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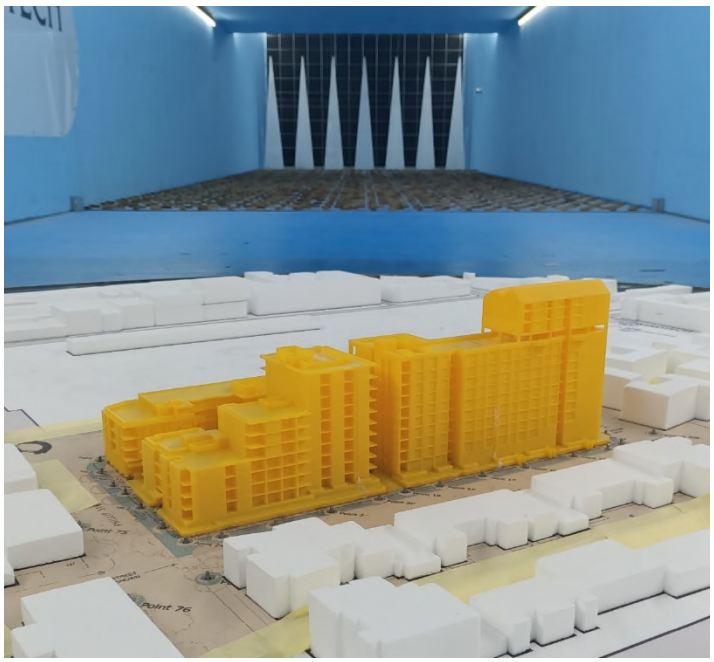

PEDESTRIAN WIND ENVIRONMENT STUDY

600-660 ELIZABETH STREET, REDFERN

WE086-07F02(REV10)- WE REPORT

JUNE 21, 2024

Prepared for:

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DOCUMENT CONTROL

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May 31, 2024	Updated treatment figures and text.	1	LA	SWR	NN
May 31, 2024	Updated to address SEARs requirements specifically.	2	LA	SWR	NN
June 5, 2024	Updated standard text from rev1.	3	LA	SWR	NN
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EXECUTIVE SUMMARY

This report presents the results of a detailed investigation into the wind environment impact of the proposed 600-660 Elizabeth Street, Redfern (Redfern Place) development. Testing was performed at Windtech's boundary layer wind tunnel facility for critical ground level areas. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. Testing was carried out using a 1:300 detailed scale model of the development, which was fabricated based on the architectural drawings received between April 16 and 18, 2024. The effects of nearby buildings and land topography have been accounted for through the use of a proximity model which represents an area with a radius of 375m.

Peak gust and mean wind speeds were measured at selected Ground Level critical outdoor trafficable locations within and around the subject development. Wind velocity coefficients representing the local wind speeds are derived from the wind tunnel and are combined with a statistical model of the regional wind climate (which accounts for the directional strength and frequency of occurrence of the prevailing regional winds) to provide the equivalent full-scale wind speeds at the site. The wind speed measurements are compared with criteria for pedestrian comfort and safety, based on Gust-Equivalent Mean (GEM) and annual maximum gust winds, respectively.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing. The existing site conditions were also tested, for comparison. In-principle treatments have been recommended for any Ground Level areas exposed to strong winds.

The results of the study indicate that wind conditions for the majority of trafficable outdoor locations within and around the development will be suitable for their intended uses. However, some areas will experience strong winds which will exceed the relevant criteria for comfort and/or safety. Suggested treatments are described as follows:

<u>Ground Level Trafficable Areas:</u>

- Introduce densely foliating evergreen tree planting, ensuring interlocking canopies where applicable, within through-site link between Buildings S2 and S3 and within the courtyard encompassed by Building S3, ensuring they are able to grow to a height and width of 3-5m.

- Introduce a planter box along the western edge of the Building S2 southern entrance, ensuring the combined total height of the physical planter box and foliage is 1.5m.

- Retain existing and proposed street trees at the corner of Elizabeth Street and Kettle Street (retain size as per the landscaping drawings received 20 June 2024), ensuring interlocking canopies where applicable and that the proposed trees have the potential to grow to a height and width of 5-8m.

With the inclusion of these treatments to the final design, it is expected that wind conditions for all outdoor trafficable areas within and around the development will be suitable for their intended uses.

CONTENTS

1 INTRODUCTION

This report has been prepared in response to the relevant requirements outlined within the Planning Secretary's Environmental Assessments Requirements (SEARs). These are outlined in Table 1 below, along with the relevant report sections. This report also addresses the relevant requirements outlined in the Design Guide, which are similarly outlined in

Table 2 below, along with the relevant report sections.

Table 1: Secretary's Environmental Assessments Requirements

Item	SEARs Requirements	Relevant Section of Report
5	Environmental Amenity • Assess amenity impacts on the surrounding locality, including lighting impacts, reflectivity, solar access, visual privacy, visual amenity, view loss and view sharing, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Section 6
7	Public Space • Demonstrate how the development: o Maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and wind protection.	

Table 2: Design Guide Requirements

Item	SEARs Requirements	Relevant Section of Report
Objective (a)	Ensure streets and Public Places have wind conditions that are safe and comfortable for walking and to encourage conditions that are comfortable for sitting.	Section 6
Objective (b)	Ensure new developments mitigate adverse wind effects.	
1	Development must: (a) not cause a wind speed that exceeds the Wind Safety Standard, the Wind Comfort Standard for Walking and the Wind Comfort Standard for Sitting in Parks except where the existing wind speeds exceed the standard. (b) not worsen, by increasing spatial extent and/or frequency and/or speed, an existing wind speed that exceeds the Wind Safety Standard, the Wind Comfort Standard for Walking and the Wind Comfort Standard for Sitting in Parks. (c) take all reasonable steps to create a comfortable wind environment in Public Places that is consistent with the Wind Comfort Standards for Sitting and Standing.	

Item	SEARs Requirements	Relevant Section of Report
2	For the purpose of this section: (a) Wind Safety Standard is an annual maximum peak 0.5 second gust wind speed in one hour measured between 6am and 10pm Eastern Standard Time of 24 metres per second. (b) Wind Comfort Standard for Walking is an hourly mean wind speed, or gust equivalent mean wind speed, whichever is greater for each wind direction, for no more than 292 hours per annum measured between 6 am and 10 pm Eastern Standard Time (i.e. 5% of those hours) of 8 metres per second. (c) Wind Comfort Standard for Sitting in Parks is an hourly mean wind speed, or gust equivalent mean wind speed, whichever is greater for each wind direction, for no more than 292 hours per annum measured between 6 am and 10 pm Eastern Standard Time of 4 metres per second and applies to Public Places protected by Sun Access Planes and/or No Additional Overshadowing Controls. (d) Wind Comfort Standards for Sitting and Standing is hourly mean wind speed, or gust equivalent mean wind speed, whichever is greater for each wind direction, for no more than 292 hours per annum measured between 6 am and 10 pm Eastern Standard Time of; 4 metres per second for sitting; and 6 metres per second for standing.	Section 6 Note that there are no areas which are considered to be Park areas.

A wind tunnel study has been undertaken to assess wind speeds at selected critical Ground Level outdoor trafficable areas within and around the subject development. The test procedures followed for this wind tunnel study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013).

A scale model of the development was prepared, including the surrounding buildings and land topography. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. The wind tunnel was configured to the appropriate boundary layer wind profile for each wind direction. Wind speeds were measured using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, positioned to monitor wind conditions at critical outdoor trafficable areas of the development.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing. The wind speeds measured during testing were combined with a statistical model of the regional wind climate to provide the equivalent full-scale wind speeds at the site. The measured wind speeds were compared against appropriate criteria for pedestrian comfort and safety, and in-principle treatments have been recommended for any Ground Level area which was exposed to strong winds (referencing the updated landscaping drawings received on June 20 2024 – a list of which is provided in Appendix G). These treatments could be in the form of retaining vegetation that is already proposed for the site, or including additional vegetation, screens, awnings, etc. Note however that, in accordance with the AWES Guidelines (2014), only architectural elements or modifications are used to treat winds which represent an exceedance of the existing wind conditions and exceed the safety limit.

This report accompanies a detailed State Significant Development Application that seeks approval for a mixed-use development at 600-660 Elizabeth Street, Redfern (Redfern Place). The development proposes four buildings comprising community facilities, commercial/office, affordable/social/specialist disability housing apartments and new public links and landscaping.

The project site comprises Lot 1 in DP 1249145. It has an area of approximately 10,850m2. Part of the site currently accommodates the existing Police Citizens Youth Club (PCYC) (to be demolished and replaced). The remaining portion of the site is vacant with remnant vegetation.

The SSDA seeks approval for redevelopment of the site, including:

- Demolition of existing buildings.
- Tree removal.
- Bulk earthworks including excavation.
- Construction of a community facility building known as Building S1.
- Construction of two residential flat buildings (known as Buildings S2 and S3) up to 14 and 10 storeys respectively, for social and affordable housing.
- Construction of a five-storey mixed use building (known as Building S4) comprising commercial uses on the ground level and social and specialist disability housing above.
- Construction of one basement level below Buildings S2, S3 and part of S4 with vehicle access from Kettle Street.
- Site-wide landscaping and public domain works including north-south and east-west pedestrian through-site link.

For a detailed project description refer to the Environmental Impact Statement prepared by Ethos Urban.

2 WIND TUNNEL MODEL

Wind tunnel testing for critical Ground Level areas was carried out using a 1:300 scale model of the development and surroundings. The study model incorporates all necessary architectural features on the façade of the development to ensure an accurate wind flow is achieved around the model, and was constructed using a Computer Aided Manufacturing (CAM) process to ensure that a high level of detail and accuracy is achieved. The study model was fabricated based on the architectural drawings received between April 16 and 18, 2024 (see list in Appendix F). The effect of nearby buildings and land topography has been accounted for through the use of a proximity model, which represents a radius of 375m from the development site. Photographs of the wind tunnel model are presented in Figures 1. A plan of the proximity model is provided in Figure 2.

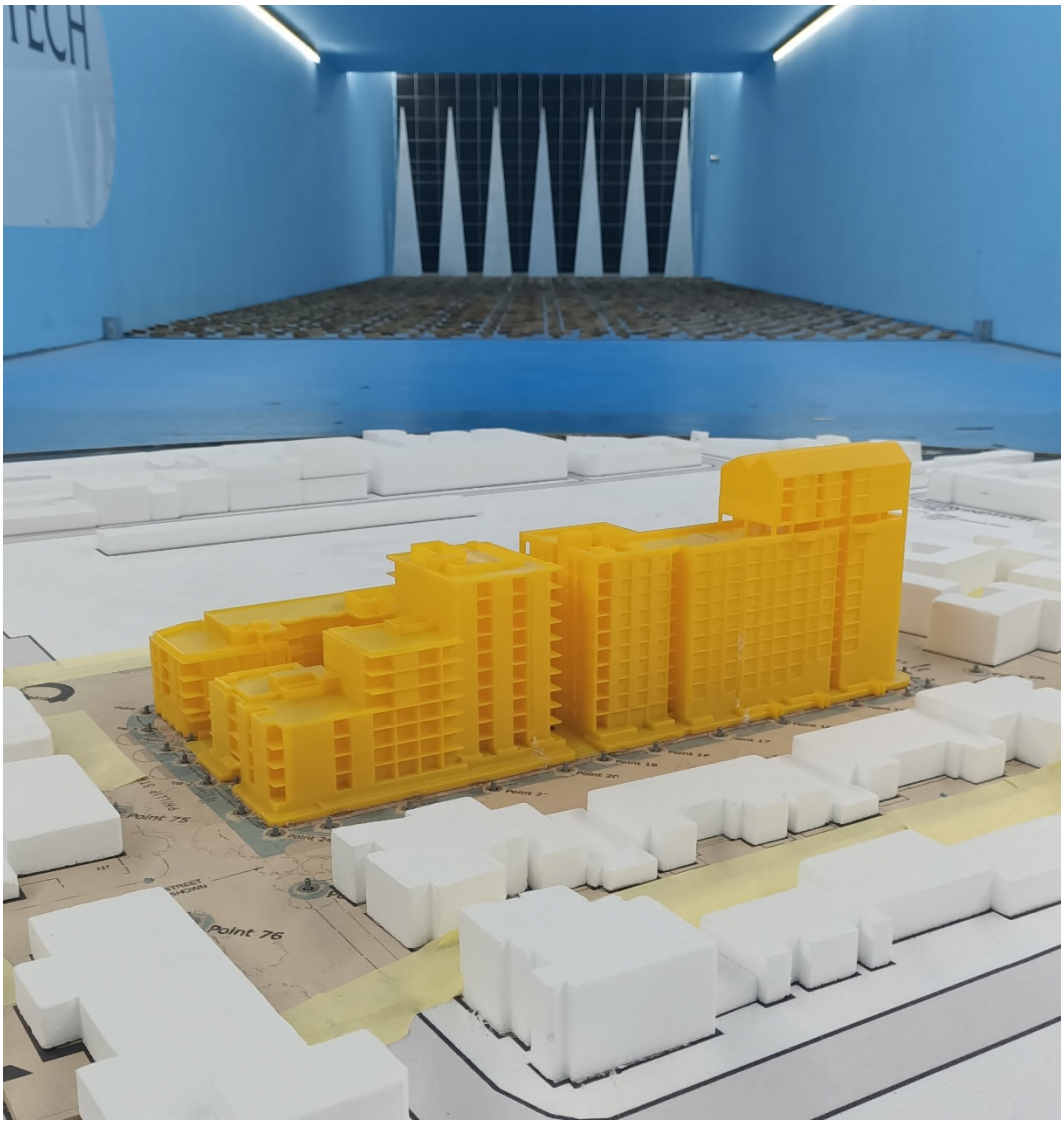

Figure 1a: Photograph of the Wind Tunnel Model (proposed scenario, view from the south-east)

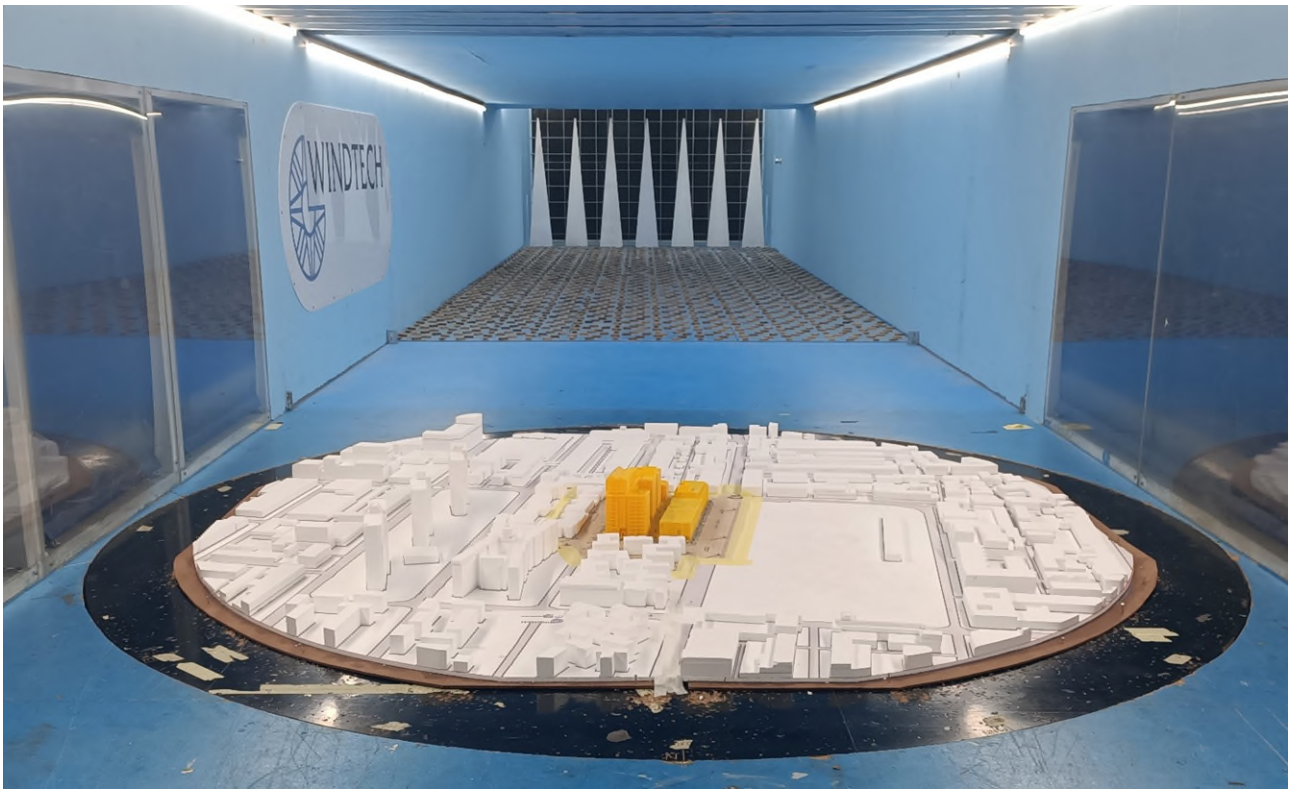

Figure 1b: Photograph of the Wind Tunnel Model (proposed scenario, view from the north)

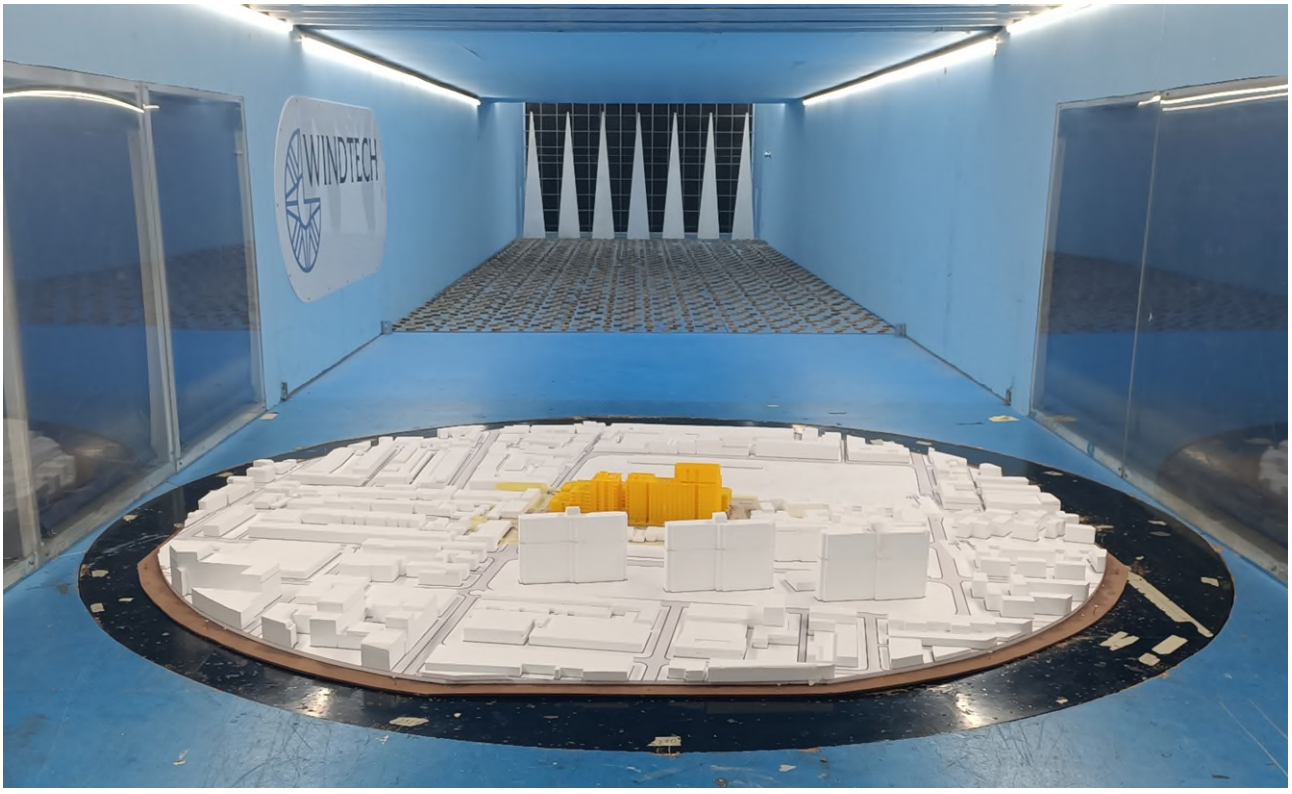

Figure 1c: Photograph of the Wind Tunnel Model (proposed scenario, view from the east)

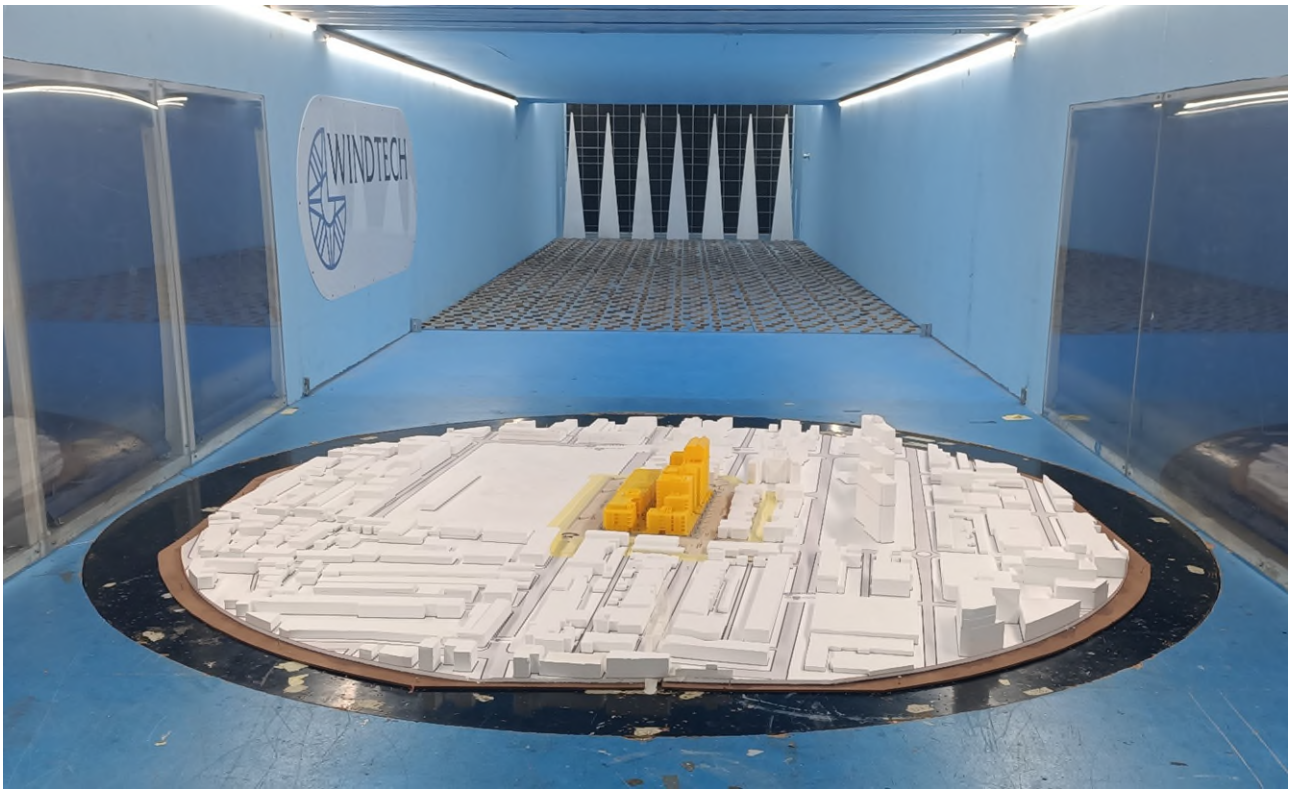

Figure 1d: Photograph of the Wind Tunnel Model (proposed scenario, view from the south)

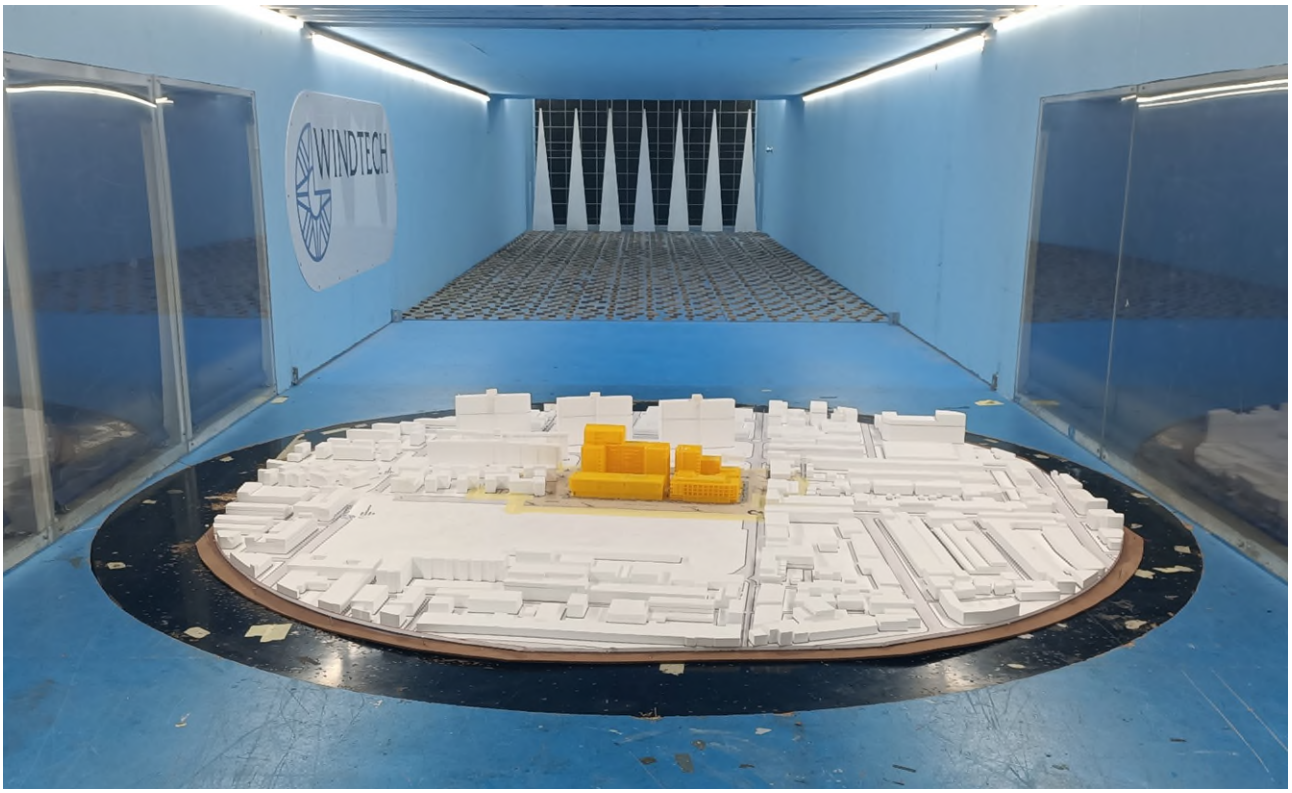

Figure 1e: Photograph of the Wind Tunnel Model (proposed scenario, view from the west)

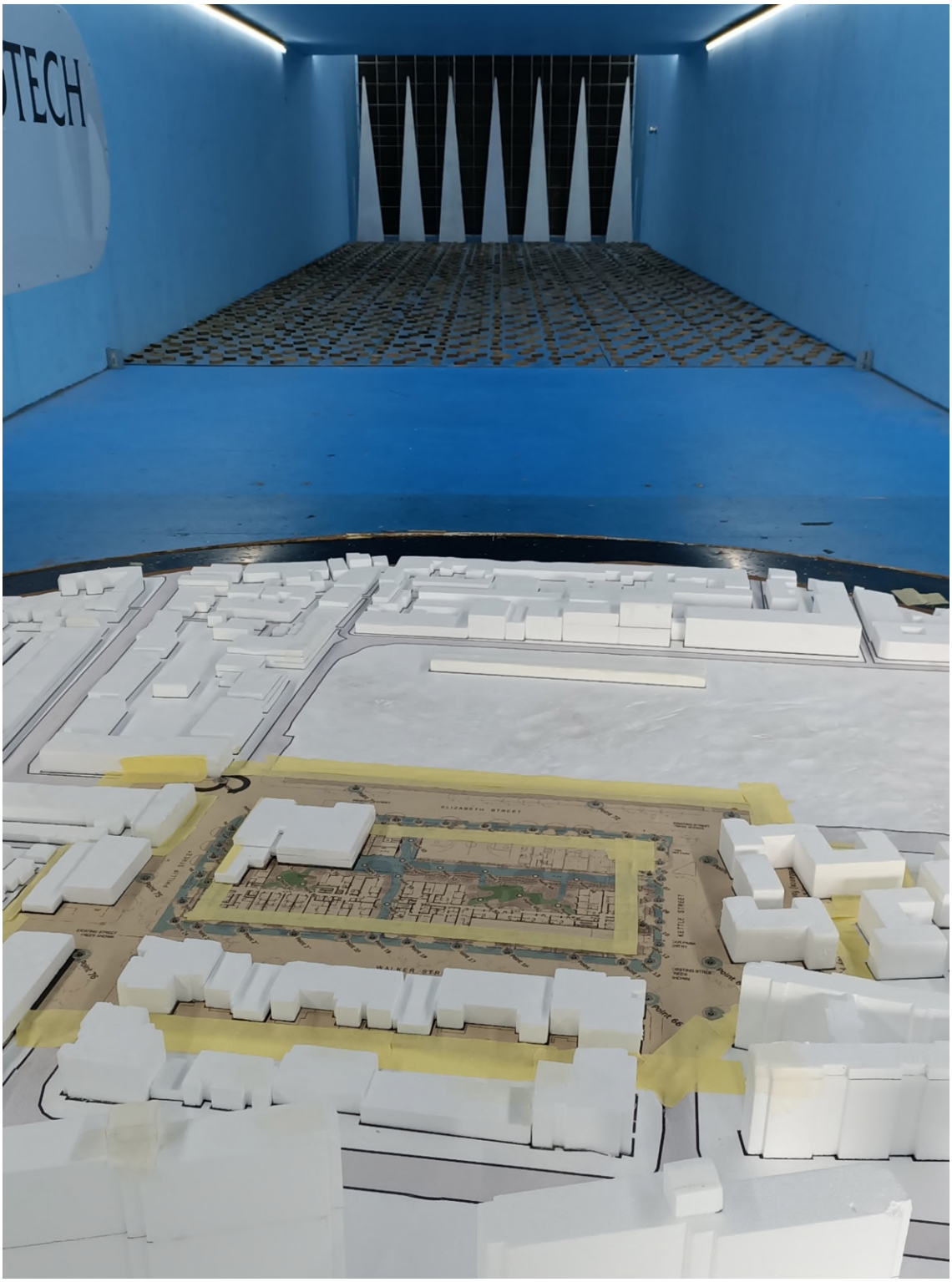

Figure 1f: Photograph of the Wind Tunnel Model (existing scenario, view from the east)

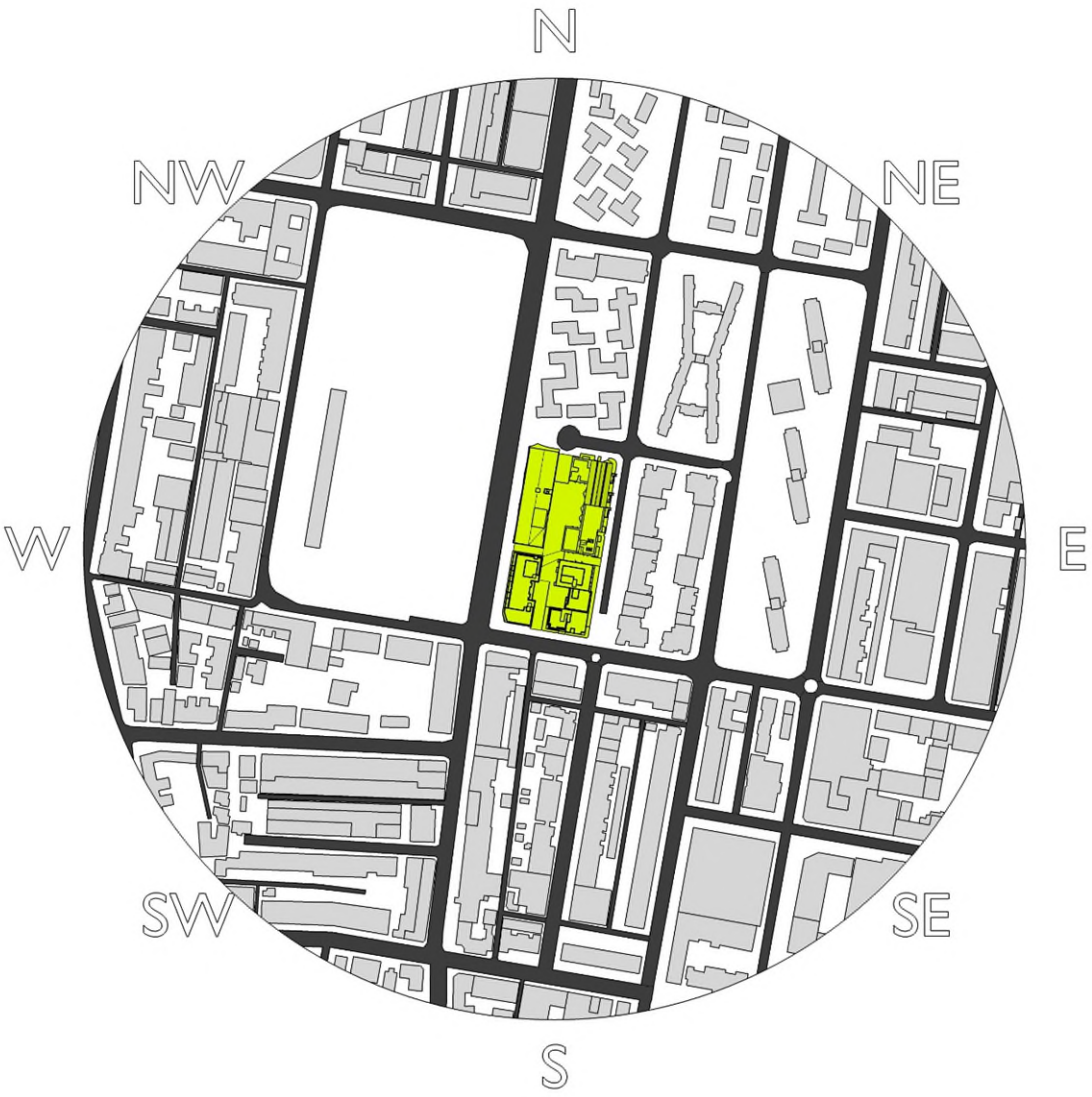

Figure 2a: Proximity Model Plan (Proposed Scenario)

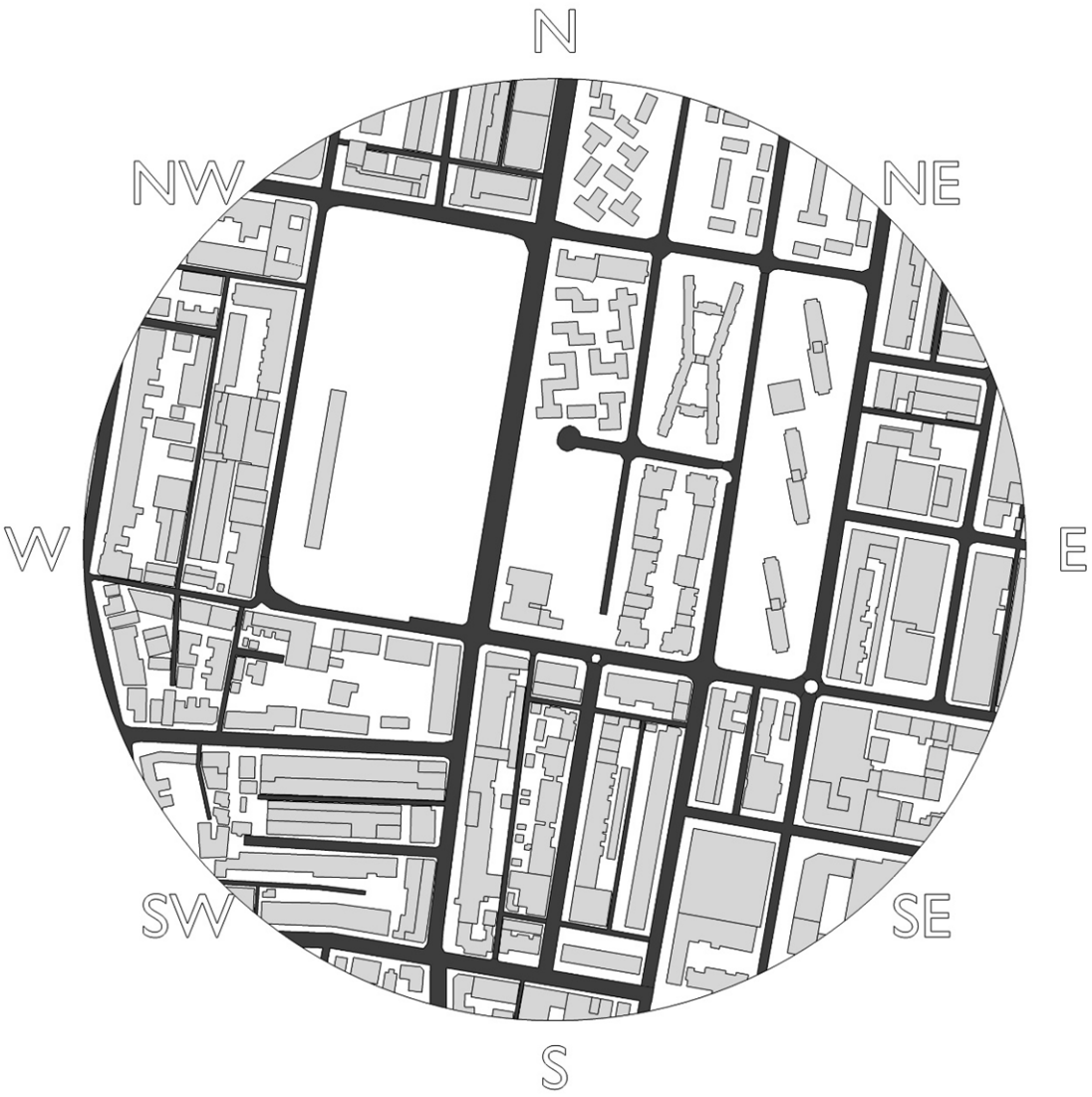

Figure 2b: Proximity Model Plan (Existing Scenario)

3 BOUNDARY LAYER WIND PROFILES AT THE SITE

The roughness of the surface of the earth has the effect of slowing down the wind near the ground. This effect is observed up to the boundary layer height, which can range between 500m to 3km above the earth's surface depending on the roughness of the surface (ie: oceans, open farmland, etc). Within this range the prevailing wind forms a boundary layer wind profile.

Various wind codes and standards and other publications classify various types of boundary layer wind flows depending on the surface roughness z_0. Descriptions of typical boundary layer wind profiles, based on D.M. Deaves and R.I. Harris (1978), are summarised as follows:

- Flat terrain (0.002m < z_0 < 0.003m). Examples include inland water bodies such as lakes, dams, rivers, etc, and the open ocean.
- Semi-open terrain (0.006m < z_0 < 0.01m). Examples include flat deserts and plains.
- Open terrain (0.02m < z_0 < 0.03m). Examples include grassy fields, semi-flat plains, and open farmland (without buildings or trees).
- Semi-suburban/semi-forest terrain (0.06m < z_0 < 0.1m). Examples include farmland with scattered trees and buildings and very low-density suburban areas.
- Suburban/forest terrain (0.2m < z_0 < 0.3m). Examples include suburban areas of towns and areas with dense vegetation such as forests, bushland, etc.
- Semi-urban terrain (0.6m < z_0 < 1.0m). Examples include centres of small cities, industrial parks, etc.
- Urban terrain (2.0m < z_0 < 3.0m). Examples include centres of large cities with many high-rise towers, and also areas with many closely-spaced mid-rise buildings.

The boundary layer wind profile does not change instantly due to changes in the terrain roughness. It can take many kilometres (at least 100km) of a constant surface roughness for the boundary layer wind profile to achieve a state of equilibrium. Hence an analysis of the effect of changes in the upwind terrain roughness is necessary to determine an accurate boundary layer wind profile at the development site location.

The proximity model accounts for the effect of the near field topographic effects as well as the influence of the local built forms. To account for further afield effects, an assessment of the upwind terrain roughness has been undertaken based on the method given in AS/NZS1170.2:2021, using a fetch ranging from 20 to 60 times the study reference height (as per the recommendation by AS/NZS1170.2:2021). An aerial image showing the surrounding terrain is presented in Figure 3 for a range of 1.5km from the edge of the proximity model used for the wind tunnel study. The resulting mean and gust terrain and height multipliers at the site location are presented in Table 3, referenced to the study reference height (which is approximately half the height of the subject development since typically we are most interested in the wind effects at the ground plane). Details of the boundary layer wind profiles at the site are combined with the regional wind model (see Section 4) to determine the site wind speeds.

Table 3: Approaching Boundary Layer Wind Profile Analysis Summary (at the study reference height)

Wind Sector (degrees)	Terrain and Height Multiplier $k_{tr,T=1hr}$ (hourly)	$k_{tr,T=10min}$ (10min)	$k_{tr,T=3s}$ (3sec)	Turbulence Intensity I_v	Equivalent Terrain Category (AS/NZS1170.2:2021 naming convention)
0	0.59	0.63	1.00	0.230	3.0
30	0.59	0.63	1.00	0.231	3.0
60	0.65	0.69	1.05	0.202	2.6
90	0.63	0.67	1.03	0.211	2.7
120	0.64	0.68	1.04	0.206	2.7
150	0.56	0.60	0.97	0.251	3.1
180	0.51	0.55	0.93	0.283	3.4
210	0.47	0.51	0.91	0.304	3.5
240	0.59	0.63	1.00	0.231	3.0
270	0.57	0.60	0.98	0.246	3.1
300	0.62	0.66	1.02	0.217	2.8
330	0.53	0.57	0.95	0.267	3.2

NOTE: These terrain and height multipliers are to be applied to a basic regional wind speed averaged over 3-seconds. Divide these values by 1.10 for a basic wind speed averaged over 0.2-seconds, 0.69 for a basic wind speed averaged over 10-minutes, or 0.66 for a basic wind speed averaged over 1-hour.

For each of the 16 wind directions tested in this study, the approaching boundary layer wind profiles modelled in the wind tunnel closely matched the profiles listed in Table 3. Plots of the boundary layer wind profiles used for the wind tunnel testing are presented in Appendix E of this report.

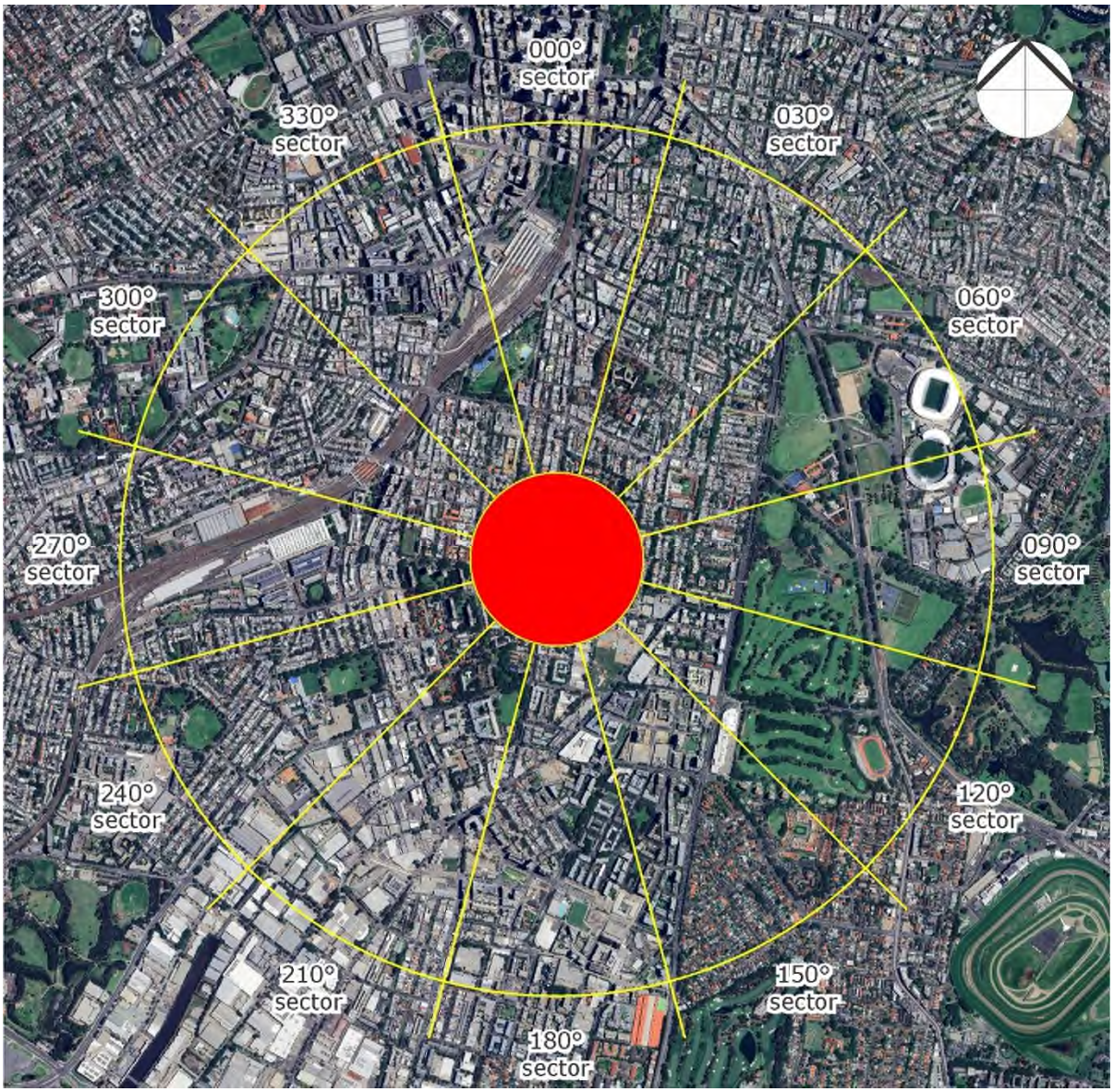

Figure 3: Aerial Image of the Surrounding Terrain (radius of 1.5km from the edge of the proximity model)

4 REGIONAL WIND MODEL

The regional wind model used in this study was determined from an analysis of measured directional mean wind speeds obtained at the meteorological recording station located at Kingsford Smith Airport (Sydney Airport). Data was collected from 1995 to 2016 and corrected so that it represents winds over standard open terrain at a height of 10m above ground for each wind direction. From this analysis, directional probabilities of exceedance and directional wind speeds for the region are determined. The directional wind speeds are summarised in Table 4. The directional wind speeds and corresponding directional frequencies of occurrence are presented in Figure 4.

The data indicates that the southerly winds are by far the most frequent winds for the Sydney region and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently occur during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

The recurrence intervals examined in this study are for exceedances of 5% (per 90 degree sector) of the pedestrian comfort criteria using Gust-Equivalent Mean (GEM) wind speeds, and annual maximum wind speeds (per 22.5 degree sector) for the pedestrian safety criterion. Note that the 5% probability wind speeds presented in Table 4 are only used for the directional plot presented in Figure 4 and are not used for the integration of the probabilities.

Table 4: Regional Directional Wind Speeds (hourly means, at 10m height in standard open terrain) (m/s)

Wind Direction	5% Exceedance	Annual Maximum
N	5.9	9.9
NNE	9.9	12.9
NE	9.7	12.3
ENE	7.5	10.0
E	6.3	9.3
ESE	6.2	9.1
SE	7.0	10.1
SSE	8.5	12.2
S	10.3	13.9
SSW	10.0	14.1
SW	6.9	11.9
WSW	9.3	13.6
W	9.8	14.4
WNW	8.8	14.3
NW	6.7	12.6
NNW	5.5	10.7

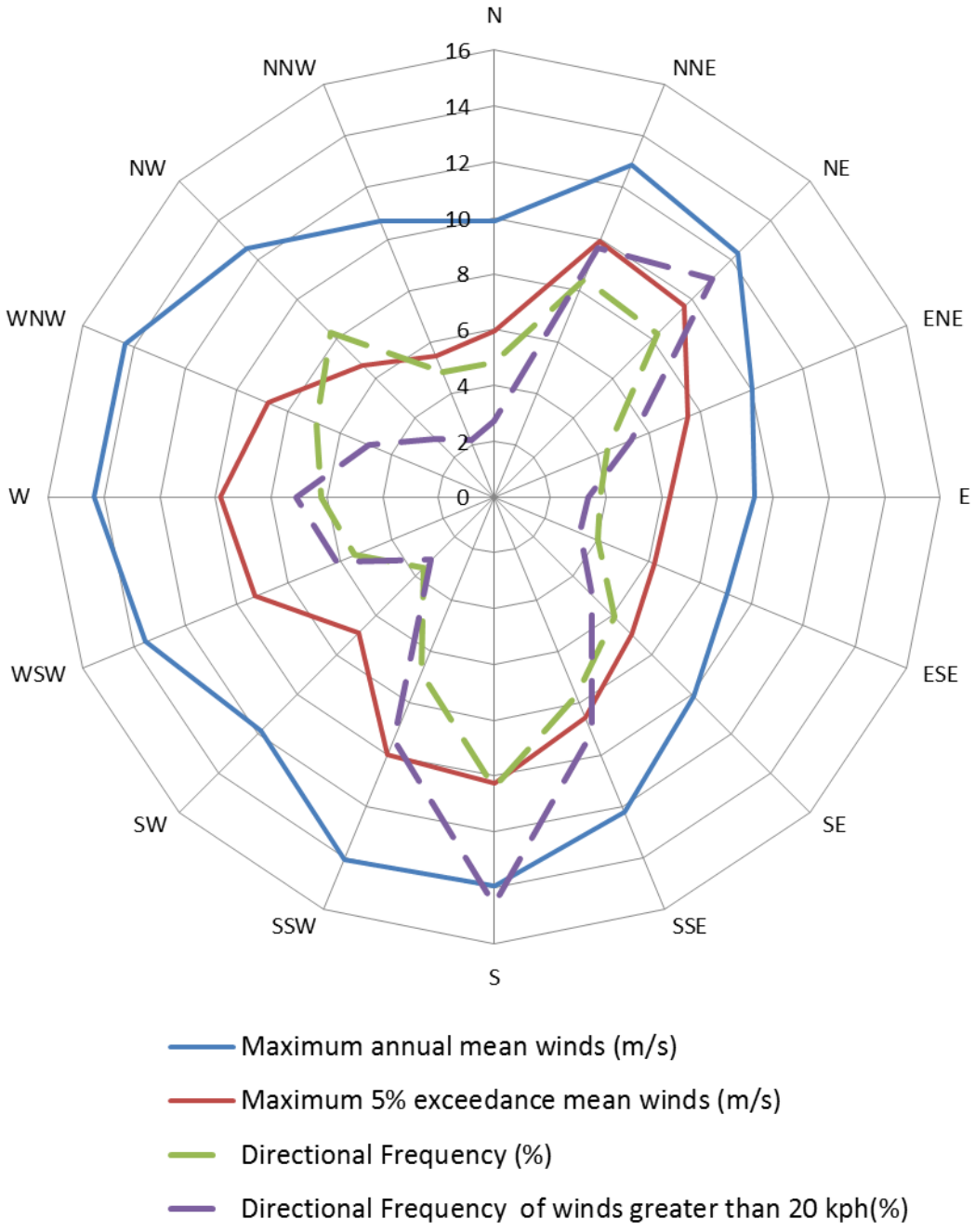

Figure 4: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (at 10m height in standard open terrain)

5 PEDESTRIAN WIND COMFORT AND SAFETY

The acceptability of wind conditions for an area is determined by comparing the measured wind speeds against an appropriate criteria. This section outlines how the measured wind speeds were obtained, the criteria considered for the development, as well as the critical trafficable areas that were assessed and their corresponding criteria designation.

5.1 Measured Wind Speeds

Wind speeds were measured using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, positioned to monitor wind conditions at critical outdoor trafficable areas of the development. The reference mean free-stream wind speed measured in the wind tunnel, which is at a full-scale height of 200m and measured 3m upstream of the study model.

Measurements were acquired for 16 wind directions at 22.5 degree increments using a sample rate of 1,024Hz. The full methodology of determining the wind speed measurements at the site from either the Dantec Hot-wire probe anemometers or pressure-based wind speed sensors is provided in Appendix B. Based on the results of the analysis of the boundary layer wind profiles at the site (see Section 3), and incorporating the regional wind model (see Section 4), the data sampling length of the wind tunnel test for each wind direction corresponds to a full-scale sample length ranging between 30 minutes and 1 hour. Research by A.W. Rofail and K.C.S. Kwok (1991) has shown that, in addition to the mean and standard deviation of the wind being stable for sample lengths of 15 minutes or more (full-scale), the peak value determined using the upcrossing method is stable for sample lengths of 30 minutes or more.

5.2 Wind Speed Criteria Used for This Study

For this study, the measured wind conditions for the various critical outdoor trafficable areas around the subject development are compared against the criteria presented in the Draft Sydney Development Control Plan 2012 - Central Sydney Planning Review Amendment, which supersedes the criteria detailed in the City of Sydney Development Control Plan 2012 (SDCP2012).

For pedestrian comfort, the Draft Sydney DCP 2012 requires that the hourly mean wind speed, or Gust-Equivalent Mean (GEM) wind speed (whichever is greater for each wind direction), must not exceed 8m/s for walking, 6m/s for standing, and 4m/s for sitting. These are based on a 5% probability of exceedance.

For pedestrian safety, the Draft Sydney DCP 2012 defines a safety limit criterion of 24m/s, based on an annual maximum 0.5 second gust wind speed, which applies to all areas.

Furthermore, in accordance with the provisions of the Draft Sydney DCP 2012, the existing conditions for the pedestrian footpaths around the site are also analysed as part of this study to determine the impact of the subject development. If it is found that the existing conditions exceed the relevant criteria, then the target wind speed for that area with the inclusion of the proposed development is to at least match the existing site conditions.

In accordance with the provisions of the Draft Sydney DCP 2012, the wind speed assessment is undertaken for winds occurring between 6am and 10pm (AEST).

A more detailed comparison of published criteria for pedestrian wind comfort and safety is provided in Appendix A.

For this study the measured wind conditions of the selected critical outdoor trafficable areas are compared against two sets of criteria; one for pedestrian safety, and one for pedestrian comfort. The safety criterion is applied to the annual maximum gust winds, and the comfort criteria is applied to Gust Equivalent Mean (GEM) winds. In accordance with ASCE (2003), the GEM wind speed is defined as follows:

$$GEM = max\left(\bar{V}, \frac{\hat{V}}{1.85}\right) \quad (5.1)$$

where:

$\bar{V}$ is the mean wind speed.

$\hat{V}$ is the gust wind speed.

The criteria considered in this study are summarised in Tables 5 and 6 for pedestrian comfort and safety, respectively. The results of the wind tunnel study are presented in the form of directional plots attached in Appendix C of this report. For each study point there is a plot of the annual probability of exceedance of the assigned comfort criteria, and a plot for the annual maximum gust wind speeds using the safety criterion. The velocity coefficients are also presented in the form of directional plots in Appendix D

Table 5: Pedestrian Comfort Criteria (Draft Sydney DCP 2012)

Classification	Description	Maximum 5% Exceedance GEM Wind Speed (m/s)
Sitting	Outdoor areas that involve seating such as parks, dining areas in restaurants, amphitheatres, etc.	4.0
Standing	Short duration stationary activities (generally less than 1 hour), including window shopping, waiting areas, etc.	6.0
Walking	For pedestrian thoroughfares, private swimming pools, most communal areas, private balconies and terraces, etc.	8.0

Table 6: Pedestrian Safety Criterion (Draft Sydney DCP 2012)

Classification	Description	Annual Maximum Gust Wind Speed (m/s)
Safety	Safety criterion applies to all trafficable areas.	24

5.3 Layout of Study Points

For the assessment of the publicly accessible Ground Level areas a total of 76 study point locations were selected for analysis. The majority of these are located within the public pedestrian footpaths around the site, with the exception of 19 study points located within the through site links.

The locations of the various study points tested for this study, as well as the target wind speed criteria for the various outdoor trafficable areas of the development, are presented in Figures 5 in the form of marked-up plans. It should be noted that only the most critical Ground Level outdoor locations of the development have been selected for analysis.

Figure 5a: Study Point Locations and Target Wind Speed Criteria – Ground Floor Plan

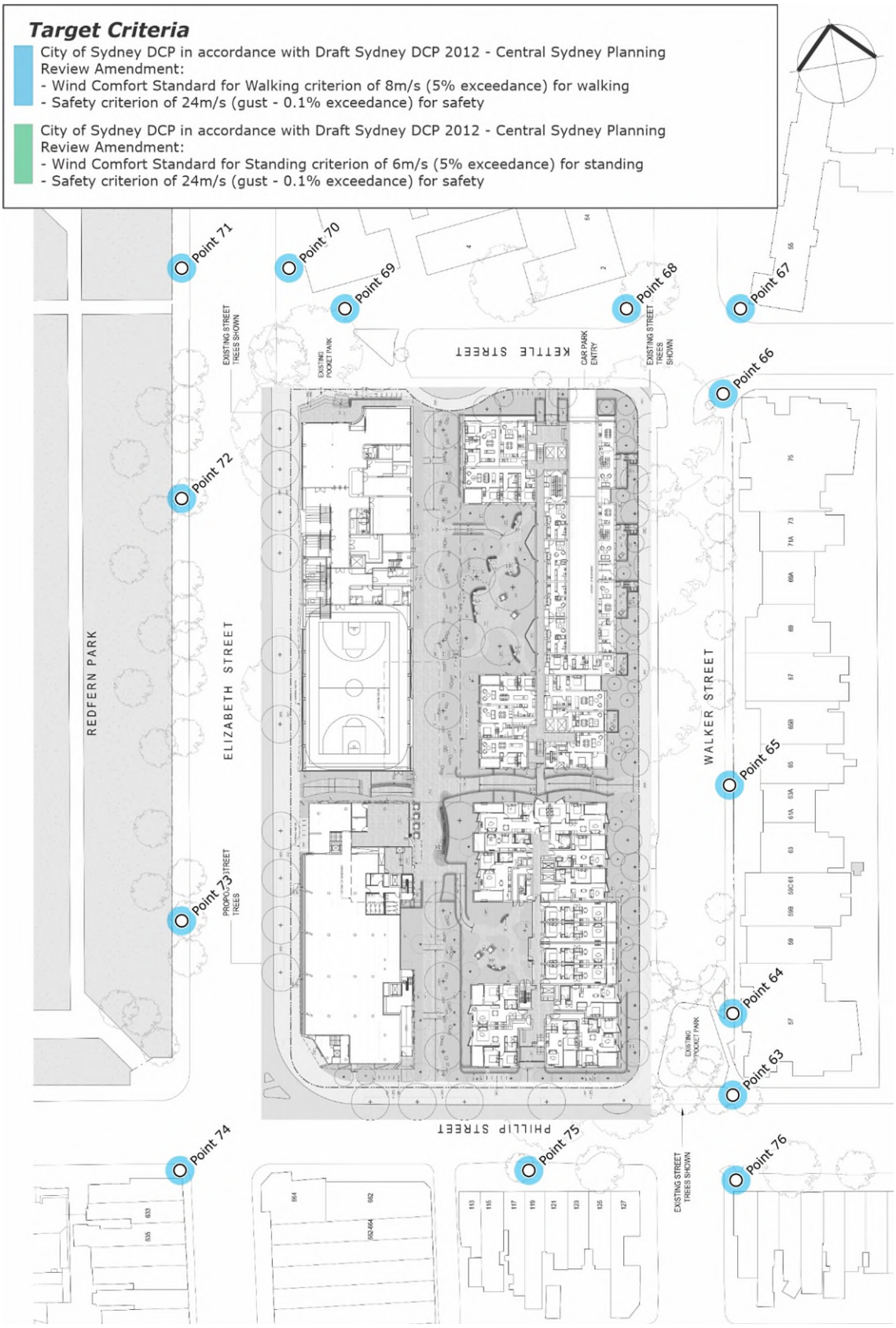

Figure 5b: Study Point Locations and Target Wind Speed Criteria – Surrounding Ground Level Plan

6 RESULTS AND DISCUSSION

The results of the wind tunnel study for critical Ground Level areas are presented in the form of directional plots in Appendix C for all study points locations, summarised in Table 7, and shown on marked-up plans in Figures 6. The velocity coefficients are also presented in the form of directional plots in Appendix D The wind speed criteria that the wind conditions should achieve are also listed in Table 7 for each study point location, as well as in Figures 5.

The results of the study indicate that wind conditions for the majority of Ground level trafficable outdoor locations within and around the development will be suitable for their intended uses. However, some areas will experience strong winds which will exceed the relevant criteria for comfort and/or safety. Suggested treatments are described as follows (referencing the updated landscaping drawings received on June 20, 2024 – a list of which is provided in Appendix G):

- Introduce densely foliating evergreen tree planting, ensuring interlocking canopies where applicable, within through-site link between Buildings S2 and S3 and within the courtyard encompassed by Building S3, ensuring they are able to grow to a height and width of 3-5m (refer to Figure 7).

- Introduce a planter box along the western edge of the Building S2 southern entrance, ensuring the combined total height of the physical planter box and foliage is 1.5m (refer to Figure 7).

- Retain existing and proposed street trees at the corner of Elizabeth Street and Kettle Street (retain size as per the landscaping drawings received 20 June 2024). Ensuring interlocking canopies where applicable and that the proposed trees have the potential to grow to a height and width of 5-8m (refer to Figure 7).

Furthermore, to ensure year-round effectiveness it is recommended that the any proposed planting to be of a densely foliating every green variety.

As a general note, the use of loose glass-tops and light-weight sheets or covers (including loose BBQ lids) is not appropriate on high-rise outdoor terraces and balconies. Furthermore, lightweight furniture is not recommended unless it is securely attached to the balcony or terrace floor slab.

With the inclusion of these treatments to the final design, it is expected that wind conditions for all outdoor Ground Level trafficable areas within and around the development will be suitable for their intended uses.

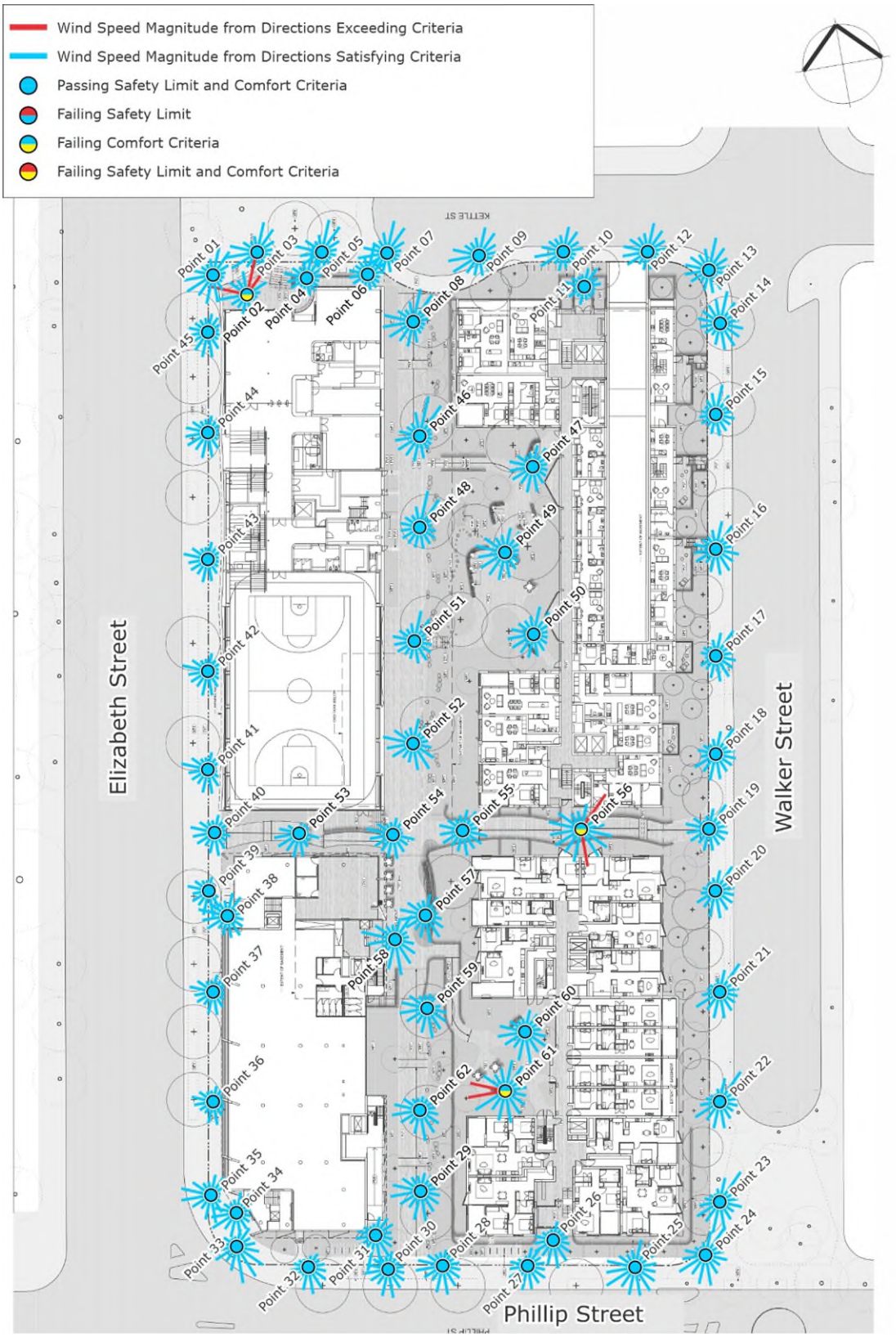

Figure 6a: Wind Tunnel Results – Ground Floor Plan
(results shown without treatments applied)

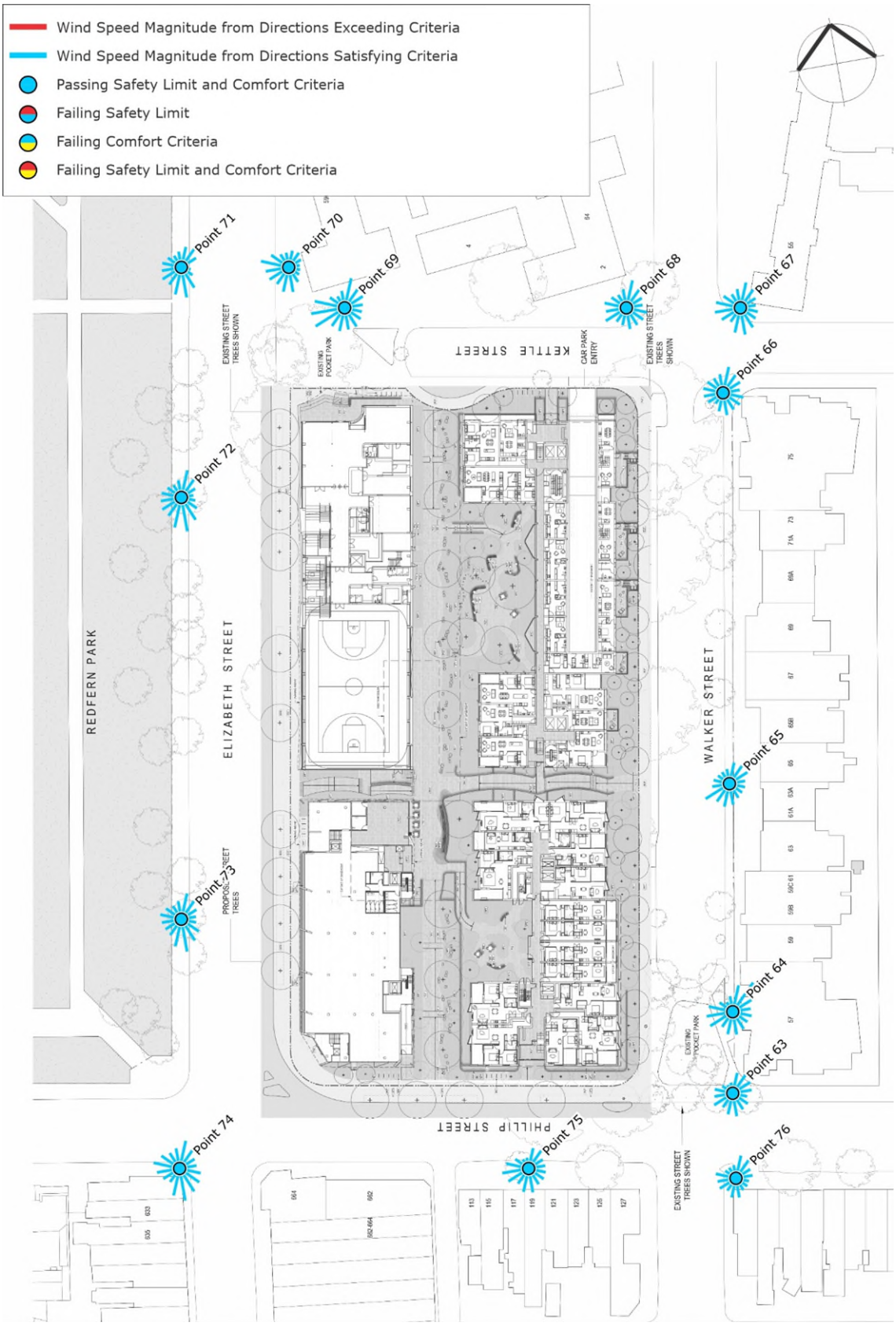

Figure 6b: Wind Tunnel Results – Surrounding Ground Floor Plan
(results shown without treatments applied)

Table 7: Wind Tunnel Results Summary

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (m/s)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 01	8.0	7.1	Pass	24	19	Pass	Pass	-
Existing		6.5	Pass		18	Pass	Pass	
Point 02	6.0	6.3	Fail	24	20	Pass	Fail	Refer to Figure 7.
Point 03	8.0	6.8	Pass	24	20	Pass	Pass	-
Existing		6.5	Pass		19	Pass	Pass	
Point 04	8.0	6.6	Pass	24	20	Pass	Pass	-
Point 05	8.0	6.6	Pass	24	19	Pass	Pass	-
Existing		6.1	Pass		18	Pass	Pass	
Point 06	8.0	5.9	Pass	24	18	Pass	Pass	-
Existing		5.7	Pass		19	Pass	Pass	
Point 07	8.0	6.8	Pass	24	19	Pass	Pass	-
Existing		5.9	Pass		19	Pass	Pass	
Point 08	8.0	7.3	Pass	24	22	Pass	Pass	-
Point 09	8.0	6.7	Pass	24	21	Pass	Pass	-
Existing		5.9	Pass		16	Pass	Pass	
Point 10	8.0	6.0	Pass	24	19	Pass	Pass	-
Existing		5.8	Pass		16	Pass	Pass	
Point 11	6.0	3.6	Pass	24	11	Pass	Pass	-
Existing		6.0	Pass		16	Pass	Pass	
Point 12	8.0	6.1	Pass	24	17	Pass	Pass	-
Existing		5.8	Pass		16	Pass	Pass	
Point 13	8.0	6.6	Pass	24	19	Pass	Pass	-
Existing		6.0	Pass		17	Pass	Pass	
Point 14	8.0	6.8	Pass	24	19	Pass	Pass	-
Existing		5.9	Pass		16	Pass	Pass	
Point 15	8.0	5.8	Pass	24	18	Pass	Pass	-
Existing		5.9	Pass		17	Pass	Pass	
Point 16	8.0	6.4	Pass	24	16	Pass	Pass	-
Existing		6.1	Pass		17	Pass	Pass	
Point 17	8.0	6.1	Pass	24	18	Pass	Pass	-
Existing		6.1	Pass		18	Pass	Pass	
Point 18	8.0	6.4	Pass	24	18	Pass	Pass	-

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (m/s)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Existing		6.1	Pass		17	Pass	Pass	
Point 19	8.0	6.0	Pass	24	17	Pass	Pass	-
Existing		6.2	Pass		17	Pass	Pass	
Point 20	8.0	6.2	Pass	24	17	Pass	Pass	-
Existing		6.1	Pass		17	Pass	Pass	
Point 21	8.0	6.8	Pass	24	20	Pass	Pass	-
Existing		6.2	Pass		18	Pass	Pass	
Point 22	8.0	7.1	Pass	24	21	Pass	Pass	-
Existing		6.2	Pass		17	Pass	Pass	
Point 23	8.0	7.4	Pass	24	21	Pass	Pass	-
Existing		6.4	Pass		18	Pass	Pass	
Point 24	8.0	7.2	Pass	24	20	Pass	Pass	-
Existing		6.1	Pass		18	Pass	Pass	
Point 25	8.0	7.3	Pass	24	17	Pass	Pass	-
Existing		7.2	Pass		17	Pass	Pass	
Point 26	6.0	4.4	Pass	24	13	Pass	Pass	-
Existing		5.9	Pass		17	Pass	Pass	
Point 27	8.0	5.4	Pass	24	16	Pass	Pass	-
Existing		5.2	Pass		15	Pass	Pass	
Point 28	8.0	6.3	Pass	24	18	Pass	Pass	-
Existing		5.7	Pass		18	Pass	Pass	
Point 29	8.0	6.9	Pass	24	20	Pass	Pass	-
Point 30	8.0	6.0	Pass	24	18	Pass	Pass	-
Existing		5.7	Pass		19	Pass	Pass	
Point 31	6.0	5.7	Pass	24	18	Pass	Pass	-
Existing		5.4	Pass		18	Pass	Pass	
Point 32	8.0	5.6	Pass	24	17	Pass	Pass	-
Existing		5.7	Pass		17	Pass	Pass	
Point 33	8.0	7.8	Pass	24	23	Pass	Pass	-
Existing		6.3	Pass		20	Pass	Pass	
Point 34	6.0	4.4	Pass	24	14	Pass	Pass	-
Point 35	8.0	6.4	Pass	24	22	Pass	Pass	-
Existing		5.6	Pass		17	Pass	Pass	
Point 36	8.0	4.9	Pass	24	16	Pass	Pass	-

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (m/s)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Existing		4.9	Pass		15	Pass	Pass	
Point 37	8.0	5.1	Pass	24	17	Pass	Pass	-
Existing		5.2	Pass		15	Pass	Pass	
Point 38	6.0	4.5	Pass	24	16	Pass	Pass	-
Existing		6.2	Fail		18	Pass	Fail	
Point 39	8.0	5.3	Pass	24	16	Pass	Pass	-
Existing		6.4	Pass		18	Pass	Pass	
Point 40	8.0	5.3	Pass	24	18	Pass	Pass	-
Existing		6.2	Pass		17	Pass	Pass	
Point 41	8.0	5.4	Pass	24	20	Pass	Pass	-
Existing		6.3	Pass		17	Pass	Pass	
Point 42	8.0	5.5	Pass	24	19	Pass	Pass	-
Existing		6.4	Pass		17	Pass	Pass	
Point 43	8.0	5.2	Pass	24	18	Pass	Pass	-
Existing		6.8	Pass		18	Pass	Pass	
Point 44	8.0	5.7	Pass	24	16	Pass	Pass	-
Existing		6.7	Pass		18	Pass	Pass	
Point 45	8.0	5.9	Pass	24	17	Pass	Pass	-
Existing		6.6	Pass		18	Pass	Pass	
Point 46	8.0	7.9	Pass	24	23	Pass	Pass	-
Point 47	6.0	4.4	Pass	24	13	Pass	Pass	-
Point 48	8.0	7.2	Pass	24	21	Pass	Pass	-
Point 49	6.0	5.2	Pass	24	16	Pass	Pass	-
Point 50	6.0	4.7	Pass	24	13	Pass	Pass	-
Point 51	8.0	6.1	Pass	24	18	Pass	Pass	-
Point 52	8.0	6.7	Pass	24	22	Pass	Pass	-
Point 53	8.0	5.6	Pass	24	16	Pass	Pass	-
Point 54	8.0	5.8	Pass	24	20	Pass	Pass	-
Point 55	8.0	6.0	Pass	24	17	Pass	Pass	-
Point 56	6.0	6.8	Fail	24	19	Pass	Fail	Refer to Figure 7.
Point 57	8.0	6.2	Pass	24	19	Pass	Pass	-
Point 58	6.0	5.7	Pass	24	19	Pass	Pass	-
Point 59	8.0	6.5	Pass	24	19	Pass	Pass	-
Point 60	6.0	5.1	Pass	24	15	Pass	Pass	-

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (m/s)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 61	6.0	6.2	Fail	24	17	Pass	Fail	Refer to Figure 7.
Point 62	8.0	6.5	Pass	24	19	Pass	Pass	-
Point 63	8.0	5.8	Pass	24	16	Pass	Pass	-
Existing		6.3	Pass		17	Pass	Pass	
Point 64	8.0	7.0	Pass	24	17	Pass	Pass	-
Existing		5.4	Pass		16	Pass	Pass	
Point 65	8.0	6.0	Pass	24	18	Pass	Pass	-
Existing		5.2	Pass		15	Pass	Pass	
Point 66	8.0	5.7	Pass	24	16	Pass	Pass	-
Existing		6.2	Pass		18	Pass	Pass	
Point 67	8.0	6.2	Pass	24	17	Pass	Pass	-
Existing		5.8	Pass		18	Pass	Pass	
Point 68	8.0	5.9	Pass	24	16	Pass	Pass	-
Existing		6.2	Pass		18	Pass	Pass	
Point 69	8.0	7.3	Pass	24	20	Pass	Pass	-
Existing		6.5	Pass		19	Pass	Pass	
Point 70	8.0	5.9	Pass	24	21	Pass	Pass	-
Existing		7.0	Pass		23	Pass	Pass	
Point 71	8.0	6.2	Pass	24	18	Pass	Pass	-
Existing		7.1	Pass		20	Pass	Pass	
Point 72	8.0	7.0	Pass	24	21	Pass	Pass	-
Existing		7.0	Pass		20	Pass	Pass	
Point 73	8.0	6.6	Pass	24	20	Pass	Pass	-
Existing		6.5	Pass		19	Pass	Pass	
Point 74	8.0	7.0	Pass	24	20	Pass	Pass	-
Existing		6.6	Pass		19	Pass	Pass	
Point 75	8.0	5.8	Pass	24	17	Pass	Pass	-
Existing		4.8	Pass		14	Pass	Pass	
Point 76	8.0	5.2	Pass	24	15	Pass	Pass	-
Existing		4.8	Pass		13	Pass	Pass	

Note that, for any study points listed in Table 7 with two rows of results data, the second row is for the existing site conditions. The test results shown in Table 7 are without any treatments applied. If treatment is required, the treatment is described in Table 7.

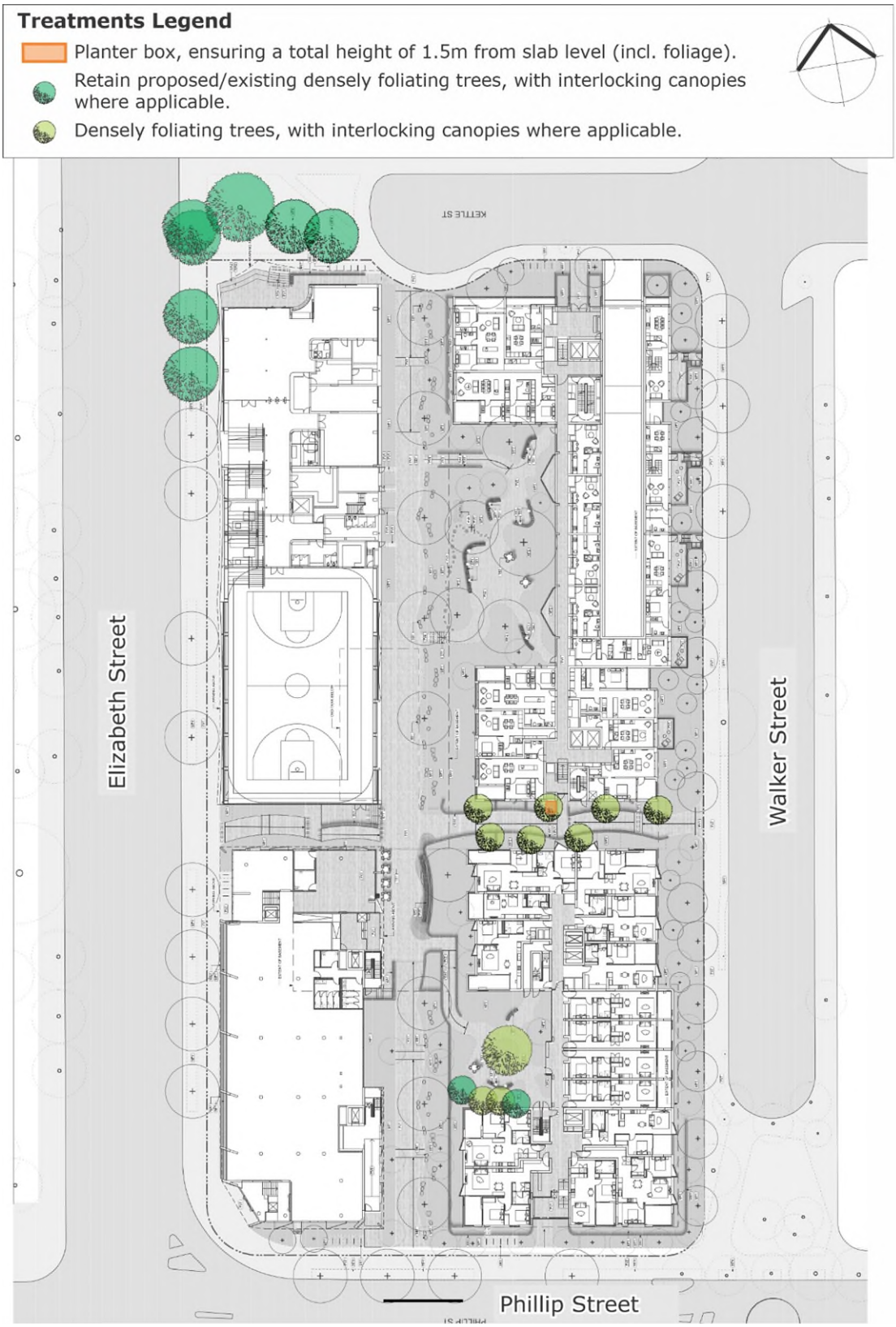

Figure 7: Suggested Treatments – Ground Level Plan

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Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions". Journal of Wind Engineering and Industrial Aerodynamics, vol. 3, pp241-249.

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APPENDIX A PUBLISHED ENVIRONMENTAL CRITERIA

A.1 Wind Effects on People

The acceptability of wind in an area is dependent upon the use of the area. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Quantifying wind comfort has been the subject of much research and many researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. This section discusses and compares the various published criteria.

A.2 A.D. Penwarden (1973) Criteria for Mean Wind Speeds

A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table A.1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table A.1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Hourly Mean Wind Speed (m/s)	Effects
Calm	0	0 - 0.3	
Calm, light air	1	0.3 - 1.6	No noticeable wind
Light breeze	2	1.6 - 3.4	Wind felt on face
Gentle breeze	3	3.4 - 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant
Near gale	7	13.9 – 17.2	Inconvenience felt when walking
Gale	8	17.2 - 20.8	Generally impedes progress, difficulty balancing in gusts
Strong gale	9	20.8 – 24.5	People blown over

A.3 A.G. Davenport (1972) Criteria for Mean Wind Speeds

A.G. Davenport (1972) also determined a set of criteria in terms of the Beaufort scale and for various return periods. Table A.2 presents a summary of the criteria based on a probability of exceedance of 5%.

Table A.2: Criteria by A.G. Davenport (1972)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Walking Fast	Acceptable for walking, main public accessways.	7.5 - 10.0
Strolling, Skating	Slow walking, etc.	5.5 - 7.5
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	3.5 - 5.5
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 3.5

A.4 T.V. Lawson (1975) Criteria for Mean Wind Speeds

In 1973, T.V. Lawson, while referring to the Beaufort wind speeds of A.D. Penwarden (1973) (as listed in Table A.1), quoted that a Beaufort 4 wind speed would be acceptable if it is not exceeded for more than 4% of the time, and that a Beaufort 6 wind speed would be unacceptable if it is exceeded more than 2% of the time. Later, in 1975, T.V. Lawson presented a set of criteria very similar to those presented in A.G. Davenport (1972) (as listed in Table A.2). These criteria are presented in Table A.3 and Table A.4 for safety and comfort respectively.

Table A.3: Safety Criteria by T.V. Lawson (1975)

Classification	Activities	Annual Mean Wind Speed (m/s)
Safety (all weather areas)	Accessible by the general public.	0 – 15
Safety (fair weather areas)	Private areas, balconies/terraces, etc.	0 – 20

Table A.4: Comfort Criteria by T.V. Lawson (1975)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Business Walking	Objective Walking from A to B.	8 - 10
Pedestrian Walking	Slow walking, etc.	6 - 8
Short Exposure Activities	Pedestrian standing or sitting for short times.	4 – 6
Long Exposure Activities	Pedestrian sitting for a long duration.	0 - 4

A.5 W.H. Melbourne (1978) Criteria for Gust Wind Speeds

W.H. Melbourne (1978) introduced a set of criteria for the assessment of environmental wind conditions that were developed for a temperature range of 10°C to 30°C and for people suitably dressed for outdoor conditions. These criteria are presented in Table A.5, and are based on maximum gust wind speeds with a probability of exceedance of once per year.

Table A.5: Criteria by W.H. Melbourne (1978)

Classification	Activities	Annual Gust Wind Speed (m/s)
Limit for Safety	Completely unacceptable: people likely to get blown over.	23
Marginal	Unacceptable as main public accessways.	16 - 23
Comfortable Walking	Acceptable for walking, main public accessways	13 - 16
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	10 - 13
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 10

A.6 Comparison of the Published Wind Speed Criteria

W.H. Melbourne (1978) presented a comparison of the criteria of various researchers on a probabilistic basis. Figure A.1 presents the results of this comparison, and indicates that the criteria of W.H. Melbourne (1978) are comparatively quite conservative. This conclusion was also observed by A.W. Rofail (2007) when undertaking on-site remedial studies. The results of A.W. Rofail (2007) concluded that the criteria by W.H. Melbourne (1978) generally overstates the wind effects in a typical urban setting due to the assumption of a fixed 15% turbulence intensity for all areas. It was observed in A.W. Rofail (2007) that the 15% turbulence intensity assumption is not real and that the turbulence intensities at 1.5m above ground is at least 20% and in a suburban or urban setting is generally in the range of 30% to 60%.

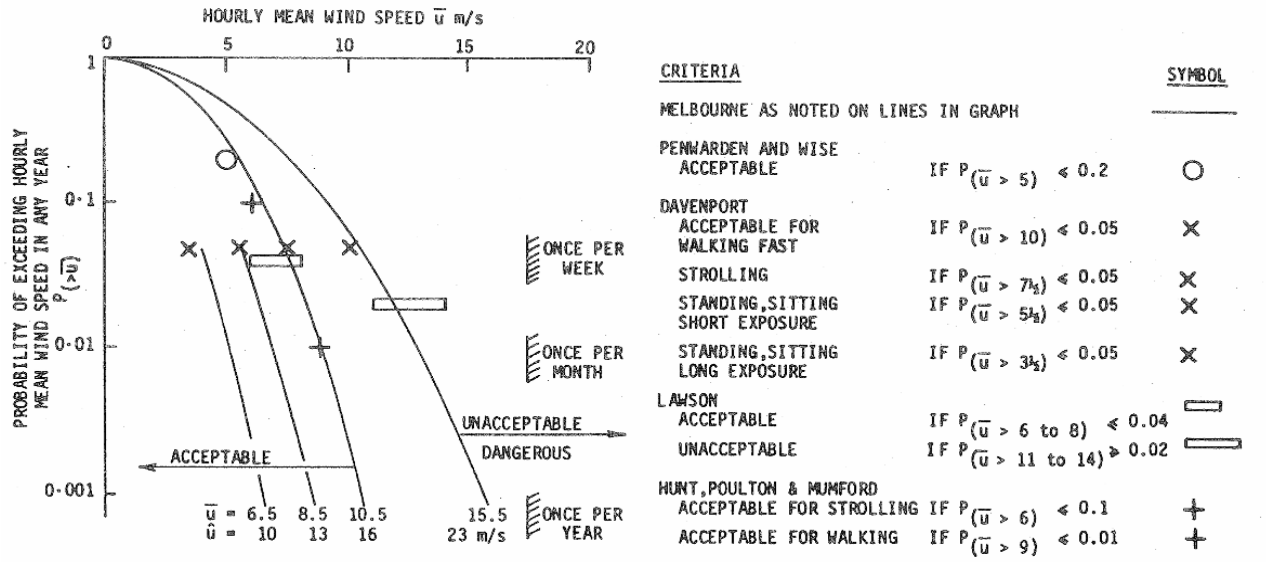

Figure A.1: Comparison of Various Mean and Gust Wind Environment Criteria, assuming 15% turbulence and a Gust Factor of 1.5 (W.H. Melbourne, 1978)

A.7 References relating to Pedestrian Comfort Criteria

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APPENDIX B DATA ACQUISITION

The wind tunnel testing procedures utilised for this study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013). The wind speed measurements for the wind tunnel study were determined as coefficients using data acquired by either Dantec hot-wire probe anemometers or pressure-based wind speed sensors and converted to full-scale wind speeds using details of the regional wind climate obtained from an analysis of directional wind speed recordings from the local meteorological recording station(s).

B.1 Measurement of the Velocity Coefficients

The study model and proximity model were setup within the wind tunnel which was configured to the appropriate boundary layer profile, and the wind velocity measurements were monitored using either Dantec hot-wire probe anemometers or pressure-based wind speed sensors at selected critical outdoor locations. The wind velocity results presented in this study for each study point are representative of wind at a full-scale height of approximately 1.5m above ground/slab level. In the case of the Dantec hot-wire probe anemometers, the support of the probe is mounted such that the probe wire is vertical as much as possible to ensure that the measured wind speeds are independent of wind direction along the horizontal plane. In addition, care was taken in the alignment of the hot-wire probe wire and in avoiding wall-heating effects.

Wind speed measurements were made in the wind tunnel for the wind directions described within this report. Data was acquired for each wind direction using a sample rate of 1024Hz. The sample length was determined to produce a full-scale sample time that is sufficient for this type of study. In the case of the pressure-based wind speed sensors, the phase lag between the various channels where data is acquired simultaneously is within 10% of a typical pressure cycle, and the signal is low-pass filtered at 500Hz and then digital filtering is applied over this range to provide an unbiased response from the pressure measurement system (A.W. Rofail, 2004).

The mean, gust and standard deviation velocity coefficients were determined from the data acquired in the wind tunnel. The gust velocity coefficients were also derived for each wind direction from by the following relation:

$$\hat{C}_V = \bar{C}_V + g \cdot \sigma_{C_V} \qquad \text{B.1}$$

where:

$\hat{C}_V$ is the gust velocity coefficient.

$\bar{C}_V$ is the mean velocity coefficient.

g is the peak factor, taken as 3.0 for a 3-sec gust and 3.4 for a 0.5-sec gust.

σ_{C_V} is the standard deviation of the velocity coefficient measurement.

In the case of a Dantec hot-wire probe anemometer, the velocity coefficient is obtained as follows:

$$C_V = \frac{C_{V,study}}{C_{V,200m}} \quad \text{B.2}$$

where:

$C_{V,study}$ is the velocity coefficient measurement obtained from the Dantec hot-wire probe anemometer at the study point location.

$C_{V,200m}$ is the velocity coefficient measurement obtained from the Dantec hot-wire probe anemometer at the free-stream reference location at 200m height upwind of the model in the wind tunnel.

However, in the case of the pressure-based wind speed sensors, these are determined from the measured differential mean, standard deviation and maximum pressure coefficients obtained from the wind speed sensor. For this analysis all calculations are performed on the square root of the differential pressure measurements. The velocity coefficient at the pressure-based wind speed sensor location is then calculated as follows:

$$C_V = \frac{\alpha + \beta\sqrt{\Delta p}}{V_{200m}} \quad \text{B.3}$$

where:

C_V is the velocity coefficient measurement at the study point location.

α is a calibration coefficient for the pressure-based wind speed sensor.

β is a calibration coefficient for the pressure-based wind speed sensor.

Δp is the differential pressure obtained from the pressure-based wind speed sensor at the study point location.

V_{200m} is the wind speed at the free-stream reference location of 200m height (full-scale) in the wind tunnel, which is determined directly in the wind tunnel using a pitot static probe.

B.2 Calculation of the Full-Scale Results

The full-scale results determine if the wind conditions at a study location satisfy the designated criteria of that location. More specifically, the full-scale results need to determine the probability of exceedance of a given wind speed at a study location. To determine the probability of exceedance, the measured velocity coefficients were combined with a statistical model of the local wind climate that relates wind speed to a probability of exceedance. Details of the wind climate model are outlined in Section 4 of the main report.

The statistical model of the wind climate includes the impact of wind directionality as any local variations in wind speed or frequency with wind direction. This is important as the wind directions that produce the highest wind speed events for a region may not coincide with the most wind exposed direction at the site.

The methodology adopted for the derivation of the full-scale results for the maximum gust and the GEM wind speeds are outlined in the following sub-sections.

B.3 Maximum Gust Wind Speeds

The full-scale maximum gust wind speed at each study point location is derived from the measured coefficient using the following relationship:

$$V_{study} = V_{ref,RH}\left(\frac{k_{200m,tr,T=1hr}}{k_{RH,tr,T=1hr}}\right)C_V \qquad \text{B.4}$$

where:

V_{study} is the full-scale wind speed at the study point location.

$V_{ref,RH}$ is the full-scale reference wind speed at the study reference height. This value is determined by combining the directional wind speed data for the region (detailed in Section 4) and the upwind terrain and height multipliers for the site (detailed in Section 3).

$k_{200m,tr,T=1hr}$ is the hourly mean terrain and height multiplier at the free-stream reference location of 200m height.

$k_{RH,tr,T=1hr}$ is the hourly mean terrain and height multiplier at the study reference height (Section 3).

C_V is the velocity coefficient, obtained from either Equation B.2 (in the case of Dantec hot-wire probe anemometers) or Equation B.3 (in the case of pressure-based wind speed sensors).

The value of $V_{ref,RH}$ varies with each prevailing wind direction. Wind directions where there is a high probability that a strong wind will occur have a higher directional wind speed than other directions. To determine the directional wind speeds, a probability level must be assigned for each wind direction. These probability levels are set following the approach used in AS/NZS1170.2:2021, which assumes that the major contributions to the combined probability of exceedance of a typical load effect comes from only two 45 degree sectors.

B.4 Maximum Gust-Equivalent Mean Wind Speeds

The contribution to the probability of exceedance of a specified wind speed (ie: the desired wind speed for pedestrian comfort, as per the criteria) was calculated for each wind direction. These contributions are then combined over all wind directions to calculate the total probability of exceedance of the specified wind speed. To calculate the probability of exceedance for a specified wind speed a statistical wind climate model was used to describe the relationship between directional wind speeds and the probability of exceedance. A detailed description of the methodology is given by T.V. Lawson (1980).

The criteria used in this study is referenced to a probability of exceedance of 5% of a specified wind speed.

B.5 References relating to Data Acquisition

American Society of Civil Engineers (ASCE), ASCE-7-16, 2016, "Minimum Design Loads for Buildings and Other Structures".

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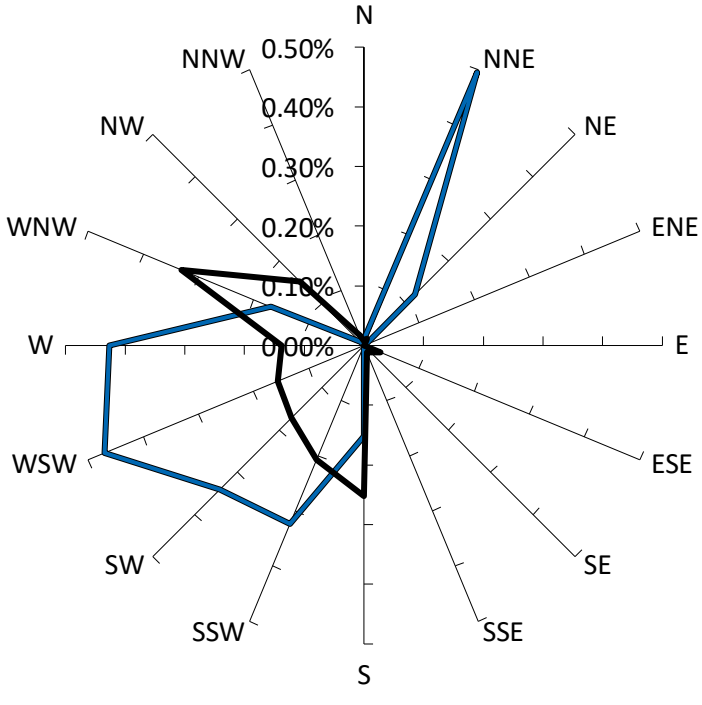
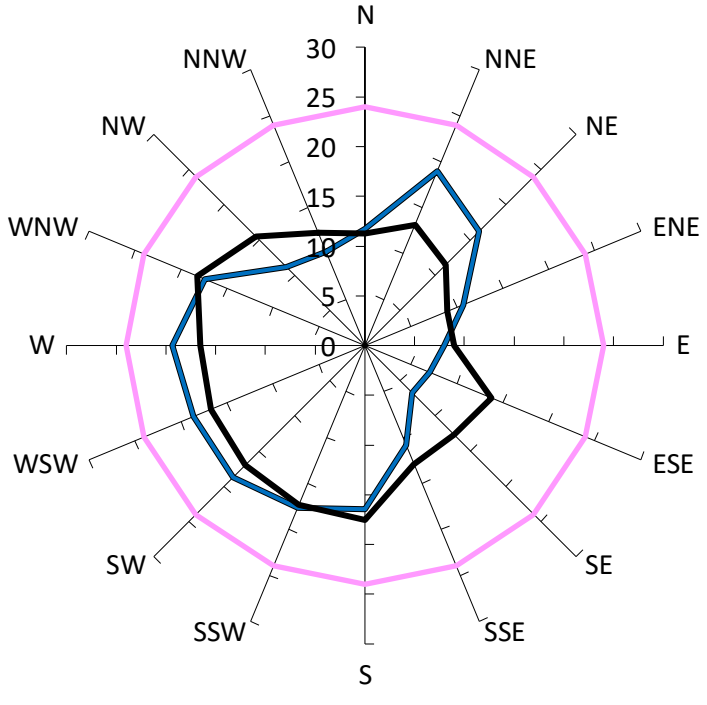
Standards Australia and Standards New Zealand, AS/NZS 1170.2, 2021, "SAA Wind Loading Standard, Part 2: Wind Actions".

APPENDIX C DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

Results for Point 01



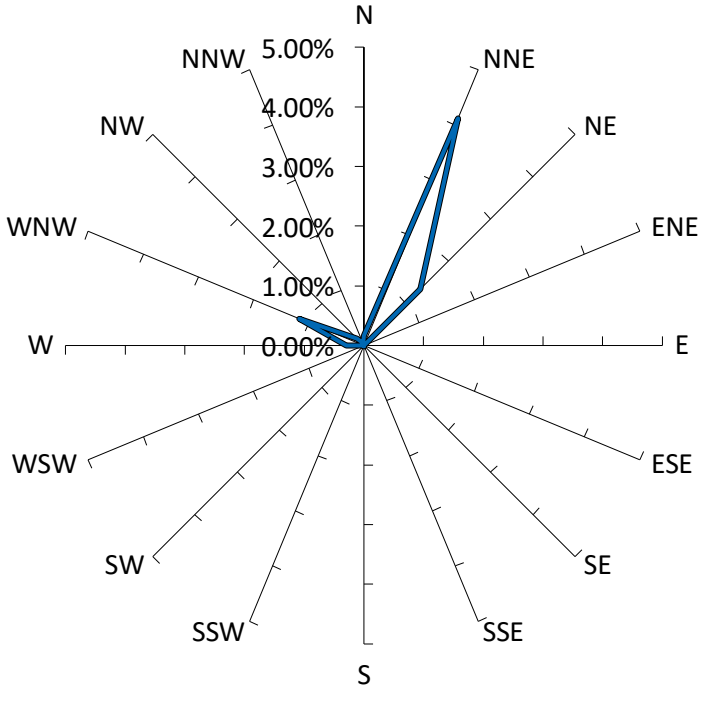
Annual probability of exceeding 8m/s (%)



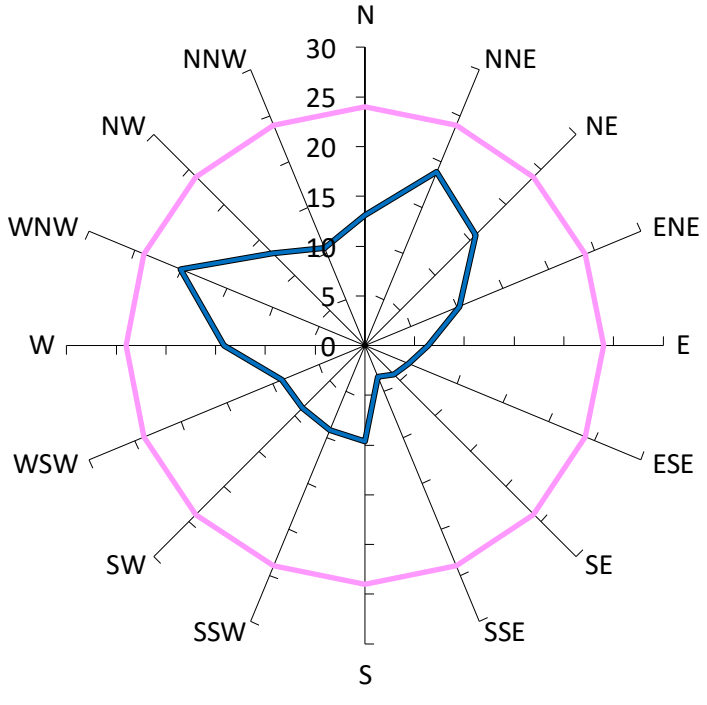
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.1	19
	Existing Site Conditions	6.5	18

Results for Point 02



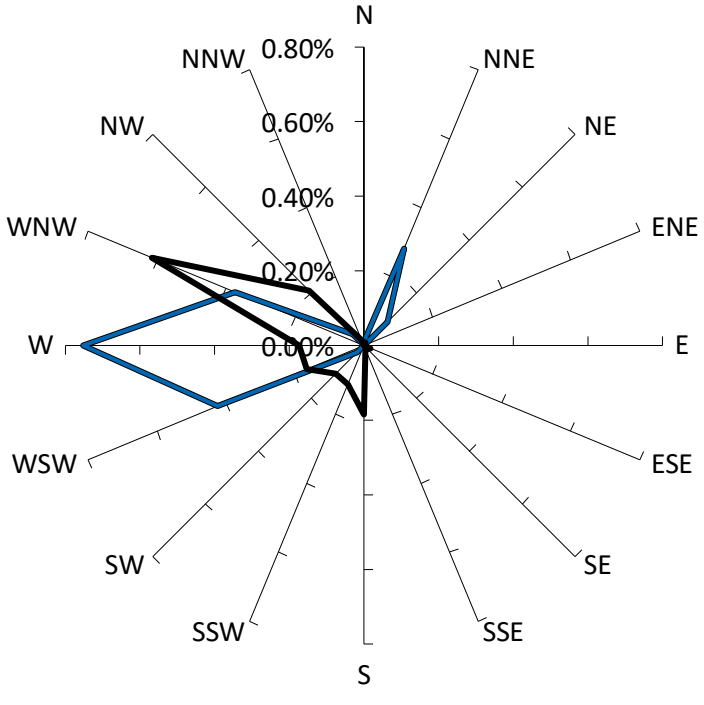
Annual probability of exceeding 6m/s (%)



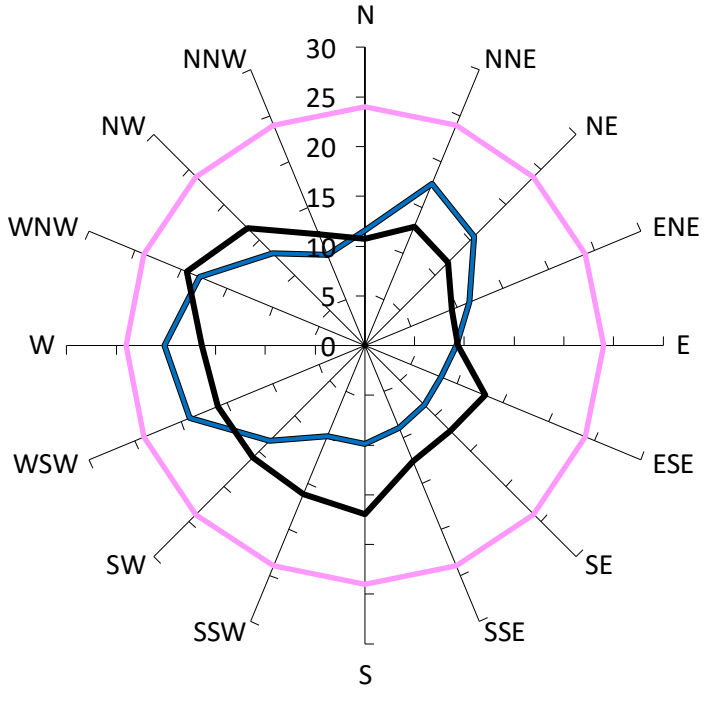
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	6.3	20

Results for Point 03



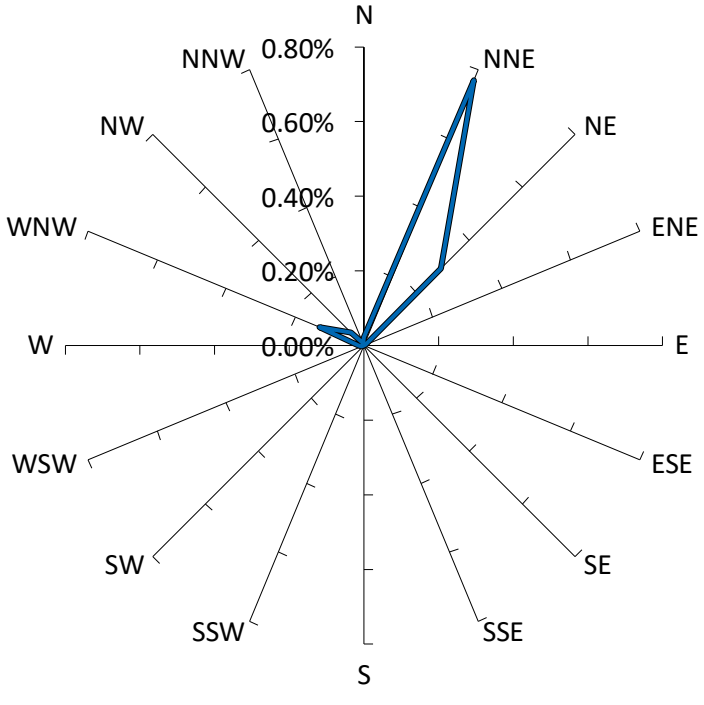
Annual probability of exceeding 8m/s (%)



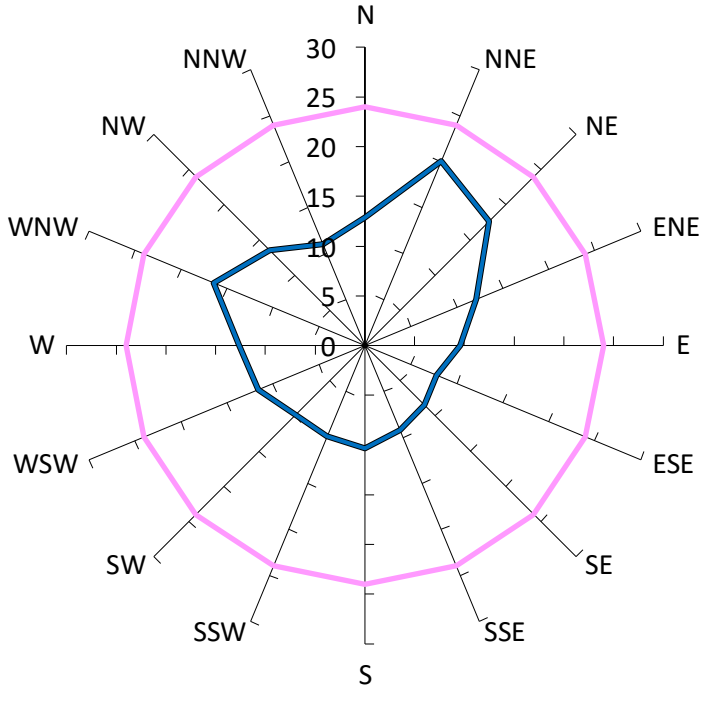
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.8	20
	Existing Site Conditions	6.5	19

Results for Point 04



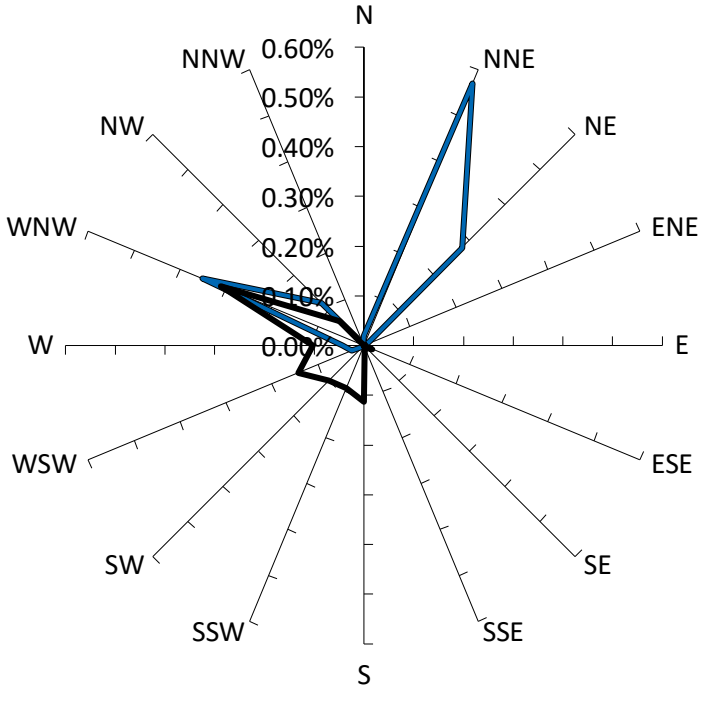
Annual probability of exceeding 8m/s (%)



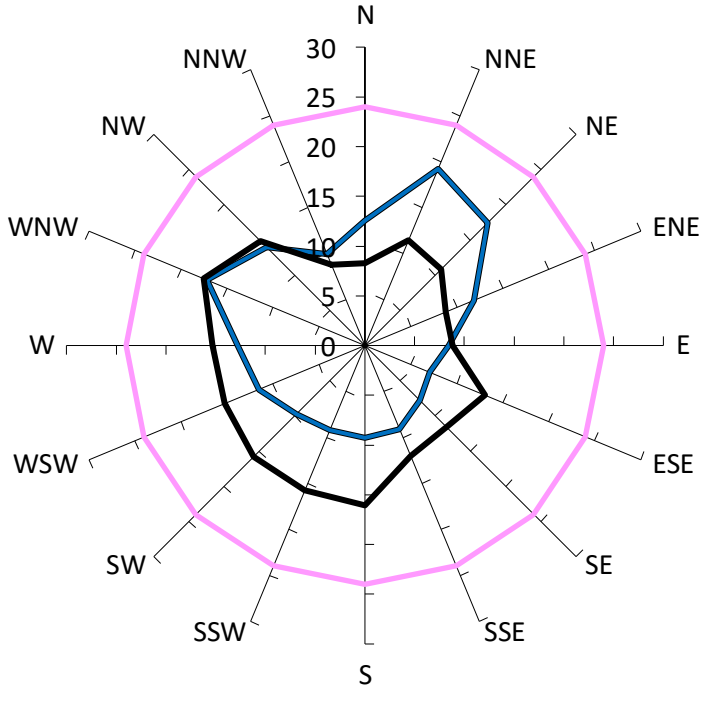
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.6	20

Results for Point 05



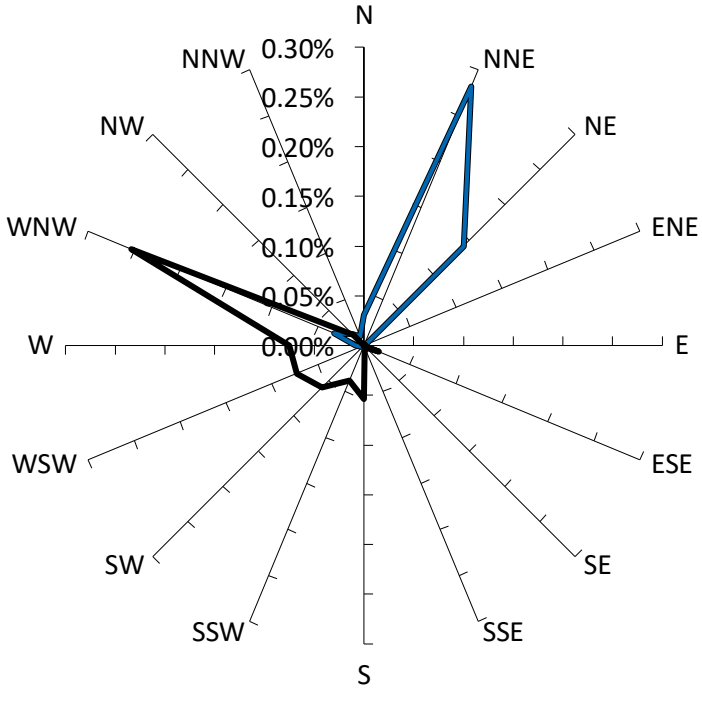
Annual probability of exceeding 8m/s (%)



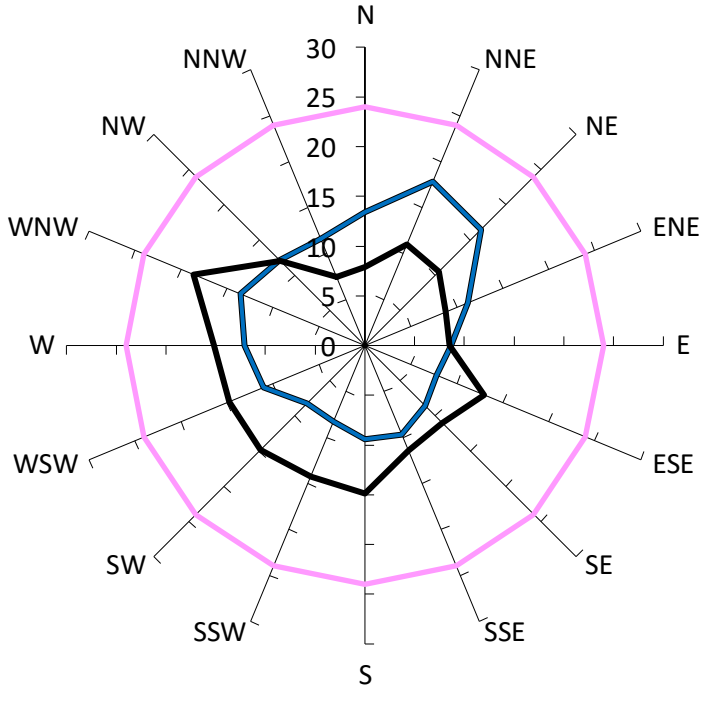
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.6	19
	Existing Site Conditions	6.1	18

Results for Point 06



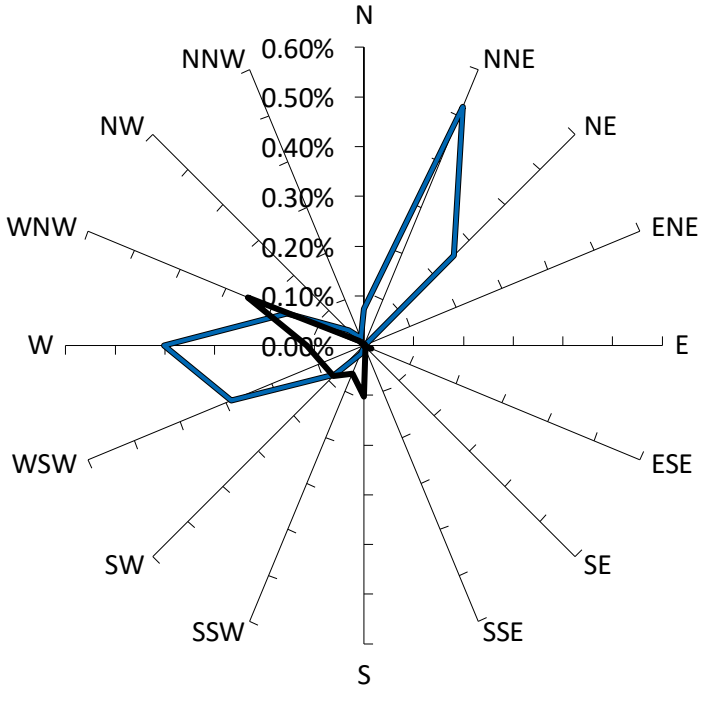
Annual probability of exceeding 8m/s (%)



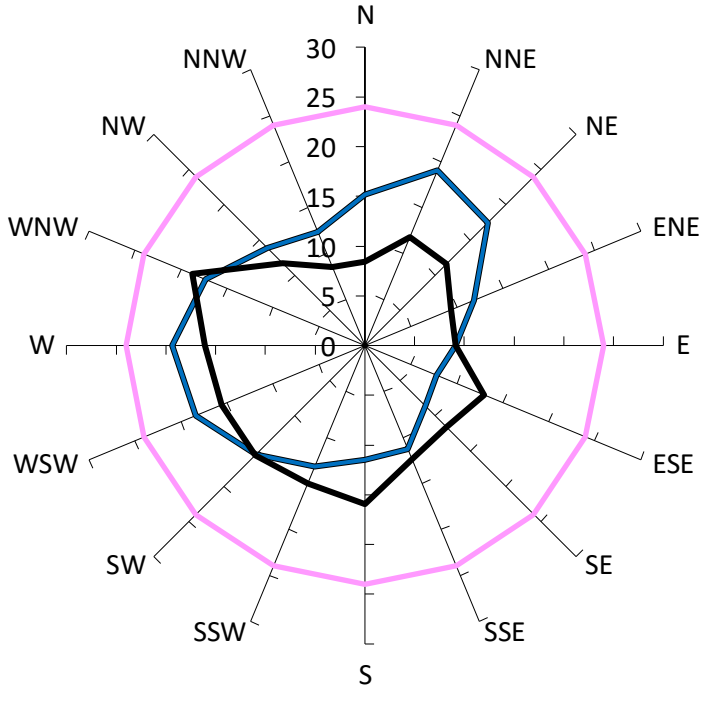
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.9	18
	Existing Site Conditions	5.7	19

Results for Point 07



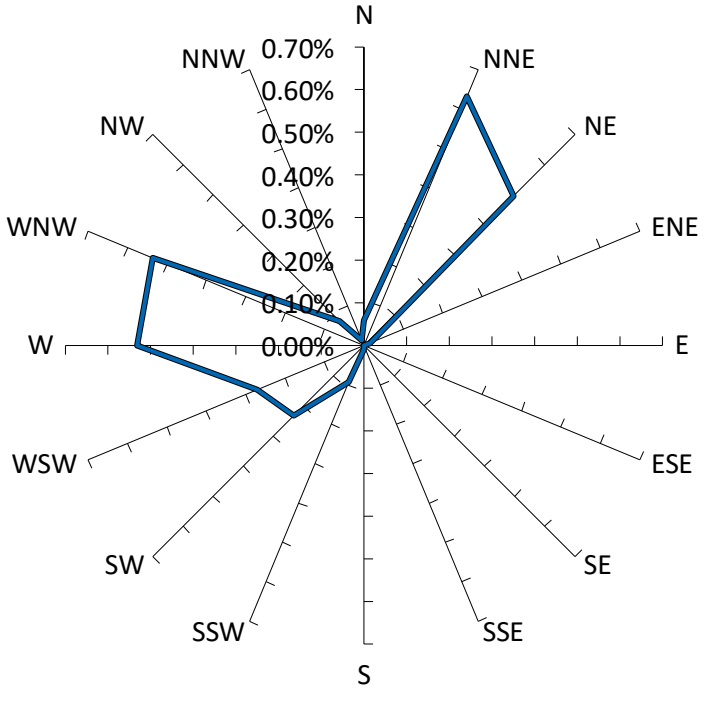
Annual probability of exceeding 8m/s (%)



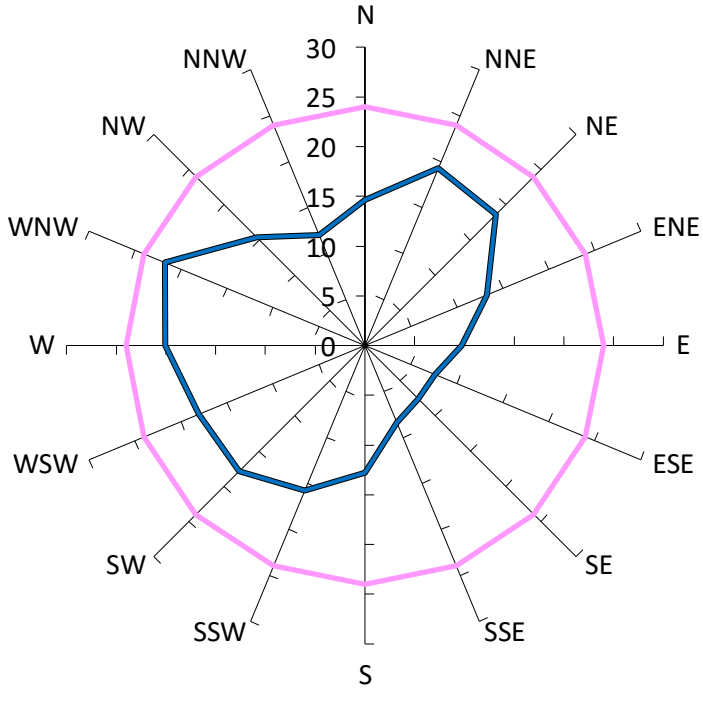
Annual Maximum Gust (m/s)

Description	GEM Wind Speed (m/s)	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
With development "as proposed", no vegetation or other treatments.	6.8	19
Existing Site Conditions	5.9	19

Results for Point 08



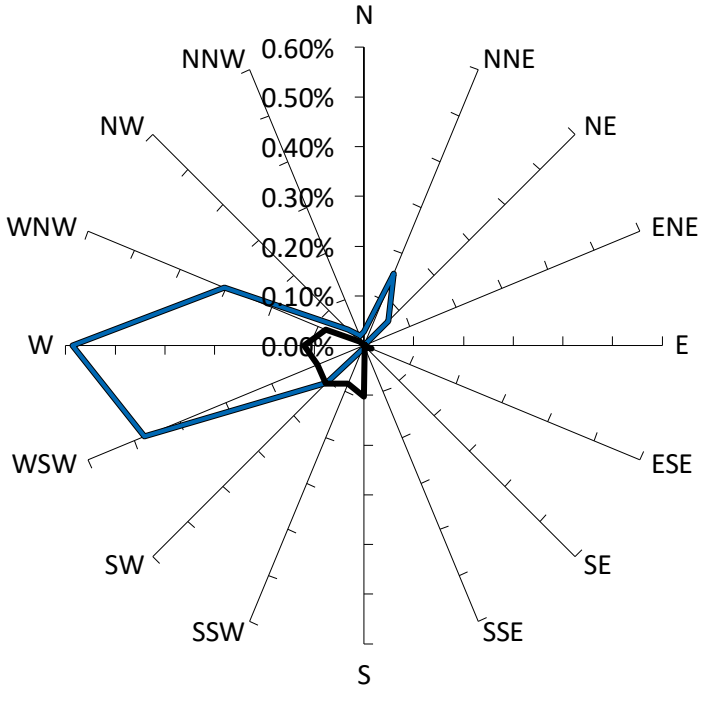
Annual probability of exceeding 8m/s (%)



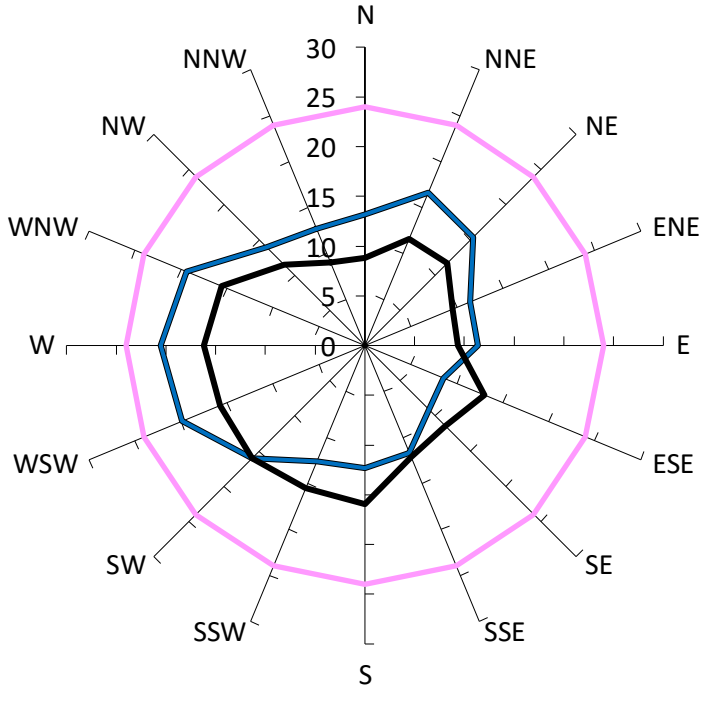
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.3	22

Results for Point 09



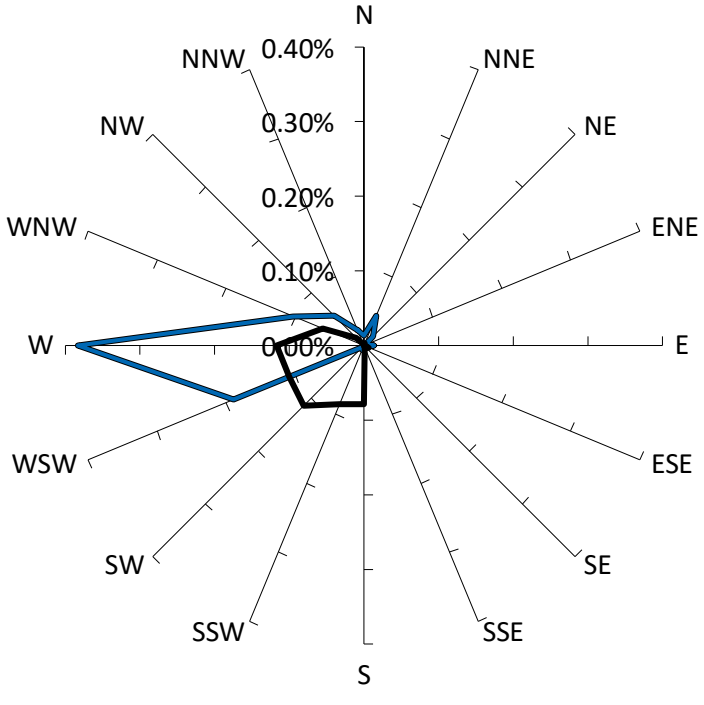
Annual probability of exceeding 8m/s (%)



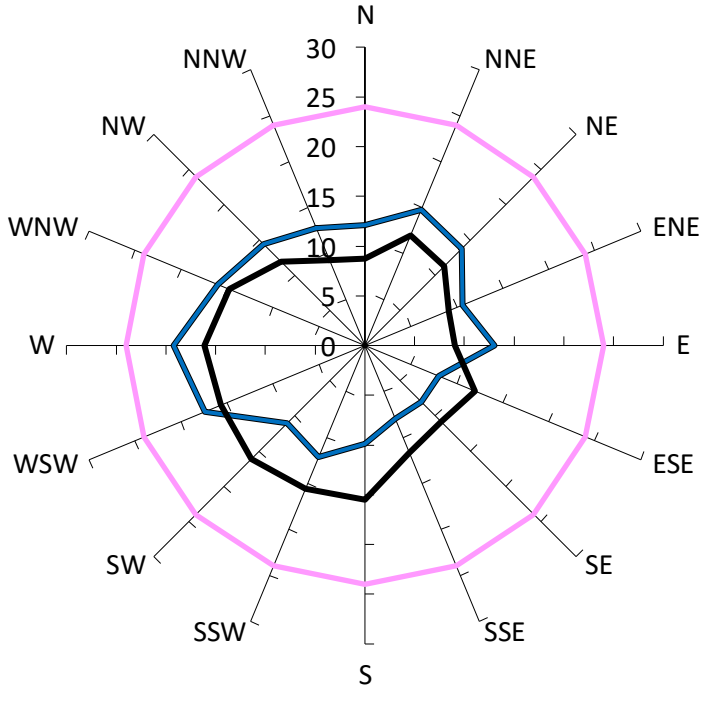
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.7	21
	Existing Site Conditions	5.9	16

Results for Point 10



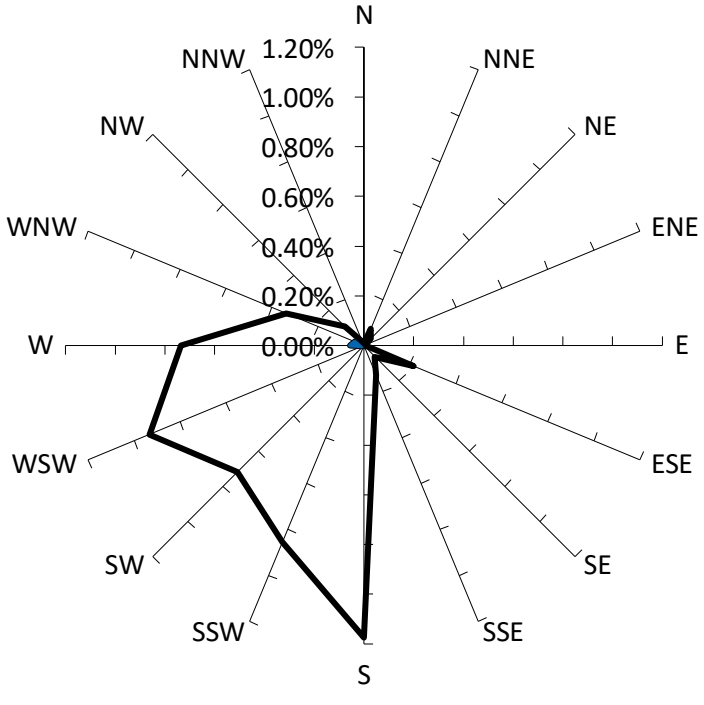
Annual probability of exceeding 8m/s (%)



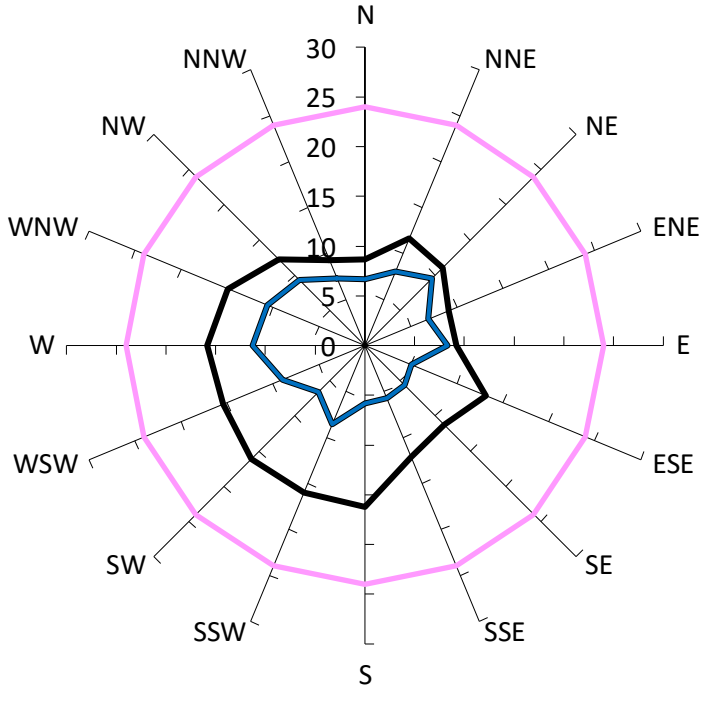
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.0	19
	Existing Site Conditions	5.8	16

Results for Point 11



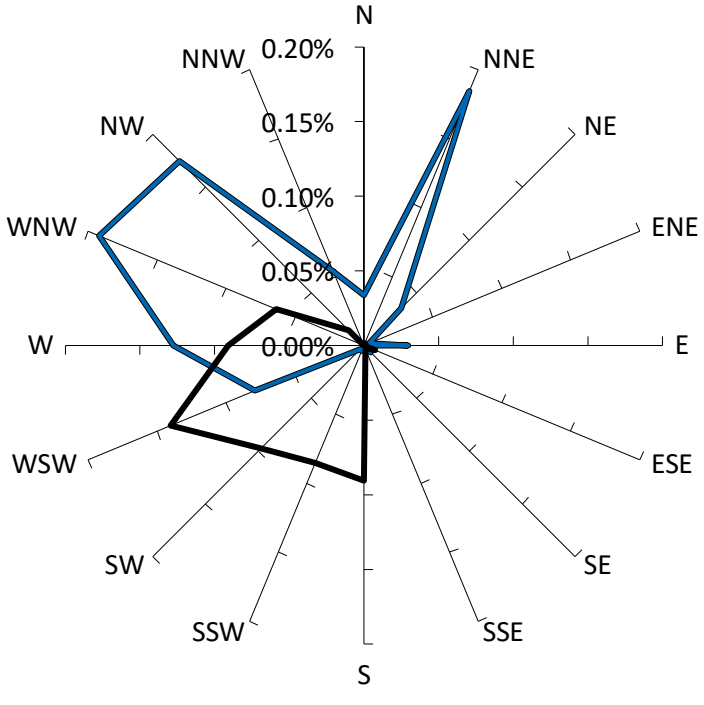
Annual probability of exceeding 6m/s (%)



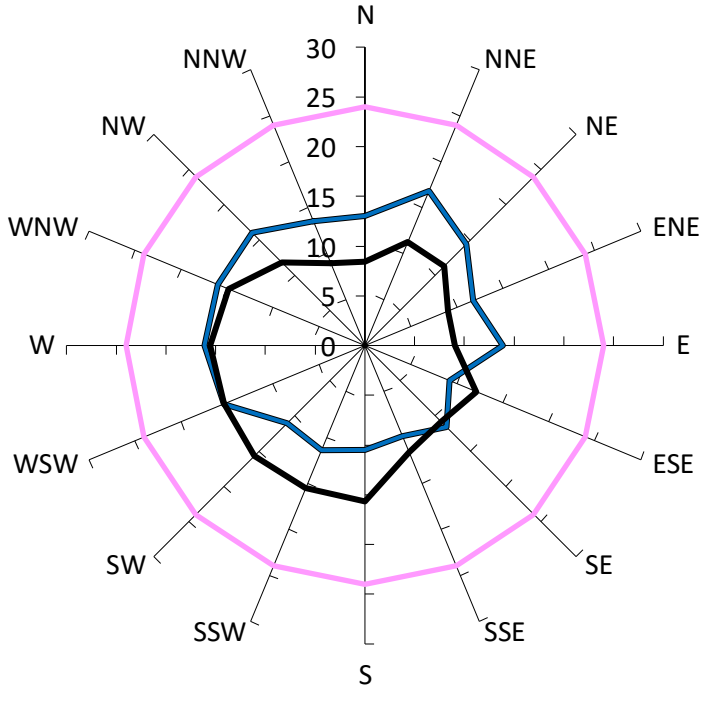
Annual Maximum Gust (m/s)

Description	GEM Wind Speed (m/s)	Peak Gust m/s
Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
With development "as proposed", no vegetation or other treatments.	3.6	11
Existing Site Conditions	6.0	16

Results for Point 12



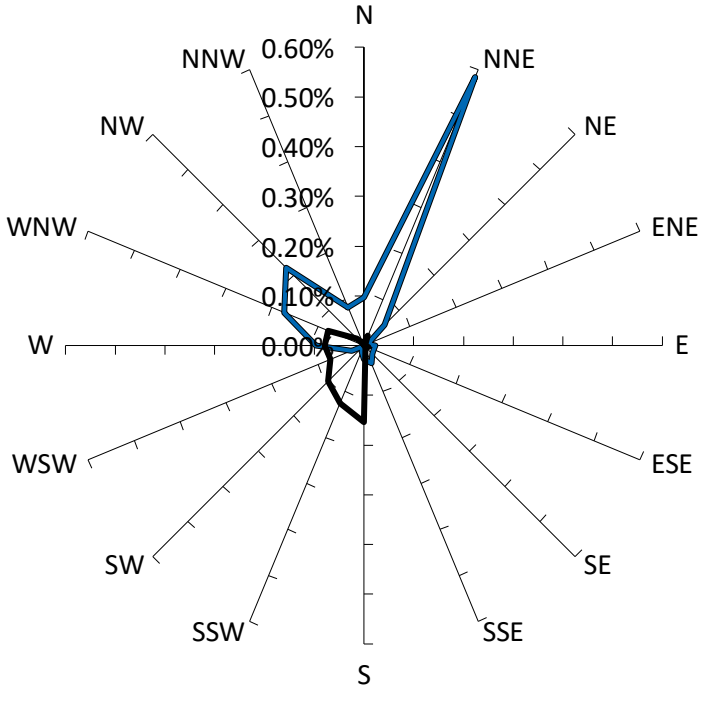
Annual probability of exceeding 8m/s (%)



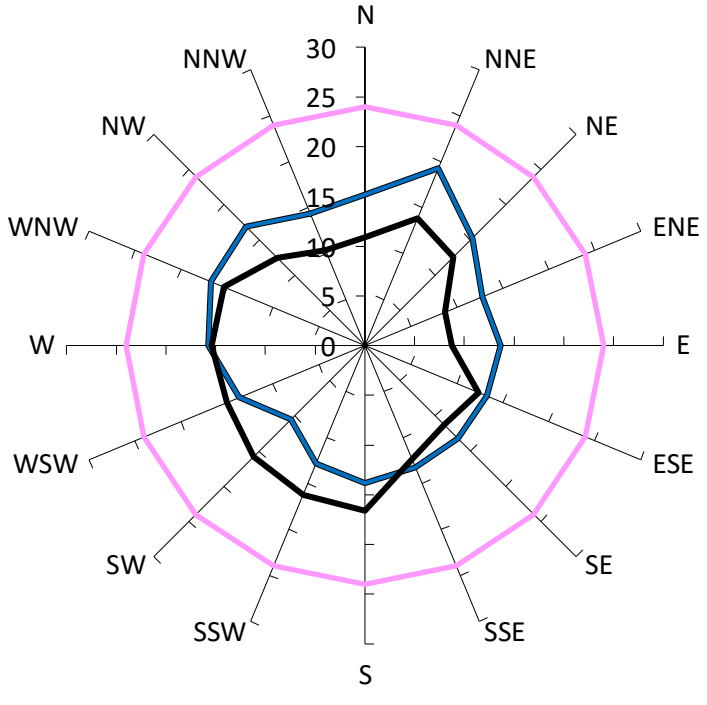
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.1	17
	Existing Site Conditions	5.8	16

Results for Point 13



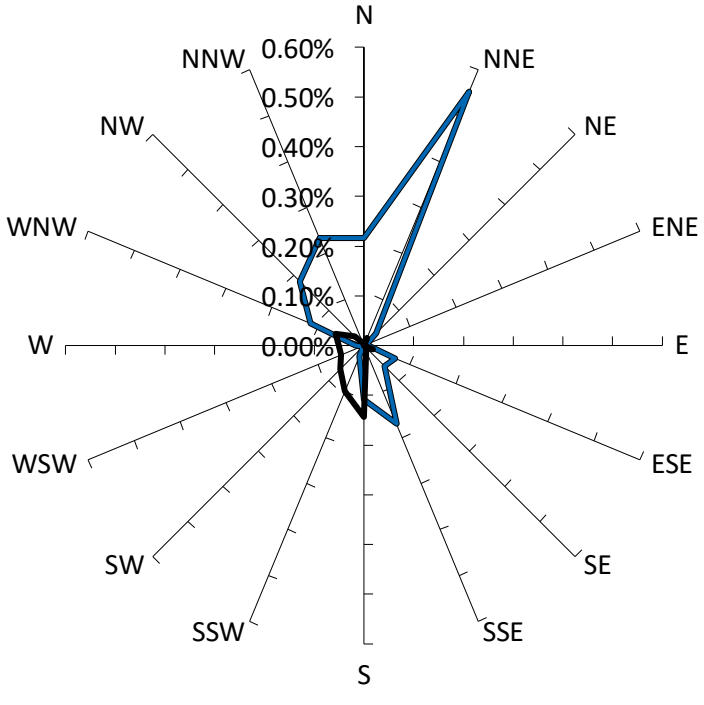
Annual probability of exceeding 8m/s (%)



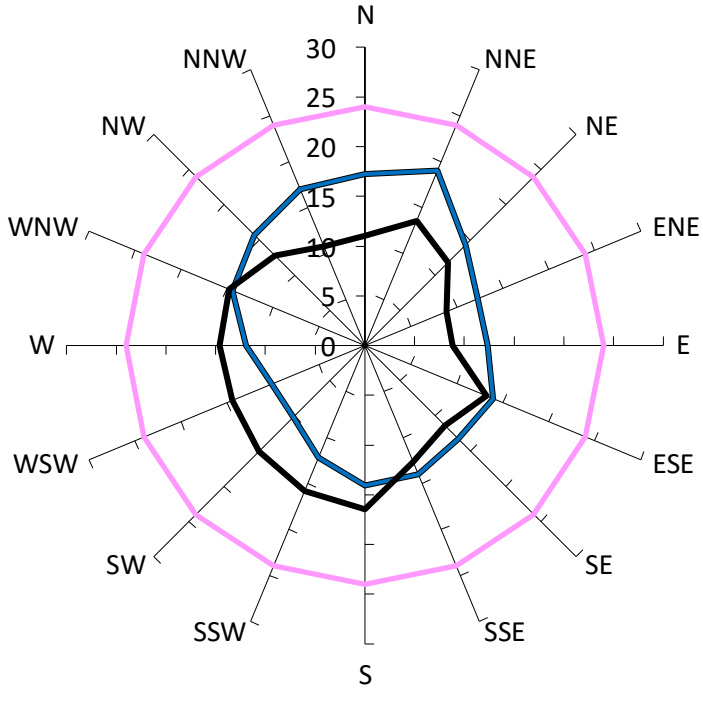
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.6	19
	Existing Site Conditions	6.0	17

Results for Point 14



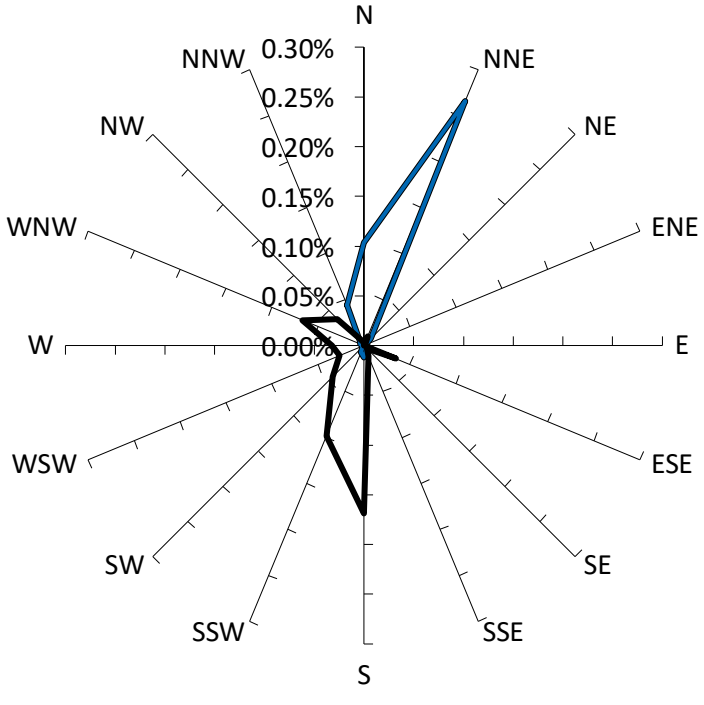
Annual probability of exceeding 8m/s (%)



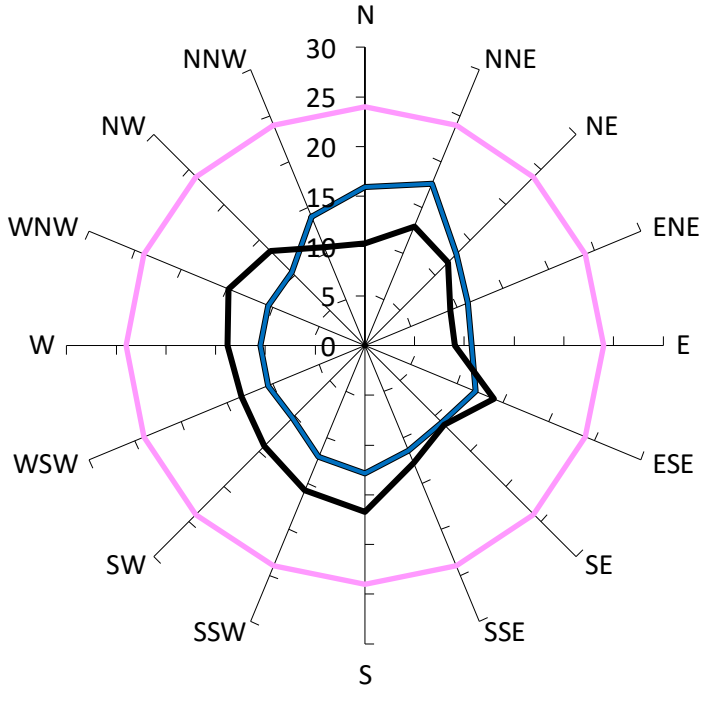
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.8	19
	Existing Site Conditions	5.9	16

Results for Point 15



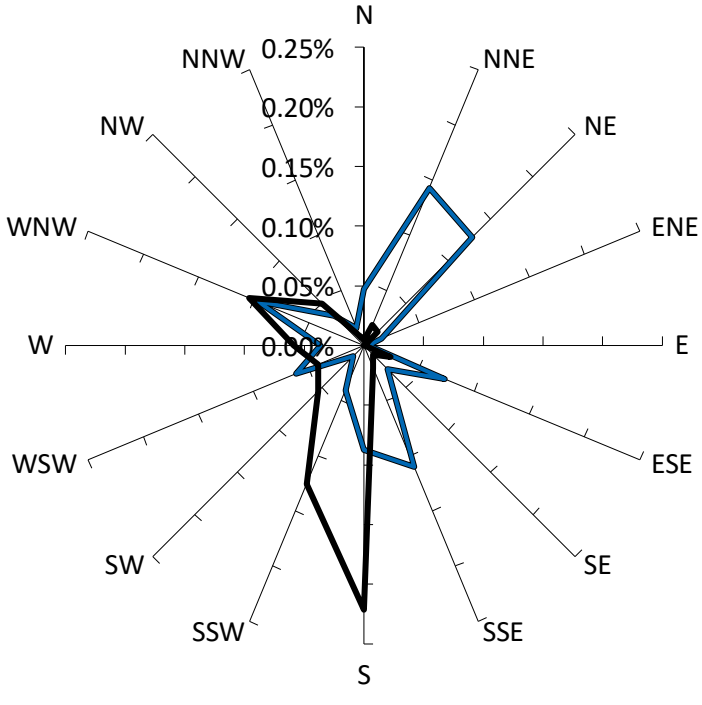
Annual probability of exceeding 8m/s (%)



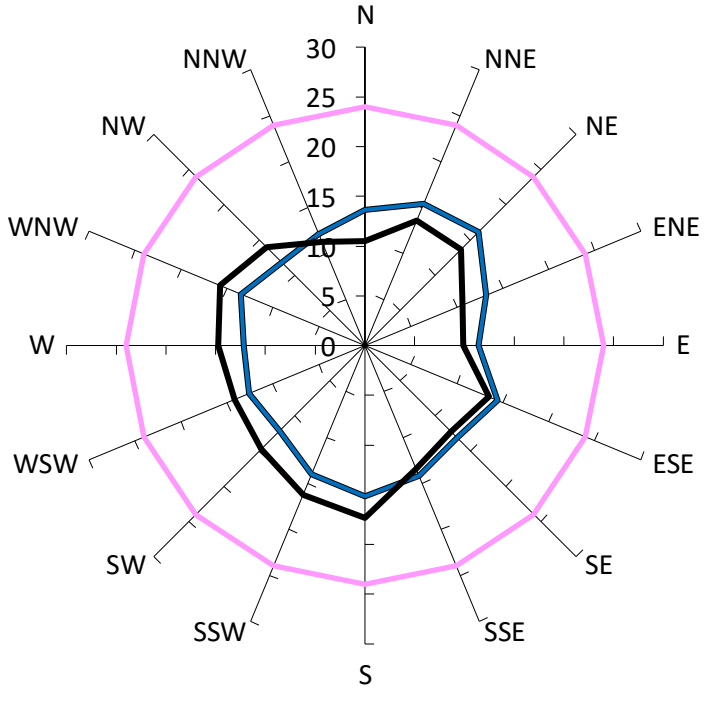
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.8	18
	Existing Site Conditions	5.9	17

Results for Point 16



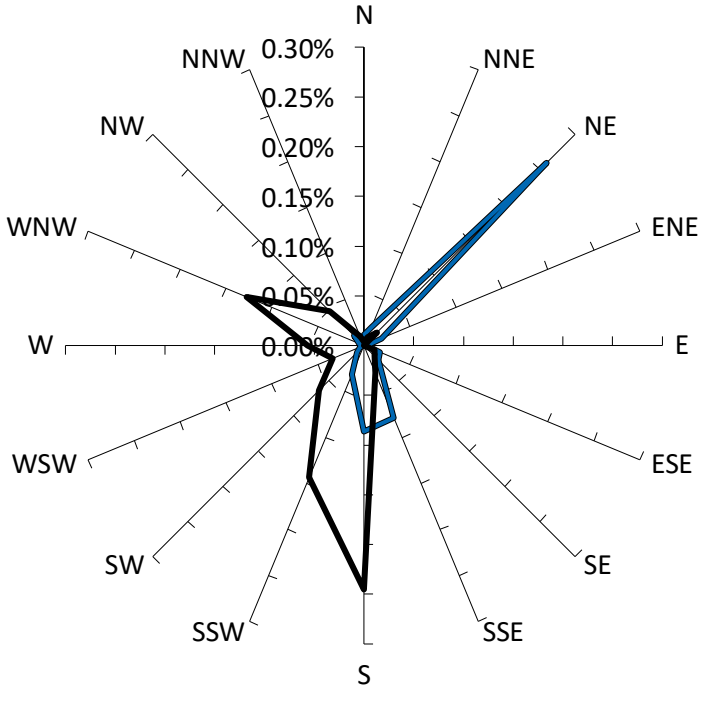
Annual probability of exceeding 8m/s (%)



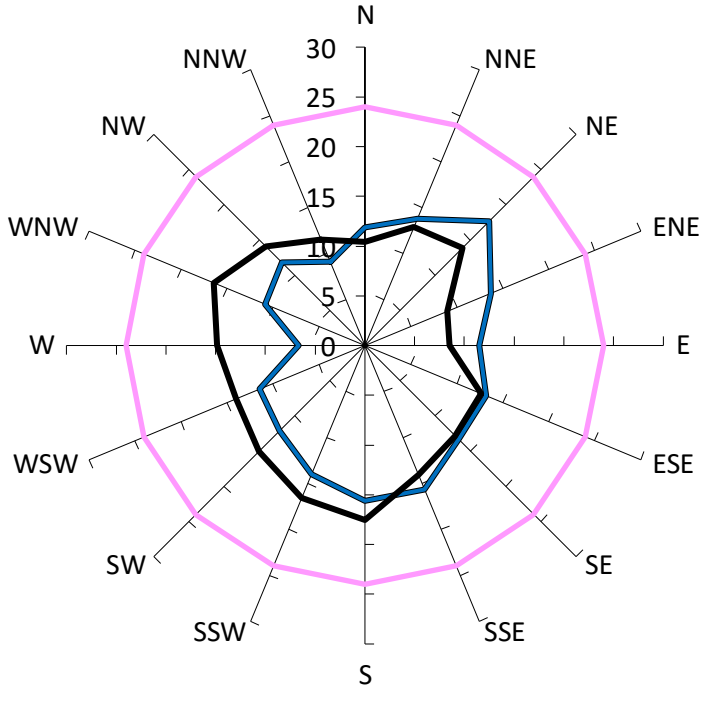
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.4	16
	Existing Site Conditions	6.1	17

Results for Point 17



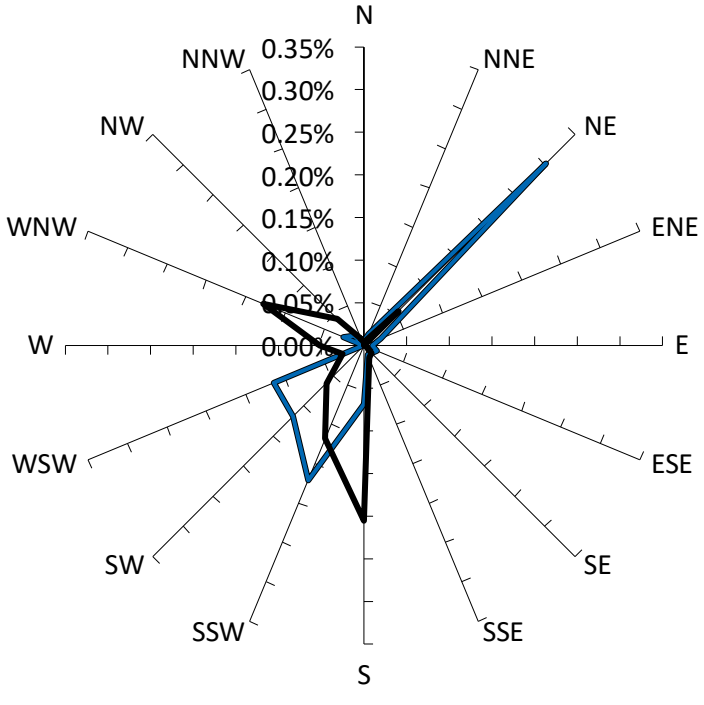
Annual probability of exceeding 8m/s (%)



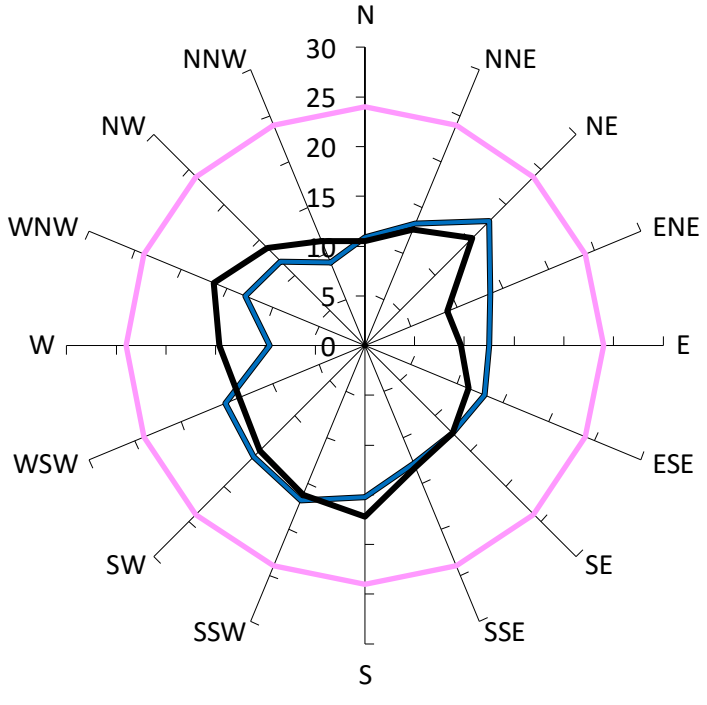
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.1	18
	Existing Site Conditions	6.1	18

Results for Point 18



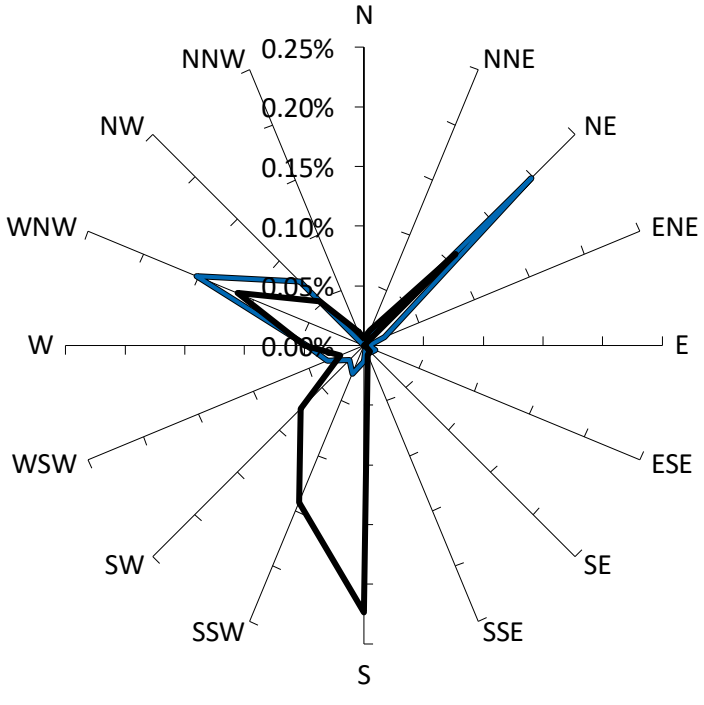
Annual probability of exceeding 8m/s (%)



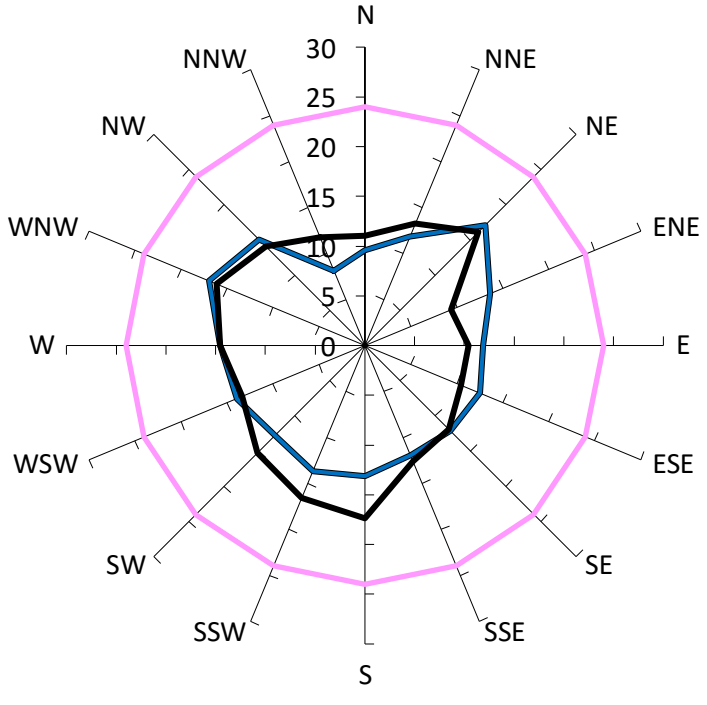
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.4	18
	Existing Site Conditions	6.1	17

Results for Point 19



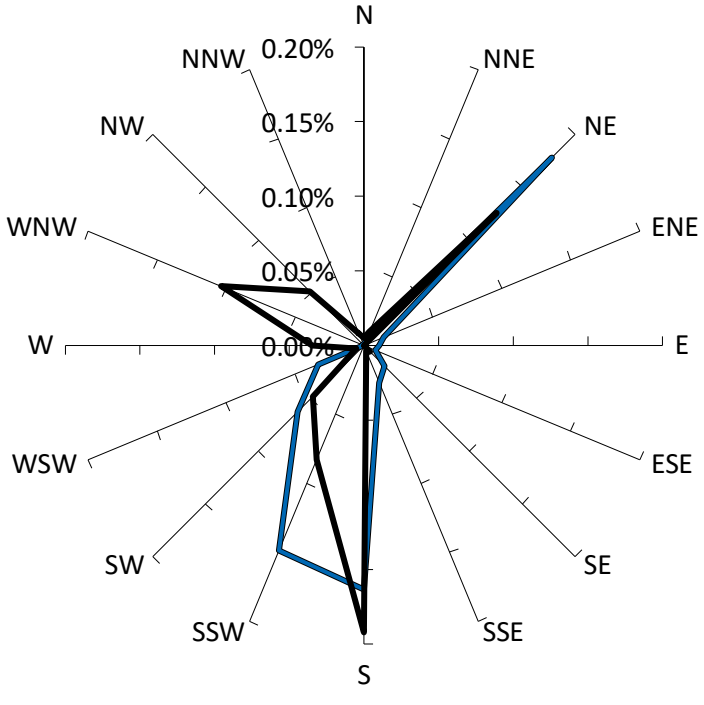
Annual probability of exceeding 8m/s (%)



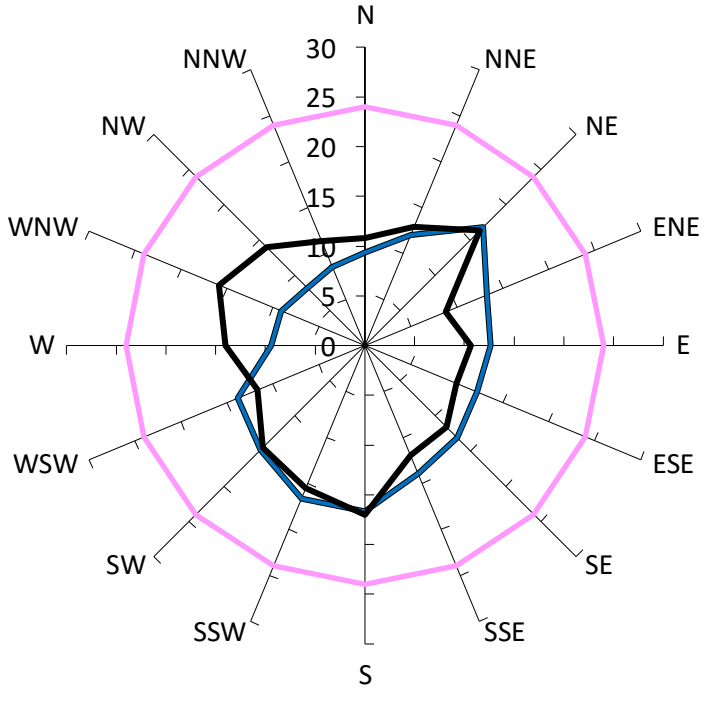
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.0	17
	Existing Site Conditions	6.2	17

Results for Point 20



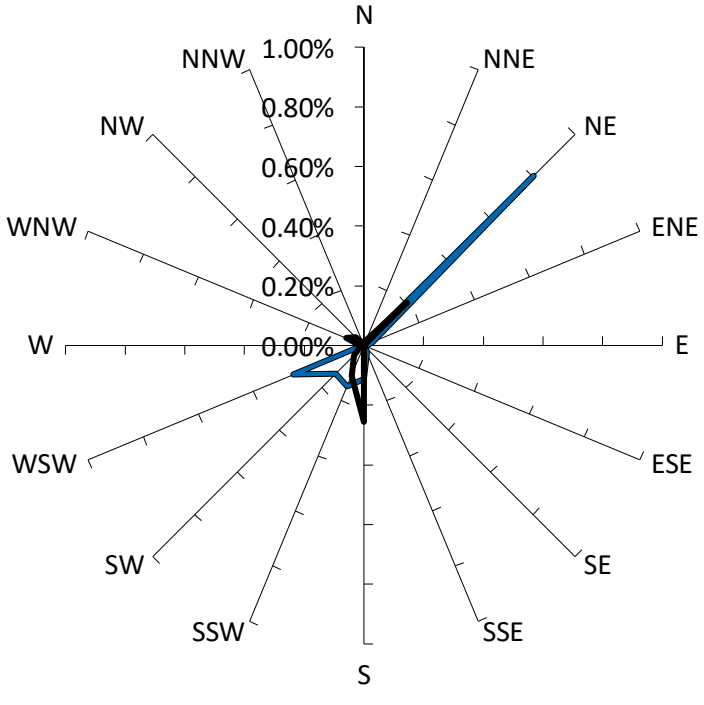
Annual probability of exceeding 8m/s (%)



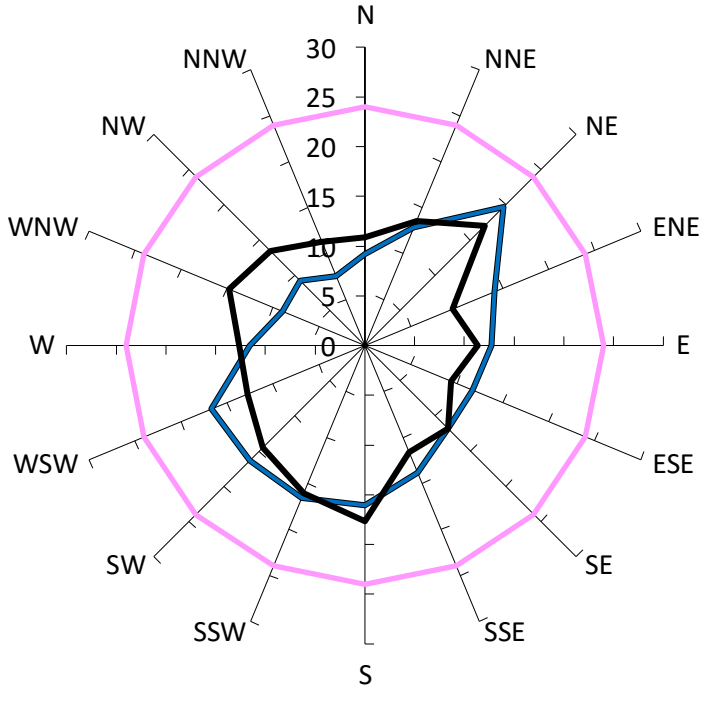
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.2	17
	Existing Site Conditions	6.1	17

Results for Point 21



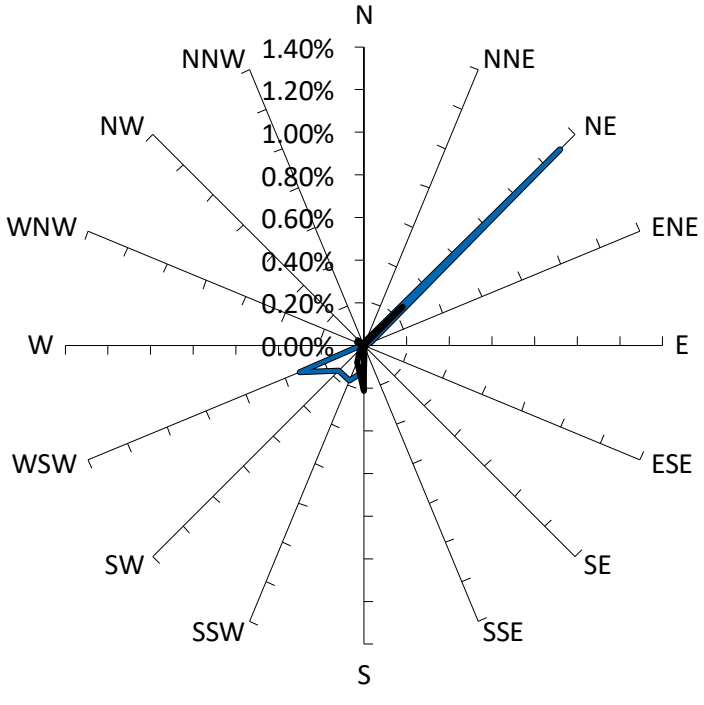
Annual probability of exceeding 8m/s (%)



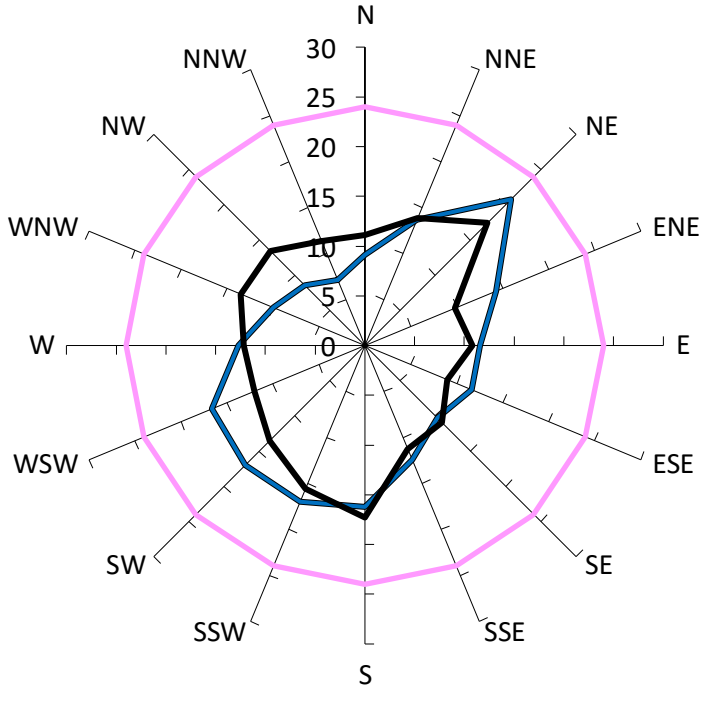
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.8	20
	Existing Site Conditions	6.2	18

Results for Point 22



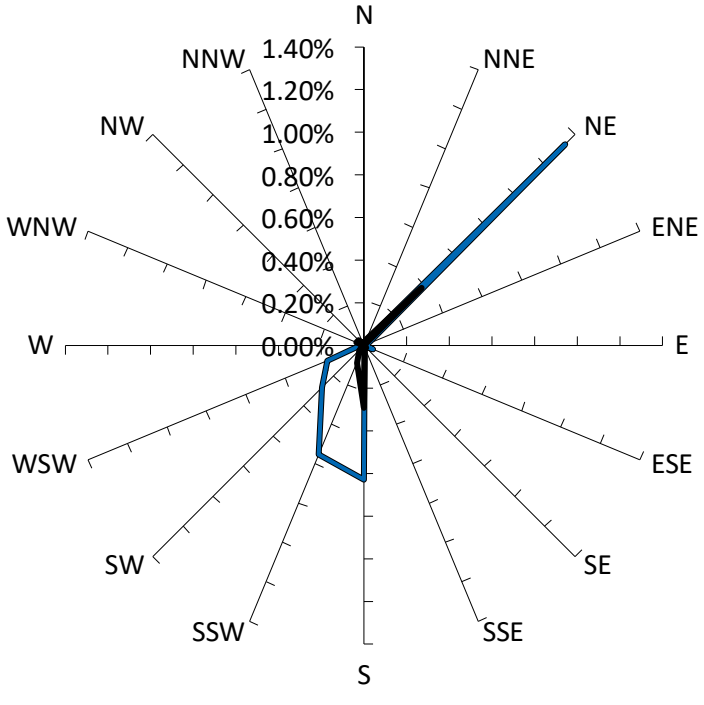
Annual probability of exceeding 8m/s (%)



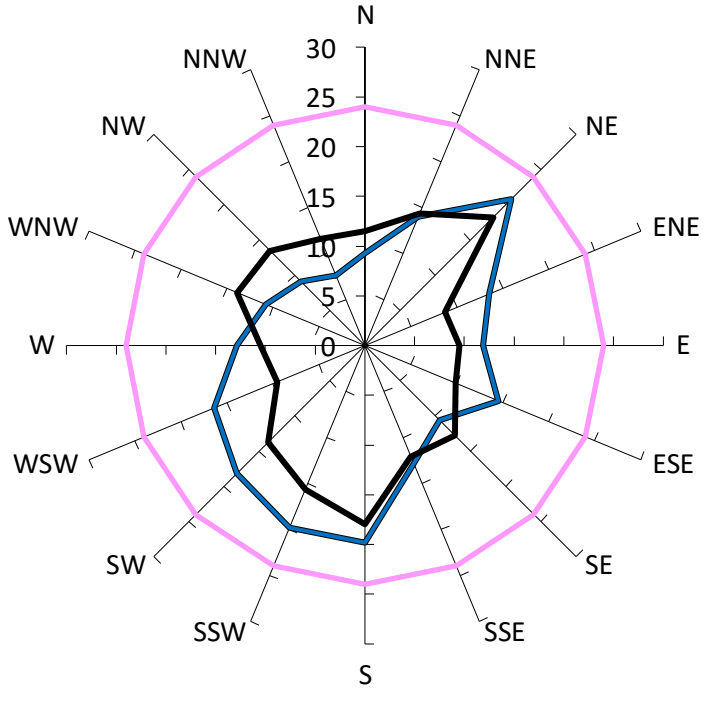
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.1	21
	Existing Site Conditions	6.2	17

Results for Point 23



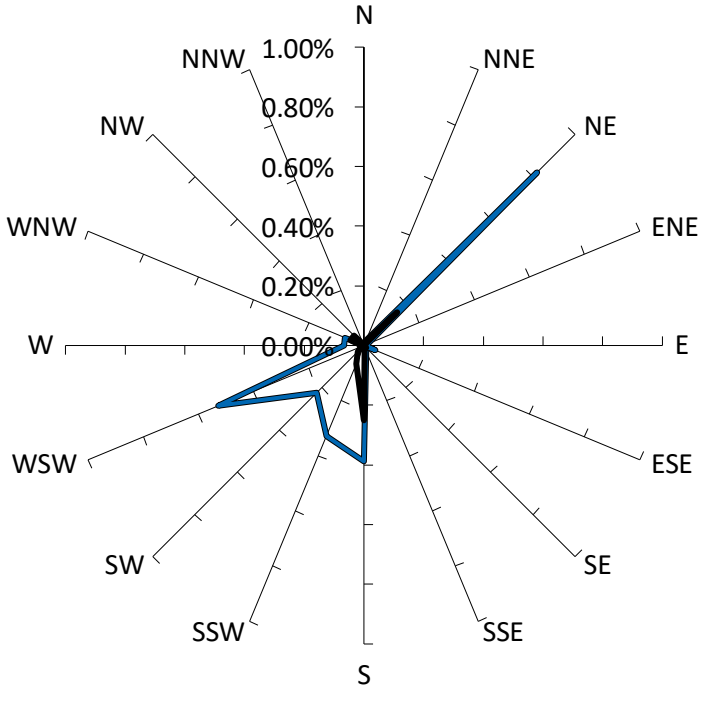
Annual probability of exceeding 8m/s (%)



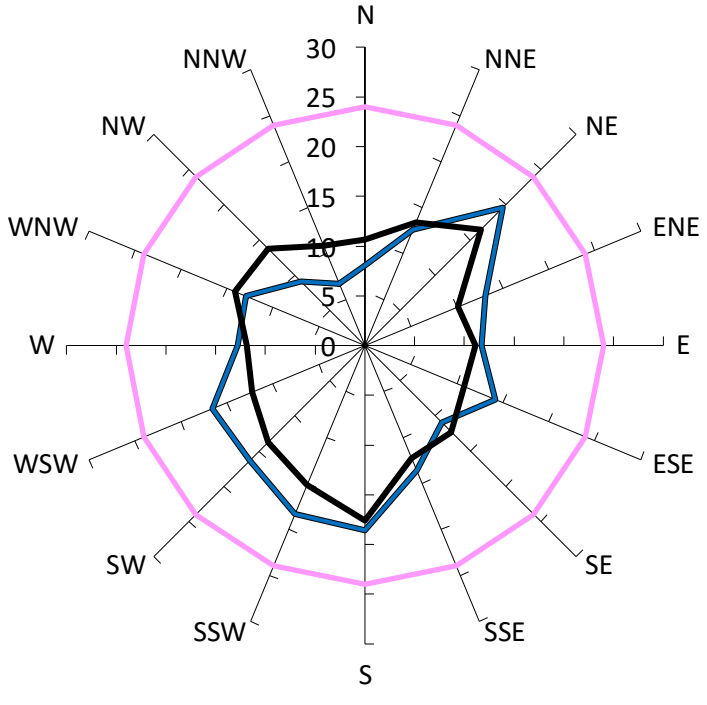
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.4	21
	Existing Site Conditions	6.4	18

Results for Point 24



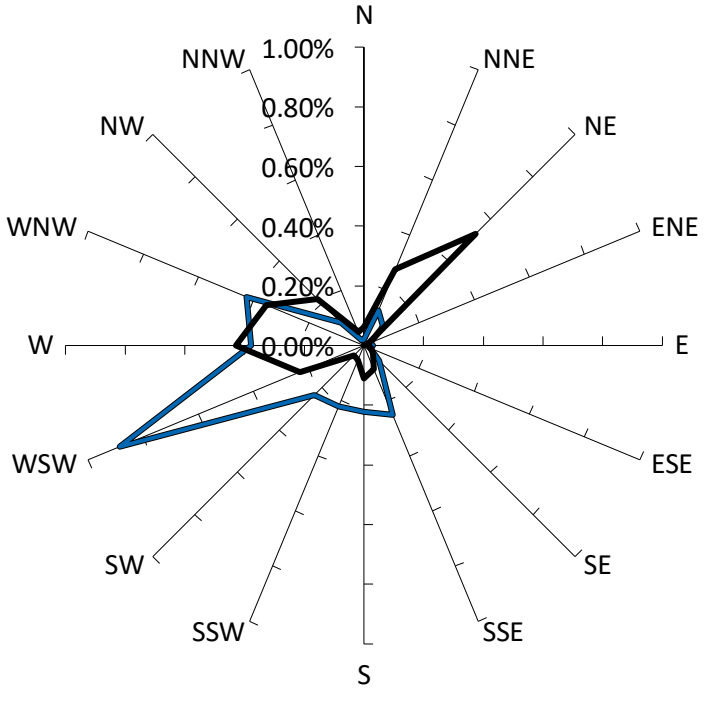
Annual probability of exceeding 8m/s (%)



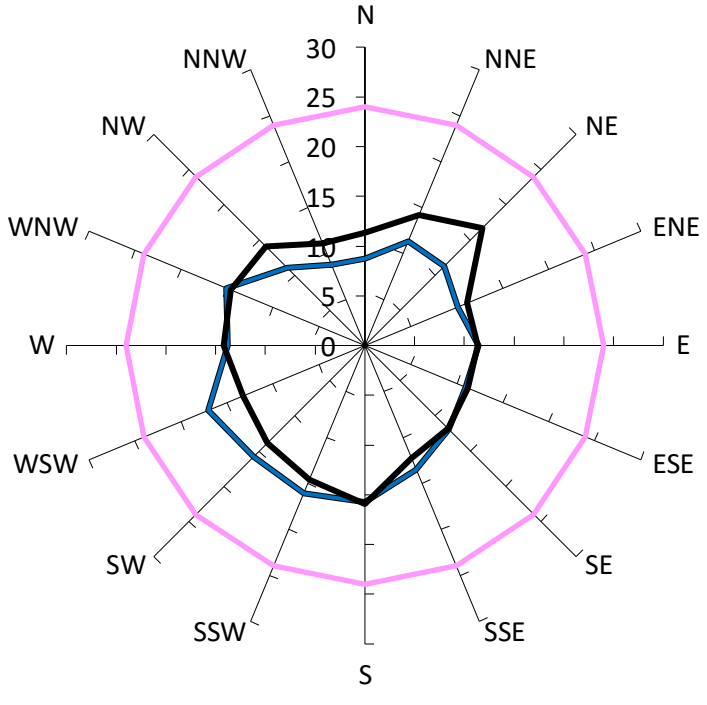
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.2	20
	Existing Site Conditions	6.1	18

Results for Point 25



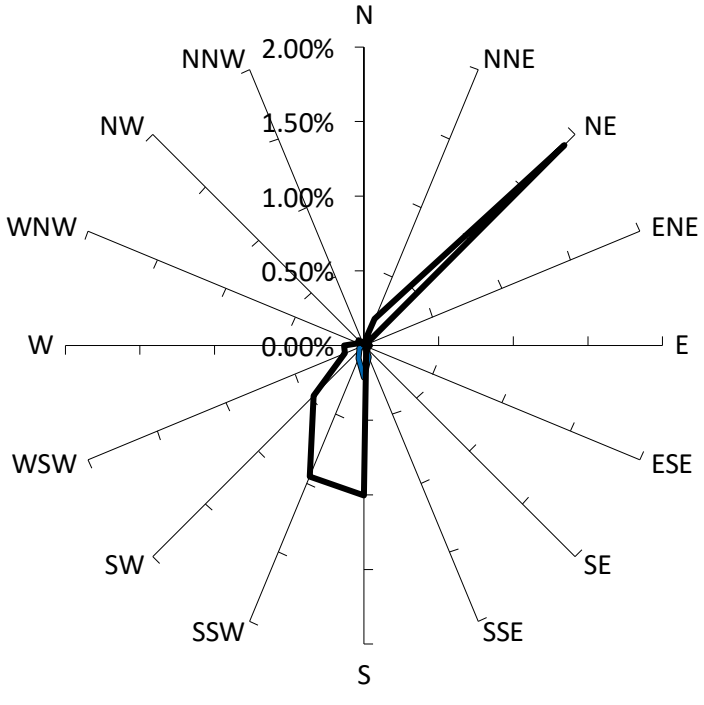
Annual probability of exceeding 8m/s (%)



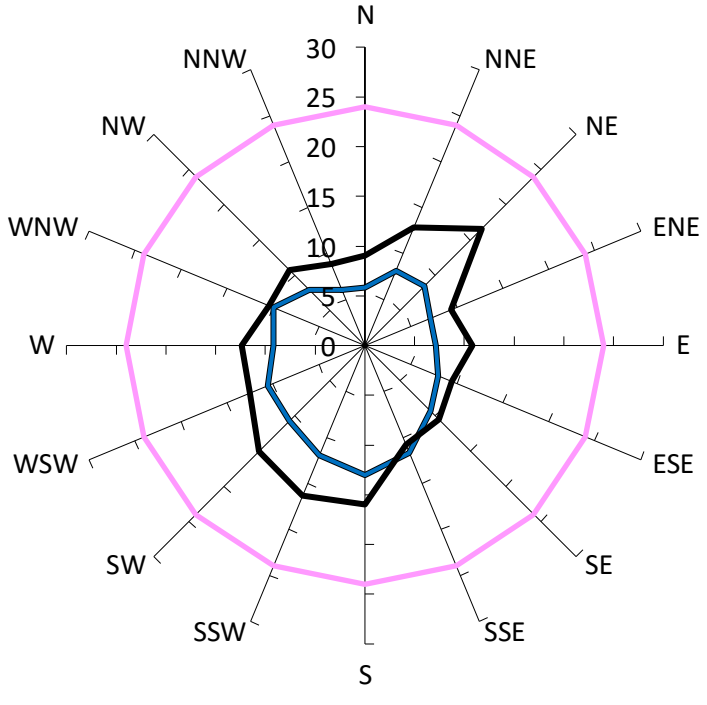
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.3	17
	Existing Site Conditions	7.2	17

Results for Point 26



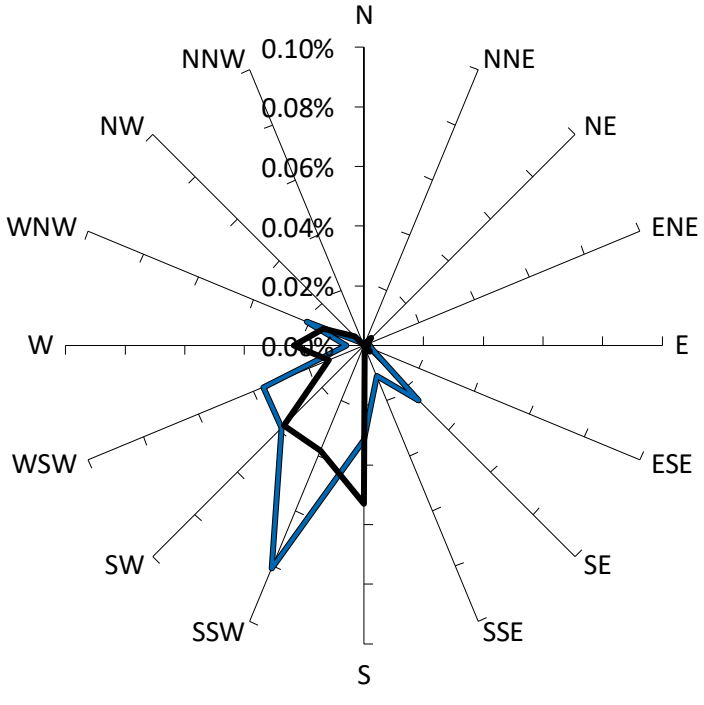
Annual probability of exceeding 6m/s (%)



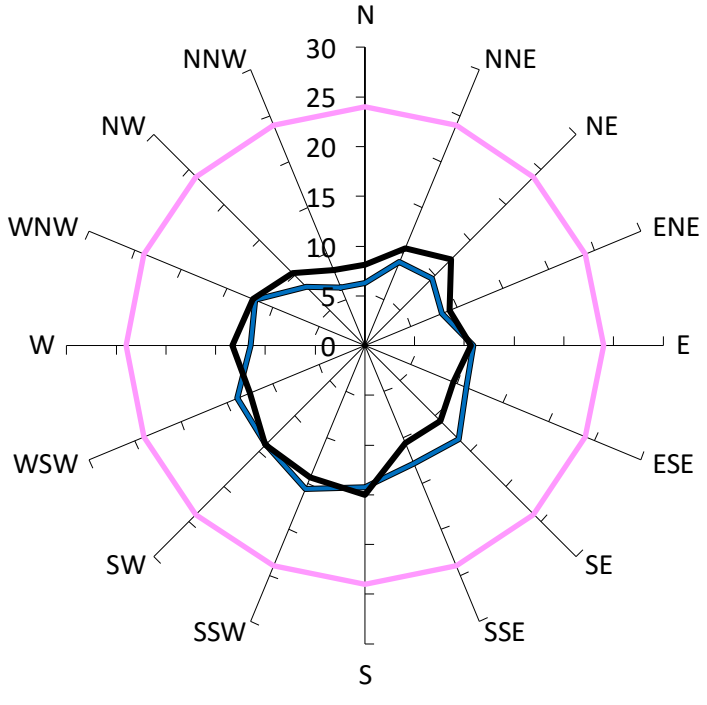
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	4.4	13
	Existing Site Conditions	5.9	17

Results for Point 27



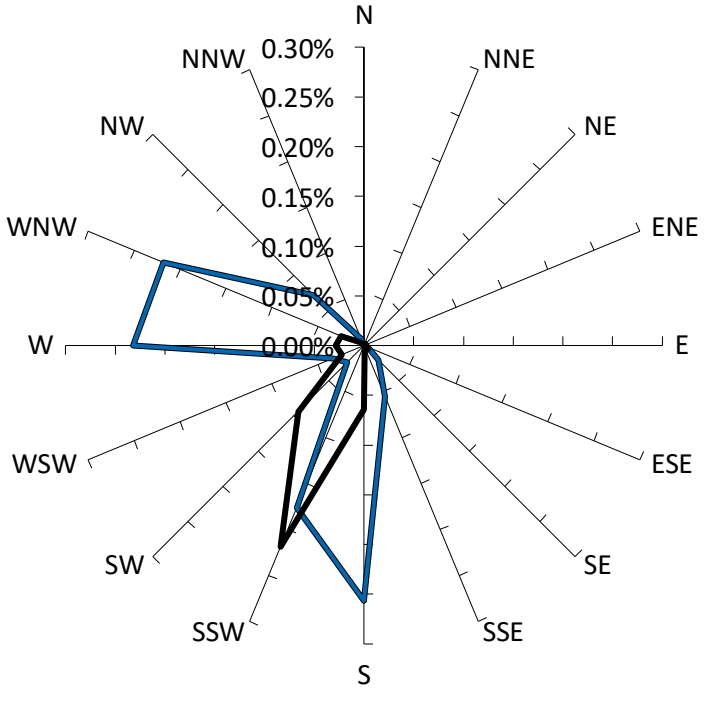
Annual probability of exceeding 8m/s (%)



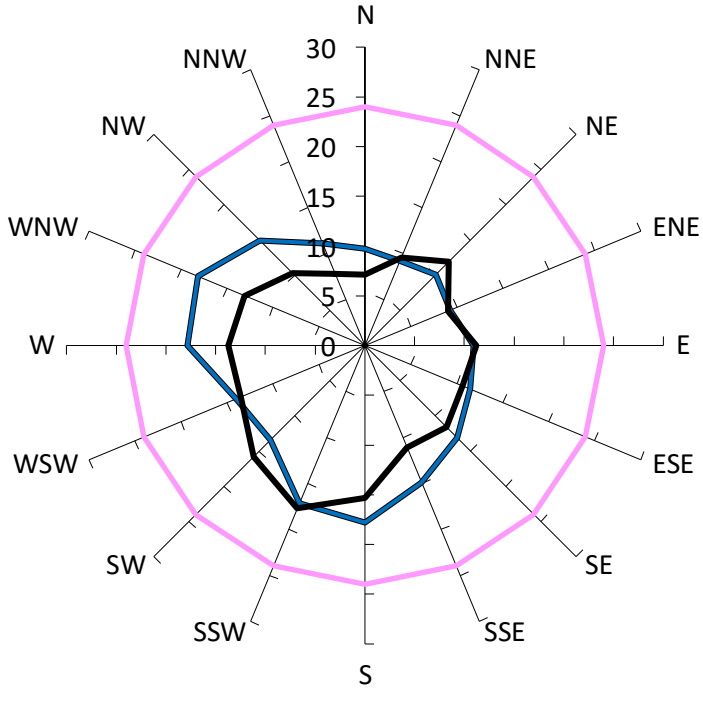
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.4	16
	Existing Site Conditions	5.2	15

Results for Point 28



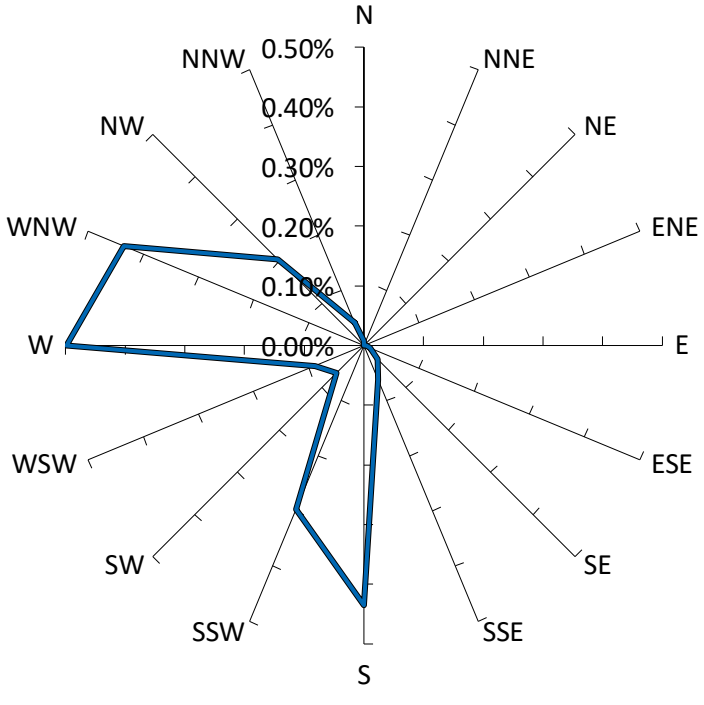
Annual probability of exceeding 8m/s (%)



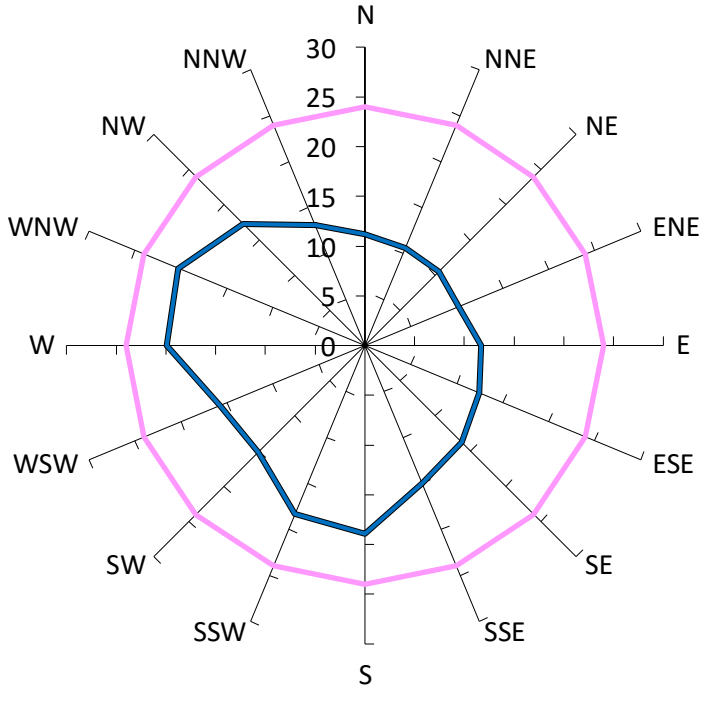
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.3	18
	Existing Site Conditions	5.7	18

Results for Point 29



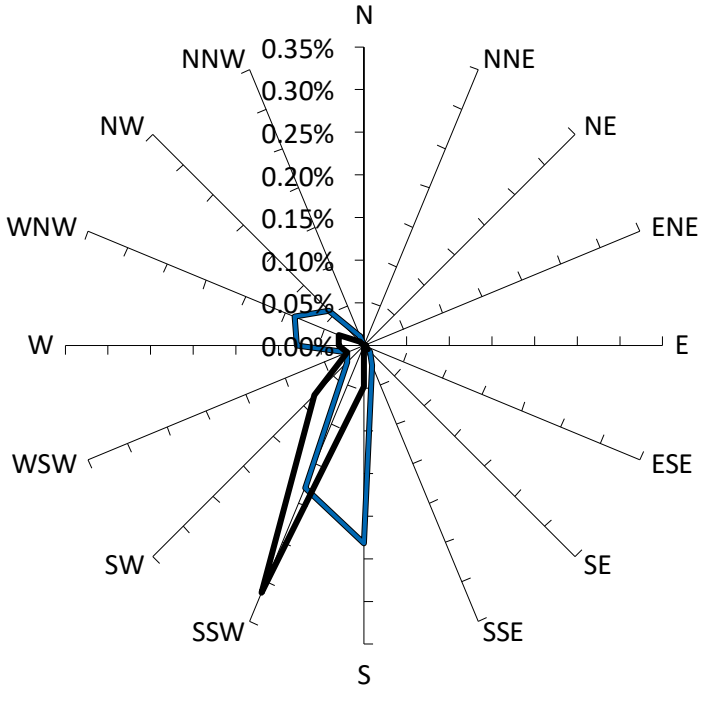
Annual probability of exceeding 8m/s (%)



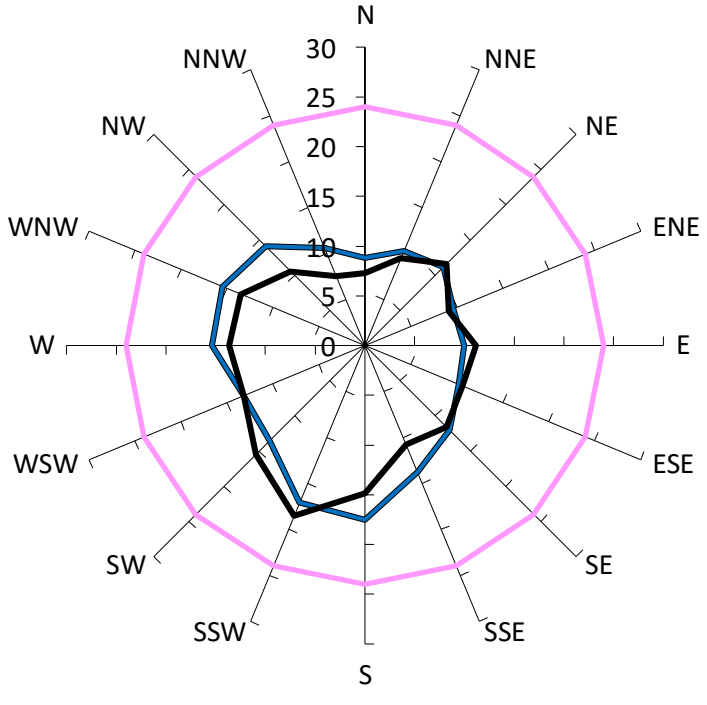
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.9	20

Results for Point 30



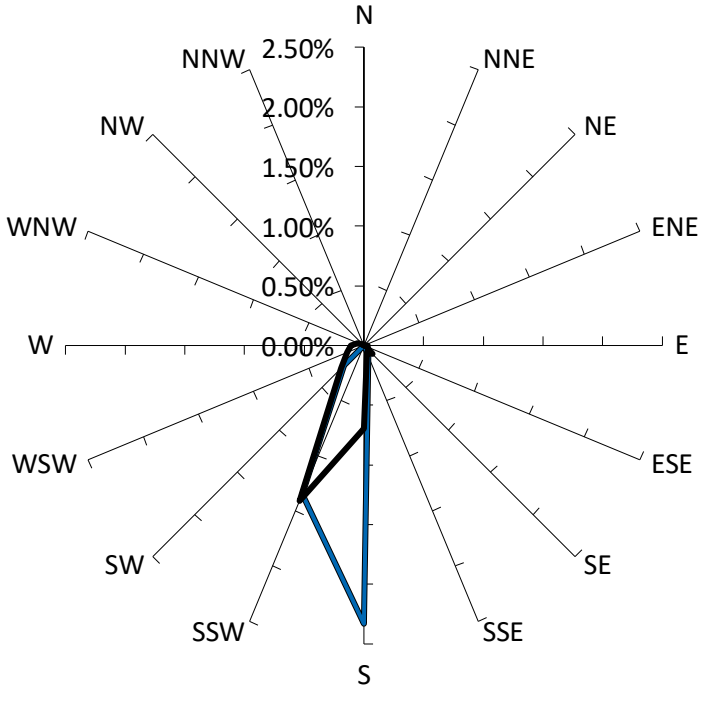
Annual probability of exceeding 8m/s (%)



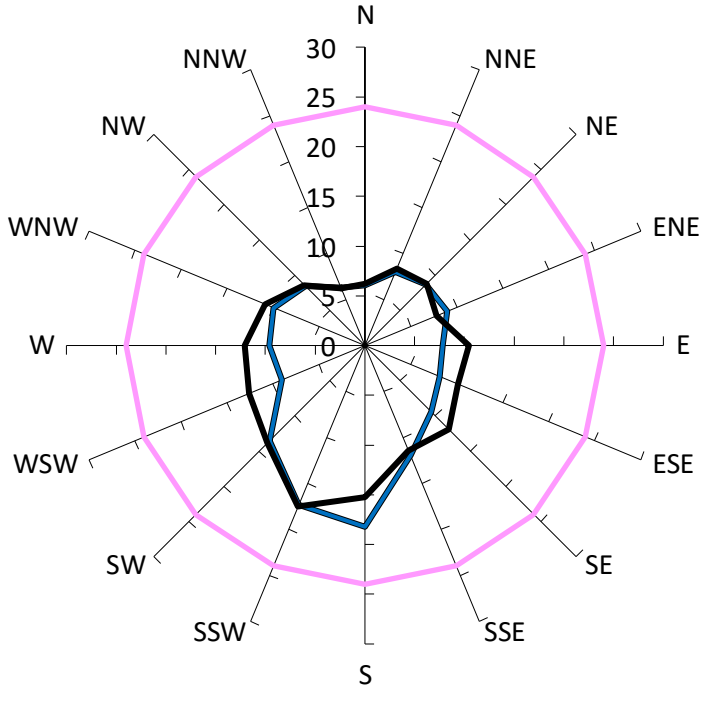
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.0	18
	Existing Site Conditions	5.7	19

Results for Point 31



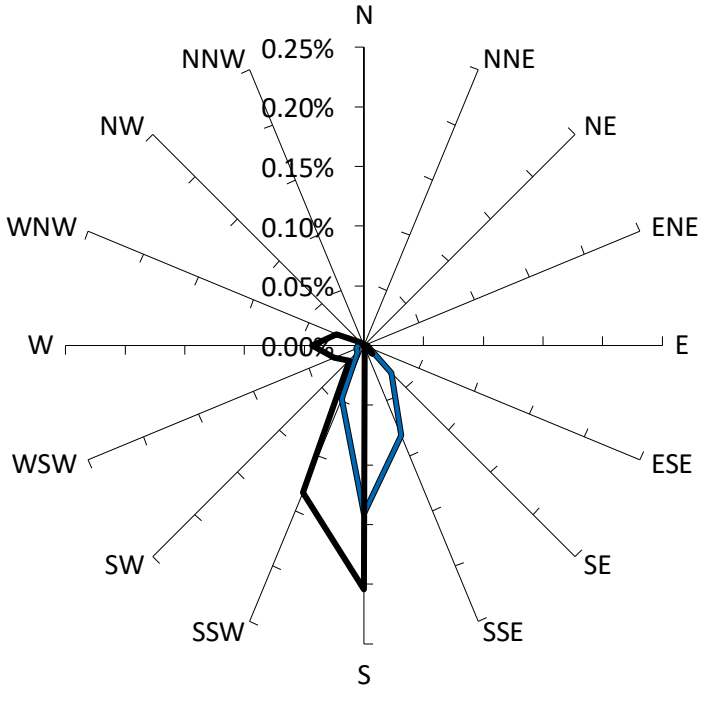
Annual probability of exceeding 6m/s (%)



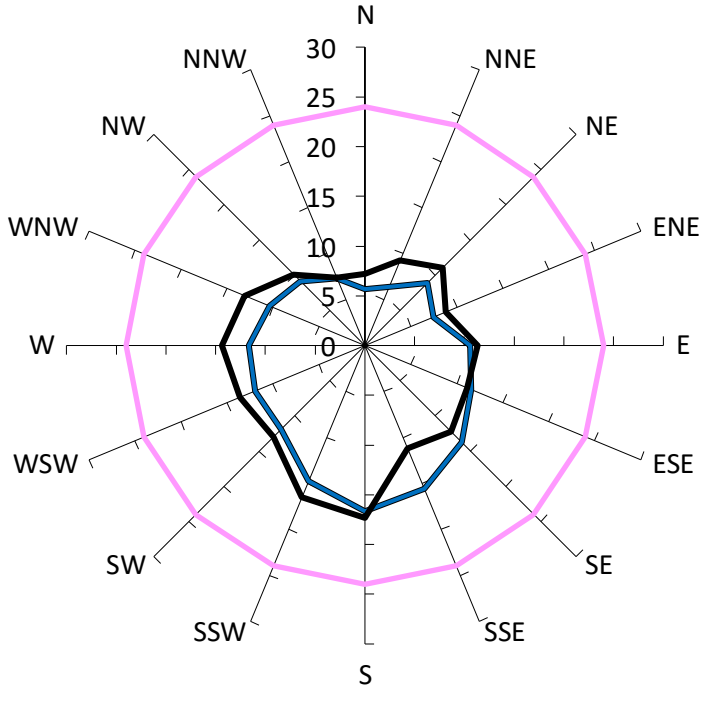
Annual Maximum Gust (m/s)

Description	GEM Wind Speed (m/s)	Peak Gust m/s
Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
With development "as proposed", no vegetation or other treatments.	5.7	18
Existing Site Conditions	5.4	18

Results for Point 32



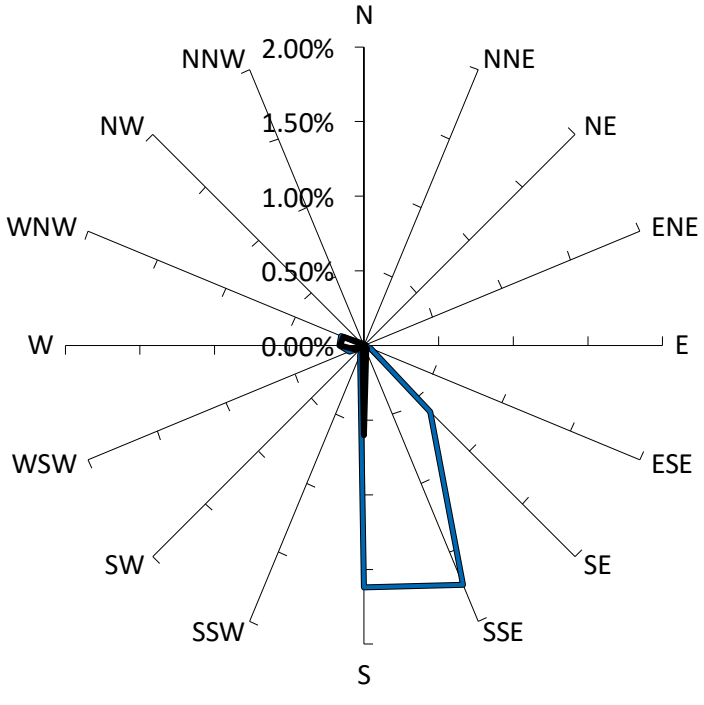
Annual probability of exceeding 8m/s (%)



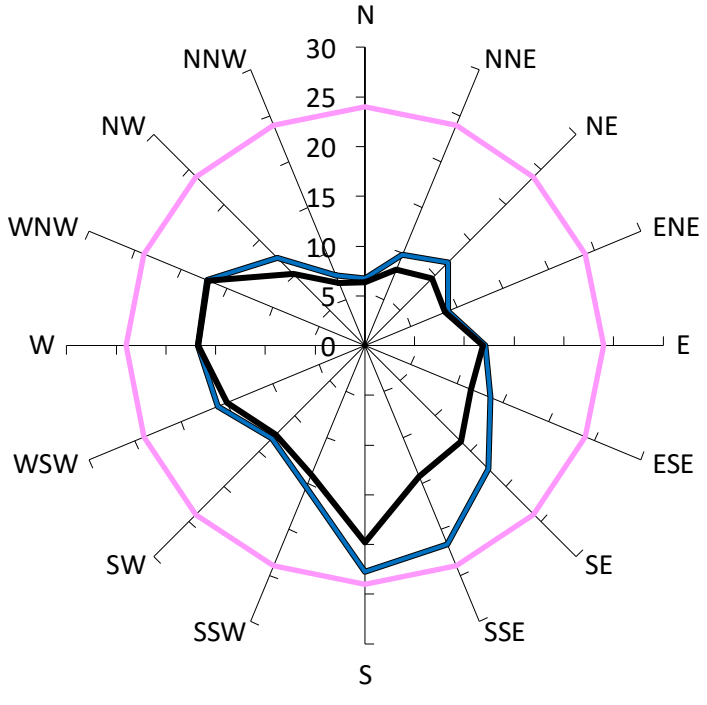
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.6	17
	Existing Site Conditions	5.7	17

Results for Point 33



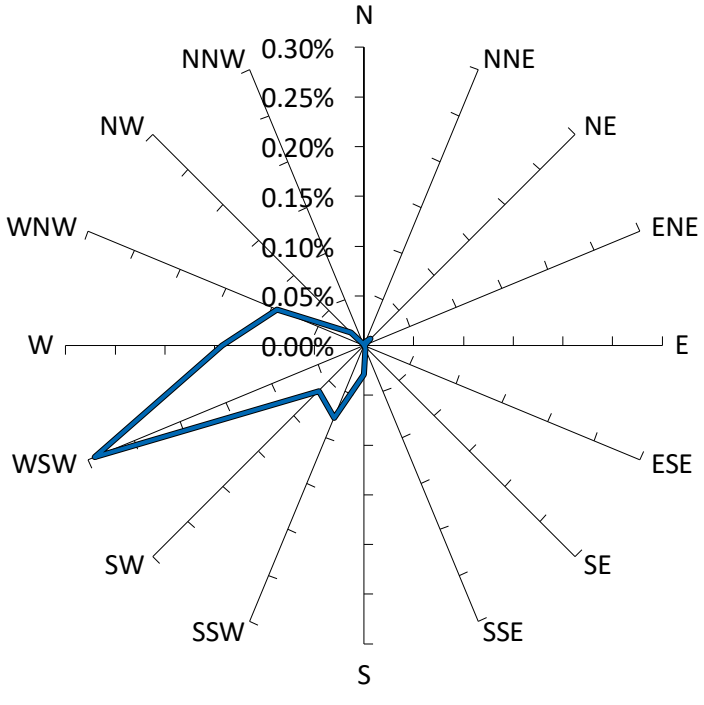
Annual probability of exceeding 8m/s (%)



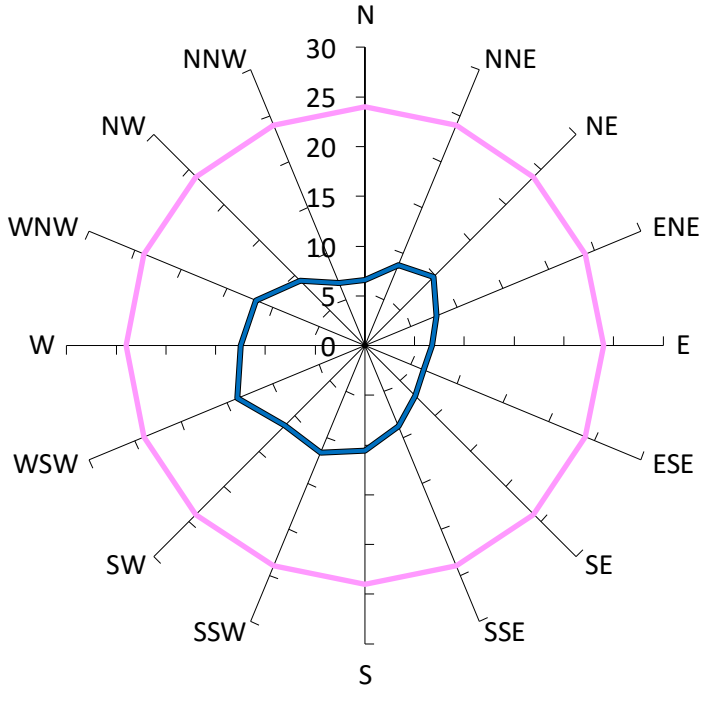
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.8	23
	Existing Site Conditions	6.3	20

Results for Point 34



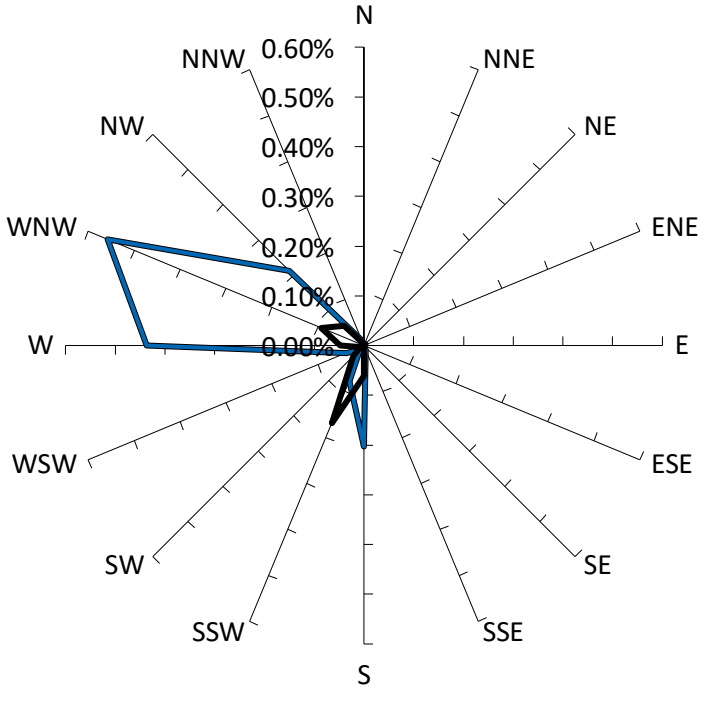
Annual probability of exceeding 6m/s (%)



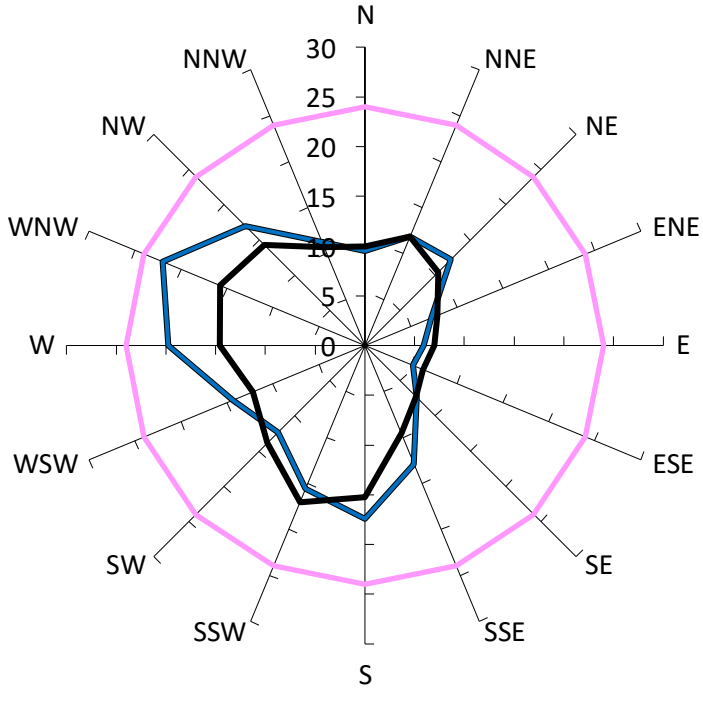
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	4.4	14

Results for Point 35



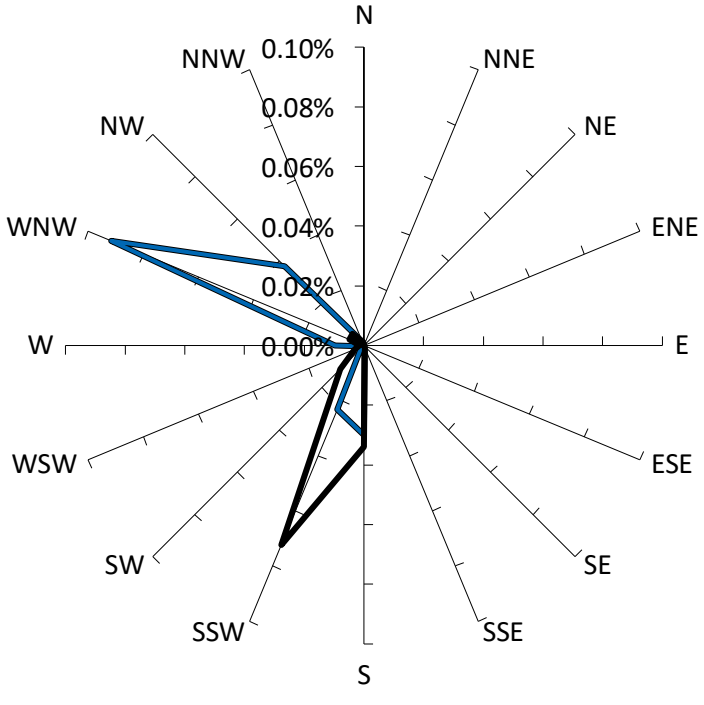
Annual probability of exceeding 8m/s (%)



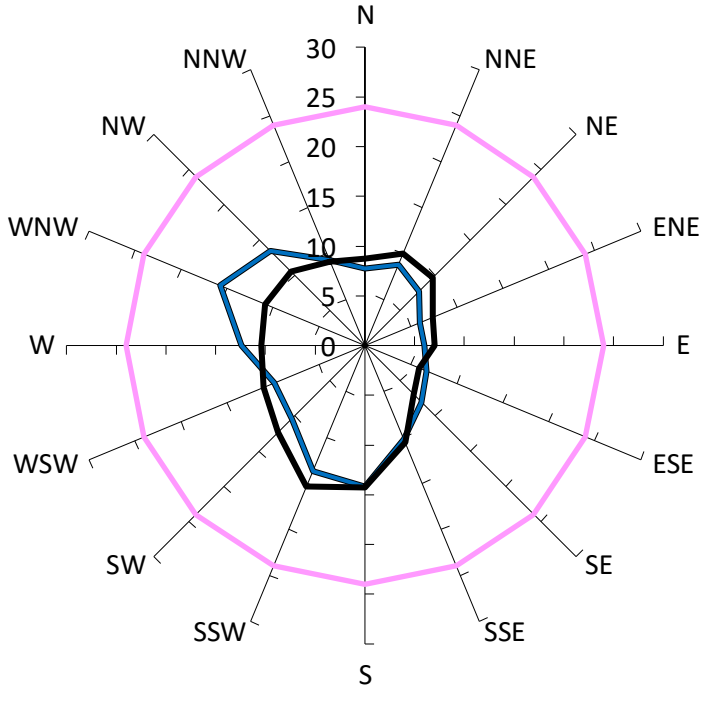
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.4	22
	Existing Site Conditions	5.6	17

Results for Point 36



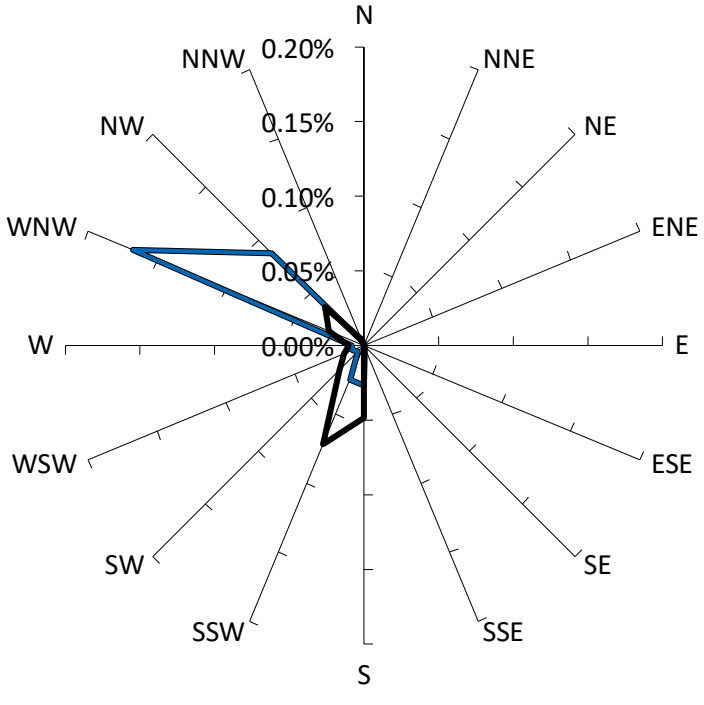
Annual probability of exceeding 8m/s (%)



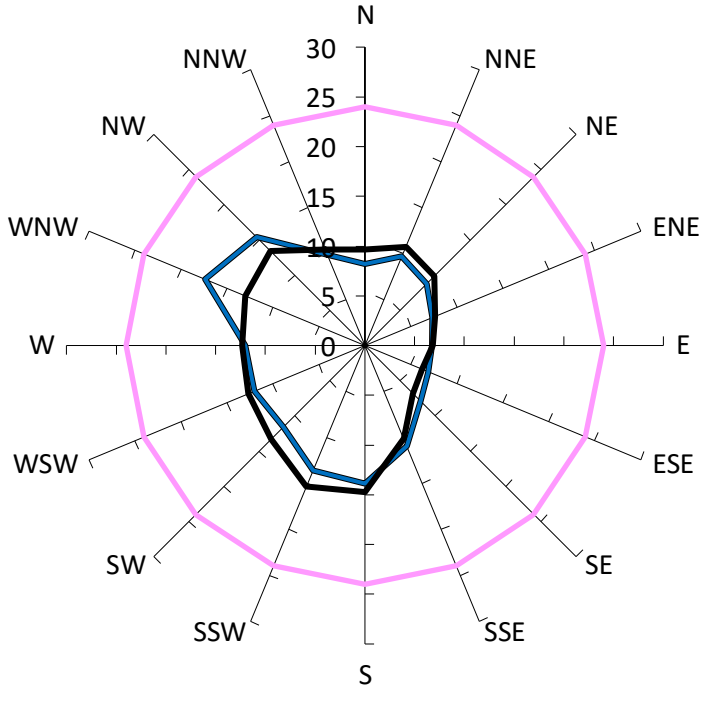
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	4.9	16
	Existing Site Conditions	4.9	15

Results for Point 37



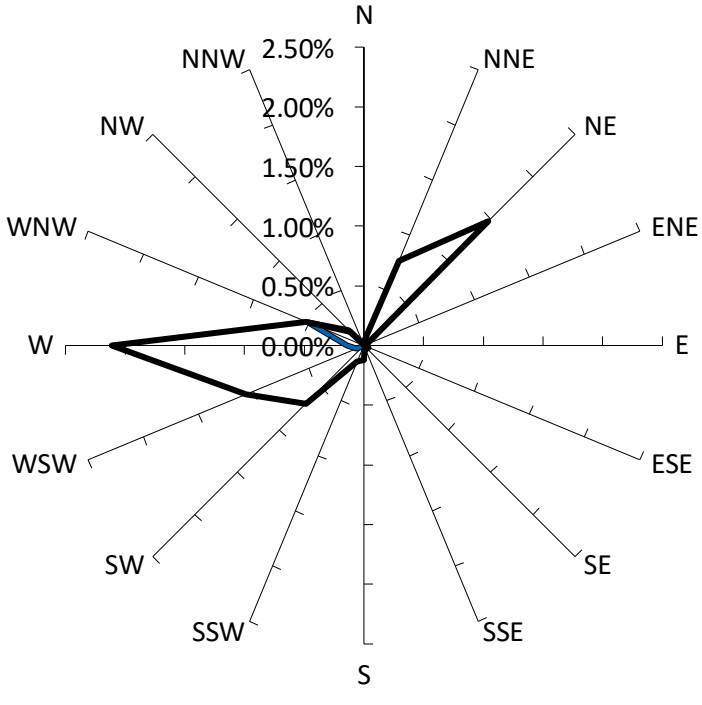
Annual probability of exceeding 8m/s (%)



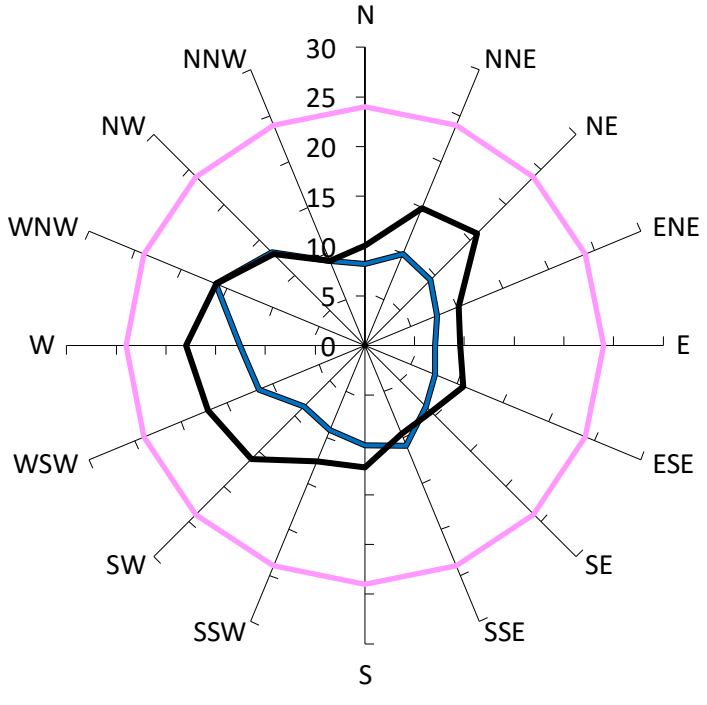
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.1	17
	Existing Site Conditions	5.2	15

Results for Point 38



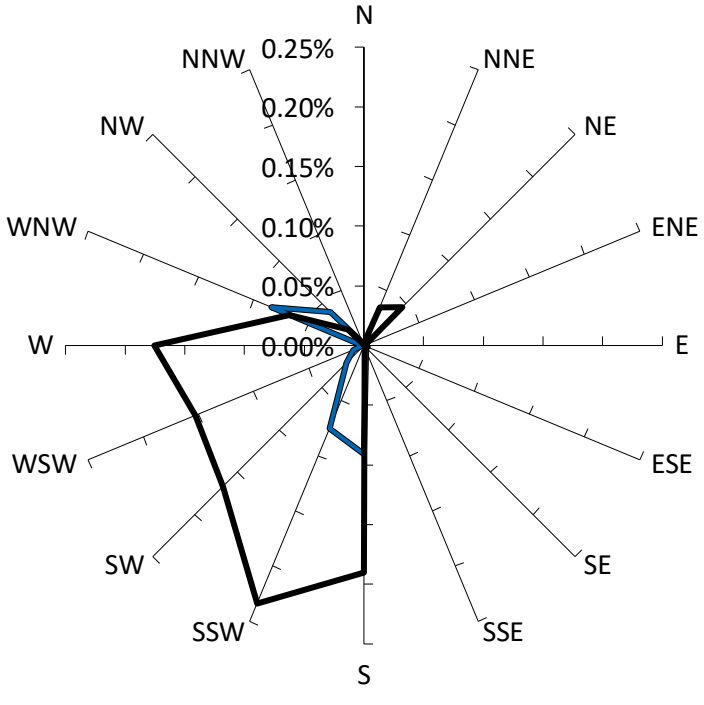
Annual probability of exceeding 6m/s (%)



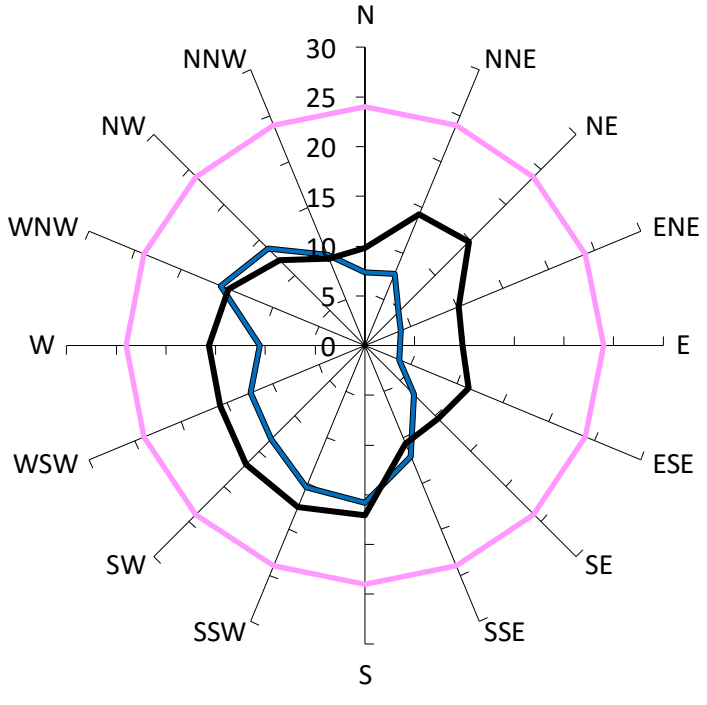
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	4.5	16
	Existing Site Conditions	6.2	18

Results for Point 39



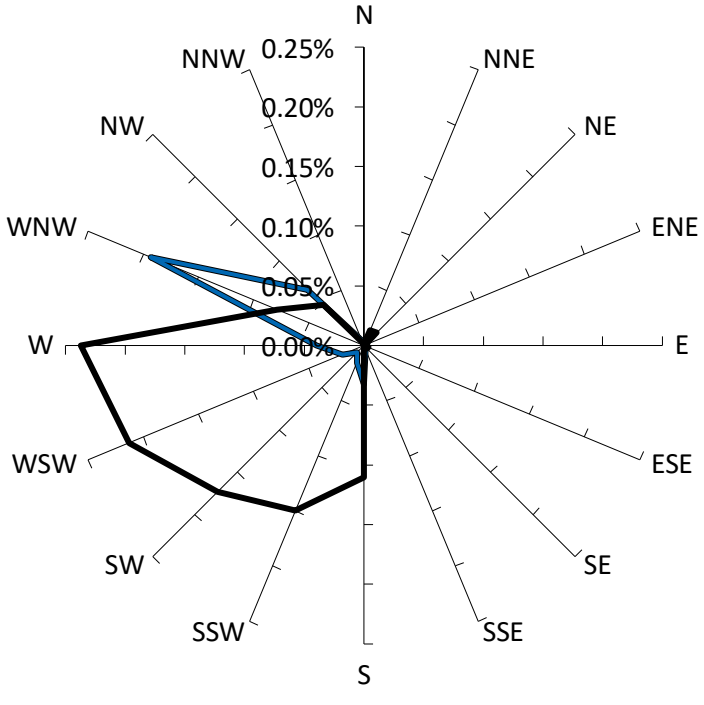
Annual probability of exceeding 8m/s (%)



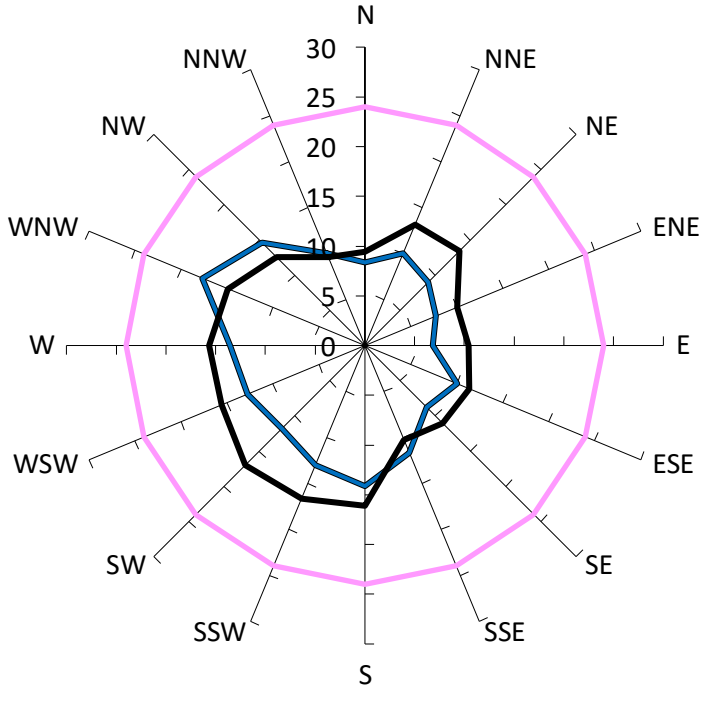
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.3	16
	Existing Site Conditions	6.4	18

Results for Point 40



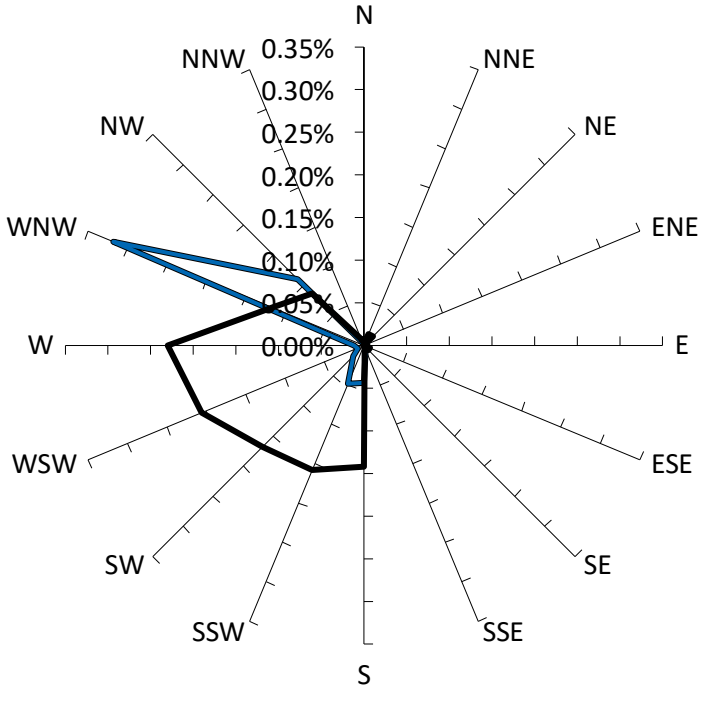
Annual probability of exceeding 8m/s (%)



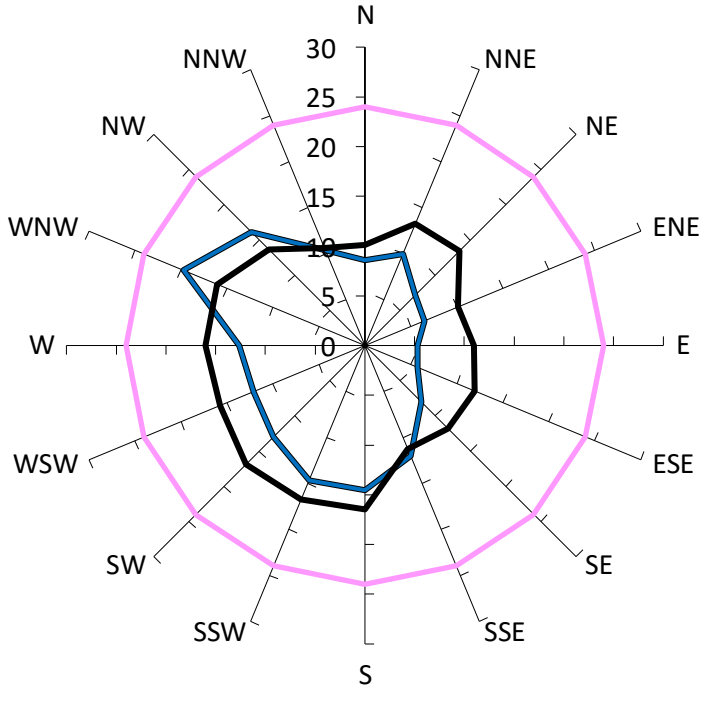
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.3	18
	Existing Site Conditions	6.2	17

Results for Point 41



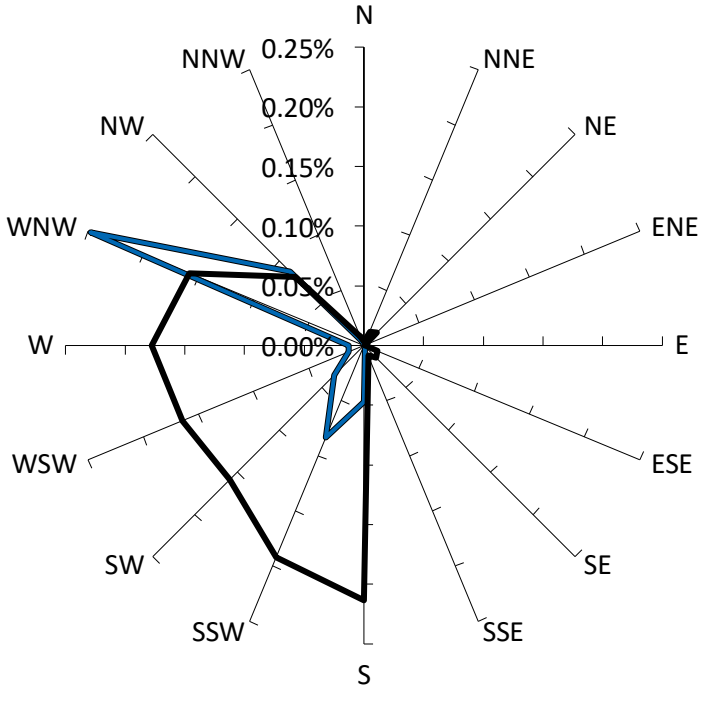
Annual probability of exceeding 8m/s (%)



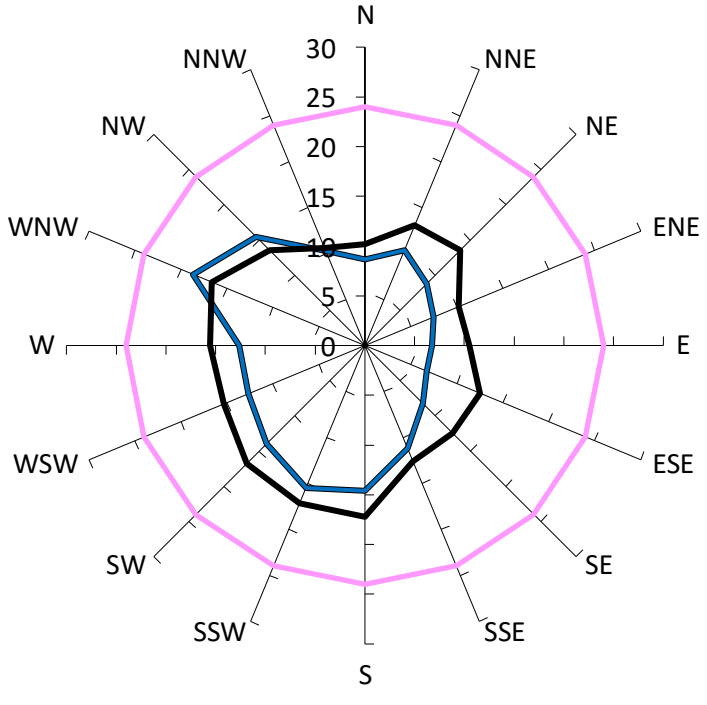
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.4	20
	Existing Site Conditions	6.3	17

Results for Point 42



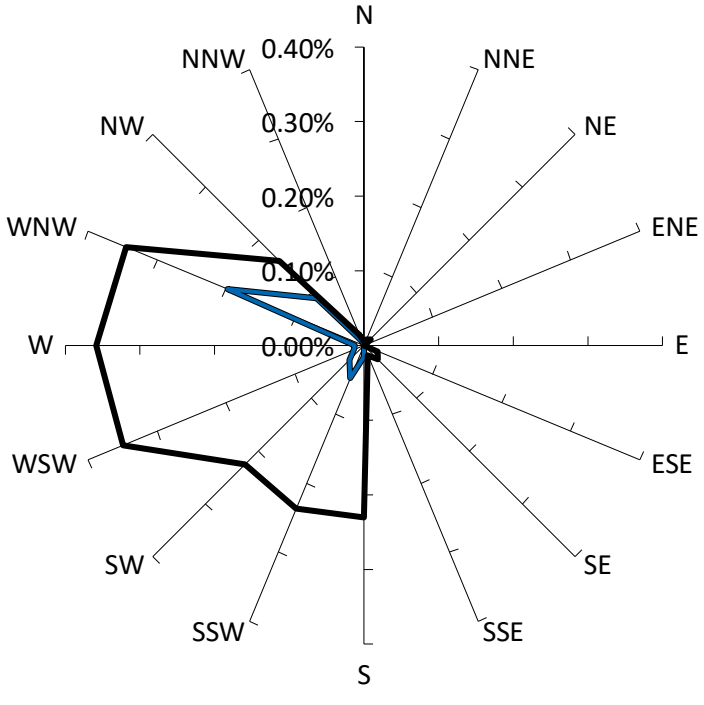
Annual probability of exceeding 8m/s (%)



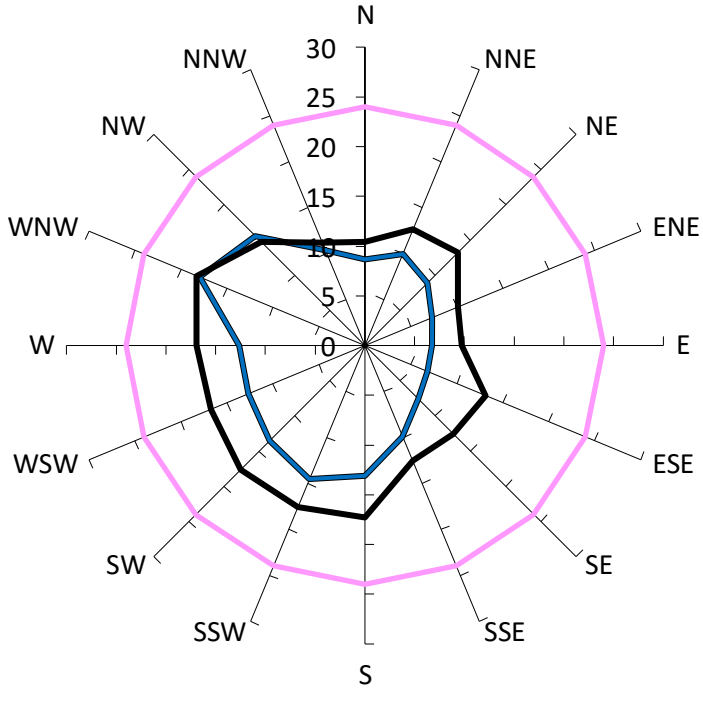
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.5	19
	Existing Site Conditions	6.4	17

Results for Point 43



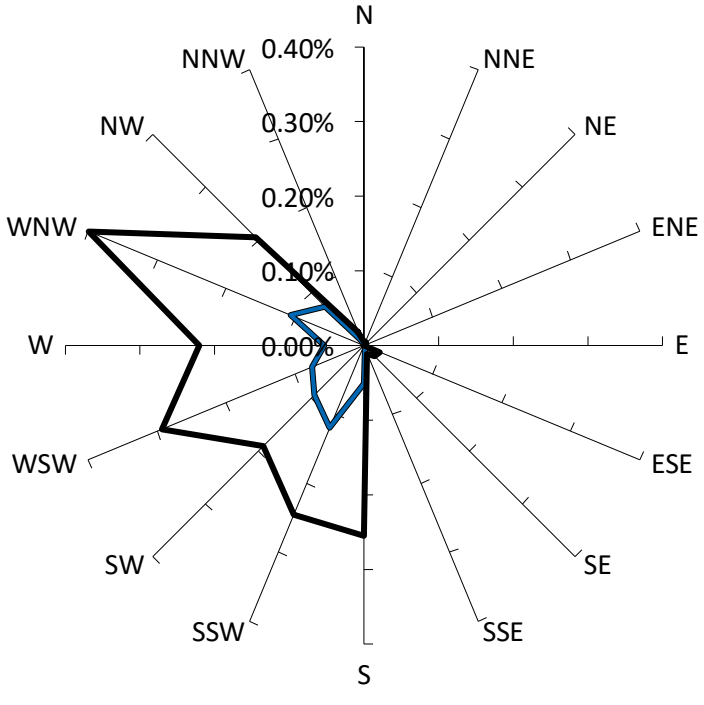
Annual probability of exceeding 8m/s (%)



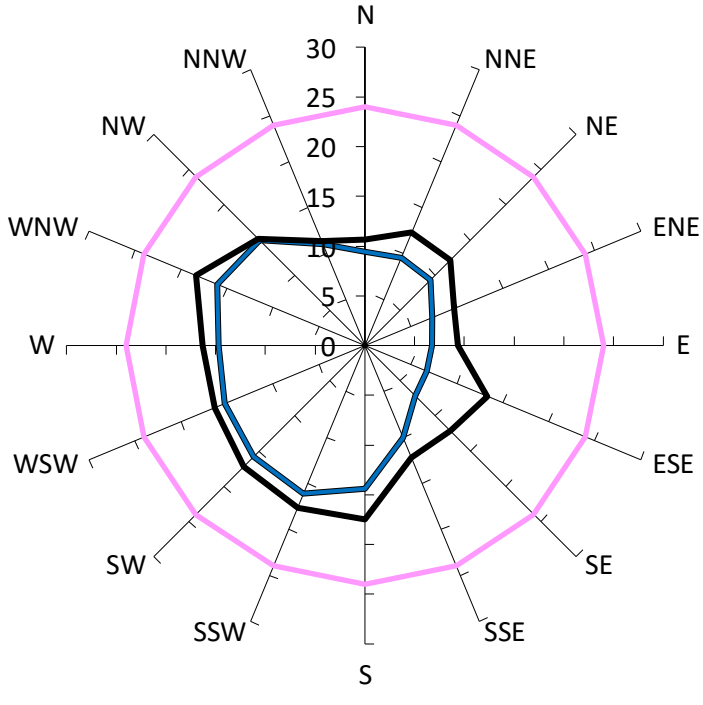
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.2	18
	Existing Site Conditions	6.8	18

Results for Point 44



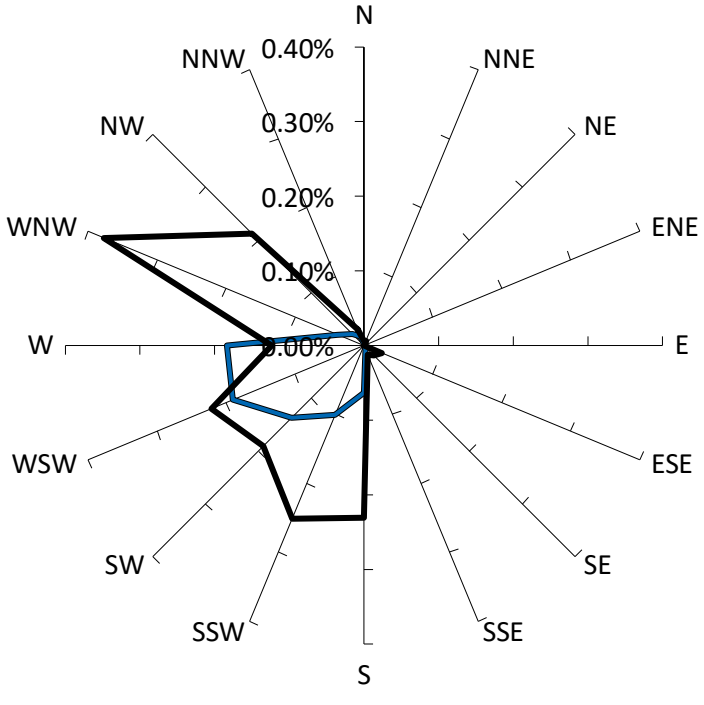
Annual probability of exceeding 8m/s (%)



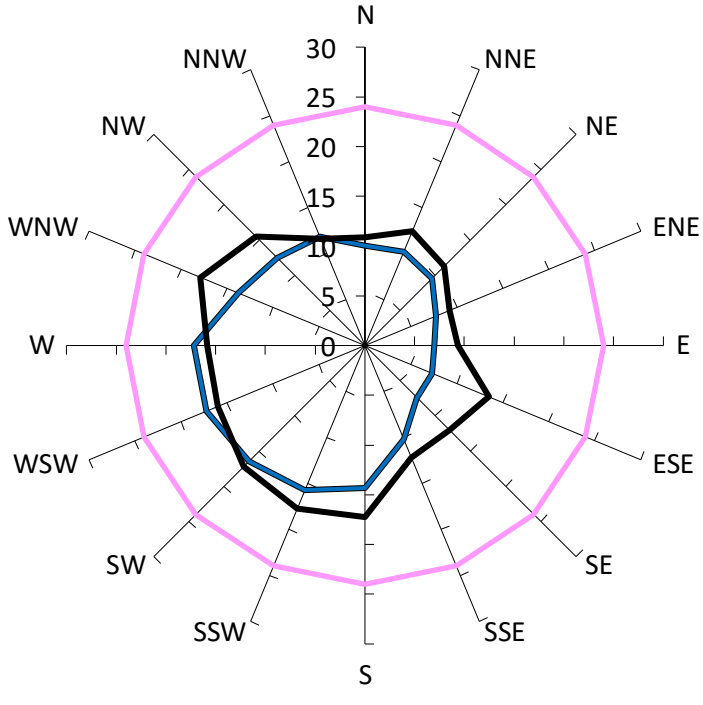
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.7	16
	Existing Site Conditions	6.7	18

Results for Point 45



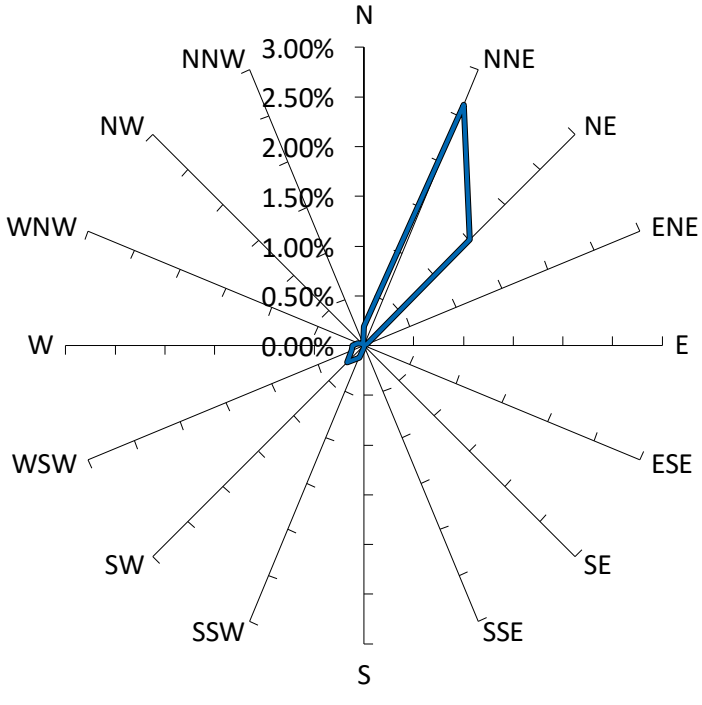
Annual probability of exceeding 8m/s (%)



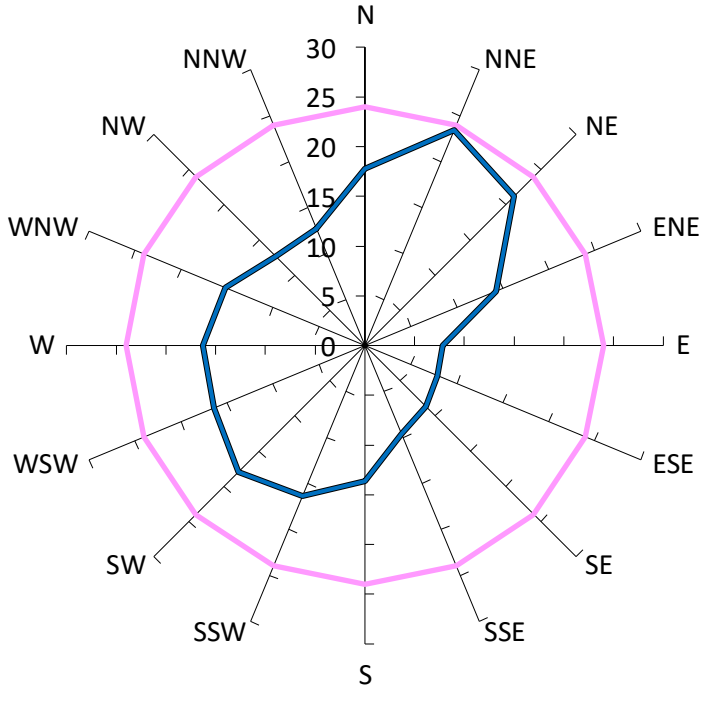
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.9	17
	Existing Site Conditions	6.6	18

Results for Point 46



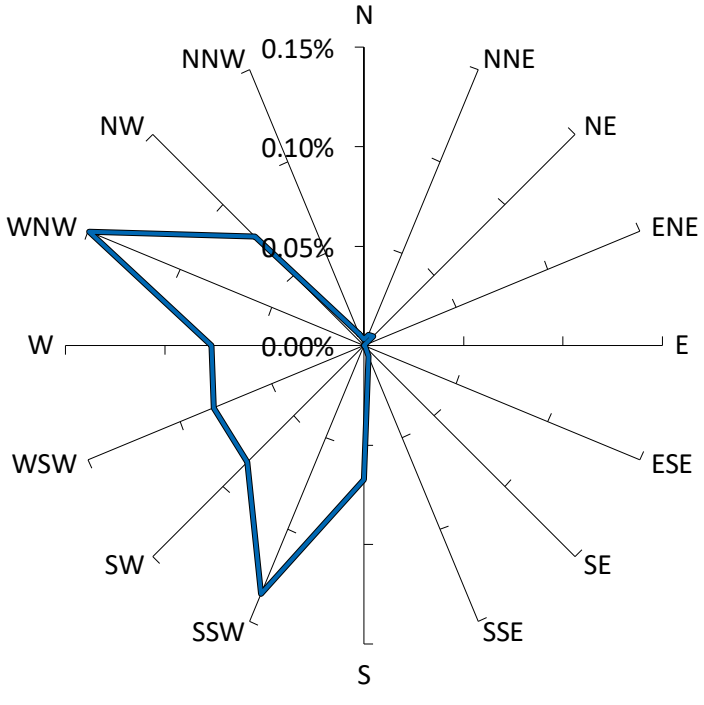
Annual probability of exceeding 8m/s (%)



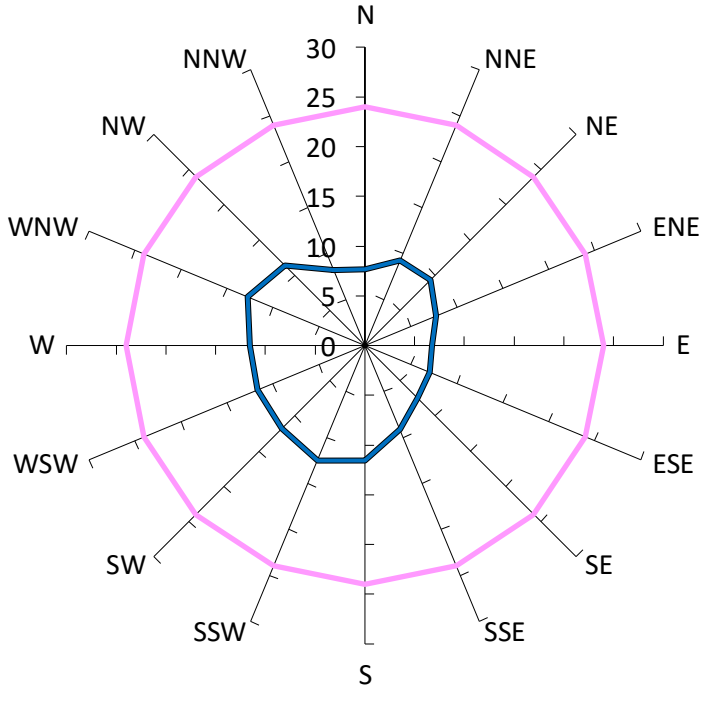
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.9	23

Results for Point 47



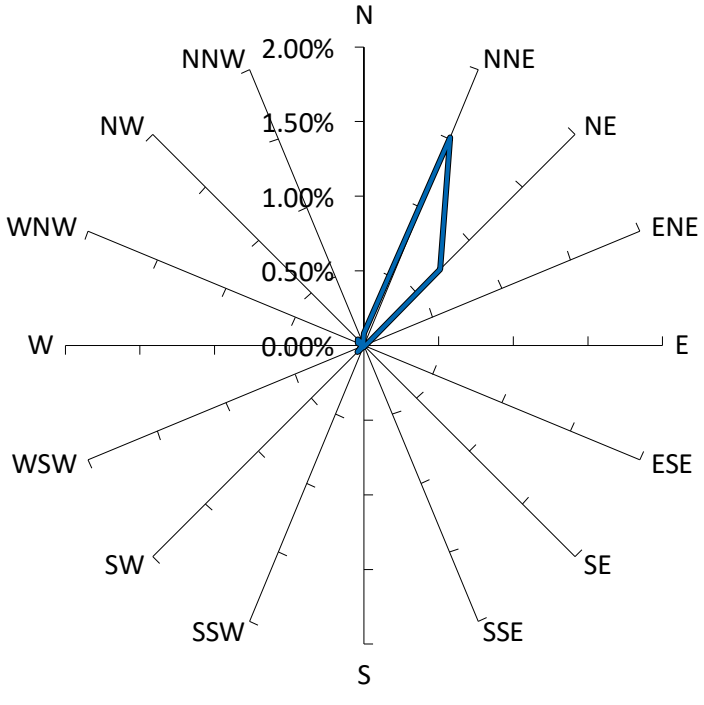
Annual probability of exceeding 6m/s (%)



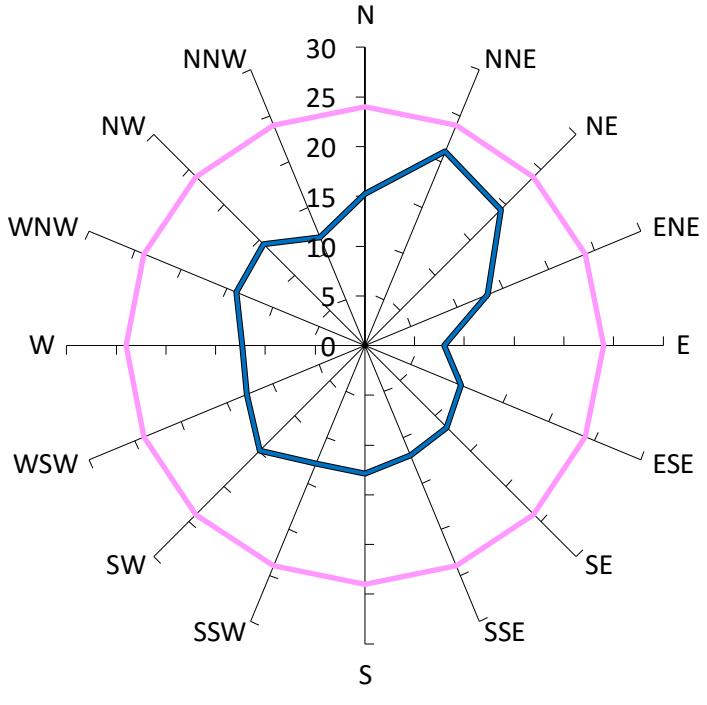
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	4.4	13

Results for Point 48



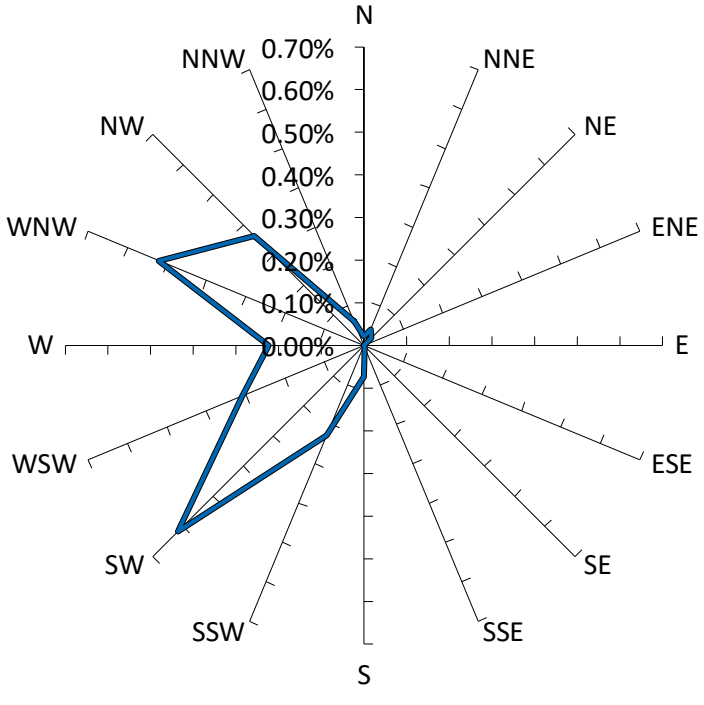
Annual probability of exceeding 8m/s (%)



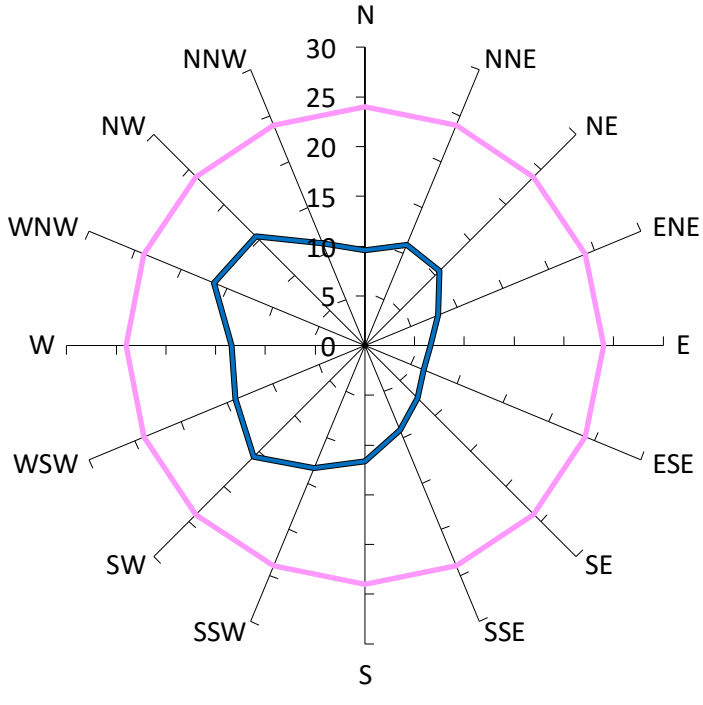
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.2	21

Results for Point 49



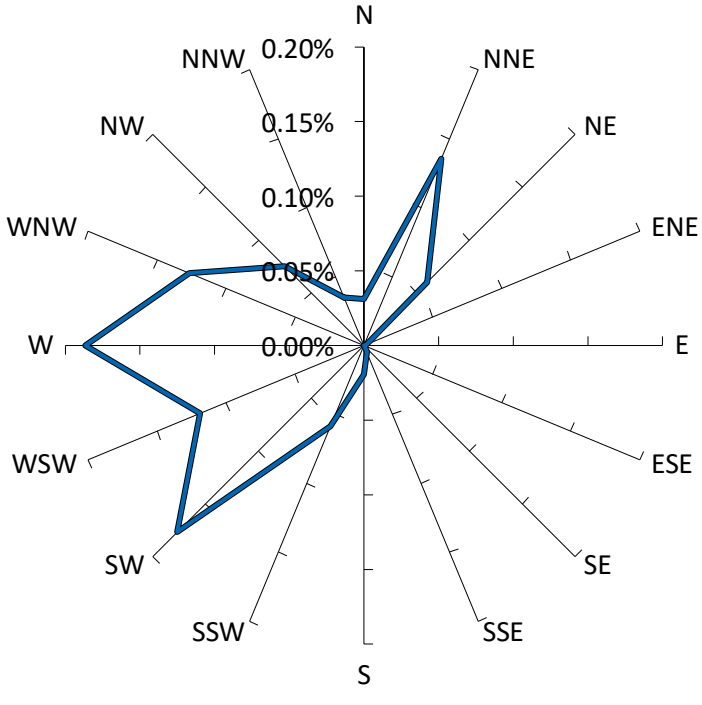
Annual probability of exceeding 6m/s (%)



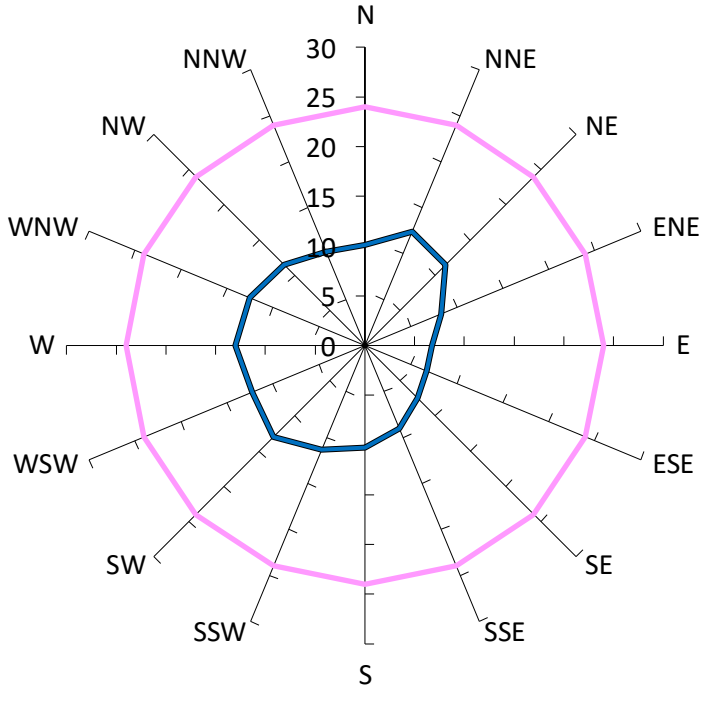
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	5.2	16

Results for Point 50



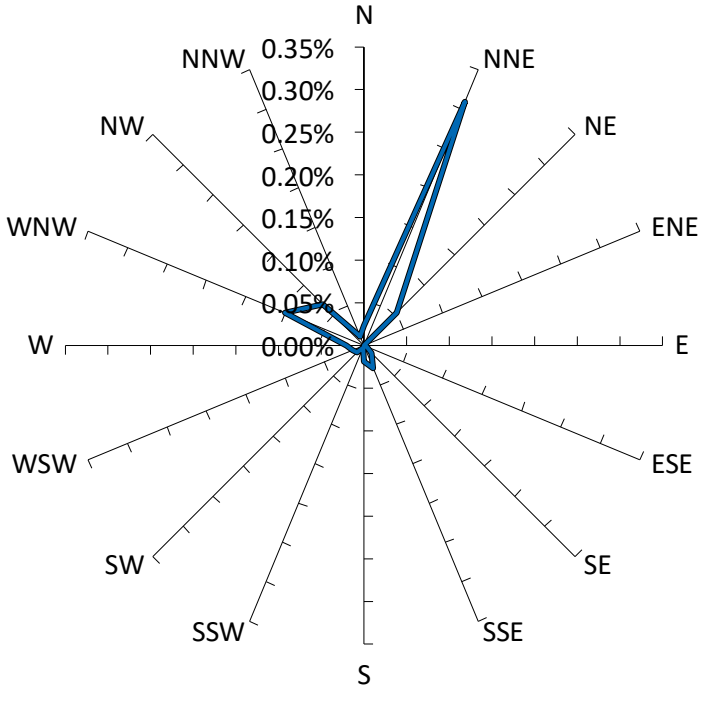
Annual probability of exceeding 6m/s (%)



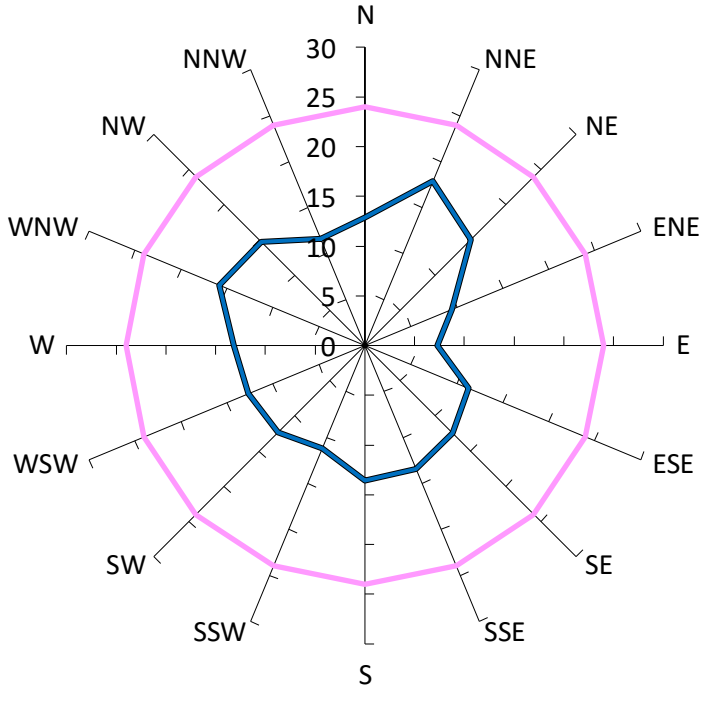
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	4.7	13

Results for Point 51



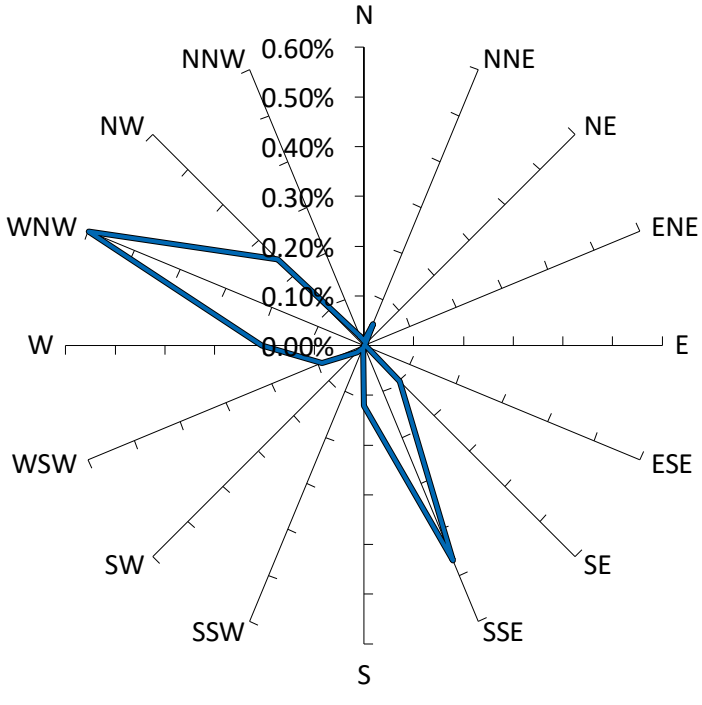
Annual probability of exceeding 8m/s (%)



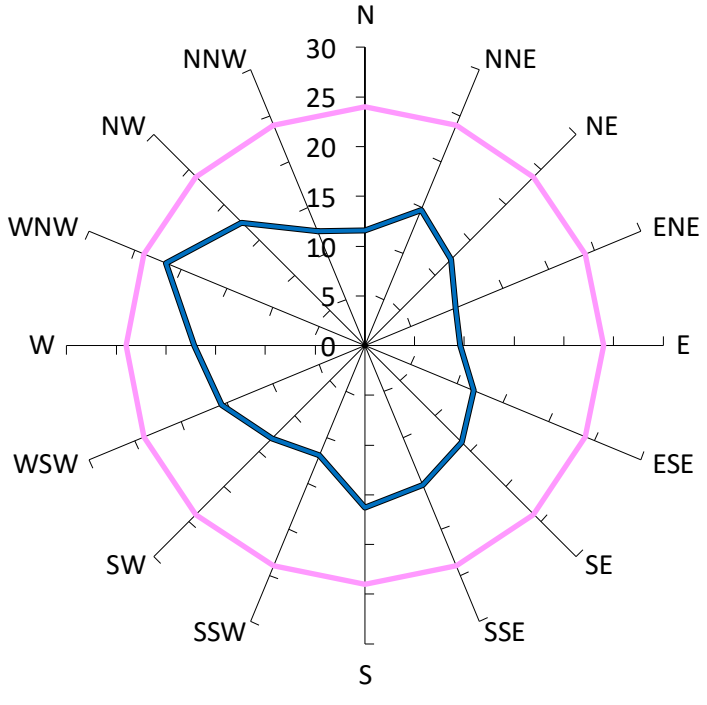
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.1	18

Results for Point 52



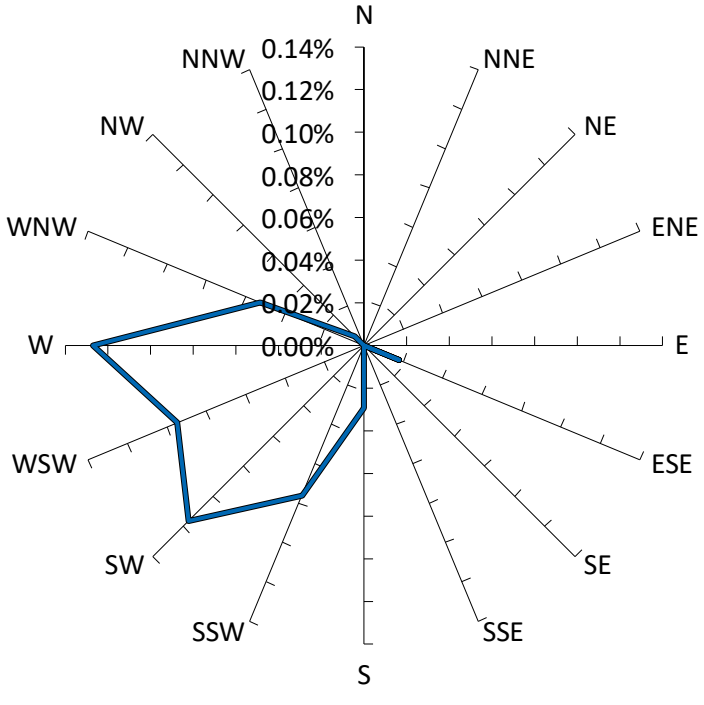
Annual probability of exceeding 8m/s (%)



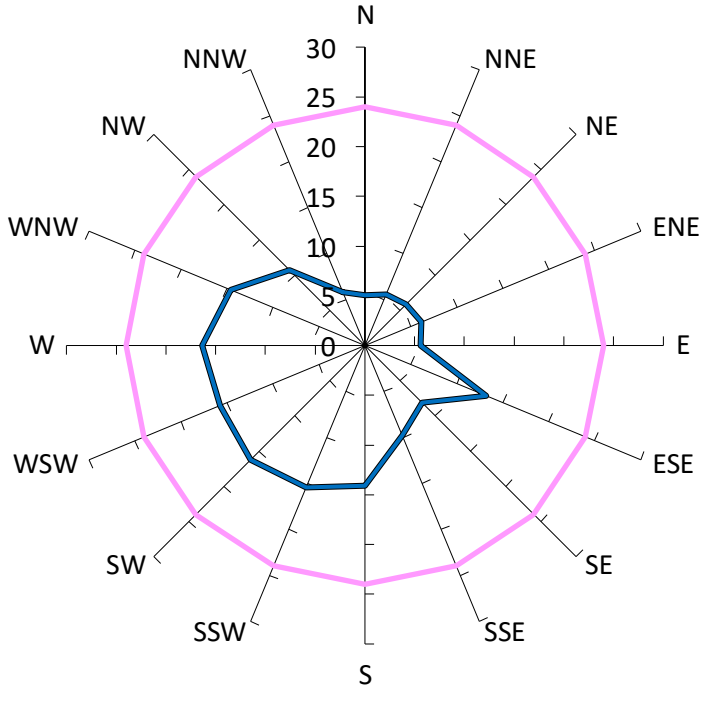
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.7	22

Results for Point 53



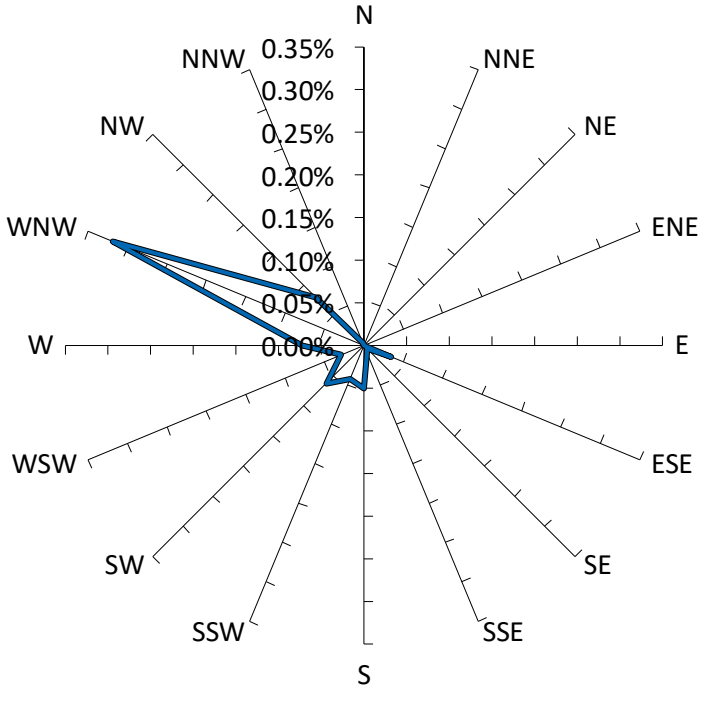
Annual probability of exceeding 8m/s (%)



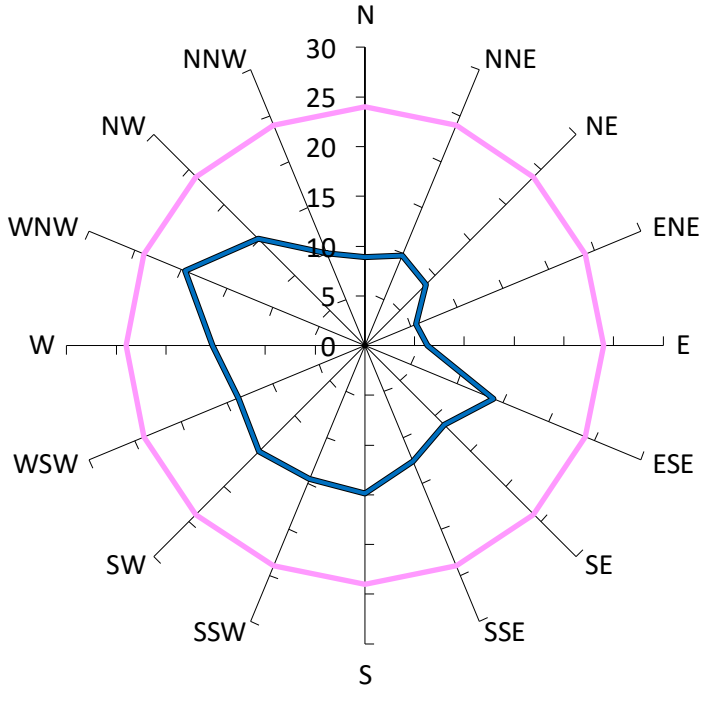
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.6	16

Results for Point 54



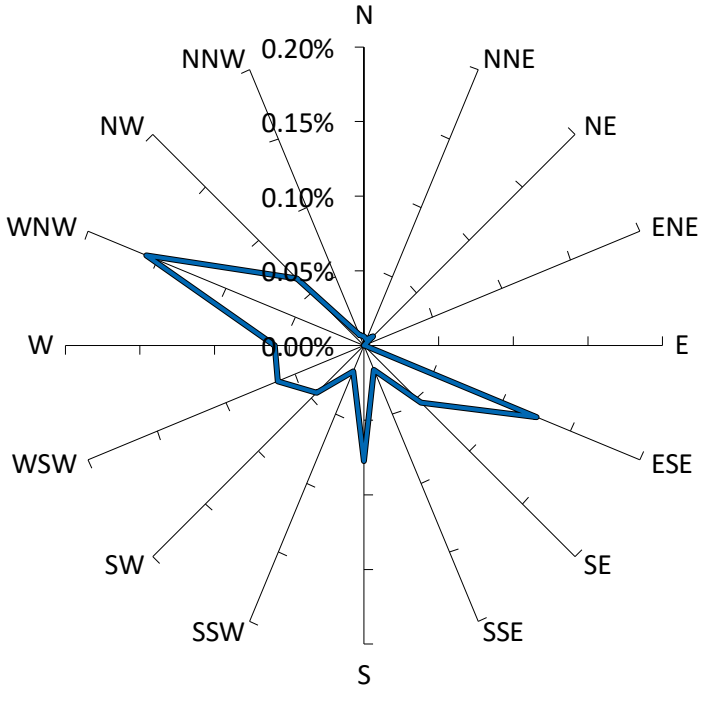
Annual probability of exceeding 8m/s (%)



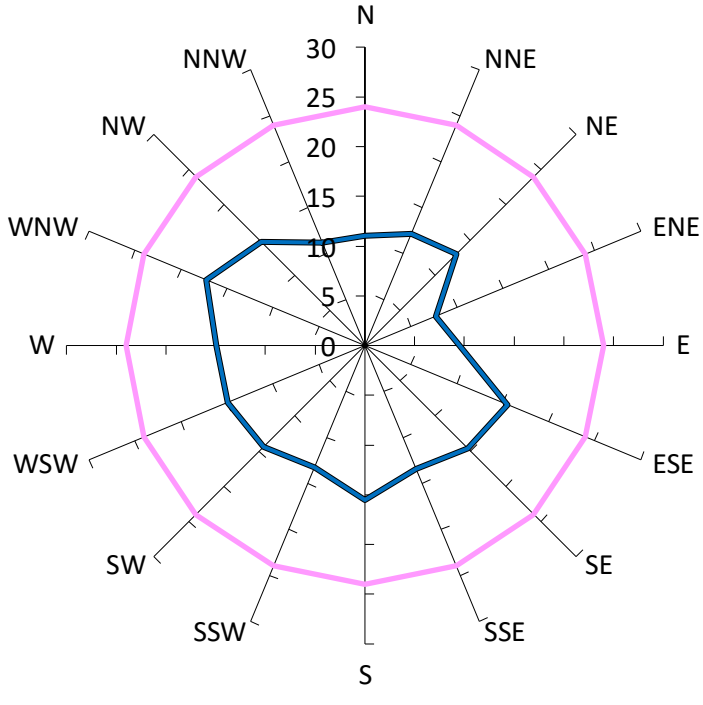
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.8	20

Results for Point 55



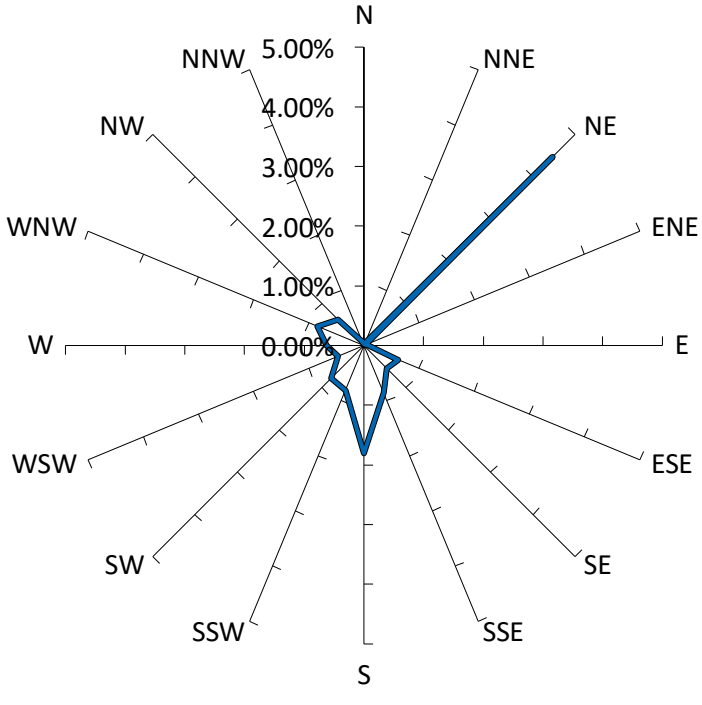
Annual probability of exceeding 8m/s (%)



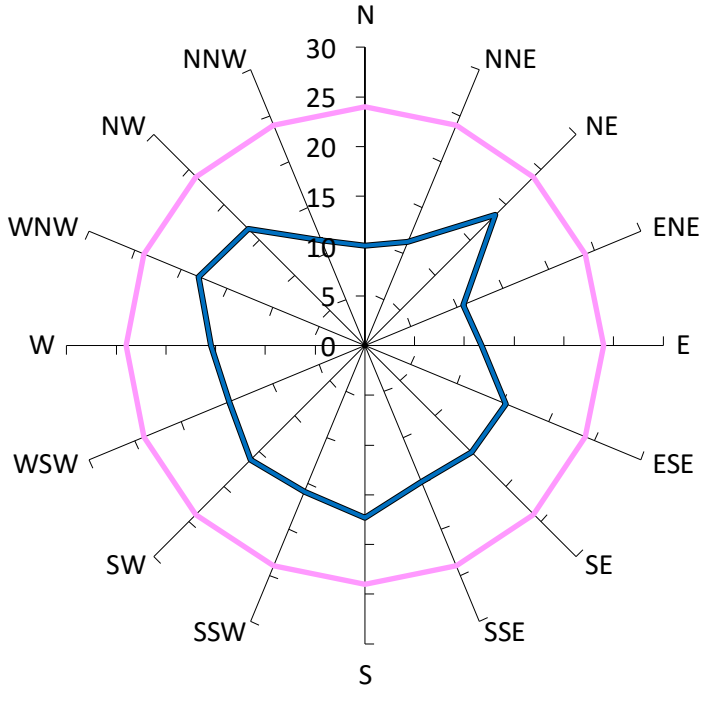
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.0	17

Results for Point 56



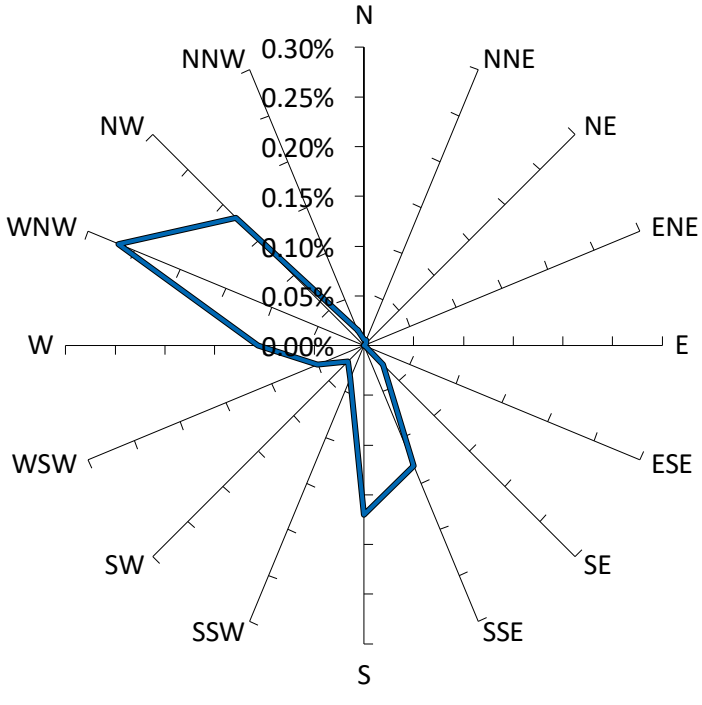
Annual probability of exceeding 6m/s (%)



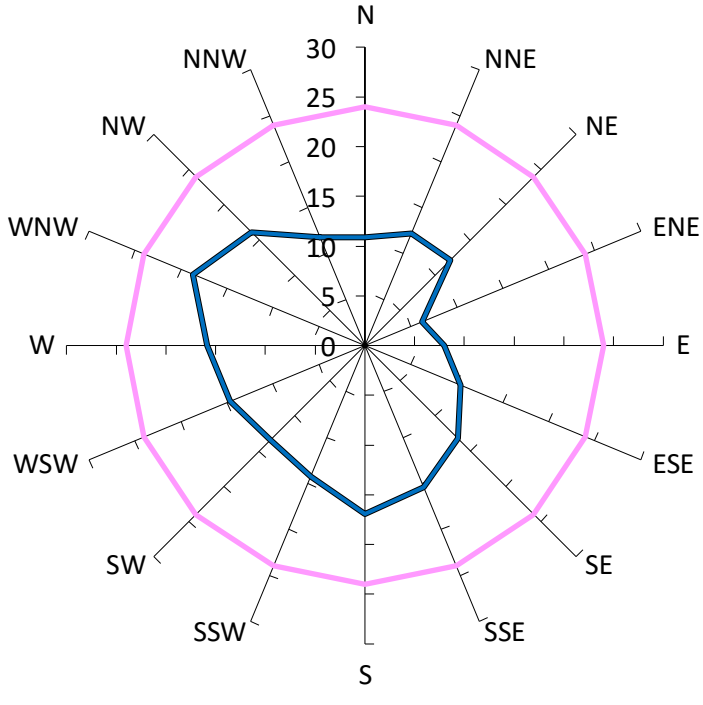
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	6.8	19

Results for Point 57



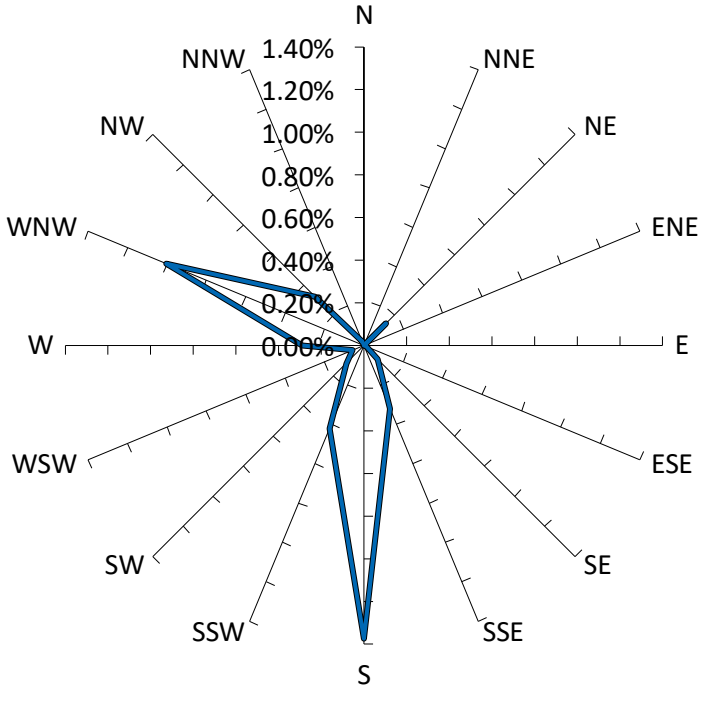
Annual probability of exceeding 8m/s (%)



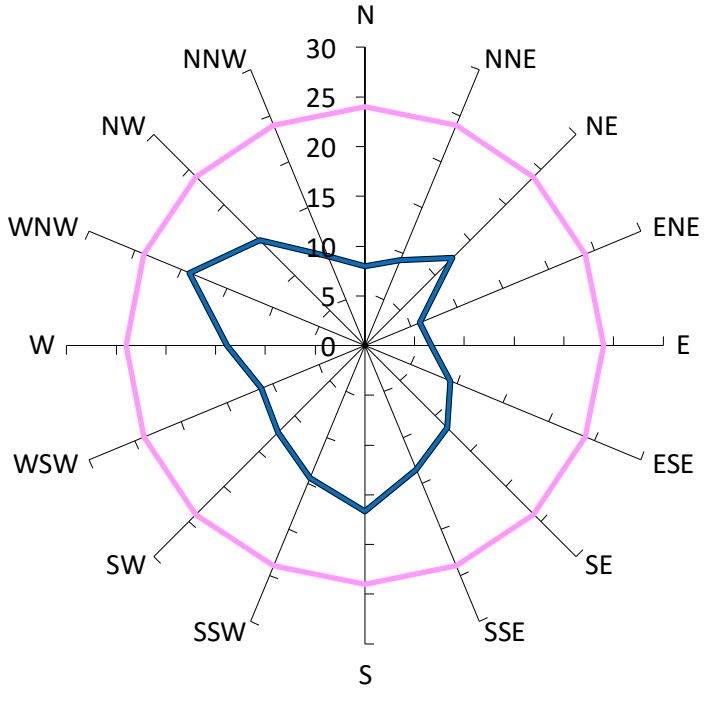
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.2	19

Results for Point 58



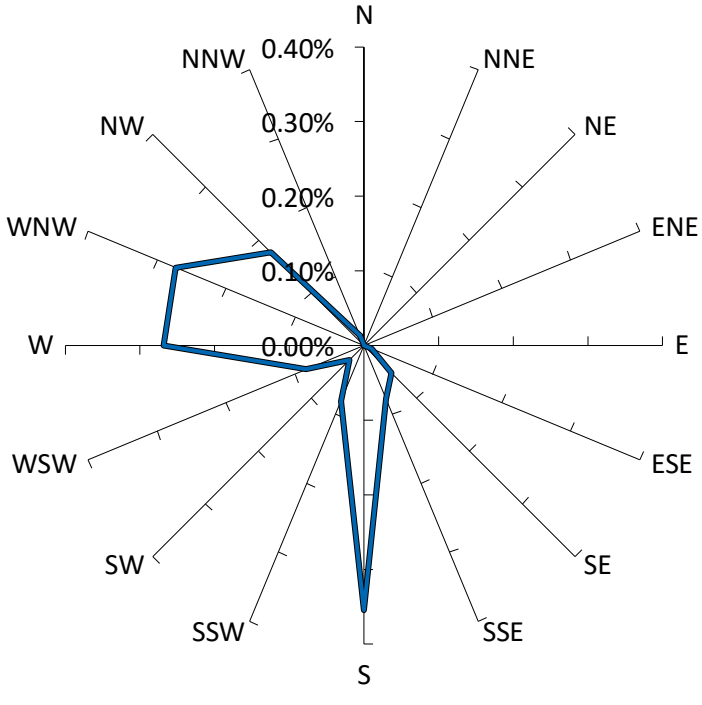
Annual probability of exceeding 6m/s (%)



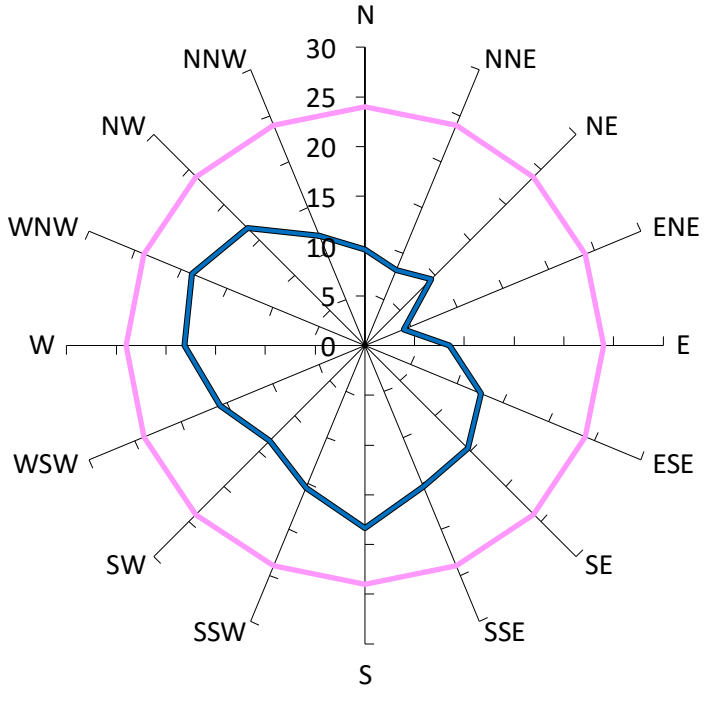
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	5.7	19

Results for Point 59



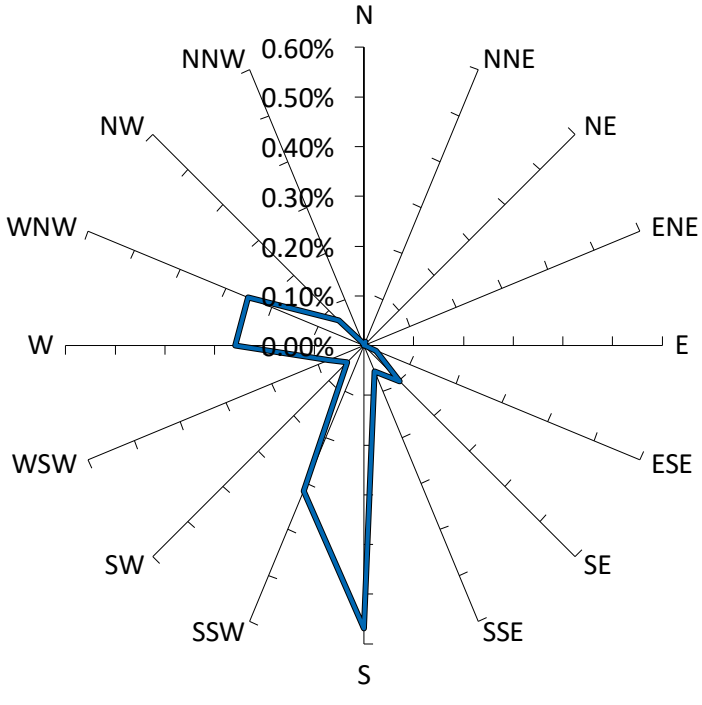
Annual probability of exceeding 8m/s (%)



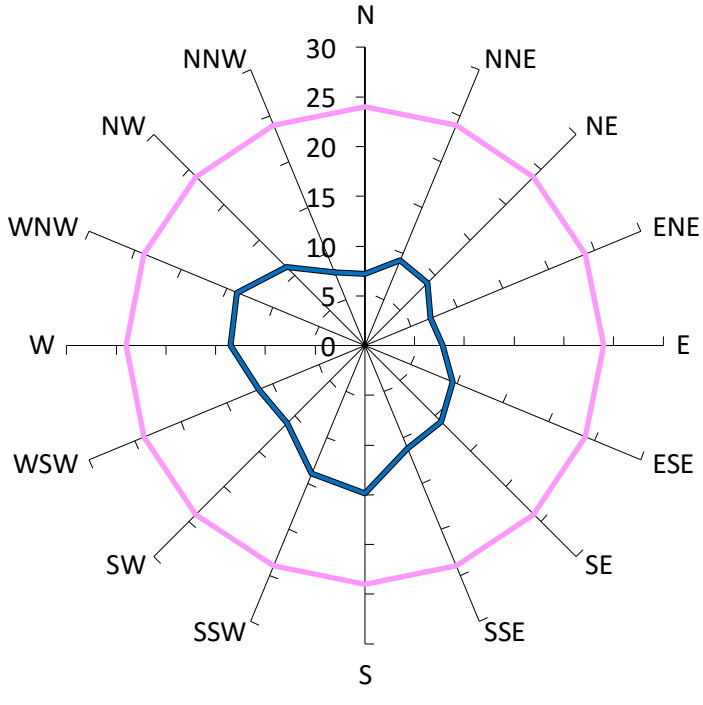
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.5	19

Results for Point 60



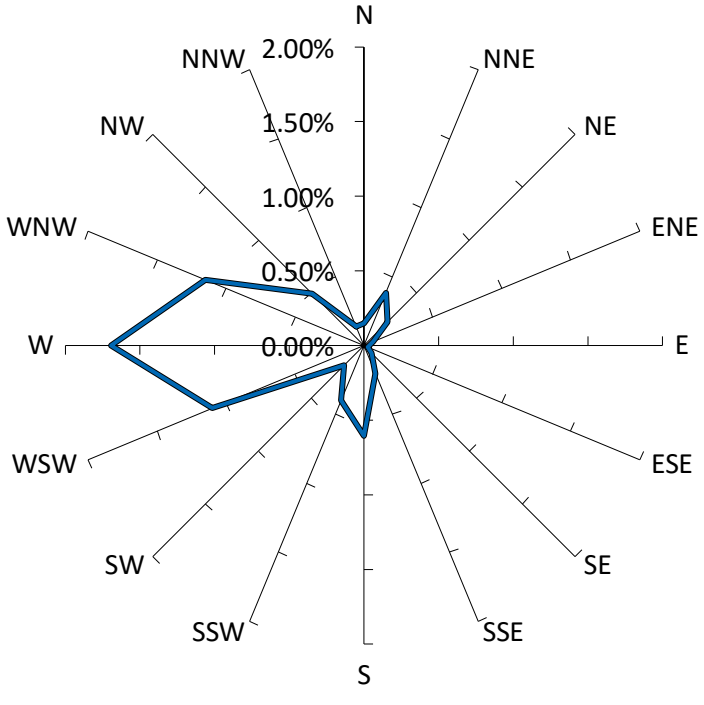
Annual probability of exceeding 6m/s (%)



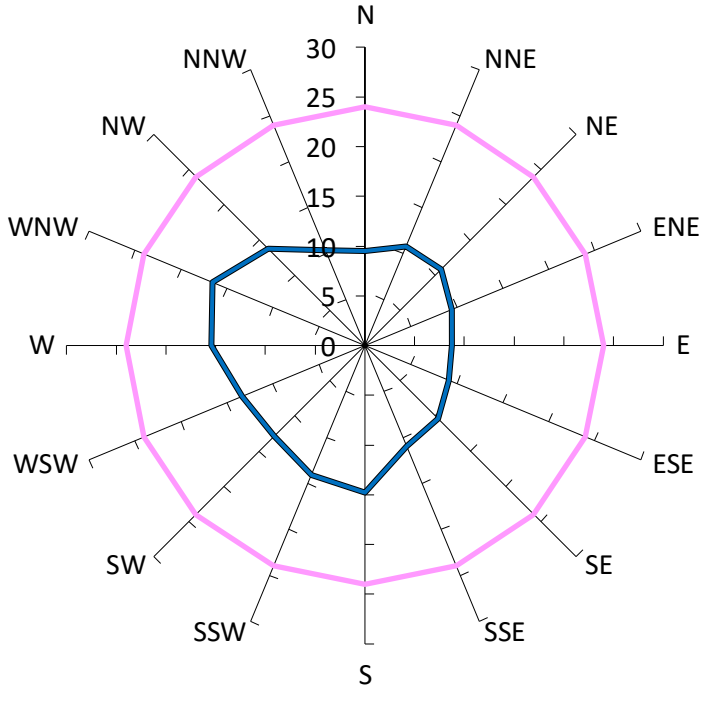
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	5.1	15

Results for Point 61



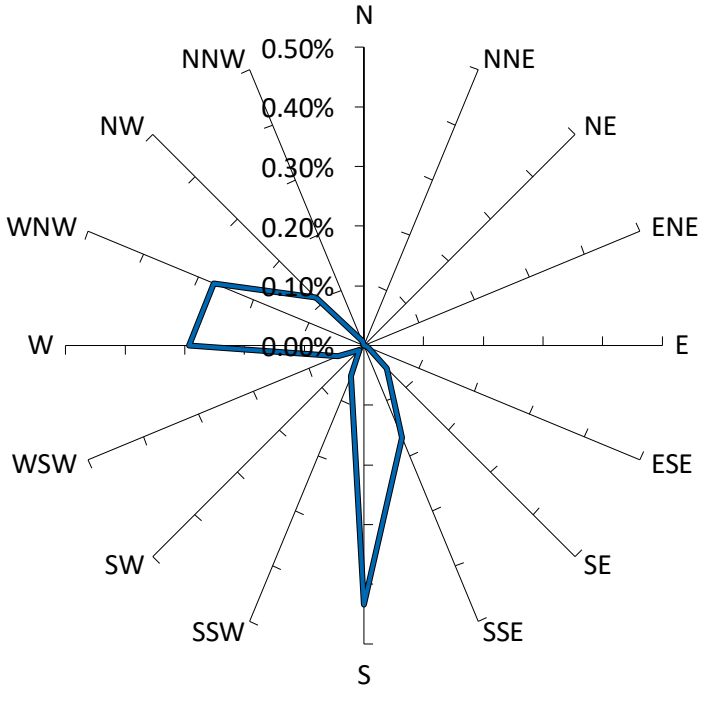
Annual probability of exceeding 6m/s (%)



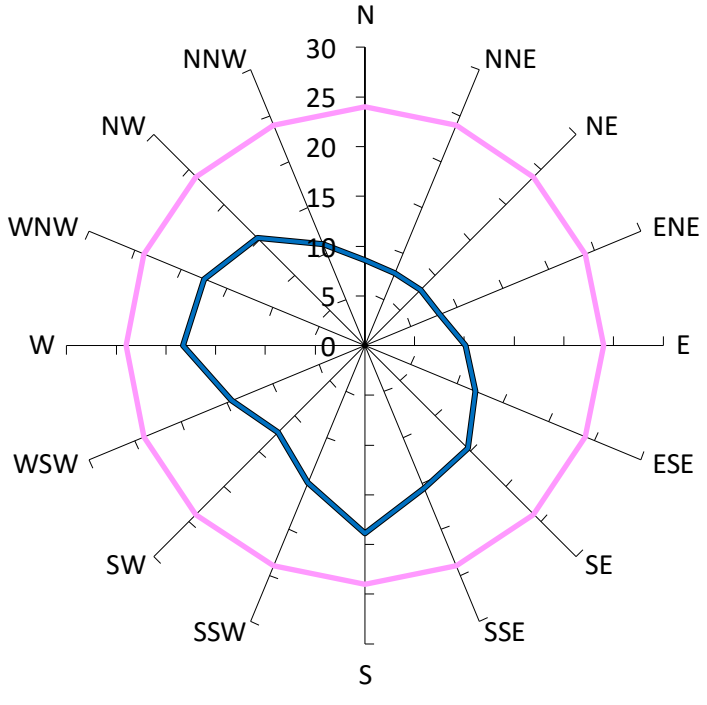
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s).	6.0	24
	With development "as proposed", no vegetation or other treatments.	6.2	17

Results for Point 62



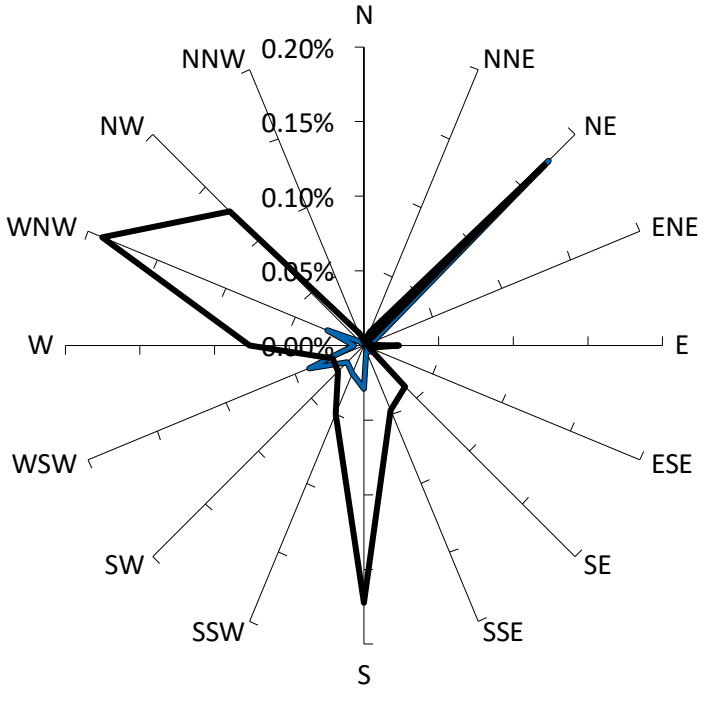
Annual probability of exceeding 8m/s (%)



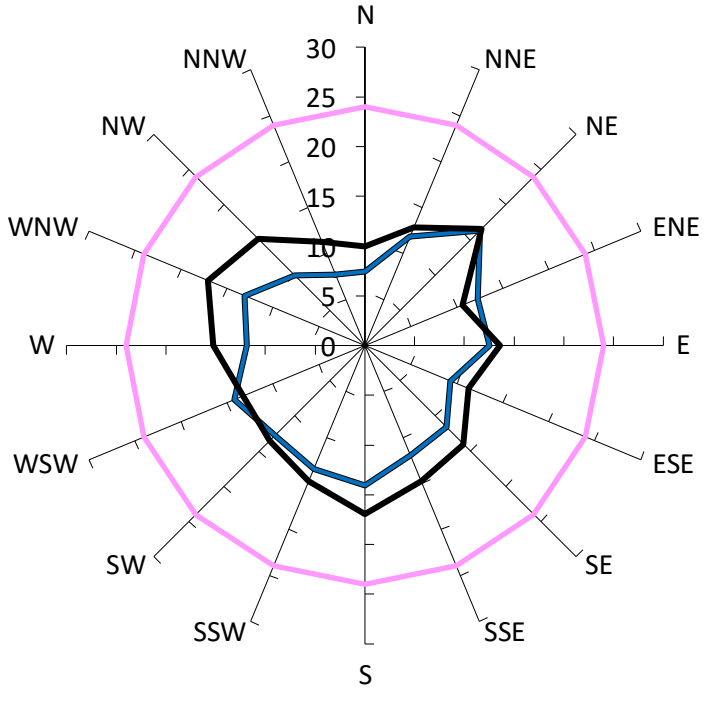
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.5	19

Results for Point 63



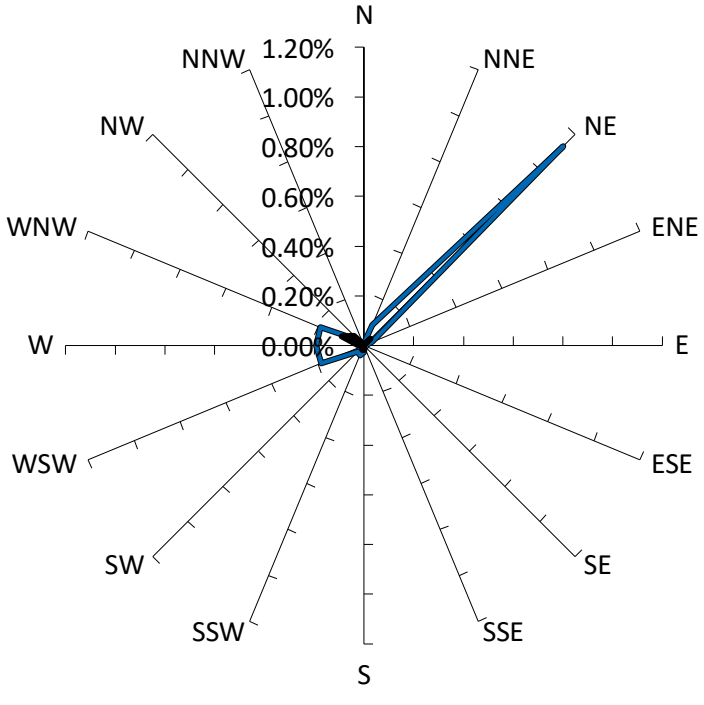
Annual probability of exceeding 8m/s (%)



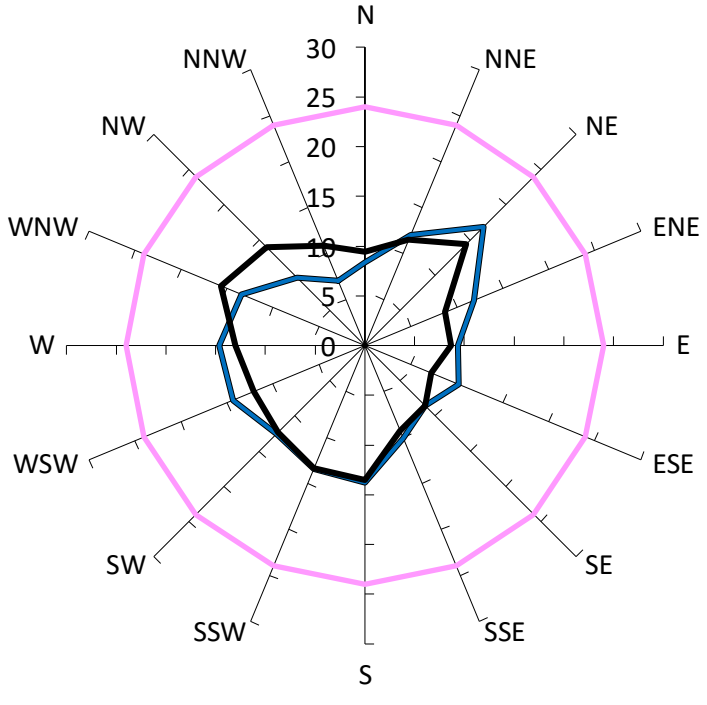
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.8	16
	Existing Site Conditions	6.3	17

Results for Point 64



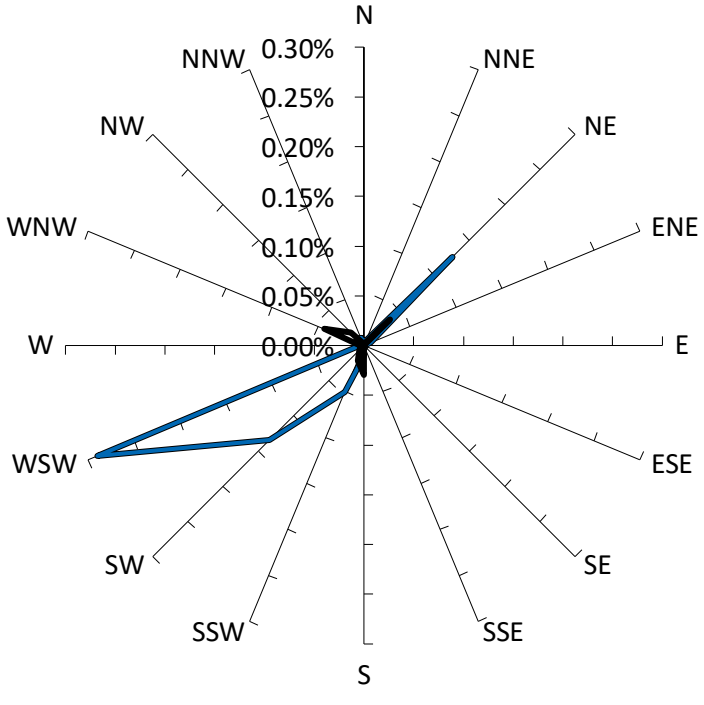
Annual probability of exceeding 8m/s (%)



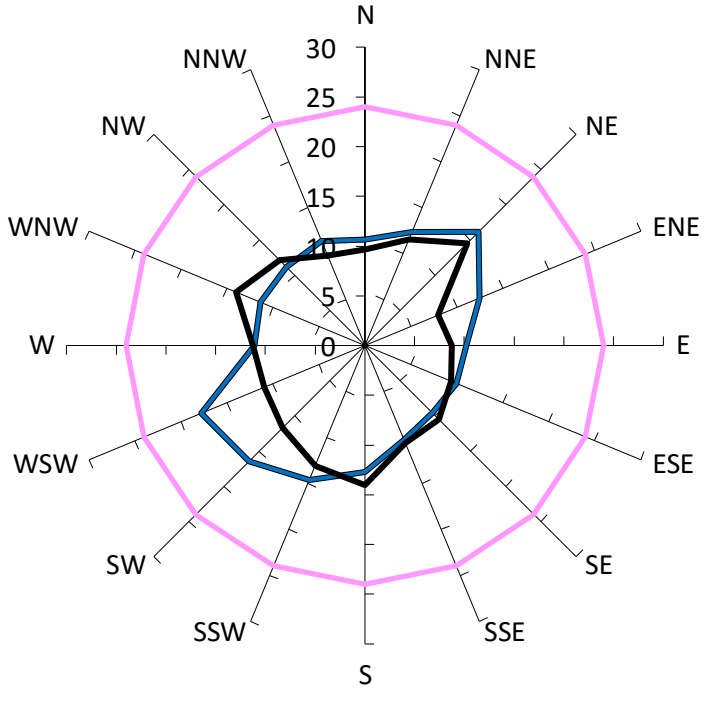
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.0	17
	Existing Site Conditions	5.4	16

Results for Point 65



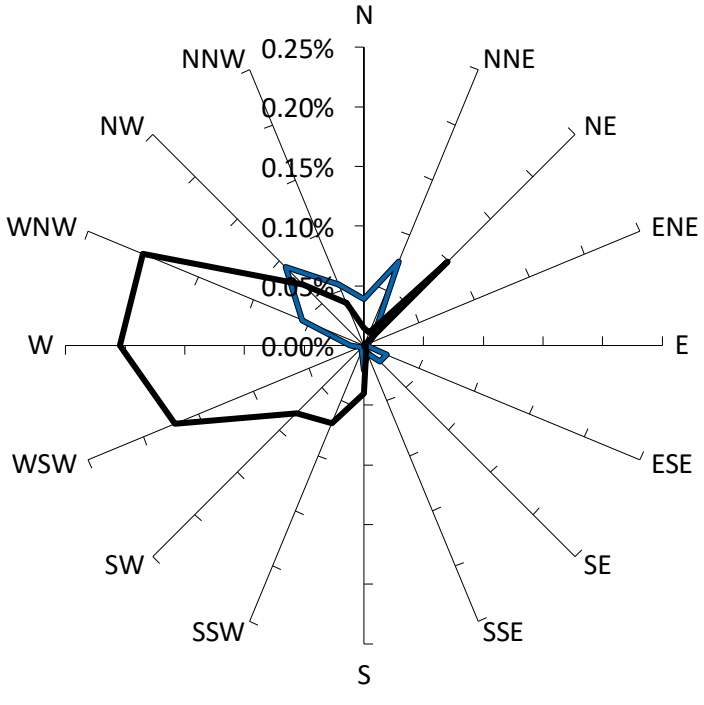
Annual probability of exceeding 8m/s (%)



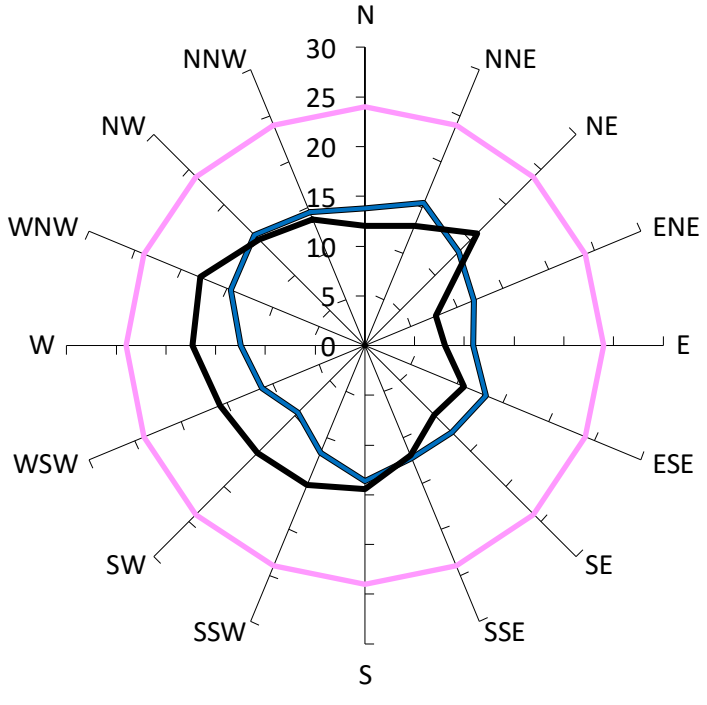
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.0	18
	Existing Site Conditions	5.2	15

Results for Point 66



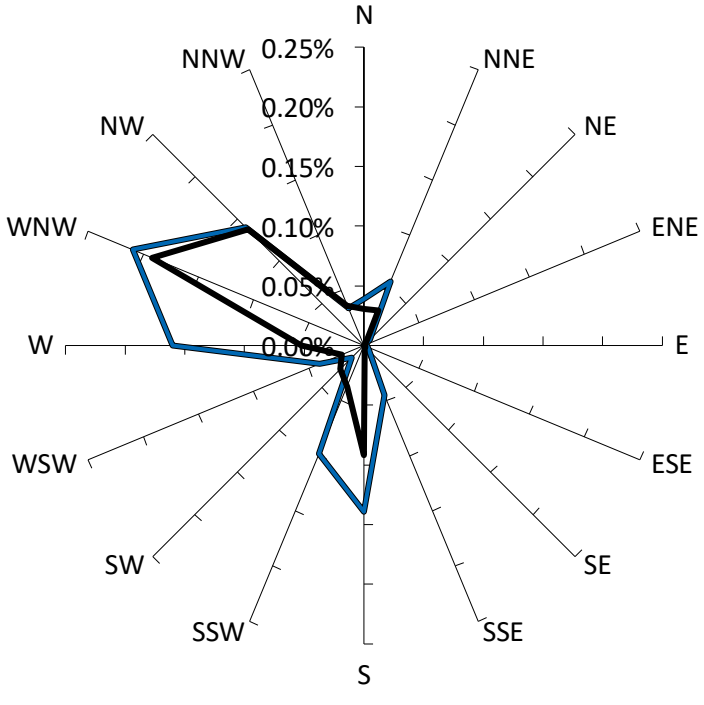
Annual probability of exceeding 8m/s (%)



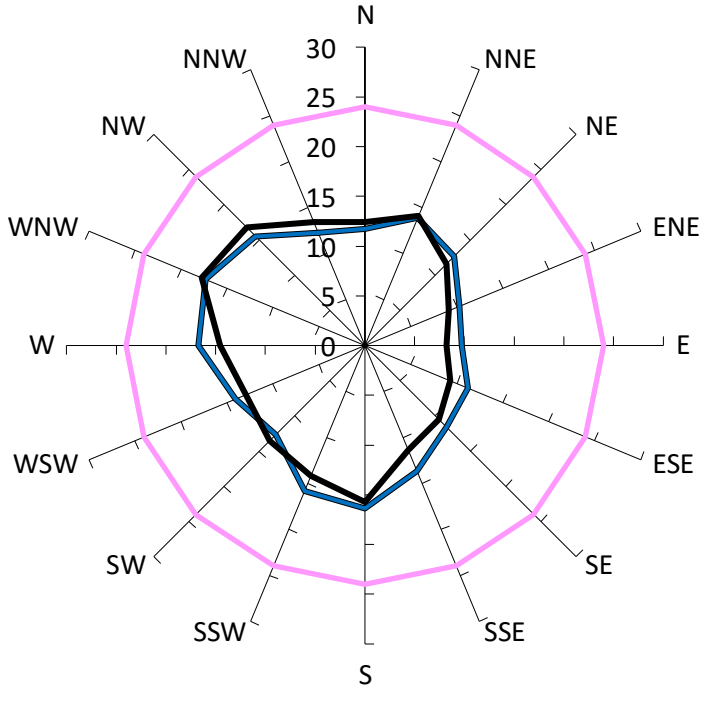
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.7	16
	Existing Site Conditions	6.2	18

Results for Point 67



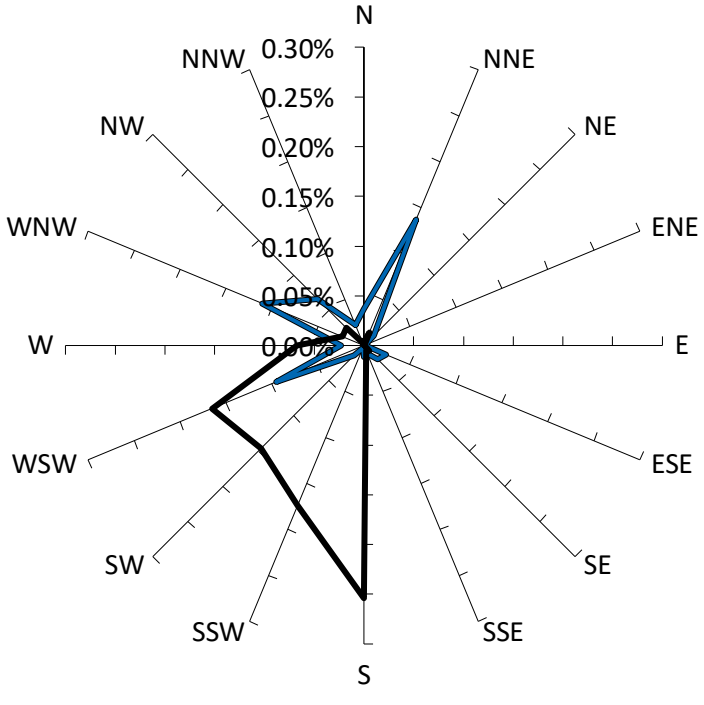
Annual probability of exceeding 8m/s (%)



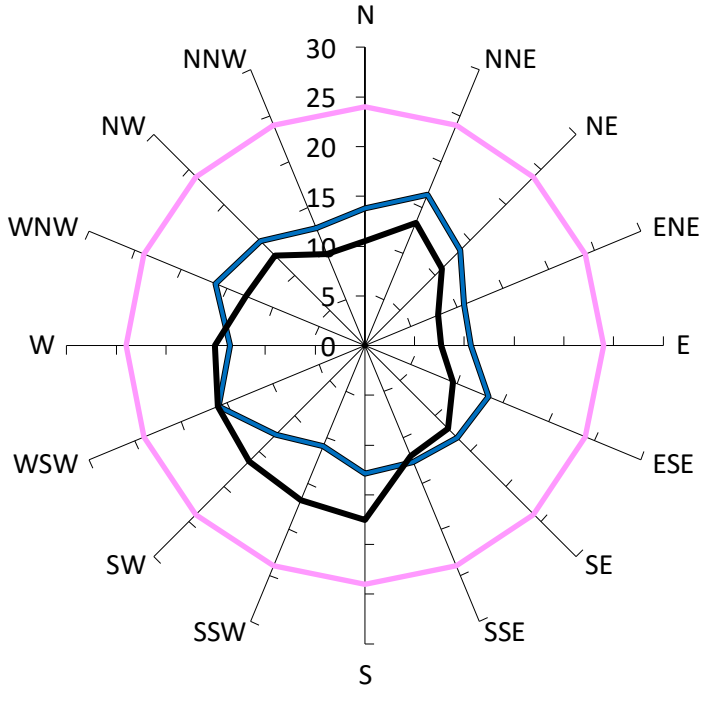
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.2	17
	Existing Site Conditions	5.8	18

Results for Point 68



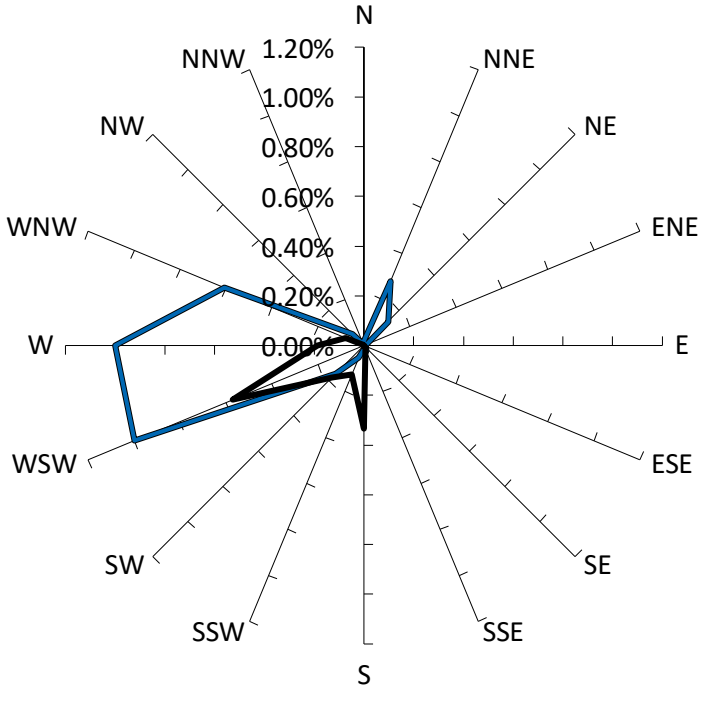
Annual probability of exceeding 8m/s (%)



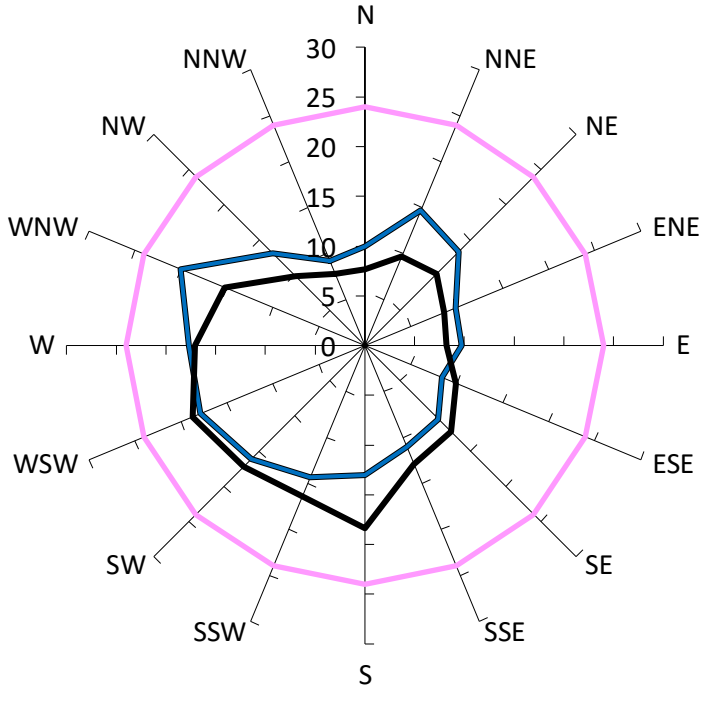
Annual Maximum Gust (m/s)

Description	GEM Wind Speed (m/s)	Peak Gust m/s
Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
With development "as proposed", no vegetation or other treatments.	5.9	16
Existing Site Conditions	6.2	18

Results for Point 69



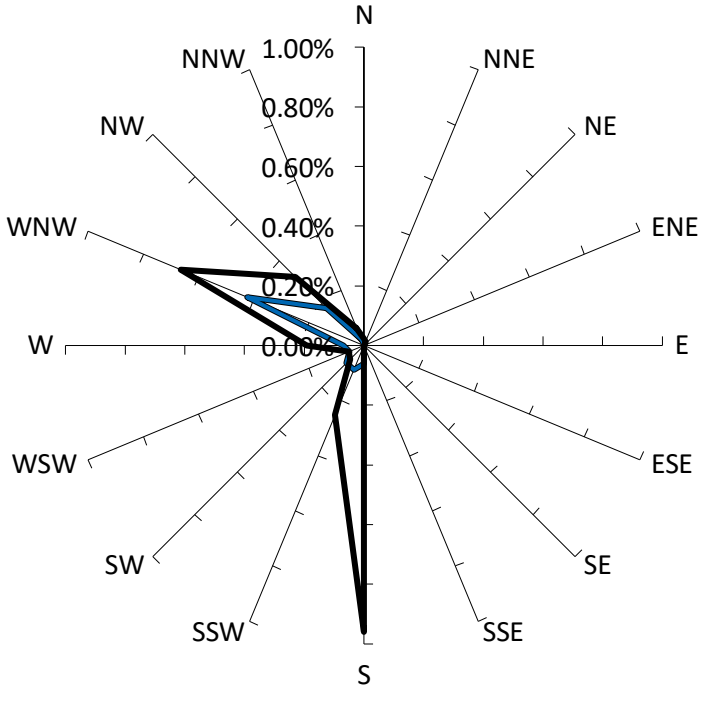
Annual probability of exceeding 8m/s (%)



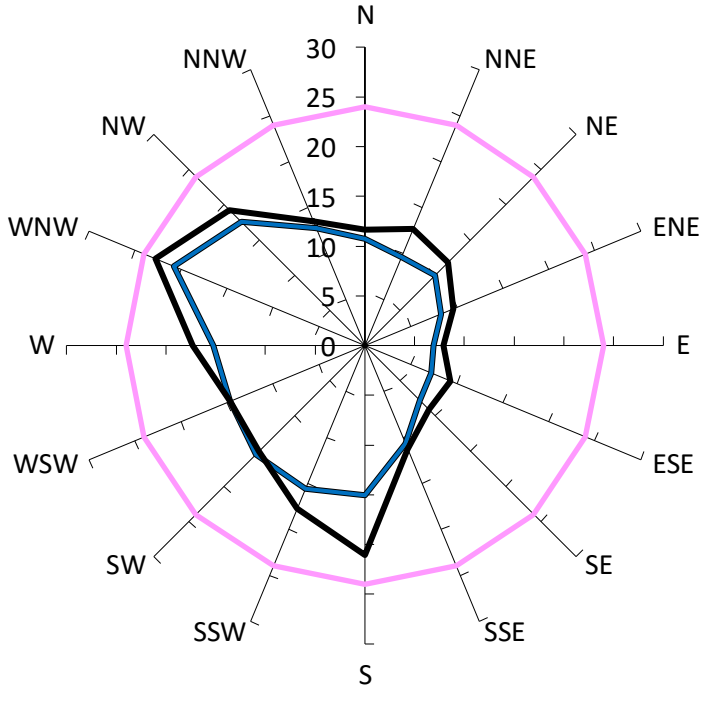
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.3	20
	Existing Site Conditions	6.5	19

Results for Point 70



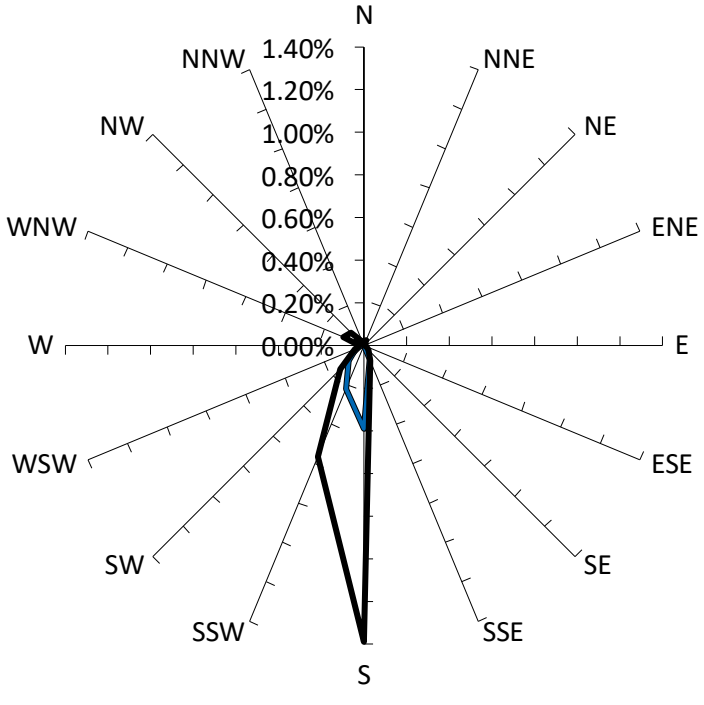
Annual probability of exceeding 8m/s (%)



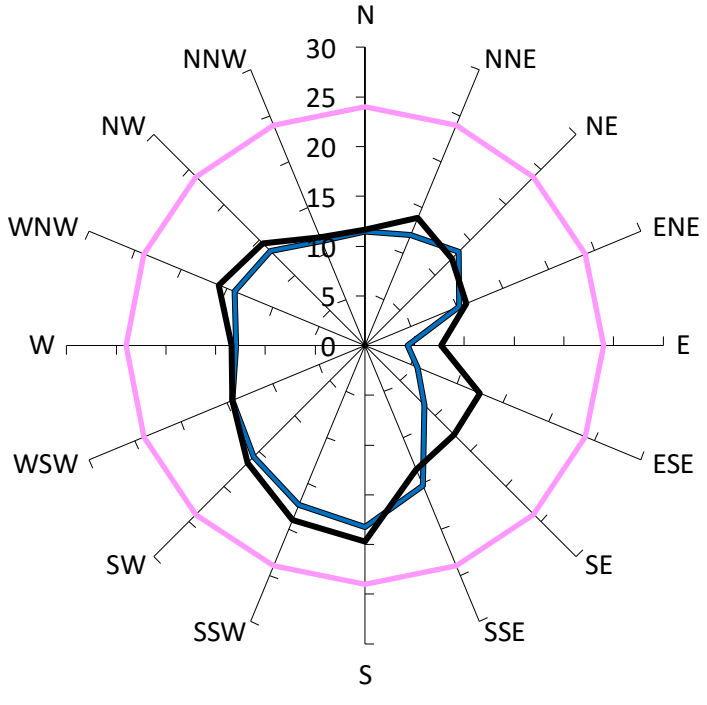
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.9	21
	Existing Site Conditions	7.0	23

Results for Point 71



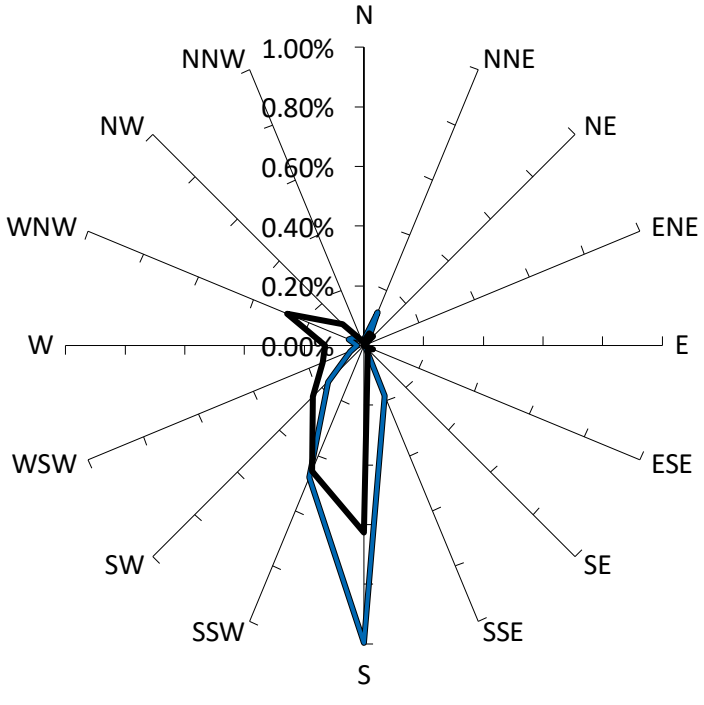
Annual probability of exceeding 8m/s (%)



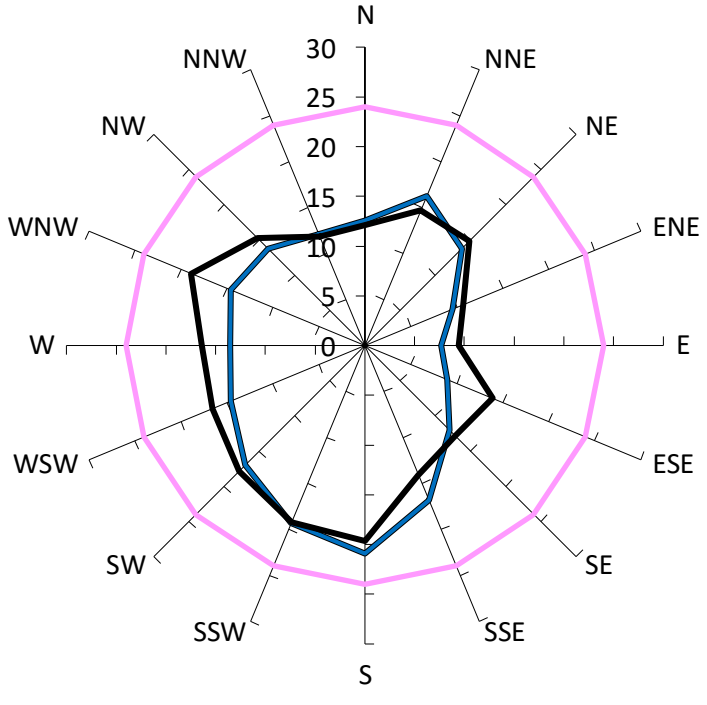
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.2	18
	Existing Site Conditions	7.1	20

Results for Point 72



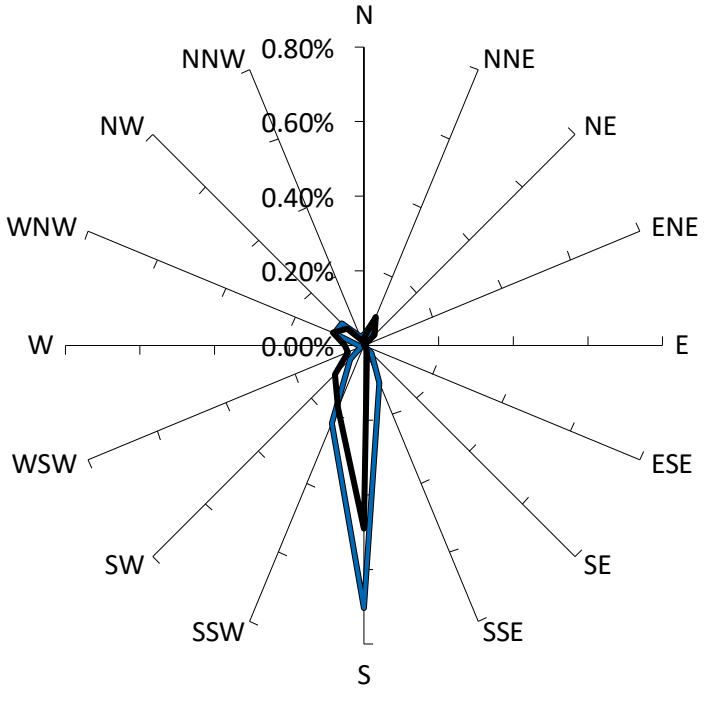
Annual probability of exceeding 8m/s (%)



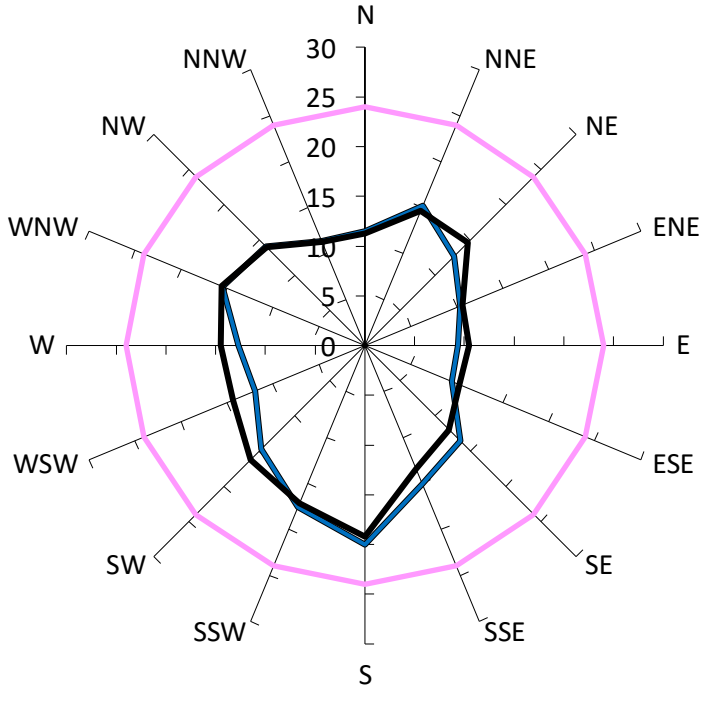
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.0	21
	Existing Site Conditions	7.0	20

Results for Point 73



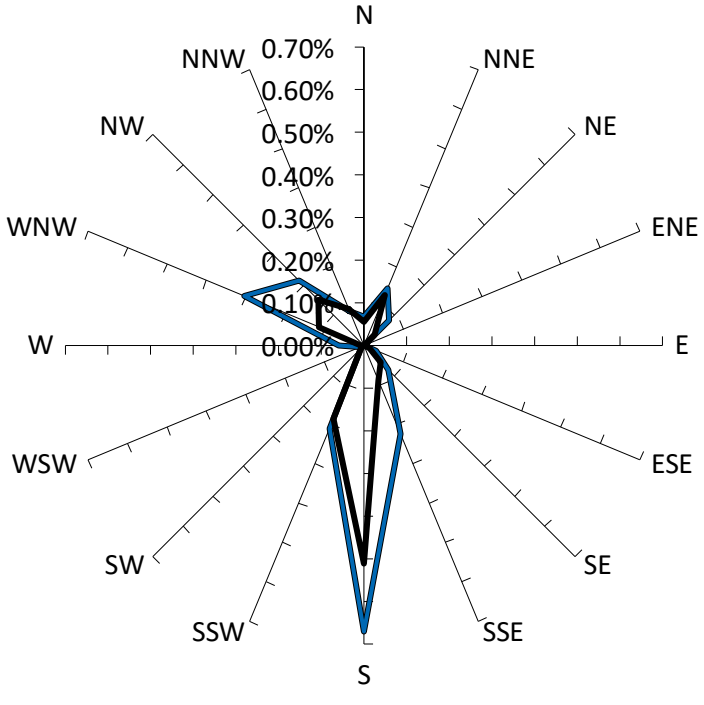
Annual probability of exceeding 8m/s (%)



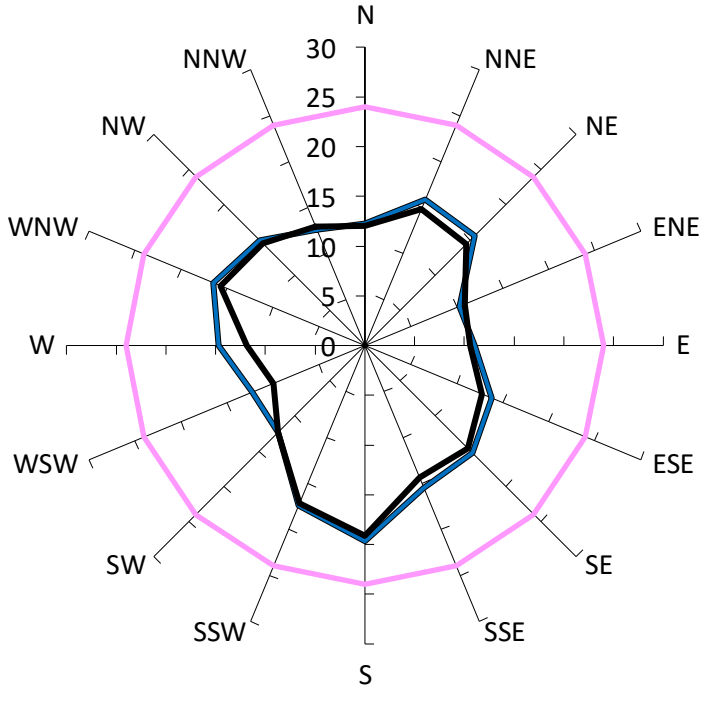
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	6.6	20
	Existing Site Conditions	6.5	19

Results for Point 74



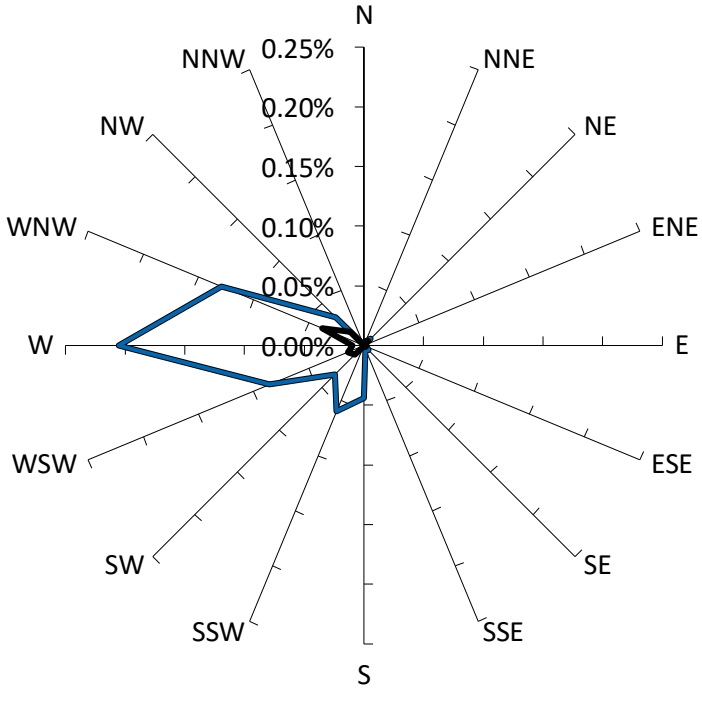
Annual probability of exceeding 8m/s (%)



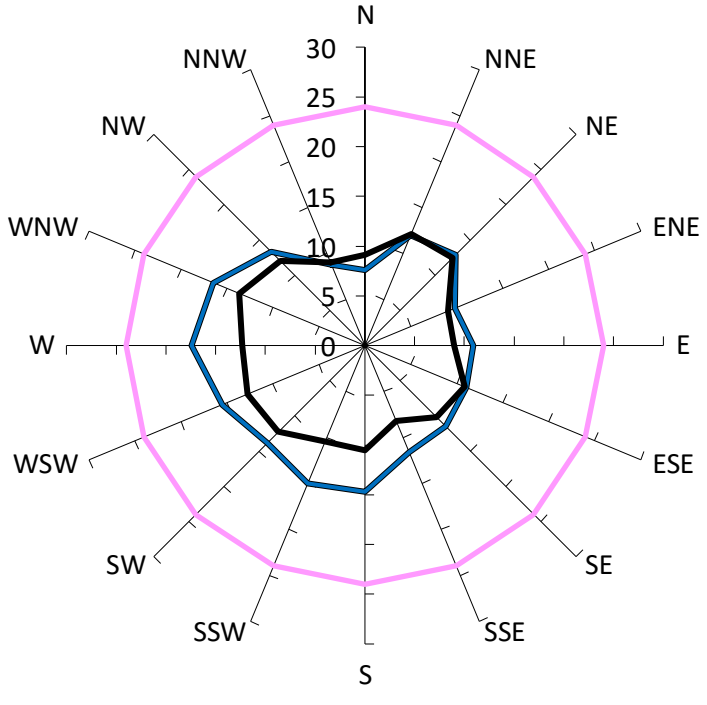
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	7.0	20
	Existing Site Conditions	6.6	19

Results for Point 75



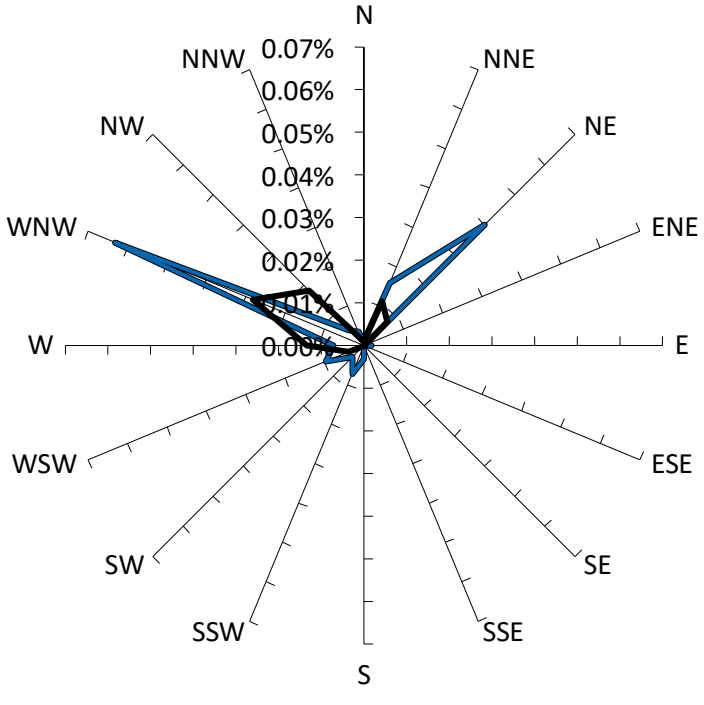
Annual probability of exceeding 8m/s (%)



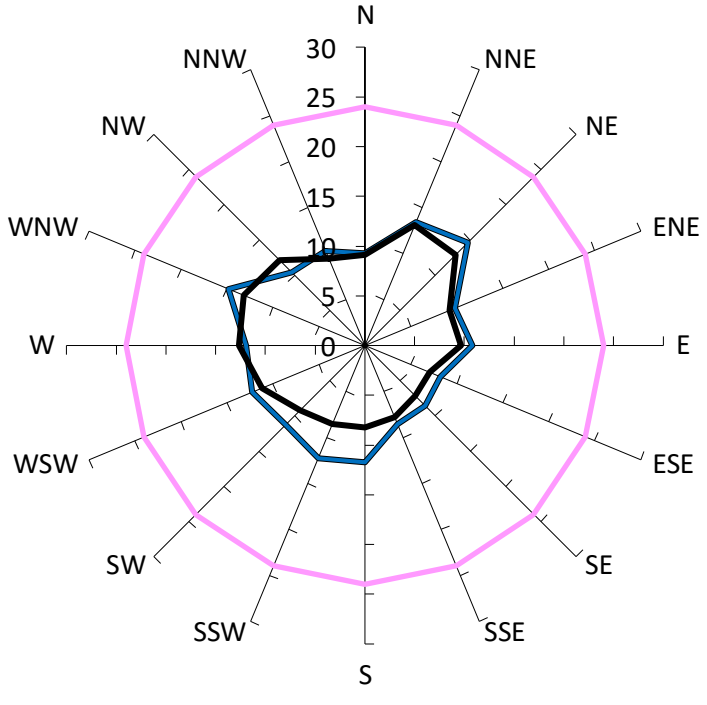
Annual Maximum Gust (m/s)

	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.8	17
	Existing Site Conditions	4.8	14

Results for Point 76



Annual probability of exceeding 8m/s (%)

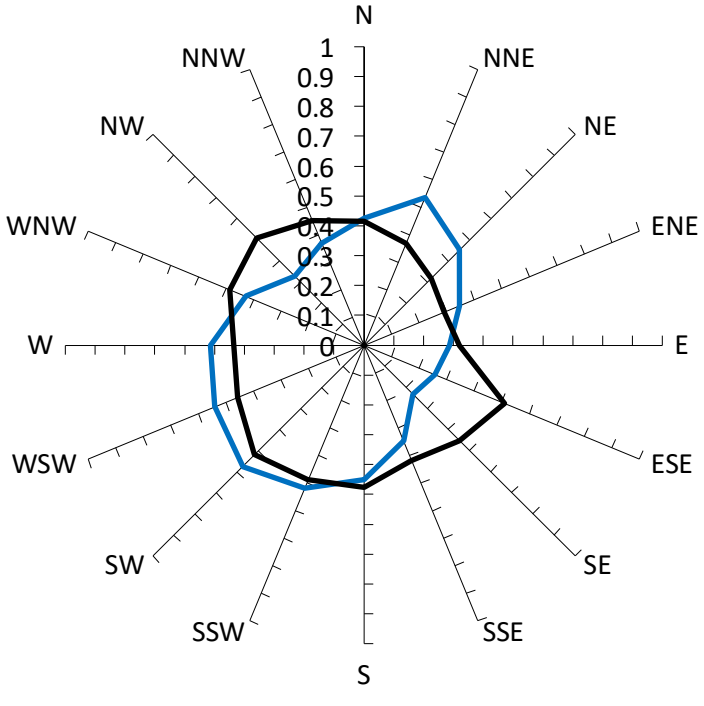


Annual Maximum Gust (m/s)

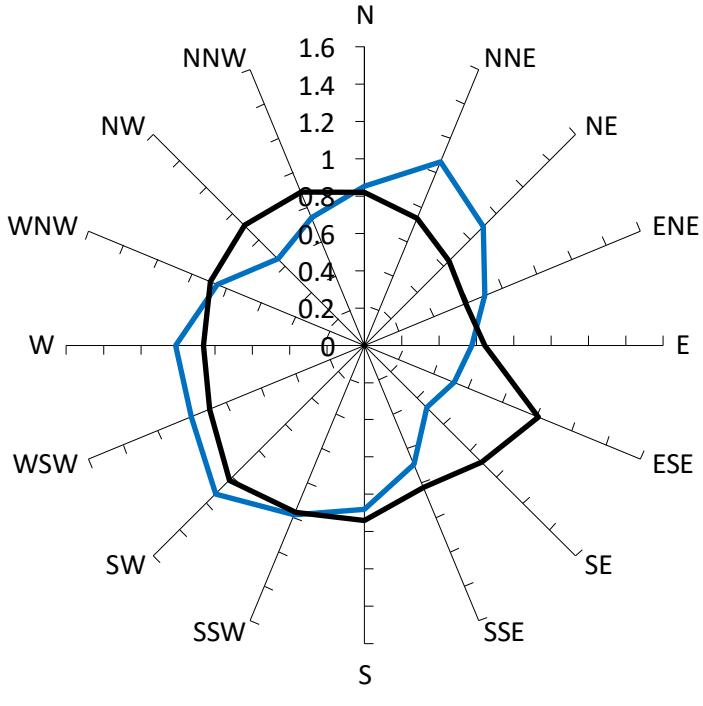
	Description	GEM Wind Speed (m/s)	Peak Gust m/s
	Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s).	8.0	24
	With development "as proposed", no vegetation or other treatments.	5.2	15
	Existing Site Conditions	4.8	13

APPENDIX D DIRECTIONAL VELOCITY COEFFICIENT PLOTS

Results for Point 01



GEM Velocity Coefficients

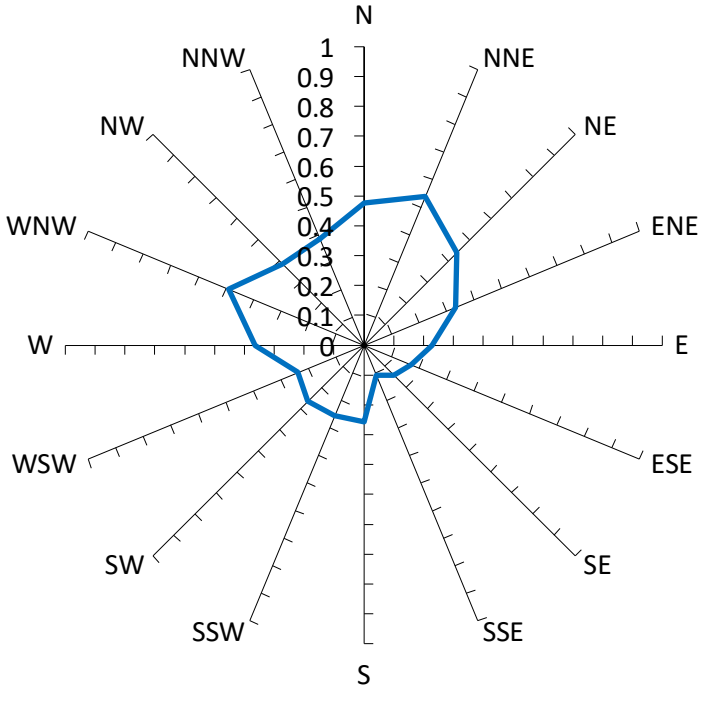


Gust Velocity Coefficients

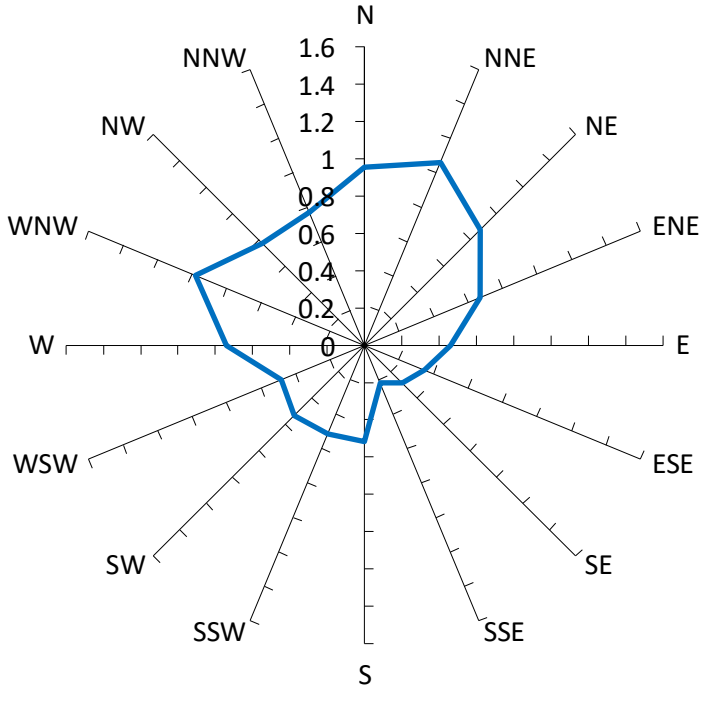
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 02



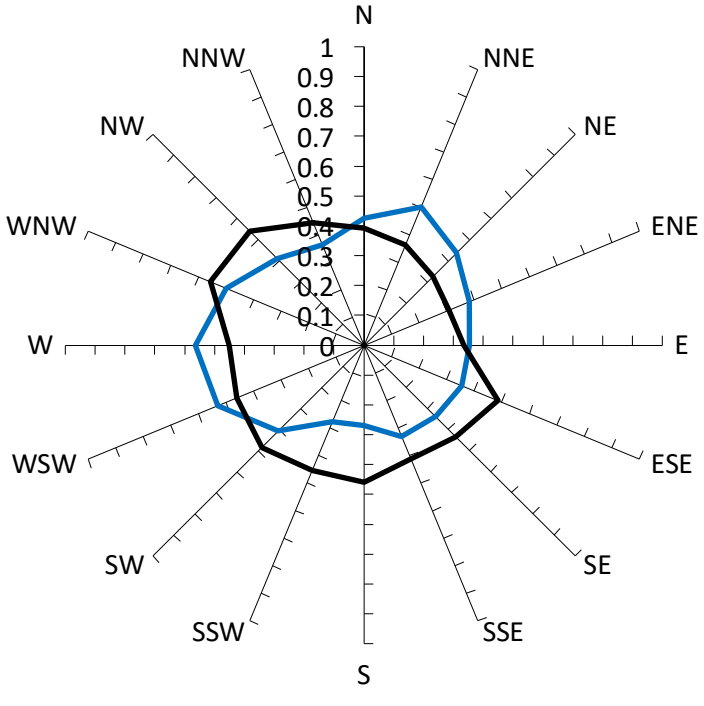
GEM Velocity Coefficients



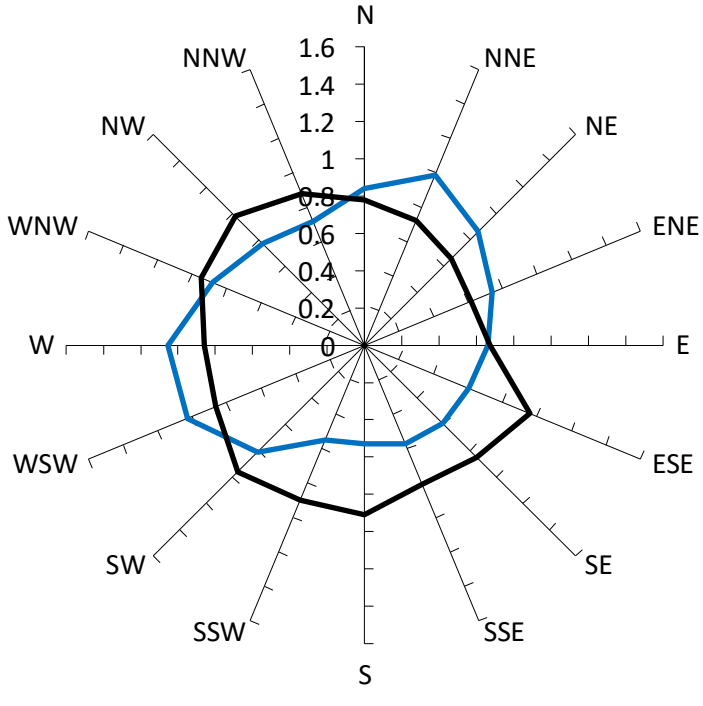
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 03



GEM Velocity Coefficients

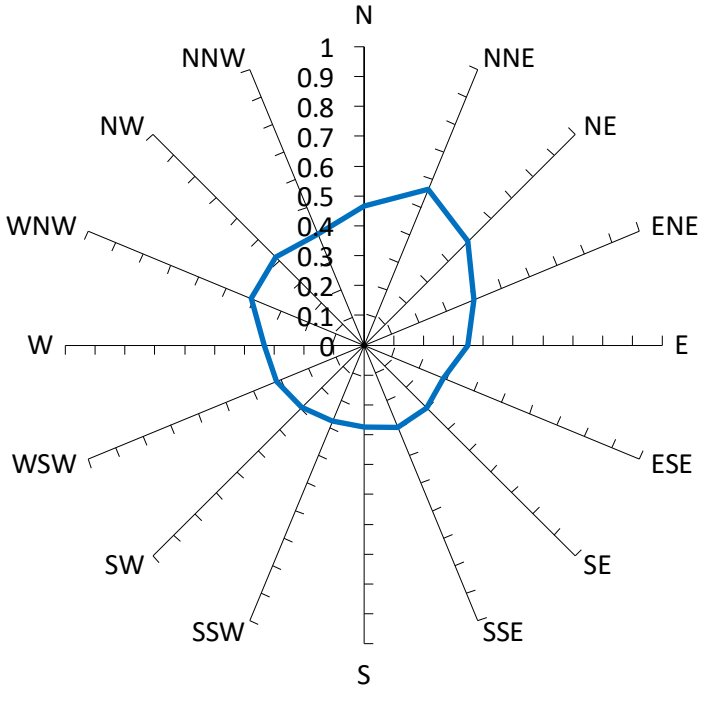


Gust Velocity Coefficients

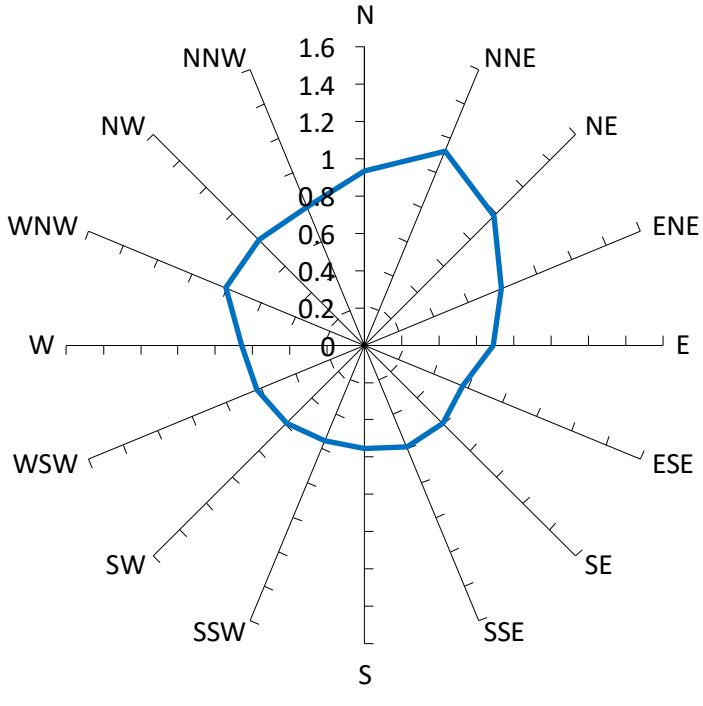
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 04



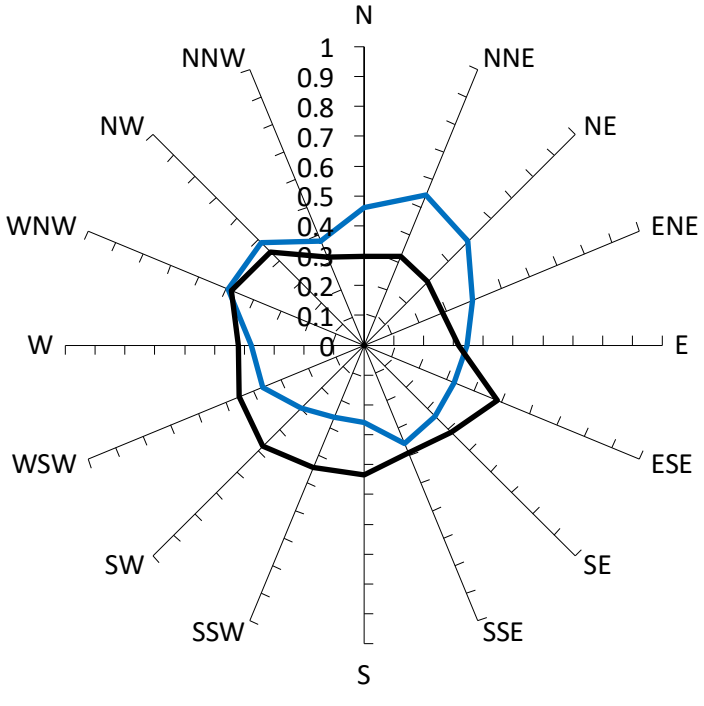
GEM Velocity Coefficients



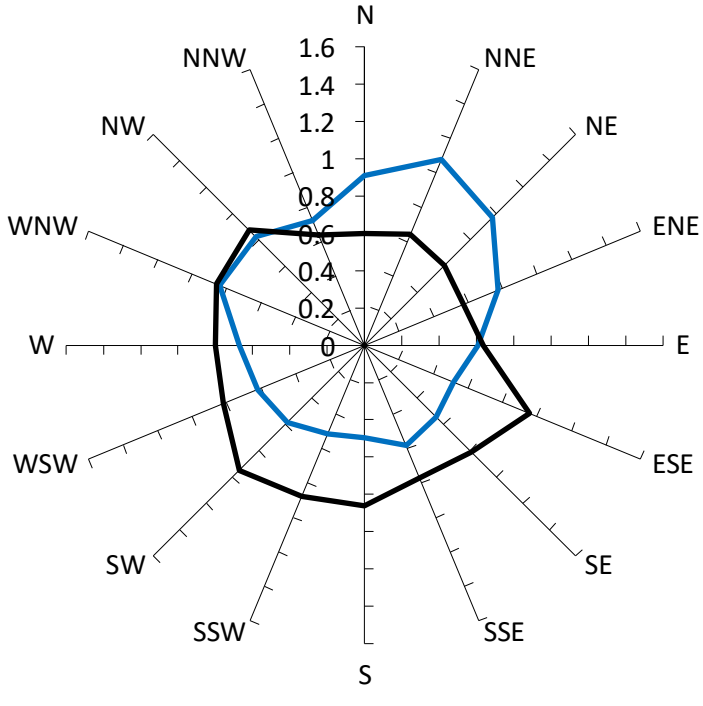
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 05



GEM Velocity Coefficients

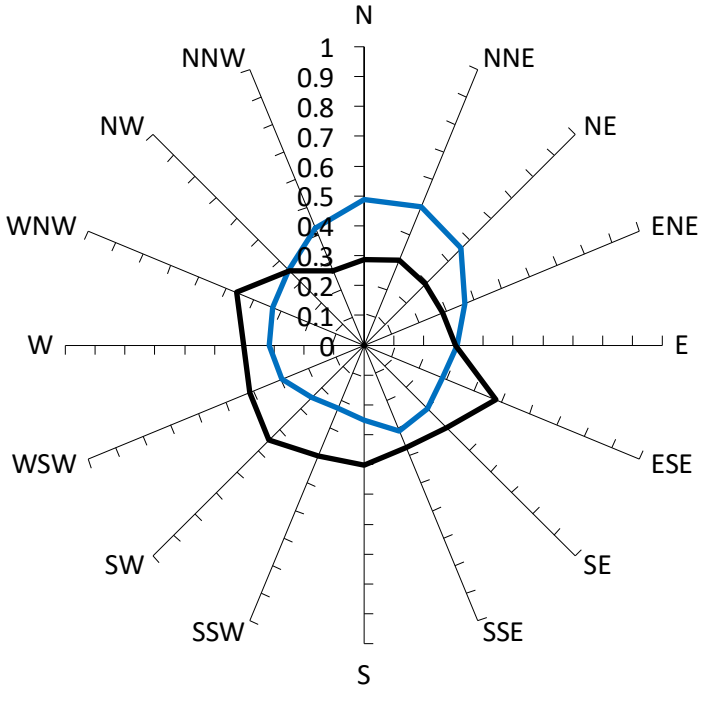


Gust Velocity Coefficients

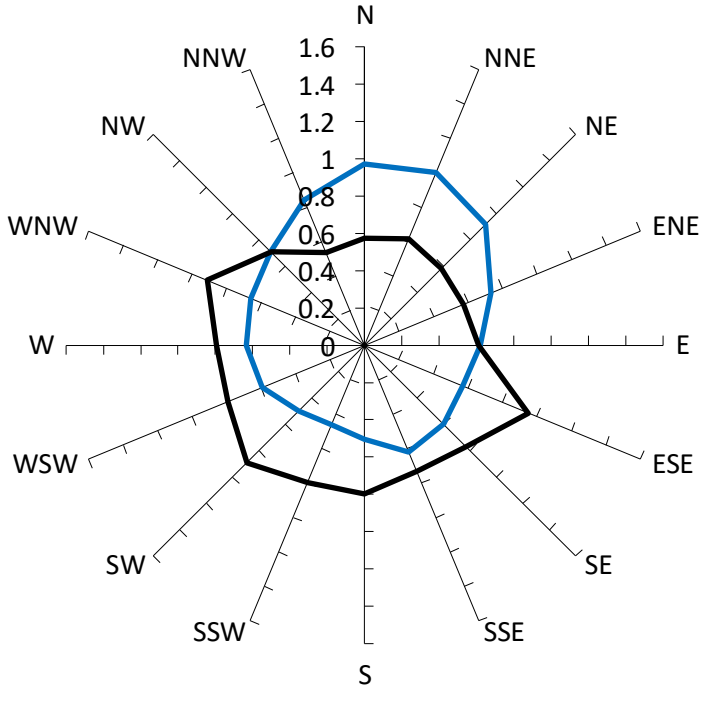
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 06



GEM Velocity Coefficients

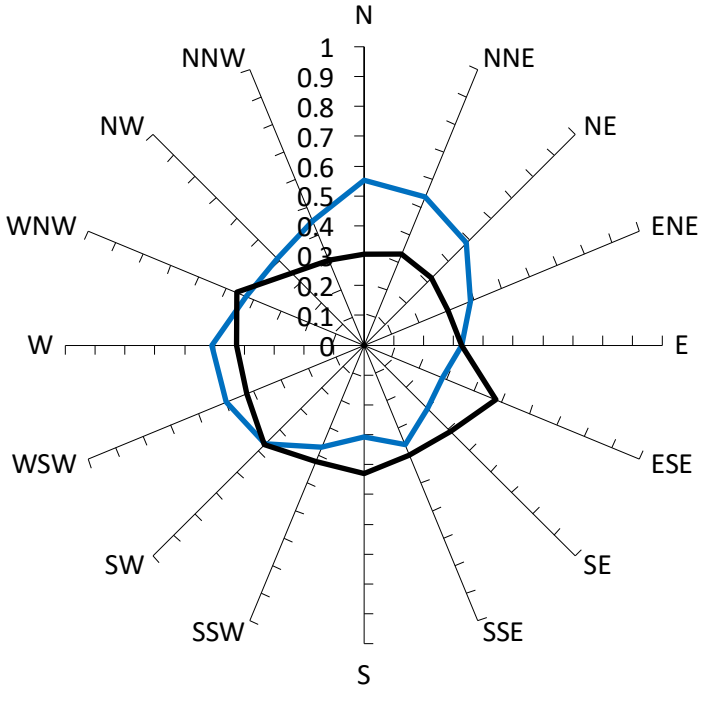


Gust Velocity Coefficients

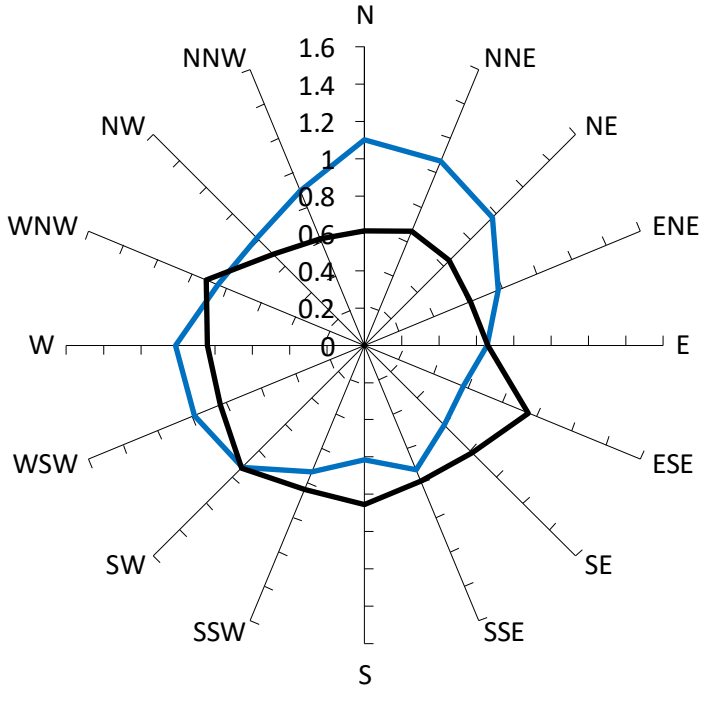
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 07



GEM Velocity Coefficients

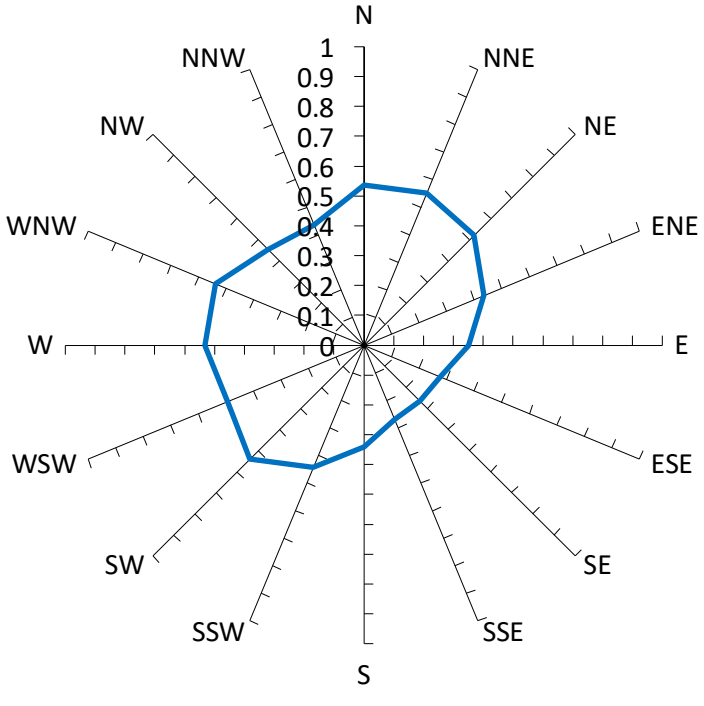


Gust Velocity Coefficients

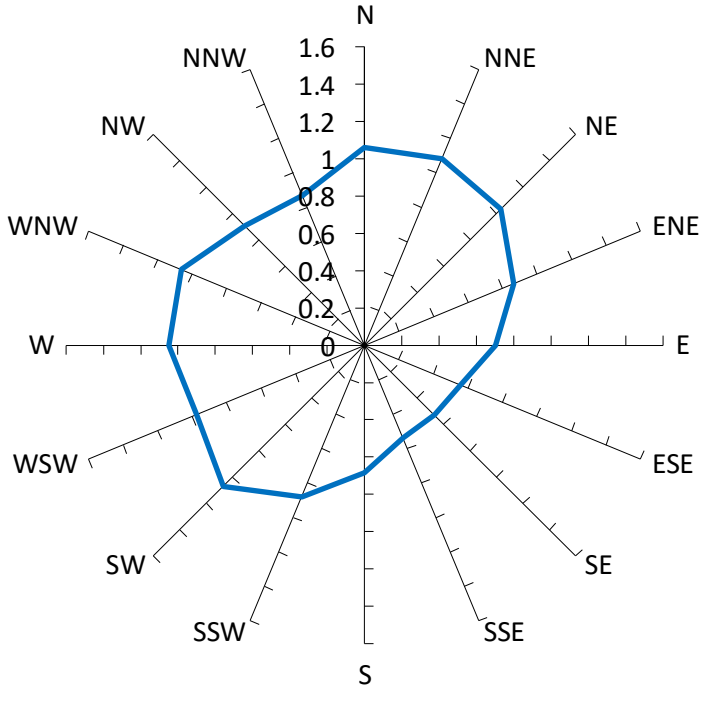
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 08



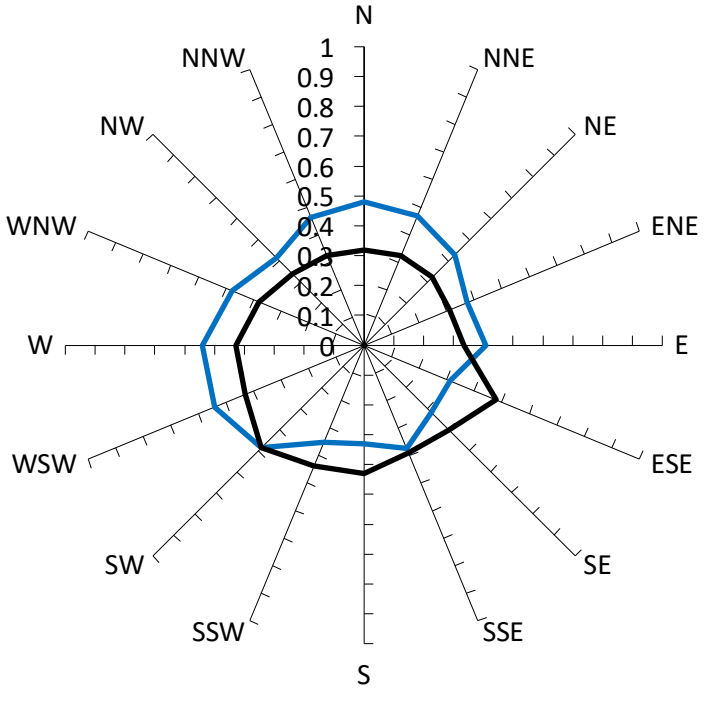
GEM Velocity Coefficients



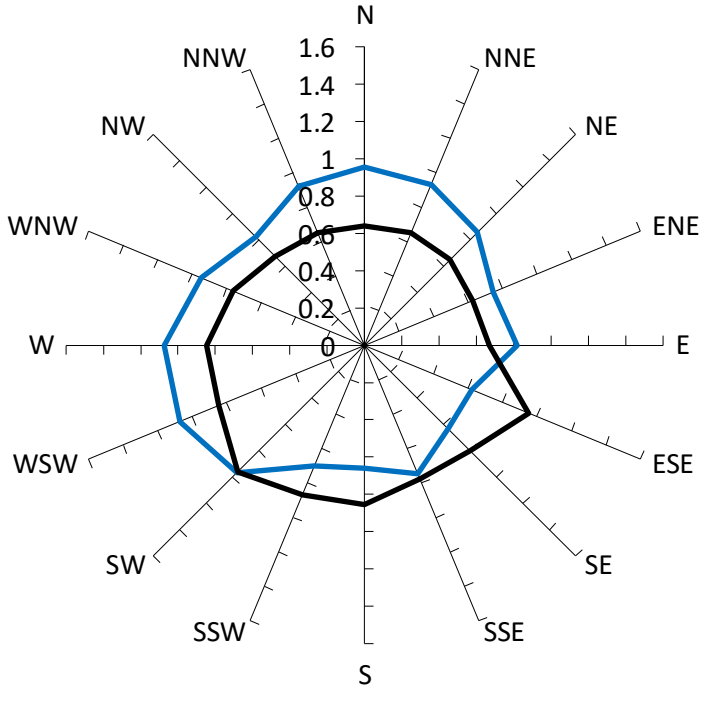
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 09



GEM Velocity Coefficients

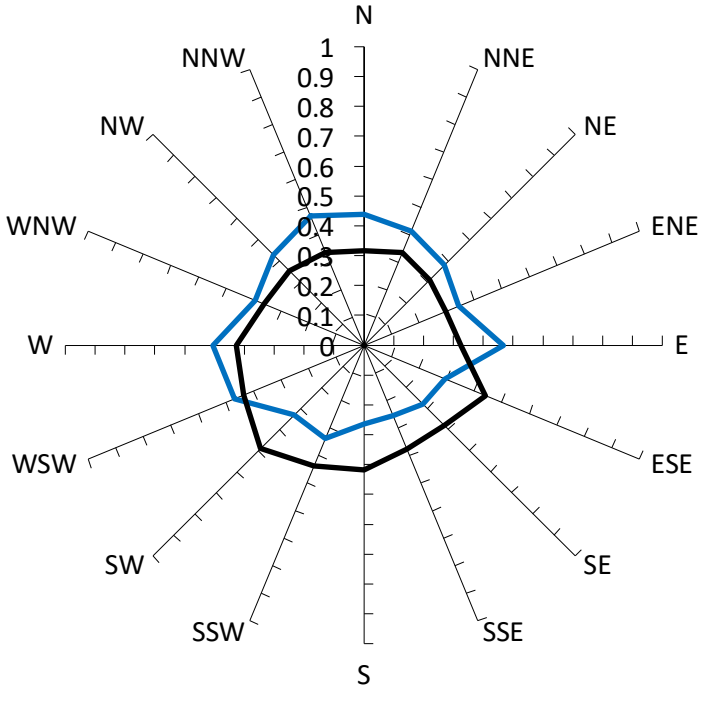


Gust Velocity Coefficients

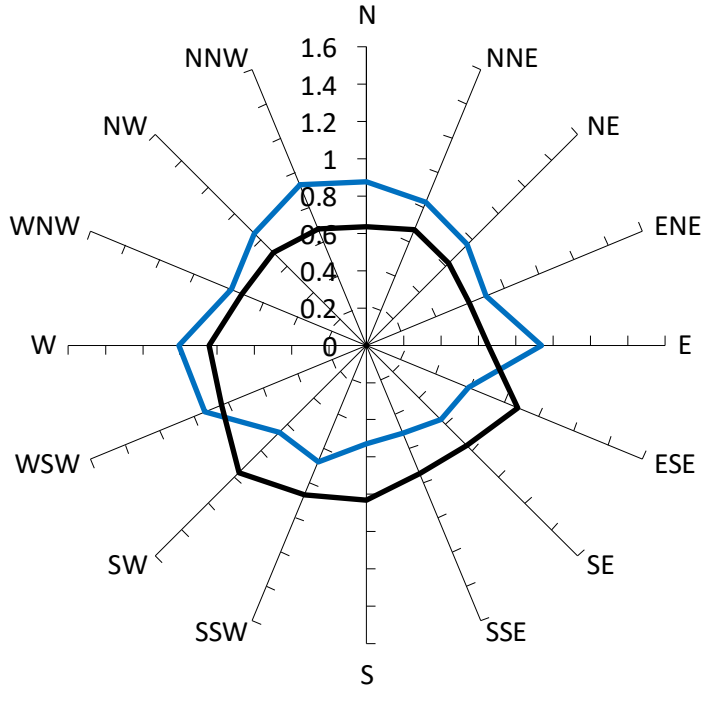
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 10



GEM Velocity Coefficients

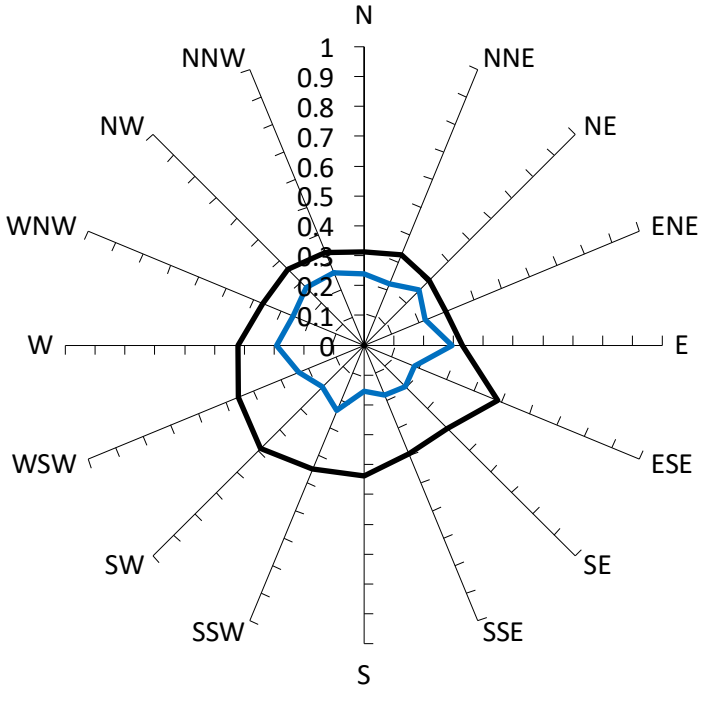


Gust Velocity Coefficients

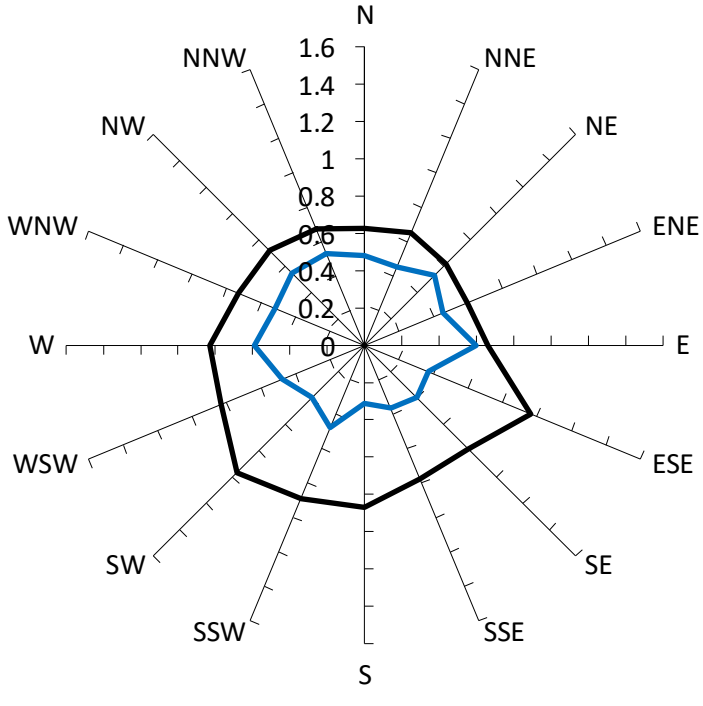
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 11



GEM Velocity Coefficients

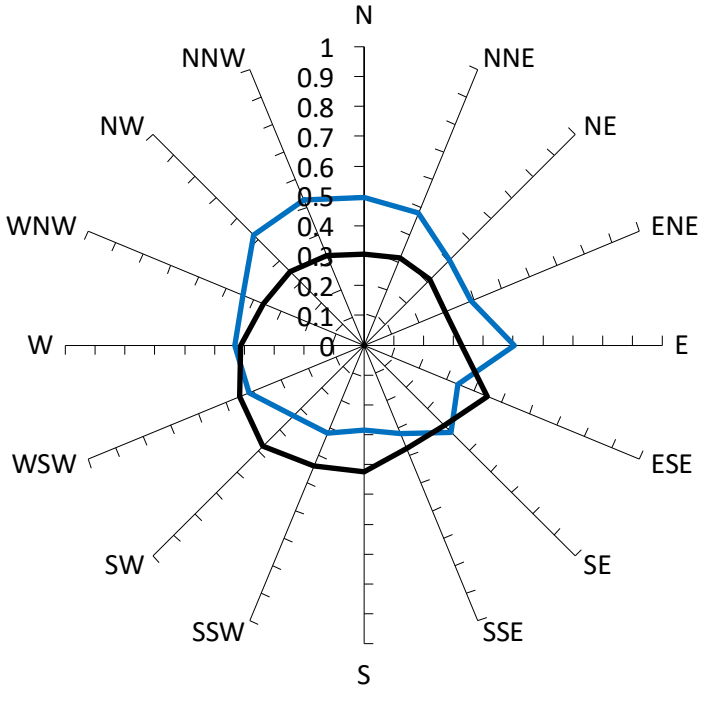


Gust Velocity Coefficients

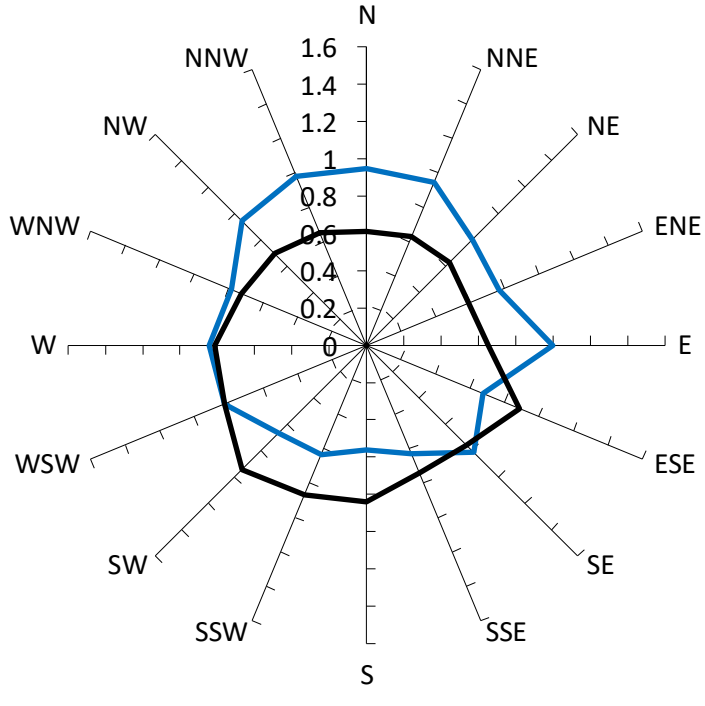
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 12



GEM Velocity Coefficients

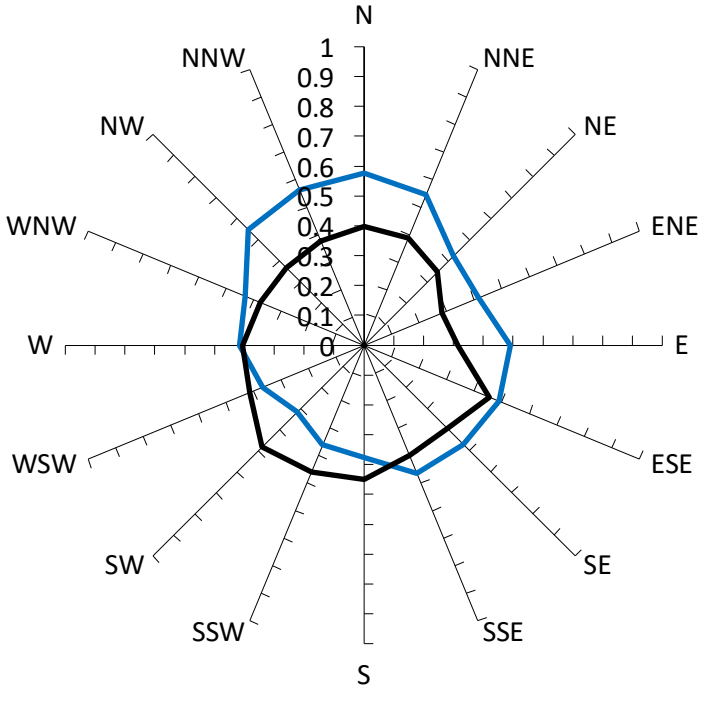


Gust Velocity Coefficients

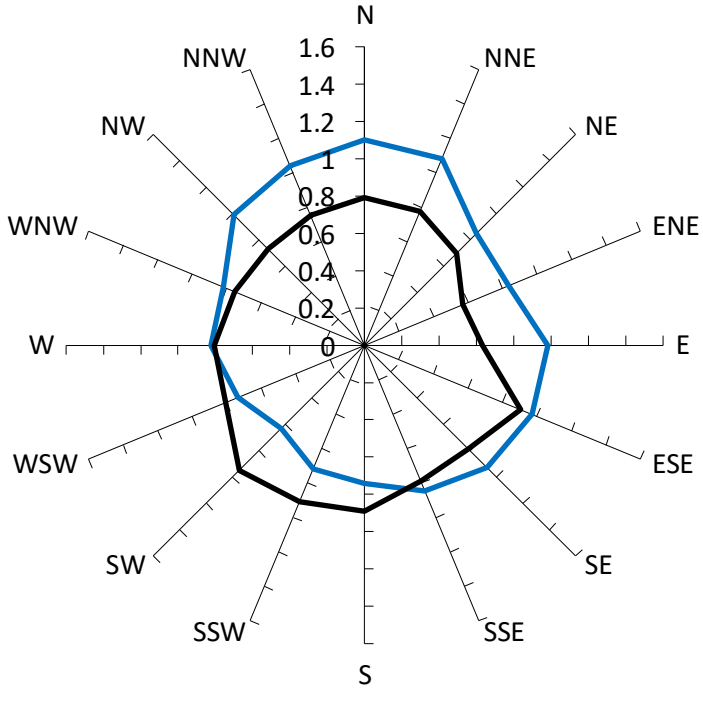
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 13



GEM Velocity Coefficients

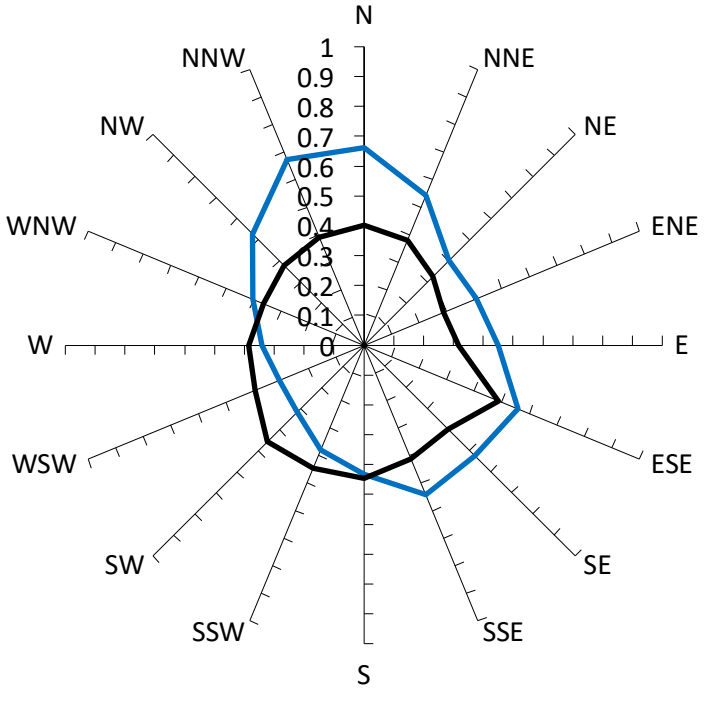


Gust Velocity Coefficients

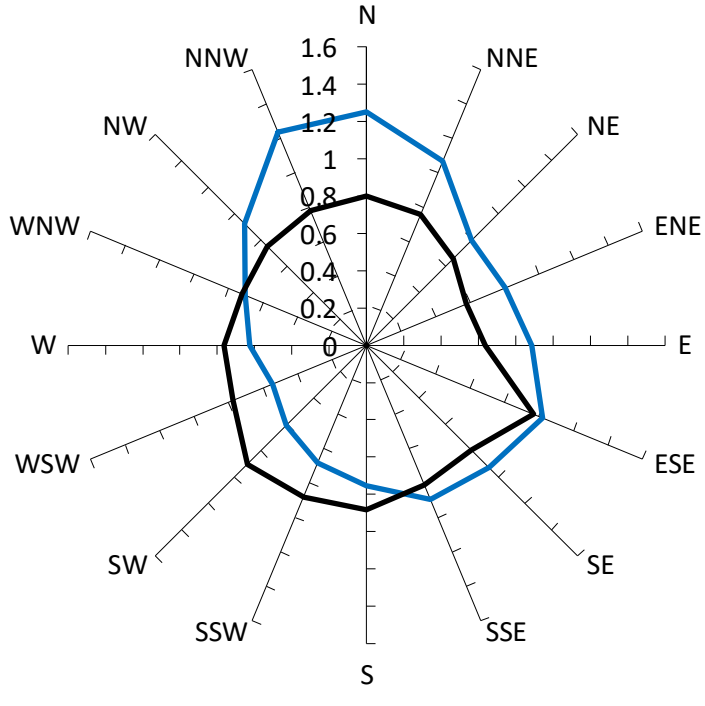
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 14



GEM Velocity Coefficients

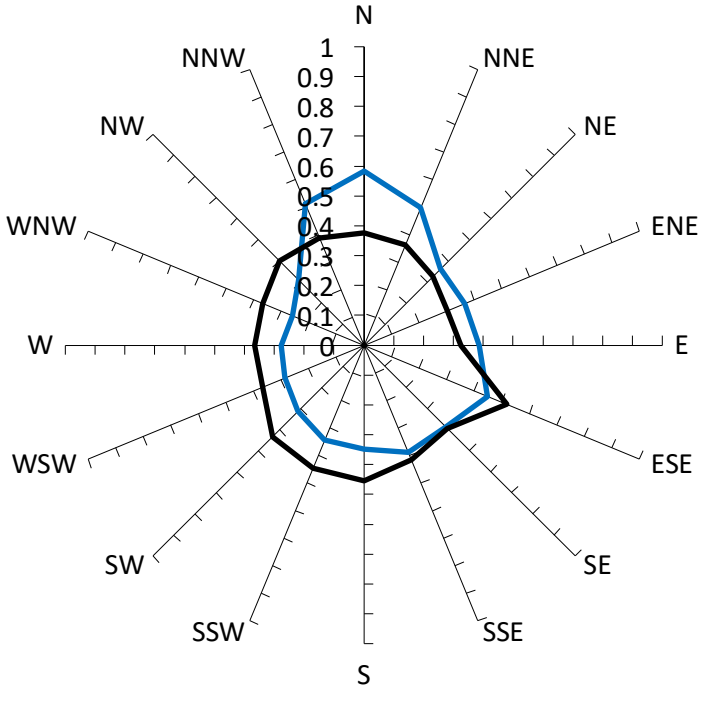


Gust Velocity Coefficients

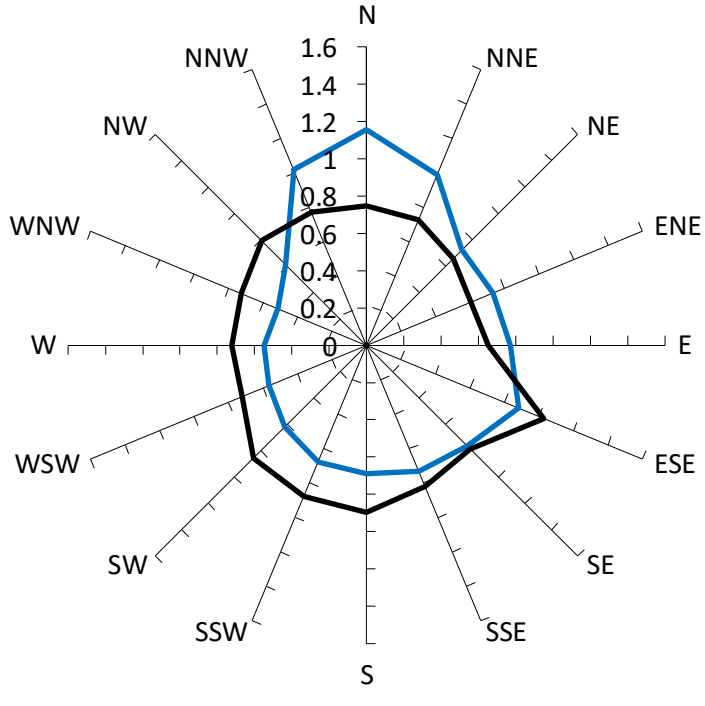
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 15



GEM Velocity Coefficients

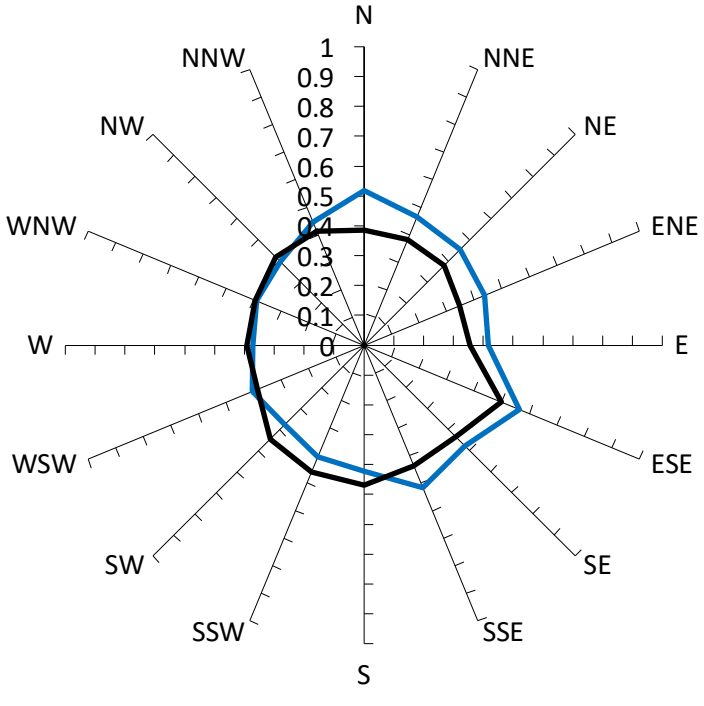


Gust Velocity Coefficients

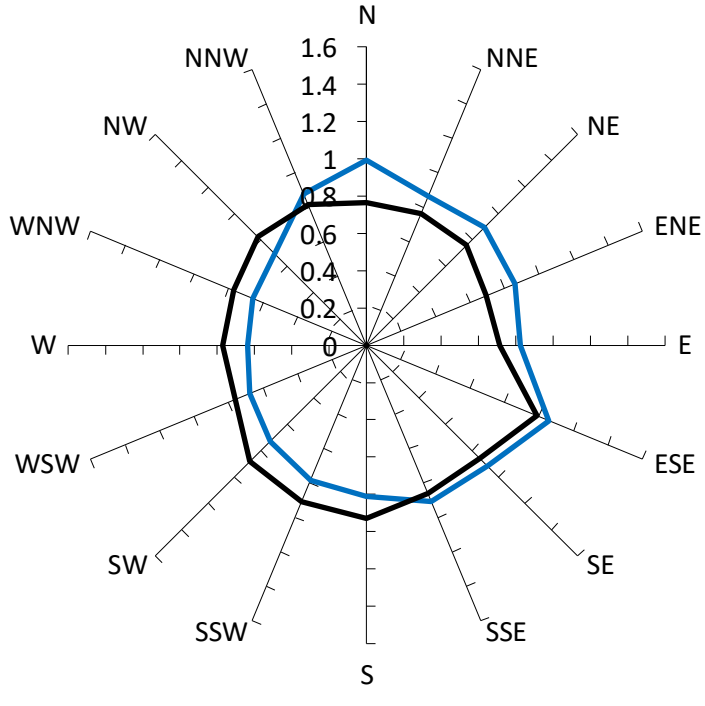
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 16



GEM Velocity Coefficients

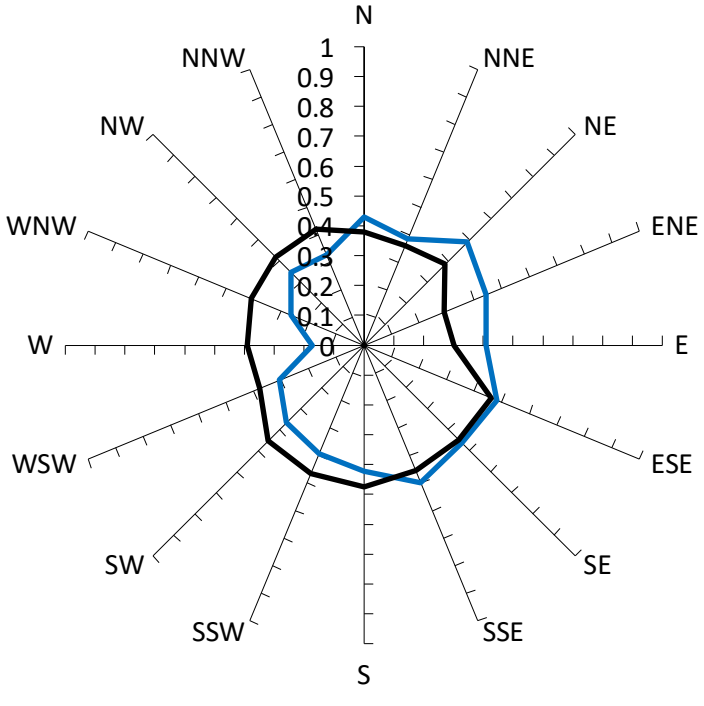


Gust Velocity Coefficients

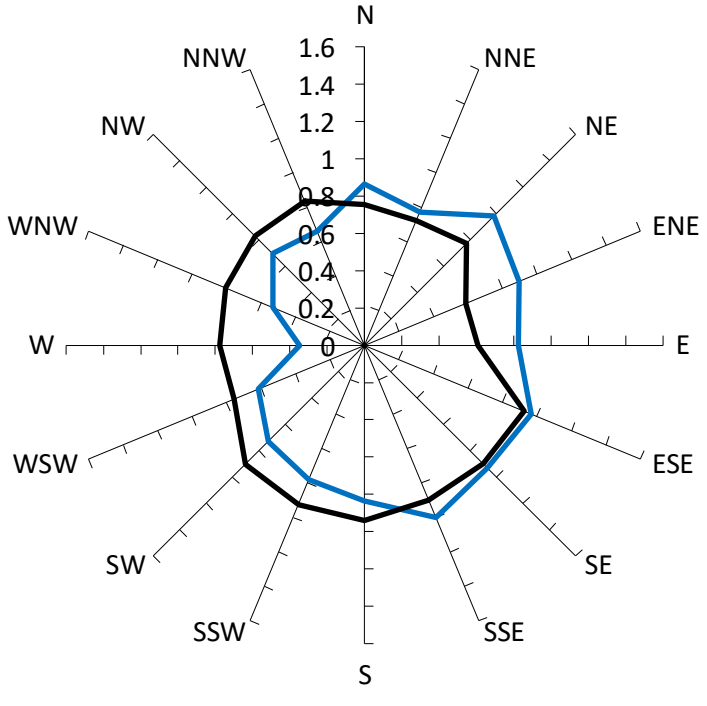
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 17



GEM Velocity Coefficients

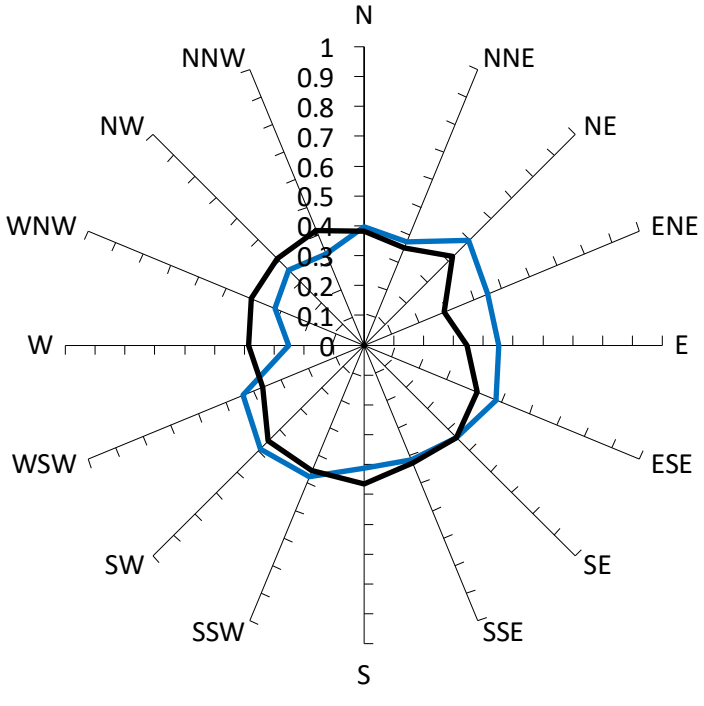


Gust Velocity Coefficients

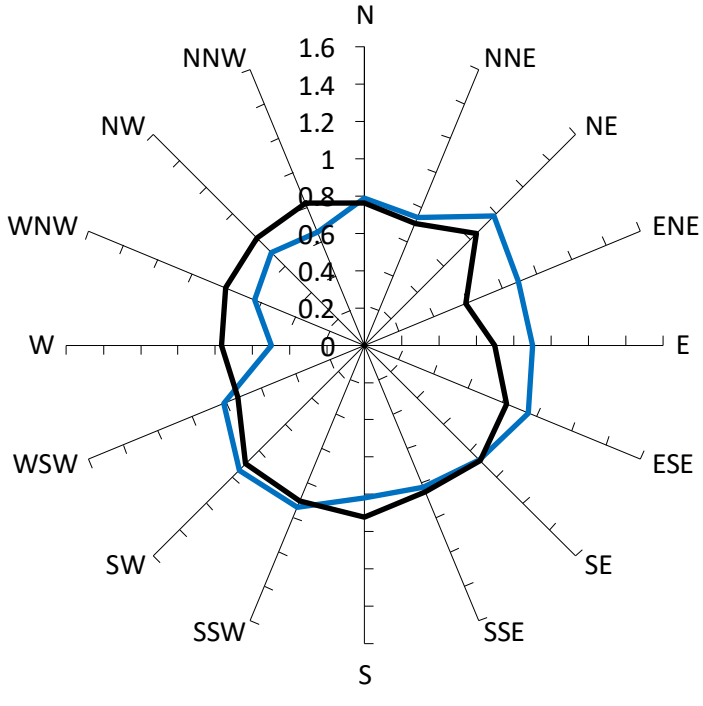
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 18



GEM Velocity Coefficients

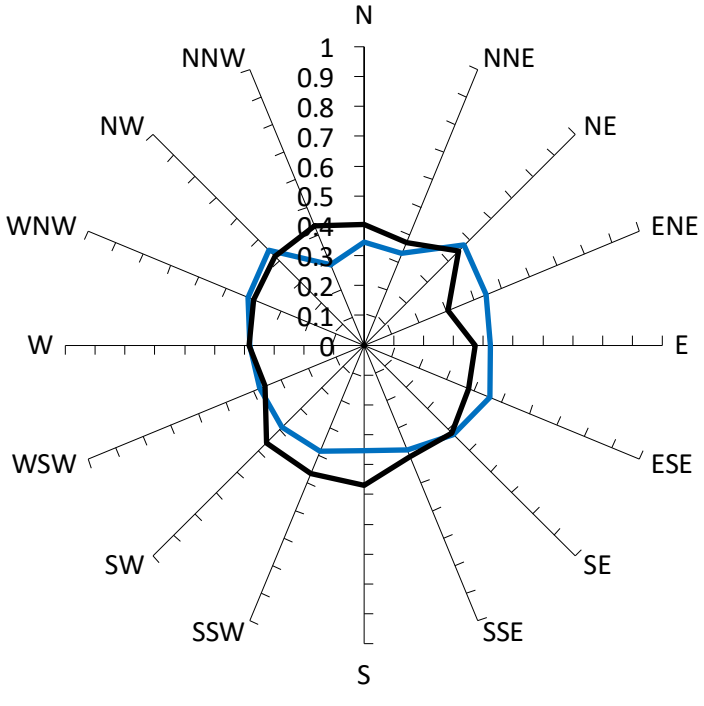


Gust Velocity Coefficients

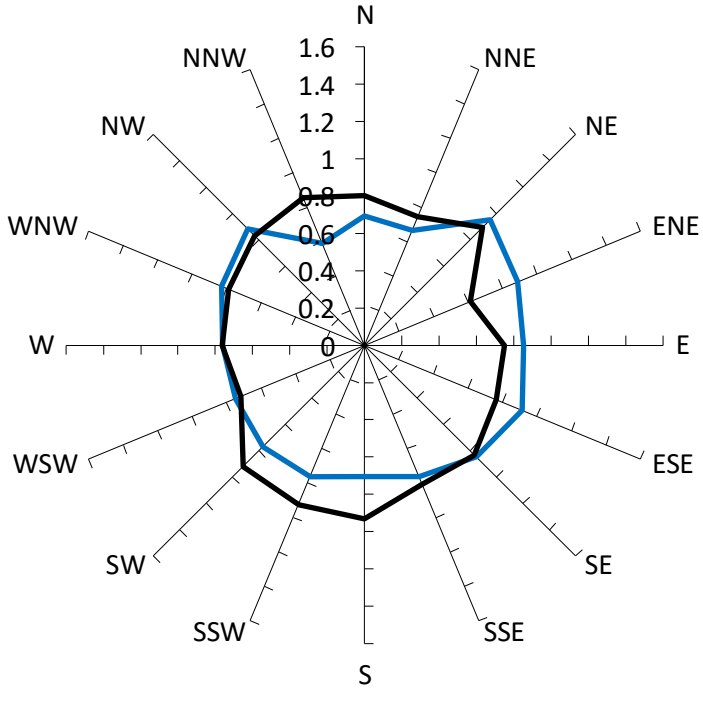
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 19



GEM Velocity Coefficients

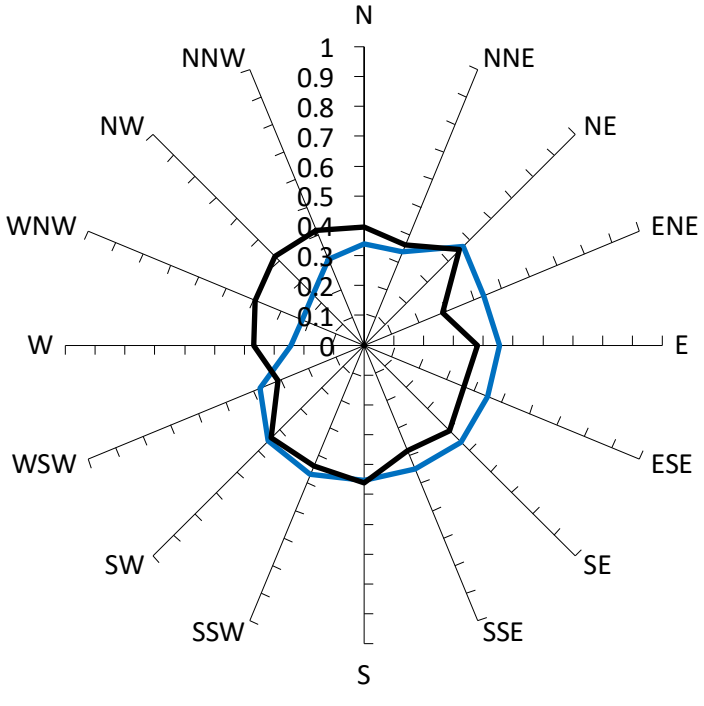


Gust Velocity Coefficients

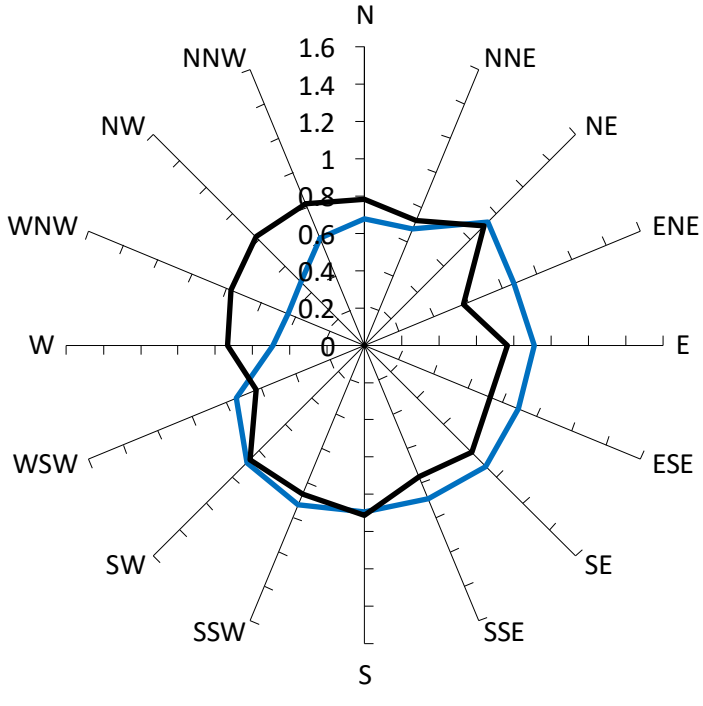
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 20



GEM Velocity Coefficients

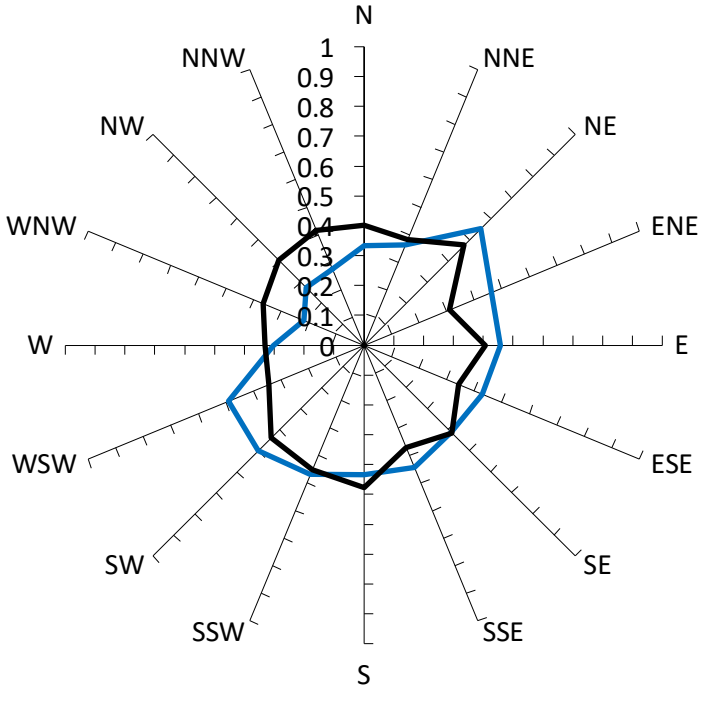


Gust Velocity Coefficients

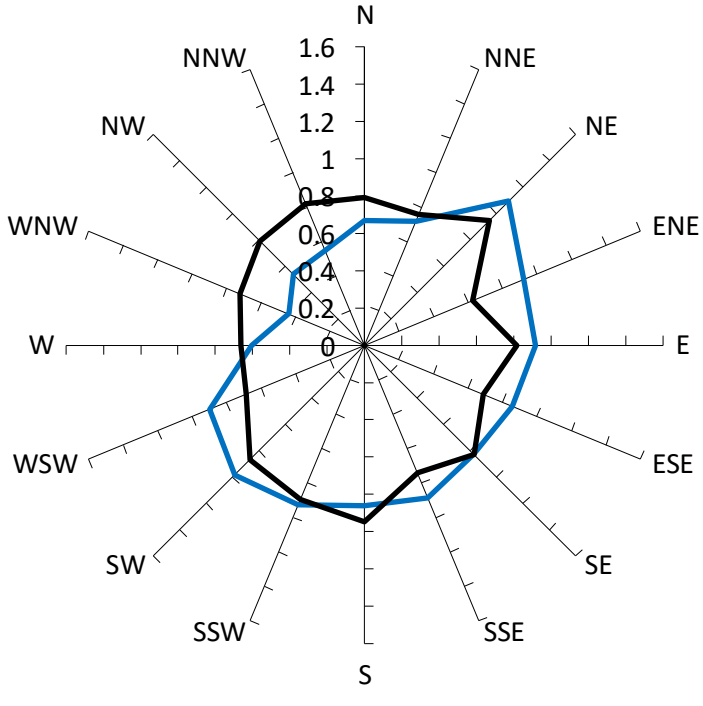
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 21



GEM Velocity Coefficients

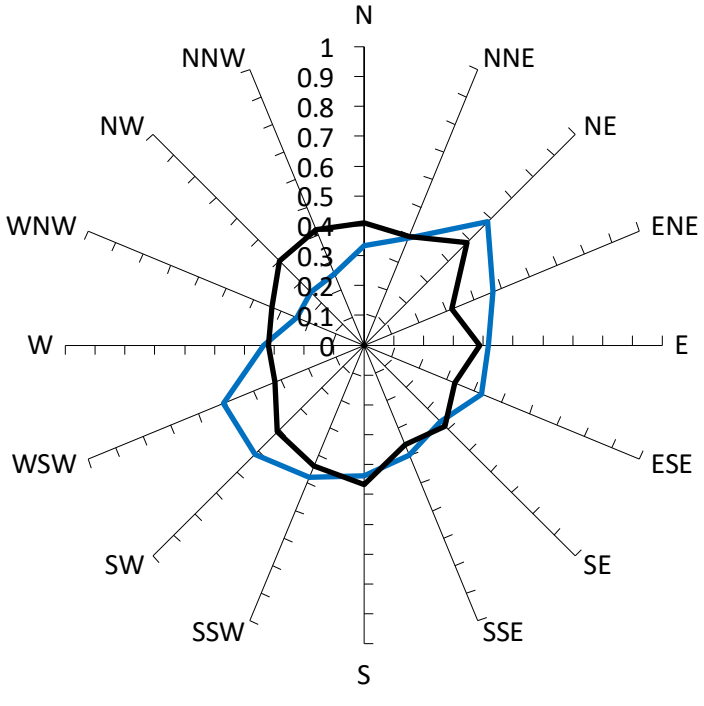


Gust Velocity Coefficients

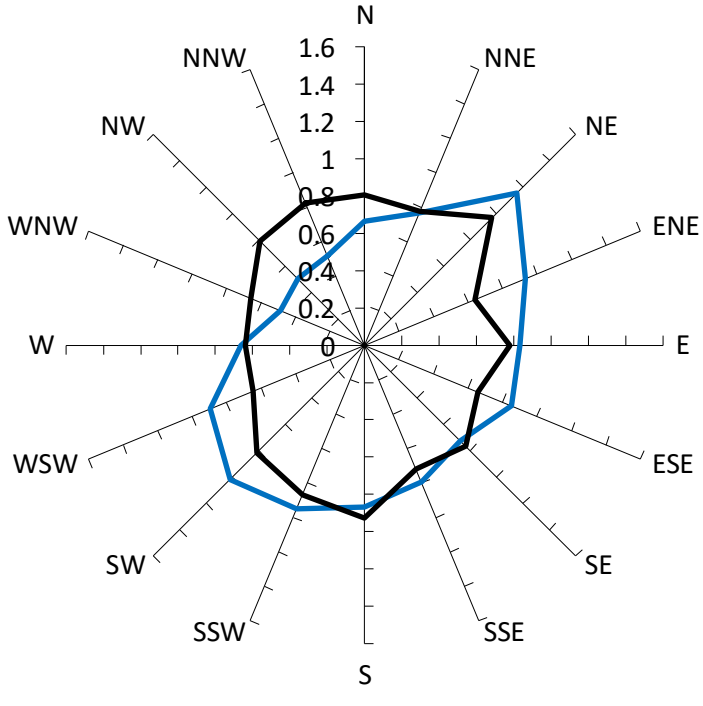
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 22



GEM Velocity Coefficients

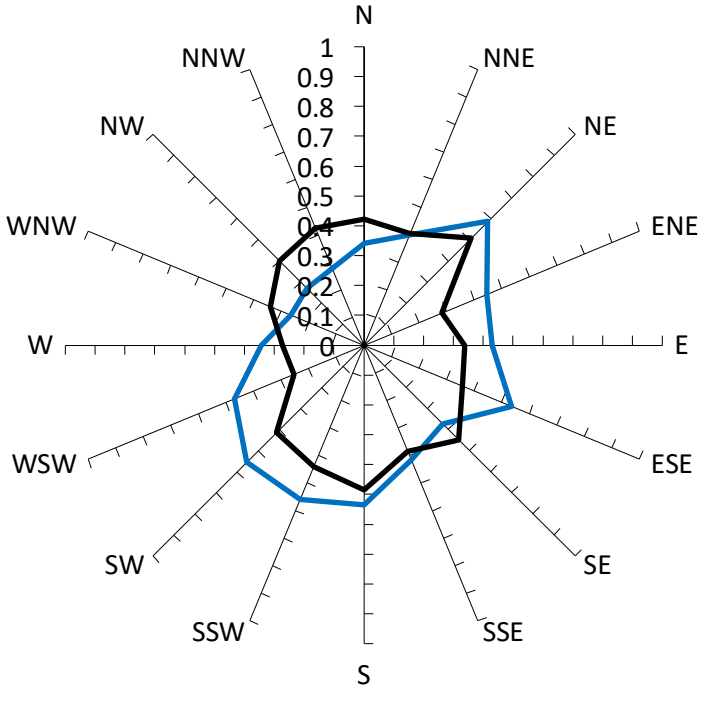


Gust Velocity Coefficients

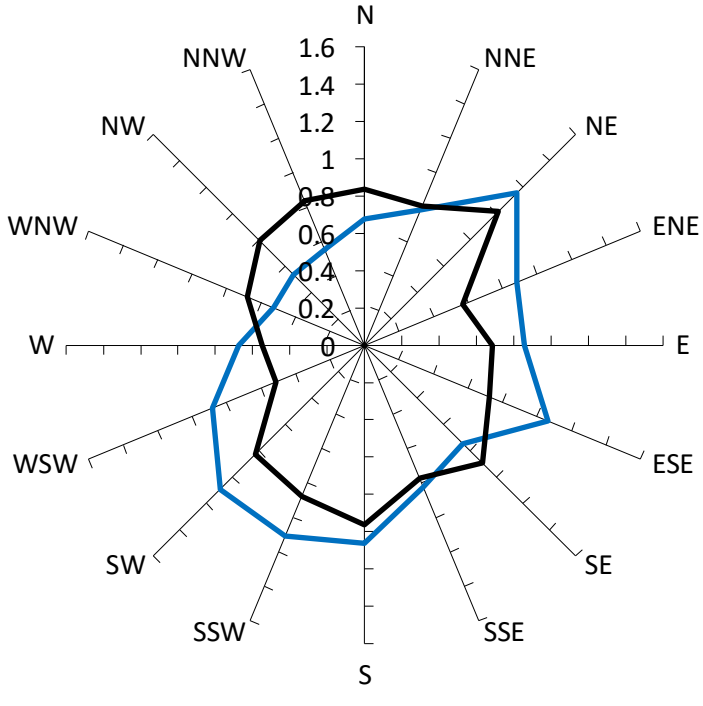
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 23



GEM Velocity Coefficients

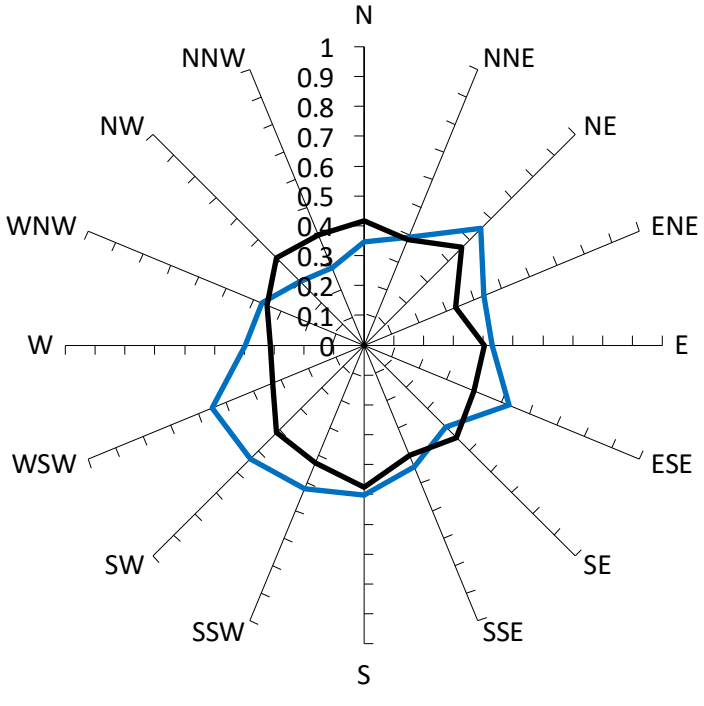


Gust Velocity Coefficients

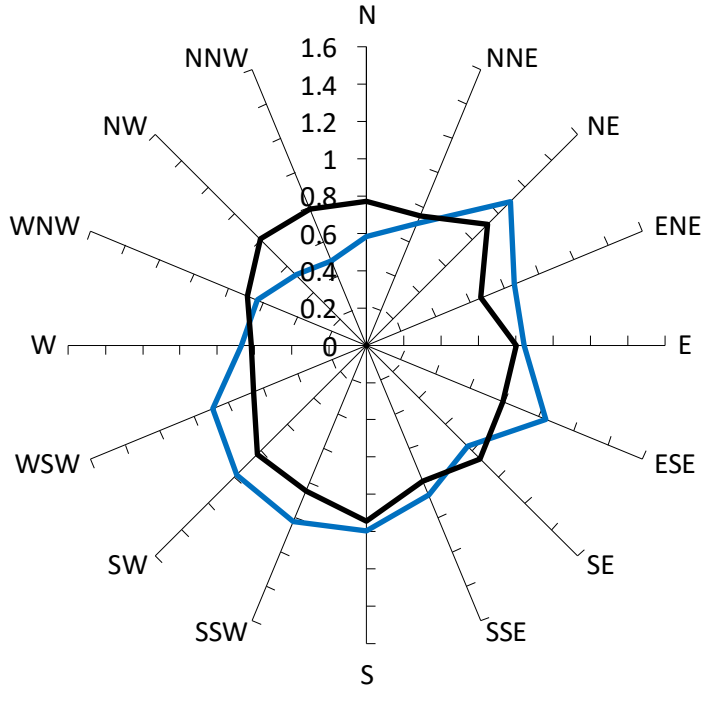
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 24



GEM Velocity Coefficients

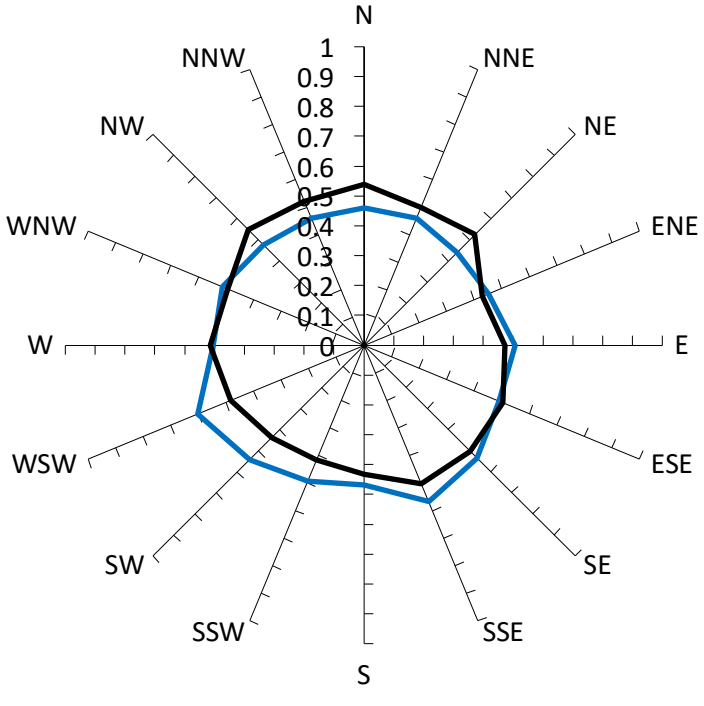


Gust Velocity Coefficients

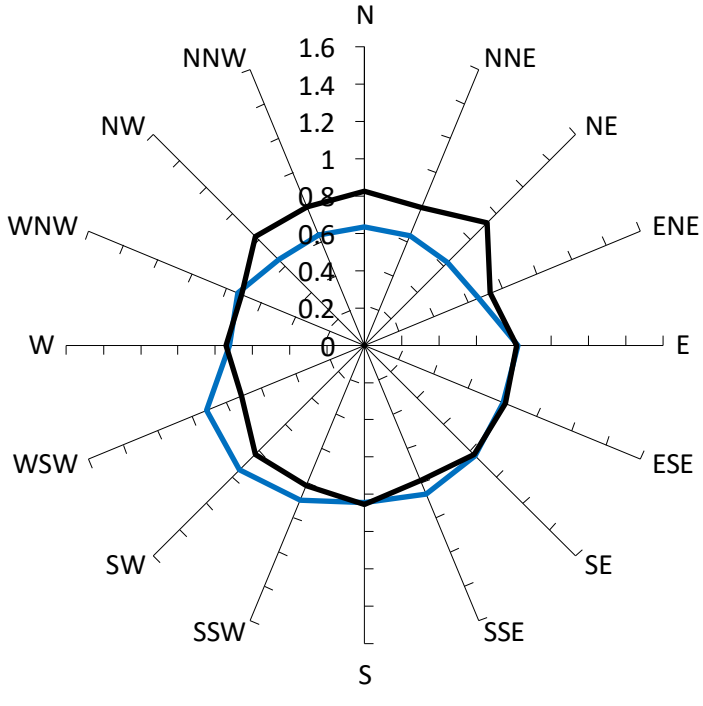
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 25



GEM Velocity Coefficients

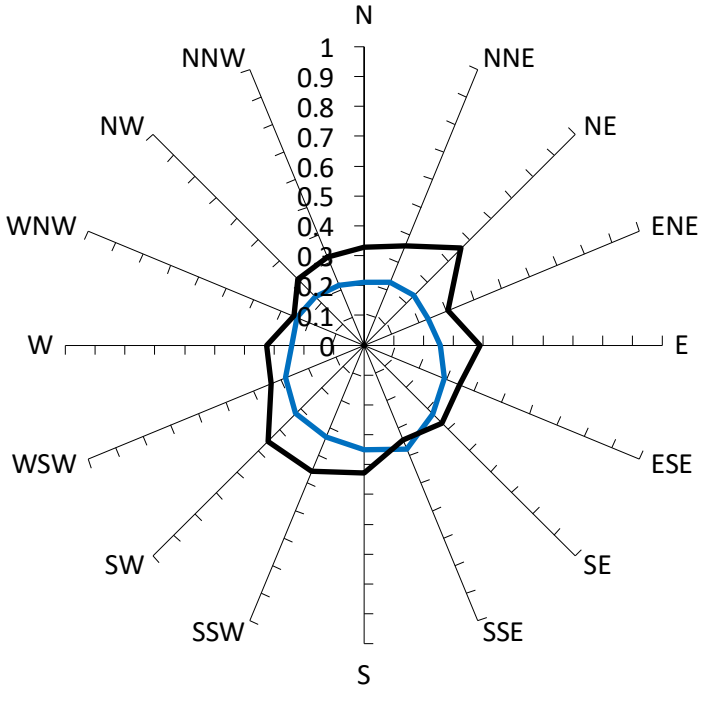


Gust Velocity Coefficients

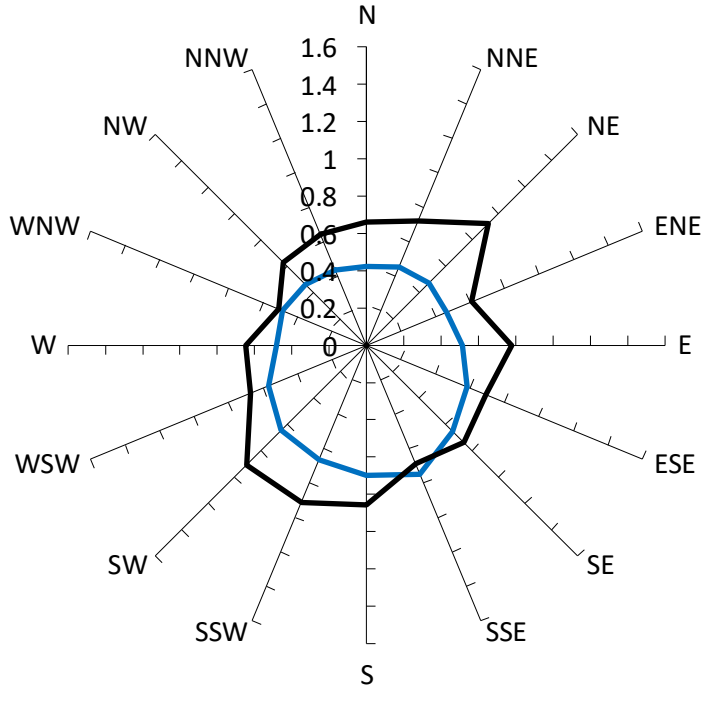
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 26



GEM Velocity Coefficients

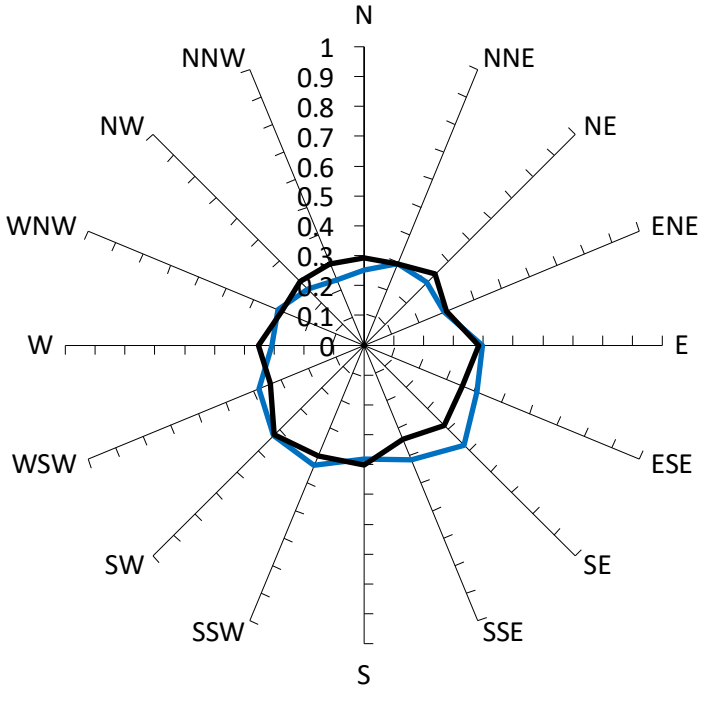


Gust Velocity Coefficients

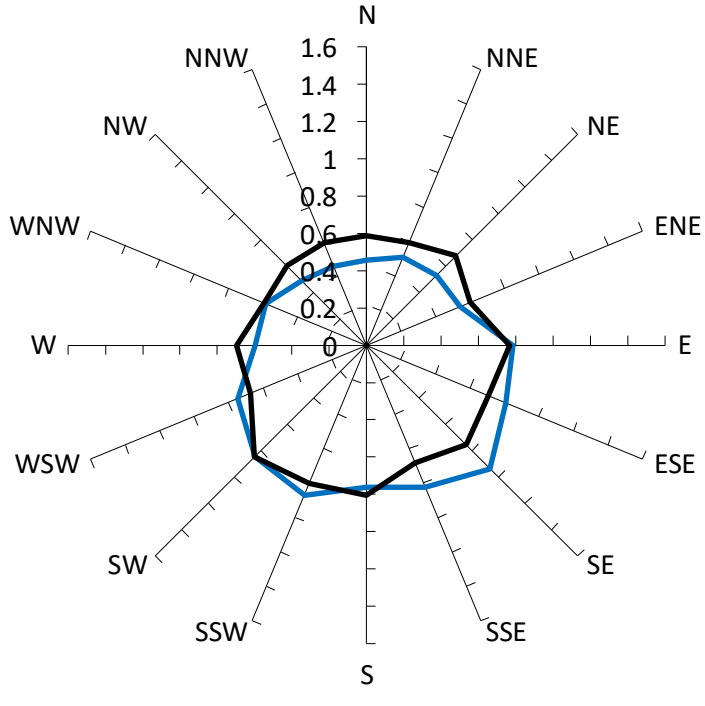
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 27



GEM Velocity Coefficients

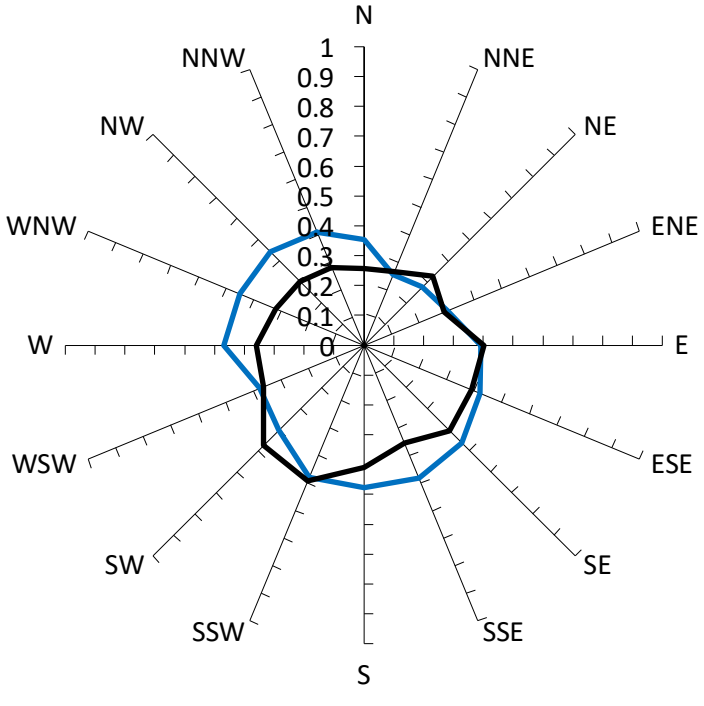


Gust Velocity Coefficients

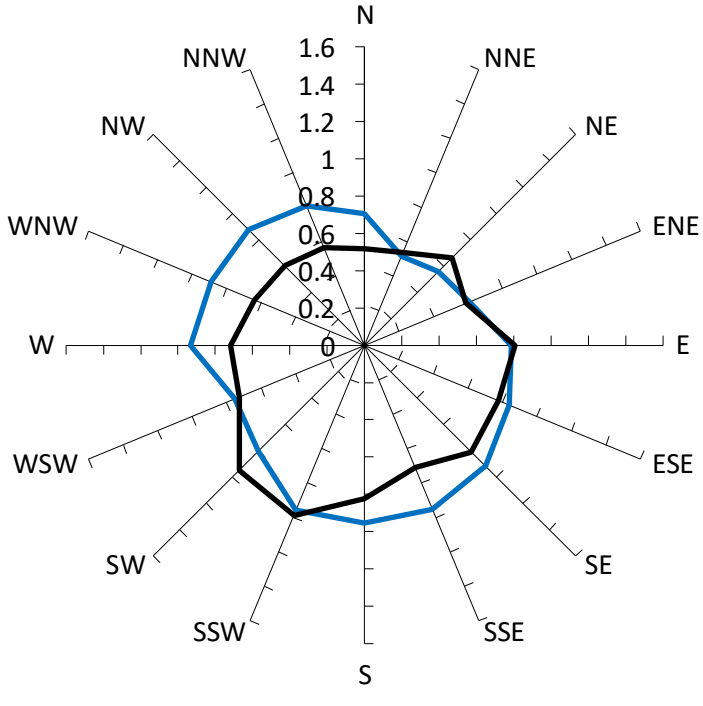
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 28



GEM Velocity Coefficients

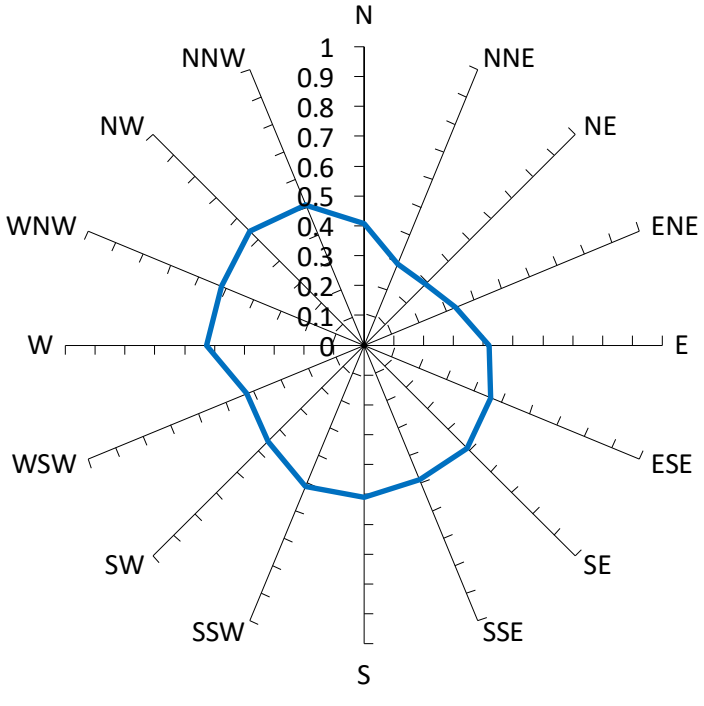


Gust Velocity Coefficients

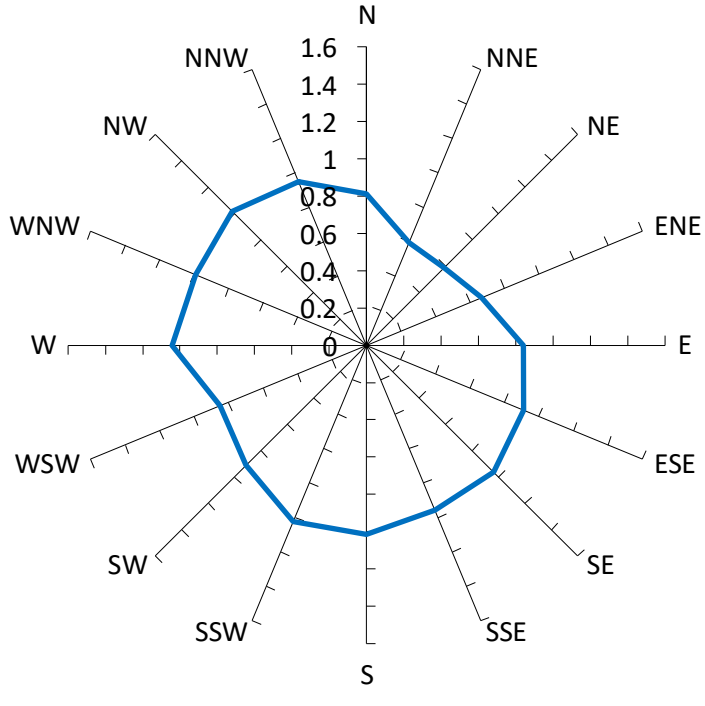
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 29



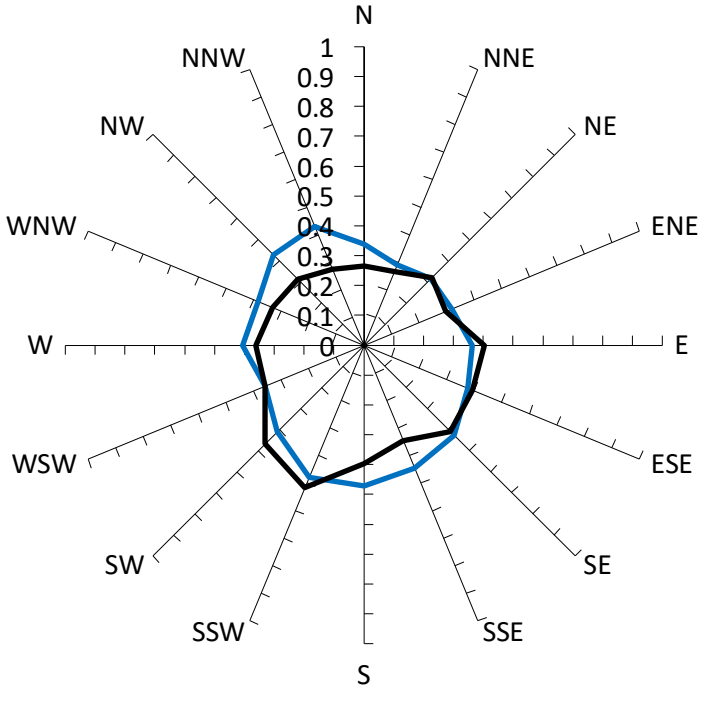
GEM Velocity Coefficients



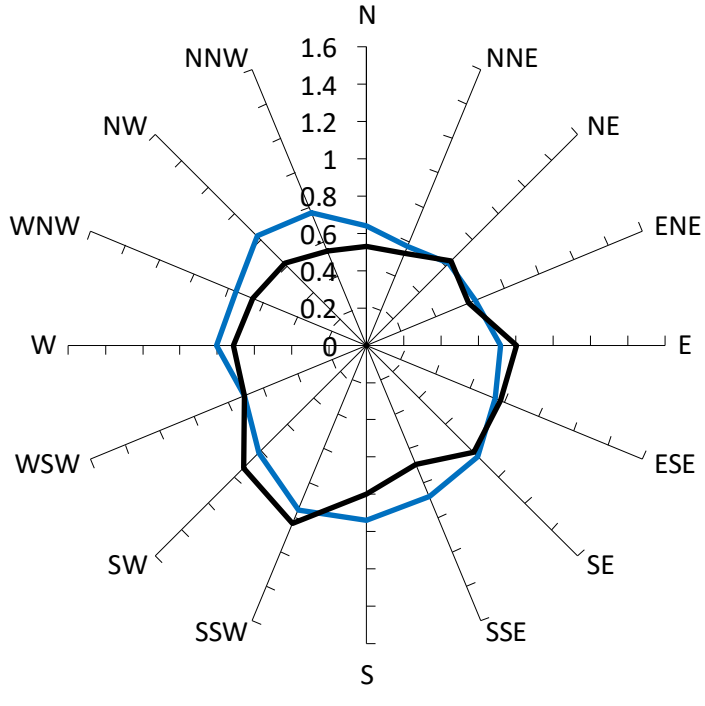
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 30



GEM Velocity Coefficients

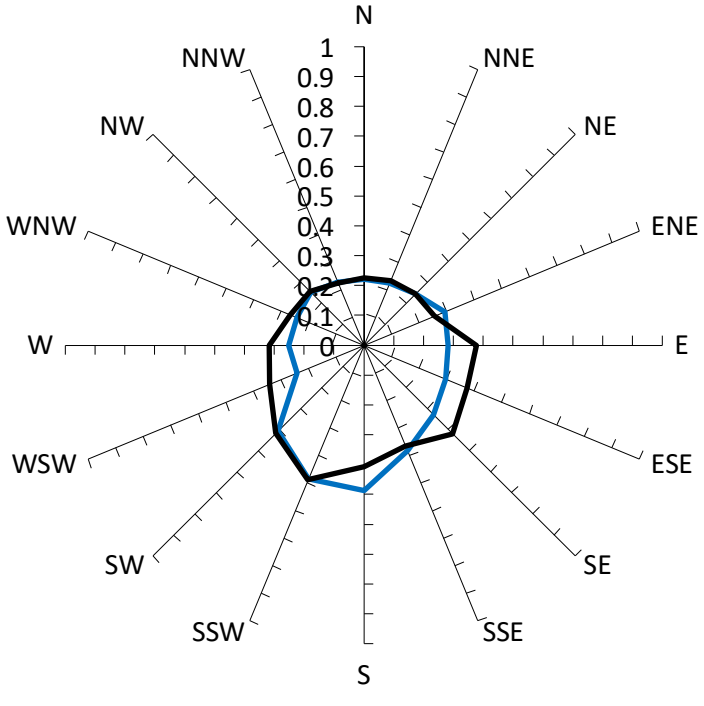


Gust Velocity Coefficients

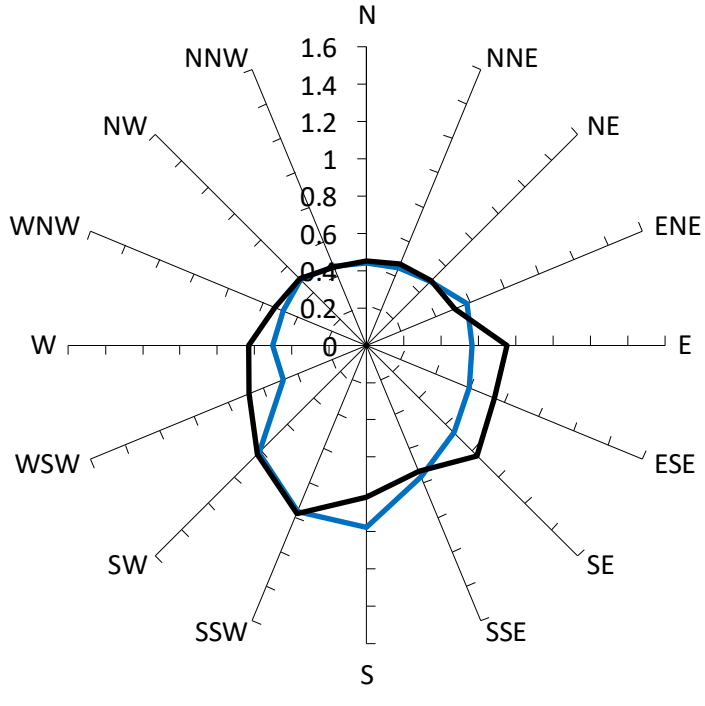
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 31



GEM Velocity Coefficients

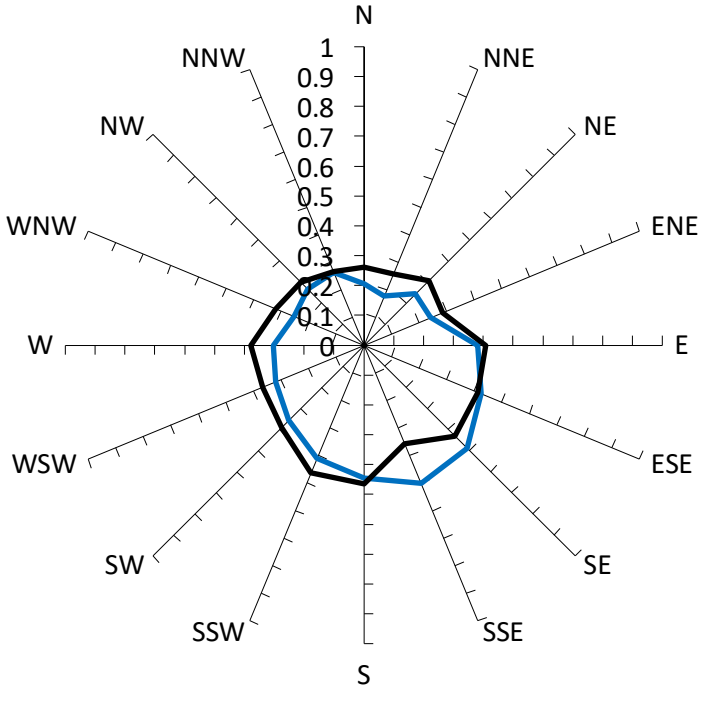


Gust Velocity Coefficients

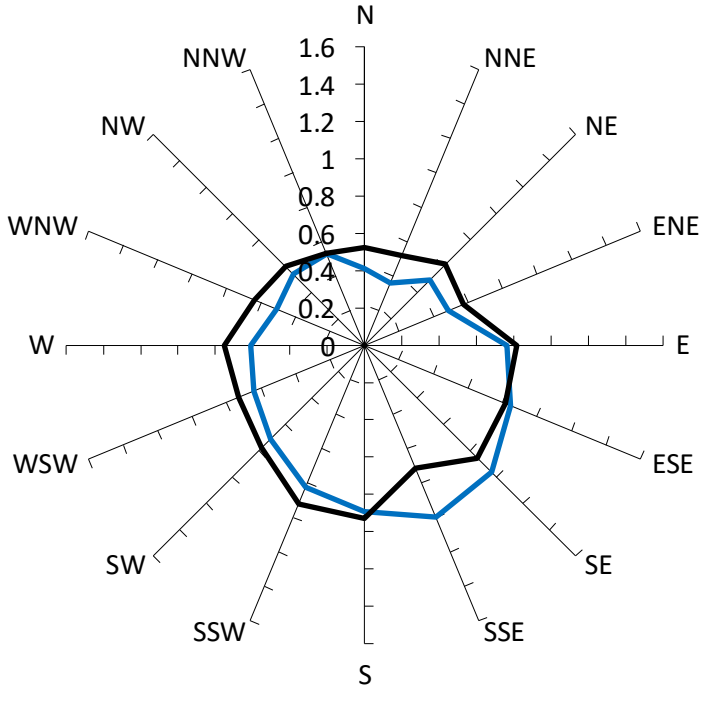
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 32



GEM Velocity Coefficients

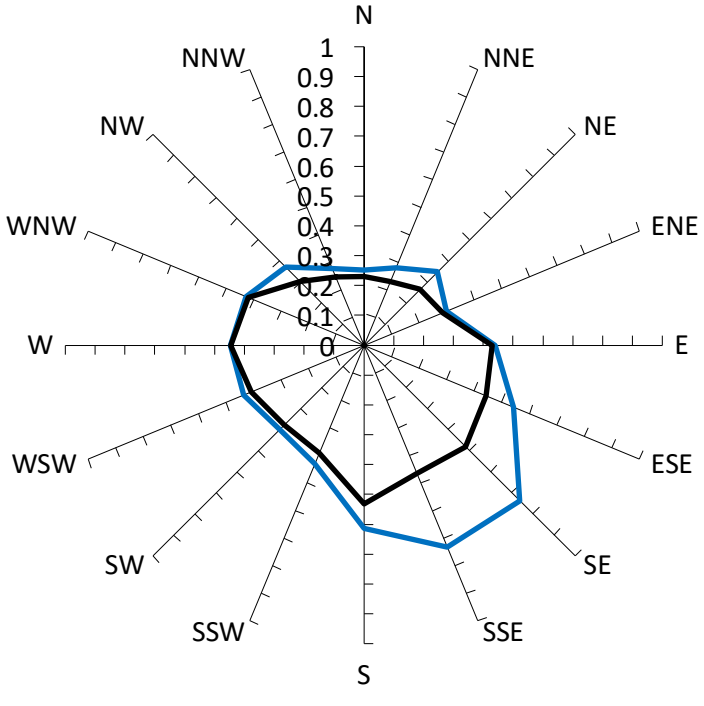


Gust Velocity Coefficients

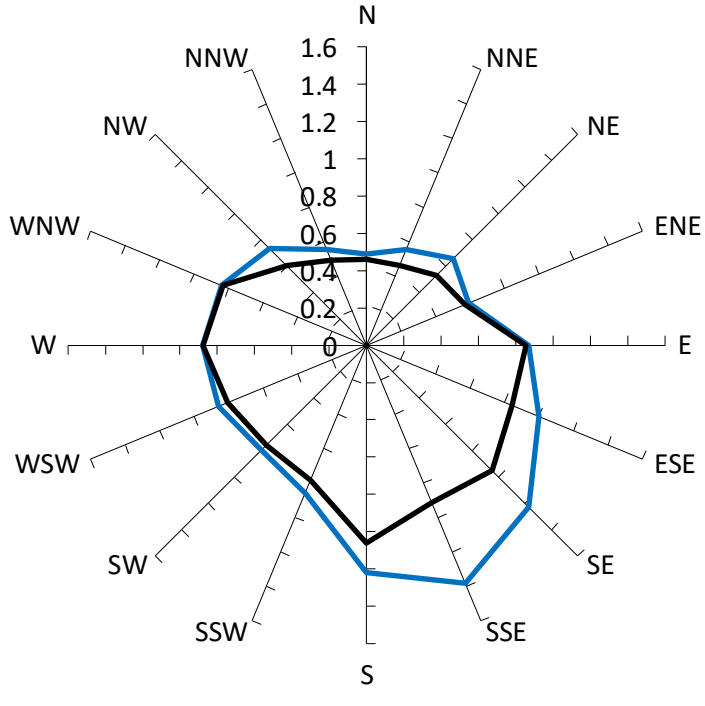
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 33



GEM Velocity Coefficients

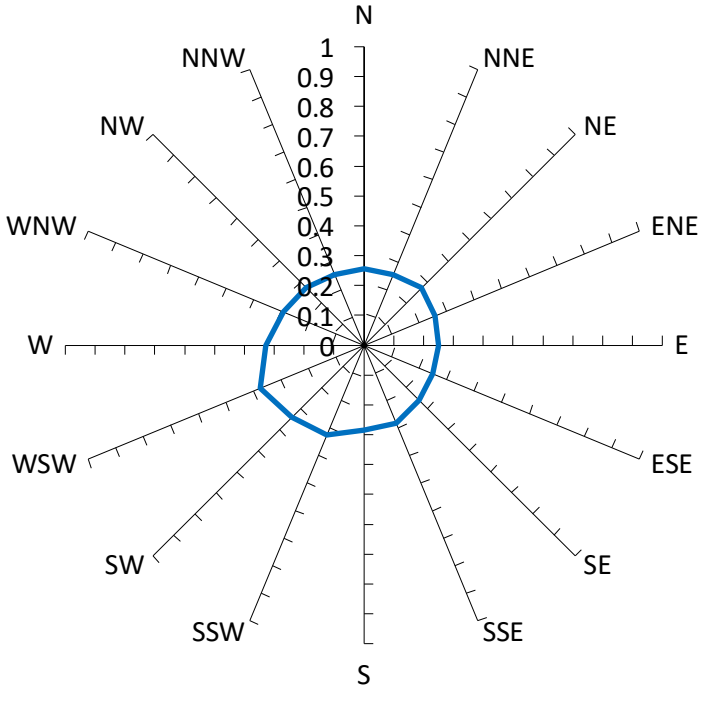


Gust Velocity Coefficients

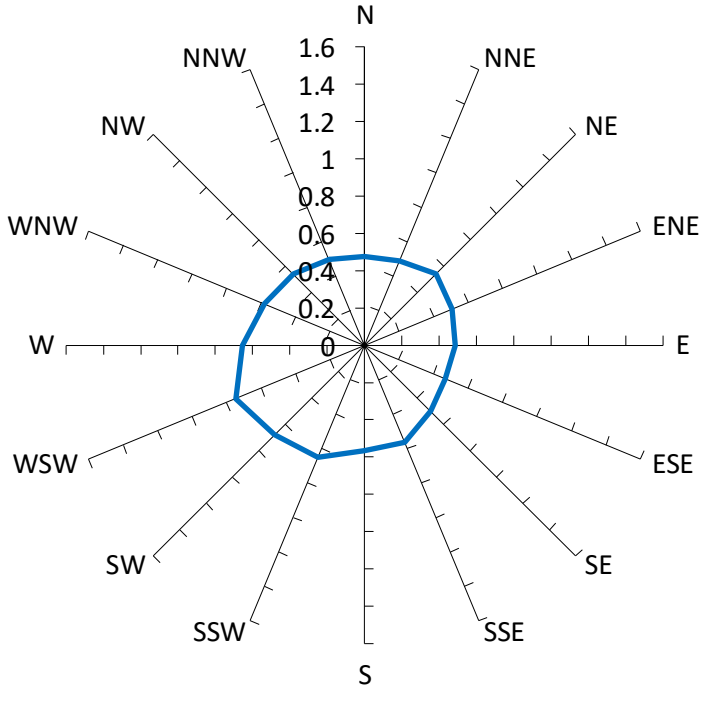
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 34



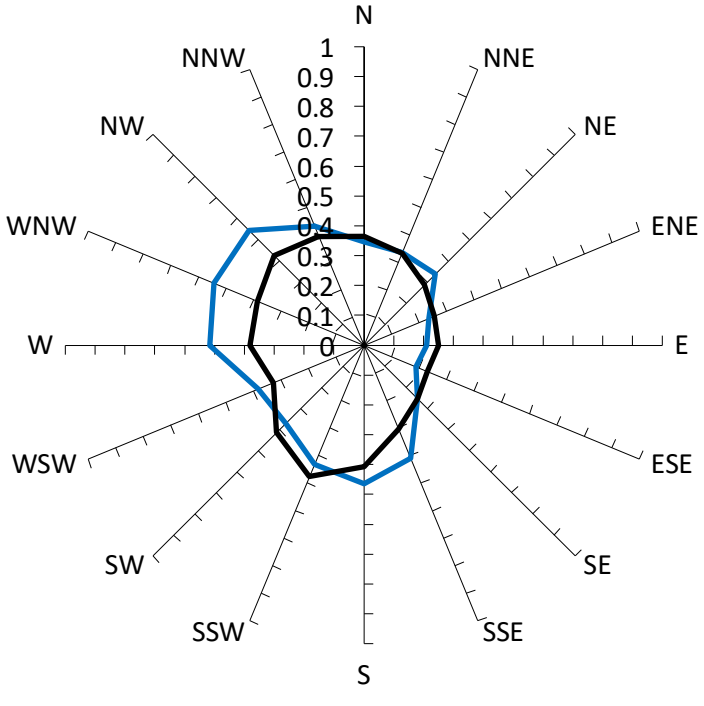
GEM Velocity Coefficients



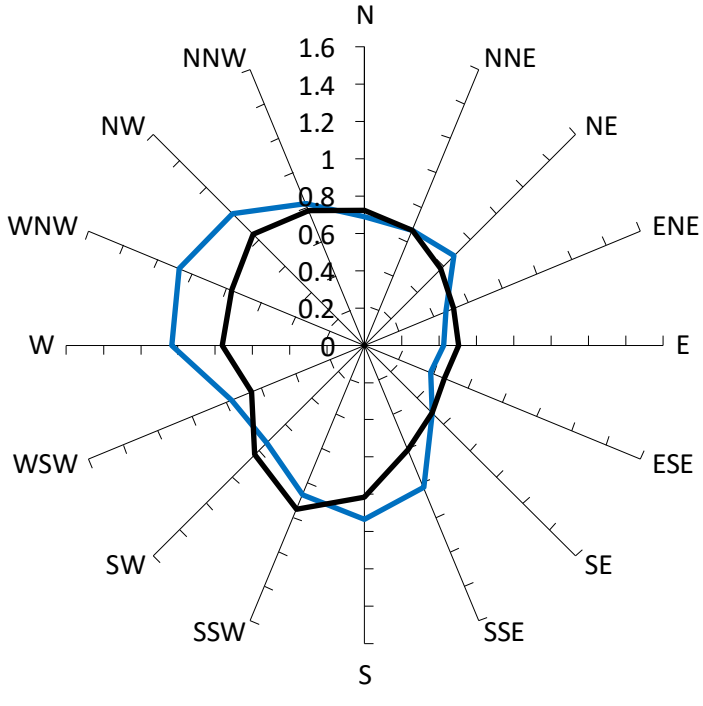
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 35



GEM Velocity Coefficients

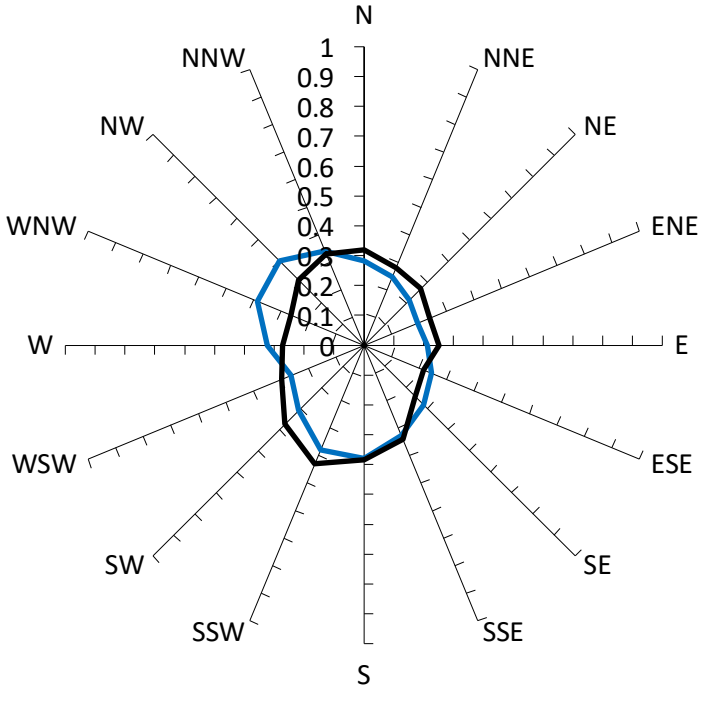


Gust Velocity Coefficients

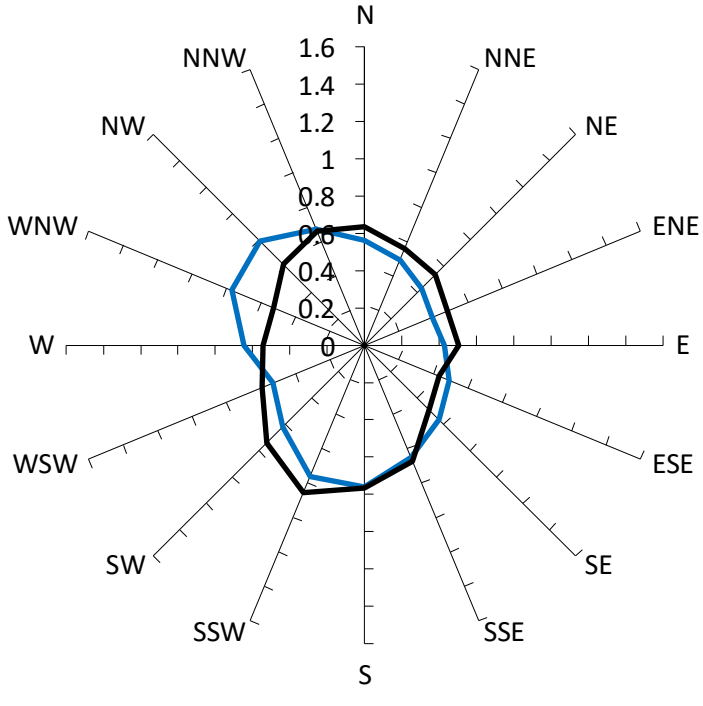
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 36



GEM Velocity Coefficients

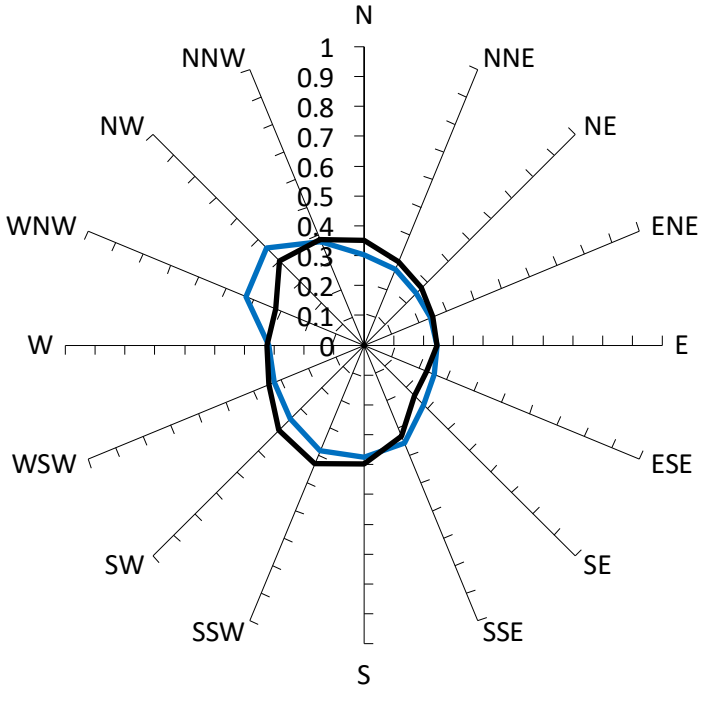


Gust Velocity Coefficients

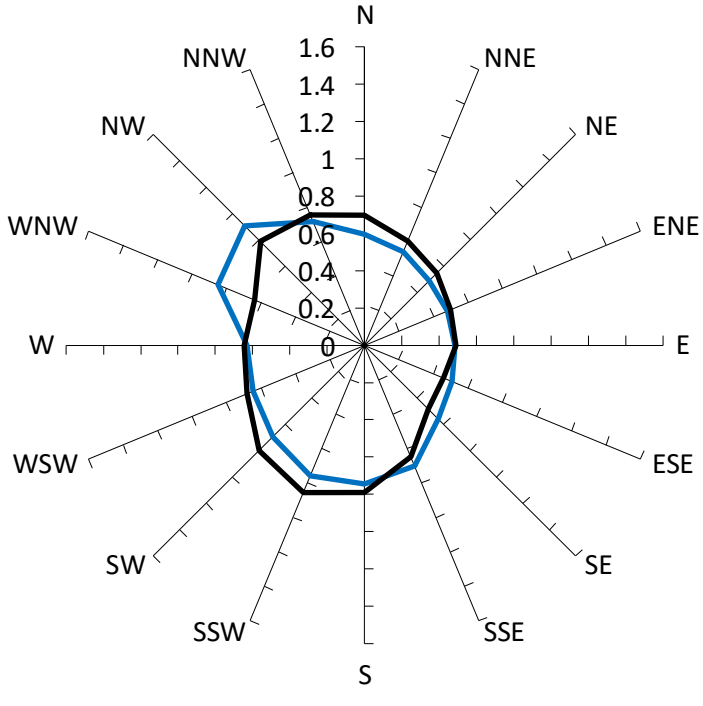
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 37



GEM Velocity Coefficients

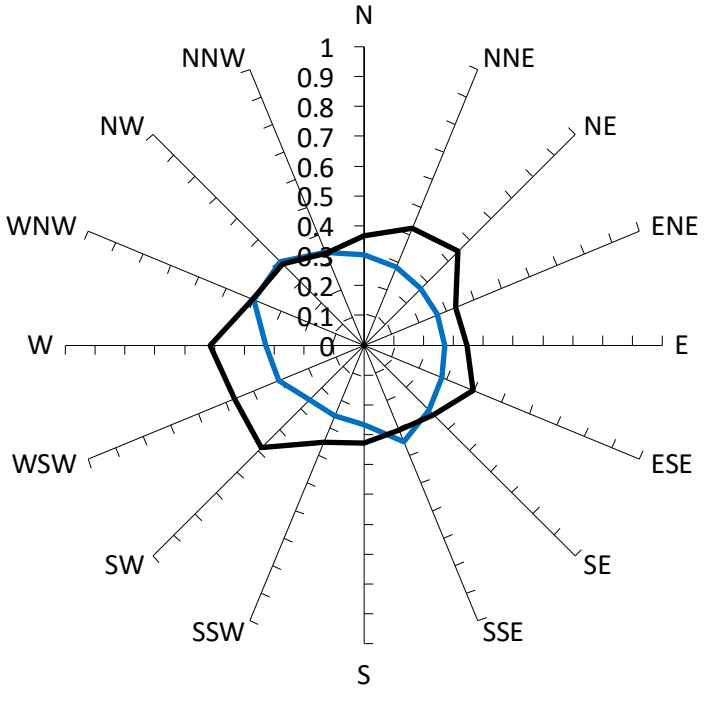


Gust Velocity Coefficients

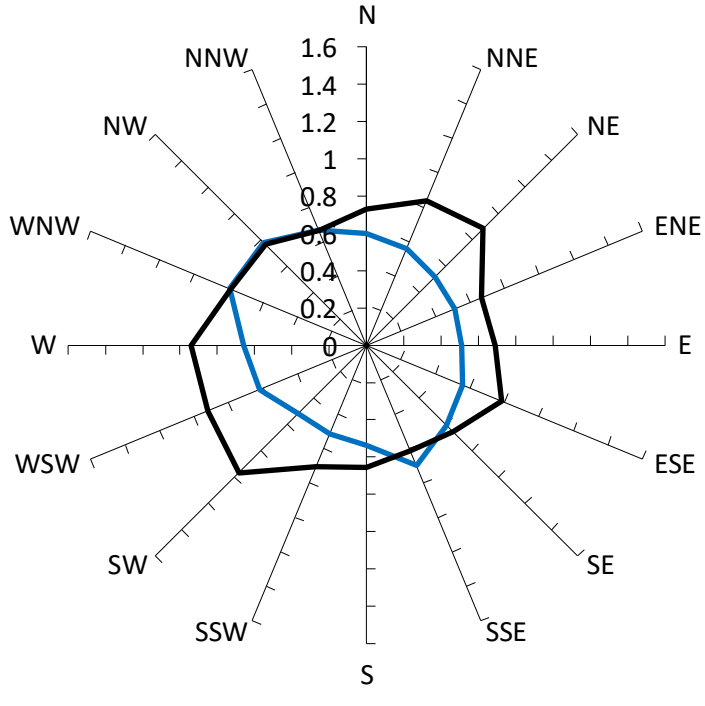
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 38



GEM Velocity Coefficients

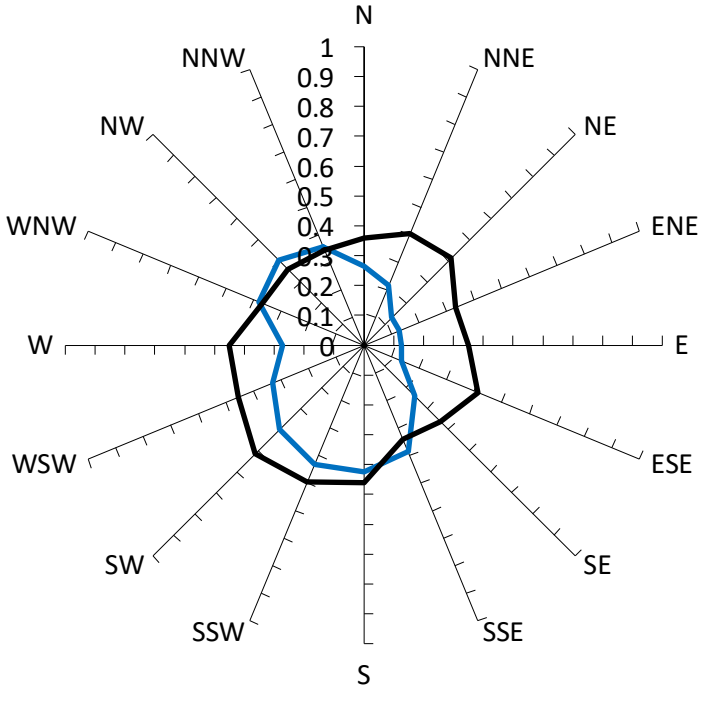


Gust Velocity Coefficients

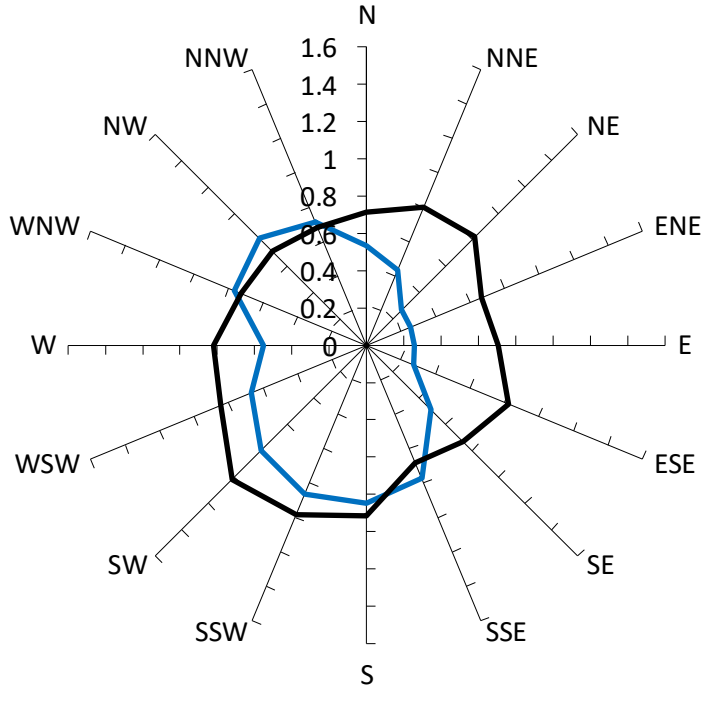
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 39



GEM Velocity Coefficients

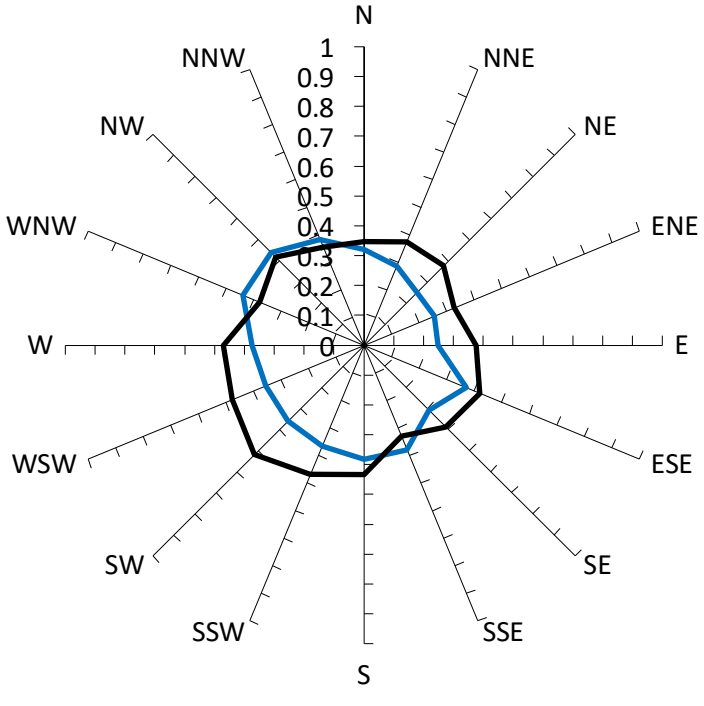


Gust Velocity Coefficients

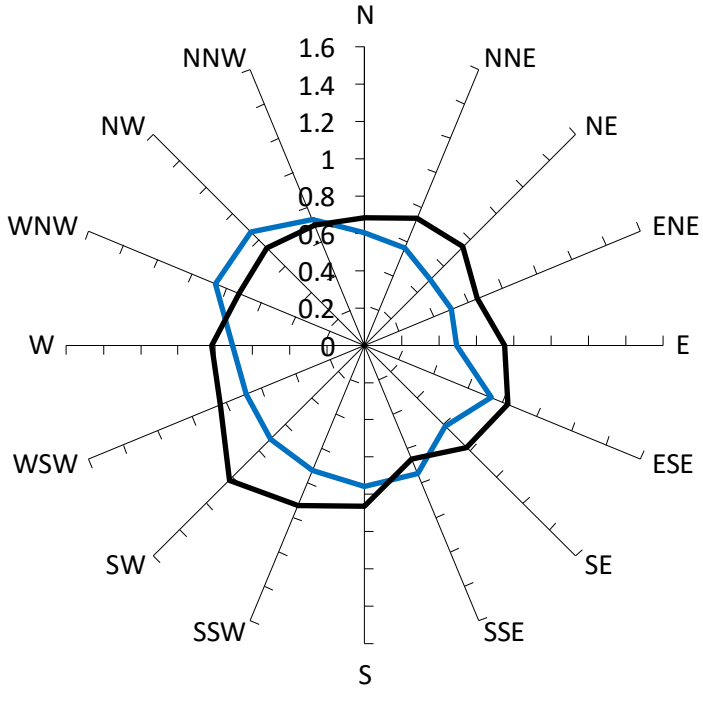
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 40



GEM Velocity Coefficients

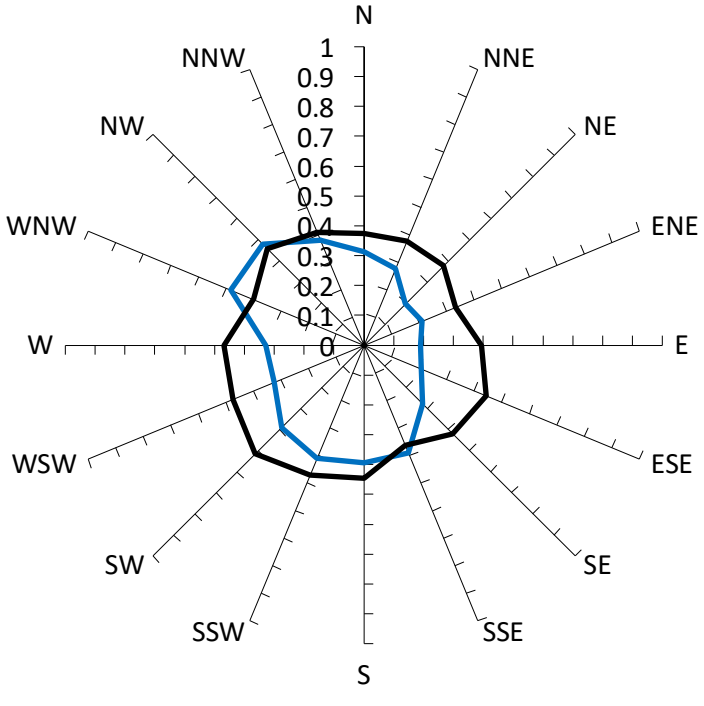


Gust Velocity Coefficients

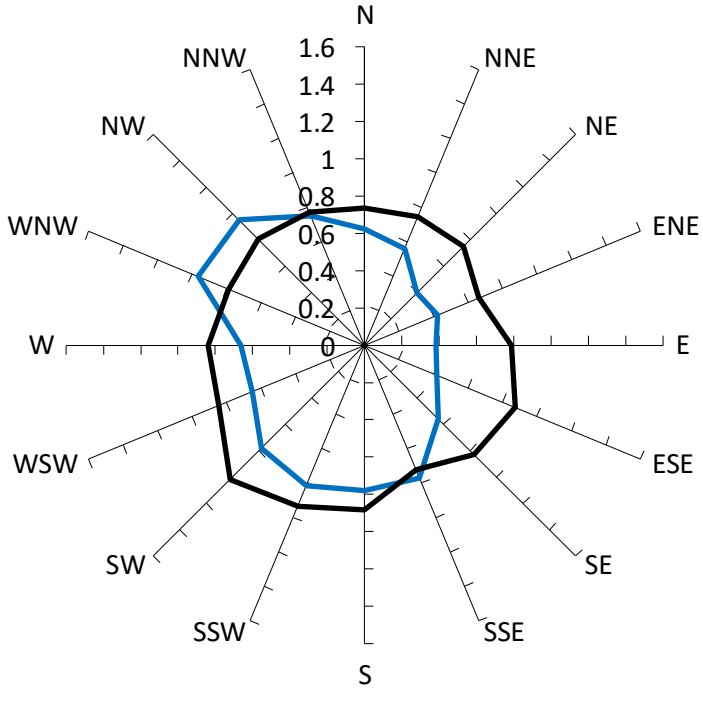
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 41



GEM Velocity Coefficients

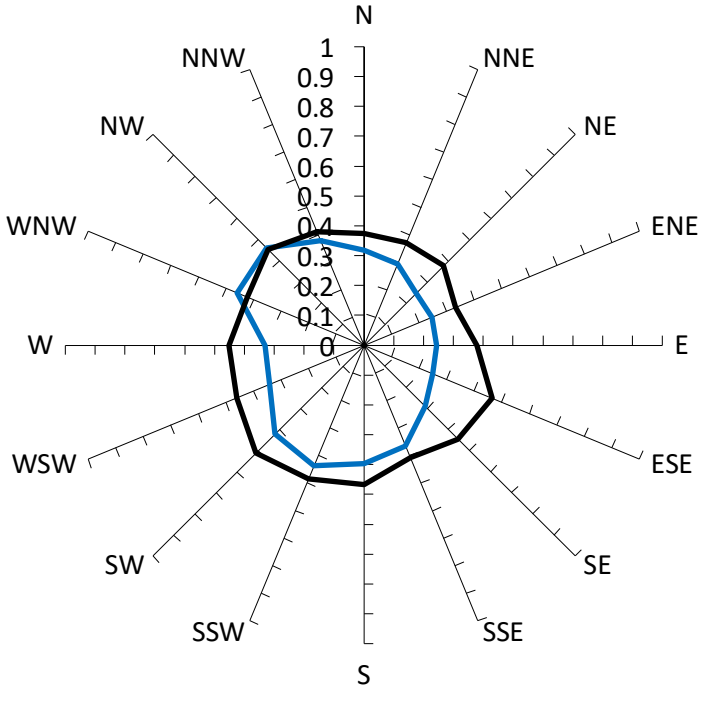


Gust Velocity Coefficients

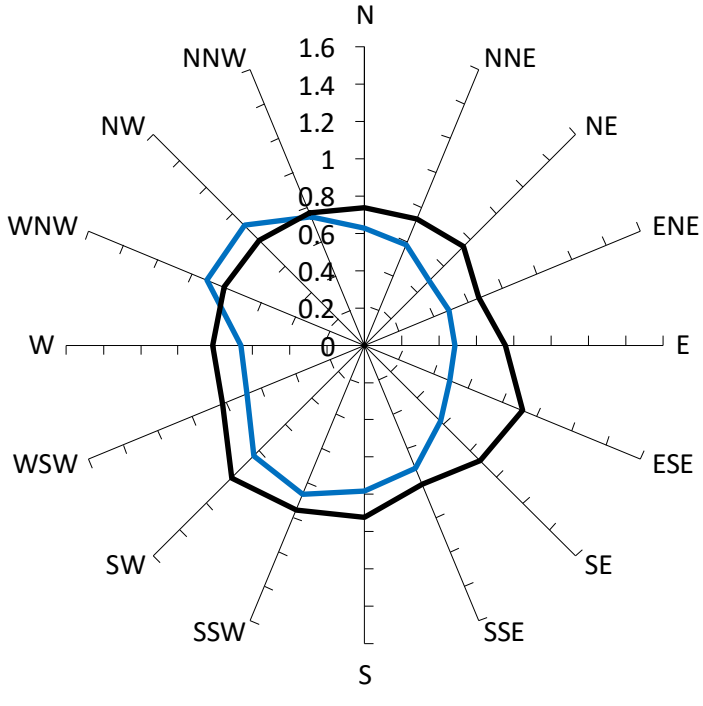
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 42



GEM Velocity Coefficients

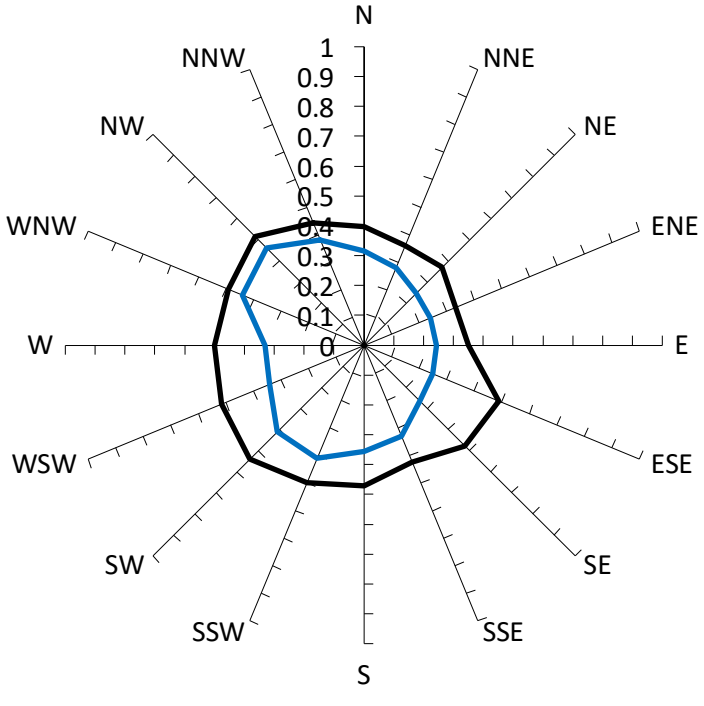


Gust Velocity Coefficients

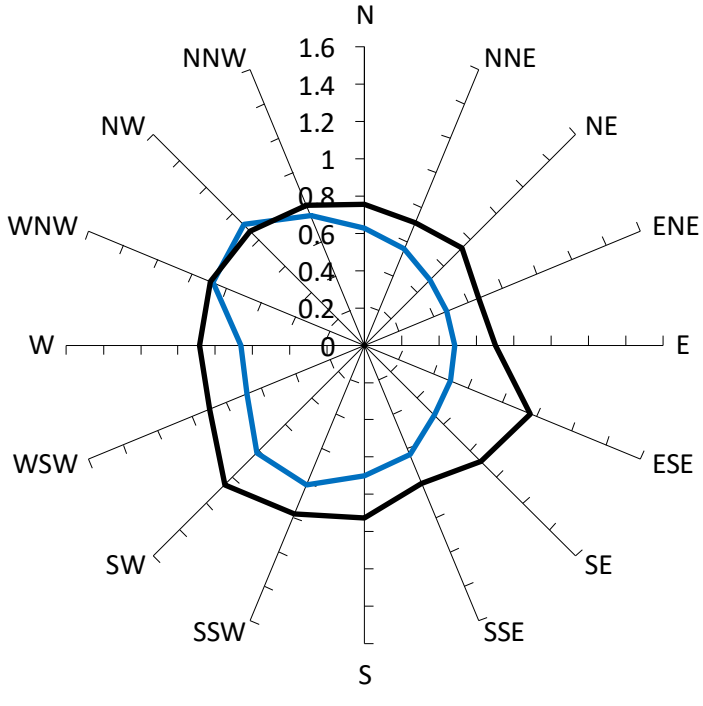
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 43



GEM Velocity Coefficients

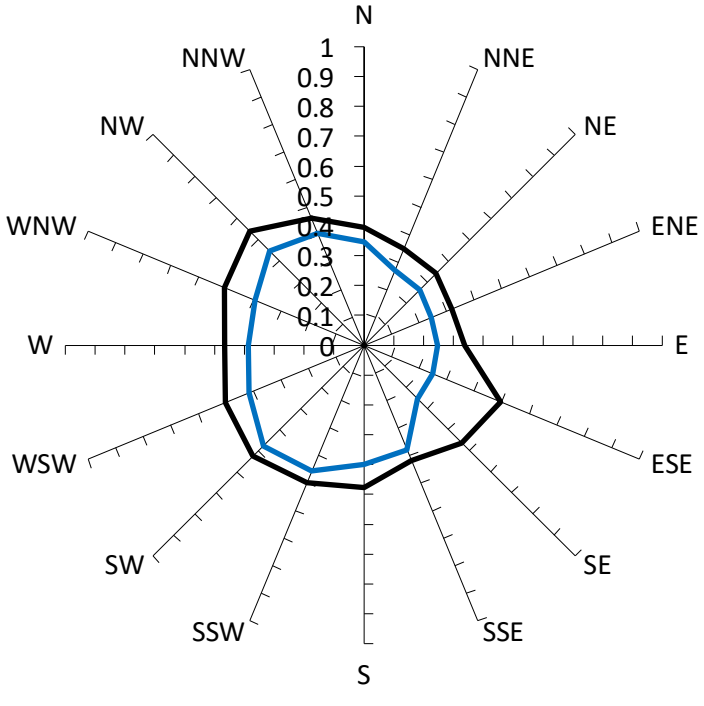


Gust Velocity Coefficients

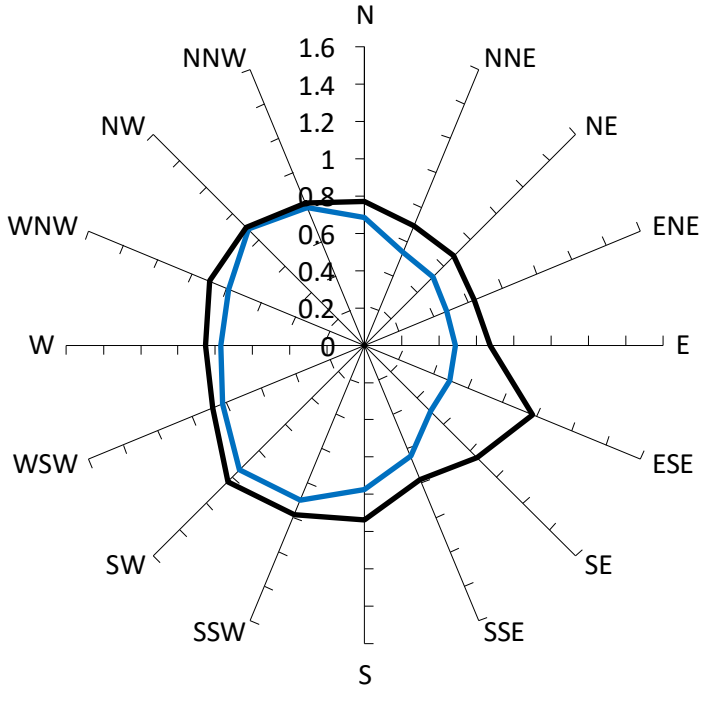
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 44



GEM Velocity Coefficients

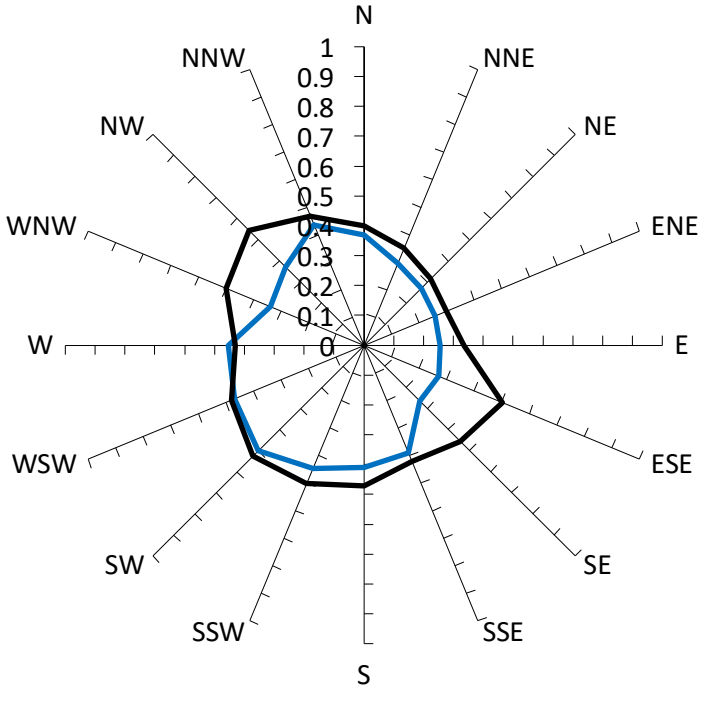


Gust Velocity Coefficients

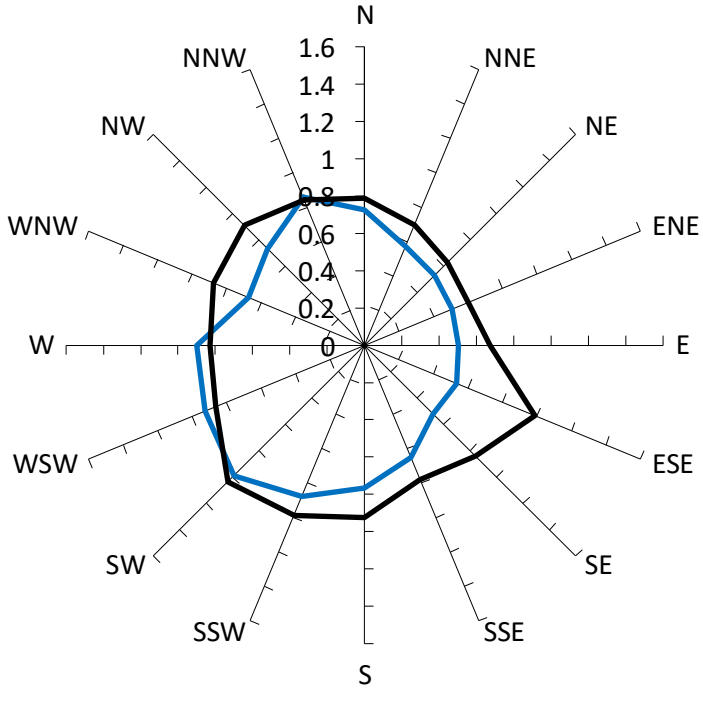
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 45



GEM Velocity Coefficients

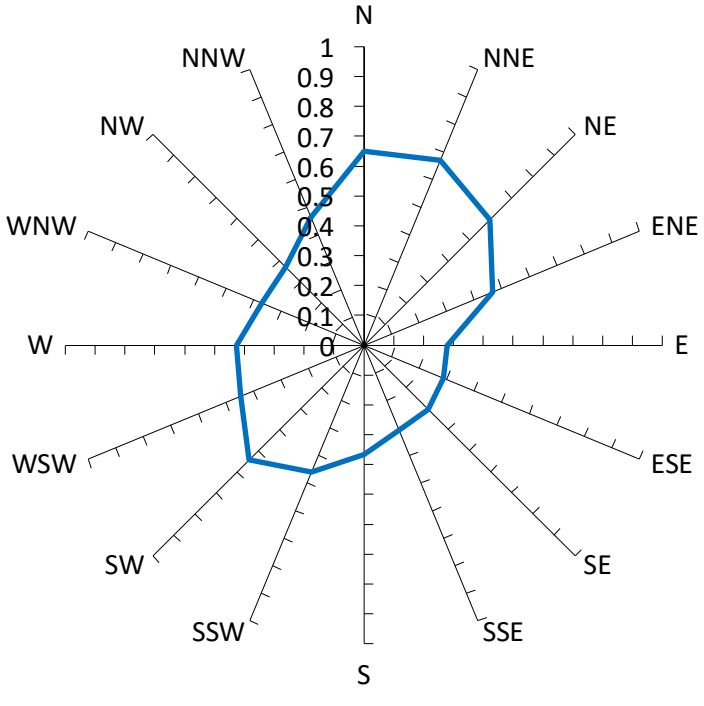


Gust Velocity Coefficients

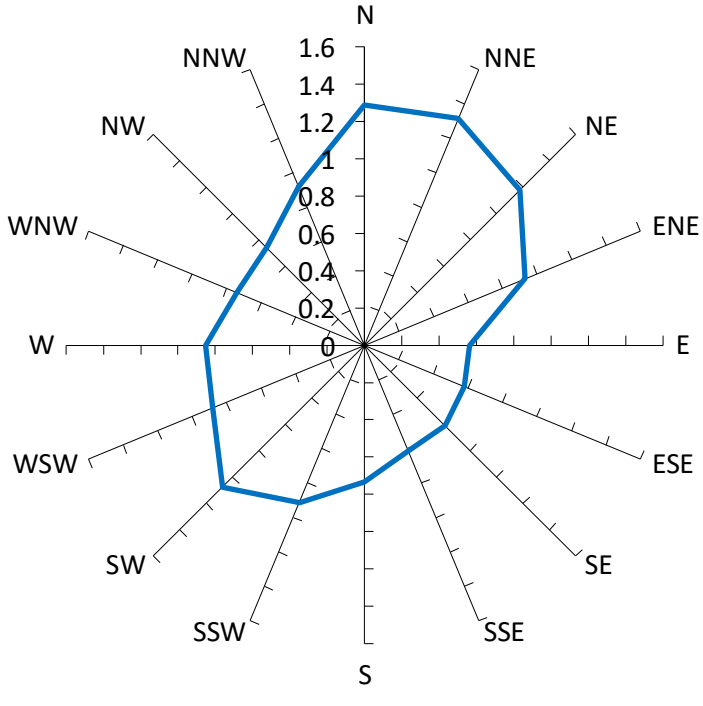
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 46



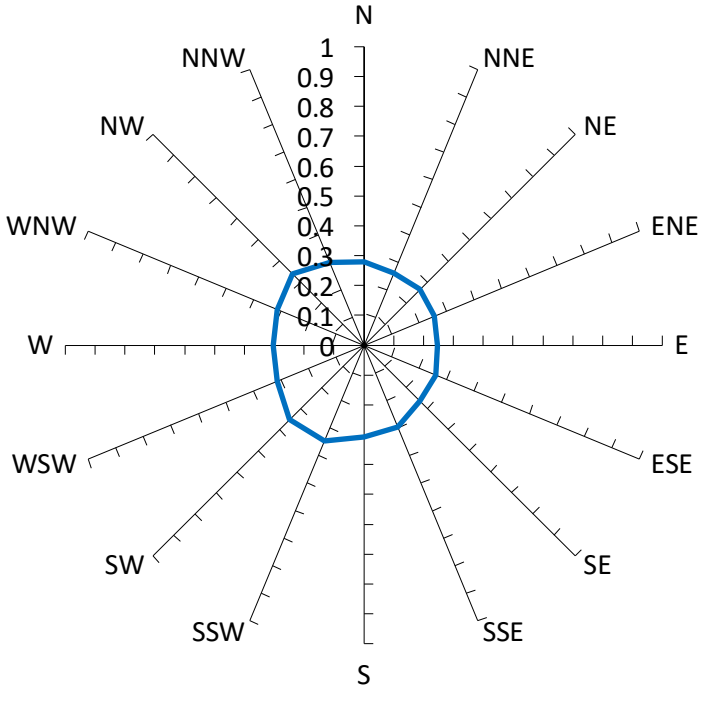
GEM Velocity Coefficients



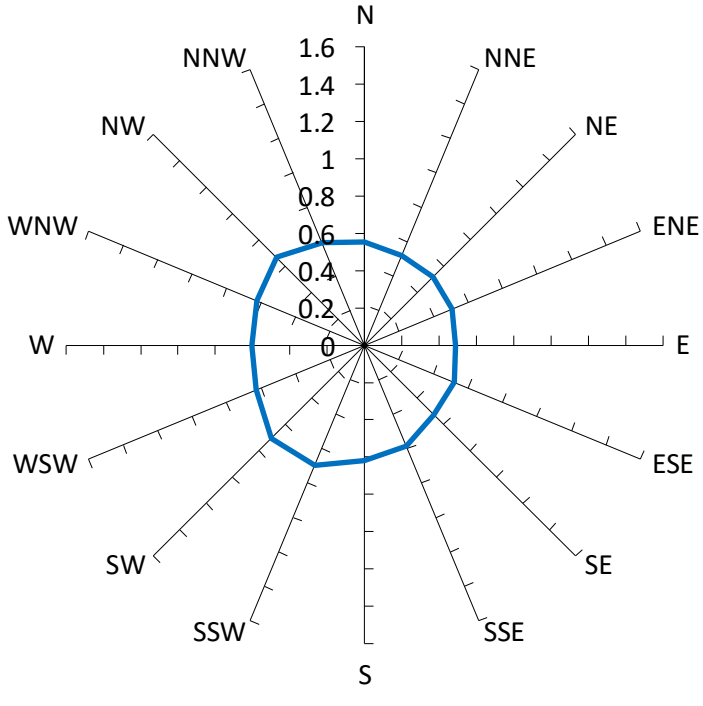
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 47



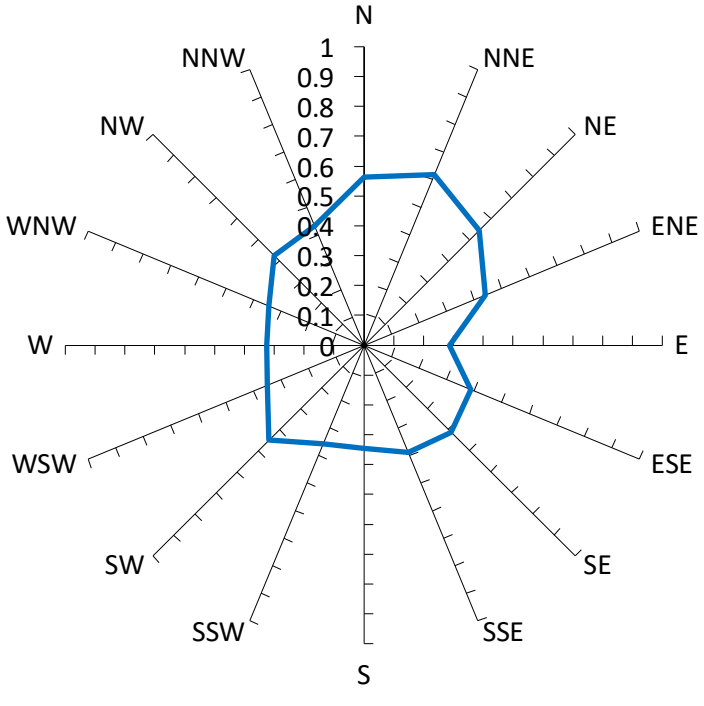
GEM Velocity Coefficients



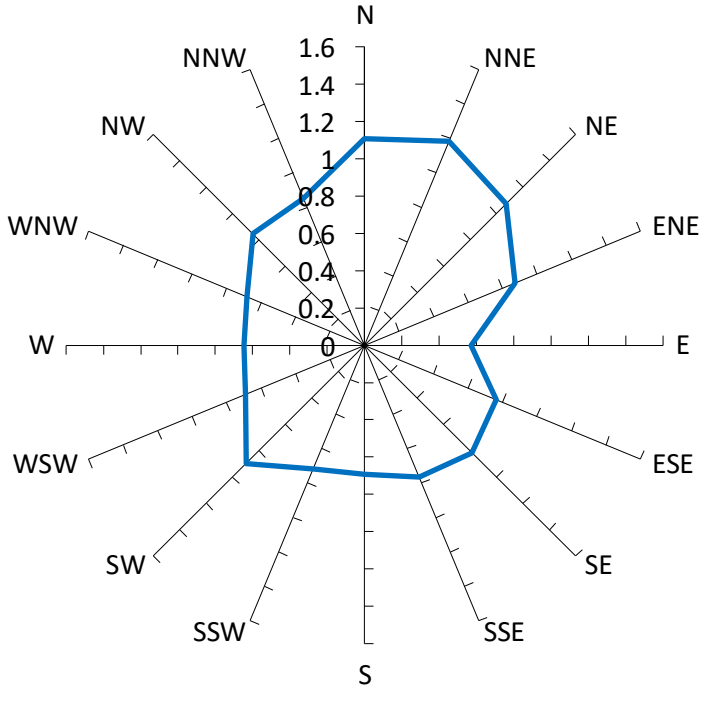
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 48



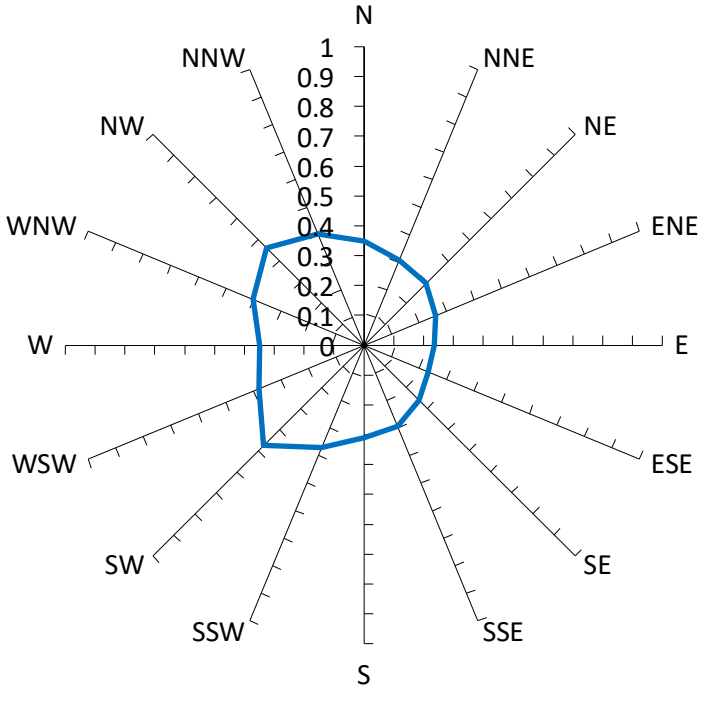
GEM Velocity Coefficients



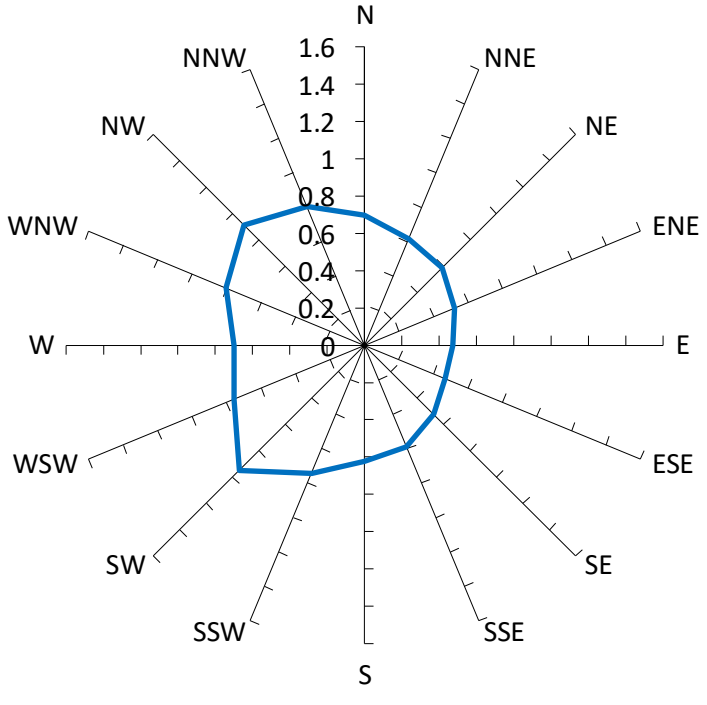
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 49



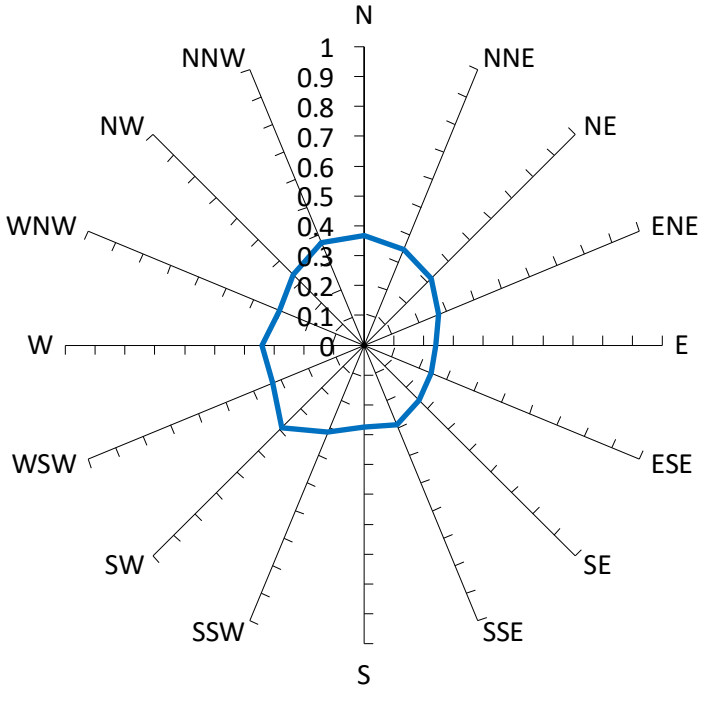
GEM Velocity Coefficients



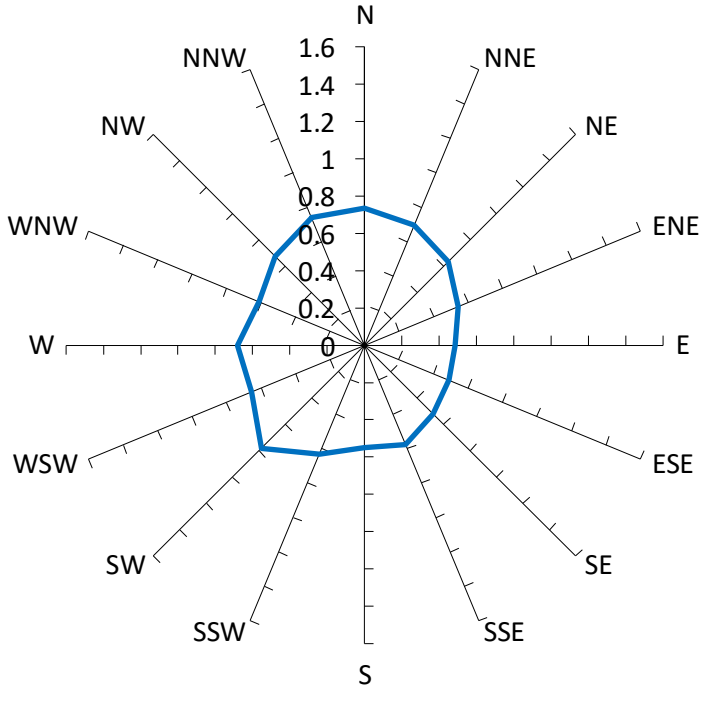
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 50



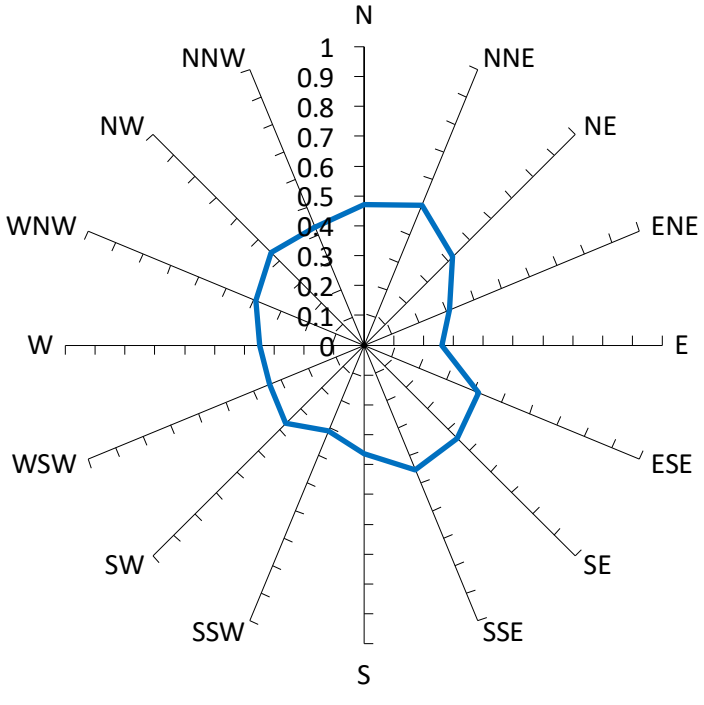
GEM Velocity Coefficients



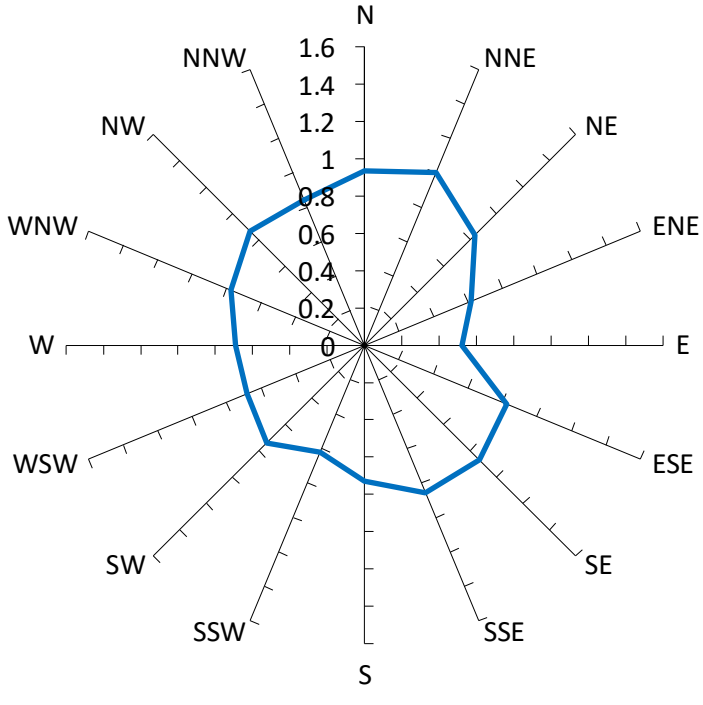
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 51



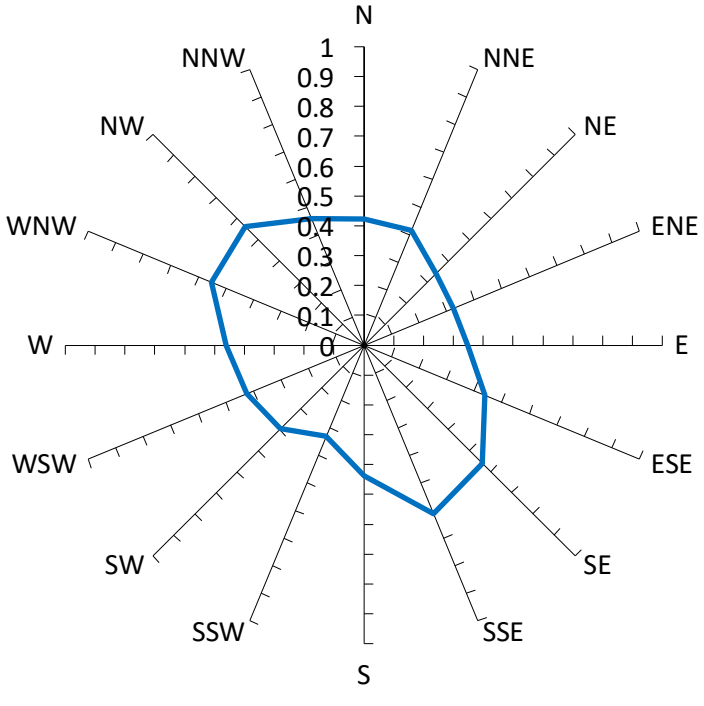
GEM Velocity Coefficients



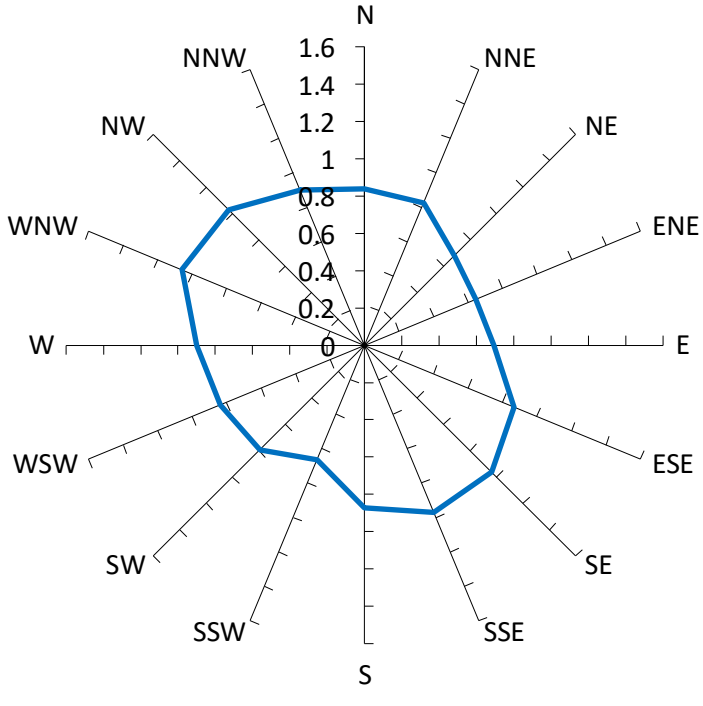
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 52



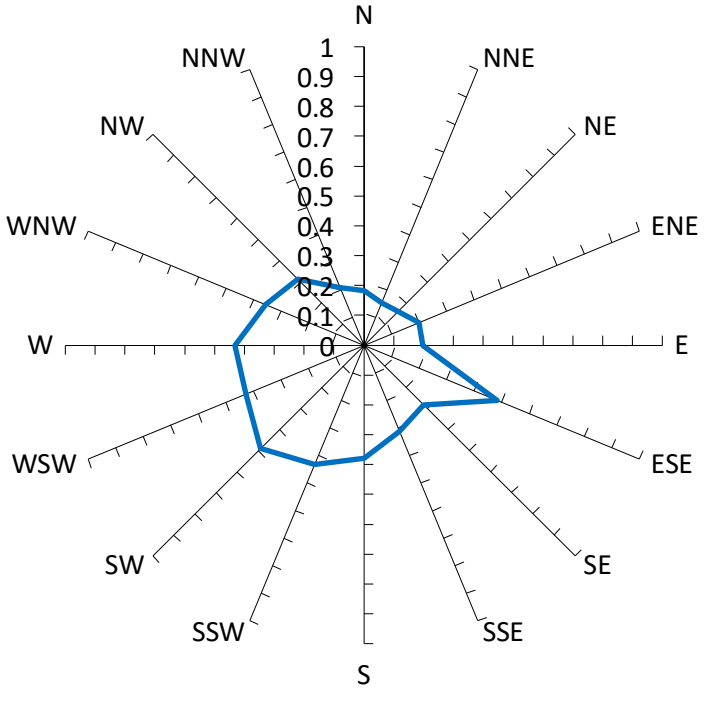
GEM Velocity Coefficients



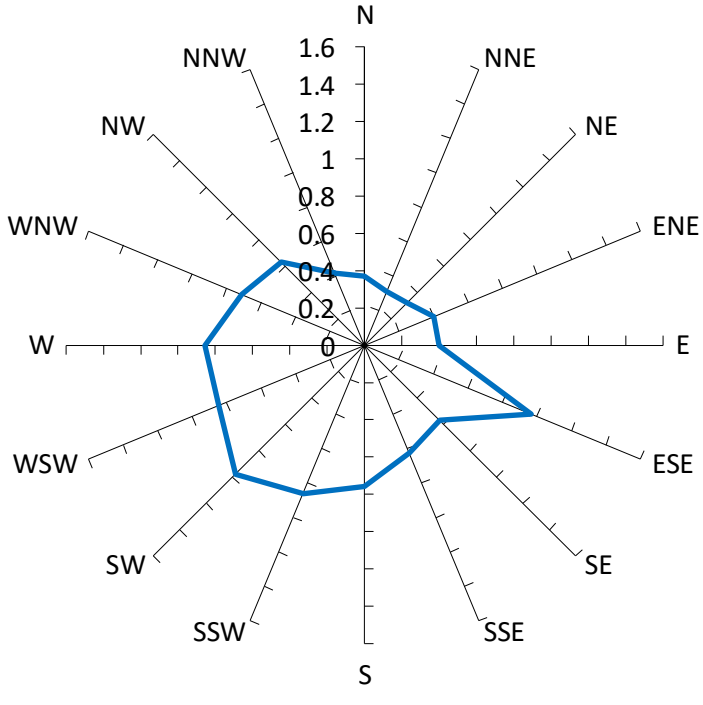
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 53



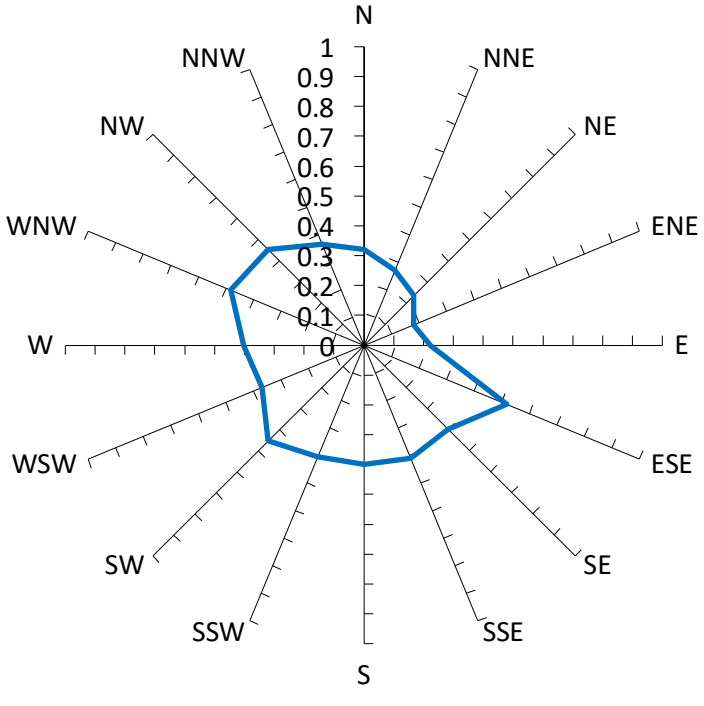
GEM Velocity Coefficients



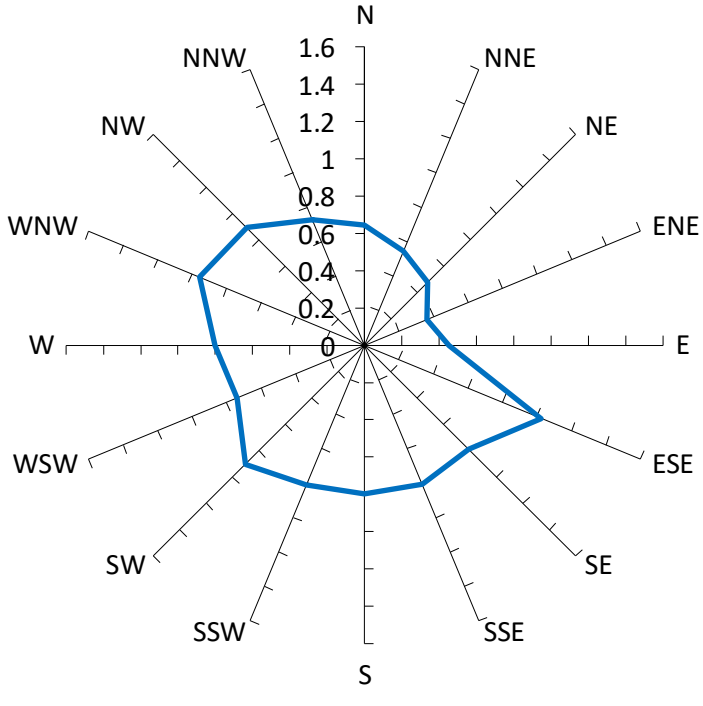
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 54



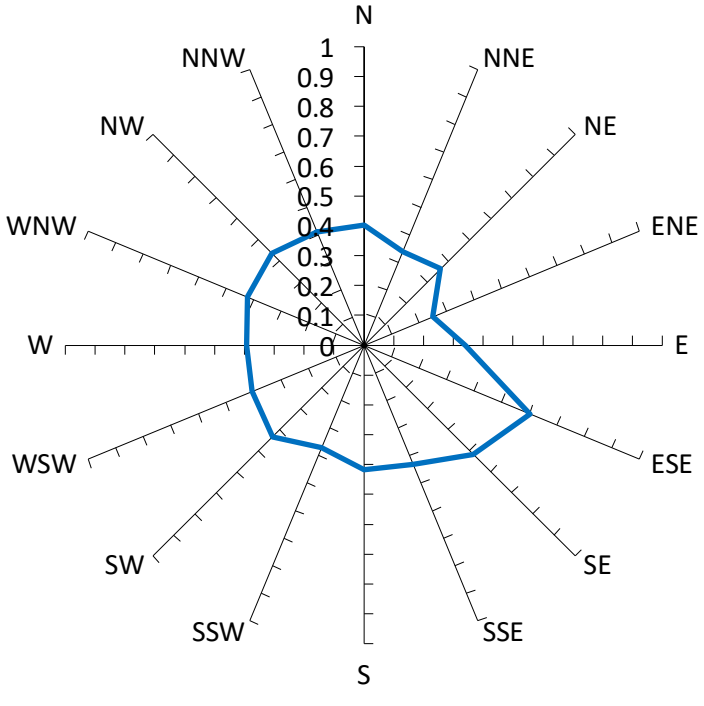
GEM Velocity Coefficients



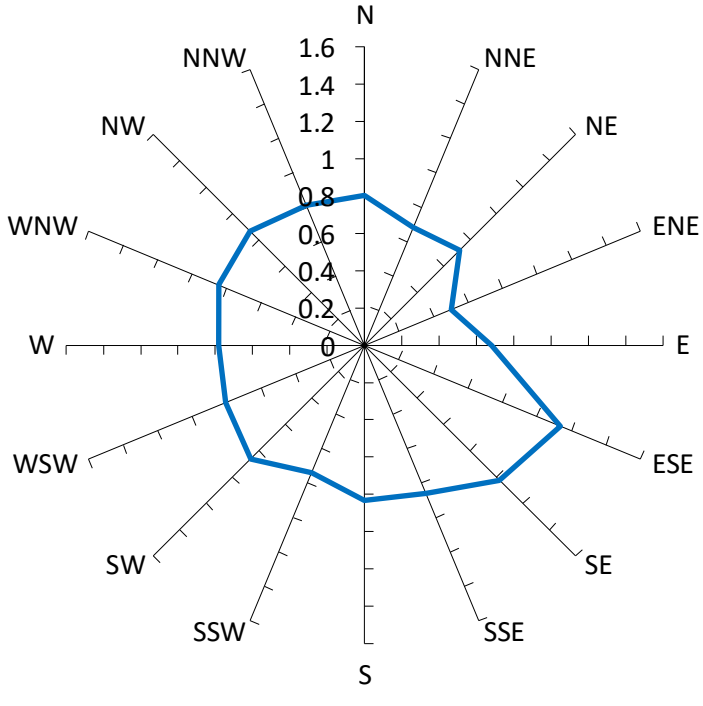
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 55



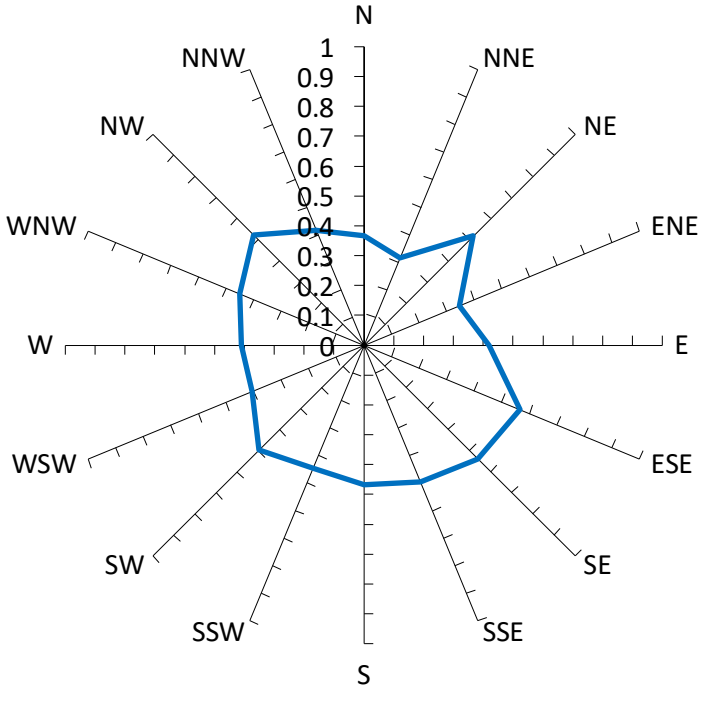
GEM Velocity Coefficients



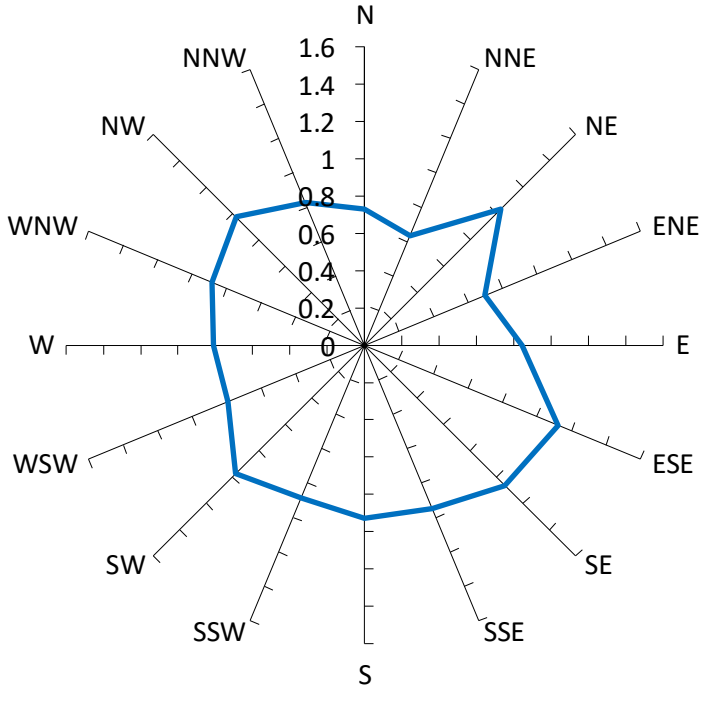
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 56



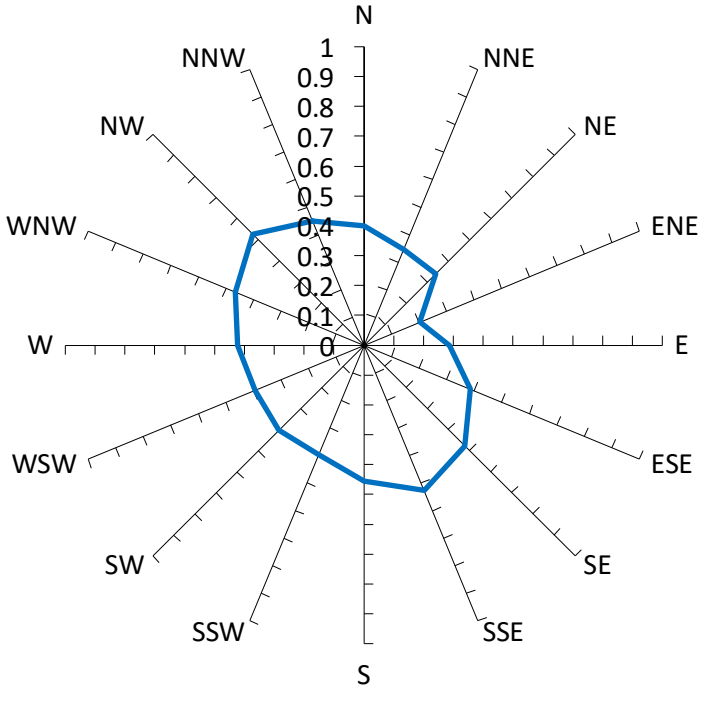
GEM Velocity Coefficients



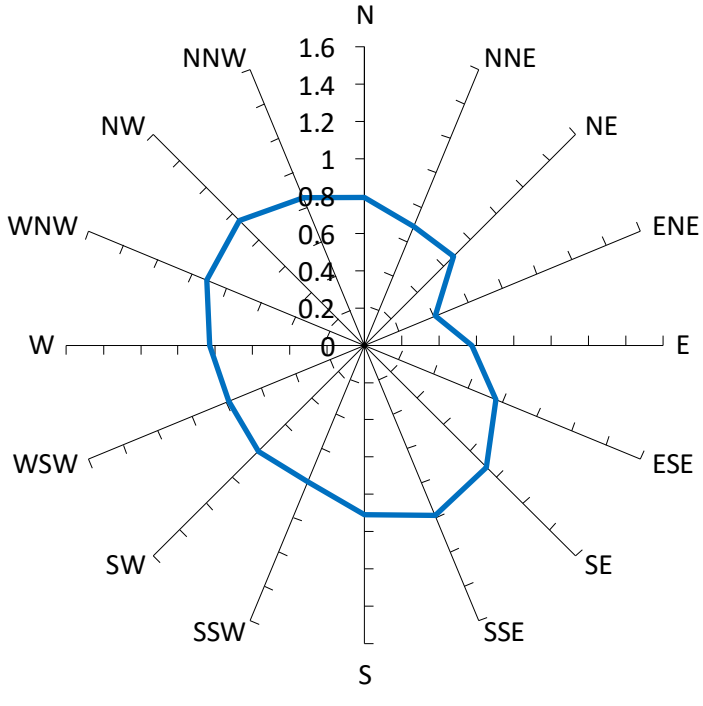
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 57



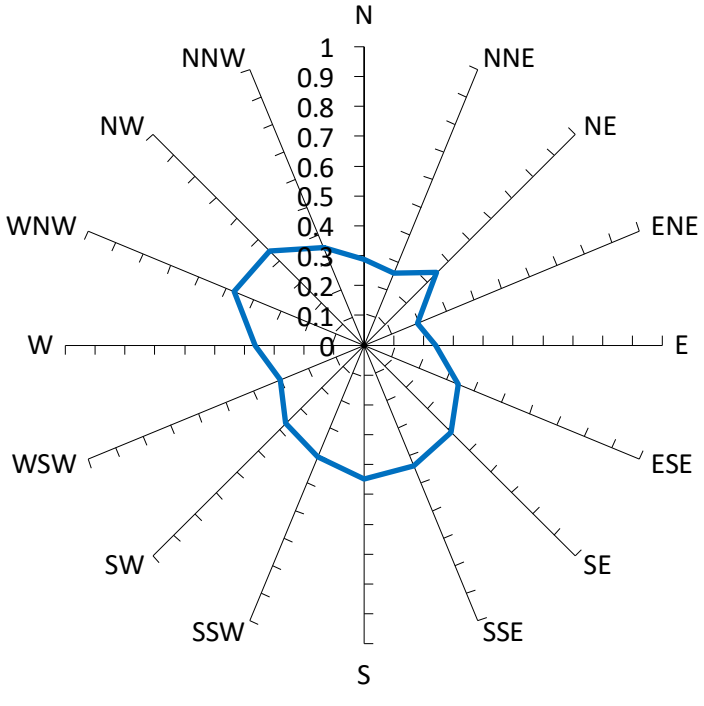
GEM Velocity Coefficients



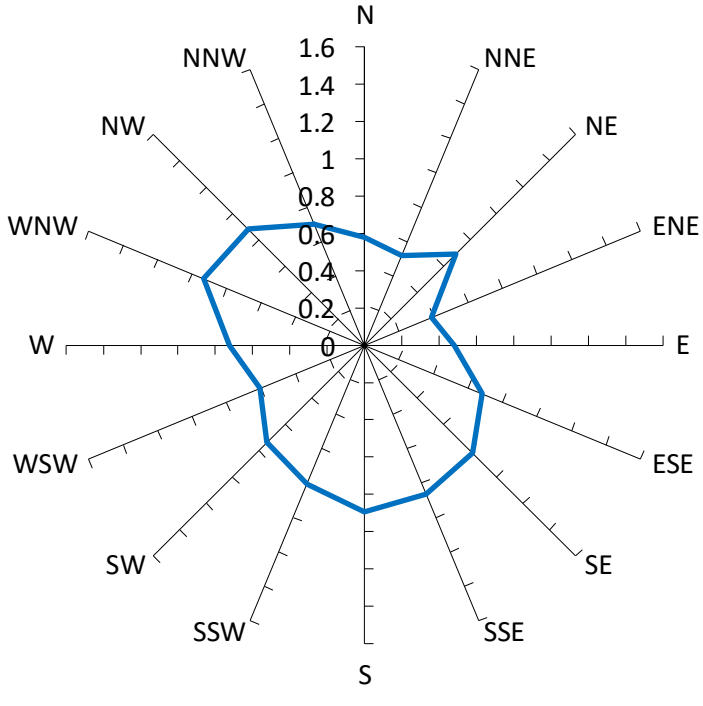
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 58



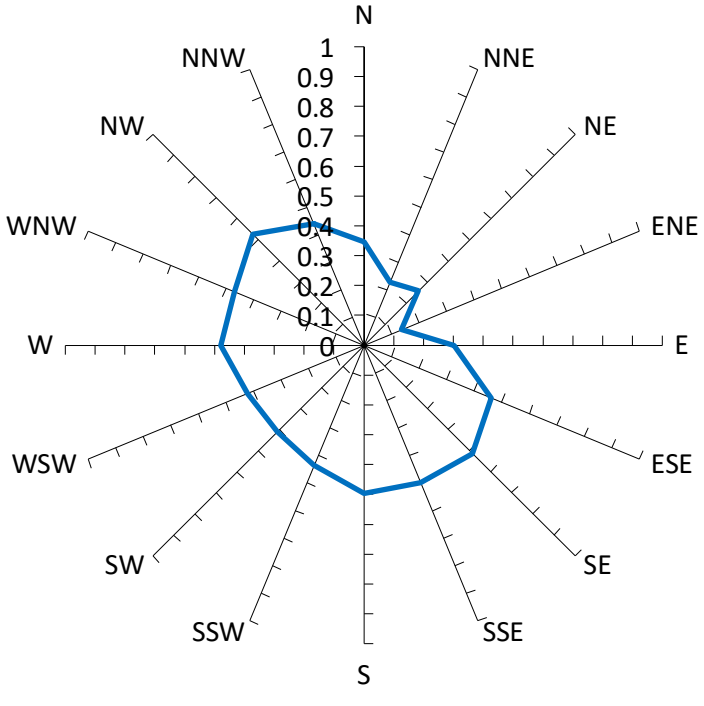
GEM Velocity Coefficients



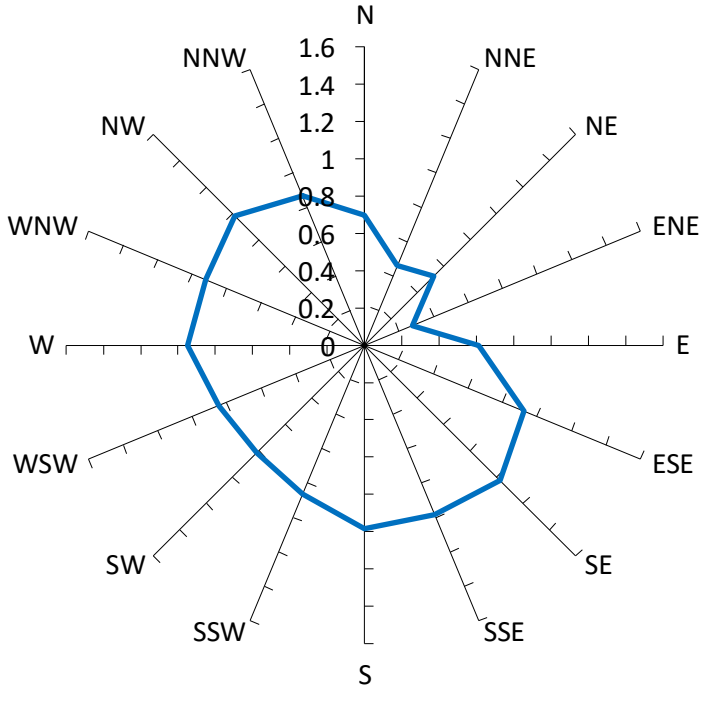
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 59



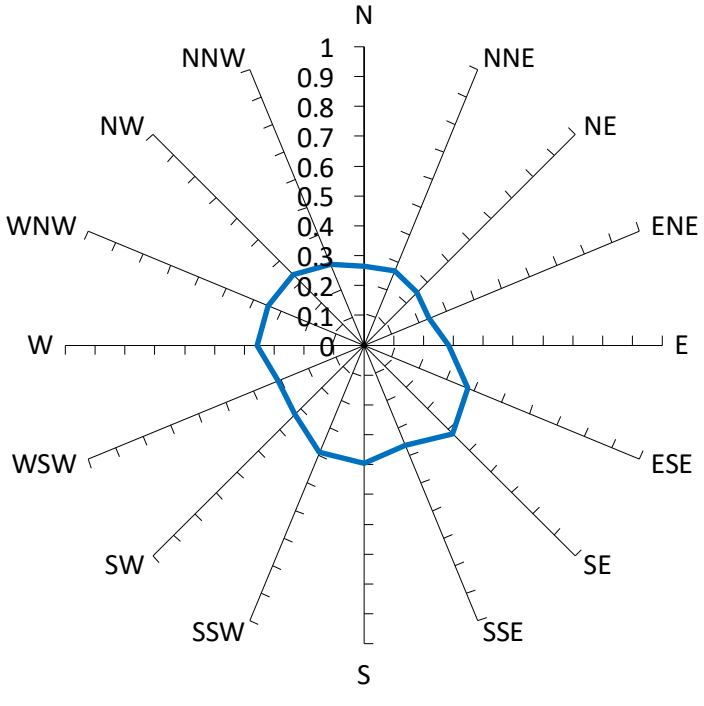
GEM Velocity Coefficients



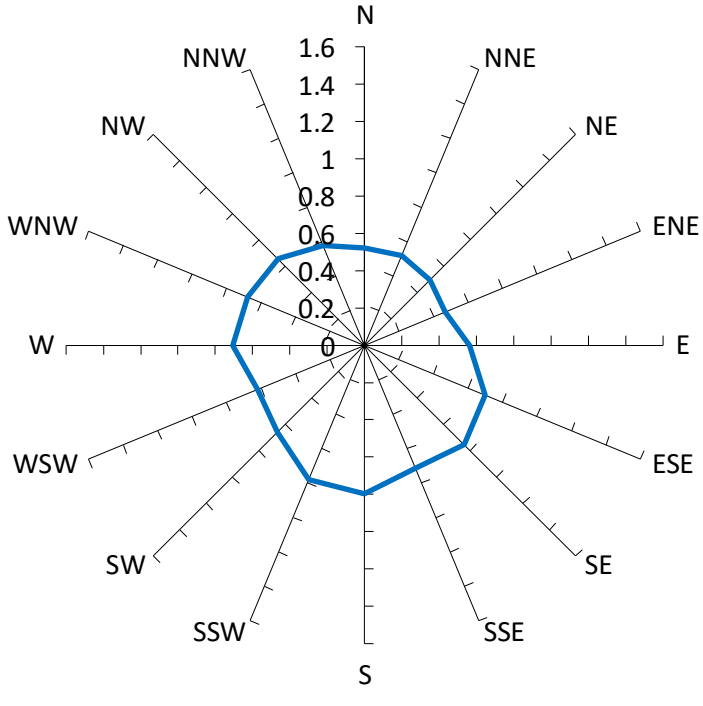
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 60



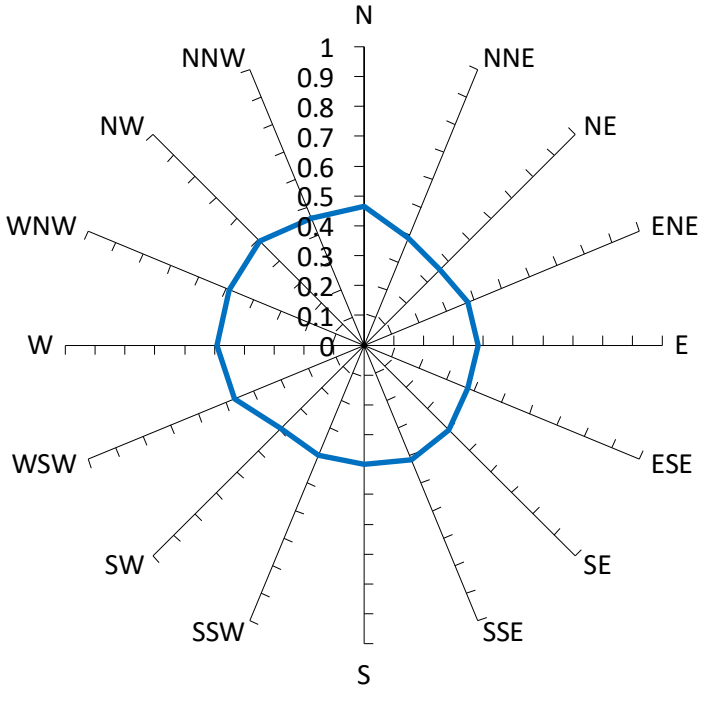
GEM Velocity Coefficients



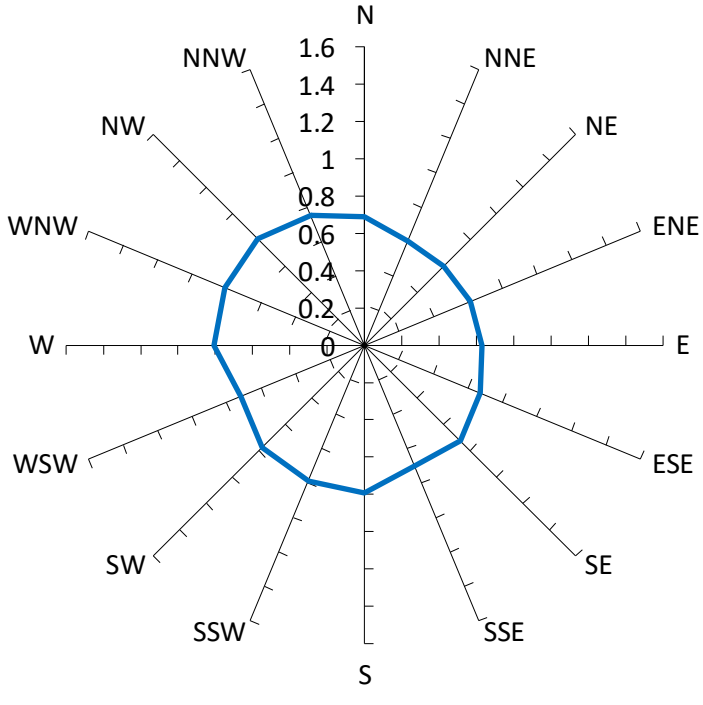
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 61



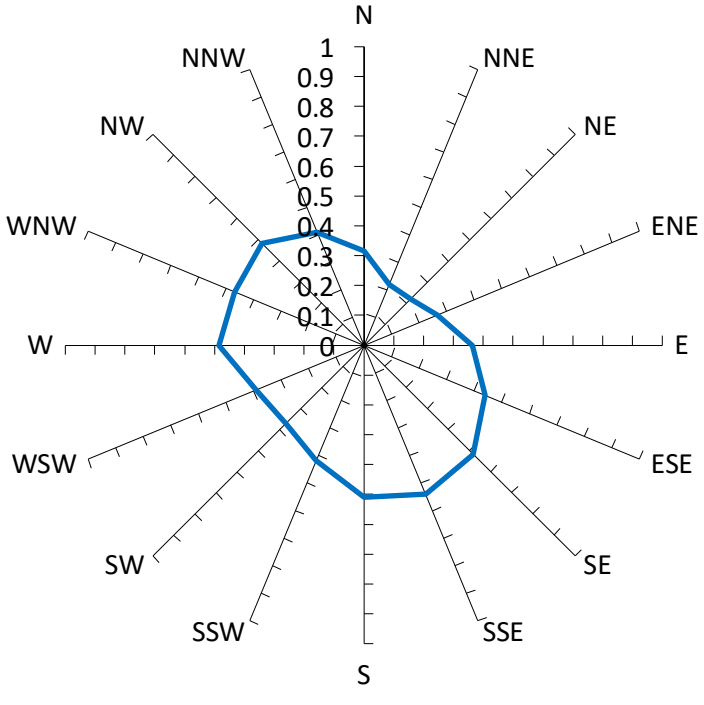
GEM Velocity Coefficients



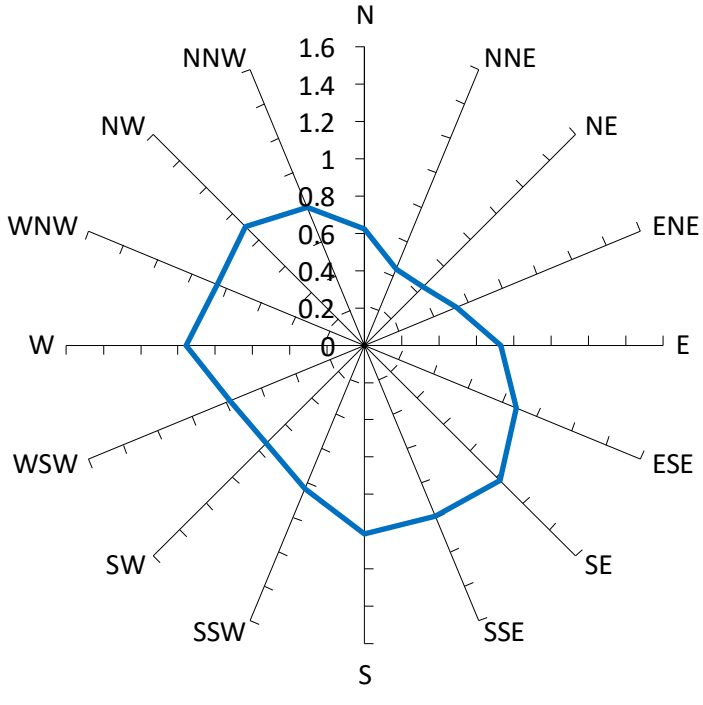
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 62



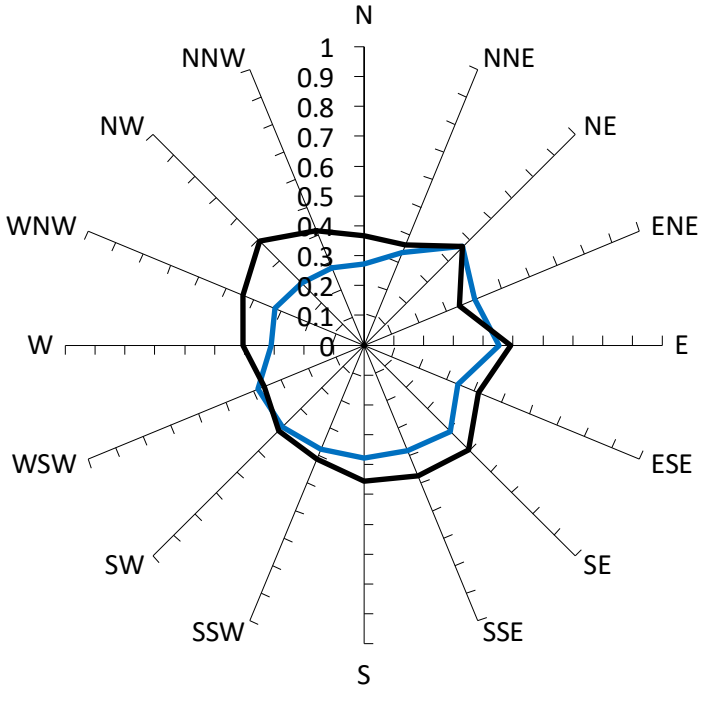
GEM Velocity Coefficients



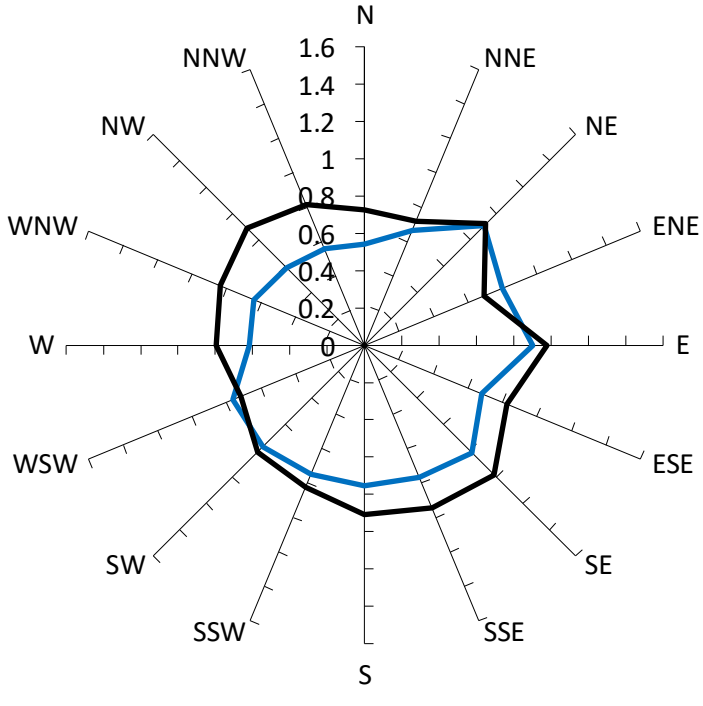
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

Results for Point 63



GEM Velocity Coefficients

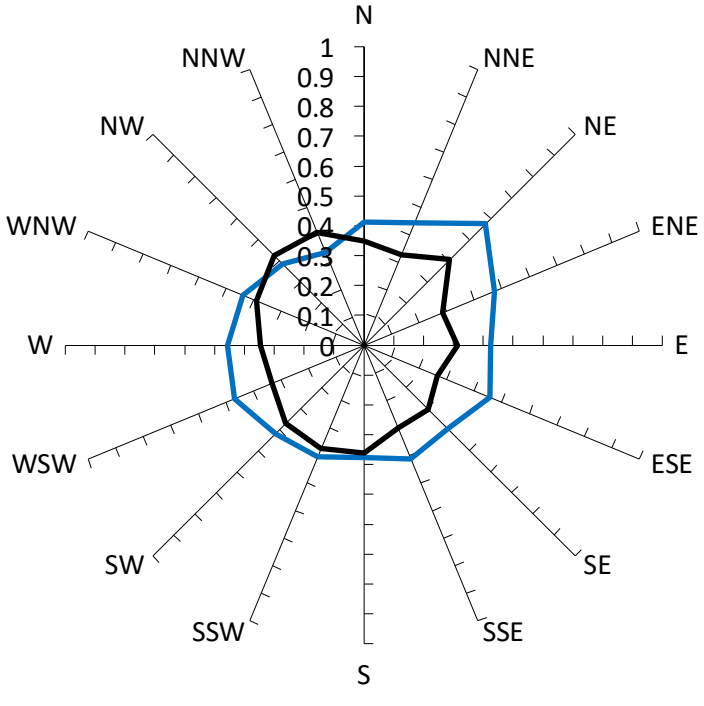


Gust Velocity Coefficients

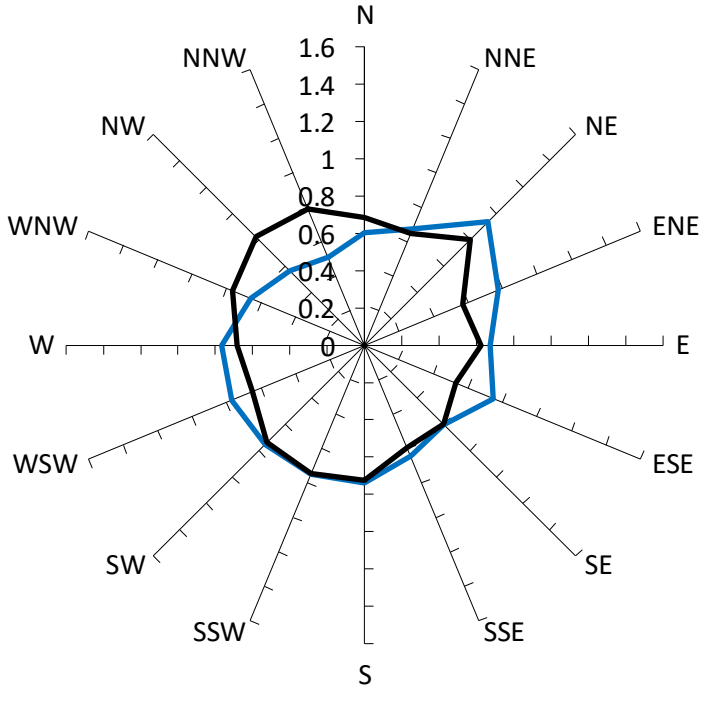
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 64



GEM Velocity Coefficients

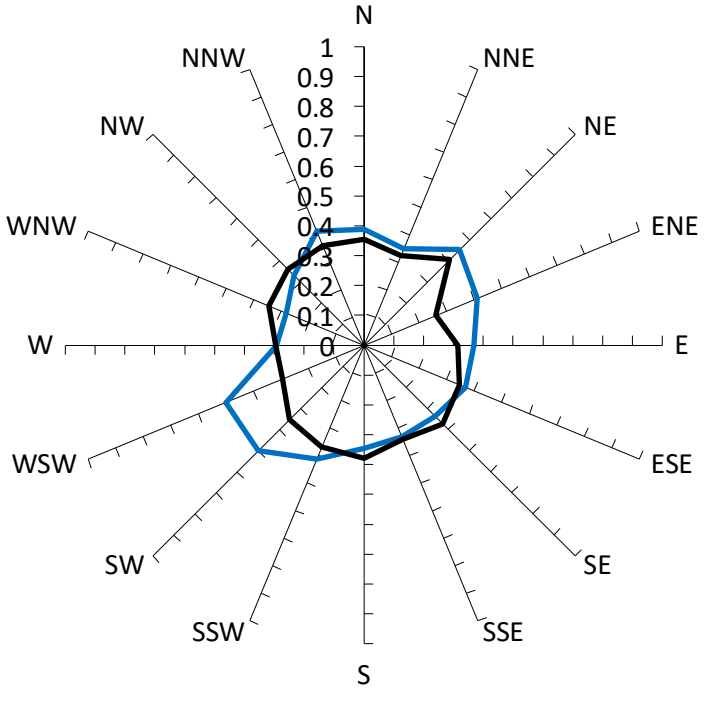


Gust Velocity Coefficients

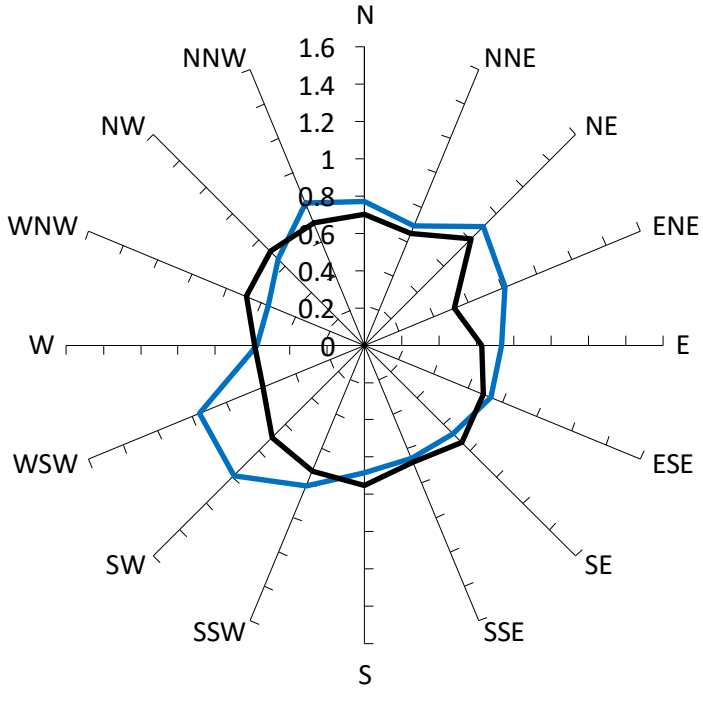
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 65



GEM Velocity Coefficients

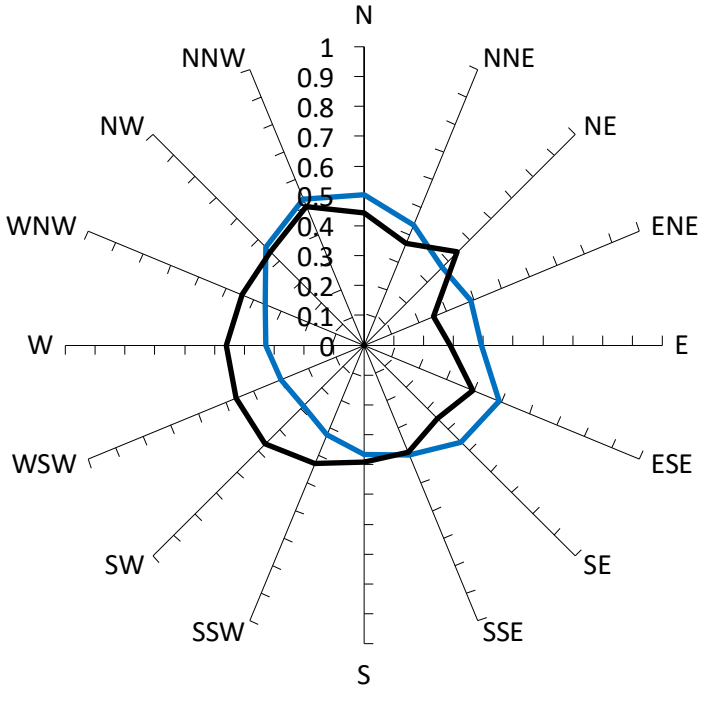


Gust Velocity Coefficients

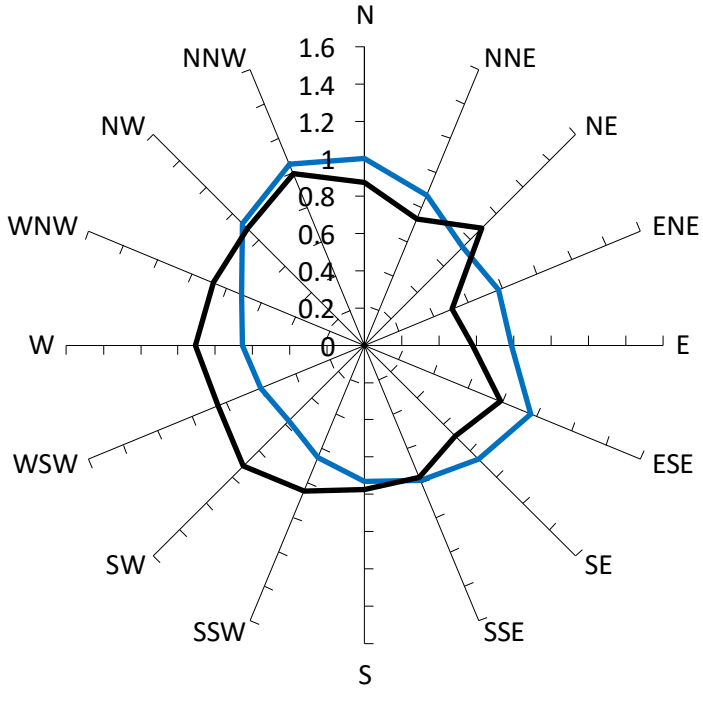
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 66



GEM Velocity Coefficients

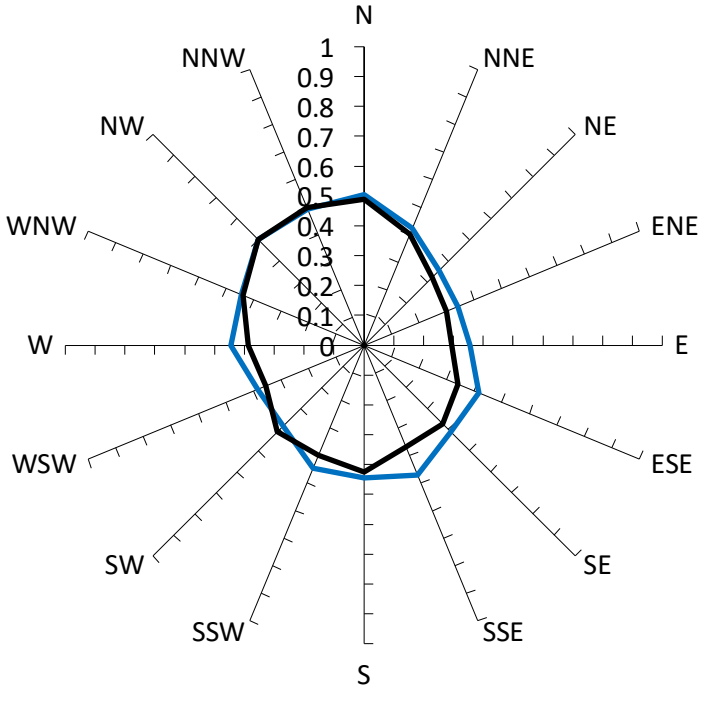


Gust Velocity Coefficients

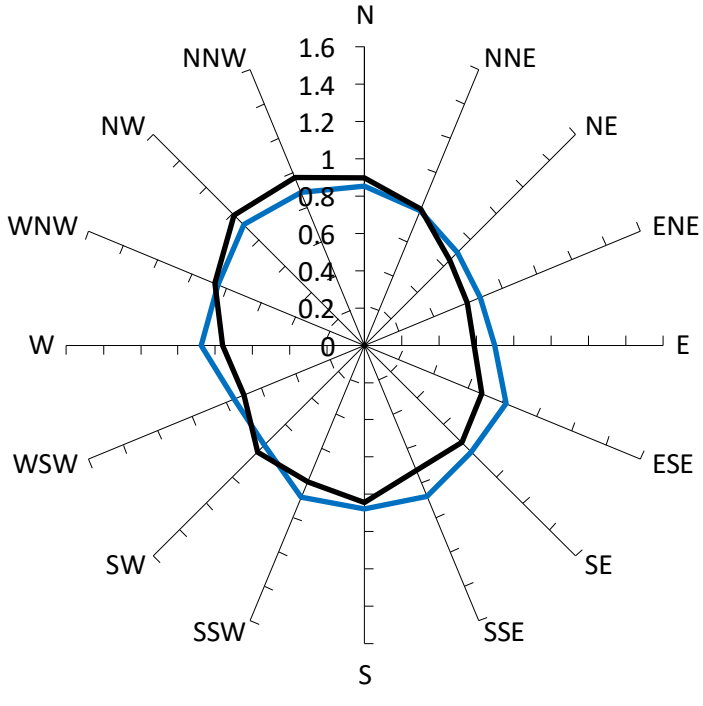
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 67



GEM Velocity Coefficients

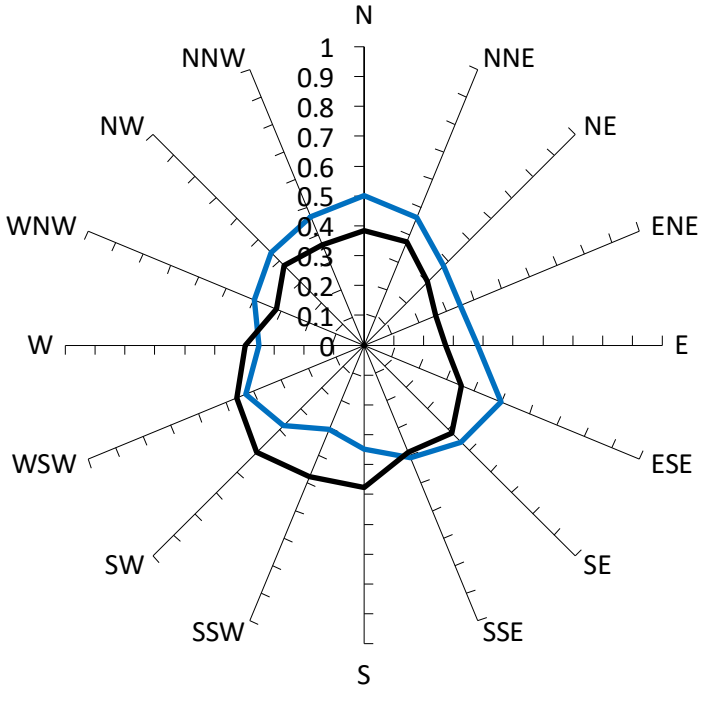


Gust Velocity Coefficients

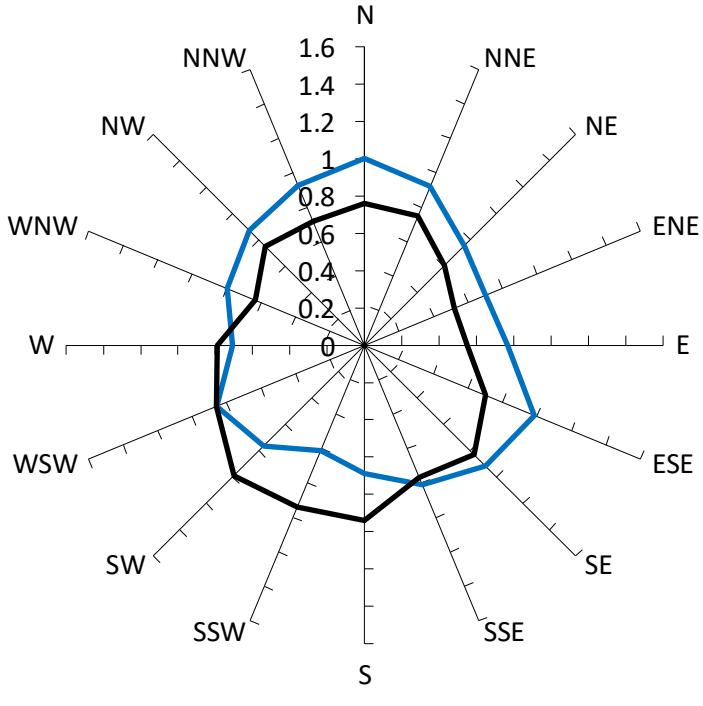
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 68



GEM Velocity Coefficients

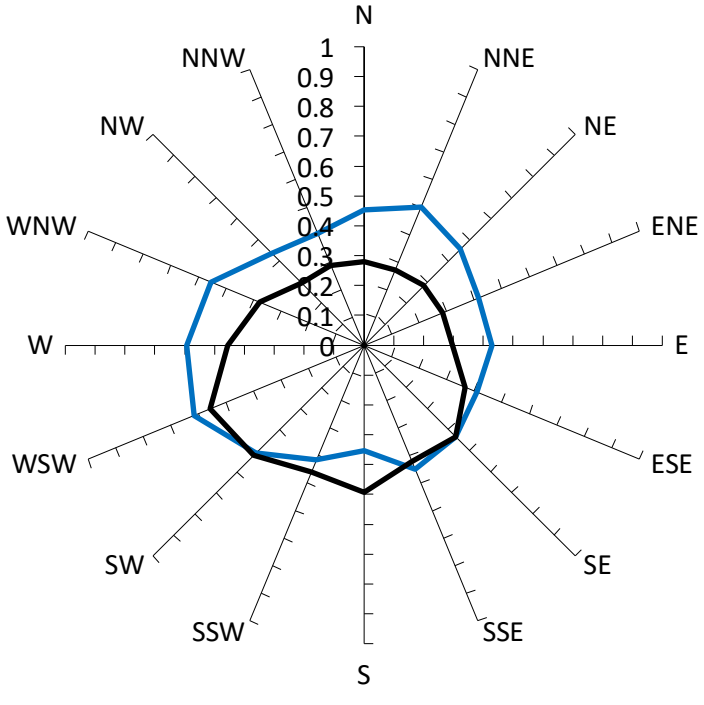


Gust Velocity Coefficients

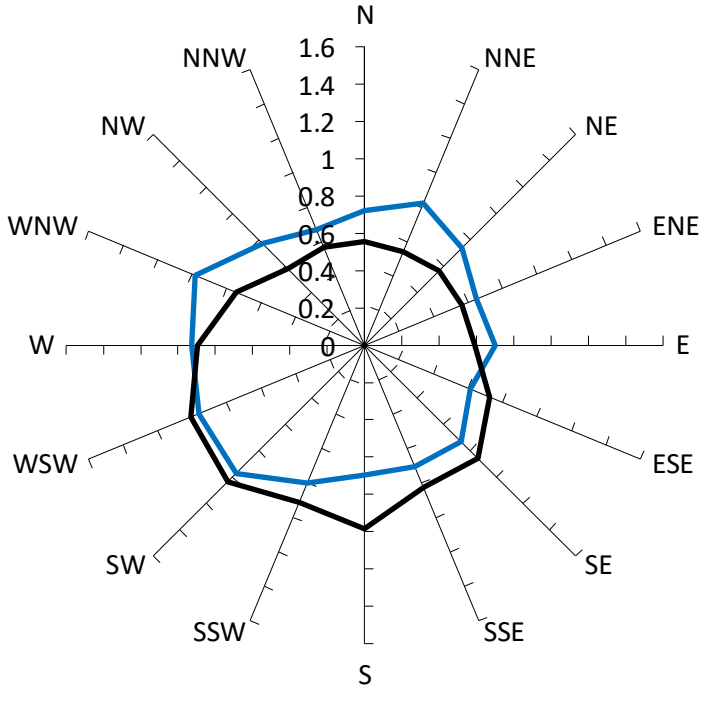
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 69



GEM Velocity Coefficients

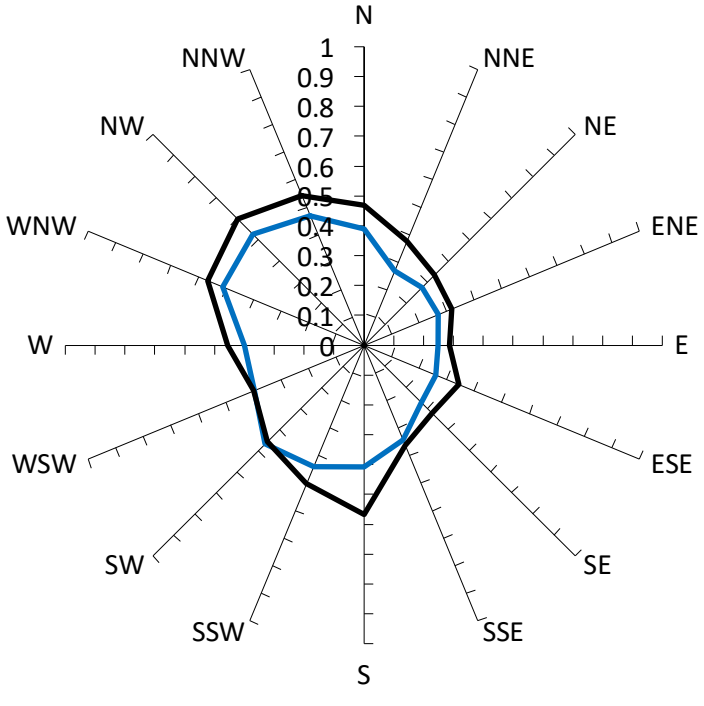


Gust Velocity Coefficients

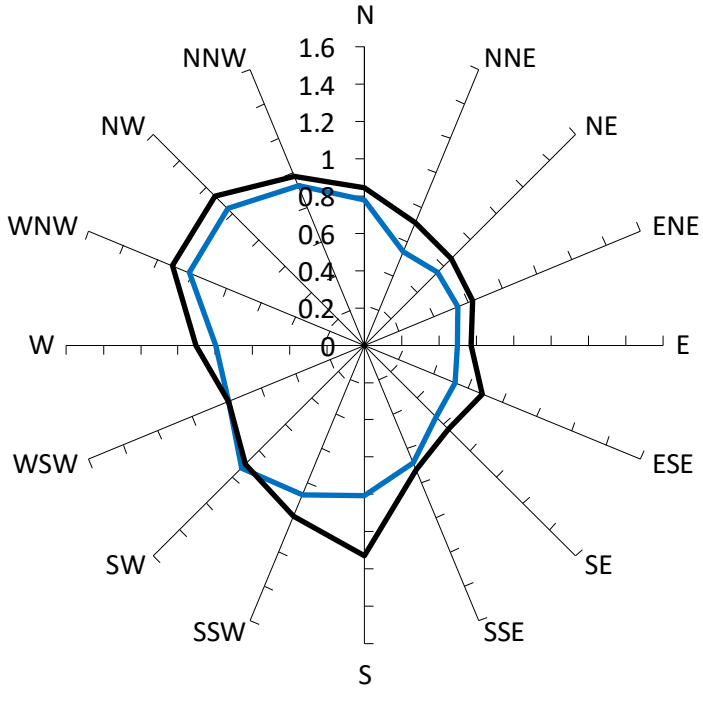
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 70



GEM Velocity Coefficients

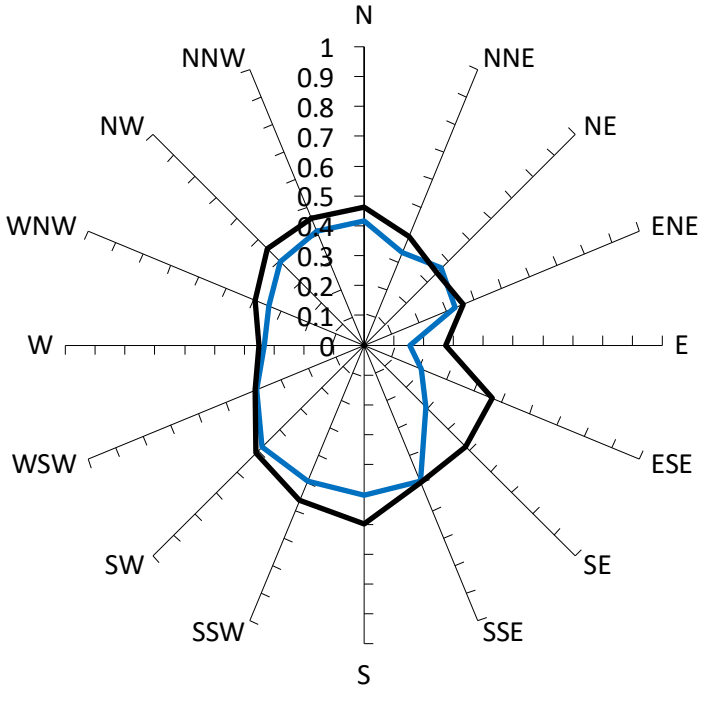


Gust Velocity Coefficients

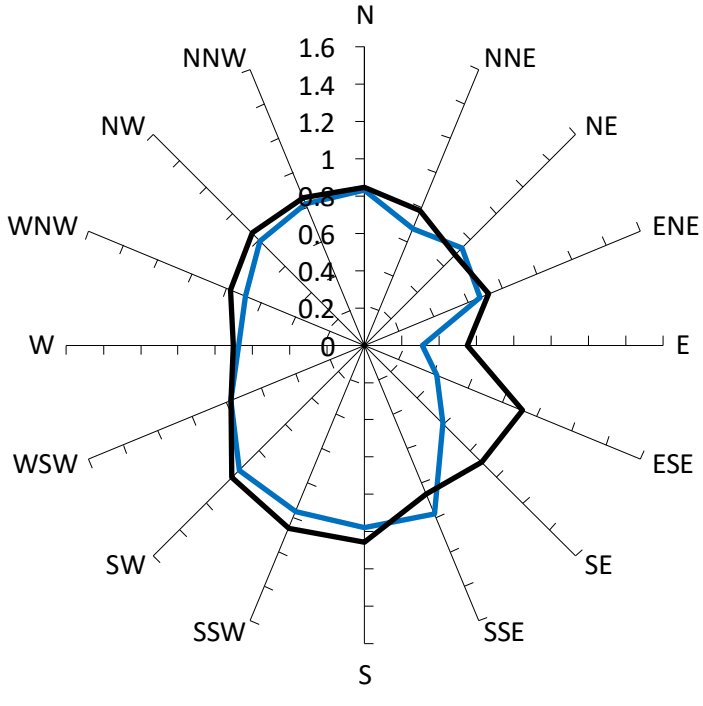
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 71



GEM Velocity Coefficients

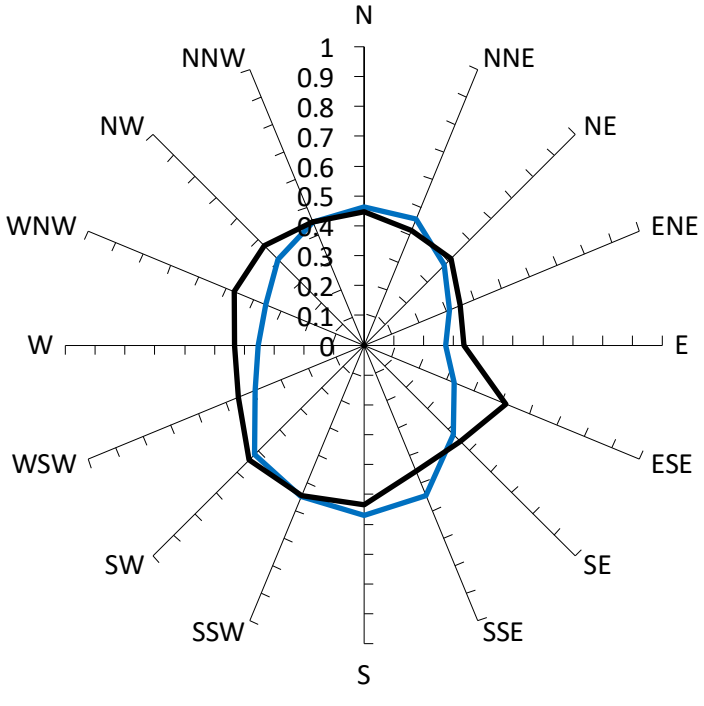


Gust Velocity Coefficients

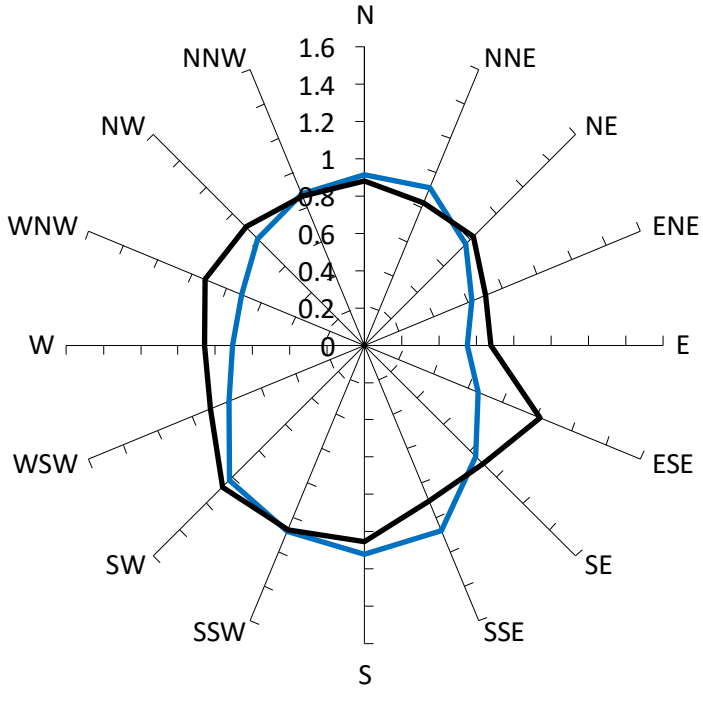
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 72



GEM Velocity Coefficients

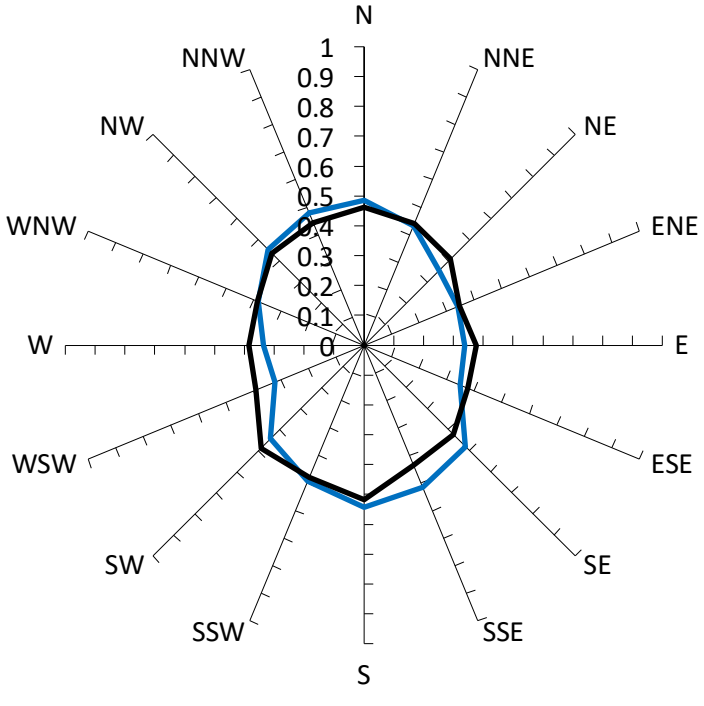


Gust Velocity Coefficients

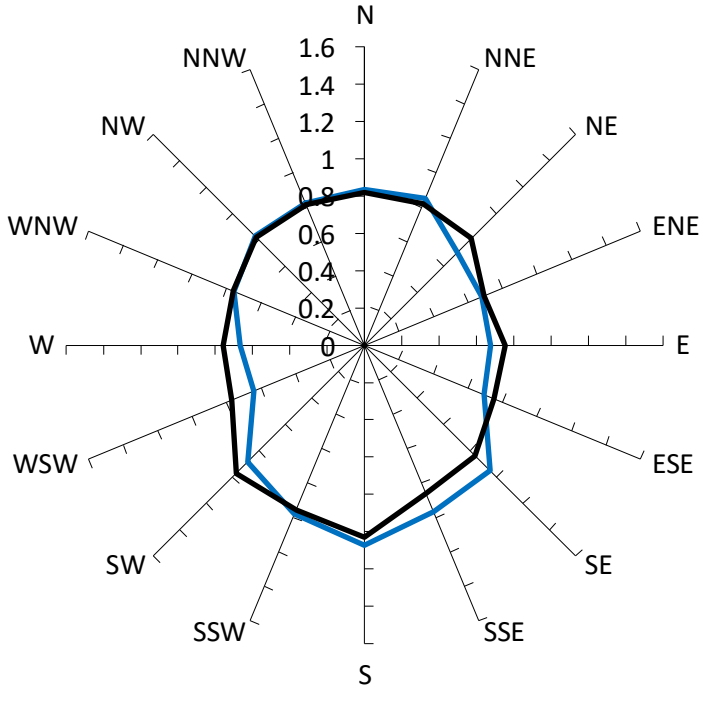
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 73



GEM Velocity Coefficients

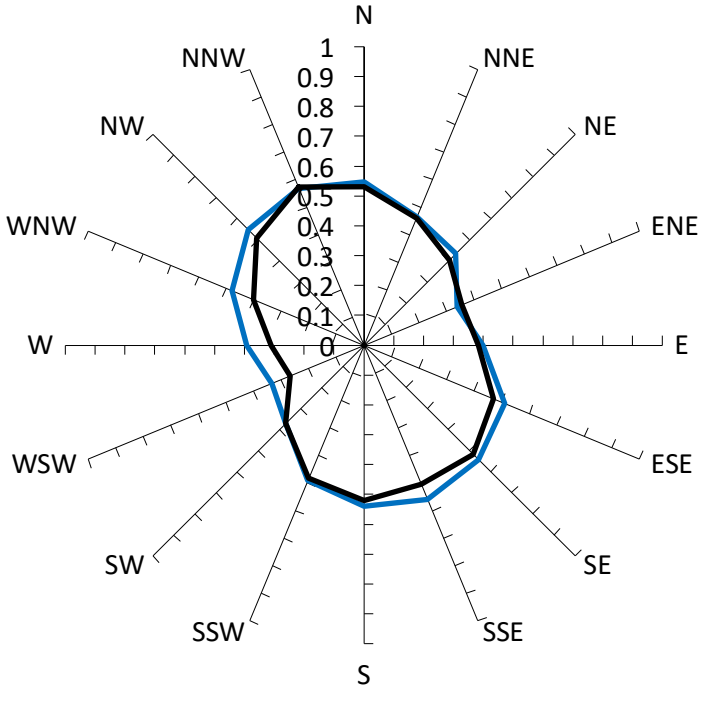


Gust Velocity Coefficients

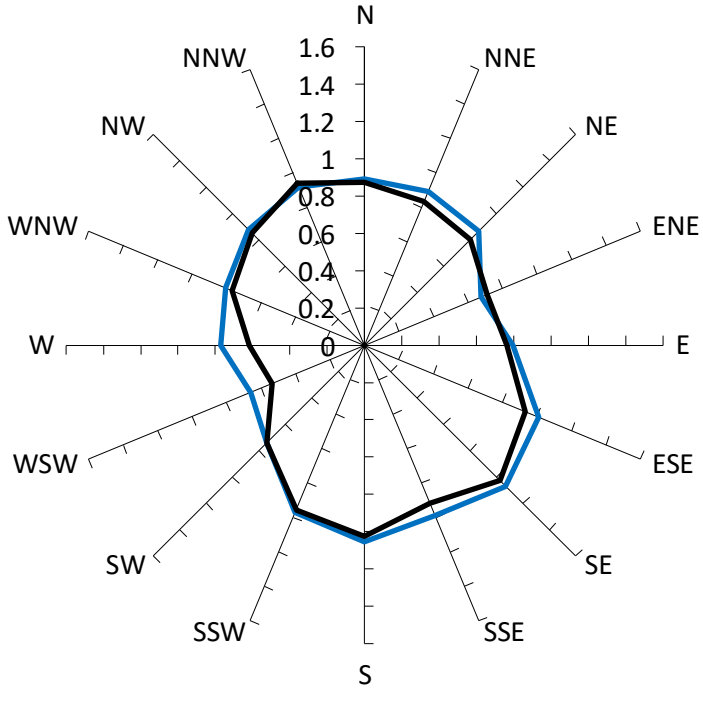
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 74



GEM Velocity Coefficients

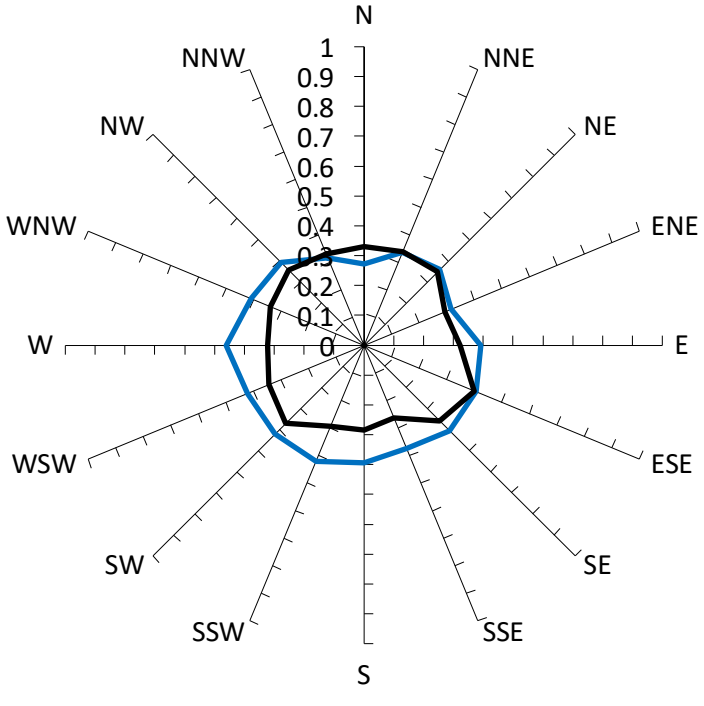


Gust Velocity Coefficients

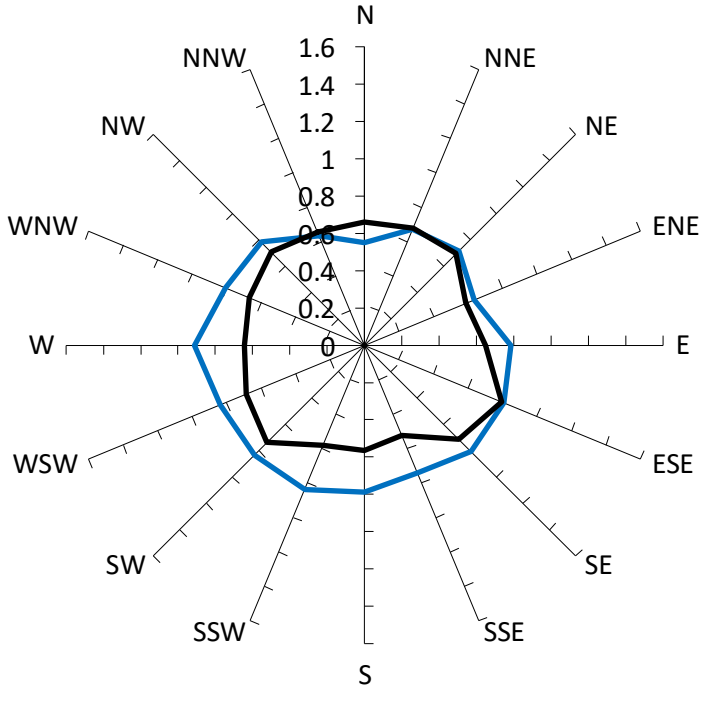
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 75



GEM Velocity Coefficients

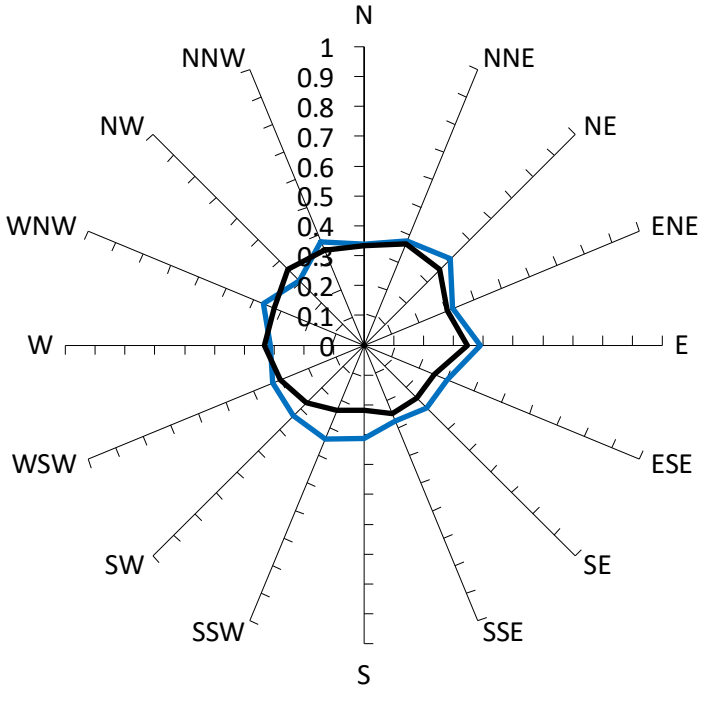


Gust Velocity Coefficients

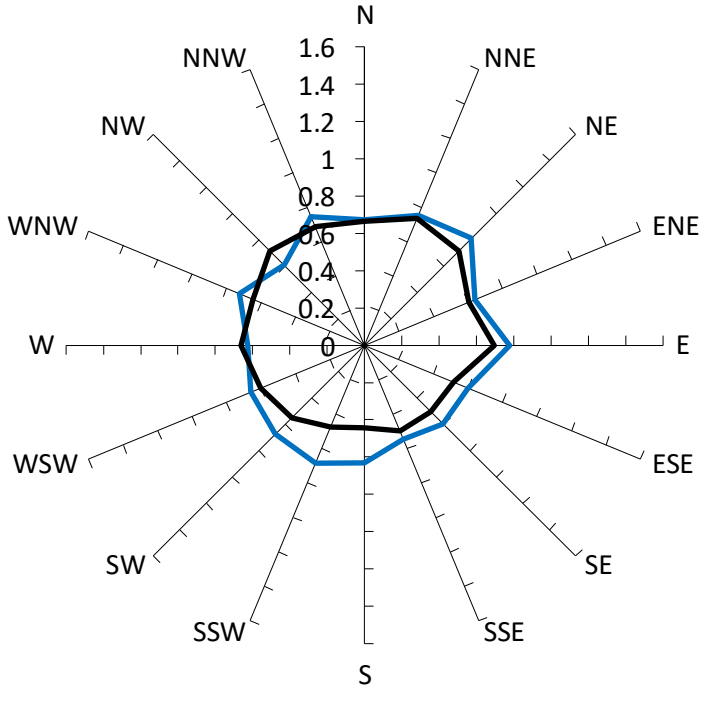
With development "as proposed", no vegetation or other treatments.

Existing Site Conditions

Results for Point 76



GEM Velocity Coefficients

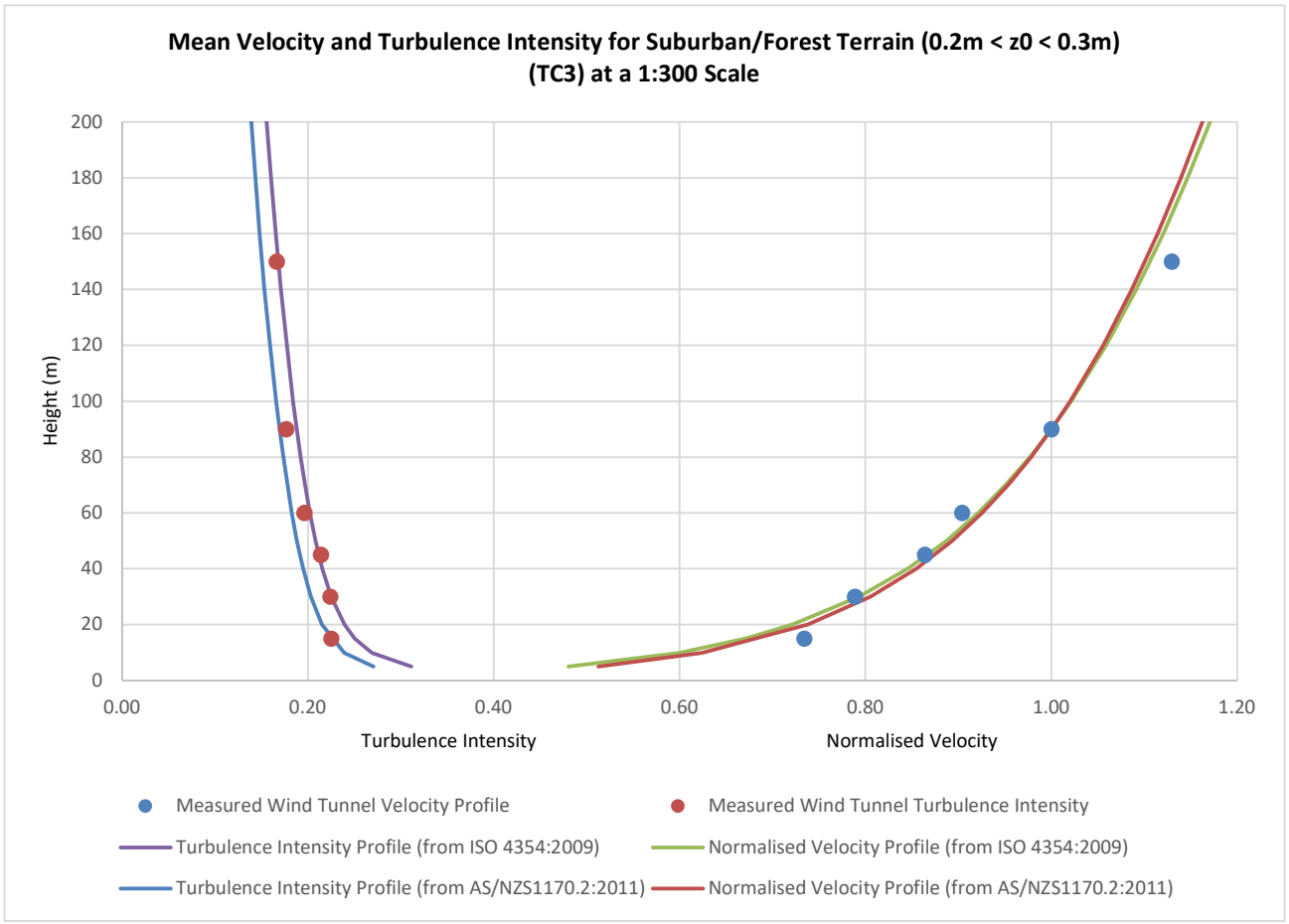


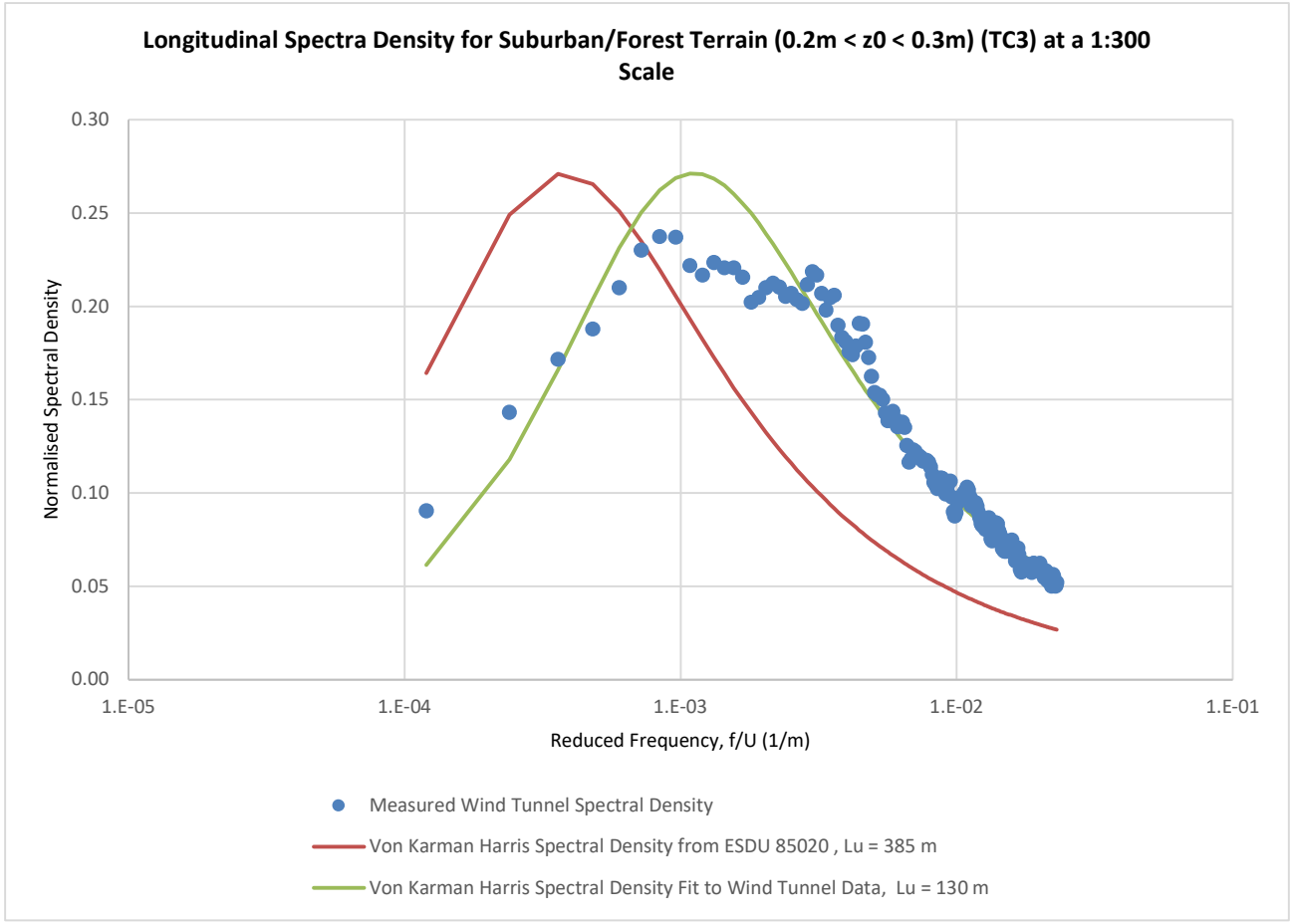
Gust Velocity Coefficients

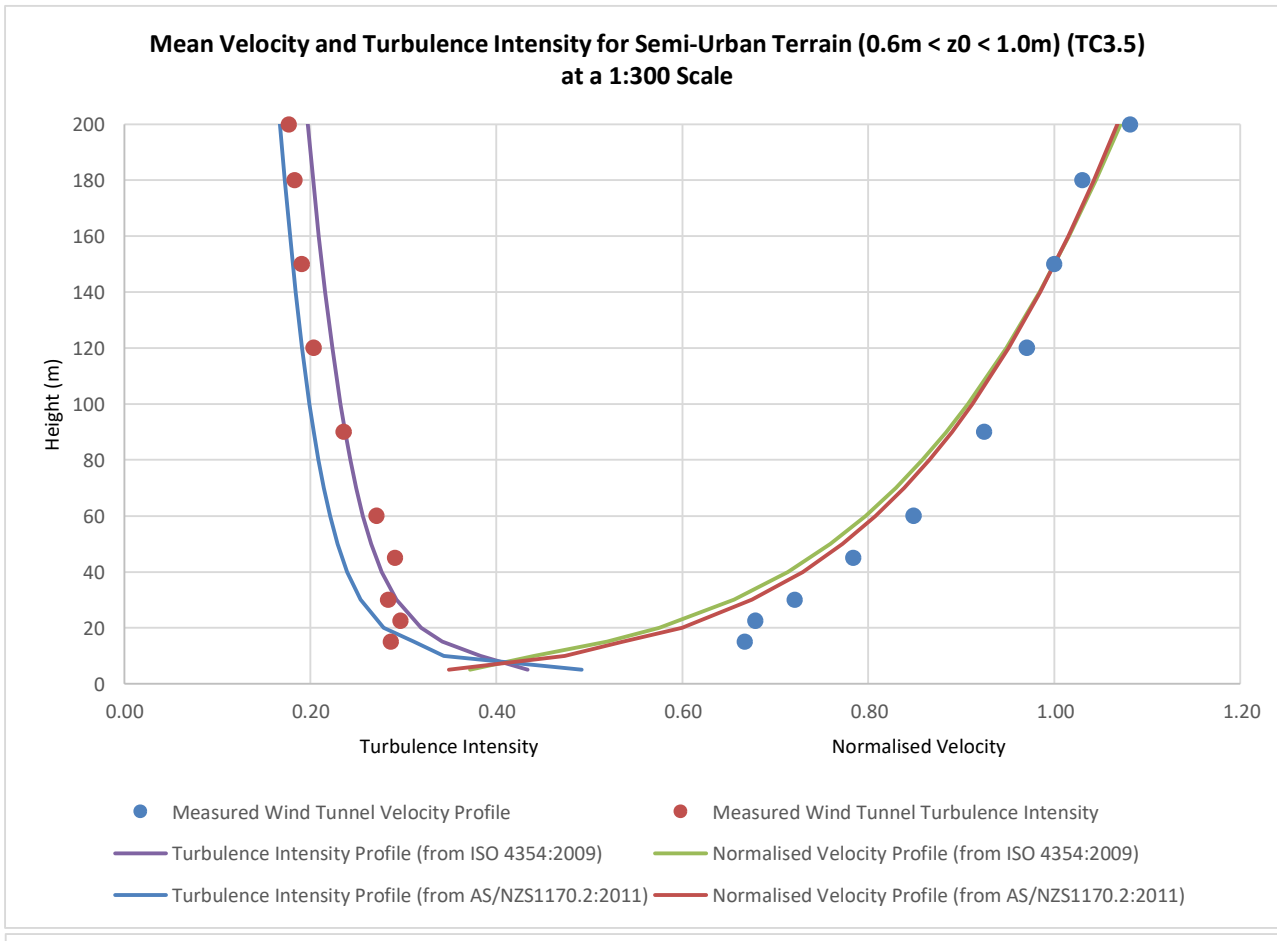
With development "as proposed", no vegetation or other treatments.

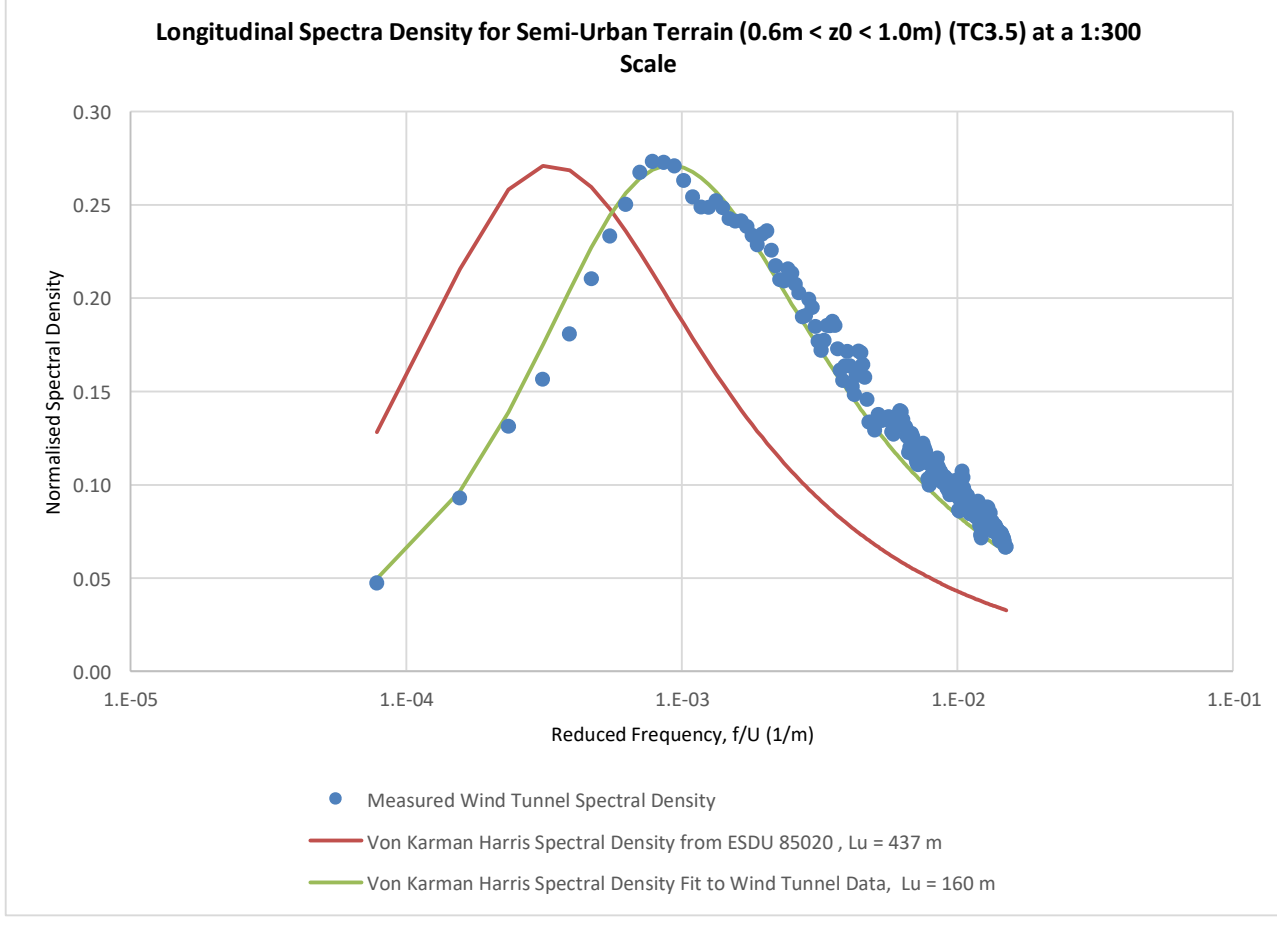
Existing Site Conditions

APPENDIX E VELOCITY AND TURBULENCE INTENSITY PROFILES


Mean Velocity and Turbulence Intensity for Suburban/Forest Terrain (0.2m < z0 < 0.3m) (TC3) at a 1:300 Scale
Height (m)
200
180
160
140
120
100
80
60
40
20
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity
Normalised Velocity
Measured Wind Tunnel Velocity Profile
Measured Wind Tunnel Turbulence Intensity
Turbulence Intensity Profile (from ISO 4354:2009)
Normalised Velocity Profile (from ISO 4354:2009)
Turbulence Intensity Profile (from AS/NZS1170.2:2011)
Normalised Velocity Profile (from AS/NZS1170.2:2011)


Longitudinal Spectra Density for Suburban/Forest Terrain (0.2m < z0 < 0.3m) (TC3) at a 1:300 Scale
Normalised Spectral Density
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.E-05
1.E-04
1.E-03
1.E-02
1.E-01
Reduced Frequency, f/U (1/m)
Measured Wind Tunnel Spectral Density
Von Karman Harris Spectral Density from ESDU 85020 , Lu = 385 m
Von Karman Harris Spectral Density Fit to Wind Tunnel Data, Lu = 130 m


Mean Velocity and Turbulence Intensity for Semi-Urban Terrain (0.6m < z0 < 1.0m) (TC3.5) at a 1:300 Scale
Height (m)
200
180
160
140
120
100
80
60
40
20
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity
Normalised Velocity
Measured Wind Tunnel Velocity Profile
Measured Wind Tunnel Turbulence Intensity
Turbulence Intensity Profile (from ISO 4354:2009)
Normalised Velocity Profile (from ISO 4354:2009)
Turbulence Intensity Profile (from AS/NZS1170.2:2011)
Normalised Velocity Profile (from AS/NZS1170.2:2011)


Longitudinal Spectra Density for Semi-Urban Terrain (0.6m < z0 < 1.0m) (TC3.5) at a 1:300 Scale
Normalised Spectral Density
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.E-05
1.E-04
1.E-03
1.E-02
1.E-01
Reduced Frequency, f/U (1/m)
Measured Wind Tunnel Spectral Density
Von Karman Harris Spectral Density from ESDU 85020 , Lu = 437 m
Von Karman Harris Spectral Density Fit to Wind Tunnel Data, Lu = 160 m

APPENDIX F LIST OF ARCHITECTURAL DRAWINGS REFERENCED

Drawing Number	Title	Revision	Issued	Received
2314-SD11	GROUND FLOOR PLAN	F	-	17/4/2024
2314-SD12	LEVEL 1 FLOOR PLAN	F	9/4/2024	17/4/2024
2314-SD13	LEVEL 2 FLOOR PLAN	F	9/4/2024	17/4/2024
2314-SD14	ROOF PLAN	F	9/4/2024	17/4/2024
2314-SD21	SECTIONS 01	B	20/3/2024	17/4/2024
2314-SD22	SECTIONS 02	B	20/3/2024	17/4/2024
2314-SD31	ELEVATIONS 01	F	9/4/2024	17/4/2024
2314-SD32	ELEVATIONS 01	F	9/4/2024	17/4/2024
180-A-SK-1101	GA Plan Ground Level	-	-	16/4/2024
180-A-SK-1102	GA Plan Level 01	-	-	16/4/2024
180-A-SK-1103	GA Plan Level 02-09	-	-	16/4/2024
180-A-SK-1104	GA Plan Level 10	-	-	16/4/2024
180-A-SK-1105	GA Plan Level 11-13	-	-	16/4/2024
180-A-SK-1106	GA Plan Plant	-	-	16/4/2024
180-A-SK-1107	GA Plan Roof	-	-	16/4/2024
180-A-SK-2001	ELEVATION NORTH	-	-	16/4/2024
180-A-SK-2002	ELEVATION SOUTH	-	-	16/4/2024
180-A-SK-2003	ELEVATION EAST	-	-	16/4/2024
180-A-SK-2004	ELEVATION WEST	-	-	16/4/2024
S3. A02.00	S3 PLAN – GROUND FLOOR	DRP4	9/4/2024	17/4/2024
S3. A02.01	S3 PLAN – LEVEL 1	DRP4	9/4/2024	17/4/2024
S3. A02.04	S3 PLAN - LEVEL 4	DRP4	9/4/2024	17/4/2024
S3. A02.05	S3 PLAN - LEVEL 5	DRP4	9/4/2024	17/4/2024
S3. A02.07	S3 PLAN - LEVEL 7	DRP4	9/4/2024	17/4/2024
S3. A02.10	S3 PLAN - ROOF	DRP4	9/4/2024	17/4/2024
S3. A06.01	BUILDING ELEVATIONS	DRP4	9/4/2024	17/4/2024
S4. A02.00	S4 PLAN - GROUND FLOOR	DRP4	9/4/2024	17/4/2024
S4. A02.01	S4 PLAN - LEVEL 1	DRP4	9/4/2024	17/4/2024
S4. A02.04	S4 PLAN - LEVEL 4	DRP4	9/4/2024	17/4/2024
S4. A02.05	S4 PLAN - ROOF	DRP4	9/4/2024	17/4/2024
S4. A06.01	BUILDING ELEVATIONS	DRP4	9/4/2024	17/4/2024
A06.01	SITE SECTIONS	DRP4	9/4/2024	17/4/2024

Drawing Number	Title	Revision	Issued	Received
A06.02	SITE SECTIONS	DRP4	9/4/2024	17/4/2024
A06.20	SITE ELEVATIONS	DRP4	9/4/2024	17/4/2024
A02.01	MASTERPLAN NEW	DRP4	9/4/2024	17/4/2024

APPENDIX G LIST OF UPDATED LANDSCAPING DRAWINGS REFERENCED

Drawing Number	Title	Revision	Issued	Received
LA_SSDA_001	COVERSHEET	A	19/06/2024	20/06/2024
LA_SSDA_201	GENERAL ARRANGEMENT – GROUND	A	19/06/2024	20/06/2024
LA_SSDA_211	GENERAL ARRANGEMENT – ROOF TERRACE	A	19/06/2024	20/06/2024
LA_SSDA_301	LEVELS & GRADING PLANS – GROUND	A	19/06/2024	20/06/2024
LA_SSDA_501	PLANTING PLANS – GROUND	A	19/06/2024	20/06/2024
LA_SSDA_511	PLANTING PLANS – ROOF TERRACE	A	19/06/2024	20/06/2024

APPENDIX H WIND EFFECTS GLOSSARY

H.1 Downwash and Upwash Effects

The downwash wind effect occurs when wind is deflected down the windward face of a building, causing accelerated winds at pedestrian level. This can lead to other adverse effects as corner acceleration as the wind attempts to flow around the building, as seen in Figure H.1.

This can also lead to recirculating flow in the presence of a shorter upstream building, causing local ground level winds to move back into the prevailing wind.

The upwash effect occurs near upper level edge of a building form as the wind flows over the top of the building. This has the potential to cause acceleration of winds near the leading edge, as well as potentially reattaching onto the roof area. This effect causes wind issues particularly near the leading edges of tall building and on the rooftop areas if there is sufficient depth along the wind direction. Upwash is more apparent in taller towers and podia.

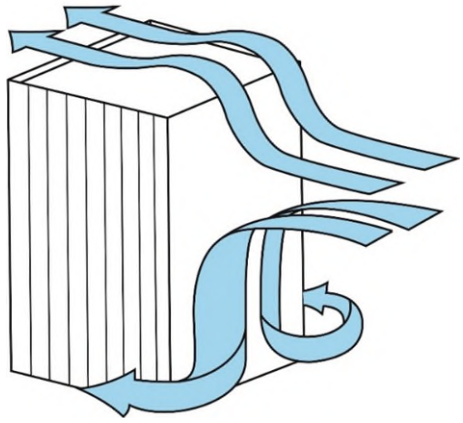


Figure H.1: Downwash Leading to Corner Wind Effect, and Upwash Effects

H.2 Funnelling/Venturi Effect

Funnelling occurs when the wind interacts with two or more buildings which are located adjacent to each other, which results in a bottleneck, as shown in Figure H.2. This causes the wind to be accelerated through the gap between the buildings, resulting in adverse wind conditions and pedestrian discomfort within the constricted space. Funnelling effects are common along pedestrian links and thoroughfares generally located between neighbouring buildings that have moderate gaps between them.

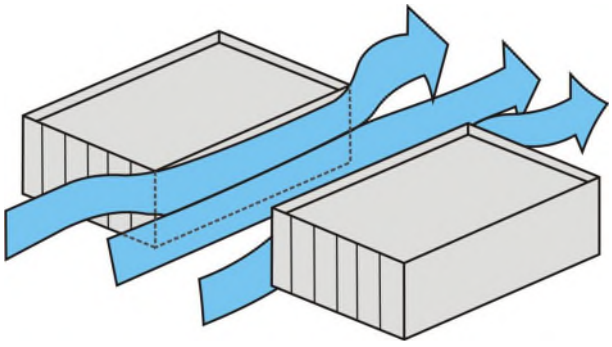


Figure H.2: Funnelling/Venturi Wind Effect

H.3 Gap Effect

The gap effect occurs in small openings in the façade that are open to wind on opposite faces, as seen in Figure H.3. This can involve a combination of funnelling and downwash effects. Presenting a small gap in the façade on the windward aspect as the easiest means through which the wind can flow through can result in wind acceleration through this gap. The pressure difference between the windward façade and the leeward façade also tends to exacerbate the wind flow through this gap.

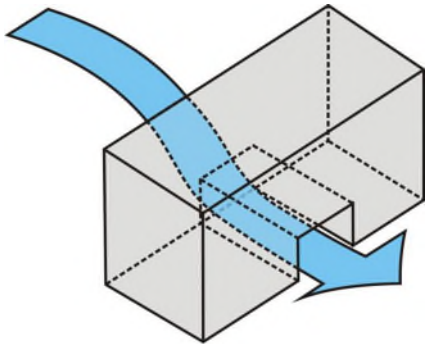


Figure H.3: Gap Wind Effect

H.4 Sidestream and Corner Effects

The sidestream effect is due to a gradual accumulation of wind shearing along the building façade that eventuates in an acceleration corner effect. The flow is parallel to the façade and can be exacerbated by downwash effects as well, or due to corner effect winds reattaching on the façade.

This is shown in Figure H.4. The corner refers to the acceleration of wind at the exterior vertical edge of a building, caused by the interaction of a large building massing with the incident wind, with the flow at the corner being accelerated due to high pressure differentials sets up between the windward façade and the orthogonal aspects. It can be further exacerbated by downwash effects that build up as the flow shears down the façade.

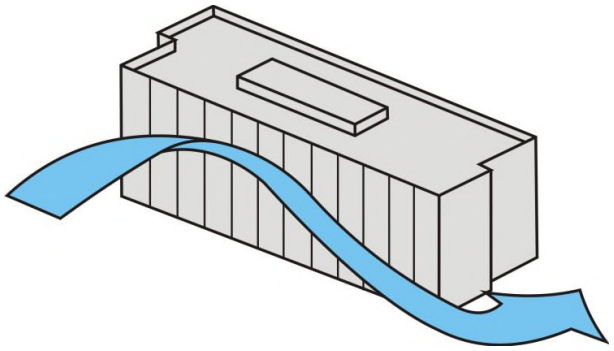


Figure H.4: Sidestream and Corner Wind Effect

H.5 Stagnation

Stagnation in a region refers to an area where the wind velocity is significantly reduced due to the effect of the flow being impeded by the bluff body. For a particular prevailing wind direction, this is typically located near the middle of the windward face of the building form or over a short distance in front of the windward face of a screen or fence. Concave building shapes tend to create an area of stagnation within the cavity, and wind speeds are generally low in these areas.