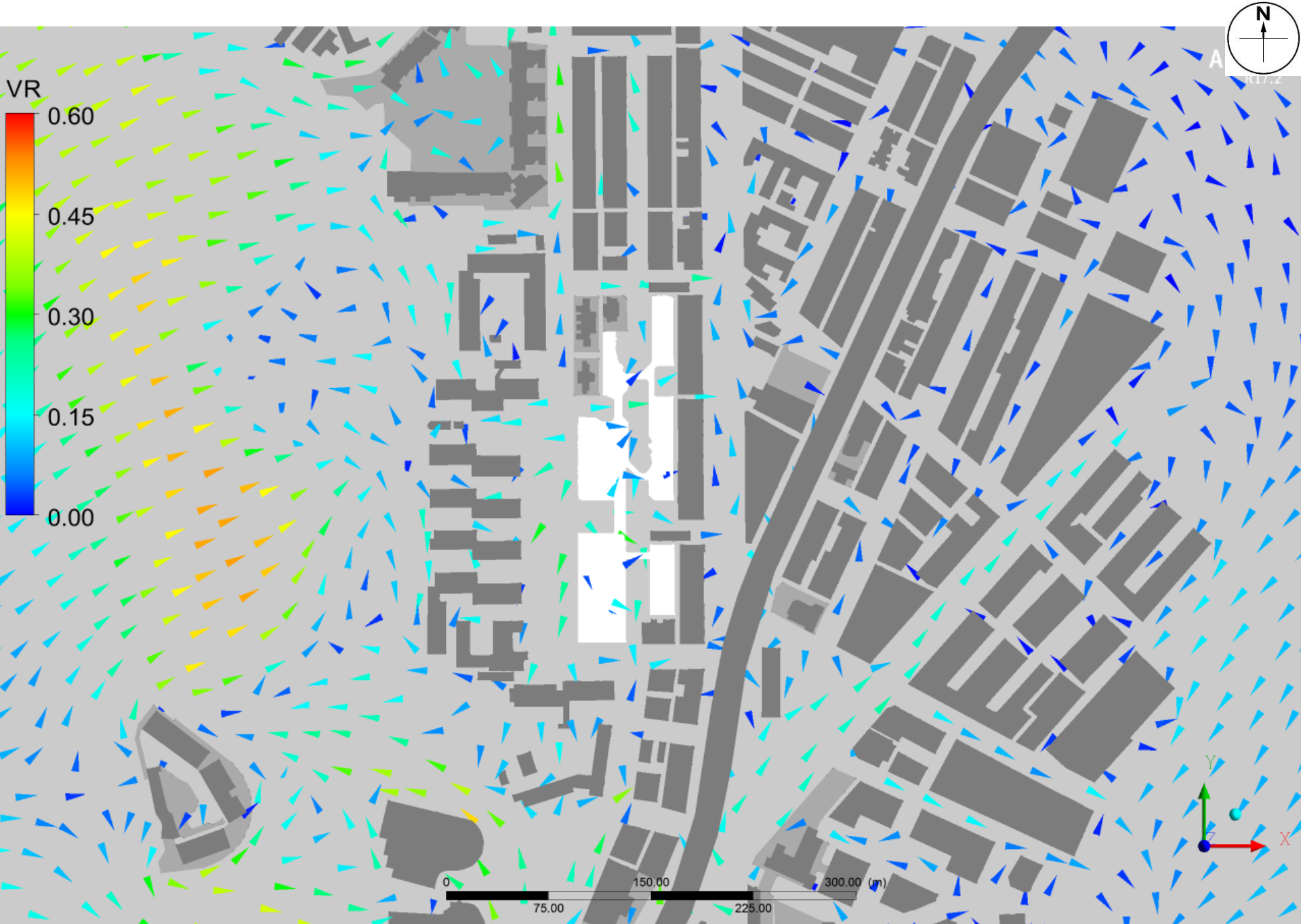
Proposed Scheme - Vector plot at pedestrian level under S Wind



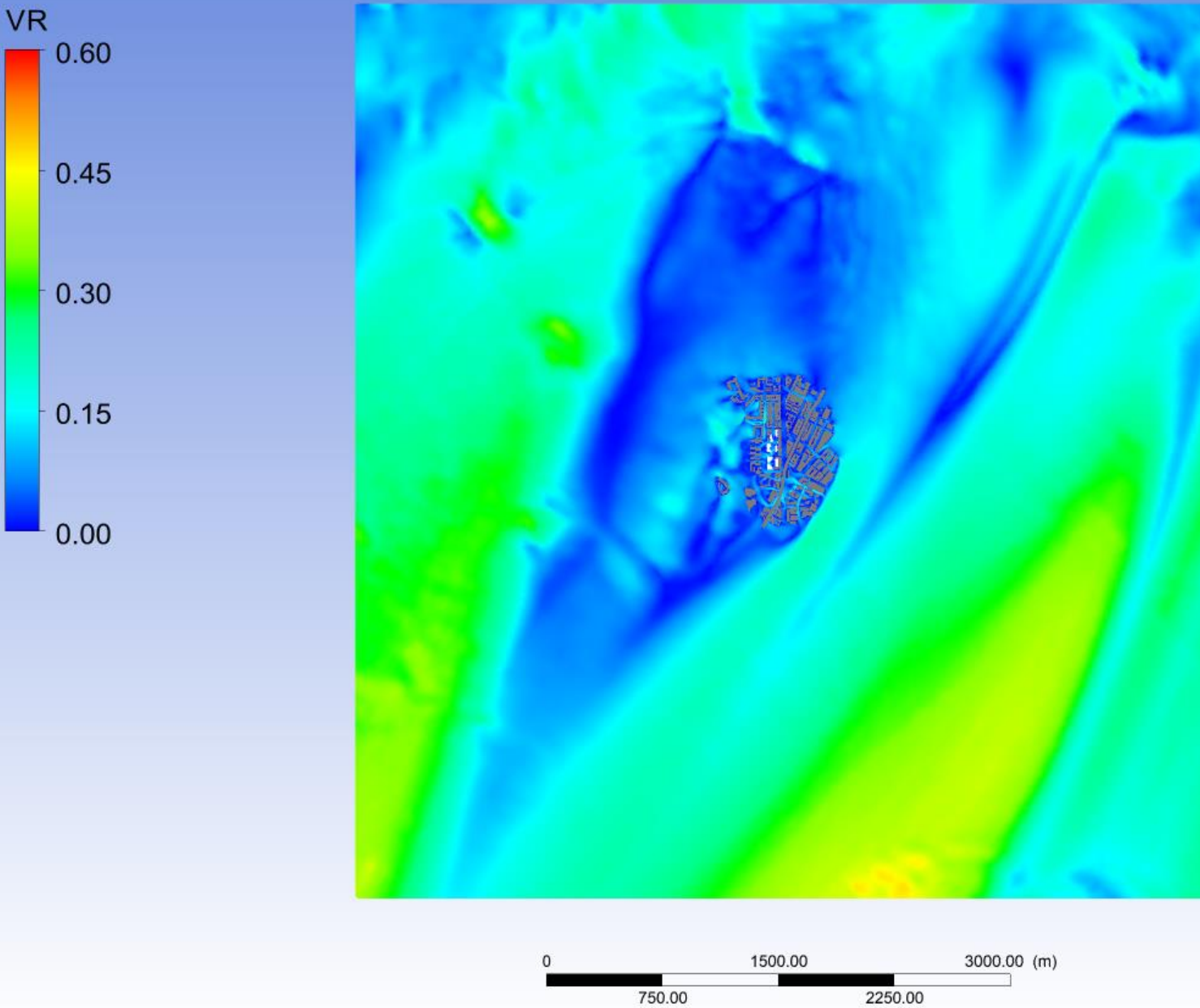
Proposed Scheme - Vector plot at pedestrian level under SSW Wind



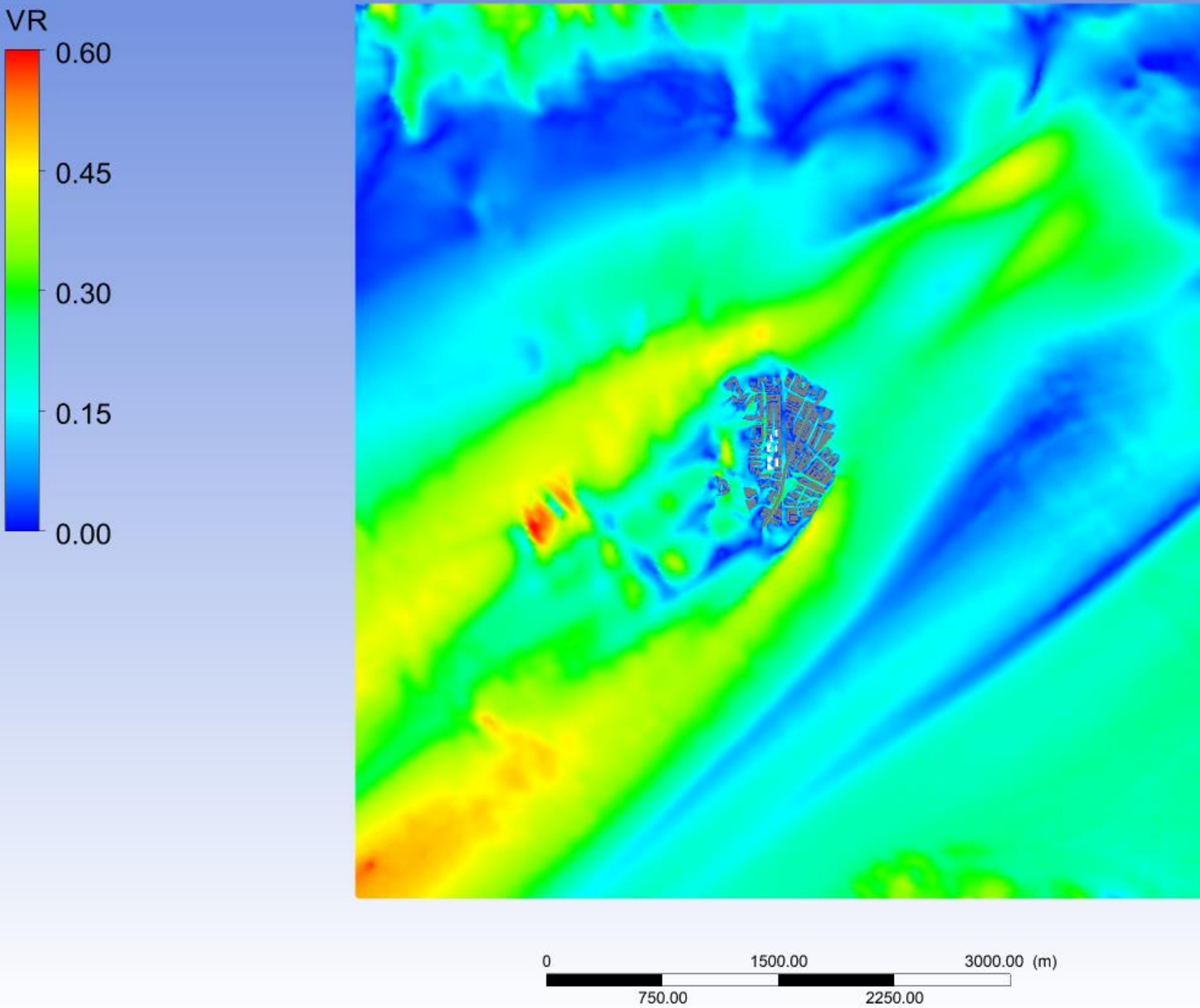
Proposed Scheme - Vector plot at pedestrian level under SW Wind



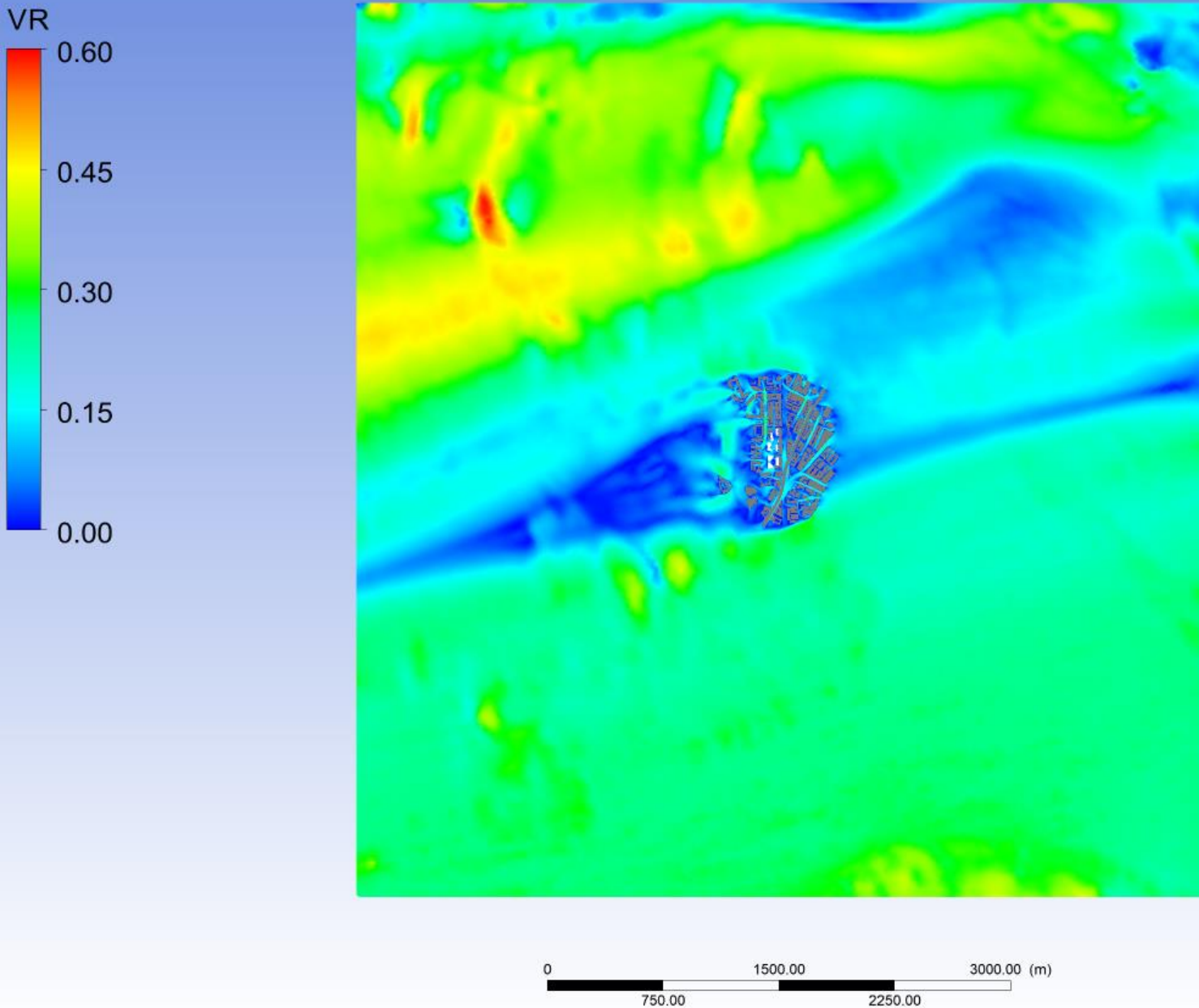
Proposed Scheme - Vector plot at pedestrian level under WSW Wind



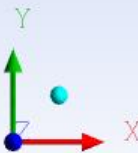
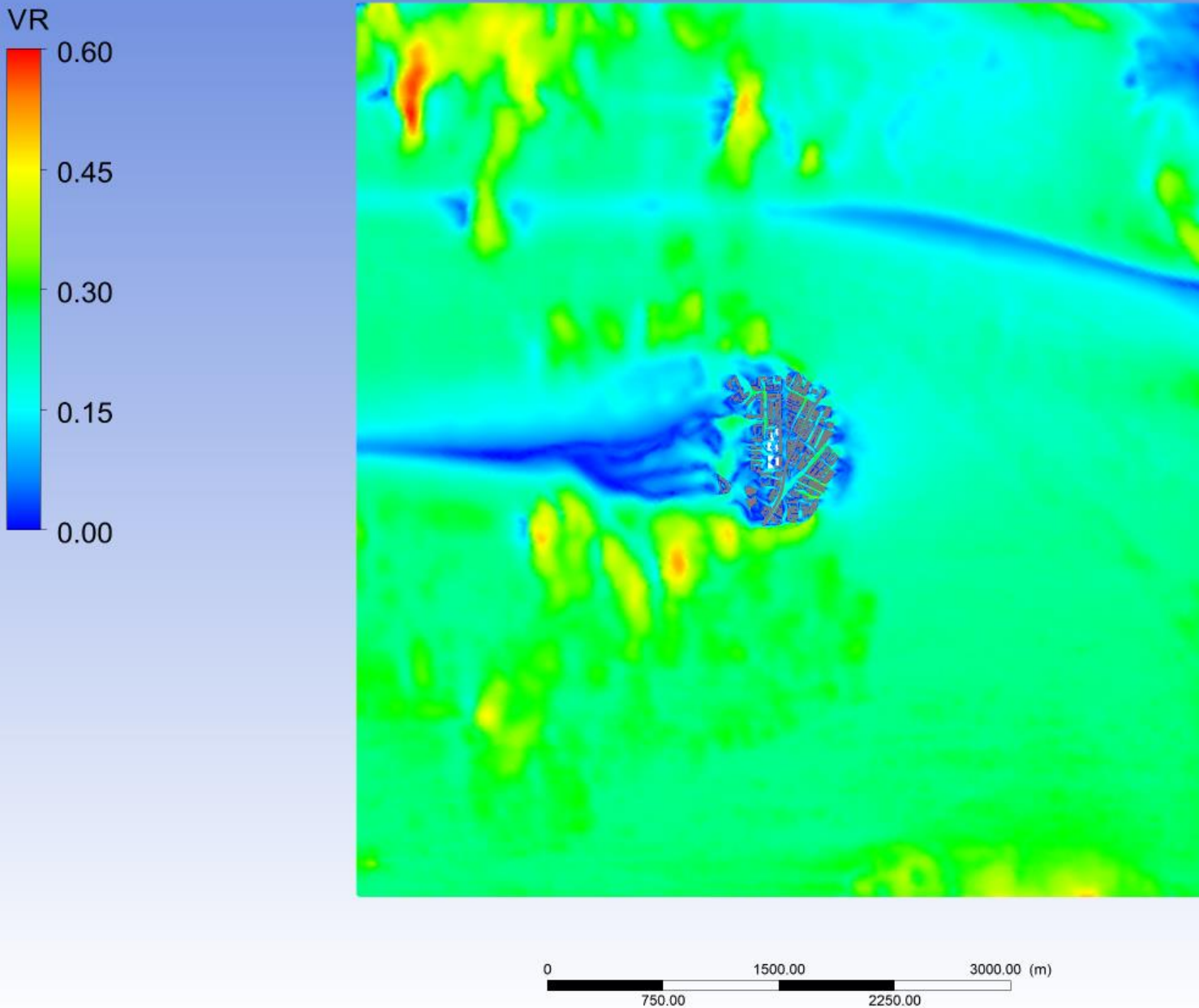
Proposed Scheme - Domain Contour plot at pedestrian level under NNE Wind



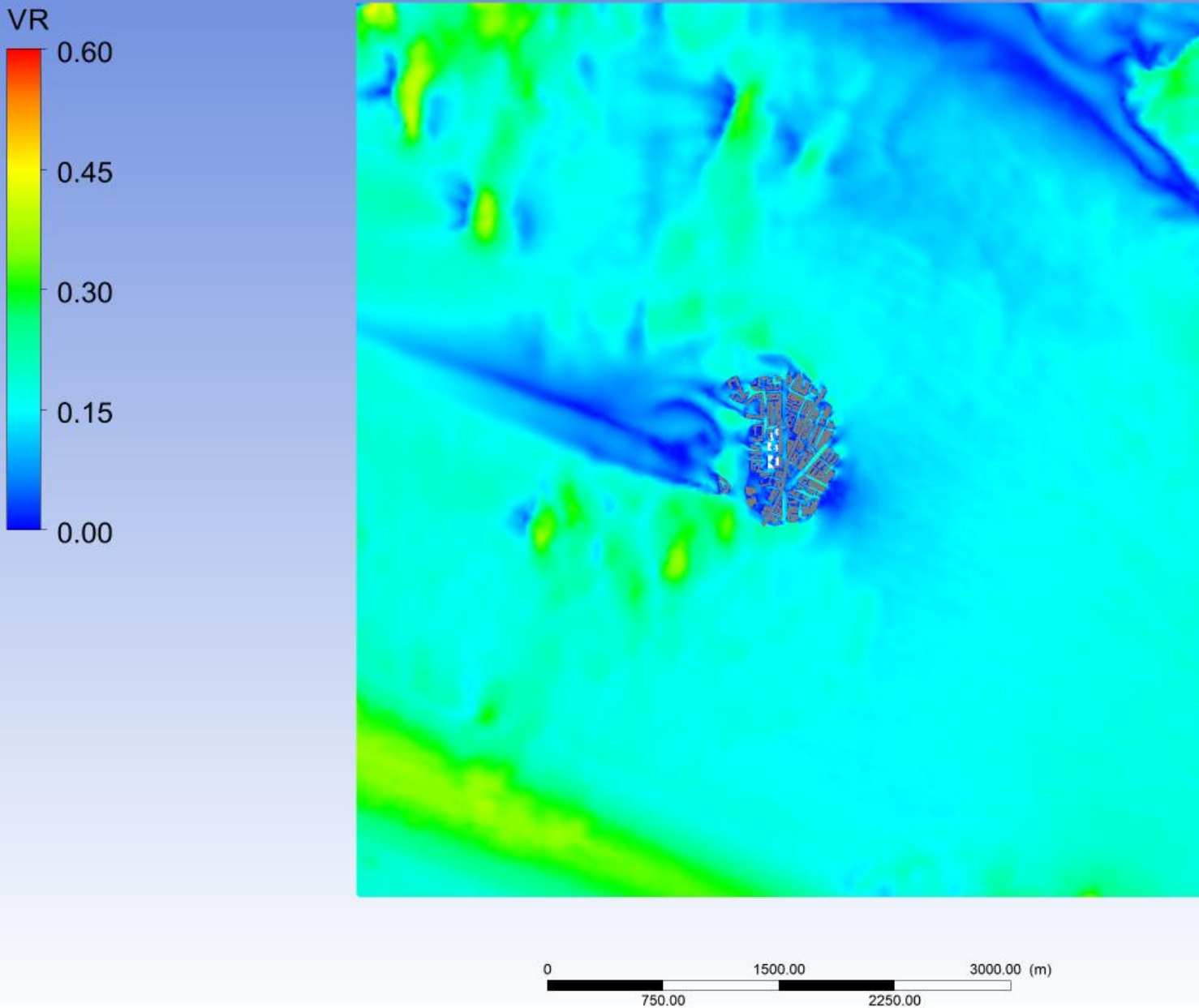
Proposed Scheme - Domain Contour plot at pedestrian level under NE Wind



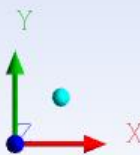
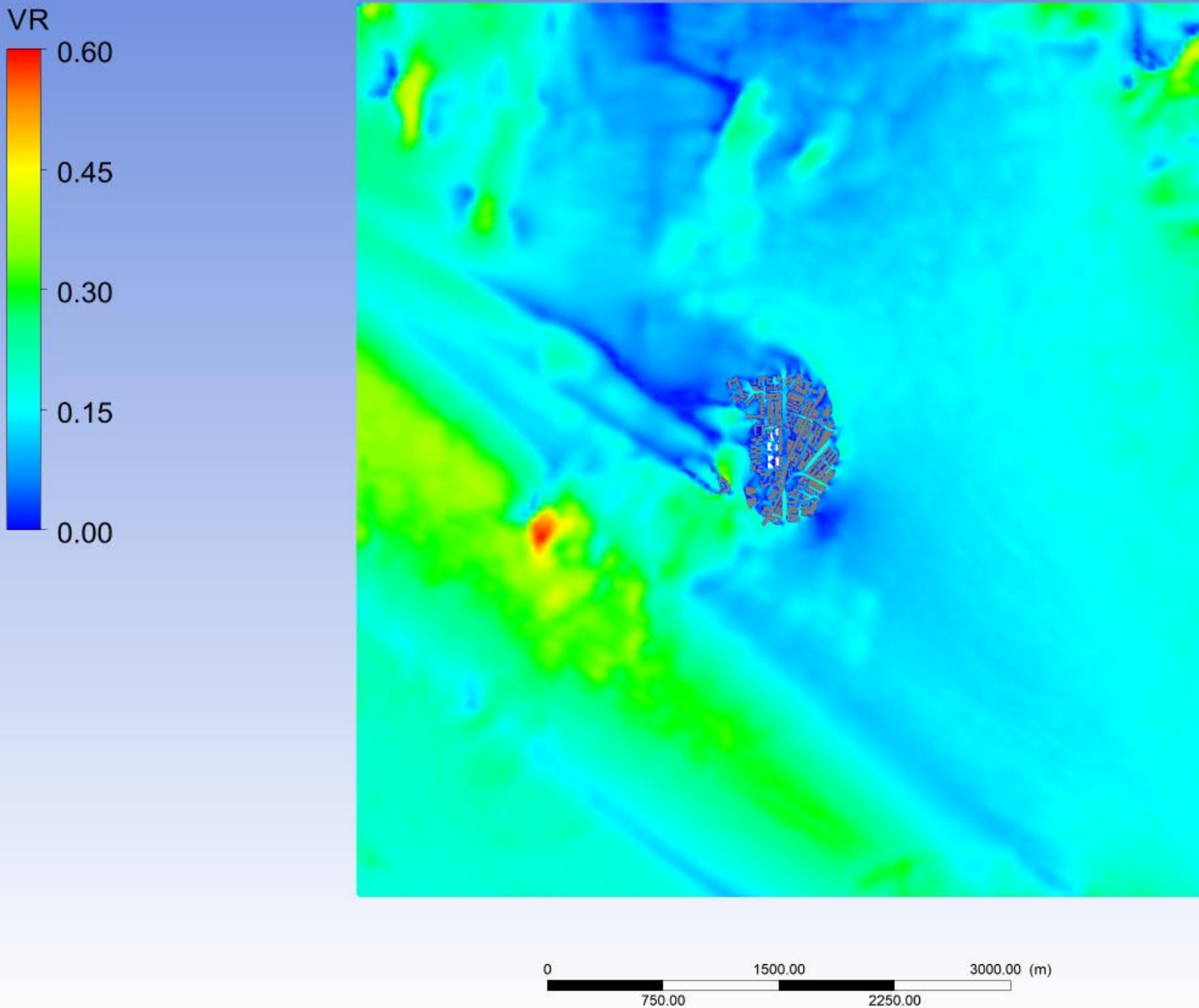
Proposed Scheme - Domain Contour plot at pedestrian level under ENE Wind



Proposed Scheme - Domain Contour plot at pedestrian level under E Wind

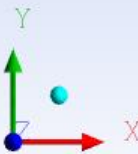
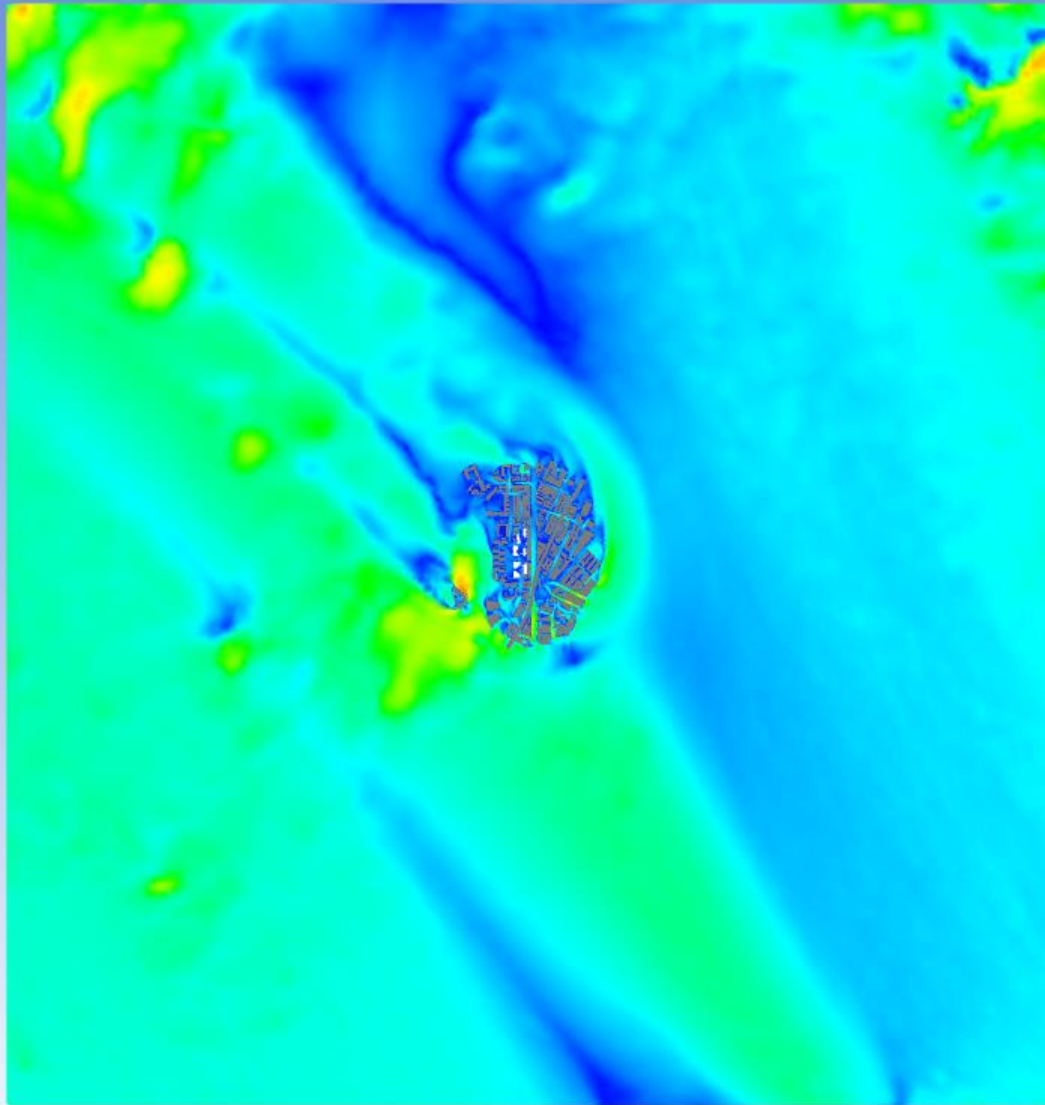
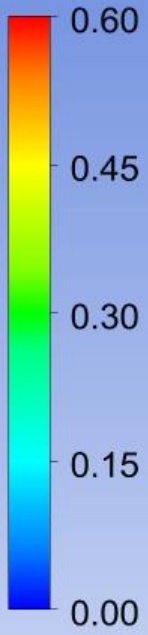


Proposed Scheme - Domain Contour plot at pedestrian level under ESE Wind



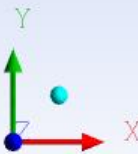
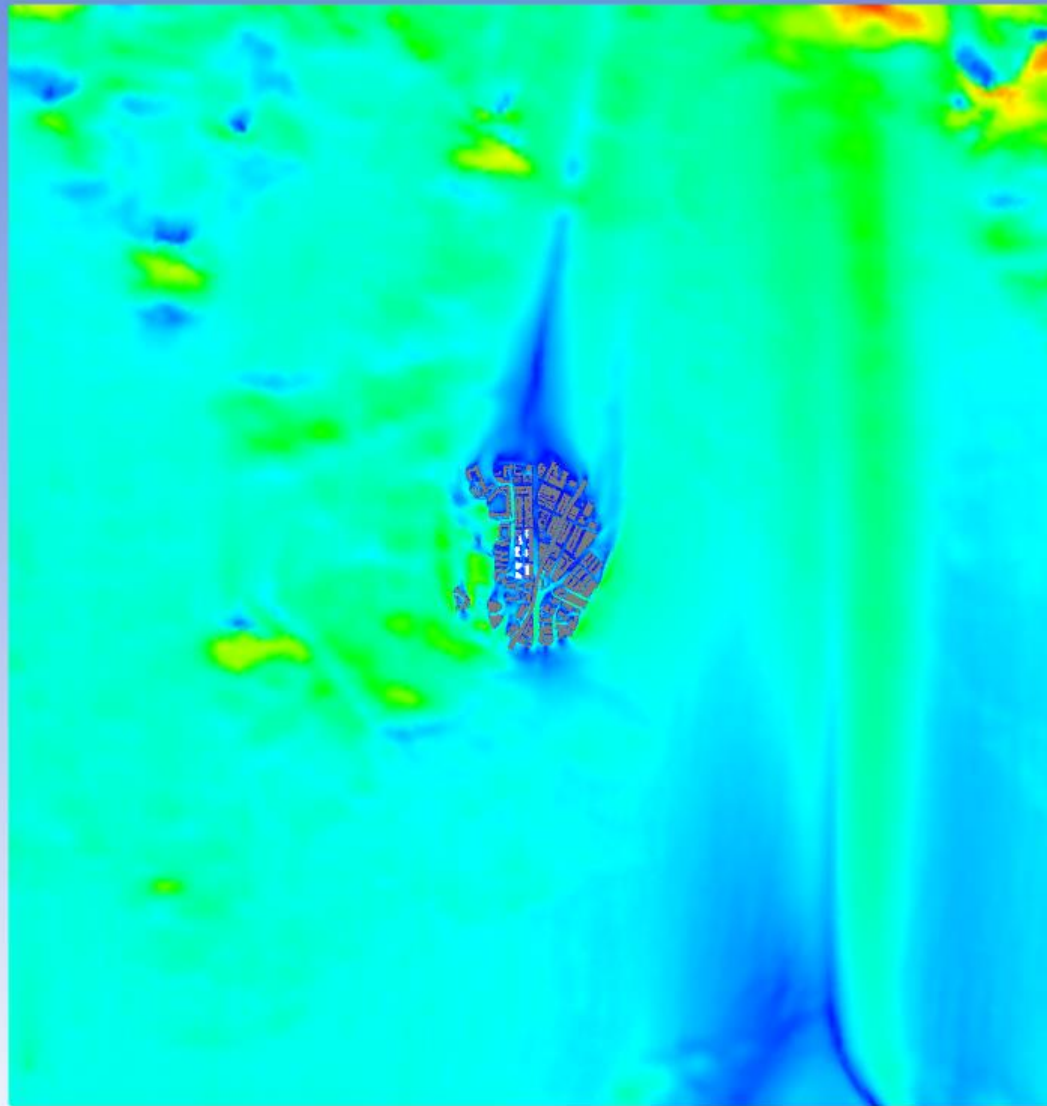
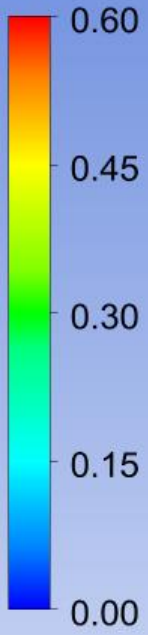
Proposed Scheme - Domain Contour plot at pedestrian level under SE Wind

VR



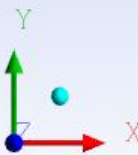
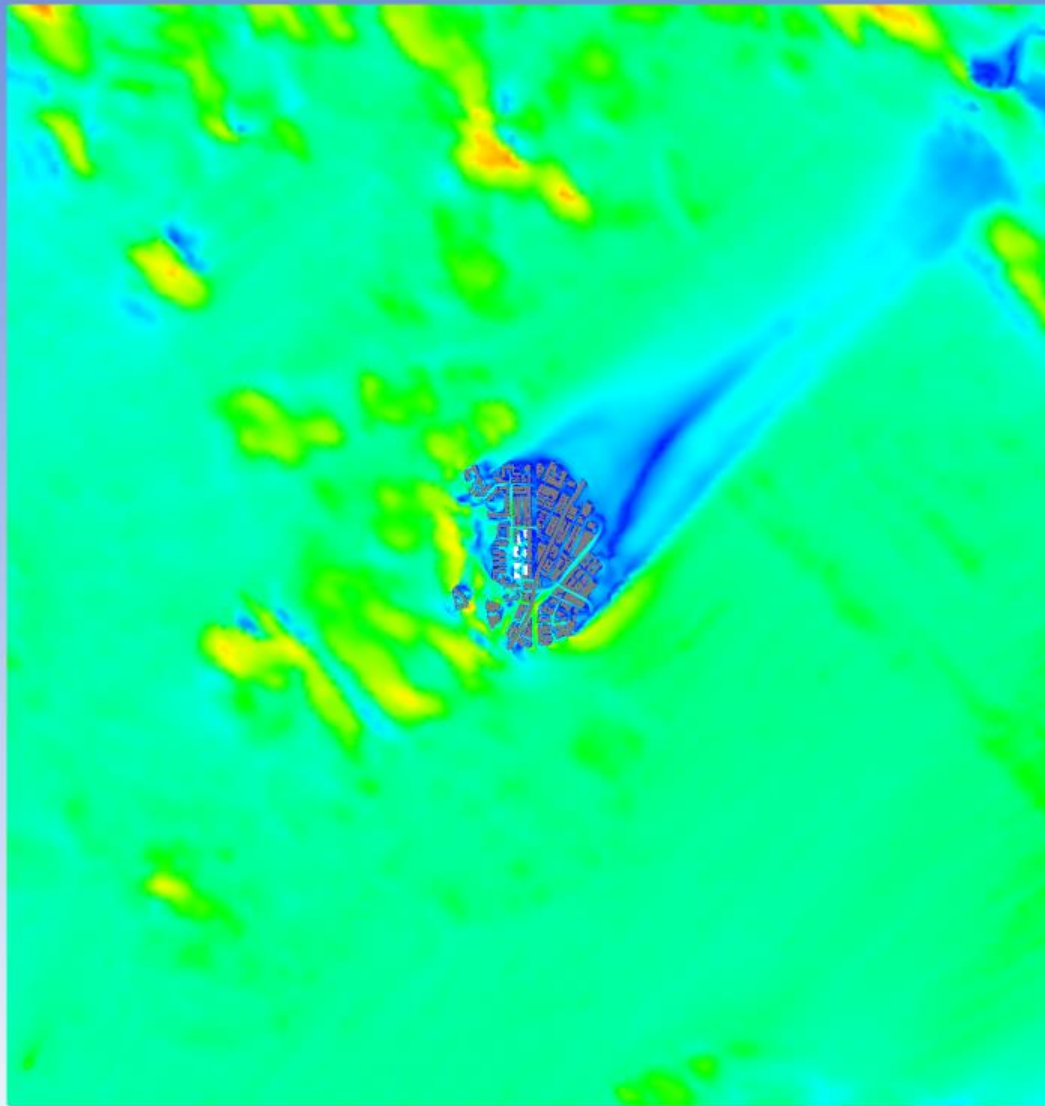
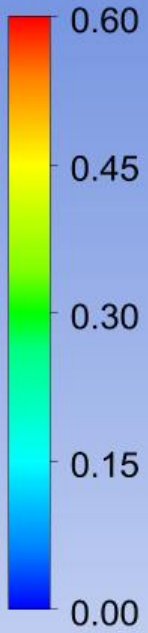
Proposed Scheme - Domain Contour plot at pedestrian level under SSE Wind

VR

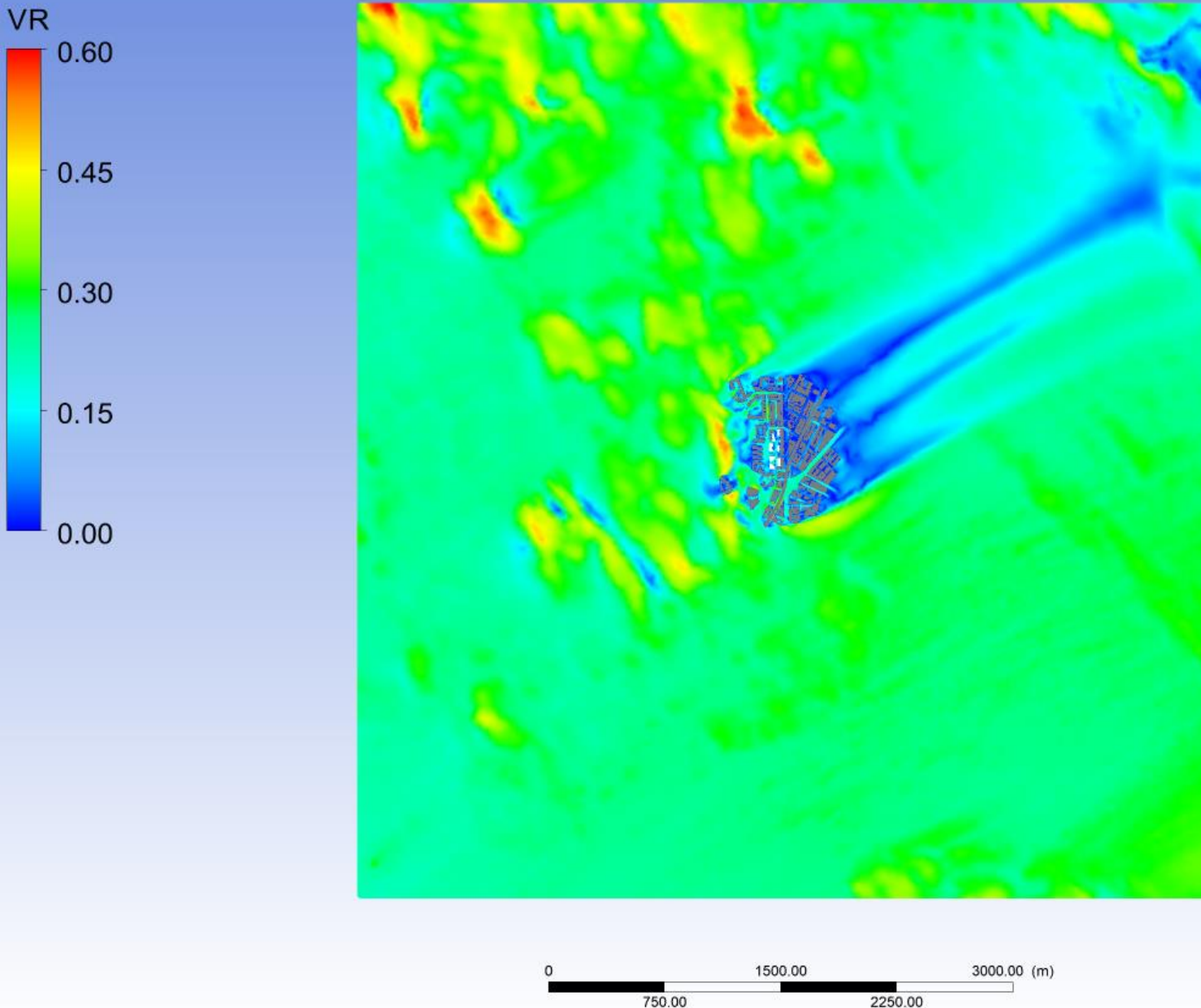


Proposed Scheme - Domain Contour plot at pedestrian level under S Wind

VR

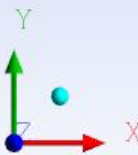
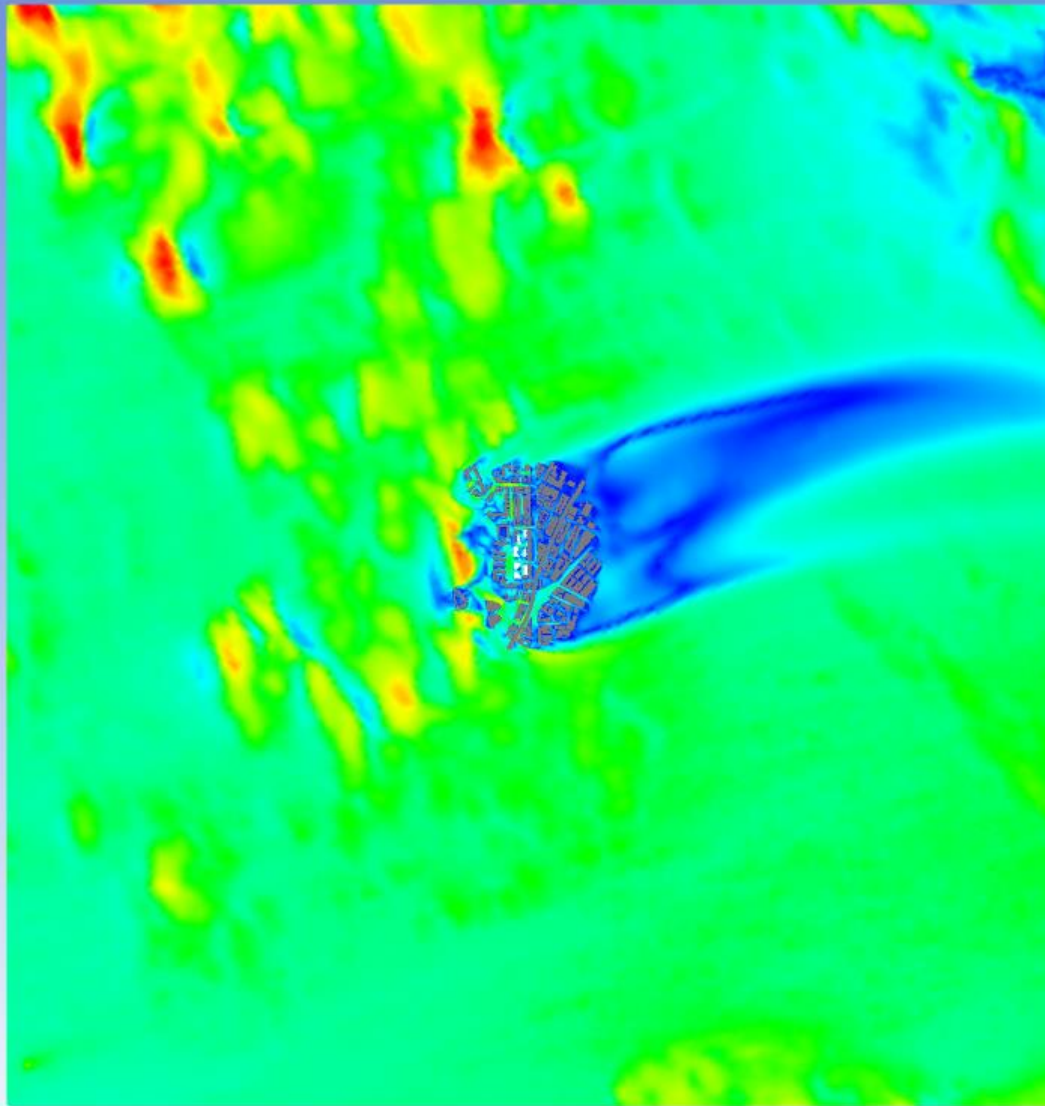
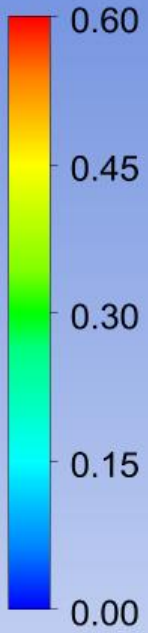


Proposed Scheme - Domain Contour plot at pedestrian level under SSW Wind



Proposed Scheme - Domain Contour plot at pedestrian level under SW Wind

VR



Proposed Scheme - Domain Contour plot at pedestrian level under WSW Wind

Appendix 5

Detailed CFD Simulation Result for Selected Test Points

Baseline Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
P01	0.03	0.06	0.05	0.04	0.05	0.05	0.05	0.03	0.19	0.22	0.20	0.07	0.12
P02	0.06	0.12	0.16	0.17	0.14	0.08	0.04	0.01	0.05	0.02	0.11	0.12	0.07
P03	0.05	0.11	0.17	0.14	0.12	0.08	0.05	0.03	0.07	0.06	0.13	0.11	0.08
P04	0.01	0.02	0.18	0.04	0.02	0.01	0.01	0.04	0.09	0.01	0.20	0.05	0.05
P05	0.01	0.05	0.17	0.13	0.10	0.09	0.04	0.02	0.05	0.02	0.11	0.10	0.07
P06	0.02	0.14	0.20	0.06	0.02	0.10	0.03	0.03	0.04	0.03	0.15	0.08	0.05
P07	0.01	0.05	0.05	0.01	0.01	0.07	0.03	0.03	0.00	0.03	0.17	0.03	0.04
P08	0.04	0.12	0.16	0.15	0.10	0.09	0.04	0.02	0.01	0.07	0.13	0.11	0.07
P09	0.04	0.20	0.23	0.21	0.14	0.12	0.05	0.00	0.02	0.04	0.17	0.15	0.09
P10	0.08	0.17	0.16	0.12	0.09	0.04	0.01	0.03	0.13	0.14	0.06	0.12	0.09
P11	0.05	0.05	0.06	0.05	0.05	0.01	0.02	0.01	0.04	0.08	0.07	0.05	0.05
P12	0.05	0.11	0.11	0.09	0.07	0.02	0.02	0.02	0.05	0.09	0.06	0.08	0.06
P13	0.08	0.17	0.15	0.12	0.10	0.04	0.02	0.04	0.07	0.10	0.07	0.11	0.07
P14	0.03	0.05	0.06	0.08	0.06	0.02	0.04	0.02	0.13	0.06	0.08	0.06	0.07
P15	0.08	0.11	0.08	0.13	0.07	0.07	0.07	0.05	0.11	0.08	0.08	0.10	0.08
P16	0.09	0.10	0.05	0.13	0.07	0.08	0.09	0.04	0.09	0.10	0.03	0.09	0.08
P17	0.10	0.15	0.04	0.16	0.10	0.10	0.09	0.14	0.11	0.12	0.19	0.11	0.13
P18	0.03	0.11	0.08	0.05	0.09	0.07	0.07	0.09	0.15	0.13	0.26	0.08	0.12
P19	0.05	0.11	0.05	0.03	0.04	0.05	0.07	0.09	0.07	0.07	0.28	0.05	0.09
P20	0.04	0.15	0.08	0.11	0.07	0.01	0.10	0.14	0.19	0.18	0.25	0.10	0.14
P21	0.13	0.27	0.19	0.22	0.18	0.09	0.07	0.13	0.26	0.28	0.24	0.20	0.20
P22	0.02	0.09	0.02	0.09	0.04	0.01	0.03	0.10	0.23	0.24	0.24	0.08	0.14
P23	0.01	0.05	0.06	0.08	0.04	0.04	0.05	0.09	0.25	0.27	0.19	0.09	0.15
P24	0.02	0.06	0.09	0.13	0.08	0.06	0.06	0.03	0.24	0.26	0.05	0.11	0.13
P25	0.03	0.06	0.04	0.10	0.08	0.09	0.02	0.11	0.21	0.23	0.10	0.10	0.13
P26	0.01	0.04	0.06	0.06	0.07	0.11	0.05	0.13	0.22	0.24	0.08	0.08	0.13
P27	0.03	0.07	0.04	0.05	0.05	0.02	0.03	0.01	0.07	0.06	0.03	0.05	0.04
P28	0.05	0.15	0.11	0.11	0.08	0.06	0.02	0.01	0.14	0.13	0.06	0.11	0.09
P29	0.06	0.17	0.13	0.16	0.09	0.08	0.04	0.02	0.21	0.20	0.16	0.14	0.13
P30	0.03	0.12	0.09	0.14	0.07	0.11	0.11	0.05	0.06	0.06	0.09	0.10	0.08
Average SVR	0.04	0.11	0.10	0.10	0.08	0.06	0.05	0.05	0.12	0.12	0.13	0.09	0.09
T01	0.12	0.24	0.18	0.22	0.12	0.04	0.06	0.24	0.15	0.31	0.23	0.18	0.18
T02	0.06	0.19	0.13	0.18	0.12	0.12	0.07	0.18	0.13	0.21	0.17	0.15	0.15
T03	0.04	0.06	0.07	0.06	0.03	0.19	0.12	0.36	0.27	0.17	0.18	0.09	0.18
T04	0.09	0.11	0.10	0.09	0.06	0.18	0.02	0.35	0.25	0.27	0.16	0.12	0.19
T05	0.03	0.13	0.03	0.03	0.07	0.08	0.03	0.07	0.02	0.04	0.06	0.05	0.05
T06	0.05	0.11	0.06	0.04	0.02	0.02	0.04	0.03	0.16	0.18	0.19	0.07	0.10
T07	0.08	0.25	0.12	0.26	0.17	0.10	0.06	0.02	0.25	0.28	0.19	0.20	0.18
T08	0.01	0.13	0.08	0.08	0.06	0.05	0.02	0.06	0.24	0.29	0.29	0.10	0.16
T09	0.03	0.18	0.16	0.17	0.06	0.07	0.02	0.04	0.23	0.25	0.35	0.15	0.17
T10	0.06	0.07	0.08	0.11	0.10	0.08	0.13	0.16	0.08	0.10	0.30	0.09	0.13
T11	0.02	0.08	0.09	0.10	0.12	0.07	0.07	0.01	0.04	0.05	0.09	0.08	0.07
T12	0.09	0.24	0.16	0.16	0.11	0.04	0.03	0.04	0.02	0.04	0.06	0.13	0.06
T13	0.02	0.12	0.10	0.06	0.03	0.03	0.02	0.06	0.02	0.04	0.11	0.06	0.04
T14	0.06	0.11	0.10	0.07	0.02	0.05	0.02	0.20	0.22	0.32	0.33	0.10	0.17
T15	0.11	0.28	0.24	0.24	0.09	0.08	0.12	0.28	0.35	0.42	0.40	0.22	0.27
T16	0.15	0.37	0.30	0.35	0.18	0.13	0.10	0.28	0.23	0.31	0.24	0.27	0.24
T17	0.01	0.28	0.25	0.31	0.16	0.13	0.17	0.22	0.17	0.15	0.18	0.22	0.18
T18	0.12	0.42	0.34	0.40	0.25	0.19	0.16	0.20	0.27	0.19	0.05	0.30	0.22
T19	0.01	0.10	0.21	0.08	0.14	0.14	0.10	0.14	0.22	0.23	0.05	0.13	0.15
T20	0.04	0.24	0.27	0.28	0.19	0.15	0.14	0.15	0.24	0.26	0.15	0.23	0.20
T21	0.01	0.16	0.18	0.15	0.05	0.09	0.04	0.05	0.27	0.30	0.22	0.14	0.17
T22	0.12	0.25	0.16	0.23	0.19	0.07	0.06	0.10	0.26	0.30	0.33	0.20	0.21
T23	0.01	0.03	0.03	0.13	0.10	0.08	0.06	0.12	0.17	0.20	0.31	0.10	0.15
T24	0.07	0.06	0.04	0.13	0.08	0.07	0.03	0.06	0.24	0.22	0.23	0.11	0.15
T25	0.07	0.14	0.13	0.14	0.14	0.18	0.03	0.26	0.19	0.14	0.10	0.14	0.15
T26	0.07	0.12	0.12	0.11	0.14	0.18	0.08	0.26	0.19	0.15	0.12	0.13	0.16
T27	0.01	0.08	0.07	0.08	0.08	0.04	0.06	0.03	0.08	0.25	0.27	0.08	0.12
T28	0.03	0.07	0.08	0.13	0.09	0.05	0.14	0.04	0.08	0.27	0.29	0.10	0.14
T29	0.03	0.09	0.10	0.14	0.10	0.04	0.13	0.02	0.04	0.15	0.15	0.10	0.10
T30	0.02	0.11	0.11	0.12	0.07	0.03	0.09	0.03	0.03	0.05	0.04	0.08	0.06
T31	0.02	0.12	0.11	0.11	0.10	0.07	0.09	0.02	0.04	0.12	0.11	0.09	0.08
T32	0.07	0.09	0.06	0.11	0.13	0.09	0.09	0.03	0.22	0.23	0.24	0.12	0.15
T33	0.02	0.07	0.03	0.06	0.03	0.06	0.10	0.03	0.23	0.17	0.24	0.07	0.13
T34	0.03	0.03	0.05	0.12	0.09	0.07	0.08	0.03	0.13	0.12	0.08	0.09	0.10
T35	0.05	0.03	0.05	0.12	0.07	0.02	0.04	0.05	0.07	0.09	0.07	0.07	0.07
T36	0.01	0.05	0.02	0.11	0.04	0.04	0.03	0.02	0.05	0.07	0.02	0.06	0.05
T37	0.02	0.08	0.05	0.18	0.07	0.07	0.10	0.06	0.07	0.10	0.03	0.10	0.09
T38	0.05	0.10	0.06	0.13	0.05	0.08	0.07	0.03	0.03	0.07	0.03	0.08	0.06
T39	0.04	0.07	0.05	0.07	0.04	0.12	0.13	0.05	0.11	0.06	0.04	0.07	0.08
T40	0.03	0.04	0.05	0.08	0.08	0.11	0.06	0.04	0.09	0.09	0.06	0.07	0.08
T41	0.01	0.06	0.05	0.06	0.02	0.06	0.05	0.05	0.14	0.04	0.07	0.05	0.06
T42	0.03	0.06	0.09	0.14	0.17	0.05	0.10	0.04	0.06	0.03	0.25	0.10	0.10
T43	0.04	0.04	0.05	0.10	0.12	0.02	0.13	0.04	0.04	0.02	0.05	0.07	0.06

Baseline Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
T44	0.04	0.07	0.11	0.13	0.15	0.02	0.10	0.03	0.04	0.05	0.05	0.10	0.07
T45	0.02	0.07	0.14	0.12	0.11	0.01	0.10	0.06	0.03	0.04	0.03	0.09	0.06
T46	0.03	0.08	0.12	0.10	0.10	0.02	0.19	0.09	0.03	0.04	0.12	0.08	0.08
T47	0.04	0.13	0.15	0.11	0.08	0.02	0.14	0.08	0.04	0.07	0.07	0.09	0.07
T48	0.09	0.22	0.16	0.12	0.09	0.10	0.10	0.07	0.02	0.03	0.03	0.11	0.07
T49	0.02	0.18	0.12	0.15	0.07	0.10	0.12	0.02	0.07	0.12	0.08	0.11	0.09
T50	0.13	0.23	0.16	0.21	0.11	0.17	0.11	0.05	0.27	0.29	0.20	0.19	0.19
T51	0.04	0.12	0.10	0.12	0.14	0.19	0.17	0.24	0.16	0.18	0.12	0.13	0.17
T52	0.03	0.03	0.05	0.09	0.04	0.10	0.07	0.02	0.01	0.09	0.02	0.06	0.05
T53	0.03	0.10	0.16	0.21	0.10	0.08	0.17	0.04	0.07	0.01	0.09	0.13	0.09
T54	0.02	0.04	0.03	0.09	0.09	0.09	0.10	0.04	0.07	0.04	0.07	0.07	0.07
T55	0.02	0.02	0.08	0.17	0.03	0.02	0.07	0.02	0.09	0.06	0.10	0.08	0.07
T56	0.03	0.25	0.22	0.28	0.08	0.13	0.14	0.09	0.09	0.09	0.05	0.18	0.11
T57	0.04	0.08	0.03	0.12	0.04	0.03	0.01	0.05	0.07	0.12	0.02	0.07	0.06
T58	0.05	0.16	0.15	0.18	0.10	0.07	0.04	0.11	0.05	0.09	0.05	0.13	0.09
T59	0.06	0.04	0.12	0.13	0.06	0.06	0.01	0.04	0.03	0.06	0.09	0.09	0.06
T60	0.01	0.10	0.12	0.19	0.06	0.11	0.13	0.12	0.06	0.03	0.09	0.10	0.09
T61	0.02	0.08	0.11	0.08	0.02	0.08	0.05	0.03	0.01	0.06	0.07	0.07	0.05
T62	0.05	0.03	0.05	0.08	0.05	0.07	0.08	0.05	0.03	0.03	0.04	0.06	0.05
T63	0.06	0.12	0.13	0.14	0.12	0.10	0.14	0.02	0.07	0.01	0.10	0.11	0.08
T64	0.10	0.18	0.15	0.23	0.12	0.09	0.13	0.09	0.03	0.05	0.11	0.15	0.10
T65	0.01	0.16	0.13	0.13	0.08	0.01	0.05	0.02	0.05	0.07	0.09	0.10	0.06
T66	0.02	0.09	0.04	0.11	0.11	0.06	0.02	0.11	0.05	0.11	0.11	0.08	0.09
T67	0.04	0.20	0.13	0.12	0.09	0.05	0.10	0.06	0.03	0.06	0.16	0.10	0.08
T68	0.07	0.07	0.05	0.10	0.04	0.08	0.06	0.08	0.16	0.27	0.15	0.10	0.13
T69	0.06	0.08	0.07	0.07	0.06	0.09	0.15	0.13	0.09	0.11	0.11	0.08	0.10
T70	0.10	0.26	0.19	0.25	0.17	0.18	0.20	0.12	0.10	0.29	0.21	0.20	0.19
T71	0.03	0.04	0.04	0.06	0.03	0.03	0.11	0.08	0.26	0.28	0.06	0.08	0.13
T72	0.06	0.21	0.13	0.19	0.11	0.04	0.11	0.10	0.06	0.14	0.08	0.13	0.11
T73	0.01	0.03	0.03	0.04	0.02	0.04	0.08	0.14	0.39	0.41	0.48	0.09	0.23
T74	0.11	0.19	0.12	0.19	0.10	0.12	0.18	0.14	0.36	0.36	0.43	0.18	0.25
T75	0.11	0.20	0.11	0.13	0.11	0.09	0.17	0.09	0.29	0.34	0.35	0.16	0.21
T76	0.13	0.23	0.10	0.15	0.12	0.05	0.06	0.02	0.27	0.19	0.19	0.15	0.15
T77	0.11	0.29	0.20	0.25	0.15	0.11	0.19	0.11	0.35	0.35	0.38	0.22	0.25
T78	0.10	0.22	0.18	0.23	0.13	0.05	0.02	0.11	0.22	0.27	0.10	0.18	0.16
T79	0.06	0.14	0.08	0.05	0.06	0.12	0.15	0.09	0.28	0.36	0.12	0.11	0.18
T80	0.07	0.14	0.09	0.07	0.04	0.13	0.11	0.09	0.26	0.34	0.39	0.12	0.20
T81	0.08	0.16	0.12	0.13	0.05	0.11	0.11	0.01	0.27	0.36	0.41	0.14	0.20
T82	0.03	0.16	0.09	0.13	0.06	0.09	0.14	0.10	0.34	0.42	0.41	0.14	0.24
T83	0.05	0.19	0.08	0.11	0.01	0.06	0.04	0.11	0.13	0.16	0.23	0.09	0.11
T84	0.01	0.15	0.06	0.06	0.06	0.08	0.14	0.16	0.17	0.23	0.26	0.09	0.15
T85	0.06	0.19	0.13	0.10	0.04	0.06	0.11	0.16	0.29	0.25	0.28	0.13	0.18
T86	0.08	0.22	0.04	0.12	0.09	0.06	0.23	0.14	0.38	0.39	0.46	0.15	0.26
T87	0.08	0.19	0.04	0.09	0.09	0.10	0.26	0.11	0.24	0.31	0.37	0.12	0.21
T88	0.04	0.01	0.01	0.05	0.02	0.08	0.09	0.20	0.26	0.27	0.07	0.07	0.15
T89	0.02	0.02	0.02	0.03	0.02	0.03	0.07	0.11	0.15	0.14	0.08	0.04	0.09
T90	0.01	0.04	0.04	0.04	0.04	0.03	0.13	0.20	0.26	0.27	0.07	0.07	0.15
T91	0.02	0.03	0.03	0.03	0.03	0.04	0.07	0.12	0.12	0.12	0.04	0.05	0.08
T92	0.02	0.08	0.04	0.03	0.07	0.09	0.09	0.04	0.01	0.04	0.18	0.05	0.06
T93	0.03	0.09	0.04	0.09	0.10	0.10	0.11	0.04	0.01	0.06	0.20	0.07	0.08
T94	0.04	0.08	0.06	0.12	0.14	0.10	0.12	0.03	0.06	0.04	0.23	0.09	0.10
T95	0.01	0.04	0.02	0.03	0.02	0.04	0.03	0.02	0.02	0.05	0.03	0.03	0.03
T96	0.01	0.03	0.03	0.04	0.02	0.08	0.05	0.02	0.05	0.05	0.07	0.04	0.05
T97	0.04	0.08	0.05	0.11	0.08	0.06	0.07	0.00	0.04	0.07	0.04	0.07	0.06
T98	0.02	0.03	0.03	0.09	0.05	0.06	0.09	0.01	0.04	0.04	0.04	0.05	0.05
T99	0.03	0.04	0.03	0.07	0.04	0.08	0.12	0.01	0.06	0.04	0.04	0.05	0.05
T100	0.03	0.04	0.03	0.07	0.05	0.10	0.12	0.01	0.06	0.09	0.04	0.06	0.07
T101	0.02	0.03	0.04	0.06	0.04	0.10	0.14	0.00	0.06	0.13	0.04	0.06	0.07
T102	0.02	0.01	0.03	0.06	0.05	0.09	0.17	0.02	0.09	0.18	0.01	0.06	0.09
T103	0.03	0.01	0.02	0.03	0.03	0.05	0.07	0.05	0.02	0.01	0.02	0.03	0.03
T104	0.04	0.01	0.02	0.04	0.10	0.04	0.01	0.07	0.03	0.03	0.01	0.04	0.04
T105	0.02	0.02	0.03	0.05	0.03	0.09	0.06	0.10	0.23	0.16	0.14	0.06	0.12
T106	0.07	0.05	0.06	0.02	0.05	0.06	0.06	0.03	0.24	0.25	0.16	0.08	0.13
T107	0.06	0.06	0.04	0.02	0.04	0.04	0.02	0.05	0.10	0.20	0.13	0.06	0.09
T108	0.02	0.06	0.02	0.03	0.03	0.09	0.09	0.09	0.23	0.24	0.19	0.06	0.14
T109	0.02	0.09	0.04	0.02	0.03	0.03	0.07	0.07	0.13	0.12	0.15	0.05	0.09
T110	0.02	0.06	0.02	0.03	0.01	0.02	0.02	0.08	0.07	0.15	0.02	0.04	0.06
T111	0.01	0.10	0.06	0.06	0.01	0.02	0.03	0.08	0.08	0.13	0.03	0.06	0.06
T112	0.04	0.05	0.07	0.07	0.04	0.03	0.07	0.03	0.08	0.09	0.09	0.06	0.07
T113	0.01	0.09	0.16	0.18	0.07	0.01	0.04	0.01	0.02	0.05	0.06	0.10	0.05
T114	0.03	0.04	0.06	0.08	0.03	0.04	0.02	0.02	0.01	0.04	0.02	0.05	0.03
T115	0.03	0.06	0.12	0.15	0.05	0.01	0.09	0.04	0.06	0.08	0.05	0.09	0.07
T116	0.05	0.15	0.15	0.14	0.12	0.07	0.22	0.08	0.14	0.09	0.02	0.12	0.11
T117	0.06	0.15	0.16	0.08	0.07	0.08	0.13	0.13	0.07	0.05	0.02	0.09	0.08

Baseline Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
T118	0.03	0.18	0.15	0.16	0.11	0.11	0.21	0.03	0.05	0.09	0.05	0.13	0.10
T119	0.05	0.20	0.16	0.08	0.09	0.09	0.19	0.17	0.12	0.03	0.03	0.10	0.09
T120	0.07	0.15	0.05	0.10	0.07	0.02	0.06	0.14	0.08	0.08	0.11	0.08	0.08
T121	0.06	0.15	0.18	0.14	0.03	0.16	0.11	0.19	0.07	0.28	0.22	0.13	0.15
T122	0.15	0.26	0.14	0.04	0.01	0.14	0.06	0.18	0.19	0.24	0.18	0.12	0.14
T123	0.09	0.25	0.15	0.13	0.07	0.14	0.01	0.25	0.19	0.29	0.20	0.15	0.17
T124	0.07	0.26	0.15	0.22	0.12	0.06	0.15	0.30	0.35	0.25	0.22	0.19	0.22
T125	0.06	0.07	0.08	0.13	0.02	0.03	0.03	0.04	0.06	0.17	0.09	0.09	0.08
T126	0.03	0.06	0.06	0.02	0.08	0.07	0.07	0.07	0.11	0.19	0.15	0.06	0.10
T127	0.09	0.22	0.15	0.21	0.17	0.06	0.06	0.05	0.11	0.12	0.01	0.16	0.10
T128	0.03	0.14	0.12	0.04	0.04	0.06	0.07	0.03	0.09	0.13	0.16	0.07	0.08
T129	0.03	0.11	0.04	0.12	0.03	0.05	0.06	0.10	0.12	0.10	0.19	0.08	0.10
T130	0.07	0.15	0.15	0.15	0.08	0.07	0.11	0.18	0.27	0.24	0.25	0.14	0.18
T131	0.04	0.04	0.02	0.02	0.03	0.10	0.05	0.10	0.14	0.18	0.05	0.05	0.09
T132	0.03	0.06	0.04	0.05	0.02	0.10	0.04	0.11	0.19	0.07	0.15	0.06	0.10
T133	0.13	0.32	0.21	0.24	0.11	0.21	0.26	0.24	0.37	0.24	0.19	0.22	0.24
T134	0.06	0.27	0.18	0.23	0.18	0.08	0.15	0.09	0.19	0.24	0.19	0.19	0.18
T135	0.08	0.25	0.13	0.22	0.16	0.10	0.11	0.05	0.32	0.26	0.20	0.19	0.19
T136	0.14	0.31	0.18	0.23	0.11	0.04	0.06	0.03	0.30	0.26	0.23	0.20	0.18
T137	0.17	0.29	0.09	0.23	0.17	0.10	0.04	0.07	0.28	0.28	0.22	0.20	0.19
T138	0.05	0.05	0.07	0.22	0.16	0.03	0.08	0.02	0.29	0.28	0.22	0.15	0.18
T139	0.02	0.09	0.14	0.12	0.13	0.11	0.02	0.06	0.02	0.24	0.04	0.12	0.10
T140	0.06	0.15	0.11	0.06	0.08	0.08	0.11	0.07	0.05	0.11	0.09	0.08	0.08
T141	0.02	0.15	0.11	0.09	0.07	0.14	0.05	0.24	0.12	0.27	0.02	0.11	0.14
T142	0.04	0.11	0.11	0.05	0.09	0.15	0.15	0.21	0.15	0.08	0.05	0.09	0.11
T143	0.07	0.21	0.17	0.22	0.15	0.14	0.14	0.29	0.22	0.13	0.15	0.18	0.18
T144	0.07	0.27	0.20	0.28	0.16	0.12	0.13	0.24	0.16	0.13	0.27	0.20	0.18
T145	0.05	0.21	0.15	0.22	0.12	0.06	0.01	0.06	0.03	0.18	0.04	0.15	0.10
Average LVR	0.05	0.12	0.10	0.12	0.08	0.08	0.08	0.09	0.14	0.15	0.14	0.11	0.12
S01	0.03	0.14	0.10	0.14	0.09	0.12	0.12	0.05	0.05	0.01	0.13	0.10	0.08
S02	0.05	0.20	0.18	0.15	0.05	0.11	0.11	0.06	0.08	0.09	0.21	0.12	0.10
S03	0.07	0.19	0.15	0.19	0.12	0.08	0.09	0.02	0.08	0.08	0.25	0.14	0.11
S04	0.06	0.14	0.13	0.09	0.06	0.04	0.05	0.06	0.07	0.06	0.16	0.09	0.07
S05	0.03	0.03	0.05	0.07	0.05	0.02	0.03	0.02	0.10	0.05	0.06	0.06	0.06
S06	0.12	0.23	0.17	0.20	0.16	0.08	0.01	0.08	0.26	0.31	0.03	0.19	0.16
S07	0.09	0.12	0.17	0.16	0.10	0.07	0.02	0.09	0.29	0.30	0.06	0.16	0.16

Proposed Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
P01	0.05	0.13	0.07	0.11	0.10	0.07	0.04	0.04	0.20	0.21	0.21	0.11	0.14
P02	0.03	0.08	0.05	0.10	0.08	0.06	0.04	0.01	0.04	0.03	0.02	0.07	0.05
P03	0.02	0.05	0.02	0.04	0.04	0.03	0.03	0.03	0.09	0.10	0.10	0.04	0.06
P04	0.06	0.17	0.09	0.16	0.13	0.11	0.08	0.03	0.11	0.11	0.16	0.13	0.11
P05	0.03	0.15	0.05	0.15	0.11	0.13	0.12	0.06	0.10	0.10	0.08	0.11	0.11
P06	0.06	0.16	0.10	0.07	0.04	0.00	0.05	0.07	0.13	0.11	0.05	0.08	0.07
P07	0.08	0.14	0.01	0.02	0.01	0.04	0.05	0.06	0.12	0.11	0.04	0.05	0.06
P08	0.05	0.09	0.10	0.10	0.09	0.06	0.05	0.02	0.05	0.04	0.05	0.08	0.06
P09	0.07	0.12	0.15	0.15	0.11	0.09	0.08	0.04	0.14	0.12	0.12	0.13	0.11
P10	0.07	0.15	0.14	0.05	0.09	0.02	0.01	0.01	0.02	0.02	0.09	0.07	0.04
P11	0.06	0.08	0.08	0.03	0.05	0.01	0.02	0.01	0.03	0.05	0.13	0.05	0.04
P12	0.01	0.12	0.06	0.03	0.05	0.02	0.01	0.04	0.09	0.12	0.07	0.06	0.06
P13	0.01	0.09	0.02	0.01	0.04	0.02	0.01	0.03	0.08	0.10	0.09	0.04	0.06
P14	0.01	0.11	0.06	0.07	0.07	0.01	0.09	0.06	0.21	0.18	0.21	0.08	0.12
P15	0.07	0.19	0.16	0.15	0.11	0.09	0.09	0.10	0.23	0.13	0.11	0.14	0.13
P16	0.09	0.26	0.21	0.20	0.12	0.09	0.07	0.06	0.12	0.07	0.05	0.16	0.10
P17	0.10	0.25	0.19	0.17	0.11	0.09	0.08	0.10	0.12	0.16	0.21	0.16	0.14
P18	0.03	0.03	0.05	0.07	0.04	0.02	0.02	0.12	0.06	0.10	0.26	0.05	0.09
P19	0.03	0.02	0.03	0.03	0.03	0.02	0.05	0.11	0.07	0.11	0.27	0.04	0.09
P20	0.01	0.03	0.02	0.00	0.01	0.03	0.09	0.11	0.05	0.11	0.31	0.03	0.09
P21	0.15	0.29	0.18	0.08	0.05	0.06	0.07	0.05	0.23	0.29	0.34	0.14	0.17
P22	0.13	0.26	0.19	0.23	0.10	0.09	0.06	0.07	0.16	0.23	0.31	0.18	0.16
P23	0.03	0.08	0.06	0.09	0.17	0.07	0.06	0.08	0.10	0.19	0.28	0.10	0.14
P24	0.02	0.07	0.01	0.06	0.12	0.05	0.03	0.10	0.17	0.24	0.15	0.08	0.13
P25	0.09	0.25	0.19	0.24	0.08	0.04	0.02	0.12	0.24	0.26	0.14	0.18	0.16
P26	0.10	0.14	0.09	0.16	0.13	0.09	0.08	0.14	0.20	0.20	0.09	0.14	0.15
P27	0.10	0.18	0.13	0.18	0.14	0.07	0.08	0.06	0.31	0.29	0.18	0.17	0.18
P28	0.06	0.09	0.08	0.11	0.08	0.06	0.03	0.01	0.02	0.02	0.01	0.08	0.04
P29	0.06	0.16	0.12	0.14	0.08	0.06	0.06	0.02	0.18	0.17	0.21	0.12	0.12
P30	0.08	0.21	0.04	0.20	0.16	0.09	0.06	0.06	0.03	0.08	0.17	0.13	0.10
Average SVR	0.06	0.14	0.09	0.11	0.08	0.06	0.05	0.06	0.12	0.13	0.15	0.10	0.10
T01	0.18	0.27	0.20	0.22	0.14	0.04	0.06	0.23	0.15	0.29	0.22	0.20	0.18
T02	0.11	0.19	0.13	0.19	0.13	0.11	0.04	0.16	0.14	0.19	0.17	0.15	0.15
T03	0.12	0.11	0.08	0.03	0.03	0.05	0.10	0.34	0.27	0.20	0.19	0.09	0.16
T04	0.16	0.12	0.09	0.08	0.02	0.03	0.09	0.34	0.24	0.28	0.16	0.11	0.17
T05	0.06	0.08	0.03	0.05	0.06	0.02	0.06	0.13	0.02	0.05	0.05	0.05	0.05
T06	0.03	0.10	0.08	0.09	0.06	0.09	0.07	0.03	0.14	0.16	0.19	0.09	0.11
T07	0.09	0.27	0.23	0.09	0.14	0.10	0.09	0.02	0.18	0.21	0.24	0.16	0.15
T08	0.10	0.17	0.14	0.19	0.10	0.08	0.07	0.12	0.15	0.21	0.34	0.15	0.17
T09	0.07	0.04	0.10	0.17	0.13	0.08	0.08	0.12	0.15	0.16	0.35	0.12	0.16
T10	0.04	0.19	0.16	0.13	0.12	0.01	0.05	0.19	0.15	0.11	0.31	0.12	0.14
T11	0.02	0.15	0.06	0.16	0.12	0.03	0.04	0.05	0.02	0.05	0.03	0.10	0.06
T12	0.08	0.19	0.08	0.01	0.05	0.06	0.05	0.01	0.06	0.05	0.08	0.06	0.05
T13	0.09	0.19	0.17	0.21	0.13	0.07	0.04	0.06	0.09	0.02	0.06	0.14	0.08
T14	0.14	0.13	0.11	0.10	0.02	0.04	0.05	0.22	0.31	0.36	0.36	0.13	0.21
T15	0.19	0.27	0.23	0.22	0.10	0.07	0.08	0.28	0.36	0.42	0.41	0.22	0.27
T16	0.24	0.37	0.31	0.34	0.21	0.11	0.10	0.27	0.22	0.33	0.26	0.28	0.24
T17	0.03	0.25	0.25	0.29	0.19	0.12	0.10	0.23	0.19	0.16	0.05	0.21	0.17
T18	0.16	0.38	0.34	0.28	0.20	0.09	0.14	0.20	0.27	0.17	0.16	0.26	0.19
T19	0.01	0.13	0.12	0.13	0.09	0.05	0.04	0.16	0.26	0.23	0.06	0.12	0.14
T20	0.11	0.24	0.20	0.21	0.16	0.12	0.08	0.18	0.20	0.21	0.16	0.19	0.17
T21	0.03	0.06	0.05	0.05	0.19	0.09	0.08	0.14	0.16	0.21	0.27	0.09	0.16
T22	0.13	0.27	0.14	0.11	0.05	0.03	0.07	0.06	0.17	0.23	0.34	0.13	0.14
T23	0.10	0.16	0.14	0.17	0.12	0.06	0.08	0.09	0.10	0.13	0.32	0.14	0.13
T24	0.05	0.15	0.13	0.13	0.06	0.07	0.04	0.03	0.16	0.18	0.23	0.12	0.12
T25	0.14	0.04	0.03	0.10	0.14	0.11	0.12	0.28	0.20	0.12	0.06	0.10	0.14
T26	0.12	0.04	0.04	0.10	0.13	0.11	0.15	0.28	0.19	0.11	0.11	0.10	0.15
T27	0.05	0.08	0.07	0.08	0.04	0.02	0.03	0.04	0.11	0.27	0.21	0.08	0.11
T28	0.08	0.13	0.07	0.11	0.09	0.05	0.11	0.03	0.12	0.28	0.22	0.11	0.14
T29	0.06	0.14	0.09	0.11	0.08	0.06	0.10	0.02	0.05	0.16	0.11	0.10	0.09
T30	0.06	0.14	0.10	0.08	0.06	0.06	0.07	0.04	0.04	0.08	0.08	0.08	0.06
T31	0.06	0.16	0.12	0.07	0.12	0.10	0.05	0.02	0.06	0.08	0.08	0.10	0.07
T32	0.04	0.12	0.08	0.19	0.18	0.17	0.06	0.05	0.30	0.24	0.23	0.17	0.19
T33	0.02	0.05	0.02	0.11	0.12	0.06	0.06	0.04	0.26	0.22	0.26	0.10	0.16
T34	0.03	0.07	0.04	0.11	0.06	0.11	0.03	0.03	0.16	0.16	0.15	0.09	0.11
T35	0.03	0.02	0.03	0.08	0.04	0.03	0.07	0.08	0.02	0.05	0.03	0.05	0.05
T36	0.05	0.04	0.04	0.08	0.04	0.02	0.05	0.04	0.07	0.07	0.05	0.06	0.06
T37	0.04	0.08	0.08	0.15	0.03	0.09	0.03	0.08	0.01	0.01	0.03	0.08	0.05
T38	0.02	0.09	0.03	0.13	0.06	0.05	0.04	0.03	0.05	0.05	0.04	0.07	0.05
T39	0.01	0.06	0.07	0.07	0.10	0.14	0.12	0.02	0.09	0.03	0.02	0.07	0.07
T40	0.01	0.03	0.06	0.10	0.08	0.12	0.10	0.05	0.09	0.02	0.05	0.07	0.07
T41	0.01	0.06	0.09	0.05	0.04	0.08	0.04	0.05	0.08	0.03	0.05	0.06	0.05
T42	0.04	0.07	0.12	0.15	0.16	0.18	0.14	0.04	0.08	0.07	0.24	0.12	0.13
T43	0.04	0.07	0.05	0.06	0.08	0.04	0.14	0.04	0.01	0.03	0.12	0.05	0.06

Proposed Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
T44	0.02	0.07	0.08	0.13	0.13	0.06	0.05	0.01	0.03	0.07	0.05	0.09	0.07
T45	0.01	0.08	0.11	0.14	0.10	0.06	0.15	0.10	0.04	0.03	0.02	0.09	0.07
T46	0.04	0.10	0.10	0.10	0.09	0.04	0.14	0.11	0.04	0.04	0.16	0.08	0.08
T47	0.05	0.11	0.14	0.11	0.08	0.04	0.20	0.12	0.04	0.03	0.02	0.09	0.07
T48	0.09	0.22	0.15	0.09	0.06	0.08	0.22	0.04	0.04	0.05	0.04	0.10	0.07
T49	0.02	0.18	0.12	0.17	0.08	0.12	0.32	0.01	0.16	0.11	0.08	0.13	0.13
T50	0.13	0.24	0.15	0.19	0.12	0.16	0.22	0.11	0.26	0.24	0.22	0.18	0.20
T51	0.12	0.05	0.04	0.12	0.11	0.11	0.20	0.25	0.16	0.13	0.16	0.10	0.15
T52	0.00	0.08	0.06	0.09	0.08	0.08	0.01	0.02	0.04	0.01	0.09	0.07	0.05
T53	0.02	0.12	0.17	0.22	0.09	0.15	0.16	0.02	0.06	0.05	0.09	0.13	0.09
T54	0.02	0.06	0.06	0.04	0.12	0.08	0.08	0.01	0.04	0.03	0.09	0.06	0.06
T55	0.01	0.04	0.09	0.14	0.05	0.04	0.07	0.03	0.07	0.02	0.10	0.08	0.06
T56	0.01	0.25	0.26	0.28	0.04	0.13	0.12	0.10	0.05	0.06	0.03	0.17	0.09
T57	0.00	0.07	0.03	0.09	0.03	0.09	0.07	0.07	0.01	0.05	0.02	0.06	0.05
T58	0.03	0.18	0.18	0.18	0.09	0.04	0.05	0.12	0.05	0.06	0.09	0.13	0.08
T59	0.02	0.19	0.14	0.06	0.02	0.07	0.05	0.09	0.02	0.06	0.11	0.07	0.06
T60	0.04	0.13	0.16	0.15	0.06	0.07	0.03	0.13	0.02	0.08	0.12	0.11	0.08
T61	0.02	0.16	0.14	0.03	0.02	0.09	0.03	0.01	0.02	0.09	0.07	0.06	0.05
T62	0.02	0.04	0.07	0.09	0.07	0.05	0.05	0.01	0.01	0.02	0.04	0.06	0.04
T63	0.03	0.14	0.14	0.16	0.13	0.09	0.15	0.10	0.06	0.10	0.10	0.12	0.11
T64	0.07	0.24	0.17	0.24	0.15	0.08	0.14	0.11	0.09	0.09	0.04	0.17	0.11
T65	0.04	0.17	0.08	0.14	0.08	0.06	0.04	0.08	0.09	0.09	0.01	0.10	0.07
T66	0.03	0.11	0.05	0.12	0.11	0.05	0.09	0.12	0.05	0.06	0.08	0.08	0.08
T67	0.07	0.22	0.16	0.19	0.11	0.06	0.12	0.10	0.17	0.14	0.13	0.15	0.13
T68	0.03	0.05	0.02	0.09	0.03	0.10	0.03	0.07	0.24	0.25	0.11	0.09	0.13
T69	0.04	0.10	0.11	0.10	0.06	0.08	0.10	0.14	0.07	0.05	0.12	0.08	0.09
T70	0.10	0.34	0.16	0.24	0.17	0.18	0.21	0.15	0.12	0.24	0.25	0.20	0.19
T71	0.03	0.05	0.04	0.03	0.02	0.03	0.13	0.05	0.24	0.28	0.04	0.07	0.12
T72	0.07	0.20	0.14	0.19	0.09	0.04	0.12	0.09	0.09	0.09	0.13	0.13	0.10
T73	0.02	0.07	0.06	0.06	0.02	0.04	0.10	0.12	0.38	0.43	0.44	0.10	0.23
T74	0.13	0.21	0.16	0.18	0.11	0.13	0.21	0.12	0.36	0.38	0.42	0.19	0.26
T75	0.10	0.16	0.09	0.08	0.11	0.10	0.16	0.08	0.29	0.32	0.34	0.13	0.20
T76	0.14	0.19	0.06	0.11	0.13	0.04	0.05	0.02	0.31	0.23	0.21	0.14	0.16
T77	0.12	0.28	0.17	0.23	0.15	0.10	0.16	0.10	0.33	0.30	0.37	0.21	0.23
T78	0.11	0.26	0.17	0.24	0.12	0.03	0.06	0.11	0.22	0.23	0.10	0.18	0.15
T79	0.06	0.10	0.06	0.10	0.04	0.06	0.16	0.04	0.29	0.32	0.09	0.11	0.16
T80	0.06	0.10	0.07	0.11	0.04	0.10	0.22	0.13	0.22	0.31	0.28	0.11	0.19
T81	0.07	0.10	0.05	0.09	0.04	0.03	0.13	0.07	0.25	0.33	0.44	0.10	0.19
T82	0.05	0.11	0.08	0.09	0.05	0.05	0.06	0.07	0.35	0.42	0.43	0.12	0.22
T83	0.06	0.16	0.16	0.14	0.06	0.04	0.09	0.10	0.11	0.13	0.21	0.12	0.11
T84	0.04	0.11	0.13	0.12	0.05	0.06	0.21	0.13	0.19	0.22	0.27	0.11	0.16
T85	0.07	0.18	0.15	0.12	0.02	0.09	0.14	0.15	0.28	0.24	0.27	0.13	0.18
T86	0.12	0.15	0.09	0.11	0.08	0.10	0.18	0.16	0.37	0.38	0.48	0.15	0.25
T87	0.10	0.14	0.09	0.07	0.09	0.12	0.22	0.15	0.24	0.29	0.38	0.12	0.21
T88	0.03	0.07	0.03	0.03	0.02	0.06	0.10	0.18	0.29	0.22	0.05	0.07	0.13
T89	0.01	0.06	0.03	0.03	0.03	0.02	0.04	0.10	0.13	0.13	0.06	0.05	0.08
T90	0.03	0.10	0.05	0.05	0.05	0.03	0.10	0.21	0.26	0.05	0.04	0.07	0.10
T91	0.02	0.05	0.02	0.03	0.03	0.03	0.04	0.11	0.13	0.08	0.03	0.04	0.07
T92	0.02	0.06	0.07	0.06	0.02	0.05	0.08	0.03	0.03	0.04	0.15	0.05	0.05
T93	0.00	0.06	0.07	0.09	0.07	0.09	0.10	0.02	0.06	0.05	0.16	0.07	0.08
T94	0.01	0.07	0.09	0.12	0.12	0.14	0.12	0.02	0.04	0.05	0.19	0.09	0.09
T95	0.00	0.04	0.05	0.04	0.03	0.05	0.04	0.03	0.03	0.03	0.02	0.04	0.03
T96	0.02	0.04	0.03	0.02	0.01	0.10	0.04	0.06	0.06	0.03	0.04	0.03	0.04
T97	0.02	0.07	0.07	0.11	0.09	0.07	0.10	0.04	0.04	0.05	0.07	0.08	0.07
T98	0.02	0.03	0.03	0.02	0.02	0.07	0.09	0.02	0.02	0.03	0.04	0.03	0.04
T99	0.02	0.09	0.05	0.02	0.03	0.06	0.12	0.03	0.04	0.05	0.05	0.04	0.05
T100	0.03	0.10	0.05	0.06	0.01	0.06	0.09	0.03	0.03	0.05	0.10	0.05	0.05
T101	0.02	0.07	0.06	0.10	0.01	0.06	0.14	0.03	0.03	0.04	0.11	0.06	0.06
T102	0.01	0.08	0.01	0.13	0.00	0.12	0.14	0.01	0.06	0.04	0.19	0.06	0.08
T103	0.01	0.02	0.01	0.04	0.06	0.04	0.08	0.09	0.06	0.03	0.01	0.03	0.05
T104	0.03	0.04	0.04	0.07	0.04	0.04	0.09	0.12	0.05	0.01	0.04	0.05	0.06
T105	0.06	0.02	0.04	0.04	0.03	0.02	0.05	0.11	0.24	0.18	0.16	0.06	0.12
T106	0.06	0.06	0.05	0.07	0.02	0.04	0.03	0.08	0.29	0.25	0.18	0.09	0.14
T107	0.03	0.07	0.06	0.07	0.02	0.05	0.00	0.06	0.11	0.12	0.14	0.06	0.08
T108	0.03	0.06	0.05	0.05	0.01	0.02	0.09	0.10	0.25	0.25	0.18	0.07	0.14
T109	0.04	0.10	0.07	0.09	0.02	0.04	0.05	0.06	0.14	0.13	0.15	0.08	0.09
T110	0.07	0.04	0.01	0.03	0.03	0.01	0.01	0.08	0.07	0.12	0.04	0.04	0.06
T111	0.04	0.02	0.02	0.08	0.02	0.01	0.02	0.09	0.08	0.11	0.04	0.05	0.06
T112	0.09	0.08	0.08	0.09	0.06	0.01	0.05	0.06	0.08	0.05	0.09	0.07	0.06
T113	0.10	0.08	0.14	0.19	0.03	0.01	0.01	0.03	0.07	0.03	0.06	0.10	0.05
T114	0.08	0.07	0.05	0.10	0.03	0.05	0.04	0.05	0.08	0.01	0.06	0.06	0.05
T115	0.08	0.06	0.10	0.15	0.03	0.02	0.03	0.06	0.06	0.02	0.03	0.08	0.05
T116	0.04	0.14	0.17	0.15	0.13	0.05	0.13	0.11	0.04	0.04	0.10	0.11	0.09
T117	0.03	0.17	0.16	0.06	0.08	0.09	0.24	0.15	0.03	0.03	0.02	0.09	0.08

Proposed Scheme(VR)													
Test Point	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Annual	Summer
T118	0.02	0.15	0.16	0.10	0.10	0.08	0.10	0.06	0.03	0.14	0.12	0.11	0.09
T119	0.03	0.18	0.16	0.08	0.07	0.08	0.12	0.18	0.06	0.02	0.07	0.09	0.08
T120	0.07	0.21	0.07	0.11	0.07	0.04	0.06	0.15	0.10	0.10	0.10	0.10	0.09
T121	0.06	0.13	0.14	0.07	0.05	0.13	0.14	0.18	0.04	0.23	0.21	0.10	0.13
T122	0.14	0.25	0.13	0.08	0.03	0.12	0.07	0.17	0.19	0.22	0.19	0.13	0.15
T123	0.07	0.24	0.16	0.13	0.07	0.12	0.05	0.25	0.19	0.25	0.19	0.15	0.17
T124	0.08	0.27	0.18	0.21	0.09	0.06	0.04	0.25	0.36	0.26	0.24	0.19	0.21
T125	0.05	0.12	0.10	0.10	0.12	0.08	0.07	0.04	0.08	0.13	0.04	0.10	0.09
T126	0.02	0.12	0.08	0.21	0.21	0.09	0.07	0.07	0.07	0.10	0.17	0.14	0.12
T127	0.06	0.21	0.13	0.08	0.05	0.09	0.07	0.07	0.08	0.08	0.12	0.10	0.08
T128	0.09	0.18	0.20	0.24	0.17	0.10	0.06	0.06	0.07	0.12	0.15	0.17	0.12
T129	0.01	0.21	0.19	0.20	0.12	0.04	0.04	0.09	0.10	0.07	0.22	0.14	0.11
T130	0.03	0.15	0.14	0.17	0.12	0.07	0.05	0.19	0.27	0.22	0.26	0.15	0.18
T131	0.02	0.07	0.04	0.04	0.03	0.04	0.10	0.10	0.14	0.19	0.08	0.06	0.10
T132	0.03	0.12	0.06	0.08	0.03	0.06	0.09	0.11	0.14	0.08	0.14	0.07	0.09
T133	0.13	0.33	0.20	0.24	0.13	0.20	0.38	0.23	0.42	0.24	0.19	0.23	0.26
T134	0.07	0.28	0.16	0.26	0.17	0.05	0.11	0.04	0.26	0.29	0.26	0.20	0.20
T135	0.06	0.26	0.14	0.20	0.12	0.08	0.07	0.13	0.39	0.29	0.22	0.19	0.21
T136	0.13	0.32	0.16	0.22	0.14	0.04	0.08	0.04	0.35	0.29	0.27	0.20	0.20
T137	0.16	0.26	0.12	0.21	0.12	0.04	0.02	0.13	0.32	0.28	0.24	0.19	0.19
T138	0.05	0.03	0.08	0.21	0.15	0.05	0.06	0.02	0.33	0.31	0.25	0.16	0.19
T139	0.04	0.12	0.11	0.12	0.12	0.07	0.03	0.04	0.05	0.15	0.12	0.11	0.09
T140	0.03	0.11	0.04	0.15	0.03	0.04	0.09	0.16	0.07	0.10	0.09	0.08	0.09
T141	0.03	0.08	0.07	0.05	0.01	0.02	0.05	0.22	0.13	0.26	0.11	0.07	0.12
T142	0.05	0.05	0.05	0.06	0.05	0.07	0.16	0.22	0.15	0.06	0.18	0.06	0.12
T143	0.13	0.11	0.09	0.15	0.16	0.14	0.08	0.25	0.21	0.12	0.17	0.14	0.16
T144	0.09	0.28	0.20	0.26	0.19	0.16	0.10	0.19	0.15	0.12	0.29	0.20	0.18
T145	0.11	0.20	0.13	0.20	0.16	0.14	0.01	0.06	0.03	0.17	0.03	0.16	0.10
Average LVR	0.06	0.13	0.10	0.12	0.08	0.07	0.09	0.09	0.14	0.14	0.15	0.11	0.12
S01	0.08	0.18	0.06	0.19	0.14	0.08	0.05	0.06	0.03	0.05	0.20	0.12	0.09
S02	0.07	0.15	0.14	0.16	0.14	0.09	0.05	0.09	0.12	0.18	0.14	0.14	0.13
S03	0.09	0.18	0.11	0.07	0.11	0.08	0.01	0.10	0.18	0.20	0.18	0.11	0.13
S04	0.04	0.04	0.05	0.06	0.02	0.03	0.08	0.08	0.24	0.27	0.16	0.08	0.14
S05	0.02	0.12	0.07	0.09	0.08	0.02	0.12	0.06	0.20	0.18	0.23	0.09	0.13
S06	0.13	0.27	0.18	0.19	0.15	0.10	0.02	0.12	0.08	0.08	0.23	0.16	0.12
S07	0.08	0.20	0.17	0.18	0.14	0.09	0.02	0.02	0.10	0.11	0.33	0.15	0.12

Appendix 6

Master Layout Plan of Future/Committed Development

1. No. 10 Maidstone Road





2. 41, 43 and 45 Pau Chung Street







The Group acquired this parcel of land situated at No.1 Luen Fat Street, Tsimshing, the new territories in January 2021, and intends to develop into a residential-cum-retail complex with a total gross floor area of approximately 36,000 square feet. Development plan had been approved by the Town Planning Board and the land exchange application to convert the use of land is under processing. Upon completion of the redevelopment of the site, the completed properties will be sold to generate revenue for the Group.

Pau Chung Street project

The site, located at No. 41, 43 and 45 Pau Chun Street in To Kwa Wan, Kowloon, was acquired by the Group in October 2021 and is being redeveloped into a 25-storey residential tower over two levels of shops with a gross floor area of approximately 31,000 square feet. Superstructure construction works are well underway and the development is scheduled to be completed in the first half of 2023. Upon completion of the redevelopment of the site, the completed properties will be sold to generate revenue for the Group.

Property Development—Mainland China

The Group acquired its first land parcel in Mainland China in July 2021 through government public auction. The land parcel is located at Guangxi-ASEAN Economic and Technological Development Zone, Wuming District, Nanning City, Guangxi Province. The site has an area of approximately 574,000 square feet and is planned to be developed into a luxury residential project under the

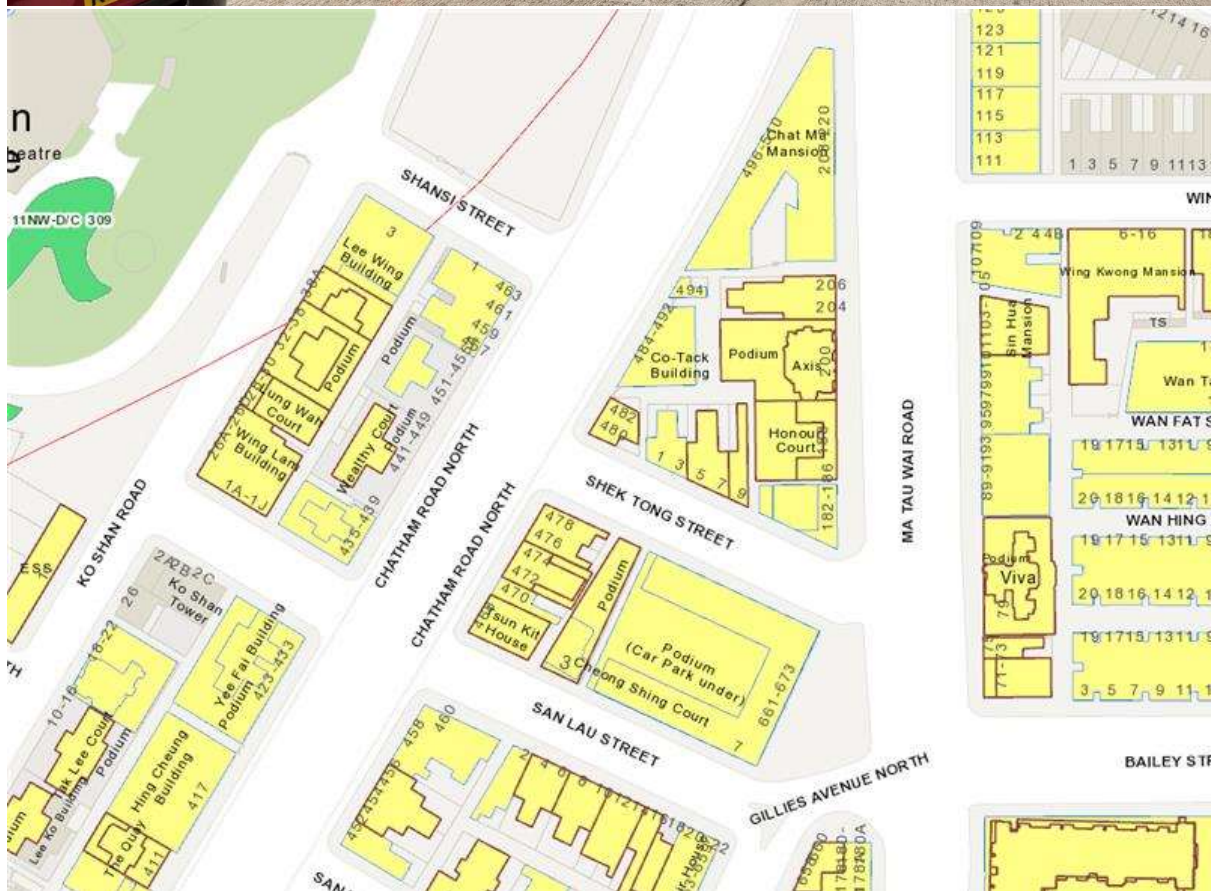
Source: <http://delaycontent.megahubhk.com/Fundamental/CompanyProfile.aspx?style=megahub&showStock=0&sid=01271&lang=en>

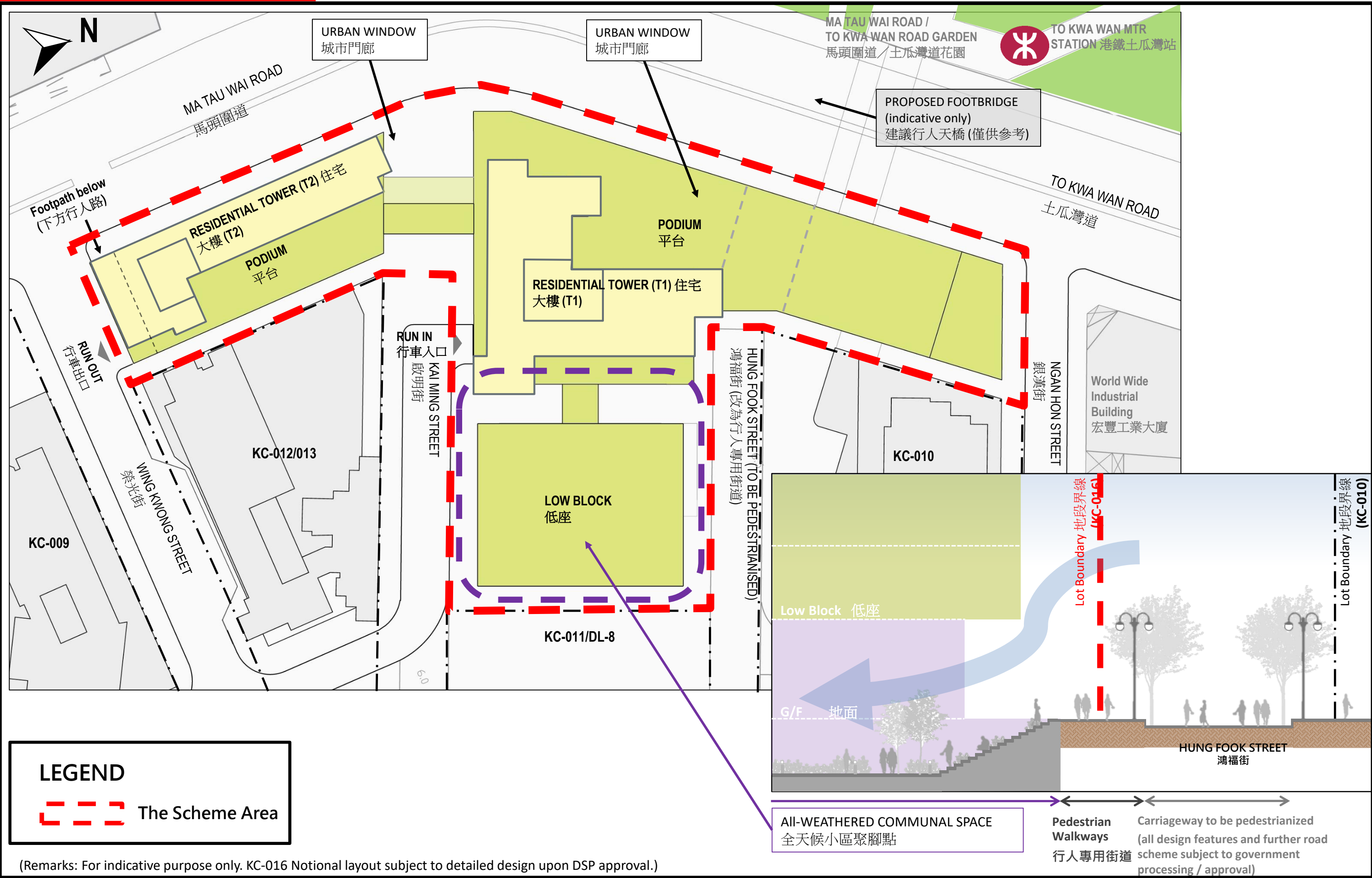
3. Public Housing Development. Ko Shan Road



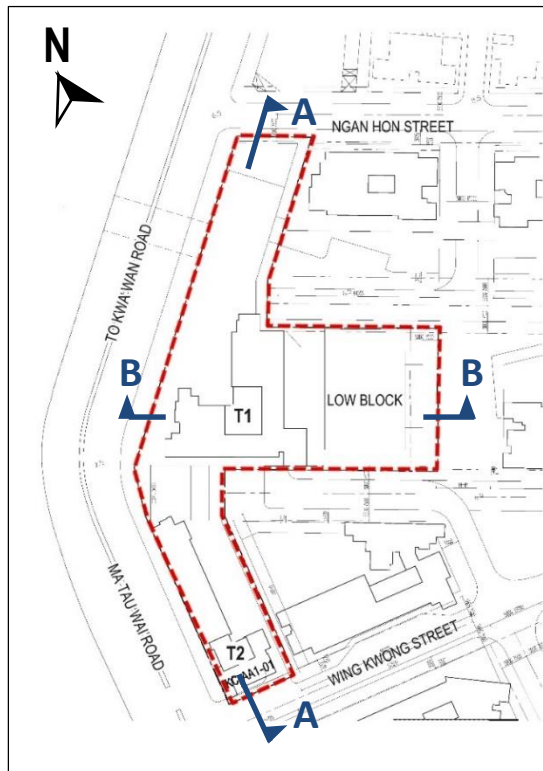
*Image captured from Google Earth Street View

4.. Proposed Residential Redevelopment, 470-478 Chatham Road North

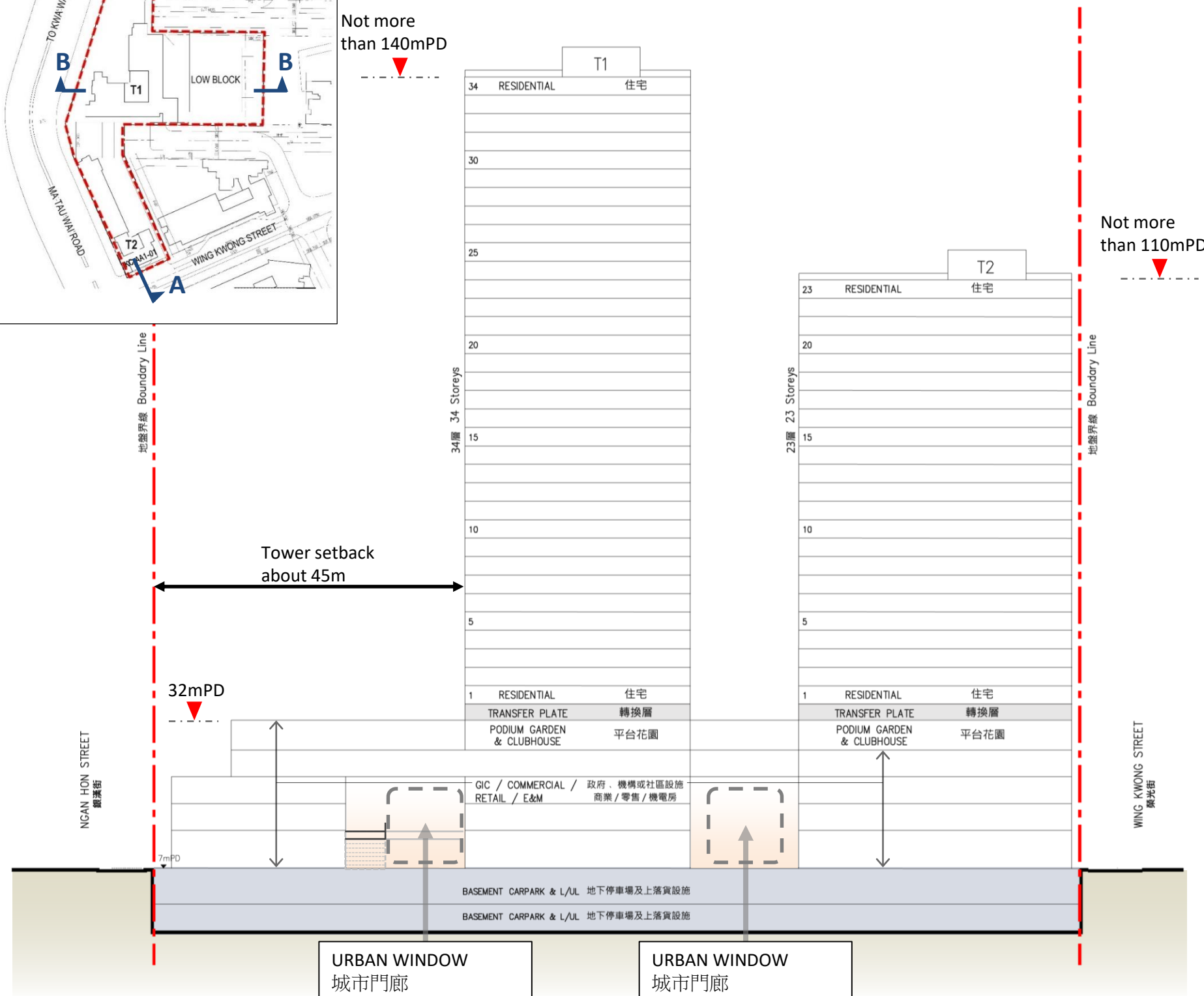




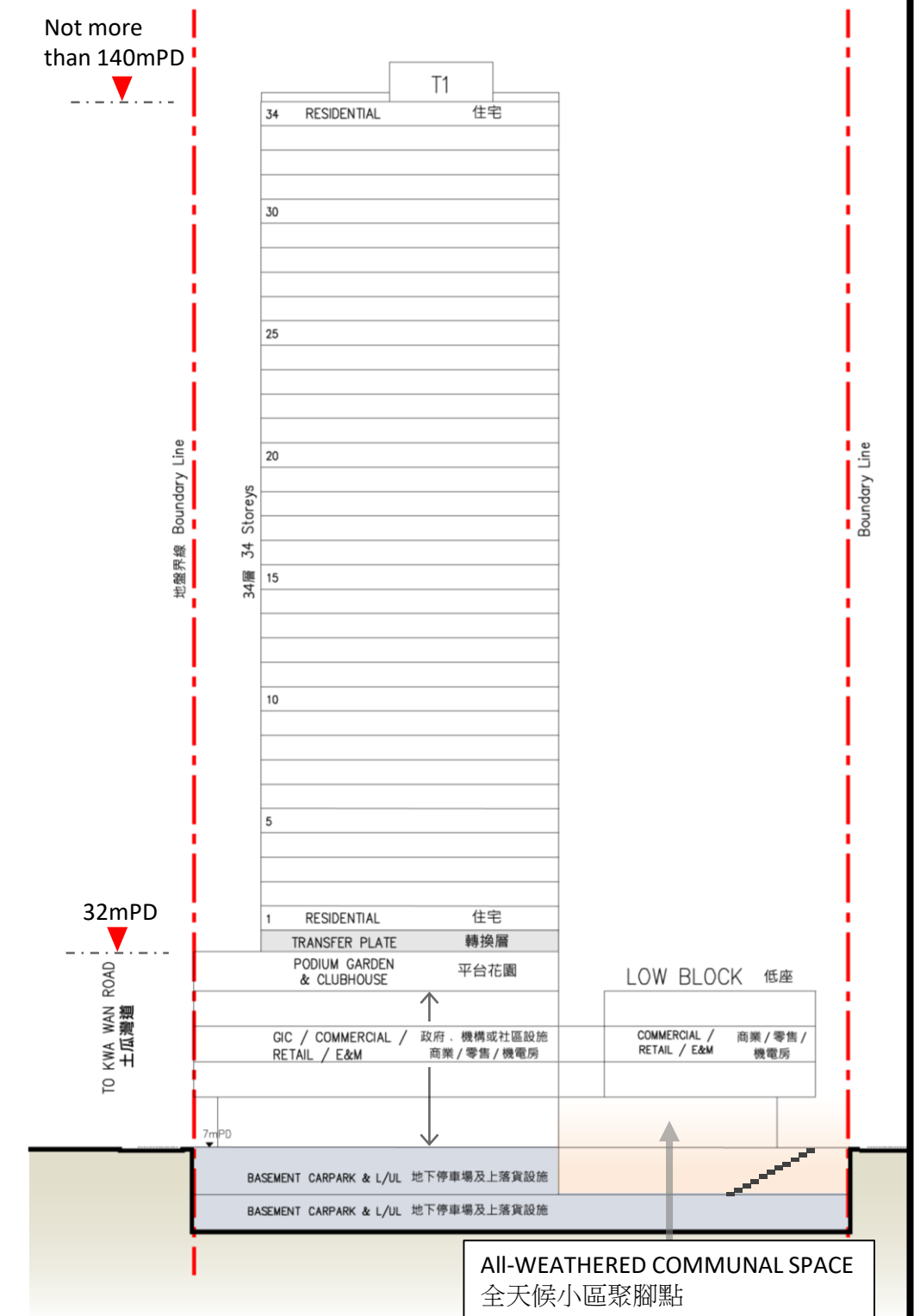
N



Not more
than 140mPD



Not more
than 140mPD

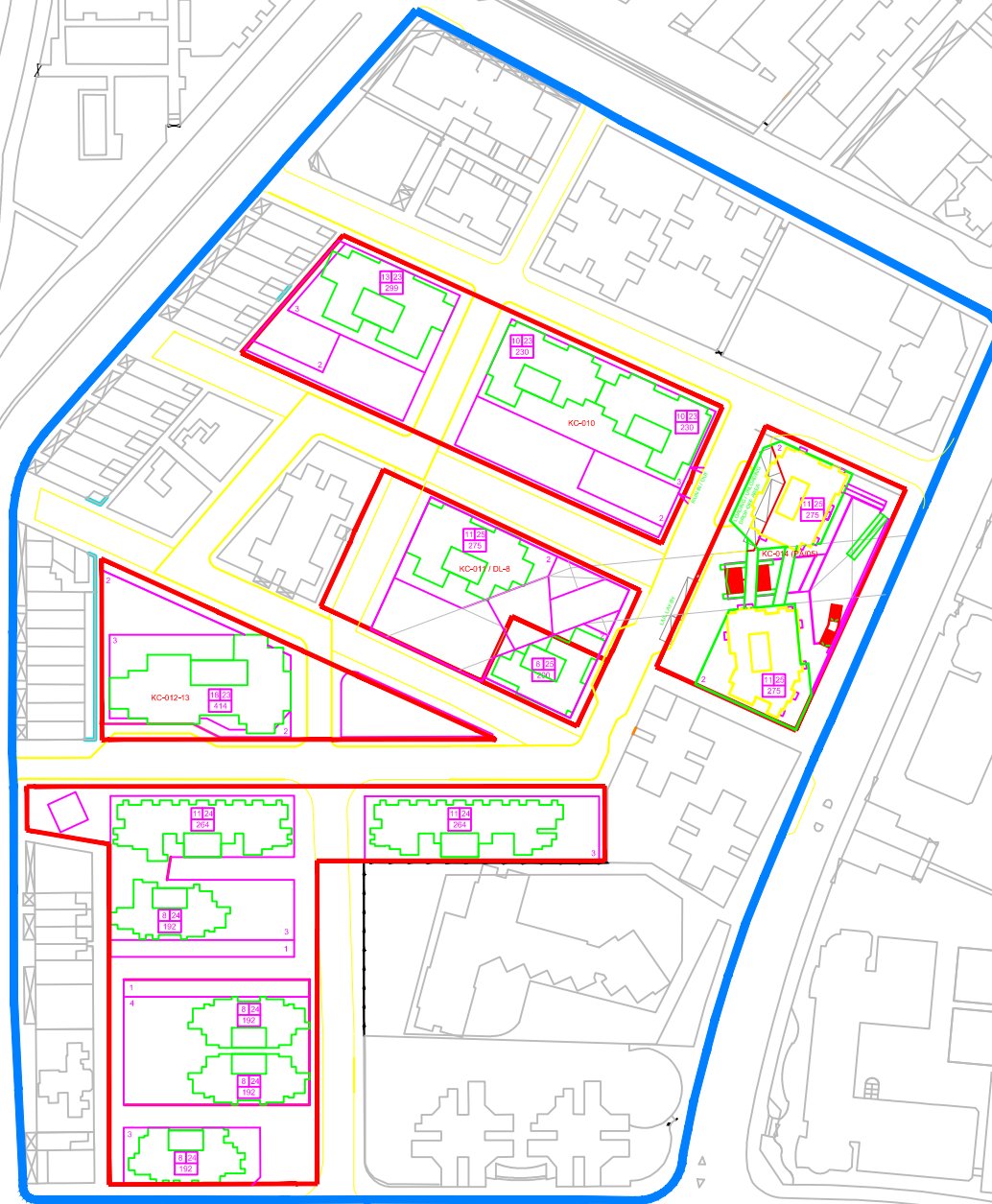


市區重建局
URBAN RENEWAL
AUTHORITY

Figure 1.3

Not drawn to scale

Mar 2021



LEGEND:

9	25	No. of Flats per floor
9	25	No. of residential floors
225		Total no. of Flats