MOTT MACDONALD

To Amend the Notes of the "Comprehensive Development to include Wetland Restoration Area" Zone for a Proposed Comprehensive Development at Wo Shang Wai, Yuen Long, Lots 77 and 50 S.A in DD101

Air Ventilation Assessment - Initial Study

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Air Ventilation Assessment - Initial Study

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1 Introduction

1.1 Background

This application is made under section 12A of the Town Planning Ordinance, to rezone the Application Site on the Approved Mai Po and Fairview Park Outline Zoning Plan ("OZP") No. S/YL-MP/8. The rezoning application aims to increase the plot ratio ("PR") from 0.4 (i.e. maximum permissible PR on the OZP) to 1.3, with a maximum building height ("BH") adjusted to not more than 10-storeys and not exceeding +42mPD by amending the Notes of the current "Other Specified Uses (Comprehensive Development to include Wetland Restoration Area)" ("OU(CDWRA)") zone.

The Applicant, Profit Point Enterprises Limited, proposes to increase the development intensity, and revise the layout and form of the housing developments in the Application Site, in response to the drastic changes in the development site context and planning circumstances of the area.

The Application Site is located at Wo Shang Wai, Yuen Long. It is generally bounded by Castle Peak Road – Mai Po and San Tin Highway to the east, fishponds to the north, residential developments, namely Royal Palms and Palm Springs to the south, and Wo Shang Wai Village to the southeast.

Indicative Development Parameters

Application Site Area (Approx.)	**207, 408m^2**
Areas of the Site (Approx.)	
Wetland	47,400m^2
Communal Open Space	21,203m^2
Communal Landscape and Communal Perimeter Landscape	39,072m^2
Communal Streetside Landscape	2,988m^2
Communal Water Body	5,103m^2
Private Garden	15,444m^2
Domestic Buildings and Clubhouse	42,078m^2
Internal Road/Driveway	34,120m^2
Domestic Components	
Plot Ratio Domestic Non-Domestic	1.3 1.28 0.02
Maximum Domestic GFA (Approx.)	265,847m^2
Maximum Non-Domestic GFA (Approx.)	3,800 m^2
Site Coverage (not more than)	25%
Total Number of Units	3,751
Average Unit Size (Approx.)	74.45m^2
Ancillary Recreational Facilities (Approx.)	3,800 m^2
Estimated Population	9,998*
Completion Year	2031

Building Height	
3-storey House	+21mPD
6--storey Residential Tower	+28mPD
8-storey Residential Tower	+35mPD
10-storey Residential Tower	+42mPD
Clubhouse (2-storey)	+16 mPD

Remarks:
* Based on person per flat ration of 2.8.

1.2 Study Objectives

In order to assess if any potential adverse air ventilation impacts might be induced on the surrounding pedestrian wind environment due to the proposed residential development, a site-specific AVA-IS using Computational Fluid Dynamics (CFD) has been conducted to demonstrate that the building’s potential impact on the local wind environment has been duly considered by comparing the Proposed Scheme with a Baseline Scheme.

The objective of this study is to assess quantitatively the potential air ventilation impacts of the Proposed Scheme and the Baseline Scheme on the surroundings using the methodology of AVA, based on the “Housing Planning and Lands Bureau – Technical Circular No. 1/06, Environment, Transport and Works Bureau – Technical Circular No. 1/06” issued on 19th July 2006 (the Technical Circular) and “Technical Guide for Air Ventilation Assessment for Development in Hong Kong – Annex A” (the Technical Guide) of the Technical Circular.

2 Site Characteristics

2.1 Project Site and Its Surrounding Area

The Project Site is located at Wo Shang Wai, Yuen Long, with an area of approximately 207,408 m^2. The Project Site is currently a land area zoned as OU(CDWRA) under the Approved Mai Po and Fairview Park Outline Zoning Plan No. S/YL-MP/8 ("OZP"). Location of the Project Site is shown in **Figure 2.1**.

There are fish ponds from the south to the north of the Project Site and mountains such as Ki Lun Shan, Ngau Tam Shan and Pine Tree Hill at the east of the Project Site. Please refer to **Appendix E** for the topography around the Project Site.

To the north of the Project Site lies a cluster of low-lying fishponds within the "Other Specified Uses" ("OU") zone. Royal Palms with building height of approximately 16mPD under "Residential (Group C)" ("R(C)") zone is located at the east and southeast of the Project Site. Mai Po Ventilation Building with building height of approximately 21.5mPD under OU (CDWRA) zone lies to the east of the Project Site. There is also a cluster of village houses under "Village Type Development" ("V") zone at the east of the Site across Mai Po South Road, namely Mai Po San Tsuen with building height of approximately 12.7mPD.

To the south of the Project Site lies a cluster of residential developments under R(C) zone, namely Wo Shang Wai Village, Palm Springs – Arcadia and Palm Springs Plaza with building height of approximately 7.7mPD, 16mPD and 13.6mPD respectively.

To the west and southwest of the Project Site also lies a cluster of residential developments under R(C) zone, namely Palm Springs – Westwood with building height of approximately 16mPD. To the further west of the Project Site across Palm Springs – Westwood is a low-lying area with numerous fishponds under OU zone.

Figure 2.1 shows an overview of the Project Site and its surroundings. **Figure 2.2** shows an overview of the Project Site and its surroundings as shown on the OZP. The building height for the existing developments in the vicinity of the Project Site are listed out in **Table 2.1**.

Table 2.1: Existing Developments around the Project Site

Name of Existing Developments	Building Height (mPD)
Royal Palms	14.5 - 17.7
Palm Springs - Arcadia	13.9 - 16.5
Palm Springs - Westwood	13.6 - 17.4
Palm Springs Plaza	13.6
Wo Shang Wai Village	7.7
Mai Po Ventilation Building	21.5
Mai Po San Tsuen	6.4 - 13.3

Figure 2.1: Overview of the Project Site and its Surroundings

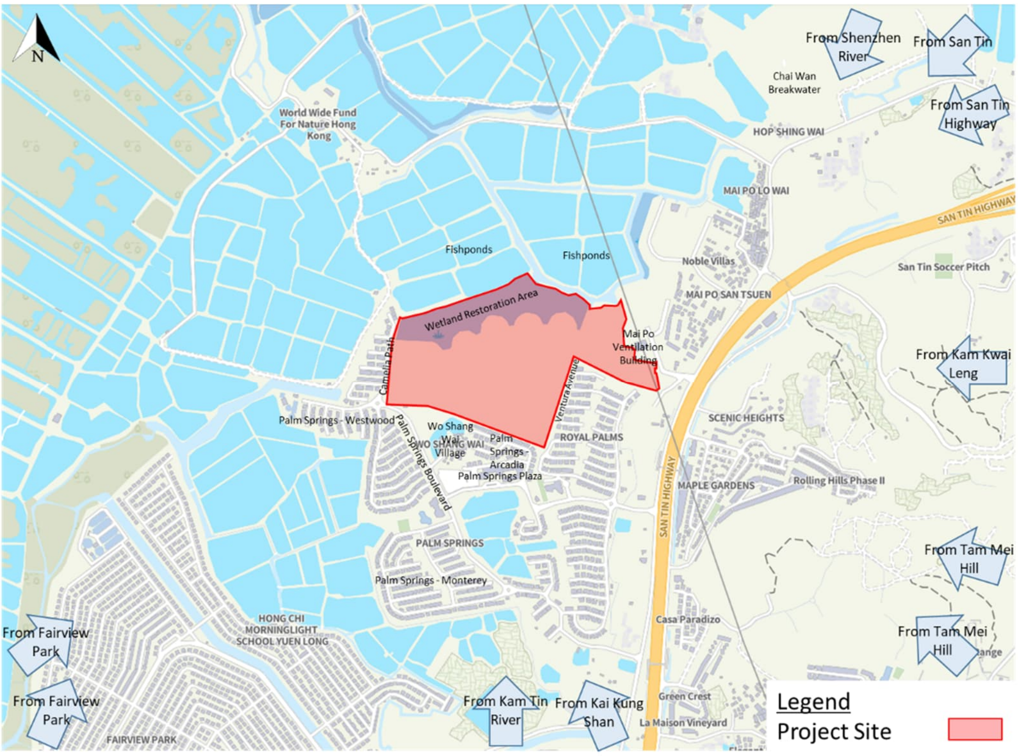
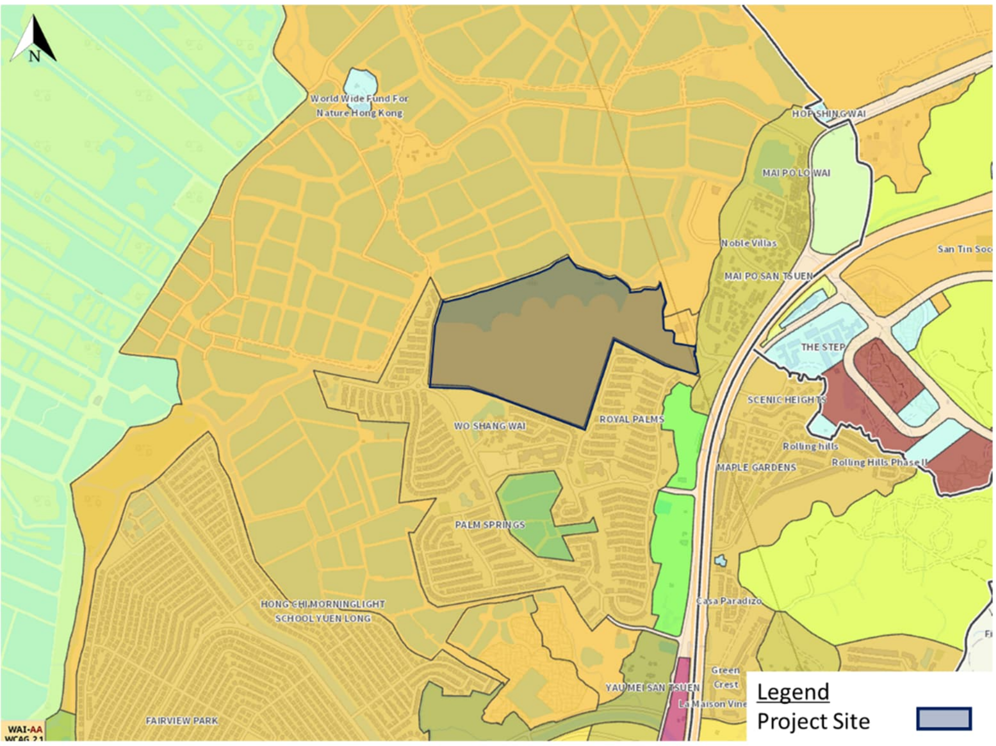


Figure 2.2: Overview of the Project Site and its Surroundings as shown on the OZP



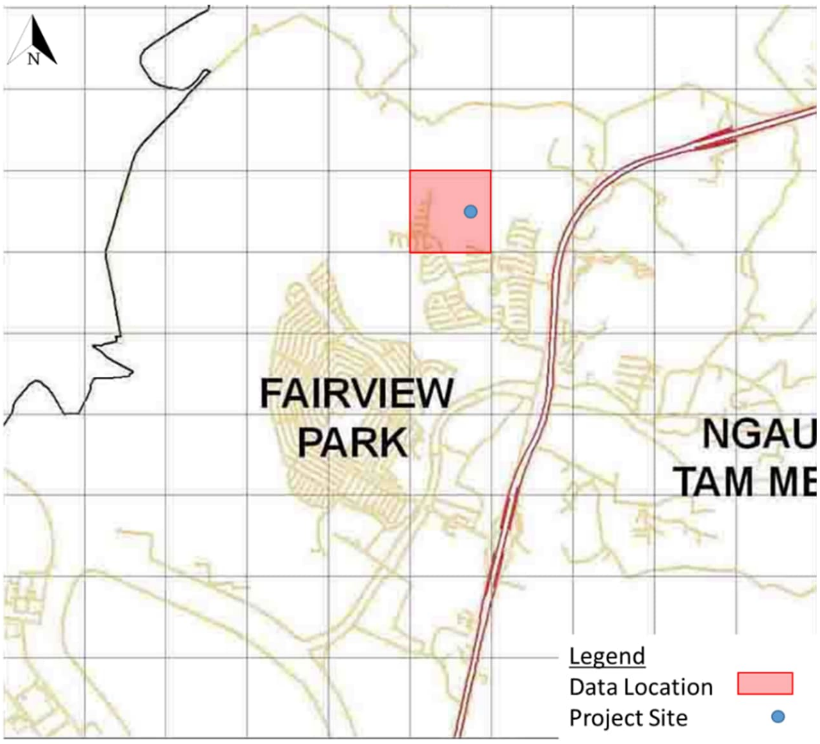
3 Wind Availability Data

The wind profile input for the CFD simulation requires wind data at different heights and at the wind boundary level. The characteristics of the site wind availability should be identified in order to investigate the wind performance of the Project Site and its surrounding area. Site wind availability data could be used to assess the wind characteristics in terms of the magnitude and frequency of approaching wind from each wind direction. In this study, the simulated Regional Atmospheric Modelling System (RAMS) wind data from Planning Department (PlanD) has been used for the quantitative assessment.

3.1 Site Wind Availability Data

City University of Hong Kong (CityU) utilized the meso-scale numerical model Regional Atmospheric Modeling System (RAMS) to produce site wind availability data for Hong Kong and is available at PlanD's database[1]. Based on the archived dataset, wind statistics and wind roses for each 0.5km×0.5km grid box at different height levels could be extracted. Simulated data at grid (X055, Y080) corresponds to the location of the Project Site and annual wind conditions at 500m above ground are referenced in this study. The location of grid (X055, Y080) is shown in **Figure 3.1**. The extracted wind roses show that easterlies dominate under the annual wind condition while south westerly winds dominate under the summer wind condition. **Figure 3.2** and **Figure 3.3** shows the annual and summer wind roses at 500m above ground level for grid (X055, Y080) respectively.

Figure 3.1: Location of the Selected RAMS Wind Data - Grid (X055, Y080)



[1] http://www.pland.gov.hk/pland_en/info_serv/site_wind/site_wind/index.html

Figure 3.2: Annual Wind Rose at 500m – Grid (X055, Y080)

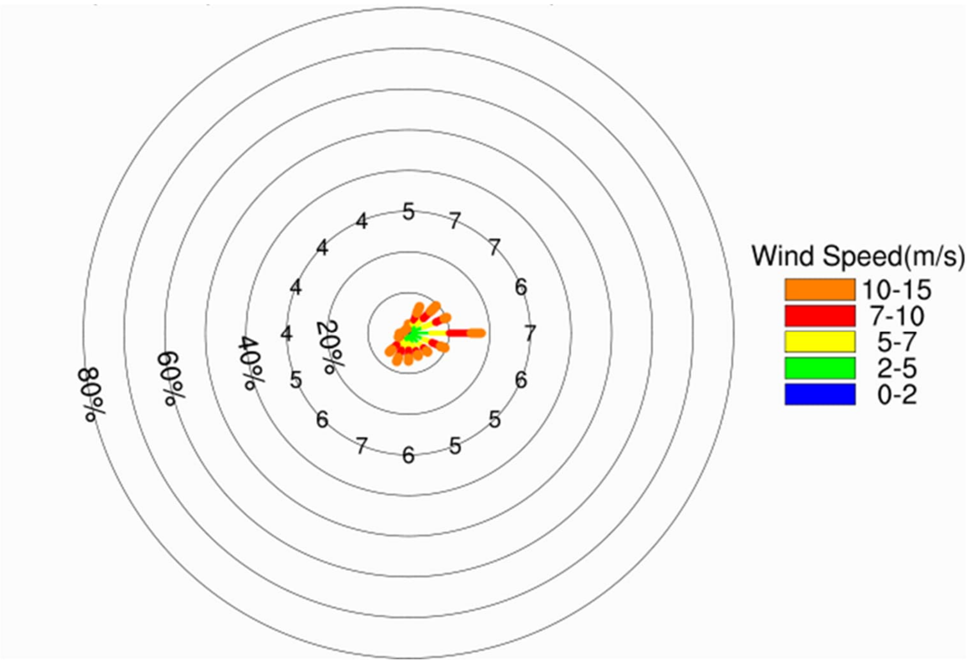
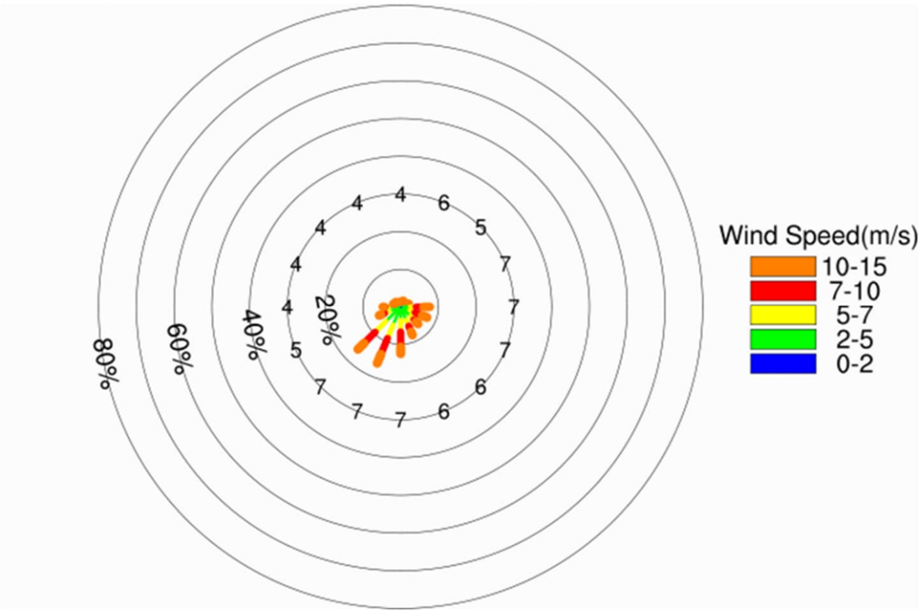


Figure 3.3: Summer Wind Rose at 500m – Grid (X055, Y080)



3.2 Annual Prevailing Wind

Nine prevailing wind directions (**bolded** in **Table 3.1**) are considered in this quantitative assessment which covers 83.2% of the total annual wind frequency, exceeding the 75% required by the Technical Guide of AVA. They are North-Northeast (7.2%), Northeast (9.8%), East-Northeast (10.2%), East (18.1%), East-Southeast (9.8%), Southeast (6.7%), South (7.0%), South-Southwest (7.7%) and Southwest (6.7%) winds.

Table 3.1: Annual Wind Frequency at 500m

Direction	N	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	SSE
Frequency (%)	2.3	**7.2**	**9.8**	**10.2**	**18.1**	**9.8**	**6.7**	6.2
Direction	**S**	**SSW**	**SW**	WSW	W	WNW	NW	NNW
Frequency (%)	**7.0**	**7.7**	**6.7**	2.7	2.2	1.1	1.1	1.1

3.3 Summer Prevailing Wind

Seven prevailing wind directions (**bolded** in **Table 3.2**) are considered in this quantitative assessment which covers 76.4% of the total summer wind frequency, exceeding the 75% required by the Technical Guide of AVA. They are East (8.1%), East-Southeast (7.8%), Southeast (6.6%), South-Southeast (8.2%), South (12.9%), South-Southwest (16.5%) and Southwest (16.3%).

Table 3.2: Summer Wind Frequency at 500m

Direction	N	NNE	NE	ENE	**E**	**ESE**	**SE**	**SSE**
Frequency (%)	1.4	1.8	1.6	2.4	**8.1**	**7.8**	**6.6**	**8.2**
Direction	**S**	**SSW**	**SW**	WSW	W	WNW	NW	NNW
Frequency (%)	**12.9**	**16.5**	**16.3**	6.2	4.7	2.1	1.8	1.4

3.4 Wind Profile

As mentioned in Section 5.1, the RAMS wind data extracted from Planning Department's Website will be adopted in this AVA Initial Study. The wind profile data from 10 – 500m will be directly adopted as it reflects the exact wind data whereas the power law equation will be used to approximate near ground wind profile (i.e. 0 – 10m). For wind data above 500m, wind velocity shall be assumed as the wind velocity at 500m. **Figure 3.4** to **Figure 3.7** indicates the overall wind profile curve adopted for the CFD simulation.

The vertical discretization of velocity profile is approximated by using an exponential law, which is a function of ground roughness and height:

$$U_Z = U_G \left(\frac{z}{z_G} \right)^n$$

where

U_G = reference velocity at height z_G

Z_G = reference height

Z = height above ground

U_Z = velocity at height z

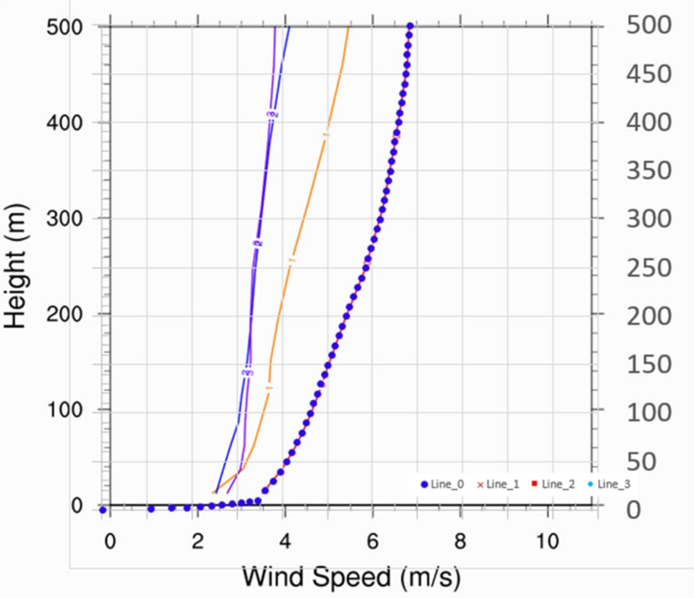
n = power law exponent

The power n is related to the ground roughness. A larger value of the power n represents the higher roughness of the ground i.e. the dense city. Alternatively, smaller n represents the lower ground roughness, i.e. the sea surface. **Table 3.3** shows the n value adopted for CFD simulation.

Table 3.3: Value of n (Power Law Exponent) Adopted for CFD Simulation

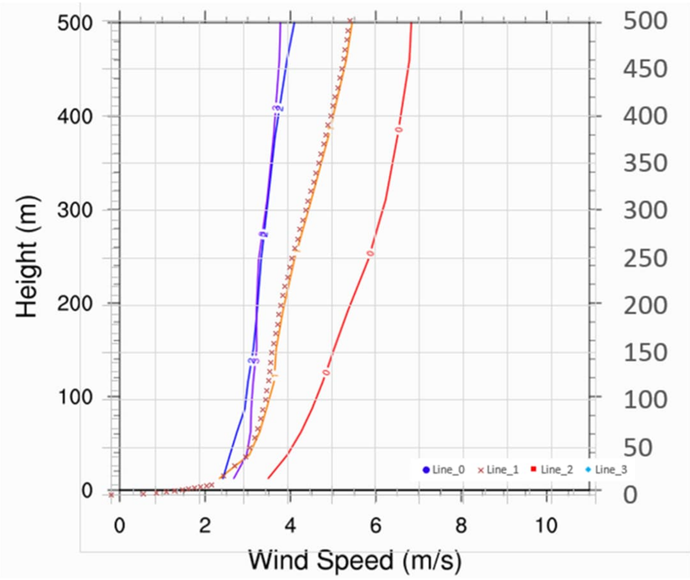
Direction	NNE	NE	ENE	E	ESE	SE
Value of n	0.35	0.35	0.35	0.35	0.35	0.35
Direction	**SSE**	**S**	**SSW**	**SW**	**WSW**	
Value of n	0.35	0.35	0.35	0.35	0.35	

Figure 3.4: Wind Profile Curve for Wind Directions of 22.5º - 112.4º at Grid (X055, Y080)



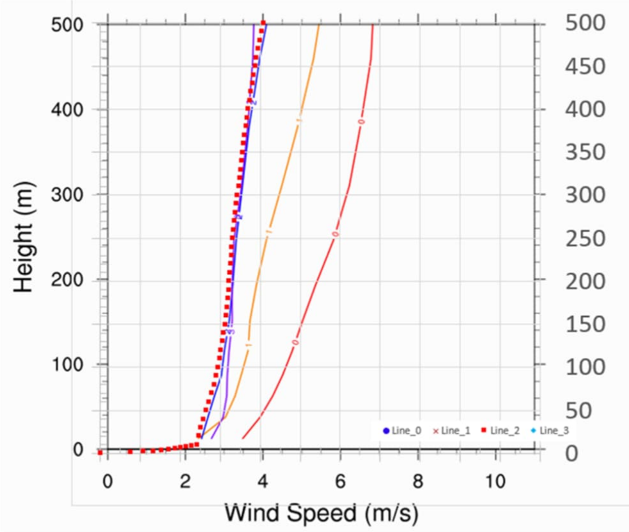
(line – original data from RAMS, dots – input data adopted for CFD simulation)

Figure 3.5: Wind Profile Curve for Wind Directions of 112.5º - 202.4º at Grid (X055, Y080)



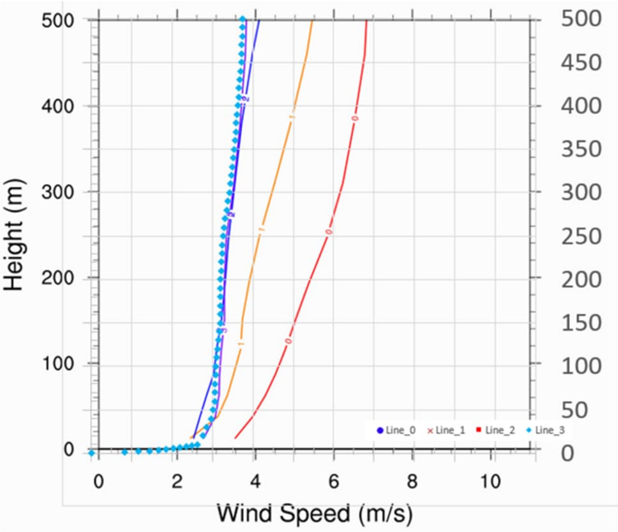
(line – original data from RAMS, dots – input data adopted for CFD simulation)

Figure 3.6: Wind Profile Curve for Wind Directions of 202.5º - 292.4º at Grid (X055, Y080)



(line – original data from RAMS, dots – input data adopted for CFD simulation)

Figure 3.7: Wind Profile Curve for Wind Directions of 292.5º - 22.4º at Grid (X055, Y080)



(line – original data from RAMS, dots – input data adopted for CFD simulation)

Table 3.4 shows the data for each wind profile curve adopted in the current AVA Initial Study, which acts as the inlet boundary data in the CFD simulation.

Table 3.4: Wind Profile Data for All Wind Directions

Height	Wind Speed (m/s)			
	22.5˚ – 112.4˚	112.5˚ – 202.4˚	202.5˚ – 292.4˚	292.5˚ – 22.4˚
0	0.00	0.00	0.00	0.00
10	3.44	2.27	2.42	2.64
20	3.61	2.55	2.46	2.76
40	3.95	3.05	2.59	2.98
60	4.21	3.25	2.73	3.05
80	4.43	3.39	2.87	3.07

100	4.61	3.51	2.96	3.10
150	5.01	3.65	3.12	3.20
200	5.40	3.85	3.23	3.20
250	5.83	4.10	3.31	3.26
300	6.15	4.41	3.44	3.42
350	6.38	4.71	3.56	3.54
400	6.56	4.98	3.70	3.63
450	6.73	5.24	3.88	3.72
500	6.81	5.42	4.08	3.75

4 Design Schemes for Initial Study

Two schemes were studied for the AVA, namely Baseline Scheme and Proposed Scheme based on the design options provided by the project team.

The 3D simulation model takes information via the Geographical Information System (GIS) platform to construct the surrounding buildings and site topography. All major elevated structures such as elevated walkway have been incorporated in the simulation model. No noise barriers are located within the Surrounding Area.

In addition, the western tip of a planned/committed development of San Tin Technopole under the approved EIA Report, “*Agreement No. CE 20/2021 (CE) First Phase Development of the New Territories North – San Tin / Lok Ma Chau Development Node – Investigation*” is located within the Surrounding Area. It is noted that there are planned developments reserved for government reserve and workshop and related facilities of the Fire Services Department within this region but there is no available data for the planned developments. Please refer to **Appendix G** for the location of this planned / committed development.

Overviews of the whole domain 3D simulation model are provided in **Appendix H**.

4.1 Baseline Scheme

The Baseline Scheme is referred to the previous approved scheme under Planning Application No. A/YL-MP/344. It comprises of 749 2-storey houses and 40 3-storey houses above ground with a maximum building height of 16.8mPD and 21.3mPD respectively. It also comprises of 4 clubhouses with a maximum building height of 17mPD. **Figure 4.1** to **Figure 4.4** shows the simulation model of the Baseline Scheme. Architectural layout drawings of the Baseline Scheme are provided in **Appendix A**.

Chapter 11 of “Hong Kong Planning Standards and Guideline” on Air Ventilation was referenced in order to determine the good design features in the Baseline Scheme from an air ventilation standpoint. The following good design feature of the Baseline Scheme is identified and shown in **Appendix A**.

- At least 7.5m-wide building setback from the eastern site boundary.

Figure 4.1: Simulation Model of the Baseline Scheme (Part 1 of 4)

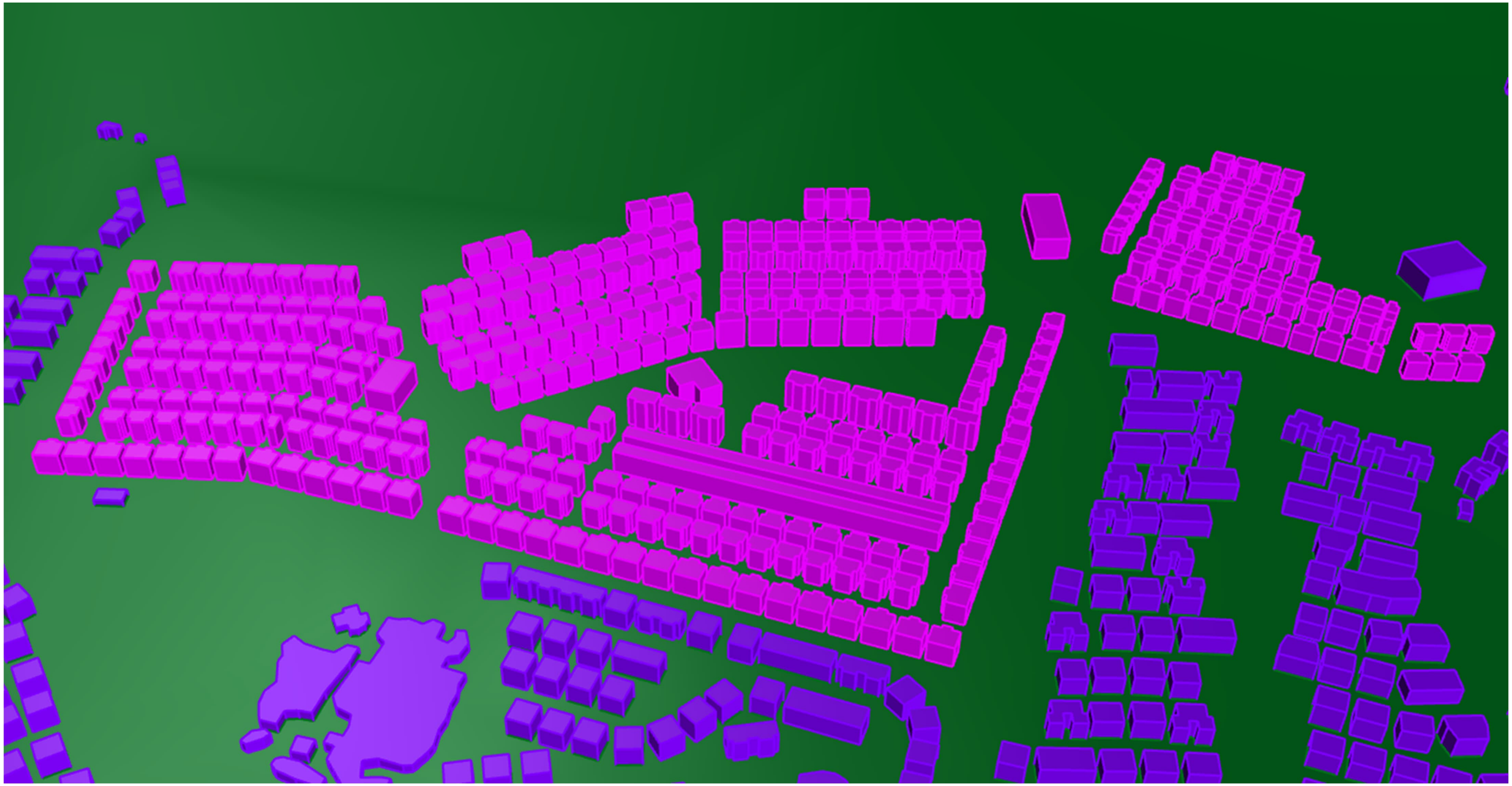


Figure 4.2: Simulation Model of the Baseline Scheme (Part 2 of 4)

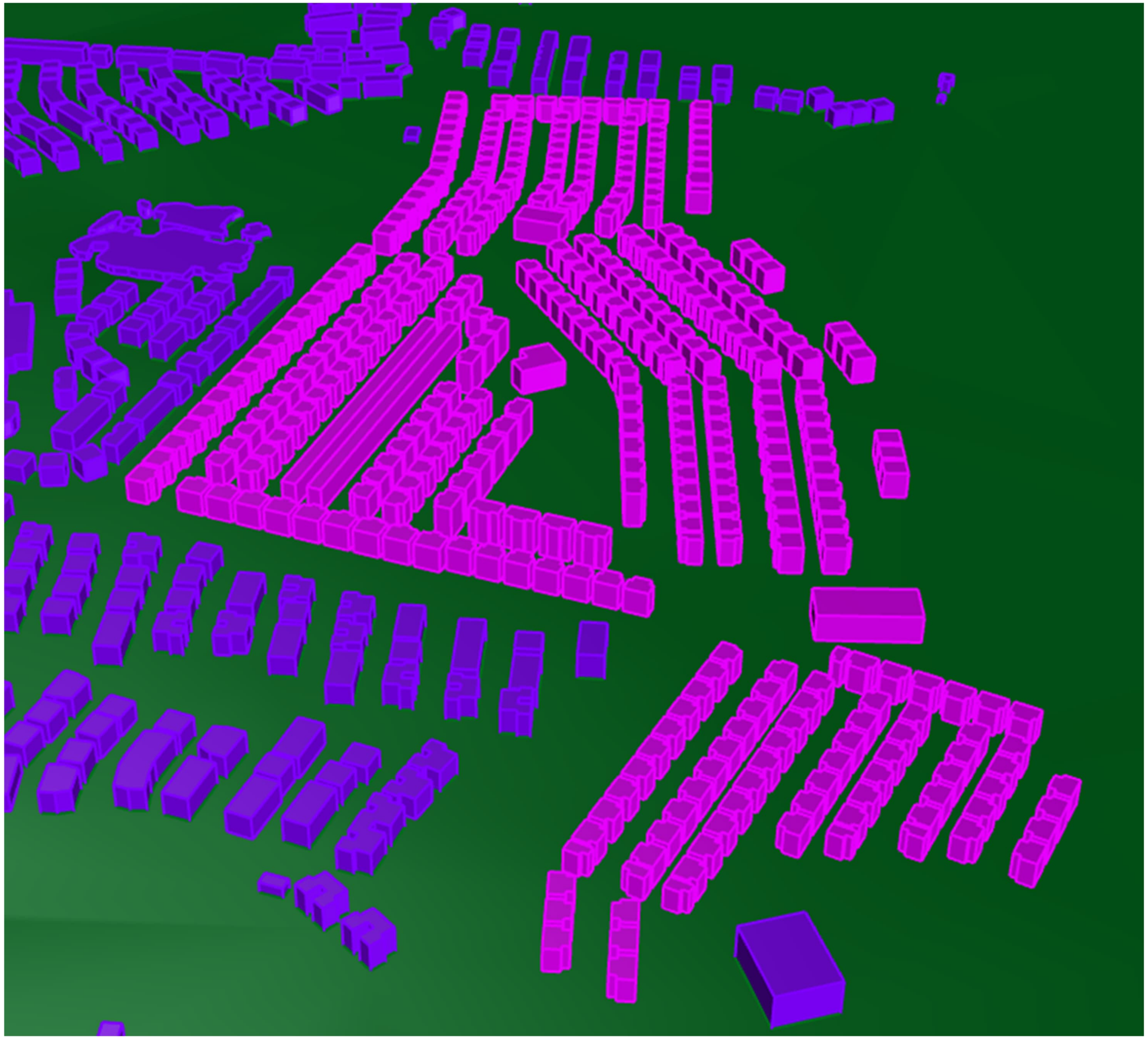


Figure 4.3: Simulation Model of the Baseline Scheme (Part 3 of 4)

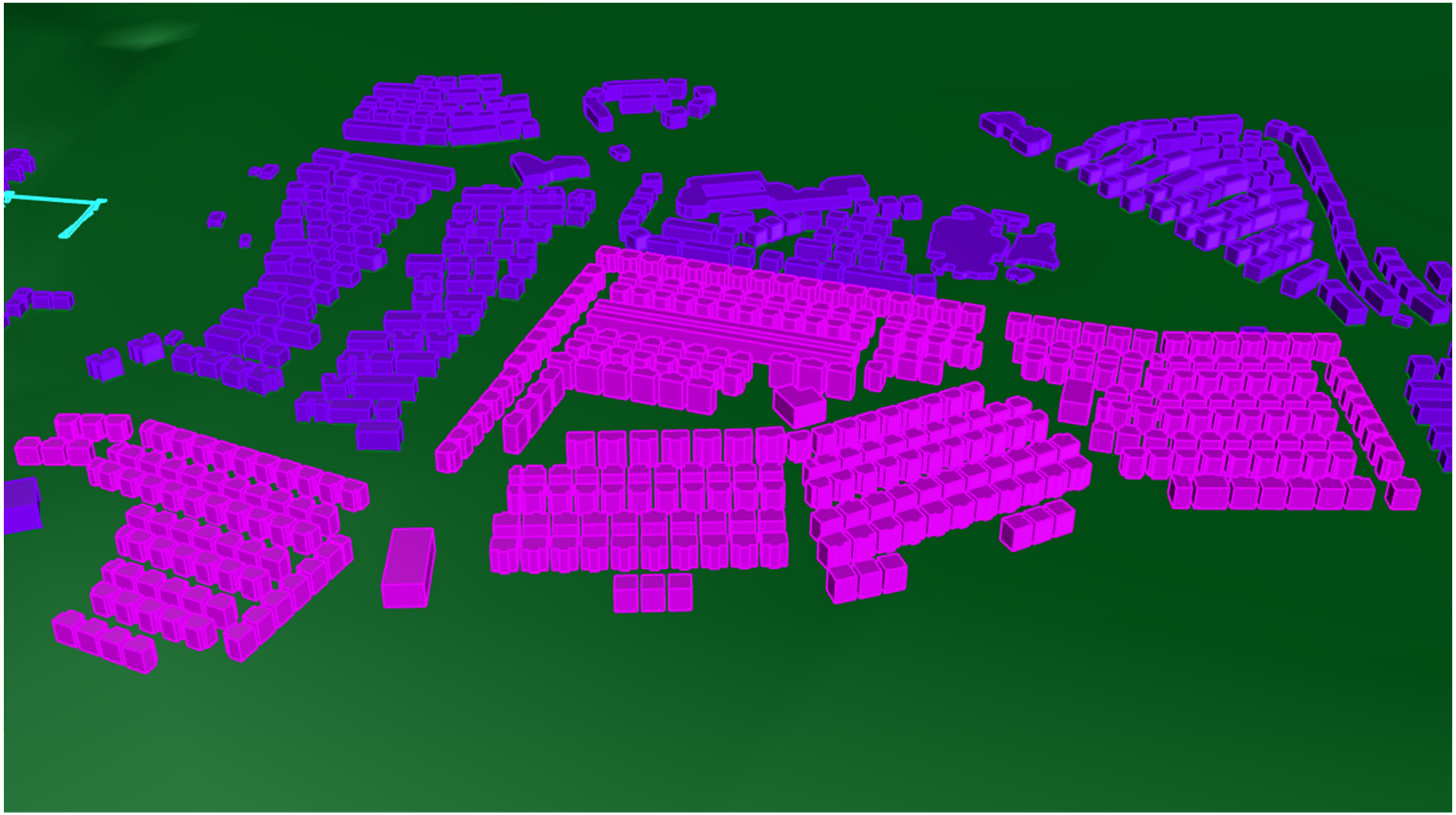
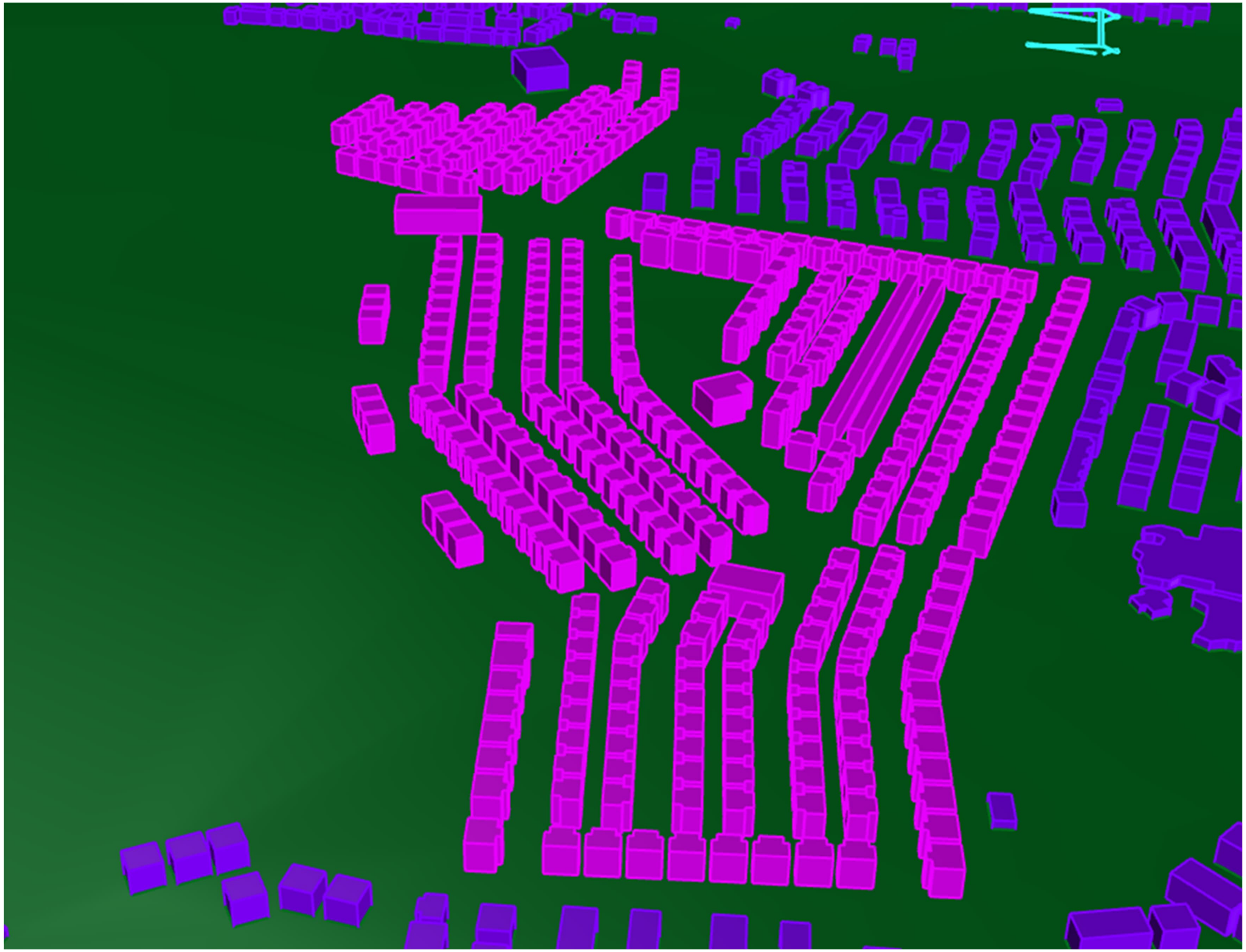


Figure 4.4: Simulation Model of the Baseline Scheme (Part 4 of 4)



4.2 Proposed Scheme

The Proposed Scheme comprises of 24 3-storey detached houses above ground with a maximum building height of 21.0mPD. There are also 104 3-storey semi-detached houses above ground with a maximum building height of 21.0mPD. It also comprises of 47 residential towers ranging from 6-storey to 10-storey with a maximum building height ranging from 28.0mPD to 42.0mPD. In addition, there is a 4-storey Residential Care Home for the Elderly (RCHE) above ground with a maximum building height of 25.0mPD. The Proposed Schemes also included 4 individual clubhouses with a maximum building height of 16.0mPD. In comparison with the Baseline Scheme, the number of buildings is reduced whilst more open spaces and building separations are introduced. The introduction of more open spaces and building separations are expected to enhance the site permeability at pedestrian level.

Chapter 11 of "Hong Kong Planning Standards and Guideline" on Air Ventilation was referenced in order to determine the good design features in the Proposed Scheme from an air ventilation standpoint. The following good design features of the Proposed Scheme are identified and shown in **Appendix B**.

- At least 15m-wide building separation between domestic blocks at the eastern side of the Proposed Scheme.
- At least 9m-wide building separation between domestic blocks at the center of the Proposed Scheme.
- At least 15m-wide building separation between domestic blocks at the western side of the Proposed Scheme.

Figure 4.5 to **Figure 4.8** shows the simulation model of the Proposed Scheme. Architectural layout drawings of the Proposed Scheme are provided in **Appendix B**.

Figure 4.5: Simulation Model of the Proposed Scheme (Part 1 of 4)

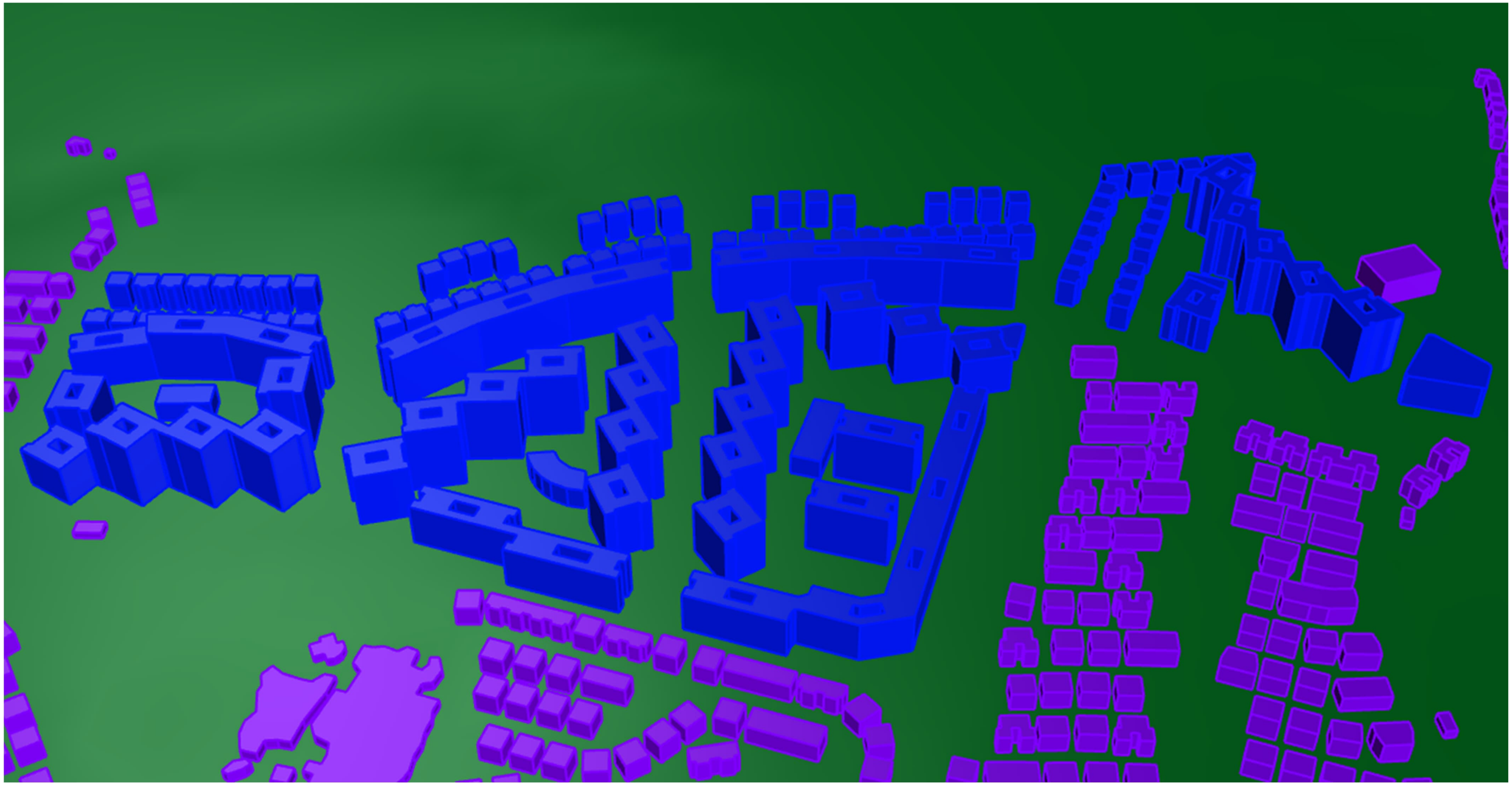


Figure 4.6: Simulation Model of the Proposed Scheme (Part 2 of 4)

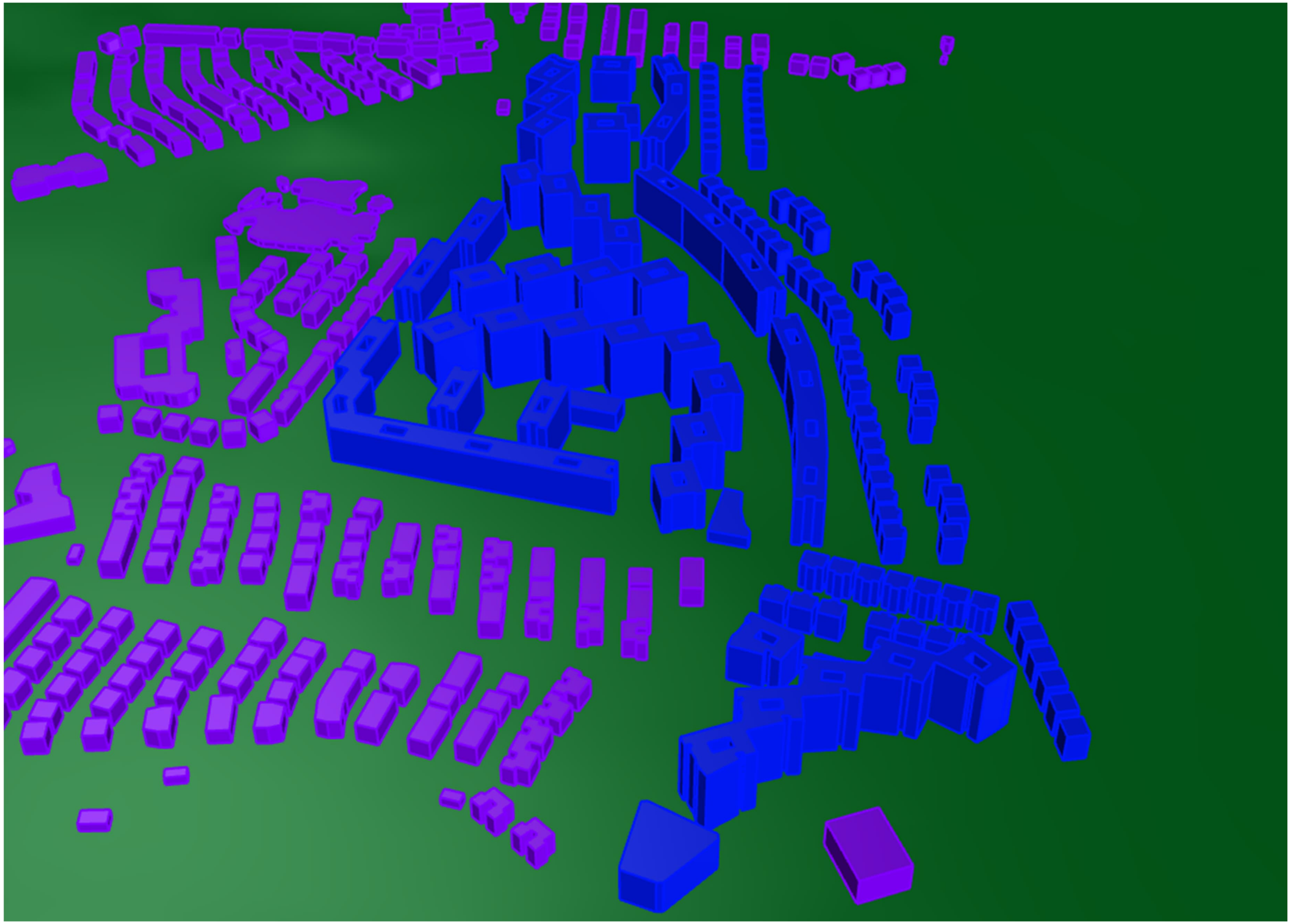


Figure 4.7: Simulation Model of the Proposed Scheme (Part 3 of 4)

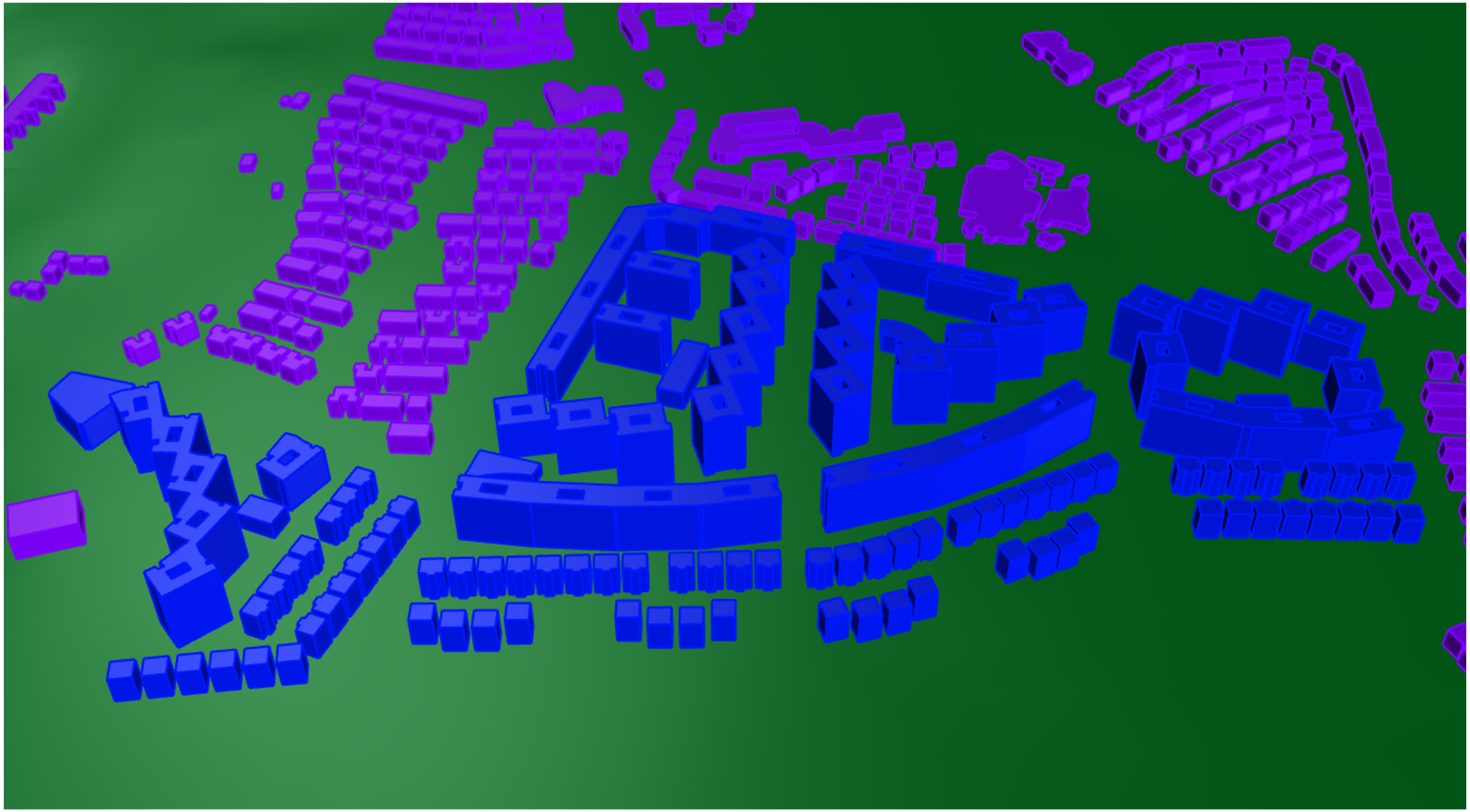
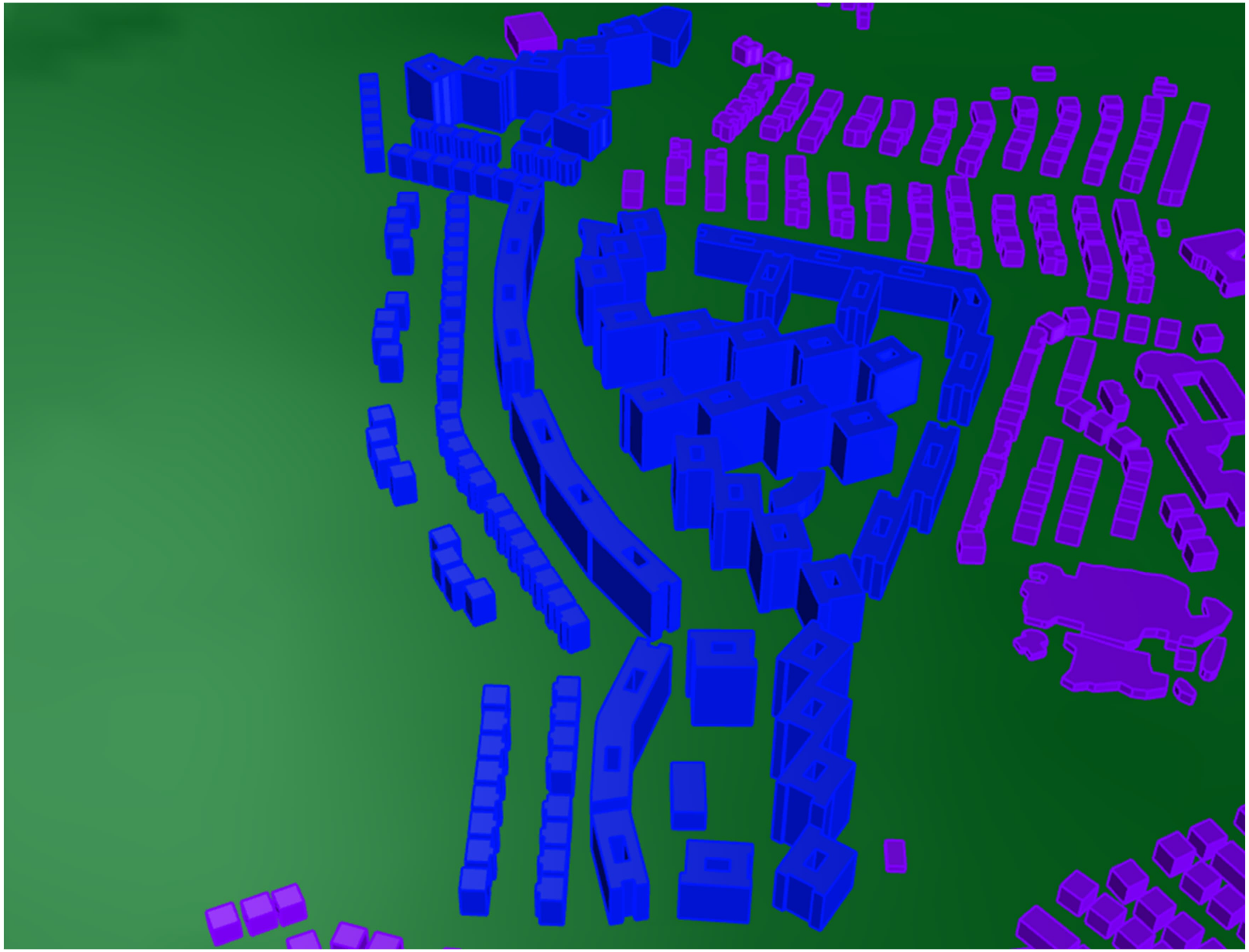


Figure 4.8: Simulation Model of the Proposed Scheme (Part 4 of 4)



5 Methodology

Computational Fluid Dynamics (CFD) was utilized for the AVA. With the use of three-dimensional CFD method, the local airflow distribution can be visualized in detail. The velocity distribution within the flow domain, being affected by the site-specific design and the nearby topography, was simulated under the studied prevailing wind conditions.

5.1 Assessment and Surrounding Areas

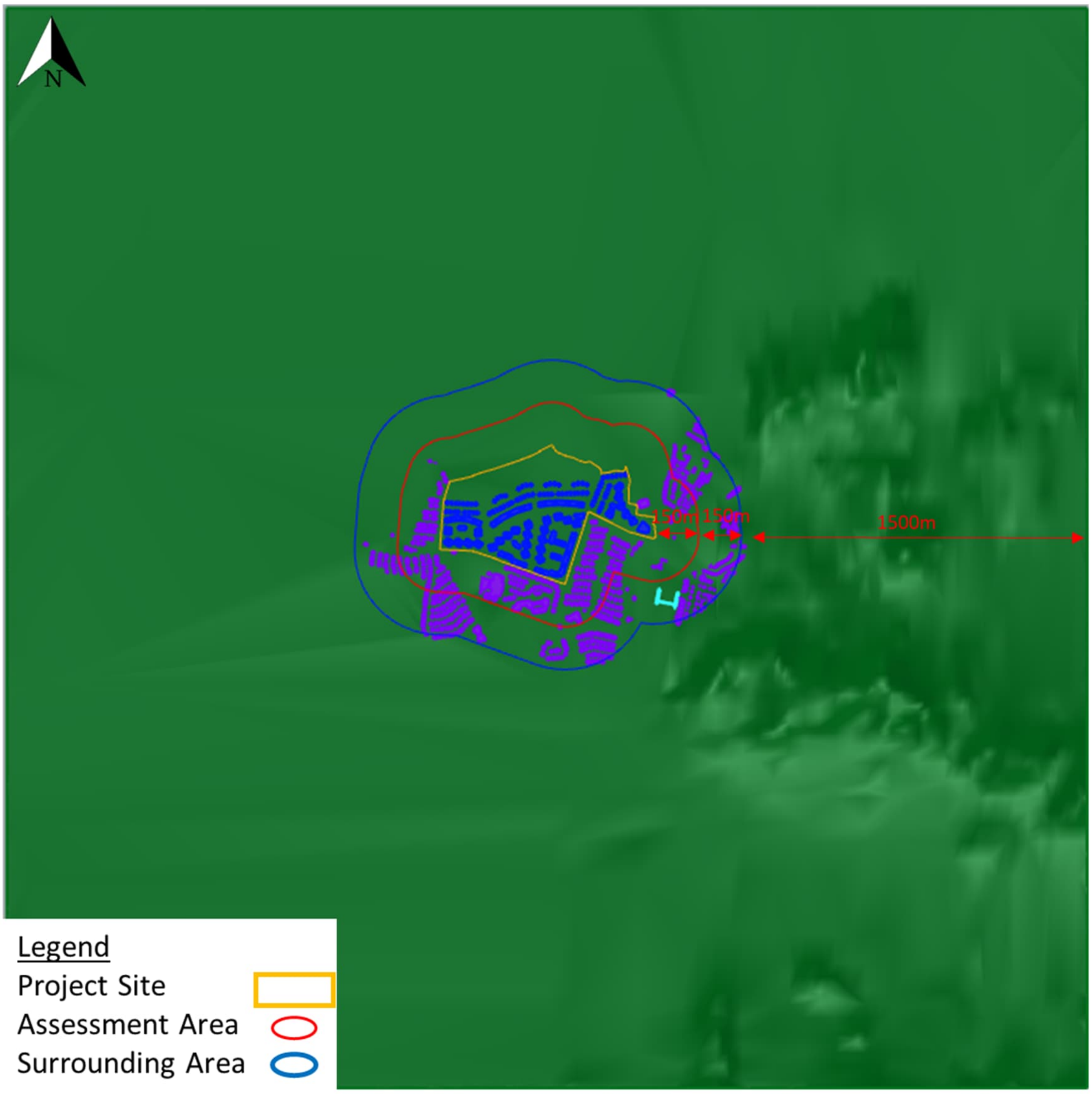
With reference to the Technical Guide, the Assessment Area should include the project's surrounding up to a perpendicular distance 1H from the site boundary of the Project Site with H being the height of the tallest building on site, which is equivalent to approximately 42m hence the Assessment Area is deduced to be 1H=42m and the Surrounding Area will be 2H=84m.

However, in order to incorporate special surrounding features and open spaces beyond the Assessment Area, the H is extended to 150m hence the new Assessment Area for the current study will be 1H=150m and the Surrounding Area will be 2H=300m.

The model takes information on the surrounding buildings and site topography via the Geographical Information System (GIS) platform. The computational domain of the CFD model for this AVA Initial Study is approximately 3800 m (L) x 3800 m (W) x 1000 m (H).

Figure 5.1 shows the size and location of the Project Site, Assessment Area, Surrounding Area and the computational domain. The whole computational domain in different directions are shown in **Appendix H**.

Figure 5.1: Project, Assessment and Surrounding Areas along Computational Domain



5.2 Technical Details for CFD Simulation

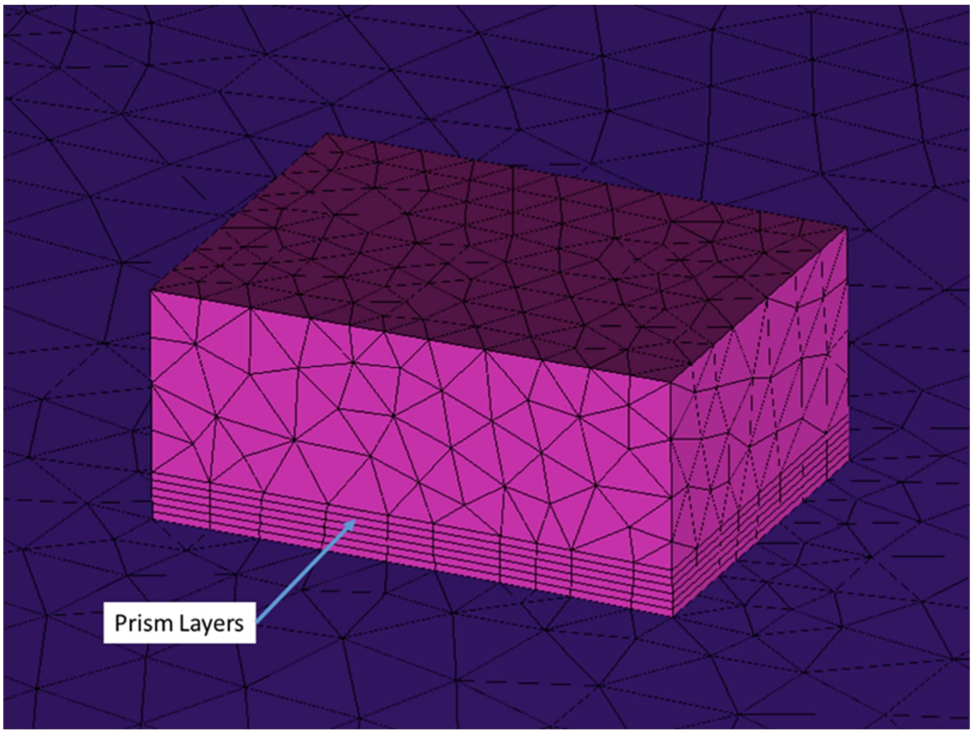
5.2.1 Modelling Tool

A commercial CFD package STAR-CCM+ was used which is widely adopted in the industry for AVA studies and other types of complex fluid flow related problems.

5.2.2 Mesh Setup

Body-fitted unstructured grid technique is used to fit the geometry to reflect the geometry details which is essential for proper modeling on turbulence flow. A prism layer of 3m above ground (totally 6 layers and each layer is 0.5m) is incorporated in the meshing so as to better capture the approaching wind near ground as shown in **Figure 5.2**. The expansion ratio is not greater than 1.1 while the maximum blockage ratio is 2%.

Figure 5.2: Prism Mesh Layers at Ground Level



5.2.3 Mesh Setup

According to COST Action C14 (2004)[2], realizable k – ε turbulence model is adopted as it is recommended for modeling pedestrian wind environment. This turbulence model provides more accurate representation of the levels of turbulence that can be expected in an urban environment.

5.2.4 Calculation Method and Boundary Condition

Pressure-Based segregated algorithm will be adopted to solve the governing equations. The pressure and velocity coupling will be handled by SIMPLE algorithm or its variation. A collocated variable arrangement with Rhie-and-Chow-type approach is also adopted to prevent checker board problem. A higher order differencing scheme is applied to discretize all governing

[2] J. Franke, C. Hirsch, A.G. Jensen, H.W. Krüs, M. Schatzmann, P.S. Westbury, S.D. Miles, J.A. Wisse and N.G. Wright, Recommendations on the use of CFD in Wind Engineering, In J.P.A.J. van Beek (Ed.), Proc. Int. Conf. on Urban Wind Engineering and Building Aerodynamics: COST C14 – Impact of Wind and Storm on City life and Built Environment, Rhode-Saint-Genèse, 2004.

equations. The convergence criterion is set to 0.0001 on mass, momentum and turbulence equations. The calculation will repeat until the solution satisfies this convergence criterion. The prevailing wind direction is set to inlet boundary of the model with respective wind profile as detailed in **Section 3**. The downwind boundary is set to pressure with value of atmospheric pressure. The top and side boundaries are set to symmetry. In addition, to eliminate the boundary effects, the model domain is built more than 5H from the Surrounding Area as recommended in the Technical Circular.

5.2.5 Summary

Based on previous sections, the detail parameters of the model are summarized in **Table 5.1**.

Table 5.1: Summary of CFD Model

	CFD Model
Computational Model Scale	1:1 scale to real environment
Model details	Topography, Buildings blocks, Streets/highways, all major elevated structures and noise barriers are included. No minor structures like signboard, street light, trees, shrubs, turfs, etc are included in the simulation model.
Domain	3800m(L) x 3800m(W) x 1000m(H)
Assessment Area	Within 1H (150m) Area
Surrounding building Area	Within 2H (300m) Area
Turbulence Model	Realizable k-ε model
Grid Expansion Ratio	Maximum expansion ratio = 1.1
Prismatic layer	6 layer of prismatic layers and 0.5m each (i.e. total 3m above ground)
Inflow boundary Condition	Respective wind profile obtained from RAMS
Outflow boundary	Pressure boundary condition with pressure equal to zero
Wall boundary condition	Logarithmic law boundary
Solving algorithms	SIMPLE with Rhie and Chow approach + Higher order differencing scheme
Blockage ratio	Maximum = 2%
Convergence criteria	Below $1.0E^{-4}$

5.3 AVA Indicator

5.3.1 Wind Velocity Ratio

The Wind Velocity Ratio (VR) as stipulated in the Technical Circular will be used to assess the ventilation performance of the proposed development and its surrounding environment. Higher VR implies better ventilation. The calculation of VR is given by the following formula:

$$VR = \frac{V_p}{V_\infty}$$

V_P= the wind velocity at the pedestrian level (2m above ground).

V_∞= the wind velocity at the top of the wind boundary layer (typically assumed to be around 500m above the center of the site of concern, or at a height where wind is unaffected by the urban roughness below).

The Average VR is defined as the frequency weighted average VR with respect to the percentage of occurrence of all considered wind directions. This gives a general idea of the ventilation performance at the considered location at both annual and summer wind conditions.

5.3.2 Spatial Average Velocity Ratio

CFD simulations will be conducted to study the wind environment under annual and summer wind conditions. As specified in the Technical Circular, indicator of ventilation performance should be the VR, defined as the ratio of the wind velocity at the pedestrian level to the wind velocity at the top of the wind boundary layer. Site spatial average velocity ratio (SVR) and a Local spatial average velocity ratio (LVR) should be determined.

The SVR gives an idea of how the lower portion of the proposed development may affect the immediate surroundings. When problems are detected, it is likely that design changes may be needed for the lower portion of the development (e.g. the coverage of the podium).

The LVR gives an idea of how the upper portion of the proposed development may affect the local surroundings. When problems are detected, it is likely that design changes may be needed for the upper portion of the development (e.g. re-orientation of blocks and building height adjustment on the towers).

Table 5.2: Terminology of the AVA Initial Study

Terminology	Description
Site spatial average velocity ratio (SVR)	The SVR represent the average VR of all perimeter test points along the site boundary as identified in the report.
Local spatial average velocity ratio (LVR)	The LVR represents the average VR of all points, i.e. perimeter and overall test points within the Assessment Area, as identified in the report.

5.4 Locations of Test Points

Test points are evenly placed along the site boundary as well as open spaces, along streets and places within the Assessment Area which are frequently accessed by pedestrians. Test points have been placed at 2m above ground or podium level to determine the pedestrian ventilation performance. Three types of test points have been adopted in this study.

5.4.1 Perimeter Test Points

Perimeter test points are the points positioned at the site boundary of the Project Site. In accordance with the Technical Guide, 50 perimeter test points are positioned along the site boundary as shown in **Figure 5.3** to **Figure 5.4**.

Figure 5.3: Demarcation of the Perimeter (P) Test Points in Baseline Scheme

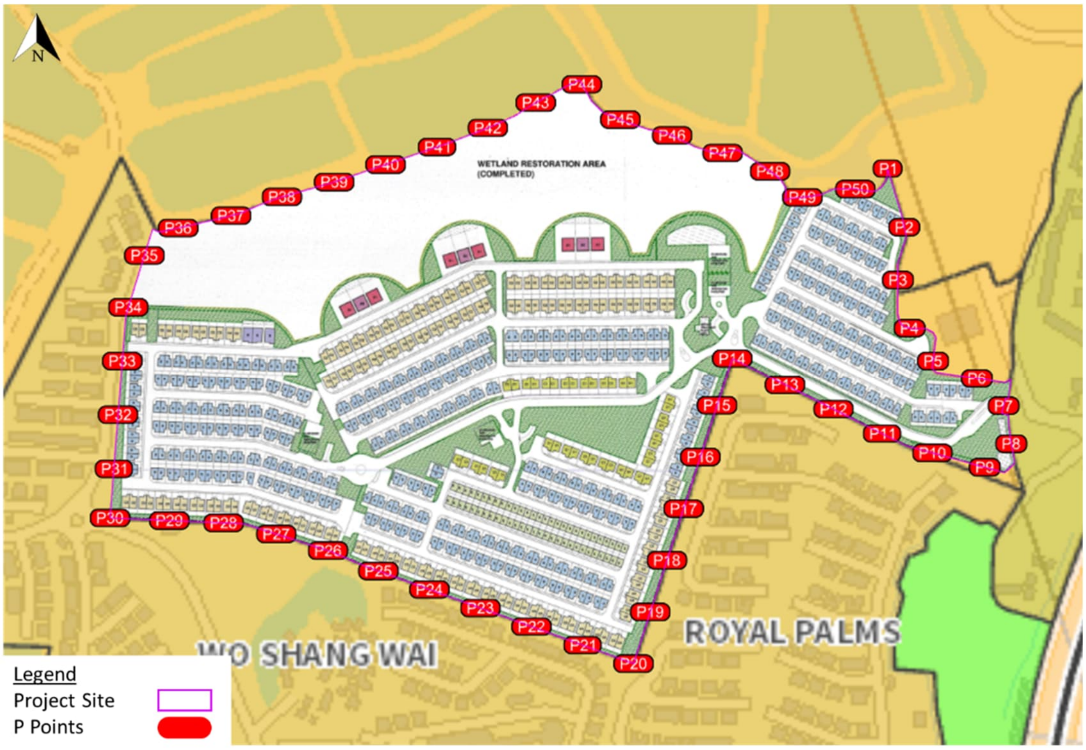
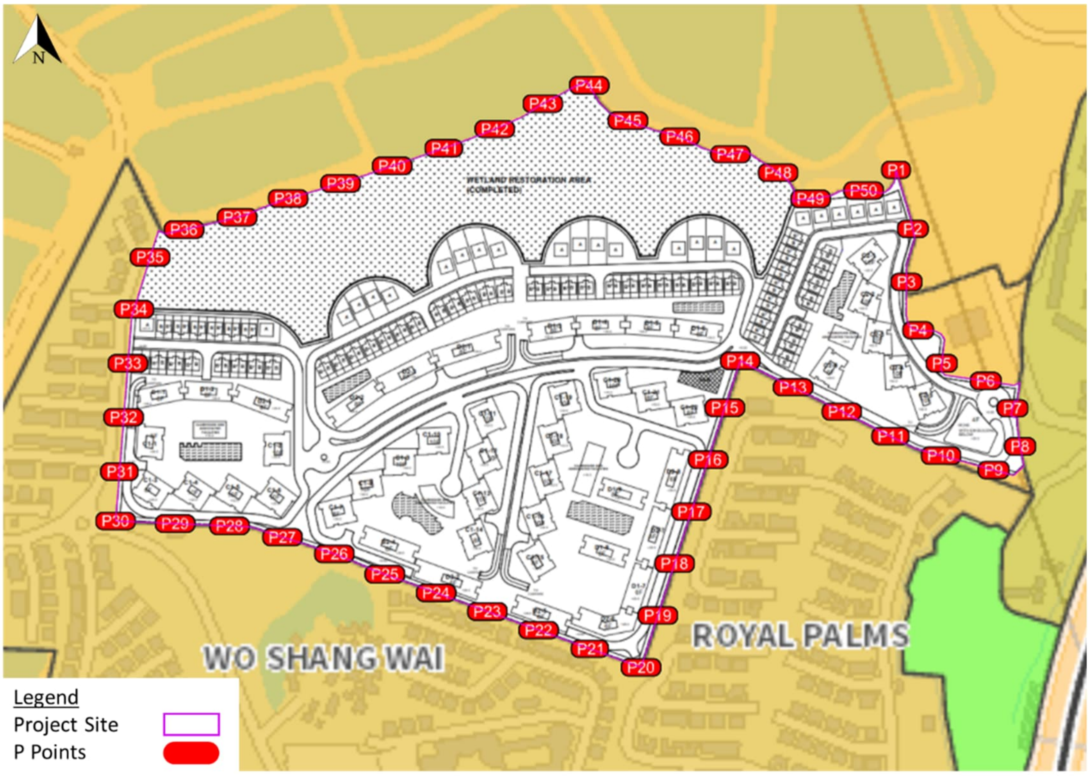


Figure 5.4: Demarcation of the Perimeter (P) Test Points in Proposed Scheme



5.4.2 Overall Test Points

177 overall test points are evenly distributed at open spaces, streets and places that are frequently accessed by pedestrians within the Assessment Area. The locations of the overall test points are shown in **Figure 5.5** to **Figure 5.6**.

Figure 5.5: Demarcation of the Overall (O) Test Points in Baseline Scheme

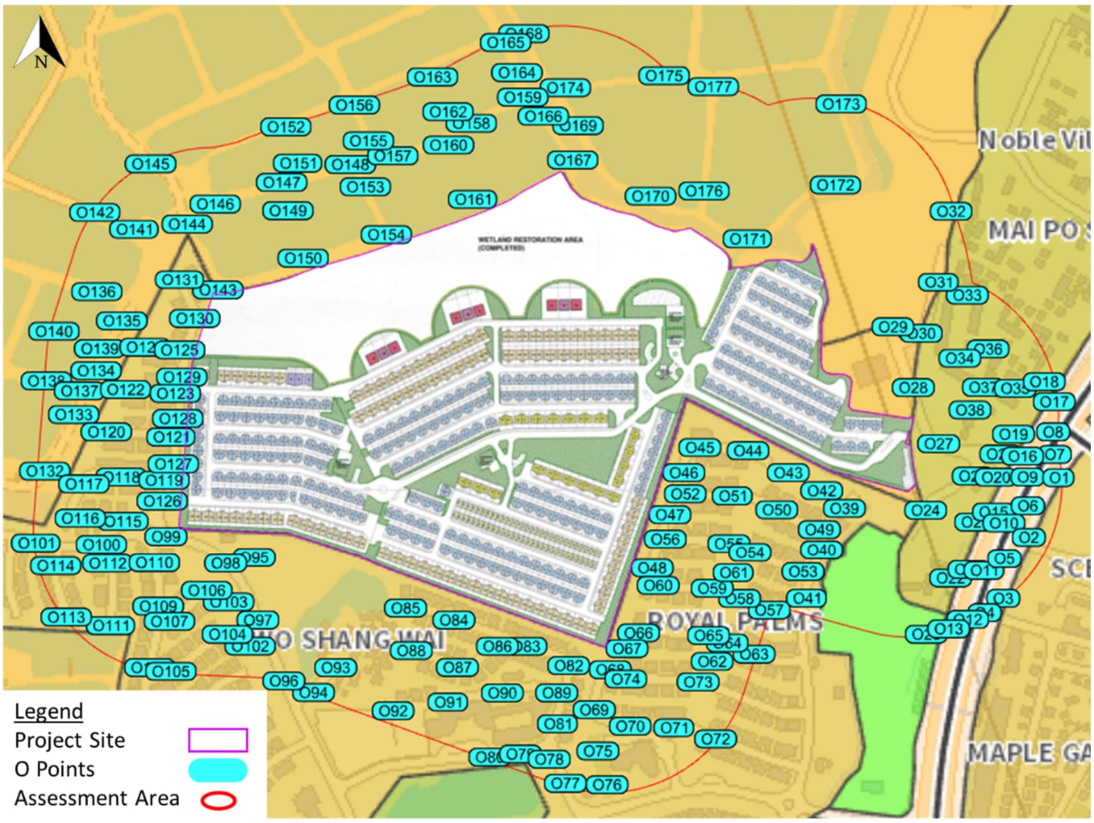
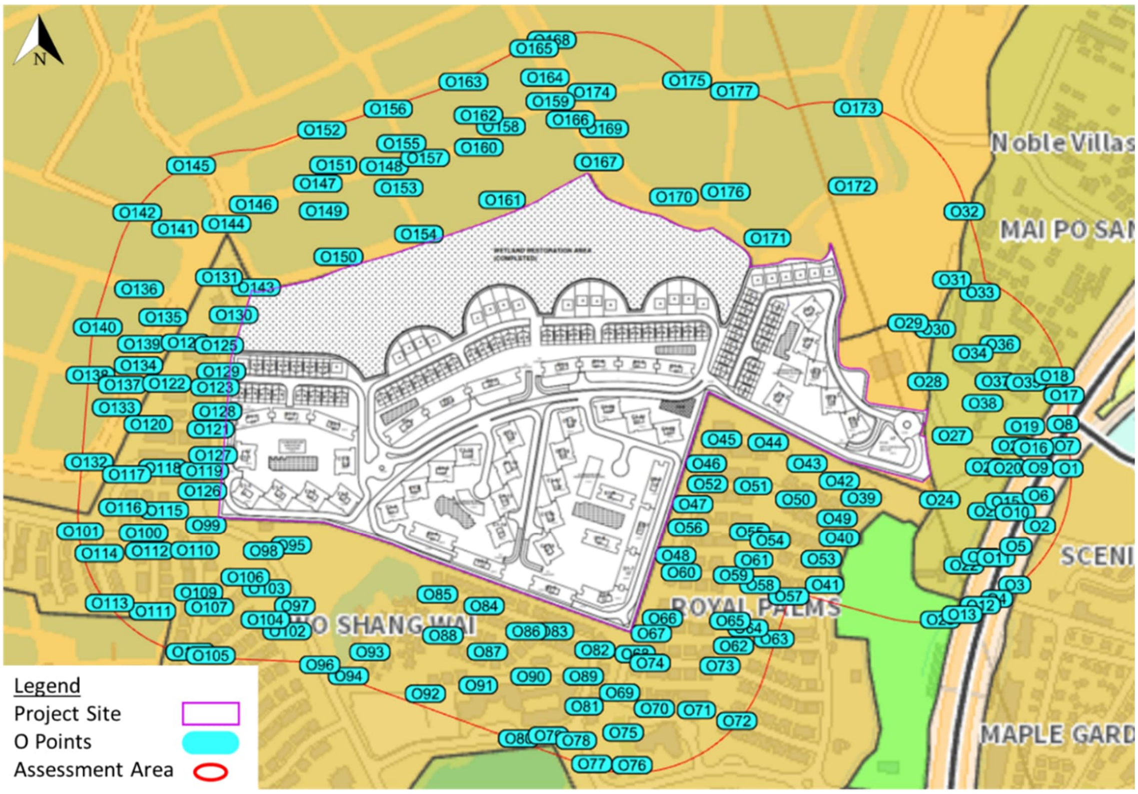


Figure 5.6: Demarcation of the Overall (O) Test Points in Proposed Scheme



5.4.3 SPECIAL TEST POINTS

In addition to the overall test points, special test points are selected within the Project Site. 32 special test points are selected as shown in **Figure 5.7** to **Figure 5.8.**

Figure 5.7: Demarcation of the Special (S) Test Points in Baseline Scheme

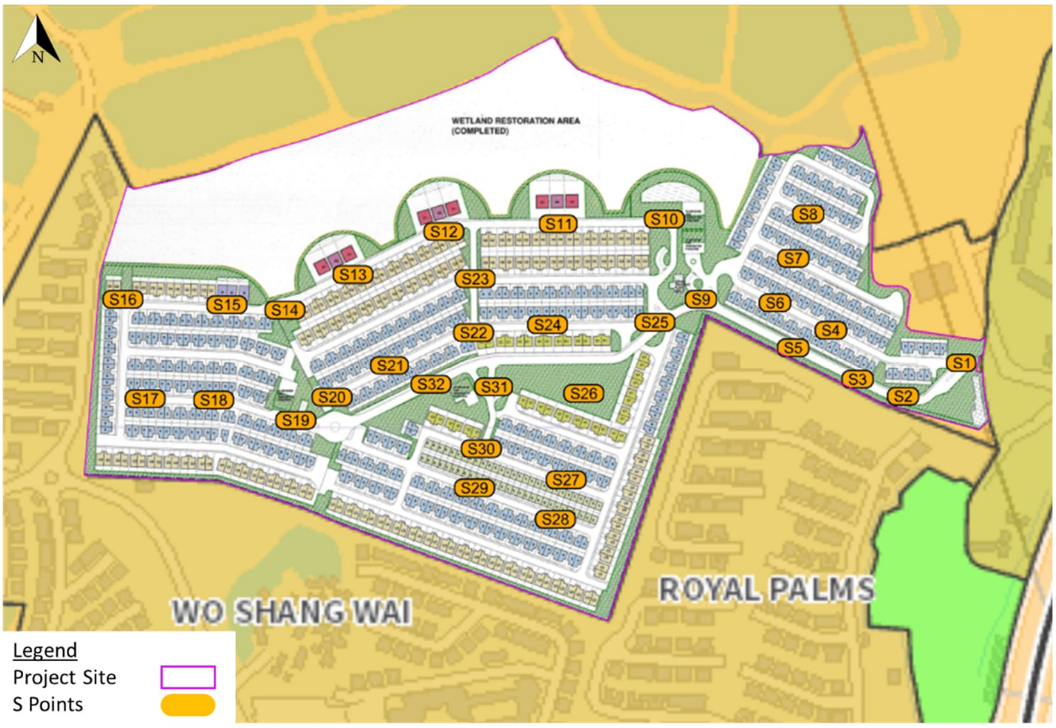
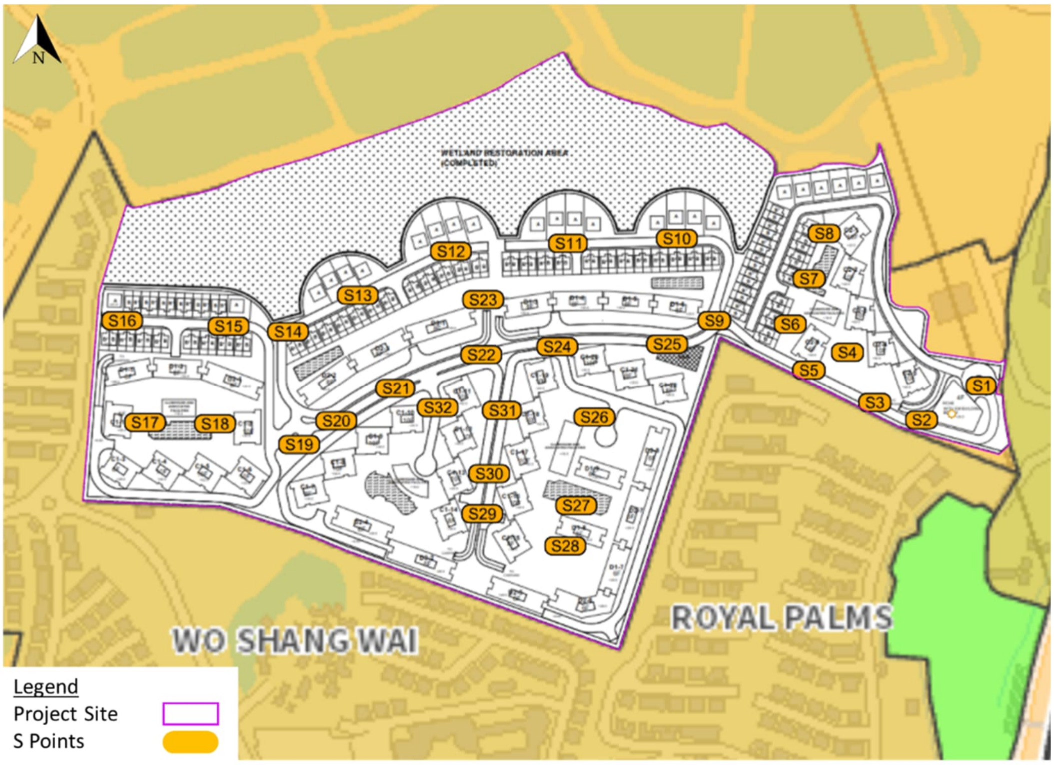


Figure 5.8: Demarcation of the Special (S) Test Points in Proposed Scheme



5.5 Demarcation of Focus Areas

In addition to the SVR for the Project Site (i.e. P1-P50) and LVR (i.e. P1-50 and O1-O177), the spatial average wind velocity ratio (SAVR) of various focus areas will be presented for the in-depth quantitative analysis.

Table 5.3 shows the various focus areas and their representative test points and **Figure 5.9** to **Figure 5.15** show the location of the focus areas within the Assessment Area

Table 5.3: Demarcation of Focus Areas

	Focus Areas	Test Points
A	San Tam Road	O1-O3
B	San Tin Highway	O4-O12
C	Castle Peak Road - Mai Po	O13-O17
D	Road 1	O18-O19
E	Road 2	O20-O23
F	Road 3	O24-O25
G	Mai Po South Road	O26-O29
H	Road 4	O30-O32
I	Mai Po San Tsuen	O33-O38
J	Royal Palms	O39-O76
K	Palm Springs - Arcadia	O77-O92
L	Wo Shang Wai Village	O93-O94
M	Palm Springs - Westwood	O95-O131
N	Fishponds 1	O132-O142
O	Fishponds 2	O143-O177

Figure 5.9: Location of the Focus Areas within the Assessment Area (Overview)

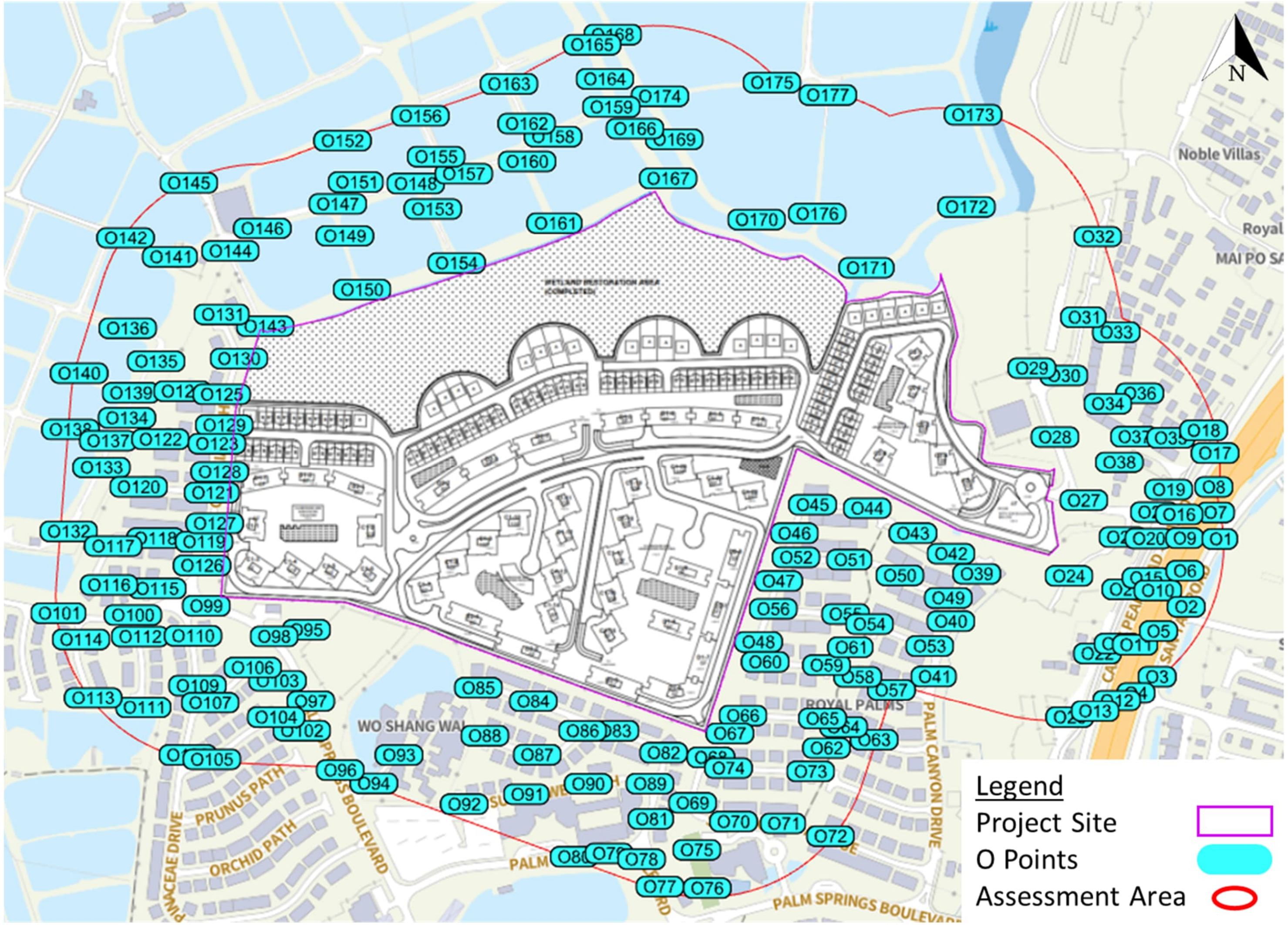


Figure 5.10: Location of the Focus Areas within the Assessment Area (East)

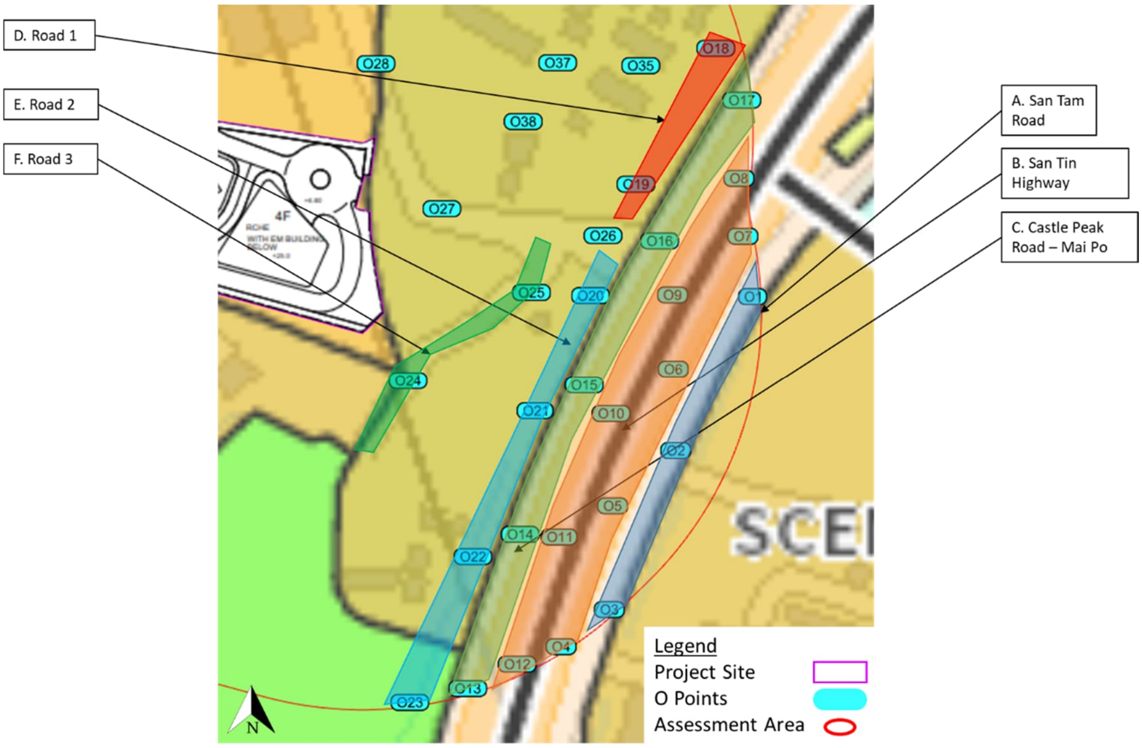


Figure 5.11: Location of the Focus Areas within the Assessment Area (Northeast)

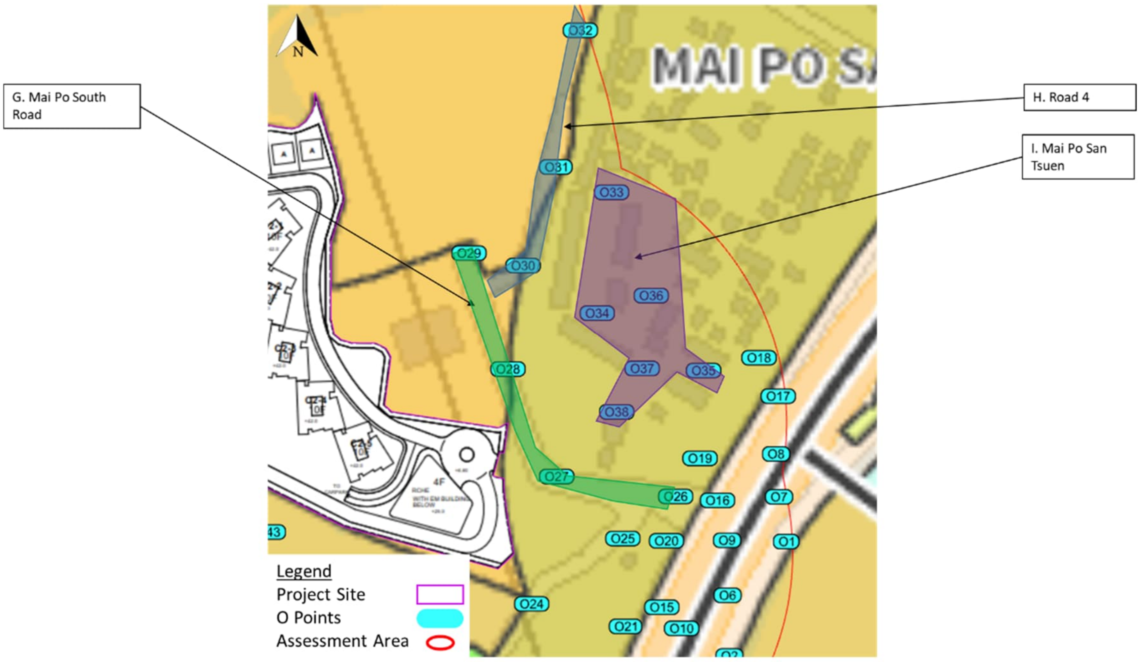


Figure 5.12: Location of the Focus Areas within the Assessment Area (South)

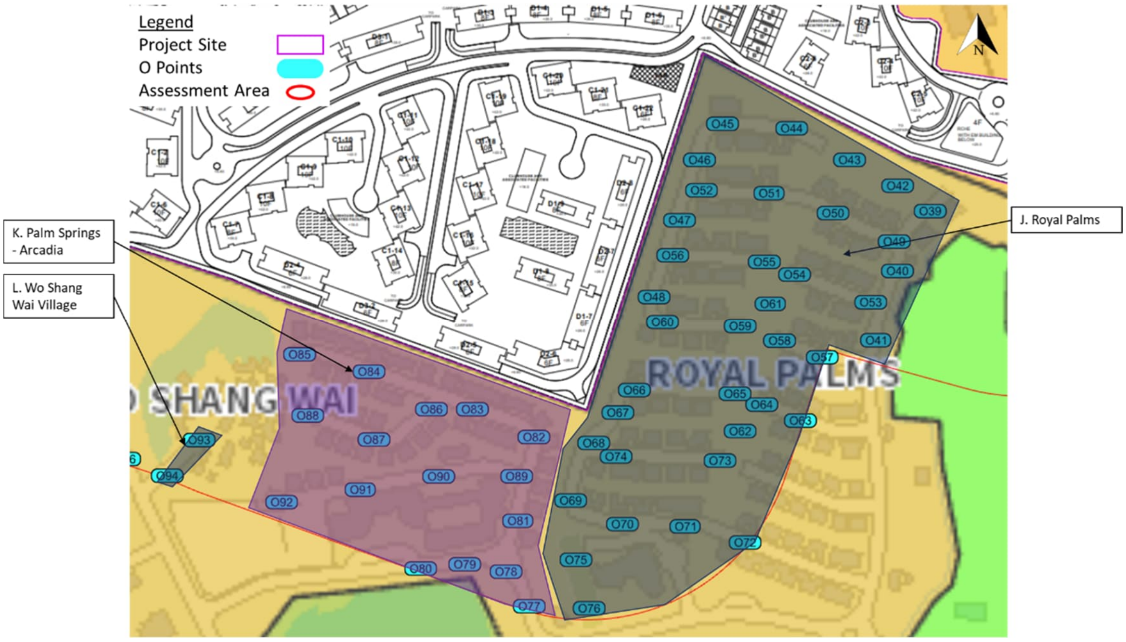


Figure 5.13: Location of the Focus Areas within the Assessment Area (West Part 1)

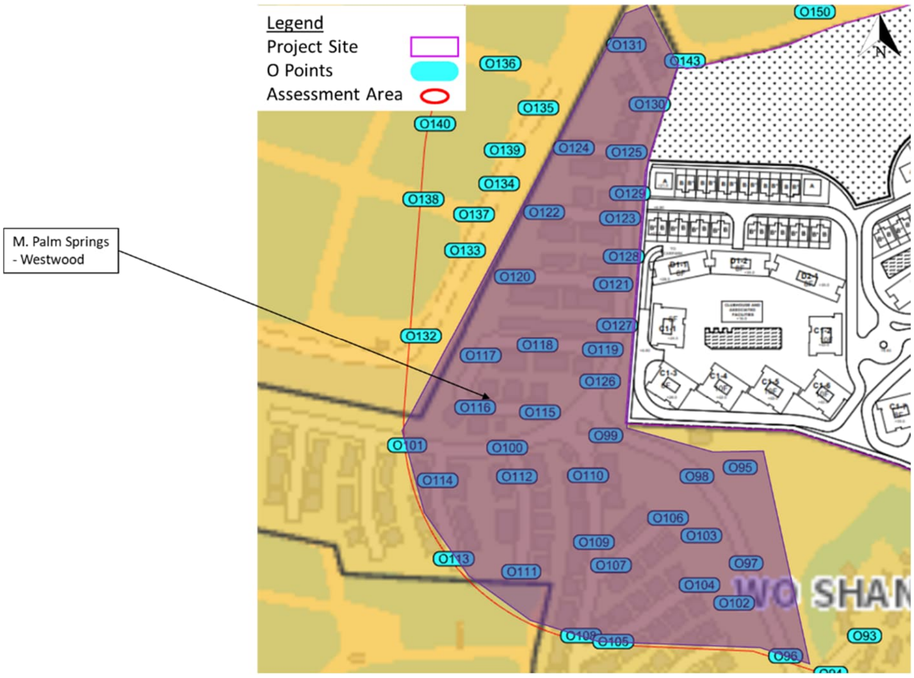


Figure 5.14: Location of the Focus Areas within the Assessment Area (West Part 2)

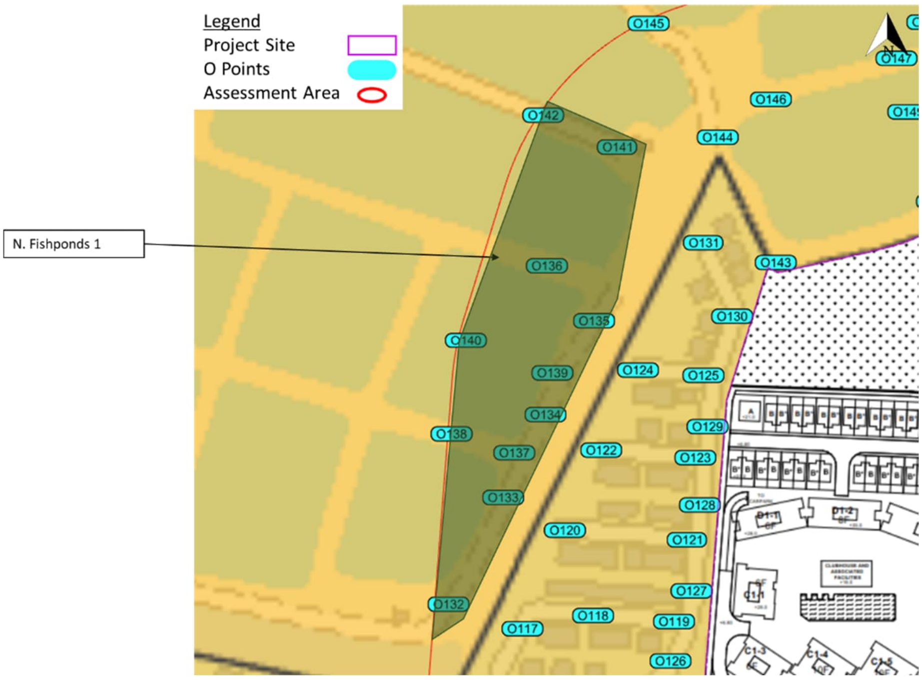
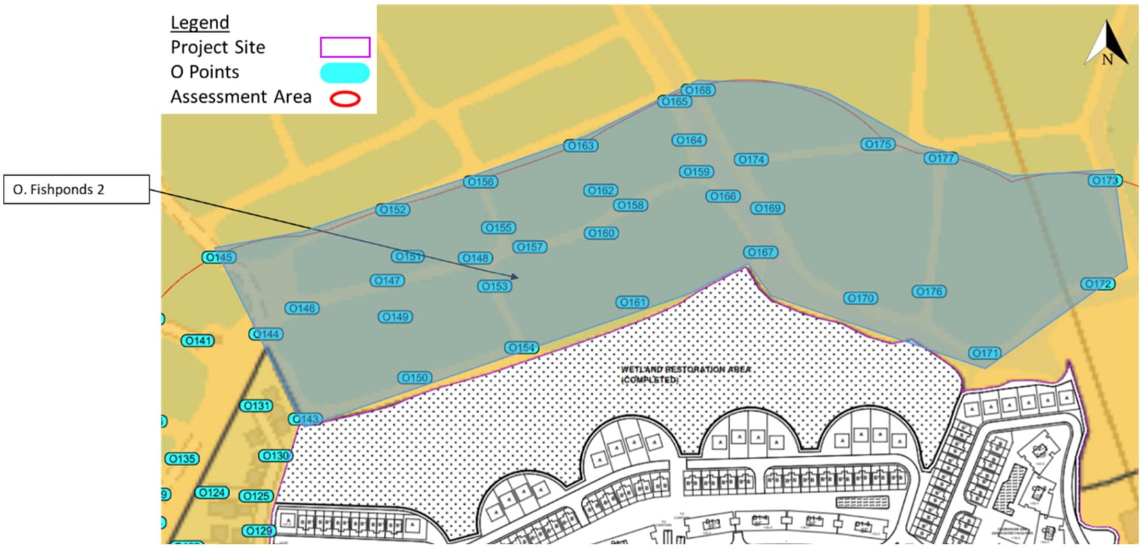


Figure 5.15: Location of the Focus Areas within the Assessment Area (North)



6 Results and Discussion

6.1 Directional Analysis

6.1.1 NNE Wind - Wind Frequency: 7.2% (Annual)

The incoming NNE wind mainly comes from Shenzhen River. For the Project Site, the incoming NNE wind reaches the Project Site via the low-lying fishponds to the north with minimal obstruction.

In the Baseline Scheme, majority of incoming NNE wind is obstructed by the proposed low-rise houses within the Project Site hence the shielding effect creates wake zones at immediate downwind regions including Palm Springs – Arcadia, Wo Shang Wai Village and Palm Springs – Westwood. Nonetheless, two streams of NNE wind are able to penetrate through the Project Site to ventilate the aforementioned downwind regions. One stream of NNE wind flows along the open spaces within the Project Site to reach the downwind regions of Wo Shang Wai Village whereas the other stream of NNE wind travels along Ventura Avenue to ventilate the downwind regions of Royal Palms.

In the Proposed Scheme, NNE wind is shielded by the proposed low-rise residential houses and mid-rise residential towers within the Project Site resulting in a relatively larger wake zone in the downwind region of Palm Springs - Monterey when compared with the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations allowed a larger portion of NNE wind to penetrate through the Project Site via the building separations at the eastern and western side of the Project Site. As a result, the adverse air ventilation impact to the downwind regions including Wo Shang Wai Village, Ventura Avenue and Royal Palms are reduced when compared with the Baseline Scheme.

Figure 6.1 and **Figure 6.3** shows the VR contour plots of NNE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.2** and **Figure 6.4** shows the VR vector plots of NNE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.1: VR Contour Plot at Pedestrian Level under NNE Wind for Baseline Scheme

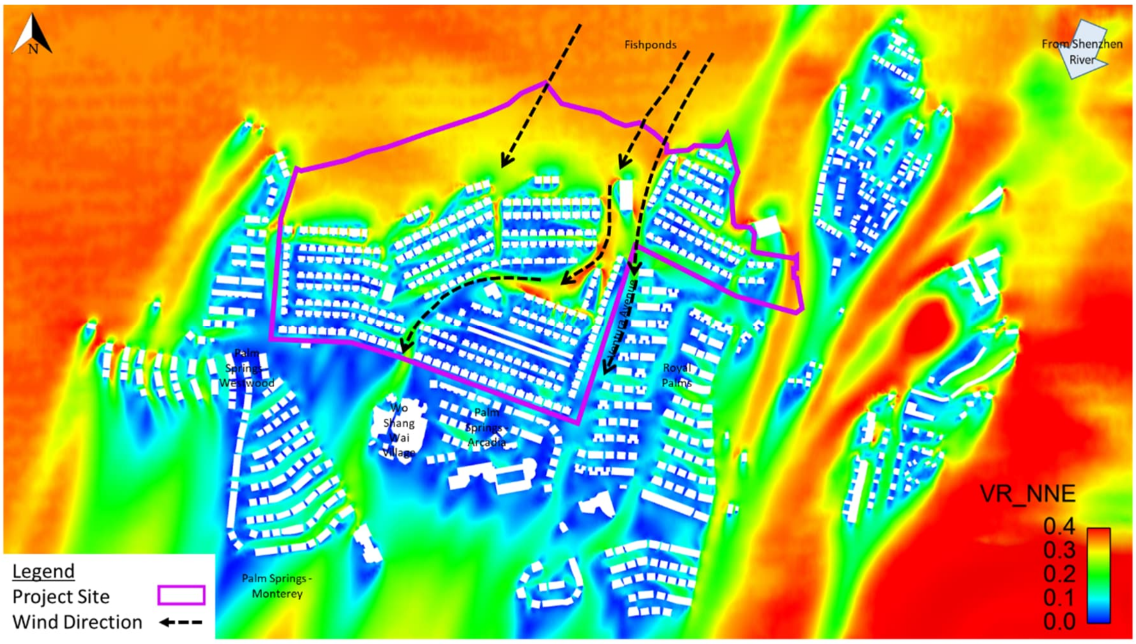


Figure 6.2: VR Vector Plot at Pedestrian Level under NNE Wind for Baseline Scheme

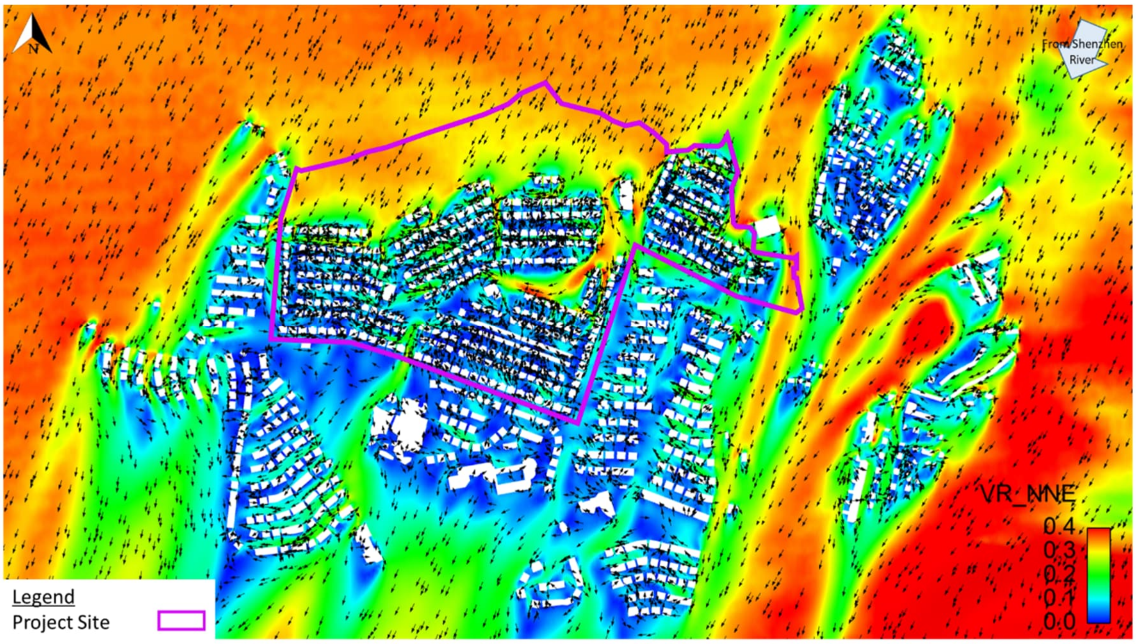


Figure 6.3: VR Contour Plot at Pedestrian Level under NNE Wind for Proposed Scheme

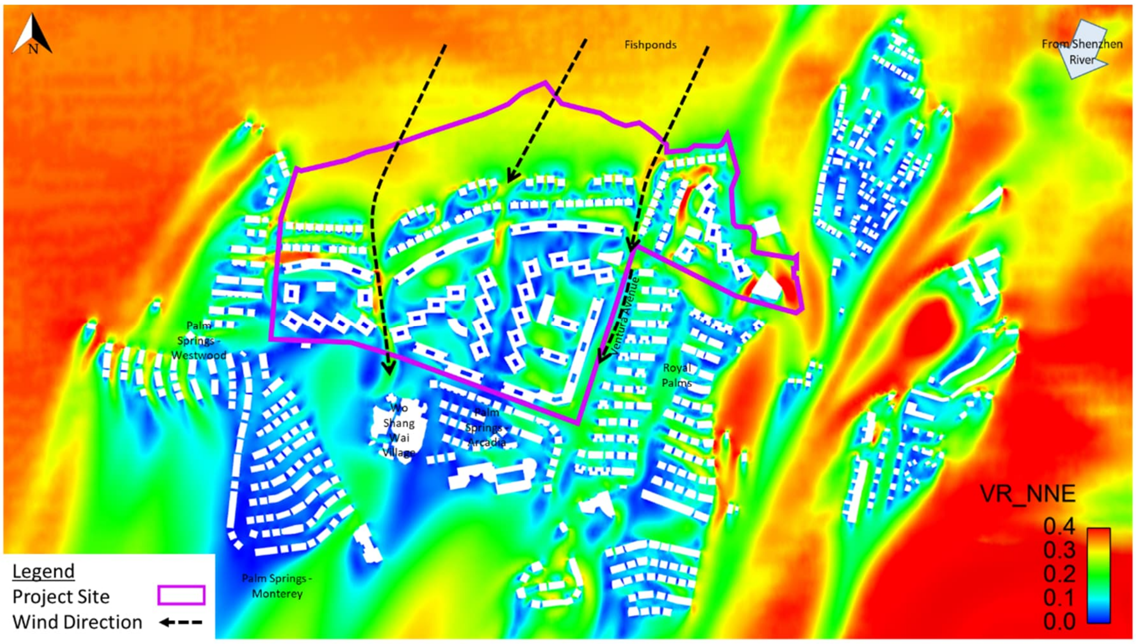
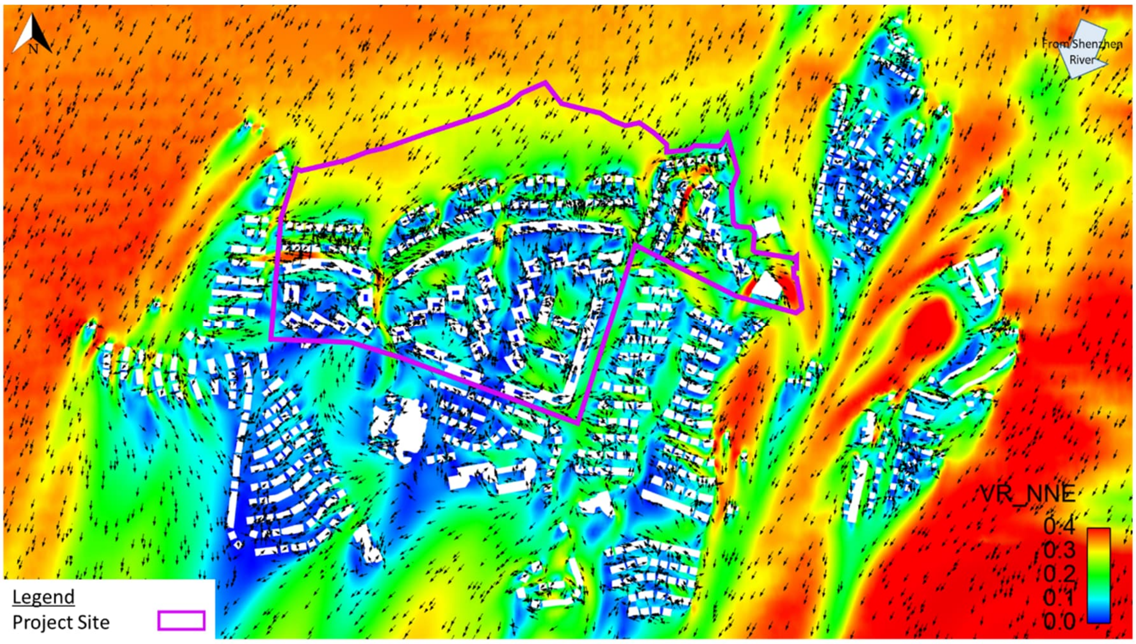


Figure 6.4: VR Contour Plot at Pedestrian Level under NNE Wind for Proposed Scheme



6.1.2 NE Wind - Wind Frequency: 9.8% (Annual)

The incoming NE wind mainly comes from San Tin. For the Project Site, the incoming NE wind reaches the Project Site via the low-lying fishponds to the north with minimal obstruction.

In the Baseline Scheme, majority of incoming NE wind is obstructed by the proposed low-rise houses within the Project Site hence the shielding effect creates wake zones at immediate downwind regions including Palm Springs – Westwood, Wo Shang Wai Village and Palm Springs – Arcadia. Nonetheless, a portion of incoming NE wind is deflected towards Camelia Path by the proposed houses at the north western portion of the Project Site to ventilate Palm Springs – Westwood. Another portion of NE wind travels along Ventura Avenue to ventilate the downwind regions of Royal Palms.

In the Proposed Scheme, a portion of incoming NE wind is also blocked by the proposed low-rise residential houses and mid-rise residential towers within the Project Site. In particular, the residential developments at the western portion of the Project Site deflected the incoming NE wind towards Camelia Path hence a relatively larger wake zone is observed at Palm Springs – Westwood when compared with the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations allowed a larger portion of NE wind to penetrate through the Project Site via the building separations at the eastern and western of the Project Site. As a result, the adverse air ventilation impact to the downwind regions including Wo Shang Wai Village, Ventura Avenue, Palm Springs - Arcadia and Royal Palms are reduced when compared with the Baseline Scheme.

Figure 6.5 and **Figure 6.7** shows the VR contour plots of NE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.6** and **Figure 6.8** shows the VR vector plots of NE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.5: VR Contour Plot at Pedestrian Level under NE Wind for Baseline Scheme

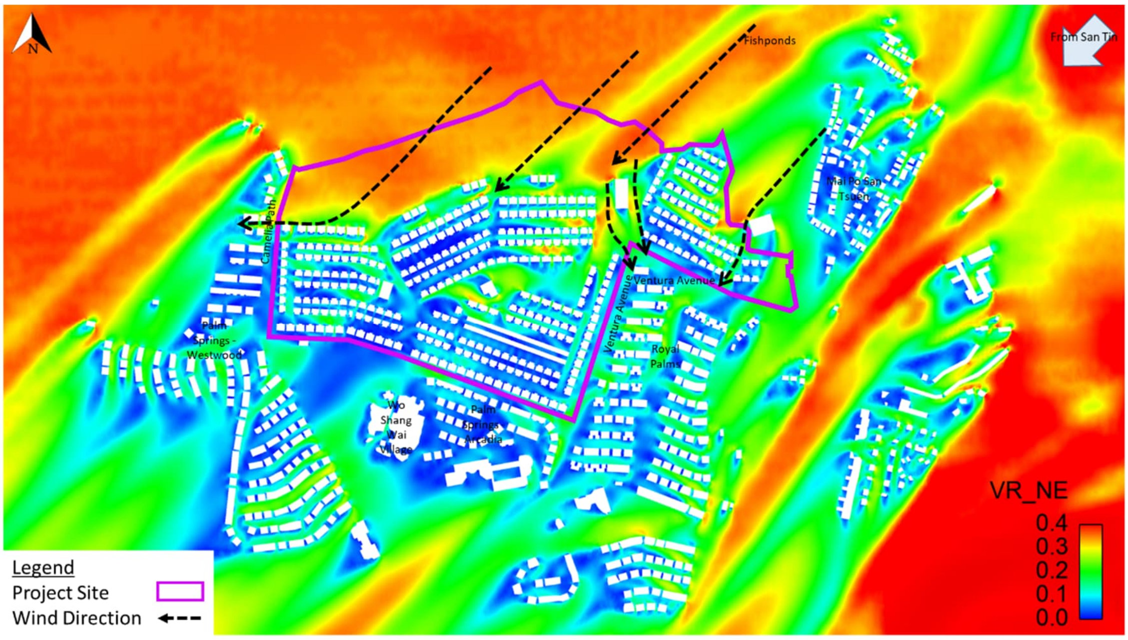


Figure 6.6: VR Vector Plot at Pedestrian Level under NE Wind for Baseline Scheme

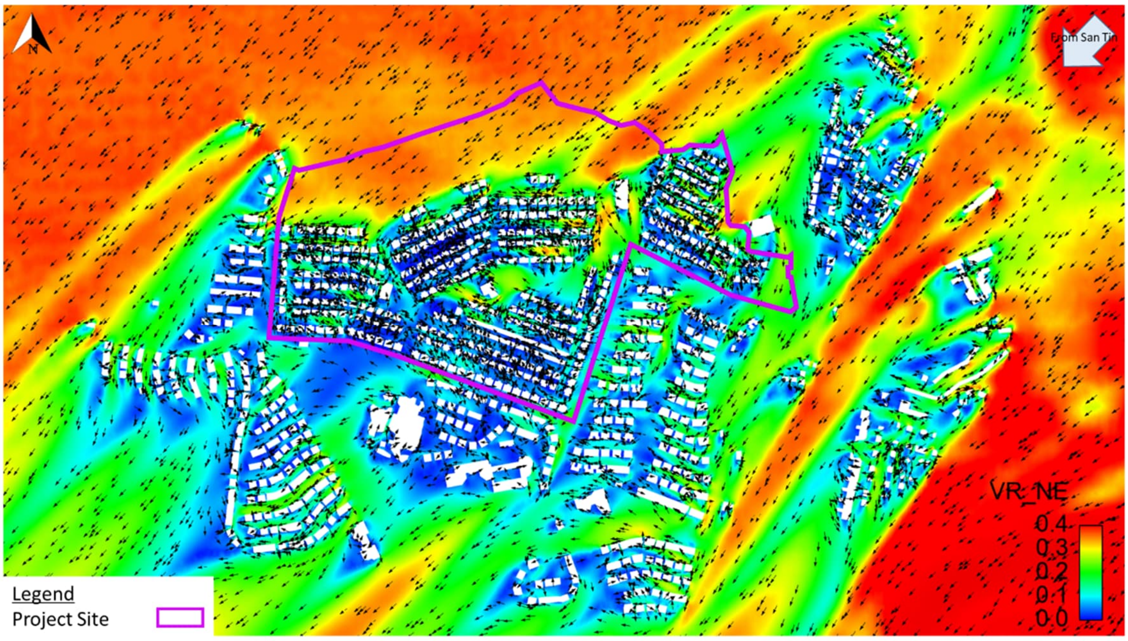


Figure 6.7: VR Contour Plot at Pedestrian Level under NE Wind for Proposed Scheme

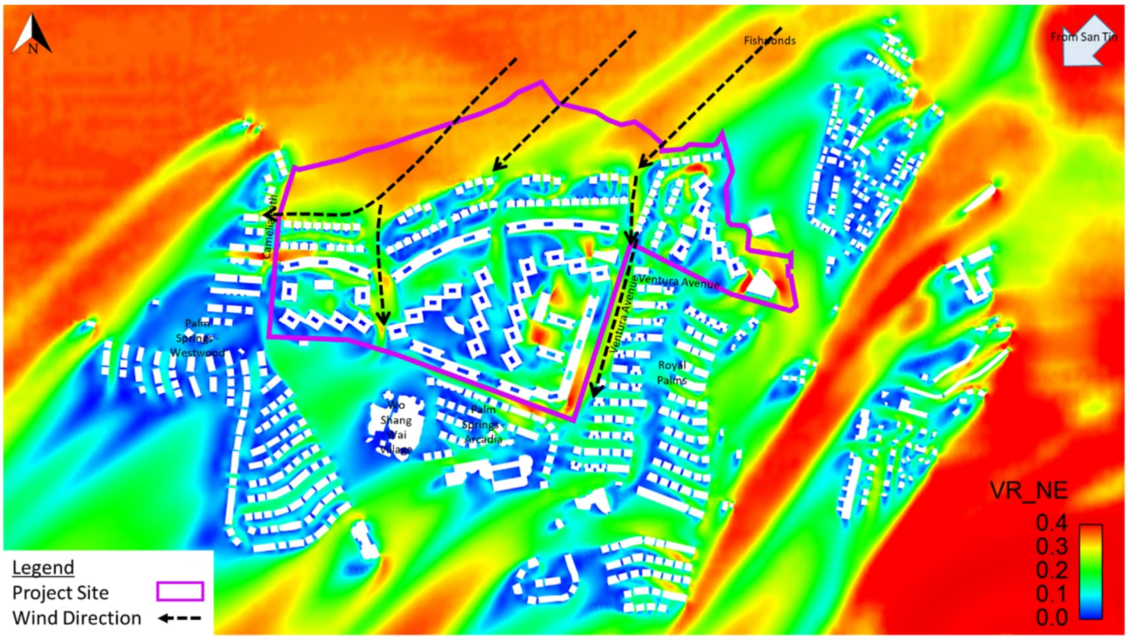
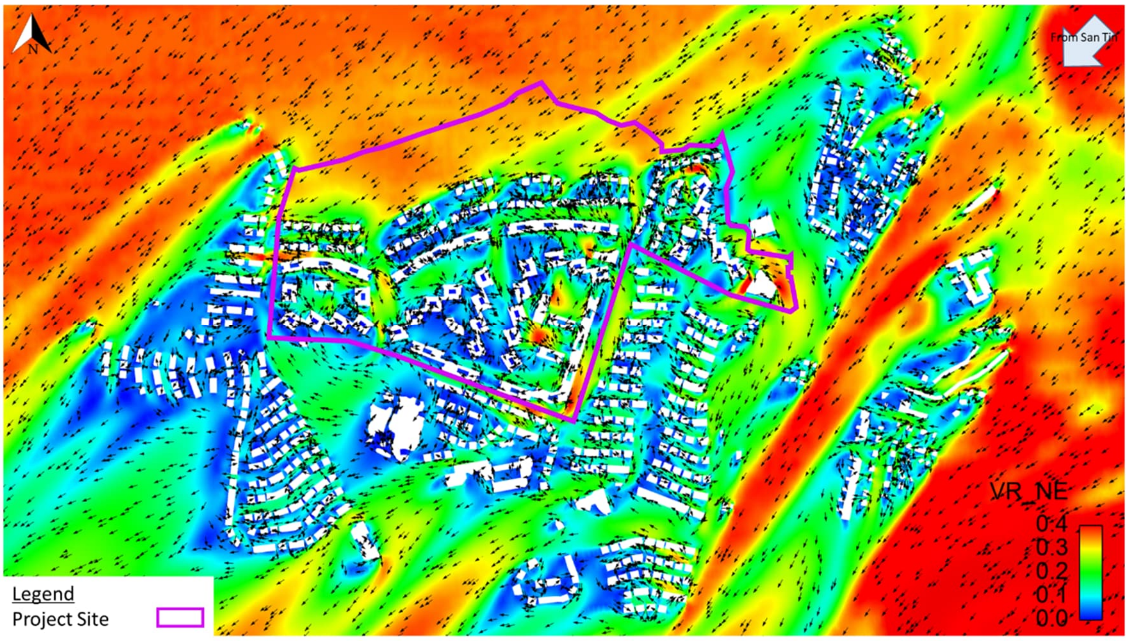


Figure 6.8: VR Vector Plot at Pedestrian Level under NE Wind for Proposed Scheme



6.1.3 ENE Wind - Wind Frequency: 10.2% (Annual)

The incoming ENE wind mainly comes from San Tin Highway. However, incoming ENE wind to the Project Site will be obstructed by the low-rise residential developments of Mai Po San Tsuen at the upwind regions.

In the Baseline Scheme, incoming ENE wind is obstructed by Mai Po San Tsuen and the proposed low-rise houses within the Project Site hence the combined shielding effect creates wake zones at immediate downwind regions including Palm Springs – Westwood, Wo Shang Wai Village and Palm Springs – Arcadia. Nonetheless, two streams of ENE wind are able to penetrate through the Project Site freely. One stream of ENE wind will penetrate through the Project Site to reach Camelia Path via the Wetland Restoration Area whereas a second stream of ENE wind will reach Royal Palms and Ventura Avenue via the open space resulting from the building setback from the eastern site boundary.

In the Proposed Scheme, the presence of the mid-rise residential towers at the eastern portion of the Project Site disrupted the local wind flow pattern around this region thus a relatively larger wake zone is observed between Mai Po San Tsuen and the eastern part of the Project Site when compared with the Baseline Scheme. In addition, the mid-rise residential towers within the Project Site obstructed the ENE wind to the downwind regions thus a relatively larger wake zone is also observed at Palm Springs – Westwood when compared to the Baseline Scheme. Nonetheless, a portion of ENE wind is observed to pass through the opening at the eastern portion of the Project Site to mitigate the air ventilation impact towards the downwind regions of Ventura Avenue and Royal Palms.

Figure 6.9 and **Figure 6.11** shows the VR contour plots of ENE wind for the Baseline Scheme and Proposed Scheme respectively**. Figure 6.10** and **Figure 6.12** shows the VR vector plots of ENE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.9: VR Contour Plot at Pedestrian Level under ENE Wind for Baseline Scheme

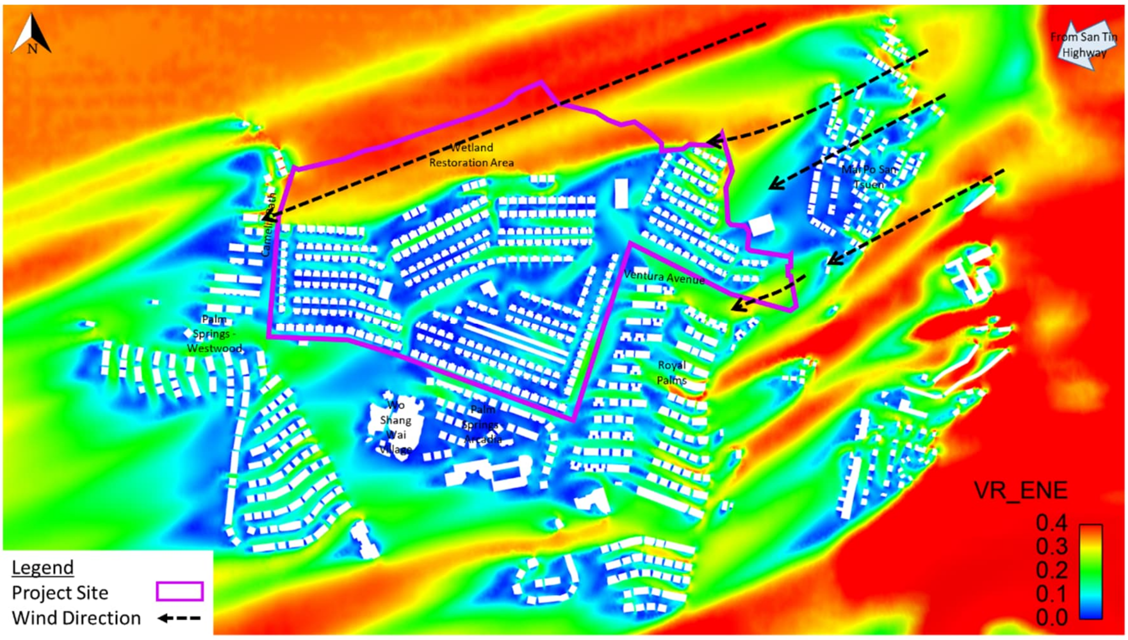


Figure 6.10: VR Contour Plot at Pedestrian Level under ENE Wind for Baseline Scheme

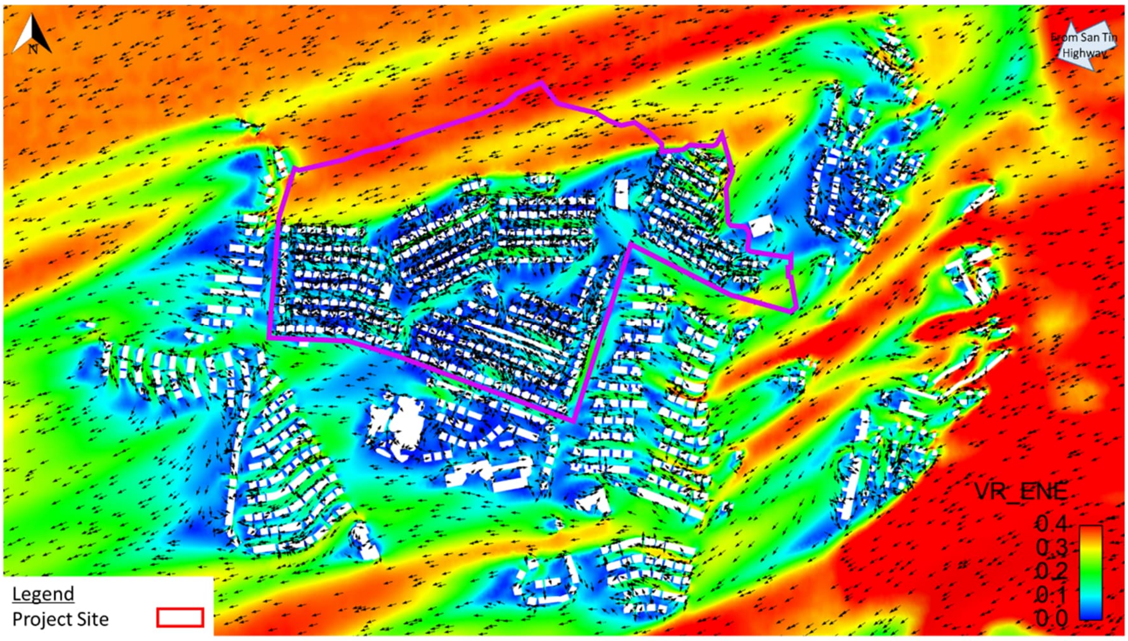


Figure 6.11: VR Contour Plot at Pedestrian Level under ENE Wind for Proposed Scheme

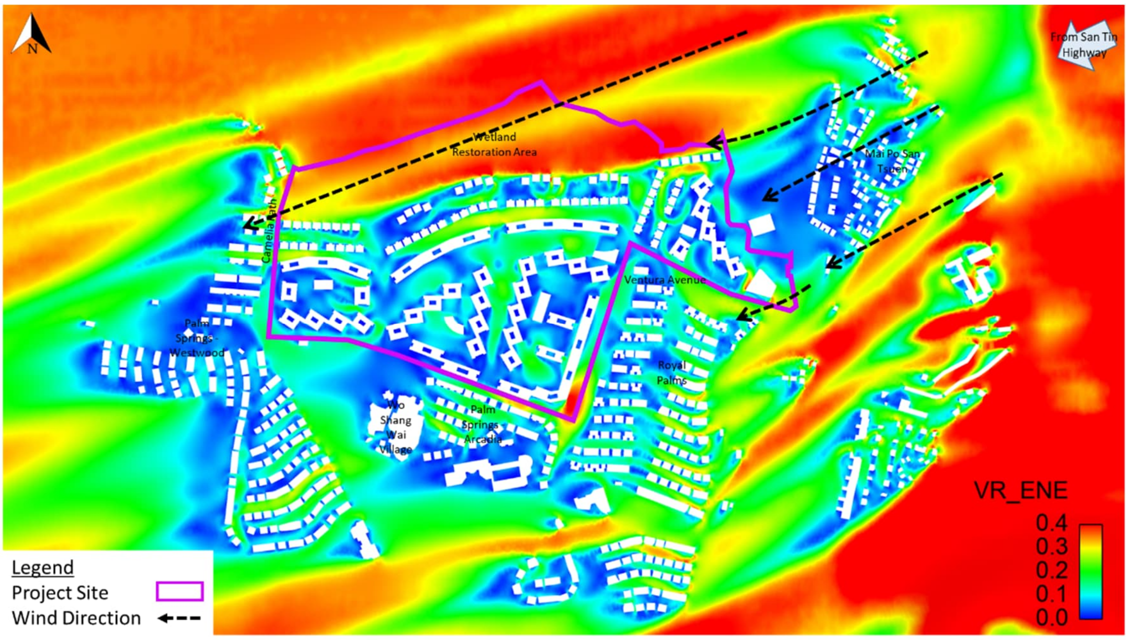
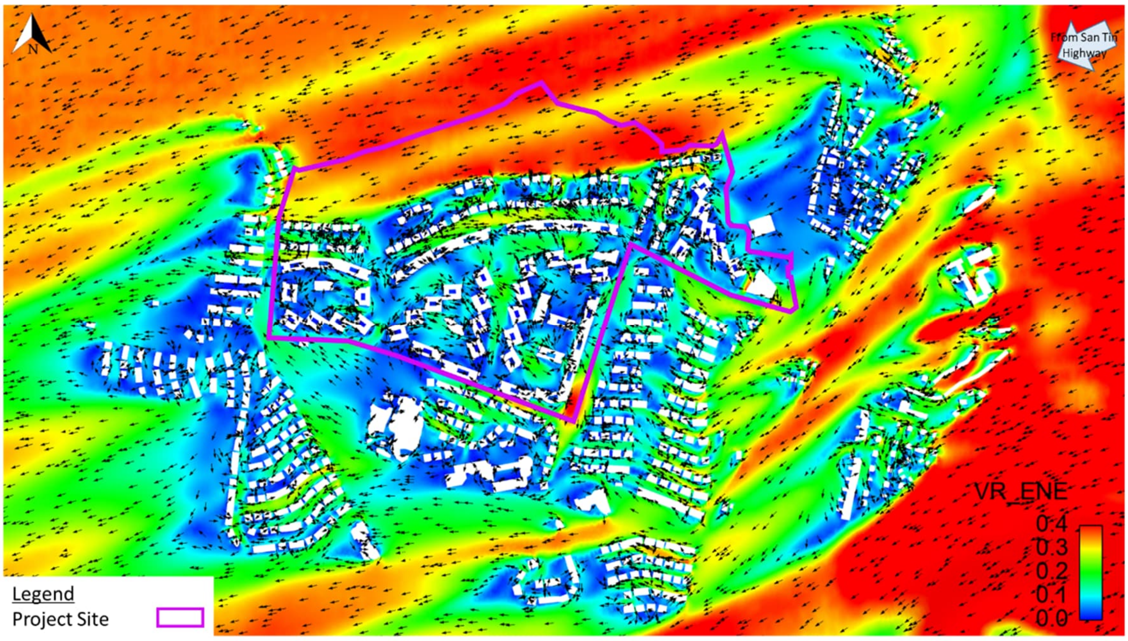


Figure 6.12: VR Vector Plot at Pedestrian Level under ENE Wind for Proposed Scheme



6.1.4 E Wind - Wind Frequency: 18.1% (Annual); 8.1% (Summer)

E wind mainly comes from the mountains to the east, namely Kam Kwai Leng.

In the Baseline Scheme, a portion of incoming E wind will be obstructed by Mai Po San Tsuen and the proposed low-rise houses at the eastern portion of the Project Site. Nonetheless, a portion of E wind is able to penetrate through the Project Site via Ventura Avenue and the open spaces within the Project Site to reach the northern portion of the Project Site. This stream of E wind will ventilate the Wetland Restoration Area and then continue to flow towards Palm Springs – Westwood via Camelia Path.

In the Proposed Scheme, the mid-rise residential towers at the southeast side of the Project Site. disrupted the local wind flow pattern around this region thus a relatively larger wake zone is observed along the south eastern portion of the Project Site and west of Royal Palms when compared with the Baseline Scheme. On the other hand, the mid-rise residential towers at the eastern portion of the Project Site deflected a portion of incoming E wind towards the north hence higher VRs are observed at the Wetland Restoration Area when compared with the Baseline Scheme. Besides, the mid-rise residential towers at the eastern portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at the eastern site boundary when compared to the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations allowed a larger portion of E wind to penetrate through the open spaces within the Project Site to ventilate the downwind regions of Palm Springs - Westwood.

Figure 6.13 and **Figure 6.15** shows the VR contour plots of E wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.14** and **Figure 6.16** shows the VR vector plots of E wind for Baseline Scheme and Proposed Scheme respectively.

Figure 6.13: VR Contour Plot at Pedestrian Level under E Wind for Baseline Scheme

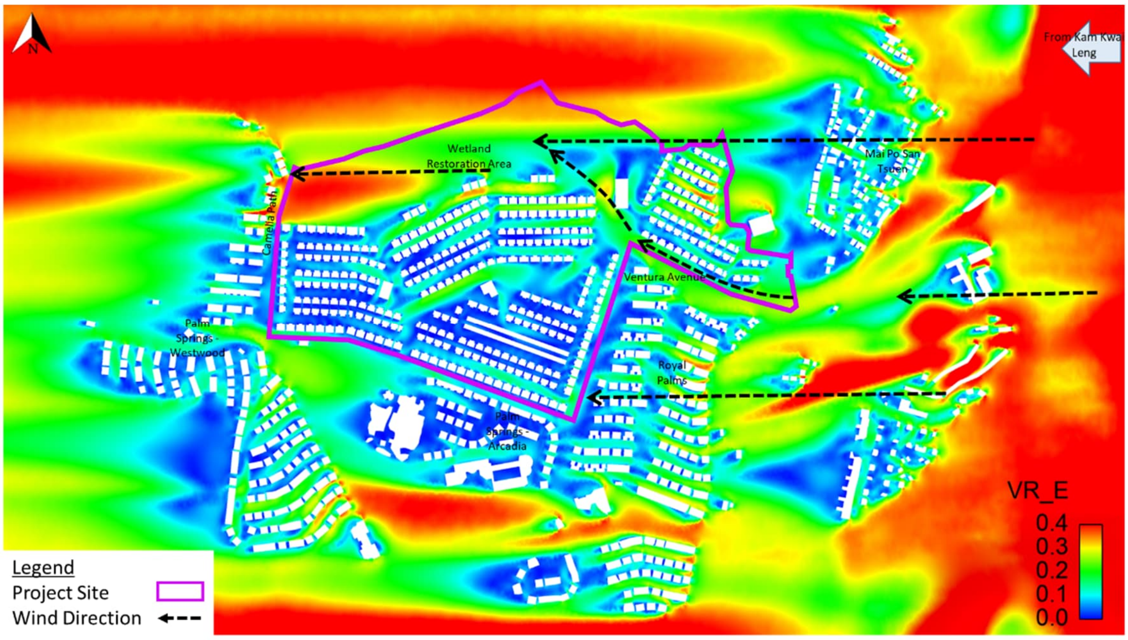


Figure 6.14: VR Vector Plot at Pedestrian Level under E Wind for Baseline Scheme

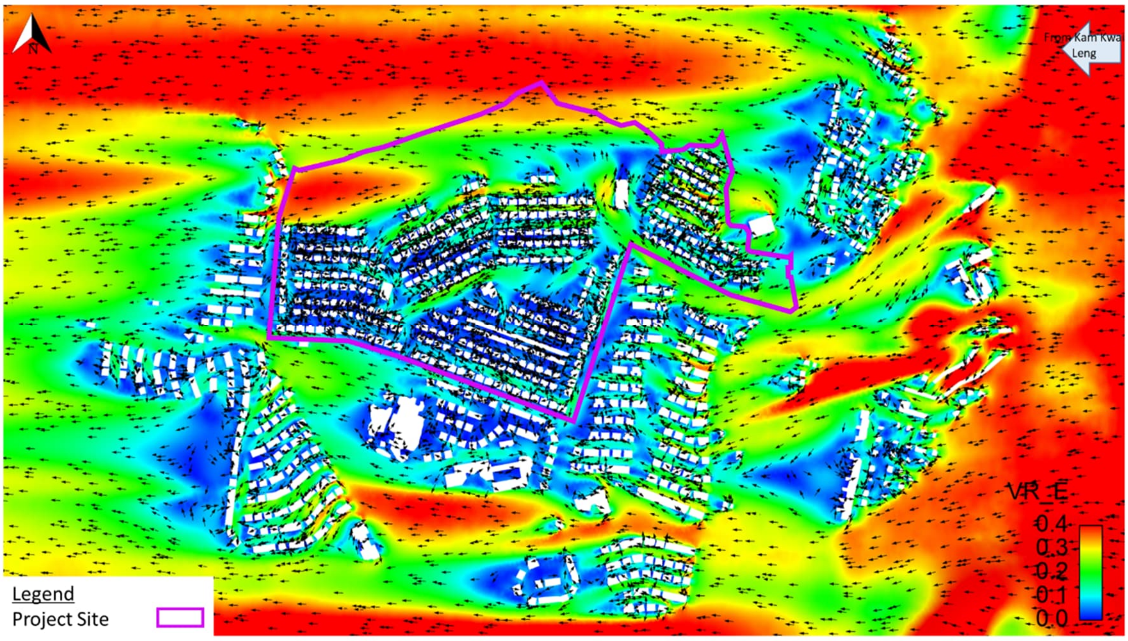


Figure 6.15: VR Contour Plot at Pedestrian Level under E Wind for Proposed Scheme

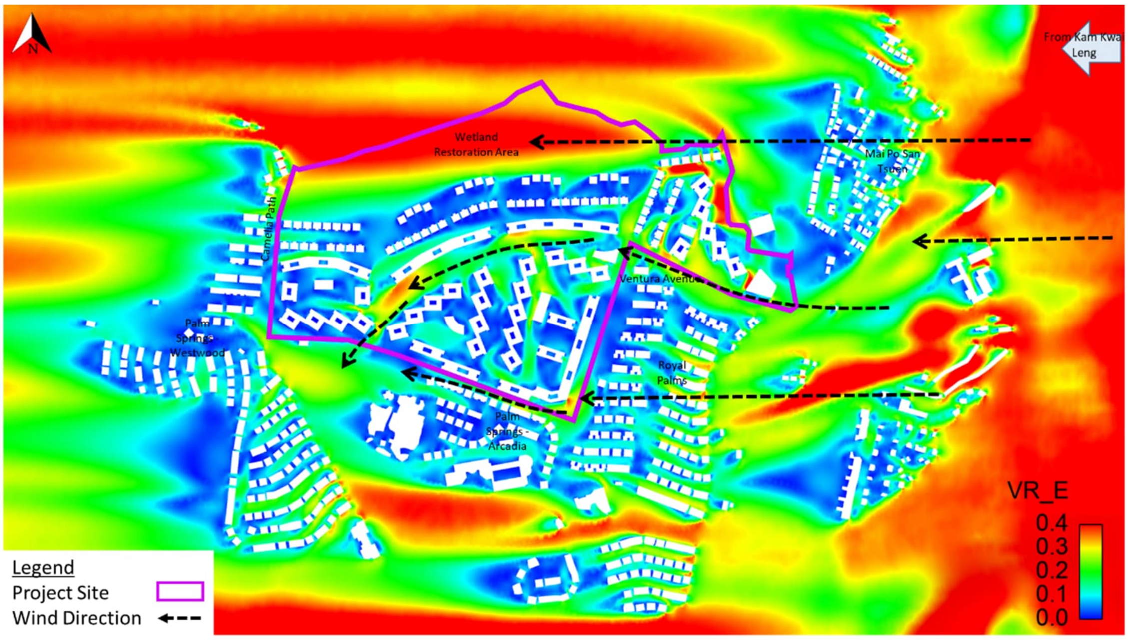
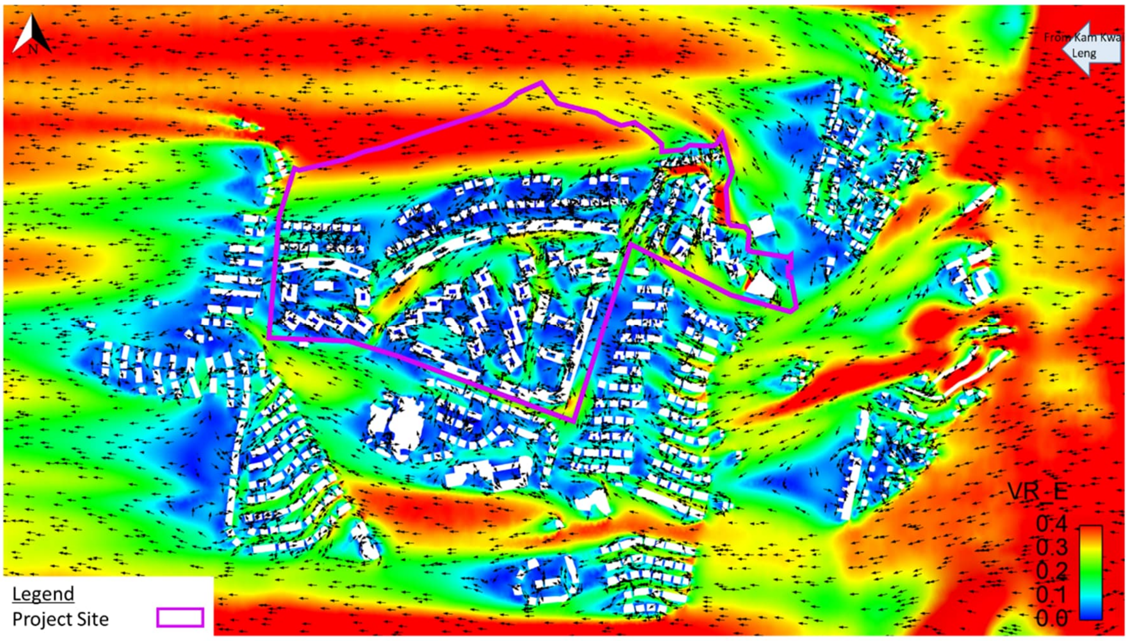


Figure 6.16: VR Vector Plot at Pedestrian Level under E Wind for Proposed Scheme



6.1.5 ESE Wind - Wind Frequency: 9.8% (Annual); 7.8% (Summer) SE Wind - Wind Frequency: 6.7% (Annual); 6.6% (Summer)

ESE / SE wind to the Project Site comes from Tam Mei Hill. A portion of the ESE / SE wind to the Project Site will be obstructed by the upwind developments of Scenic Heights and Royal Palms.

In the Baseline Scheme, a significant portion of the ESE / SE wind will be obstructed by the aforementioned upwind regions and the proposed low-rise houses at the eastern portion of the Project Site thus wake zones are observed within the Project Site and at Palm Springs – Westwood. Nonetheless, a portion of ESE / SE wind is able to penetrate through the Project Site via Ventura Avenue and the open spaces within the Project Site to reach the northern portion of the Project Site.

In the Proposed Scheme, the mid-rise residential towers at the south eastern portion of the Project Site obstructs incoming ESE / SE wind from reaching the downwind regions hence a relatively larger wake zone is observed around Palm Springs – Westwood when compared to the Baseline Scheme. In contrast, the mid-rise residential towers at the eastern portion of the Project Site deflected the incoming ESE / SE wind towards the north hence higher VRs are observed at the Mai Po Ventilation Building and fishponds to the north of the Project Site when compared with the Baseline Scheme. Besides, the proposed mid-rise residential towers at the south-eastern portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at the eastern & southern site boundary as well as open spaces within the Project Site when compared to the Baseline Scheme.

Figure 6.17 and **Figure 6.19** shows the VR contour plots of ESE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.18** and **Figure 6.20** shows the VR vector plots of ESE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.21 and **Figure 6.23** shows the VR contour plots of SE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.22** and **Figure 6.24** shows the VR vector plots of SE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.17: VR Contour Plot at Pedestrian Level under ESE Wind for Baseline Scheme

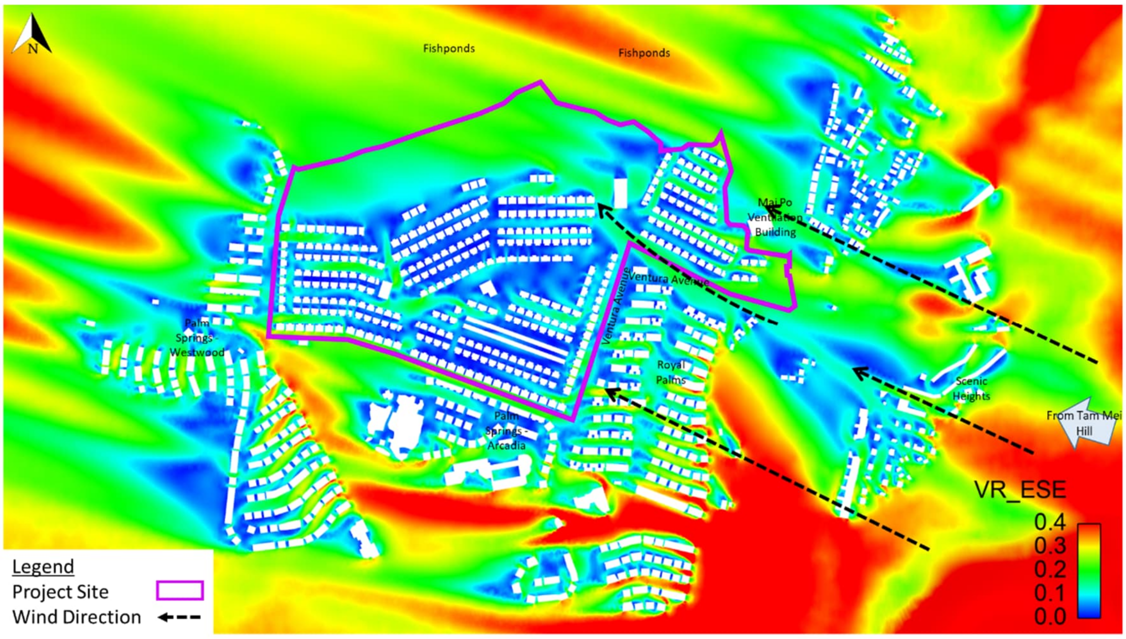


Figure 6.18: VR Contour Plot at Pedestrian Level under ESE Wind for Baseline Scheme

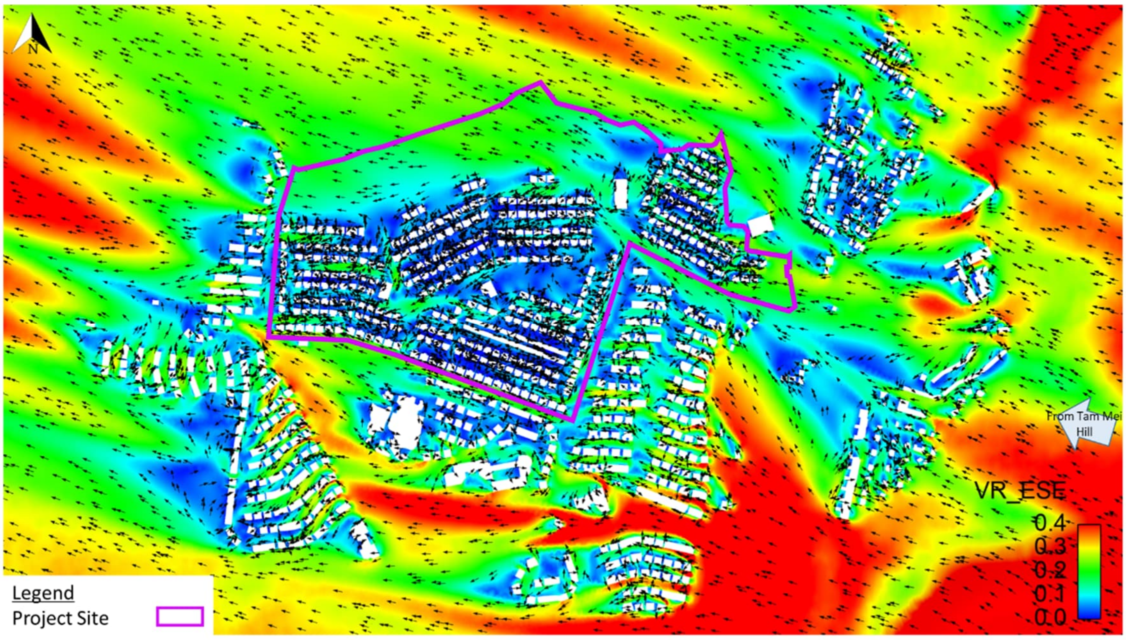


Figure 6.19: VR Contour Plot at Pedestrian Level under ESE Wind for Proposed Scheme

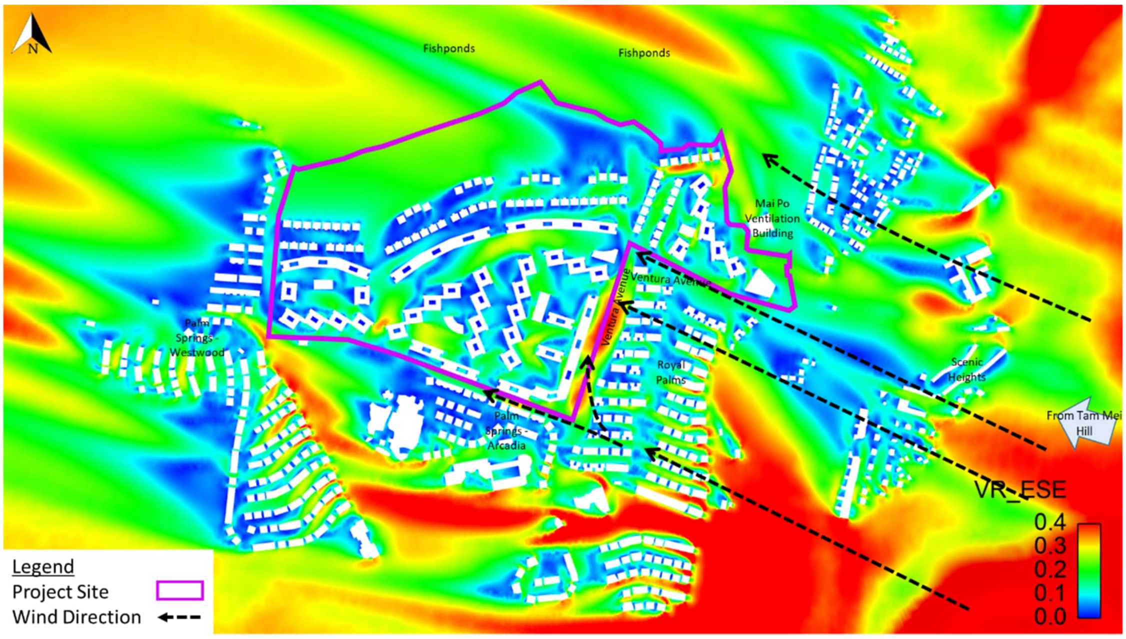


Figure 6.20: VR Vector Plot at Pedestrian Level under ESE Wind for Proposed Scheme

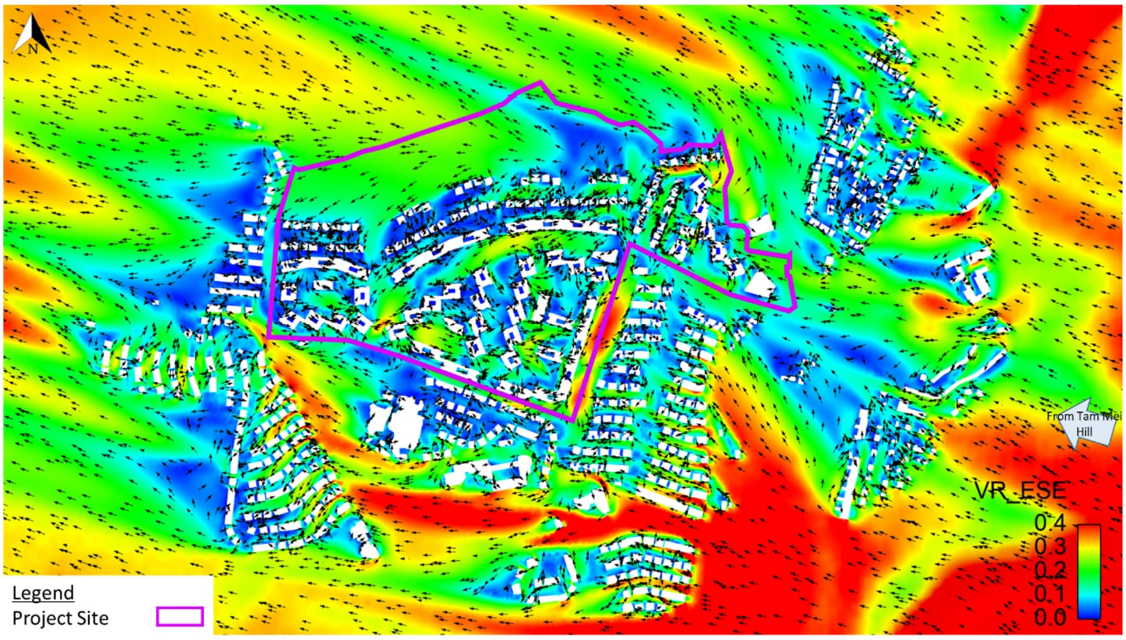


Figure 6.21: VR Contour Plot at Pedestrian Level under SE Wind for Baseline Scheme

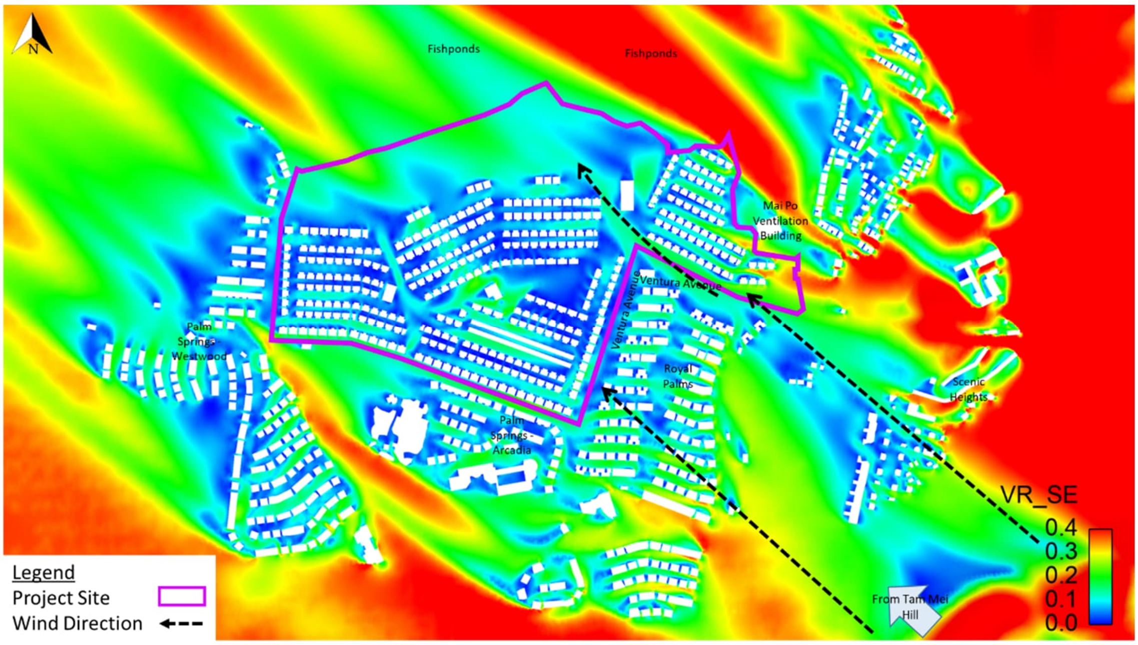


Figure 6.22: VR Contour Plot at Pedestrian Level under SE Wind for Baseline Scheme

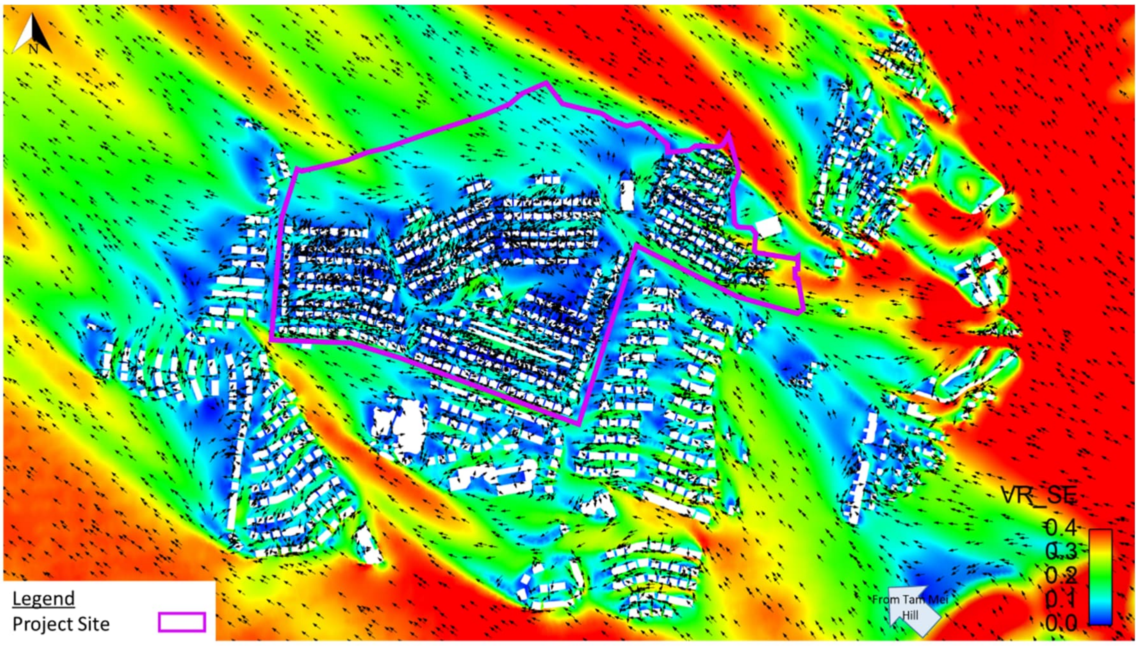


Figure 6.23: VR Contour Plot at Pedestrian Level under SE Wind for Proposed Scheme

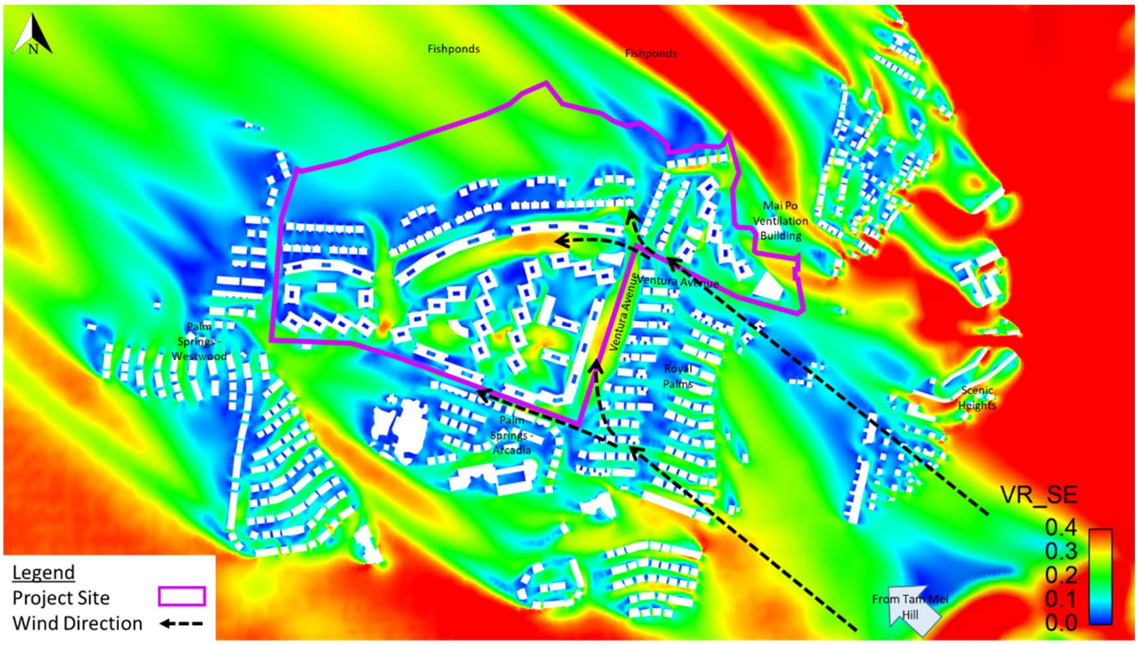
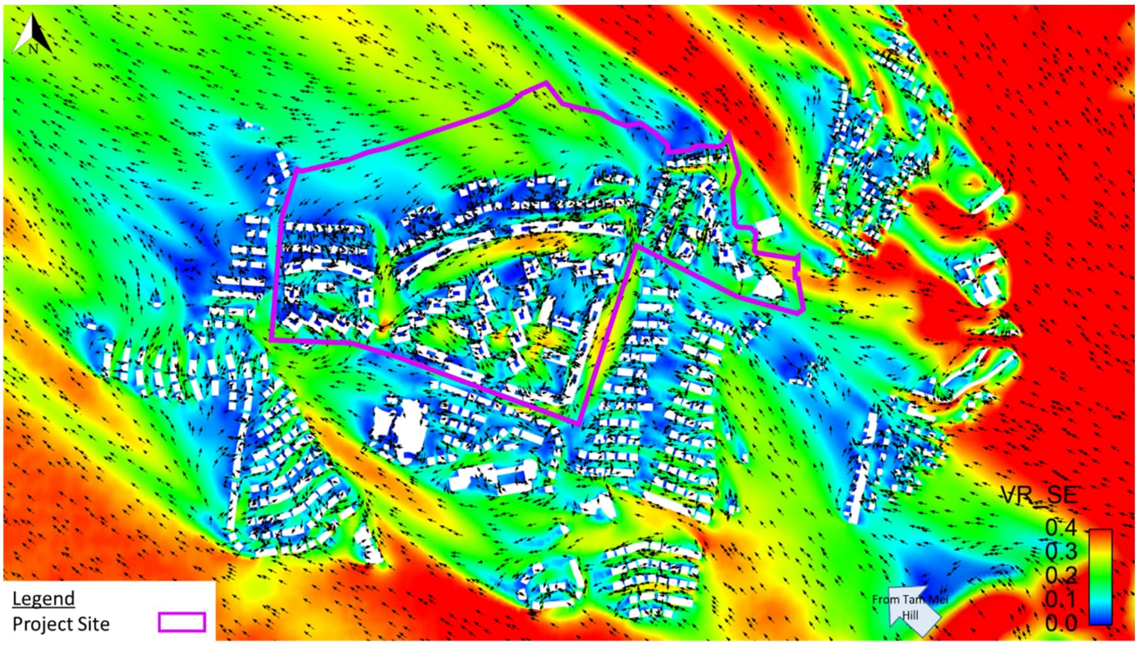


Figure 6.24: VR Vector Plot at Pedestrian Level under SE Wind for Proposed Scheme



6.1.6 SSE Wind – Wind Frequency: 8.2% (Summer)

SSE wind to the Project Site comes from Kai Kung Shan. Incoming SSE wind is obstructed by the residential developments in the upwind region including Wo Shang Wai Village, Royal Palms, Palm Springs – Arcadia and southern portion of Palm Springs – Westwood.

In the Baseline Scheme, a significant portion of the SSE wind will be obstructed by the aforementioned upwind regions and the proposed low-rise houses at the southern portion of the Project Site thus wake zones are observed at the northern portion of the Project Site. Nonetheless, a portion of SSE wind travels along Palm Springs Boulevard to ventilate Palm Springs – Westwood via Camelia Path. In addition, another portion of SSE wind is able to penetrate though the Project Site via the open spaces within the Project Site and Ventura Avenue to ventilate the downwind regions of the fishponds to the north of the Project Site.

In the Proposed Scheme, the mid-rise residential towers within the Project Site obstructs a portion of SSE wind from reaching the downwind regions hence a relatively larger wake zone is observed at the fish ponds located to the north of the Project Site when compared to the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations enhanced site permeability thus higher VRs are observed within the Project Site when compared with the Baseline Scheme. Besides, the proposed mid-rise residential towers at the southern portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at Palm Springs – Westwood, Ventura Avenue, Royal Palms and along the southern site boundary when compared to the Baseline Scheme.

Figure 6.25 and **Figure 6.27** shows the VR contour plots of SSE wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.26** and **Figure 6.28** shows the VR vector plots of SSE wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.25: VR Contour Plot at Pedestrian Level under SSE Wind for Baseline Scheme

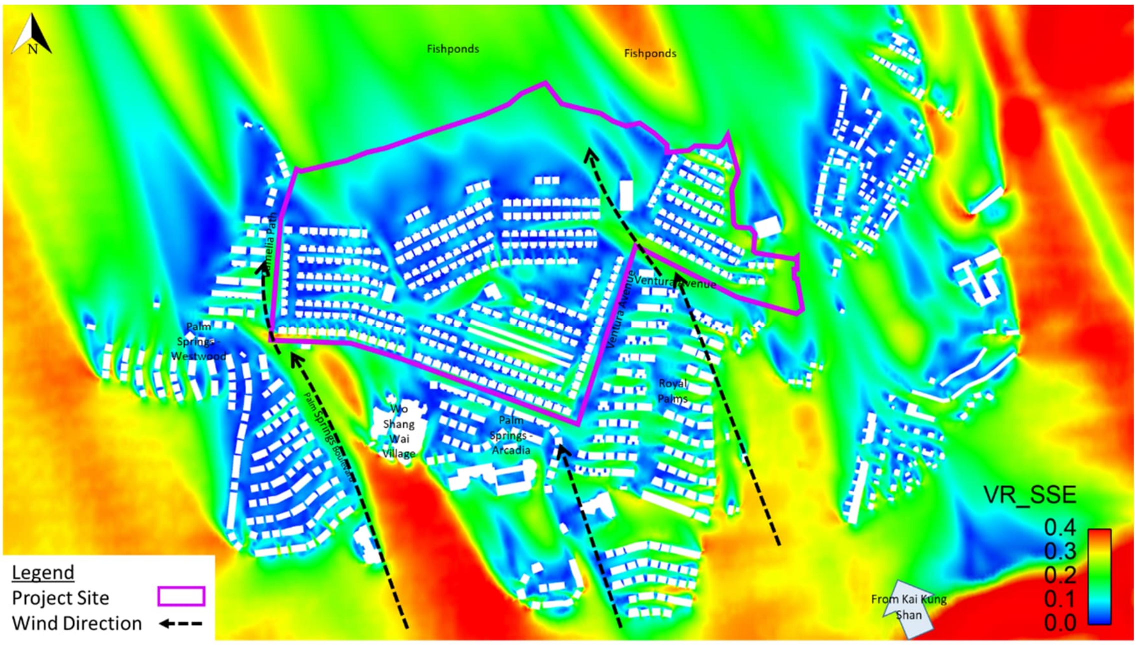


Figure 6.26: VR Vector Plot at Pedestrian Level under SSE Wind for Baseline Scheme

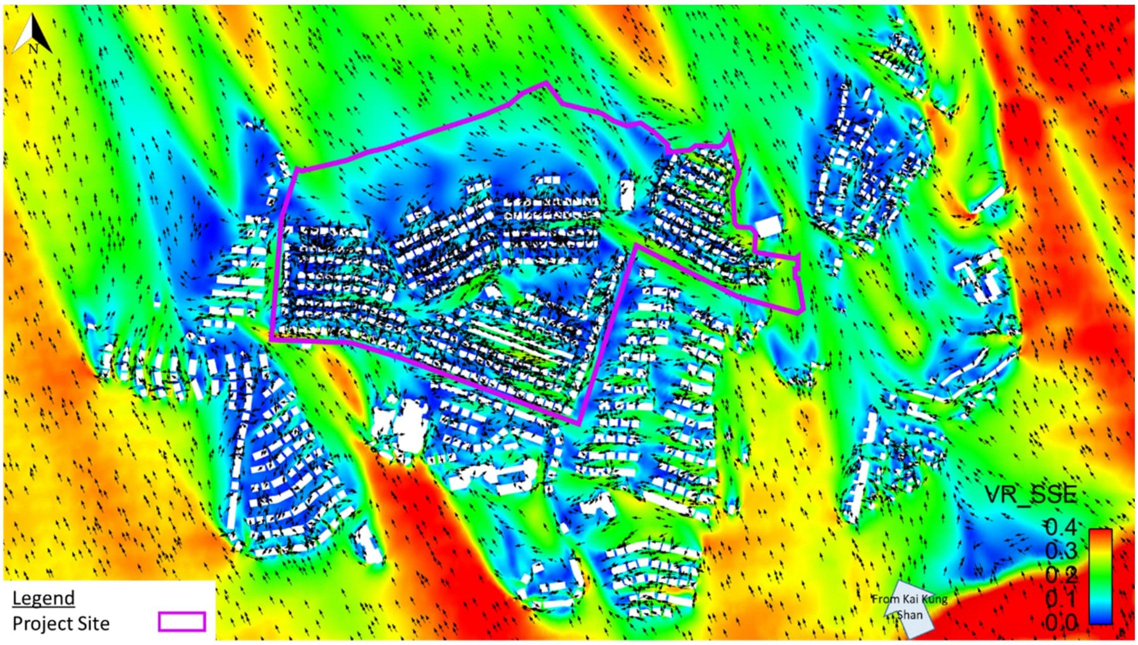


Figure 6.27: VR Contour Plot at Pedestrian Level under SSE Wind for Proposed Scheme

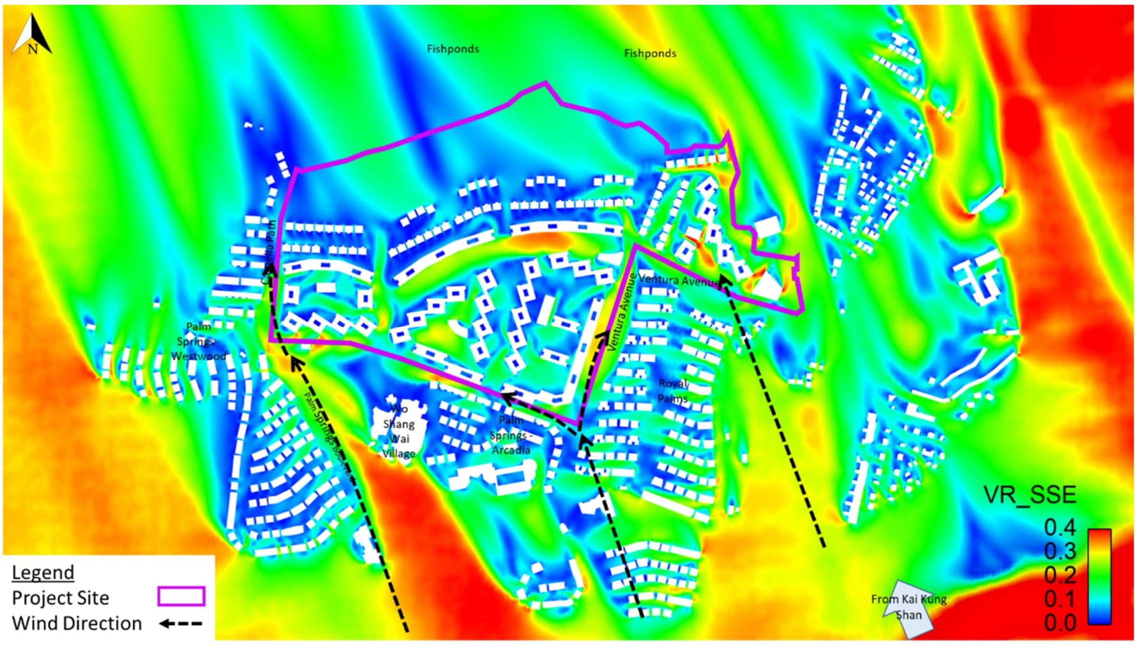
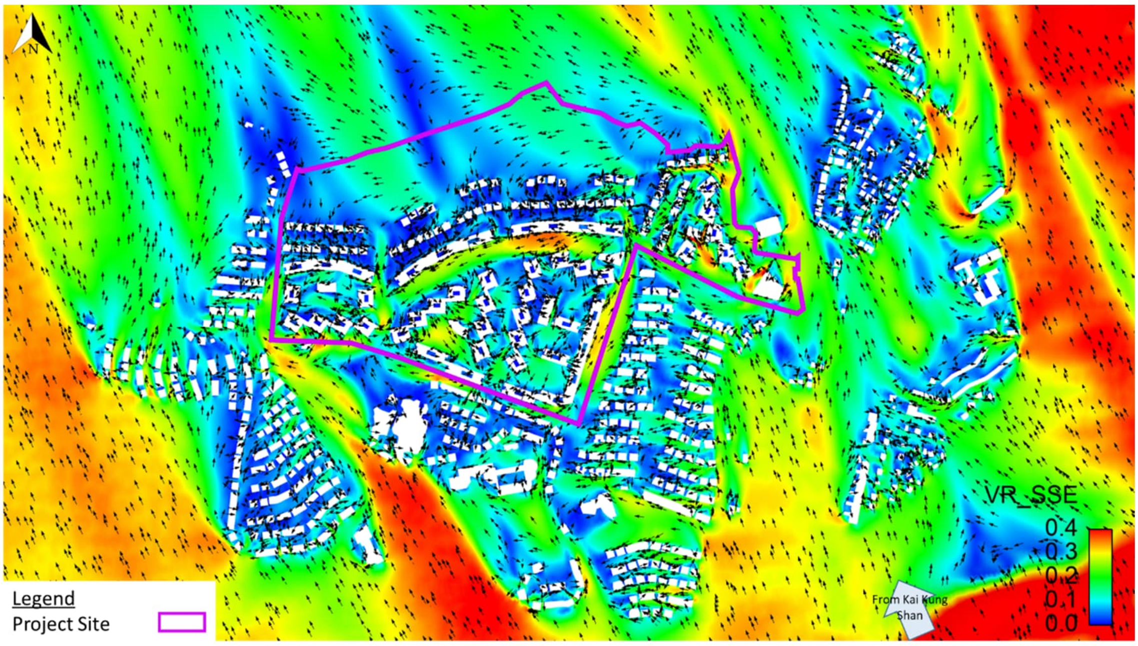


Figure 6.28: VR Vector Plot at Pedestrian Level under SSE Wind for Proposed Scheme



6.1.7 S Wind - Wind Frequency: 7.0% (Annual); 12.9% (Summer)

S wind to the Project Site comes from Kam Tin River. Incoming S wind is obstructed by the residential developments in the upwind region including Wo Shang Wai Village, Royal Palms, Palm Springs – Arcadia and southern portion of Palm Springs – Westwood.

In the Baseline Scheme, a significant portion of the S wind will be obstructed by the aforementioned upwind regions and the proposed low-rise houses at the southern portion of the Project Site thus massive wake zones are observed at the northern portion of the Project Site. Nonetheless, a portion of S wind is able to skim over the low-rise houses in Wo Shang Wai Village to flow along the open spaces within the Project Site via the opening at the south. Besides, another portion of incoming S wind travels along Ventura Avenue to reach the fishponds to the north of the Project Site.

In the Proposed Scheme, the mid-rise residential towers within the Project Site obstructs a portion of S wind from reaching the downwind regions hence a relatively larger wake zone is observed at the fish ponds located to the north of the Project Site when compared to the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations enhanced site permeability thus higher VRs are observed within the Project Site. Besides, the proposed mid-rise residential towers at the southern portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at Palm Springs – Westwood, Camelia Path, Ventura Avenue, Royal Palms and along the southern site boundary when compared to the Baseline Scheme.

Figure 6.29 and **Figure 6.31** shows the VR contour plots of S wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.30** and **Figure 6.32** shows the VR vector plots of S wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.29: VR Contour Plot at Pedestrian Level under S Wind for Baseline Scheme

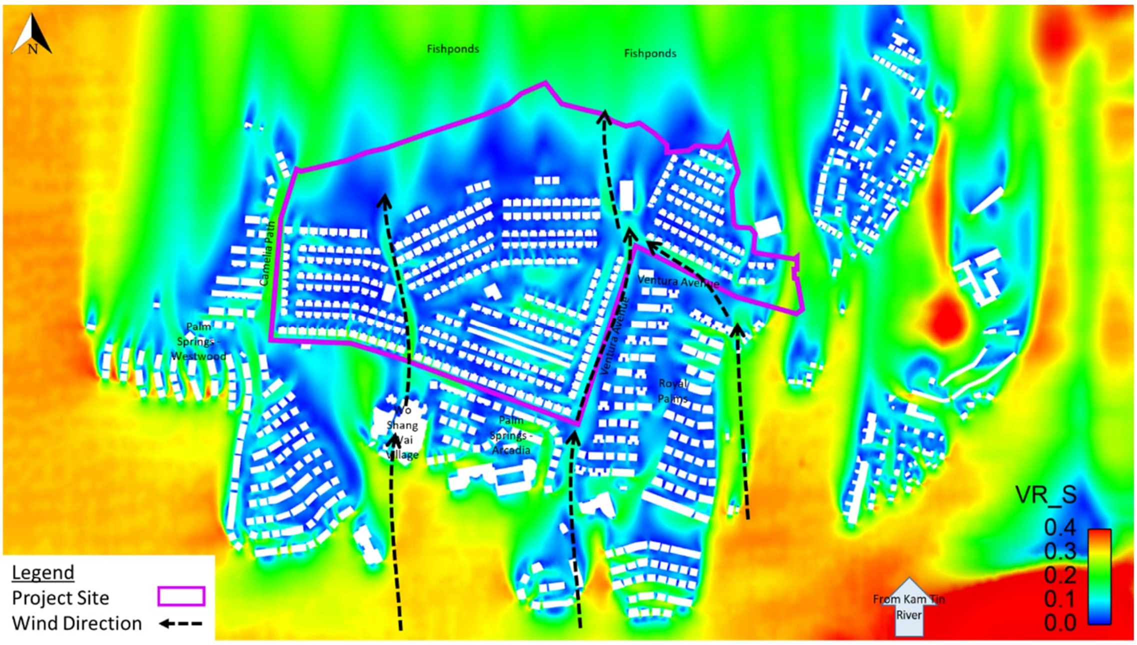


Figure 6.30: VR Vector Plot at Pedestrian Level under S Wind for Baseline Scheme

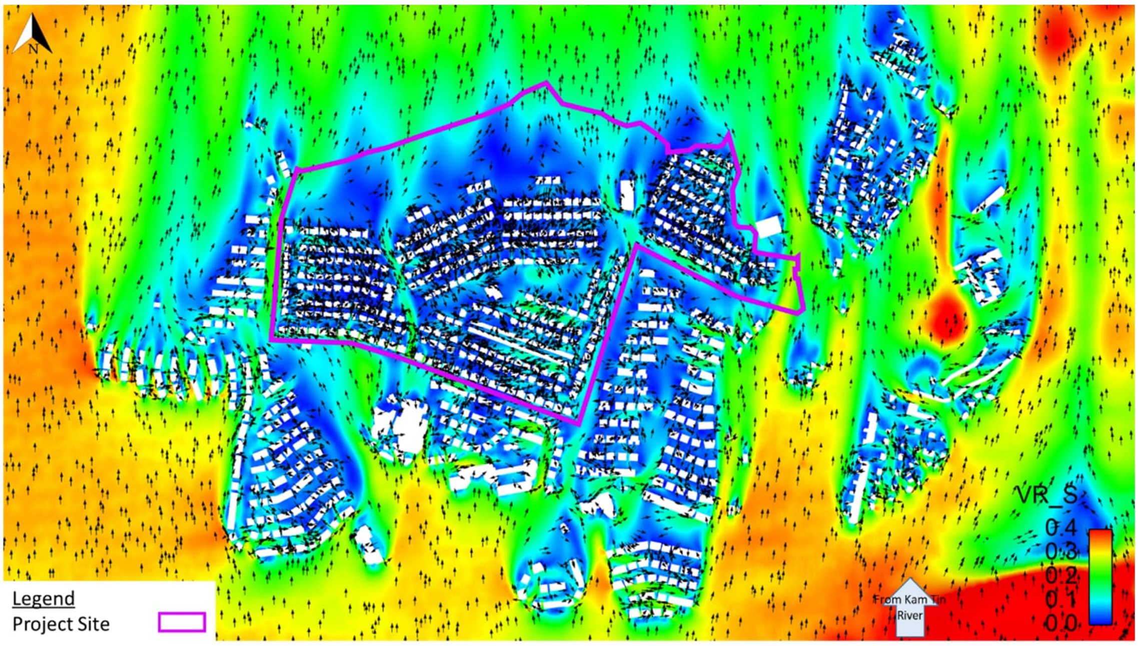


Figure 6.31: VR Contour Plot at Pedestrian Level under S Wind for Proposed Scheme

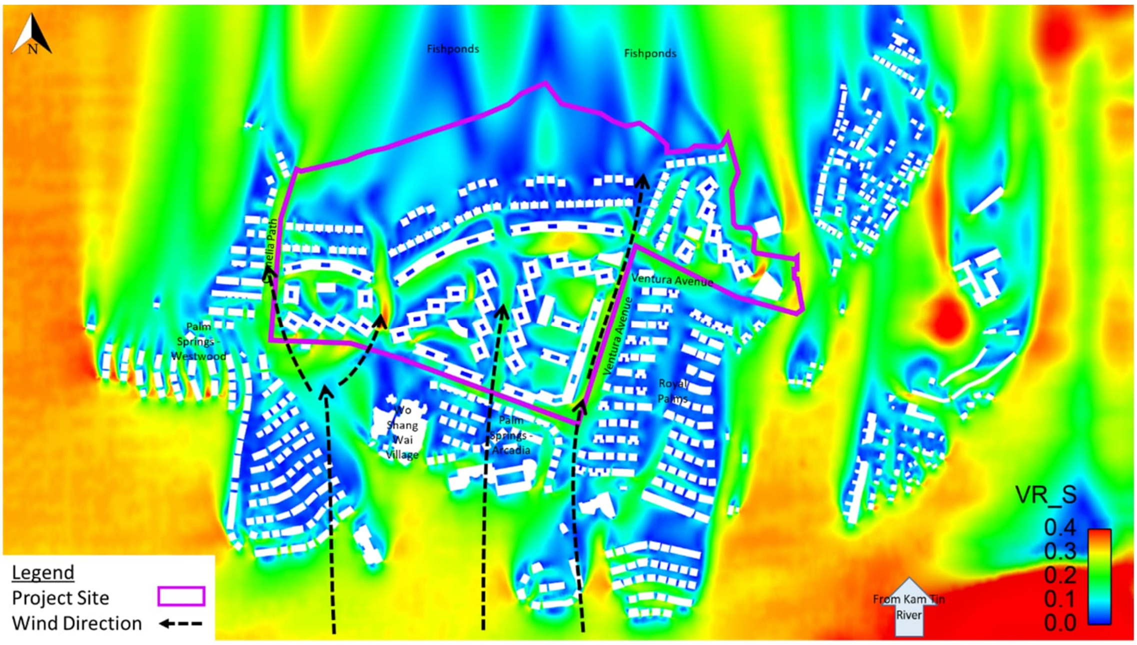
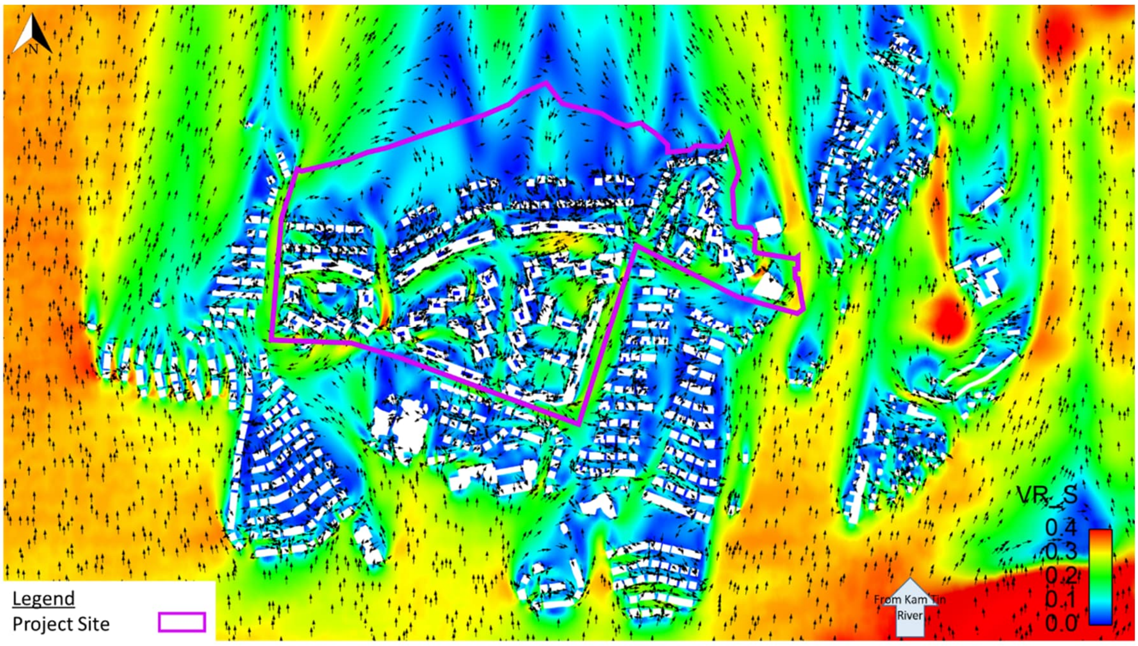


Figure 6.32: VR Vector Plot at Pedestrian Level under S Wind for Proposed Scheme



6.1.8 SSW Wind - Wind Frequency: 7.7% (Annual); 16.5% (Summer)

SSW wind to the Project Site comes from Fairview Park. Incoming SSW wind is obstructed by the residential developments in the upwind region including Wo Shang Wai Village, Royal Palms, Palm Springs – Arcadia and southern portion of Palm Springs – Westwood.

In the Baseline Scheme, a significant portion of the SSW wind will be obstructed by the aforementioned upwind regions and the proposed low-rise houses at the south western portion of the Project Site thus wake zones are observed at the northern portion of the Project Site. A portion of SSW wind is directed by the proposed low-rise houses along the western site boundary to flow along Camelia Path to reach the downwind regions of the fishponds to the north. Another portion of SSW travels freely along Ventura Avenue then penetrates through the Project Site to reach the downwind regions of the fishponds to the north.

In the Proposed Scheme, the mid-rise residential towers within the Project Site obstructs a portion of SSW wind from reaching the downwind regions hence a relatively larger wake zone is observed at the fish ponds located to the north of the Project Site when compared to the Baseline Scheme. Nonetheless, the introduction of more open spaces and building separations enhanced site permeability thus higher VRs are observed within the Project Site when compared with the Baseline Scheme. Besides, the proposed mid-rise residential towers at the southern portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at Palm Springs – Westwood, Camelia Path, Ventura Avenue, Royal Palms and along the southern site boundary when compared to the Baseline Scheme.

Figure 6.33 and **Figure 6.35** shows the VR contour plots of SSW wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.34** and **Figure 6.36** shows the VR vector plots of SSW wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.33: VR Contour Plot at Pedestrian Level under SSW Wind for Baseline Scheme

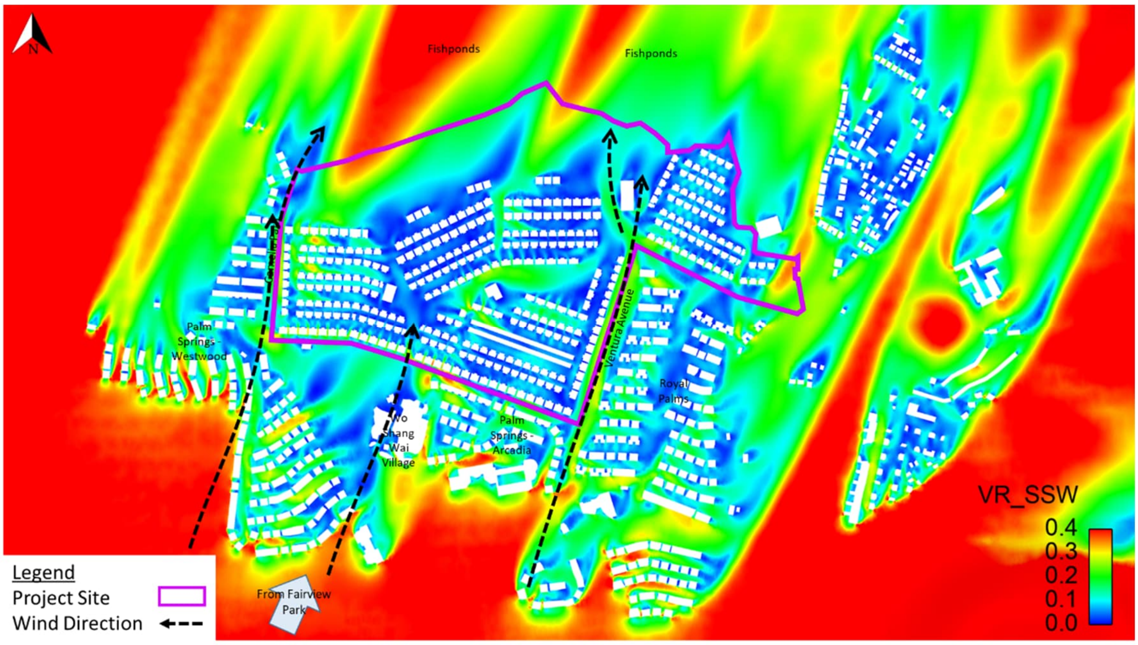


Figure 6.34: VR Vector Plot at Pedestrian Level under SSW Wind for Baseline Scheme

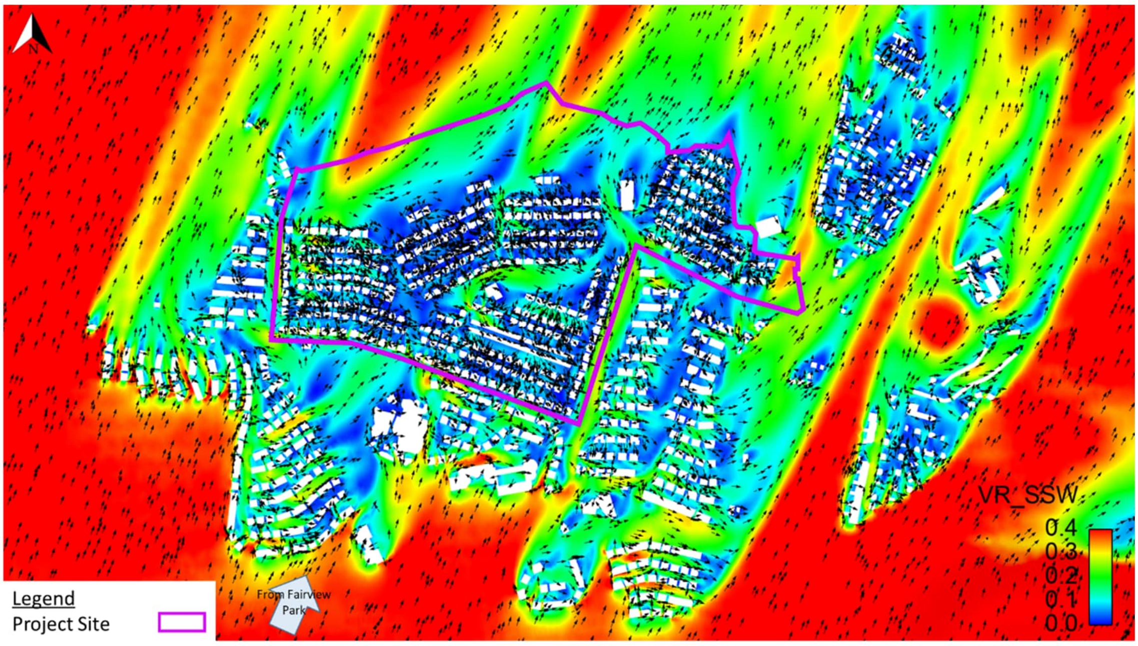


Figure 6.35: VR Vector Plot at Pedestrian Level under SSW Wind for Proposed Scheme

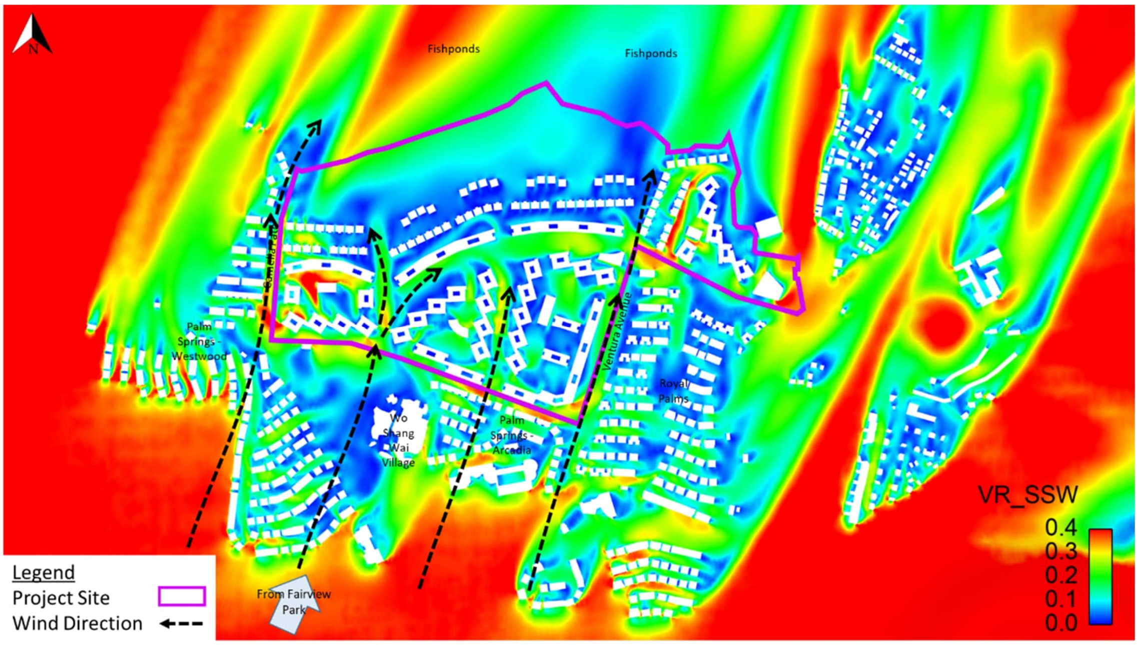
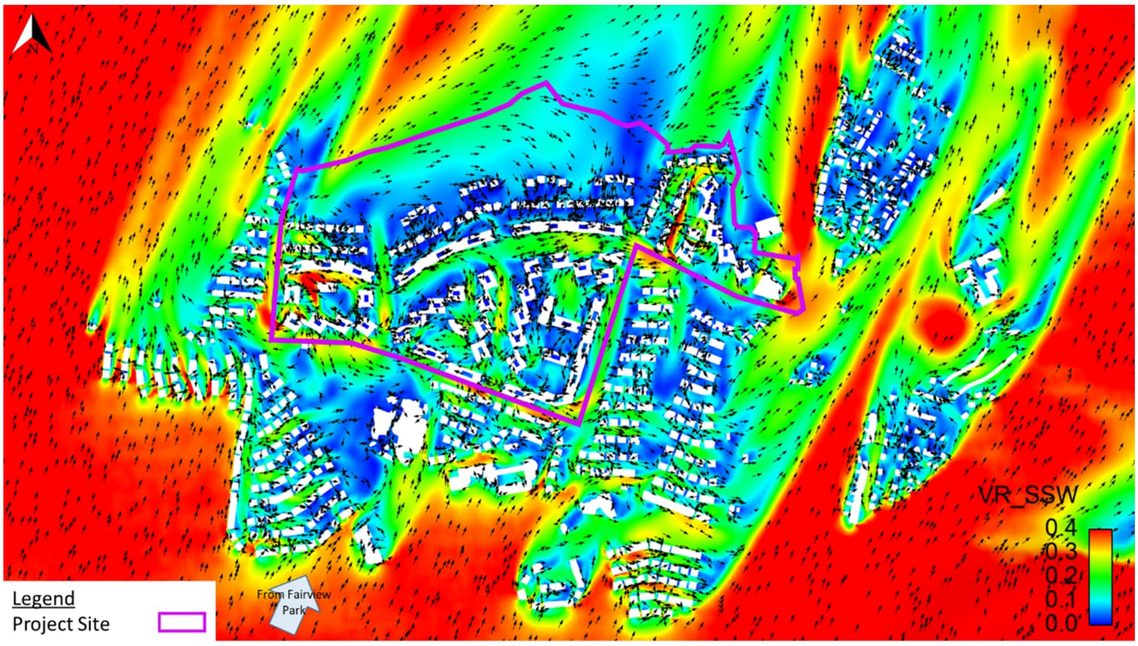


Figure 6.36: VR Contour Plot at Pedestrian Level under SSW Wind for Proposed Scheme



6.1.9 SW Wind - Wind Frequency: 6.7% (Annual); 16.3% (Summer)

SW wind to the Project Site comes from Fairview Park. Incoming SW wind is obstructed by the residential developments in the upwind region including Wo Shang Wai Village, Royal Palms, Palm Springs – Arcadia and southern portion of Palm Springs – Westwood.

In the Baseline Scheme, a significant portion of the SW wind will be obstructed by the aforementioned upwind regions and the proposed low-rise houses at the south western portion of the Project Site thus wake zones are observed within the Project Site.

A portion of SW wind skims over Palm Springs – Westwood and is then diverted towards Camelia Path by the proposed low-rise houses at the western portion of the Project Site. The SW wind would travel along Camelia Path to ventilate the downwind regions of the fishponds to the north of the Project Site. Another portion of SW wind would enter the Project Site via the opening at the southern portion of the Project Site and ventilate the open spaces within the Project Site. Lastly, a portion of SW wind would travel along Ventura Avenue to reach the eastern portion of the Project Site.

In the Proposed Scheme, more open spaces and building separations are introduced at the west and center thus significantly higher VRs are observed within the Project Site when compared with the Baseline Scheme. Besides, the proposed mid-rise residential towers at the western portion of the Project Site creates strong downwash effect to enhance the ventilation at pedestrian level hence higher VRs are observed at Camelia Path and Palm Springs - Westwood when compared to the Baseline Scheme. Another portion of SW wind would penetrate through the Project Site via building separations at the center and western portion of the Project Site to ventilate the open spaces within the Project Site. Lastly, a portion of SW wind would travel along Ventura Avenue to reach the central portion of the Project Site. However, the conversion from low-rise houses in the Baseline Scheme to mid-rise residential towers in the Proposed Scheme blocks SW wind from reaching Mai Po San Tsuen.

Figure 6.37 and **Figure 6.39** shows the VR contour plots of SW wind for the Baseline Scheme and Proposed Scheme respectively. **Figure 6.38** and **Figure 6.40** shows the VR vector plots of SW wind for the Baseline Scheme and Proposed Scheme respectively.

Figure 6.37: VR Contour Plot at Pedestrian Level under SW Wind for Baseline Scheme

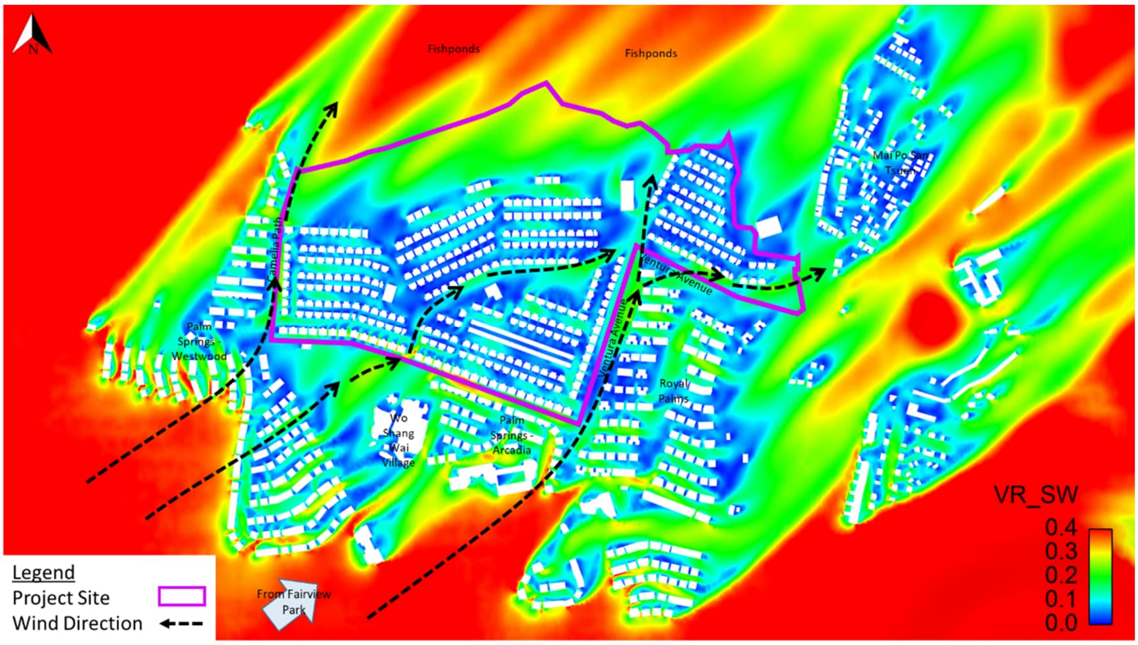


Figure 6.38: VR Vector Plot at Pedestrian Level under SW Wind for Baseline Scheme

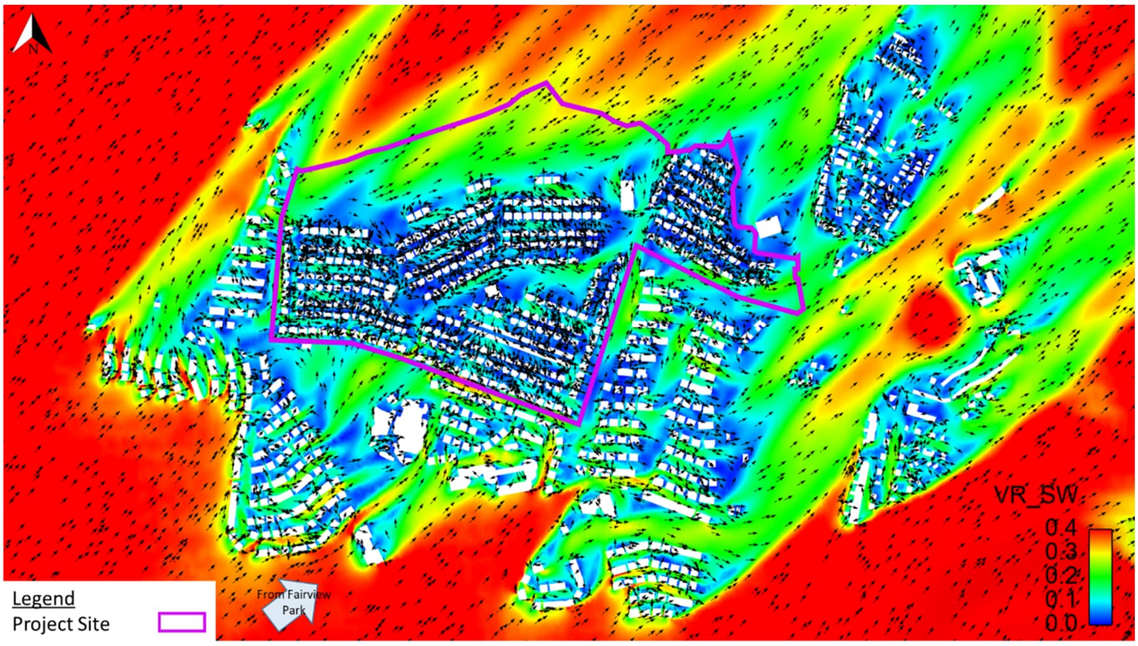


Figure 6.39: VR Contour Plot at Pedestrian Level under SW Wind for Proposed Scheme

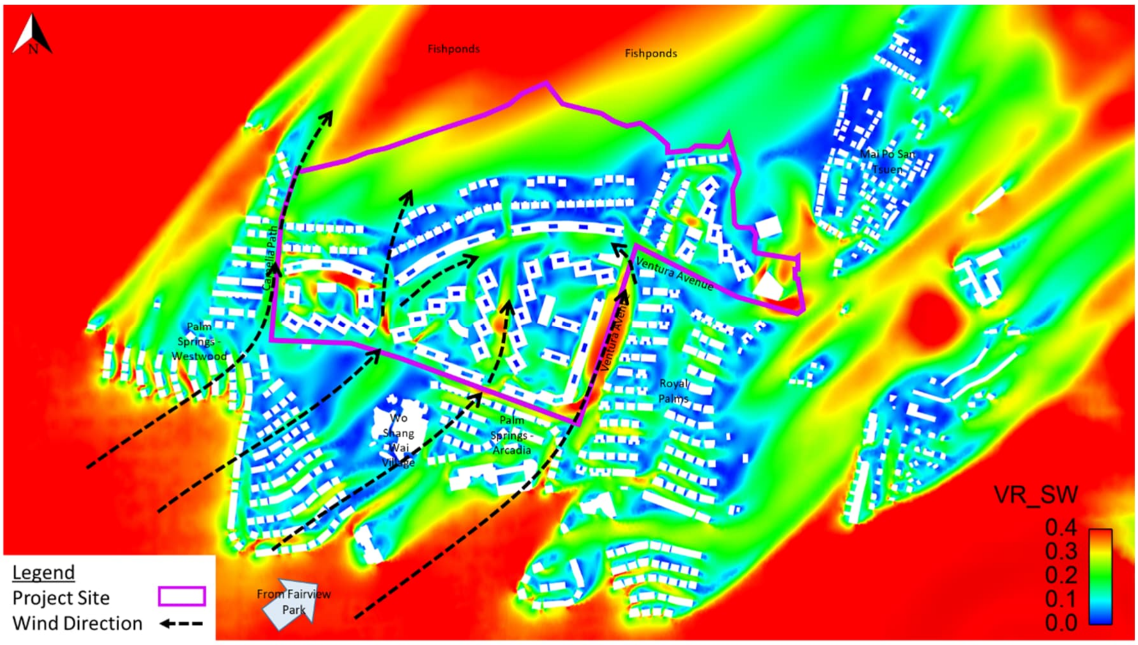
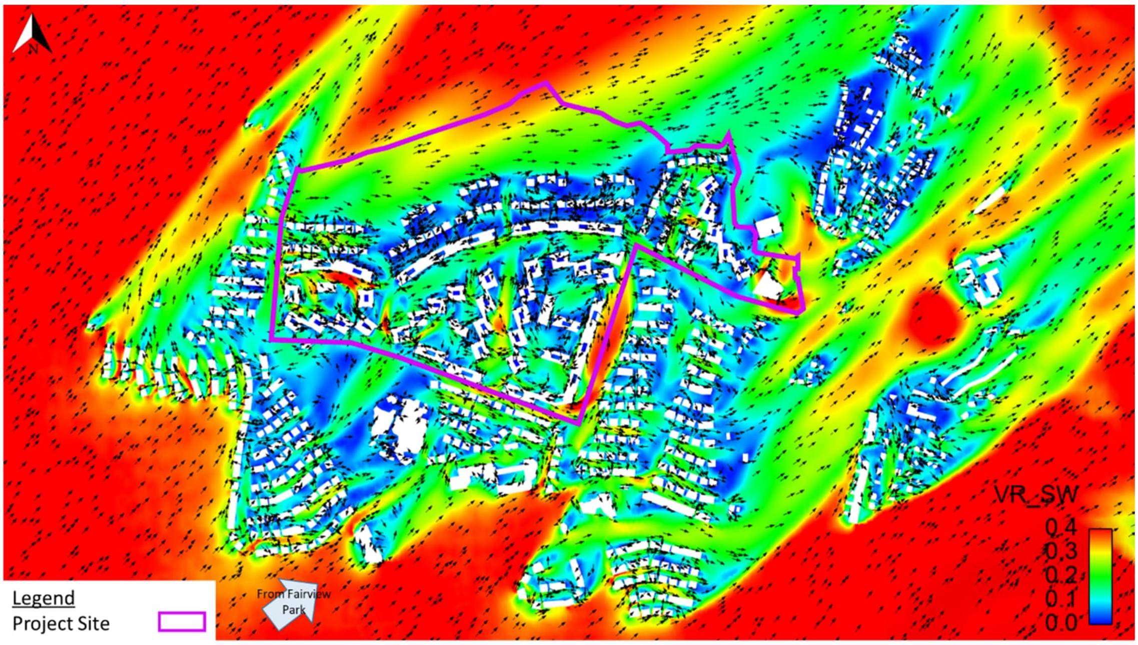


Figure 6.40: VR Vector Plot at Pedestrian Level under SW Wind for Proposed Scheme



6.2 Summary Of Velocity Ratio (VR) Results Under Annual Wind Condition

According to the average Velocity Ratio (VR) simulation results under annual wind condition in **Table 6.1**, the SVR of the Baseline Scheme is lower (i.e. 0.18) than the Proposed Scheme (i.e. 0.20). The LVR of the Baseline Scheme and the Proposed Scheme are both 0.19.

The Baseline Scheme is comprised 749 2-storey houses and 40 3-storey houses above ground with a maximum building height of 16.8mPD and 21.3mPD respectively. It also comprises of 4 clubhouses with a maximum building height of 17mPD. Numerous numbers of houses affect the amount of annual prevailing wind passing through the Project Site as well as the surrounding area. When compared with the Proposed Scheme, the VR is lower in areas such as San Tam Road, (Baseline 0.27 vs Proposed 0.28), Road 3 (Baseline 0.22 vs Proposed 0.23), Mai Po South Road (Baseline 0.21 vs Proposed 0.23), Road 4 (Baseline 0.14 vs Proposed 0.16), Royal Palms (Baseline 0.13 vs Proposed 0.14), Palm Springs - Arcadia (Baseline 0.13 vs Proposed 0.14), Wo Shang Wai Village (Baseline 0.10 vs Proposed 0.11) and Palm Springs - Westwood (Baseline 0.13 vs Proposed 0.14)

The Proposed Scheme is comprised of 24 3-storey detached houses above ground with a maximum building height of 21.0mPD. There are also 104 3-storey semi-detached houses above ground with a maximum building height of 21.0mPD. It also comprises of 47 residential towers ranging from 6-storey to 10-storey with a maximum building height ranging from 28.0mPD to 42.0mPD. In addition, there is a 4-storey RCHE above ground with a maximum building height of 25.0mPD. The Proposed Schemes also included 4 individual clubhouses with a maximum building height of 16.0mPD. The number of buildings is reduced, more open spaces and building separations is introduced when compared with Baseline Scheme. Reduction of building number and introduction of building separation enhances the wind permeability through the Project Site to ventilate the downwind regions such as San Tam Road, (Baseline 0.27 vs Proposed 0.28), Road 3 (Baseline 0.22 vs Proposed 0.23), Mai Po South Road (Baseline 0.21 vs Proposed 0.23), Road 4 (Baseline 0.14 vs Proposed 0.16), Royal Palms (Baseline 0.13 vs Proposed 0.14), Palm Springs - Arcadia (Baseline 0.13 vs Proposed 0.14), Wo Shang Wai Village (Baseline 0.10 vs Proposed 0.11) and Palm Springs - Westwood (Baseline 0.13 vs Proposed 0.14).

For the remaining focus areas (i.e. San Tin Highway and Mai Po San Tsuen), the wind performance is comparable for both Baseline Scheme and Proposed Scheme.

The annual weighted average VR contour plots for the Baseline Scheme and Proposed Scheme are shown in **Figure 6.41** to **Figure 6.42** respectively.

Table 6.1: Summary of SVR, LVR and SAVR Results under Annual Wind Condition

Focus Areas		Test Points	Baseline Scheme	Proposed Scheme
SVR		P1-P50	0.18	0.20
LVR		P1-P50, O1-O177	0.19	0.19
A	San Tam Road	O1-O3	0.27	0.28
B	San Tin Highway	O4-O12	0.28	0.28
C	Castle Peak Road - Mai Po	O13-O17	0.28	0.27
D	Road 1	O18-O19	0.27	0.26
E	Road 2	O20-O23	0.26	0.24
F	Road 3	O24-O25	0.22	0.23
G	Mai Po South Road	O26-O29	0.21	0.23
H	Road 4	O30-O32	0.14	0.16
I	Mai Po San Tsuen	O33-O38	0.10	0.10
J	Royal Palms	O39-O76	0.13	0.14
K	Palm Springs - Arcadia	O77-O92	0.13	0.14
L	Wo Shang Wai Village	O93-O94	0.10	0.11
M	Palm Springs - Westwood	O95-O131	0.13	0.14
N	Fishponds 1	O132-O142	0.20	0.19
O	Fishponds 2	O143-O177	0.31	0.30
			Special Test Points	
	VR within Project Site	S1-S32	0.11	0.14

Note:
Red denotes VR is higher in the Proposed Scheme
Blue denotes VR is higher in the Baseline Scheme

Figure 6.41: Annual Weighted Average VR Contour Plot at Pedestrian Level for Baseline Scheme

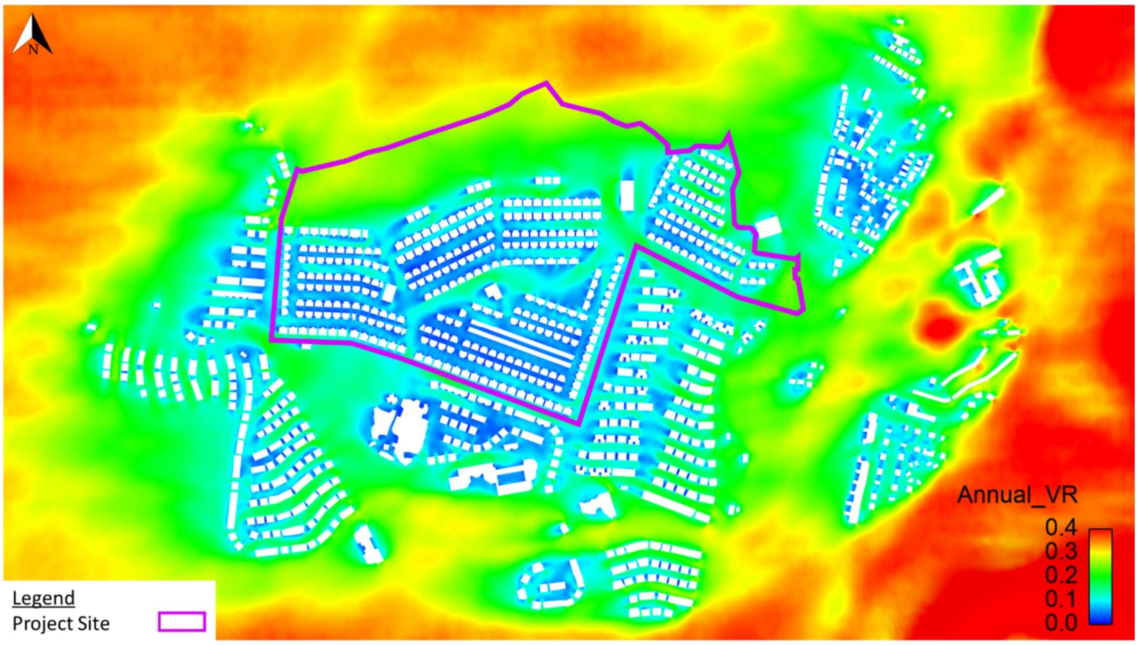
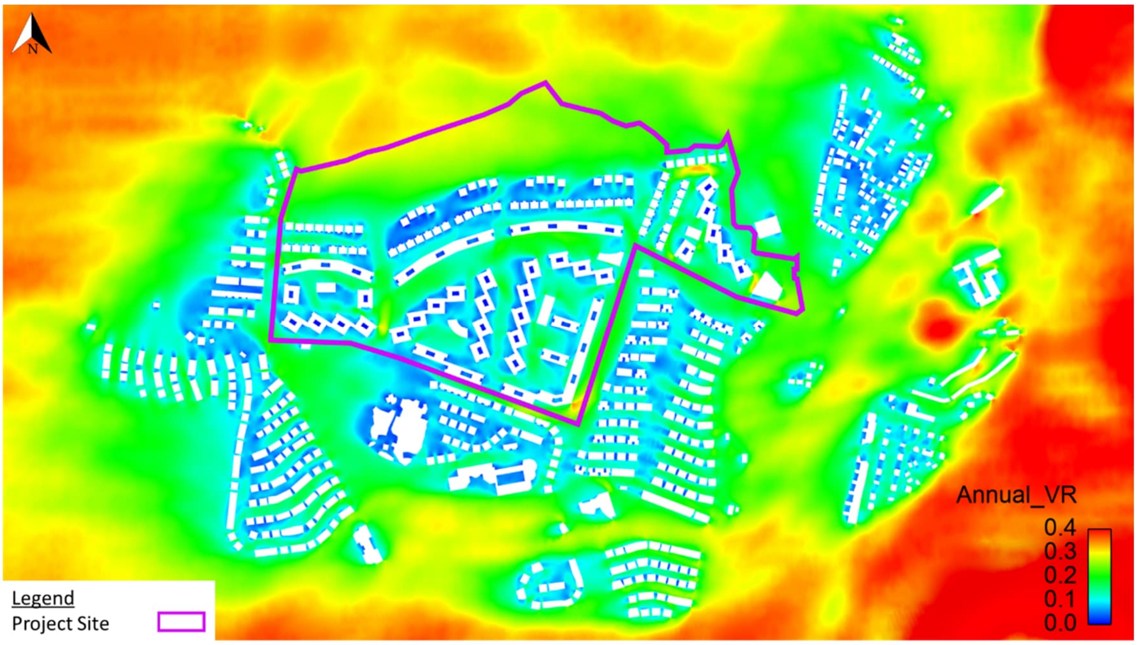


Figure 6.42: Annual Weighted Average VR Contour Plot at Pedestrian Level for Proposed Scheme



6.3 Summary of Velocity Ratio (VR) Results under summer wind condition

According to the average Velocity Ratio (VR) simulation results under summer wind condition in **Table 6.2**, the SVR of the Baseline Scheme is lower (i.e. 0.15) than the Proposed Scheme (i.e. 0.19). The LVR of the Baseline Scheme and the Proposed Scheme are both 0.18.

The Baseline Scheme is comprised 749 2-storey houses and 40 3-storey houses above ground with a maximum building height of 16.8mPD and 21.3mPD respectively. It also comprises of 4 clubhouses with a maximum building height of 17mPD. Numerous numbers of houses affect the amount of annual prevailing wind passing through the Project Site as well as the surrounding area. When compared with the Proposed Scheme, the VR is lower in areas such as San Tam Road (Baseline 0.25 vs Proposed 0.26), Road 1 (Baseline 0.21 vs Proposed 0.22), Road 3 (Baseline 0.21 vs Proposed 0.23), Mai Po South Road (Baseline 0.21 vs Proposed 0.25), Road 4 (Baseline 0.15 vs Proposed 0.19), Mai Po San Tsuen (Baseline 0.11 vs Proposed 0.12), Royal Palms (Baseline 0.13 vs Proposed 0.14), Palm Springs - Westwood (Baseline 0.14 vs Proposed 0.15) and Fishponds 1 (Baseline 0.20 vs Proposed 0.21).

The Proposed Scheme is comprised of 24 3-storey detached houses above ground with a maximum building height of 21.0mPD. There are also 104 3-storey semi-detached houses above ground with a maximum building height of 21.0mPD. It also comprises of 47 residential towers ranging from 6-storey to 10-storey with a maximum building height ranging from 28.0mPD to 42.0mPD. In addition, there is a 4-storey RCHE above ground with a maximum building height of 25.0mPD. The Proposed Schemes also included 4 individual clubhouses with a maximum building height of 16.0mPD. The number of buildings is reduced, more open spaces and building separations is introduced when compared with Baseline Scheme. Reduction of building number and introduction of building separation enhances the wind permeability through the Project Site to ventilate the downwind regions such San Tam Road (Baseline 0.25 vs Proposed 0.26), Road 1 (Baseline 0.21 vs Proposed 0.22), Road 3 (Baseline 0.21 vs Proposed 0.23), Mai Po South Road (Baseline 0.21 vs Proposed 0.25), Road 4 (Baseline 0.15 vs Proposed 0.19), Mai Po San Tsuen (Baseline 0.11 vs Proposed 0.12), Royal Palms (Baseline 0.13 vs Proposed 0.14), Palm Springs - Westwood (Baseline 0.14 vs Proposed 0.15) and Fishponds 1 (Baseline 0.20 vs Proposed 0.21).

The summer weighted average VR contour plots for the Baseline Scheme and the Proposed Scheme are shown in **Figure 6.43** to **Figure 6.44** respectively.

Table 6.2: Summary of SVR, LVR and SAVR Results under Summer Wind Condition

Focus Areas		Test Points	Baseline Scheme	Proposed Scheme
SVR		P1-P50	0.15	0.19
LVR		P1-P50, O1-O177	0.18	0.18
A	San Tam Road	O1-O3	0.25	0.26
B	San Tin Highway	O4-O12	0.26	0.25
C	Castle Peak Road - Mai Po	O13-O17	0.24	0.22
D	Road 1	O18-O19	0.21	0.22
E	Road 2	O20-O23	0.21	0.20
F	Road 3	O24-O25	0.21	0.23
G	Mai Po South Road	O26-O29	0.21	0.25
H	Road 4	O30-O32	0.15	0.19
I	Mai Po San Tsuen	O33-O38	0.11	0.12
J	Royal Palms	O39-O76	0.13	0.14
K	Palm Springs - Arcadia	O77-O92	0.18	0.17
L	Wo Shang Wai Village	O93-O94	0.13	0.12
M	Palm Springs - Westwood	O95-O131	0.14	0.15
N	Fishponds 1	O132-O142	0.20	0.21
O	Fishponds 2	O143-O177	0.27	0.25
		Special Test Points		
	VR within Project Site	S1-S32	0.10	0.14

Note:
Red denotes VR is higher in the Proposed Scheme
Blue denotes VR is higher in the Baseline Scheme

Figure 6.43: Summer Weighted Average VR Contour Plot at Pedestrian Level for Baseline Scheme

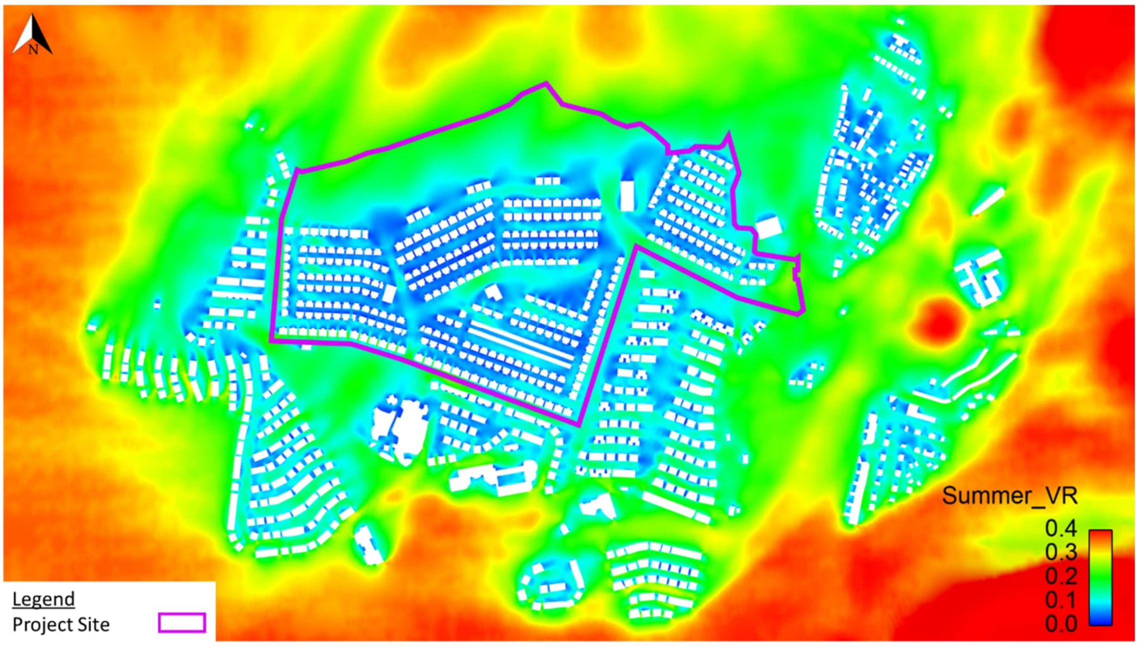
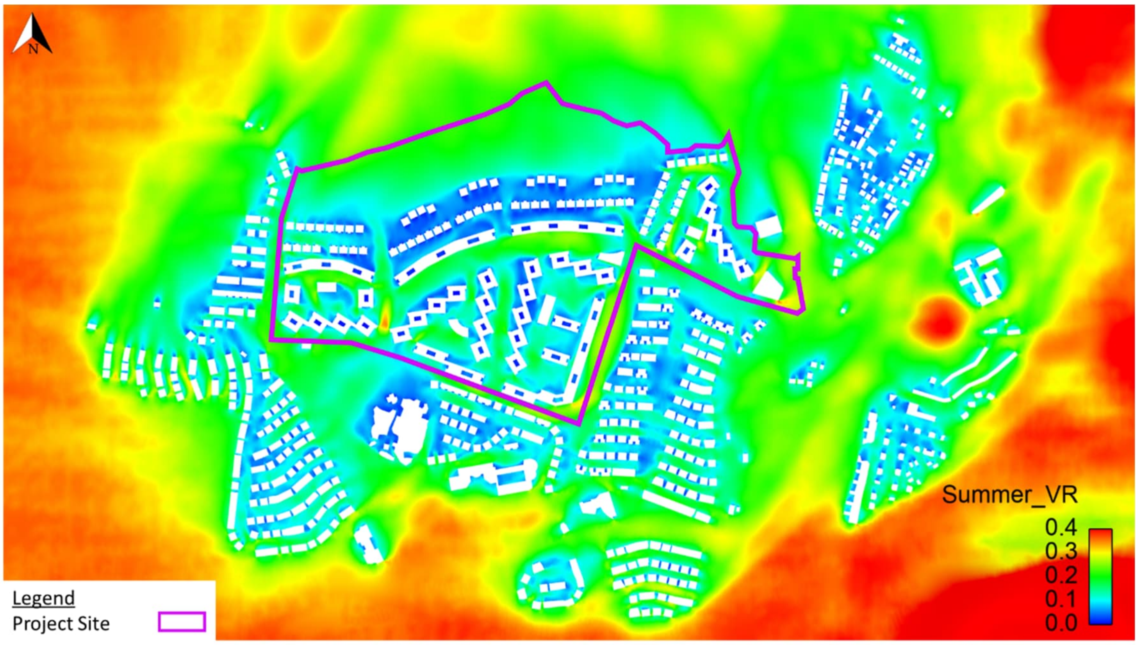


Figure 6.44: Summer Weighted Average VR Contour Plot at Pedestrian Level for Proposed Scheme



7 Conclusion

An Air Ventilation Assessment - Initial Study (AVA-IS) was conducted to assess the ventilation performance of the area within the Project Site and the local environment.

The major findings of this study could be summarized as follows:

AVA Study

A series of CFD simulations using realizable k- ε turbulence model was performed based on the Air Ventilation Assessment (AVA) methodology for the Initial Study as stipulated in the Technical Circular No. 1/06 on Air Ventilation Assessment (2006). Eleven (11) wind directions covering about 83.2% occurrence of annual wind and about 76.4% occurrence of summer wind were studied. The ventilation performance for the proposed development at the Project Site and all focus areas within the assessment area were assessed.

According to the Technical Circular No. 1/06 on Air Ventilation Assessment (2006), the Velocity Ratio of each test point was assessed in terms of SVR, LVR and SAVR of various focus areas within the Assessment Area. A total of 50 perimeter test points, 177 overall test points and 32 special test points were selected to assess the ventilation performance.

Changes in building design are introduced to enhance the wind permeability through the Project Site to ventilate the downwind regions as shown below:

- The annual weighted Site Spatial Average Velocity Ratio (SVR) for the Baseline Scheme and Proposed Scheme are 0.18 and 0.20 respectively. The summer weighted Site Spatial Average Velocity Ratio (SVR) for the Baseline Scheme and Proposed Scheme are both 0.19.
- The annual weighted Local Spatial Average Velocity Ratio (LVR) for the Baseline Scheme and Proposed Scheme are 0.15 and 0.19 respectively. The summer weighted LVR for the Baseline Scheme and Proposed Scheme are both 0.18.

From the directional analysis in Section 6, the mid-rise residential towers in the Proposed Scheme will indeed obstruct a portion of the annual and summer prevailing winds thus larger wakes at some downwind regions are observed when compared with the Baseline. However, as shown in the summary above, the annual weighted SVR and LVR show that the Proposed Scheme on average has a similar performance when compared with the Baseline Scheme. Hence, it is concluded that with the mitigation measures implemented, the Proposed Scheme would not result in a significant adverse air ventilation impact on the pedestrian wind environment in the area surrounding the Project Site when compared with the Baseline Scheme.

All improvements and mitigation measures should consider the following design principles at the detailed design stage:

- Adopt building permeability equivalent to 20% to 25% with reference to PNAP APP-152;
- Adopt building setback with reference to PNAP APP-152;
- Avoid long continuous façades; and
- Make reference to the recommendations of design measures in the Hong Kong Planning Standards and Guidelines.

Appendices

Appendix A - Architectural Layout of Baseline Scheme

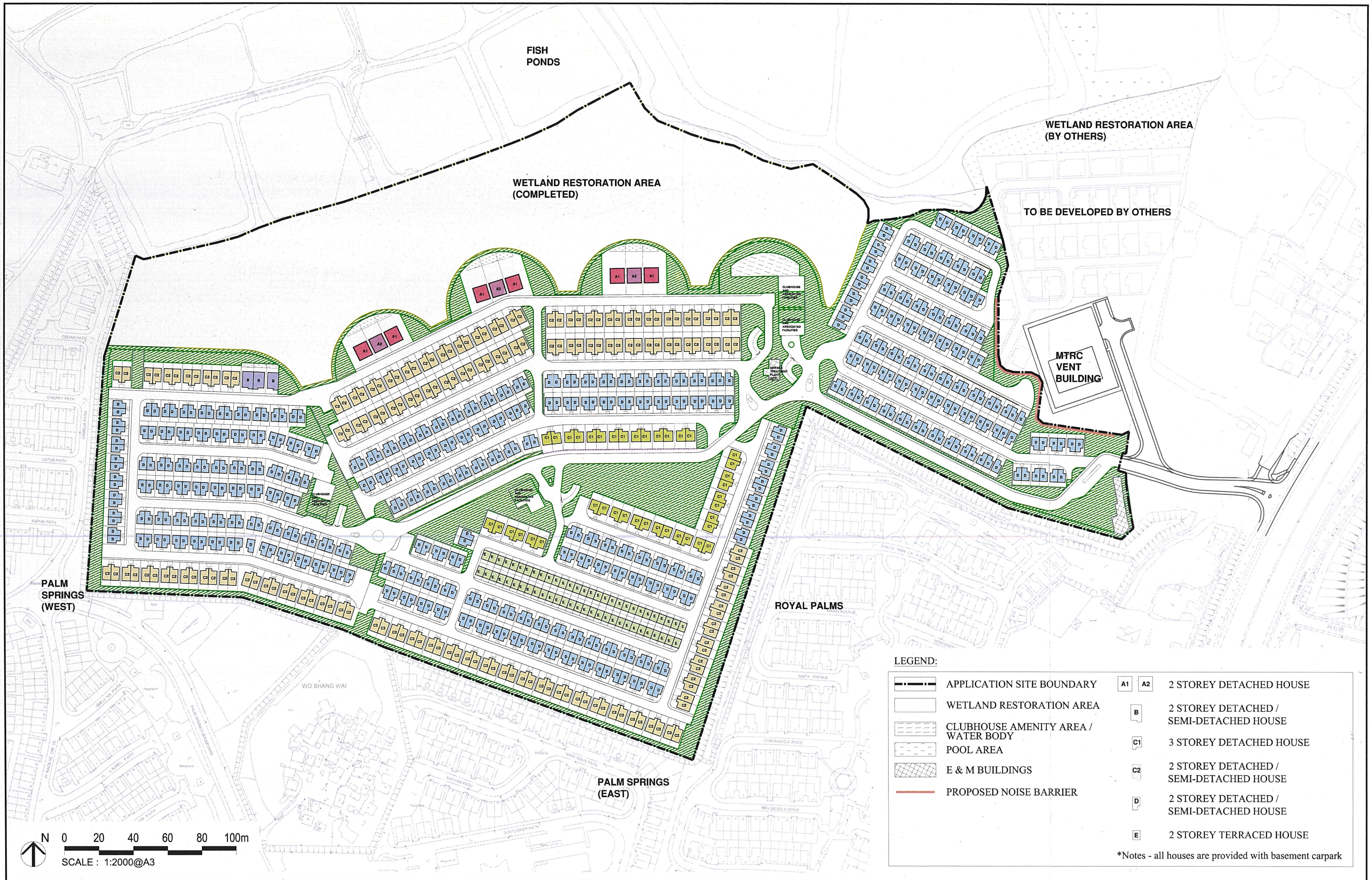


Figure 3: Revised Master Layout Plan in this Amendment Application

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lwk & partners architects

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DWG. No. : 3809-003

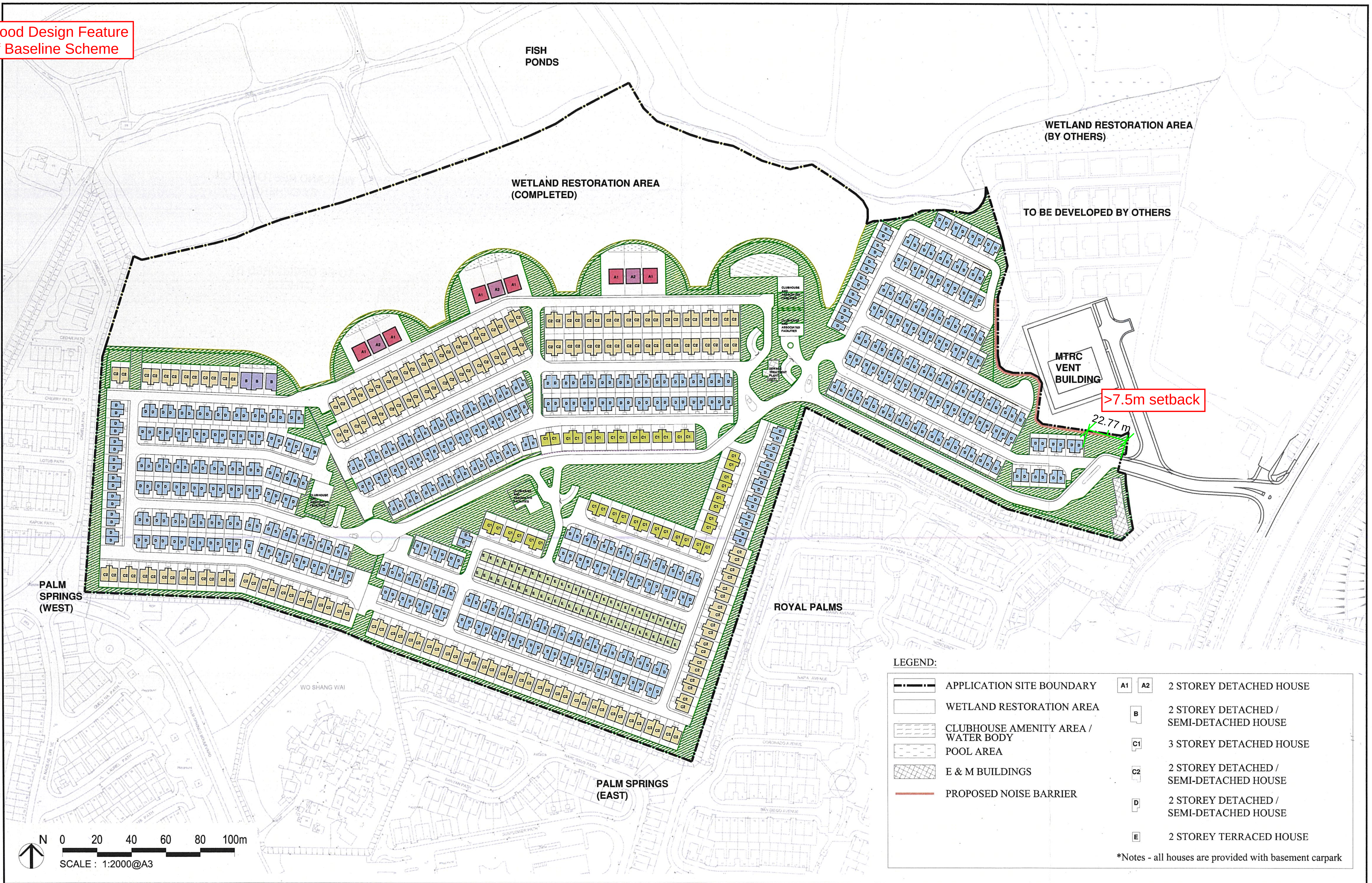

Figure 3: Revised Master Layout Plan in this Amendment Application

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Appendix B – Architectural Layout of Proposed Scheme

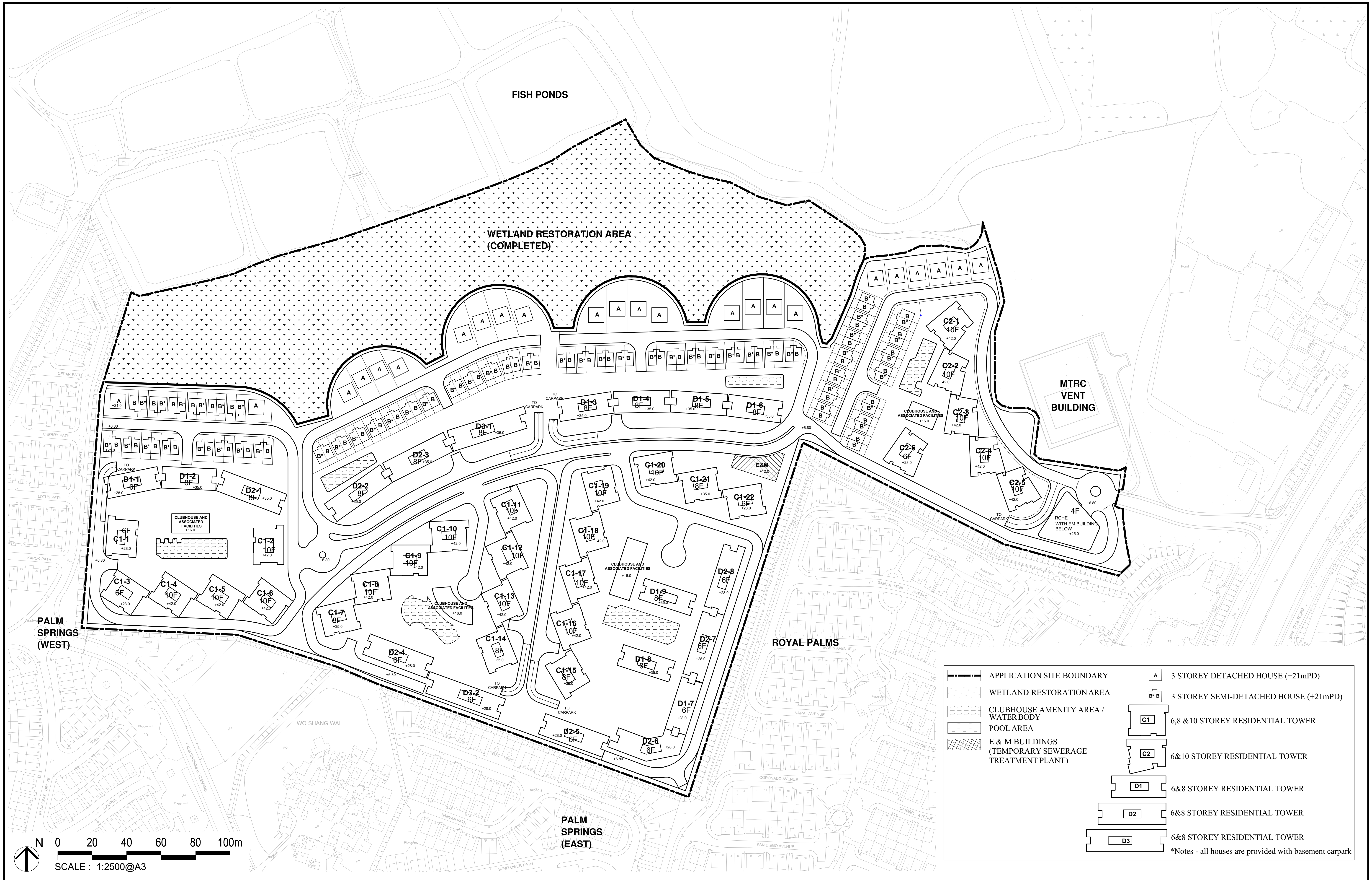

Figure 3: Revised Master Layout Plan in this Amendment Application

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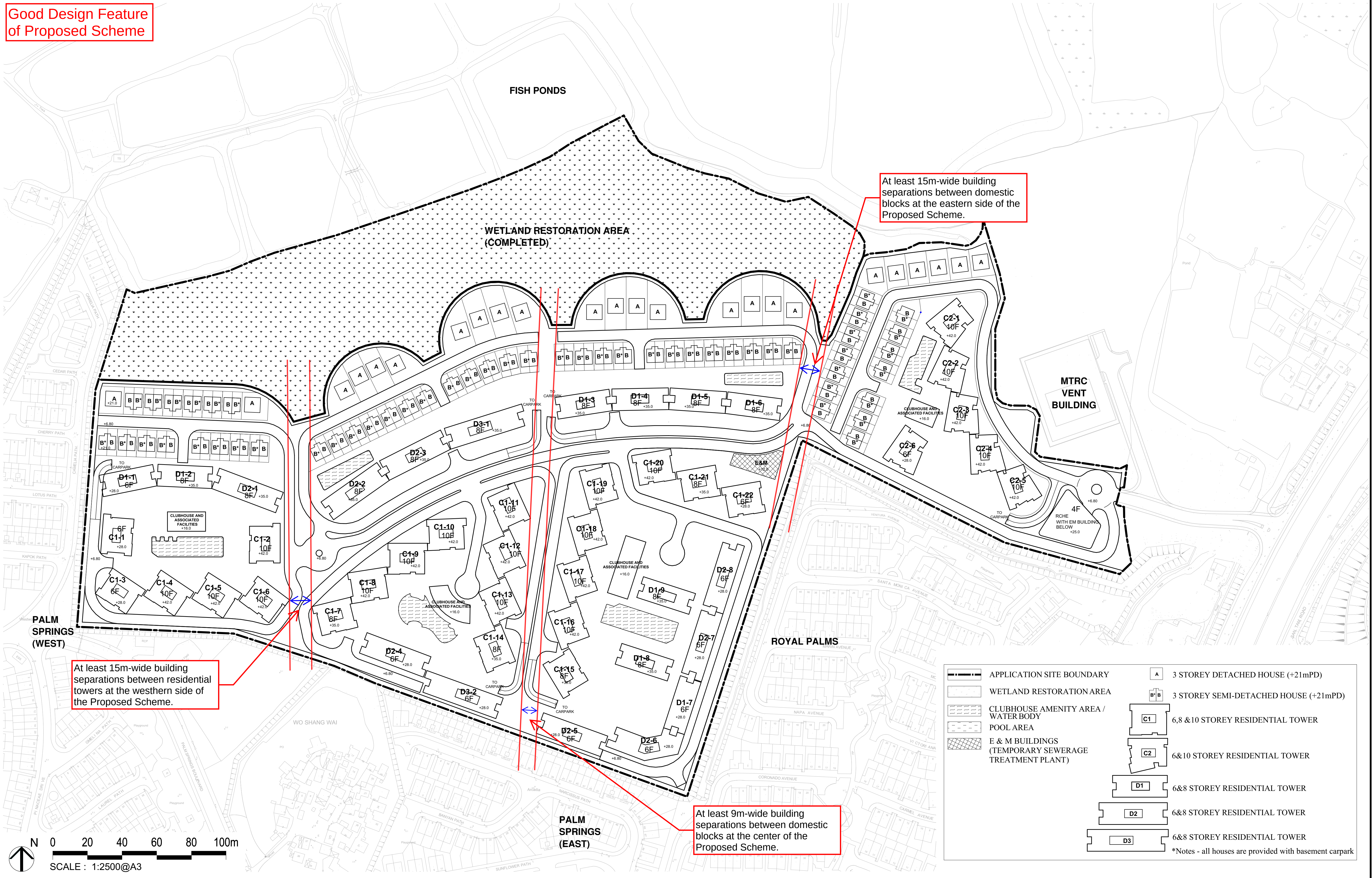

Figure 3: Revised Master Layout Plan in this Amendment Application

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Appendix C – Detailed Velocity Ratio for Each Test Point for Baseline Scheme

Baseline Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	Annual	Summer
Annual	7.2%	9.8%	10.2%	18.1%	9.8%	6.7%		7.0%	7.7%	6.7%	83.2%	
Summer				8.1%	7.8%	6.6%	8.2%	12.9%	16.5%	16.3%		76.4%
O1	0.34	0.40	0.37	0.21	0.24	0.30	0.22	0.22	0.34	0.29	0.29	0.27
O2	0.24	0.26	0.26	0.20	0.10	0.14	0.13	0.18	0.34	0.31	0.22	0.23
O3	0.35	0.30	0.32	0.44	0.13	0.16	0.09	0.14	0.37	0.31	0.30	0.25
O4	0.36	0.33	0.33	0.24	0.08	0.08	0.14	0.25	0.40	0.30	0.26	0.25
O5	0.25	0.30	0.26	0.32	0.02	0.12	0.15	0.17	0.39	0.32	0.25	0.24
O6	0.30	0.36	0.36	0.14	0.18	0.27	0.20	0.18	0.38	0.25	0.26	0.24
O7	0.37	0.39	0.36	0.30	0.18	0.36	0.17	0.20	0.36	0.29	0.31	0.27
O8	0.37	0.35	0.29	0.28	0.10	0.41	0.18	0.20	0.35	0.31	0.29	0.27
O9	0.37	0.37	0.38	0.23	0.22	0.29	0.25	0.17	0.37	0.26	0.29	0.26
O10	0.35	0.37	0.40	0.24	0.15	0.20	0.14	0.23	0.33	0.19	0.27	0.22
O11	0.28	0.33	0.27	0.41	0.12	0.16	0.16	0.27	0.37	0.31	0.29	0.28
O12	0.32	0.35	0.37	0.25	0.08	0.10	0.17	0.30	0.41	0.31	0.28	0.27
O13	0.32	0.37	0.38	0.24	0.07	0.08	0.26	0.31	0.37	0.31	0.27	0.27
O14	0.33	0.35	0.33	0.37	0.11	0.12	0.18	0.29	0.23	0.15	0.27	0.21
O15	0.35	0.34	0.41	0.20	0.17	0.22	0.15	0.27	0.22	0.20	0.26	0.21
O16	0.36	0.36	0.30	0.29	0.27	0.36	0.26	0.15	0.25	0.29	0.29	0.26
O17	0.34	0.39	0.37	0.30	0.21	0.38	0.12	0.21	0.28	0.34	0.31	0.27
O18	0.15	0.28	0.33	0.38	0.26	0.17	0.11	0.17	0.10	0.10	0.25	0.16
O19	0.22	0.34	0.36	0.31	0.22	0.41	0.26	0.17	0.19	0.31	0.29	0.25
O20	0.32	0.35	0.32	0.25	0.21	0.32	0.15	0.27	0.17	0.26	0.27	0.23
O21	0.31	0.34	0.42	0.24	0.14	0.18	0.15	0.30	0.13	0.21	0.26	0.20
O22	0.30	0.34	0.35	0.37	0.09	0.10	0.23	0.27	0.11	0.05	0.25	0.16
O23	0.28	0.35	0.35	0.32	0.15	0.11	0.32	0.30	0.14	0.27	0.27	0.23
O24	0.24	0.20	0.29	0.18	0.12	0.16	0.15	0.12	0.26	0.26	0.20	0.19
O25	0.13	0.22	0.30	0.28	0.21	0.31	0.03	0.20	0.23	0.30	0.25	0.23
O26	0.25	0.36	0.33	0.30	0.27	0.36	0.22	0.25	0.17	0.30	0.29	0.26
O27	0.25	0.13	0.22	0.06	0.28	0.37	0.20	0.21	0.23	0.17	0.19	0.21
O28	0.34	0.20	0.08	0.06	0.12	0.17	0.21	0.26	0.30	0.13	0.16	0.19
O29	0.30	0.24	0.06	0.19	0.20	0.40	0.25	0.19	0.08	0.10	0.19	0.17
O30	0.30	0.18	0.05	0.13	0.14	0.25	0.13	0.24	0.24	0.06	0.16	0.17
O31	0.29	0.19	0.07	0.06	0.07	0.14	0.04	0.07	0.25	0.18	0.13	0.13
O32	0.24	0.13	0.13	0.07	0.08	0.08	0.06	0.12	0.25	0.25	0.14	0.16
O33	0.04	0.02	0.05	0.13	0.09	0.18	0.07	0.04	0.02	0.09	0.08	0.08
O34	0.13	0.10	0.01	0.16	0.12	0.19	0.09	0.15	0.15	0.08	0.12	0.13
O35	0.06	0.11	0.15	0.13	0.06	0.44	0.19	0.13	0.11	0.11	0.14	0.15
O36	0.05	0.12	0.03	0.03	0.07	0.21	0.04	0.04	0.09	0.05	0.07	0.07
O37	0.07	0.05	0.03	0.11	0.06	0.08	0.13	0.15	0.19	0.18	0.10	0.14
O38	0.02	0.07	0.15	0.10	0.02	0.02	0.08	0.07	0.11	0.11	0.08	0.08
O39	0.15	0.21	0.18	0.04	0.10	0.12	0.13	0.13	0.17	0.01	0.12	0.10
O40	0.17	0.06	0.10	0.02	0.32	0.24	0.29	0.23	0.17	0.08	0.14	0.18
O41	0.17	0.16	0.30	0.20	0.33	0.22	0.19	0.14	0.12	0.06	0.20	0.16
O42	0.16	0.05	0.27	0.27	0.14	0.13	0.14	0.09	0.08	0.09	0.16	0.12
O43	0.01	0.14	0.22	0.24	0.14	0.13	0.16	0.07	0.06	0.08	0.14	0.11
O44	0.11	0.09	0.24	0.27	0.18	0.15	0.21	0.07	0.12	0.16	0.17	0.15
O45	0.11	0.08	0.16	0.25	0.08	0.10	0.10	0.08	0.18	0.12	0.14	0.13
O46	0.09	0.07	0.17	0.11	0.03	0.07	0.01	0.03	0.23	0.24	0.11	0.13

O47	0.06	0.15	0.09	0.05	0.05	0.06	0.04	0.03	0.20	0.21	0.09	0.11
O48	0.06	0.07	0.07	0.04	0.04	0.04	0.06	0.04	0.02	0.04	0.05	0.04
O49	0.06	0.03	0.12	0.06	0.33	0.25	0.26	0.22	0.16	0.11	0.14	0.18
O50	0.06	0.04	0.20	0.09	0.18	0.18	0.23	0.19	0.06	0.11	0.12	0.14
O51	0.08	0.13	0.13	0.08	0.15	0.16	0.16	0.08	0.07	0.21	0.12	0.13
O52	0.06	0.15	0.15	0.02	0.13	0.14	0.15	0.05	0.11	0.22	0.11	0.12
O53	0.11	0.12	0.19	0.35	0.37	0.28	0.22	0.13	0.07	0.24	0.22	0.21
O54	0.06	0.08	0.18	0.26	0.14	0.14	0.16	0.10	0.04	0.17	0.15	0.13
O55	0.05	0.06	0.09	0.19	0.08	0.11	0.14	0.04	0.10	0.07	0.10	0.10
O56	0.07	0.15	0.09	0.08	0.18	0.11	0.04	0.06	0.13	0.14	0.11	0.11
O57	0.24	0.18	0.27	0.21	0.25	0.19	0.24	0.05	0.10	0.10	0.19	0.14
O58	0.13	0.15	0.32	0.26	0.24	0.19	0.14	0.04	0.05	0.06	0.18	0.11
O59	0.10	0.12	0.15	0.12	0.13	0.15	0.11	0.01	0.08	0.06	0.11	0.08
O60	0.11	0.19	0.08	0.14	0.05	0.12	0.18	0.05	0.12	0.06	0.11	0.10
O61	0.08	0.15	0.10	0.08	0.14	0.07	0.10	0.05	0.06	0.16	0.10	0.09
O62	0.07	0.07	0.08	0.12	0.09	0.09	0.18	0.08	0.06	0.12	0.09	0.10
O63	0.20	0.18	0.23	0.17	0.24	0.07	0.05	0.06	0.09	0.05	0.15	0.09
O64	0.11	0.09	0.15	0.16	0.23	0.02	0.19	0.05	0.09	0.09	0.12	0.11
O65	0.07	0.12	0.11	0.09	0.20	0.04	0.17	0.06	0.09	0.17	0.11	0.12
O66	0.12	0.08	0.09	0.06	0.22	0.20	0.11	0.04	0.18	0.16	0.12	0.14
O67	0.05	0.02	0.02	0.01	0.01	0.04	0.06	0.07	0.21	0.12	0.05	0.09
O68	0.07	0.05	0.07	0.04	0.05	0.07	0.10	0.13	0.29	0.18	0.09	0.15
O69	0.07	0.03	0.05	0.04	0.05	0.08	0.01	0.15	0.26	0.06	0.08	0.11
O70	0.03	0.11	0.14	0.18	0.33	0.22	0.21	0.13	0.19	0.24	0.18	0.21
O71	0.05	0.11	0.10	0.16	0.17	0.15	0.09	0.08	0.29	0.28	0.15	0.19
O72	0.08	0.07	0.17	0.25	0.32	0.26	0.15	0.04	0.20	0.25	0.19	0.20
O73	0.05	0.08	0.18	0.09	0.14	0.17	0.06	0.04	0.06	0.03	0.10	0.07
O74	0.09	0.09	0.14	0.13	0.19	0.17	0.19	0.05	0.12	0.14	0.13	0.13
O75	0.05	0.13	0.01	0.01	0.14	0.10	0.11	0.12	0.31	0.37	0.12	0.20
O76	0.03	0.11	0.20	0.27	0.44	0.22	0.06	0.12	0.11	0.12	0.20	0.17
O77	0.12	0.13	0.15	0.25	0.32	0.21	0.22	0.13	0.26	0.38	0.22	0.26
O78	0.03	0.08	0.06	0.28	0.26	0.17	0.24	0.21	0.35	0.38	0.20	0.29
O79	0.07	0.15	0.06	0.29	0.29	0.19	0.18	0.16	0.27	0.35	0.21	0.26
O80	0.05	0.16	0.11	0.34	0.38	0.20	0.18	0.21	0.27	0.29	0.24	0.27
O81	0.02	0.09	0.06	0.05	0.11	0.18	0.19	0.28	0.41	0.41	0.15	0.27
O82	0.05	0.15	0.07	0.07	0.07	0.06	0.05	0.14	0.09	0.25	0.10	0.12
O83	0.07	0.12	0.04	0.02	0.07	0.08	0.07	0.16	0.21	0.12	0.09	0.12
O84	0.07	0.09	0.08	0.10	0.15	0.16	0.15	0.05	0.13	0.21	0.11	0.14
O85	0.04	0.07	0.16	0.09	0.13	0.04	0.02	0.06	0.10	0.15	0.10	0.09
O86	0.03	0.03	0.02	0.03	0.10	0.09	0.09	0.13	0.19	0.09	0.07	0.11
O87	0.13	0.04	0.03	0.01	0.05	0.10	0.08	0.05	0.18	0.16	0.07	0.11
O88	0.04	0.03	0.04	0.04	0.06	0.15	0.08	0.02	0.02	0.17	0.06	0.08
O89	0.01	0.02	0.08	0.08	0.14	0.11	0.19	0.16	0.02	0.22	0.09	0.13
O90	0.07	0.06	0.05	0.13	0.17	0.17	0.13	0.06	0.26	0.28	0.13	0.18
O91	0.02	0.07	0.08	0.12	0.22	0.18	0.03	0.29	0.38	0.29	0.17	0.25
O92	0.04	0.04	0.04	0.13	0.36	0.13	0.30	0.25	0.21	0.15	0.15	0.21
O93	0.03	0.10	0.06	0.01	0.06	0.03	0.13	0.09	0.07	0.09	0.06	0.07
O94	0.09	0.12	0.06	0.12	0.32	0.36	0.34	0.25	0.06	0.07	0.15	0.18
O95	0.08	0.05	0.18	0.21	0.23	0.18	0.33	0.10	0.08	0.16	0.15	0.16
O96	0.17	0.16	0.16	0.14	0.34	0.37	0.22	0.07	0.08	0.07	0.17	0.15

O97	0.09	0.04	0.10	0.17	0.33	0.30	0.26	0.07	0.19	0.11	0.16	0.18
O98	0.04	0.12	0.21	0.24	0.32	0.24	0.23	0.09	0.13	0.14	0.18	0.18
O99	0.05	0.11	0.21	0.29	0.34	0.27	0.20	0.07	0.23	0.06	0.20	0.18
O100	0.05	0.17	0.19	0.10	0.11	0.06	0.02	0.04	0.11	0.22	0.12	0.11
O101	0.24	0.10	0.15	0.15	0.13	0.15	0.21	0.13	0.16	0.13	0.15	0.15
O102	0.11	0.08	0.15	0.12	0.33	0.36	0.20	0.02	0.02	0.04	0.14	0.11
O103	0.04	0.06	0.10	0.23	0.34	0.33	0.22	0.03	0.09	0.12	0.16	0.16
O104	0.05	0.07	0.15	0.14	0.36	0.36	0.18	0.04	0.29	0.18	0.18	0.21
O105	0.08	0.08	0.14	0.14	0.20	0.03	0.04	0.12	0.25	0.11	0.13	0.14
O106	0.06	0.11	0.16	0.25	0.39	0.34	0.11	0.11	0.08	0.07	0.19	0.16
O107	0.13	0.14	0.18	0.22	0.22	0.04	0.02	0.15	0.09	0.11	0.16	0.12
O108	0.03	0.07	0.03	0.06	0.11	0.08	0.05	0.07	0.17	0.15	0.08	0.11
O109	0.03	0.07	0.07	0.14	0.15	0.08	0.03	0.15	0.17	0.10	0.11	0.12
O110	0.02	0.06	0.08	0.13	0.14	0.16	0.08	0.20	0.09	0.06	0.11	0.12
O111	0.07	0.09	0.10	0.07	0.07	0.03	0.09	0.28	0.32	0.28	0.13	0.20
O112	0.14	0.17	0.16	0.10	0.18	0.09	0.04	0.05	0.11	0.21	0.13	0.12
O113	0.22	0.11	0.05	0.15	0.14	0.09	0.21	0.25	0.30	0.34	0.17	0.24
O114	0.12	0.05	0.12	0.06	0.26	0.13	0.16	0.15	0.30	0.23	0.14	0.20
O115	0.18	0.14	0.18	0.25	0.19	0.06	0.08	0.07	0.06	0.05	0.15	0.09
O116	0.13	0.02	0.12	0.16	0.05	0.11	0.06	0.10	0.11	0.03	0.10	0.08
O117	0.16	0.07	0.07	0.07	0.04	0.06	0.06	0.06	0.06	0.05	0.07	0.06
O118	0.06	0.07	0.13	0.11	0.24	0.10	0.16	0.12	0.08	0.16	0.12	0.13
O119	0.02	0.04	0.10	0.06	0.06	0.07	0.13	0.13	0.10	0.05	0.07	0.09
O120	0.04	0.07	0.15	0.11	0.19	0.08	0.03	0.02	0.12	0.16	0.11	0.10
O121	0.05	0.03	0.05	0.07	0.04	0.05	0.14	0.14	0.09	0.01	0.06	0.07
O122	0.11	0.11	0.06	0.16	0.06	0.08	0.07	0.04	0.14	0.20	0.11	0.12
O123	0.18	0.12	0.09	0.13	0.14	0.10	0.13	0.20	0.12	0.12	0.13	0.14
O124	0.09	0.14	0.04	0.06	0.24	0.15	0.04	0.06	0.14	0.23	0.12	0.14
O125	0.04	0.29	0.33	0.38	0.16	0.12	0.04	0.18	0.10	0.25	0.23	0.18
O126	0.06	0.05	0.06	0.05	0.13	0.09	0.14	0.13	0.15	0.18	0.09	0.13
O127	0.09	0.06	0.09	0.09	0.12	0.09	0.18	0.21	0.13	0.05	0.10	0.12
O128	0.16	0.07	0.03	0.08	0.06	0.08	0.18	0.22	0.19	0.08	0.10	0.14
O129	0.20	0.04	0.04	0.03	0.10	0.09	0.10	0.22	0.17	0.06	0.09	0.12
O130	0.08	0.26	0.29	0.31	0.15	0.11	0.06	0.19	0.01	0.07	0.19	0.11
O131	0.12	0.07	0.25	0.07	0.11	0.09	0.02	0.08	0.09	0.27	0.12	0.12
O132	0.31	0.19	0.13	0.13	0.13	0.11	0.07	0.08	0.15	0.22	0.16	0.14
O133	0.31	0.13	0.04	0.10	0.16	0.09	0.03	0.12	0.16	0.26	0.14	0.15
O134	0.29	0.16	0.06	0.12	0.06	0.06	0.00	0.13	0.20	0.31	0.14	0.16
O135	0.35	0.30	0.22	0.14	0.17	0.17	0.18	0.14	0.26	0.35	0.22	0.22
O136	0.29	0.34	0.17	0.23	0.15	0.20	0.22	0.20	0.24	0.39	0.24	0.25
O137	0.32	0.15	0.02	0.15	0.07	0.07	0.01	0.14	0.18	0.30	0.15	0.16
O138	0.32	0.33	0.18	0.18	0.19	0.13	0.07	0.12	0.21	0.27	0.21	0.18
O139	0.32	0.27	0.18	0.13	0.16	0.09	0.02	0.16	0.22	0.33	0.20	0.18
O140	0.35	0.34	0.27	0.21	0.22	0.14	0.06	0.13	0.28	0.40	0.26	0.23
O141	0.26	0.09	0.07	0.16	0.15	0.14	0.11	0.18	0.25	0.37	0.17	0.22
O142	0.35	0.36	0.33	0.29	0.16	0.17	0.21	0.22	0.34	0.41	0.29	0.28
O143	0.29	0.28	0.27	0.29	0.18	0.14	0.20	0.19	0.09	0.22	0.23	0.18
O144	0.32	0.34	0.32	0.35	0.22	0.29	0.26	0.11	0.27	0.24	0.29	0.24
O145	0.34	0.35	0.34	0.42	0.23	0.36	0.28	0.16	0.27	0.41	0.33	0.30
O146	0.32	0.34	0.29	0.37	0.21	0.32	0.24	0.16	0.15	0.30	0.29	0.24

O147	0.33	0.34	0.30	0.39	0.25	0.19	0.17	0.14	0.17	0.30	0.29	0.23
O148	0.33	0.33	0.30	0.40	0.26	0.25	0.19	0.17	0.41	0.40	0.33	0.31
O149	0.32	0.34	0.35	0.35	0.22	0.18	0.16	0.11	0.27	0.34	0.29	0.24
O150	0.34	0.35	0.38	0.26	0.17	0.22	0.14	0.07	0.38	0.30	0.28	0.24
O151	0.35	0.35	0.30	0.42	0.26	0.22	0.16	0.14	0.22	0.31	0.31	0.25
O152	0.35	0.36	0.35	0.41	0.29	0.27	0.18	0.18	0.24	0.23	0.32	0.25
O153	0.31	0.33	0.35	0.37	0.24	0.23	0.18	0.18	0.38	0.38	0.32	0.30
O154	0.31	0.33	0.36	0.28	0.22	0.17	0.13	0.13	0.25	0.20	0.26	0.20
O155	0.33	0.34	0.28	0.40	0.26	0.24	0.21	0.21	0.42	0.41	0.33	0.32
O156	0.35	0.35	0.33	0.37	0.28	0.21	0.23	0.22	0.43	0.37	0.33	0.32
O157	0.32	0.33	0.31	0.40	0.25	0.21	0.19	0.19	0.40	0.41	0.33	0.31
O158	0.36	0.38	0.33	0.41	0.29	0.15	0.22	0.19	0.32	0.38	0.33	0.29
O159	0.34	0.36	0.29	0.36	0.31	0.35	0.23	0.19	0.28	0.34	0.32	0.29
O160	0.33	0.35	0.35	0.41	0.25	0.12	0.21	0.19	0.32	0.36	0.32	0.28
O161	0.31	0.34	0.37	0.34	0.24	0.14	0.16	0.11	0.20	0.32	0.28	0.22
O162	0.36	0.37	0.31	0.40	0.30	0.15	0.24	0.22	0.39	0.45	0.34	0.33
O163	0.36	0.37	0.35	0.33	0.30	0.25	0.25	0.23	0.45	0.47	0.34	0.35
O164	0.34	0.36	0.31	0.31	0.38	0.41	0.23	0.19	0.30	0.39	0.33	0.31
O165	0.36	0.37	0.35	0.40	0.39	0.45	0.25	0.18	0.36	0.47	0.37	0.36
O166	0.34	0.36	0.36	0.38	0.28	0.33	0.21	0.20	0.23	0.35	0.33	0.28
O167	0.34	0.36	0.39	0.42	0.28	0.21	0.18	0.16	0.25	0.29	0.32	0.25
O168	0.35	0.37	0.35	0.42	0.37	0.47	0.25	0.22	0.34	0.46	0.38	0.36
O169	0.34	0.35	0.38	0.39	0.28	0.37	0.20	0.18	0.22	0.34	0.33	0.27
O170	0.34	0.34	0.33	0.33	0.26	0.19	0.10	0.14	0.19	0.30	0.28	0.22
O171	0.32	0.33	0.37	0.25	0.19	0.16	0.16	0.02	0.11	0.19	0.23	0.15
O172	0.31	0.32	0.26	0.29	0.29	0.32	0.16	0.17	0.18	0.22	0.27	0.22
O173	0.34	0.33	0.40	0.29	0.21	0.35	0.19	0.21	0.30	0.32	0.31	0.27
O174	0.35	0.37	0.31	0.34	0.38	0.44	0.22	0.21	0.23	0.35	0.33	0.30
O175	0.34	0.35	0.34	0.29	0.30	0.44	0.35	0.20	0.40	0.32	0.33	0.33
O176	0.33	0.29	0.28	0.31	0.25	0.37	0.22	0.11	0.16	0.31	0.27	0.23
O177	0.35	0.36	0.38	0.31	0.28	0.39	0.33	0.17	0.25	0.37	0.32	0.29
P1	0.25	0.24	0.31	0.21	0.23	0.43	0.15	0.08	0.04	0.12	0.22	0.15
P2	0.06	0.23	0.37	0.11	0.11	0.19	0.22	0.09	0.05	0.03	0.15	0.10
P3	0.11	0.26	0.23	0.23	0.11	0.07	0.21	0.07	0.03	0.06	0.15	0.10
P4	0.36	0.34	0.14	0.18	0.08	0.06	0.23	0.08	0.10	0.02	0.16	0.10
P5	0.22	0.23	0.08	0.21	0.25	0.31	0.25	0.07	0.05	0.07	0.17	0.14
P6	0.13	0.04	0.07	0.11	0.25	0.30	0.29	0.05	0.06	0.05	0.12	0.13
P7	0.35	0.25	0.21	0.14	0.26	0.35	0.21	0.28	0.33	0.20	0.24	0.25
P8	0.33	0.19	0.25	0.22	0.21	0.28	0.19	0.20	0.22	0.16	0.23	0.21
P9	0.33	0.21	0.22	0.26	0.16	0.18	0.25	0.30	0.23	0.12	0.23	0.21
P10	0.03	0.13	0.32	0.27	0.18	0.15	0.06	0.09	0.09	0.15	0.18	0.13
P11	0.03	0.13	0.15	0.20	0.21	0.15	0.12	0.06	0.05	0.09	0.13	0.11
P12	0.14	0.06	0.16	0.18	0.16	0.16	0.19	0.12	0.04	0.17	0.14	0.13
P13	0.22	0.11	0.16	0.21	0.18	0.17	0.21	0.08	0.07	0.03	0.15	0.11
P14	0.22	0.20	0.11	0.21	0.16	0.11	0.22	0.11	0.16	0.14	0.17	0.16
P15	0.06	0.04	0.07	0.09	0.10	0.04	0.05	0.11	0.23	0.12	0.09	0.12
P16	0.10	0.08	0.08	0.12	0.10	0.02	0.04	0.08	0.25	0.14	0.11	0.13
P17	0.13	0.11	0.11	0.09	0.07	0.03	0.03	0.09	0.26	0.12	0.11	0.12
P18	0.08	0.12	0.19	0.07	0.18	0.13	0.14	0.10	0.27	0.04	0.13	0.13
P19	0.07	0.07	0.13	0.11	0.12	0.05	0.10	0.10	0.20	0.05	0.10	0.11

P20	0.09	0.20	0.09	0.12	0.14	0.15	0.12	0.07	0.13	0.16	0.13	0.13
P21	0.08	0.19	0.13	0.09	0.20	0.21	0.19	0.10	0.14	0.24	0.14	0.17
P22	0.08	0.04	0.10	0.10	0.23	0.22	0.15	0.06	0.19	0.21	0.13	0.16
P23	0.11	0.07	0.11	0.09	0.24	0.19	0.08	0.02	0.03	0.26	0.12	0.12
P24	0.06	0.13	0.16	0.08	0.26	0.16	0.16	0.15	0.19	0.35	0.16	0.21
P25	0.05	0.19	0.07	0.13	0.26	0.15	0.13	0.15	0.21	0.19	0.15	0.18
P26	0.05	0.05	0.03	0.07	0.23	0.13	0.07	0.04	0.12	0.20	0.10	0.13
P27	0.04	0.04	0.10	0.07	0.24	0.15	0.12	0.09	0.10	0.11	0.10	0.12
P28	0.07	0.07	0.13	0.12	0.23	0.15	0.14	0.13	0.16	0.09	0.13	0.14
P29	0.08	0.04	0.05	0.14	0.22	0.13	0.17	0.07	0.09	0.08	0.10	0.11
P30	0.06	0.07	0.16	0.21	0.29	0.27	0.29	0.13	0.29	0.09	0.18	0.21
P31	0.09	0.07	0.11	0.06	0.04	0.03	0.12	0.17	0.11	0.17	0.09	0.11
P32	0.17	0.04	0.06	0.04	0.05	0.02	0.18	0.21	0.26	0.21	0.10	0.17
P33	0.06	0.03	0.07	0.03	0.06	0.05	0.16	0.22	0.26	0.08	0.08	0.14
P34	0.30	0.32	0.31	0.35	0.10	0.08	0.07	0.18	0.23	0.20	0.25	0.19
P35	0.24	0.37	0.37	0.37	0.17	0.13	0.10	0.14	0.08	0.15	0.25	0.15
P36	0.31	0.31	0.33	0.33	0.19	0.14	0.21	0.16	0.04	0.25	0.25	0.18
P37	0.33	0.34	0.36	0.28	0.17	0.26	0.13	0.07	0.33	0.27	0.27	0.22
P38	0.33	0.35	0.37	0.25	0.17	0.18	0.12	0.08	0.36	0.23	0.26	0.21
P39	0.34	0.36	0.39	0.24	0.17	0.13	0.10	0.15	0.28	0.18	0.25	0.19
P40	0.31	0.33	0.36	0.25	0.22	0.17	0.14	0.09	0.19	0.25	0.25	0.19
P41	0.31	0.33	0.37	0.30	0.22	0.21	0.12	0.13	0.18	0.30	0.27	0.21
P42	0.31	0.34	0.38	0.33	0.23	0.13	0.15	0.06	0.18	0.30	0.27	0.20
P43	0.33	0.35	0.39	0.36	0.20	0.11	0.16	0.12	0.15	0.29	0.28	0.20
P44	0.34	0.36	0.39	0.40	0.25	0.15	0.19	0.14	0.19	0.28	0.30	0.23
P45	0.33	0.35	0.35	0.33	0.18	0.12	0.16	0.13	0.33	0.31	0.28	0.24
P46	0.33	0.33	0.30	0.32	0.16	0.10	0.14	0.12	0.17	0.27	0.25	0.19
P47	0.33	0.34	0.35	0.25	0.12	0.06	0.07	0.10	0.13	0.25	0.23	0.15
P48	0.34	0.36	0.38	0.21	0.10	0.07	0.09	0.07	0.12	0.14	0.21	0.12
P49	0.28	0.28	0.10	0.11	0.03	0.05	0.01	0.04	0.07	0.14	0.12	0.07
P50	0.11	0.10	0.26	0.18	0.12	0.04	0.13	0.03	0.04	0.03	0.12	0.07
S1	0.27	0.25	0.21	0.15	0.24	0.33	0.23	0.22	0.35	0.17	0.23	0.24
S2	0.05	0.06	0.07	0.20	0.21	0.20	0.16	0.04	0.05	0.13	0.12	0.12
S3	0.03	0.10	0.12	0.17	0.22	0.22	0.18	0.05	0.08	0.14	0.13	0.13
S4	0.04	0.12	0.15	0.10	0.04	0.14	0.10	0.04	0.04	0.05	0.09	0.06
S5	0.18	0.08	0.15	0.18	0.14	0.17	0.20	0.15	0.15	0.10	0.15	0.14
S6	0.02	0.06	0.08	0.08	0.08	0.11	0.04	0.03	0.14	0.01	0.07	0.07
S7	0.19	0.27	0.15	0.24	0.05	0.12	0.06	0.05	0.07	0.08	0.15	0.09
S8	0.12	0.26	0.23	0.28	0.17	0.16	0.21	0.06	0.12	0.08	0.19	0.14
S9	0.22	0.22	0.11	0.19	0.17	0.15	0.24	0.14	0.20	0.10	0.17	0.17
S10	0.32	0.21	0.09	0.32	0.16	0.12	0.13	0.13	0.15	0.13	0.20	0.16
S11	0.26	0.29	0.23	0.25	0.17	0.11	0.10	0.08	0.04	0.12	0.19	0.11
S12	0.29	0.34	0.04	0.25	0.07	0.09	0.11	0.06	0.04	0.11	0.16	0.10
S13	0.33	0.26	0.07	0.20	0.06	0.13	0.07	0.03	0.05	0.10	0.14	0.08
S14	0.16	0.08	0.05	0.16	0.08	0.11	0.06	0.14	0.01	0.07	0.10	0.08
S15	0.02	0.06	0.04	0.03	0.05	0.07	0.09	0.05	0.13	0.11	0.06	0.09
S16	0.27	0.23	0.09	0.10	0.18	0.11	0.09	0.08	0.09	0.07	0.13	0.09
S17	0.07	0.03	0.10	0.05	0.10	0.13	0.01	0.09	0.19	0.12	0.09	0.11
S18	0.08	0.16	0.09	0.03	0.08	0.10	0.15	0.01	0.09	0.06	0.07	0.07
S19	0.09	0.06	0.09	0.11	0.14	0.03	0.13	0.04	0.03	0.07	0.08	0.07

S20	0.21	0.05	0.02	0.11	0.03	0.01	0.03	0.03	0.02	0.04	0.06	0.04
S21	0.10	0.07	0.06	0.09	0.04	0.09	0.04	0.03	0.06	0.05	0.06	0.05
S22	0.14	0.02	0.18	0.04	0.08	0.05	0.15	0.05	0.11	0.05	0.08	0.08
S23	0.28	0.06	0.16	0.07	0.07	0.07	0.05	0.03	0.16	0.05	0.10	0.08
S24	0.06	0.28	0.18	0.13	0.04	0.05	0.01	0.04	0.04	0.05	0.11	0.05
S25	0.34	0.30	0.08	0.09	0.07	0.04	0.01	0.04	0.09	0.10	0.13	0.07
S26	0.26	0.11	0.09	0.06	0.09	0.03	0.02	0.05	0.08	0.03	0.09	0.05
S27	0.07	0.06	0.17	0.05	0.01	0.08	0.16	0.09	0.11	0.06	0.08	0.08
S28	0.02	0.04	0.14	0.02	0.01	0.07	0.22	0.12	0.10	0.07	0.06	0.09
S29	0.06	0.07	0.04	0.03	0.05	0.16	0.15	0.07	0.07	0.12	0.07	0.09
S30	0.04	0.05	0.04	0.05	0.03	0.15	0.15	0.03	0.06	0.09	0.06	0.07
S31	0.26	0.26	0.09	0.10	0.07	0.12	0.19	0.05	0.09	0.04	0.12	0.09
S32	0.06	0.13	0.11	0.21	0.08	0.23	0.21	0.09	0.19	0.13	0.14	0.16

Appendix D – Detailed Velocity Ratio for Each Test Point for Proposed Scheme

Proposed Scheme

	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	Annual	Summer
Annual	7.2%	9.8%	10.2%	18.1%	9.8%	6.7%		7.0%	7.7%	6.7%	83.2%	
Summer				8.1%	7.8%	6.6%	8.2%	12.9%	16.5%	16.3%		76.4%
O1	0.31	0.41	0.36	0.19	0.22	0.28	0.22	0.23	0.34	0.30	0.29	0.27
O2	0.24	0.31	0.32	0.20	0.10	0.15	0.11	0.17	0.37	0.30	0.23	0.23
O3	0.32	0.33	0.31	0.45	0.11	0.12	0.14	0.22	0.39	0.32	0.31	0.27
O4	0.32	0.35	0.34	0.38	0.06	0.06	0.15	0.27	0.39	0.31	0.29	0.26
O5	0.29	0.36	0.33	0.30	0.03	0.11	0.12	0.25	0.36	0.31	0.26	0.24
O6	0.34	0.39	0.37	0.11	0.17	0.26	0.14	0.17	0.36	0.24	0.25	0.22
O7	0.36	0.37	0.31	0.28	0.21	0.35	0.22	0.20	0.33	0.29	0.30	0.27
O8	0.36	0.34	0.28	0.25	0.09	0.41	0.19	0.21	0.28	0.32	0.27	0.26
O9	0.38	0.37	0.35	0.21	0.18	0.28	0.19	0.18	0.28	0.26	0.27	0.23
O10	0.35	0.37	0.39	0.18	0.13	0.18	0.16	0.26	0.22	0.20	0.25	0.20
O11	0.33	0.38	0.33	0.37	0.11	0.14	0.18	0.28	0.30	0.30	0.29	0.26
O12	0.33	0.38	0.37	0.24	0.07	0.09	0.20	0.31	0.37	0.31	0.27	0.26
O13	0.34	0.42	0.36	0.29	0.07	0.06	0.30	0.31	0.19	0.30	0.27	0.23
O14	0.29	0.37	0.39	0.32	0.11	0.11	0.20	0.30	0.14	0.13	0.26	0.18
O15	0.30	0.34	0.38	0.16	0.14	0.18	0.15	0.29	0.15	0.21	0.23	0.19
O16	0.35	0.35	0.28	0.27	0.25	0.35	0.22	0.18	0.21	0.31	0.28	0.25
O17	0.29	0.38	0.36	0.29	0.17	0.43	0.19	0.20	0.24	0.27	0.29	0.25
O18	0.14	0.26	0.32	0.35	0.25	0.31	0.16	0.16	0.11	0.10	0.24	0.18
O19	0.14	0.26	0.34	0.27	0.23	0.40	0.23	0.24	0.25	0.28	0.27	0.27
O20	0.23	0.34	0.29	0.25	0.19	0.30	0.16	0.30	0.20	0.28	0.26	0.24
O21	0.16	0.30	0.37	0.19	0.10	0.13	0.21	0.29	0.18	0.24	0.22	0.21
O22	0.17	0.33	0.39	0.32	0.08	0.10	0.25	0.27	0.03	0.04	0.22	0.14
O23	0.23	0.40	0.34	0.28	0.16	0.11	0.31	0.31	0.14	0.26	0.26	0.23
O24	0.31	0.29	0.23	0.25	0.09	0.12	0.19	0.14	0.32	0.25	0.23	0.21
O25	0.12	0.15	0.25	0.26	0.19	0.29	0.10	0.20	0.30	0.30	0.23	0.24
O26	0.15	0.27	0.33	0.27	0.26	0.35	0.16	0.29	0.25	0.30	0.27	0.27
O27	0.35	0.27	0.16	0.08	0.25	0.35	0.23	0.24	0.30	0.25	0.22	0.25
O28	0.30	0.22	0.06	0.13	0.14	0.14	0.26	0.29	0.42	0.30	0.20	0.27
O29	0.25	0.19	0.04	0.20	0.19	0.34	0.25	0.25	0.28	0.13	0.20	0.23
O30	0.29	0.15	0.03	0.14	0.12	0.25	0.15	0.21	0.46	0.28	0.19	0.26
O31	0.27	0.15	0.05	0.06	0.15	0.19	0.02	0.04	0.42	0.04	0.14	0.15
O32	0.25	0.11	0.03	0.11	0.15	0.08	0.07	0.10	0.40	0.09	0.14	0.16
O33	0.06	0.04	0.03	0.12	0.12	0.26	0.10	0.05	0.03	0.11	0.09	0.10
O34	0.12	0.11	0.06	0.12	0.07	0.19	0.08	0.18	0.03	0.14	0.11	0.11
O35	0.06	0.06	0.12	0.10	0.05	0.45	0.20	0.14	0.14	0.16	0.13	0.16
O36	0.09	0.11	0.03	0.06	0.08	0.21	0.07	0.03	0.08	0.08	0.08	0.08
O37	0.07	0.03	0.05	0.07	0.05	0.09	0.13	0.17	0.21	0.26	0.10	0.16
O38	0.11	0.10	0.09	0.05	0.08	0.05	0.06	0.06	0.09	0.16	0.08	0.09
O39	0.11	0.17	0.14	0.14	0.13	0.11	0.15	0.13	0.08	0.12	0.13	0.12
O40	0.09	0.03	0.06	0.06	0.30	0.24	0.26	0.16	0.09	0.10	0.12	0.16
O41	0.27	0.23	0.23	0.19	0.32	0.21	0.19	0.03	0.02	0.06	0.19	0.11
O42	0.22	0.22	0.27	0.22	0.15	0.12	0.18	0.08	0.04	0.16	0.18	0.12
O43	0.28	0.16	0.26	0.21	0.14	0.14	0.17	0.10	0.04	0.11	0.17	0.11
O44	0.13	0.09	0.08	0.22	0.06	0.13	0.20	0.17	0.19	0.09	0.14	0.15
O45	0.20	0.16	0.09	0.15	0.18	0.06	0.05	0.15	0.16	0.07	0.14	0.12
O46	0.11	0.24	0.14	0.06	0.26	0.24	0.16	0.08	0.06	0.26	0.15	0.15

O47	0.19	0.29	0.07	0.06	0.35	0.26	0.23	0.19	0.10	0.37	0.19	0.22
O48	0.07	0.27	0.13	0.05	0.20	0.24	0.22	0.19	0.14	0.34	0.17	0.21
O49	0.06	0.22	0.09	0.12	0.21	0.16	0.16	0.09	0.08	0.10	0.13	0.12
O50	0.06	0.17	0.22	0.06	0.16	0.17	0.20	0.10	0.05	0.17	0.12	0.12
O51	0.19	0.19	0.10	0.05	0.12	0.13	0.15	0.08	0.19	0.05	0.12	0.11
O52	0.04	0.23	0.08	0.04	0.29	0.19	0.08	0.03	0.02	0.23	0.12	0.12
O53	0.08	0.13	0.17	0.30	0.37	0.27	0.22	0.05	0.07	0.21	0.20	0.18
O54	0.13	0.13	0.17	0.24	0.13	0.14	0.15	0.02	0.04	0.09	0.14	0.10
O55	0.07	0.04	0.08	0.17	0.08	0.08	0.12	0.05	0.01	0.10	0.09	0.08
O56	0.13	0.28	0.01	0.02	0.29	0.25	0.22	0.19	0.10	0.36	0.16	0.21
O57	0.07	0.24	0.22	0.25	0.25	0.18	0.22	0.05	0.09	0.08	0.18	0.14
O58	0.15	0.16	0.24	0.28	0.24	0.17	0.10	0.03	0.04	0.07	0.17	0.11
O59	0.07	0.11	0.14	0.16	0.10	0.10	0.07	0.03	0.05	0.08	0.10	0.08
O60	0.10	0.16	0.08	0.10	0.02	0.07	0.09	0.04	0.07	0.06	0.08	0.06
O61	0.14	0.11	0.03	0.03	0.09	0.04	0.08	0.08	0.08	0.10	0.07	0.08
O62	0.10	0.05	0.09	0.16	0.10	0.09	0.14	0.04	0.13	0.16	0.11	0.12
O63	0.22	0.13	0.28	0.18	0.24	0.04	0.03	0.09	0.11	0.05	0.16	0.10
O64	0.14	0.05	0.22	0.18	0.22	0.02	0.17	0.06	0.13	0.14	0.14	0.13
O65	0.18	0.15	0.13	0.10	0.16	0.04	0.14	0.02	0.17	0.19	0.13	0.13
O66	0.20	0.15	0.08	0.03	0.09	0.14	0.07	0.13	0.20	0.20	0.12	0.14
O67	0.19	0.09	0.14	0.11	0.23	0.09	0.04	0.10	0.14	0.27	0.15	0.15
O68	0.16	0.16	0.13	0.07	0.16	0.08	0.07	0.13	0.21	0.31	0.15	0.17
O69	0.04	0.05	0.04	0.08	0.21	0.17	0.11	0.05	0.14	0.06	0.09	0.11
O70	0.11	0.19	0.18	0.20	0.34	0.22	0.21	0.10	0.22	0.20	0.20	0.20
O71	0.20	0.16	0.14	0.18	0.16	0.11	0.08	0.08	0.31	0.26	0.18	0.19
O72	0.03	0.04	0.17	0.25	0.30	0.23	0.13	0.09	0.22	0.22	0.18	0.20
O73	0.17	0.15	0.13	0.07	0.14	0.14	0.04	0.03	0.05	0.10	0.11	0.08
O74	0.16	0.17	0.16	0.11	0.15	0.11	0.15	0.08	0.16	0.16	0.14	0.13
O75	0.16	0.23	0.05	0.03	0.14	0.11	0.09	0.08	0.32	0.32	0.14	0.19
O76	0.15	0.12	0.19	0.25	0.42	0.23	0.02	0.07	0.07	0.13	0.20	0.15
O77	0.12	0.17	0.16	0.27	0.35	0.23	0.21	0.15	0.28	0.38	0.24	0.28
O78	0.08	0.21	0.15	0.31	0.27	0.19	0.24	0.21	0.34	0.38	0.24	0.29
O79	0.14	0.12	0.13	0.28	0.31	0.20	0.18	0.16	0.28	0.35	0.22	0.26
O80	0.13	0.06	0.13	0.33	0.40	0.22	0.19	0.19	0.26	0.28	0.23	0.26
O81	0.08	0.08	0.06	0.03	0.08	0.14	0.22	0.25	0.32	0.31	0.13	0.22
O82	0.07	0.08	0.13	0.10	0.05	0.04	0.04	0.08	0.03	0.15	0.09	0.08
O83	0.18	0.28	0.14	0.09	0.11	0.11	0.06	0.12	0.20	0.17	0.15	0.14
O84	0.02	0.01	0.19	0.11	0.07	0.12	0.16	0.12	0.18	0.27	0.12	0.16
O85	0.06	0.08	0.03	0.15	0.05	0.07	0.06	0.06	0.07	0.17	0.09	0.10
O86	0.03	0.03	0.18	0.04	0.04	0.07	0.05	0.12	0.16	0.17	0.09	0.11
O87	0.02	0.09	0.13	0.03	0.02	0.03	0.03	0.03	0.05	0.18	0.06	0.07
O88	0.06	0.08	0.26	0.06	0.06	0.11	0.06	0.03	0.05	0.11	0.09	0.07
O89	0.08	0.02	0.09	0.11	0.14	0.09	0.16	0.13	0.03	0.21	0.10	0.12
O90	0.15	0.11	0.05	0.14	0.19	0.16	0.15	0.03	0.24	0.24	0.14	0.17
O91	0.06	0.19	0.06	0.10	0.21	0.19	0.06	0.25	0.34	0.22	0.17	0.22
O92	0.04	0.16	0.04	0.12	0.34	0.14	0.29	0.24	0.21	0.22	0.16	0.22
O93	0.10	0.01	0.10	0.04	0.07	0.01	0.08	0.06	0.03	0.09	0.06	0.06
O94	0.11	0.04	0.16	0.13	0.35	0.30	0.34	0.23	0.03	0.08	0.16	0.17
O95	0.13	0.14	0.13	0.20	0.18	0.21	0.12	0.23	0.26	0.08	0.17	0.18
O96	0.10	0.10	0.18	0.16	0.37	0.34	0.25	0.10	0.06	0.02	0.16	0.14

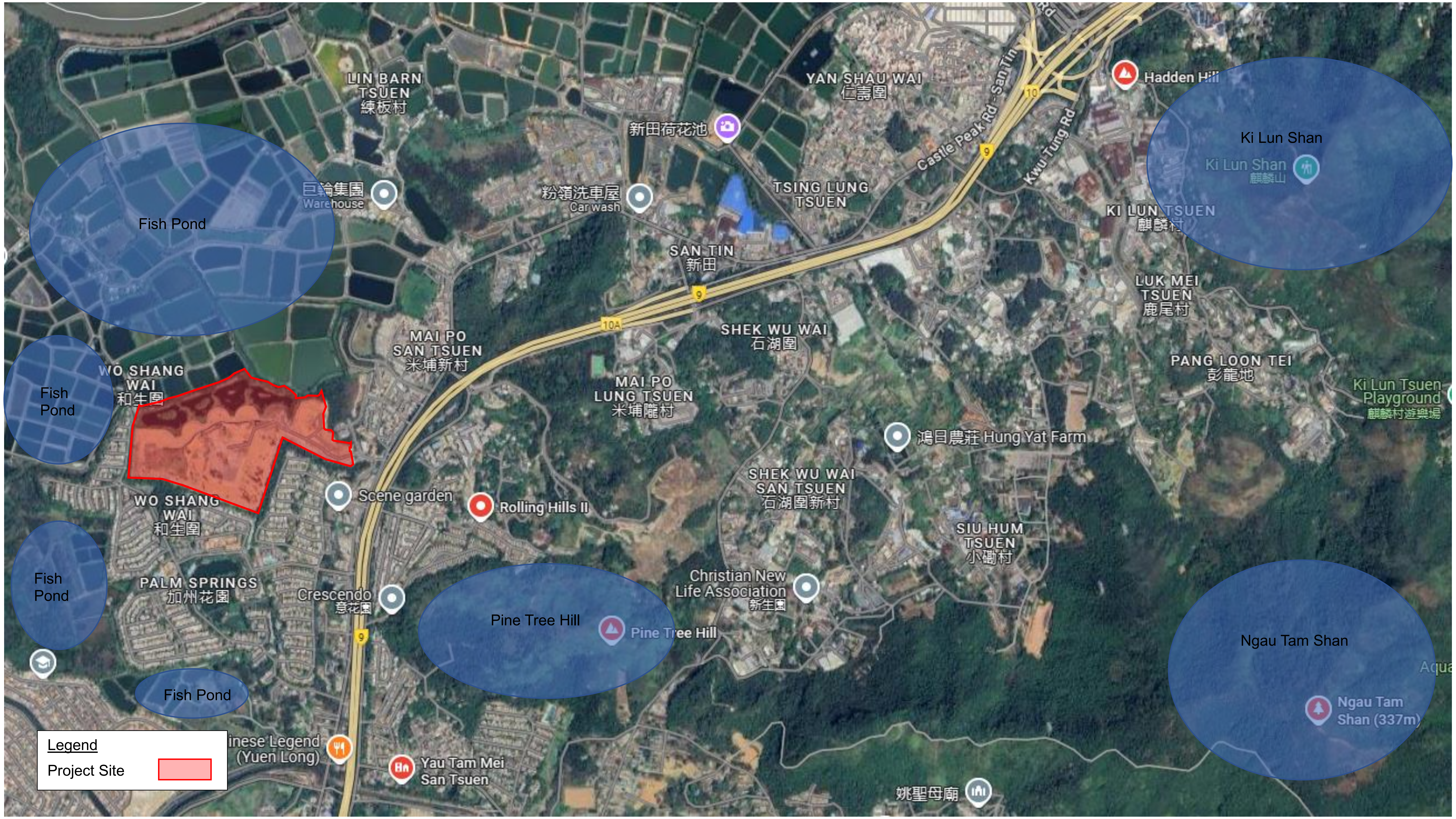
O97	0.14	0.18	0.12	0.21	0.33	0.18	0.23	0.11	0.09	0.05	0.17	0.14
O98	0.09	0.17	0.14	0.26	0.31	0.24	0.28	0.24	0.04	0.12	0.19	0.18
O99	0.12	0.02	0.06	0.16	0.18	0.16	0.16	0.11	0.19	0.09	0.12	0.15
O100	0.07	0.05	0.07	0.03	0.13	0.14	0.04	0.14	0.12	0.23	0.10	0.13
O101	0.20	0.08	0.04	0.04	0.16	0.16	0.17	0.11	0.13	0.13	0.10	0.13
O102	0.13	0.18	0.18	0.13	0.34	0.31	0.24	0.10	0.06	0.01	0.16	0.13
O103	0.10	0.15	0.10	0.26	0.35	0.22	0.24	0.13	0.10	0.08	0.18	0.17
O104	0.12	0.19	0.20	0.16	0.36	0.33	0.19	0.09	0.14	0.14	0.19	0.18
O105	0.07	0.04	0.10	0.14	0.21	0.03	0.06	0.02	0.22	0.10	0.11	0.12
O106	0.09	0.17	0.12	0.30	0.40	0.28	0.26	0.14	0.09	0.06	0.20	0.18
O107	0.08	0.05	0.08	0.20	0.19	0.09	0.10	0.10	0.06	0.04	0.11	0.10
O108	0.05	0.07	0.04	0.06	0.10	0.03	0.04	0.03	0.14	0.10	0.07	0.08
O109	0.07	0.10	0.07	0.15	0.14	0.07	0.05	0.03	0.14	0.10	0.10	0.10
O110	0.02	0.08	0.11	0.10	0.15	0.16	0.18	0.12	0.06	0.09	0.10	0.11
O111	0.04	0.07	0.05	0.07	0.07	0.03	0.06	0.28	0.32	0.26	0.12	0.20
O112	0.07	0.02	0.09	0.07	0.17	0.12	0.05	0.07	0.04	0.15	0.09	0.09
O113	0.24	0.06	0.11	0.12	0.21	0.15	0.17	0.27	0.31	0.32	0.18	0.24
O114	0.22	0.07	0.06	0.05	0.29	0.18	0.14	0.18	0.31	0.24	0.16	0.21
O115	0.22	0.06	0.04	0.09	0.06	0.08	0.07	0.04	0.03	0.05	0.07	0.06
O116	0.18	0.08	0.03	0.06	0.01	0.10	0.16	0.14	0.16	0.12	0.09	0.12
O117	0.19	0.06	0.03	0.03	0.05	0.04	0.04	0.04	0.05	0.09	0.06	0.05
O118	0.19	0.06	0.01	0.01	0.06	0.14	0.17	0.14	0.17	0.14	0.09	0.13
O119	0.01	0.07	0.14	0.08	0.10	0.18	0.21	0.19	0.35	0.16	0.13	0.20
O120	0.05	0.16	0.15	0.11	0.04	0.04	0.13	0.08	0.15	0.13	0.10	0.11
O121	0.26	0.29	0.17	0.05	0.10	0.02	0.03	0.20	0.27	0.14	0.16	0.14
O122	0.14	0.03	0.05	0.15	0.11	0.05	0.11	0.12	0.24	0.25	0.13	0.17
O123	0.13	0.08	0.12	0.15	0.10	0.12	0.02	0.25	0.18	0.16	0.14	0.15
O124	0.13	0.09	0.10	0.16	0.04	0.09	0.04	0.05	0.16	0.23	0.12	0.13
O125	0.28	0.31	0.34	0.26	0.16	0.09	0.05	0.20	0.14	0.28	0.24	0.18
O126	0.11	0.07	0.14	0.11	0.16	0.17	0.20	0.18	0.33	0.16	0.15	0.20
O127	0.19	0.08	0.13	0.09	0.07	0.10	0.26	0.24	0.35	0.20	0.15	0.21
O128	0.31	0.34	0.20	0.05	0.13	0.12	0.00	0.25	0.27	0.17	0.19	0.16
O129	0.19	0.07	0.05	0.03	0.09	0.10	0.08	0.24	0.09	0.14	0.09	0.12
O130	0.10	0.23	0.27	0.26	0.15	0.06	0.04	0.23	0.03	0.12	0.18	0.13
O131	0.12	0.08	0.22	0.21	0.09	0.02	0.01	0.10	0.13	0.30	0.15	0.14
O132	0.29	0.04	0.09	0.10	0.01	0.15	0.12	0.15	0.19	0.22	0.12	0.15
O133	0.23	0.16	0.11	0.12	0.12	0.03	0.15	0.16	0.17	0.25	0.14	0.16
O134	0.26	0.19	0.09	0.06	0.09	0.06	0.15	0.20	0.24	0.31	0.15	0.19
O135	0.35	0.23	0.13	0.09	0.05	0.11	0.14	0.21	0.29	0.37	0.18	0.22
O136	0.27	0.35	0.17	0.21	0.14	0.12	0.16	0.25	0.25	0.33	0.23	0.23
O137	0.30	0.19	0.03	0.16	0.16	0.02	0.20	0.19	0.19	0.30	0.17	0.19
O138	0.34	0.34	0.18	0.18	0.21	0.10	0.14	0.16	0.24	0.30	0.22	0.21
O139	0.32	0.19	0.13	0.14	0.04	0.09	0.13	0.22	0.25	0.34	0.18	0.21
O140	0.32	0.35	0.25	0.17	0.08	0.08	0.23	0.17	0.27	0.36	0.22	0.22
O141	0.22	0.10	0.07	0.22	0.15	0.08	0.07	0.23	0.26	0.35	0.18	0.22
O142	0.35	0.36	0.31	0.29	0.19	0.11	0.18	0.24	0.33	0.42	0.29	0.28
O143	0.28	0.28	0.28	0.32	0.17	0.09	0.03	0.26	0.10	0.21	0.24	0.17
O144	0.32	0.34	0.34	0.41	0.27	0.16	0.04	0.09	0.33	0.30	0.30	0.24
O145	0.34	0.35	0.34	0.33	0.30	0.19	0.10	0.23	0.28	0.42	0.31	0.28
O146	0.32	0.34	0.32	0.35	0.29	0.15	0.09	0.23	0.25	0.33	0.30	0.25

O147	0.32	0.34	0.32	0.31	0.30	0.21	0.18	0.22	0.14	0.27	0.28	0.23
O148	0.31	0.33	0.33	0.32	0.27	0.27	0.06	0.13	0.36	0.39	0.30	0.27
O149	0.31	0.33	0.37	0.38	0.28	0.16	0.17	0.19	0.23	0.34	0.30	0.25
O150	0.32	0.35	0.39	0.44	0.24	0.11	0.16	0.14	0.28	0.34	0.31	0.25
O151	0.34	0.35	0.30	0.33	0.30	0.24	0.18	0.21	0.16	0.29	0.29	0.24
O152	0.35	0.36	0.34	0.41	0.27	0.28	0.18	0.24	0.24	0.28	0.32	0.27
O153	0.30	0.32	0.36	0.30	0.27	0.26	0.02	0.08	0.31	0.40	0.29	0.25
O154	0.29	0.33	0.37	0.42	0.26	0.22	0.00	0.08	0.20	0.29	0.30	0.21
O155	0.32	0.33	0.29	0.37	0.19	0.27	0.02	0.10	0.37	0.40	0.30	0.27
O156	0.34	0.35	0.33	0.39	0.20	0.27	0.05	0.16	0.34	0.34	0.31	0.26
O157	0.31	0.33	0.34	0.34	0.18	0.26	0.05	0.05	0.34	0.42	0.29	0.25
O158	0.35	0.37	0.37	0.43	0.27	0.28	0.18	0.13	0.28	0.43	0.34	0.29
O159	0.33	0.35	0.31	0.39	0.23	0.19	0.18	0.15	0.24	0.42	0.30	0.27
O160	0.32	0.35	0.37	0.38	0.19	0.24	0.15	0.04	0.28	0.41	0.30	0.25
O161	0.29	0.33	0.38	0.33	0.19	0.23	0.12	0.09	0.17	0.35	0.27	0.21
O162	0.35	0.37	0.31	0.42	0.28	0.29	0.17	0.06	0.33	0.47	0.33	0.30
O163	0.35	0.37	0.35	0.37	0.27	0.29	0.19	0.05	0.38	0.46	0.33	0.30
O164	0.33	0.36	0.31	0.35	0.24	0.15	0.19	0.18	0.27	0.44	0.30	0.28
O165	0.34	0.36	0.35	0.37	0.32	0.20	0.20	0.20	0.32	0.48	0.34	0.32
O166	0.33	0.35	0.38	0.41	0.23	0.18	0.17	0.06	0.19	0.41	0.30	0.24
O167	0.33	0.35	0.40	0.34	0.26	0.23	0.15	0.05	0.12	0.39	0.29	0.22
O168	0.34	0.36	0.35	0.39	0.34	0.26	0.20	0.18	0.31	0.47	0.34	0.32
O169	0.32	0.35	0.39	0.41	0.22	0.13	0.14	0.03	0.15	0.41	0.29	0.22
O170	0.31	0.33	0.31	0.31	0.24	0.07	0.09	0.02	0.07	0.28	0.23	0.15
O171	0.27	0.32	0.40	0.22	0.10	0.02	0.05	0.06	0.17	0.12	0.20	0.11
O172	0.28	0.30	0.29	0.21	0.23	0.41	0.25	0.23	0.16	0.14	0.25	0.21
O173	0.33	0.32	0.38	0.31	0.21	0.27	0.15	0.28	0.27	0.28	0.30	0.26
O174	0.34	0.36	0.34	0.38	0.24	0.19	0.17	0.03	0.20	0.42	0.29	0.24
O175	0.33	0.35	0.37	0.33	0.36	0.47	0.30	0.13	0.13	0.42	0.32	0.28
O176	0.30	0.30	0.30	0.32	0.16	0.11	0.10	0.13	0.05	0.26	0.23	0.16
O177	0.33	0.35	0.39	0.35	0.37	0.47	0.31	0.16	0.11	0.37	0.33	0.28
P1	0.19	0.17	0.33	0.38	0.13	0.24	0.31	0.21	0.13	0.17	0.24	0.21
P2	0.20	0.11	0.10	0.21	0.29	0.23	0.26	0.20	0.12	0.06	0.17	0.17
P3	0.12	0.05	0.14	0.45	0.23	0.12	0.23	0.16	0.12	0.14	0.20	0.19
P4	0.15	0.17	0.09	0.35	0.06	0.10	0.25	0.16	0.10	0.12	0.17	0.15
P5	0.24	0.28	0.10	0.08	0.19	0.27	0.18	0.10	0.06	0.07	0.15	0.12
P6	0.30	0.32	0.03	0.08	0.21	0.29	0.22	0.13	0.31	0.26	0.19	0.22
P7	0.31	0.31	0.07	0.04	0.22	0.33	0.29	0.24	0.30	0.25	0.20	0.25
P8	0.41	0.35	0.22	0.16	0.14	0.18	0.26	0.32	0.39	0.35	0.26	0.29
P9	0.26	0.22	0.30	0.25	0.13	0.13	0.11	0.18	0.28	0.37	0.24	0.23
P10	0.09	0.13	0.16	0.15	0.12	0.15	0.22	0.03	0.08	0.15	0.12	0.12
P11	0.15	0.03	0.19	0.25	0.22	0.14	0.09	0.08	0.13	0.10	0.16	0.13
P12	0.30	0.15	0.20	0.28	0.14	0.09	0.17	0.21	0.08	0.20	0.19	0.17
P13	0.17	0.11	0.07	0.27	0.09	0.12	0.24	0.18	0.32	0.17	0.17	0.21
P14	0.21	0.17	0.08	0.23	0.13	0.21	0.15	0.14	0.30	0.18	0.19	0.20
P15	0.16	0.17	0.12	0.15	0.11	0.23	0.32	0.30	0.20	0.32	0.18	0.24
P16	0.11	0.23	0.16	0.02	0.33	0.27	0.28	0.24	0.22	0.33	0.19	0.25
P17	0.14	0.15	0.11	0.06	0.39	0.31	0.29	0.24	0.21	0.37	0.20	0.27
P18	0.17	0.27	0.19	0.11	0.30	0.30	0.30	0.22	0.13	0.38	0.22	0.25
P19	0.18	0.32	0.35	0.26	0.37	0.24	0.16	0.25	0.25	0.30	0.28	0.26

P20	0.20	0.11	0.32	0.19	0.19	0.05	0.08	0.16	0.13	0.19	0.18	0.15
P21	0.15	0.34	0.21	0.23	0.22	0.25	0.20	0.26	0.34	0.29	0.25	0.27
P22	0.13	0.32	0.30	0.22	0.17	0.05	0.03	0.13	0.29	0.26	0.22	0.19
P23	0.02	0.23	0.16	0.20	0.17	0.12	0.04	0.16	0.31	0.37	0.19	0.23
P24	0.07	0.19	0.05	0.17	0.19	0.13	0.30	0.14	0.24	0.19	0.15	0.20
P25	0.10	0.16	0.04	0.09	0.14	0.12	0.25	0.12	0.18	0.12	0.12	0.15
P26	0.02	0.09	0.03	0.03	0.10	0.09	0.13	0.05	0.13	0.12	0.07	0.10
P27	0.07	0.04	0.14	0.20	0.10	0.12	0.16	0.10	0.32	0.12	0.14	0.17
P28	0.10	0.09	0.12	0.01	0.13	0.17	0.22	0.18	0.24	0.10	0.11	0.16
P29	0.05	0.04	0.03	0.07	0.18	0.16	0.16	0.17	0.26	0.12	0.11	0.17
P30	0.13	0.13	0.16	0.20	0.29	0.22	0.25	0.24	0.26	0.10	0.19	0.22
P31	0.09	0.05	0.06	0.03	0.05	0.03	0.20	0.21	0.06	0.17	0.07	0.12
P32	0.08	0.04	0.09	0.09	0.08	0.07	0.23	0.22	0.23	0.21	0.12	0.18
P33	0.05	0.04	0.05	0.02	0.09	0.11	0.09	0.27	0.35	0.21	0.11	0.20
P34	0.35	0.36	0.34	0.18	0.13	0.09	0.09	0.27	0.28	0.22	0.24	0.20
P35	0.29	0.36	0.36	0.32	0.19	0.09	0.02	0.21	0.07	0.15	0.25	0.14
P36	0.29	0.30	0.33	0.35	0.19	0.10	0.07	0.22	0.06	0.25	0.25	0.17
P37	0.31	0.32	0.36	0.40	0.21	0.12	0.12	0.14	0.29	0.30	0.29	0.24
P38	0.31	0.34	0.37	0.42	0.23	0.11	0.16	0.12	0.22	0.29	0.29	0.22
P39	0.32	0.35	0.38	0.44	0.25	0.16	0.11	0.07	0.20	0.28	0.30	0.21
P40	0.29	0.32	0.35	0.42	0.25	0.22	0.04	0.09	0.17	0.29	0.29	0.21
P41	0.28	0.33	0.37	0.40	0.26	0.26	0.07	0.06	0.16	0.33	0.29	0.21
P42	0.29	0.33	0.38	0.35	0.19	0.23	0.12	0.10	0.16	0.35	0.28	0.22
P43	0.31	0.35	0.40	0.31	0.10	0.25	0.16	0.06	0.14	0.37	0.27	0.20
P44	0.32	0.35	0.40	0.32	0.23	0.26	0.15	0.07	0.12	0.37	0.28	0.21
P45	0.31	0.34	0.32	0.32	0.15	0.25	0.14	0.06	0.10	0.28	0.25	0.18
P46	0.30	0.29	0.32	0.33	0.14	0.20	0.09	0.04	0.08	0.25	0.23	0.15
P47	0.30	0.32	0.36	0.32	0.15	0.05	0.08	0.05	0.02	0.22	0.22	0.12
P48	0.29	0.34	0.41	0.29	0.12	0.05	0.09	0.07	0.07	0.13	0.22	0.11
P49	0.22	0.28	0.40	0.20	0.04	0.04	0.06	0.03	0.16	0.12	0.18	0.10
P50	0.16	0.21	0.36	0.08	0.12	0.07	0.06	0.06	0.15	0.18	0.15	0.11
S1	0.37	0.35	0.07	0.05	0.20	0.32	0.30	0.18	0.28	0.36	0.21	0.25
S2	0.44	0.43	0.25	0.24	0.06	0.15	0.22	0.07	0.14	0.09	0.22	0.13
S3	0.14	0.04	0.06	0.26	0.22	0.16	0.17	0.14	0.15	0.09	0.15	0.15
S4	0.28	0.04	0.01	0.28	0.15	0.16	0.35	0.15	0.18	0.15	0.16	0.19
S5	0.18	0.05	0.13	0.25	0.17	0.17	0.28	0.20	0.19	0.18	0.18	0.20
S6	0.20	0.09	0.10	0.01	0.15	0.09	0.15	0.11	0.33	0.22	0.13	0.18
S7	0.34	0.12	0.02	0.07	0.14	0.15	0.07	0.06	0.26	0.26	0.14	0.16
S8	0.37	0.28	0.16	0.19	0.11	0.14	0.20	0.13	0.35	0.22	0.21	0.21
S9	0.25	0.18	0.10	0.24	0.13	0.20	0.18	0.14	0.25	0.19	0.19	0.19
S10	0.12	0.05	0.04	0.02	0.20	0.19	0.17	0.05	0.06	0.09	0.08	0.10
S11	0.13	0.08	0.09	0.03	0.15	0.04	0.05	0.04	0.01	0.10	0.07	0.06
S12	0.13	0.11	0.22	0.05	0.08	0.02	0.05	0.06	0.03	0.02	0.08	0.04
S13	0.07	0.18	0.10	0.02	0.04	0.04	0.05	0.04	0.05	0.06	0.06	0.04
S14	0.04	0.05	0.06	0.07	0.05	0.03	0.04	0.01	0.02	0.05	0.05	0.04
S15	0.10	0.14	0.10	0.05	0.06	0.08	0.03	0.06	0.07	0.20	0.09	0.09
S16	0.19	0.20	0.18	0.14	0.03	0.08	0.01	0.18	0.22	0.24	0.16	0.15
S17	0.05	0.15	0.07	0.04	0.09	0.12	0.08	0.14	0.14	0.17	0.10	0.12
S18	0.05	0.04	0.09	0.05	0.02	0.09	0.11	0.06	0.09	0.05	0.06	0.07
S19	0.10	0.24	0.07	0.30	0.25	0.22	0.05	0.05	0.04	0.14	0.18	0.13

S20	0.15	0.14	0.10	0.29	0.16	0.11	0.19	0.12	0.09	0.15	0.17	0.15
S21	0.22	0.17	0.11	0.17	0.14	0.21	0.18	0.08	0.02	0.14	0.14	0.12
S22	0.25	0.22	0.12	0.15	0.25	0.26	0.16	0.14	0.12	0.05	0.17	0.14
S23	0.26	0.19	0.28	0.08	0.06	0.08	0.01	0.16	0.05	0.01	0.13	0.06
S24	0.09	0.10	0.17	0.22	0.14	0.26	0.28	0.27	0.19	0.10	0.18	0.20
S25	0.08	0.22	0.06	0.06	0.11	0.15	0.17	0.15	0.18	0.12	0.12	0.14
S26	0.20	0.35	0.08	0.18	0.10	0.07	0.09	0.20	0.21	0.15	0.17	0.16
S27	0.21	0.32	0.09	0.04	0.22	0.30	0.13	0.14	0.05	0.08	0.15	0.12
S28	0.13	0.09	0.17	0.03	0.24	0.16	0.17	0.16	0.07	0.15	0.12	0.13
S29	0.08	0.06	0.17	0.03	0.09	0.24	0.09	0.14	0.19	0.27	0.12	0.17
S30	0.07	0.11	0.16	0.02	0.09	0.10	0.11	0.18	0.30	0.35	0.13	0.20
S31	0.13	0.17	0.23	0.19	0.12	0.08	0.09	0.17	0.20	0.24	0.17	0.17
S32	0.12	0.10	0.09	0.04	0.06	0.09	0.15	0.26	0.21	0.19	0.11	0.16

Appendix E – Bird View of the Topography Surrounding Project Site



Fish Pond
Fish Pond
Fish Pond
Fish Pond
Pine Tree Hill
Ki Lun Shan
Ngau Tam Shan
Legend
Project Site
LIN BARN TSUEN 練板村
YAN SHAU WAI 仁壽圍
新田荷花池
巨輪集團 Warehouse
粉嶺洗車屋 Car wash
TSING LUNG TSUEN
SAN TIN 新田
Hadden Hill
Ki Lun Shan 麒麟山
KI LUN TSUEN 麒麟村
LUK MEI TSUEN 鹿尾村
Castle Peak Rd - San Tin
Kwu Tung Rd
MAI PO SAN TSUEN 米埔新村
SHEK WU WAI 石湖圍
PANG LOON TEI 彭龍地
Ki Lun Tsuen Playground 麒麟村遊樂場
WO SHANG WAI 和生圍
MAI PO LUNG TSUEN 米埔隴村
鴻日農莊 Hung Yat Farm
Scene garden
Rolling Hills II
SHEK WU WAI SAN TSUEN 石湖圍新村
SIU HUM TSUEN 小磡村
WO SHANG WAI 和生圍
PALM SPRINGS 加州花園
Crescendo 意花園
Christian New Life Association 新生園
Pine Tree Hill
Ngau Tam Shan (337m)
Chinese Legend (Yuen Long)
Yau Tam Mei San Tsuen
姚聖母廟

Appendix F – VR Contour and Vector plots of the Whole Computational Domain (Baseline Scheme & Proposed Scheme)

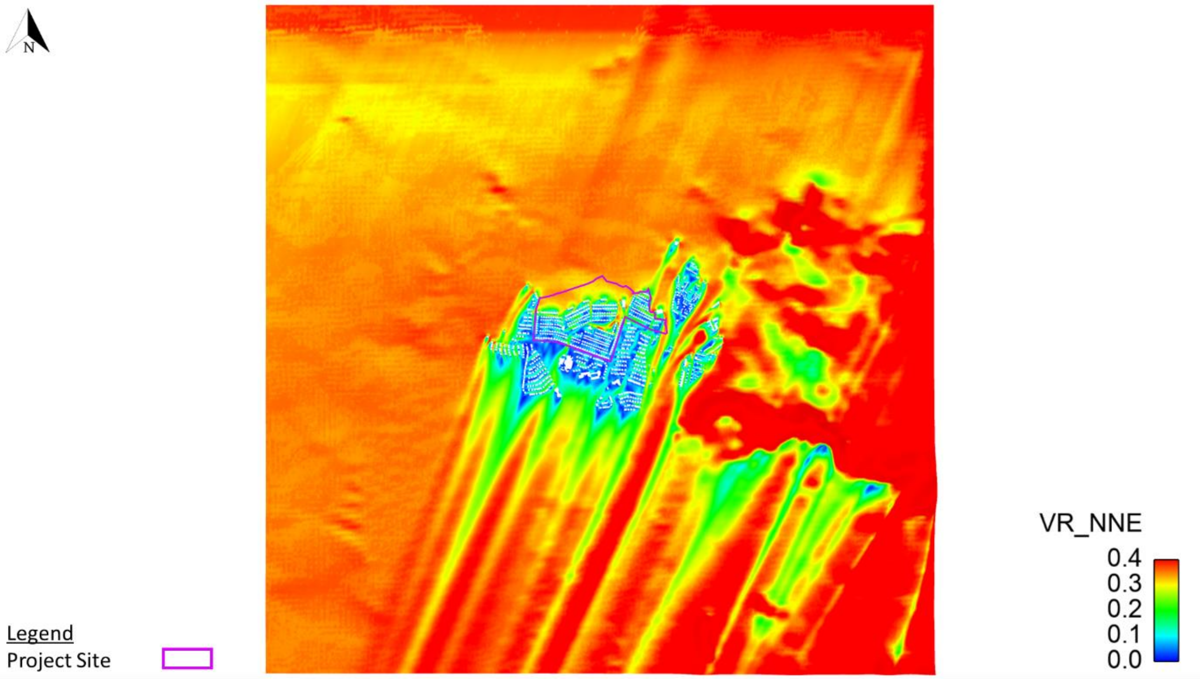


Figure 1 VR Contour Plot of Whole Domain at Pedestrian Level under NNE Wind for Baseline Scheme

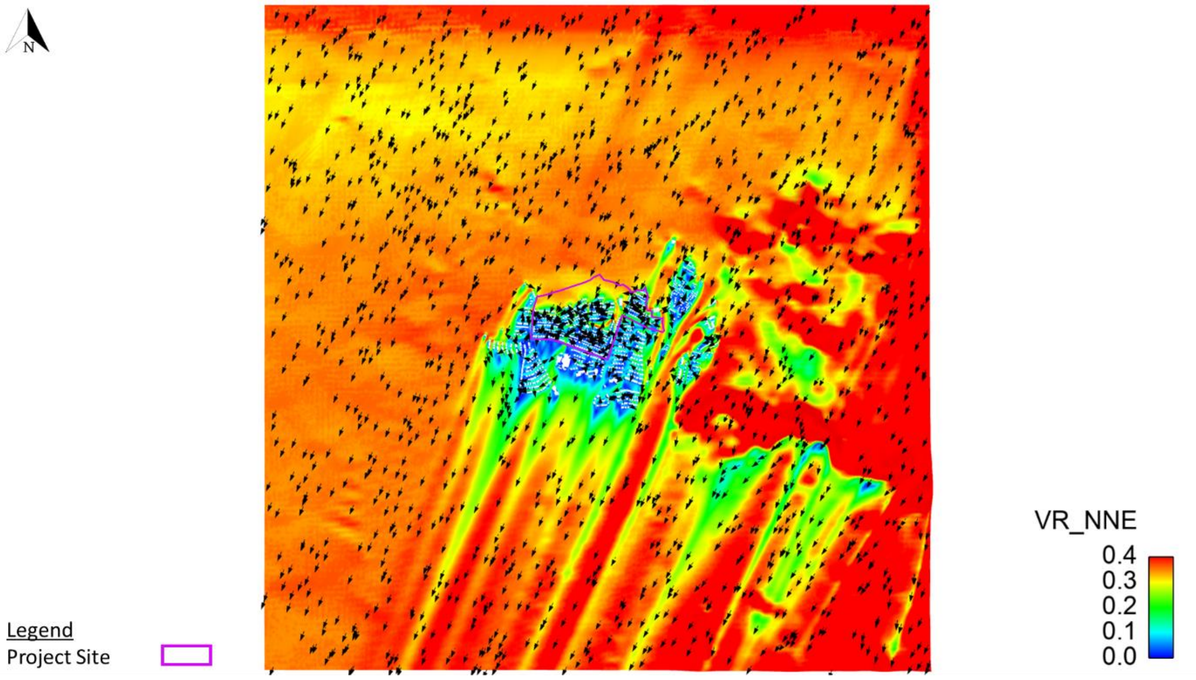


Figure 2 VR Vector Plot of Whole Domain at Pedestrian Level under NNE Wind for Baseline Scheme

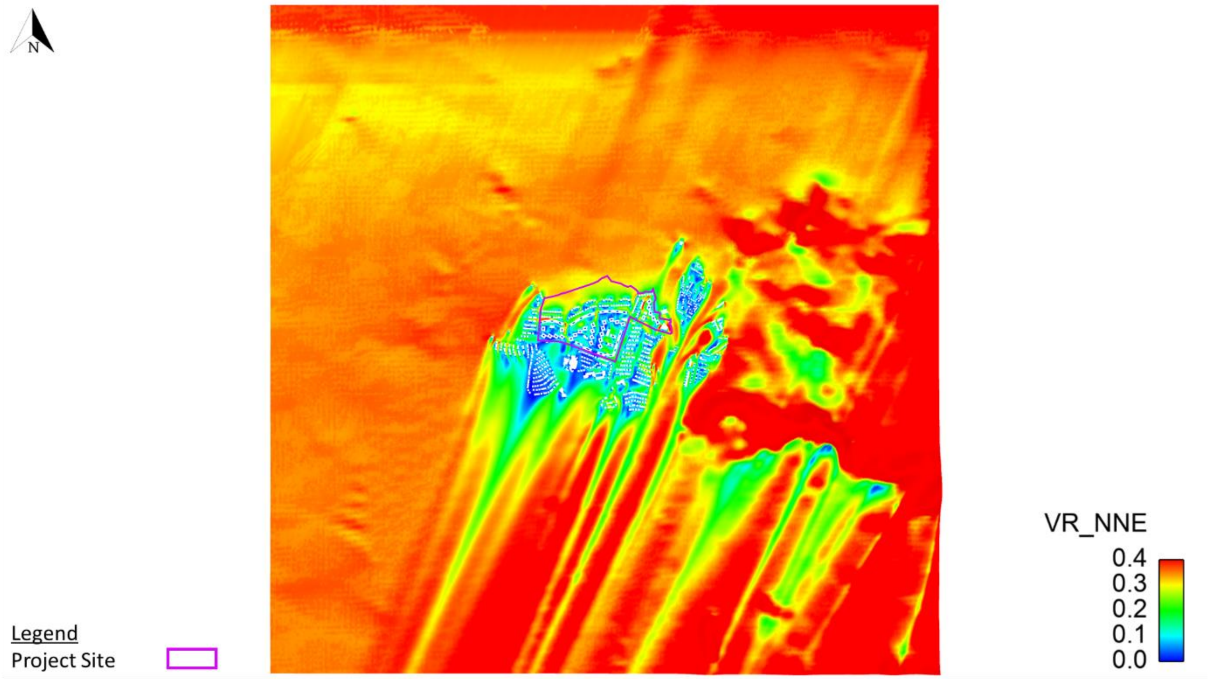


Figure 3 VR Contour Plot of Whole Domain at Pedestrian Level under NNE Wind for Proposed Scheme

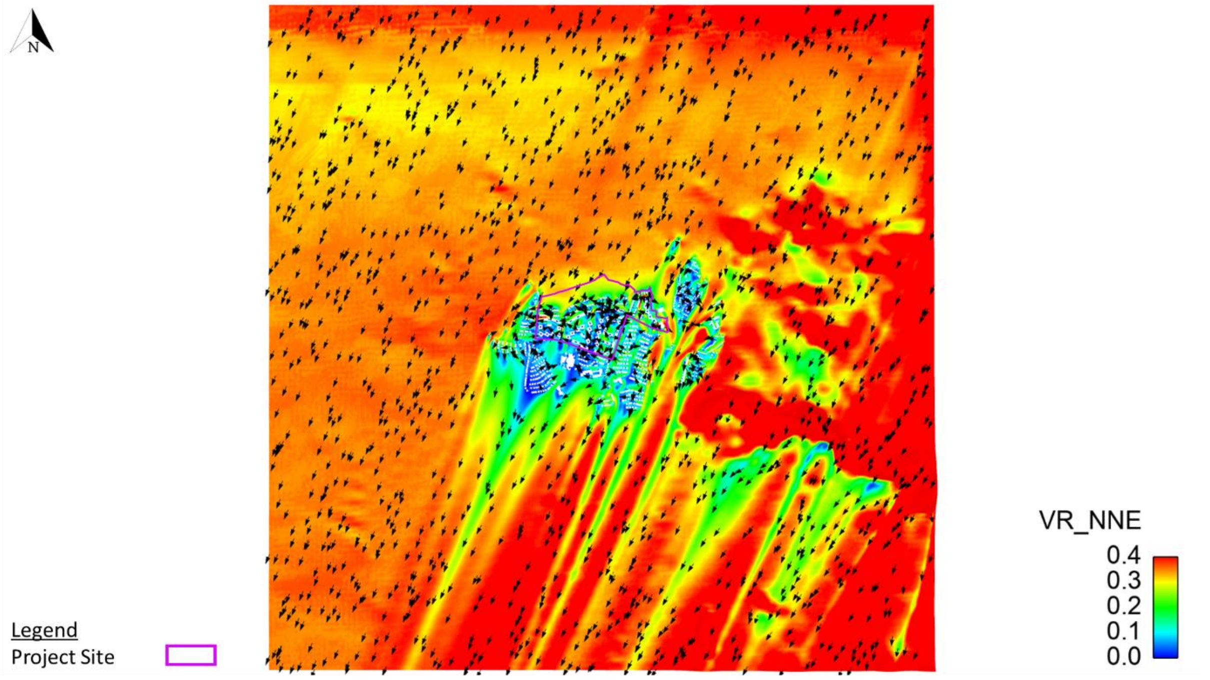


Figure 4 VR Vector Plot of Whole Domain at Pedestrian Level under NNE Wind for Proposed Scheme

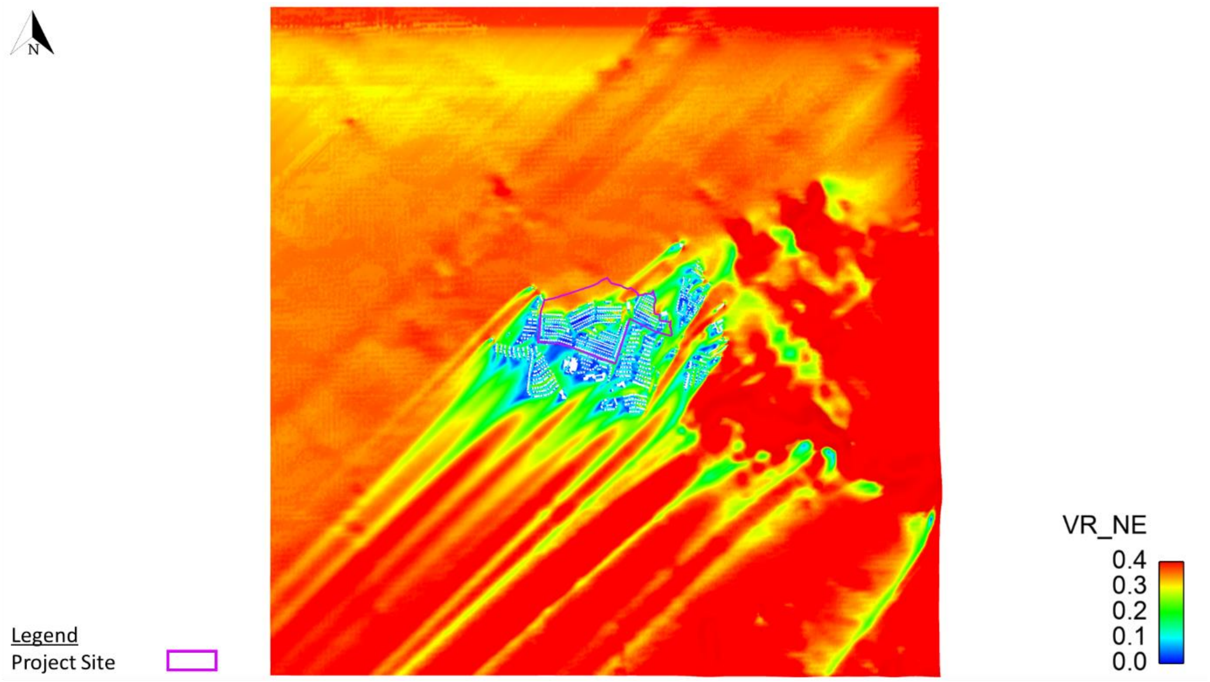


Figure 5 VR Contour Plot of Whole Domain at Pedestrian Level under NE Wind for Baseline Scheme

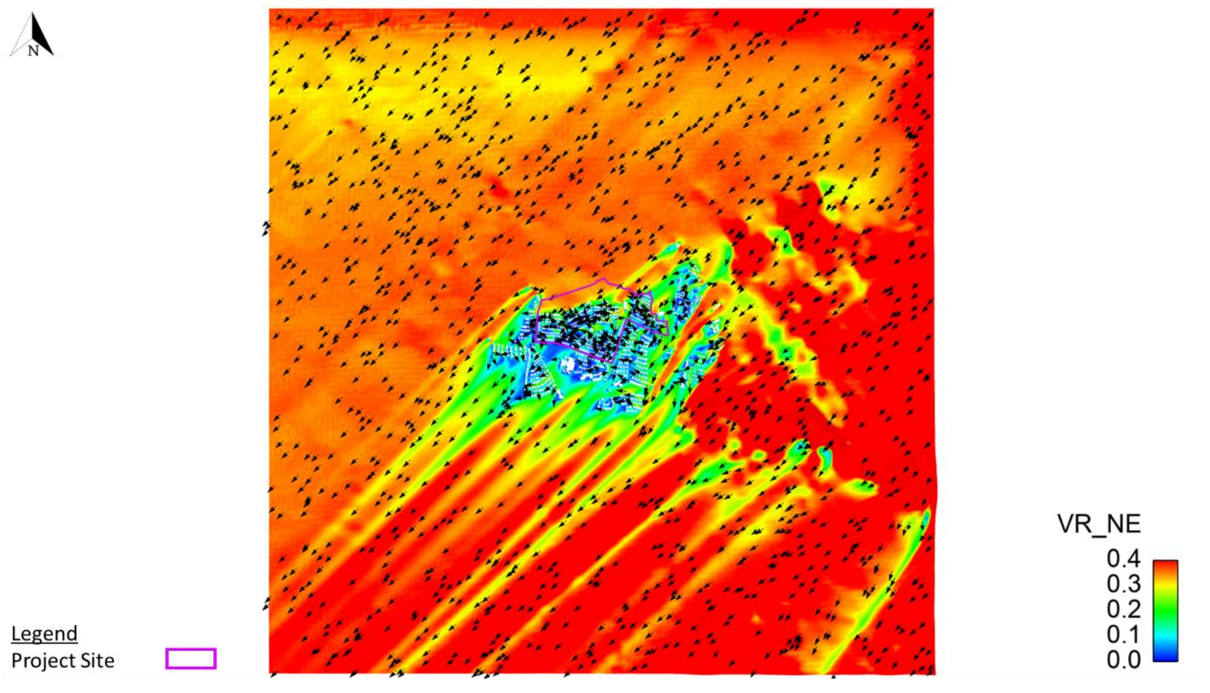


Figure 6 VR Vector Plot of Whole Domain at Pedestrian Level under NE Wind for Baseline Scheme

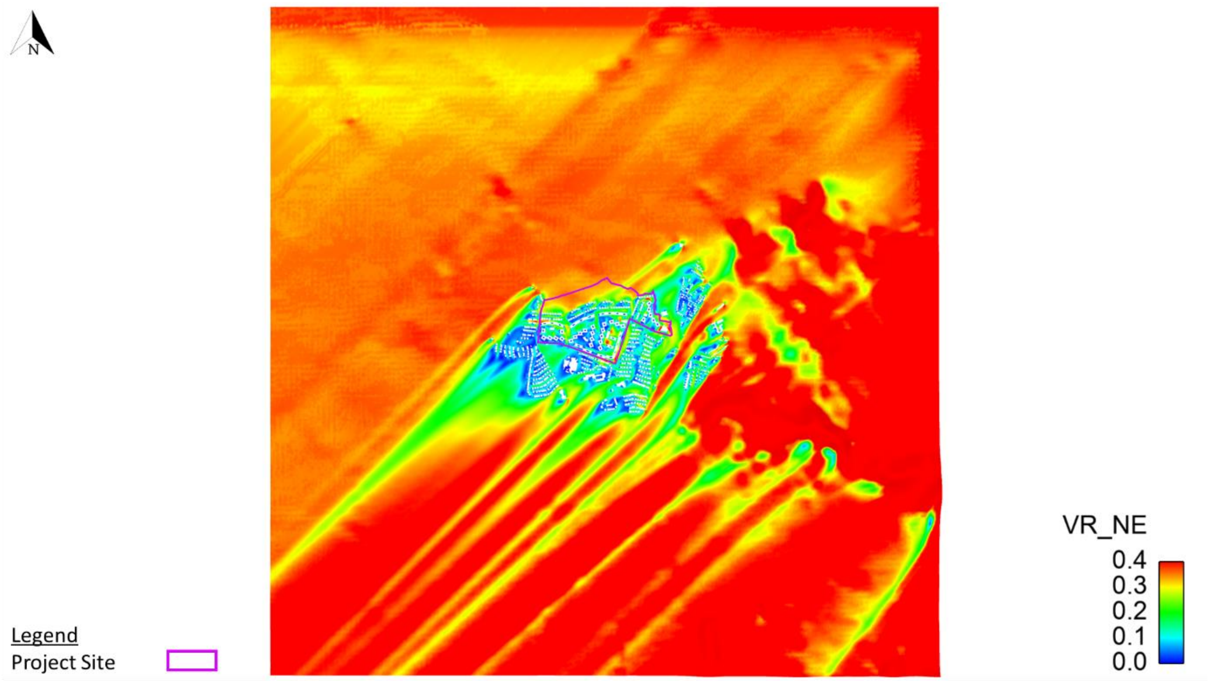


Figure 7 VR Contour Plot of Whole Domain at Pedestrian Level under NE Wind for Proposed Scheme

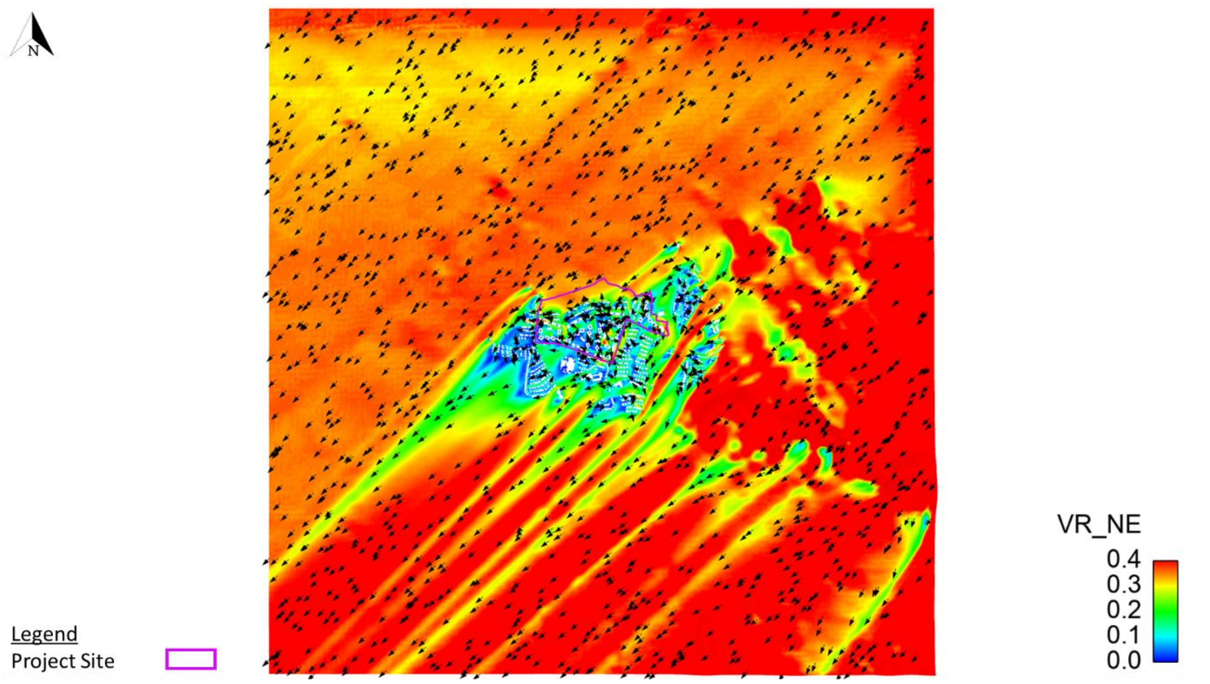


Figure 8 VR Vector Plot of Whole Domain at Pedestrian Level under NE Wind for Proposed Scheme

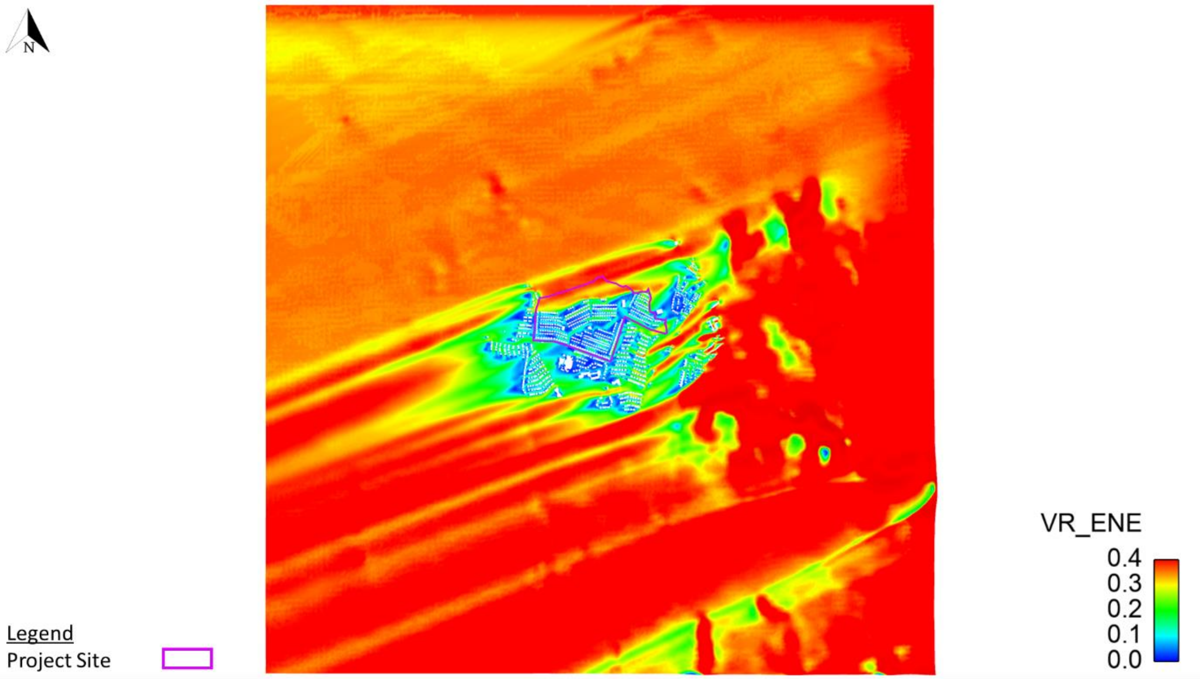


Figure 9 VR Contour Plot of Whole Domain at Pedestrian Level under ENE Wind for Baseline Scheme

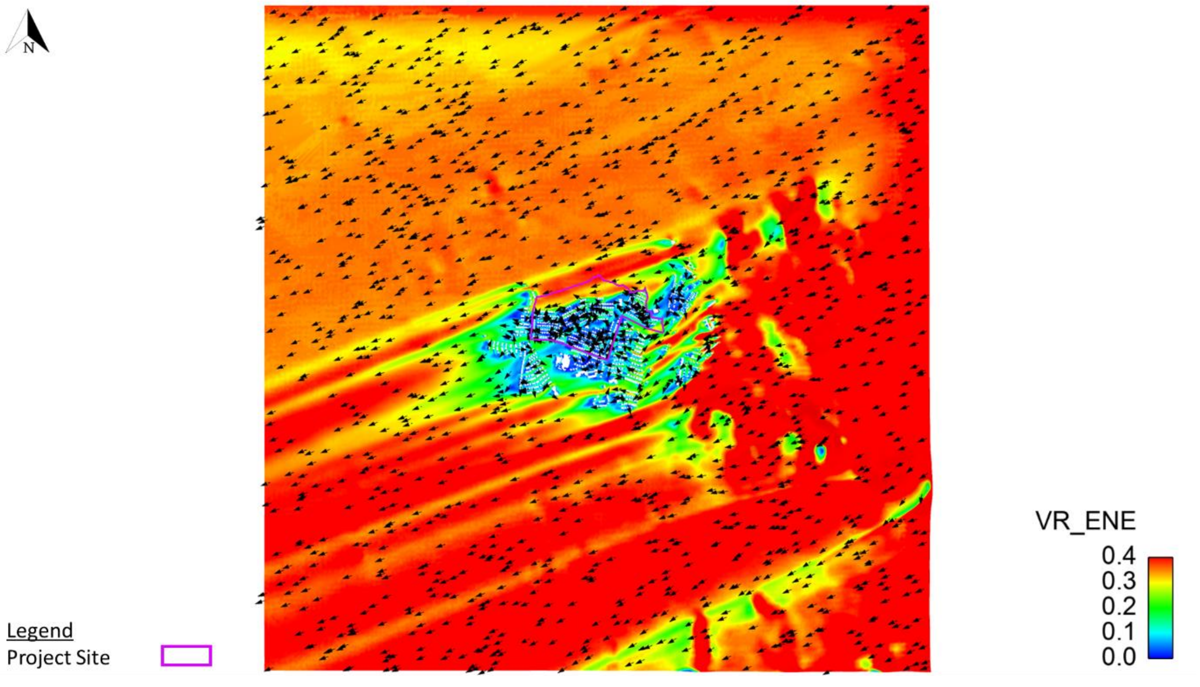


Figure 10 VR Vector Plot of Whole Domain at Pedestrian Level under ENE Wind for Baseline Scheme

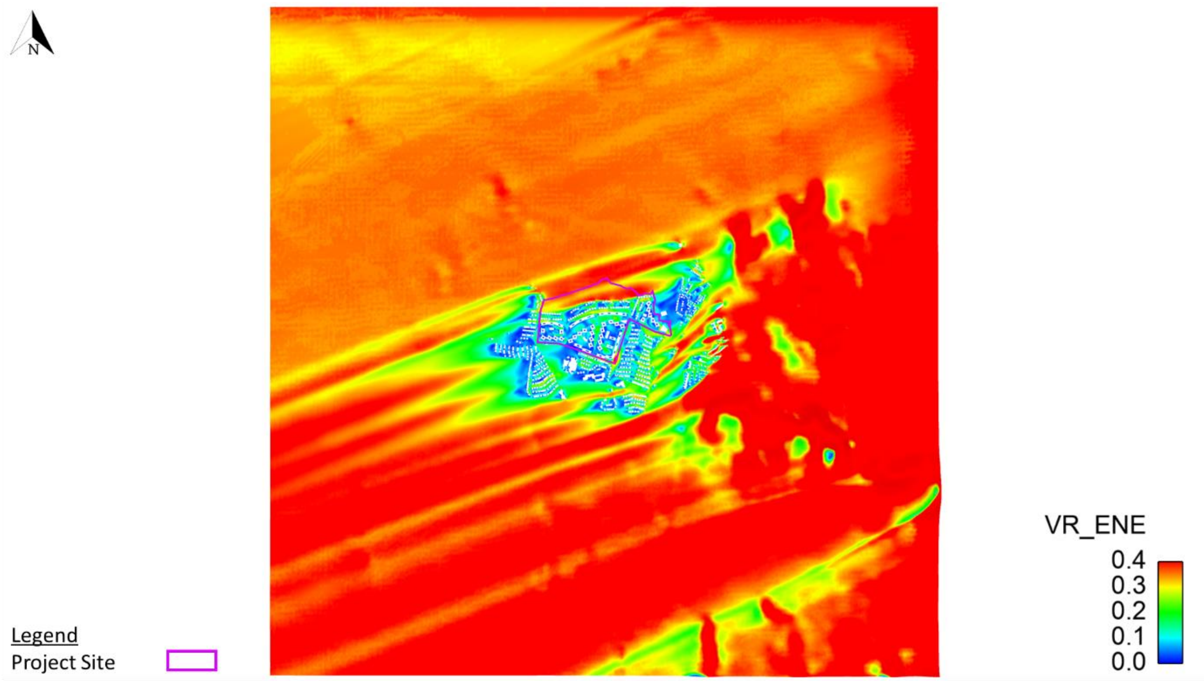


Figure 11 VR Contour Plot of Whole Domain at Pedestrian Level under ENE Wind for Proposed Scheme

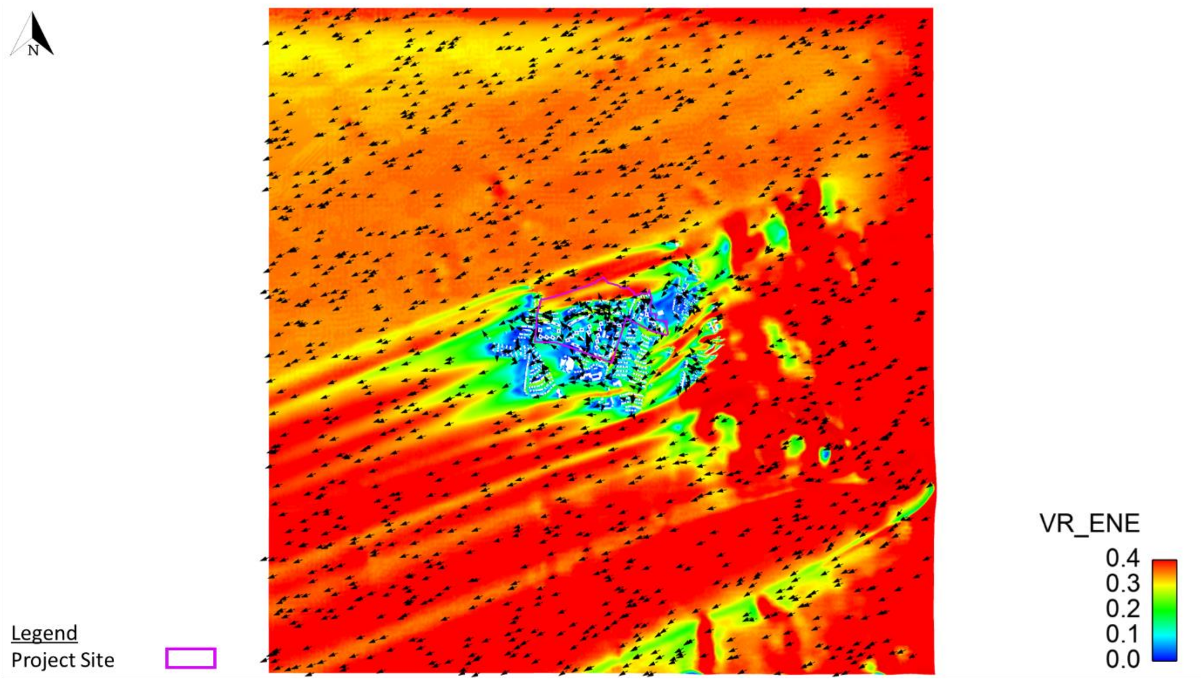


Figure 12 VR Vector Plot of Whole Domain at Pedestrian Level under ENE Wind for Proposed Scheme

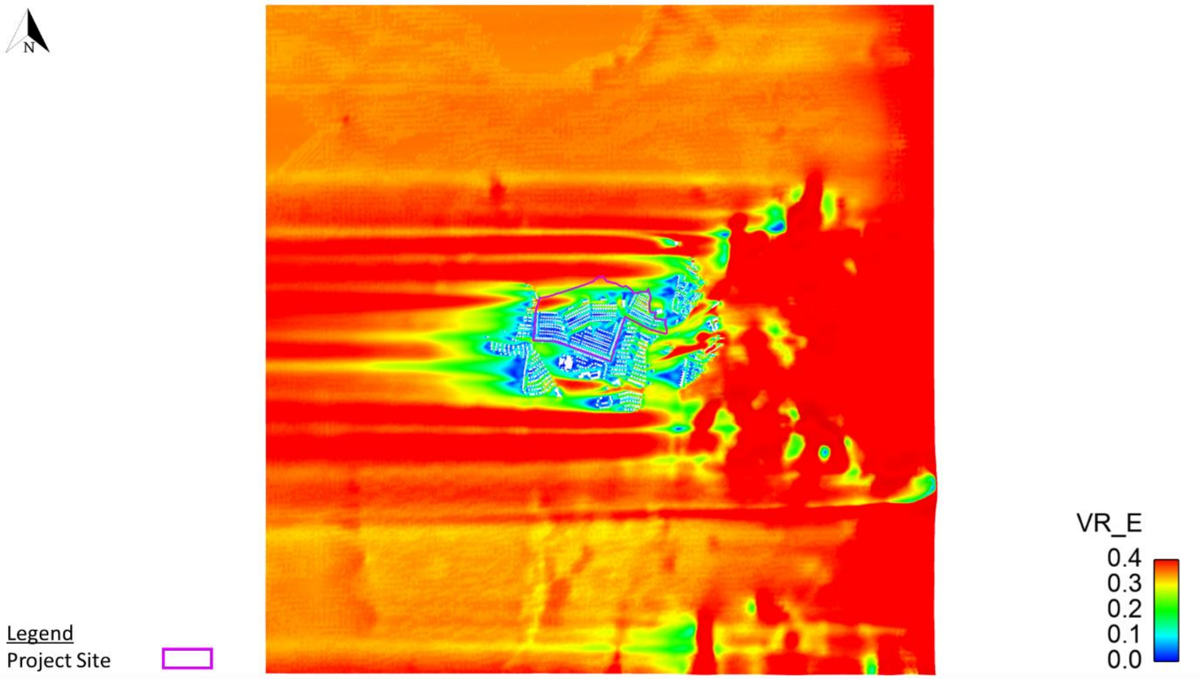


Figure 13 VR Contour Plot of Whole Domain at Pedestrian Level under E Wind for Baseline Scheme

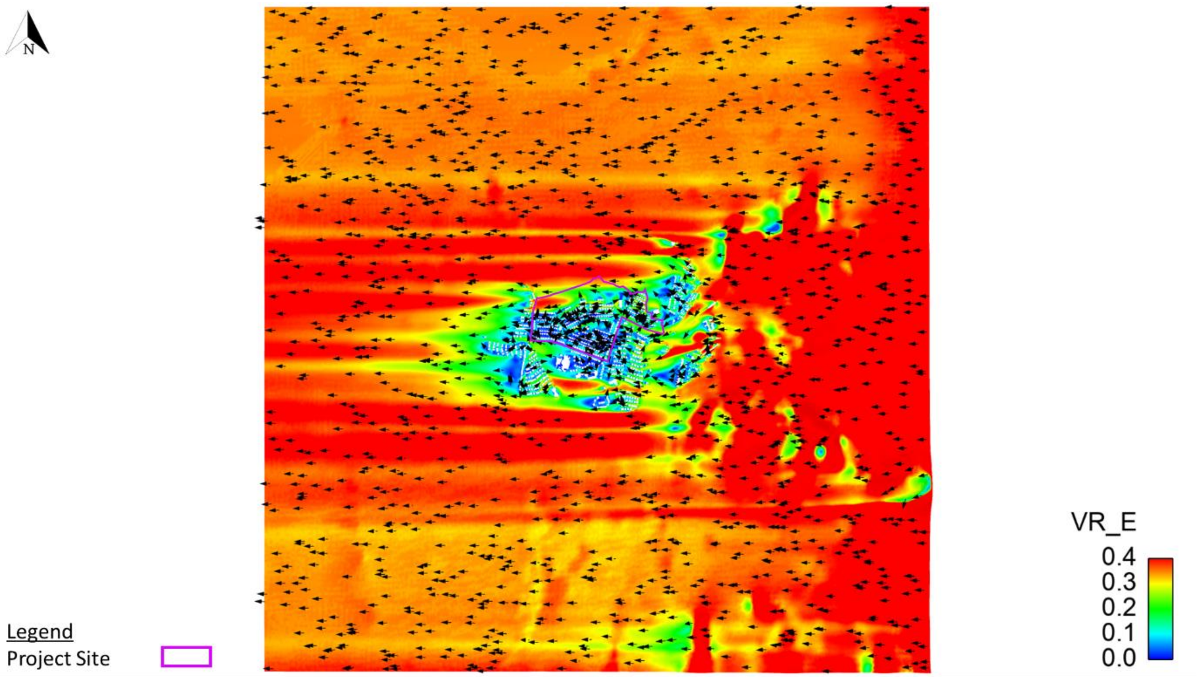


Figure 14 VR Vector Plot of Whole Domain at Pedestrian Level under E Wind for Baseline Scheme

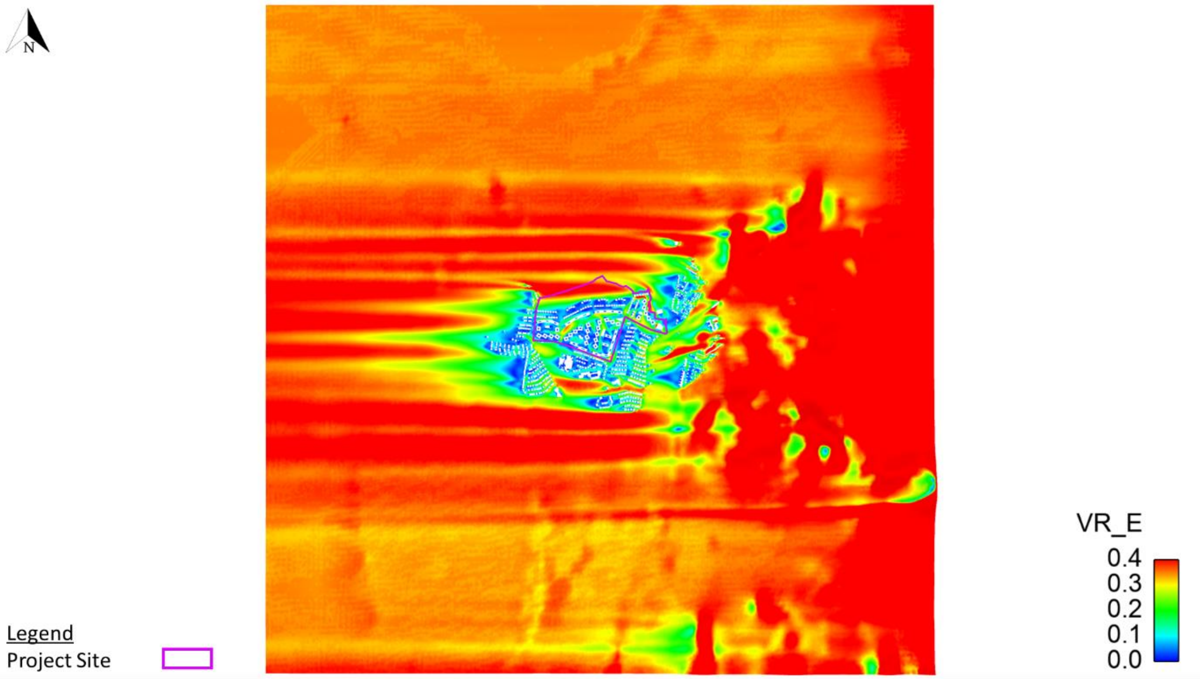


Figure 15 VR Contour Plot of Whole Domain at Pedestrian Level under E Wind for Proposed Scheme

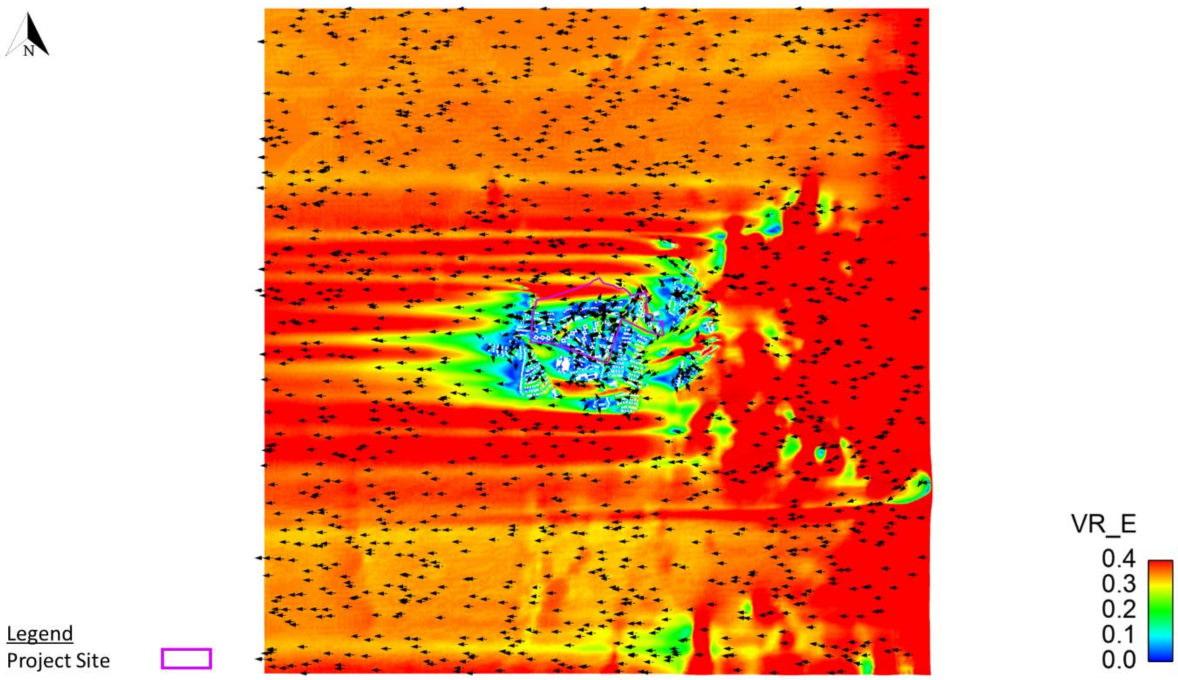


Figure 16 VR Vector Plot of Whole Domain at Pedestrian Level under E Wind for Proposed Scheme

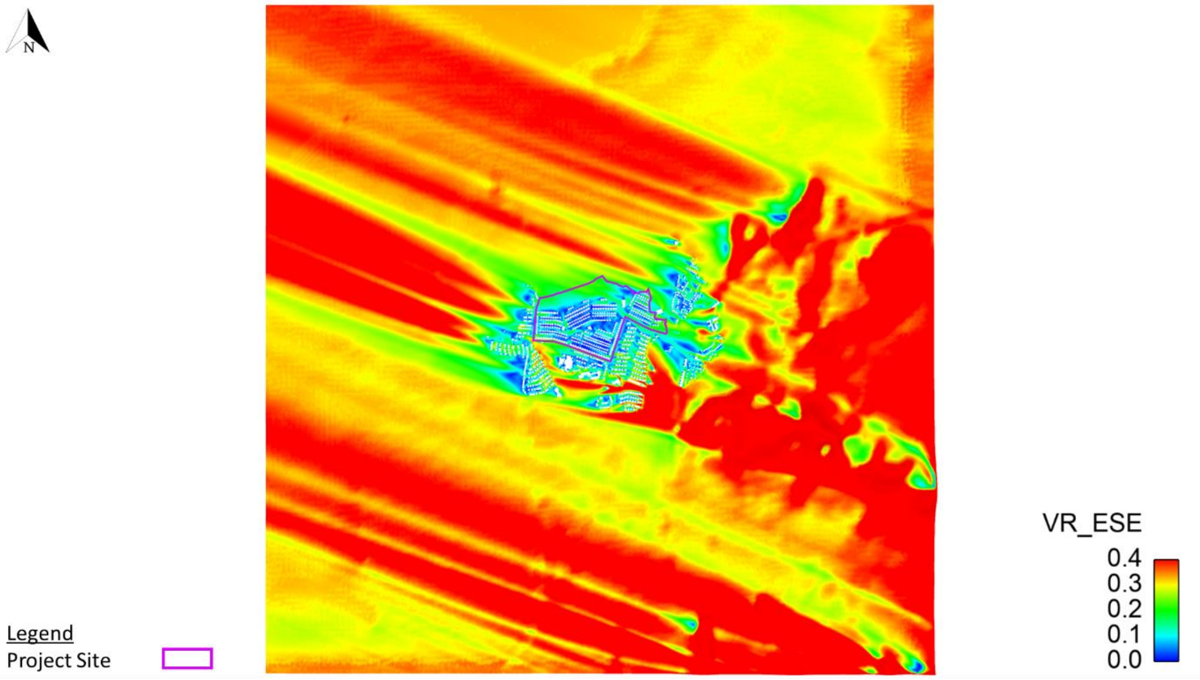


Figure 17 VR Contour Plot of Whole Domain at Pedestrian Level under ESE Wind for Baseline Scheme

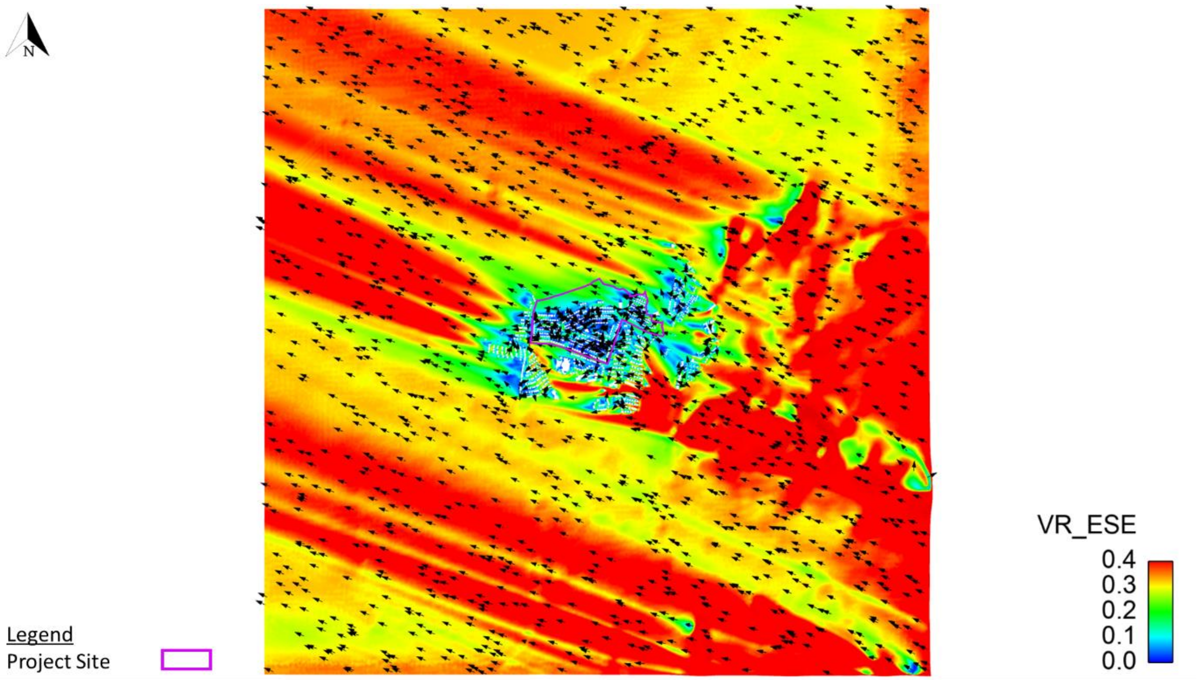


Figure 18 VR Vector Plot of Whole Domain at Pedestrian Level under ESE Wind for Baseline Scheme

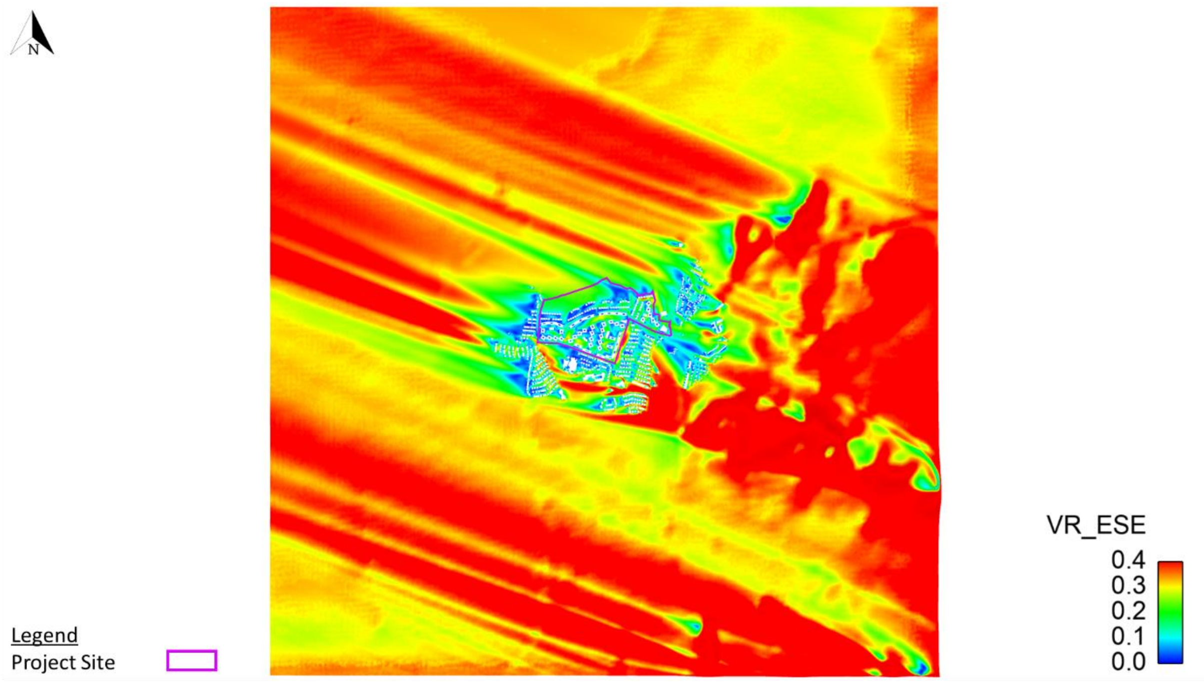


Figure 19 VR Contour Plot of Whole Domain at Pedestrian Level under ESE Wind for Proposed Scheme

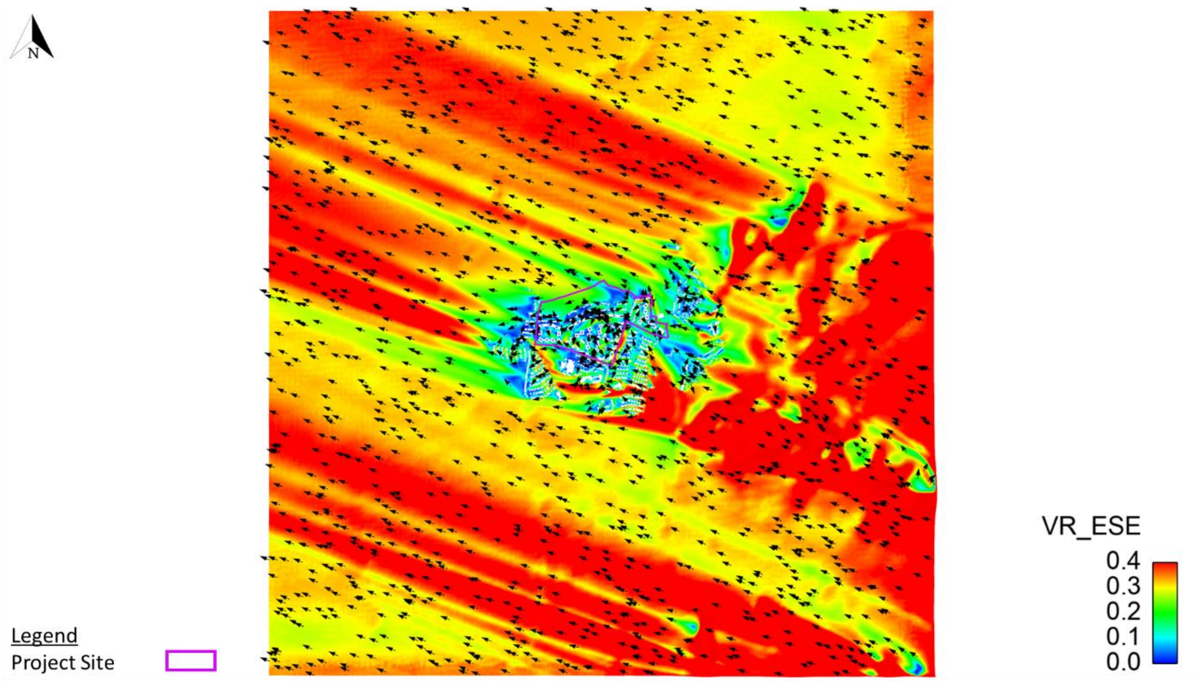


Figure 20 VR Vector Plot of Whole Domain at Pedestrian Level under ESE Wind for Proposed Scheme

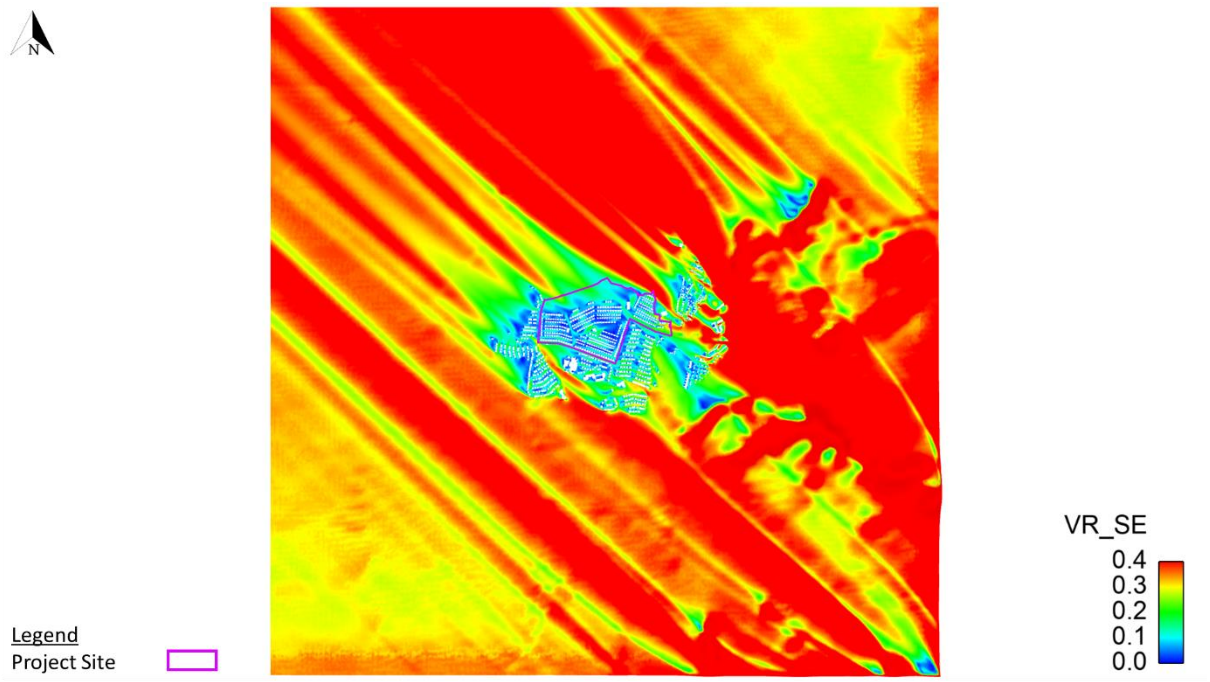


Figure 21 VR Contour Plot of Whole Domain at Pedestrian Level under SE Wind for Baseline Scheme

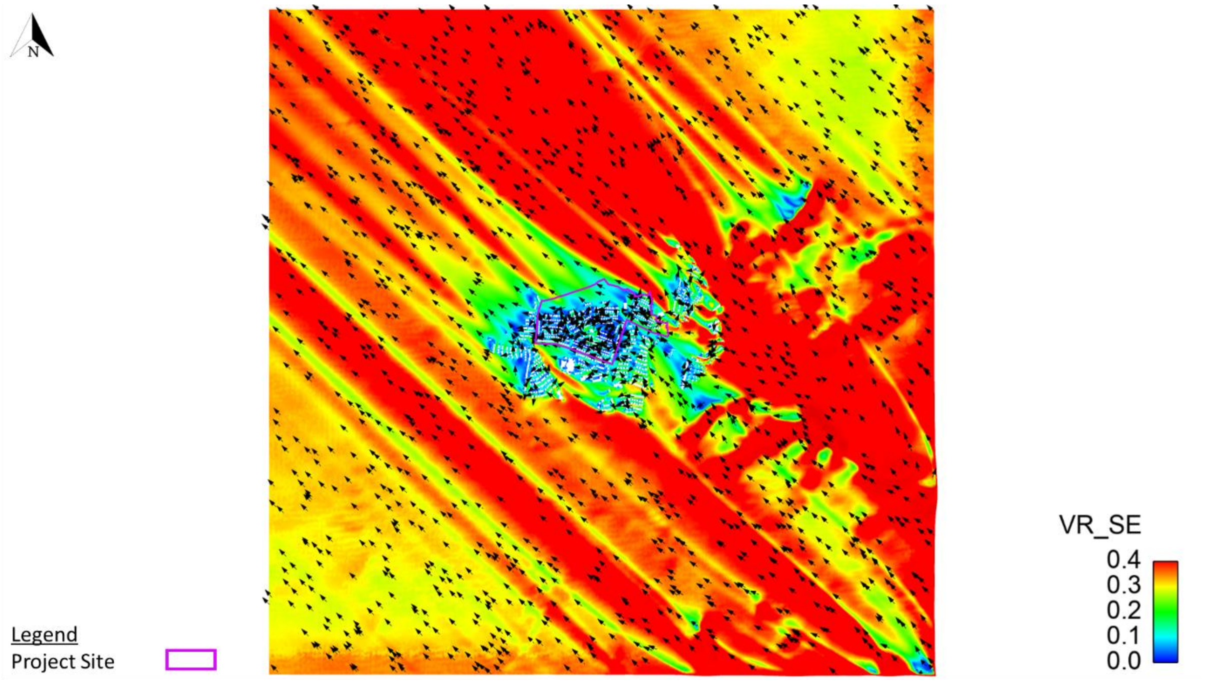


Figure 22 VR Vector Plot of Whole Domain at Pedestrian Level under SE Wind for Baseline Scheme

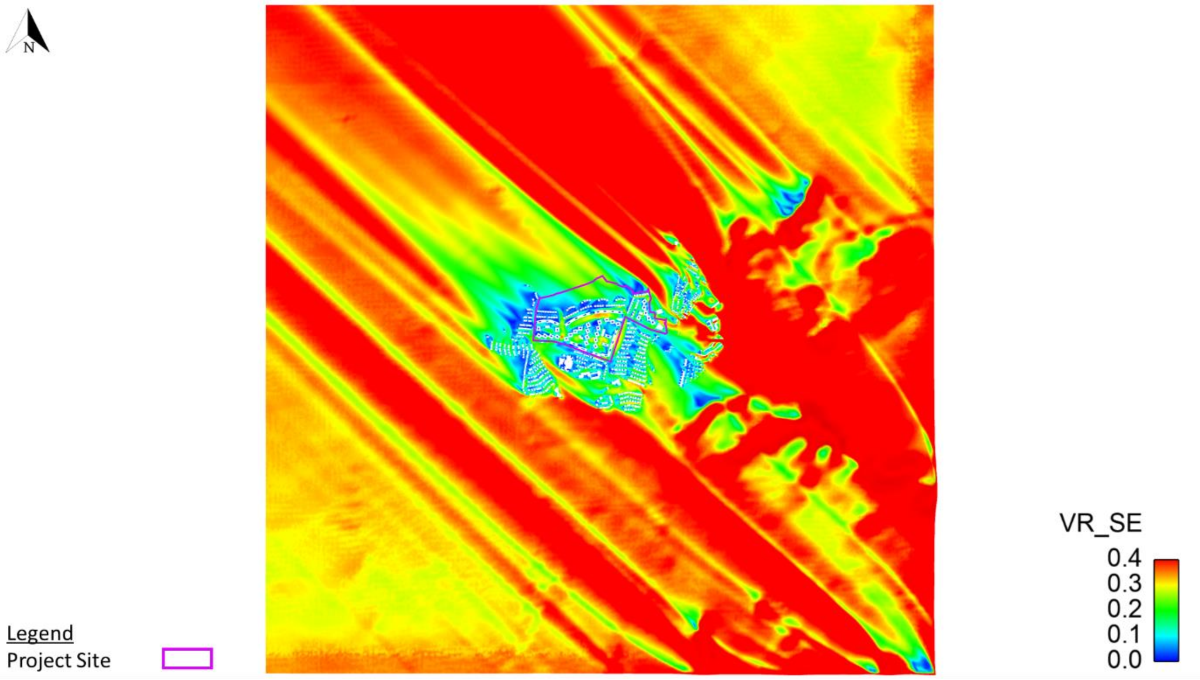


Figure 23 VR Contour Plot of Whole Domain at Pedestrian Level under SE Wind for Proposed Scheme

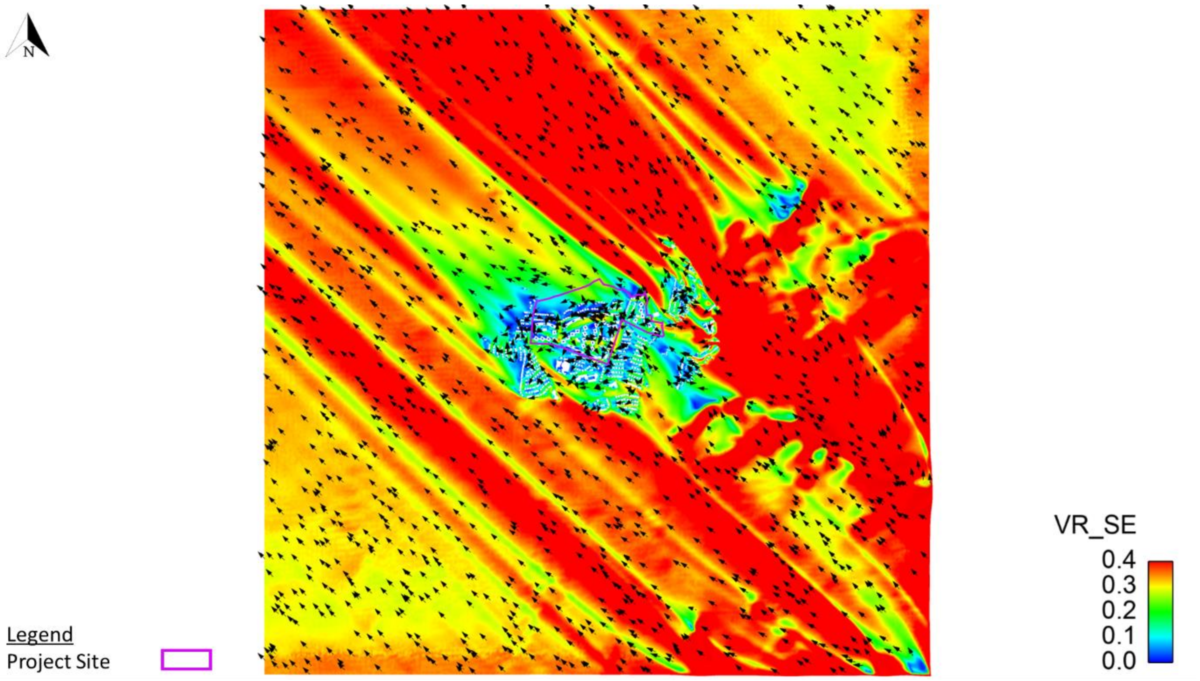


Figure 24 VR Vector Plot of Whole Domain at Pedestrian Level under SE Wind for Proposed Scheme

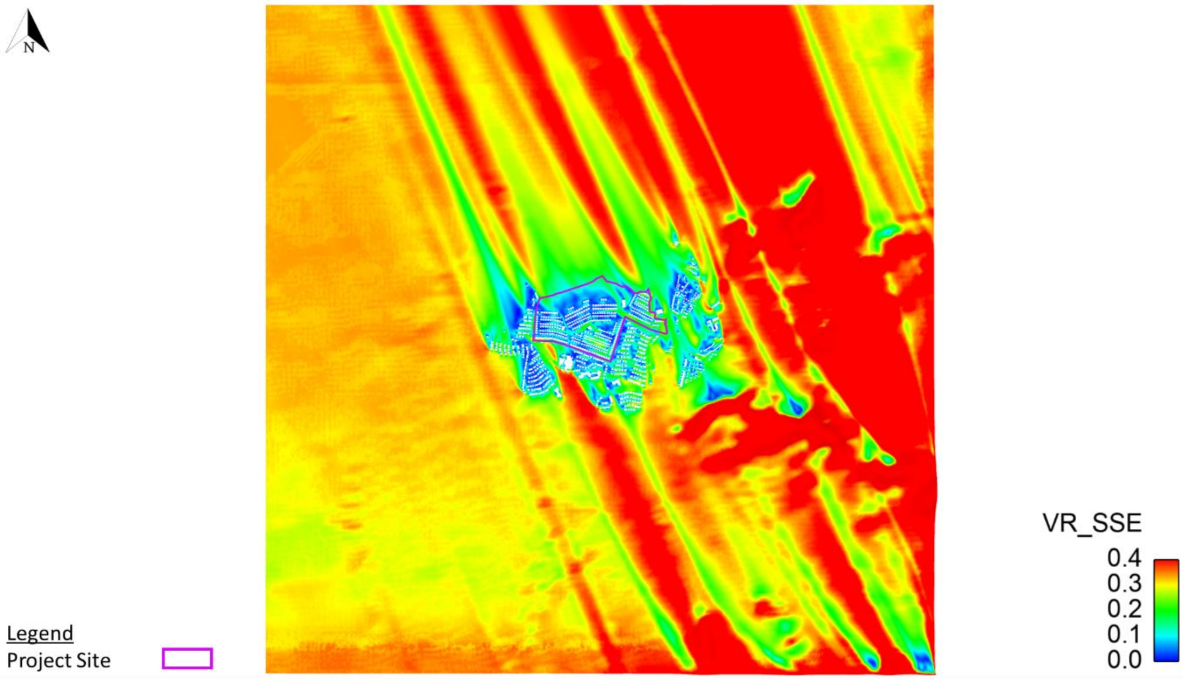


Figure 25 VR Contour Plot of Whole Domain at Pedestrian Level under SSE Wind for Baseline Scheme

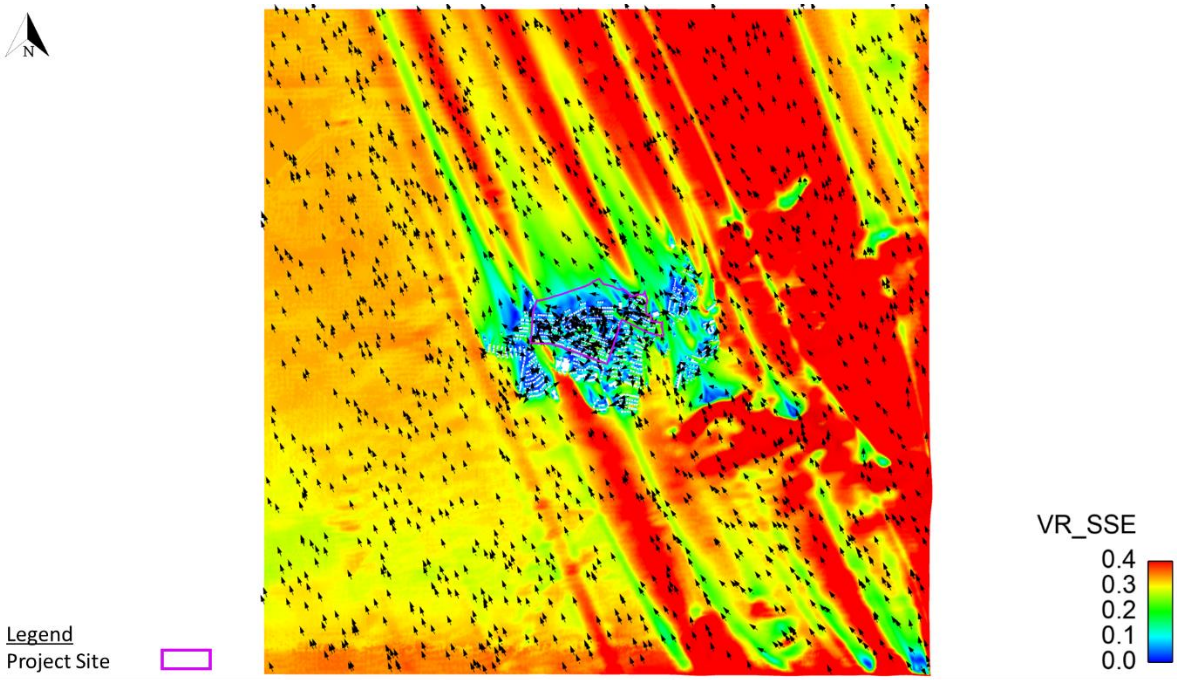


Figure 26 VR Vector Plot of Whole Domain at Pedestrian Level under SSE Wind for Baseline Scheme

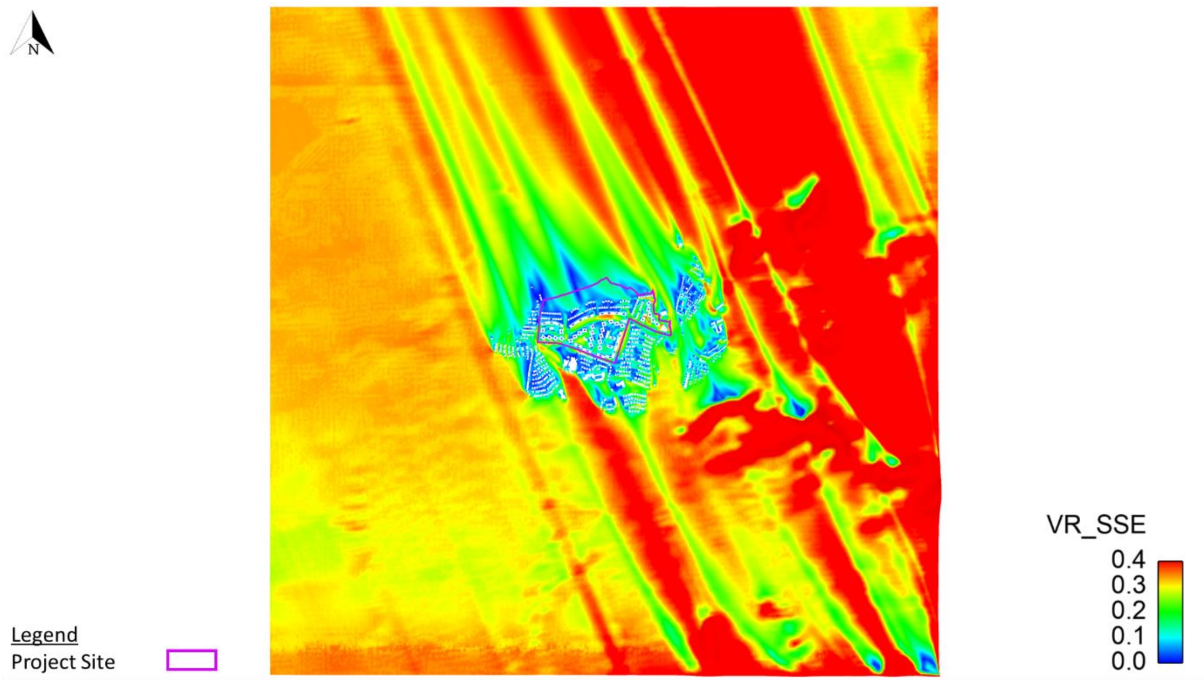


Figure 27 VR Contour Plot of Whole Domain at Pedestrian Level under SSE Wind for Proposed Scheme

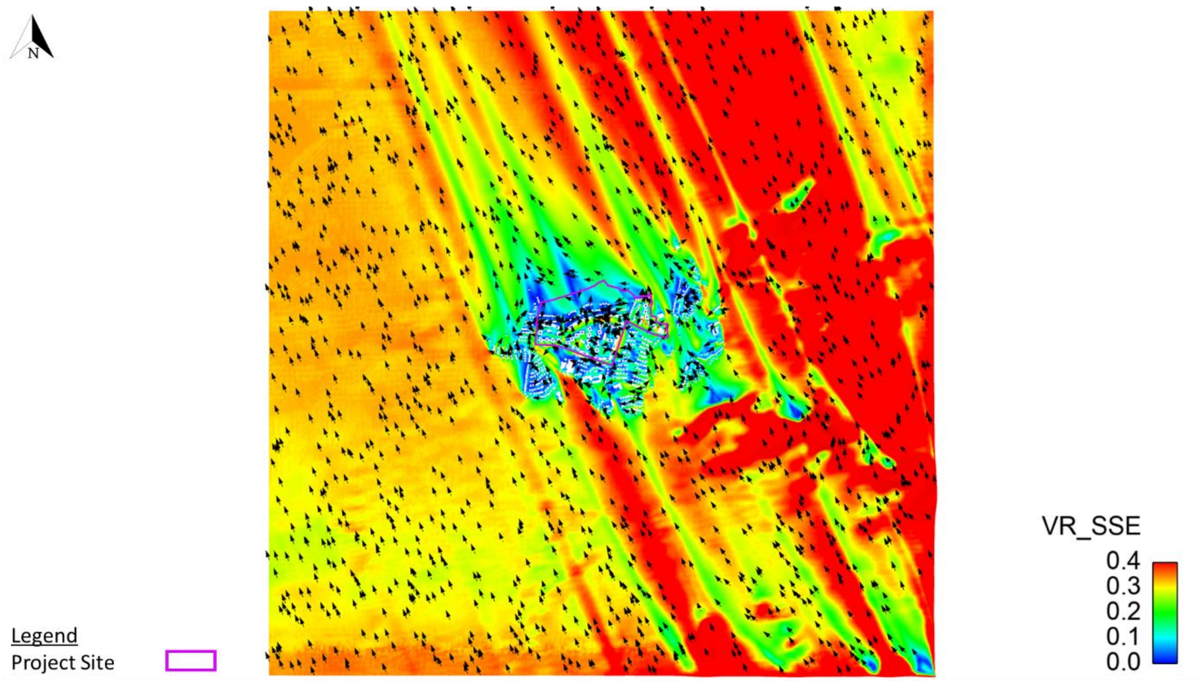


Figure 28 VR Vector Plot of Whole Domain at Pedestrian Level under SSE Wind for Proposed Scheme

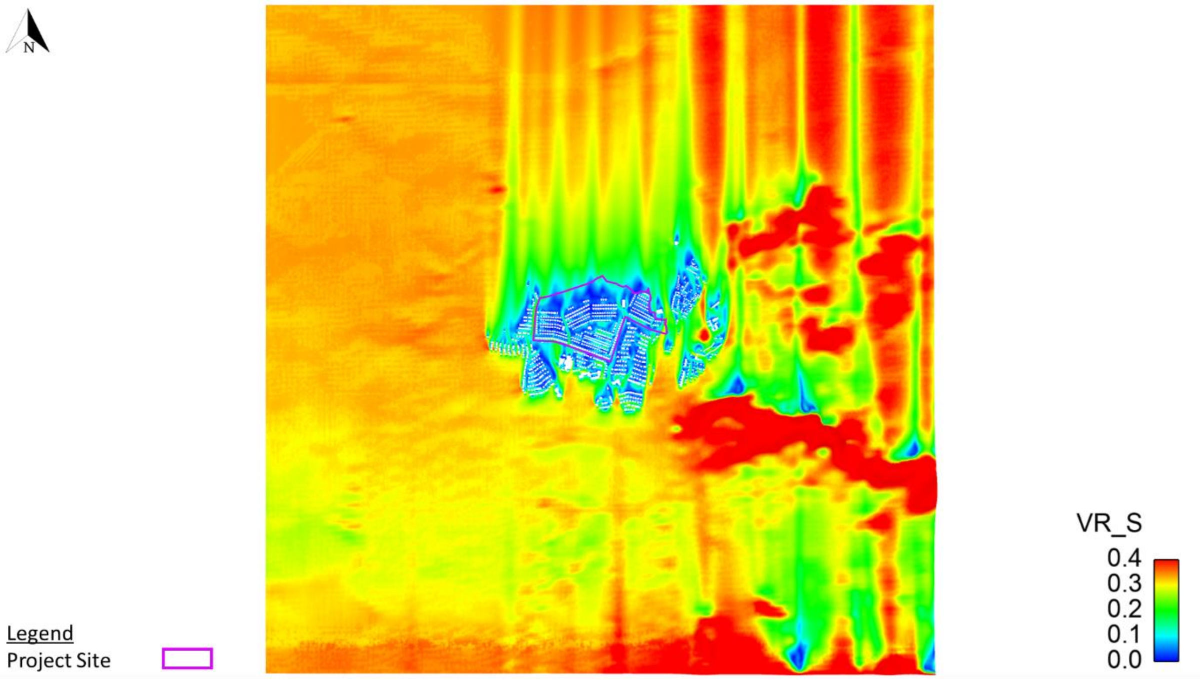


Figure 29 VR Contour Plot of Whole Domain at Pedestrian Level under S Wind for Baseline Scheme

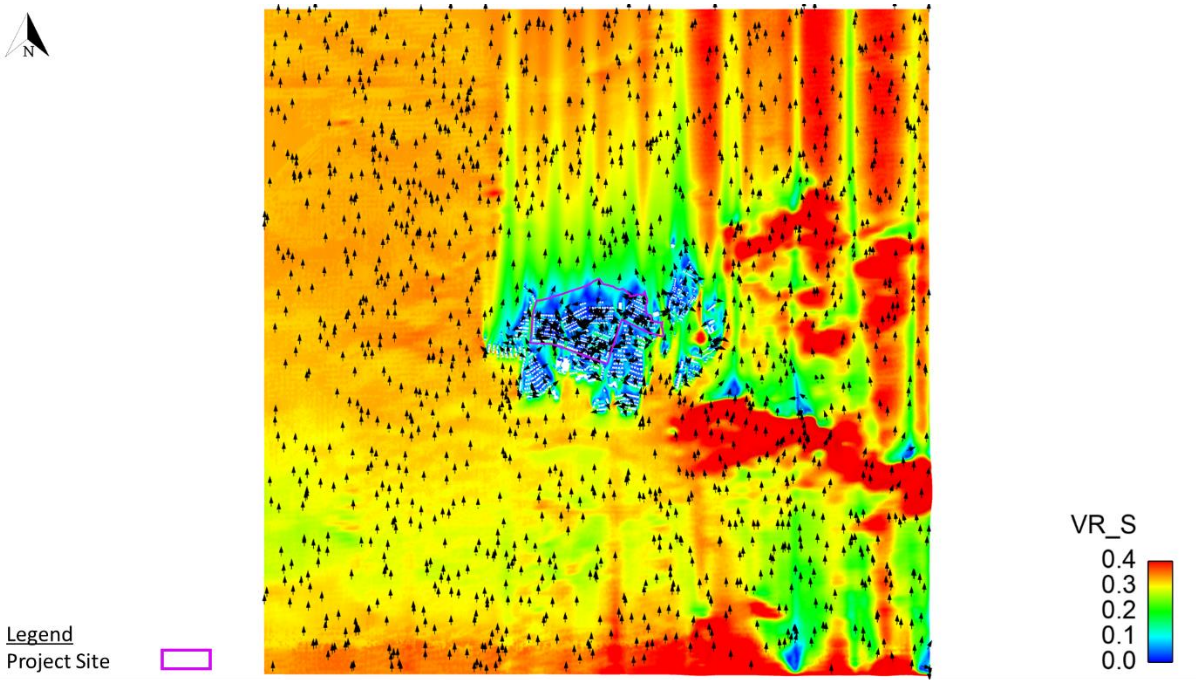


Figure 30 VR Vector Plot of Whole Domain at Pedestrian Level under S Wind for Baseline Scheme

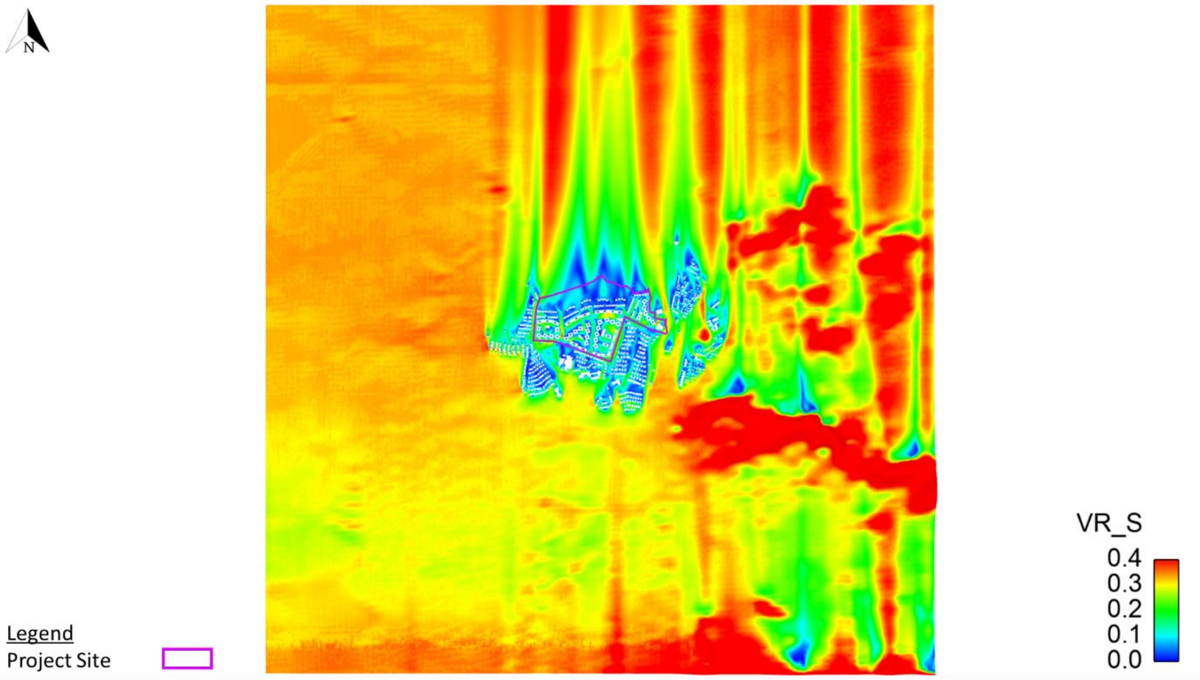


Figure 31 VR Contour Plot of Whole Domain at Pedestrian Level under S Wind for Proposed Scheme

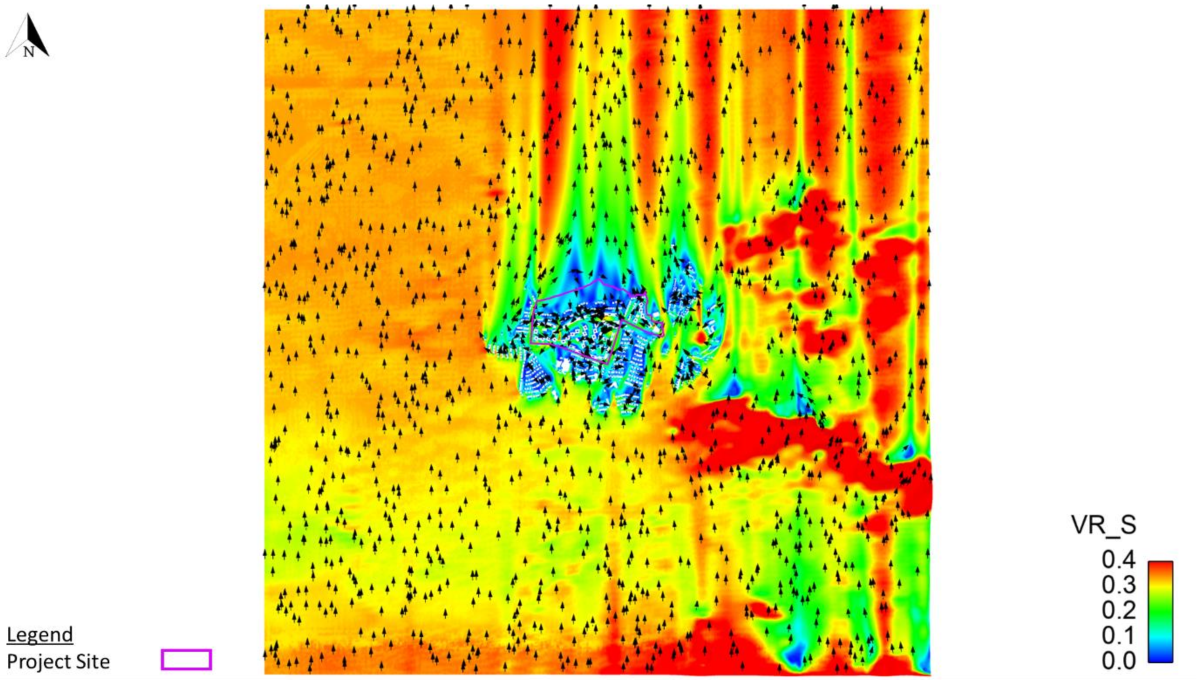


Figure 32 VR Vector Plot of Whole Domain at Pedestrian Level under S Wind for Proposed Scheme

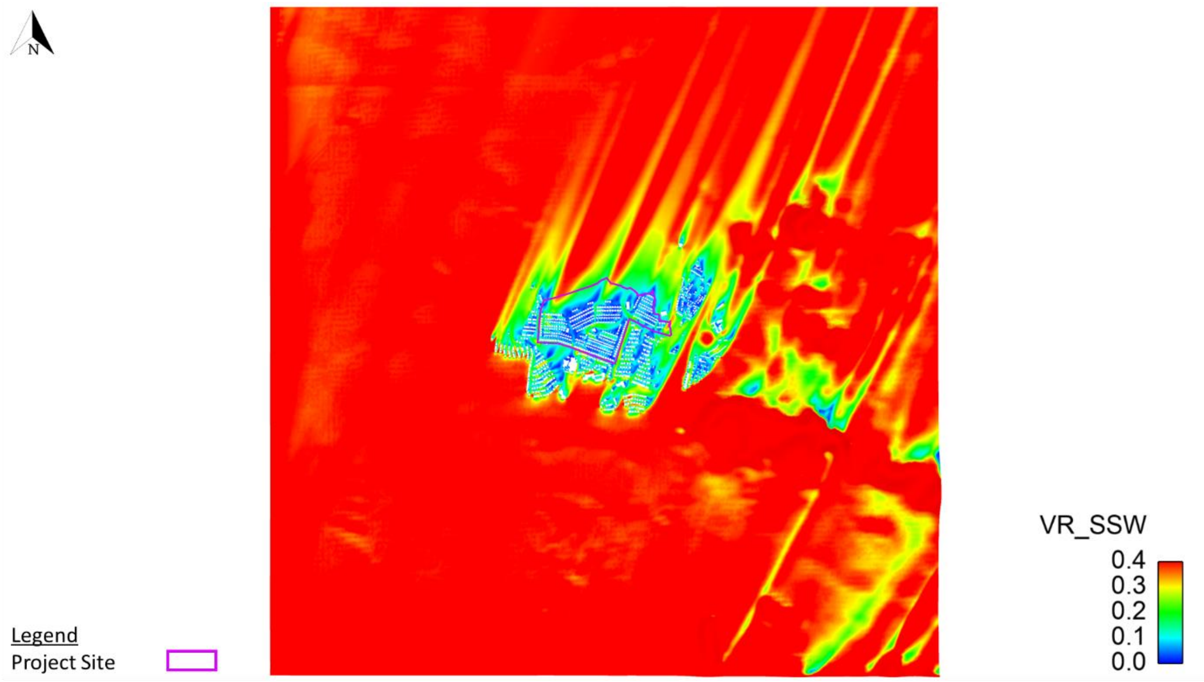


Figure 33 VR Contour Plot of Whole Domain at Pedestrian Level under SSW Wind for Baseline Scheme

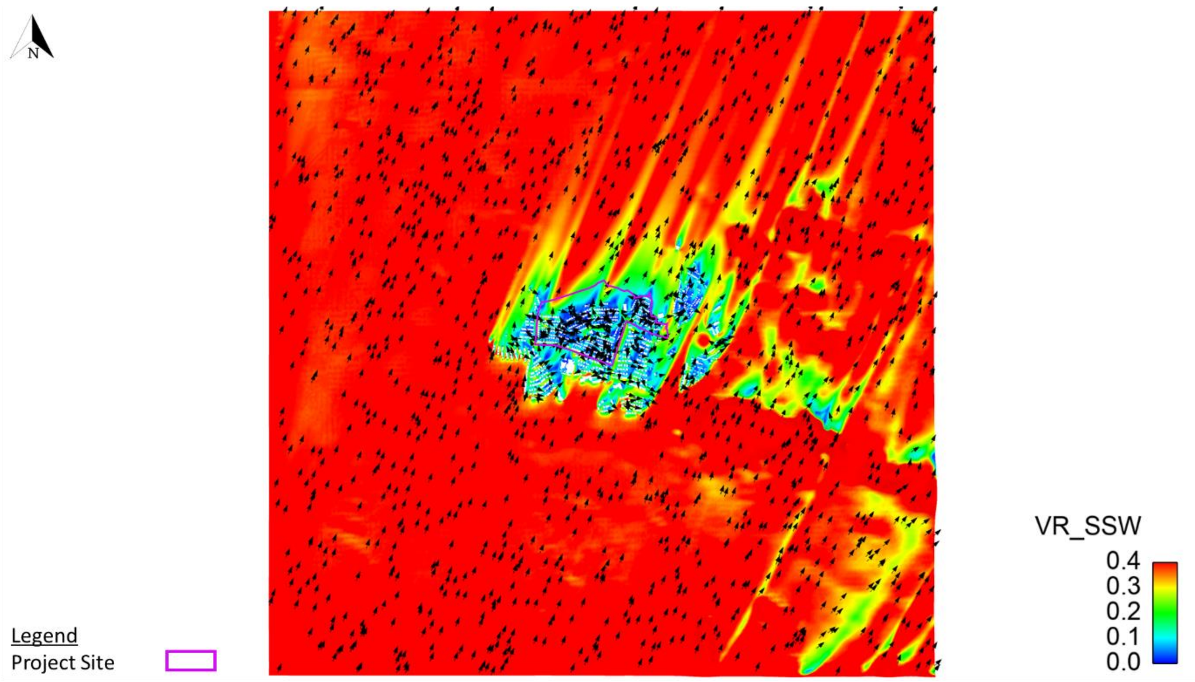


Figure 34 VR Vector Plot of Whole Domain at Pedestrian Level under SSW Wind for Baseline Scheme

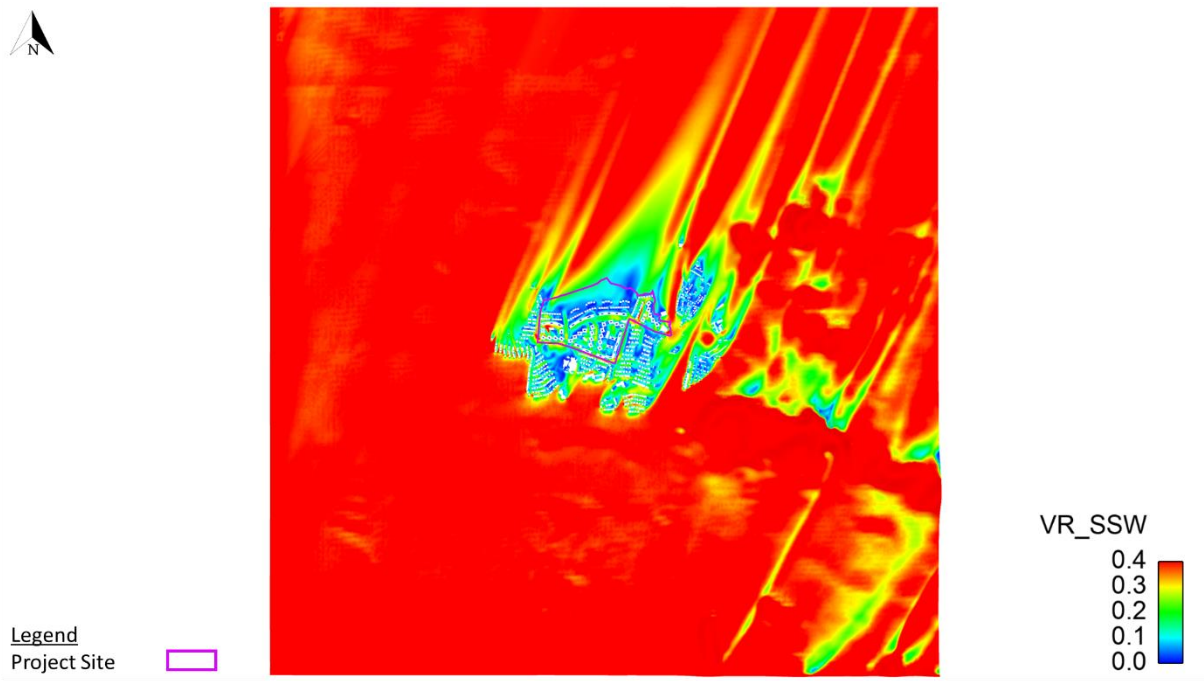


Figure 35 VR Contour Plot of Whole Domain at Pedestrian Level under SSW Wind for Proposed Scheme

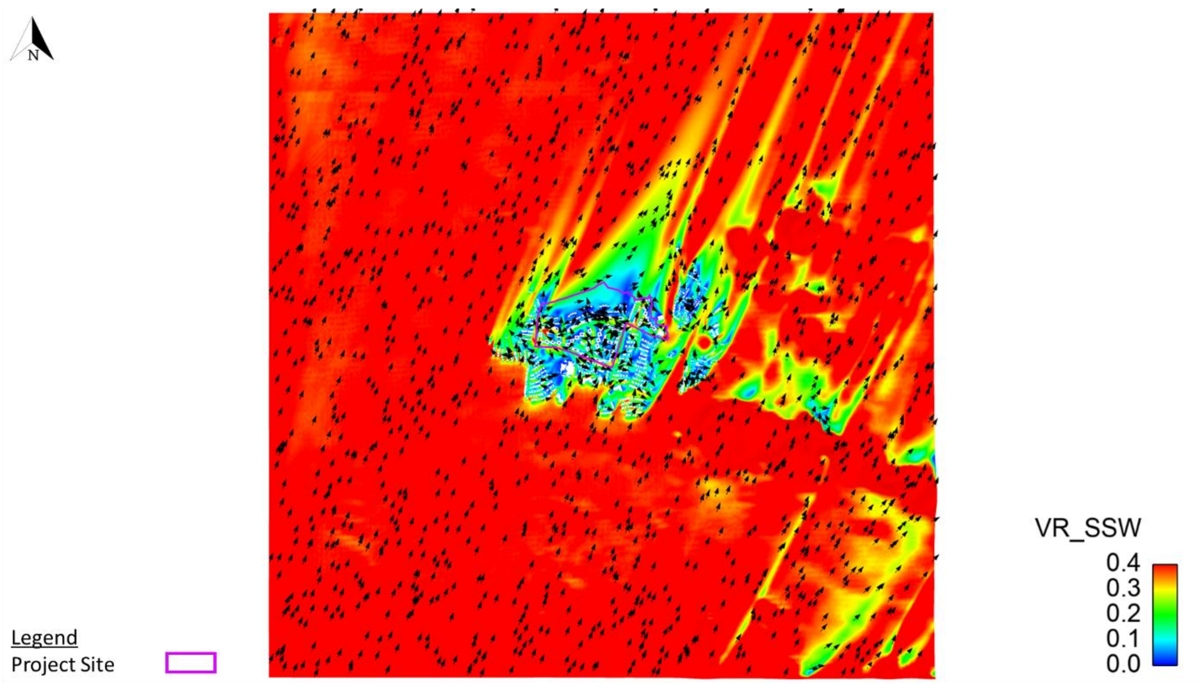


Figure 36 VR Vector Plot of Whole Domain at Pedestrian Level under SSW Wind for Proposed Scheme

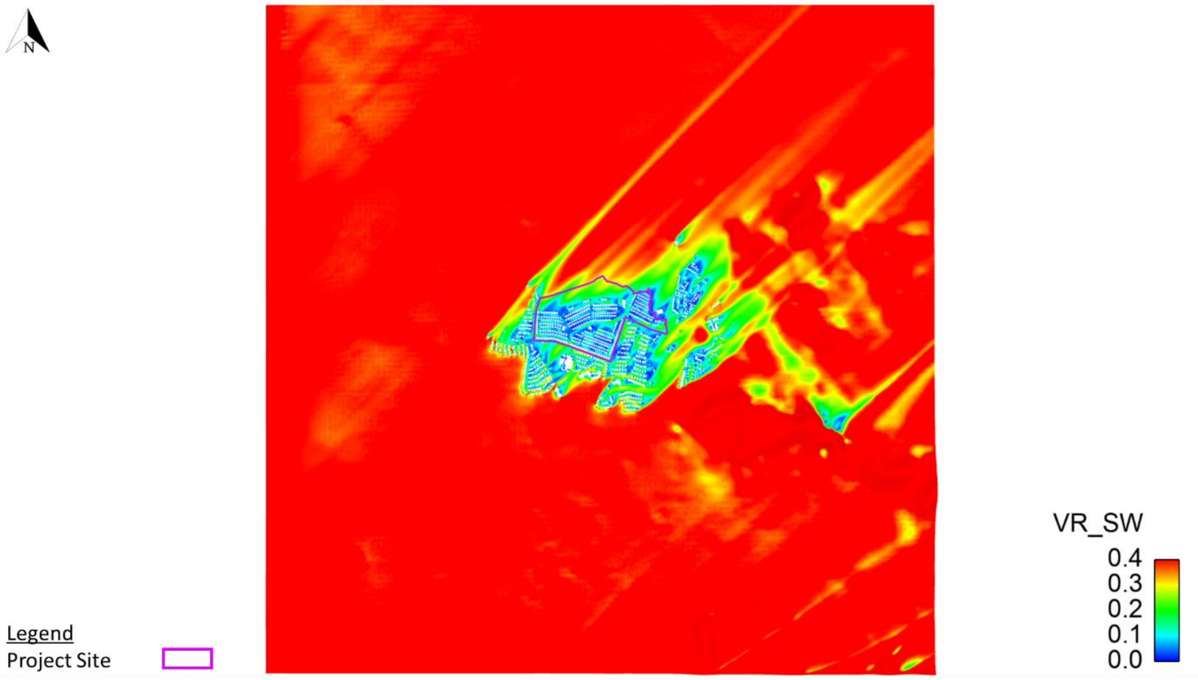


Figure 37 VR Contour Plot of Whole Domain at Pedestrian Level under SW Wind for Baseline Scheme

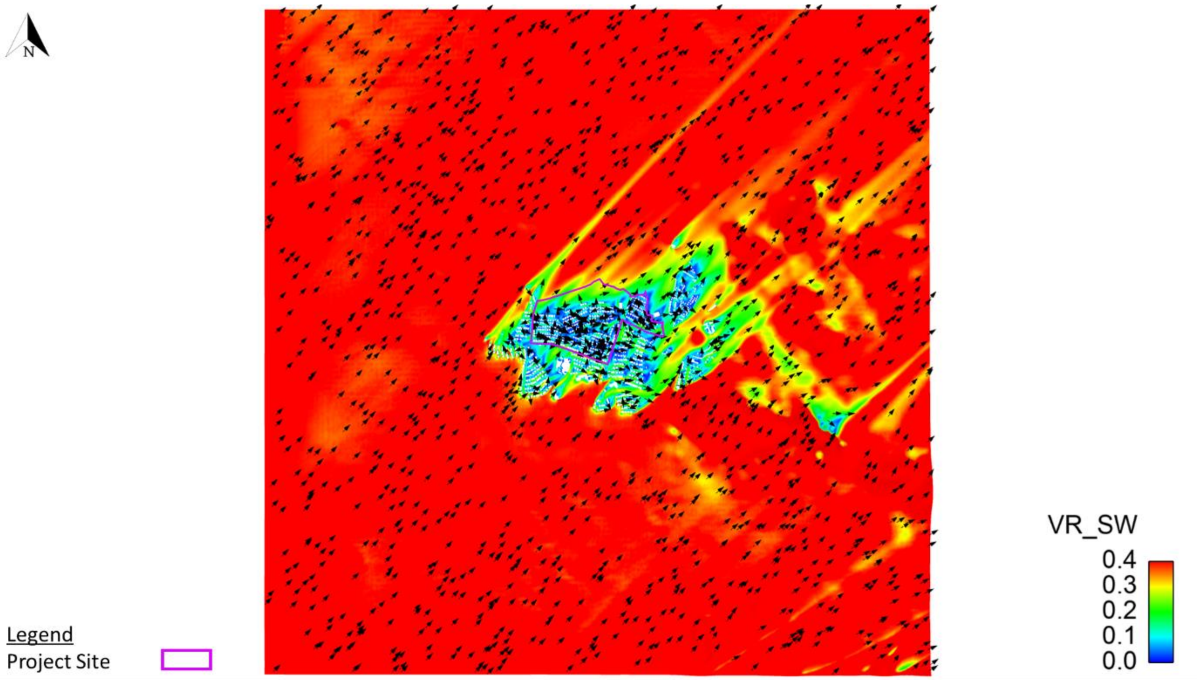


Figure 38 VR Vector Plot of Whole Domain at Pedestrian Level under SW Wind for Baseline Scheme

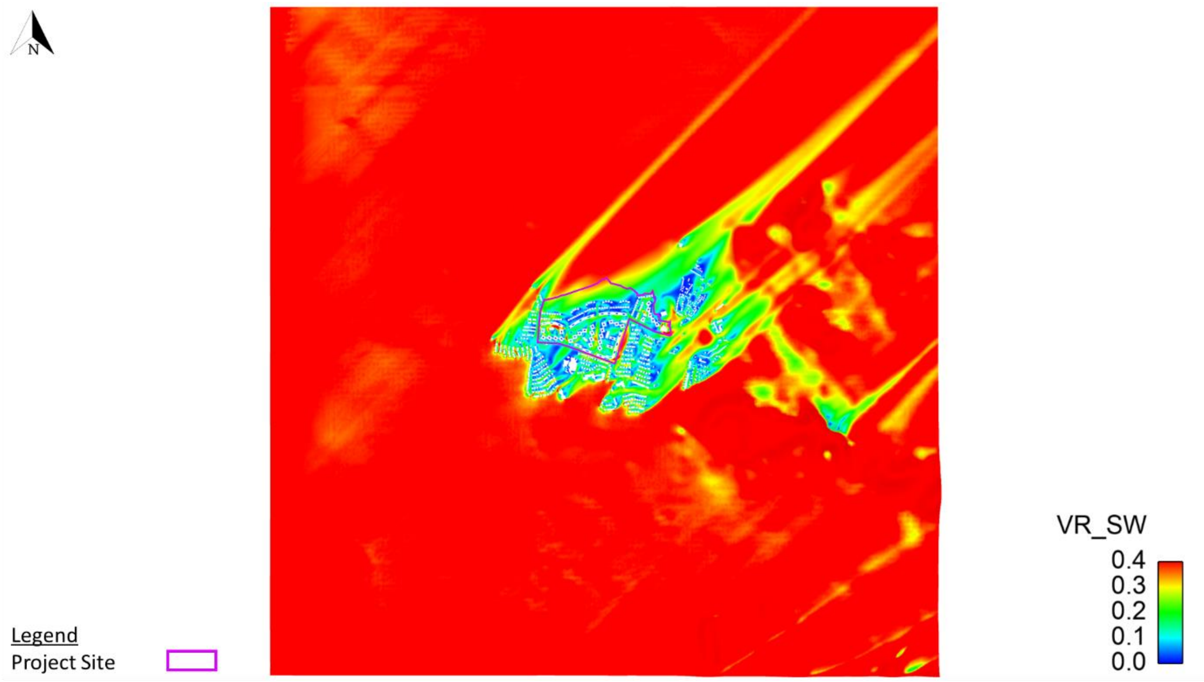


Figure 39 VR Contour Plot of Whole Domain at Pedestrian Level under SW Wind for Proposed Scheme

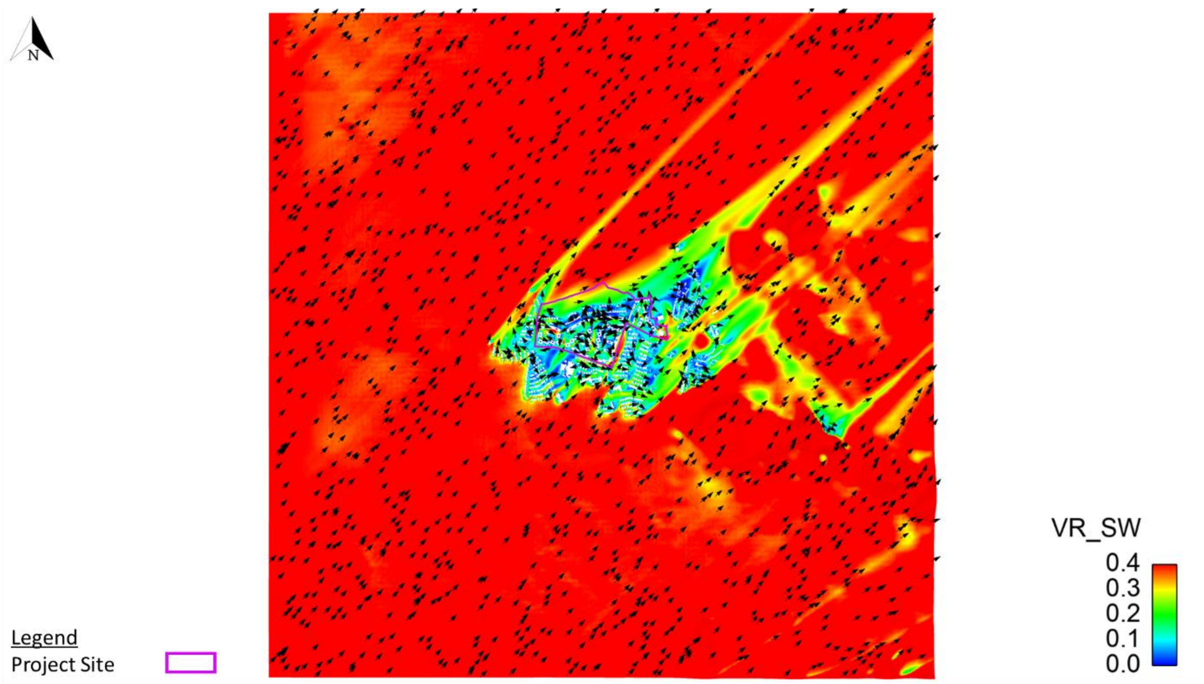


Figure 40 VR Vector Plot of Whole Domain at Pedestrian Level under SW Wind for Proposed Scheme

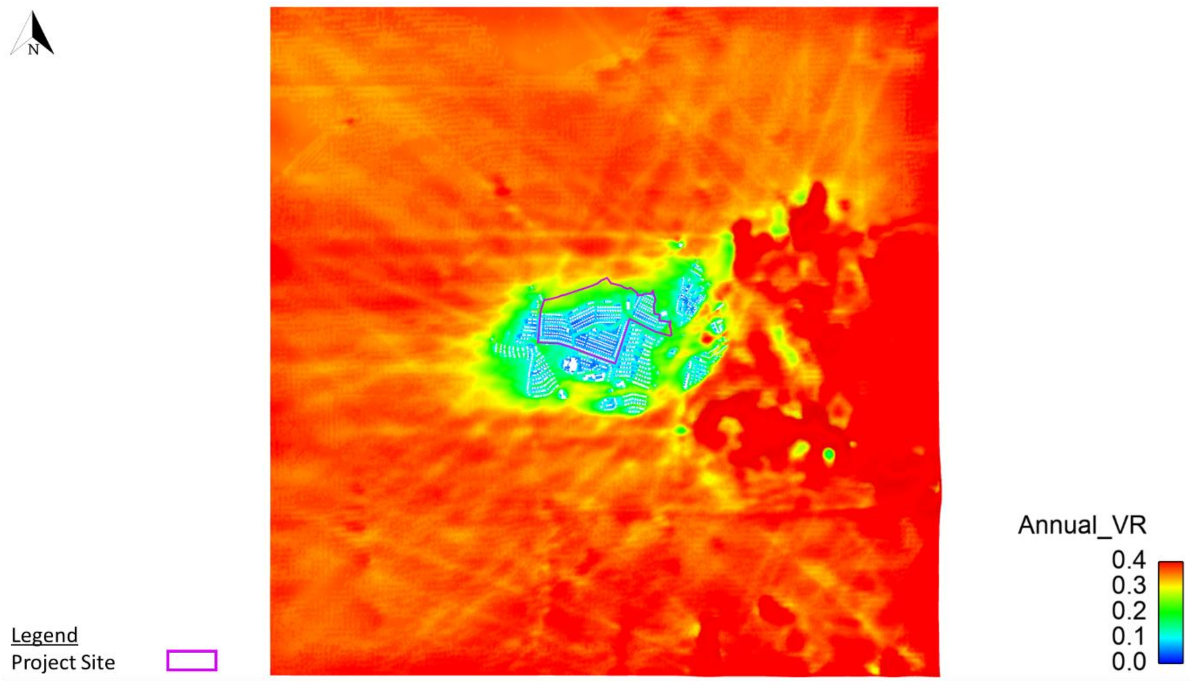


Figure 41 Annual Weighted Average VR Contour Plot of Whole Domain at Pedestrian Level for Baseline Scheme

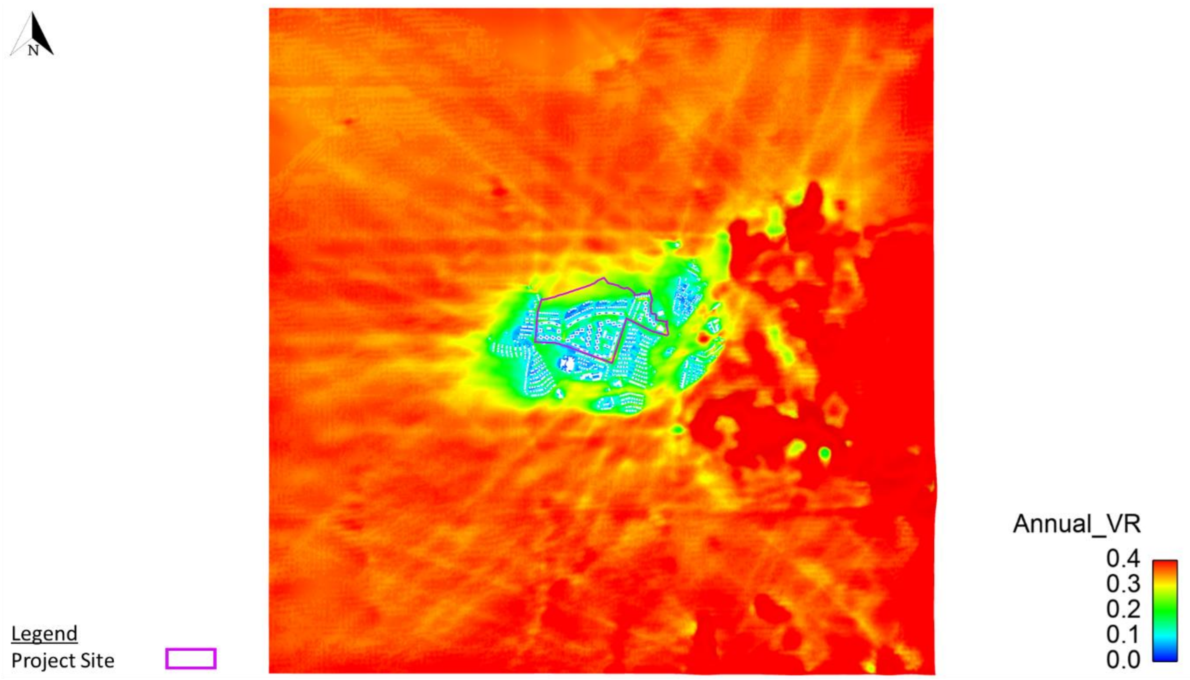


Figure 42 Annual Weighted Average VR Contour Plot of Whole Domain at Pedestrian Level for Proposed Scheme

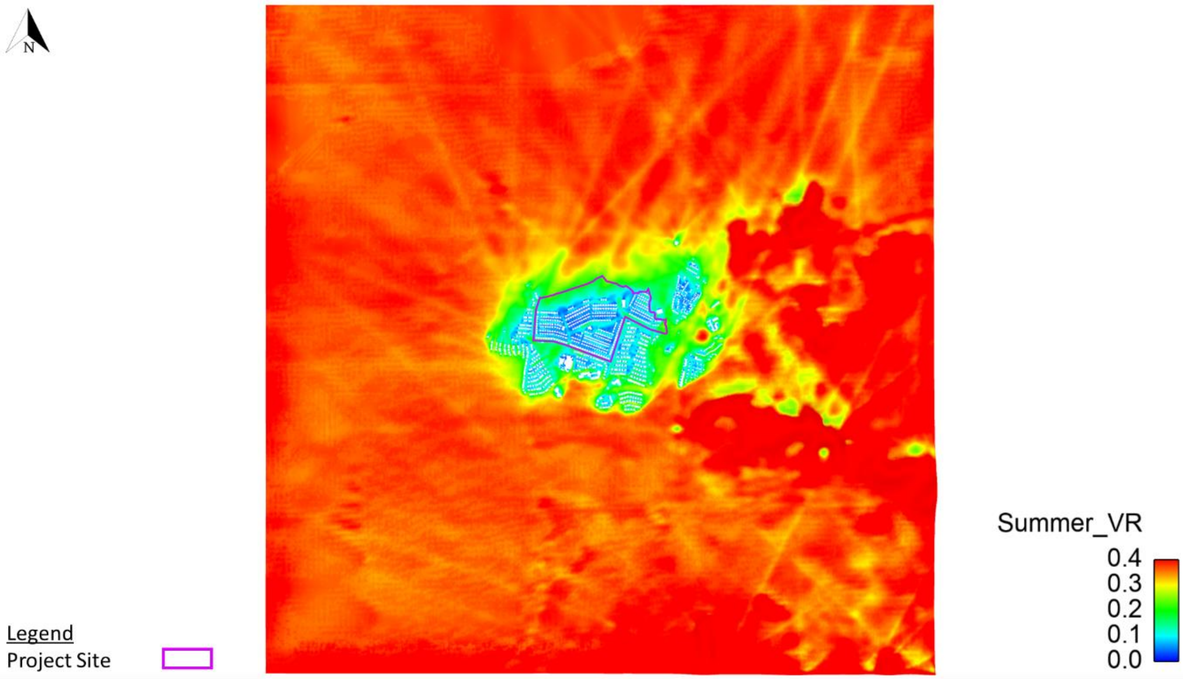


Figure 43 Summer Weighted Average VR Contour Plot of Whole Domain at Pedestrian Level for Baseline Scheme

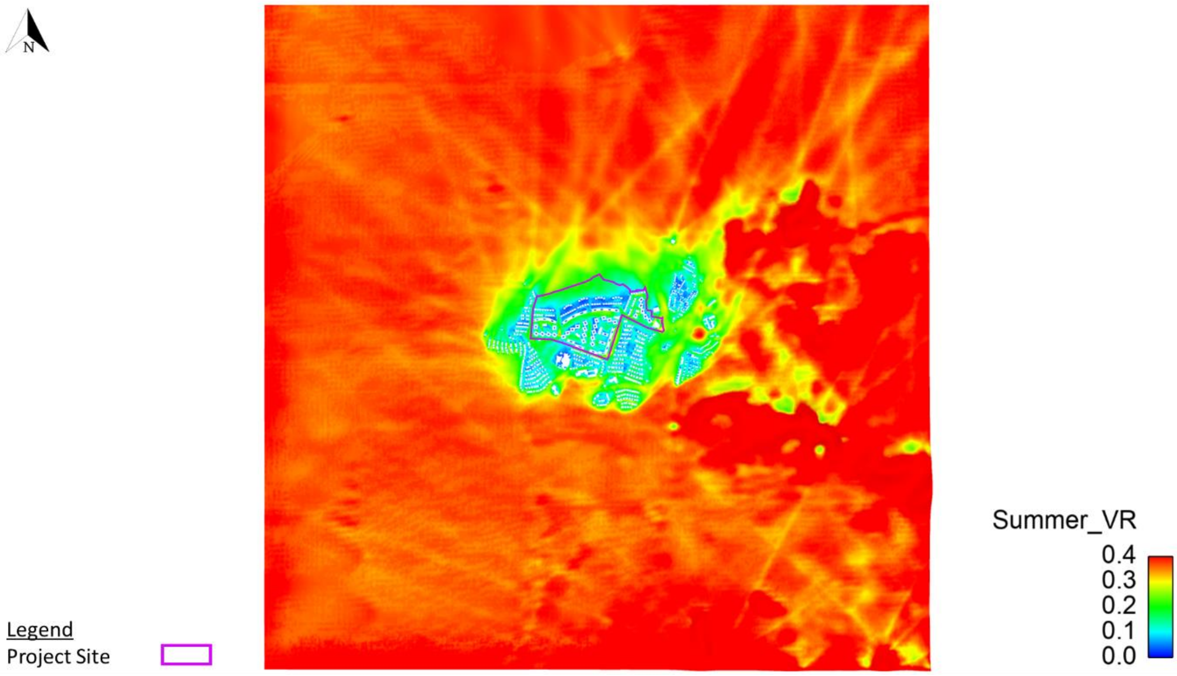
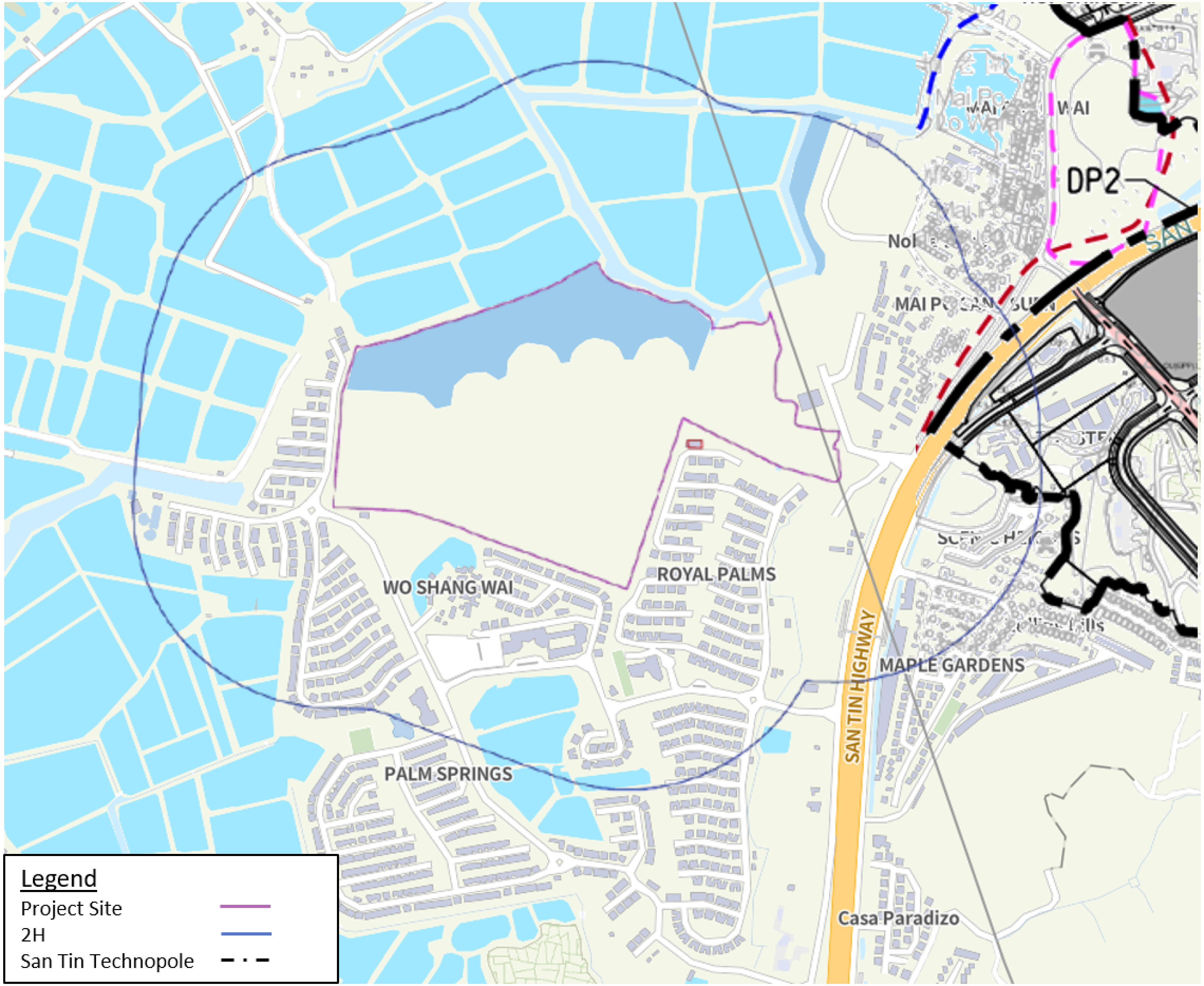


Figure 44 Summer Weighted Average VR Contour Plot of Whole Domain at Pedestrian Level for Proposed Scheme

Appendix G – Location of the Planned / Committed Developments within the Surrounding Area

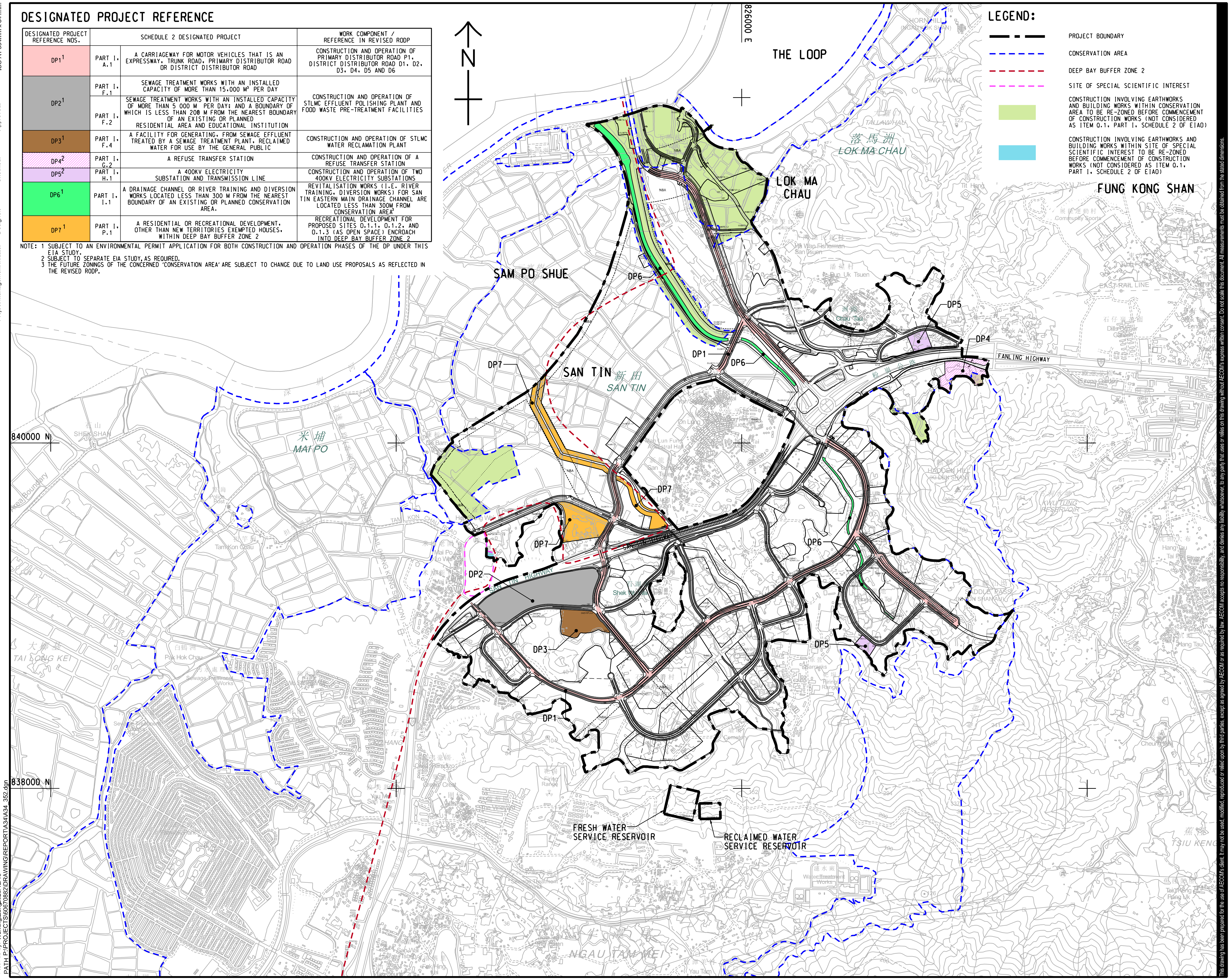


DP2
WAI
MAI PO SAN TSUEN
WO SHANG WAI
ROYAL PALMS
SAN TIN HIGHWAY
MAPLE GARDENS
PALM SPRINGS
Casa Paradizo
Legend
Project Site
2H
San Tin Technopole

DESIGNATED PROJECT REFERENCE

DESIGNATED PROJECT REFERENCE NOS.	SCHEDULE 2 DESIGNATED PROJECT		WORK COMPONENT / REFERENCE IN REVISED RODP
DP1[1]	PART I, A.1	A CARRIAGEWAY FOR MOTOR VEHICLES THAT IS AN EXPRESSWAY, TRUNK ROAD, PRIMARY DISTRIBUTOR ROAD OR DISTRICT DISTRIBUTOR ROAD	CONSTRUCTION AND OPERATION OF PRIMARY DISTRIBUTOR ROAD P1, DISTRICT DISTRIBUTOR ROAD D1, D2, D3, D4, D5 AND D6
DP2[1]	PART I, F.1	SEWAGE TREATMENT WORKS WITH AN INSTALLED CAPACITY OF MORE THAN 15,000 M^3 PER DAY	CONSTRUCTION AND OPERATION OF STLMC EFFLUENT POLISHING PLANT AND FOOD WASTE PRE-TREATMENT FACILITIES
	PART I, F.2	SEWAGE TREATMENT WORKS WITH AN INSTALLED CAPACITY OF MORE THAN 5 000 M PER DAY; AND A BOUNDARY OF WHICH IS LESS THAN 200 M FROM THE NEAREST BOUNDARY OF AN EXISTING OR PLANNED RESIDENTIAL AREA AND EDUCATIONAL INSTITUTION	
DP3[1]	PART I, F.4	A FACILITY FOR GENERATING, FROM SEWAGE EFFLUENT TREATED BY A SEWAGE TREATMENT PLANT, RECLAIMED WATER FOR USE BY THE GENERAL PUBLIC	CONSTRUCTION AND OPERATION OF STLMC WATER RECLAMATION PLANT
DP4[2]	PART I, G.2	A REFUSE TRANSFER STATION	CONSTRUCTION AND OPERATION OF A REFUSE TRANSFER STATION
DP5[2]	PART I, H.1	A 400KV ELECTRICITY SUBSTATION AND TRANSMISSION LINE	CONSTRUCTION AND OPERATION OF TWO 400KV ELECTRICITY SUBSTATIONS
DP6[1]	PART I, I.1	A DRAINAGE CHANNEL OR RIVER TRAINING AND DIVERSION WORKS LOCATED LESS THAN 300 M FROM THE NEAREST BOUNDARY OF AN EXISTING OR PLANNED CONSERVATION AREA.	REVITALISATION WORKS (I.E. RIVER TRAINING, DIVERSION WORKS) FOR SAN TIN EASTERN MAIN DRAINAGE CHANNEL ARE LOCATED LESS THAN 300M FROM CONSERVATION AREA[3]
DP7[1]	PART I, P.1	A RESIDENTIAL OR RECREATIONAL DEVELOPMENT, OTHER THAN NEW TERRITORIES EXEMPTED HOUSES, WITHIN DEEP BAY BUFFER ZONE 2	RECREATIONAL DEVELOPMENT FOR PROPOSED SITES O.1.1, O.1.2, AND O.1.3 (AS OPEN SPACE) ENCROACH INTO DEEP BAY BUFFER ZONE 2

NOTE: 1 SUBJECT TO AN ENVIRONMENTAL PERMIT APPLICATION FOR BOTH CONSTRUCTION AND OPERATION PHASES OF THE DP UNDER THIS EIA STUDY.
2 SUBJECT TO SEPARATE EIA STUDY, AS REQUIRED.
3 THE FUTURE ZONINGS OF THE CONCERNED 'CONSERVATION AREA' ARE SUBJECT TO CHANGE DUE TO LAND USE PROPOSALS AS REFLECTED IN THE REVISED RODP.



LEGEND:

- PROJECT BOUNDARY
- CONSERVATION AREA
- DEEP BAY BUFFER ZONE 2
- SITE OF SPECIAL SCIENTIFIC INTEREST
- CONSTRUCTION INVOLVING EARTHWORKS AND BUILDING WORKS WITHIN CONSERVATION AREA TO BE RE-ZONED BEFORE COMMENCEMENT OF CONSTRUCTION WORKS (NOT CONSIDERED AS ITEM O.1, PART I, SCHEDULE 2 OF EIAO)
- CONSTRUCTION INVOLVING EARTHWORKS AND BUILDING WORKS WITHIN SITE OF SPECIAL SCIENTIFIC INTEREST TO BE RE-ZONED BEFORE COMMENCEMENT OF CONSTRUCTION WORKS (NOT CONSIDERED AS ITEM O.1, PART I, SCHEDULE 2 OF EIAO)

AECOM

PROJECT 項目
FIRST PHASE DEVELOPMENT OF THE NEW TERRITORIES NORTH – SAN TIN / LOK MA CHAU DEVELOPMENT NODE – INVESTIGATION

CLIENT 業主
土木工程拓展署 CEDD Civil Engineering and Development Department
規劃署 Planning Department

CONSULTANT 工程顧問公司
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS 分判工程顧問公司

ISSUE/REVISION 修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 複核

STATUS 階段

SCALE 比例: A3 1 : 20000
DIMENSION UNIT 尺寸單位: METRES

KEY PLAN 索引圖

PROJECT NO. 項目編號: 60670882
AGREEMENT NO. 協議編號: CE 20/2021

SHEET TITLE 圖紙名稱
LOCATION OF DESIGNATED PROJECTS

SHEET NUMBER 圖紙編號
60670882/A34/FIGURE 1.2

ISO A1 594mm x 841mm
Approved:
Checked:
Designer:
Project Management Initials:
Plot File by: Wuming.Zeng2023/12/15
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Appendix H – Overviews of the 3D Model Covering Whole Computational Domain

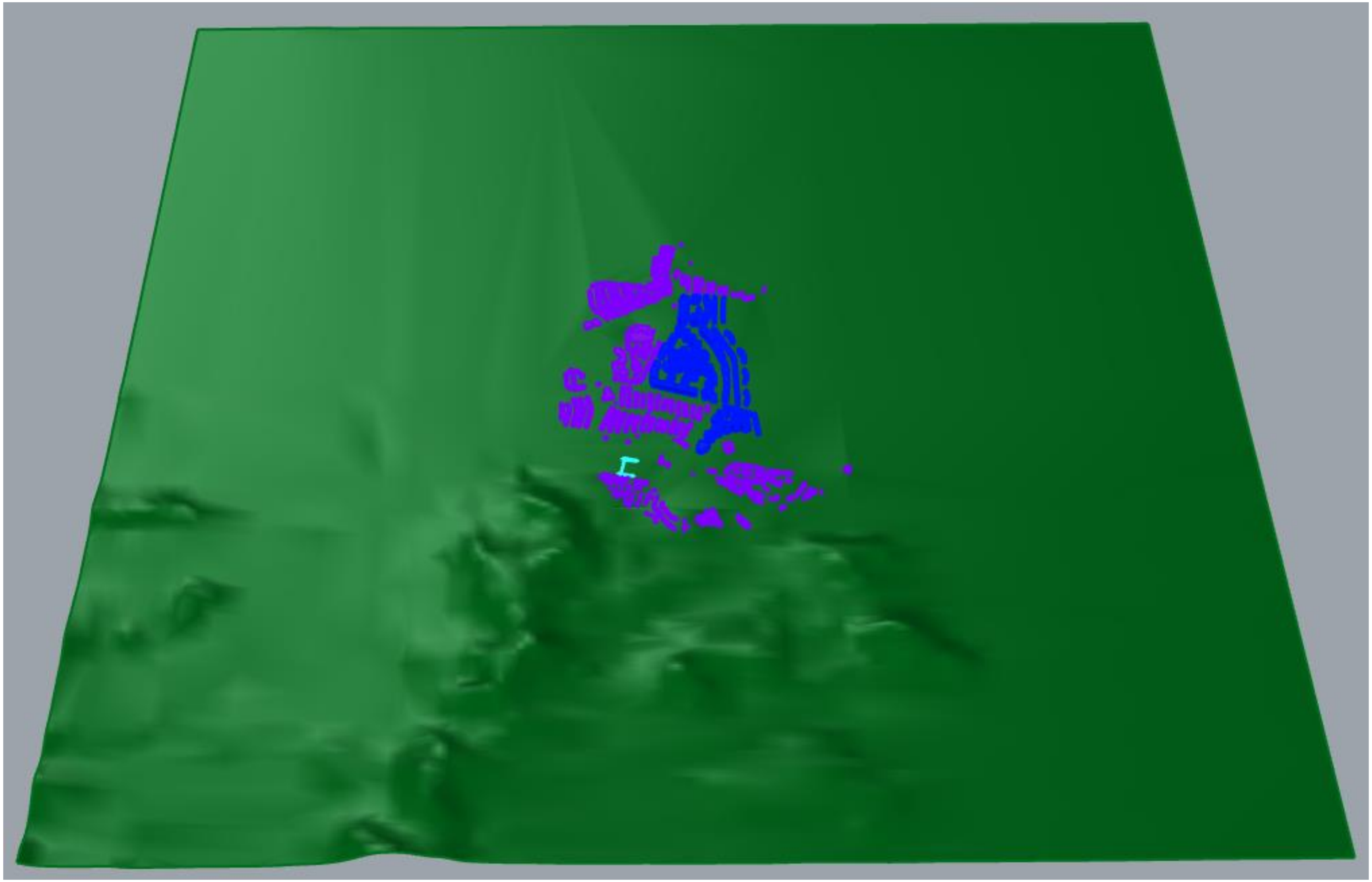

Figure 1a: Overview of the 3D Simulation Model Covering Whole Computation Domain (East)


Figure 1b: Zoom-in of the 3D Simulation Model Covering Whole Computation Domain (East)

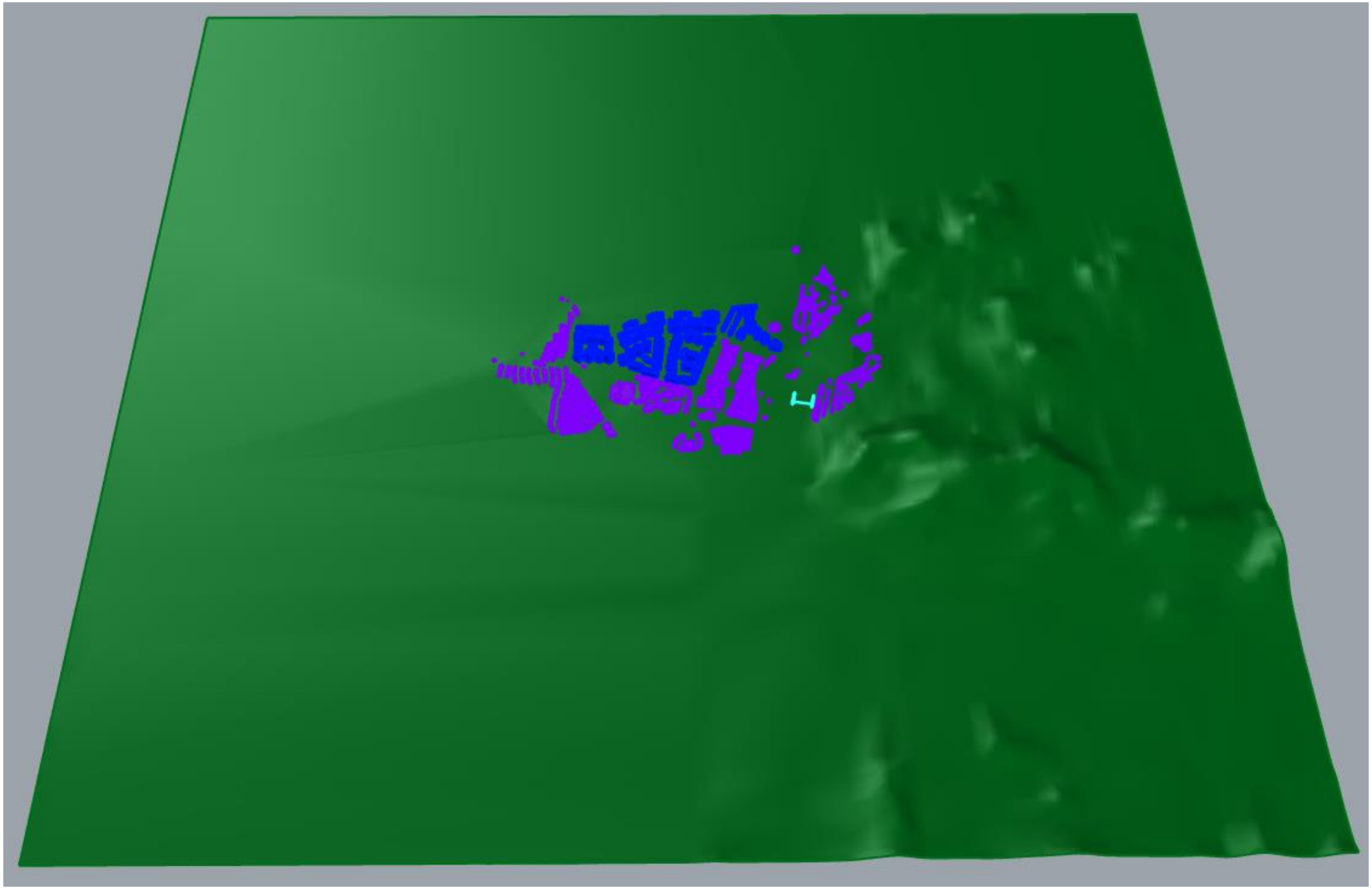

Figure 2a: Overview of the 3D Simulation Model Covering Whole Computation Domain (South)

Figure 2b: Overview of the 3D Simulation Model Covering Whole Computation Domain (South)

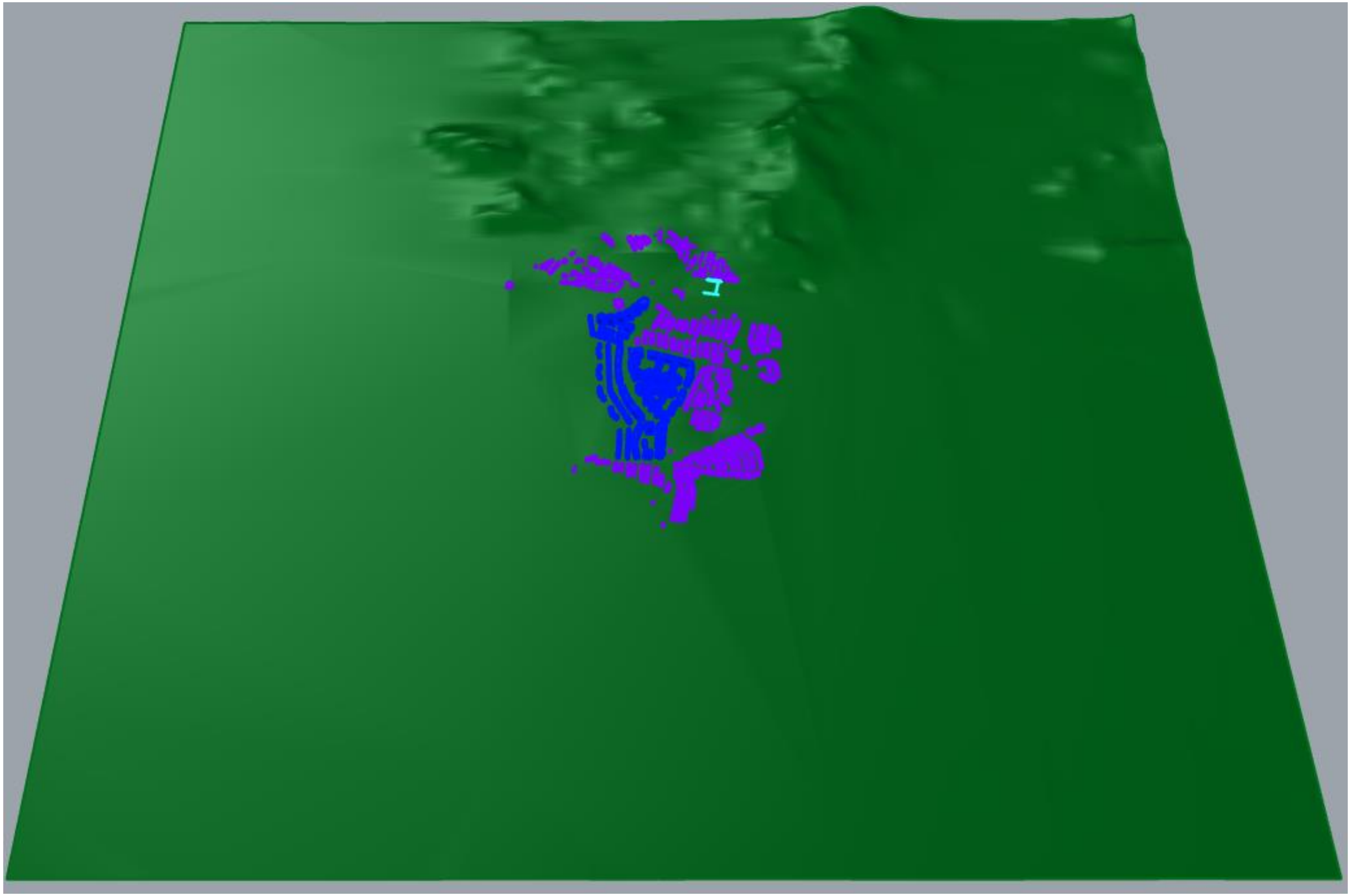

Figure 3a: Overview of the 3D Simulation Model Covering Whole Computation Domain (West)

Figure 3b: Zoom-in of the 3D Simulation Model Covering Whole Computation Domain (West)

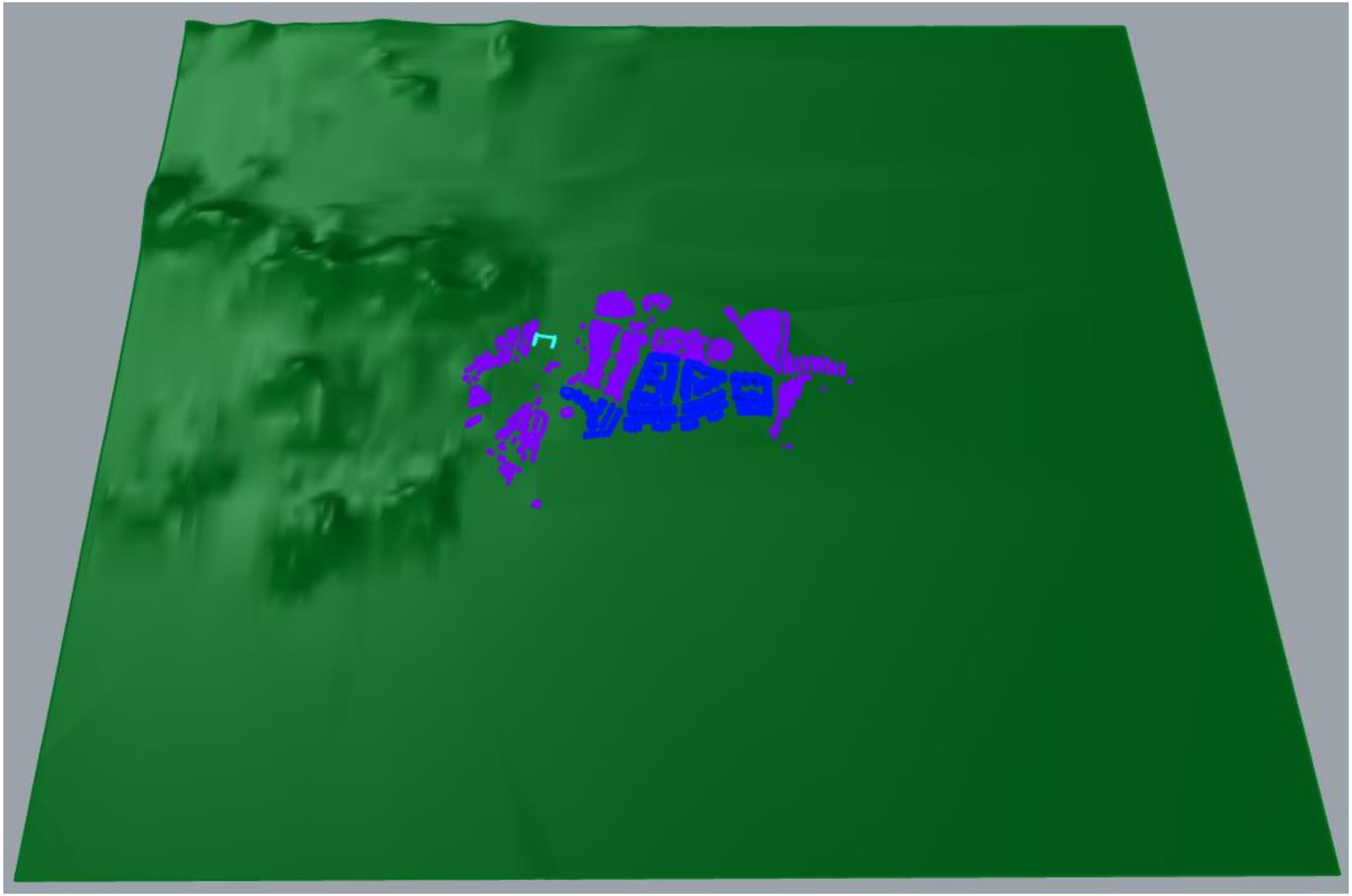

Figure 4a: Overview of the 3D Simulation Model Covering Whole Computation Domain (North)

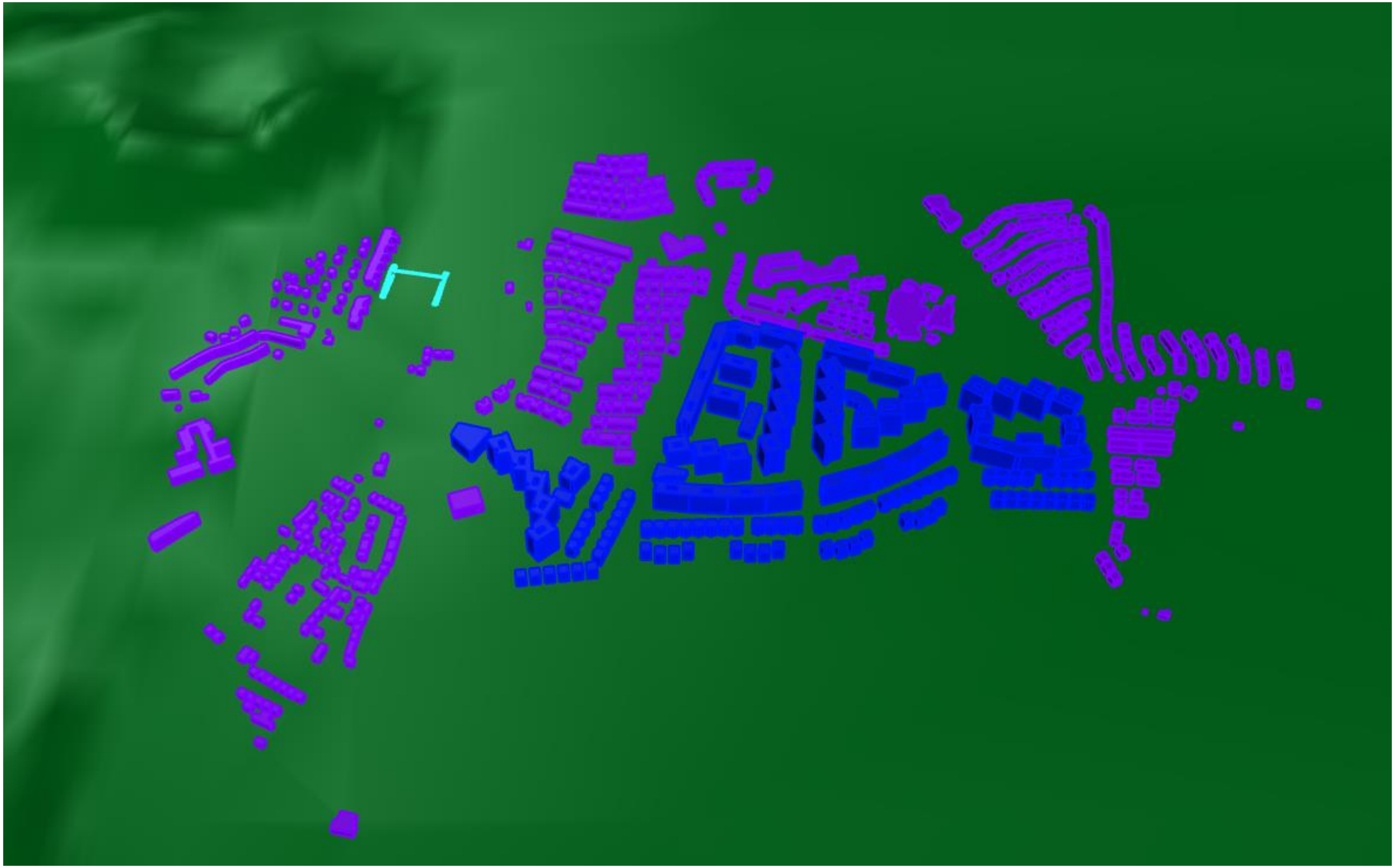

Figure 4b: Zoom-in of the 3D Simulation Model Covering Whole Computation Domain (North)