ISSUE NO. : 1
ISSUE DATE : NOVEMBER 2012
PROJECT NO. : 913A

AIR VENTILATION ASSESSMENT INITIAL STUDY

FOR

PROPOSED PUBLIC HOUSING DEVELOPMENT IN SHA TIN AREA 52 (SHUI CHUEN O)

COMMERCIAL-IN-CONFIDENCE

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1. INTRODUCTION

Allied Environmental Consultants Limited (AEC) has been commissioned by the Hong Kong Housing Authority to conduct an Air Ventilation Assessment (AVA) Initial Study for the proposed public rental housing development at Shatin Area 52 (Shui Chuen O). The AVA Initial Study aims to assess air ventilation performance of the building design and its impacts to the surrounding development accessible by pedestrians. Computational Fluid Dynamics (CFD) simulation is employed as the assessment tool for quantitative ventilation performance evaluation in the study.

2. OBJECTIVE OF THE STUDY

In accordance with Technical Circular No.1/06 "Air Ventilation Assessments" jointly issued by Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau, proponent departments, bureaux or authorities should assess the need to apply Air Ventilation Assessment (AVA) to some categories of major government Project during the planning stage. The proposed public rental housing development at Shatin Area 52 (Shui Chuen O) falls under the category of "*developments on sites of over 2 hectares and with an overall plot ratio of 5 or above*" and *"developments with podium coverage extending over one hectare"*.

The objective of this AVA Initial Study is to qualitatively evaluate the likely impact of the proposed public housing development on the pedestrian wind environment within the study area. Computational Fluid Dynamics (CFD) simulation is employed as the assessment tool in this AVA Initial Study:

- To assess the characteristics of the wind availability ($V\infty$) of the site;
- To give a general pattern and quantitative estimate of wind performance at the pedestrian level reported using Wind Velocity Ratio (VR); and
- To further refine the good design features and problem areas of the Expert Evaluation.

3. EXPERT EVALUATION

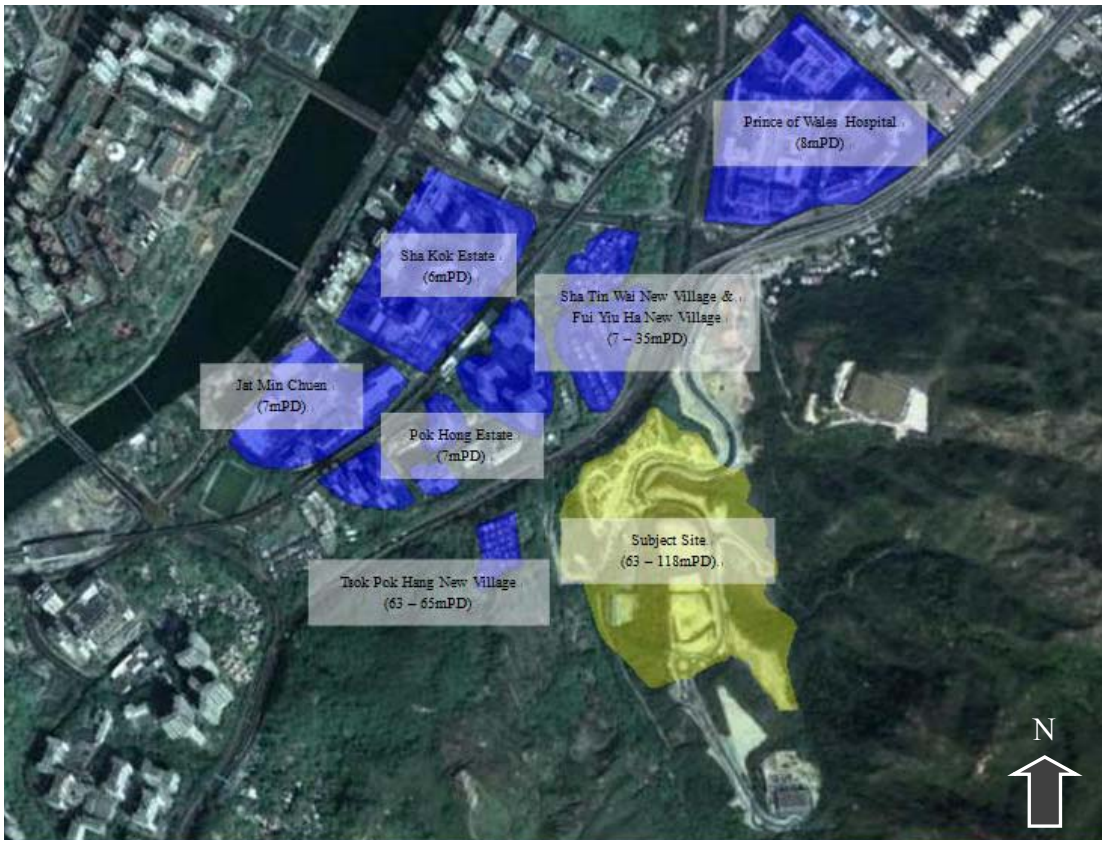
3.1. SUBJECT SITE

The proposed public rental housing development is located on terrain of different elevations alongside the Sha Tin Road with Lion Rock Country Park to the west and Ma On Shan Country Park to the south / south-east. The Proposed Development will consist of 18 domestic blocks, five covered carparks, public transport interchange (PTI) and a commercial centre. It is located on stepped platforms ranging from 63 to 118mPD and separated from the surrounding built-up area by Shatin Road.

3.2. SITE ENVIRONS

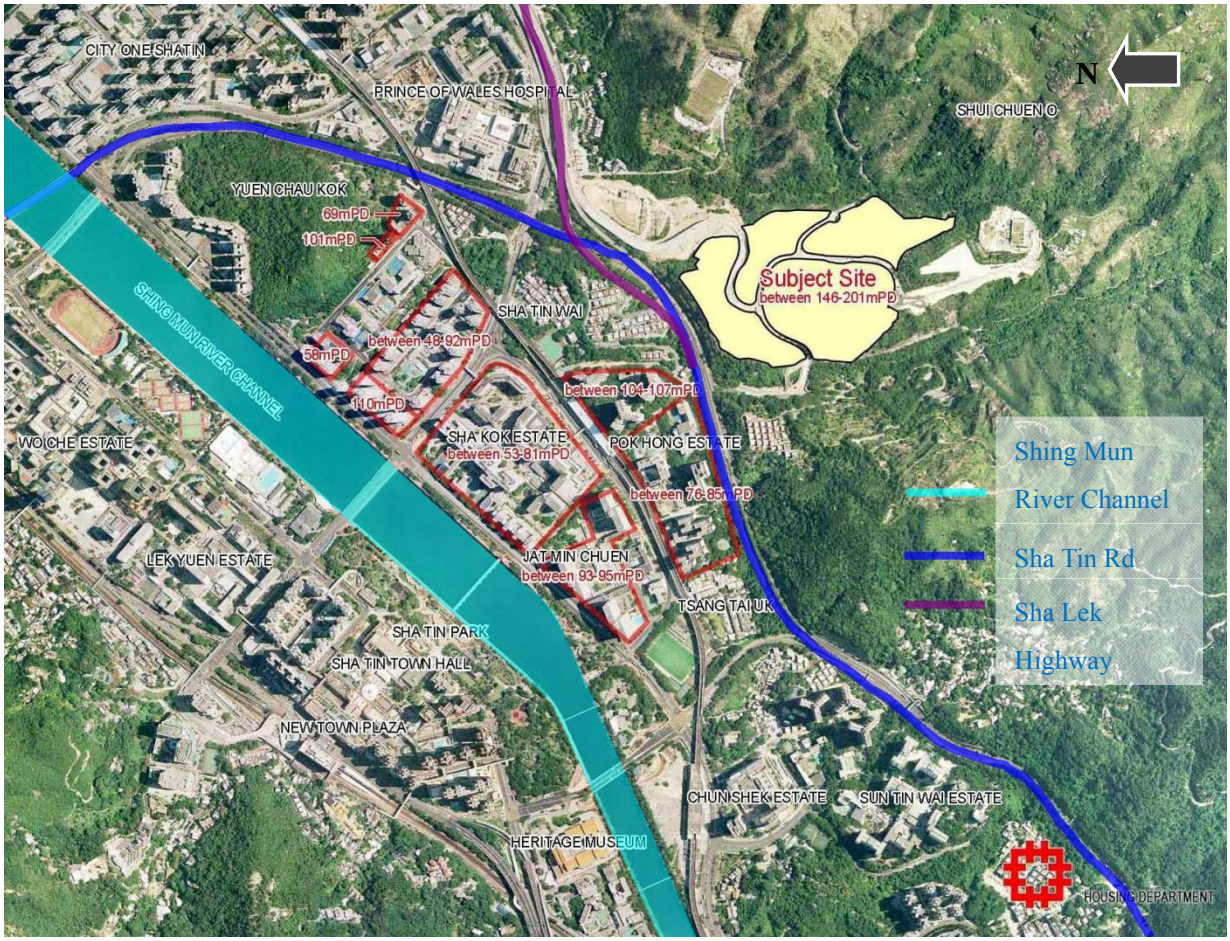
The built up area in the vicinity of the site is located to its north and on a much lower elevation, starting from 6mPD, than the Subject Site as shown in ***Plate 1*** below. These existing developments include Pok Hong Estate and Sha Kok Estate, which lie to the north-west of the proposed site; Fui Yiu Ha New Village and Sha Tin Wai Village, which lie to the north. Prince of Wales Hospital lies further to the north-east of the site. On a higher ground elevation, Tsok Pok Hang New Village is located to the west of the site across Shui Chuen Au Street.

Plate 1 Areas Surrounding the Proposed Development (Ground Elevation)



As shown in ***Plate 2*** below, the surrounding built environment is characterized by varying building heights, with relatively high-rise areas such as Pok Hong Estate and Sha Kok Estate and low-rise villages (e.g. Sha Tin Wai Village and Tsok Pok Hang New Village). There are also other institutional development such as the Prince of Wales Hospital, Christ College and outdoor recreational areas.

Plate 2 Height of Buildings in the Surrounding Area



The characteristics of the surrounding area are summarized as follows:

- Majority of the built-up areas are located on flat land at a lower elevation and separated from the site by Shatin Road;
- Varying building heights, with large-scale medium to high-rise development located to the north of the site and small-scale low-rise development located to its west;
- Road network and Shing Mun River acting ventilation corridors as shown on ***Plate 2***. It is anticipated that Shatin Road and Sha Lek Highway, with a width of 31m and 36m respectively and align with the prevailing wind direction, shall continue to be the major ventilation corridor dissipating wind into surrounding area.

3.3. SITE WIND ENVIRONMENT

The general wind flow direction in the Sha Tin District is from the northeast quadrant, which accounts for more than 50% of the total annual wind occurrence. With regards to

the wind data from Hong Kong Observatory ("HKO"), the prevailing winds for the site mainly come from northeast in non-summer whereas in summer, the south-westerly wind dominates.

Influence of the local topography to the wind flow pattern at the site and the adjacent built environment is significant. Hilly areas surrounding the Proposed Development impede wind penetration from the south. Eddies and re-circulations are expected at pedestrian areas leeward of the terrains. Wind approaching the assessment area from the northeast and northwest quadrant also tends to decelerate while flowing uphill.

The low-rise Sha Tin Wai, Sha Tin Wai New Village and Fui Yiu Ha New Village to the north of the site across Sha Tin Road are located at a much lower elevation than the site and have little influence on the Proposed Development. The high-rise Yu Chui Court may cause some impediment to the incoming north-easterly wind but the wind is expected to reattach at lower levels at the Prince of Wales Hospital and the low-rise Sha Tin Wai Village.

Elevated ground to the northeast of the Site (including To Shek Street and To Shek Service Reservoir) rises steadily to over 200mPD and may partially impede the incoming north-easterly wind. However, it is anticipated that the effect shall not be significant in the view of the fact that the wind shall be dissipated through the major ventilation pathway, Shatin Road, into the area.

Shatin Road, Sha Lek Highway and Shatin Wai Road which align with wind from the northeast quadrant shall be the major ventilation corridor to facilitate air ventilation in the area. Apart from relying on the existing road networks to the north of the site as the major breezeways, the Proposed Development has maintained ventilation paths through the site to enhance wind permeability and to lower the impact of the development on the downwind built-up area under south-westerly wind condition.

The concerns of the erection of the Proposed Development mainly entail the obstruction of downhill wind and reduced wind penetration that can potentially be brought upon to the neighbouring built-up areas. It is expected that the Proposed Development shall cause insignificant effect on the general air ventilation performance in the area since the site is located on a much higher elevation than the built-up area in the vicinity. The substantial distance between the site from existing and planned development reduces the wind availability impacts to nearby pedestrian areas. Also, the subject is situated at downwind location of the neighbouring built-up areas under non-summer wind. Ventilation impacts of the Proposed Development to the adjacent pedestrian areas should be minimal.

4. ASSESSMENT APPROACH & METHODOLOGY

4.1. GENERAL

This AVA Initial Study has adopted the Air Ventilation Assessment (AVA) methodology for Initial Study given in the *Technical Guide, "Technical Guide for Air Ventilation Assessment for Developments in Hong Kong"* published by Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau in 2006.

4.2. SITE WIND AVAILABILITY

Wind availability of the site is essential information to the investigation of the effects of the Proposed Development on the surrounding pedestrian wind environment. In the *AVA Technical Guide*, it is recommended that wind data from nearby weather station(s), simulated wind data or experimental site wind data should be referenced. Two sets of wind data will be referenced in this study, including wind data from MM5 simulation data published by the Planning Department and the Sha Tin Automation Weather Station operated by the HKO.

4.3. WIND DATA FROM MM5 SIMULATION RESULT

The *"Site Wind Availability Data"* published by the Planning Department, simulated by Fifth-Generation NCAR / Penn State Mesoscale Model (MM5), is taken into consideration in this AVA Initial Study. ***Plate 3*** shows the annual wind rose of grid (29, 30) which is the nearest grid to the site, at an elevation of 596mPD. The mean speed simulated at the nearest grid by MM5 is approximately 7.53m/s at 596m above ground. According to the provided wind speed and wind probability data, the most probable wind direction is East-Northeast, which accounts for 17.2% of the annual wind occurrence at 596mPD. The eight most frequent wind directions include North-northeast (NNE), Northeast (NE), East (E), East-northeast (ENE), East-southeast (ESE), Southeast (SE), South-southwest (SSW) and Southwest (SW), which account for approximately 77.9% accumulative annual wind occurrence. ***Table 1*** summarises the percentage of annual occurrence of the corresponding wind directions at 596mPD.

Plate 3 Annual Wind Rose of Square (29, 30), MM5 Data from the Planning Department

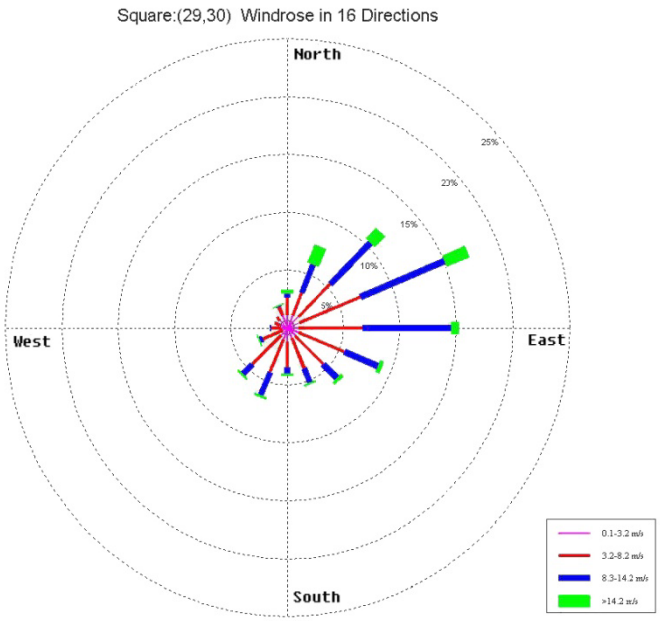


Table 1 Percentage Occurrence of Directional Winds at 596mPD

Wind Angle (º)	Wind Direction	Wind Speed at 596mPD (m/s)	Percentage Occurrence
67.5	ENE	9.38	17.2%
90	E	8.56	14.9%
45	NE	8.92	11.5%
112.5	ESE	7.24	8.6%
22.5	NNE	9.49	7.7%
202.5	SSW	6.80	6.3%
135	SE	6.70	6.1%
225	SW	6.18	5.6%
157.5	SSE	5.98	5.0%
180	S	4.96	3.7%
0 or 360	N	5.17	3.3%
247.5	WSW	5.31	2.6%
337.5	NNW	2.83	1.8%
270	W	3.71	1.4%
292.5	WNW	3.21	1.4%
315	NW	2.12	1.3%

4.4. WIND DATA FROM HONG KONG OBSERVATORY

The Sha Tin Automatic Weather Station, which is operated by HKO and located approximately 3.5 km northeast of the site at 6 mPD, is the nearest station to the site (location as shown in ***Plate 4*** below). ***Plate 5*** presents the average wind rose of the Sha Tin Anemometer Station of year 1985-2011 obtained from HKO. The annual wind roses of the Sha Tin Anemometer Station of year 2007 – 2010 (as shown in ***Plate 6***) were also obtained from the *Summary of Meteorological and Tidal Observations in Hong Kong* published by the HKO. The wind roses show that wind mostly comes from the northeast quadrant throughout a year. The summer and winter wind roses (***Plate 7***) further show that in summer wind predominantly comes from the southwest and south-southwest whereas in winter prevailing wind is mainly from the northeast quadrant. The monthly wind data (***Table 2***) also show that in the summer the prevailing wind directions are southwest and east. It can be concluded that the prevailing winds for the site may come from the northeast quadrant in non-summer period and during summer months, the winds mainly come from south-westerly (SW) direction.

Plate 4 Location of Sha Tin Automatic Weather Station

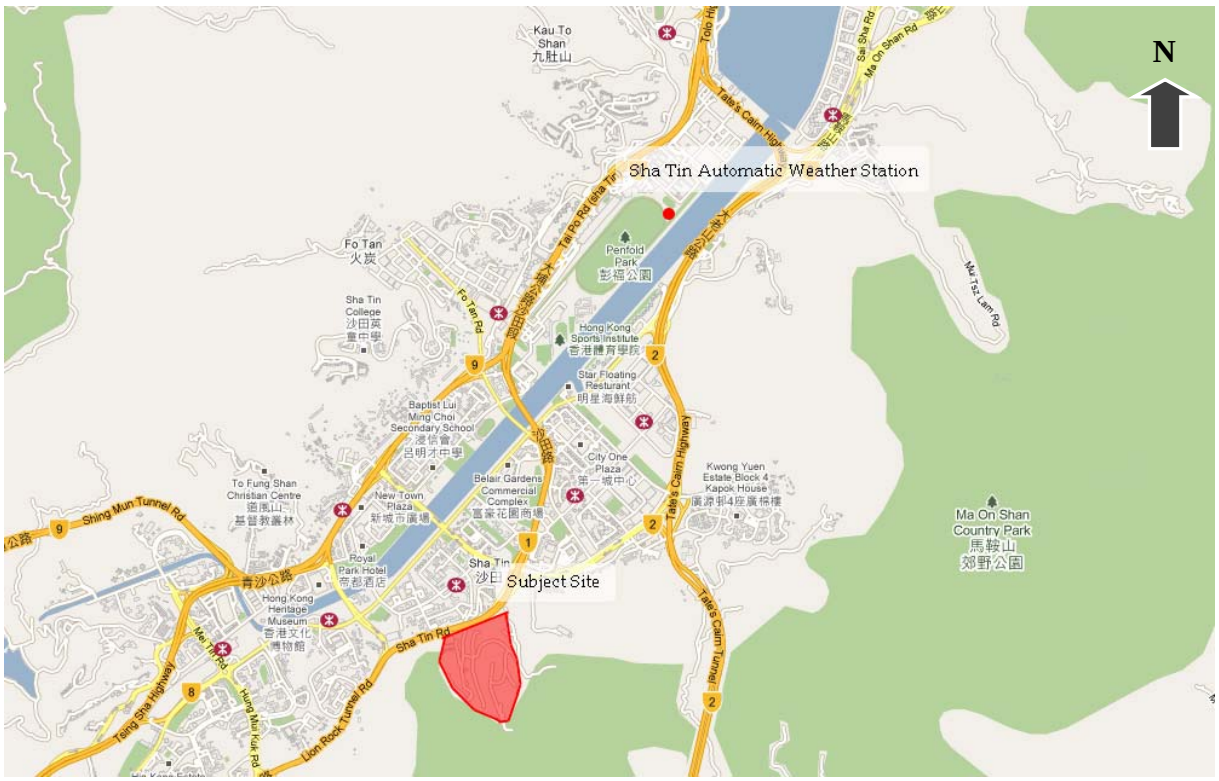


Table 2 Monthly Wind Data of Sha Tin Automation Weather Station for the past 5 years

Month	Monthly Prevailing Wind Direction (Degrees)				
	2007	2008	2009	2010	2011
January	360	40	30	360	30
February	90	350	100	350	360
March	90	80	80	80	30
April	30	90	90	90	90
May	100	220	100	90	90
June	220	220	220	220	210
July	220	220	220	220	210
August	220	220	220	100	220
September	90	360	90	220	20
October	20	90	90	20	20
November	40	30	350	30	20
December	30	30	350	30	30

Plate 5 Average Wind Rose at Sha Tin Automation Weather Station (1985 – 2011)

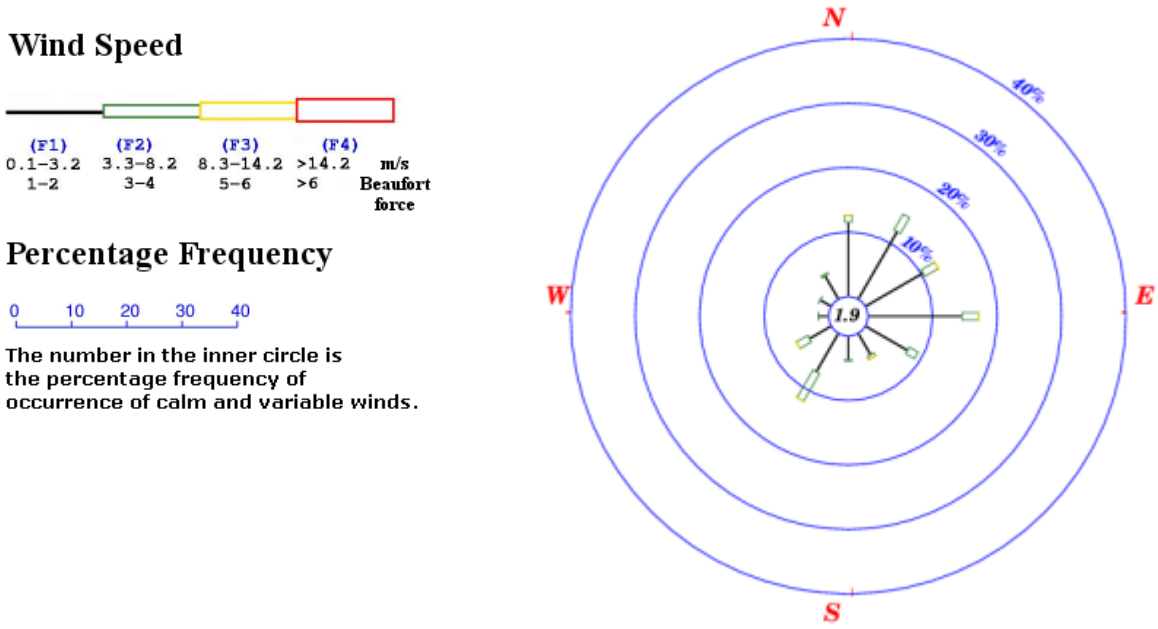
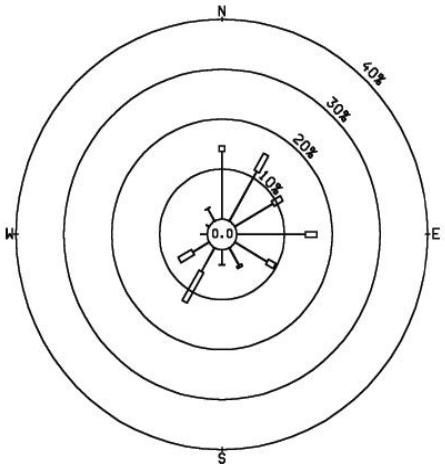
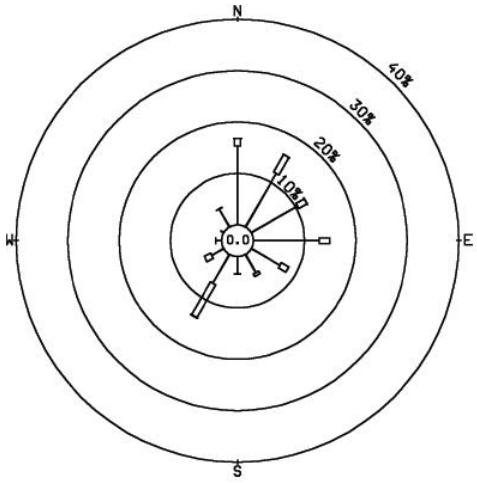


Plate 6 Annual Wind Roses at Sha Tin Automation Weather Station (2007 – 2010)

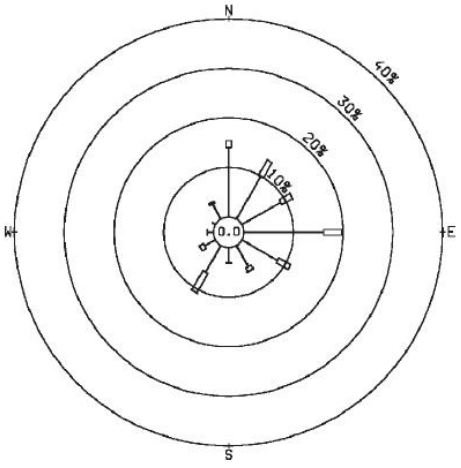
2007



2008



2009



2010

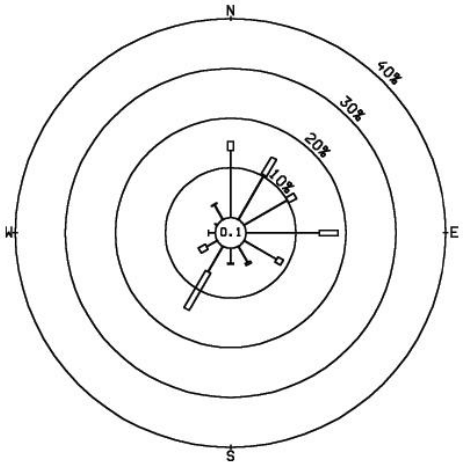
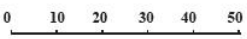


圖 例 :
Legend :

0.1 - 3.2	3.3 - 8.2	8.3 - 14.2	> 14.2	米/秒 m/s
1 - 2	3 - 4	5 - 6	> 6	蒲福氏風級 Beaufort force

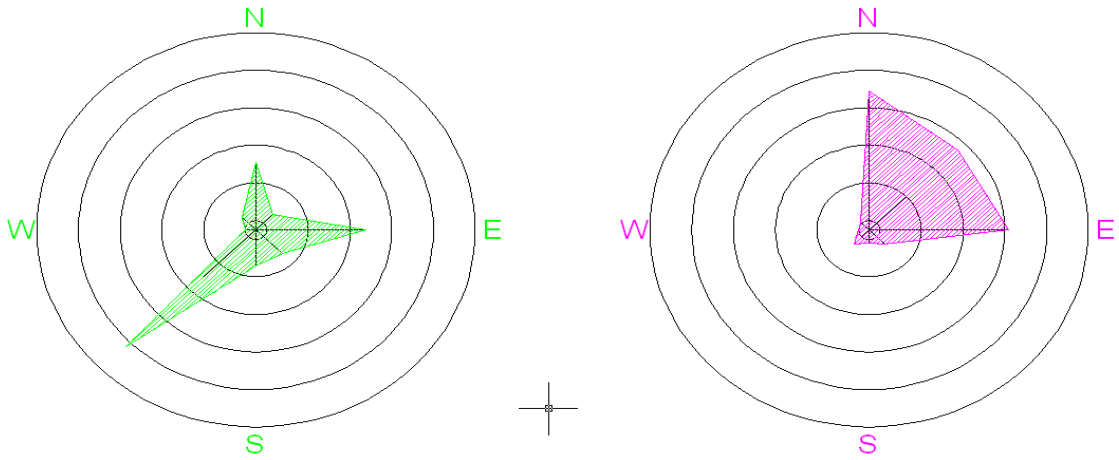
風速 **Wind Speed**



小圈內的數字表示出現無風及風向不定之情況的頻率百分比
The number in the inner circle is the percentage frequency of occurrence of calm and variable winds.

頻率百分比 **Percentage Frequency**

Plate 7 Summer and Winter Wind Roses at Sha Tin Automation Weather Station



Summer Wind Rose **Winter Wind Rose**

4.5. TOPOGRAPHICAL EFFECTS ON WIND AVAILABILITY

Since the site is located on a hillside to the south of the existing built area, its surrounding is relatively free of high-rise buildings. As a result, the wind availability of the site is largely affected by the surrounding topography. The Lion Rock to the southwest of the site is steep and smooth adjustment of boundary layer flow over the mountain is unlikely. It is therefore expected that flow separation would occur and wind availability at the site will be affected by the lee eddy before the wind flow reattaches. In the non-summer period when wind mainly comes from the northeast, this effect is expected to be less significant.

5. ASSESSMENT METHODOLOGY AND CRITERIA

5.1. GENERAL

The AVA Initial Study employed a computational fluid dynamics (CFD) computer simulation model, *ANSYS FLUENT*, for the assessment. *FLUENT* has been widely applied for numerous AVA research and studies worldwide. It provides complete mesh flexibility, solving flow problems with different types of unstructured meshes. Such unstructured grid technology allows grid consisting of elements in variety of shapes such as hexahedra, tetrahedral, prisms and pyramids for 3D simulation. Sophisticated numeric and a robust solver ensure accurate results.

5.2. INITIAL AND IMPROVED LAYOUTS

Two schemes are investigated in the AVA Initial Study, namely the Initial Scheme and the Proposed Scheme. The layout plans of the Initial and Proposed Schemes are shown in ***Figure 1*** and ***Figure 2*** respectively.

5.2.1. Initial Layout

The Initial Layout modelled in the Initial Scheme comprises 19 residential blocks of varying height profile that are closely located with little separation between buildings at podium level. The design considerations of the Initial Scheme were to maximize the development potential (i.e. number of flats) while minimizing the degree of slope cutting and rock excavation. In general, building heights gradually increase from the northern to the southern part of the site. 12 out of 19 residential blocks are typical Y-shaped/V-Shaped public housing blocks while the remaining 7 buildings are longitudinally-shaped. ***Plate 8*** and ***Plate 9*** shows the geometry setting and general layout of the Initial Scheme respectively. The height of the tallest building within the Initial Layout is approximately 90m.

Plate 8 Geometry Setting of Initial Scheme

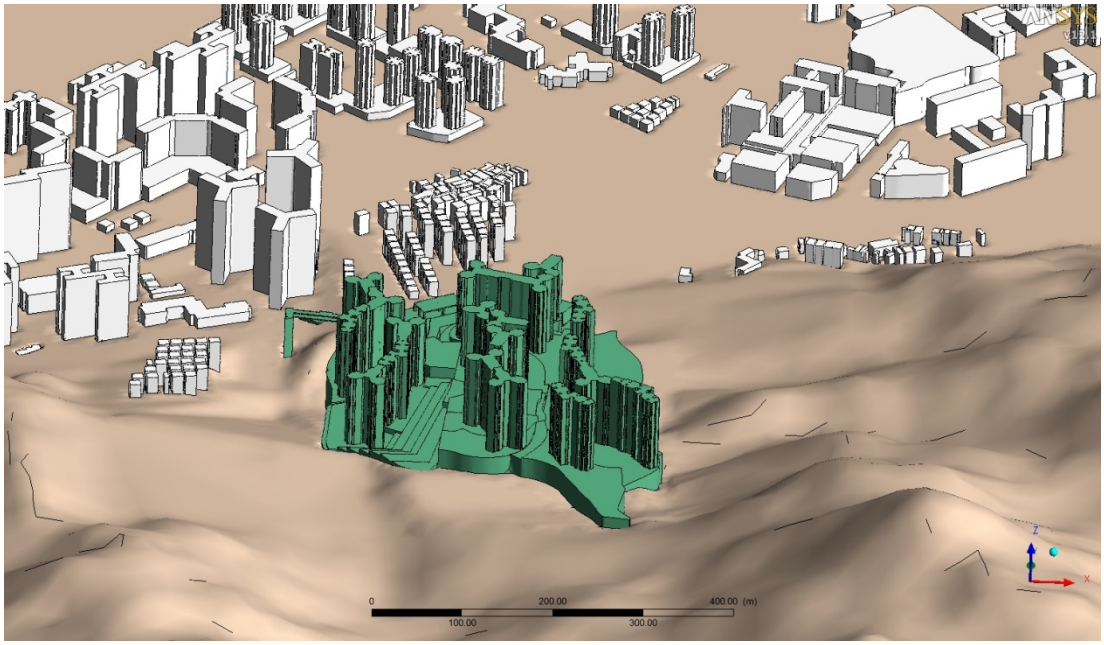
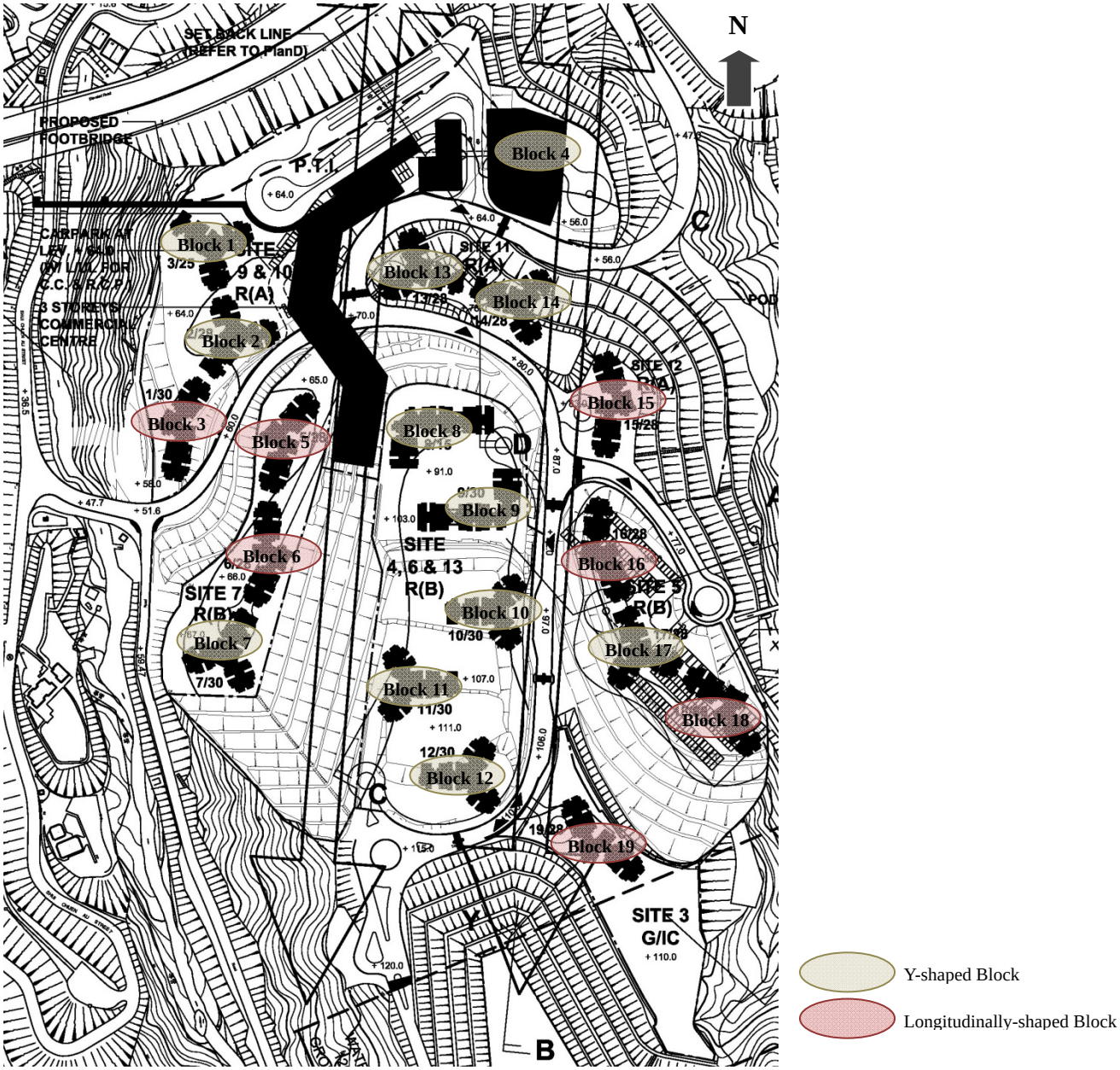


Plate 9 Ground Floor Plan of the Initial Scheme



5.2.2. Proposed Layout

The Proposed Layout modelled in the Proposed Scheme comprises 18 residential buildings of varying height profile (25 to 30 storeys) at podium level ranging from 63 to 118mPD. With one building less than the Initial Layout, more building gaps are allowed within the development to facilitate air ventilation. Similar to the Initial Layout, building heights gradually increase from the northern to the southern part of the site. 13 out of 18 buildings are Y-shaped public housing blocks while the remaining buildings are longitudinally-shaped. Building blocks are arranged to allow ventilation paths across the site and provide more

gaps between buildings than that in the Initial Layout to improve permeability. Moreover, ventilation openings at ground floor levels are incorporated to further enhance localized air ventilation performance. The Proposed Scheme is viewed as a better option than the Initial Scheme in terms of air ventilation performance. ***Plate 10*** shows the geometry setting of the Proposed Scheme. The height of the tallest building within the Proposed Layout is approximately 105m. The podium structures are divided into several land parcels by the major roads within the Subject Site to prevent air flow impediment.

Plate 10 Geometry Setting of Proposed Scheme

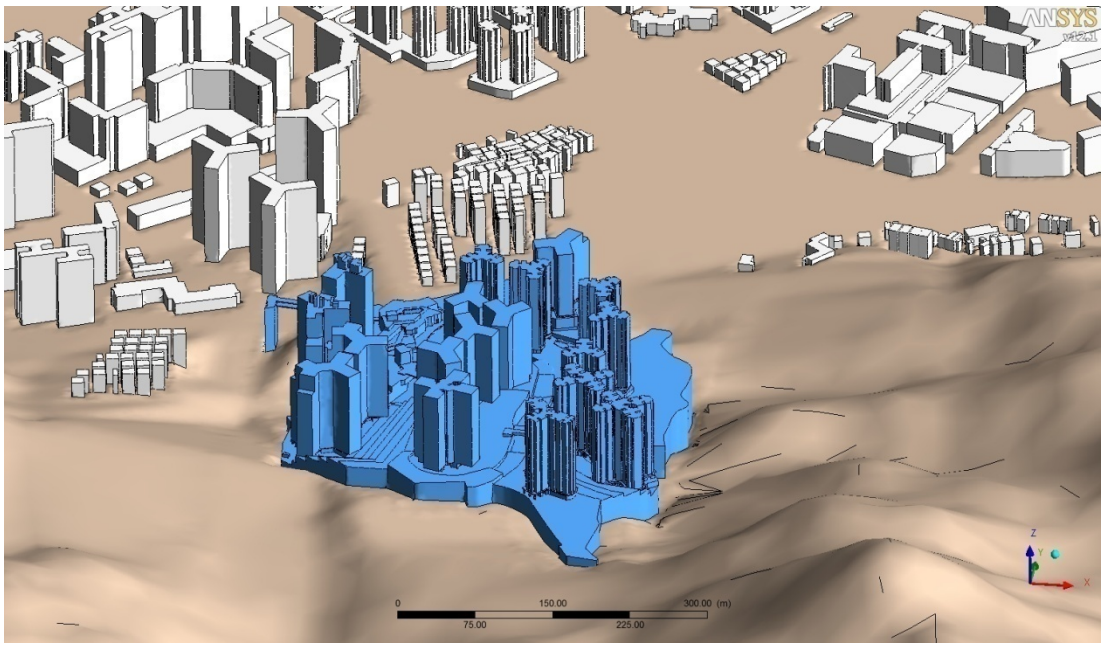
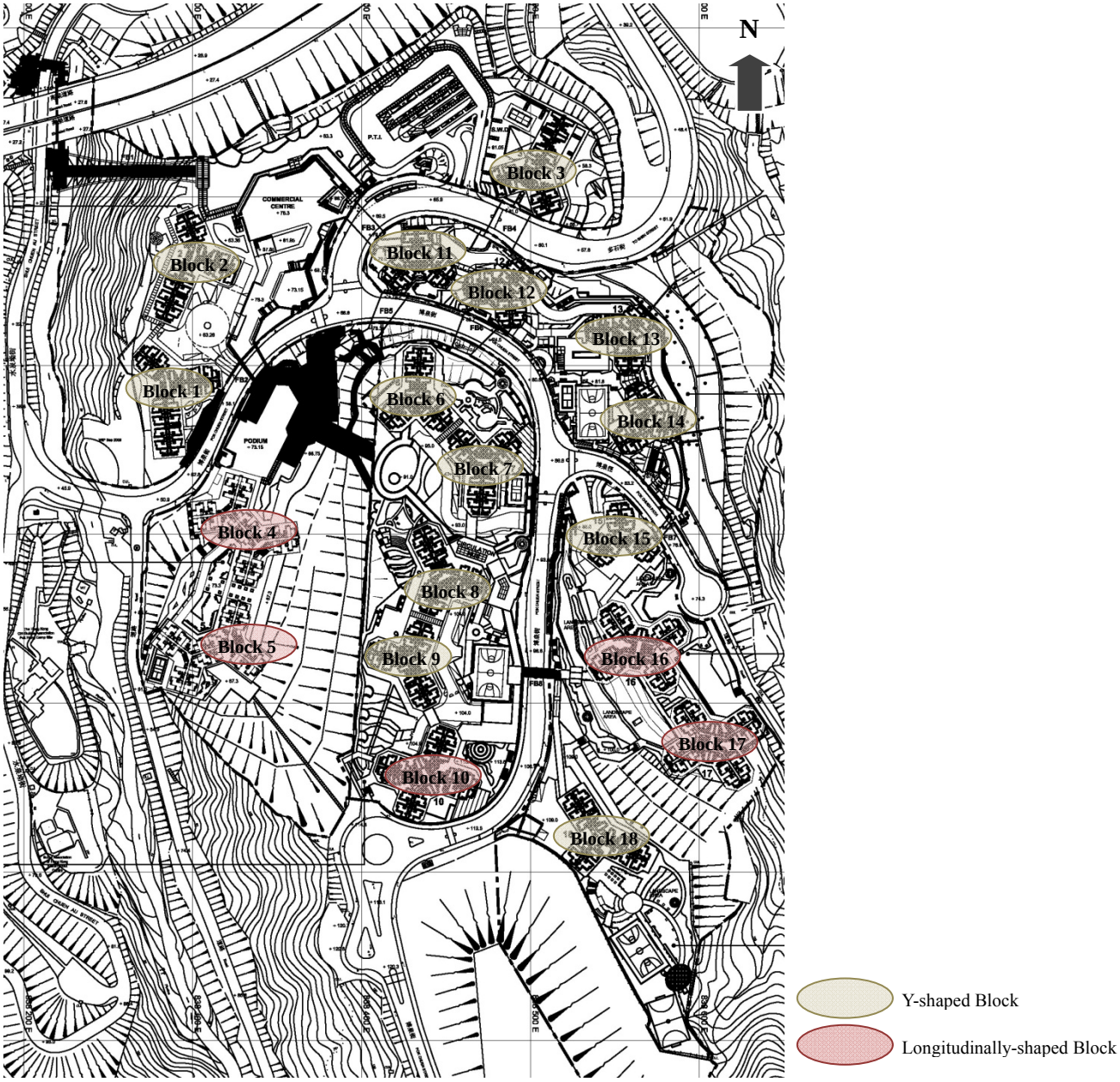


Plate 11 Ground Floor Plan of the Proposed Scheme



5.3. MODELLING TOOL AND ASSUMPTIONS

5.3.1. Domain Size & Grid Setting

In the AVA Initial Study, three-dimensional models of the site and the surrounding built environment are constructed to simulate the wind performance of the design options. Related wind speeds around the development are assessed by setting up a geometry model of the development with surrounding building structures.

It is recommended in the *Technical Guide* that the Assessment Area and Surrounding Area of the Project should include the Project's surrounding of up to a perpendicular distance *H* and 2*H* respectively from the Project boundary, while *H* being the height of the tallest building of the Proposed Development (H is assumed to be 90m and 104m in the Initial Layout and Proposed Layout respectively). However, the Assessment Area has been enlarged in the Initial Study to capture more realistic wind performance as prominent topographical features exist to the south of the site. An Assessment Area with a perpendicular distance of 500m from the Project Boundary has been adopted in the AVA Initial Study. It is calculated that the blockage ratio of the model approximates 4.0%

Top view and side view of the representation of the computational domain are shown in ***Plate 12*** and ***Plate 13*** respectively. The size of the computational domain of the 3D model is illustrated below:

x-direction (L) = 3,937m;

y-direction (W) = 3,045m; and

z-direction (H) = 1,165m

Plate 12 Top View of Domain Dimension

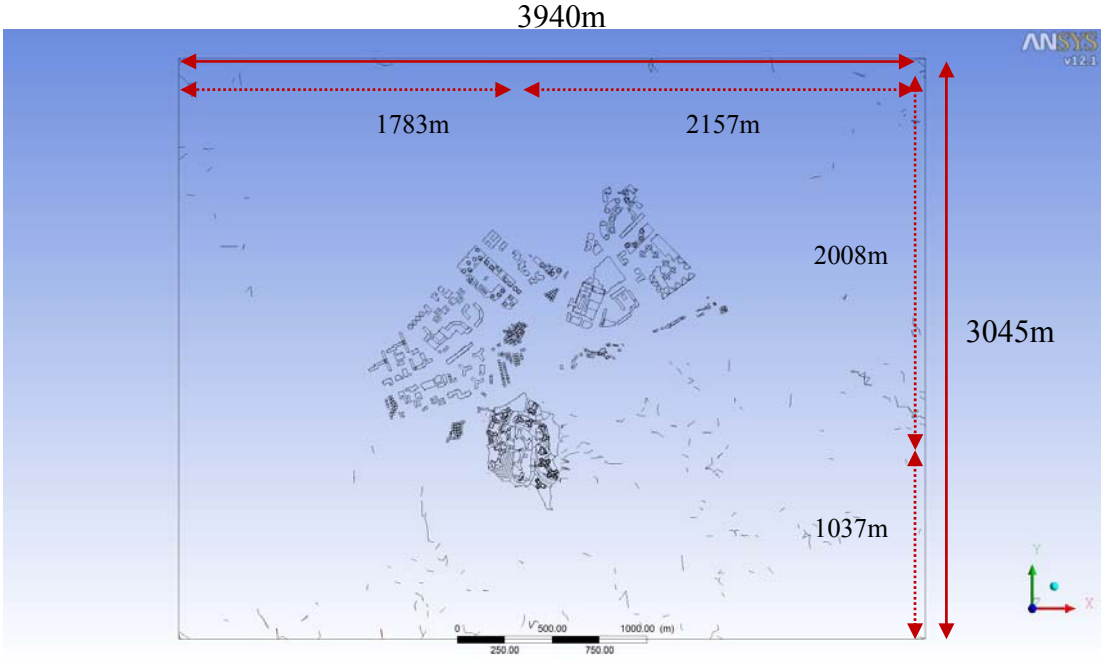
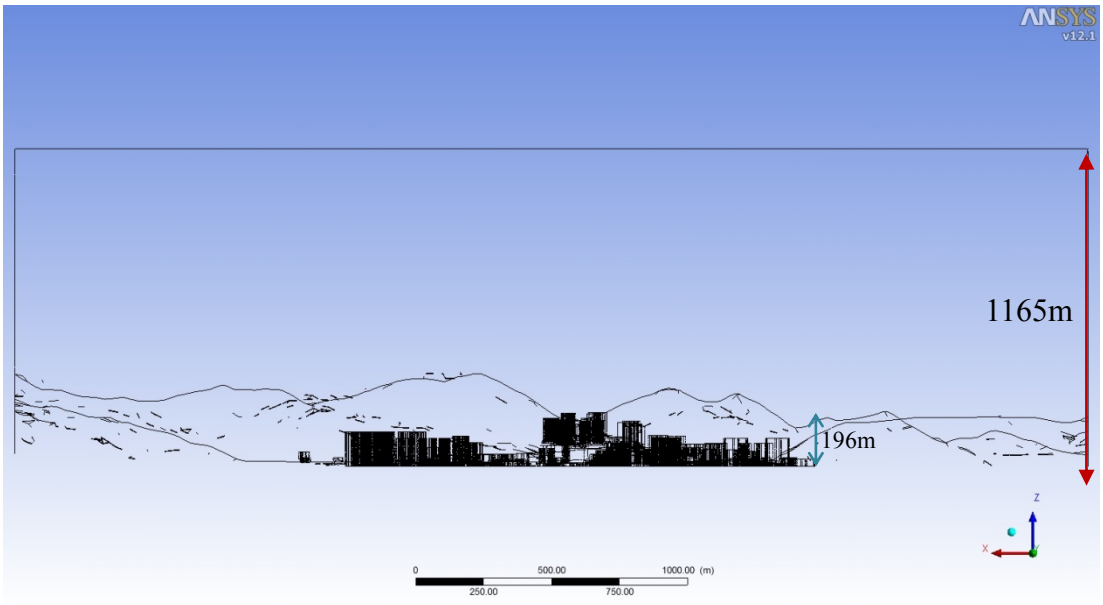


Plate 13 Side View of Domain Dimension



Unstructured grid is constructed by *ANSYS ICEM CFD* and the grid size can be manually adjusted in the aforesaid meshing tools. Within the assessment area, cells located across the *x*-axis and *y*-axis are positioned with smaller intervals than those located further from the site location in order to produce a more precise result at higher resolution where it is required.

The CFD model is developed with the combination of tetrahedral and prism cells. Approximately 14.15 million cells are constructed for the study. The grid arrangement within the assessment height of 2m above ground has been refined to facilitate the pedestrian wind environment study. In order to improve accuracy, smaller gird has been adopted in order to achieve a higher resolution at low levels of z-axis and thus capable of resolving small scale height structures and changes in topography at pedestrian level. The expansion ratio between two consecutive cells approximates 1.3. Four prism layers at prism ratio of 1.00 are created at 2m above ground to increase modelling accuracy at pedestrian level.

5.3.2. Turbulence Model

ANSYS FLUENT offers an unparalleled breadth of turbulence models such as k-epsilon turbulence model and the Reynolds stress model (RSM). In this study, the realizable k-epsilon model and a second order discretization scheme are adopted for simulation. Common computational fluid dynamics equations are also used in the analysis. A symmetry condition is prescribed at the lateral and top boundary of the 3D model. The convergence criterion adopted being the sum of the normalized absolute residuals less than

1×10^{-3}.

5.3.3. Wind Profile

The vertical discretization of the velocity profile is being approximated using a wind profile power law, which is a function of ground roughness and height:

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

where

U_G = reference velocity at height z_G

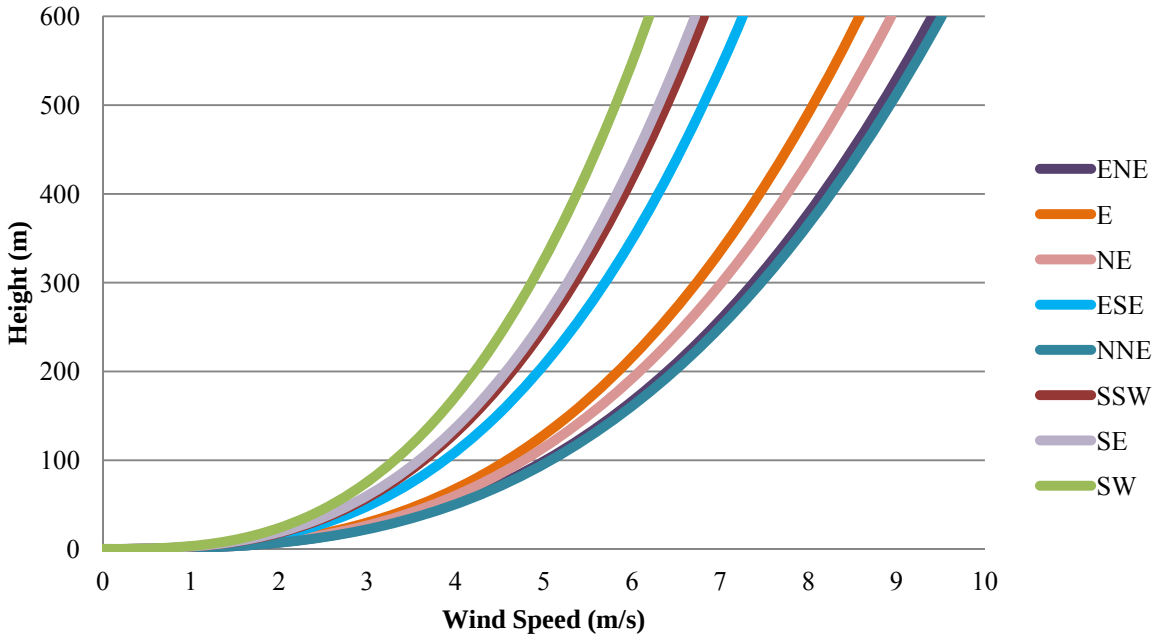
Z_G = reference height

z = height above ground

U_Z = velocity at height z

The reference velocity at the top of the wind boundary layer is determined from MM5 simulation data published by the Planning Department. The alpha coefficient α is related to the ground roughness, which is determined by terrain types. In this study, the alpha coefficient α is set at 0.35 for all the prevailing wind directions as the terrain crossed by the approaching wind is considered as suburban or mid-rise. ***Plate 14*** shows the wind profile of the 8 most probable wind directions which account for 77.9% occurrence of wind over a year at the site. Each wind profile is plotted with reference to the wind profile power law. Wind velocity at each elevation between 0 to 600m is approximated using the wind profile power law as indicated above.

Plate 14 Wind Profile of the 8 Most Probable Wind Directions



5.3.4. Wind Velocity Ratio

Wind Velocity Ratio (*VR*) should be used as an indicator of wind performance for the AVA. It indicates how much of the wind availability of a location could be experienced and enjoyed by pedestrians. The higher the wind Velocity Ratio, the less likely would be the impact of the Proposed Developments on the wind availability.

Wind Velocity Ratio is defined as follows:

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

where

V_p is the wind velocity at the pedestrian level (2m above ground) after taking into account the effects of buildings; and

V_∞ is the wind availability of the site, i.e. wind velocity at the top of the wind boundary layer. MM5 data are used to determine velocity at infinity level for the Project site.

The assessment on the overall wind performance of the current situation and the Proposed Development were analyzed by comparing the weighted wind Velocity Ratio (VR_w) to

account for wind coming from the 8 wind directions. VR_w is the sum of the Wind Velocity Ratio of wind from direction *i* (VR_i) multiplied by the probability (F_i) of wind coming from that direction.

$$VRi = \frac{V_{pi}}{V_{\infty i}} \qquad VR_w = \sum_{i=1}^{16} Fi \times VRi$$

where

V_{pi} is the wind velocity at the pedestrian level (2m above ground) when wind comes from direction *i*; and

$V_{\infty i}$ is the wind availability of the site, when wind comes from direction i

F_i is the frequency occurrence of wind from direction *i*, eight wind directions are considered.

VR_w is the wind Velocity Ratio

5.3.5. Test Points

Test Points are the assessment locations where Wind Velocity Ratios (*VRs*) at 2m above ground level are reported. The criteria of choosing Test Points are stipulated in paragraph 28 of the *Technical Guide*. Perimeter Test Points and Overall Test Points were selected within the Assessment Area so as to assess the impact on the immediate vicinity and local areas respectively. All test points are elevated at 2m above ground.

Perimeter Test Points were distributed to assess the resultant wind environment that can be frequently accessed by pedestrians. Test Points in this group were selected at around 10 m to 50 m interval along the boundary of the site, and were named with prefix "P" (i.e. P-01, P-02…). Local Test Points were positioned in the open spaces, on the streets and places of the Project and Assessment Areas which are frequently accessed by pedestrians. Test points in this group are named with prefix "O" (i.e. O-01, O-02…). ***Figure 3*** and ***Figure 4*** show the selected Test Points of the Initial Scheme and the Proposed Scheme for the purpose of this AVA Initial Study.

For the Site Air Ventilation Assessment, the weighted Site Spatial Average Wind Velocity Ratio (SVR_w) is reported. SVR_w is the average of VR_w of all Perimeter Test Points. For the Local Air Ventilation Assessment, the weighted Local Spatial Average Wind Velocity Ratio (LVR_w) is reported. LVR_w is the average of VR_w of all Overall Test Points as well as Perimeter Test Points.

6. RESULTS AND ANALYSIS

6.1. GENERAL

In this AVA Initial Study, wind environment at pedestrian level (2m above ground) is simulated under the 8 most probable wind directions in both the Initial Scheme and Proposed Scheme. Wind velocity contour and vector diagrams simulated for each assessed wind direction are provided in ***Appendix I***.

Pedestrian-level wind Velocity Ratios (*VRs*) are simulated for each Test Point under the 8 most probable wind directions in both Schemes. Furthermore, the *VRs* simulated under each wind direction are averaged taking into account wind probability to determine the weighted wind velocity ratio (VR_w) of the Baseline and Proposed Scheme. The VR_w of the 31 Perimeter Test Points and 105 Overall Test Points for the Initial and the Proposed Scheme are summarized in ***Appendix II***. The detailed average *VRs* of all Test Points under each assessed wind direction are also shown in ***Appendix III***.

6.2. LOCAL AIR VENTILATION ASSESSMENT

6.2.1. Annual Prevailing Wind Condition

Local spatial average Velocity Ratios (*LVRs*) are evaluated for each wind direction by considering the average *VR* modelled at all Overall Test Points and Perimeter Test Points. Weighted Local spatial average Velocity Ratios (LVR_w) are also determined after taking into account wind probability of the 8 assessed wind directions. ***Table 3*** summarizes the *LVR* and LVR_w results for both the Initial and Proposed Schemes under the 8 most probable wind directions.

Table 3 Analysis of Average LVR between Initial Scheme and Proposed Scheme

Wind Directions	**Average LVR (Initial Scheme)**	**Average LVR (Proposed Scheme)**	**Change in Average VR between Schemes**	**Change in Average LVR between Schemes (%)**
ENE (67.5^o)	0.132	0.154	0.022	16.5%
E (90^o)	0.143	0.161	0.019	13.1%
NE (45^o)	0.167	0.189	0.022	12.9%
ESE (112.5^o)	0.052	0.048	-0.008	-7.7%
NNE (22.5^o)	0.244	0.258	0.014	5.6%
SSW (202.5^o)	0.148	0.153	0.005	3.5%
SE (135^o)	0.063	0.077	0.014	22.2%
SW (225^o)	0.151	0.163	0.012	7.7%
LVR_w	**0.139**	**0.154**	**0.014**	**10.3%**

Comparing the Initial and Proposed Schemes, it is found that majority of the LVR values show positive change in the range of 3.5% to 22.2% with the proposed scheme in place, except for the east-southeasterly wind direction where a negative change of -7.7% is observed. Noticeable improvement (0 – 10%) in average *LVR* is found under NNE, SSW and SW wind conditions, while medium to significant increase in average *LVR* (>10%) is found under ENE, E, NE and SE wind conditions. The overall change in LVR_w is 10.3% when comparing the two Schemes. On the whole, the findings indicate a noticeable improvement in ventilation performance within the site, in its immediate vicinity and other areas accessed frequently by pedestrians with the Proposed Scheme in place.

It is noteworthy that the average LVR under SE and ESE wind directions are noticeably low (< 0.1) under both the Initial and Proposed Schemes. It is mainly attributed to the fact that

the Subject Site is located on the leeward side a topographically enclosed area under southeasterly and east-southeasterly wind. Wind decelerates downhill when flowing mountain top to the valley in which the Subject Site and surrounding built-up areas are situated. A wake zone is formed immediate downslope, within which wind speed is expected to be low.

In view of the above site constraint, the building form and orientation of residential blocks are designed to facilitate localized ventilation within the site. The N-S aligned air paths within the site, ground floor openings in each residential block, widened building gaps between residential blocks, etc., all contribute to ameliorate the adverse ventilation problems as a consequence of the presence of the proposed development.

6.2.2. Summer Prevailing Wind Condition

As far as AVA is concerned, summer wind available to pedestrian areas is important to maintain thermal comfort and ameliorate the effect of air stagnation. According to the summer wind rose as shown in ***Plate 7*** above, summer wind comes presumably from the southwest and east (accounting for more than 75% of the total occurrence). Wind environment under summer wind conditions are assessed with reference to the directional SW and E wind. The value changes and percentage changes in LVR_w and SVR_w results for both schemes are summarized in ***Table 4*** below.

Table 4 Analysis of Change in Weighted LVR and SVR under Initial Scheme and Proposed Scheme under Summer Prevailing Wind Conditions

Parameters	**Average VR (Initial Scheme)**	**Average VR (Proposed Scheme)**	**Change in VR_w**	**Change in VR_w (%)**
LVR_w	0.148	0.162	0.014	9.7%
SVR_w	0.109	0.144	0.035	31.3%

Under prevailing summer southwesterly wind, the Subject Site is situated at the upwind location of the surrounding built-up area. Wind approaching the site will eventually reattach at Shatin Road, which acts as a ventilation corridor, to the built-up area. As shown in ***Table 4***, the predicted LVR_w and SVR_w values show positive changes of 9.7% to 31.3% respectively. The findings indicate a noticeable improvement in ventilation performance within the site and in its immediate vicinity, which is mainly attributed to the increased permeability of the proposed development.

6.3. SITE AIR VENTILATION ASSESSMENT

6.3.1. Annual Prevailing Wind Condition

Site spatial average Velocity Ratios (*SVR*) are evaluated for each wind direction by considering the average Velocity Ratio modelled at all Perimeter Test Points at podium level along the boundary of the Subject Site which are accessible by pedestrians. Weighted Site spatial average Velocity Ratios (SVR_w) are also determined after taking into account wind probability of the 8 assessed wind directions. The *SVR* and SVR_w results as well as the percentage changes for both the Initial and Proposed Schemes are summarized in ***Table 5*** below.

Table 5 Analysis of Average SVR between Initial Scheme and Proposed Scheme

Wind Directions	**Average SVR (Initial Scheme)**	**Average SVR (Proposed Scheme)**	**Change in Average SVR between Schemes**	**Change in Average SVR between Schemes (%)**
ENE (67.5^o)	0.090	0.134	0.044	48.5%
E (90^o)	0.100	0.124	0.024	24.2%
NE (45^o)	0.101	0.138	0.037	36.0%
ESE (112.5^o)	0.044	0.041	-0.003	-7.6%
NNE (22.5^o)	0.163	0.184	0.022	13.3%
SSW (202.5^o)	0.139	0.153	0.014	10.2%
SE (135^o)	0.050	0.073	0.023	45.3%
SW (225^o)	0.115	0.156	0.041	35.5%
SVR_w	**0.098**	**0.126**	**0.027**	**28.1%**

As shown in ***Table 5***, the predicted *SVR* values show positive change in the range of 10.2% to 48.5% under 7 assessed wind directions, namely ENE, E, NE, NNE, SSW, SE and SW. A slightly decrease in *SVR* (-7.6%) is observed under ESE wind condition. The weighted average SVR_w is found to be 0.098 and 0.126 in the Initial and Proposed Schemes respectively. The overall change in SVR_w is 28.1% when comparing the two Schemes. The findings indicate a significant improvement in ventilation performance within the site and in its immediate vicinity with the Proposed Scheme rather than the Initial Scheme in place.

6.4. FOCUS AREAS

The Spatial Average Velocity Ratios (SAVRs) for each focus area is summarised in ***Table 6*** below. In summary, significant air ventilation problem due to the proposed development is not anticipated with reference to the assessment results. The ventilation conditions between the two schemes are similar, mainly attributed to the fact that the focus areas are of sufficient horizontal distance from the Subject Site. No stagnant areas are identified, and ventilation performance in those areas of interest is generally maintained.

Focus areas that are of a relatively close proximity to the site, including Tsok Pok Hong New Village, Fui Yiu Ha New Village, Sha Tin Wai MTR Station and To Shek Service Reservoir, are expected to experience slight increase in VR_w. Similar ventilation conditions are also found in Jat Min Chuen and Sha Kok Estate which are located farther away from the Subject Site. Pok Hong Estate, Sha Tin Wai and Sha Tin Wai New Village may experience slight decrease in weighted VR_w. However, it is evidently observed from the vector and contour diagrams that the development in the Proposed Scheme is not anticipated to obstruct wind flow or deflect the prevailing wind patterns as compared to that in the Initial Scheme.

Table 6 Analysis of Weighted Average Velocity Ratio (VR_w) in Focus Areas

Focus Area		**Test Points**	***VR*$_w$ (Baseline Scheme)**	***VR*$_w$ (Proposed Scheme)**	**Change in *VR*$_w$**
Zone 1	Tsok Pok Hang New Village	O-01 to O-18	0.147	0.149	0.003
Zone 2	Pok Hong Estate (East)	O-19 to O-25; O-40 to O-42; O-49 to O-52	0.206	0.188	-0.006
Zone 3	Pok Hong Estate (West)	O-26 to O-35; O-54 to O-60	0.143	0.159	0.016
Zone 4	Tse Uk Village and Fui Yiu Ha New Village	O-36 to O-39; O-43 to O-48	0.201	0.192	-0.009
Zone 5	Sha Tin Wai MTR Station	O-50 to O-53	0.201	0.215	0.015
Zone 6	Jat Min Chuen	O-61 to O-64	0.080	0.104	0.023
Zone 7	Sha Kok Estate	O-65 to O-70	0.105	0.106	0.002

Zone 8	Sha Tin Wai	O-71 to O-74	0.176	0.159	-0.017
Zone 9	Sha Tin Wai New Village	O-75 to O-78	0.199	0.163	-0.036
Zone 10	To Shek Service Reservoir	O-79 to O-80	0.295	0.311	0.016

6.5. AIR VENTILATION IMPROVEMENT MEASURES

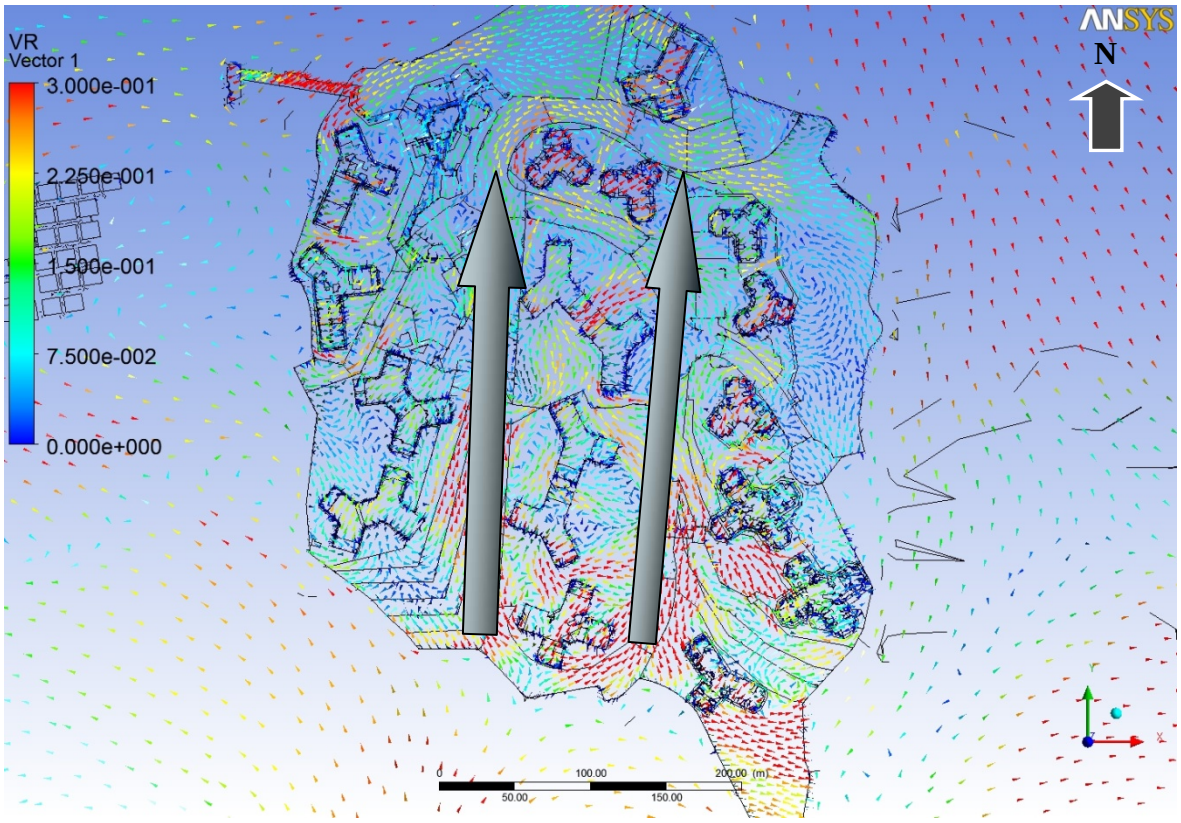
With due consideration of the prevailing wind directions and evaluation of the Initial Layout in terms of air ventilation, a series of design features have been incorporated into the layout to enhance air ventilation and wind comfort of the Proposed Development and to minimize the potential impact on the surrounding environment. These features include:

- Ventilation / Air Paths
- Height Profiles
- Ground floor openings for domestic blocks
- Building Gaps

6.5.1. Ventilation / Air Paths

Current road configurations and the valley in which the site is located act well as breezeways along prevailing wind directions. As the site is of relatively large scale and is located in the valley, ventilation paths have been maintained through the site to enhance wind permeability and to lower the impact of the development on the downwind built-up area under prevailing southwesterly wind conditions (***Plate 15***). It is anticipated that the wind paths between the aligned proposed residential buildings shall act as the main ventilation pathways along the prevailing wind direction with the Proposed Development in place.

Plate 15 Ventilation / Air Paths within the Subject Site under Southwesterly Wind



Note: VR values within each residential block are referring to the velocity ratio values at 2m above rooftop.

6.5.2. Height Profiles

The Shatin district in general has been substantially developed for both public and private housing. Most of the nearby existing public housing was built in the early 1980s, with height between 61mPD and 120mPD, and a few exceptions like Pok Hong Estate. To the north and northwest of the site, the taller residential buildings (i.e. the newly Pok Hong Estate) is surrounded by lower-rise residential areas such as Sha Tin Wai Village and the Christ College. Such gradation of building heights would help wind deflection and instigate wind flowing throughout the region.

Whilst the building height of all residential blocks in the site is maintained at 25-30 floors, the blocks are located on platforms of varying heights along the N-S direction. The lowest platforms are located at approximately 63mPD at the northern part of the site and gradually rise to the highest platform at 113mPD at the southern part of the site, following the natural rising of the valley. Such varying height profile will enhance the capturing of prevailing wind, in particular wind from the north-east quadrant, and enhance wind ventilation of the area.

6.5.3. Ground Floor Openings at Domestic Blocks

Ground floor openings would generally allow wind penetration at the pedestrian level of the site to enhance the local wind environment and facilitate air ventilation. In the Improved Layout, ground floor openings are widely incorporated in the buildings, especially for Blocks 6-10 to improve wind permeability. ***Plate 16*** below shows the locations of ground floor openings at each domestic blocks of the Proposed Scheme.

6.5.4. Building Gaps

In the proposed/improved layout the number of residential blocks has been reduced from 19 to 18. The minimum building gaps between residential blocks have been maintained at 6 meters to reduce blockage of wind (as shown in ***Plate 16*** and summarized in ***Table 7***). The building gaps channelize wind flow within the Subject Site and improve the ventilation environment of the surrounding area.

Plate 16 Ground Floor Plan of the Proposed Scheme

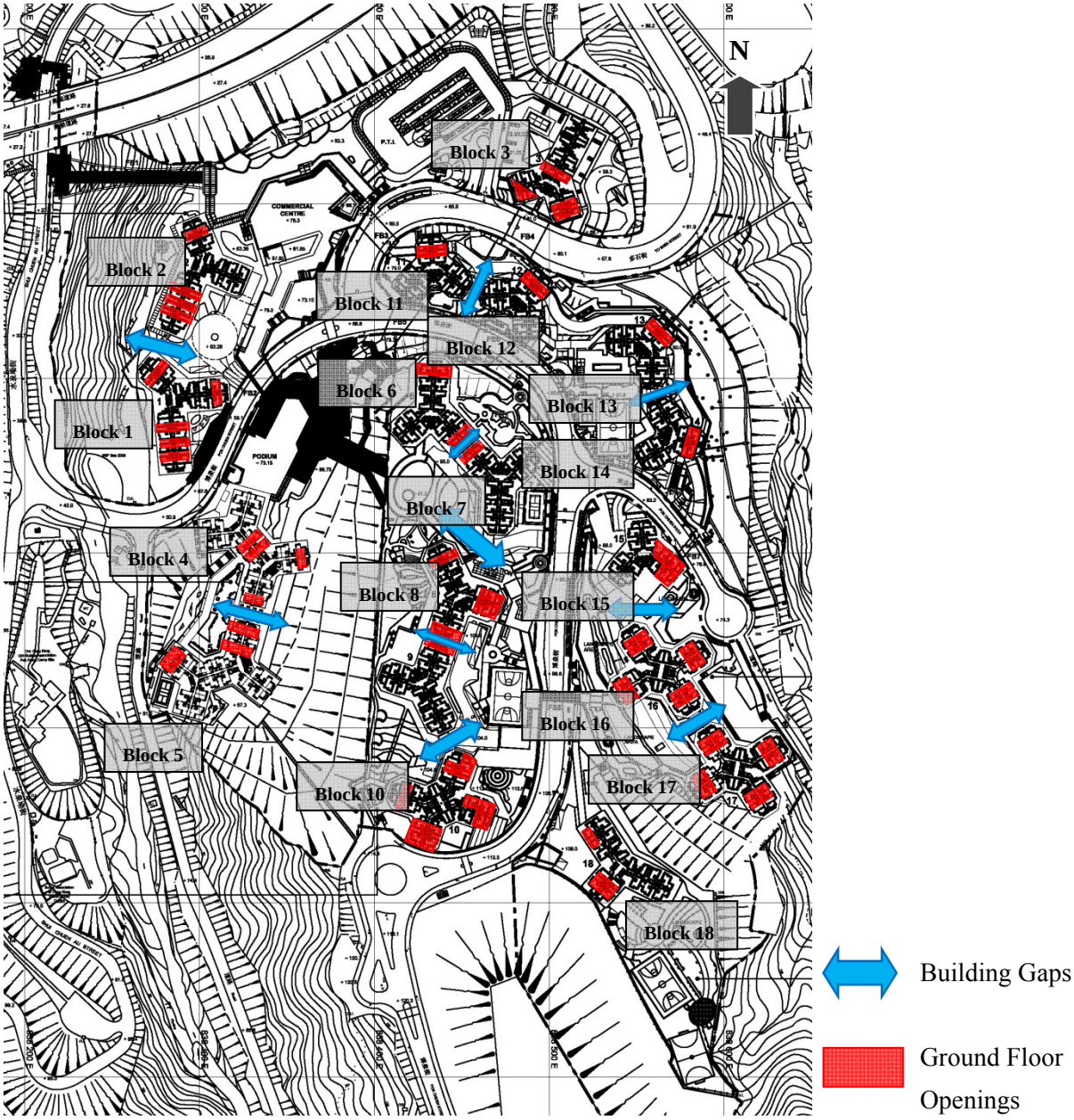


Table 7 Detailed Dimensions of Building Gaps

Residential Blocks		Horizontal Separation Distance (m)
Block 1	Block 2	17
Block 4	Block 5	10
Block 6	Block 7	6
Block 7	Block 8	23
Block 8	Block 9	6
Block 9	Block 10	14
Block 11	Block 12	6
Block 12	Block 13	36
Block 13	Block 14	6
Block 14	Block 15	30
Block 15	Block 16	23
Block 16	Block 17	12

6.5.5. Air Ventilation Assessment on Improvement Measures

The performance of the improvement measures and good design features in the proposed/improved layout is quantitatively evaluated for each of the eight most probable wind directions. 23 Overall Test Points (i.e. *O-83* to *O-105*) located within the Subject Site are chosen to assess the wind environment of the Proposed Development. The quantitative analysis of the average VR within the Subject Site between Initial and Proposed Schemes is tabulated in ***Table 8*** below.

In general, wind ventilation within the site is enhanced in the Proposed Scheme. The proposed/improved layout is found to be desirable under prevailing ENE, E, NE, NNE, SSW, SE and SW wind directions. As shown in ***Plate 17***, building gaps and ground floor openings incorporated in the proposed/improved layout (as indicated in *Section 6.5.3* and *6.5.4*) enhance wind penetration into the Subject Site under prevailing ENE wind. Wind approaching the Subject Site is diverted by Block 3. Under the Proposed Scheme, the widen gap between Block 12 and Block 13 (approx. 36m wide); Block 14 and Block 15 (approx. 30m wide); and Block 15 and Block 16 (approx. 23m wide) allow for the improved wind penetration to the residential blocks in the middle of the site. Also, widened gap between Block 7 and Block 8 (approx. 23m wide) allow wind reaching the west of the site dissipating to Block 4 and Block 5. Under the Initial Scheme, wind dissipation to the west

of the Subject Site will be hindered by the narrow building gaps (approx. 5m wide) between Blocks 8-12.

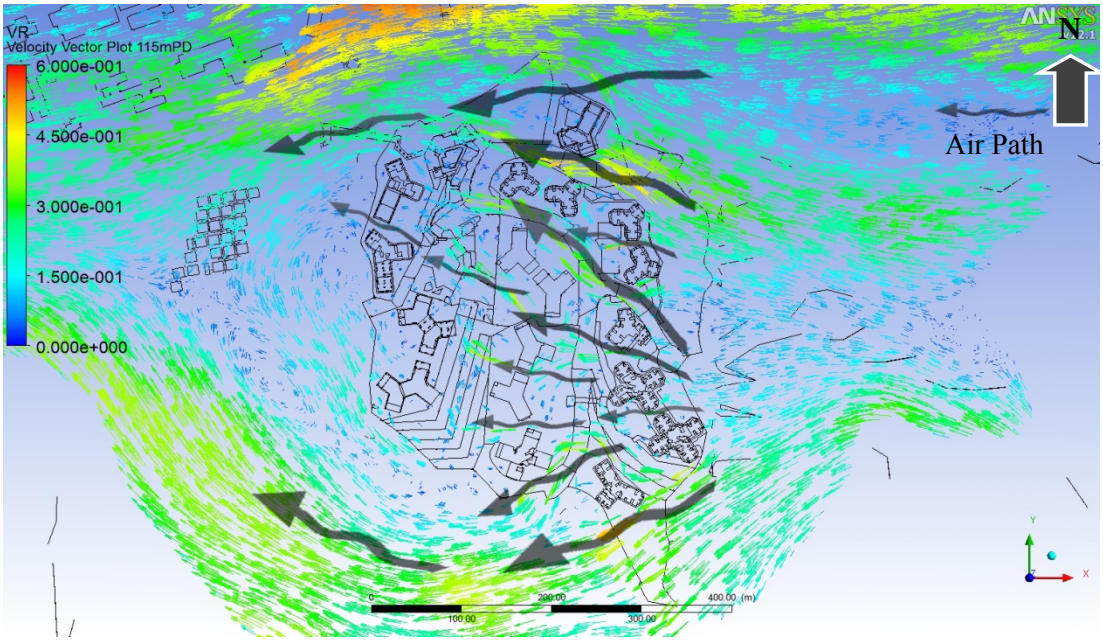
The significant improvement in ventilation within the Subject Site under south-southwesterly wind is attributed to the air paths as maintained along the N-S direction which allows wind penetration from north to south.

Wind obstruction under ESE directional wind, however, is expected under the both the Initial and Proposed Schemes. As tabulated in ***Table 8***, The average VR under ESE directional wind under the Proposed Scheme is found to be 0.021, with a -19.4% reduction as compared to the Initial Scheme. It is believed that the elevated platform of Block 18 under the Proposed Scheme impede air flow to a certain extent as compared to the Initial Scheme. Meanwhile, the exposed terrain to the southeast of the Subject Site is also believed to reduce wind availability upwind. In view of the above findings, ground floor openings have been incorporated in Blocks 15-18 under the Proposed Scheme to minimize the wind stagnation effects as a consequence of site constraint. Taken into consideration that wind amplification is expected under the rest of the 7 most probable directional winds and that ESE wind only accounts for 8.6% of the percentage of annual occurrence, the cumulative impact associated with the potential wind stagnation problem within the site is considered insignificant with the implementation of good design features.

Table 8 Analysis of Average VR within Subject Site

Wind Directions	**Average VR (Initial Scheme)**	**Average VR (Proposed Scheme)**	**Change in Average VR between Schemes**	**Change in Average VR between Schemes (%)**
ENE (67.5^{o})	0.087	0.121	0.034	38.8%
E (90^{o})	0.095	0.167	0.072	76.4%
NE (45^{o})	0.076	0.175	0.099	129.1%
ESE (112.5^{o})	0.027	0.021	-0.005	-19.4%
NNE (22.5^{o})	0.127	0.227	0.100	79.2%
SSW (202.5^{o})	0.025	0.082	0.056	222.5%
SE (135^{o})	0.119	0.141	0.022	18.2%
SW (225^{o})	0.099	0.121	0.021	21.5%
VR_w	**0.083**	**0.136**	**0.053**	**68.9%**

Plate 17 Air Path Diagram at 120mPD under prevailing East-northeasterly Wind (Proposed Scheme)

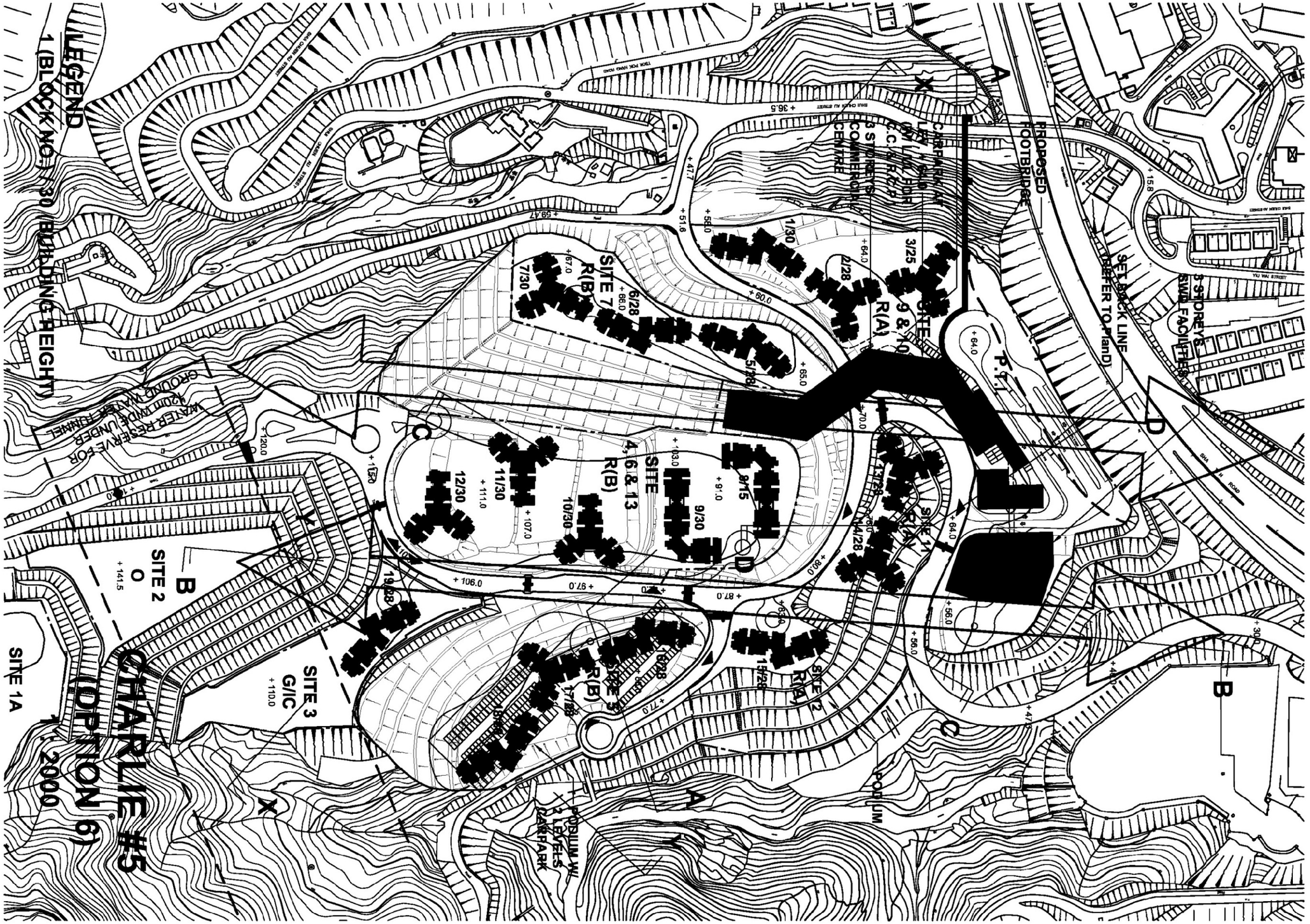


7. CONCLUSION

Computational Fluid Dynamics (CFD) technique is utilized for the AVA Initial study of the proposed public rental housing development at Shatin Area 52 (Shui Chuen O) in accordance with the Air Ventilation Assessment (AVA) methodology given in the *Technical Guide*. With reference to data from MM5 data from the Planning Department and HKO automatic weather station data, prevailing winds from the northeast quadrant are dominant in non-summer period while wind from the southwest direction are dominant in summer period within the Sha Tin Wai area. In this AVA study, 8 wind directions which account for 77.9% occurrence of wind over a year were chosen to quantitatively air ventilation performance of the Proposed Development and its surrounding environment. The eight most frequent wind directions include North-northeast (NNE), Northeast (NE), East-northeast (ENE), East (E), East-southeast (ESE), Southeast (SE), South-southwest (SSW) and Southwest (SW).

Wind Velocity Ratio (*VR*) is simulated to quantitatively evaluate the air ventilation performance of the Proposed Development and its surrounding environment. Representative assessment points, including 31 Perimeter Test Points and 105 Overall Test Points, were selected for detailed assessment. With reference to the assessment findings, no problem areas due to the proposed development has been identified in the AVA Initial Study, most likely due to the considerable distance between the Subject Site and surrounding development. Overall percentage changes in weighted Local spatial average Velocity

Ratios (LVR_w) and weighted Site spatial average Velocity Ratios (SVR_w) were found to be 10.3% and 28.1% between the Initial Scheme and Proposed Scheme respectively. Wind performance within the Subject Site is also evaluated to study the improvement measures and good design features in the Proposed Scheme. The AVA Initial Study reveals that the wind environment in the Project and assessment area will be improved with the Proposed Layout. It is anticipated that the good design features that have been incorporated in the Proposed Layout, including the reduced number of blocks, widened gaps between the buildings and the ground floor openings, facilitate wind permeability and improve local wind environment.

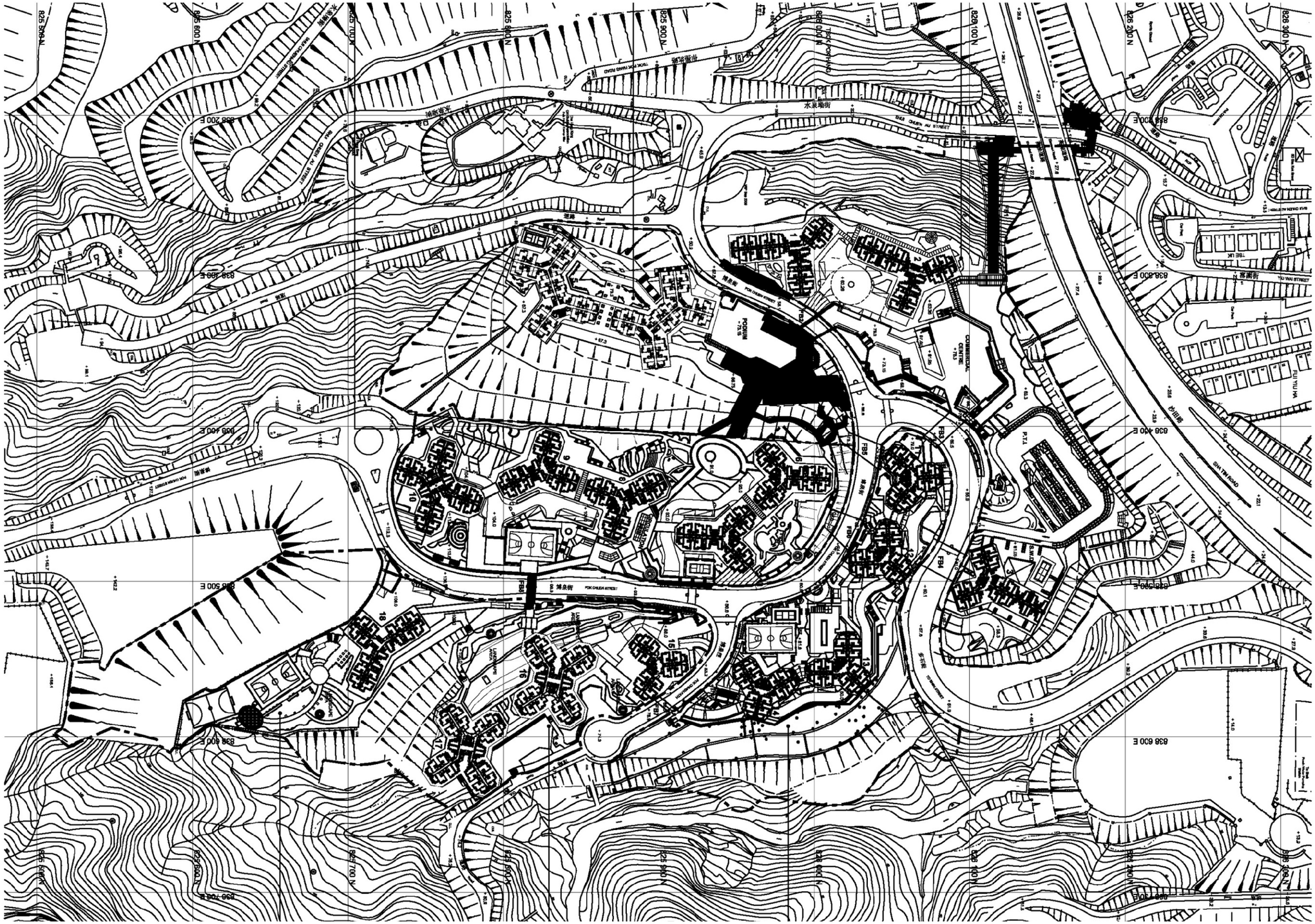


PROPOSED PUBLIC HOUSING DEVELOPMENT IN SHA TIN AREA 52 (SHUI CHUEN O)
AIR VENTILATION ASSESSMENT

Layout Plan – Initial Scheme

Figure No.	Rev:
1	0
Scale: NTS	Date: 07/12

AEC



PROPOSED PUBLIC HOUSING DEVELOPMENT IN SHA TIN AREA 52 (SHUI CHUEN O)
AIR VENTILATION ASSESSMENT

Layout Plan – Proposed Scheme

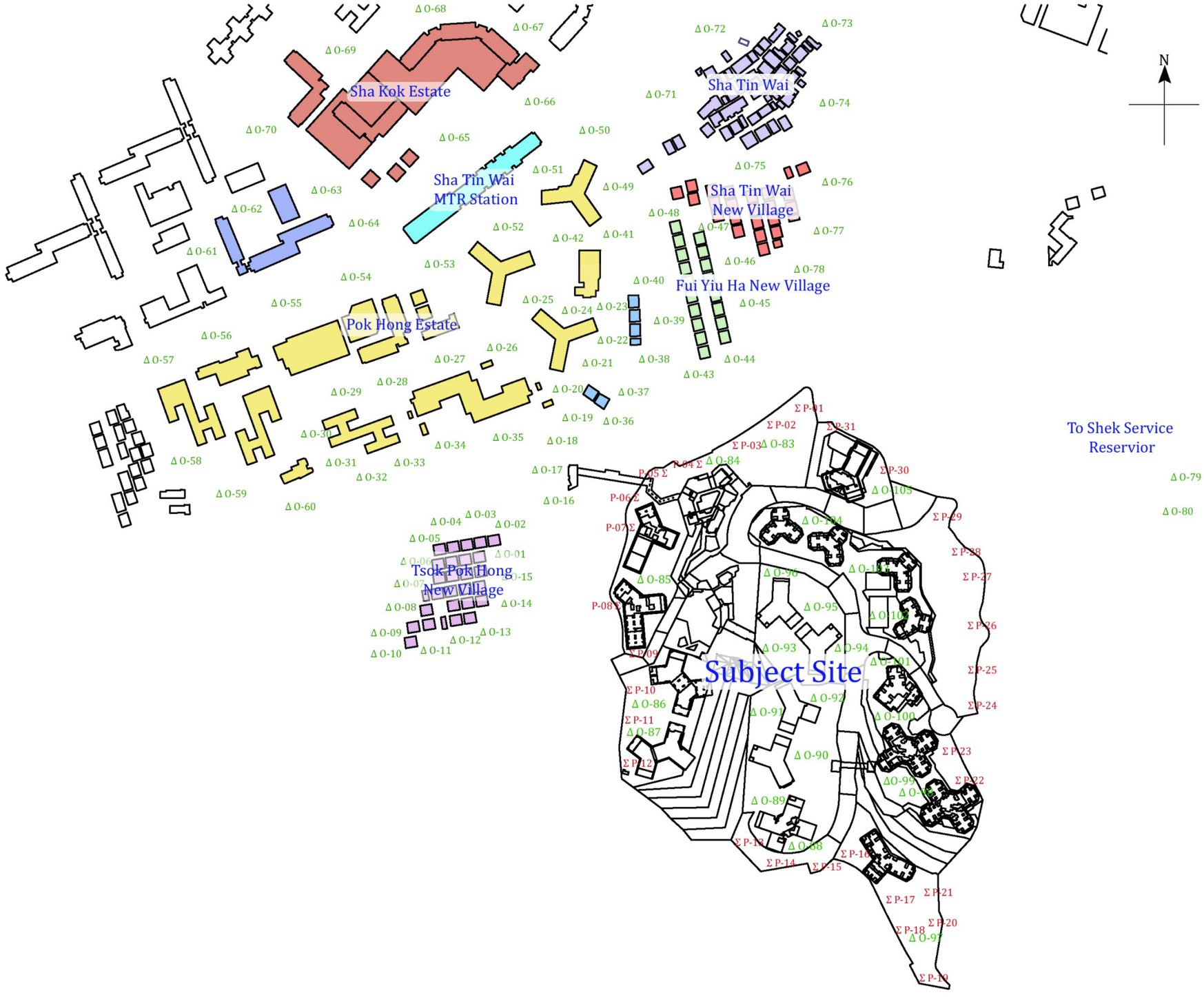
Figure No.	Rev:
2	0
Scale: NTS	Date: 07/12

AEC

PROPOSED PUBLIC HOUSING DEVELOPMENT IN SHA TIN AREA 52 (SHUI CHUEN O)
AIR VENTILATION ASSESSMENT

Test Point Position – Initial Scheme

Figure No.	Rev:
3	21
Scale: NTS	Date: 11/12



PROPOSED PUBLIC HOUSING DEVELOPMENT IN SHA TIN AREA 52 (SHUI CHUEN O)
AIR VENTILATION ASSESSMENT

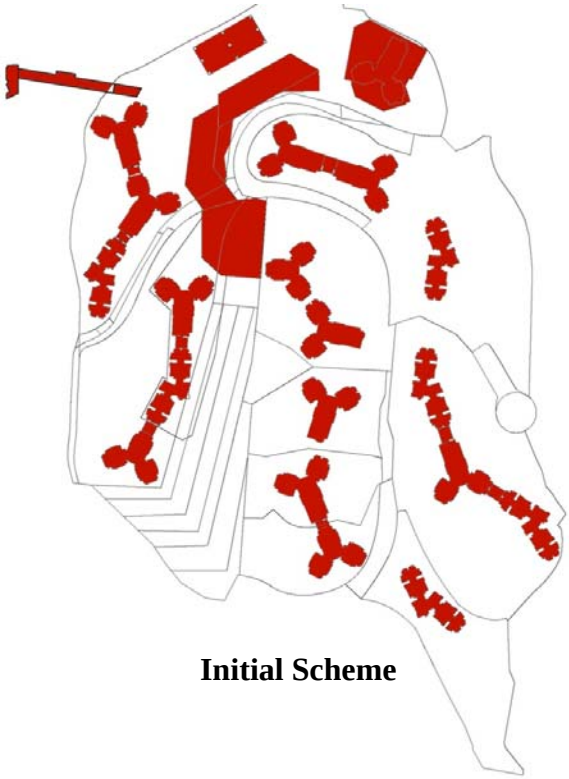
Test Point Position – Proposed Scheme

Figure No.	Rev:
4	2
Scale: NTS	Date: 11/12

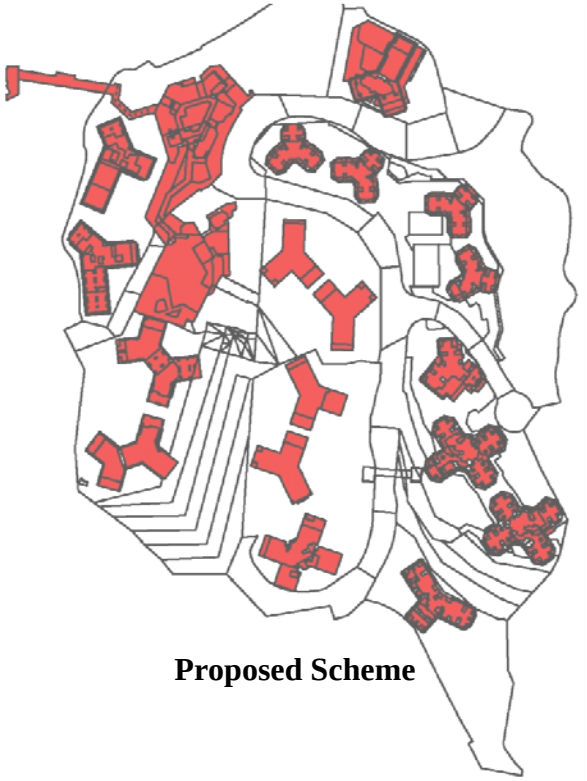
AEC

APPENDIX I: VELOCITY VECTOR, VELOCITY CONTOUR AND VELOCITY RATIO DIAGRAMS

Note: *The VR contour and vector plots at 2m above ground under both schemes are produced to illustrate the overall wind performance within the proposed development. The VR values within each residential block in the aforementioned plots are referring to the velocity ratio values at 2m above rooftop However, the wind environment at rooftop of the proposed development is not being assessed in this AVA initial study as they are not accessible by pedestrian. The locations of the rooftop area in the initial and proposed schemes are shown below for easy reference.*



Initial Scheme



Proposed Scheme

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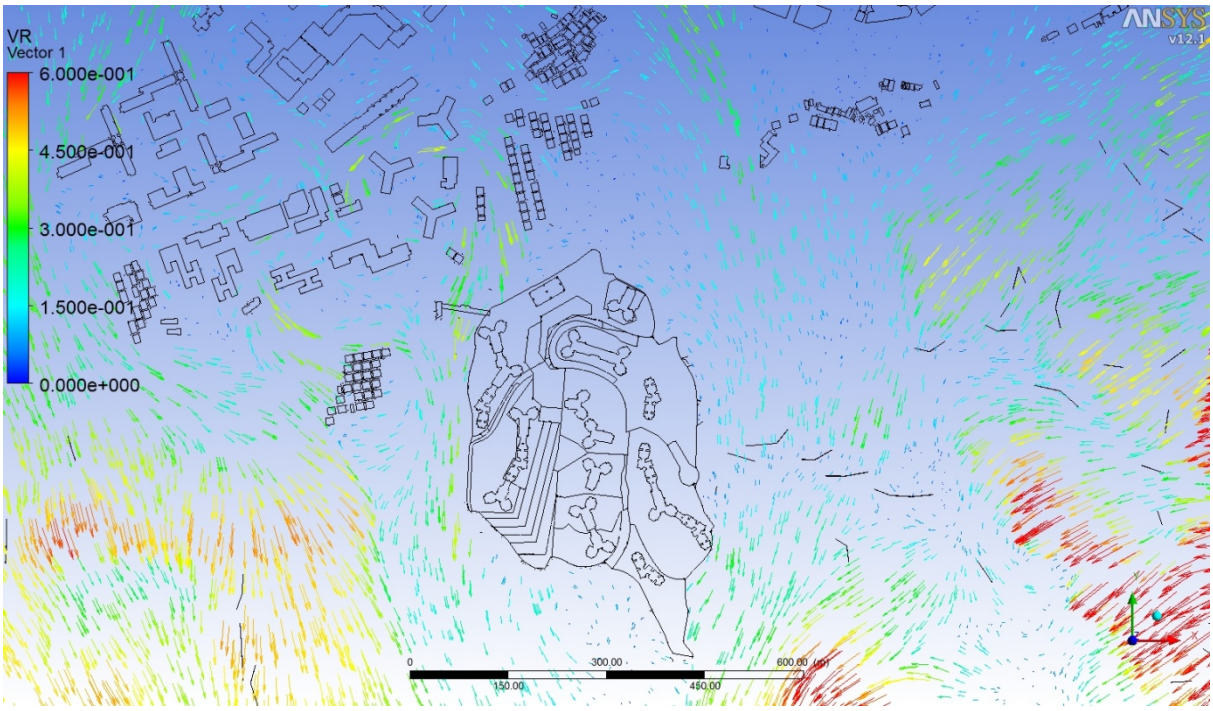
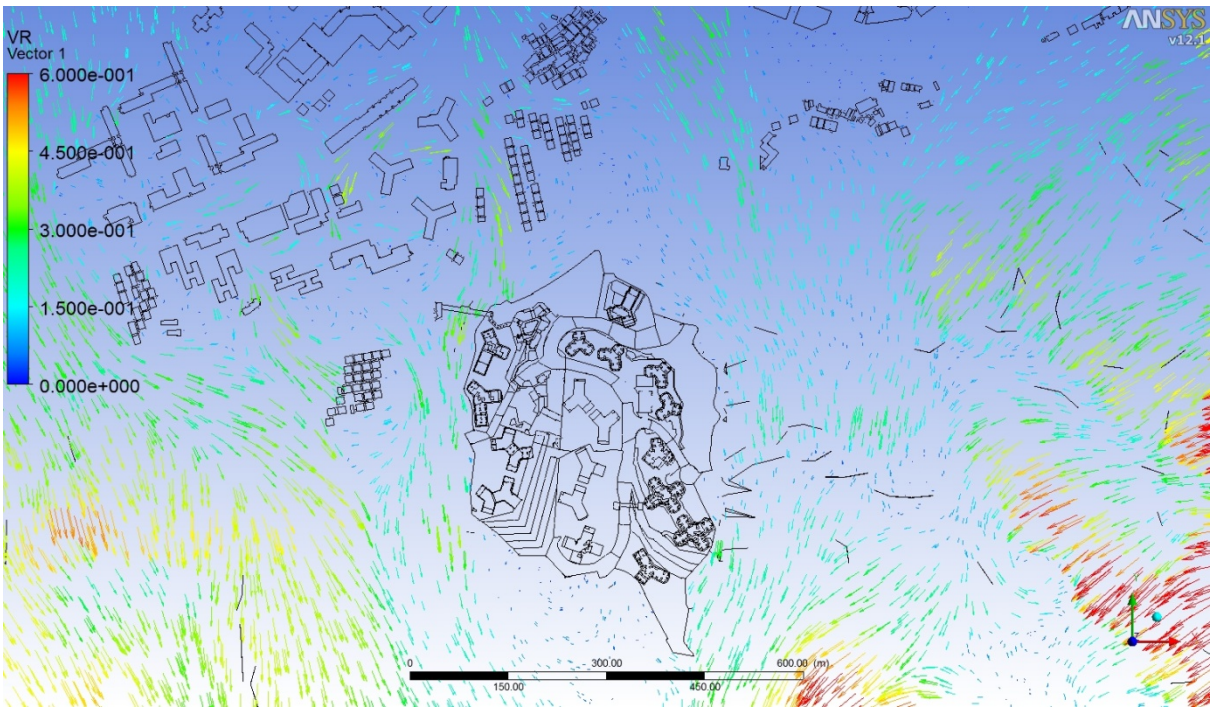
Prevailing Wind Direction: East-Northeast (ENE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

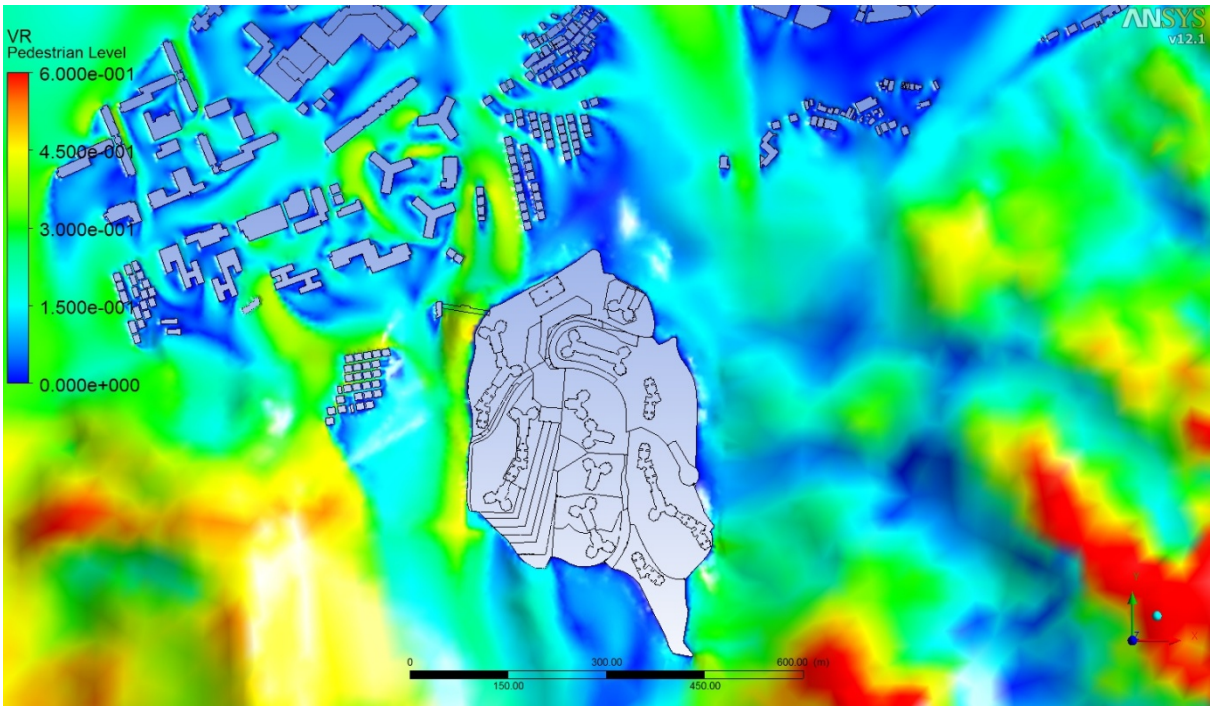


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

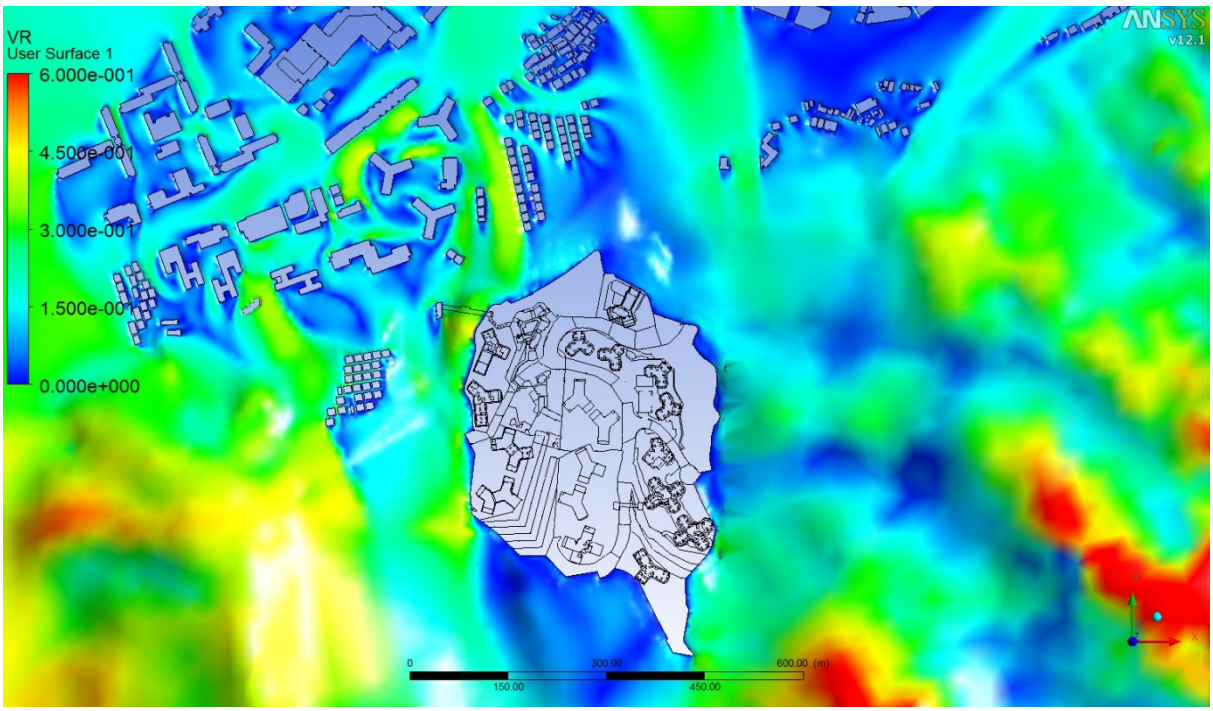


Prevailing Wind Direction: East-Northeast (ENE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

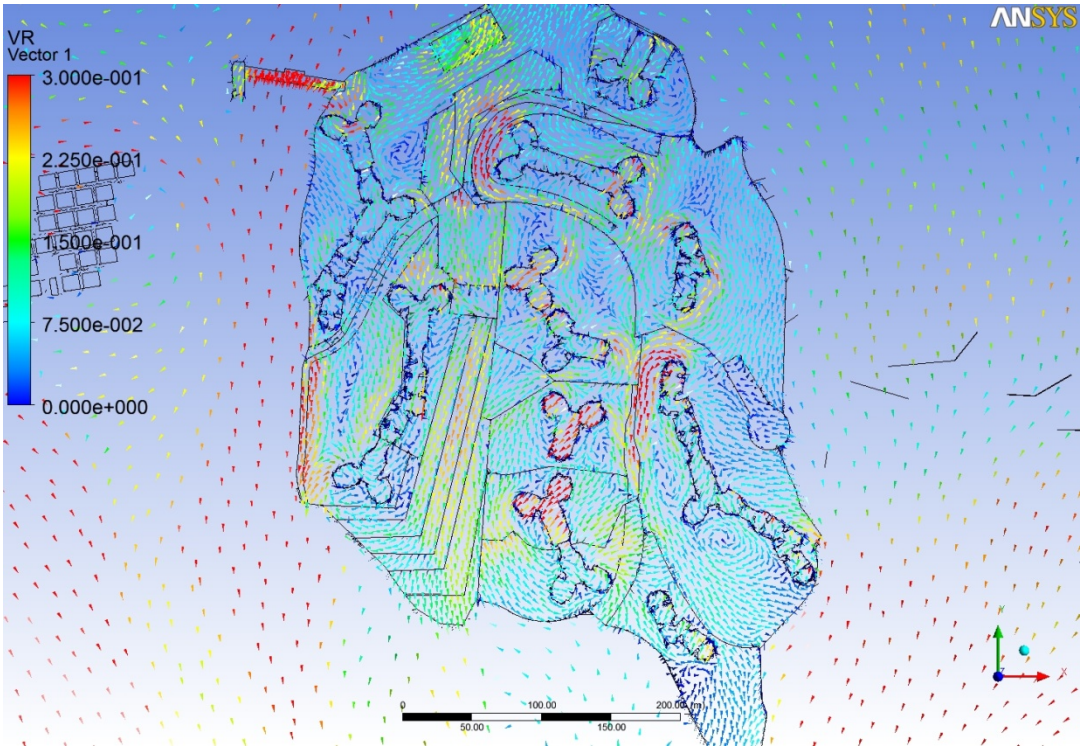


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

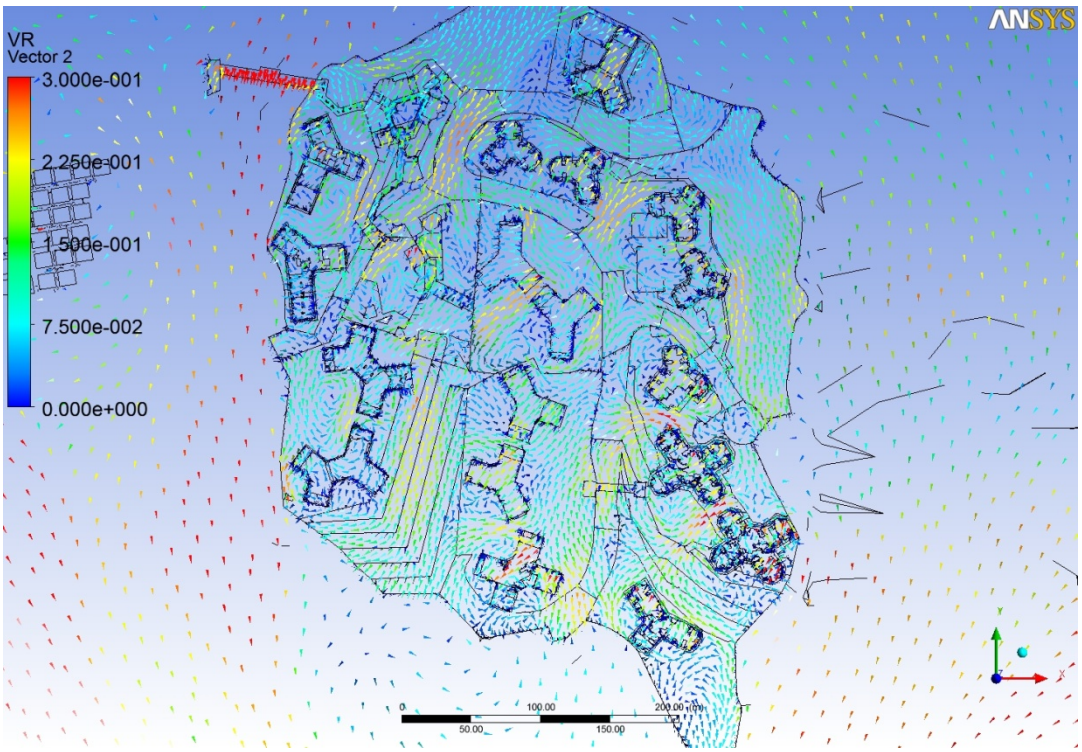


Prevailing Wind Direction: East-Northeast (ENE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

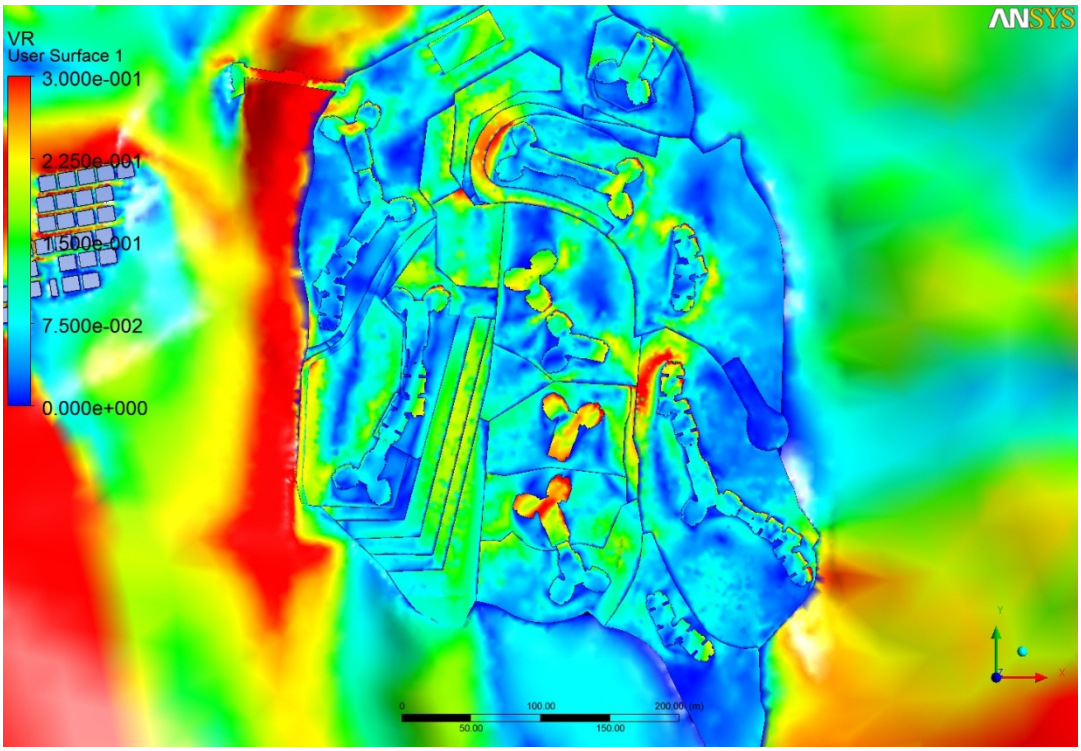


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

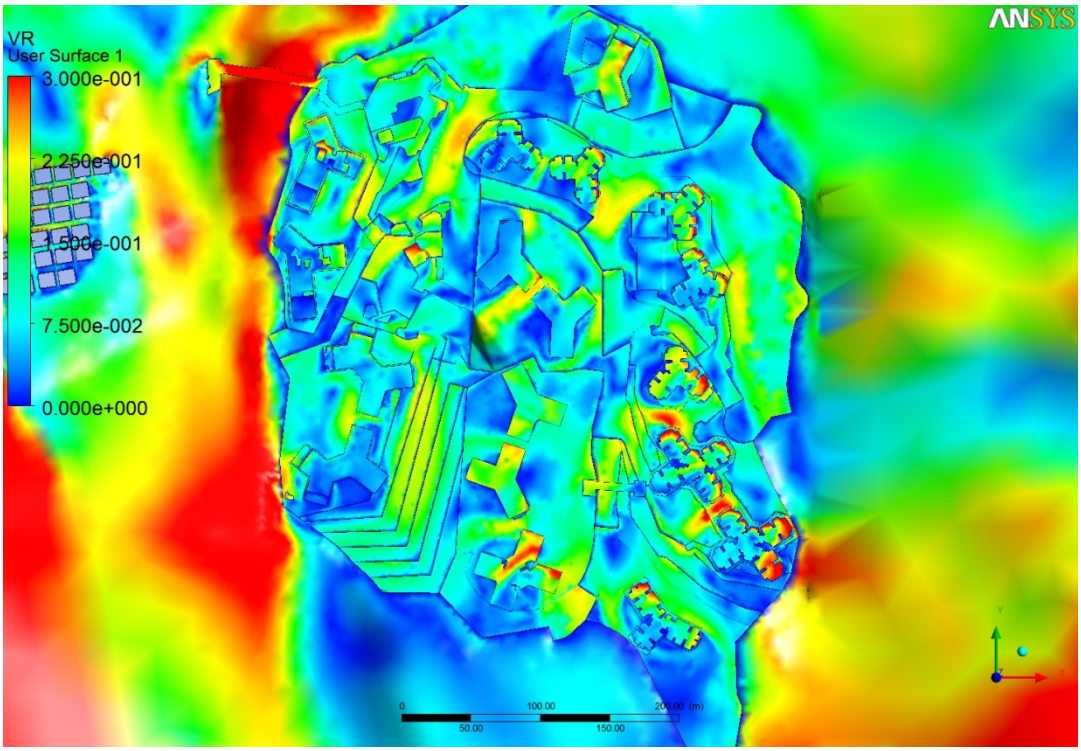


Prevailing Wind Direction: East-Northeast (ENE)

Velocity Ratio (VR) Contour Diagram at 2m above Ground Level within the Subject Site

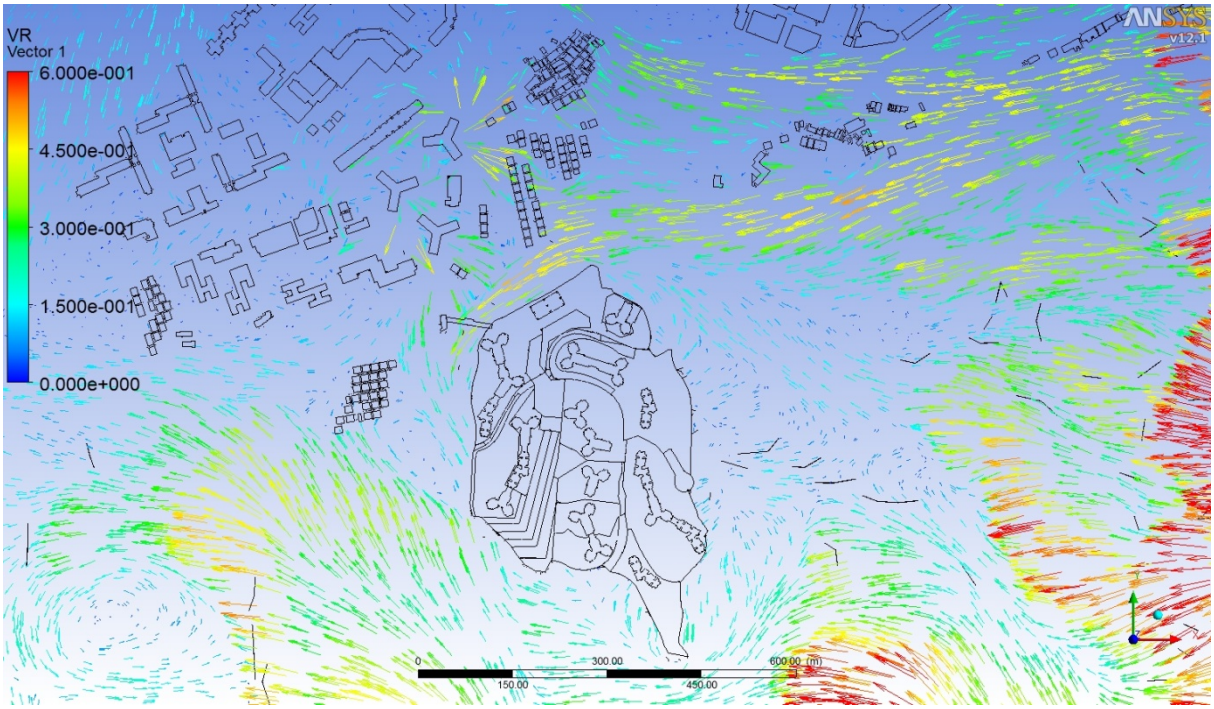


Velocity Ratio (VR) Contour Diagram at 2m above Ground Level within the Subject Site

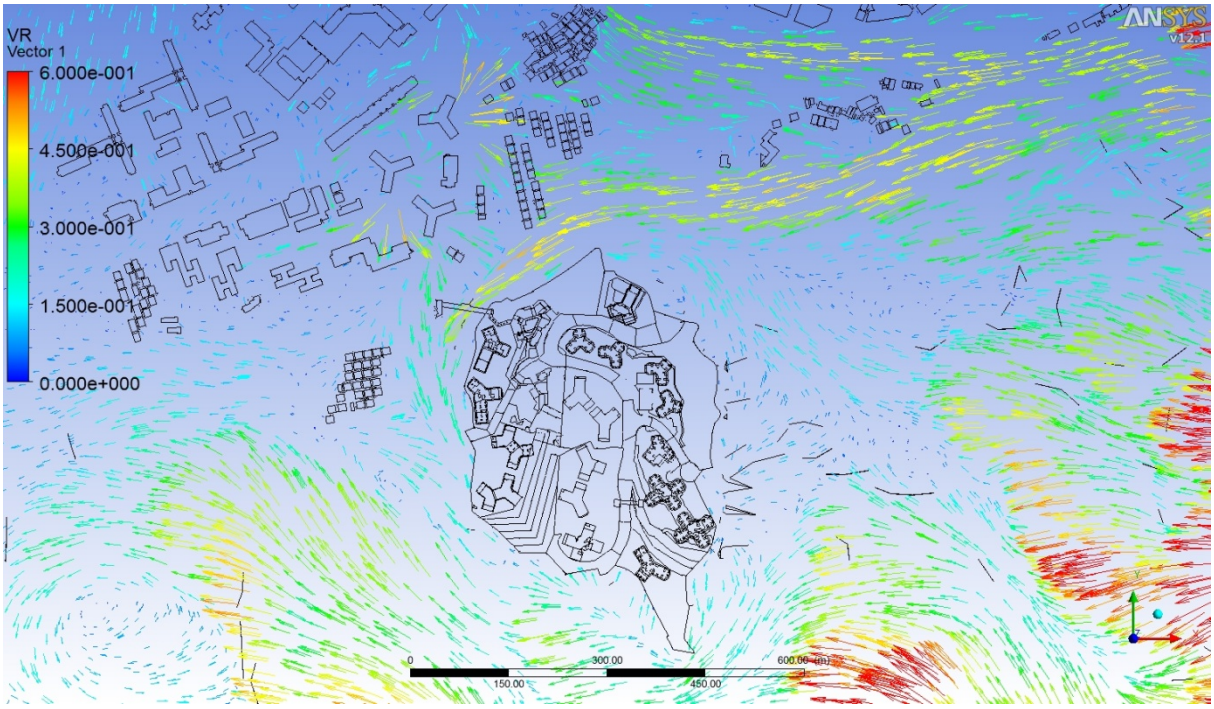


Prevailing Wind Direction: East (E)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

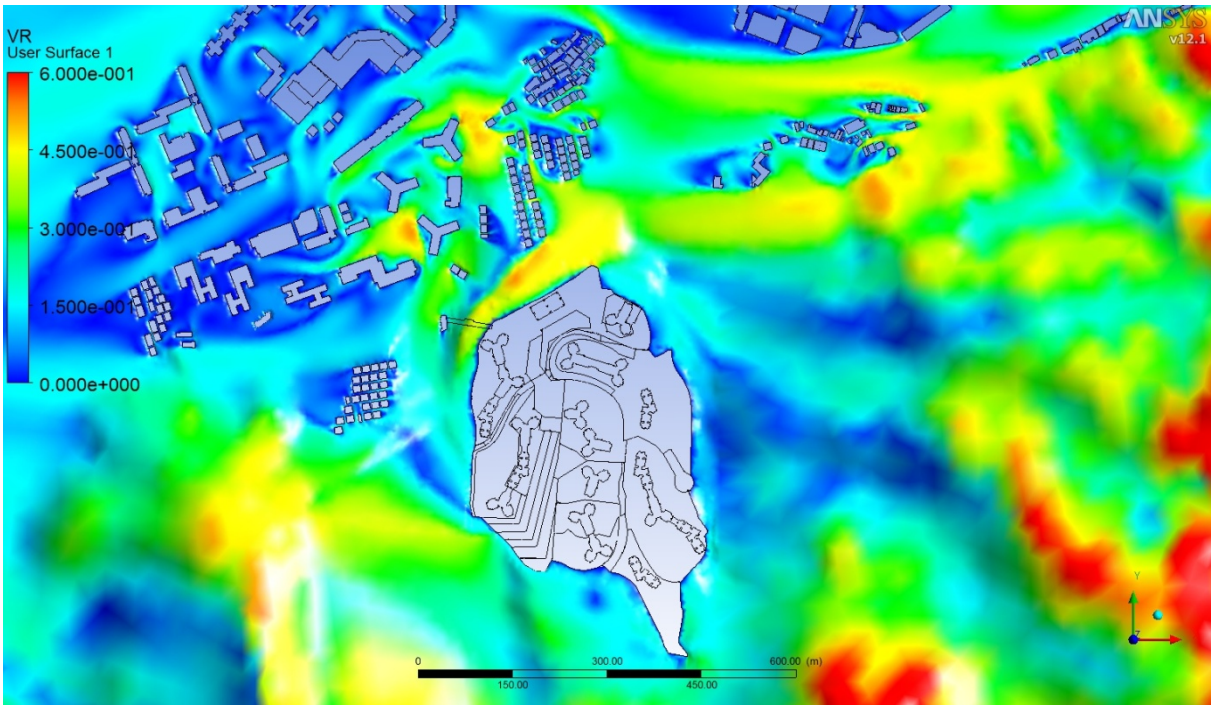


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

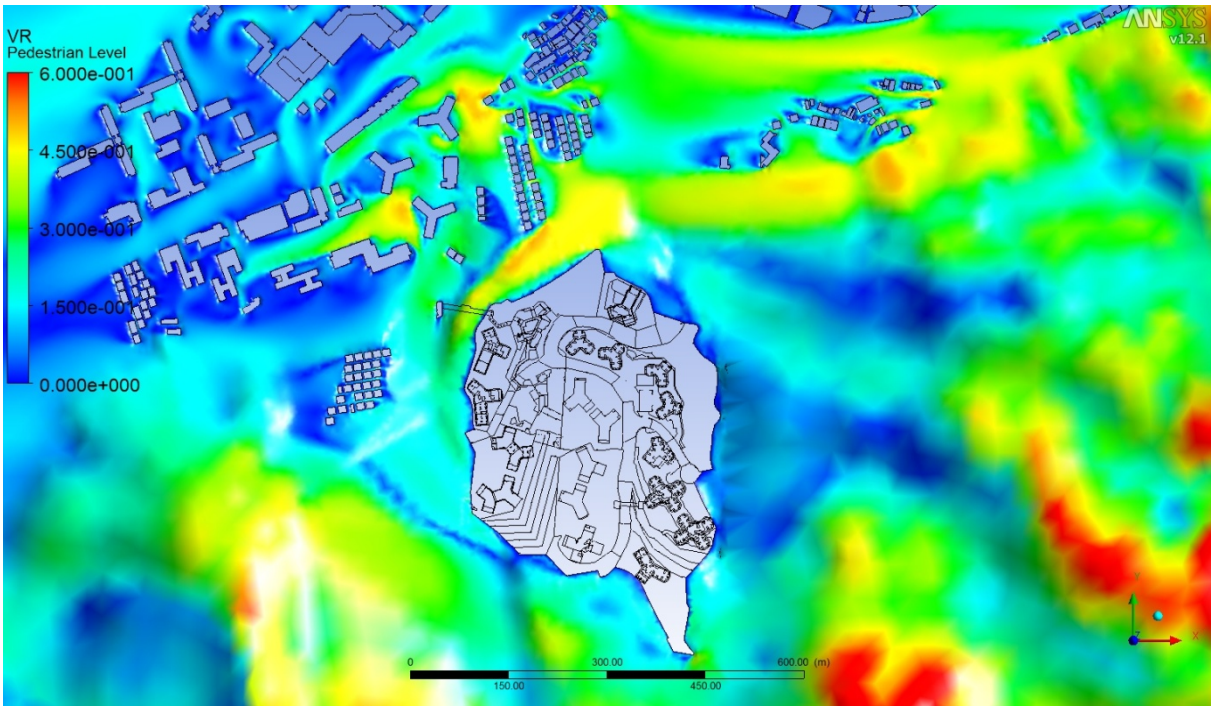


Prevailing Wind Direction: East (E)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

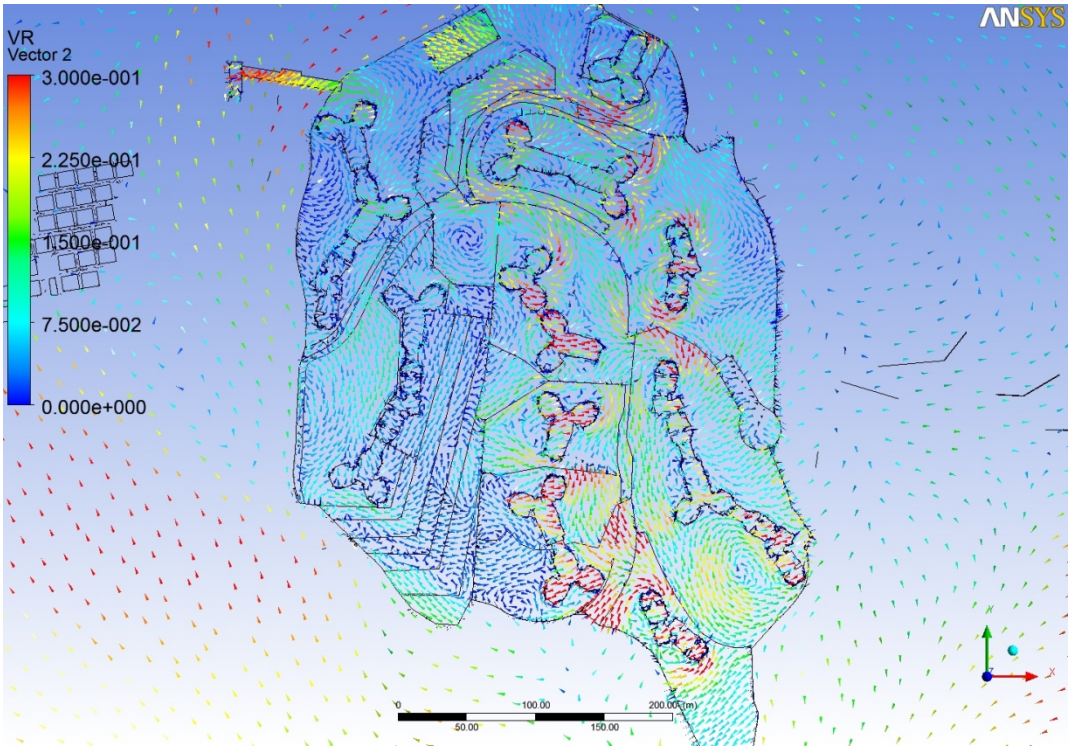


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

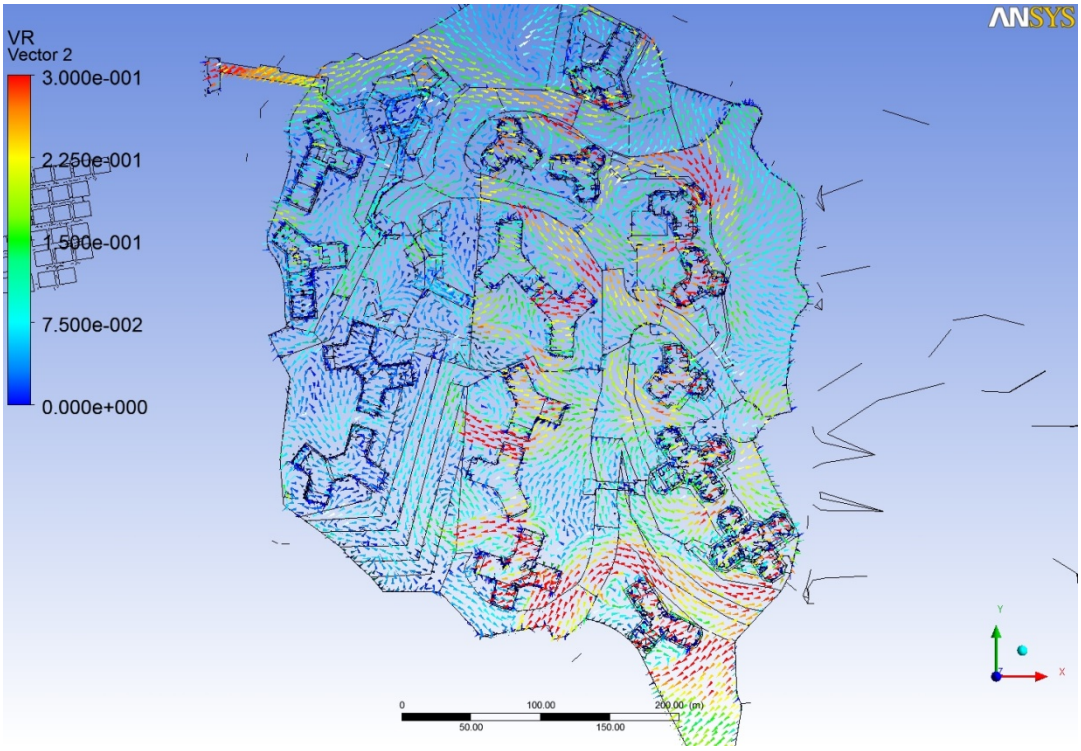


Prevailing Wind Direction: East (E)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

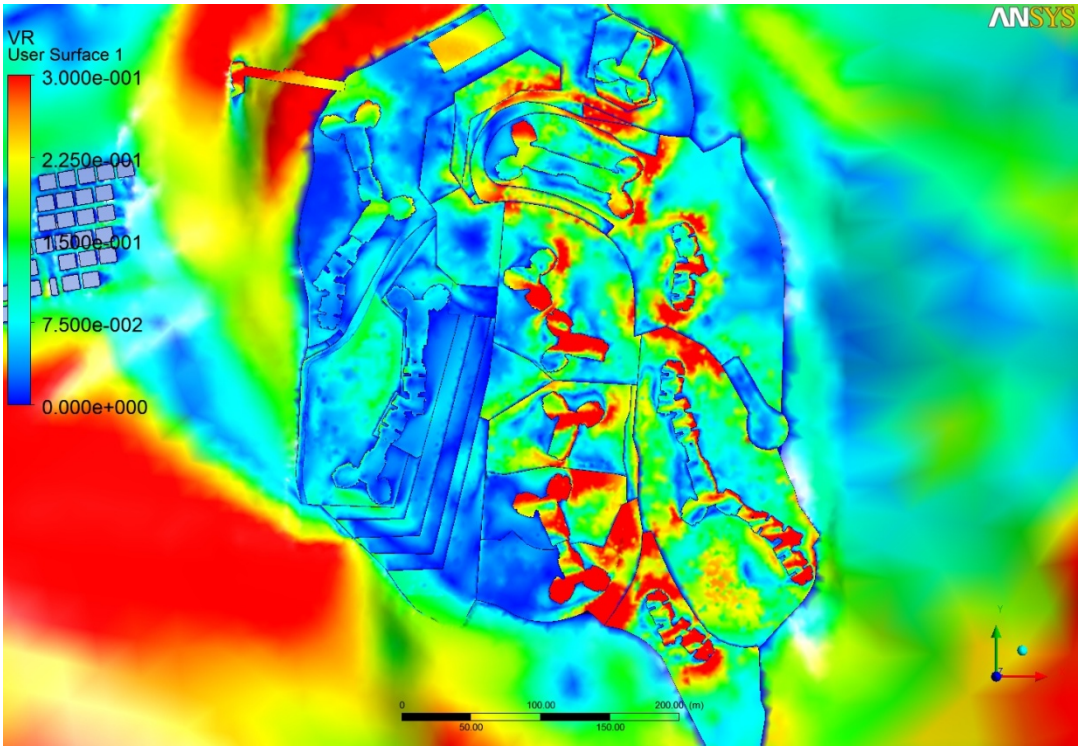


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

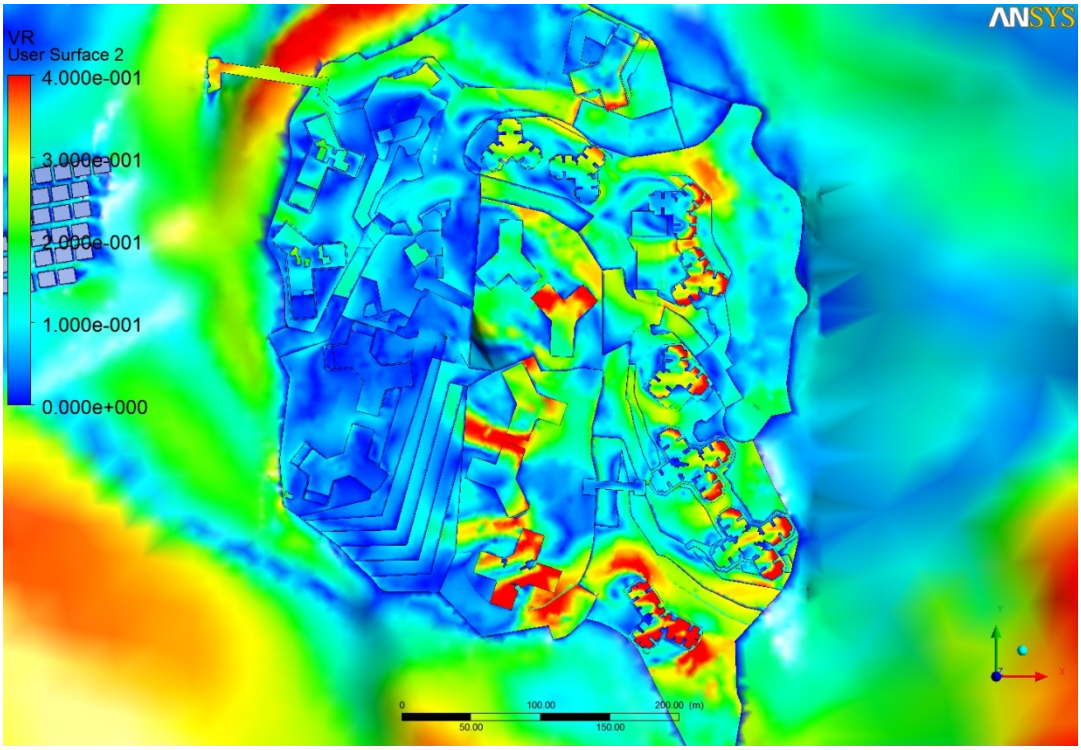


Prevailing Wind Direction: East (E)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

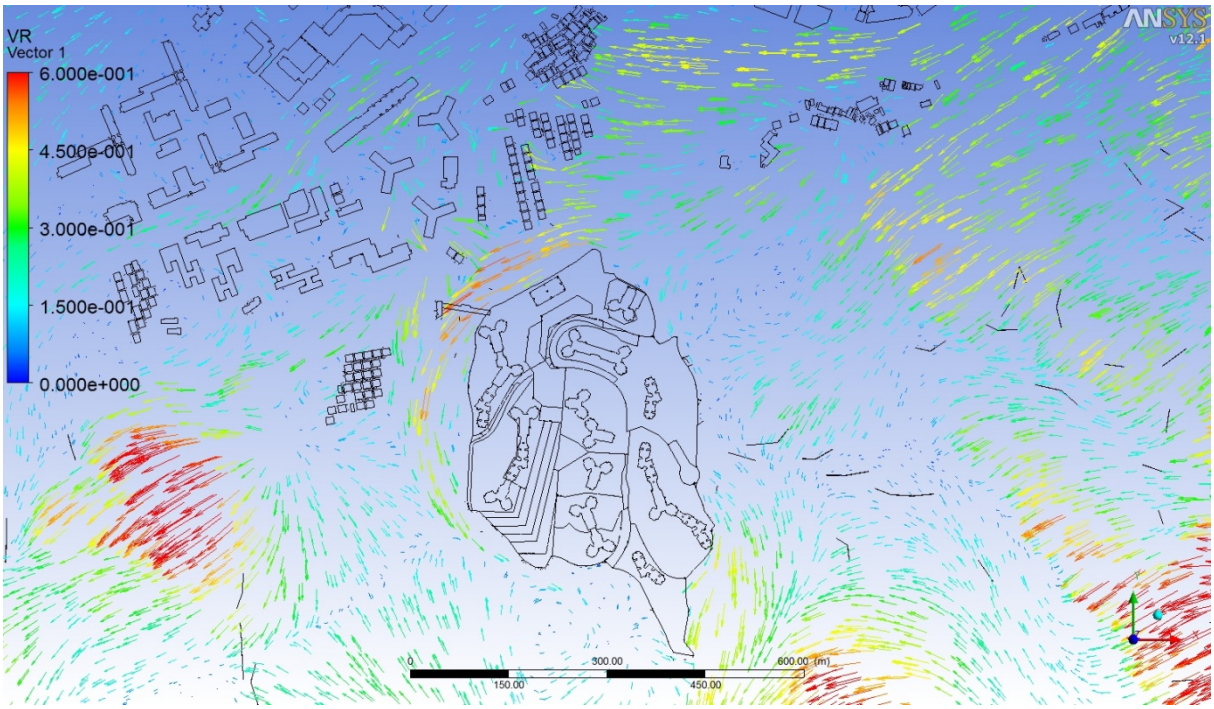


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

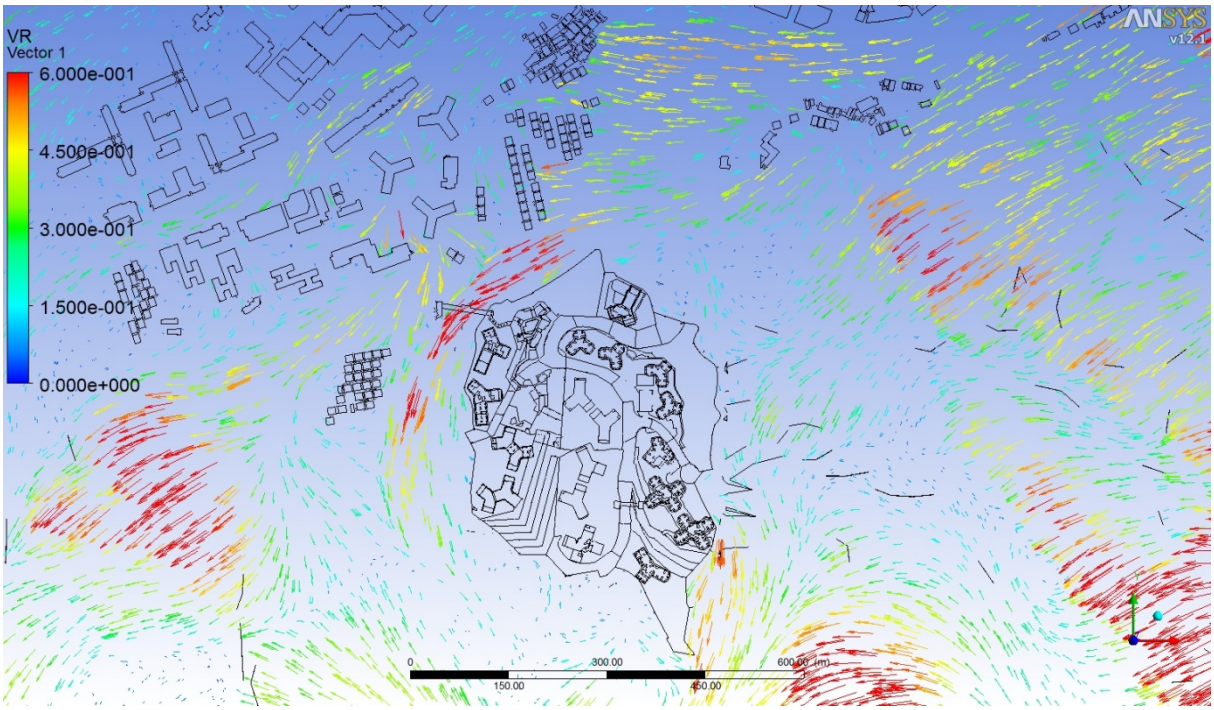


Prevailing Wind Direction: Northeast (NE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

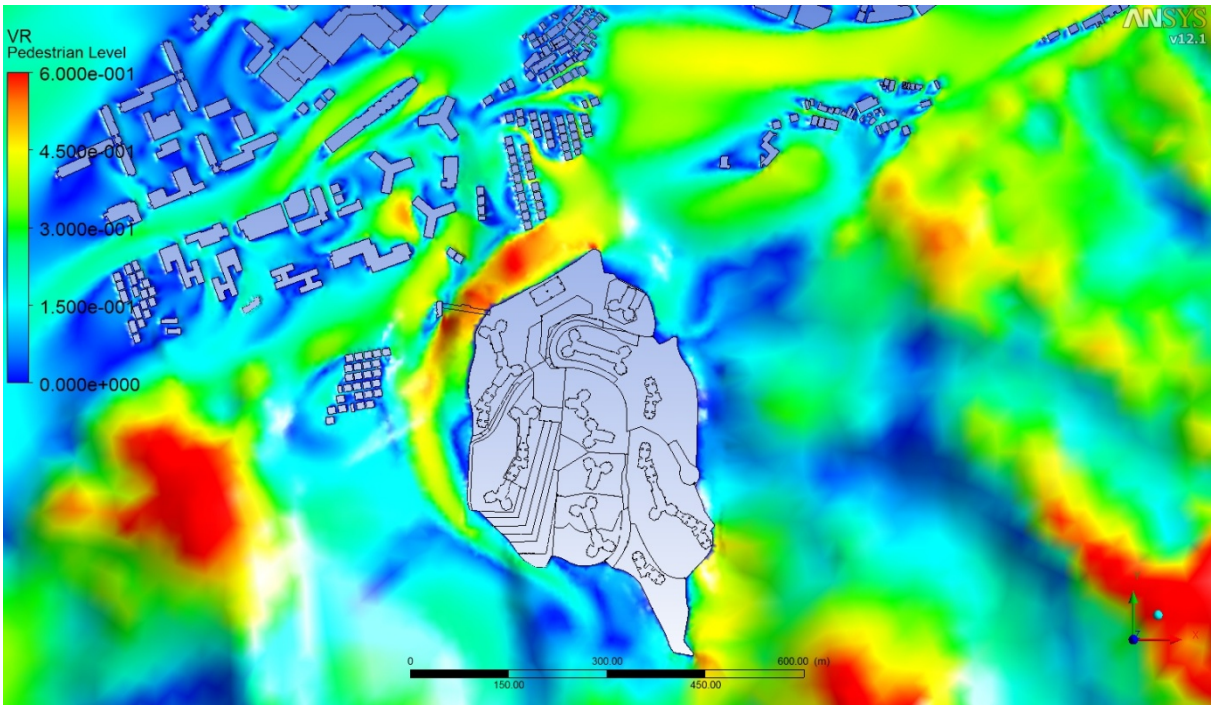


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

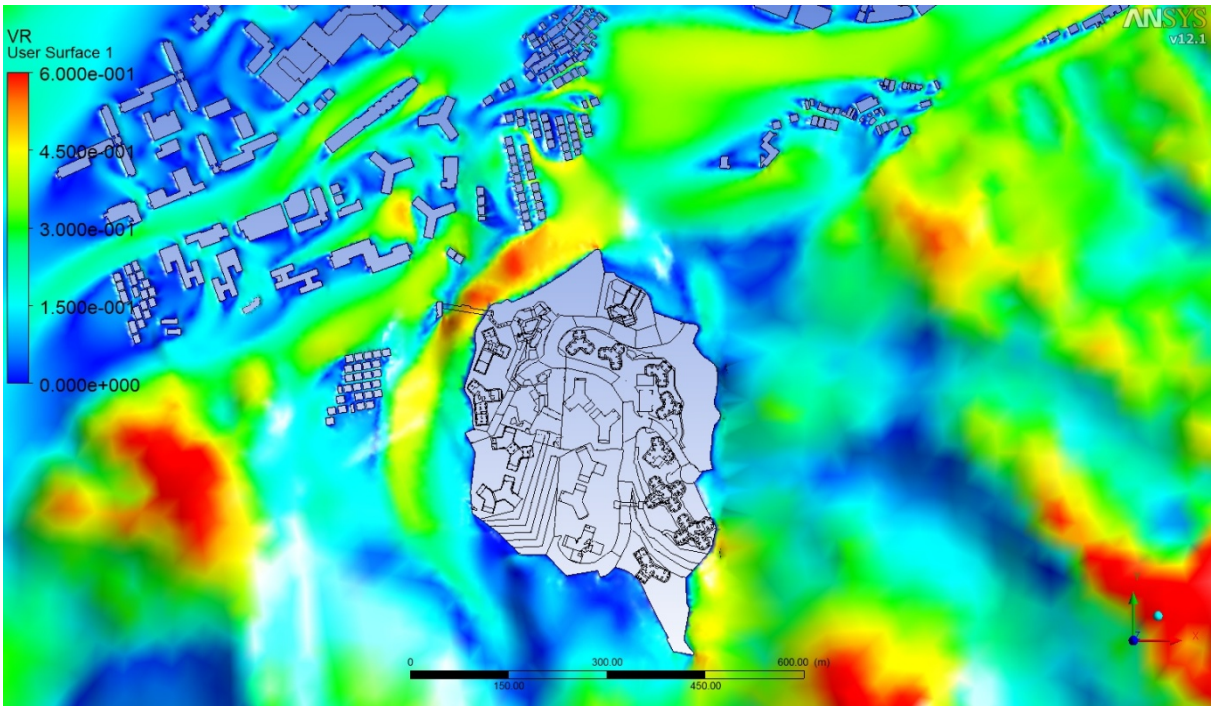


Prevailing Wind Direction: Northeast (NE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

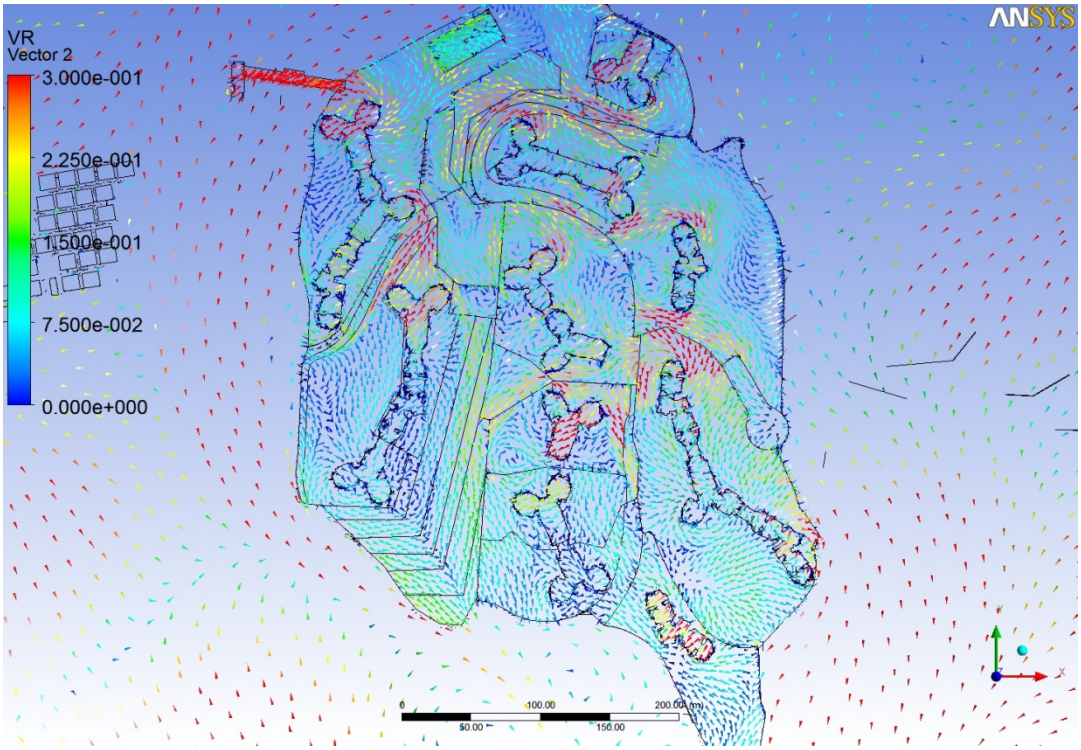


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

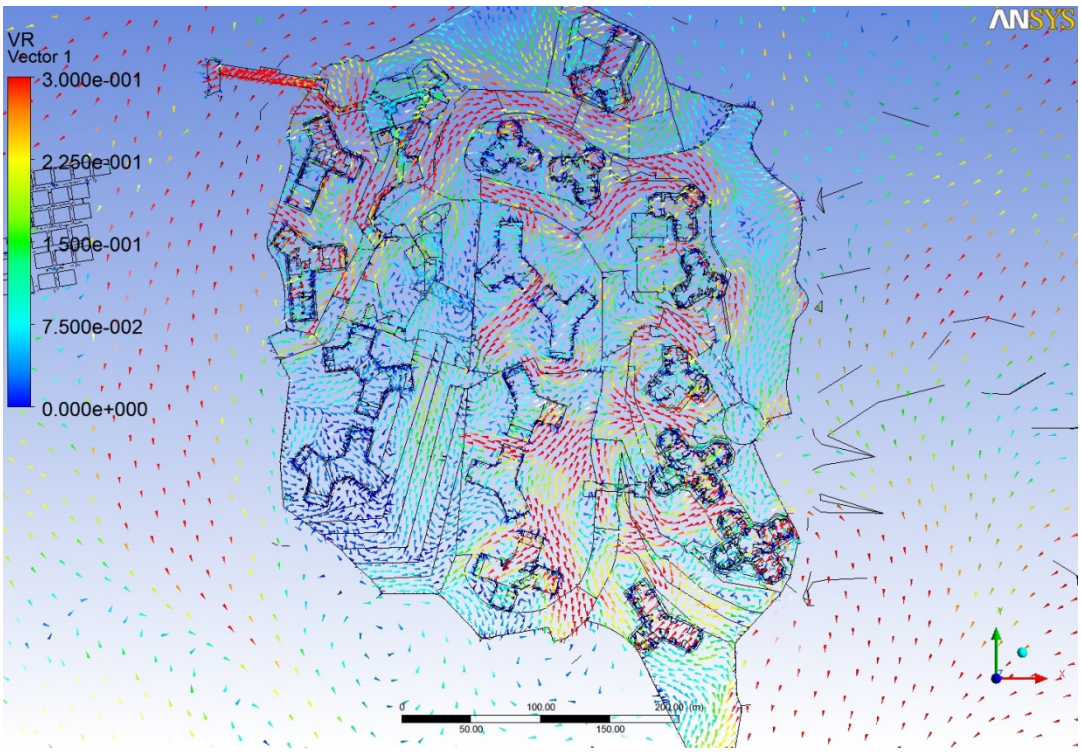


Prevailing Wind Direction: Northeast (NE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

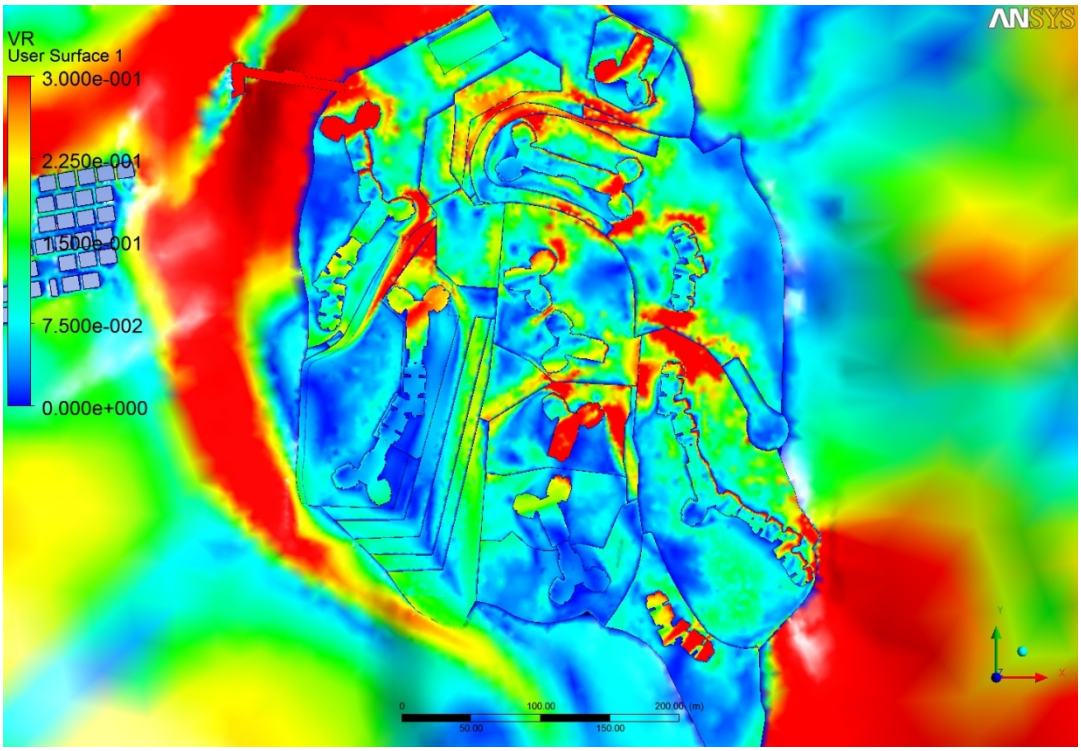


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

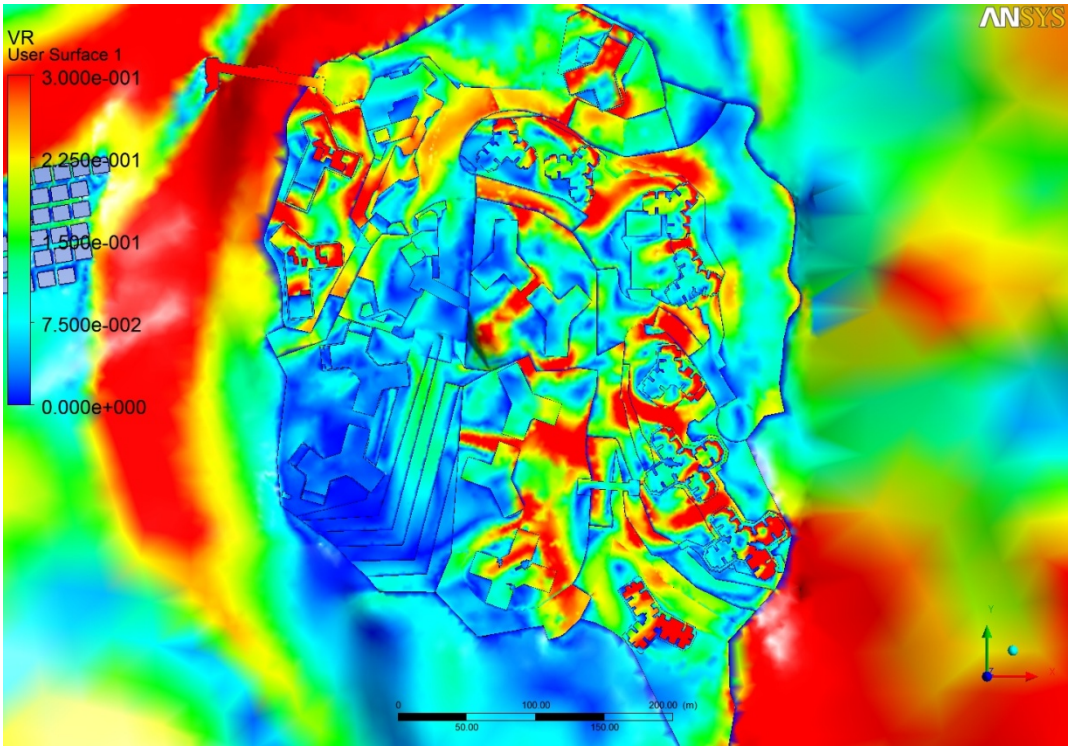


Prevailing Wind Direction: Northeast (NE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

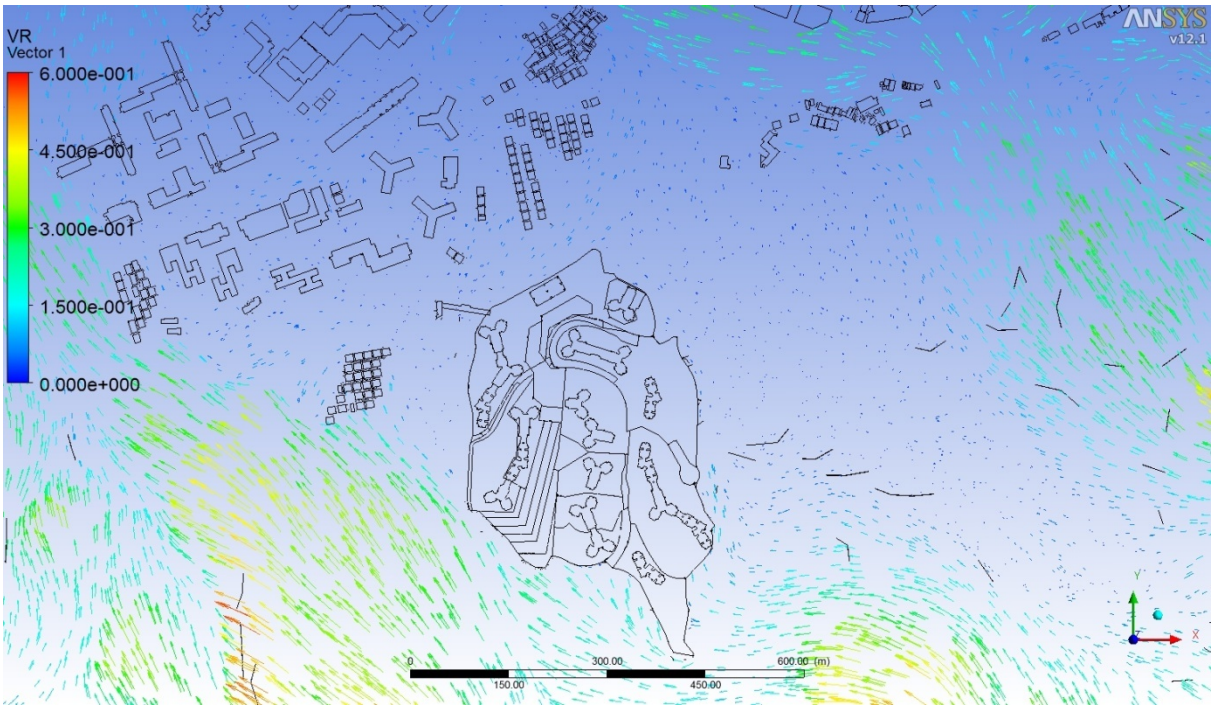


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

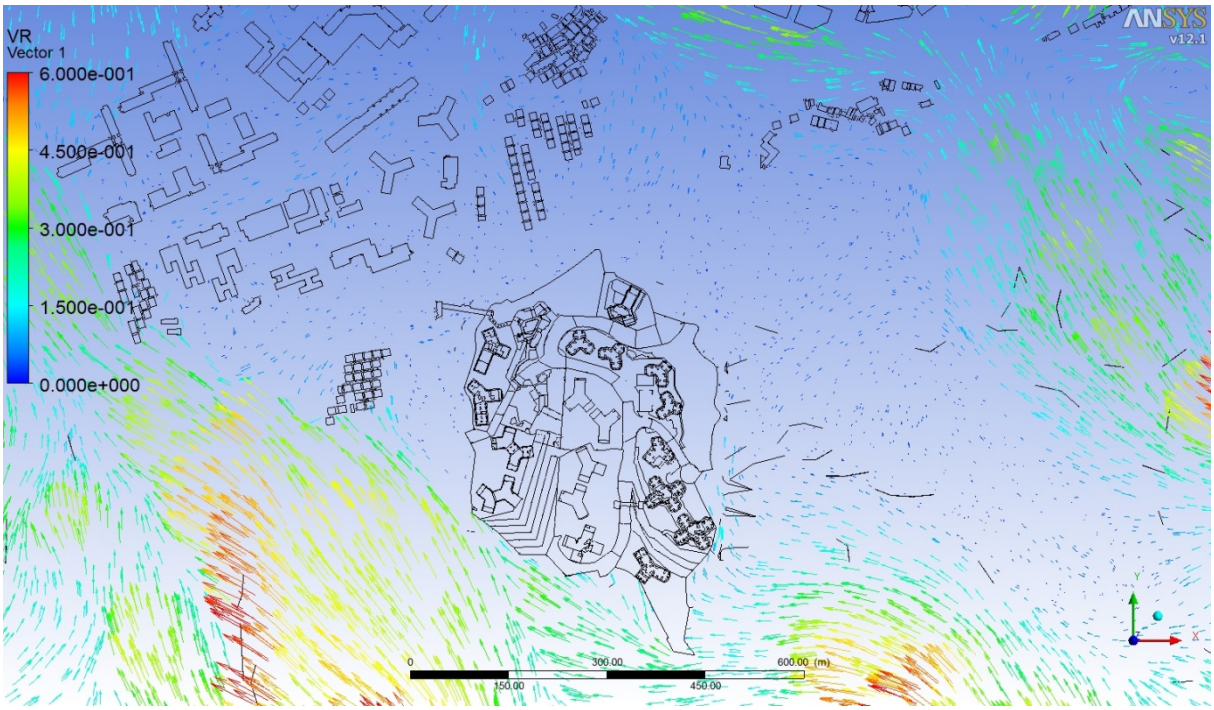


Prevailing Wind Direction: East-Southeast (ESE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

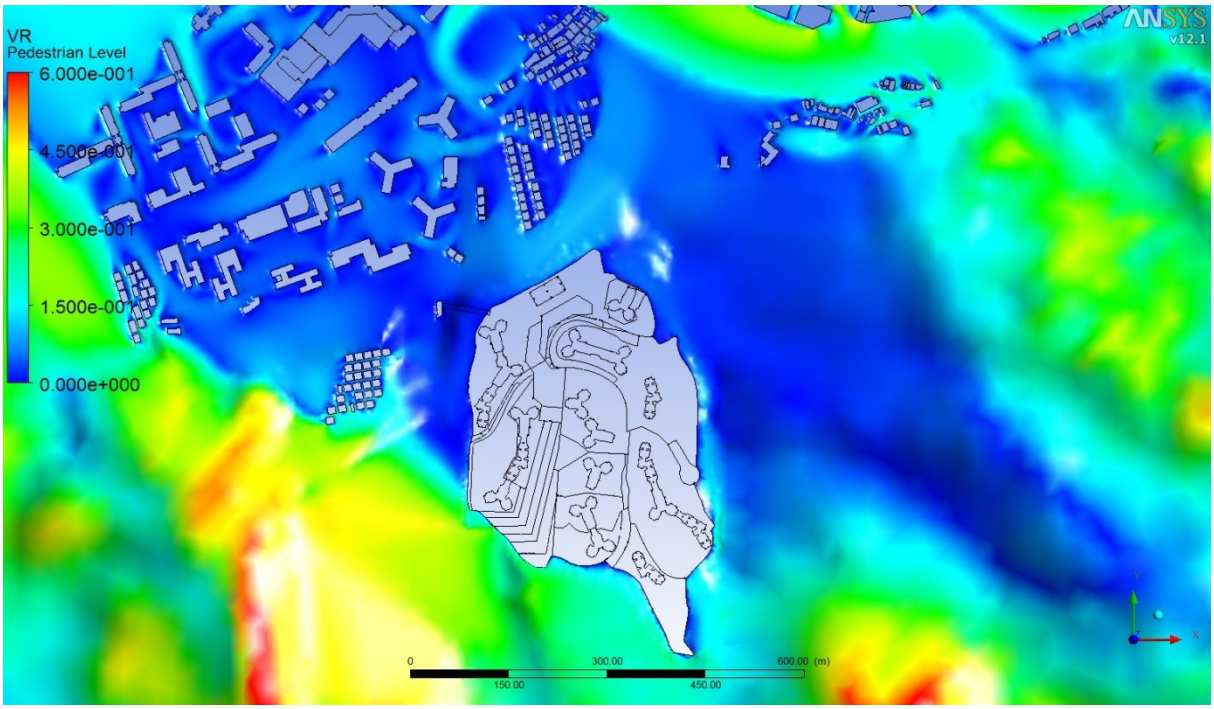


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

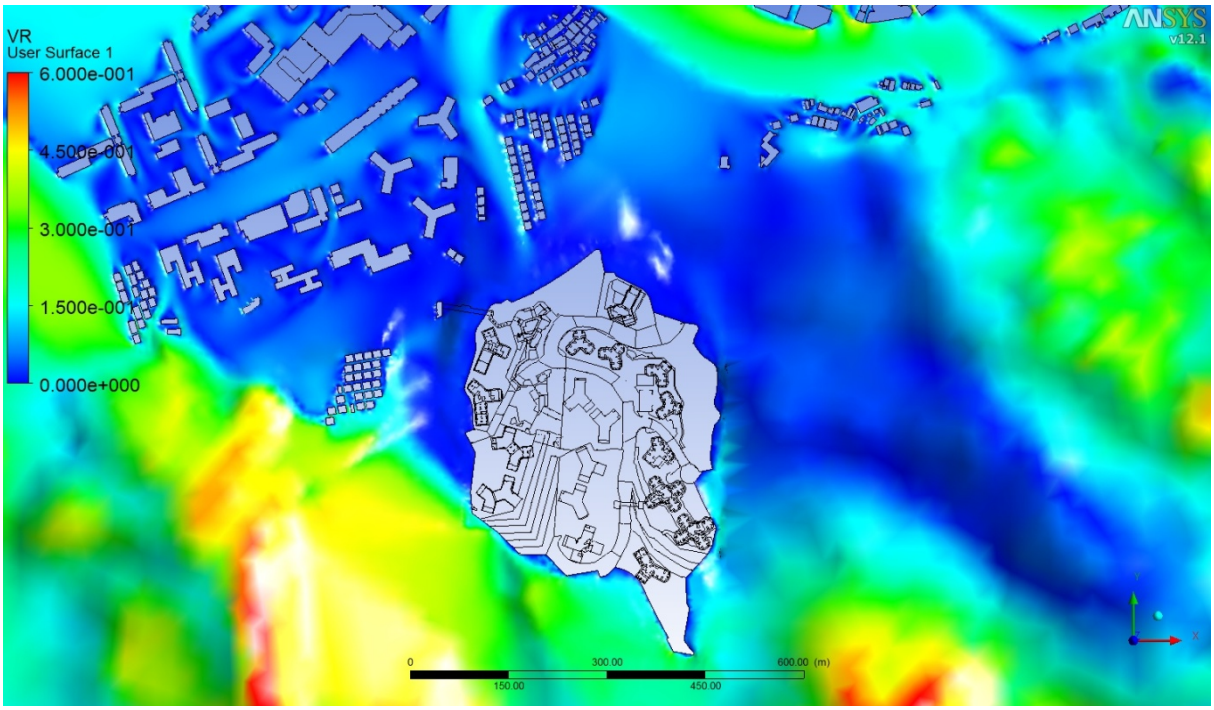


Prevailing Wind Direction: East-Southeast (ESE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

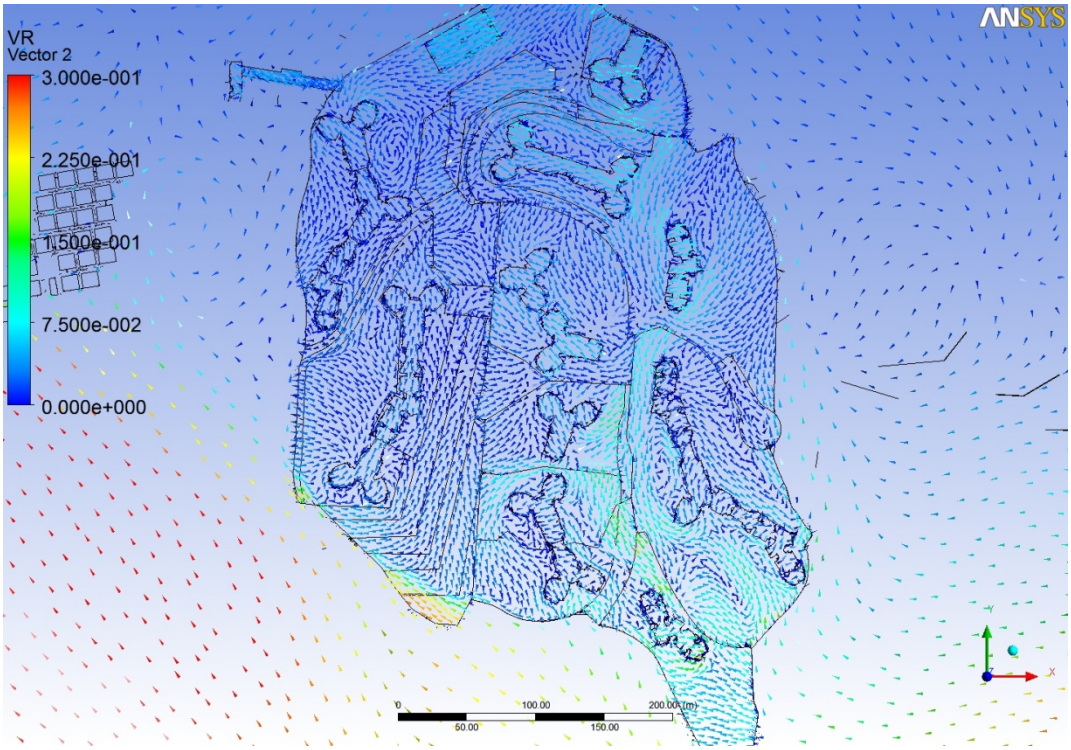


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

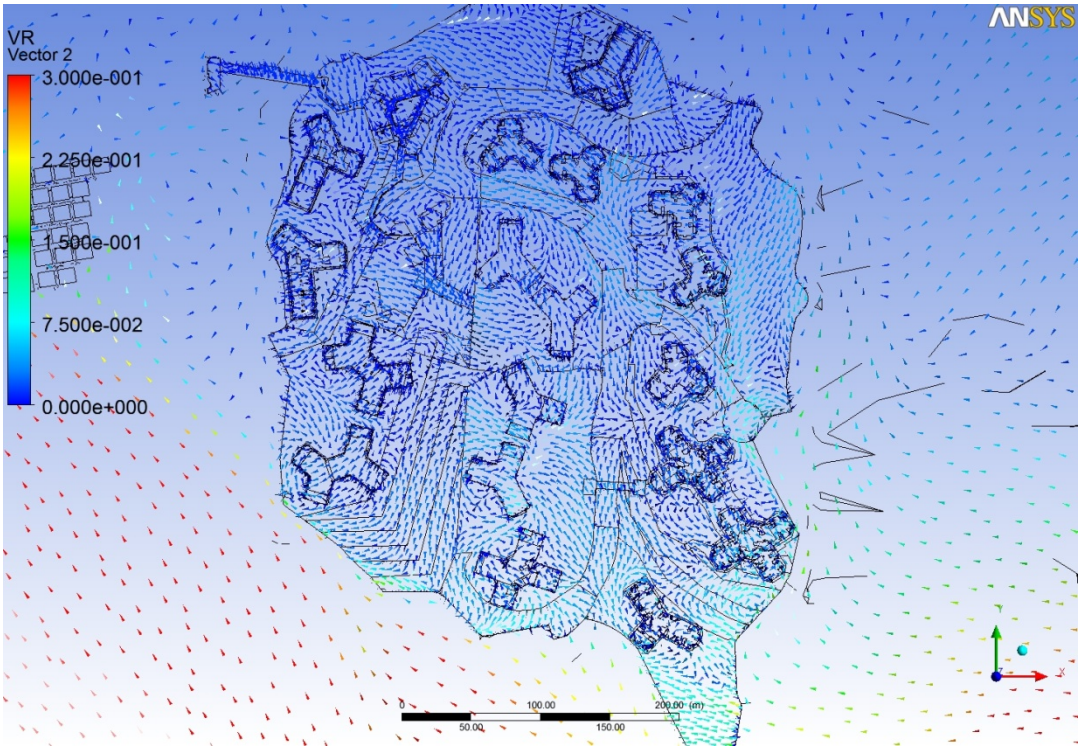


Prevailing Wind Direction: East-Southeast (ESE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

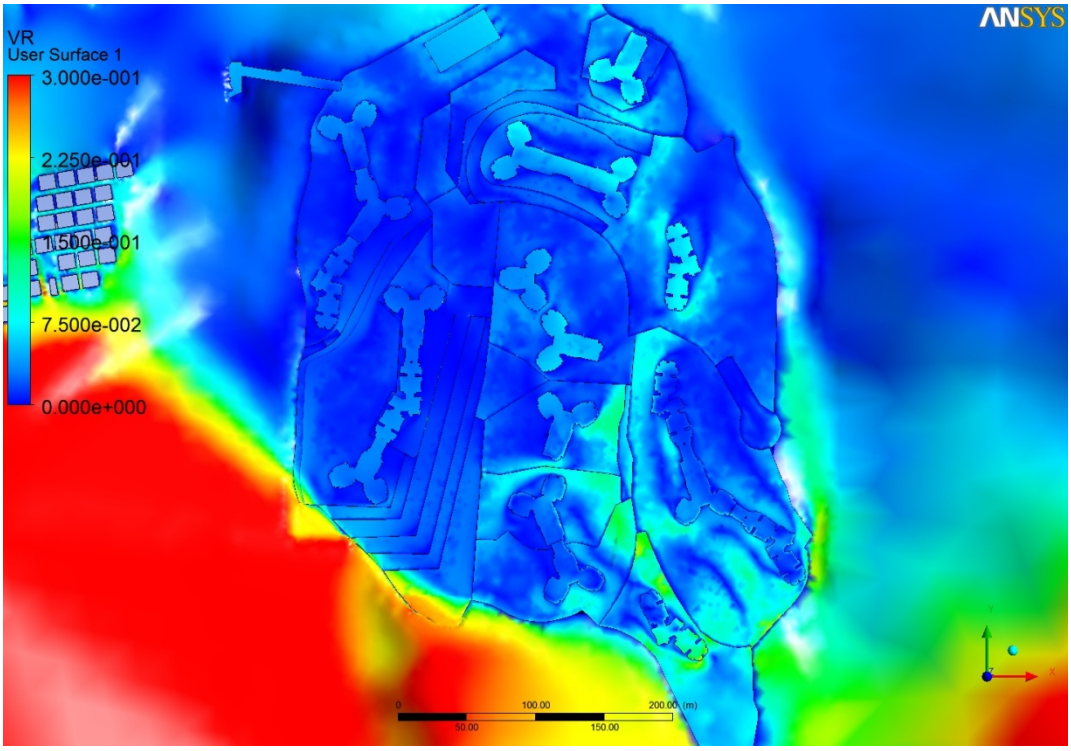


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

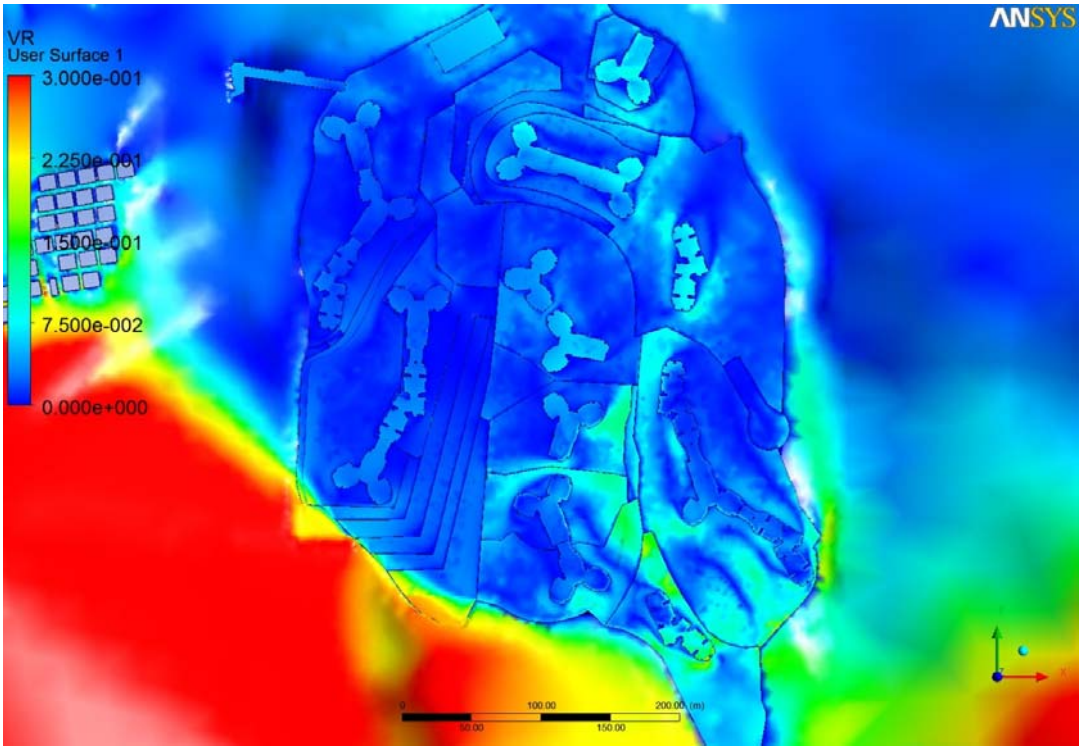


Prevailing Wind Direction: East-Southeast (ESE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

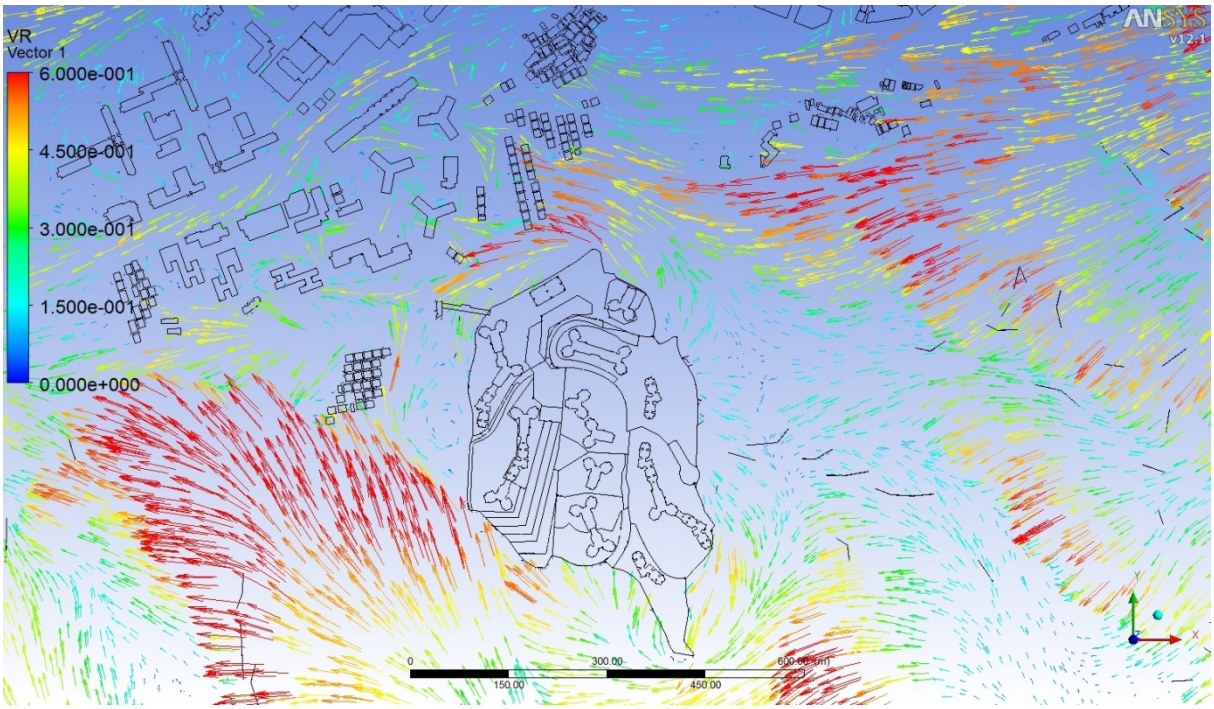


Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

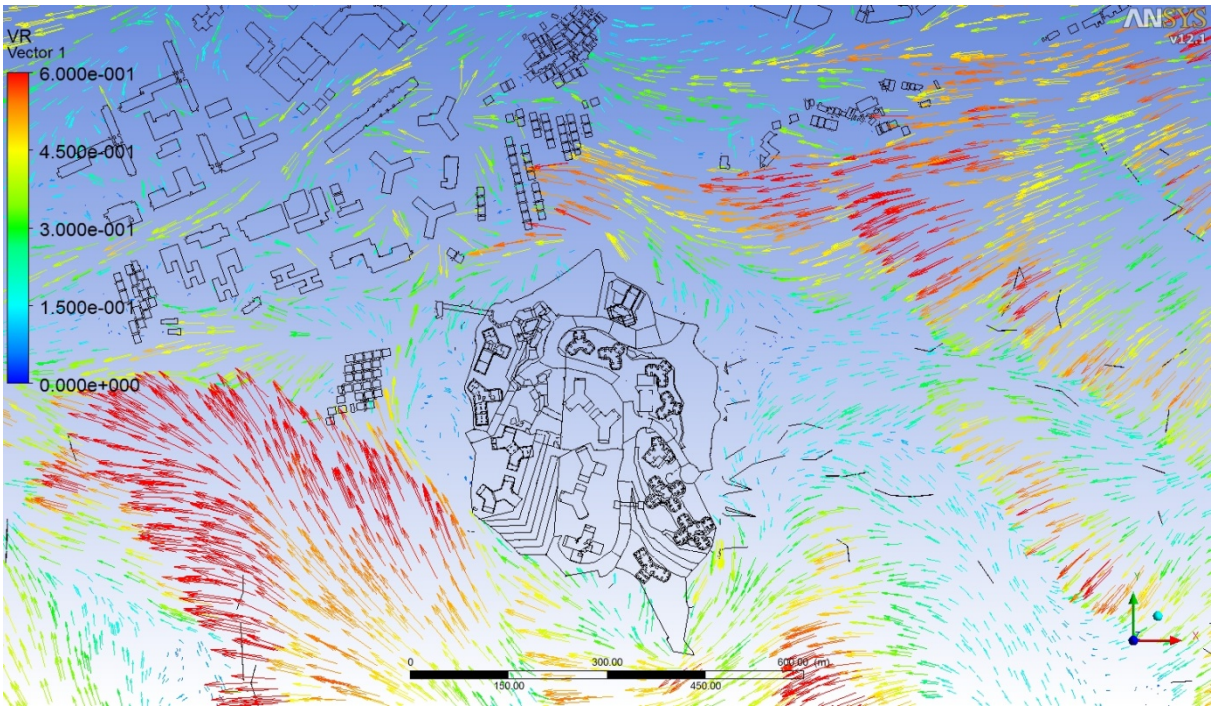


Prevailing Wind Direction: North-Northeast (NNE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

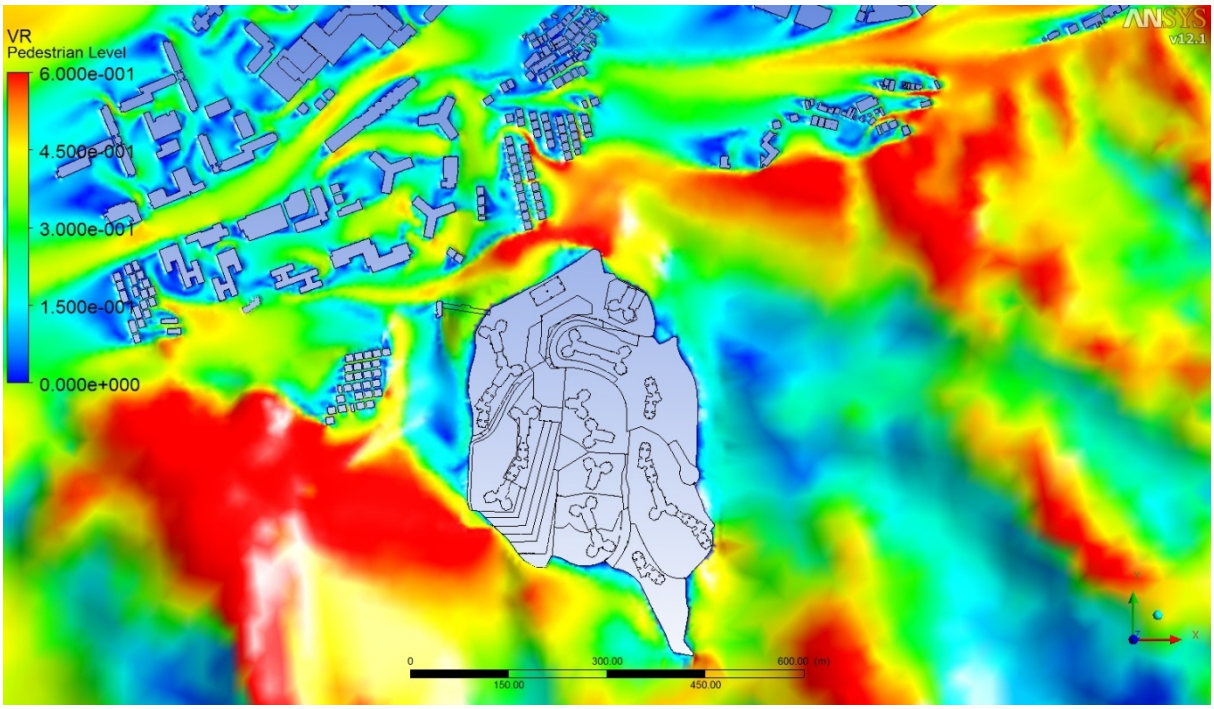


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

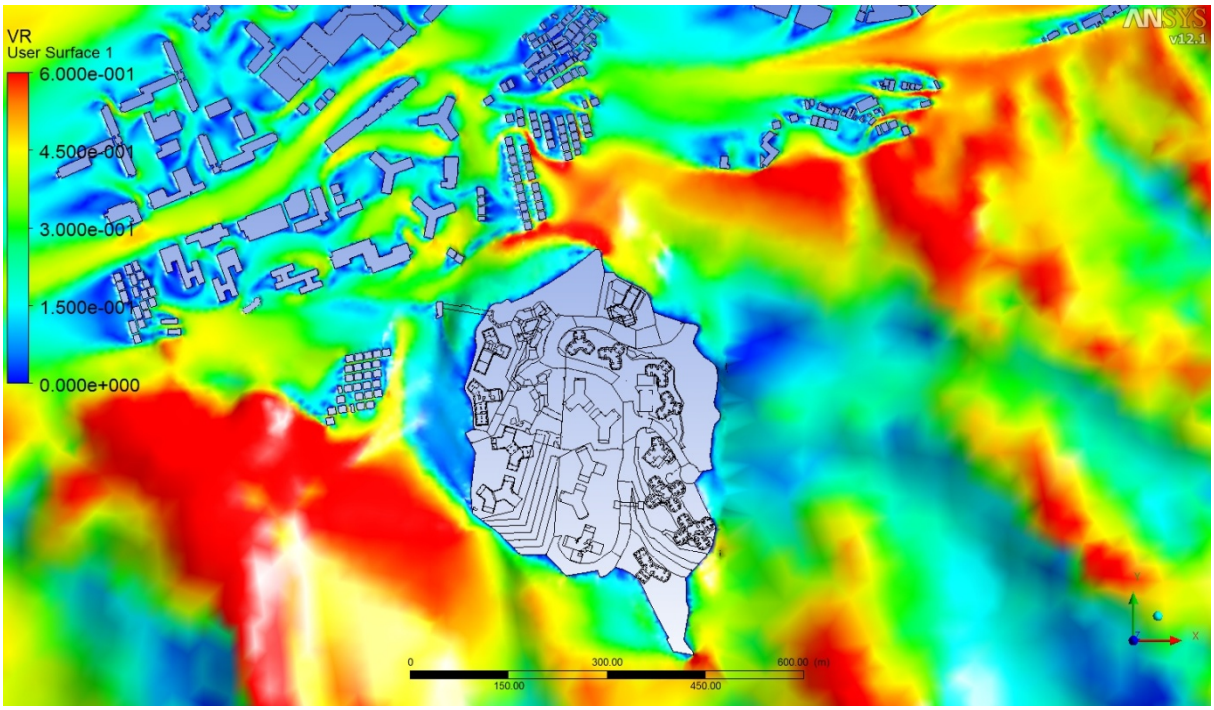


Prevailing Wind Direction: North-Northeast (NNE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

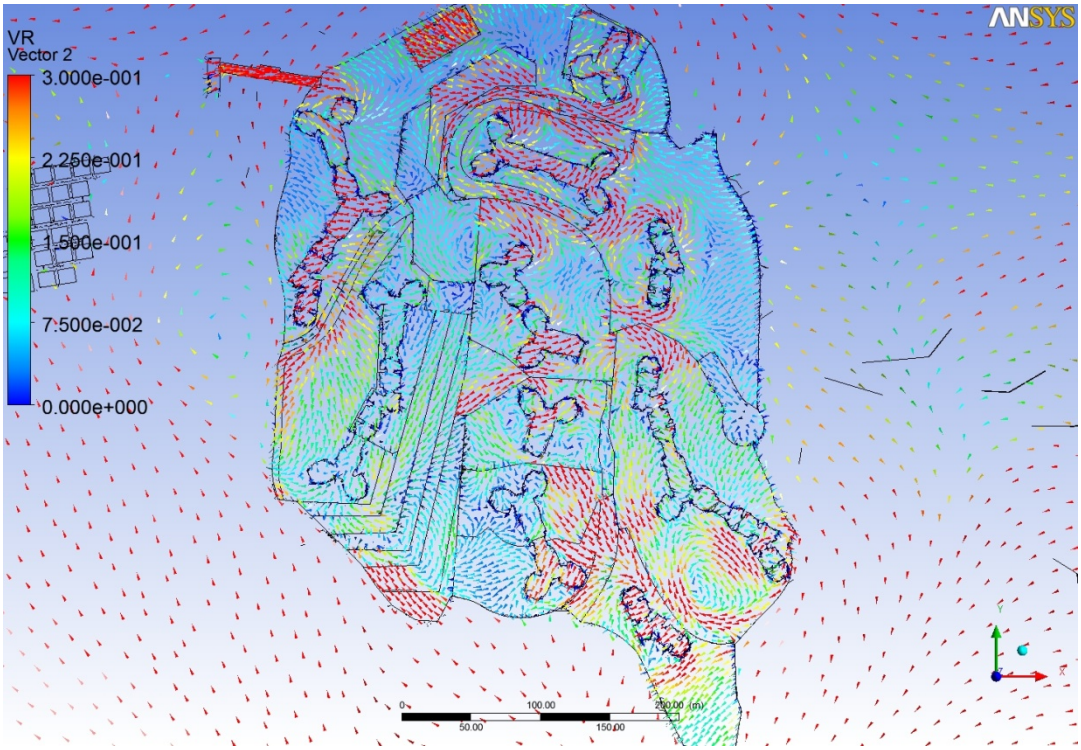


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

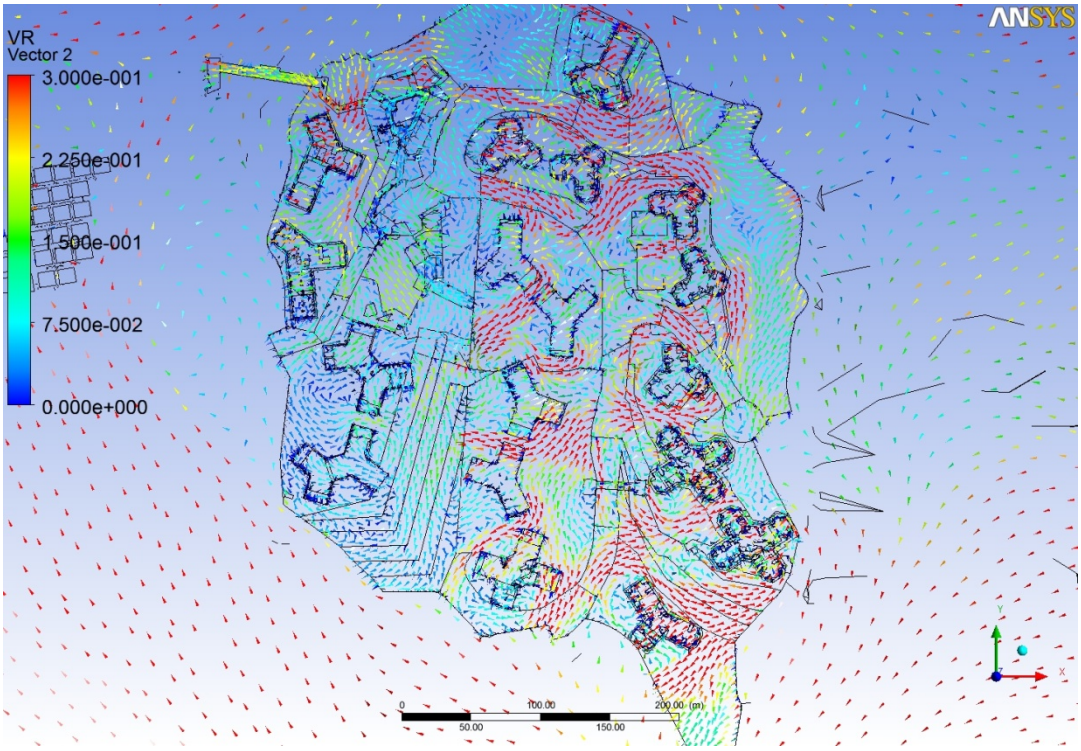


Prevailing Wind Direction: North-Northeast (NNE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

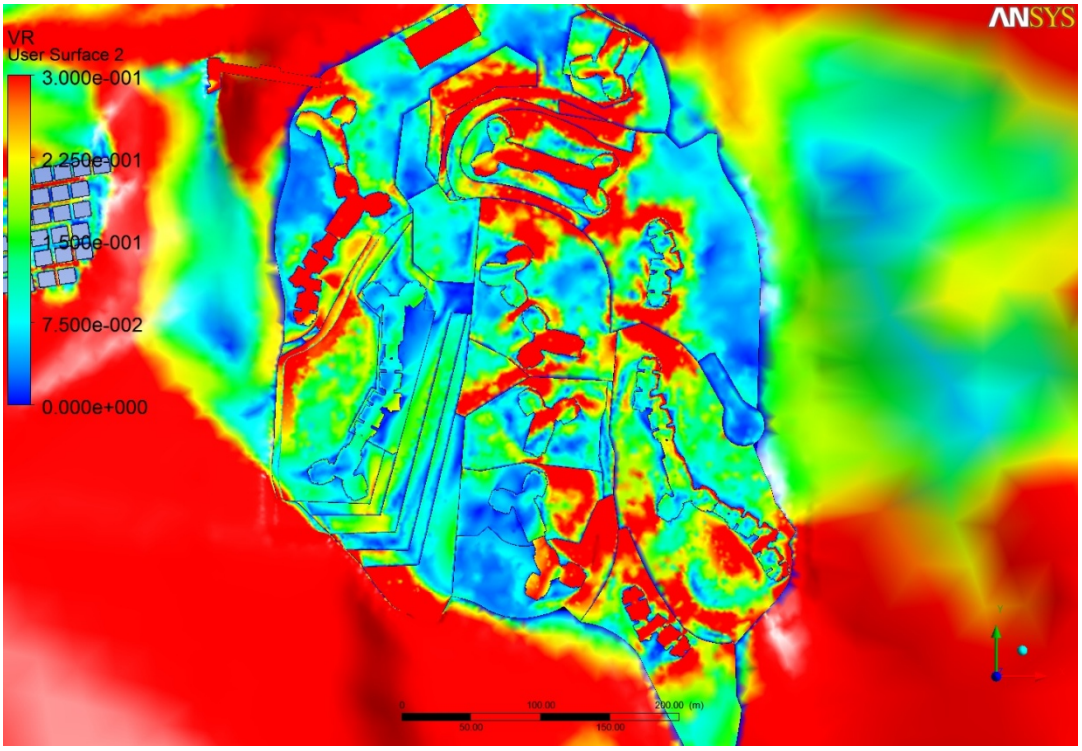


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

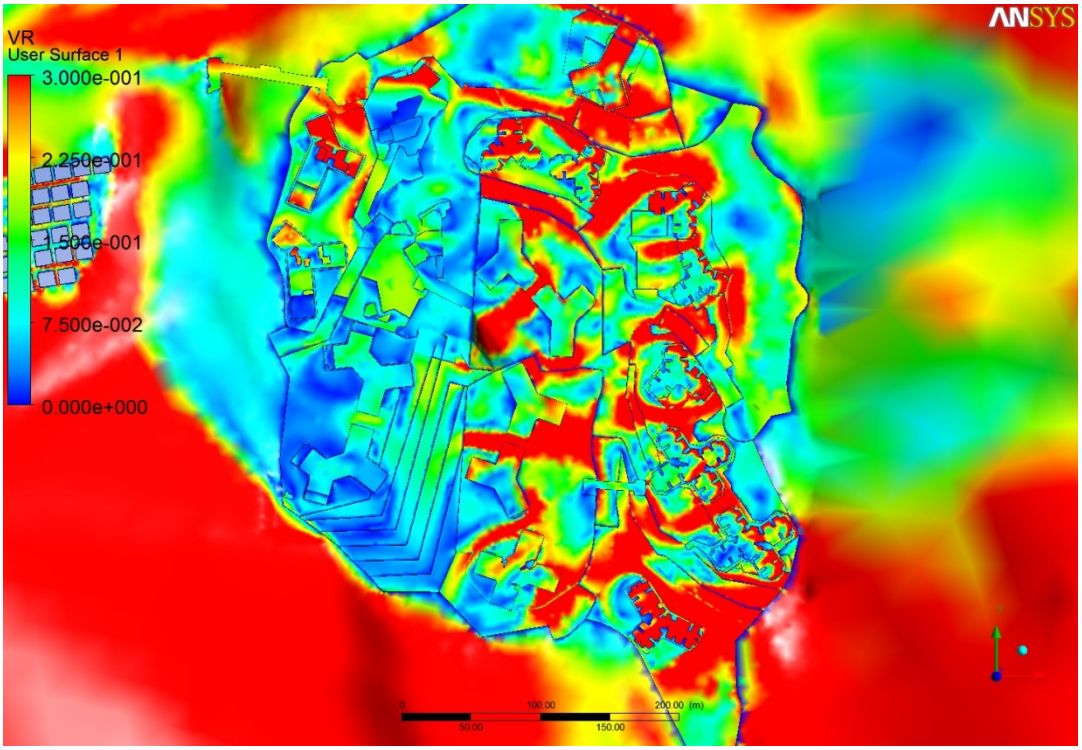


Prevailing Wind Direction: North-Northeast (NNE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

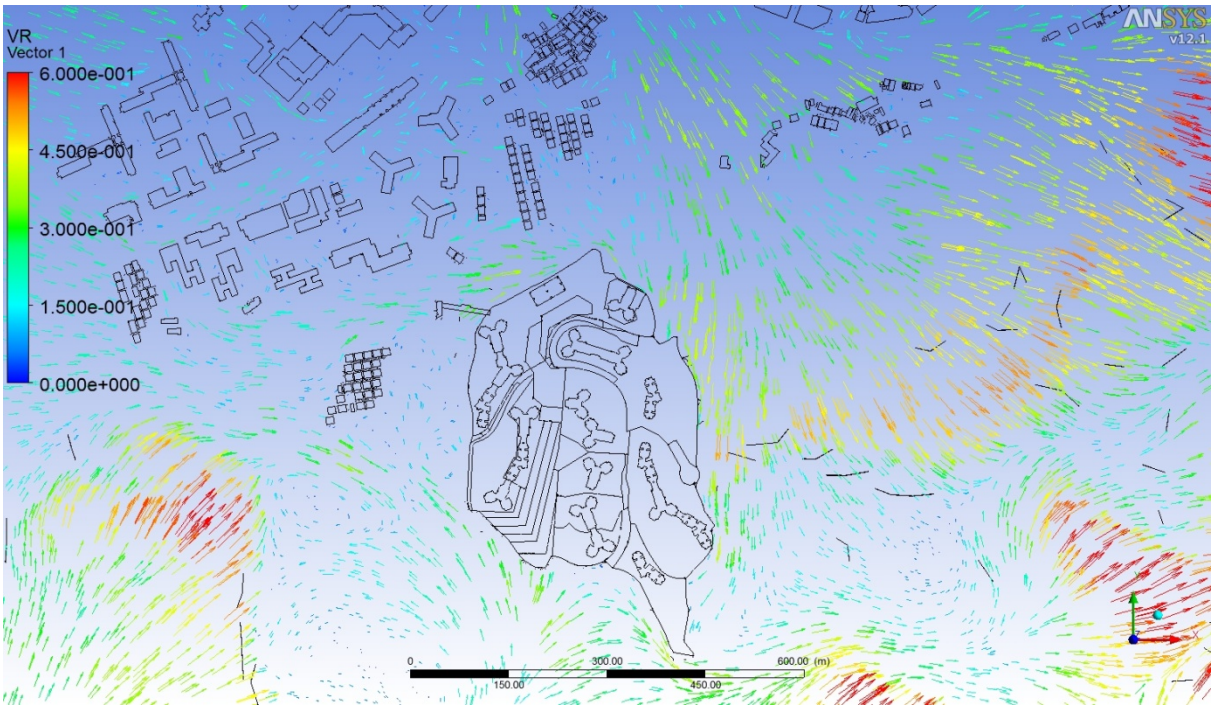


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

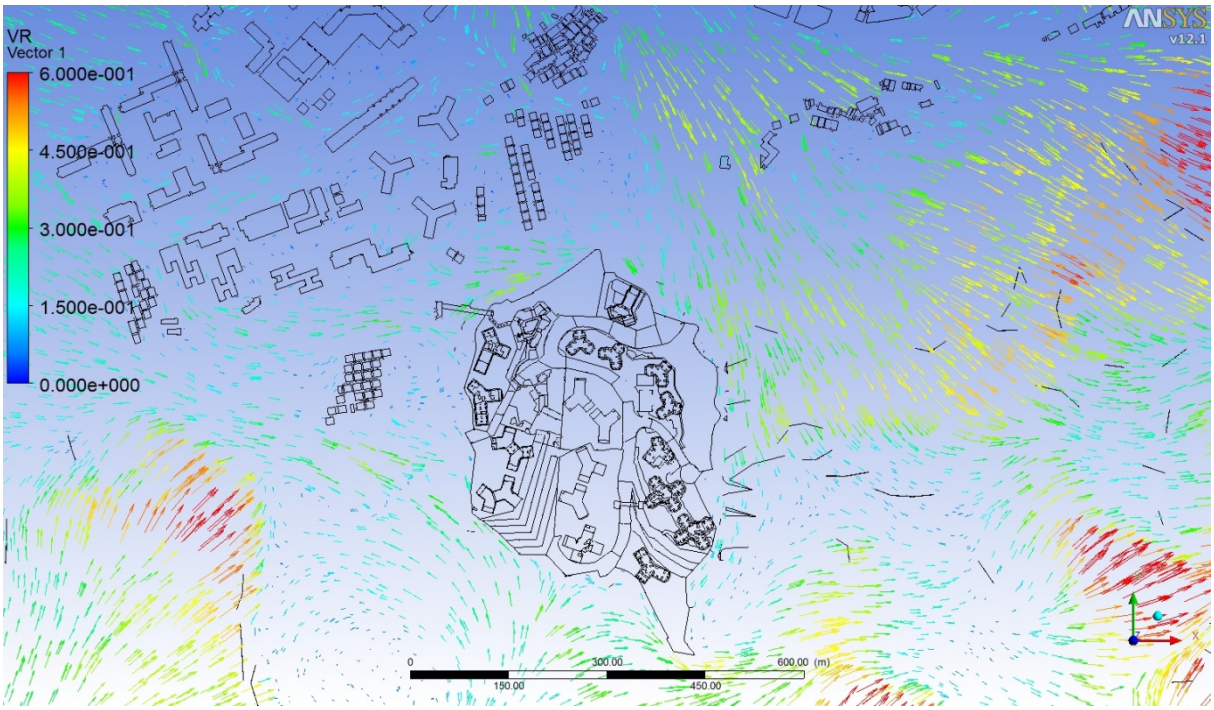


Prevailing Wind Direction: South-Southwest (SSW)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

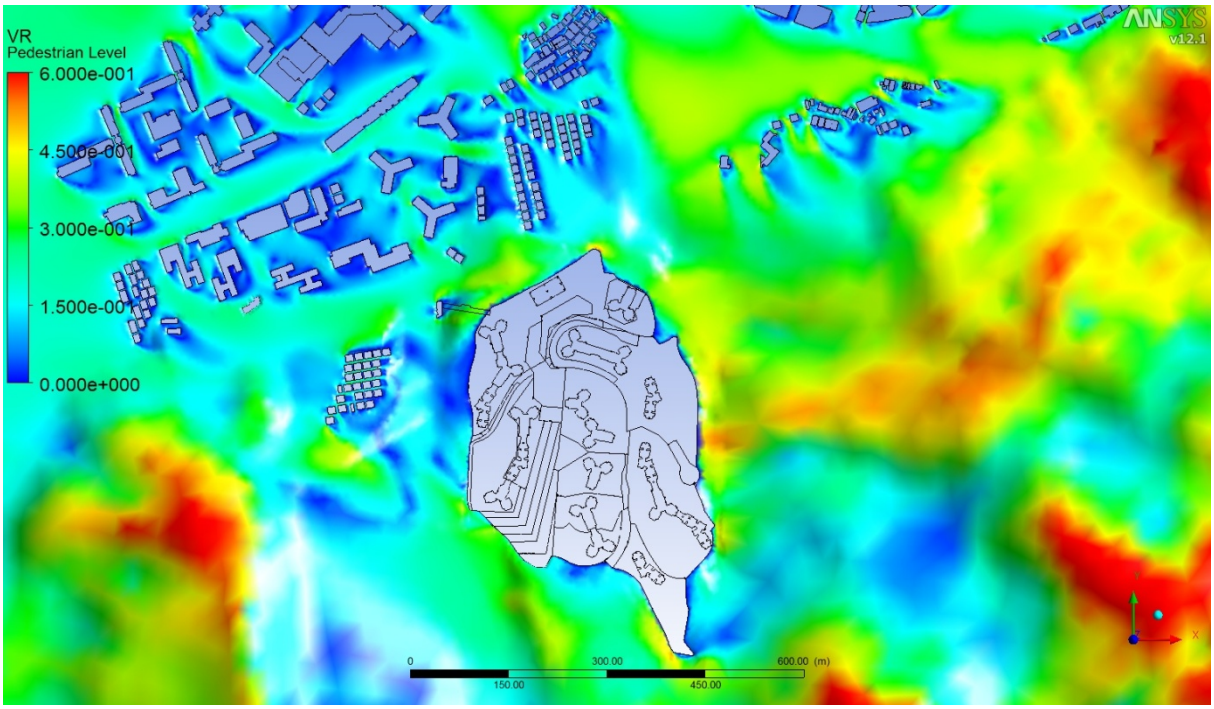


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

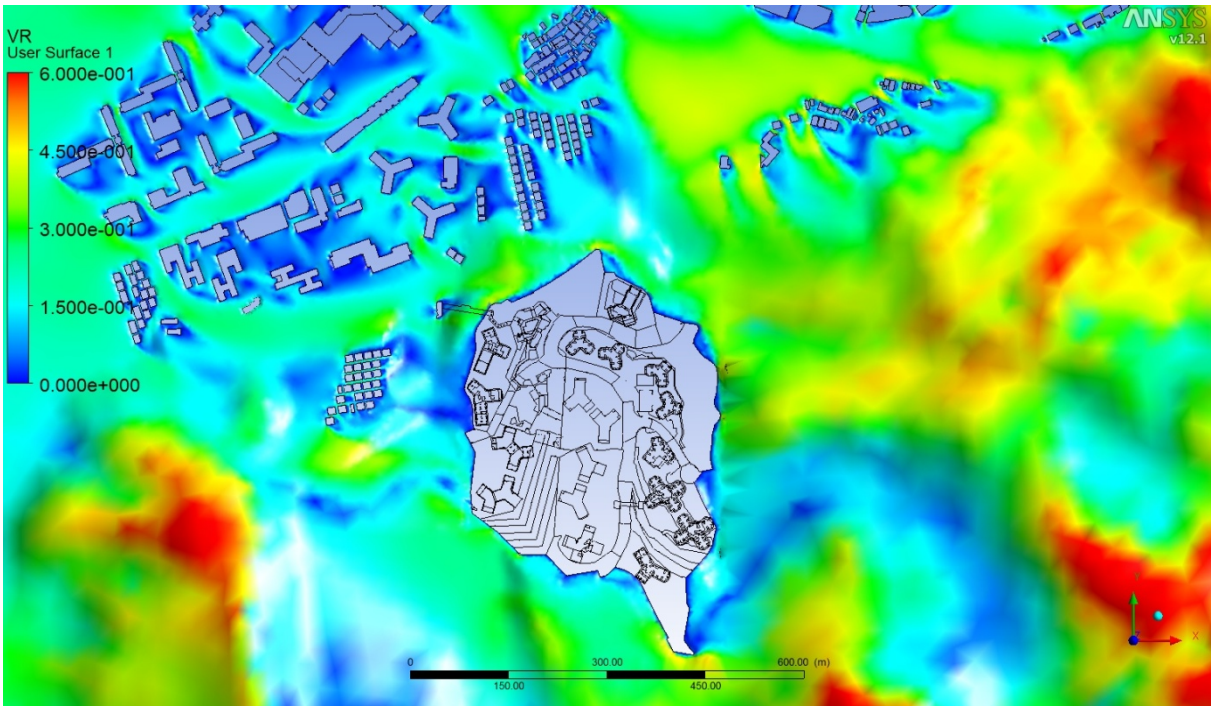


Prevailing Wind Direction: South-Southwest (SSW)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

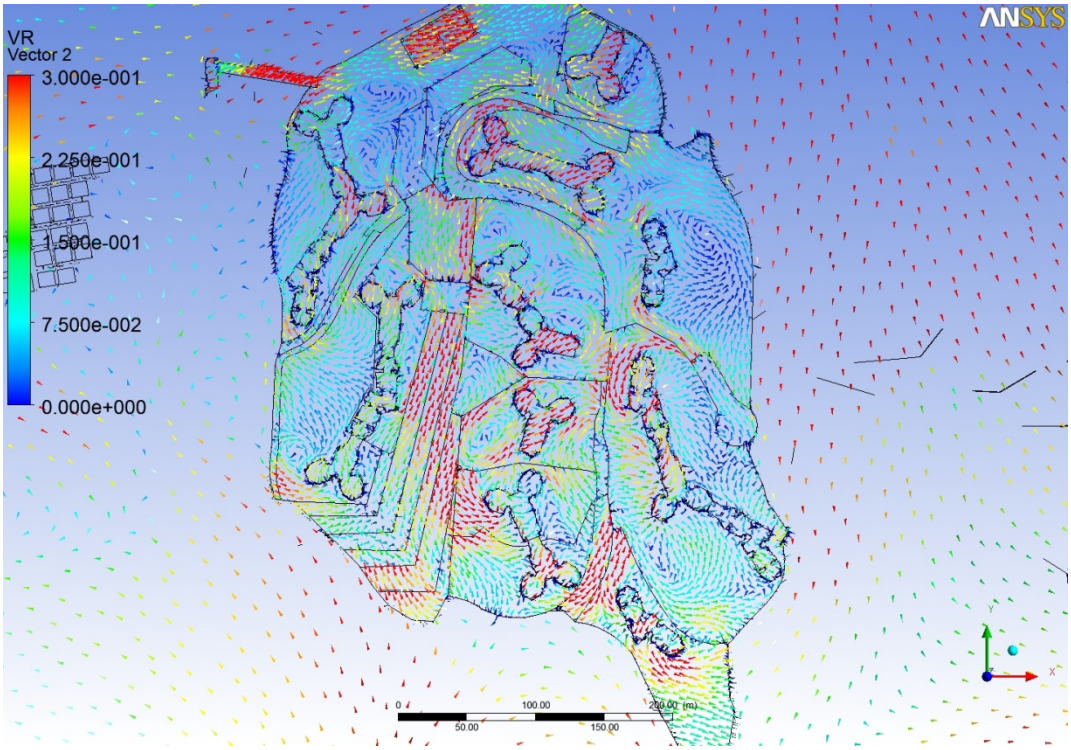


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

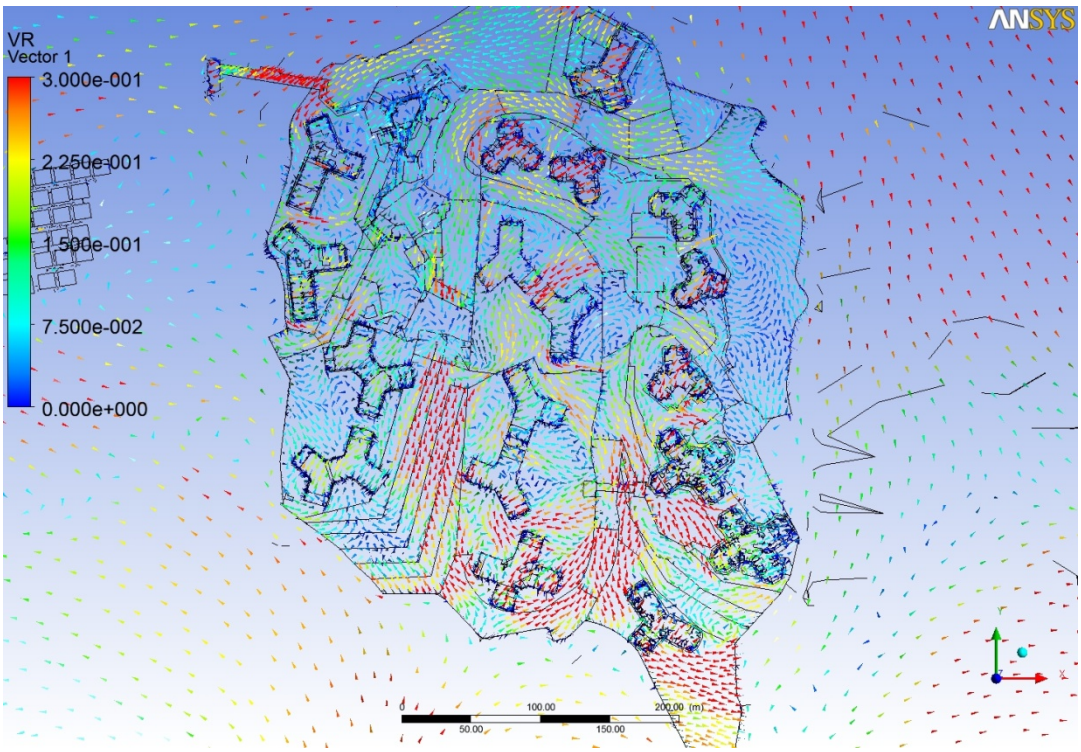


Prevailing Wind Direction: South-Southwest (SSW)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

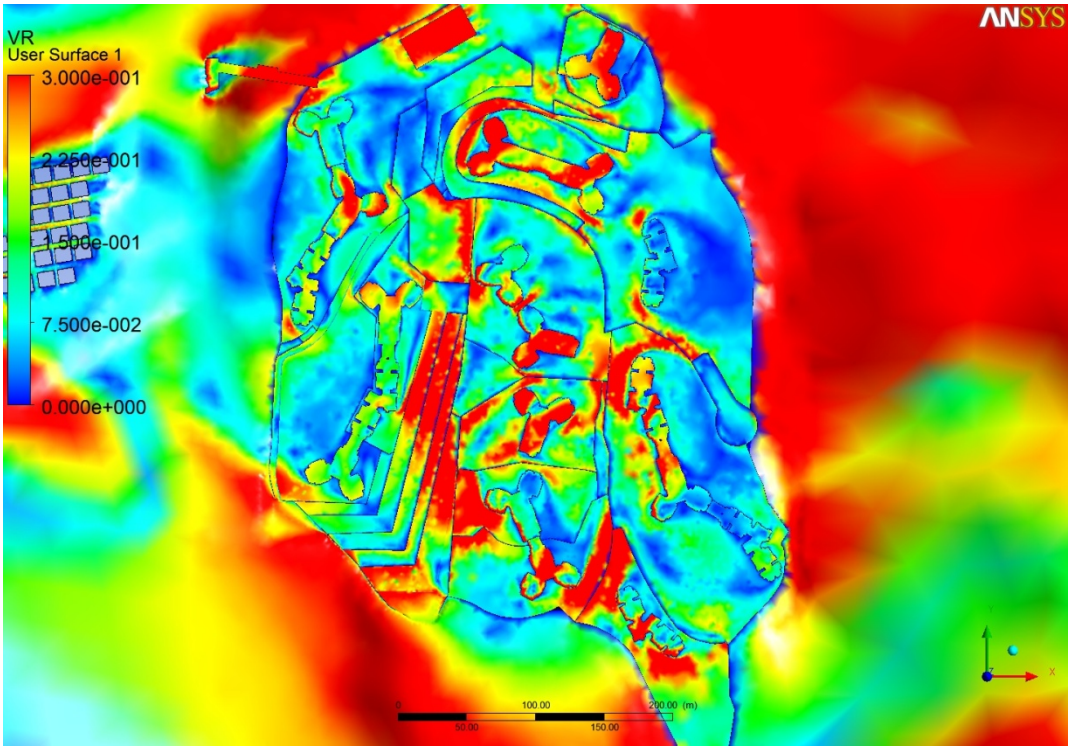


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

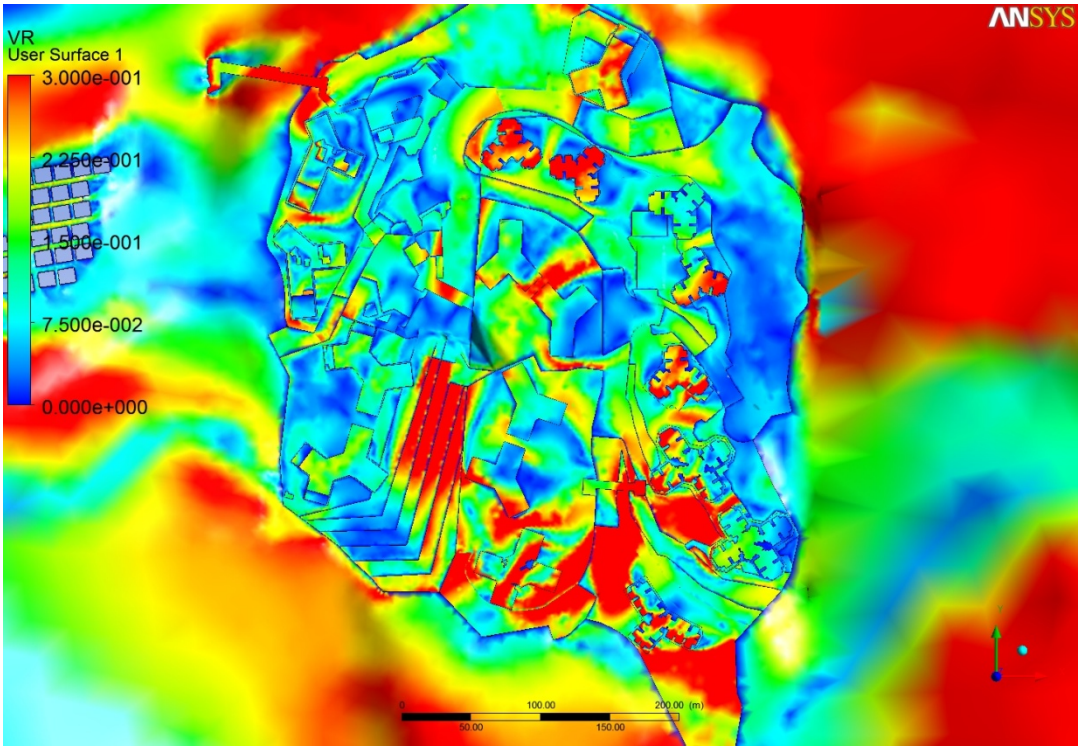


Prevailing Wind Direction: South-Southwest (SSW)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

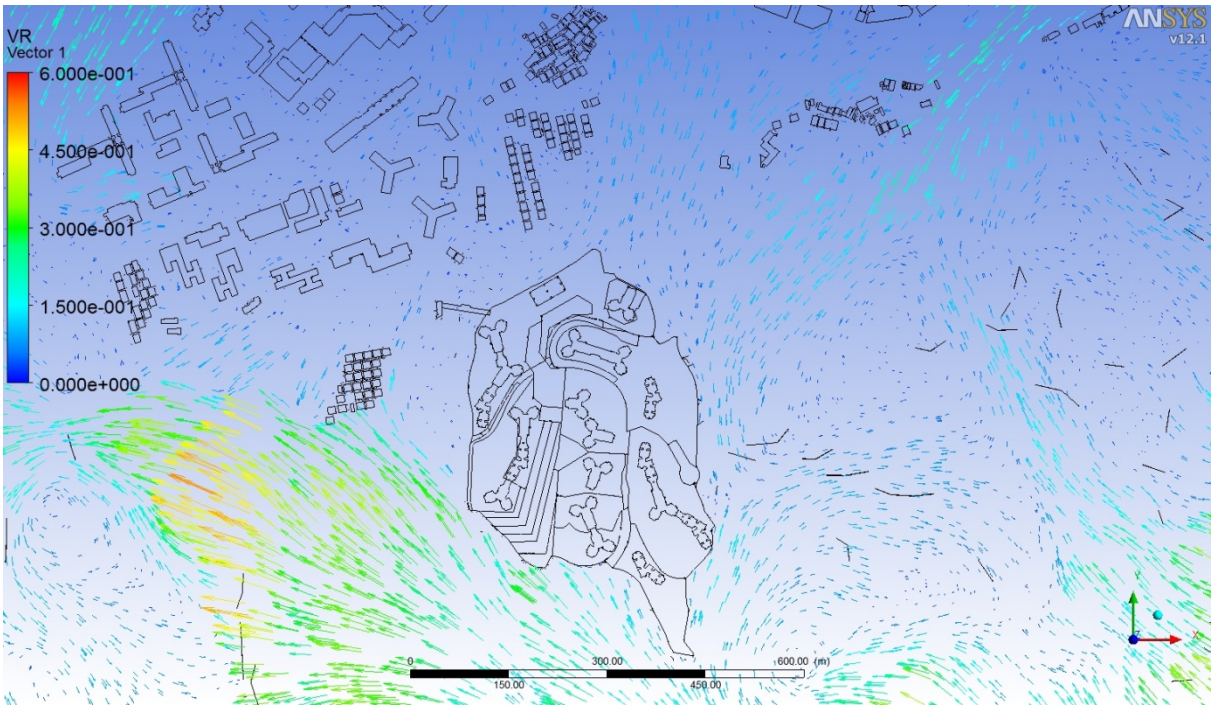


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

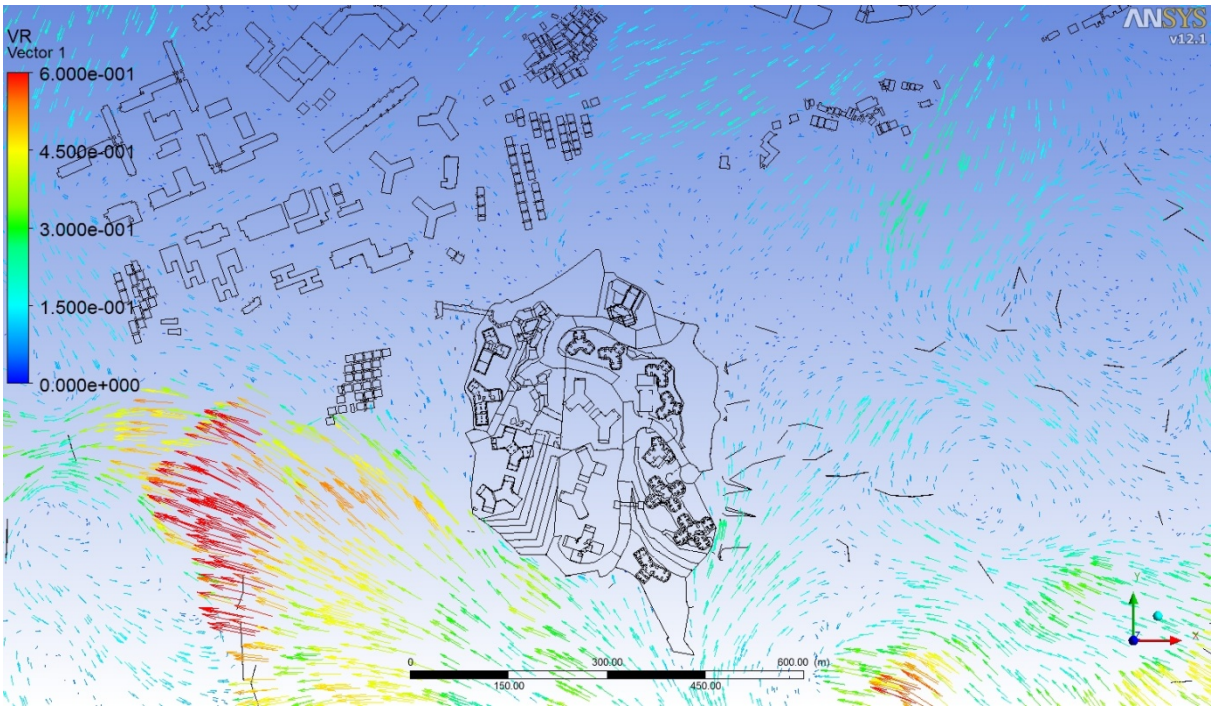


Prevailing Wind Direction: Southeast (SE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

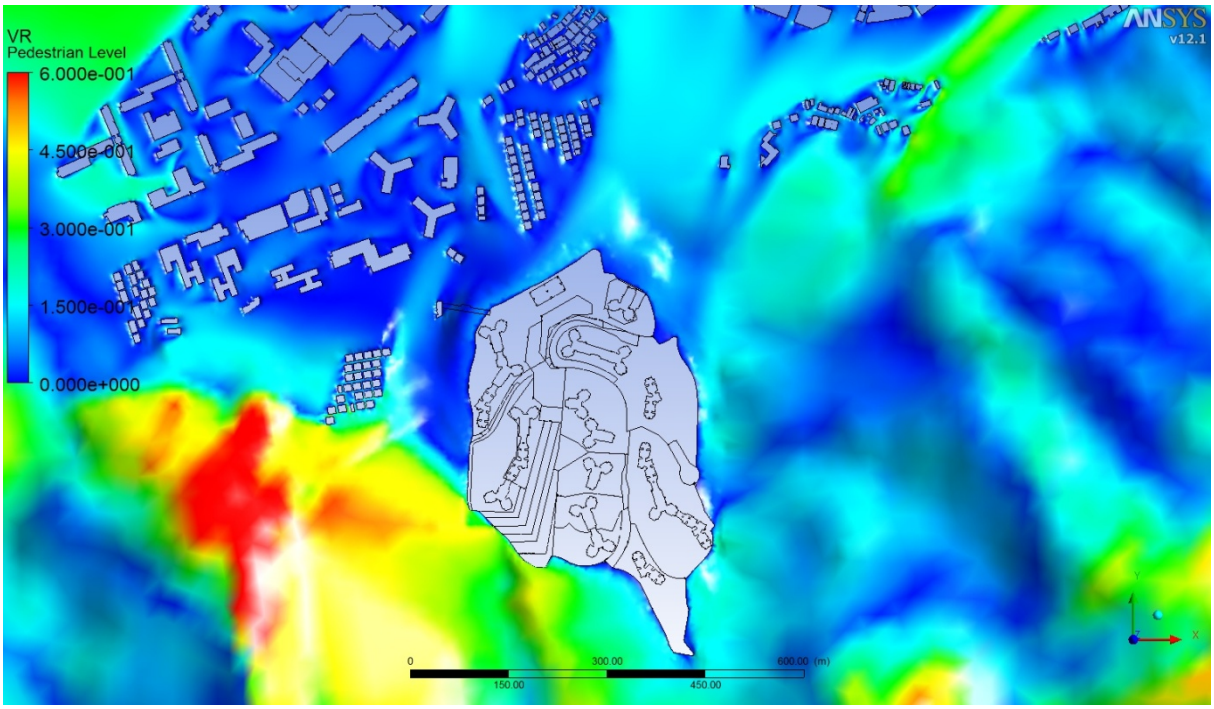


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

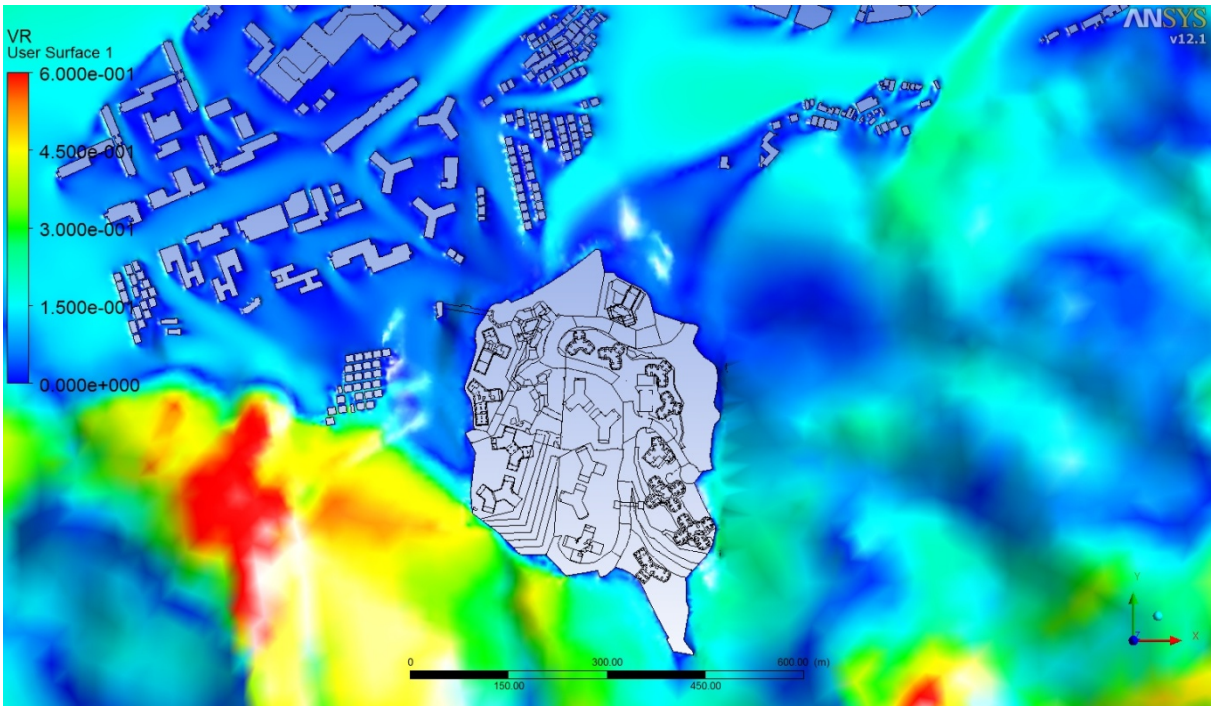


Prevailing Wind Direction: Southeast (SE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

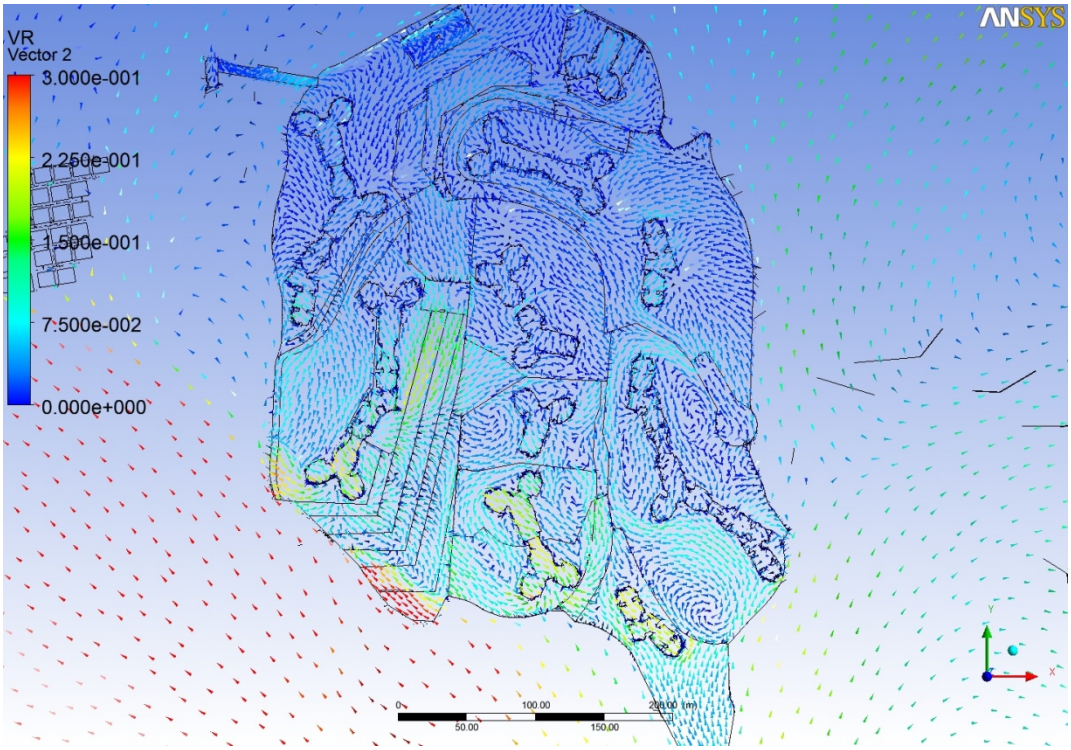


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

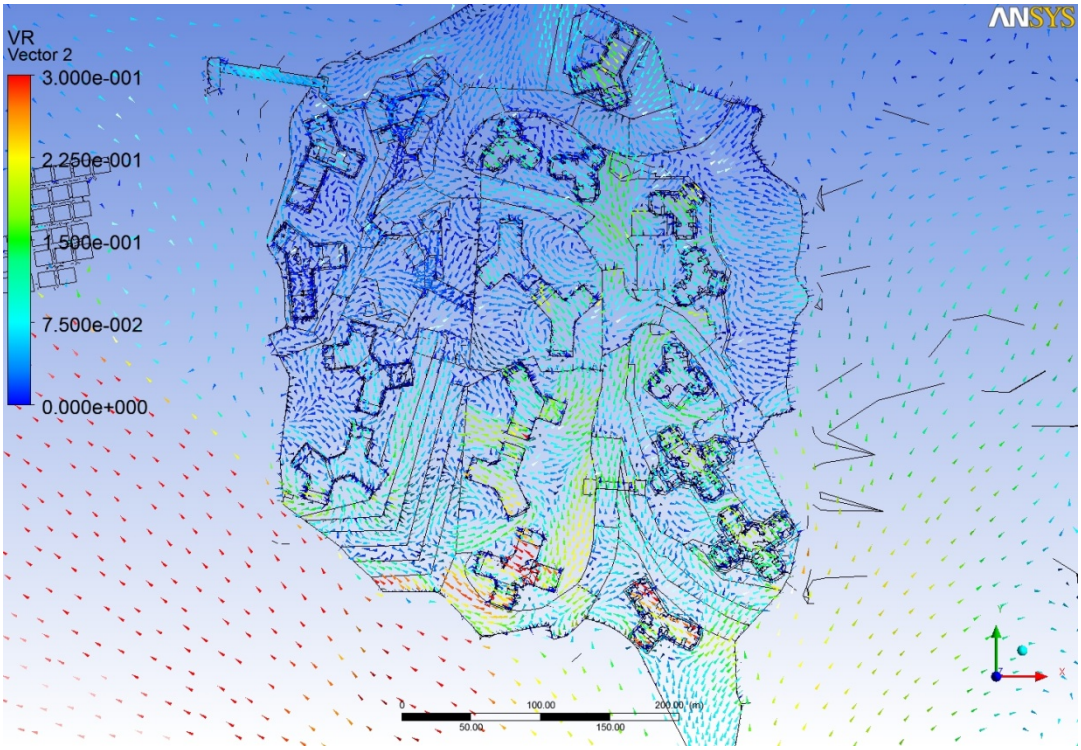


Prevailing Wind Direction: Southeast (SE)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

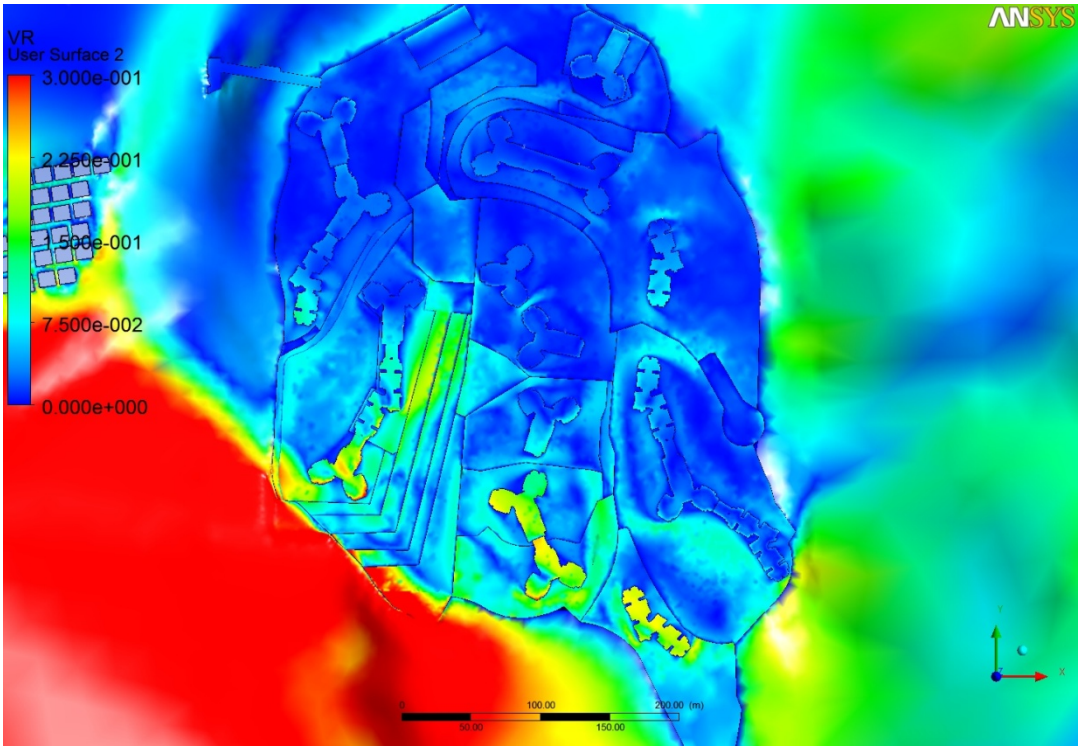


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

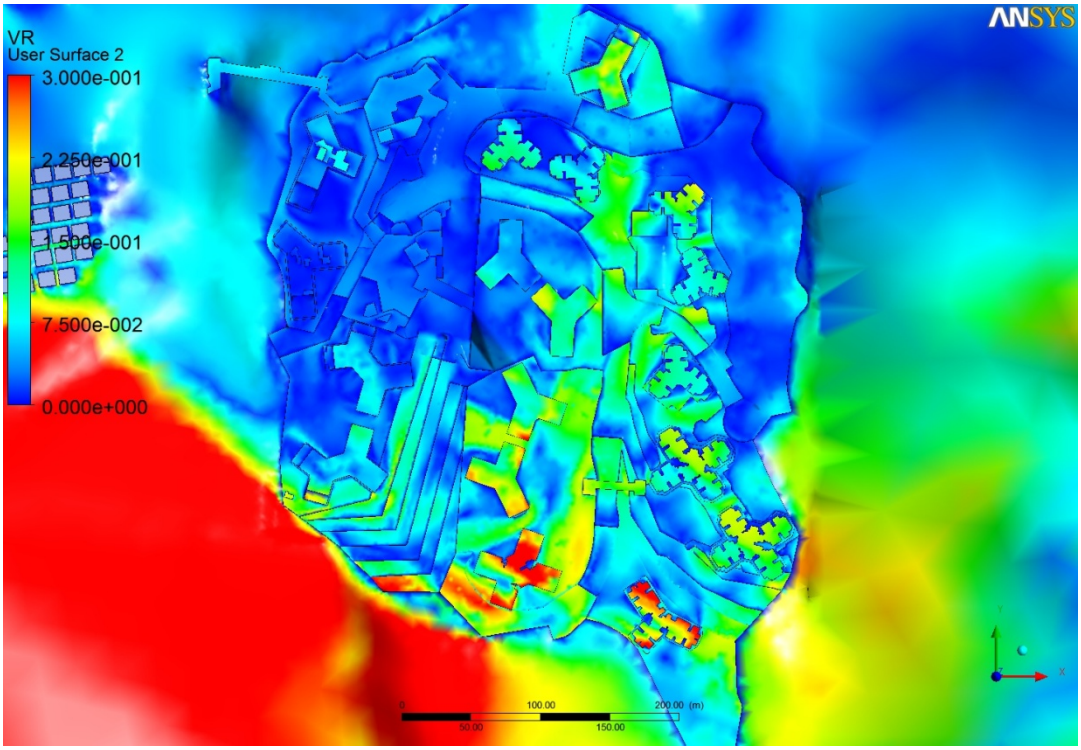


Prevailing Wind Direction: Southeast (SE)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

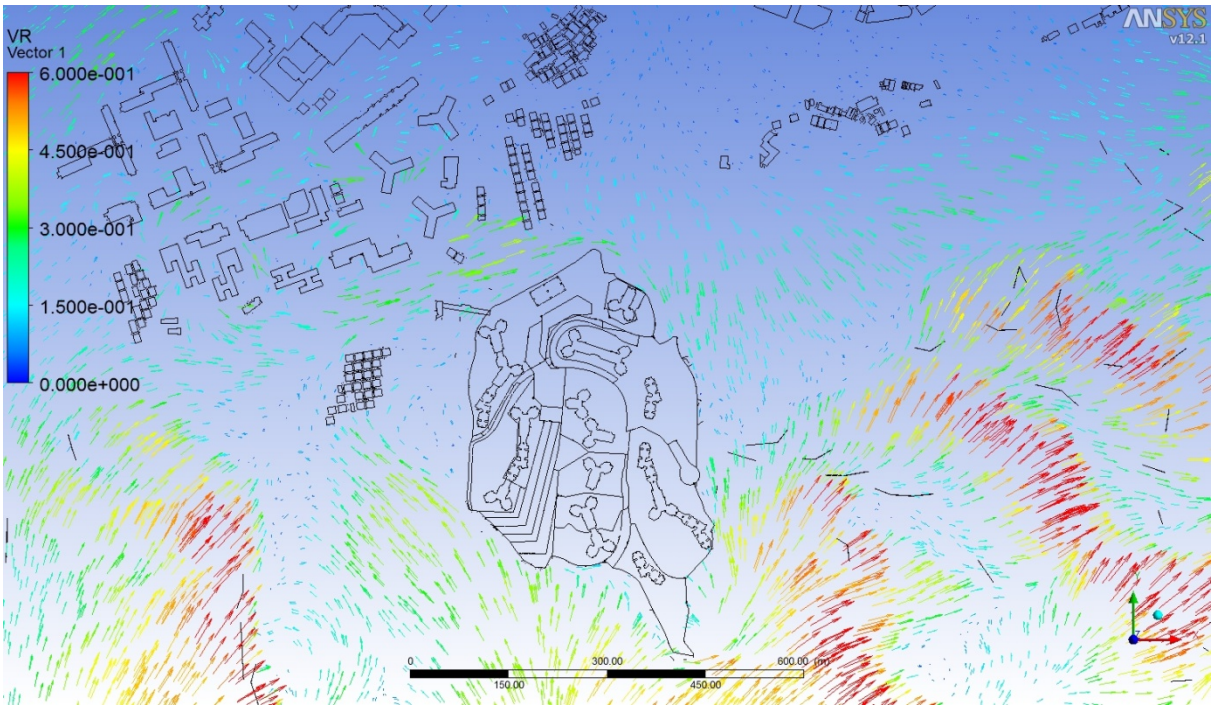


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

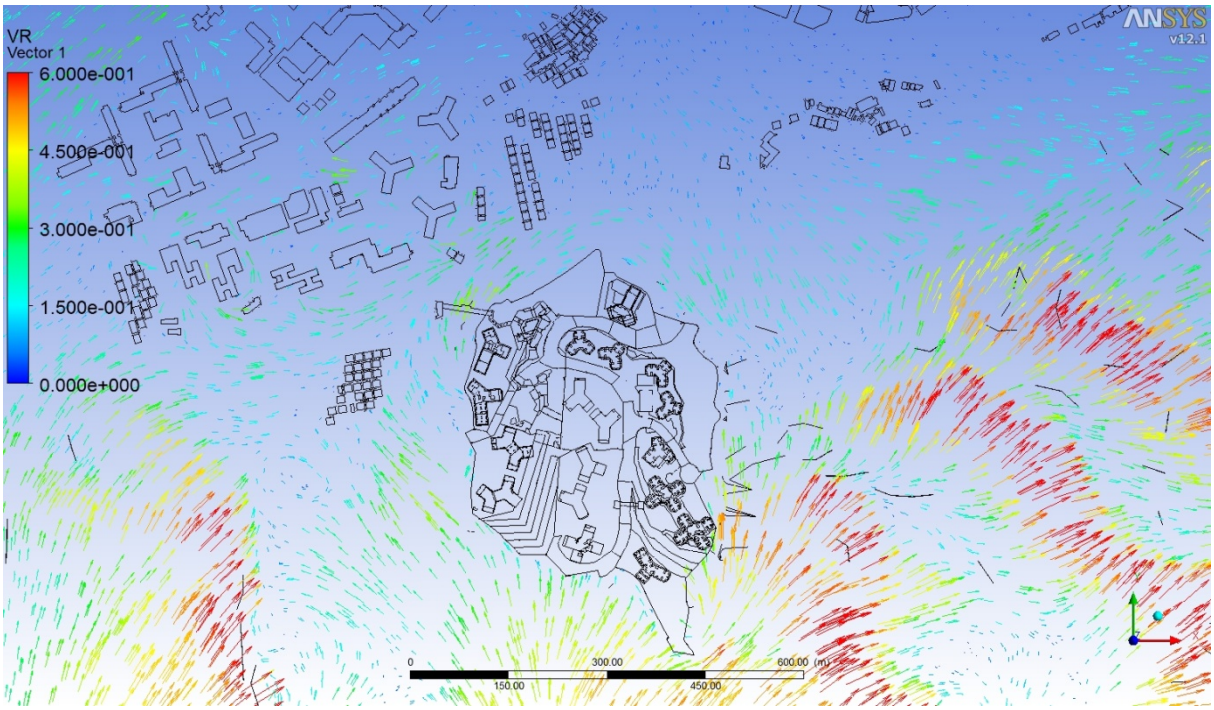


Prevailing Wind Direction: Southwest (SW)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level

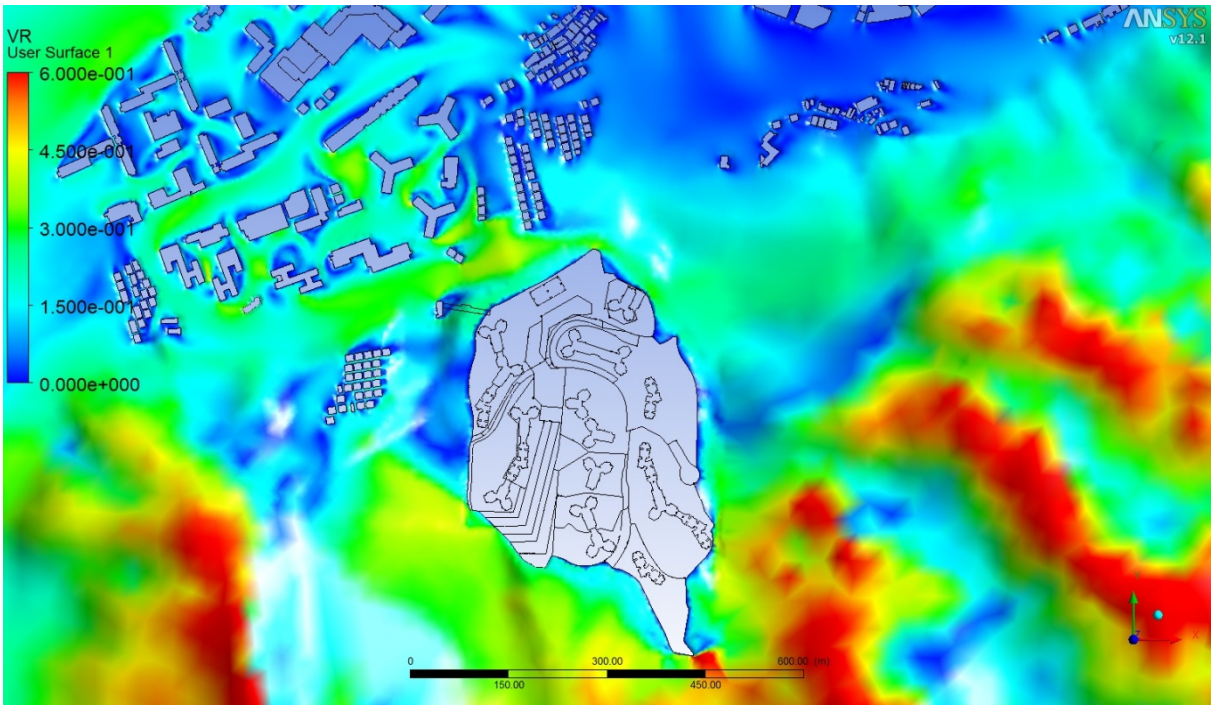


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level

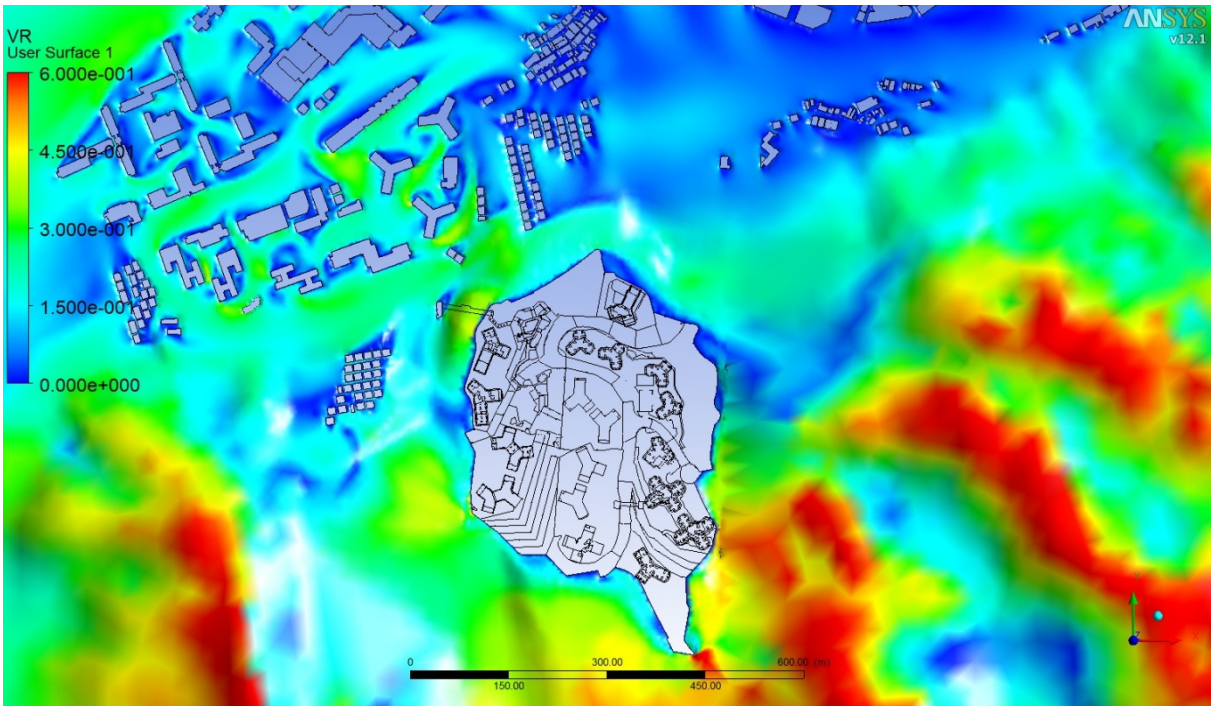


Prevailing Wind Direction: Southwest (SW)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level

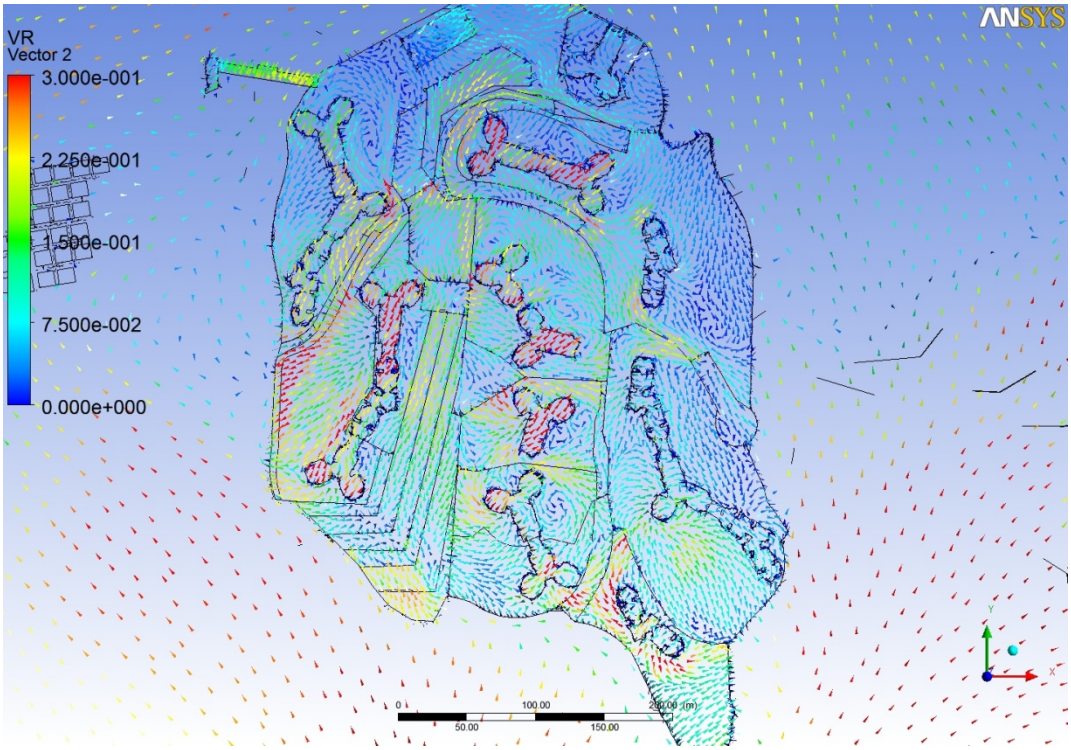


Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level

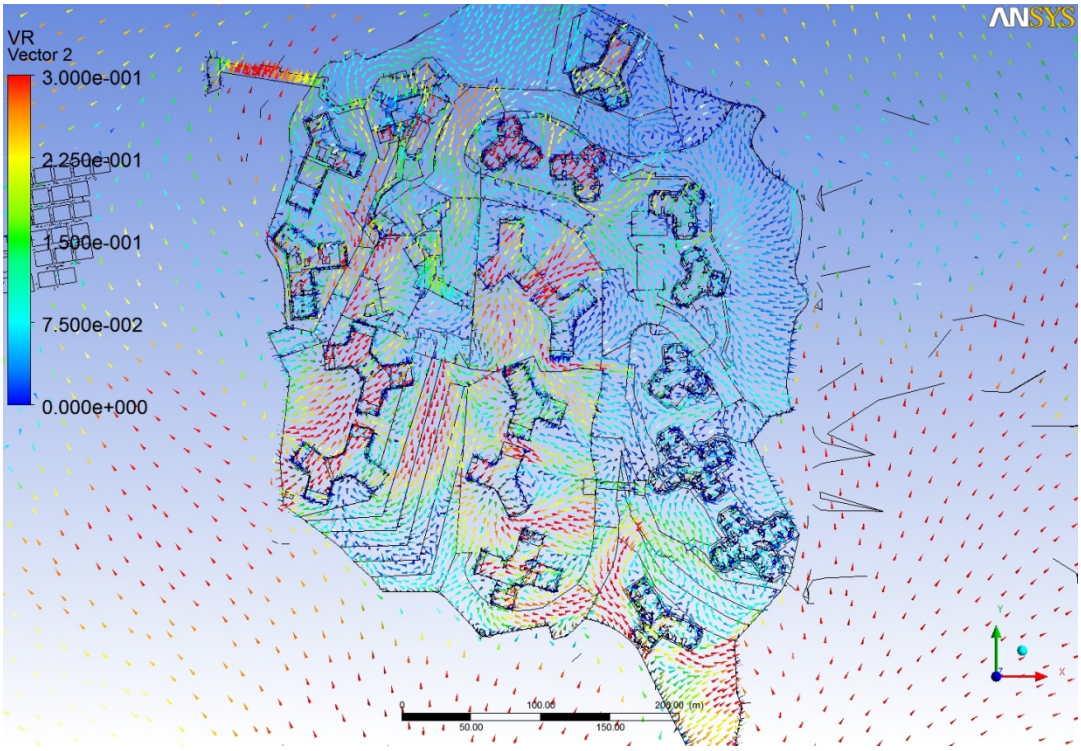


Prevailing Wind Direction: Southwest (SW)

Velocity Ratio (VR) Vector Diagram of Initial Scheme at 2m above Ground Level within the Subject Site

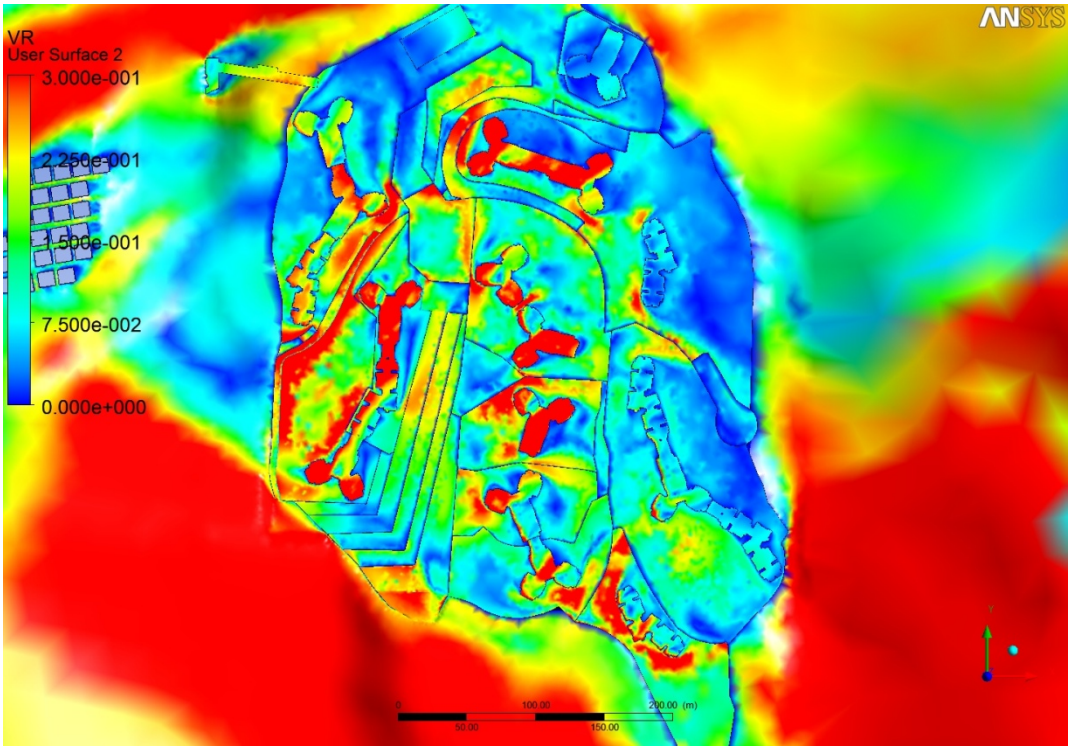


Velocity Ratio (VR) Vector Diagram of Proposed Scheme at 2m above Ground Level within the Subject Site

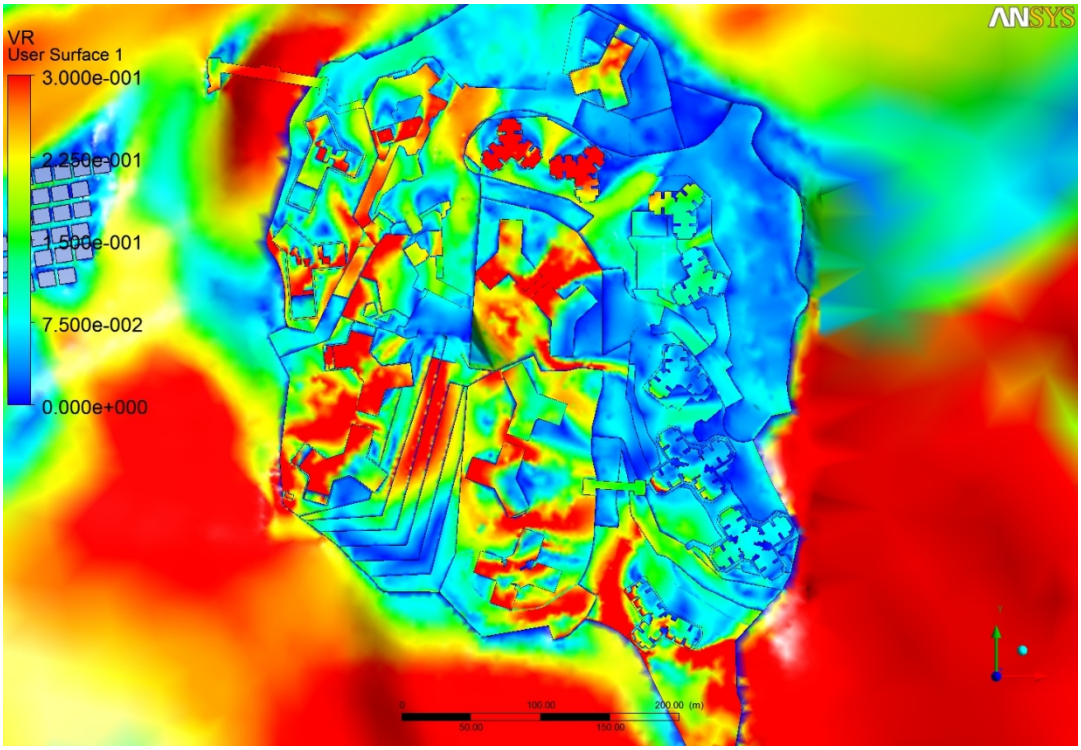


Prevailing Wind Direction: Southwest (SW)

Velocity Ratio (VR) Contour Diagram of Initial Scheme at 2m above Ground Level



Velocity Ratio (VR) Contour Diagram of Proposed Scheme at 2m above Ground Level



APPENDIX II: DETAILED VR_W RESULTS FOR ALL TEST POINTS

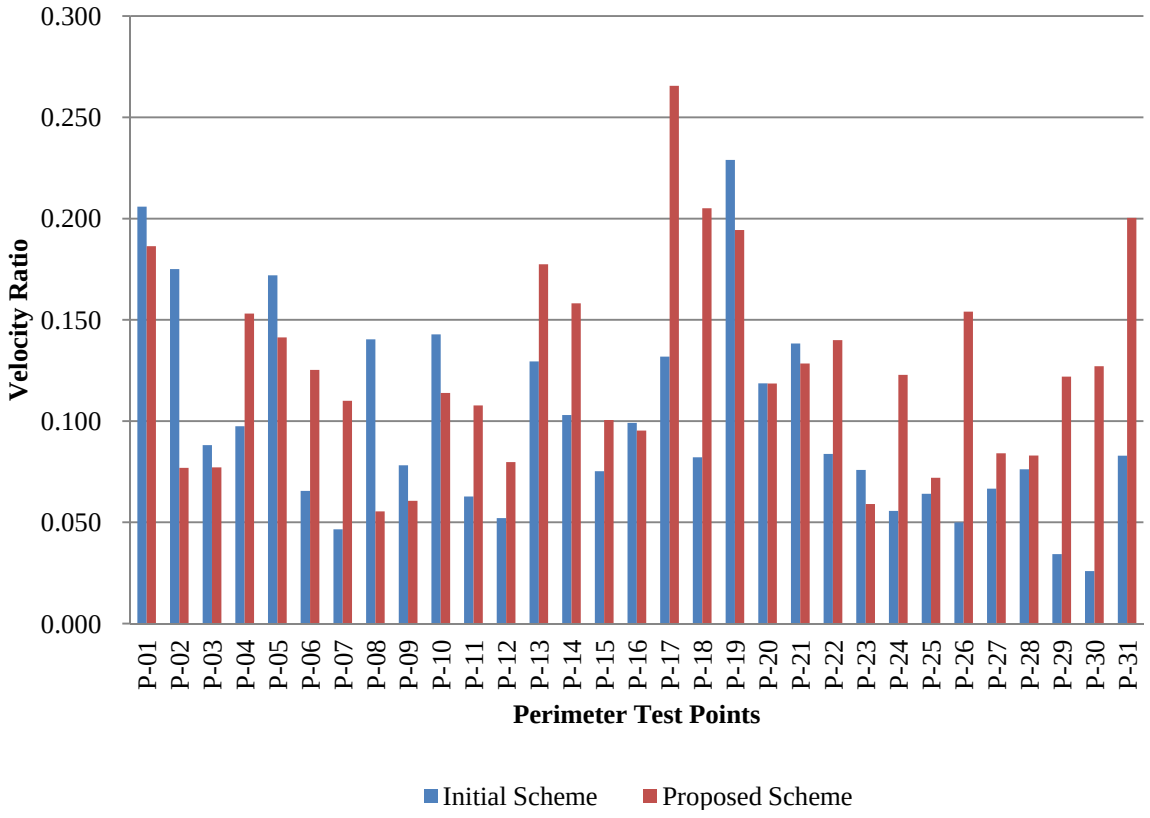
Weighted Velocity Ratio (VRw)

Test Point No.	VR_w for Initial Scheme	VR_w for Proposed Scheme	Difference in VR_w between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.206	0.186	-0.020
P-02	0.175	0.077	-0.098
P-03	0.088	0.077	-0.011
P-04	0.097	0.153	0.056
P-05	0.172	0.141	-0.031
P-06	0.066	0.125	0.060
P-07	0.047	0.110	0.063
P-08	0.140	0.055	-0.085
P-09	0.078	0.061	-0.018
P-10	0.143	0.114	-0.029
P-11	0.063	0.108	0.045
P-12	0.052	0.080	0.028
P-13	0.129	0.177	0.048
P-14	0.103	0.158	0.055
P-15	0.075	0.101	0.025
P-16	0.099	0.095	-0.004
P-17	0.132	0.266	0.134
P-18	0.082	0.205	0.123
P-19	0.229	0.194	-0.035
P-20	0.119	0.119	0.000
P-21	0.138	0.128	-0.010
P-22	0.084	0.140	0.056
P-23	0.076	0.059	-0.017
P-24	0.056	0.123	0.067
P-25	0.064	0.072	0.008
P-26	0.050	0.154	0.104
P-27	0.067	0.084	0.017
P-28	0.076	0.083	0.007
P-29	0.034	0.122	0.088
P-30	0.026	0.127	0.101
P-31	0.083	0.200	0.117

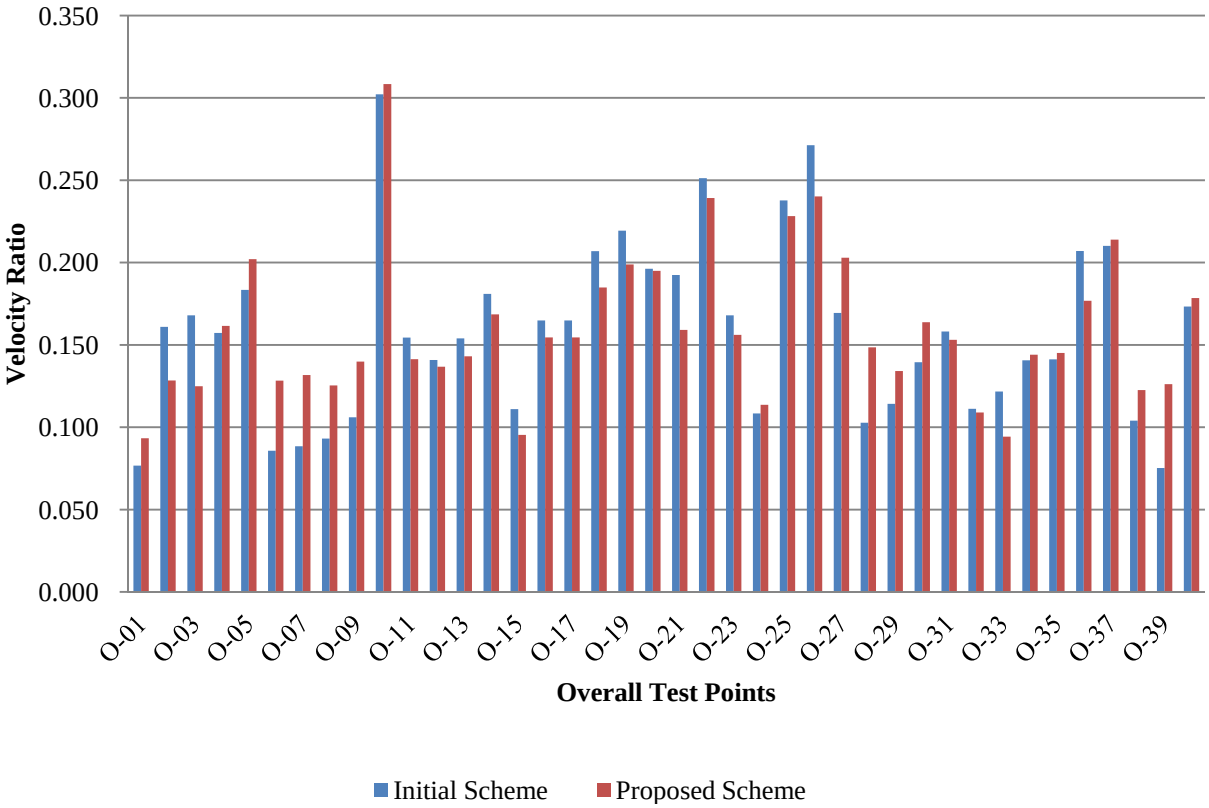
Test Point No.	VR_w for Initial Scheme	VR_w for Proposed Scheme	Difference in VR_w between Initial and Proposed Scheme
Overall Test Points			
O-01	0.077	0.093	0.017
O-02	0.161	0.128	-0.032
O-03	0.168	0.125	-0.043
O-04	0.157	0.162	0.004
O-05	0.183	0.202	0.019
O-06	0.086	0.128	0.043
O-07	0.088	0.132	0.043
O-08	0.093	0.125	0.032
O-09	0.106	0.140	0.034
O-10	0.302	0.308	0.006
O-11	0.154	0.141	-0.013
O-12	0.141	0.137	-0.004
O-13	0.154	0.143	-0.011
O-14	0.181	0.169	-0.013
O-15	0.111	0.095	-0.016
O-16	0.165	0.155	-0.010
O-17	0.165	0.155	-0.010
O-18	0.207	0.185	-0.022
O-19	0.219	0.199	-0.021
O-20	0.196	0.195	-0.001
O-21	0.192	0.159	-0.033
O-22	0.251	0.239	-0.012
O-23	0.168	0.156	-0.012
O-24	0.108	0.114	0.005
O-25	0.238	0.228	-0.009
O-26	0.271	0.240	-0.031
O-27	0.169	0.203	0.034
O-28	0.103	0.149	0.046
O-29	0.114	0.134	0.020
O-30	0.139	0.164	0.024
O-31	0.158	0.153	-0.005
O-32	0.111	0.109	-0.002
O-33	0.122	0.094	-0.027
O-34	0.141	0.144	0.003
O-35	0.141	0.145	0.004
O-36	0.207	0.177	-0.030
O-37	0.210	0.214	0.004
O-38	0.104	0.123	0.019
O-39	0.075	0.126	0.051
O-40	0.173	0.178	0.005
O-41	0.237	0.206	-0.032
O-42	0.154	0.202	0.048
O-43	0.241	0.263	0.022
O-44	0.365	0.283	-0.082
O-45	0.197	0.168	-0.028
O-46	0.260	0.215	-0.045
O-47	0.140	0.148	0.008
O-48	0.213	0.203	-0.010
O-49	0.276	0.246	-0.030
O-50	0.300	0.254	-0.046
O-51	0.267	0.253	-0.014
O-52	0.110	0.173	0.062
O-53	0.126	0.183	0.057
O-54	0.152	0.175	0.023
O-55	0.146	0.189	0.043

Test Point No.	VR_w for Initial Scheme	VR_w for Proposed Scheme	Difference in VR_w between Initial and Proposed Scheme
O-56	0.149	0.178	0.029
O-57	0.124	0.173	0.049
O-58	0.167	0.173	0.007
O-59	0.110	0.113	0.004
O-60	0.141	0.151	0.010
O-61	0.081	0.096	0.015
O-62	0.049	0.085	0.036
O-63	0.052	0.074	0.022
O-64	0.140	0.161	0.021
O-65	0.131	0.096	-0.035
O-66	0.167	0.167	0.001
O-67	0.074	0.117	0.043
O-68	0.063	0.074	0.011
O-69	0.110	0.091	-0.019
O-70	0.075	0.089	0.014
O-71	0.176	0.159	-0.018
O-72	0.119	0.149	0.031
O-73	0.212	0.179	-0.032
O-74	0.198	0.149	-0.049
O-75	0.186	0.149	-0.037
O-76	0.160	0.151	-0.008
O-77	0.182	0.154	-0.028
O-78	0.268	0.199	-0.069
O-79	0.257	0.289	0.031
O-80	0.335	0.335	0.001
O-81	0.356	0.319	-0.038
O-82	0.345	0.281	-0.064
O-83	0.042	0.098	0.057
O-84	0.071	0.097	0.026
O-85	0.051	0.124	0.073
O-86	0.093	0.108	0.015
O-87	0.062	0.104	0.042
O-88	0.022	0.103	0.080
O-89	0.097	0.087	-0.010
O-90	0.146	0.140	-0.006
O-91	0.063	0.206	0.143
O-92	0.041	0.208	0.166
O-93	0.044	0.238	0.194
O-94	0.107	0.156	0.049
O-95	0.057	0.100	0.042
O-96	0.154	0.076	-0.078
O-97	0.076	0.109	0.033
O-98	0.099	0.329	0.230
O-99	0.076	0.130	0.054
O-100	0.112	0.172	0.060
O-101	0.144	0.092	-0.052
O-102	0.108	0.086	-0.022
O-103	0.067	0.162	0.095
O-104	0.107	0.065	-0.043
O-105	0.065	0.132	0.067

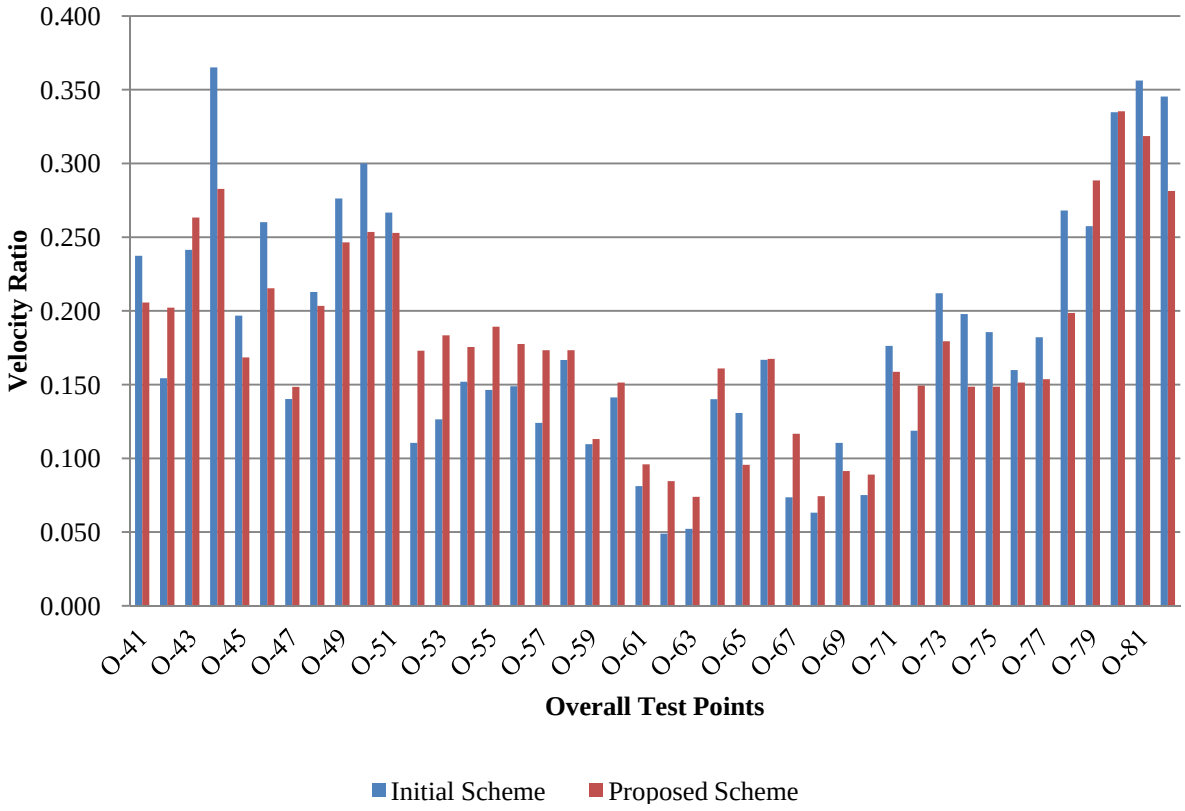
Weighted Velocity Ratios (VR_w) of Perimeter Test Points P-01 to P-31



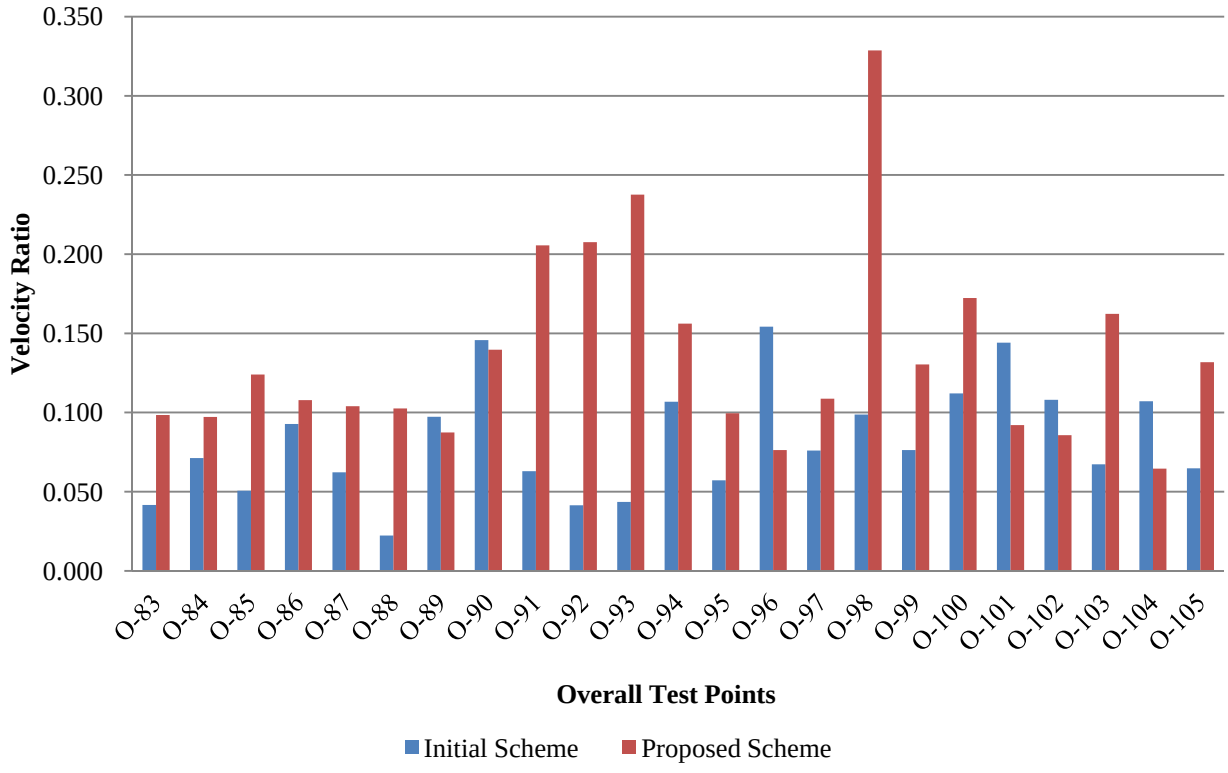
Weighted Velocity Ratios (VR_w) of Overall Test Points O-01 to O-40



Weighted Velocity Ratios (VR_w) of Overall Test Points O-41 to O-82



Weighted Velocity Ratios (VR_w) of Overall Test Points O-83 to O-105 (Test Points within Subject Site



APPENDIX III: DETAILED VELOCITY RATIO (VR) RESULTS FOR ALL TEST POINTS

Prevailing Wind Direction: East-Northeast (ENE)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.134	0.152	0.018
P-02	0.196	0.094	-0.102
P-03	0.107	0.091	-0.016
P-04	0.151	0.170	0.018
P-05	0.113	0.143	0.030
P-06	0.064	0.183	0.119
P-07	0.066	0.217	0.151
P-08	0.207	0.103	-0.104
P-09	0.122	0.102	-0.020
P-10	0.201	0.230	0.029
P-11	0.071	0.106	0.035
P-12	0.081	0.041	-0.040
P-13	0.076	0.196	0.119
P-14	0.066	0.157	0.090
P-15	0.007	0.039	0.032
P-16	0.042	0.047	0.005
P-17	0.106	0.179	0.073
P-18	0.056	0.126	0.070
P-19	0.138	0.249	0.111
P-20	0.116	0.109	-0.007
P-21	0.065	0.152	0.087
P-22	0.036	0.160	0.123
P-23	0.070	0.096	0.026
P-24	0.060	0.161	0.101
P-25	0.082	0.091	0.009
P-26	0.066	0.196	0.130
P-27	0.068	0.073	0.005
P-28	0.092	0.089	-0.003
P-29	0.032	0.124	0.092
P-30	0.037	0.166	0.130
P-31	0.065	0.111	0.047

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.026	0.044	0.018
O-02	0.313	0.239	-0.074
O-03	0.325	0.124	-0.201
O-04	0.114	0.103	-0.010
O-05	0.111	0.202	0.091
O-06	0.025	0.247	0.222
O-07	0.022	0.276	0.254
O-08	0.054	0.261	0.206
O-09	0.063	0.279	0.216
O-10	0.364	0.364	0.000
O-11	0.062	0.074	0.013
O-12	0.066	0.065	-0.001
O-13	0.118	0.123	0.005
O-14	0.112	0.095	-0.017
O-15	0.028	0.037	0.009
O-16	0.191	0.181	-0.010
O-17	0.191	0.181	-0.010
O-18	0.172	0.185	0.013
O-19	0.078	0.097	0.019
O-20	0.012	0.060	0.049
O-21	0.072	0.020	-0.052
O-22	0.331	0.313	-0.017
O-23	0.292	0.268	-0.025
O-24	0.112	0.165	0.054
O-25	0.127	0.103	-0.025
O-26	0.281	0.142	-0.139
O-27	0.096	0.162	0.066
O-28	0.163	0.171	0.008
O-29	0.181	0.199	0.018
O-30	0.238	0.319	0.081
O-31	0.364	0.360	-0.004
O-32	0.087	0.081	-0.006
O-33	0.063	0.016	-0.048
O-34	0.105	0.132	0.027
O-35	0.100	0.071	-0.029
O-36	0.287	0.282	-0.005
O-37	0.242	0.246	0.004
O-38	0.050	0.237	0.187
O-39	0.043	0.362	0.319
O-40	0.204	0.258	0.053
O-41	0.296	0.202	-0.094
O-42	0.141	0.342	0.201
O-43	0.117	0.340	0.223
O-44	0.455	0.080	-0.374
O-45	0.239	0.074	-0.164
O-46	0.294	0.112	-0.183
O-47	0.091	0.155	0.064
O-48	0.357	0.324	-0.032
O-49	0.457	0.296	-0.161
O-50	0.404	0.187	-0.218
O-51	0.330	0.239	-0.092
O-52	0.056	0.263	0.207
O-53	0.148	0.374	0.227
O-54	0.058	0.178	0.120

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.079	0.235	0.156
O-56	0.090	0.162	0.071
O-57	0.002	0.168	0.166
O-58	0.102	0.168	0.067
O-59	0.016	0.072	0.056
O-60	0.052	0.109	0.057
O-61	0.061	0.131	0.070
O-62	0.025	0.151	0.126
O-63	0.030	0.135	0.105
O-64	0.122	0.228	0.106
O-65	0.098	0.014	-0.084
O-66	0.141	0.116	-0.025
O-67	0.075	0.164	0.089
O-68	0.072	0.099	0.027
O-69	0.089	0.032	-0.057
O-70	0.057	0.106	0.050
O-71	0.206	0.201	-0.005
O-72	0.038	0.171	0.133
O-73	0.235	0.102	-0.133
O-74	0.249	0.032	-0.217
O-75	0.220	0.032	-0.188
O-76	0.162	0.095	-0.067
O-77	0.152	0.032	-0.120
O-78	0.320	0.017	-0.303
O-79	0.125	0.340	0.215
O-80	0.301	0.361	0.060
O-81	0.367	0.176	-0.190
O-82	0.407	0.095	-0.312
O-83	0.049	0.109	0.060
O-84	0.028	0.117	0.089
O-85	0.046	0.168	0.122
O-86	0.099	0.115	0.017
O-87	0.048	0.208	0.160
O-88	0.013	0.046	0.033
O-89	0.038	0.044	0.006
O-90	0.185	0.146	-0.039
O-91	0.078	0.088	0.010
O-92	0.047	0.160	0.113
O-93	0.027	0.239	0.212
O-94	0.168	0.189	0.020
O-95	0.080	0.045	-0.035
O-96	0.142	0.051	-0.091
O-97	0.082	0.014	-0.067
O-98	0.134	0.340	0.206
O-99	0.098	0.066	-0.032
O-100	0.129	0.211	0.082
O-101	0.117	0.040	-0.077
O-102	0.150	0.036	-0.114
O-103	0.057	0.177	0.120
O-104	0.110	0.020	-0.090
O-105	0.080	0.153	0.073

Prevailing Wind Direction: East (E)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.161	0.107	-0.055
P-02	0.071	0.074	0.003
P-03	0.031	0.098	0.067
P-04	0.070	0.219	0.149
P-05	0.173	0.191	0.019
P-06	0.039	0.065	0.026
P-07	0.020	0.027	0.007
P-08	0.068	0.048	-0.020
P-09	0.045	0.057	0.013
P-10	0.068	0.061	-0.007
P-11	0.014	0.022	0.007
P-12	0.003	0.070	0.068
P-13	0.147	0.209	0.062
P-14	0.169	0.083	-0.087
P-15	0.131	0.087	-0.044
P-16	0.121	0.112	-0.009
P-17	0.068	0.246	0.178
P-18	0.069	0.276	0.206
P-19	0.338	0.108	-0.230
P-20	0.191	0.132	-0.058
P-21	0.246	0.187	-0.059
P-22	0.179	0.188	0.009
P-23	0.133	0.064	-0.069
P-24	0.070	0.118	0.048
P-25	0.061	0.075	0.014
P-26	0.049	0.104	0.055
P-27	0.079	0.124	0.045
P-28	0.156	0.130	-0.027
P-29	0.026	0.132	0.106
P-30	0.040	0.197	0.157
P-31	0.058	0.232	0.174

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.023	0.047	0.024
O-02	0.140	0.152	0.012
O-03	0.105	0.112	0.007
O-04	0.124	0.126	0.002
O-05	0.121	0.134	0.012
O-06	0.028	0.043	0.016
O-07	0.024	0.090	0.065
O-08	0.060	0.070	0.011
O-09	0.069	0.021	-0.049
O-10	0.230	0.235	0.005
O-11	0.127	0.072	-0.055
O-12	0.113	0.146	0.033
O-13	0.138	0.201	0.063
O-14	0.105	0.045	-0.060
O-15	0.078	0.046	-0.032
O-16	0.236	0.219	-0.017
O-17	0.236	0.219	-0.017
O-18	0.303	0.279	-0.024
O-19	0.315	0.270	-0.045
O-20	0.287	0.233	-0.055
O-21	0.279	0.238	-0.041
O-22	0.294	0.256	-0.038
O-23	0.128	0.154	0.026
O-24	0.162	0.164	0.001
O-25	0.371	0.363	-0.008
O-26	0.438	0.440	0.002
O-27	0.300	0.364	0.064
O-28	0.070	0.249	0.178
O-29	0.046	0.223	0.177
O-30	0.075	0.101	0.026
O-31	0.062	0.023	-0.039
O-32	0.023	0.023	0.000
O-33	0.087	0.019	-0.068
O-34	0.040	0.031	-0.008
O-35	0.096	0.103	0.006
O-36	0.163	0.135	-0.028
O-37	0.265	0.233	-0.032
O-38	0.054	0.039	-0.016
O-39	0.047	0.022	-0.025
O-40	0.224	0.224	0.000
O-41	0.324	0.330	0.005
O-42	0.155	0.140	-0.015
O-43	0.128	0.115	-0.014
O-44	0.498	0.500	0.002
O-45	0.261	0.278	0.016
O-46	0.323	0.305	-0.018
O-47	0.099	0.129	0.029
O-48	0.391	0.374	-0.017
O-49	0.501	0.507	0.006
O-50	0.443	0.433	-0.011
O-51	0.362	0.346	-0.016
O-52	0.062	0.092	0.030
O-53	0.162	0.183	0.021
O-54	0.064	0.052	-0.012

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.086	0.101	0.015
O-56	0.099	0.117	0.018
O-57	0.003	0.106	0.103
O-58	0.111	0.106	-0.005
O-59	0.018	0.023	0.006
O-60	0.057	0.064	0.006
O-61	0.067	0.058	-0.009
O-62	0.027	0.039	0.011
O-63	0.033	0.041	0.008
O-64	0.133	0.148	0.015
O-65	0.108	0.049	-0.058
O-66	0.155	0.208	0.054
O-67	0.082	0.156	0.073
O-68	0.079	0.098	0.019
O-69	0.098	0.106	0.008
O-70	0.062	0.054	-0.009
O-71	0.226	0.207	-0.019
O-72	0.042	0.048	0.007
O-73	0.258	0.286	0.029
O-74	0.272	0.243	-0.029
O-75	0.241	0.243	0.002
O-76	0.177	0.190	0.013
O-77	0.166	0.155	-0.011
O-78	0.350	0.339	-0.011
O-79	0.137	0.044	-0.093
O-80	0.330	0.204	-0.127
O-81	0.402	0.416	0.014
O-82	0.446	0.462	0.017
O-83	0.054	0.078	0.025
O-84	0.030	0.150	0.120
O-85	0.050	0.079	0.029
O-86	0.108	0.108	0.000
O-87	0.053	0.085	0.032
O-88	0.015	0.055	0.040
O-89	0.041	0.117	0.076
O-90	0.203	0.077	-0.126
O-91	0.085	0.405	0.319
O-92	0.052	0.182	0.130
O-93	0.029	0.282	0.253
O-94	0.184	0.276	0.092
O-95	0.087	0.208	0.120
O-96	0.156	0.126	-0.029
O-97	0.089	0.185	0.095
O-98	0.147	0.306	0.159
O-99	0.108	0.199	0.092
O-100	0.141	0.199	0.057
O-101	0.128	0.111	-0.018
O-102	0.165	0.136	-0.028
O-103	0.062	0.188	0.126
O-104	0.120	0.068	-0.052
O-105	0.070	0.220	0.150

Prevailing Wind Direction: Northeast (NE)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.364	0.316	-0.048
P-02	0.198	0.044	-0.154
P-03	0.024	0.057	0.033
P-04	0.011	0.133	0.121
P-05	0.314	0.181	-0.133
P-06	0.079	0.159	0.080
P-07	0.090	0.017	-0.072
P-08	0.024	0.018	-0.005
P-09	0.014	0.036	0.022
P-10	0.092	0.016	-0.077
P-11	0.053	0.070	0.017
P-12	0.065	0.042	-0.024
P-13	0.016	0.266	0.249
P-14	0.064	0.165	0.101
P-15	0.021	0.033	0.012
P-16	0.046	0.105	0.059
P-17	0.196	0.298	0.101
P-18	0.099	0.155	0.056
P-19	0.386	0.400	0.014
P-20	0.176	0.134	-0.042
P-21	0.216	0.139	-0.077
P-22	0.054	0.200	0.147
P-23	0.076	0.066	-0.010
P-24	0.071	0.186	0.114
P-25	0.078	0.106	0.028
P-26	0.049	0.237	0.188
P-27	0.080	0.094	0.014
P-28	0.024	0.078	0.055
P-29	0.060	0.153	0.093
P-30	0.012	0.137	0.125
P-31	0.091	0.234	0.143

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.144	0.209	0.066
O-02	0.232	0.183	-0.049
O-03	0.227	0.252	0.025
O-04	0.282	0.324	0.043
O-05	0.311	0.366	0.056
O-06	0.061	0.073	0.012
O-07	0.165	0.070	-0.095
O-08	0.202	0.146	-0.056
O-09	0.184	0.201	0.018
O-10	0.130	0.167	0.037
O-11	0.144	0.080	-0.064
O-12	0.170	0.081	-0.089
O-13	0.108	0.047	-0.061
O-14	0.164	0.274	0.110
O-15	0.185	0.234	0.049
O-16	0.176	0.097	-0.079
O-17	0.176	0.097	-0.079
O-18	0.437	0.376	-0.062
O-19	0.404	0.373	-0.031
O-20	0.365	0.354	-0.010
O-21	0.320	0.283	-0.037
O-22	0.317	0.308	-0.010
O-23	0.228	0.220	-0.008
O-24	0.083	0.075	-0.007
O-25	0.363	0.358	-0.005
O-26	0.412	0.425	0.013
O-27	0.167	0.254	0.087
O-28	0.066	0.157	0.091
O-29	0.124	0.068	-0.057
O-30	0.198	0.179	-0.018
O-31	0.121	0.119	-0.002
O-32	0.128	0.157	0.029
O-33	0.172	0.197	0.025
O-34	0.190	0.276	0.086
O-35	0.248	0.303	0.055
O-36	0.084	0.079	-0.004
O-37	0.222	0.236	0.014
O-38	0.053	0.037	-0.016
O-39	0.170	0.123	-0.047
O-40	0.241	0.224	-0.016
O-41	0.223	0.180	-0.043
O-42	0.173	0.186	0.012
O-43	0.491	0.379	-0.113
O-44	0.516	0.500	-0.016
O-45	0.240	0.246	0.006
O-46	0.404	0.385	-0.019
O-47	0.277	0.211	-0.065
O-48	0.174	0.134	-0.040
O-49	0.049	0.069	0.020
O-50	0.277	0.266	-0.011
O-51	0.404	0.390	-0.014
O-52	0.110	0.142	0.032
O-53	0.110	0.102	-0.009
O-54	0.332	0.310	-0.022

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.226	0.230	0.004
O-56	0.220	0.227	0.007
O-57	0.262	0.259	-0.003
O-58	0.262	0.259	-0.003
O-59	0.033	0.037	0.004
O-60	0.164	0.129	-0.035
O-61	0.083	0.086	0.003
O-62	0.047	0.062	0.015
O-63	0.044	0.040	-0.004
O-64	0.214	0.204	-0.010
O-65	0.225	0.212	-0.012
O-66	0.283	0.267	-0.015
O-67	0.056	0.063	0.007
O-68	0.022	0.033	0.011
O-69	0.125	0.119	-0.005
O-70	0.088	0.081	-0.008
O-71	0.211	0.199	-0.013
O-72	0.228	0.205	-0.023
O-73	0.208	0.173	-0.035
O-74	0.328	0.315	-0.012
O-75	0.328	0.315	-0.012
O-76	0.271	0.270	-0.001
O-77	0.293	0.281	-0.012
O-78	0.344	0.339	-0.005
O-79	0.423	0.426	0.003
O-80	0.484	0.484	0.000
O-81	0.245	0.257	0.013
O-82	0.180	0.222	0.041
O-83	0.055	0.083	0.029
O-84	0.196	0.165	-0.032
O-85	0.125	0.250	0.125
O-86	0.041	0.149	0.107
O-87	0.005	0.005	0.000
O-88	0.026	0.170	0.143
O-89	0.086	0.039	-0.047
O-90	0.067	0.253	0.186
O-91	0.047	0.198	0.151
O-92	0.017	0.394	0.377
O-93	0.020	0.301	0.282
O-94	0.052	0.173	0.121
O-95	0.036	0.084	0.048
O-96	0.219	0.057	-0.162
O-97	0.027	0.046	0.019
O-98	0.085	0.569	0.484
O-99	0.039	0.168	0.129
O-100	0.089	0.253	0.164
O-101	0.278	0.155	-0.123
O-102	0.036	0.123	0.087
O-103	0.073	0.233	0.160
O-104	0.062	0.013	-0.049
O-105	0.073	0.141	0.068

Prevailing Wind Direction: East-Southeast (ESE)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.058	0.020	-0.038
P-02	0.061	0.004	-0.058
P-03	0.039	0.007	-0.032
P-04	0.048	0.013	-0.036
P-05	0.025	0.006	-0.018
P-06	0.027	0.004	-0.023
P-07	0.014	0.026	0.013
P-08	0.017	0.013	-0.005
P-09	0.015	0.019	0.004
P-10	0.030	0.039	0.008
P-11	0.025	0.035	0.009
P-12	0.022	0.086	0.064
P-13	0.186	0.037	-0.148
P-14	0.003	0.042	0.040
P-15	0.055	0.067	0.011
P-16	0.086	0.081	-0.004
P-17	0.111	0.238	0.127
P-18	0.066	0.004	-0.062
P-19	0.113	0.113	0.000
P-20	0.036	0.070	0.034
P-21	0.073	0.115	0.042
P-22	0.042	0.046	0.005
P-23	0.029	0.010	-0.019
P-24	0.019	0.050	0.031
P-25	0.025	0.022	-0.003
P-26	0.031	0.047	0.016
P-27	0.025	0.008	-0.017
P-28	0.018	0.012	-0.007
P-29	0.016	0.012	-0.004
P-30	0.006	0.017	0.010
P-31	0.047	0.003	-0.044

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.067	0.075	0.008
O-02	0.013	0.014	0.001
O-03	0.027	0.012	-0.015
O-04	0.047	0.034	-0.013
O-05	0.082	0.071	-0.011
O-06	0.068	0.062	-0.006
O-07	0.072	0.057	-0.015
O-08	0.075	0.068	-0.007
O-09	0.092	0.087	-0.005
O-10	0.343	0.340	-0.003
O-11	0.185	0.184	-0.001
O-12	0.167	0.174	0.007
O-13	0.142	0.141	-0.002
O-14	0.157	0.164	0.007
O-15	0.129	0.092	-0.037
O-16	0.018	0.056	0.037
O-17	0.018	0.056	0.037
O-18	0.009	0.014	0.005
O-19	0.020	0.011	-0.009
O-20	0.033	0.010	-0.023
O-21	0.021	0.005	-0.016
O-22	0.041	0.014	-0.026
O-23	0.032	0.015	-0.018
O-24	0.042	0.017	-0.025
O-25	0.027	0.020	-0.008
O-26	0.045	0.015	-0.030
O-27	0.031	0.020	-0.012
O-28	0.022	0.009	-0.013
O-29	0.035	0.011	-0.024
O-30	0.044	0.040	-0.003
O-31	0.021	0.039	0.018
O-32	0.042	0.011	-0.031
O-33	0.037	0.028	-0.009
O-34	0.029	0.022	-0.007
O-35	0.006	0.006	0.000
O-36	0.048	0.012	-0.036
O-37	0.061	0.027	-0.035
O-38	0.060	0.016	-0.044
O-39	0.016	0.025	0.009
O-40	0.021	0.014	-0.007
O-41	0.088	0.031	-0.057
O-42	0.082	0.063	-0.019
O-43	0.068	0.047	-0.021
O-44	0.077	0.010	-0.067
O-45	0.010	0.036	0.026
O-46	0.005	0.029	0.024
O-47	0.038	0.044	0.005
O-48	0.037	0.092	0.056
O-49	0.037	0.112	0.075
O-50	0.105	0.082	-0.022
O-51	0.046	0.043	-0.003
O-52	0.013	0.046	0.032
O-53	0.065	0.076	0.011
O-54	0.069	0.081	0.012

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.052	0.070	0.019
O-56	0.024	0.059	0.035
O-57	0.011	0.041	0.030
O-58	0.011	0.041	0.030
O-59	0.056	0.024	-0.032
O-60	0.038	0.051	0.013
O-61	0.026	0.037	0.011
O-62	0.007	0.011	0.004
O-63	0.026	0.023	-0.003
O-64	0.053	0.070	0.017
O-65	0.035	0.047	0.012
O-66	0.019	0.016	-0.003
O-67	0.065	0.067	0.002
O-68	0.033	0.039	0.006
O-69	0.056	0.046	-0.010
O-70	0.030	0.038	0.008
O-71	0.052	0.038	-0.014
O-72	0.030	0.007	-0.023
O-73	0.254	0.208	-0.046
O-74	0.063	0.069	0.007
O-75	0.063	0.069	0.007
O-76	0.072	0.090	0.018
O-77	0.071	0.078	0.007
O-78	0.068	0.060	-0.008
O-79	0.116	0.098	-0.019
O-80	0.118	0.099	-0.019
O-81	0.259	0.263	0.004
O-82	0.173	0.103	-0.070
O-83	0.002	0.004	0.002
O-84	0.031	0.012	-0.019
O-85	0.003	0.002	-0.001
O-86	0.004	0.020	0.016
O-87	0.013	0.011	-0.002
O-88	0.010	0.025	0.016
O-89	0.055	0.022	-0.033
O-90	0.057	0.033	-0.024
O-91	0.007	0.042	0.035
O-92	0.037	0.032	-0.005
O-93	0.023	0.027	0.005
O-94	0.007	0.035	0.028
O-95	0.012	0.007	-0.004
O-96	0.015	0.021	0.006
O-97	0.045	0.074	0.029
O-98	0.027	0.019	-0.008
O-99	0.015	0.005	-0.010
O-100	0.020	0.003	-0.018
O-101	0.073	0.010	-0.063
O-102	0.016	0.018	0.002
O-103	0.028	0.034	0.006
O-104	0.025	0.021	-0.004
O-105	0.087	0.016	-0.071

Prevailing Wind Direction: North-northeast (NNE)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.528	0.425	-0.103
P-02	0.409	0.115	-0.294
P-03	0.223	0.110	-0.113
P-04	0.174	0.264	0.090
P-05	0.326	0.229	-0.097
P-06	0.063	0.180	0.117
P-07	0.050	0.171	0.121
P-08	0.313	0.040	-0.273
P-09	0.155	0.022	-0.133
P-10	0.087	0.009	-0.078
P-11	0.052	0.073	0.020
P-12	0.045	0.085	0.040
P-13	0.195	0.111	-0.084
P-14	0.126	0.186	0.060
P-15	0.181	0.122	-0.059
P-16	0.152	0.055	-0.097
P-17	0.107	0.436	0.330
P-18	0.153	0.138	-0.015
P-19	0.491	0.384	-0.108
P-20	0.138	0.109	-0.029
P-21	0.185	0.137	-0.049
P-22	0.076	0.180	0.104
P-23	0.069	0.101	0.031
P-24	0.079	0.180	0.101
P-25	0.122	0.113	-0.009
P-26	0.066	0.270	0.204
P-27	0.128	0.167	0.040
P-28	0.105	0.192	0.087
P-29	0.069	0.268	0.199
P-30	0.038	0.157	0.119
P-31	0.135	0.682	0.547

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.205	0.202	-0.002
O-02	0.203	0.116	-0.087
O-03	0.122	0.150	0.028
O-04	0.205	0.224	0.019
O-05	0.356	0.355	-0.002
O-06	0.283	0.269	-0.014
O-07	0.188	0.165	-0.023
O-08	0.093	0.113	0.020
O-09	0.135	0.156	0.021
O-10	0.602	0.622	0.020
O-11	0.329	0.341	0.012
O-12	0.302	0.289	-0.013
O-13	0.338	0.308	-0.030
O-14	0.537	0.489	-0.048
O-15	0.202	0.211	0.009
O-16	0.240	0.250	0.010
O-17	0.240	0.250	0.010
O-18	0.094	0.059	-0.035
O-19	0.336	0.310	-0.026
O-20	0.422	0.436	0.014
O-21	0.400	0.351	-0.049
O-22	0.403	0.389	-0.014
O-23	0.256	0.086	-0.170
O-24	0.046	0.027	-0.019
O-25	0.376	0.358	-0.018
O-26	0.364	0.334	-0.031
O-27	0.374	0.292	-0.081
O-28	0.249	0.237	-0.012
O-29	0.282	0.274	-0.007
O-30	0.137	0.195	0.058
O-31	0.288	0.255	-0.032
O-32	0.288	0.290	0.002
O-33	0.333	0.254	-0.079
O-34	0.412	0.303	-0.109
O-35	0.290	0.312	0.021
O-36	0.486	0.371	-0.115
O-37	0.241	0.350	0.109
O-38	0.264	0.216	-0.049
O-39	0.167	0.084	-0.083
O-40	0.300	0.285	-0.015
O-41	0.334	0.333	-0.001
O-42	0.363	0.368	0.005
O-43	0.637	0.608	-0.029
O-44	0.604	0.567	-0.037
O-45	0.344	0.360	0.016
O-46	0.537	0.542	0.005
O-47	0.442	0.356	-0.086
O-48	0.194	0.158	-0.036
O-49	0.400	0.406	0.005
O-50	0.359	0.408	0.049
O-51	0.326	0.356	0.030
O-52	0.352	0.342	-0.010
O-53	0.062	0.114	0.053
O-54	0.358	0.360	0.001

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.368	0.356	-0.013
O-56	0.395	0.391	-0.005
O-57	0.454	0.448	-0.006
O-58	0.454	0.448	-0.006
O-59	0.474	0.377	-0.097
O-60	0.447	0.415	-0.031
O-61	0.179	0.185	0.007
O-62	0.092	0.084	-0.008
O-63	0.036	0.026	-0.010
O-64	0.320	0.295	-0.025
O-65	0.336	0.298	-0.038
O-66	0.435	0.428	-0.007
O-67	0.077	0.132	0.055
O-68	0.084	0.084	0.001
O-69	0.252	0.199	-0.053
O-70	0.177	0.178	0.001
O-71	0.182	0.107	-0.075
O-72	0.243	0.252	0.009
O-73	0.218	0.201	-0.018
O-74	0.093	0.113	0.020
O-75	0.093	0.113	0.020
O-76	0.177	0.180	0.003
O-77	0.428	0.444	0.016
O-78	0.519	0.527	0.007
O-79	0.531	0.527	-0.005
O-80	0.612	0.605	-0.007
O-81	0.454	0.435	-0.019
O-82	0.415	0.416	0.001
O-83	0.021	0.185	0.164
O-84	0.098	0.045	-0.054
O-85	0.094	0.218	0.124
O-86	0.203	0.163	-0.040
O-87	0.151	0.114	-0.037
O-88	0.020	0.277	0.258
O-89	0.043	0.075	0.032
O-90	0.282	0.192	-0.090
O-91	0.110	0.335	0.225
O-92	0.018	0.435	0.417
O-93	0.072	0.545	0.473
O-94	0.078	0.188	0.111
O-95	0.072	0.060	-0.012
O-96	0.443	0.088	-0.355
O-97	0.127	0.219	0.092
O-98	0.121	0.666	0.545
O-99	0.116	0.145	0.029
O-100	0.189	0.336	0.147
O-101	0.056	0.130	0.074
O-102	0.173	0.103	-0.070
O-103	0.168	0.312	0.144
O-104	0.164	0.190	0.026
O-105	0.091	0.193	0.102

Prevailing Wind Direction: South-Southwest (SSW)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.217	0.288	0.071
P-02	0.349	0.173	-0.176
P-03	0.260	0.150	-0.110
P-04	0.284	0.164	-0.120
P-05	0.297	0.193	-0.104
P-06	0.154	0.248	0.093
P-07	0.012	0.126	0.115
P-08	0.126	0.042	-0.084
P-09	0.053	0.037	-0.016
P-10	0.287	0.049	-0.237
P-11	0.142	0.342	0.200
P-12	0.078	0.125	0.046
P-13	0.188	0.203	0.015
P-14	0.134	0.264	0.130
P-15	0.148	0.289	0.141
P-16	0.190	0.175	-0.015
P-17	0.111	0.194	0.083
P-18	0.101	0.519	0.418
P-19	0.126	0.024	-0.102
P-20	0.094	0.199	0.105
P-21	0.167	0.041	-0.126
P-22	0.155	0.059	-0.096
P-23	0.106	0.017	-0.089
P-24	0.050	0.057	0.007
P-25	0.047	0.033	-0.014
P-26	0.054	0.148	0.094
P-27	0.071	0.108	0.037
P-28	0.063	0.033	-0.030
P-29	0.038	0.094	0.056
P-30	0.020	0.042	0.021
P-31	0.178	0.306	0.127

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.026	0.081	0.055
O-02	0.036	0.023	-0.013
O-03	0.222	0.216	-0.006
O-04	0.289	0.274	-0.015
O-05	0.247	0.215	-0.032
O-06	0.133	0.119	-0.014
O-07	0.121	0.120	-0.001
O-08	0.092	0.088	-0.004
O-09	0.123	0.111	-0.012
O-10	0.279	0.234	-0.045
O-11	0.211	0.210	-0.001
O-12	0.063	0.090	0.027
O-13	0.091	0.079	-0.012
O-14	0.090	0.094	0.004
O-15	0.108	0.005	-0.103
O-16	0.151	0.170	0.018
O-17	0.151	0.170	0.018
O-18	0.159	0.139	-0.021
O-19	0.218	0.189	-0.029
O-20	0.256	0.262	0.006
O-21	0.154	0.143	-0.011
O-22	0.118	0.117	-0.001
O-23	0.136	0.136	0.000
O-24	0.208	0.215	0.007
O-25	0.250	0.263	0.014
O-26	0.096	0.123	0.027
O-27	0.073	0.117	0.043
O-28	0.100	0.024	-0.076
O-29	0.053	0.037	-0.016
O-30	0.013	0.046	0.033
O-31	0.125	0.121	-0.004
O-32	0.188	0.169	-0.019
O-33	0.124	0.117	-0.007
O-34	0.191	0.163	-0.028
O-35	0.155	0.135	-0.020
O-36	0.266	0.247	-0.019
O-37	0.232	0.231	-0.001
O-38	0.182	0.182	0.001
O-39	0.044	0.045	0.001
O-40	0.091	0.092	0.001
O-41	0.290	0.297	0.007
O-42	0.140	0.155	0.016
O-43	0.288	0.284	-0.005
O-44	0.128	0.142	0.014
O-45	0.135	0.122	-0.013
O-46	0.129	0.125	-0.004
O-47	0.124	0.130	0.006
O-48	0.043	0.043	0.000
O-49	0.154	0.150	-0.004
O-50	0.246	0.245	-0.001
O-51	0.168	0.161	-0.007
O-52	0.188	0.214	0.025
O-53	0.028	0.027	0.000
O-54	0.211	0.206	-0.005

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.214	0.224	0.010
O-56	0.162	0.173	0.011
O-57	0.116	0.043	-0.073
O-58	0.116	0.043	-0.073
O-59	0.241	0.276	0.035
O-60	0.239	0.264	0.024
O-61	0.065	0.062	-0.003
O-62	0.080	0.100	0.020
O-63	0.230	0.239	0.009
O-64	0.029	0.038	0.010
O-65	0.072	0.061	-0.010
O-66	0.053	0.039	-0.014
O-67	0.117	0.117	0.000
O-68	0.050	0.040	-0.010
O-69	0.057	0.052	-0.005
O-70	0.045	0.085	0.040
O-71	0.221	0.224	0.003
O-72	0.329	0.312	-0.017
O-73	0.229	0.211	-0.019
O-74	0.181	0.208	0.027
O-75	0.181	0.208	0.027
O-76	0.125	0.106	-0.019
O-77	0.092	0.058	-0.034
O-78	0.079	0.091	0.011
O-79	0.435	0.455	0.019
O-80	0.421	0.444	0.023
O-81	0.360	0.367	0.007
O-82	0.355	0.352	-0.003
O-83	0.058	0.199	0.141
O-84	0.156	0.086	-0.070
O-85	0.006	0.095	0.089
O-86	0.087	0.079	-0.008
O-87	0.056	0.053	-0.003
O-88	0.052	0.082	0.030
O-89	0.432	0.194	-0.238
O-90	0.164	0.087	-0.077
O-91	0.039	0.195	0.156
O-92	0.122	0.185	0.063
O-93	0.108	0.121	0.013
O-94	0.126	0.019	-0.107
O-95	0.040	0.172	0.133
O-96	0.068	0.182	0.114
O-97	0.120	0.222	0.102
O-98	0.061	0.323	0.262
O-99	0.048	0.339	0.291
O-100	0.189	0.118	-0.071
O-101	0.401	0.137	-0.264
O-102	0.103	0.109	0.006
O-103	0.044	0.043	-0.001
O-104	0.237	0.158	-0.078
O-105	0.019	0.035	0.016

Prevailing Wind Direction: Southeast (SE)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
P-01	0.032	0.052	0.020
P-02	0.040	0.027	-0.013
P-03	0.020	0.031	0.011
P-04	0.009	0.050	0.041
P-05	0.035	0.026	-0.009
P-06	0.014	0.013	-0.001
P-07	0.011	0.055	0.044
P-08	0.082	0.012	-0.070
P-09	0.046	0.007	-0.039
P-10	0.245	0.152	-0.093
P-11	0.123	0.264	0.141
P-12	0.106	0.171	0.065
P-13	0.167	0.144	-0.023
P-14	0.054	0.118	0.064
P-15	0.043	0.081	0.038
P-16	0.071	0.057	-0.014
P-17	0.107	0.156	0.049
P-18	0.041	0.175	0.135
P-19	0.038	0.057	0.018
P-20	0.039	0.101	0.061
P-21	0.052	0.033	-0.019
P-22	0.038	0.071	0.033
P-23	0.031	0.010	-0.020
P-24	0.017	0.085	0.067
P-25	0.015	0.035	0.020
P-26	0.017	0.037	0.020
P-27	0.022	0.009	-0.013
P-28	0.014	0.007	-0.007
P-29	0.005	0.104	0.100
P-30	0.019	0.111	0.092
P-31	0.012	0.023	0.011

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.127	0.010	-0.117
O-02	0.020	0.051	0.031
O-03	0.034	0.041	0.007
O-04	0.056	0.030	-0.026
O-05	0.113	0.027	-0.086
O-06	0.121	0.028	-0.093
O-07	0.115	0.051	-0.065
O-08	0.109	0.067	-0.042
O-09	0.117	0.112	-0.006
O-10	0.430	0.403	-0.027
O-11	0.214	0.215	0.001
O-12	0.225	0.203	-0.022
O-13	0.201	0.142	-0.059
O-14	0.230	0.133	-0.096
O-15	0.169	0.027	-0.142
O-16	0.061	0.063	0.002
O-17	0.061	0.063	0.002
O-18	0.085	0.050	-0.035
O-19	0.085	0.059	-0.026
O-20	0.061	0.058	-0.003
O-21	0.037	0.007	-0.030
O-22	0.011	0.044	0.033
O-23	0.055	0.034	-0.022
O-24	0.034	0.025	-0.010
O-25	0.006	0.017	0.011
O-26	0.024	0.059	0.035
O-27	0.036	0.054	0.017
O-28	0.035	0.067	0.032
O-29	0.069	0.021	-0.048
O-30	0.063	0.031	-0.032
O-31	0.011	0.057	0.046
O-32	0.009	0.018	0.009
O-33	0.005	0.021	0.016
O-34	0.003	0.045	0.042
O-35	0.013	0.059	0.046
O-36	0.013	0.029	0.016
O-37	0.017	0.035	0.018
O-38	0.041	0.007	-0.034
O-39	0.067	0.047	-0.019
O-40	0.076	0.049	-0.027
O-41	0.066	0.047	-0.020
O-42	0.037	0.035	-0.002
O-43	0.028	0.048	0.020
O-44	0.015	0.111	0.096
O-45	0.020	0.122	0.102
O-46	0.028	0.005	-0.023
O-47	0.015	0.043	0.027
O-48	0.042	0.065	0.023
O-49	0.104	0.047	-0.057
O-50	0.104	0.117	0.013
O-51	0.081	0.117	0.036
O-52	0.063	0.062	-0.001
O-53	0.069	0.044	-0.024
O-54	0.037	0.068	0.030

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.024	0.079	0.055
O-56	0.015	0.078	0.063
O-57	0.113	0.077	-0.037
O-58	0.113	0.077	-0.037
O-59	0.116	0.112	-0.004
O-60	0.101	0.118	0.017
O-61	0.036	0.022	-0.014
O-62	0.024	0.057	0.033
O-63	0.043	0.039	-0.005
O-64	0.042	0.007	-0.035
O-65	0.039	0.019	-0.020
O-66	0.047	0.045	-0.002
O-67	0.006	0.049	0.043
O-68	0.046	0.045	-0.002
O-69	0.061	0.064	0.003
O-70	0.021	0.045	0.025
O-71	0.083	0.038	-0.045
O-72	0.104	0.176	0.072
O-73	0.089	0.163	0.074
O-74	0.103	0.124	0.021
O-75	0.103	0.124	0.021
O-76	0.123	0.133	0.010
O-77	0.113	0.135	0.022
O-78	0.052	0.150	0.098
O-79	0.144	0.126	-0.018
O-80	0.118	0.144	0.026
O-81	0.291	0.290	0.000
O-82	0.287	0.298	0.012
O-83	0.004	0.044	0.040
O-84	0.020	0.026	0.006
O-85	0.004	0.014	0.010
O-86	0.043	0.048	0.004
O-87	0.048	0.018	-0.030
O-88	0.044	0.103	0.059
O-89	0.072	0.063	-0.009
O-90	0.022	0.184	0.161
O-91	0.015	0.187	0.172
O-92	0.002	0.157	0.155
O-93	0.011	0.012	0.002
O-94	0.023	0.149	0.126
O-95	0.008	0.024	0.016
O-96	0.014	0.031	0.017
O-97	0.039	0.058	0.019
O-98	0.033	0.154	0.122
O-99	0.039	0.035	-0.005
O-100	0.017	0.054	0.036
O-101	0.040	0.140	0.100
O-102	0.017	0.074	0.057
O-103	0.013	0.163	0.150
O-104	0.021	0.041	0.020
O-105	0.036	0.105	0.069

Prevailing Wind Direction: Southwest (SW)

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Perimeter Test Points			
O-83	0.182	0.199	0.017
O-84	0.144	0.108	-0.037
O-85	0.085	0.052	-0.033
O-86	0.038	0.131	0.094
O-87	0.083	0.076	-0.008
O-88	0.134	0.135	0.001
O-89	0.091	0.280	0.188
O-90	0.398	0.154	-0.244
O-91	0.217	0.193	-0.024
O-92	0.244	0.389	0.145
O-93	0.103	0.147	0.045
O-94	0.034	0.135	0.101
O-95	0.195	0.171	-0.023
O-96	0.258	0.413	0.155
O-97	0.087	0.296	0.208
O-98	0.202	0.209	0.007
O-99	0.366	0.526	0.160
O-100	0.114	0.442	0.328
O-101	0.038	0.042	0.004
O-102	0.031	0.095	0.065
O-103	0.012	0.090	0.077
O-104	0.083	0.084	0.001
O-105	0.040	0.038	-0.002
O-83	0.043	0.037	-0.006
O-84	0.042	0.042	0.000
O-85	0.044	0.126	0.082
O-86	0.027	0.049	0.022
O-87	0.054	0.048	-0.006
O-88	0.020	0.045	0.026
O-89	0.013	0.042	0.029
O-90	0.144	0.038	-0.106

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
Overall Test Points			
O-01	0.077	0.111	0.034
O-02	0.067	0.010	-0.057
O-03	0.095	0.028	-0.067
O-04	0.190	0.228	0.038
O-05	0.234	0.215	-0.019
O-06	0.142	0.132	-0.010
O-07	0.129	0.098	-0.031
O-08	0.090	0.025	-0.065
O-09	0.127	0.025	-0.102
O-10	0.070	0.126	0.055
O-11	0.120	0.161	0.042
O-12	0.119	0.163	0.044
O-13	0.184	0.099	-0.086
O-14	0.226	0.194	-0.032
O-15	0.089	0.145	0.056
O-16	0.124	0.124	0.000
O-17	0.124	0.124	0.000
O-18	0.232	0.175	-0.057
O-19	0.314	0.263	-0.051
O-20	0.194	0.207	0.013
O-21	0.262	0.280	0.019
O-22	0.283	0.313	0.030
O-23	0.015	0.158	0.143
O-24	0.164	0.151	-0.013
O-25	0.337	0.322	-0.015
O-26	0.195	0.177	-0.018
O-27	0.238	0.213	-0.025
O-28	0.078	0.118	0.040
O-29	0.080	0.063	-0.017
O-30	0.265	0.245	-0.020
O-31	0.090	0.109	0.019
O-32	0.274	0.259	-0.015
O-33	0.254	0.263	0.008
O-34	0.309	0.267	-0.043
O-35	0.298	0.252	-0.045
O-36	0.339	0.234	-0.104
O-37	0.311	0.294	-0.017
O-38	0.338	0.265	-0.073
O-39	0.065	0.076	0.011
O-40	0.062	0.063	0.000
O-41	0.078	0.103	0.025
O-42	0.121	0.193	0.072
O-43	0.314	0.256	-0.059
O-44	0.189	0.252	0.063
O-45	0.154	0.051	-0.104
O-46	0.104	0.114	0.009
O-47	0.016	0.064	0.048
O-48	0.050	0.083	0.033
O-49	0.111	0.077	-0.035
O-50	0.138	0.166	0.027
O-51	0.108	0.200	0.092
O-52	0.189	0.213	0.024
O-53	0.359	0.353	-0.006
O-54	0.207	0.193	-0.014

Test Point No.	VR for Initial Scheme	VR for Proposed Scheme	Difference in VR between Initial and Proposed Scheme
O-55	0.248	0.233	-0.015
O-56	0.300	0.287	-0.013
O-57	0.277	0.271	-0.006
O-58	0.277	0.271	-0.006
O-59	0.225	0.226	0.001
O-60	0.263	0.262	-0.002
O-61	0.198	0.196	-0.002
O-62	0.183	0.176	-0.007
O-63	0.063	0.042	-0.020
O-64	0.183	0.161	-0.022
O-65	0.131	0.147	0.016
O-66	0.157	0.163	0.006
O-67	0.115	0.107	-0.008
O-68	0.131	0.134	0.002
O-69	0.183	0.173	-0.010
O-70	0.159	0.154	-0.006
O-71	0.115	0.133	0.018
O-72	0.095	0.105	0.010
O-73	0.067	0.056	-0.011
O-74	0.050	0.043	-0.008
O-75	0.050	0.043	-0.008
O-76	0.069	0.106	0.036
O-77	0.100	0.109	0.009
O-78	0.144	0.030	-0.114
O-79	0.408	0.456	0.048
O-80	0.233	0.377	0.144
O-81	0.513	0.523	0.010
O-82	0.451	0.486	0.035
O-83	0.071	0.123	0.051
O-84	0.041	0.052	0.011
O-85	0.029	0.064	0.035
O-86	0.185	0.158	-0.027
O-87	0.223	0.317	0.094
O-88	0.029	0.166	0.136
O-89	0.243	0.265	0.022
O-90	0.099	0.158	0.059
O-91	0.092	0.159	0.067
O-92	0.038	0.078	0.040
O-93	0.140	0.263	0.123
O-94	0.087	0.008	-0.080
O-95	0.073	0.206	0.133
O-96	0.122	0.061	-0.061
O-97	0.091	0.154	0.063
O-98	0.085	0.070	-0.016
O-99	0.113	0.110	-0.003
O-100	0.079	0.042	-0.038
O-101	0.049	0.044	-0.005
O-102	0.133	0.093	-0.040
O-103	0.107	0.028	-0.079
O-104	0.152	0.110	-0.041
O-105	0.000	0.045	0.045