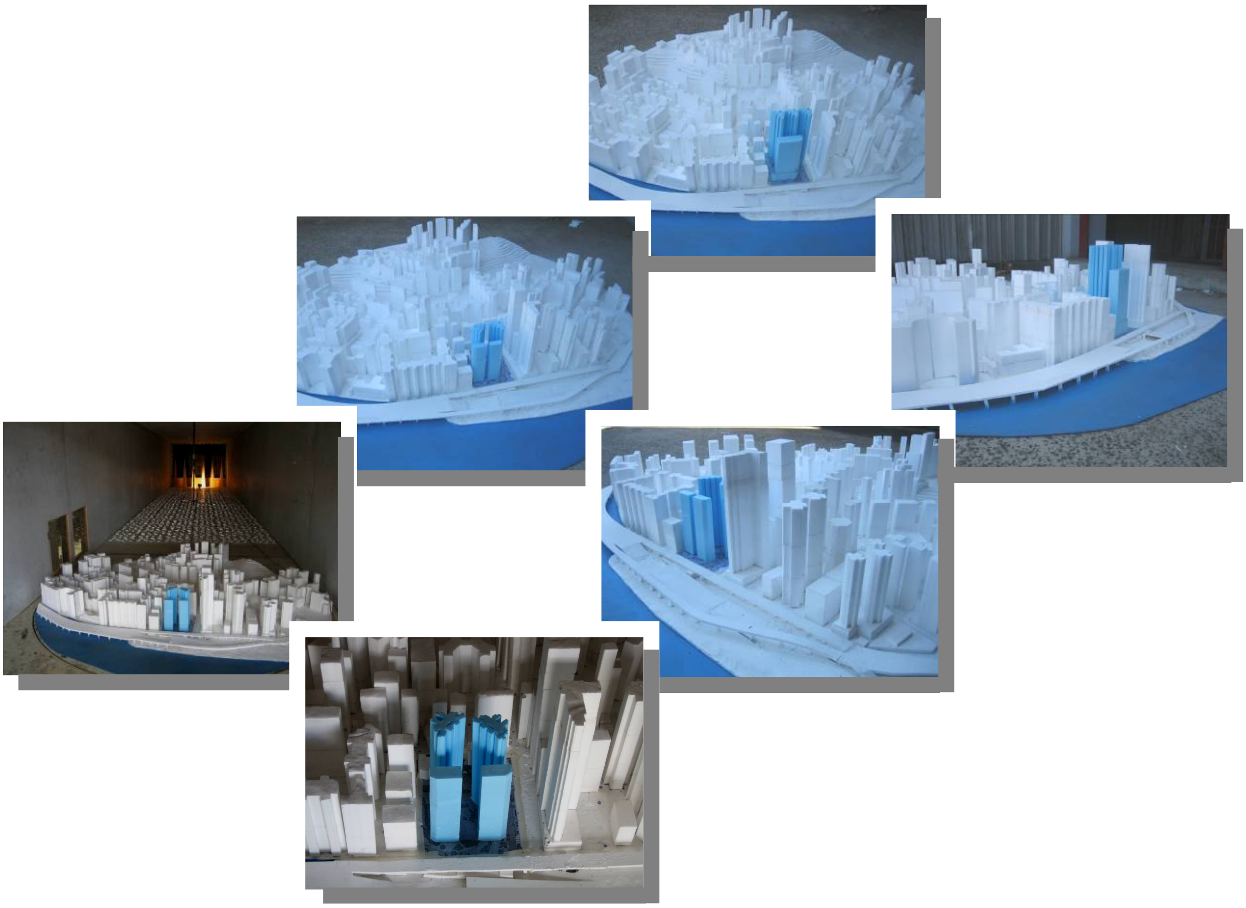
Planning Department

Air Ventilation Assessment Study
Oil Street Site
FINAL REPORT



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APPENDICES

Keyword

Wind Velocity Ratio (VR)	An indicator of wind availability, which is defined as Vp/V∞ (V pedestrian/V infinity). V∞ captures the wind velocity at the top of the wind boundary layer (assumed to be 500 m above ground in this study). V∞ is taken as the wind availability of the site. Vp captures the wind velocity at the pedestrian level (2 m above ground) after taking into account the effects of buildings and urban features. It is a common practice in wind engineering study to account for wind coming from 16 main directions. The Wind Velocity Ratio is the sum of the Wind Velocity Ratio of wind from direction i (VRi) multiply by the probability (Fi) of wind coming from that direction as expressed by the formulae $VR_w = \sum_{i=1}^{16} F_i \times VR_i$
Project Area	Defined by the project site boundaries including all open areas that pedestrians are likely to access.
Assessment Area	Generally including the project's surrounding up to a perpendicular distance H from the project boundary, H being the height of the tallest building on site.
Surrounding Area	The area that "conditions" the approaching wind profiles appropriately. The Surrounding Area of up to a perpendicular distance of 2H from the project boundary must be included in the study. Sometimes it may be necessary to enlarge the Surrounding Area if there are prominent features (e.g. tall buildings or large and bulky obstructions) immediately outside the 2H zone.
Test Points	Selected locations where Wind VRs are reported.
Perimeter Test Points	Test Points positioned on the project site boundary.
Overall Test Points	Test Points evenly distributed and positioned in the open spaces, on the streets and places of the Project and Assessment Areas where pedestrians frequently access.
Expert Evaluation	A qualitative assessment of the design and/or design options and to facilitate the identification of problems and issues.
Detailed Study	A quantitative assessment and comparison of design options to facilitate option selection.
Site spatial average Velocity Ratio (SVR)	The average Wind VR of the Perimeter Test Points to give a hint of how the development proposal impacts the wind environment of its immediate vicinity.
Local spatial average velocity ratio (LVR)	The average Wind VR of the Overall Test Points, together with that of the Perimeter Test Points to give a hint of how the development proposal impacts the wind environment of the local area.

1. INTRODUCTION

1.1 Background

1.1.1 In the Team Clean report published in August 2003, Government undertook to examine the practicality of stipulating air ventilation assessment (AVA) as one of the considerations for all major development or redevelopment proposals and in future plan making. In the "First Sustainable Development Strategy for Hong Kong" promulgated by the Office of the Chief Secretary for Administration in May 2005, a strategic objective to promote sustainable urban planning and design practices has been set out amongst other objectives with special regard to issues such as buildings affecting view corridors or restricting air flow.

1.1.2 A framework for applying AVA is developed on the basis of the "Feasibility Study on Establishment of Air Ventilation Assessment System" completed and endorsed by the Committee on Planning and Land Development on 7 June 2005. To ensure that air ventilation impacts are duly considered as one of the main criteria in the planning and design process, the Technical Circular on Air Ventilation Assessment was jointly promulgated in July 2006 by the former Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau. It sets out the guidance and need to apply AVA to all major government projects, which may have major impacts on the macro wind environment.

1.1.3 Planning Department has commissioned CH2M HILL Hong Kong Limited (in association with Windtech Consultants Pty Limited (Australia)) to provide term consultancy services for undertaking air ventilation assessment for instructed projects in September 2006. One of them is the AVA for the Oil Street Site.

1.2 Objectives and Scope of Work

1.2.1 The objective of this study is to complete air ventilation assessment for three design schemes for the Oil Street Site and to facilitate the Government to decide an appropriate design scheme for better air ventilation. Technical Guide for Air Ventilation Assessment for Developments in Hong Kong (Technical Guide) was followed.

1.2.2 The study includes 2 major tasks i.e. the Experimental Site Wind Availability Study and the Detailed Study. Experimental site wind availability testing was carried out to obtain precise wind availability and characteristics information in terms of wind directions, magnitudes and frequencies, wind speed and turbulence intensity profiles of the subject site. The detailed study aims to assess and compare the impacts of the alternative design schemes on the pedestrian level wind conditions where pedestrians frequently access or would congregate within the project and assessment areas.

1.2.3 Three design schemes were assessed, namely, the Base Scheme, the Revised Scheme and the Second Revised Scheme.

1.3 Site Environ

1.3.1 The proposed development is located at harbourfront, bounded by Oil Street to the southwest and Electric Road to the southeast. To the northwest of the subject site is the waterfront. The landward side of the subject site is densely built up. Figure 1-1 shows the location of the subject site and its immediate environ.

1.3.2 To the immediate northeast is an electricity sub-station (ESS), the Electric Centre Building and the Electric Road Municipal Services Building. To the further northeast is a high-rise residential development, the City Garden. City Garden Road is aligned in parallel to the coast and ends at the subject site.

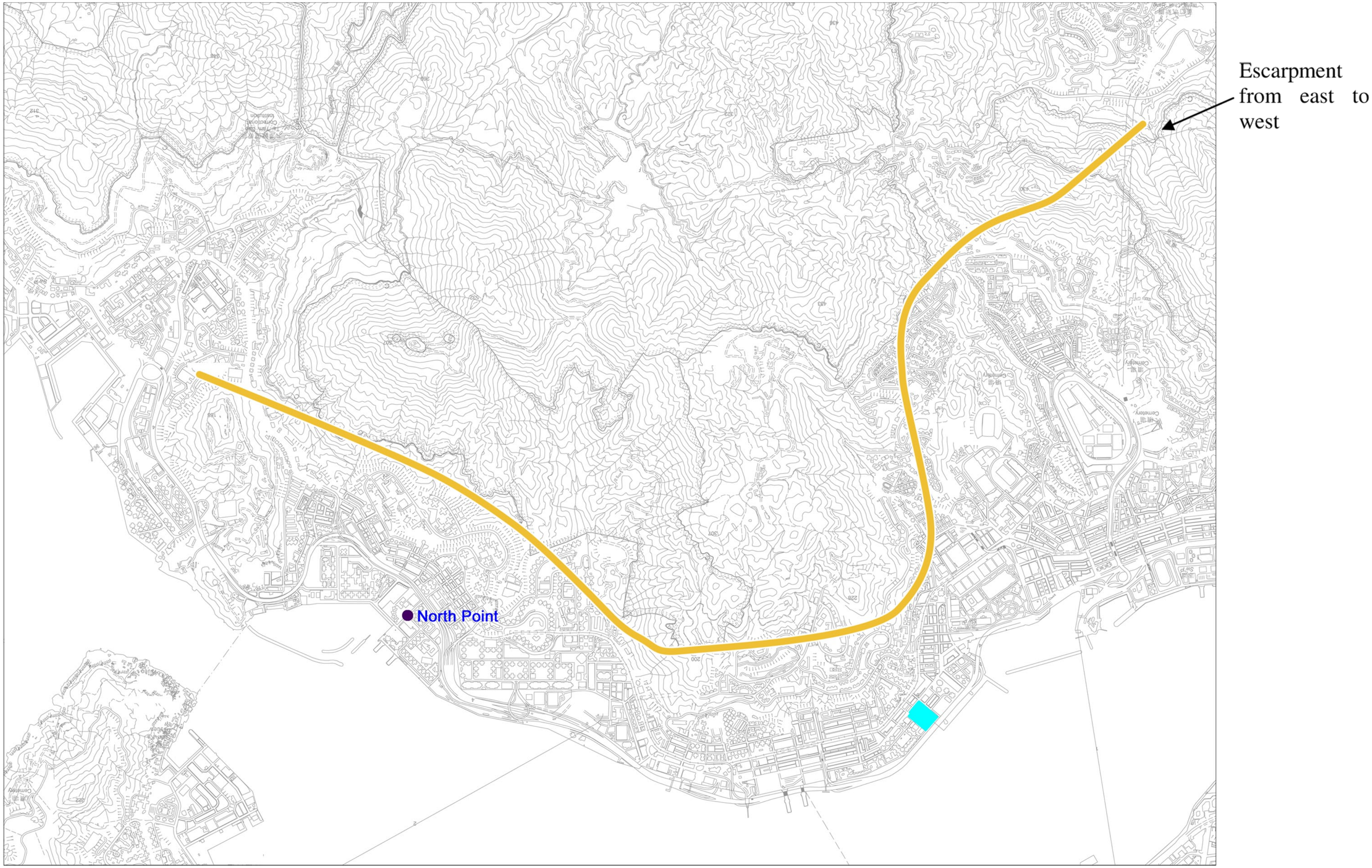
1.3.3 To the southeast on the opposite side of Electric Road is a hotel, some commercial and residential buildings. The hotel development is of long frontage to the waterfront with the height reaching about 83mPD. The heights of other existing buildings adjacent to the hotel development range from about 20 to 23mPD. The row of buildings at the back along King's Road range from about 46 to 78mPD. The topography to the further south is of much higher elevation.

1.3.4 King Wah Road and Wang On Road are aligned in parallel to the waterfront to the southwest of the subject site and ends at the subject site. An L-shaped hotel building is planned at a site bounded by King Wah Road and Oil Street. A commercial development, AIA Tower, is bounded by Electric Road and Oil Street to the south of the subject site and is about 177mPD. To the further southwest is the Harbour Heights development comprising 3 towers each of about 120mPD.

1.3.5 A section of the proposed Central-Wan Chai Bypass and ancillary facilities including the administration building is proposed at grade to the northwest of the subject site. A future waterfront park is proposed to the further northwest.

1.3.6 The land topography is relatively flat on site and in its immediate surrounding. There is, however, an escarpment with the peak rising to a height of approximately 500m within 5km from the site in the east to west directions (Figure 1-2).

Title:	**Location of the Oil Street Site**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 1-1**



Title:	**Local Area from the North-West**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 1-2**

2. EXPERIMENTAL SITE WIND AVAILABILITY STUDY

2.1 Introduction

2.1.1 The Experimental Site Wind Availability Study was undertaken in accordance with the current best international practice requirements stipulated in the Australasian Wind Engineering Society Quality Assurance Manual, AWES-QAM-1-2001 (2001) and the American Society of Civil Engineers Manual, Report on Engineering Practice No. 67 for Wind Tunnel Studies of Buildings and Structures (1999) and the Technical Guide for Air Ventilation Assessment for Developments in Hong Kong (2006).

2.2 1:4000 Physical Model

2.2.1 A 1:4000 scale topographical study was undertaken to determine the effects of local topography and the surrounding urban environment on the mean wind speed and turbulence intensity profiles of the study area. The model included the entire Hong Kong Island, the Kowloon Peninsula and mountain ranges to its north.

2.2.2 The extent of the 1:4000 scale model is shown in Figure 2-1. The landform in the model was fabricated at 40m contour intervals from information acquired from the HKSAR's Survey and Mapping Office, Lands Department. The building morphology, including existing and planned buildings and structures was constructed based on the information provided by the Planning Department. Different views of the overall model of the 20km diameter region are shown in Figure 2-2. A view of the model in the wind tunnel, including a closer view of the section of the model representing the area around the Oil Street sale site is shown in Figure 2-3.

2.2.3 The measurement point for the site wind availability study is located at the centre of the subject development site (Figure 2-7). During the test, buildings in close proximity to the site, which were included in the 1:400 scale detailed study were removed.

2.2.4 The topographical study has been referenced with the wind data measured by Hong Kong Observatory at Waglan Island during the period between 1975 and 2001. The Waglan Island data was analysed and corrected to a 500m reference height. The reference data for Waglan Island used in this report is given in Appendix I.

2.3 The Approaching Wind Characteristics of Hong Kong

2.3.1 Waglan Island, located approximately 5km southeast of Hong Kong Island, has been used by the Hong Kong Observatory (HKO) for the collection of long-term wind data since December 1952. Due to the relative lack of developments over the past 50 years and its generally uninterrupted exposure to winds, data collected at Waglan Island is considered to be representative of winds approaching Hong Kong and are of the highest quality available for wind engineering purposes. For the other inland weather stations, many developments have taken place close to them during their operational life, which make them unsuitable for wind engineering applications.

2.3.2 The annual wind rose for Waglan Island indicates the prevailing winds approaching Hong Kong occur mainly from the north-east directions and, to a lesser extent, the south-west directions.

2.3.3 The key parameters for modelling the wind behaviour within the atmospheric boundary layer over a particular terrain are the variation in the mean wind speed and the variation of the turbulence intensity with height. Turbulence intensity is a measure of the gustiness of wind due to eddies and vortices generated by frictional effects at surface level, the roughness of the terrain over which air is flowing and convective effects due to opposing movements of air masses of different temperature. In typical atmospheric boundary layer flow, turbulence intensity generally decreases with height. Closer to the ground, at pedestrian level for example, the magnitude of the turbulence intensity can be very large due to the effects of wind flowing around buildings and other structures.

2.3.4 Windtech's boundary layer wind tunnel test facility is shown in Figure 2-4. The test section has a 2.6m wide × 2m high working section and a maximum mean free stream wind speed of approximately 15m/s. The wind flow regime can be modified through the use of devices such as spires and fences to model different scale atmospheric boundary layer flows.

2.3.5 Appropriate combinations of roughness elements and fences were used to simulate the characteristics of winds approaching Hong Kong as represented by the mean wind speed and turbulence intensity profiles corresponding to wind flowing over open water. The mean wind speed profile of the wind flow approaching the study area has been made reference to the power law expression, defined in Equation (1), specified in Planning Department's Feasibility Study for Establishment of Air Ventilation Assessment System – Final Report (2005) as well as the corresponding profile defined in Hong Kong Code of Practice on Wind Effects (2004). This can be seen in Figure 2-5. The mean velocity profile stipulated by Feasibility Study for Establishment of AVAS (2005) is based on a 0.15 power law exponent, as defined in equation (1), below, and closely resembles the Deaves and Harris (1978) profile for boundary layer flow over open terrain;

$$\frac{\overline{u}(z)}{\overline{u}_{ref}} = \left(\frac{z}{z_{ref}}\right)^{\alpha} \qquad (1)$$

where:

$\overline{u}(z)$ = mean wind speed at a height z (m/s);

$\overline{u}_{ref}$ = mean wind speed at a suitable reference height (m/s);

z = height above zero plane displacement height (m);

z_{ref} = a suitable reference height (m);

α = the power law exponent, which is a constant commensurate with the terrain roughness, taken as approximately 0.15 for this study.

2.3.6 The turbulence intensity profile of the approaching wind flow was simulated in accordance with both the Hong Kong Code of Practice on Wind Effects (2004) and Terrain category 2 (Open) Terrain profile stipulated in Australian/New Zealand Standard AS/NZS 1170.2:2002, which corresponds to non-typhoon wind flow above rough open water surfaces. The simulated mean wind speed and turbulence intensity profiles are generally within ±10% of the target profiles defined in Equation (1), as well as in the Hong Kong Code of Practice on Wind Effects (2004) and AS/NZS 1170.2:2002 category 2 terrain and are presented in Figure 2-5. The spectrum of longitudinal turbulence of the approach flow measured at a height equivalent to 500m in prototype scale is presented in Figure 2-6 and satisfies the maximum ratio of 3 for modelling of the scaling of the length scale parameter, xLu as specified in the Engineering Science Data Unit 74031 (1974).

2.4 Experimental Site Wind Measurement

2.4.1 The location of the measurement point, where the wind profiles were measured is indicated in Figure 2-7. Winds approaching the modelled region were calibrated to simulate non-typhoon winds flowing over open water and the topographical model was used to determine the effects of the surrounding complex terrain on the wind speed and turbulence intensity.

2.4.2 Wind tunnel measurements were taken at 22.5° intervals for the full 360° azimuth (i.e. 16 wind directions), where a wind direction of 0° or 360° corresponds to an incident wind approaching the study area directly from the north, 90° corresponds to an incident wind approaching the study area directly from the east, etc. For each wind direction tested, mean wind speeds and turbulence intensities were determined at eight different height levels, equivalent to 50, 100, 150, 200, 250, 300, 400 and 500m in prototype scale, above the measurement positions within the study area.

2.4.3 While measurements were taken at one position, all buildings within a radius of 500m of that position were removed from the wind tunnel model for all measured wind directions. Buildings within the 500m radius will be included in the 1:400 model for the more detailed and larger scale study.

2.4.4 Wind speeds at the measurement heights were normalised by the upstream wind speed at 500m. Turbulence intensities were also obtained from the local mean and standard deviation wind speeds by the equations defined below.

$$\text{normalised wind velocity} = \frac{\overline{V}_z(\theta)}{\overline{V}_{500,\text{approach}}(\theta)} \qquad (1)$$

$$\text{turbulence intensity} = \frac{\sigma_{V,z}(\theta)}{\overline{V}_z(\theta)} \qquad (2)$$

In Equations (1) and (2):

$\overline{V}_z(\theta)$ = mean wind speed at a height z (z = 50, 100, 150, 200, 250, 300, 400 or 500m in prototype scale) for an approaching wind direction θ (θ = 22.5°, 45°, 67.5°, 90°, 112.5°, 135°, 157.5°, 180°, 202.5°, 225°, 247.5°, 270°, 292.5°, 315°, 337.5° or 360°);

$\overline{V}_{500,\text{approach}}(\theta)$ = mean wind speed of the approaching wind at a height equivalent to 500 m in prototype scale for an approaching wind direction θ;

$\sigma_{V,z}(\theta)$ = the standard deviation of the fluctuating wind speed V_z for an approaching wind direction θ.

2.4.5 The experimental site wind speed and turbulence intensity for each of the wind directions are presented in graphical form and are tabulated in Appendix II.

2.5 Site Wind Availability

2.5.1 Wind rose and the frequency table of the study area at an urban canopy level, i.e. 200m, were presented in Appendix III. A higher level wind rose (i.e. 500m) has been considered. It is the gradient height assumed in the Technical Guide and will not likely be affected by the ground level roughness. However, in order to better capture the "turning effects" as represented by the yaw angles (from the site wind availability testing) that resulted from the nearby topography, wind rose at 200m was chosen. This wind rose can better present the wind characteristics at the urban canopy level. Wind effects lower than this level would be presented by the built forms that existed in the model. The percentage occurrence of the prevailing winds is shown as Table 2-1.

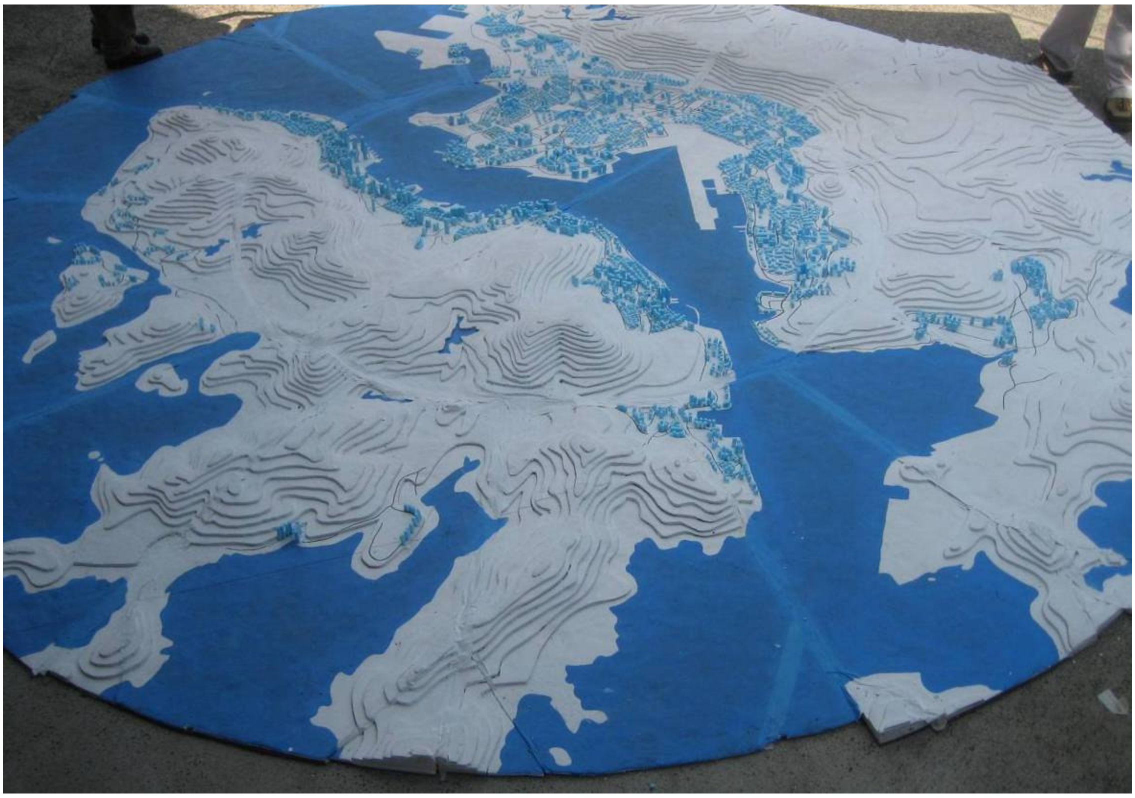
Table 2-1 Percentage Occurrence of Wind at the Subject Site

Wind Angle (º)	Percentage Occurrence (%) for wind speed ranges:				
	0-3.3 m/s	3.4–7.9 m/s	8.0–13.8 m/s	>13.8 m/s	Total
22.5	3.3%	6.7%	2.1%	0.1%	12.2%
45	3.1%	5.3%	0.7%	0.0%	9.1%
67.5	5.0%	14.9%	4.9%	0.2%	24.9%
90	3.0%	8.4%	4.7%	0.4%	16.5%
112.5	2.0%	2.0%	0.4%	0.0%	4.5%
135	1.8%	1.2%	0.2%	0.0%	3.2%
157.5	2.2%	1.6%	0.2%	0.0%	4.0%
180	1.6%	1.3%	0.1%	0.0%	3.0%
202.5	2.2%	1.9%	0.1%	0.0%	4.2%
225	1.7%	2.7%	0.2%	0.0%	4.7%
247.5	1.0%	1.8%	0.3%	0.0%	3.1%
270	0.9%	0.7%	0.1%	0.0%	1.7%
292.5	0.6%	0.2%	0.0%	0.0%	0.8%
315	0.2%	0.1%	0.0%	0.0%	0.3%
337.5	0.8%	0.4%	0.1%	0.0%	1.3%
0	1.2%	3.6%	2.0%	0.2%	6.9%

2.5.2 Reference have been made to the Hong Kong Observatory wind data at North Point Pier, Figure 2-8, it is noted that the position of the weather station is at 26m above mean sea level. The wind data presents the localised wind information near the location of the measurement anemometer. No wind data at the urban canopy level where most of the wind-structural interaction happens (i.e. downwash, channelling, etc.) can be revealed from this station. Therefore, the wind tunnel modelled wind rose was adopted.

2.5.3 From Table 2-1, the prevailing wind will come from the east to north-east. Over 53% of the site approaching wind at 200m above ground would come from these directions. Another 28% and 15% of the wind will come from the south-east and the south-west sectors. The remaining 4% will be south-westerly wind.

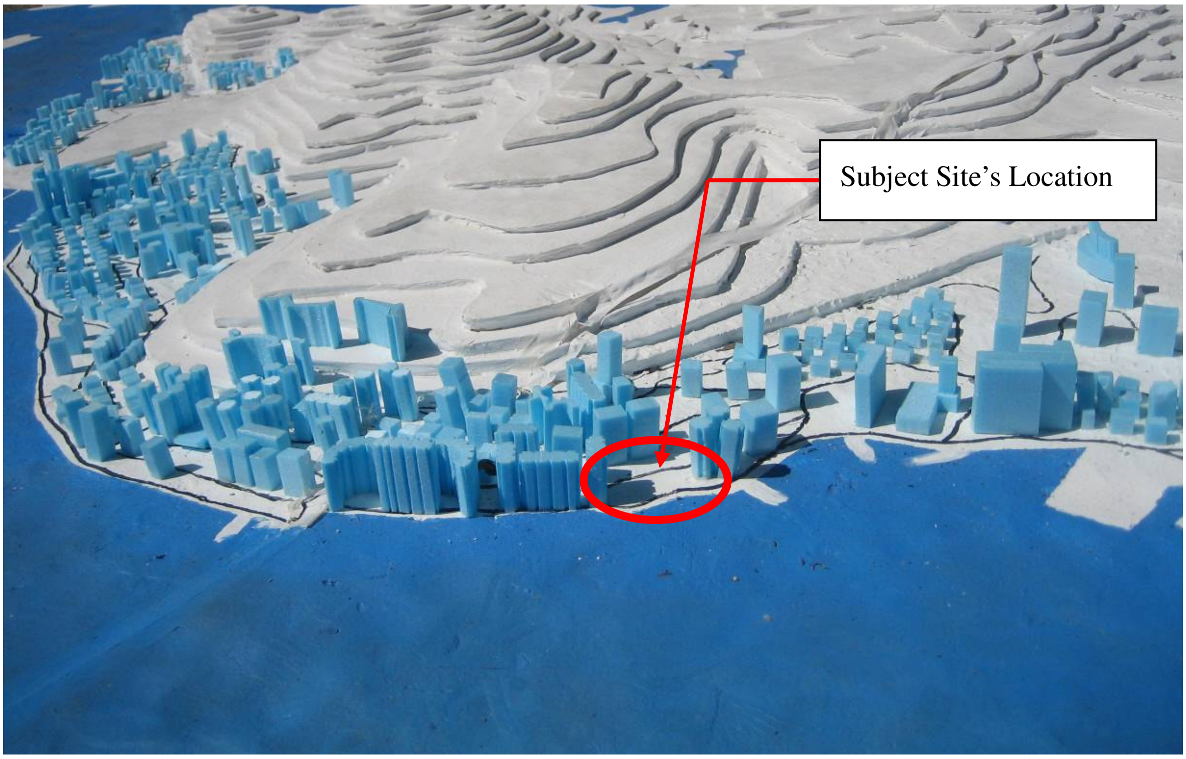
Title:	**Extent of the 1:4000 Model**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 2-1**



View of overall model from the South-East direction

View of overall model from the South-West direction

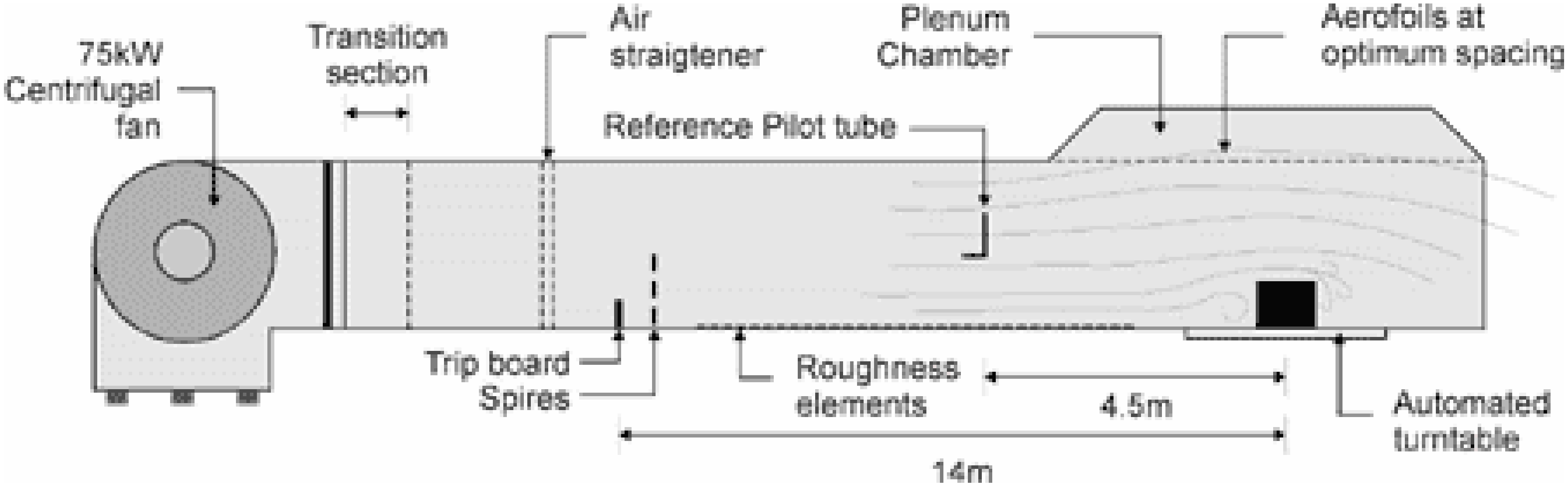
Title: The 1:4000 Scale Model	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 2-2**



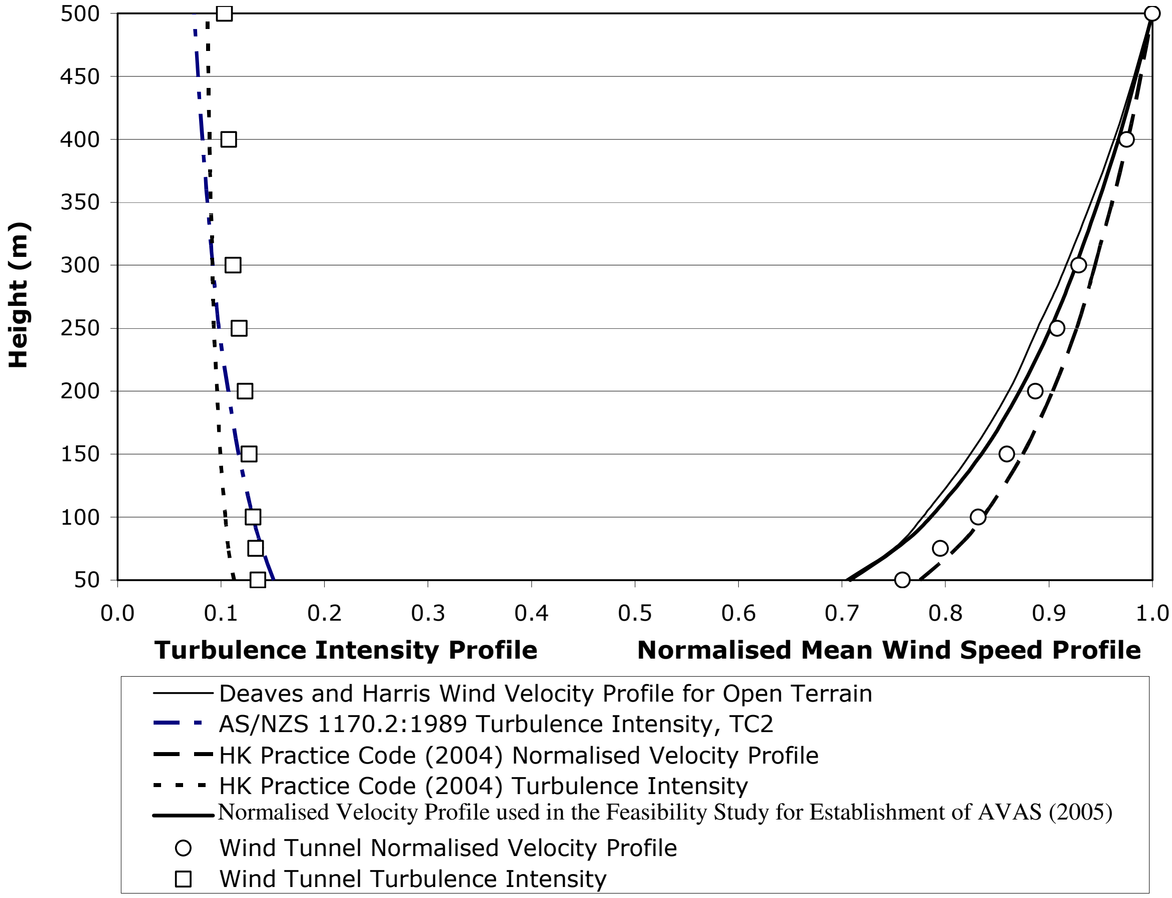
Close-up view of the 1:4000 model showing the Oil Street Site

The 1:4000 model in the wind tunnel for wind from the North-East direction

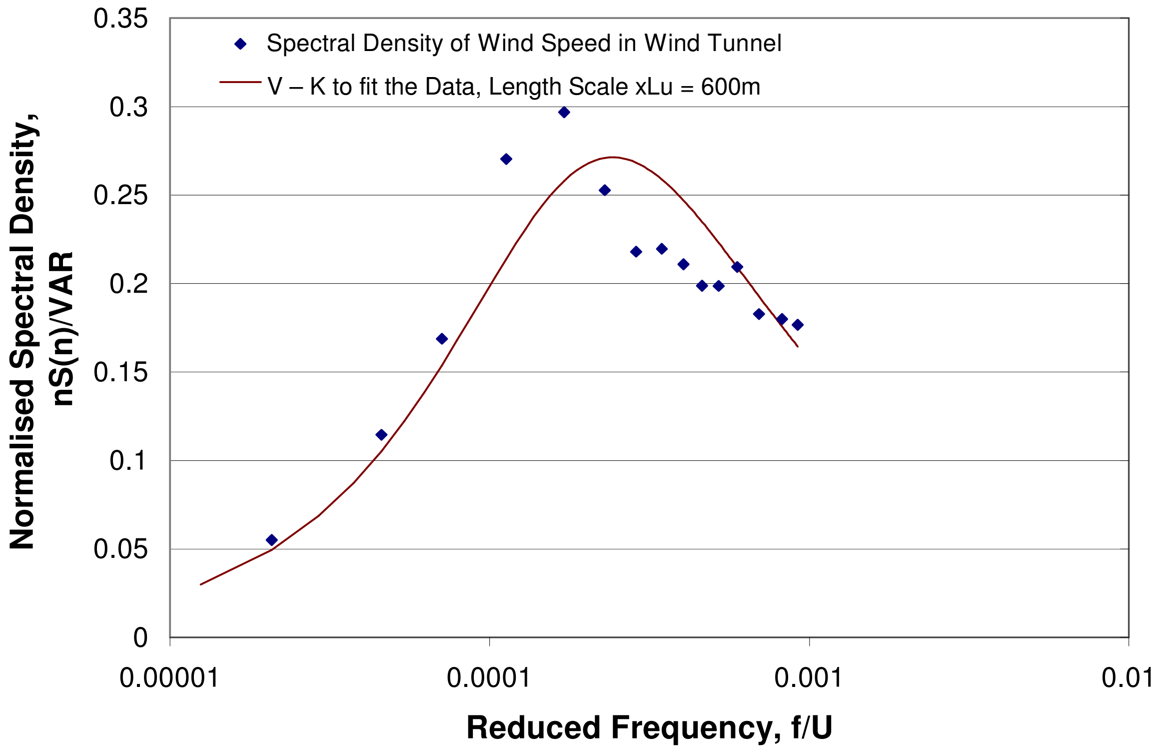
Title: The 1:4000 Scale Model in the Wind Tunnel	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 2-3**



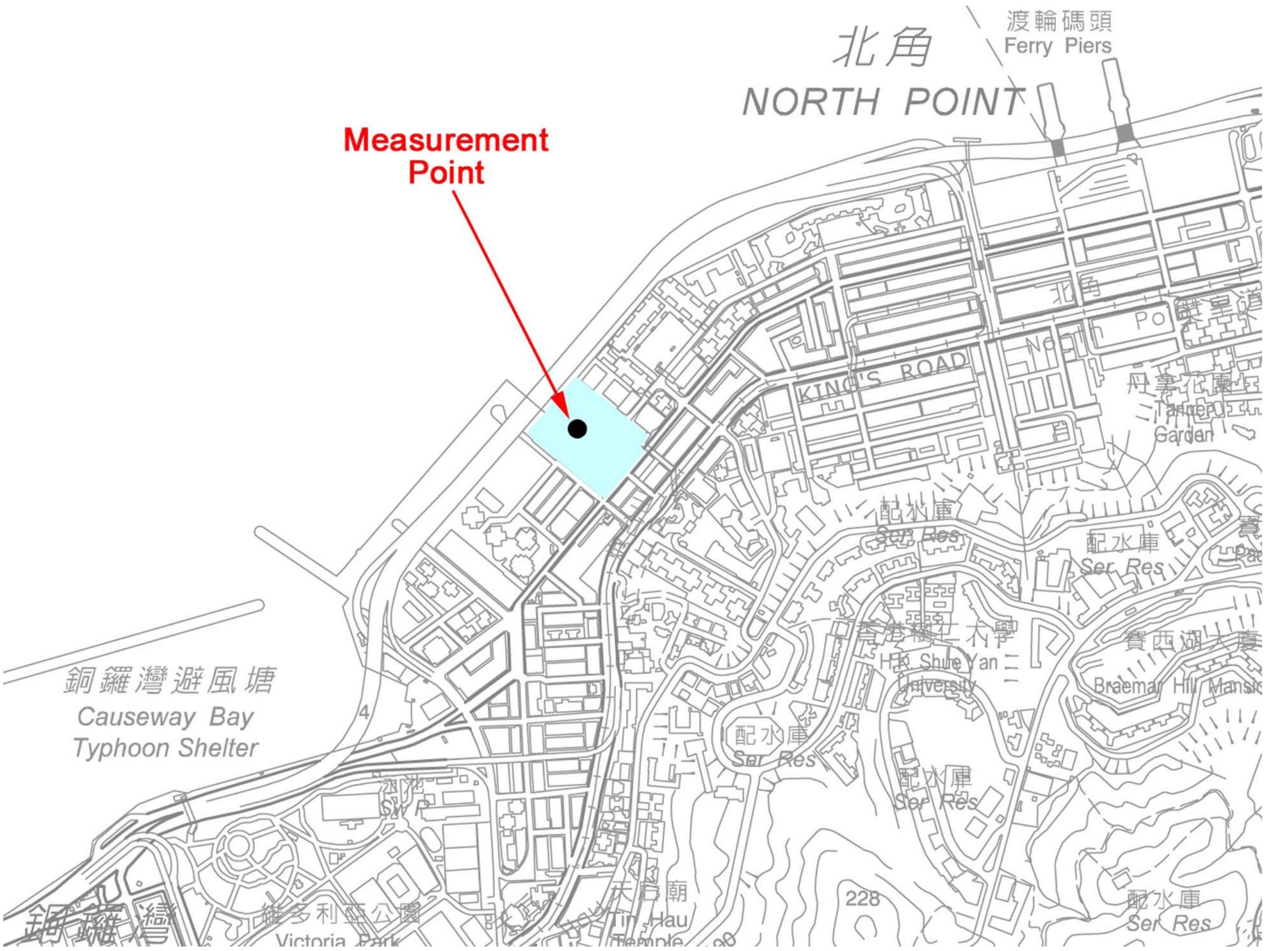
Title:	WINDTECH's Boundary Layer Wind Tunnel Facility	CH2M HILL HONG KONG LIMITED
Project:	Air Ventilation Assessment Oil Street Site - Final Report	Figure: 2-4



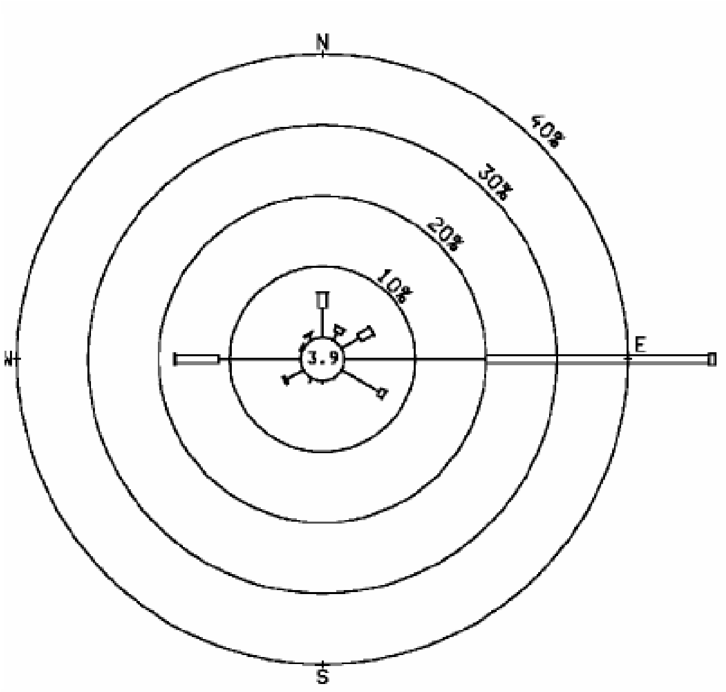
Title: **Comparison of Standard Turbulence Intensity and Wind Speed Profiles against WINDTECH's 1:4000 Scale Wind Tunnel Velocity Profiles for Hong Kong Upstream Winds beyond the 10km Radius Topography Model**	**CH2M HILL Hong Kong Limited**
Project: **Air Ventilation Assessment** **Oil Street Site - Final Report**	**FIGURE: 2-5**

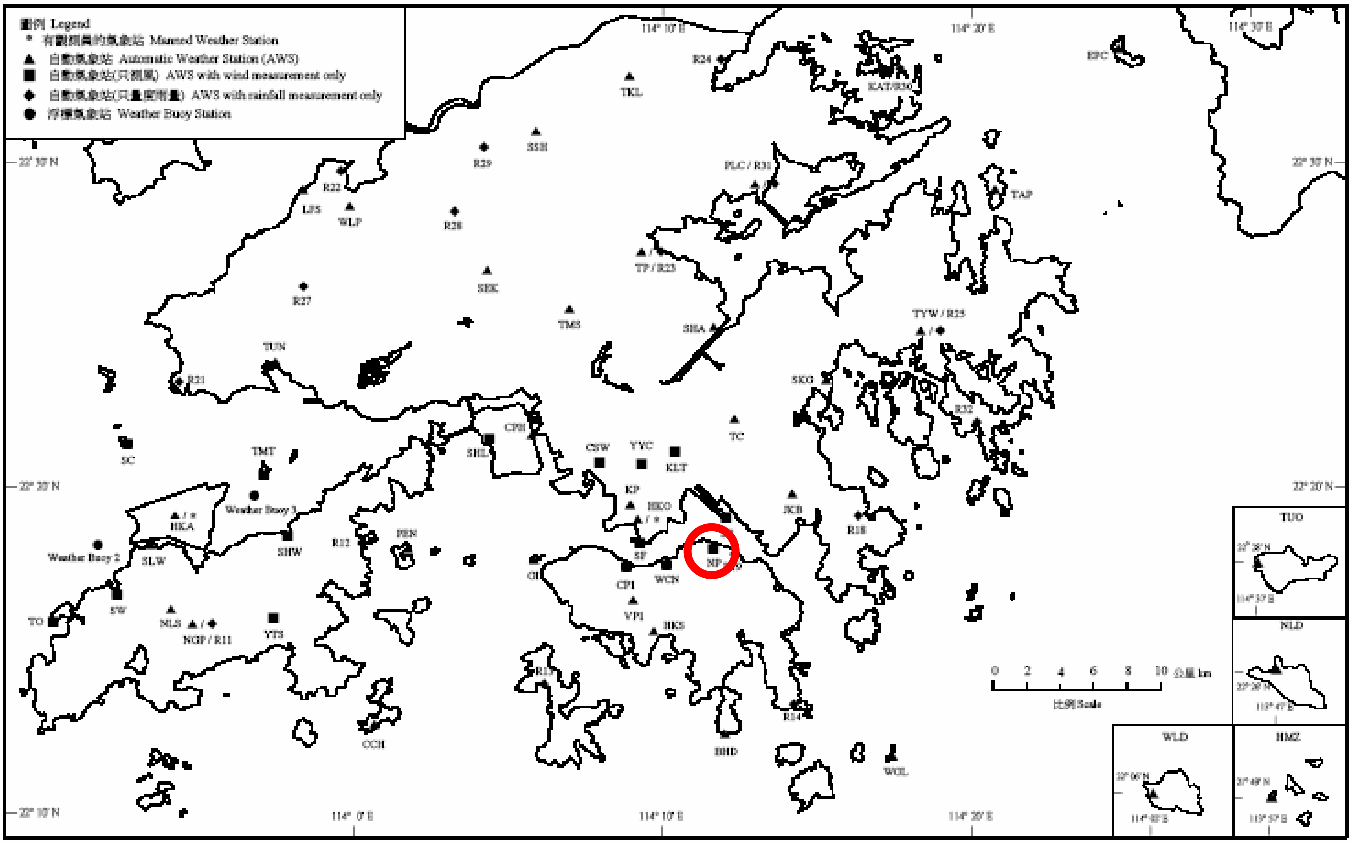


Title:	**The Spectrum of Longitudinal Turbulence Intensity at 200m for 1:4000 Scale Open Terrain Against the Von Karman Spectrum for 600m Height in Open Terrain**	**CH2M HILL Hong Kong Limited**
Project:	**Air Ventilation Assessment Oil Street Site - Final Report**	**FIGURE: 2-6**



Title: Location of the Measurement Point	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 2-7**





Title: Wind Rose obtained from the Automatic Weather Station of the Hong Kong Observatory at North Point Pier (Year 2006) and its location	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 2-8**

3. WIND CHARACTERISITICS OF THE SITE

3.1 Introduction

3.1.1 The air ventilation assessment would generally be affected by the wind availability under all wind directions and frequency of occurrence of individual wind directions, and in particular predominated by the prevailing wind flow.

3.1.2 According to the site wind availability study, the general prevailing wind flow near the subject site are easterly to northeasterly winds. The site is locating at waterfront in a northeast-to-southwest axis, the nearby buildings will significantly obstruct the prevailing winds and reduce the wind flow to the subject site.

3.2 Air Ventilation under Easterly Wind

3.2.1 As the street pattern near the subject site is along a northeast-to-southwest axis, easterly wind cannot effectively pass through the development.

3.3 Air Ventilation under North-Easterly Prevailing Wind

3.3.1 To facilitate pedestrian level ventilation and provide minimal obstructions to the north-easterly winds from reaching the areas downstream from the subject site, the existing north-easterly axis along the road networks should not be blocked.

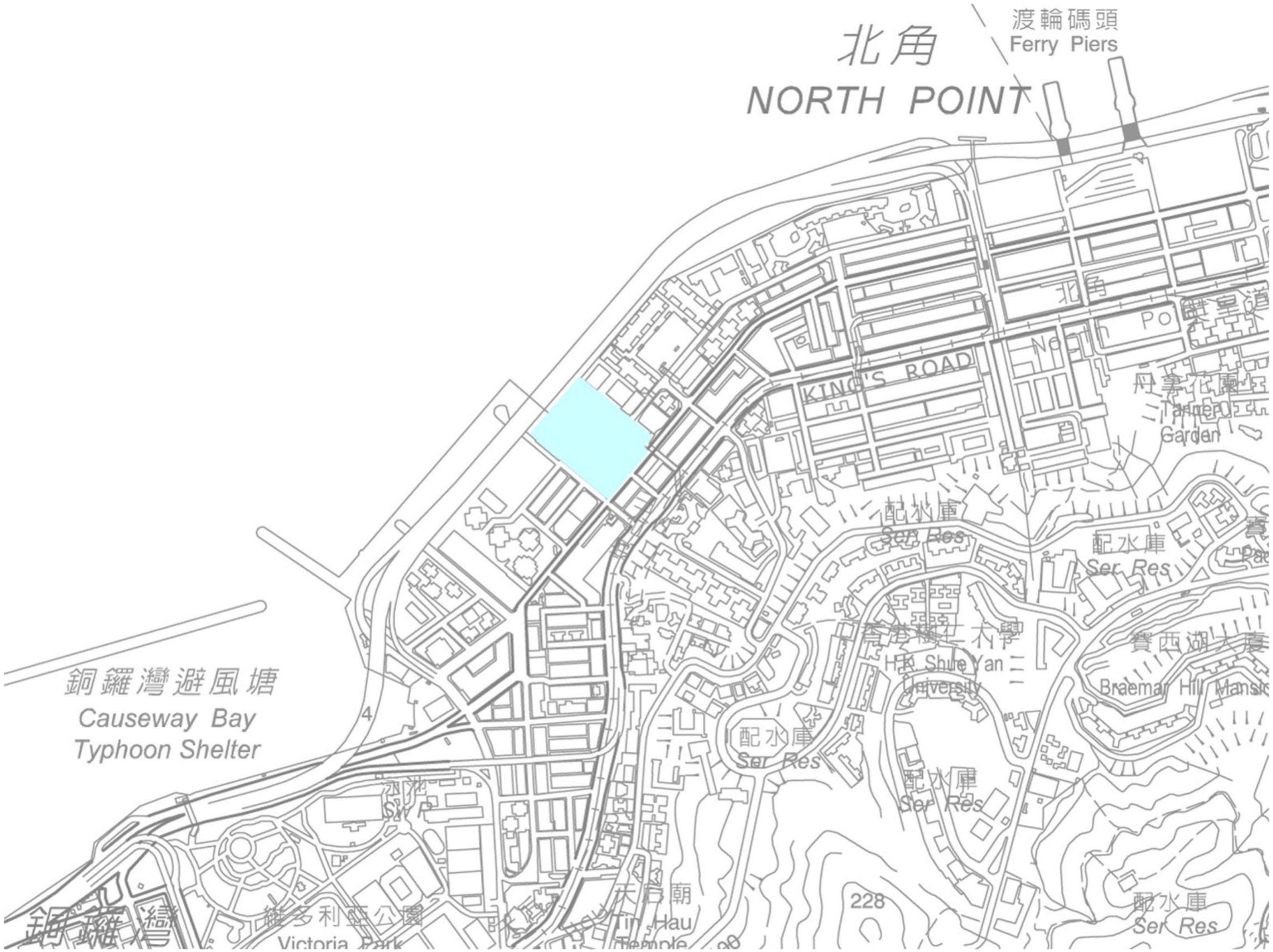
3.3.2 However, the existing City Garden already resulted in significant obstruction to the prevailing winds, wind flowing through the existing ESS and the Electric Centre will be of limited extent. Further obstruction along such an axis should be prevented.

3.4 Air Ventilation under Southerly Wind

3.4.1 The escarpment on the east to west direction reduces wind availability as well as generate additional turbulence at the levels close to the ground under southerly wind. The closely packed tall buildings located immediately upstream in the southerly directions such as the existing hotel development along Electric Road further reduce the wind availability. Weaker southerly wind is likely be experienced (Figure 3-1).

3.5 Air Ventilation under North-westerly Wind

3.5.1 The north-westerly side of the subject site as well as the Island Eastern Corridor (IEC) are fronting the harbour. Obstructions should be avoided at this direction as it is the main path for wind to enter the inland area from the harbourfront.



Title:	**Local Area**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 3-1**

4. DESIGN SCHEMES

4.1 General Design Considerations

4.1.1 The subject site is mainly designated Comprehensive Development Area (CDA) on the North Point Outline Zoning Plan. Composite residential and commercial development may be permitted on application to the Town Planning Board. In order to shield the residential developments from road traffic noise, commercial developments are proposed to front the Island Eastern Corridor (IEC) as a noise insensitive use. Besides, landscaped areas and walkway are planned in the areas around the development to provide a convenient pedestrian access from inland area to the harbourfront.

4.1.2 3 design schemes have been developed and subject to detailed study to test their air ventilation implications. They are:

(a) Base Scheme (Figure 4-1), i.e. the scheme with development parameters permitted under the existing land sale conditions;

(b) Revised Scheme (Figure 4-2), i.e. the scheme agreed by the Town Planning Board on 17/11/2006; and

(c) Second Revised Scheme (Figure 4-3), which is iteratively developed taking into account the good features and problem areas of the first two design schemes with a view to enhancing air ventilation as well as mitigating the stagnant or excessive airflow.

4.1.3 In air ventilation term, the major variations among the three design schemes are the number of building blocks and the disposition and height of the residential and commercial towers within the subject development site. Their major design features are summarized in the following sections.

4.2 Base Scheme

4.2.1 The major features of the <u>Base Scheme</u> (refer to Figure 4-1) are:

- one commercial (45,424 m^2 GFA) and two residential blocks (78,046 m^2 GFA);
- a higher building height (165mPD) for the proposed residential towers which may have additional capability to capture air flow from high level leading to downwash to the pedestrian level. But, at the same time, there may be a larger wake area at the downstream of the buildings;
- narrow building gaps between the three residential towers that may reduce building permeability;
- a podium underneath proposed buildings that may block air flow at lower elevations; and
- a frontage of about 70m for the commercial block that results in wider separation from the northeast and southwest boundaries (i.e. 20 and 35 m respectively).

4.3 Revised Scheme

4.3.1 The major features of the Revised Scheme (refer to Figure 4-2) are:

- two commercial (20,960 m^2 GFA) and two residential (49,240 m^2 GFA) blocks;
- a lower building height (120mPD) for the proposed residential towers. Comparatively speaking, there is a lower capability to capture air flow from high level, whilst the wake area is smaller;
- a wider gap of about 13m between the two residential towers to allow wind penetration;
- no podium proposed and hence reduce any potential blockage of air flow at lower elevation;
- shorter frontage of two commercial blocks with a gap of about 15m to allow wind penetration;
- 15m and 40m separation distance from the southwest boundary for the proposed residential tower and for the proposed commercial block respectively; and
- no setback from the northeast boundary for the proposed commercial block. Some blockage to the wind flow may happen.

4.4 Second Revised Scheme

4.4.1 Based on the findings of the wind tunnel tests for Base Scheme and Revised Scheme, the major features of the Second Revised Scheme (refer to Figure 4-3) are:

- building height (120mPD), domestic/non-domestic gross floor areas and number of building blocks same as the Revised Scheme;
- podium-free developments same as the Revised Scheme;
- 15m separation distance from the southwest and northeast boundaries by shifting the commercial blocks to create wind corridors; and
- a building gap of about 25m between the two proposed commercial blocks to increase permeability of the proposed development.

4.5 Summary of Design Schemes

4.5.1 The major differences of the development parameters of three design schemes are summarized below:

Table 4-1 Summary of Three Design Schemes

	Base Scheme	Revised Scheme	Second Revised Scheme
Maximum GFA:			
(a) Domestic	78,046m^2	49,240m^2	49,240m^2
(b) Non-domestic	45,424m^2	20,960m^2	20,960m^2
Maximum Building Height:			
(a) Residential	165mPD	120mPD	120mPD
(b) Commercial	120mPD	100mPD	100mPD
Public Open Space	2,970m^2	6,400m^2	6,400m^2

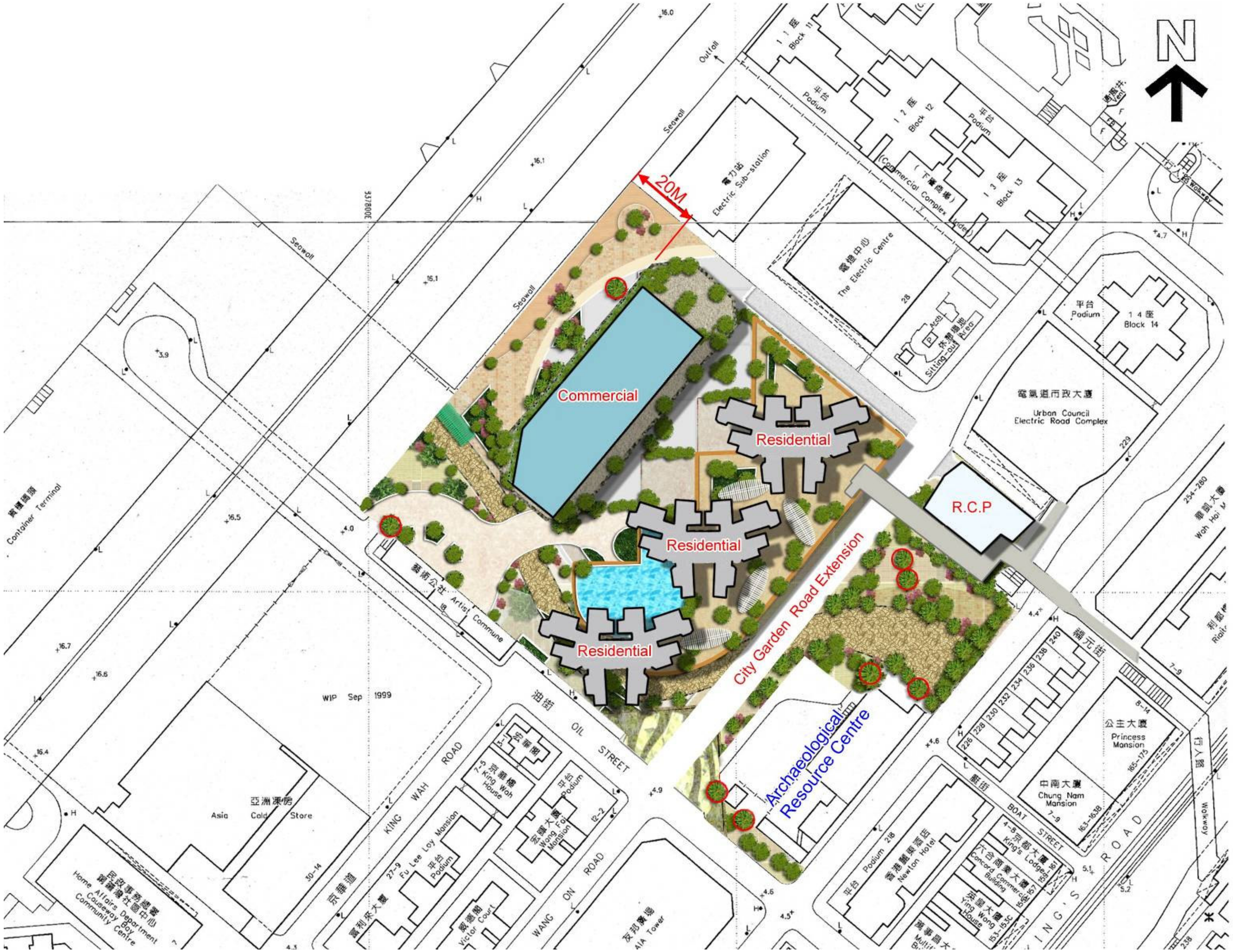
4.6 Expert Evaluation of the Three Design Schemes

4.6.1 Expert evaluation has been undertaken for each of the design schemes before detailed study. It broadly confirms that the commercial and residential towers for all the design schemes are generally aligned along the northeast axis i.e. the prevailing wind direction. In view of the surrounding high-density development, it is likely that the air ventilation impacts tend to be localized.

4.6.2 Taking into account the site wind characteristics, the expert evaluation identifies that the following major design features of the three schemes may have air ventilation impacts:

- taller building and larger variation in building height (Base Scheme) may help direct wind to the streets;
- two commercial buildings with building gap in between (the two Revised Schemes) may help improve the on-site ventilation under southerly and north-westerly wind directions;
- podium structure (Base Scheme) may obstruct wind flow; and
- an unobstructed pedestrian level wind environment (e.g. landscaped/open walkway at all Schemes) may allow wind penetration.

4.6.3 The detailed study for the three design schemes, which would be discussed in the subsequent sections, generally confirms the expert evaluation findings.



Title:	**Base Scheme Block Plan (Indicative)**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 4-1**

Title:	**Revised Scheme Block Plan (Indicative)**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 4-2**

Title:	**Second Revised Scheme Block Plan (Indicative)**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 4-3**

5. DETAILED STUDY

5.1 Introduction

5.1.1 The detailed AVA study was undertaken in accordance with Technical Guide for Air Ventilation Assessment for Developments in Hong Kong (Technical Guide) and the current best international practice requirements stipulated in the Australasian Wind Engineering Society Quality Assurance Manual, AWES-QAM-1-2001 (2001) and the American Society of Civil Engineers Manual, Report on Engineering Practice No. 67 for Wind Tunnel Studies of Buildings and Structures (1999).

5.1.2 Planning Department completed "Feasibility Study for Establishment of Air Ventilation Assessment System" in late 2005, which sets out a framework for undertaking the air ventilation assessment. The assessment framework was subsequently promulgated as a Technical Guide attached to the joint Technical Circular No. 1/06 on Air Ventilation Assessment issued by the former Housing, Planning and Lands Bureau and Environment, Transport and Works Bureau in mid 2006. The Technical Guide defines the project site, assessment area and surrounding model area under study, the wind velocity ratio which serves as an indicator of the air ventilation performance as well as the spatial averaged wind velocity ratio that should be reported as the assessment results.

5.1.3 The velocity ratio provides a basis for comparing the merits and demerits of the design schemes, and to identify any ventilation problems for design improvement purposes. There is yet any benchmark for evaluating the acceptability of a particular design.

5.2 The 1:400 Physical Model

5.2.1 A physical model covering the project site, the assessment area and the surrounding model area was prepared in 1:400 scale for each design option. Each model includes details of the land topography and the local building morphology. The terrain was fabricated at 4m contour intervals from information acquired from the HKSAR's Survey and Mapping Office, Lands Department. The model includes all existing and planned developments and the proposed design option on the subject site. Views of the testing model for the Base Scheme, the Revised Scheme and the Second Revised Scheme were shown in Figure 5-1, Figure 5-2, and Figure 5-3 respectively.

5.2.2 A hot-wire probe with a separate pressure-based meter measuring yaw angle was used to take measurement of mean and standard deviation of wind speed and direction at 22.5^{o} increments for the full 360^{o} azimuth, i.e. for 16 wind directions for all the test points defined.

5.3 Assessment Methodology

5.3.1 The assessment area is about 160 m (maximum height of the tallest building for the Base Scheme) from the project site boundary. It covers up to the promenade area to the northwest, King's Road to the southeast, Fook Yum Street to the southwest and a part of City Garden to the northeast. The model area extends for a radius of 500m from the centre of the site.

5.3.2 Overall test points were placed outside the project site and within the assessment area. Perimeter test points were placed along the project site boundary. All of the test points were placed at the junctions of the roads leading to the project site, at the main entrances to the subject site, in open spaces, at places where pedestrians frequently access (such as the bus-stop, entrance of MTR station), etc. Test point located outside and along the project site boundary were the same for all design schemes for comparison purposes. Test points within the site were placed at the same locations as far as practicable for direct comparison purpose. However, in view of the different building disposition on site for different design layout, some test point's locations are different in order to reveal the air ventilation impact of individual design. Wind from all 16 directions and their probability of occurrences have been accounted for when calculating the wind Velocity Ratios (VR).

5.3.3 i) Base Scheme

Test points for individual focus areas are summarised below in Table 5-1. Their locations and represented areas have been shown in Figure 5-4 and Figure 5-5.

Table 5-1 Summary of Test Point Location for Individual Focus Areas of the Base Scheme

Focus Areas	Test Points Representing the Focus Areas
King's Road and immediate area	Test Point: 1 to 17
Electric Road	Test Point: 18 to 20, 47 to 51, 74 to 76
City Garden Road, City Garden Extension & Wang On Road	Test Point: 21, 22, 44 to 46, 55, 60, 63, 64, 72, 77
King Wah Road	Test Point: 24, 25, 79
Fook Yum Road	Test Point: 20, 22, 23, 25, 26
Oil Street and immediate area	Test Point: 14, 76, 77, 79, 80
Northeast project boundary	Test Point: 82 to 84
Promenade	Test Point: 27 to 32
Waterfront to the south and under Island Eastern Corridor (IEC)	Test Point: 33 to 39
Central landscaped area onsite	Test Point: 66 to 69
Landscaped area to the immediate north of Oil Street and Electric Road	Test Point: 52 to 54, 62
Landscaped area fronting the harbour	Test Point: 56 to 58, 80 to 82
Building gap between commercial or residential blocks on site	Test Point: 65, 70, 71
Upstream area of the subject site (under prevailing northeast and east wind)	Test Point: 1 to 6, 32, 36 to 51, 74
Downstream area of the subject site (under prevailing northeast and east wind)	Test Point: 14 to 28, 33 to 35, 75 to 77, 79, 80

5.3.4 ii) Revised Scheme

Test points for individual focus areas are summarised below in Table 5-2. Their locations and represented areas have been shown in Figure 5-6 and Figure 5-8.

Table 5-2 Summary of Test Point Location for Individual Focus Areas of the Revised Scheme

Focus Areas	Test Points Representing the Focus Areas
King's Road and immediate area	Test Point: 1 to 17
Electric Road	Test Point: 18 to 20, 47 to 51, 72 to 74
City Garden Road, City Garden Extension & Wang On Road	Test Point: 21, 22, 44 to 46, 55 62, 65, 69, 70, 75
King Wah Road	Test Point: 24, 25, 77
Fook Yum Road	Test Point: 20, 22, 23, 25, 26
Oil Street and immediate area	Test Point: 14, 74, 75, 77, 78
Northeast project boundary	Test Point: 80 to 82
Promenade	Test Point: 27 to 32
Waterfront to the south and under Island Eastern Corridor (IEC)	Test Point: 33 to 39
Central landscaped area onsite	Test Point: 60, 61, 66 to 68
Landscaped area to the immediate north of Oil Street and Electric Road	Test Point: 52 to 54, 64
Landscaped area fronting the harbour	Test Point: 56 to 59, 78 to 80
Building gap between commercial or residential blocks on site	Test Point: 60, 67, 68
Upstream area of the subject site (under prevailing northeast and east wind)	Test Point: 1 to 6, 32, 36 to 51, 72
Downstream area of the subject site (under prevailing northeast and east wind)	Test Point: 14 to 28, 33 to 35, 73 to 75, 77, 78

5.3.5 iii) Second Revised Scheme

Test points for individual focus areas are summarised below in Table 5-3. Their locations and represented areas have been shown in Figure 5-7 and Figure 5-8.

Table 5-3 Summary of Test Point Location for Individual Focus Areas of the Second Revised Scheme

Focus Areas	Test Points Representing the Focus Areas
King's Road and immediate area	Test Point: 1 to 17
Electric Road	Test Point: 18 to 20, 47 to 51, 72 to 74
City Garden Road, City Garden Extension & Wang On Road	Test Point: 21, 22, 44 to 46, 55, 62, 65, 69, 70, 75
King Wah Road	Test Point: 24, 25, 77
Fook Yum Road	Test Point: 20, 22, 23, 25, 26
Oil Street and immediate area	Test Point: 14, 74, 75, 77, 78
Northeast project boundary	Test Point: 80 to 82
Promenade	Test Point: 27 to 32
Waterfront to the south and under Island Eastern Corridor (IEC)	Test Point: 33 to 39
Central landscaped area onsite	Test Point: 60, 61, 66 to 68
Landscaped area to the immediate north of Oil Street and Electric Road	Test Point: 52 to 54, 64
Landscaped area fronting the harbour	Test Point: 56 to 59, 78 to 80
Building gap between commercial or residential blocks on site	Test Point: 60, 67, 68
Upstream area of the subject site (under prevailing northeast and east wind)	Test Point: 1 to 6, 32, 36 to 51, 72
Downstream area of the subject site (under prevailing northeast and east wind)	Test Point: 14 to 28, 33 to 35, 58, 73 to 75, 77, 78

5.4 The Wind Profiles

5.4.1 Mean wind speed and turbulence intensity profiles were calibrated according to the Site Wind Availability Study result.

5.4.2 Mean wind direction, turbulence characteristics and yaw angle profile for 16 wind directions at eight heights equivalent to 50, 100, 150, 200, 250, 300, 400 and 500m above the ground at the site wind position measured were calibrated as the inlet boundary for the Detailed Study.

5.4.3 Figure 5-9 shows the windrose and wind profile results of the Experimental Site Wind Availability Study. According to the windrose, over 53% of the site approaching wind at 200m above the ground would be from north-east sector (wind from ENE and E direction occurs in more than 40% of time on average) and is considered prevailing. On the other hand, 28% and 15% of wind will come from south-east and south-west sectors respectively. The remaining 4% of wind will be northwesterly wind.

5.4.4 The resulting profiles from the 1:4000 scale model study for the Site Wind Availability were simulated at 1:400 scale. The 1:4000 wind speed profiles were grouped into two typical profiles, which are considered representative for the study. Profile 1 models the urban and hilly terrain of the hinterland where there is less obstruction to wind. Profile 2 models the built environment and natural topography around the subject site that pose greater obstruction to wind.

5.4.5 For Profile 1, the turbulence intensity profile varies linearly with height increasing from the range 0.15 to 0.2 at 500m to the range 0.2 to 0.3 at 50m. At the same time the corresponding normalized mean wind speed profiles tend to decrease linearly from 500m. The mean velocity ratios tend to fall in the range of 0.45 to 0.6 at 50m.

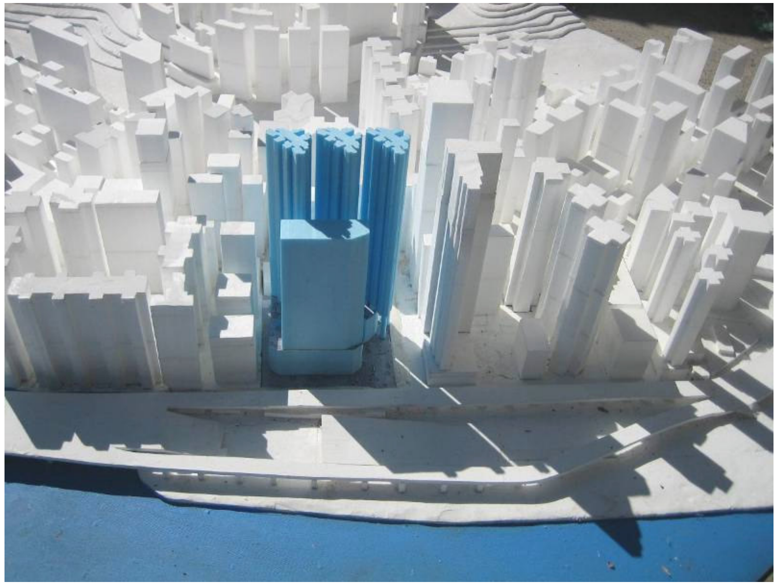
5.4.6 For Profile 2, the turbulence intensity profile gradient with respect to height changes is significantly higher than that of Profile 1. The maximum turbulence intensity tends to fall in the range of 0.3 to 0.4 at 50m. The normalized mean wind speed profiles also change below 200m and tend to drop much faster than that of Profile 1, reaching minimum values in the range of 0.3 to 0.4 at 50m.

5.4.7 Combinations of roughness elements and fences were used to simulate the characteristics of winds approaching the site at 1:400 scale as per the results of the Site Wind Availability Study. The specific configurations of roughness elements and fences used in the 1:400 scale simulation at the boundary layer wind tunnel facility for Profile 1 and Profile 2 are shown as follows:

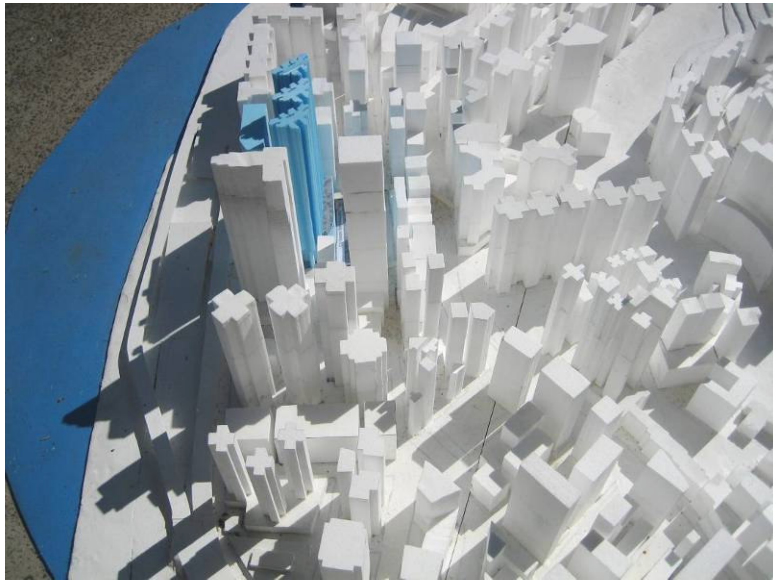
(a) Profile 1 – 1.5m high spires approximately 14m upstream, 400mm trip-board approximately 15m upstream and wind tunnel floor roughness elements (typically 10 to 15mm in height).

(b) Profile 2 – 1.5m high spires approximately 14m upstream, 400mm trip-board approximately 15m upstream, wind tunnel floor roughness elements (typically 10 to 15mm in height) and a 100mm high trip-board located 1.5m upstream.

The two profiles are shown in Figure 5-9.



North-West View

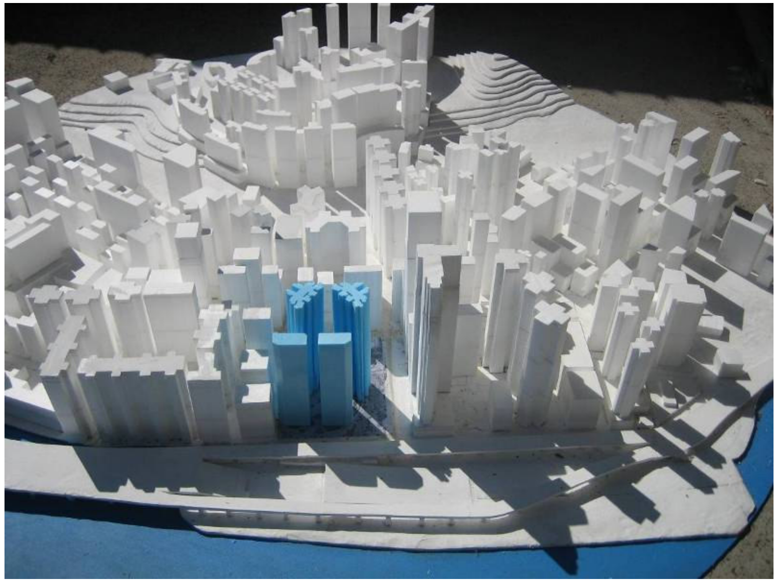


South-West View

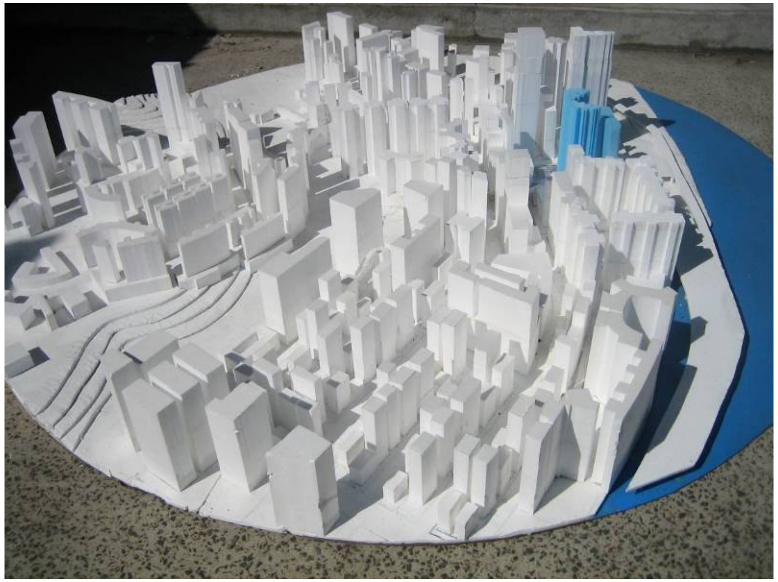
North-East View

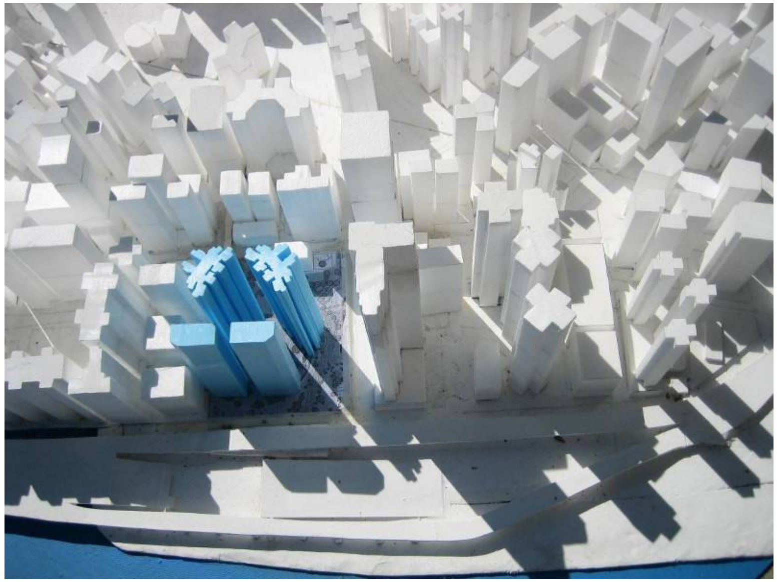
South-East View

Title:	**The 1:400 Scale Model of the Base Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 5-1**

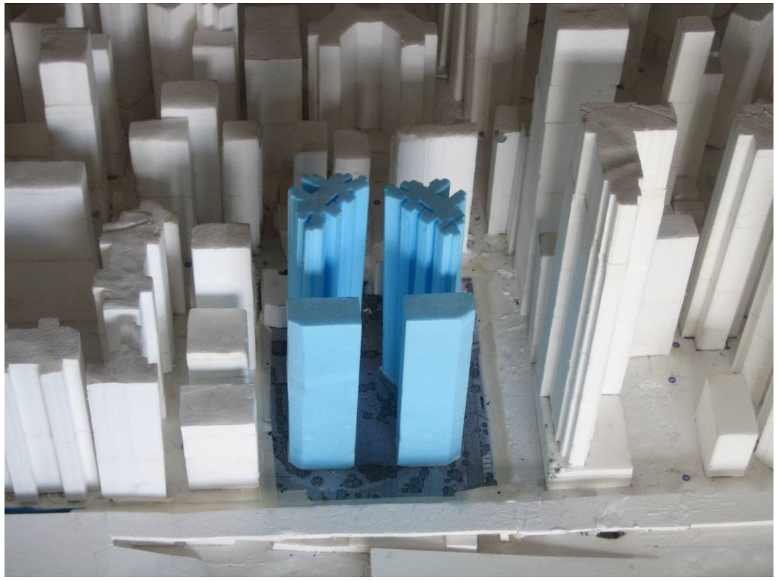

North-West View

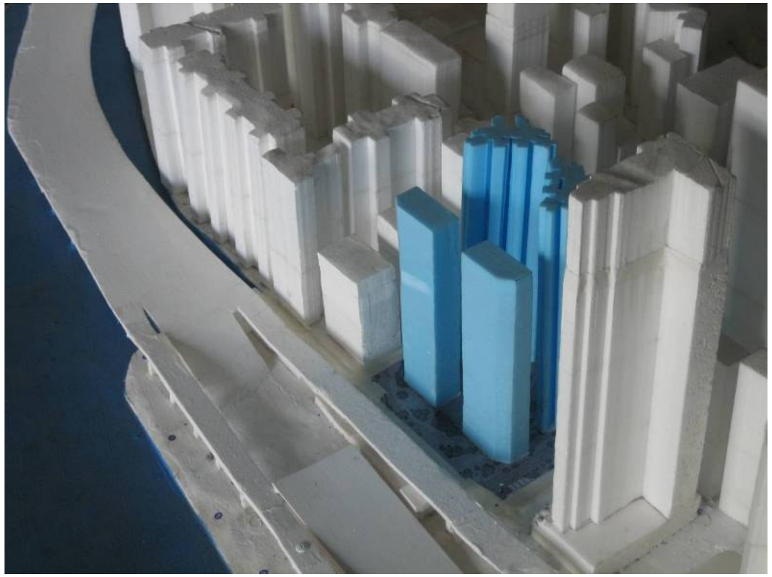

South-West View

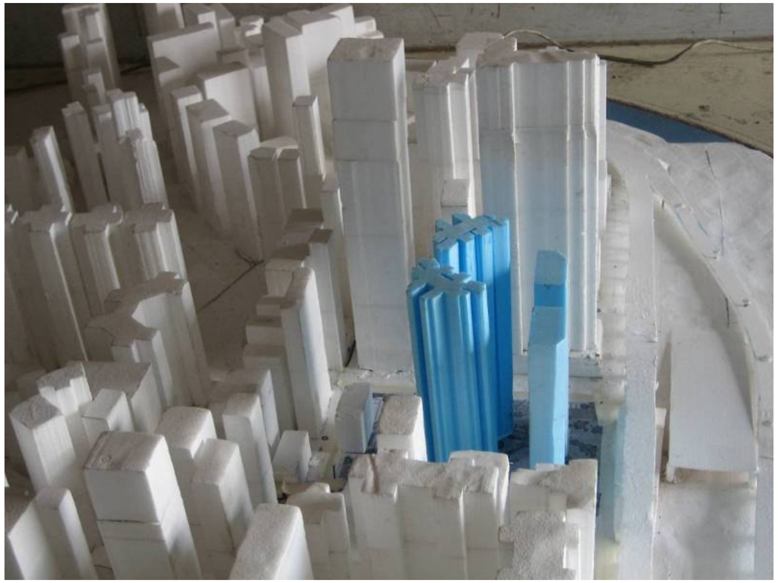

North-East View

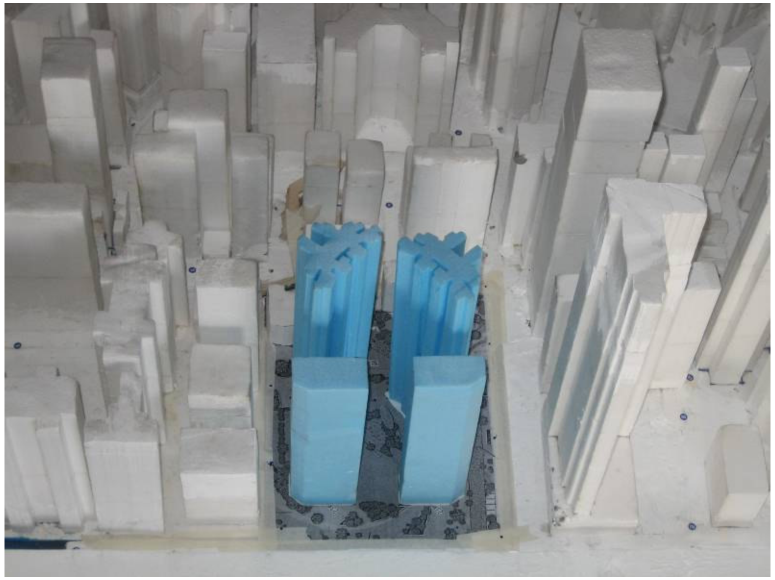

Top-Down View

Title:	**The 1:400 Scale Model of the Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 5-2**


North-West View


West View

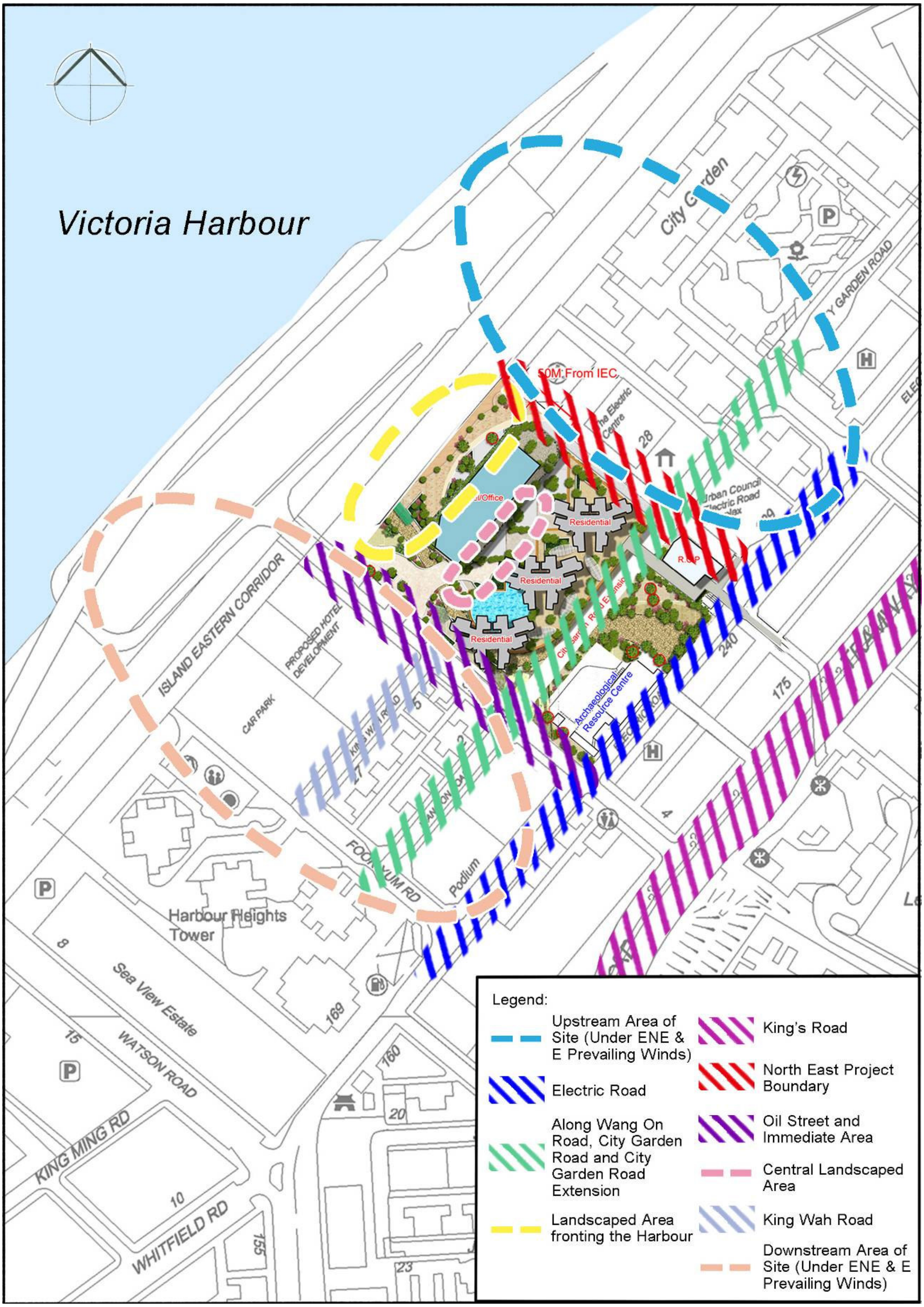

North-East View


Top-Down View

Title:	**The 1:400 Scale Model of the Second Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 5-3**

Test Points at 07, 08, 61 and 73 are located on Footbridge or on Podium.

Title: Location of the Study Point for the Base Scheme	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 5-4**

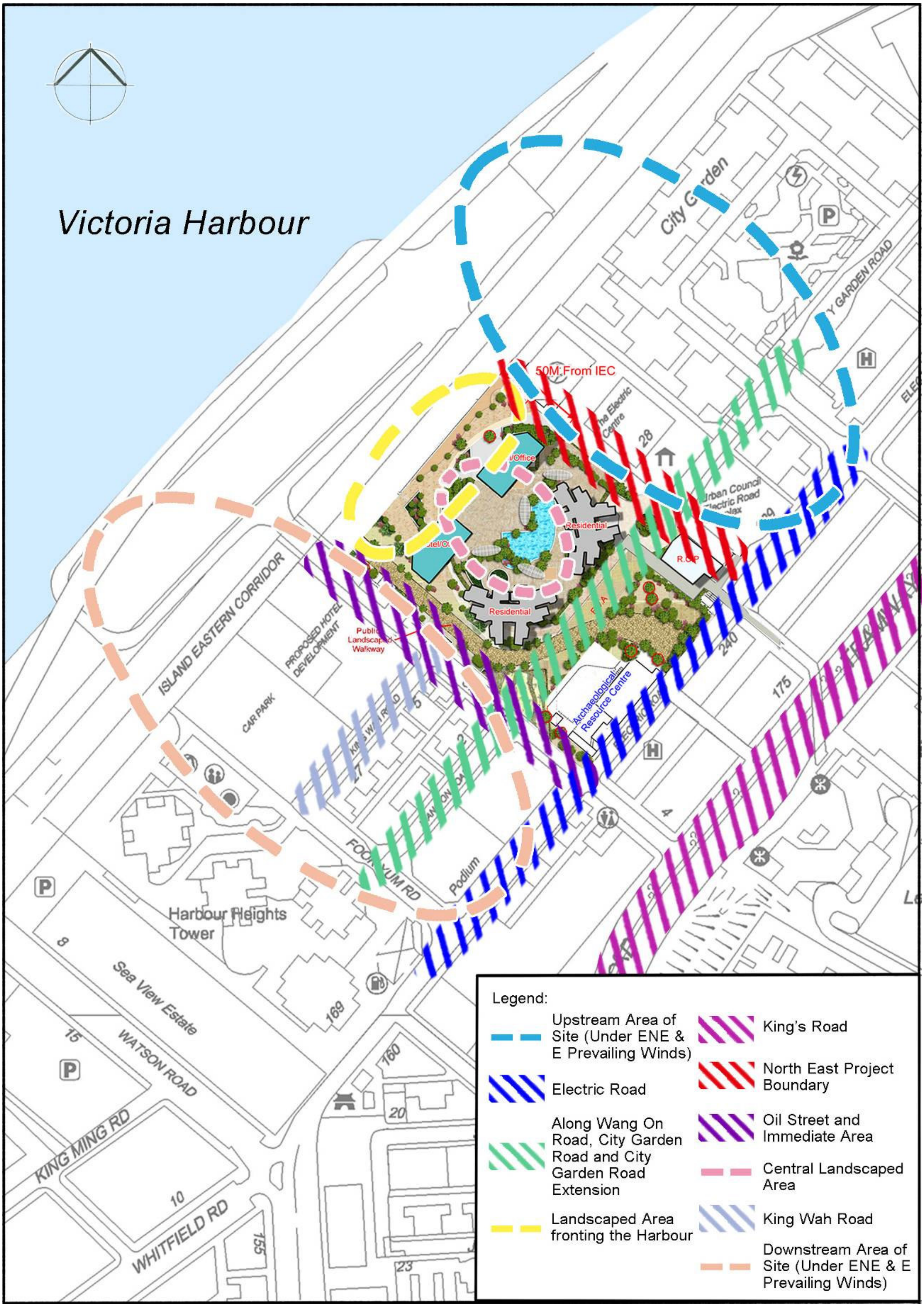


Title: Focus Areas for the Base Scheme	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 5-5**

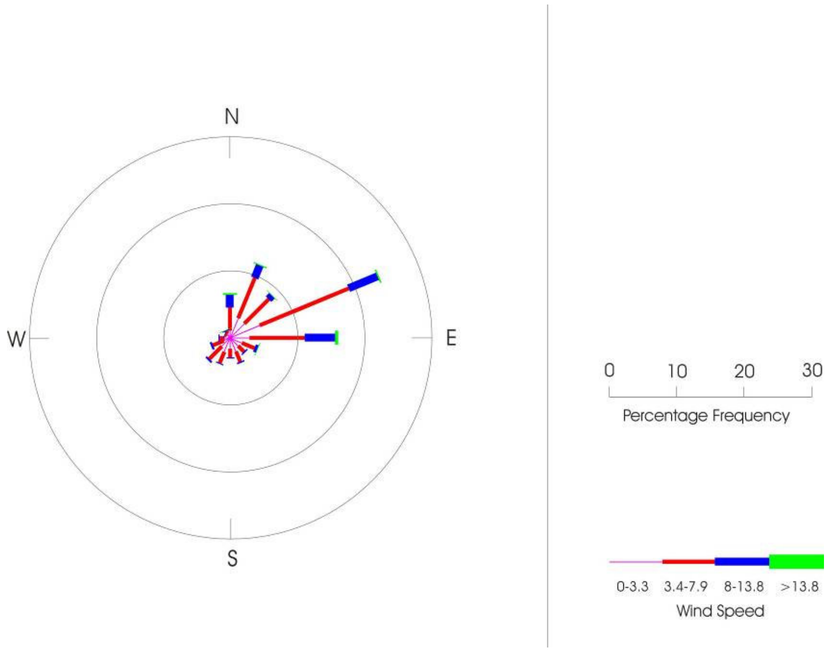
Test Points at 07, 08, 63 and 71 are located on Footbridge or on Podium.

Title: Location of Test Points for the Revised Scheme	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 5-6**

Title: Location of Test Points for the Second Revised Scheme	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 5-7**



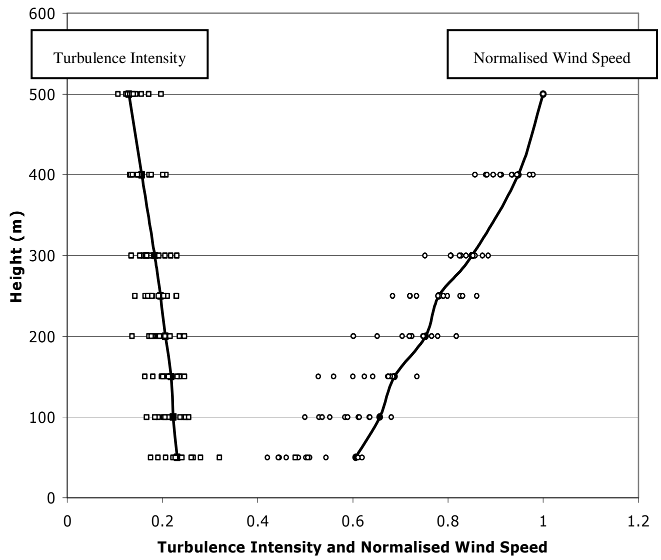
Title: Focus Areas for the Revised and the Second Revised Schemes	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment **Oil Street Site - Final Report**	**FIGURE: 5-8**



Wind Rose for Oil Street Site at 200m

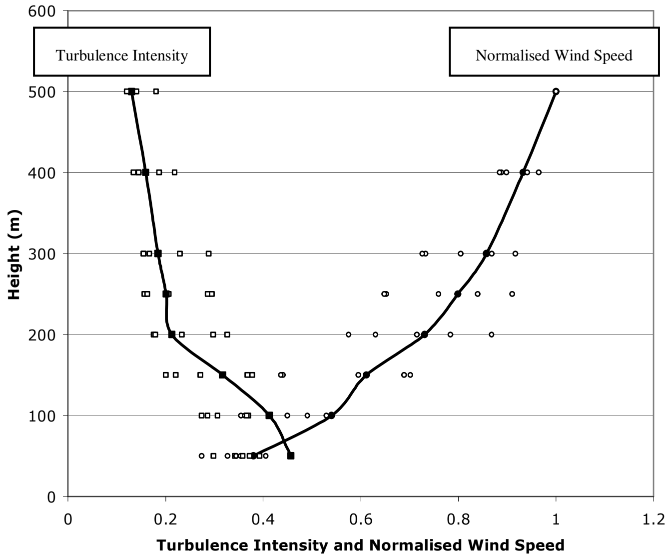
For Profile 1

Directions: 0, 22.5, 45, 67.5, 135, 157.5, 247.5, 270, 292.5, 315, 337.5



For Profile 2

Directions: 90, 112.5, 180, 202.5, 225



Wind Profiles Adopted for Detailed Study

Title: Wind Rose and Wind Profiles	CH2M HILL Hong Kong Limited
Project: Air Ventilation Assessment Oil Street Site - Final Report	FIGURE: 5-9

6. ANALYSIS FRAMEWORK

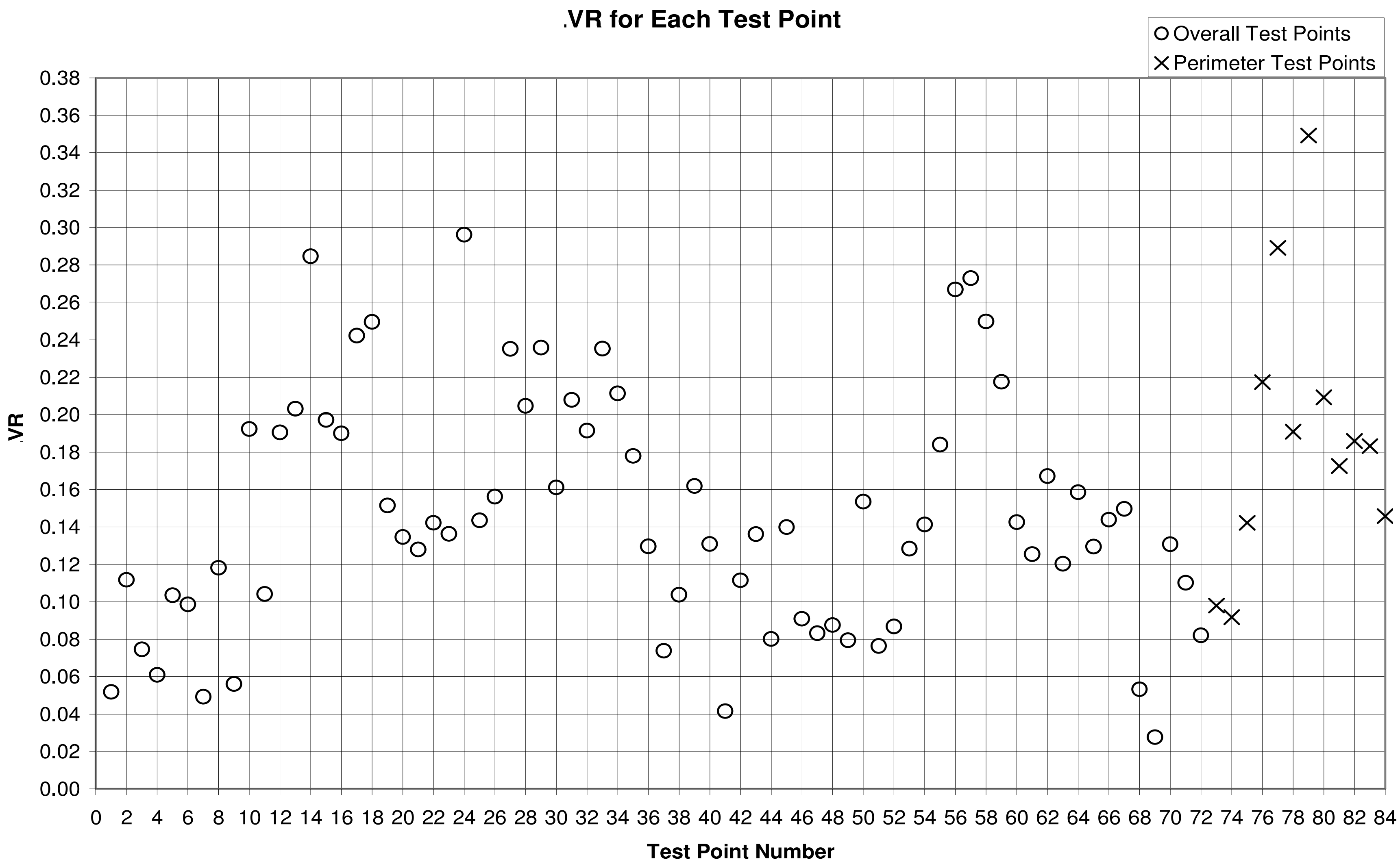
6.1.1 The air ventilation impacts of individual design schemes are interpreted based on the velocity ratios (VR). Under the detailed study, mean wind speeds for 16 wind directions for all test points were obtained through wind tunnel testing. The directional results were then weighted with the wind availability at urban canopy layer based on the frequency of occurrence of wind from the 16 wind directions tested. The directional results for Base Scheme, Revised Scheme and Second Revised Scheme were presented in Appendices IV to VI respectively. Plots of various VRs for the three design schemes were presented in Figures 6-1 to 6-3 respectively. The breakdown of VR of individual test points under each of the 16 wind directions for the three design schemes is tabulated in Appendix VII.

6.1.2 Based on the averaged VR, analysis was made systematically with respect to the following indicators:

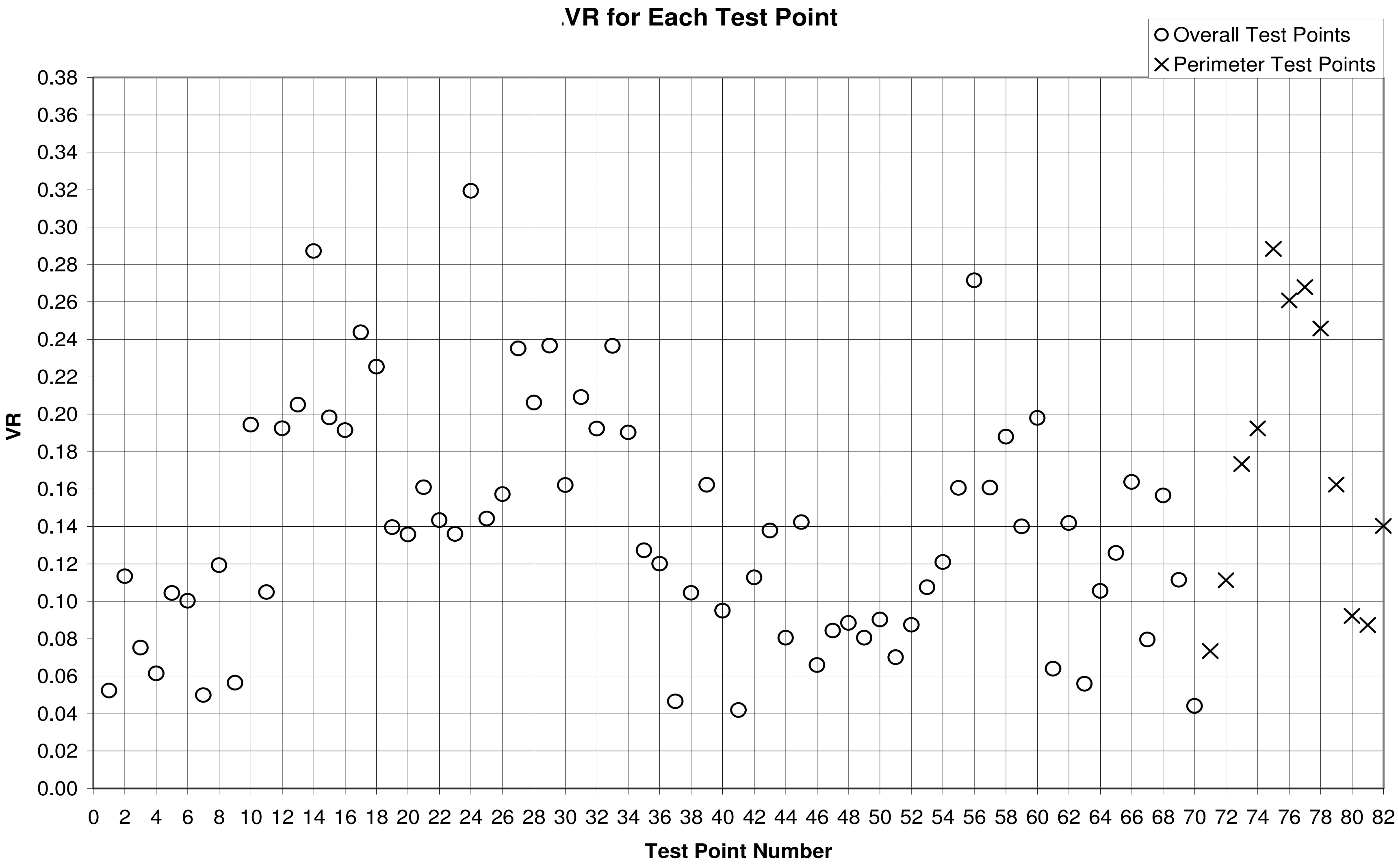
(a) SVR and LVR – the former is the average wind VR of the perimeter test points showing the overall impact of the design schemes on the wind environment of its immediate vicinity whilst the latter is the average wind VR of the overall test points showing the overall impact of the design schemes on the wind environment of the local area;

(b) average VRs for local areas – individual test points in a local area were grouped together so that their average VRs was used to indicate the air ventilation impacts of specific design layout and building disposition on the surrounding local areas; and

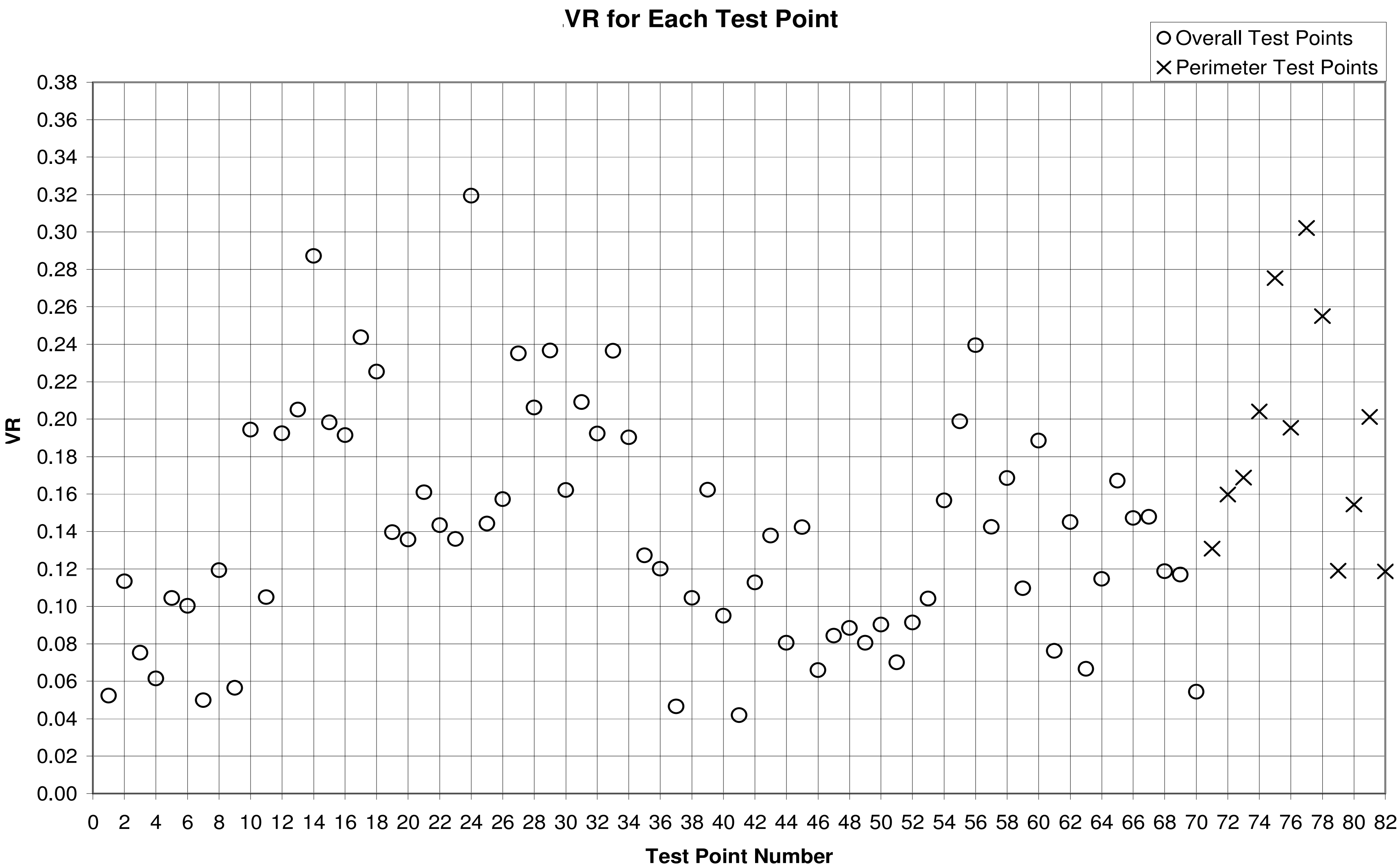
(c) directional VRs – VRs for each wind direction would be analysed to evaluate the air ventilation impacts of the design schemes under wind flow from different critical directions. Test points at upstream and downstream of the project area were also grouped together to identify if there is any potential blockage by the development.



Title:	**Velocity Ratios for Various Test Points of the Base Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site – Final Report**	**Figure: 6-1**



Title:	**Velocity Ratios for Various Test Points of the Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 6-2**



Title:	**Velocity Ratios for Various Test Points of the Second Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 6-3**

7. A SUMMARY OF RESULTS

7.1.1 The VRs for the perimeter and overall test points, focused areas and areas upstream & downstream of the three design options of the subject site are summarised in Table 7-1. The grouping of these focus areas has been presented in Figures 5-5 and 5-8.

Table 7-1 Summary of the Site and the Local Spatial Average Velocity Ratios (SVR & LVR) and the Average Velocity Ratios of the Focus Areas for all Design Schemes

	Base Scheme	Revised Scheme	Second Revised Scheme
SVR	0.19	0.18	0.19
LVR	0.15	0.14	0.15
Average VR for Individual Focus Areas:			
King's Road and immediate area	0.14	0.14	0.14
Electric Road	0.13	0.12	0.13
City Garden Road, City Garden Road Extension & Wang On Road	0.14	0.13	0.13
King Wah Road	0.26	0.23	0.25
Fook Yum Road	0.14	0.14	0.14
Oil Street and immediate area	0.26	0.25	0.26
Northeast project boundary	0.16	0.10	0.15
Promenade	0.20	0.20	0.20
Waterfront to the south and under Island Eastern Corridor (IEC)	0.15	0.14	0.14
Central landscaped area on site	0.09	0.13	0.13
On the Footbridge	0.10	0.07	0.09
Landscaped area to the immediate north of Oil Street and Electric Road	0.12	0.10	0.11
Landscaped area fronting the harbour	0.22	0.18	0.17
Building gap between commercial or residential blocks on site	0.12	0.14	0.14
Upstream area of the project site (under prevailing northeast and east wind)	0.09	0.09	0.09
Downstream area of the project site (under prevailing northeast and east wind)	0.18	0.17	0.17

8. DISCUSSION

8.1 Introduction

8.1.1 After summarizing the VRs for the three design schemes and their individual focus areas in Section 7, the air ventilation performance of the three design schemes is compared and discussed in details below.

8.2 Discussion of Air Ventilation Performance of Different Design Schemes

(1) Overall Performance

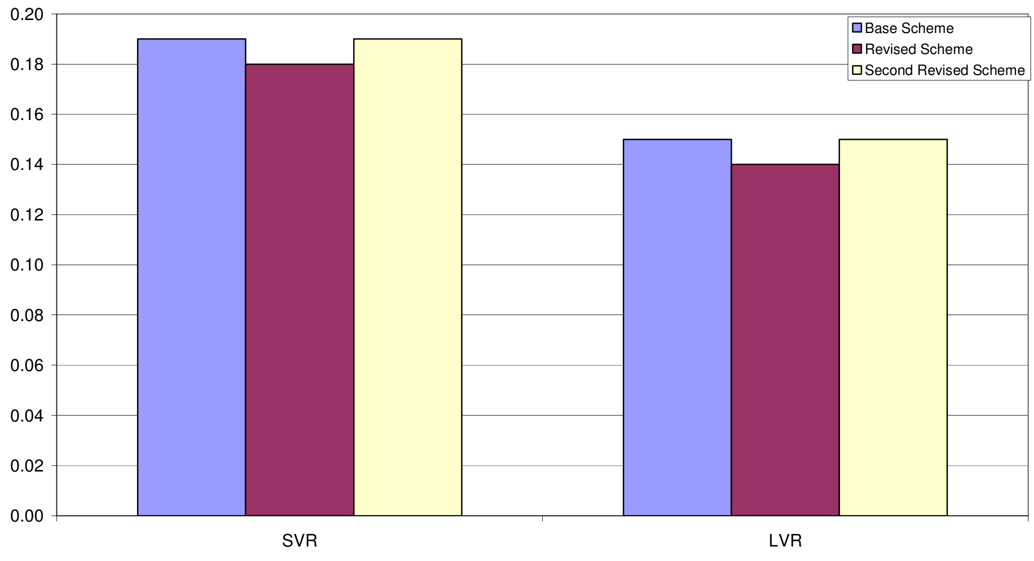
8.2.1 Generally speaking, the Base Scheme and the Second Revised Scheme perform the same and are slightly better than the Revised Scheme. As shown in Graph 8-1, the LVRs for the Base Scheme and Second Revised Scheme are 0.15 which are slightly higher than 0.14 for the Revised Scheme. The SVRs for the Base Scheme and Second Revised Scheme are 0.19 which are slightly higher than 0.18 for the Revised Scheme.

8.2.2 The SVR of the Second Revised Scheme (0.19) is slightly higher than that of the Revised Scheme (0.18). The Second Revised Scheme allows a wider gap between commercial blocks and the adjacent buildings at the northeast side. The gap between the commercial blocks have less restriction to the wind flow from north to northern-easterly directions to enter the City Garden Road Extension and the Central Landscaped Area.

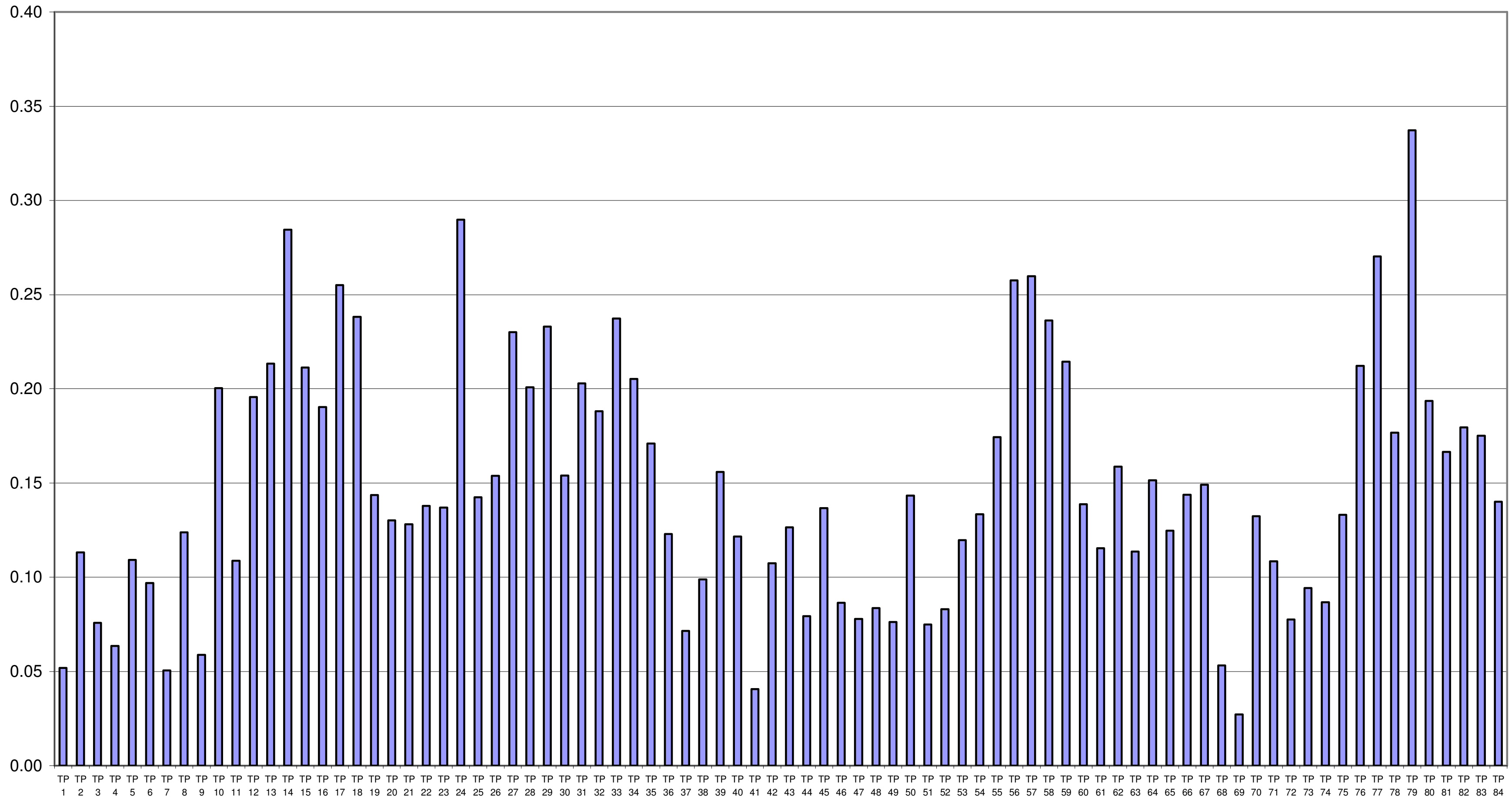
8.2.3 The SVR of the Base Scheme (0.19) is slightly higher than that of the Revised Scheme (0.18). This may be due to the higher buildings in the Base Scheme directing some of the upper level wind to the subject site. However, lower height restrictions have been imposed for other planning and design considerations.

8.2.4 The air ventilation performance of the Base Scheme, the Revised Scheme and the Second Revised Scheme are summarized in Graph 8-1 in terms of the SVR and LVR and in Graph 8-2, Graph 8-3 and Graph 8-4 in terms of individual test points. Since some of the individual test points are located in different places in different design schemes, they could not be compared directly.

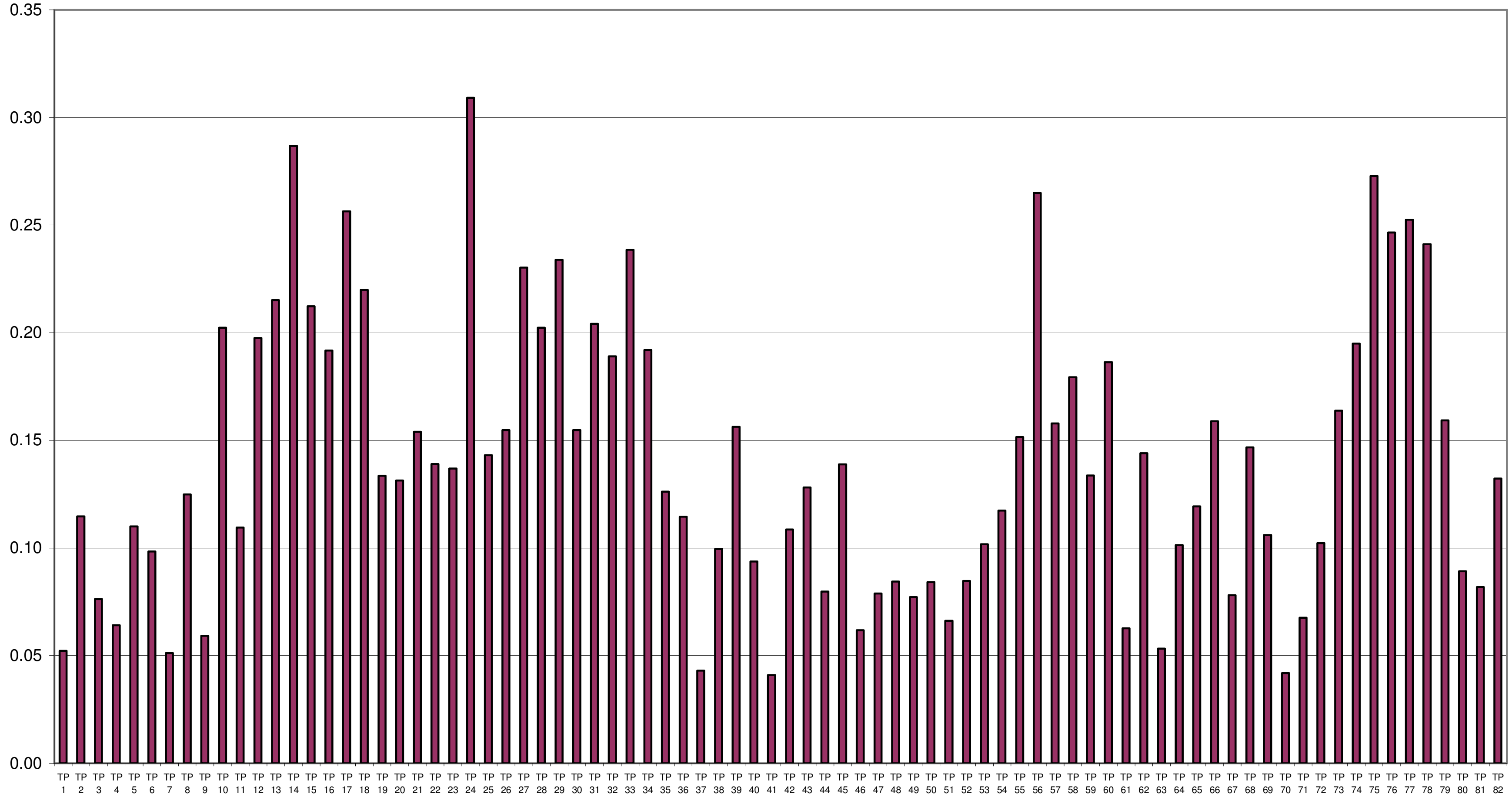
Graph 8-1 Comparison of SVR and LVR of All Schemes



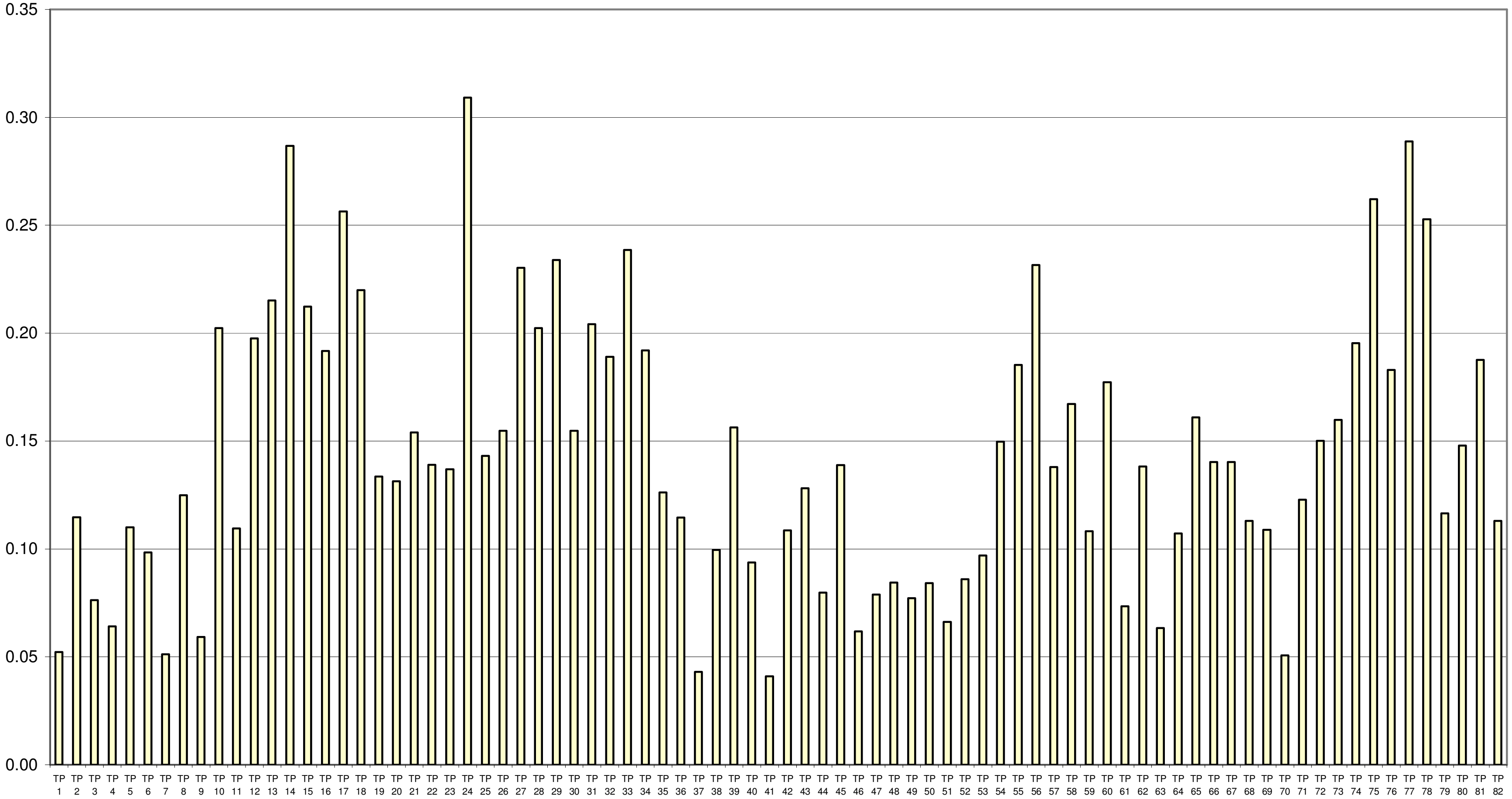
Graph 8-2 VRs of the Test Points of the Base Scheme



Graph 8-3 VRs of the Test Points of the Revised Scheme



Graph 8-4 VRs of the Test Points of the Second Revised Scheme

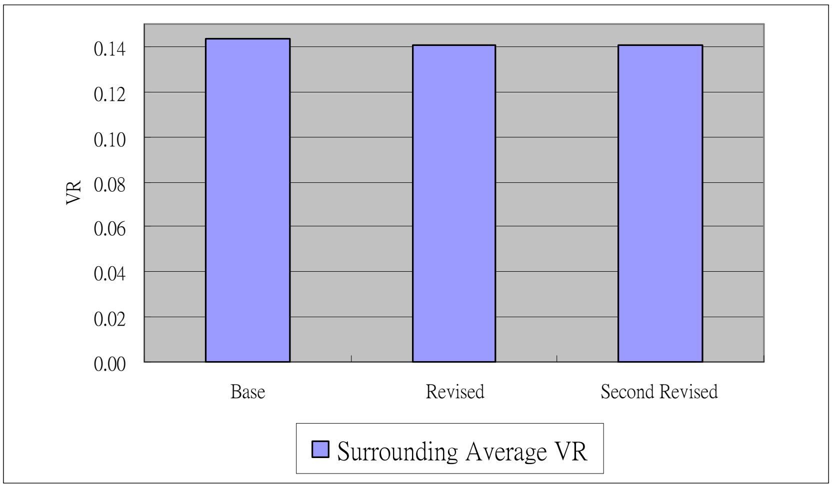


(2) Wind Performance of Individual Focus Areas

8.2.5 Immediate Surroundings -- Wind Availability Insensitive to the Change of Design Options

The variation of the design schemes does not result in any significant change in VRs of the test points in the surrounding areas outside the project site. The difference of the averaged VRs of the test points outside the subject site (and excluding those along the project boundary) among all the design schemes are insignificant (less than 0.005) despite the significant differences in terms of building height and disposition. This is because the surrounding areas are densely developed and cannot allow better wind flow to the site. The surrounding area of the subject site is shown in Figure 8-1 in light orange color.

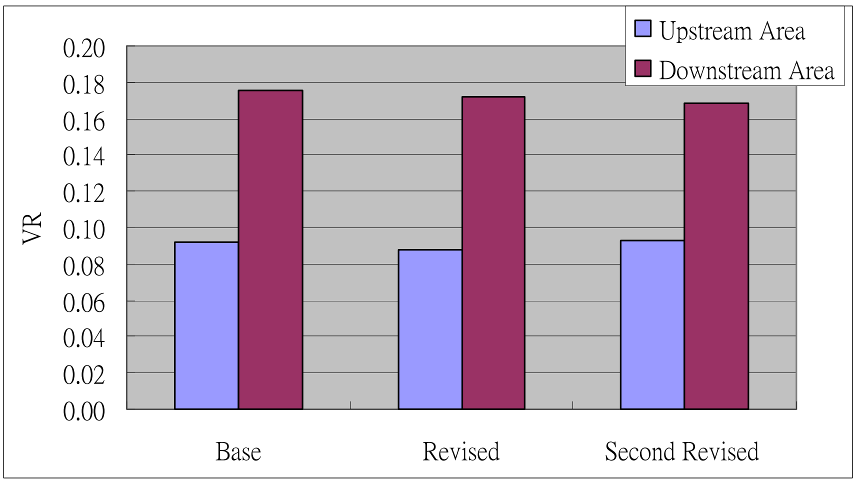
Graph 8-5 Comparison of Surrounding VRs of Different Schemes



8.2.6 No Adverse Air Ventilation Impact to the Downstream Area

There is no indication that the proposed development would block wind flow and have adverse impacts on the air ventilation performance of the downstream areas (i.e. under the prevailing easterly to north-easterly winds). Under these prevailing winds, the VRs of test points to the southwest and west of the subject site (0.17 to 0.18), equivalent to the downstream, are generally higher than those on the northeast and east of the subject site (0.09), equivalent to the upstream area (Graph 8-6). This is attributed to more open areas around the downstream area at the moment of wind tunnel testing and the denser developments in the upstream area. Besides, the building gap between commercial blocks and the residential towers of the subject site is parallel to the prevailing wind direction and can assist wind flow from the upstream to the downstream area. The upstream and downstream areas are indicated in Figure 8-2.

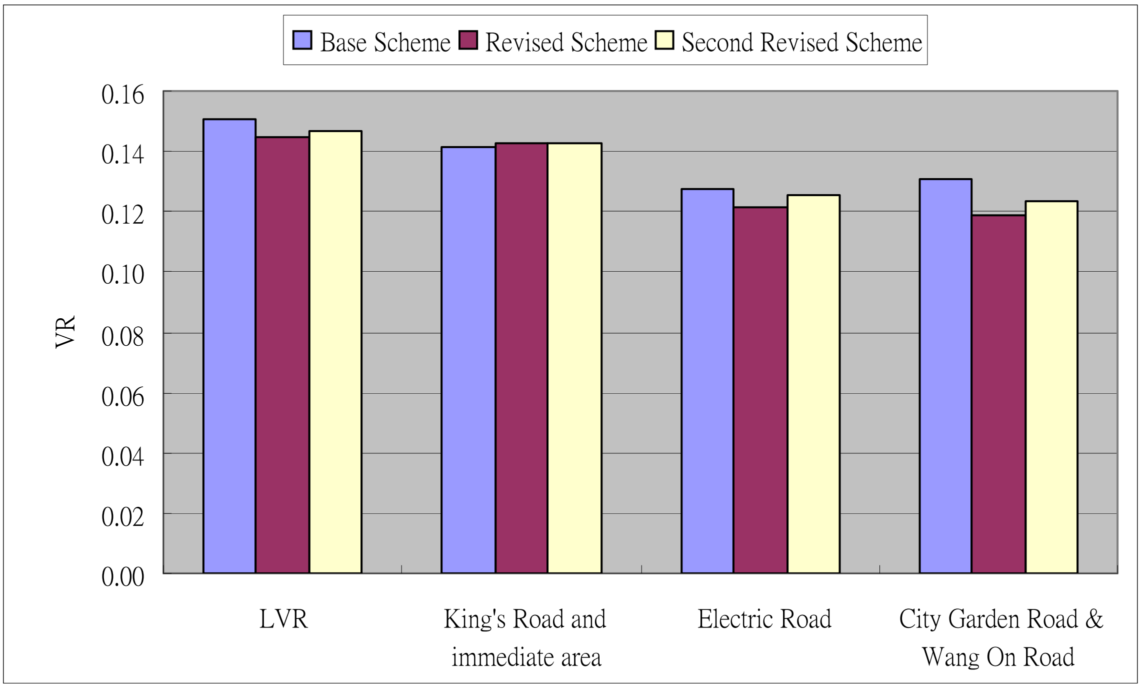
Graph 8-6 Comparison of Upstream and Downstream VRs



8.2.7 No Effective Breezeway along Prevailing Wind Direction within the Assessment Area

King's Road, Electric Road, City Garden Road, City Garden Road Extension and Wang On Road are aligned in parallel along the prevailing wind direction. While it is understood that carriageways along prevailing wind direction can generally help to maximise wind penetration through the district, the averaged VR along these carriageways is not particularly high and is slightly lower than the LVR. This suggests that these carriageways cannot serve as a continuous or effective breezeway.

Graph 8-7 VRs along Different Streets



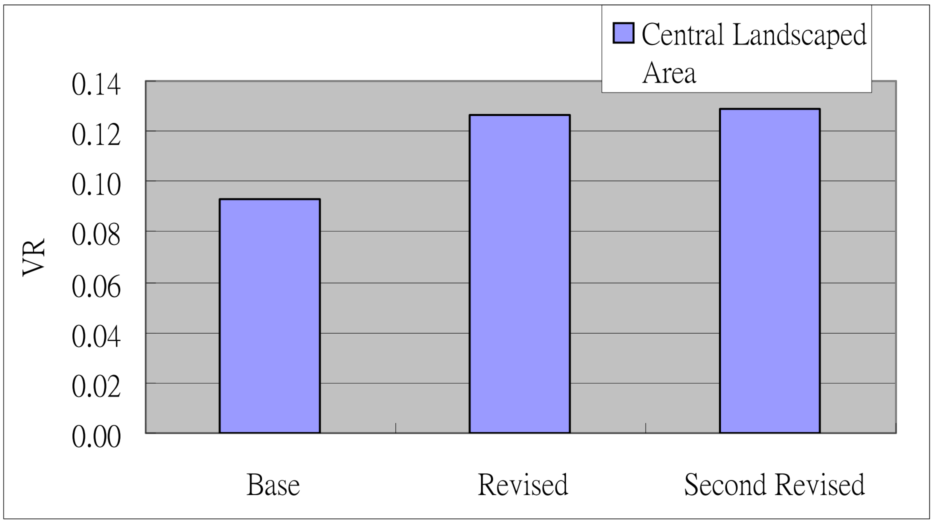
8.2.8 Wind Availability along Northeast Project Boundary Reduced by Commercial Blocks

The individual test points at the north-eastern side of the project site for both Base Scheme and Second Revised Scheme (averaged VR are 0.16 and 0.15 respectively) are better than those of the Revised Scheme (averaged VR is 0.10). This is because one of the commercial blocks of the Revised Scheme is located closer to the northeast boundary of the subject site and has critical impacts on the nearby wind environment. The setback of the commercial block away from the northeast boundary under the Base Scheme and Second Revised Scheme shall improve the situation. Among the three design schemes, the closer the building is located near the northeast boundary (i.e. the Revised Scheme), the lower ventilation performance is envisaged. Figure 8-3 shows the averaged VRs of different design schemes at the northeast boundary.

8.2.9 Building Gap between Commercial Blocks Allows Better Wind Availability at the Central Landscaped Area

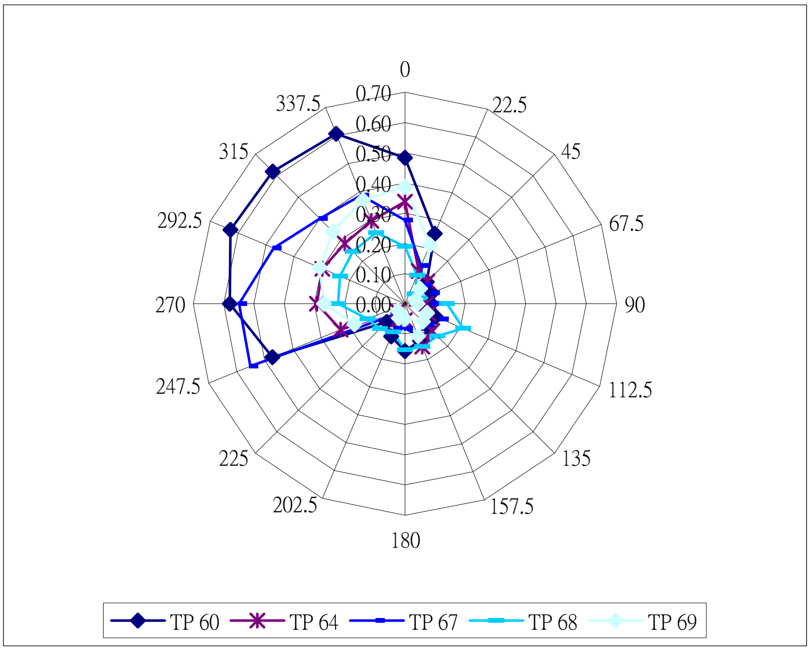
Building gap between the commercial blocks in the two Revised Schemes allows a new air path be formed in the middle of the subject site along a northwest axis. More wind flow through the air path will enhance the air ventilation and wind availability at the Central Landscaped Area and hence allow a more comfortable condition for the pedestrians (Figure 8-4). For test points within the Central Landscaped Area of the subject site, both the Revised Scheme and Second Revised Scheme outperform the Base Scheme. The averaged VR of the test points within the Central Landscaped Area for the Base Scheme is much lower than that of the Revised Scheme and the Second Revised Scheme (Graph 8-8).

Graph 8-8 Comparison of VRs of Test Points at Central Landscaped Area



8.2.10 The effectiveness for wind penetration into the central part of the subject site can be further demonstrated by examining the directional VRs of test points located along this building gap. Take the Second Revised Scheme as an example, the VRs at test points 60, 64, 67, 68 and 69 in the north-westerly directions are significantly higher than that of the other wind directions (Graph 8-9). These enhanced wind flow at the north-westerly directions demonstrates that wind flow from the harbour can easily penetrate to the central part of the subject site but will decrease when it passes further inland.

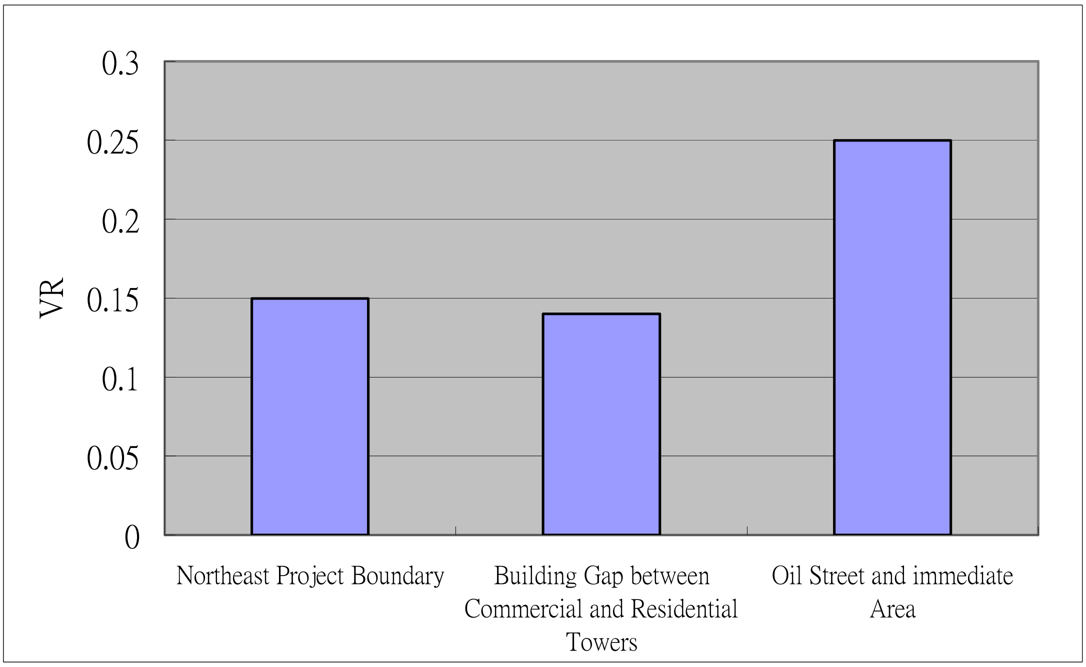
Graph 8-9 VRs at Test Points Located along the Building Gap between the Commercial Towers for the Second Revised Scheme



8.2.11 <u>Oil Street Being a Wind Corridor</u>

Wind Corridor could be formed if a wider separation between rows of buildings can be provided. This could be demonstrated by the higher VRs (0.25) for test points at Oil Street and its immediate area. Similar effects were observed in the building gaps in the central part and the Northeastern Boundary of the site as discussed in paragraphs 8.2.8 and 8.2.9 above, though with relatively lower VRs (0.14 and 0.15 respectively). Generally speaking, the wider the building gap, the higher the average VRs among the three wind corridors.

Graph 8-10 Comparison of VRs along the Wind Corridors for the Second Revised Scheme

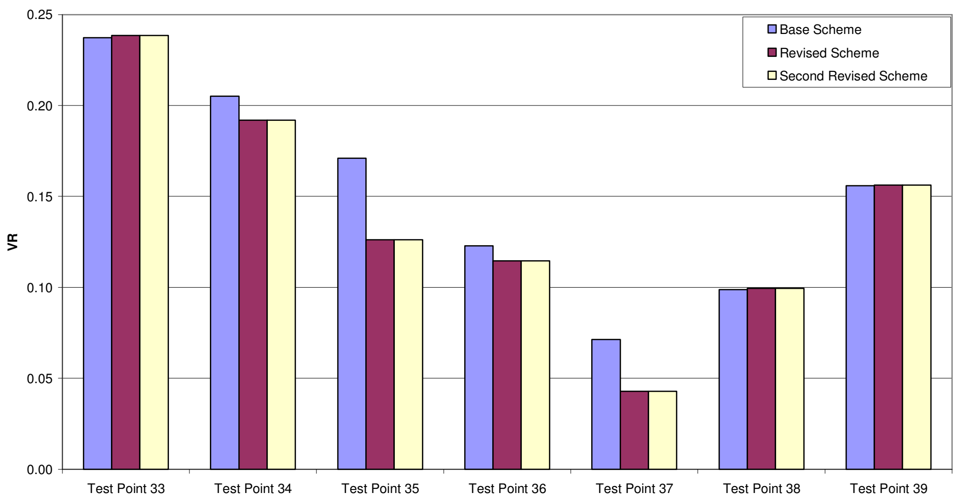


When VRs under individual wind directions are examined, it is found that VRs at test points along Oil Street under wind from WSW to NNE directions (with an angle span of 135 degrees) are also generally higher. It can be further concluded that the carriageway opens to wind coming from these directions. Despite that north-westerly winds parallel to Oil Street occurs least frequently, wind can pass through Oil Street easily when it comes from the harbourfront directions. Similar effects have been demonstrated in Graph 8-9.

8.2.12 <u>Waterfront Behind or Under IEC - Wind Availability Reduced</u>

The promenade within the assessment area represents an open area with least influence of buildings morphology except under southeasterly winds. The averaged VR at the promenade is around 0.20 as revealed from the test points along the harbourfront area. The average VRs for the areas under IEC and immediately behind the proposed administration buildings are lower (0.14-0.15). The highways and associated building and structure, although limited in extent, will reduce wind availability.

Graph 8-11 Comparison of VRs of Test Points at Waterfront behind or under IEC



8.2.13 Overall Performance

Taking into account the above analysis, whilst the Base Scheme and Second Revised Scheme are the same in the air ventilation performance (SVR and LVR), the later, with wind corridors along the southeast and northeast boundaries and a higher building permeability on site, would allow greater flexibility for achieving a better wind environment in detailed design stage.

8.3 Summary of Good Design Features of the Three Design Schemes

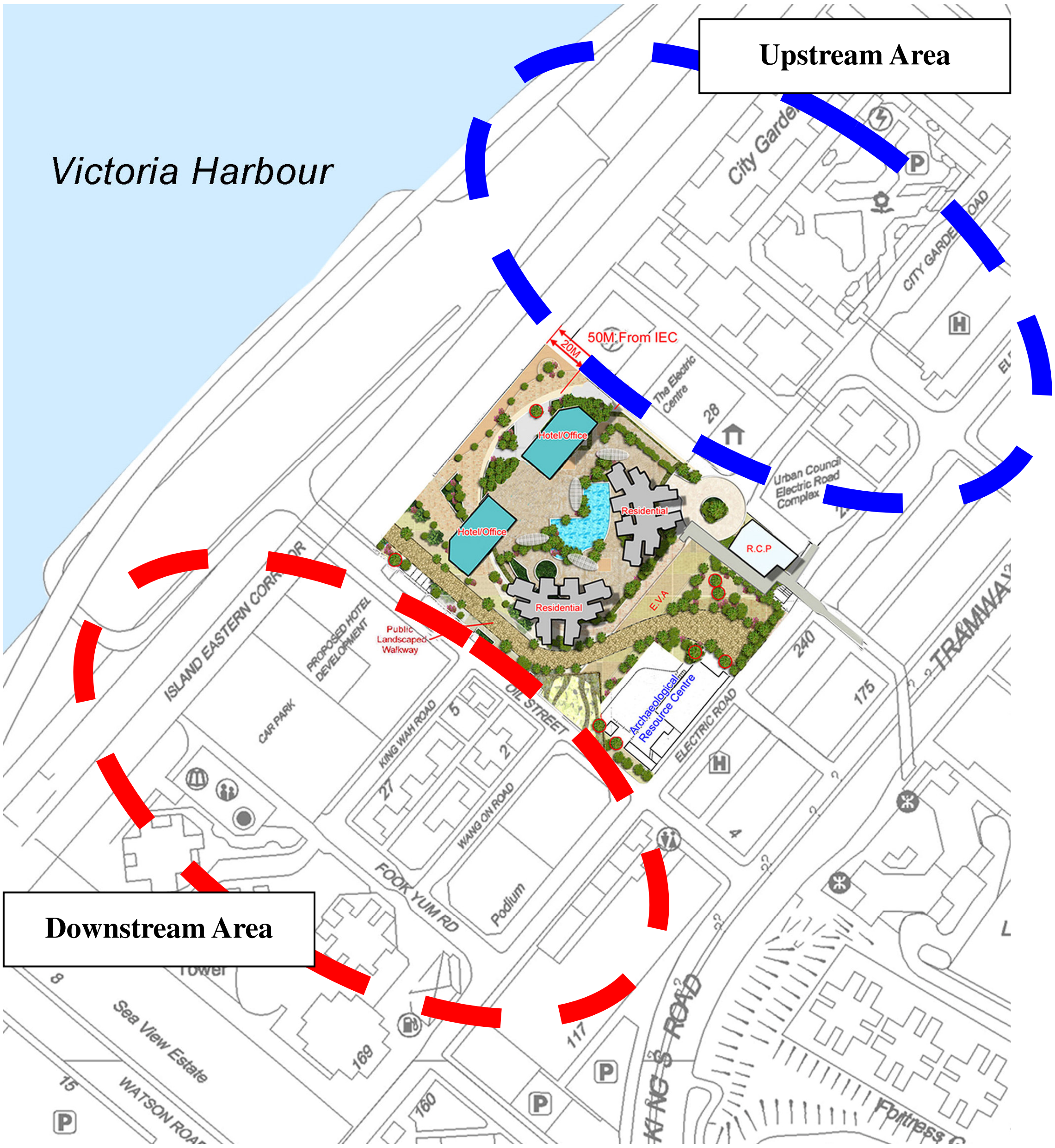
8.3.1 The final design of the proposed development will be subject to a multitude of planning, urban design and environmental considerations such as building bulk and heights, setback and need of noise mitigation measures such as non-noise sensitive building/structure. This Study mainly investigates the pedestrian level wind environment and provides the necessary information for an informed and balanced decision on site planning and design. For example, the proposed residential towers are facing Island Eastern Corridor and the proposed Central-Wan Chai By-pass which would be two of the busiest carriageways in Hong Kong. The commercial block proposed in the Base Scheme was one of the noise mitigation measures. However, the single commercial block will affect the penetration of wind into the Central Landscaped Area. Working within this context, this study recommends a gap be introduced between the commercial blocks to facilitate the penetration of wind into the Central Landscaped Area. The Study also identified some good design features which are beneficial to the wind environment through the iterative Detailed Study.

8.3.2 In view that the subject site is enclosed by dense and tall buildings on its three landward sides, the only effective source of wind for improving the ventilation of the subject site and area to its south is the wind from the harbour. Though the land/sea breeze is difficult to quantify, it is a common phenomenon, which is particular important in summer time. Therefore, it is essential to provide effective wind corridor perpendicular to the waterfront to allow the possible flow resulted from the land/sea interactions. The good design features are summarised as follows:

a) Wind can be captured and diverted to Oil Street from a wide angle ranging from WSW to NNE wind directions;
b) The wider separation of the commercial blocks from the northeast site boundary of Base Scheme and Revised Scheme can create wind corridor to provide better air ventilation; and
c) The building gap between the commercial blocks in alignment with the residential towers can increase the wind permeability into the Central Landscaped Area of the subject site.

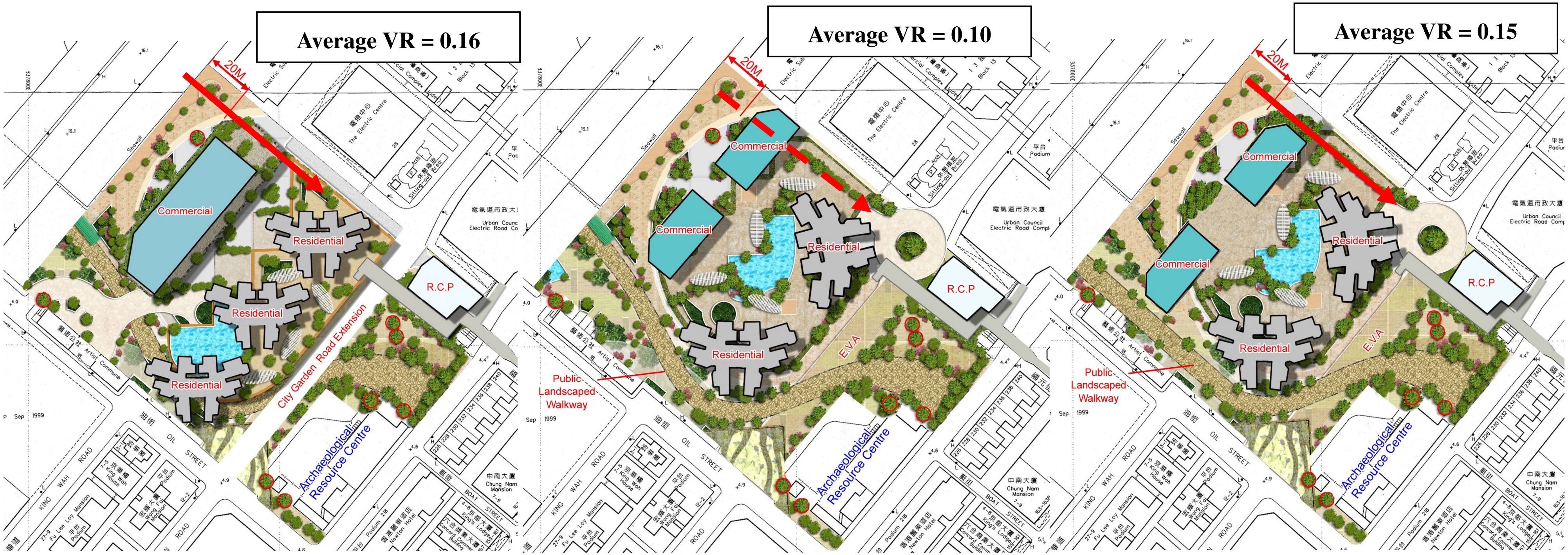
8.3.3 Not withstanding the above good design features, the wind tunnel tests have also identified some areas that may suffer from high VRs and hence an uncomfortable pedestrian environment at test points such as 55, 56, 60, 74, 75, 77 and 81. To mitigate the possible strong wind condition, planting of trees with wide crown and dense foliation has to be considered in the detailed design stage.

Title: Surrounding Area of the Subject Site	CH2M HILL Hong Kong Limited
Project: Air Ventilation Assessment Oil Street Site - Final Report	FIGURE: 8-1



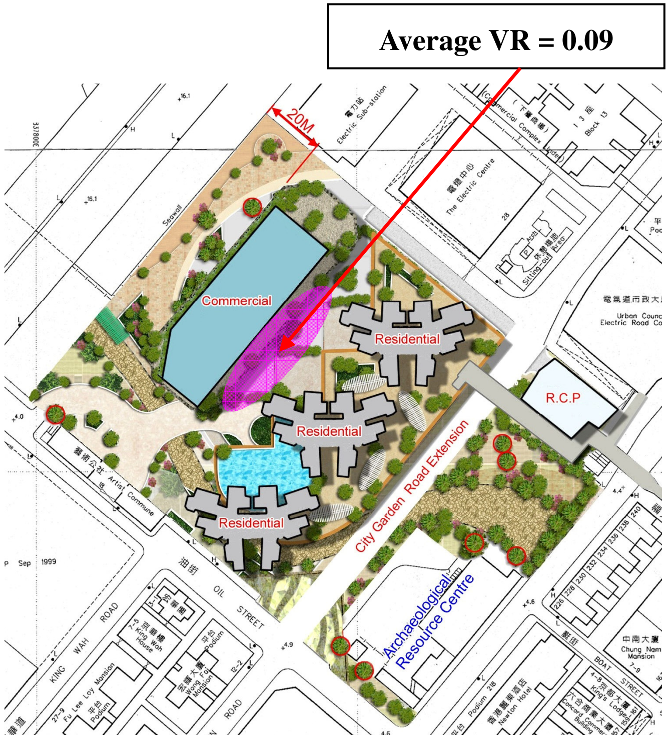
Title: Upstream and Downstream Areas of the Subject Site Under Prevailing Wind	**CH2M HILL Hong Kong Limited**
Project: Air Ventilation Assessment Oil Street Site - Final Report	**FIGURE: 8-2**

Figure 8-3 Wind Effect along Northeast Project Boundary of the Base Scheme, the Revised Scheme and the Second Revised Scheme

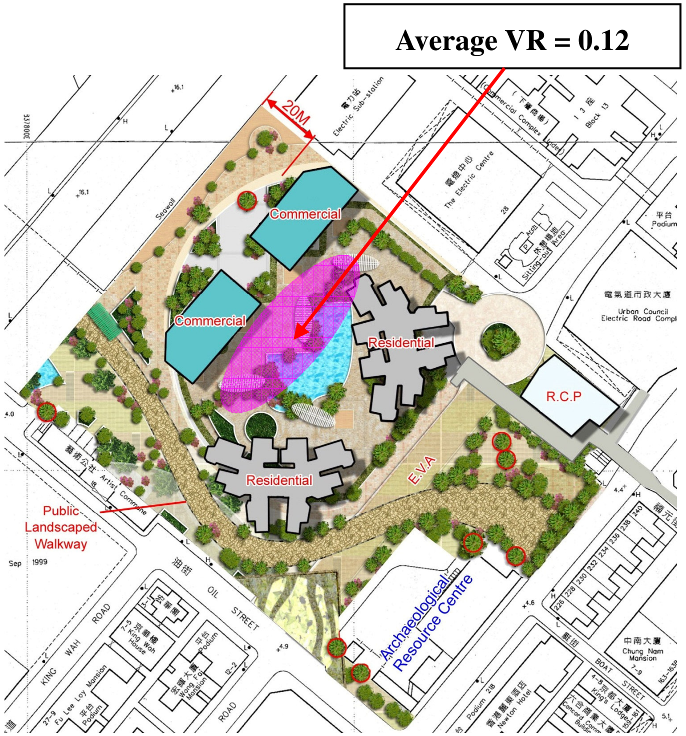


Base Scheme **Revised Scheme** **Second Revised Scheme**

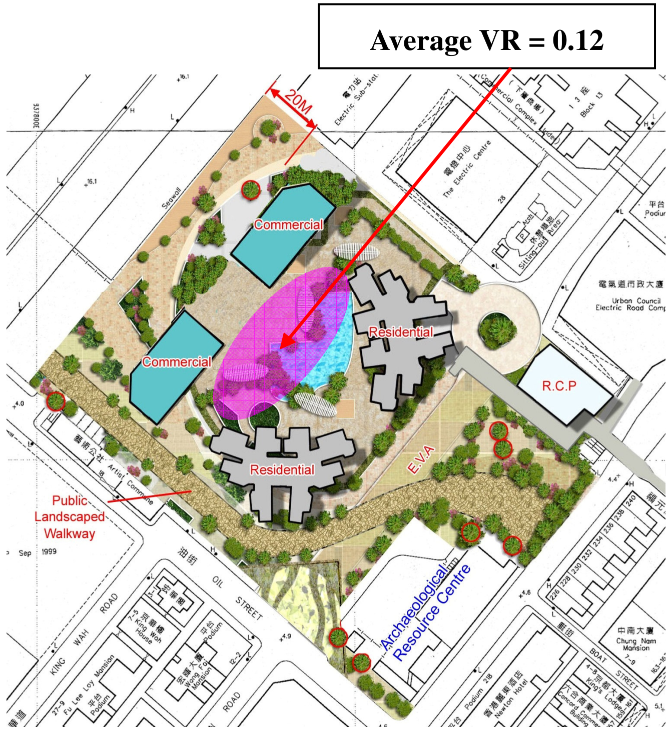
Title:	**Wind Effect along Northeast Project Boundary of the Base Scheme, the Revised Scheme and the Second Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 8-3**



Base Scheme



Revised Scheme



Second Revised Scheme

Title:	**Wind Effect at the Central Area of the Base Scheme, the Revised Scheme and the Second Revised Scheme**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 8-4**

9. FURTHER IMPROVEMENT TO SECOND REVISED SCHEME

9.1 Introduction

9.1.1 Based on the comparison of the 3 design schemes in Section 8, the Second Revised Scheme is the best and the most flexible option in air ventilation terms. Attempting to further improve this design scheme, two additional improvement features have been suggested and tested. They are:

(a) introduction of a void area of 5m high at the base of each building (Figure 9-1); and

(b) rotation of the commercial block along the northeast boundary by 45^{o} (Figure 9-2).

9.2 Result and Discussion

9.2.1 The VRs for the perimeter and overall test points, individual areas/features and areas upstream and downstream of the Second Revised Scheme with the further improvement features are summarised in Table 9-1.

Table 9-1 Summary of the Average Velocity Ratios of the Second Revised Scheme with Further Improvement Features

	Introduction of Voids	Rotation of Commercial Blocks
SVR	0.18	0.18
LVR	0.14	0.14
Average VR for Individual Focus Areas:		
King's Road and immediate area	0.14	0.14
Electric Road	0.12	0.13
City Garden Road, City Garden Road Extension & Wang On Road	0.12	0.13
King Wah Road	0.25	0.25
Fook Yum Road	0.14	0.14
Oil Street and immediate area	0.24	0.26
Northeast project boundary	0.12	0.11
Promenade	0.20	0.20
Waterfront to the south and under Island Eastern Corridor (IEC)	0.14	0.14
Central landscaped area on site	0.11	0.11
Footbridge	0.09	0.09
Landscaped area to the immediate north of Oil Street and Electric Road	0.06	0.12
Landscaped area fronting the harbour	0.19	0.15
Building gap between commercial or residential blocks on site	0.13	0.11
Upstream area of the project site (under prevailing northeast and east wind)	0.09	0.09
Downstream area of the project site (under prevailing northeast and east wind)	0.18	0.17

9.2.2 Effect of the 5m Height Void

The introduction of the 5m void into the base of each building in the Second Revised Scheme has insignificant effects on the LVR and SVR. Generally speaking, only little amount of wind can be captured by the buildings and channelled at the base of the buildings to improve the wind environment on site. On the other hand, the wind channelled to the base of the buildings would be diverted to the areas under the towers and slow down the wind at the pedestrian access ways around the buildings.

9.2.3 Effect of the Rotated Block

The effect on the LVR and SVR is insignificant after the commercial block near the northeastern boundary is rotated. Although the blockage of the north wind can be reduced, the separation between the rotated block and the residential tower would be decreased and hence negatively affect the wind flow to the Central Landscaped Area under ENE wind direction.

9.2.4 The two further improvement features cannot effectively enhance the overall air ventilation of the Second Revised Scheme.

Title:	**Further Improvement Measure – Introduction of Void Areas at the Ground Floor (Indicative)**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 9-1**

Title:	**Further Improvement Measure – Rotation of the Commercial Building at the Northeast Boundary by 45° (Indicative)**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment** **Oil Street Site - Final Report**	**Figure: 9-2**

10. CONCLUSION OF THE STUDY

10.1.1 By conducting the Experimental Site Wind Availability Study with the 1:4000 scale model, the wind availability and characteristics information in terms of wind directions, magnitudes and frequencies, wind speed and turbulence intensity profiles of the study site were obtained. Based on the obtained information, the Detailed Studies were conducted for the three Design Schemes and the two improvement features. The findings of the Detailed Studies have been concluded in the following paragraphs.

10.1.2 By comparing the VRs for individual areas and the SVR and LVR of three design schemes (detailed in Section 8), the Second Revised Scheme performs the best within the site with the consideration of different design constraints to allow for a higher wind permeability to the site, i.e. wider building gap between the commercial buildings in alignment with that of the residential buildings.

10.1.3 The Detailed Study also showed that two wind corridors fronting and perpendicular to the harbourfront at the north-easterly site boundary and the wind corridor along Oil Street will provide better ventilation for the site.

10.1.4 To sum up, a total of three wind corridors (along Oil Street, north-eastern boundary and the middle part of the subject site) are recommended for the development of the subject site. Figure 10-1 shows their broad locations. However, high wind velocity ratios or uncomfortable wind environment may be found at some locations (e.g. test points 55, 56, 60, 74, 75, 77 and 81) with probable strong wind area along Oil Street. To ameliorate strong wind, planting of trees with wide crown and dense foliation has to be considered in the detailed design stage.

10.1.5 In this study, further testing of two possible improvement features were conducted. However no further improvement to the air ventilation on site could be achieved by introducing a 5m high void at the ground floor of all the buildings or rotating the commercial block at the northeast boundary of the site.

Title:	**Proposed Wind Corridors for the Subject Site**	**CH2M HILL HONG KONG LIMITED**
Project:	**Air Ventilation Assessment Oil Street Site - Final Report**	**Figure: 10-1**

Appendix I

Directional Winds Data Measured at Waglan Island

APPENDIX I
WIND SPEED FREQUENCY DATA & WIND ROSE FOR WAGLAN ISLAND

Table 1: Weibull Parameters (for Waglan Island Wind Speed Data: 1975 - 2001)

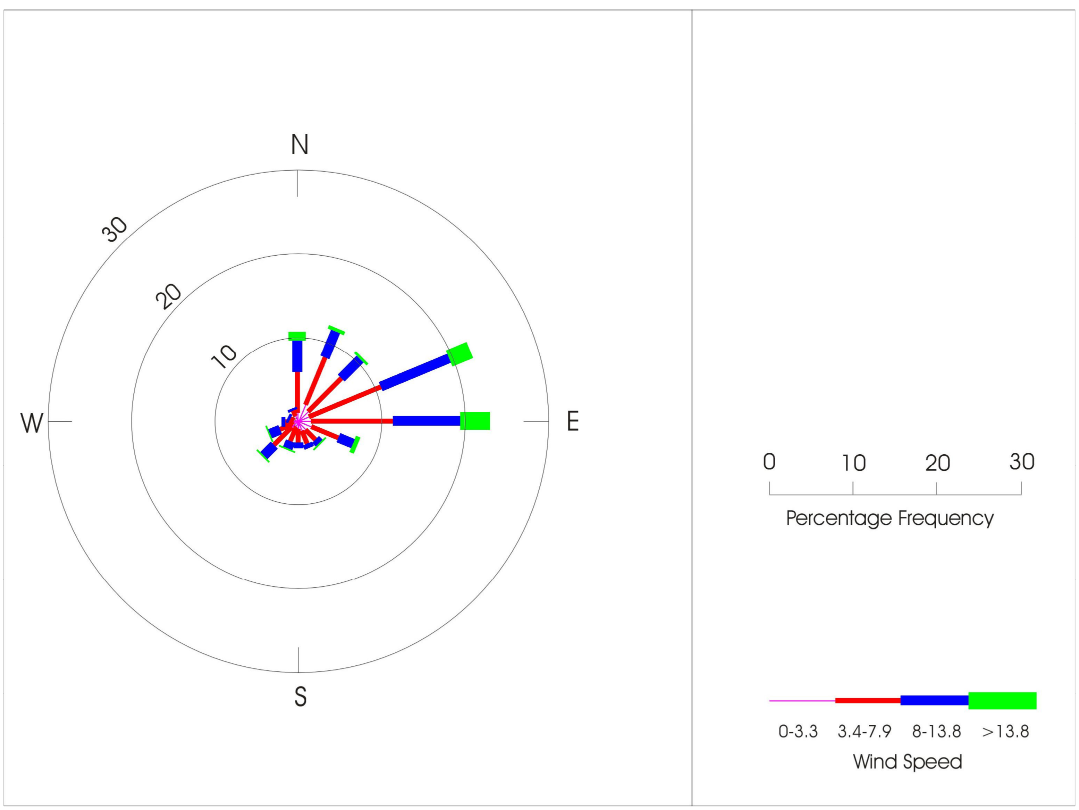
Wind direction (degrees)	A	k	C			
			Waglan Island	500m above Waglan Is.	Site/Waglan (at 500m)*	500m above site
22.5	**0.1087**	**1.94**	6.60	**7.46**	0.98	**7.31**
45	**0.1002**	**2.15**	6.37	**7.50**	0.87	**6.53**
67.5	**0.1822**	**2.39**	8.76	**10.36**	0.80	**8.29**
90	**0.1834**	**2.16**	8.90	**10.72**	0.83	**8.90**
112.5	**0.0655**	**1.55**	6.09	**7.50**	0.87	**6.53**
135	**0.0345**	**1.42**	5.00	**5.75**	0.79	**4.54**
157.5	**0.0305**	**1.57**	4.85	**5.37**	0.92	**4.94**
180	**0.0289**	**1.73**	5.72	**6.19**	0.87	**5.39**
202.5	**0.0329**	**1.87**	6.23	**6.78**	0.85	**5.76**
225	**0.0530**	**2.13**	6.60	**7.51**	0.96	**7.21**
247.5	**0.0333**	**2.24**	6.96	**8.00**	0.93	**7.44**
270	**0.0183**	**1.74**	5.52	**6.26**	1.01	**6.32**
292.5	**0.0115**	**1.39**	4.70	**5.48**	1.08	**5.92**
315	**0.0064**	**1.11**	3.20	**3.78**	1.06	**4.01**
337.5	**0.0138**	**1.10**	4.14	**4.96**	0.95	**4.71**
360	**0.0899**	**2.09**	8.35	**9.41**	1.07	**10.07**

* This is obtained from wind speed profile data – see Appendix II

Table 2: Percentage occurrence of directional winds at 500m

Wind Angle (º)	Percentage Occurrence (%) for wind speed ranges:				
	0-3.3 m/s	3.4–7.9 m/s	8.0–13.8 m/s	>13.8 m/s	Total
0	1.0%	4.5%	3.5%	1.0%	10.0%
22.5	2.0%	5.7%	3.2%	0.4%	11.3%
45	1.6%	5.4%	3.0%	0.2%	10.3%
67.5	1.1%	8.8%	8.3%	2.5%	20.7%
90	1.4%	9.3%	7.7%	3.3%	21.6%
112.5	1.6%	3.2%	1.7%	0.5%	7.0%
135	1.3%	1.6%	0.6%	0.1%	3.6%
157.5	1.1%	1.5%	0.5%	0.0%	3.1%
180	0.8%	1.5%	0.6%	0.1%	2.9%
202.5	0.8%	1.7%	0.8%	0.1%	3.4%
225	0.8%	2.9%	1.6%	0.1%	5.4%
247.5	0.4%	1.8%	1.1%	0.1%	3.4%
270	0.5%	0.9%	0.4%	0.0%	1.9%
292.5	0.4%	0.5%	0.2%	0.0%	1.2%
315	0.4%	0.2%	0.1%	0.0%	0.6%
337.5	0.7%	0.5%	0.2%	0.1%	1.4%

Corresponding wind rose below.



Appendix II

Result of Mean Wind Speed and Turbulence Intensity Profiles

APPENDIX II

PLOTS AND TABULATED RESULTS OF THE SITE WIND SPEED AND TURBULENCE INTENSITY PROFILES AND YAW ANGLE PROFILES

Table 1: Wind Characteristics at 0^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	1.07	0.156
400	1.00	0.172
300	0.90	0.206
250	0.84	0.203
200	0.80	0.206
150	0.73	0.198
100	0.68	0.192
50	0.66	0.191

Table 2: Wind Characteristics at 22.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.98	0.145
400	0.89	0.151
300	0.81	0.160
250	0.81	0.174
200	0.75	0.172
150	0.61	0.180
100	0.57	0.184
50	0.45	0.207

Table 3: Wind Characteristics at 45^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.87	0.137
400	0.82	0.150
300	0.75	0.166
250	0.64	0.210
200	0.63	0.216
150	0.52	0.237
100	0.46	0.255
50	0.40	0.320

Table 4: Wind Characteristics at 67.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.80	0.124
400	0.76	0.132
300	0.68	0.135
250	0.67	0.143
200	0.62	0.137
150	0.54	0.163
100	0.51	0.167
50	0.49	0.175

Table 5: Wind Characteristics at 90^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.83	0.139
400	0.80	0.145
300	0.76	0.155
250	0.75	0.157
200	0.72	0.176
150	0.57	0.221
100	0.41	0.274
50	0.27	0.393

Table 6: Wind Characteristics at 112.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.87	0.128
400	0.78	0.145
300	0.70	0.167
250	0.66	0.207
200	0.62	0.233
150	0.52	0.271
100	0.46	0.286
50	0.31	0.299

Table 7: Wind Characteristics at 135^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.79	0.132
400	0.77	0.133
300	0.70	0.152
250	0.68	0.164
200	0.64	0.180
150	0.58	0.209
100	0.46	0.245
50	0.39	0.265

Table 8: Wind Characteristics at 157.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.92	0.171
400	0.89	0.177
300	0.80	0.193
250	0.73	0.192
200	0.69	0.191
150	0.63	0.213
100	0.56	0.248
50	0.47	0.280

Table 9: Wind Characteristics at 180^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.87	0.121
400	0.82	0.134
300	0.76	0.155
250	0.73	0.163
200	0.68	0.179
150	0.61	0.200
100	0.39	0.307
50	0.35	0.342

Table 10: Wind Characteristics at 202.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.85	0.141
400	0.75	0.187
300	0.62	0.229
250	0.55	0.287
200	0.49	0.326
150	0.37	0.377
100	0.30	0.370
50	0.23	0.372

Table 11: Wind Characteristics at 225^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.96	0.181
400	0.85	0.219
300	0.70	0.289
250	0.62	0.295
200	0.61	0.298
150	0.42	0.368
100	0.35	0.366
50	0.33	0.358

Table 12: Wind Characteristics at 247.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.93	0.197
400	0.83	0.208
300	0.75	0.230
250	0.73	0.229
200	0.67	0.236
150	0.63	0.236
100	0.63	0.237
50	0.39	0.479

Table 13: Wind Characteristics at 270^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	1.01	0.127
400	0.89	0.152
300	0.81	0.173
250	0.73	0.179
200	0.71	0.184
150	0.65	0.202
100	0.62	0.203
50	0.55	0.223

Table 14: Wind Characteristics at 292.5^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	1.08	0.107
400	0.95	0.137
300	0.83	0.165
250	0.73	0.178
200	0.66	0.194
150	0.57	0.231
100	0.54	0.212
50	0.45	0.228

Table 15: Wind Characteristics at 315^0

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	1.06	0.171
400	0.90	0.201
300	0.79	0.218
250	0.72	0.230
200	0.63	0.246
150	0.56	0.246
100	0.53	0.255
50	0.47	0.261

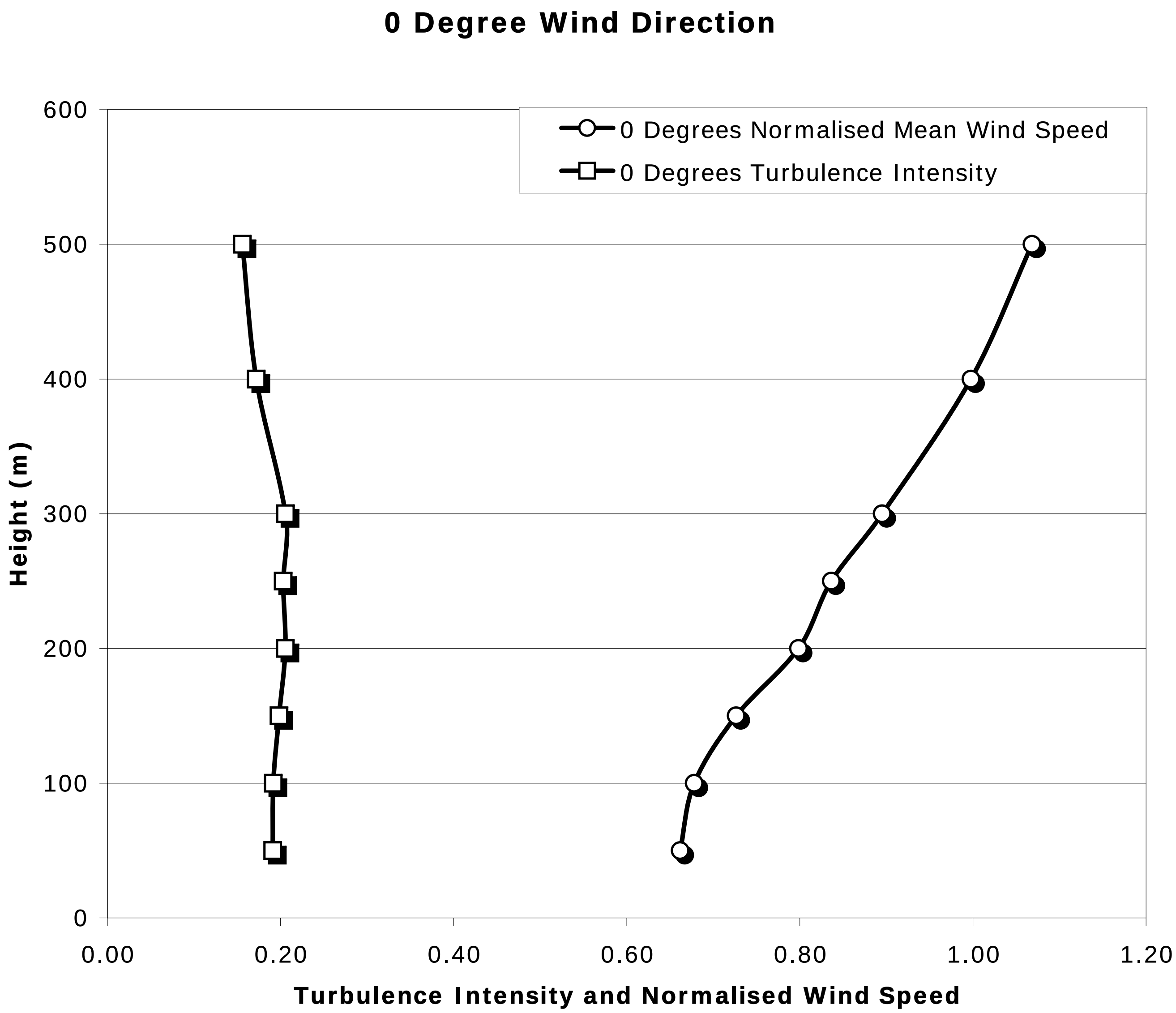
Table 16: Wind Characteristics at 337.5^{0}

Prototype scale height (m)	Normalised mean wind speed	Turbulence Intensity
500	0.95	0.139
400	0.87	0.148
300	0.81	0.167
250	0.75	0.169
200	0.69	0.177
150	0.64	0.201
100	0.53	0.206
50	0.48	0.241

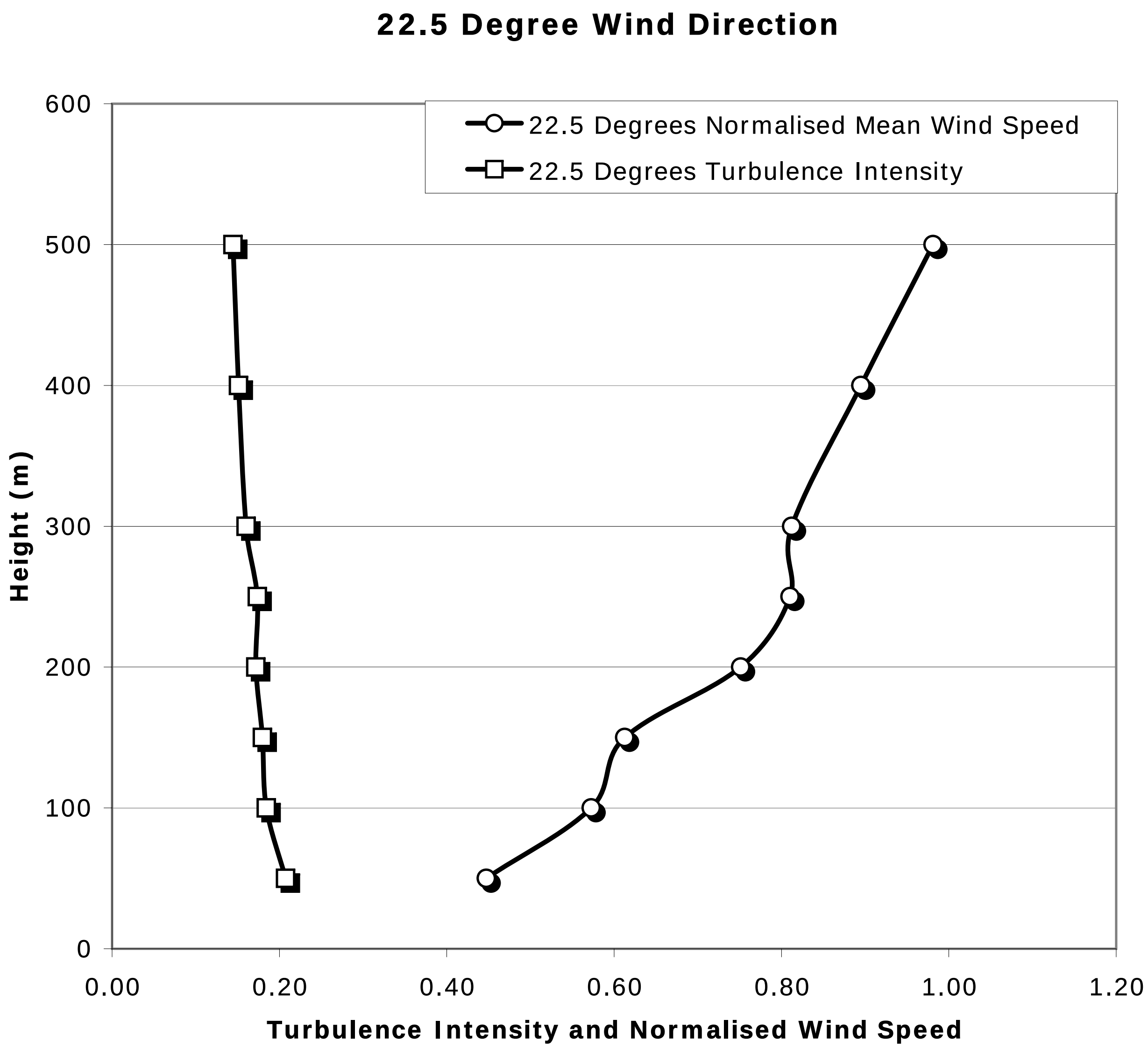
Table 17: YAW ANGLE PROFILES

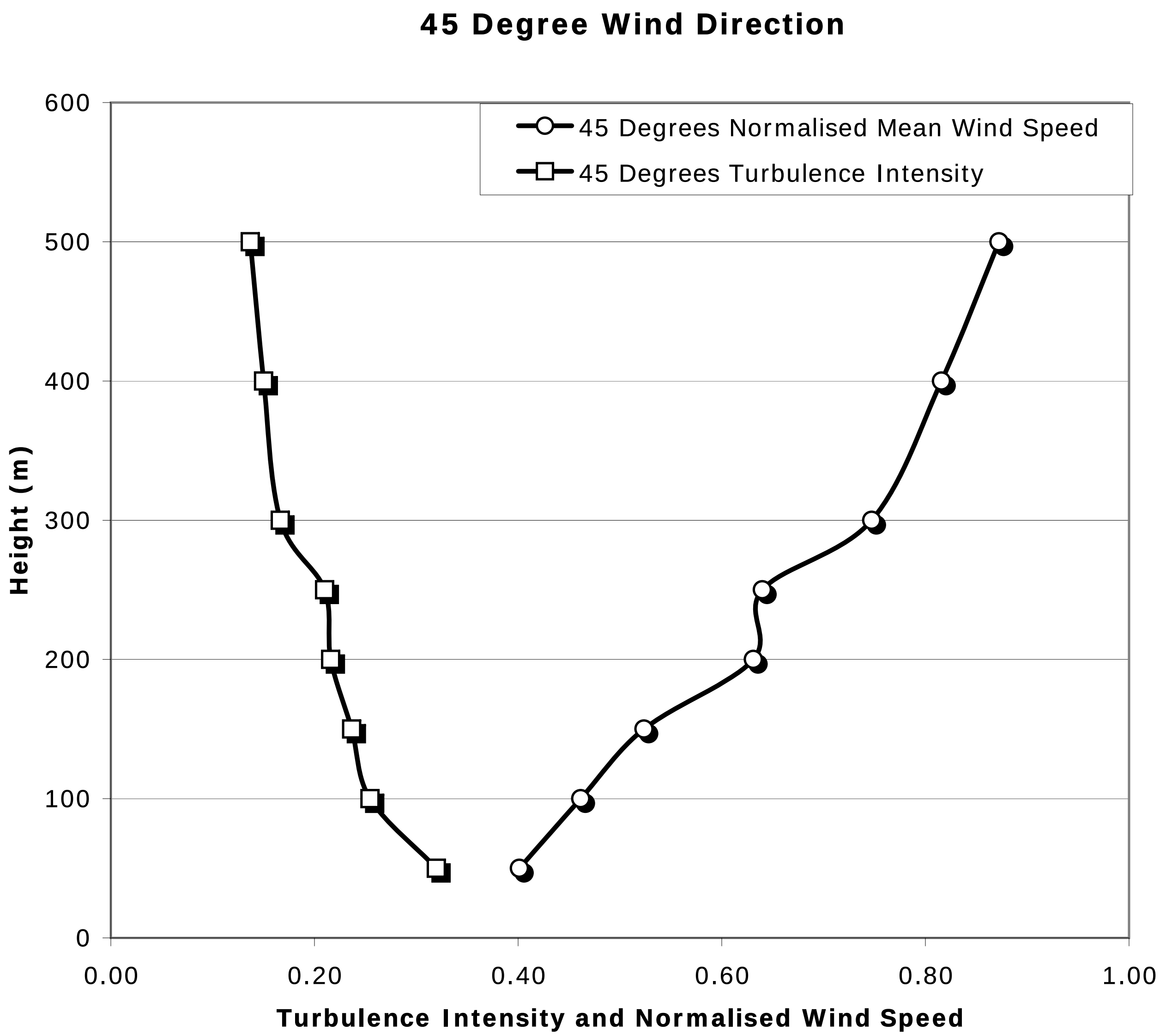
Wind Direction	Height Above Ground (m)							
	50	100	150	200	250	300	400	500
0.0	12.2	1.9	5.4	6.0	-1.0	-6.7	-3.4	3.0
22.5	10.8	0.2	3.9	2.5	-5.8	-12.3	-9.4	1.0
45.0	7.7	0.4	3.9	6.9	-1.3	-9.4	-1.7	1.7
67.5	-3.4	-11.1	-3.0	-1.1	-8.7	-15.8	-9.9	-0.6
90.0	-31.8	-26.1	-18.3	-5.3	-13.3	-19.7	-12.9	-2.3
112.5	17.7	-11.1	-5.2	-7.2	-10.2	-23.9	-9.4	-2.4
135.0	5.0	5.3	4.9	1.7	-14.8	-21.4	-16.8	-0.3
157.5	28.0	9.3	7.1	1.4	10.6	-12.9	-6.0	4.9
180.0	8.0	-0.3	4.8	-6.7	-11.8	-10.3	-5.8	-4.3
202.5	-13.1	-2.5	-0.5	-5.3	-14.1	-13.2	-5.0	-0.2
225.0	-0.4	-7.2	-3.7	-7.2	-14.8	-14.4	-6.3	-0.8
247.5	-27.1	-7.0	-4.1	-7.5	-14.7	-15.1	-5.0	0.2
270.0	-39.0	-10.8	-6.9	-10.5	-18.7	-18.5	-8.0	-2.2
292.5	-43.4	-15.0	-10.8	-14.0	-21.1	-20.3	-9.4	-3.6
315.0	-36.5	-16.6	-11.3	-13.7	-19.3	-16.9	-7.1	-1.7
337.5	6.9	-3.7	3.0	2.3	-7.9	-16.2	-10.1	0.1

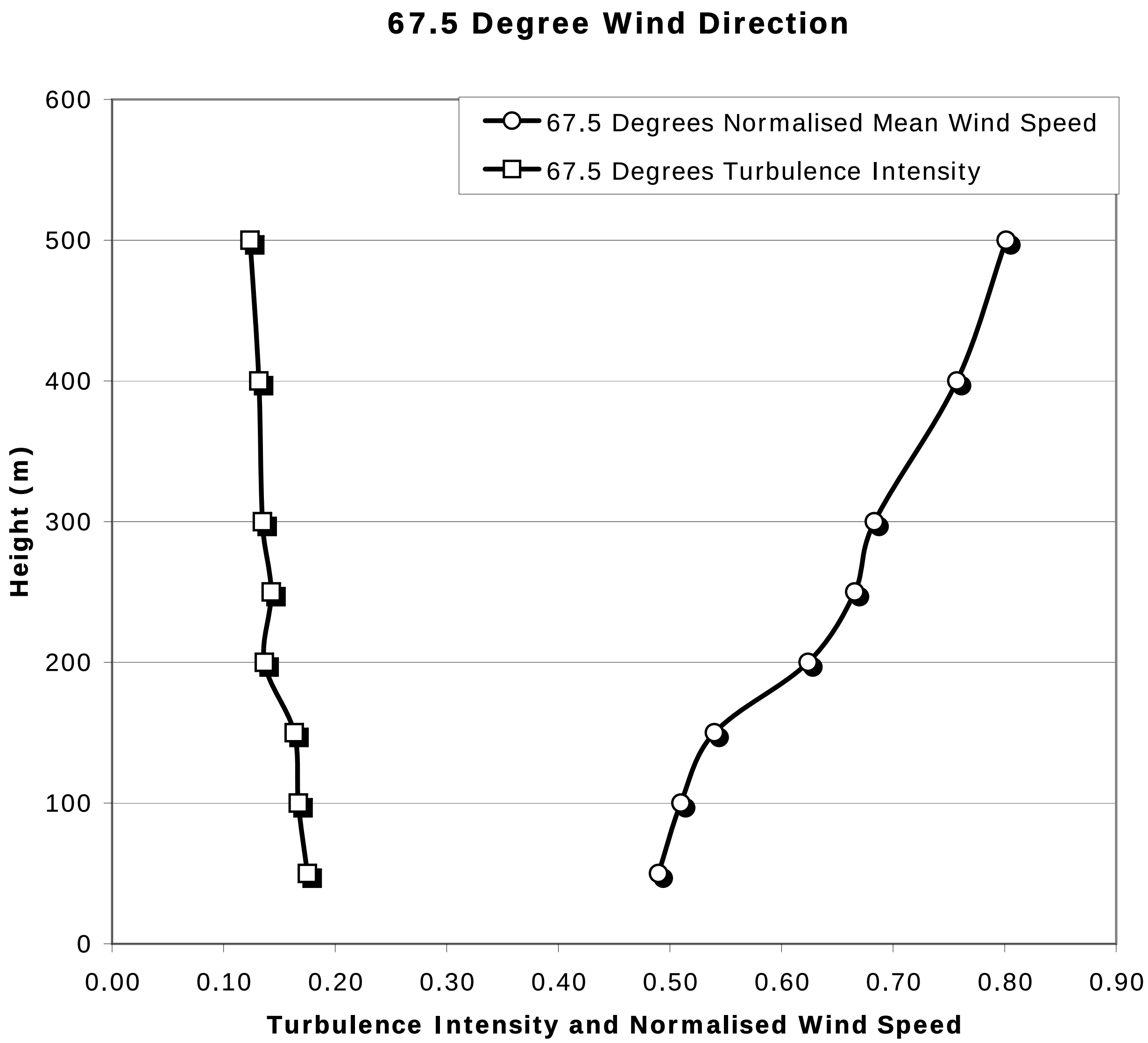
Note: Yaw angle is positive if the change in wind direction is in the clockwise direction.



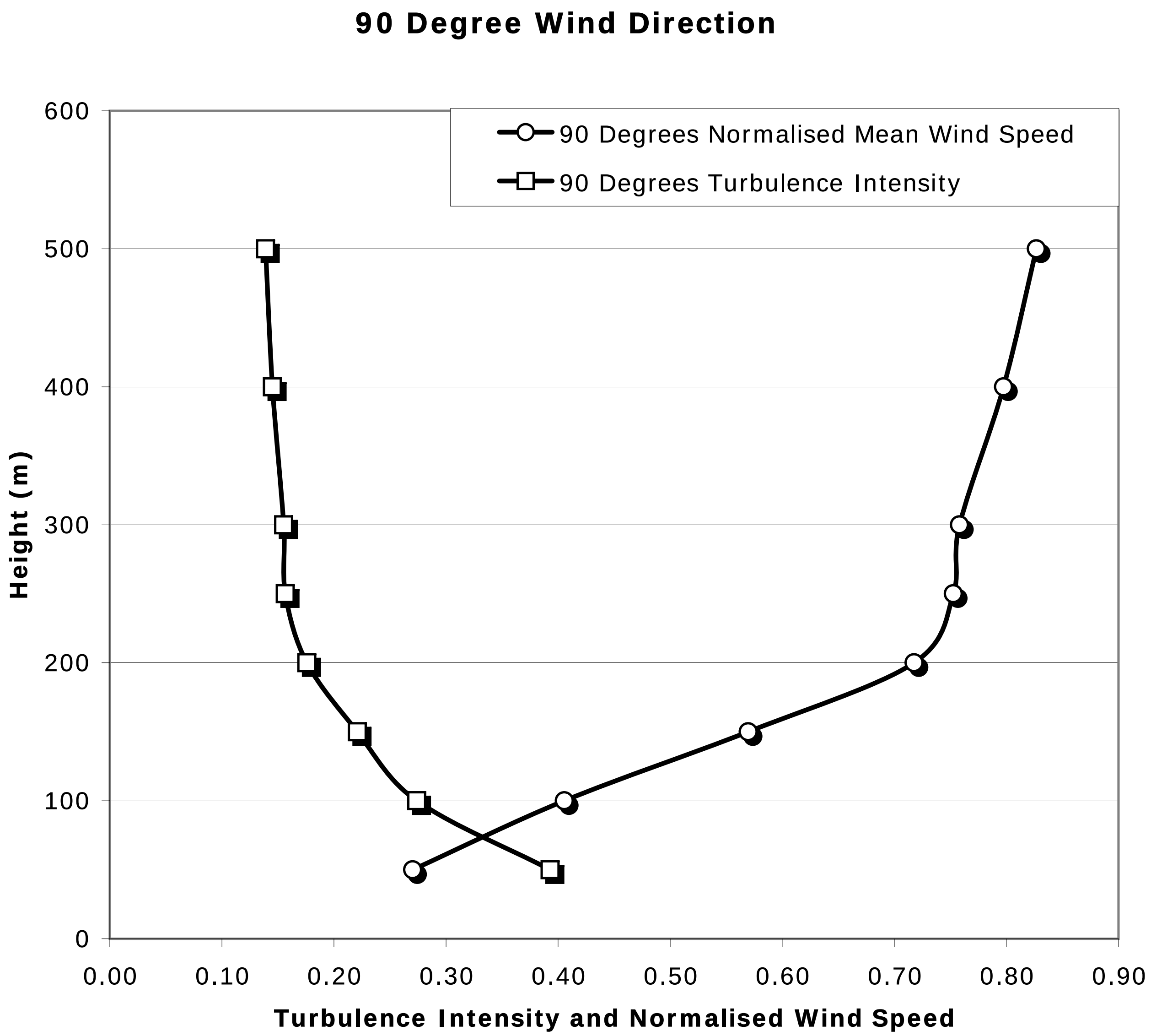
0 Degree Wind Direction
0 Degrees Normalised Mean Wind Speed
0 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed


22.5 Degree Wind Direction
22.5 Degrees Normalised Mean Wind Speed
22.5 Degrees Turbulence Intensity
Height (m)
0
100
200
300
400
500
600
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed

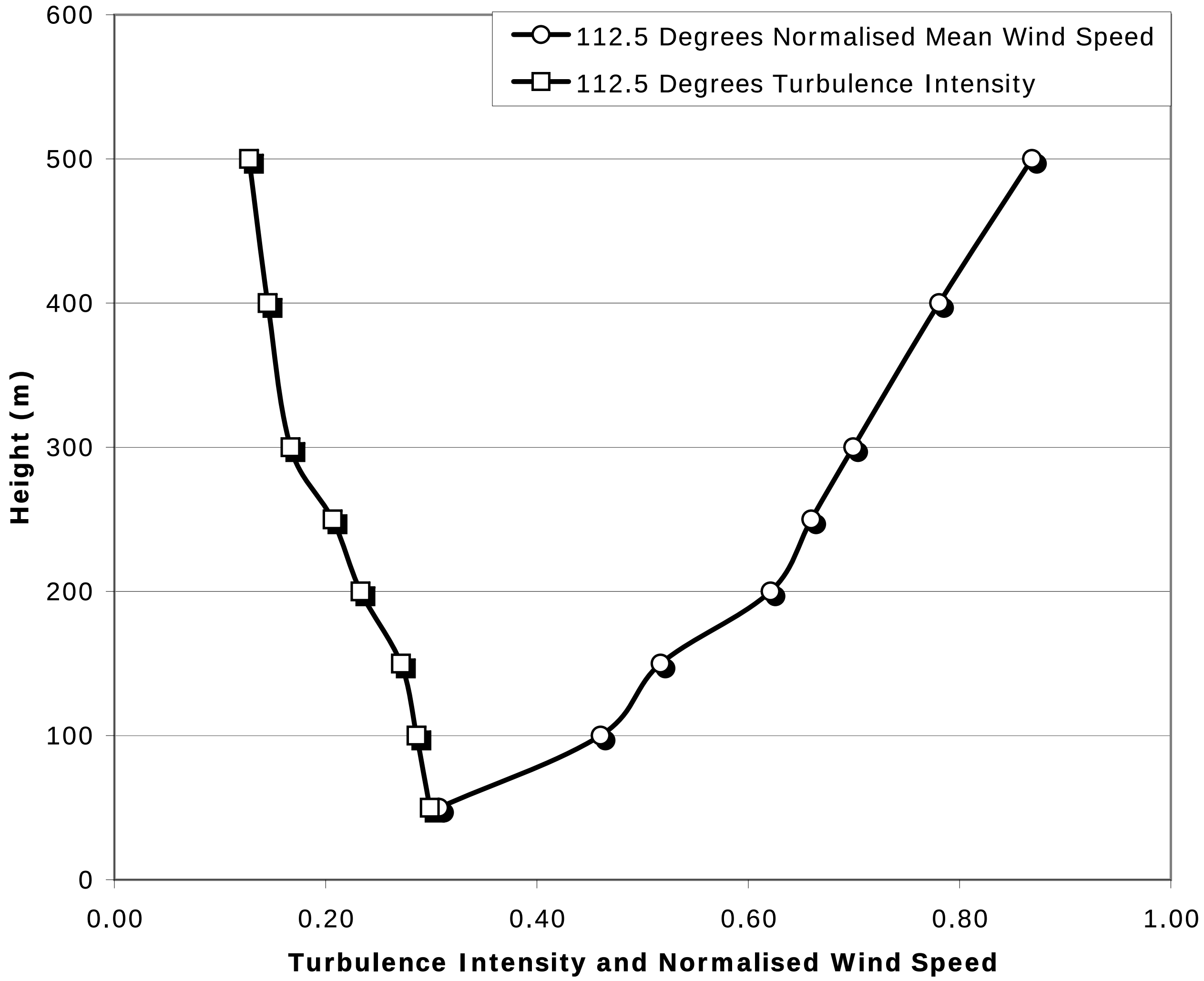

45 Degree Wind Direction
45 Degrees Normalised Mean Wind Speed
45 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
Turbulence Intensity and Normalised Wind Speed

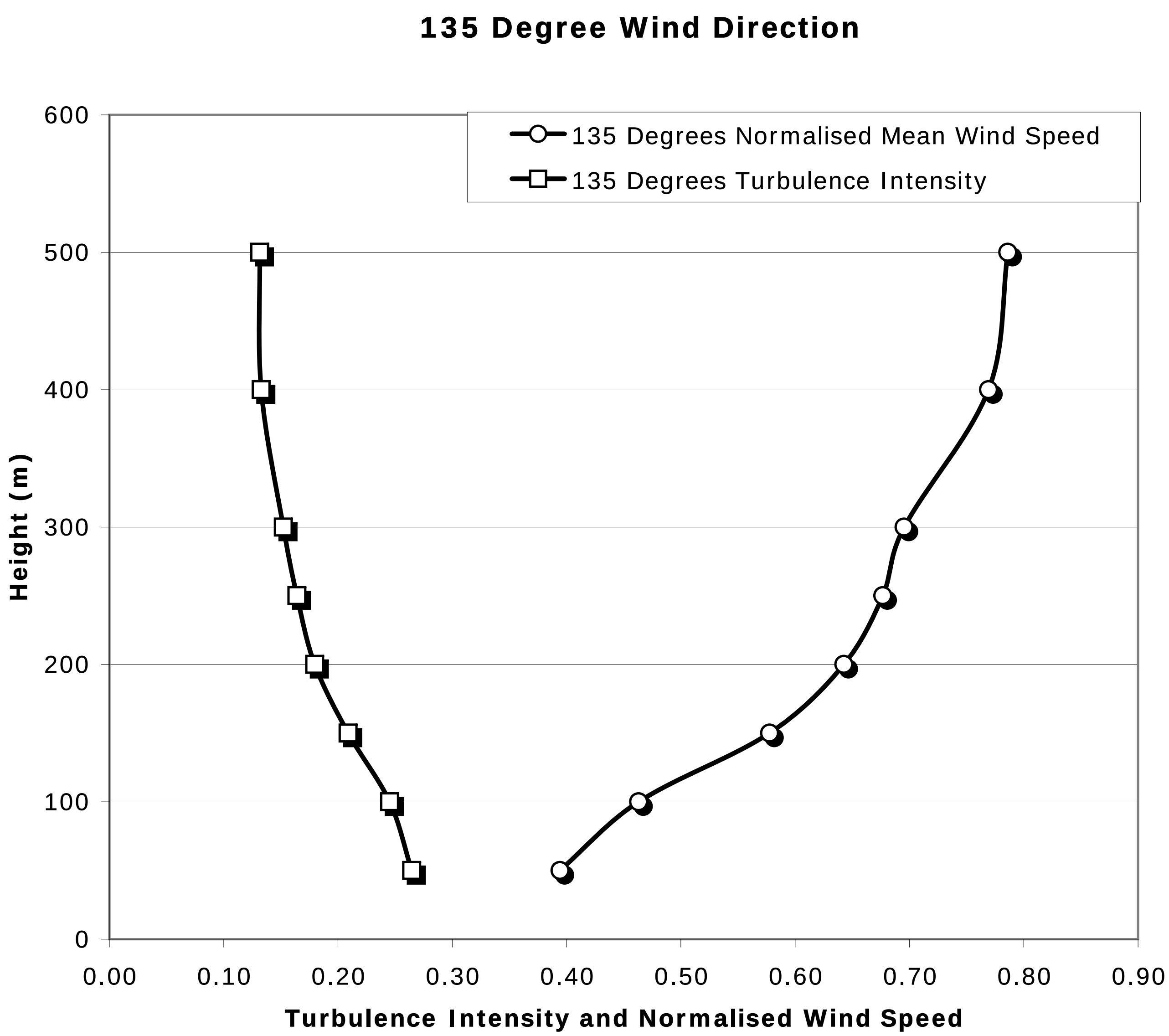


67.5 Degree Wind Direction
600
500
400
300
200
100
0
Height (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
Turbulence Intensity and Normalised Wind Speed
67.5 Degrees Normalised Mean Wind Speed
67.5 Degrees Turbulence Intensity

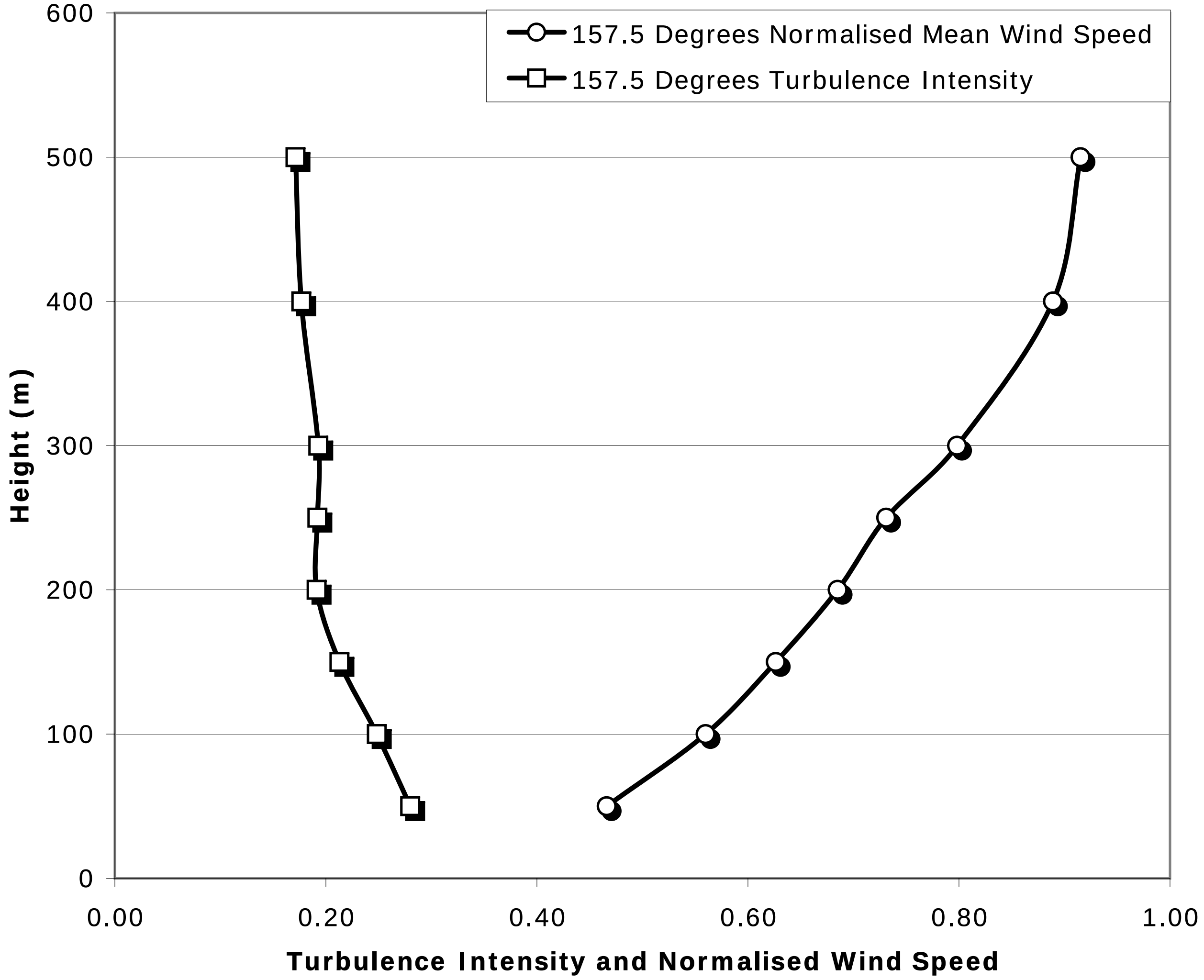

90 Degree Wind Direction
600
500
400
300
200
100
0
Height (m)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
Turbulence Intensity and Normalised Wind Speed
90 Degrees Normalised Mean Wind Speed
90 Degrees Turbulence Intensity

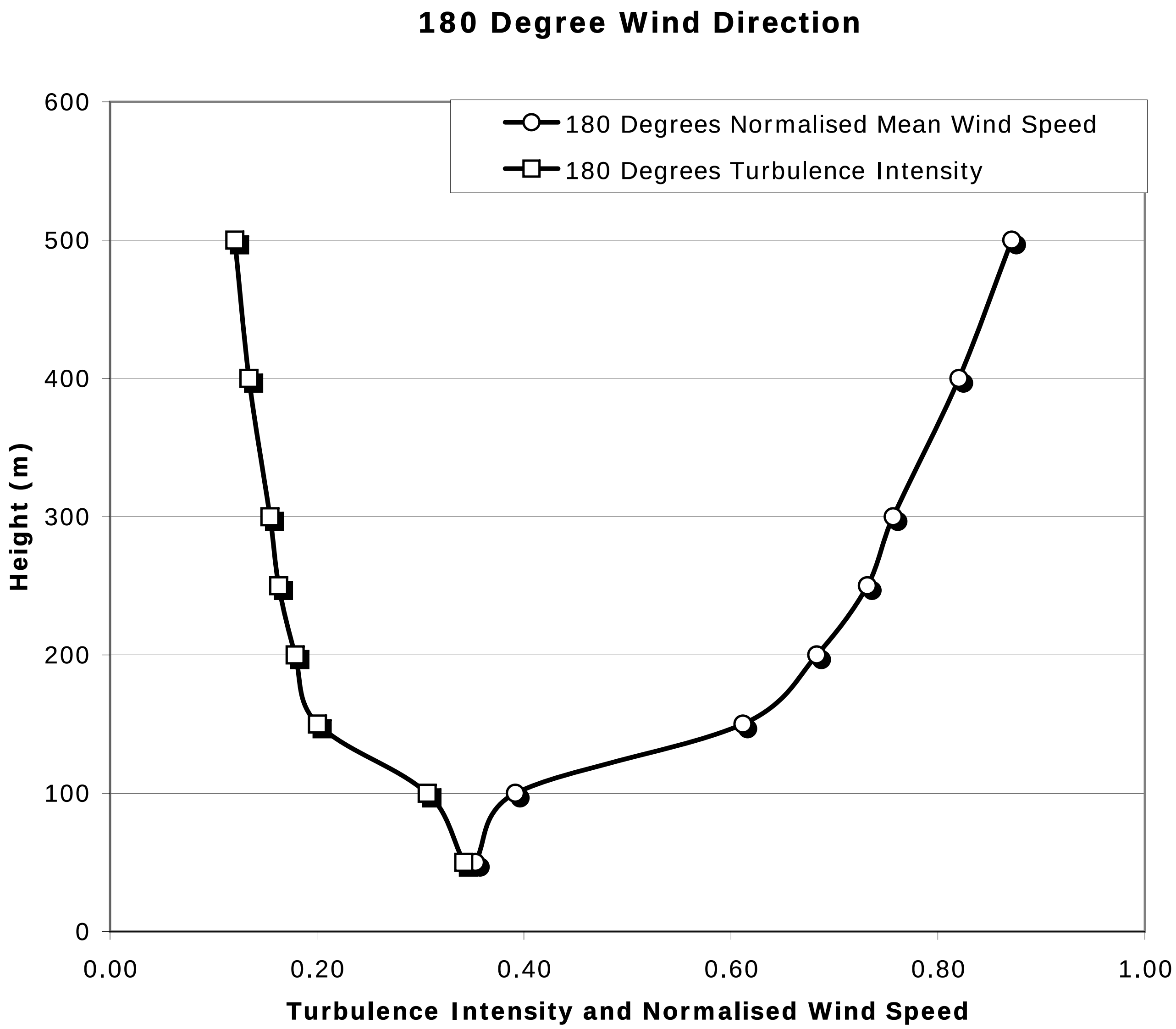
112.5 Degree Wind Direction



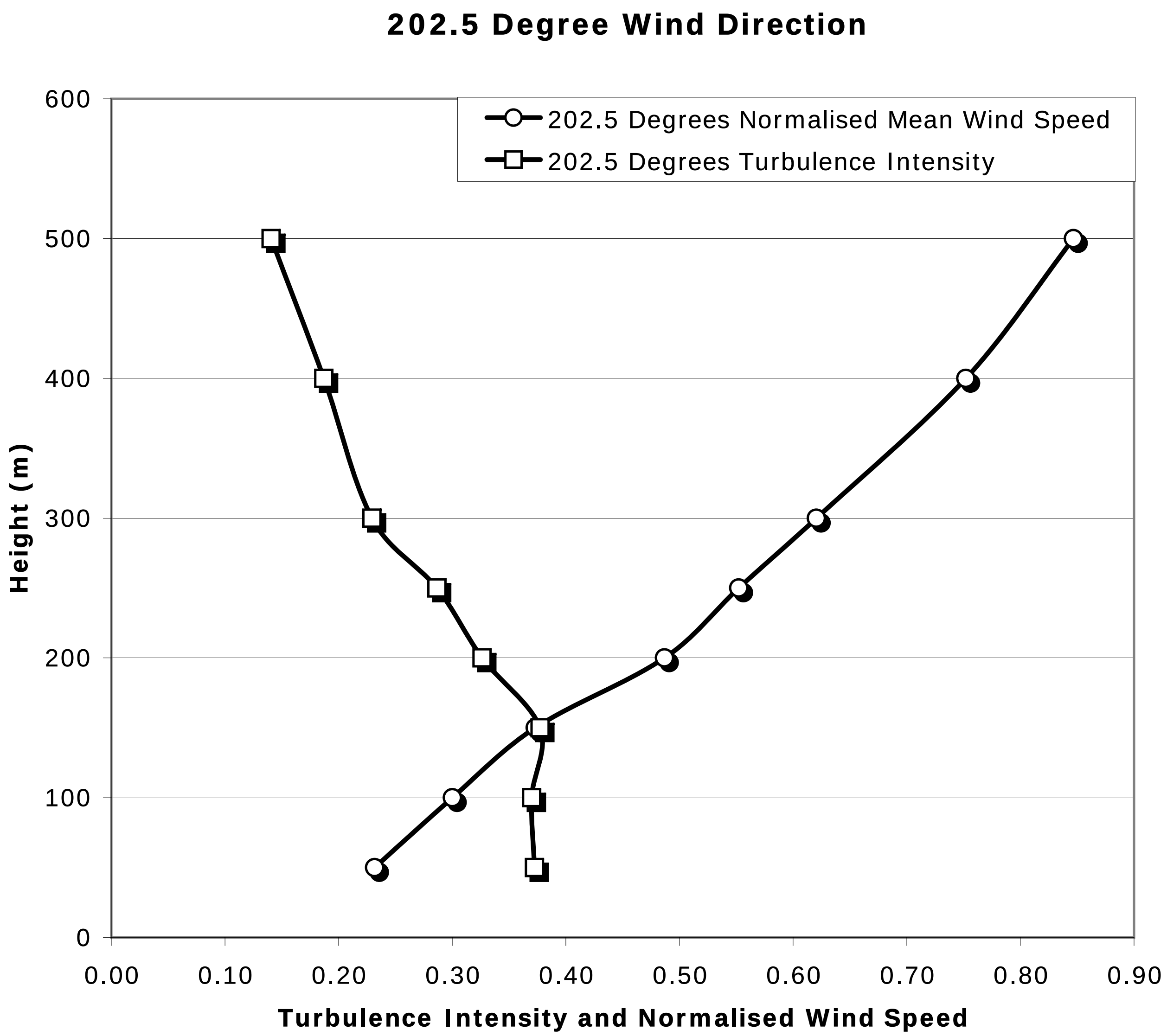

135 Degree Wind Direction
135 Degrees Normalised Mean Wind Speed
135 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
Turbulence Intensity and Normalised Wind Speed

157.5 Degree Wind Direction

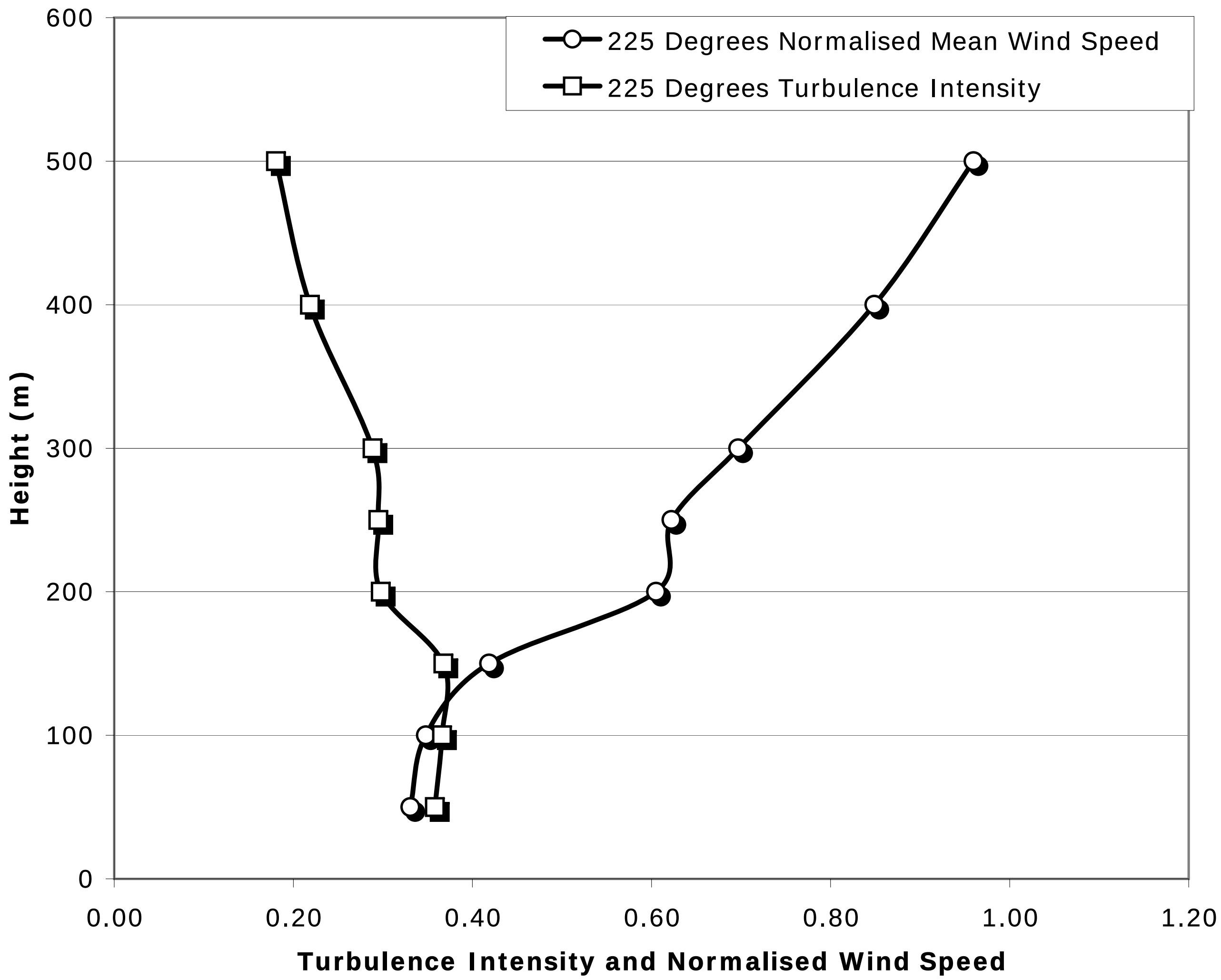




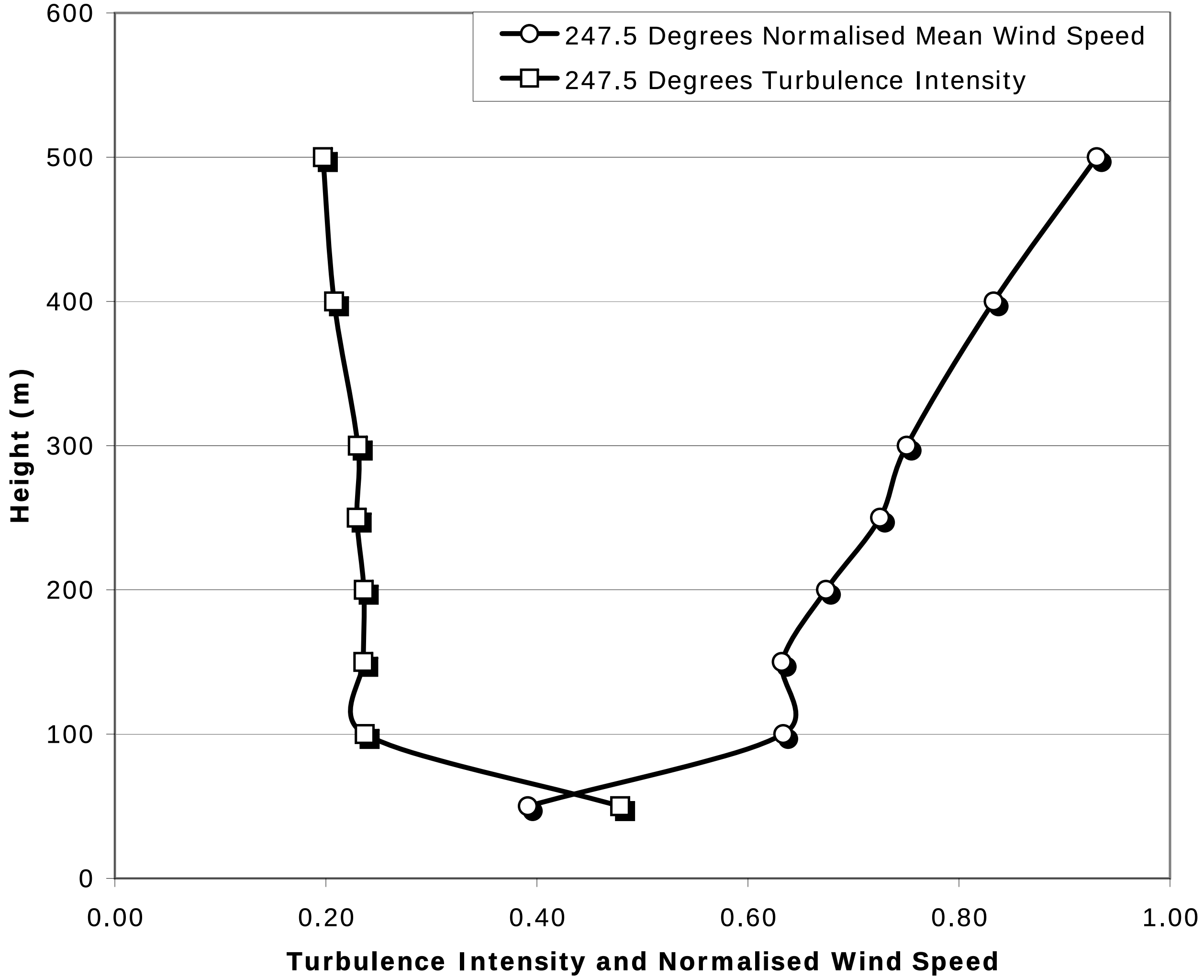
180 Degree Wind Direction
180 Degrees Normalised Mean Wind Speed
180 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
Turbulence Intensity and Normalised Wind Speed

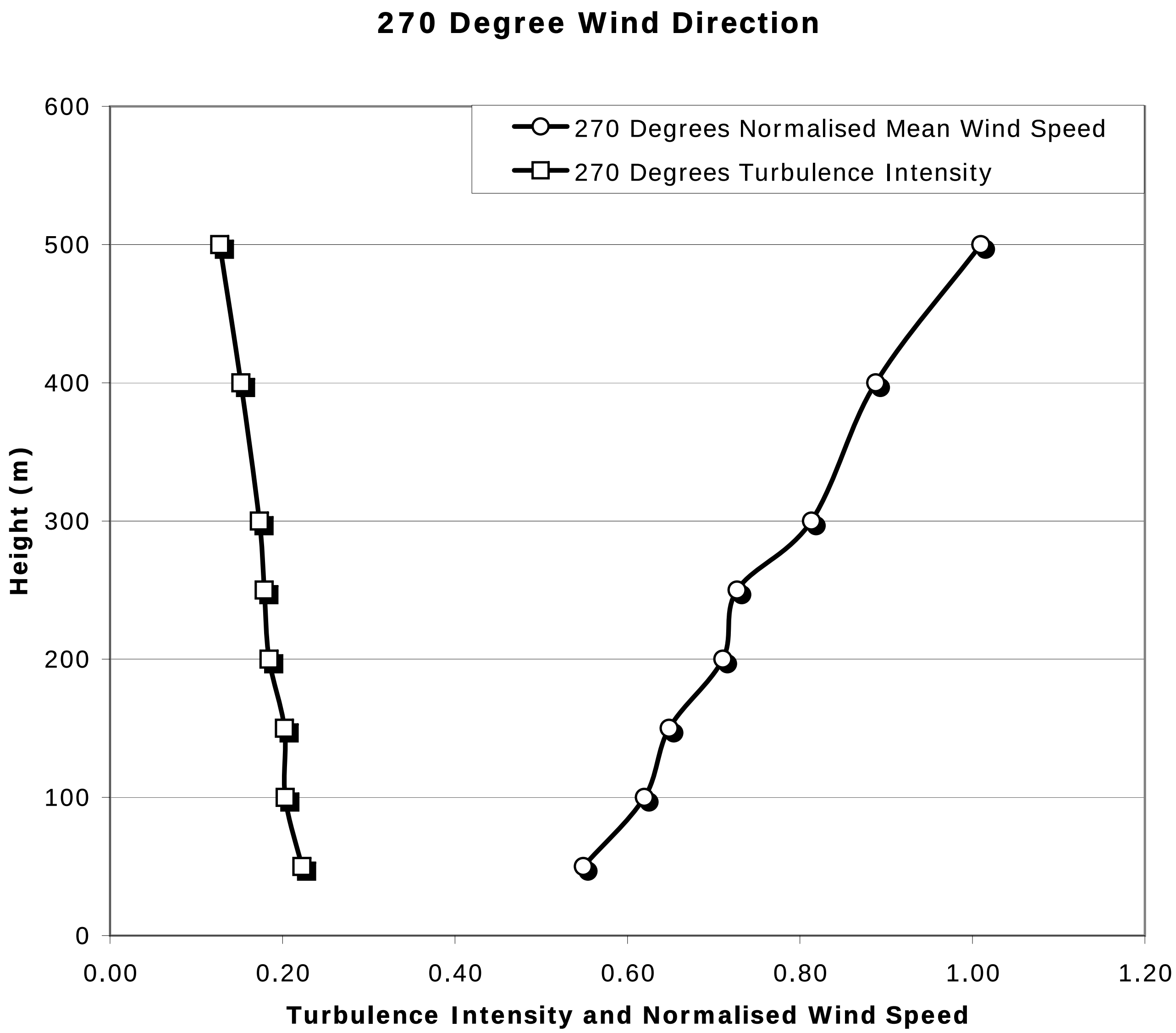

202.5 Degree Wind Direction
202.5 Degrees Normalised Mean Wind Speed
202.5 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
Turbulence Intensity and Normalised Wind Speed

225 Degree Wind Direction

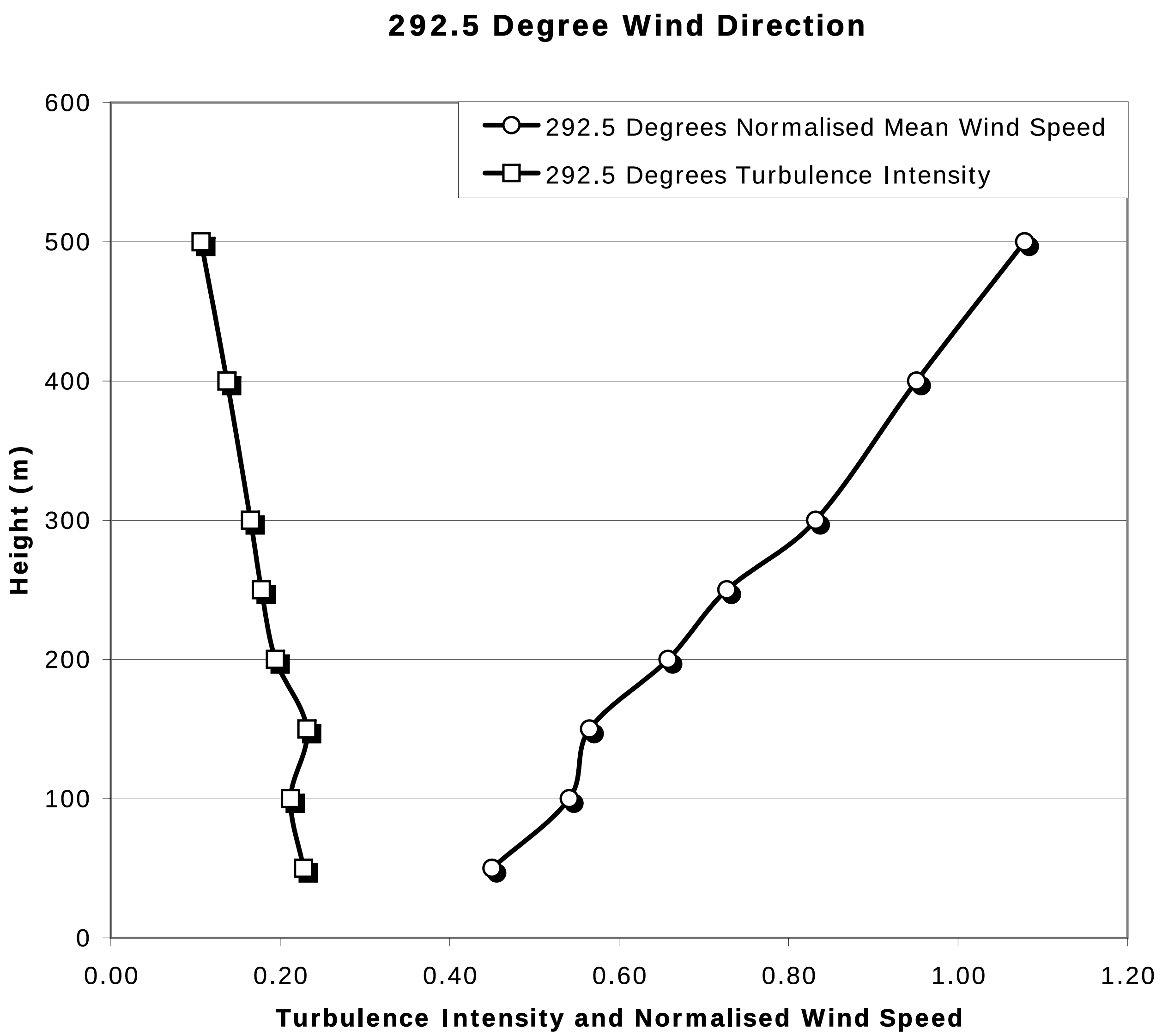


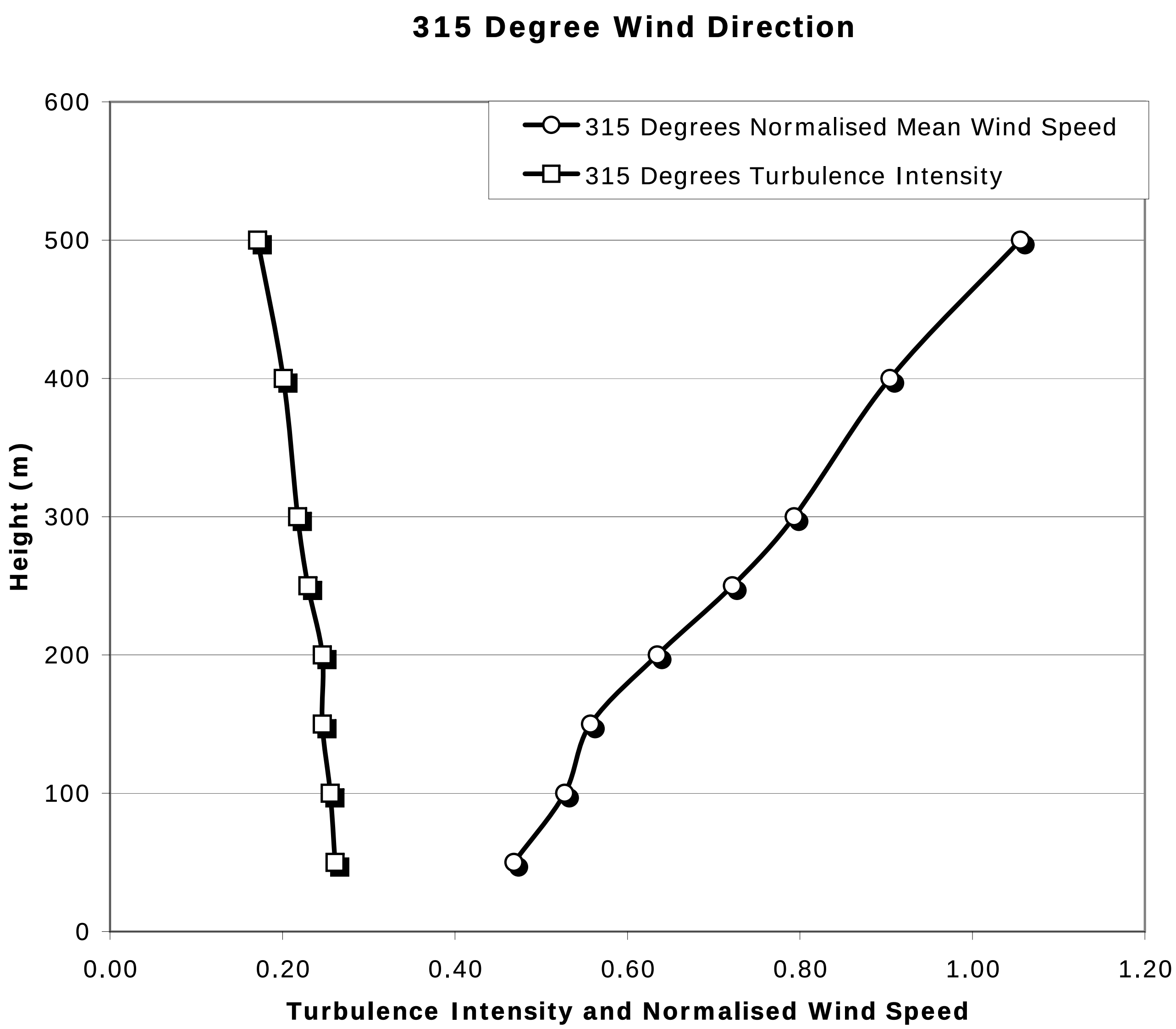
247.5 Degree Wind Direction



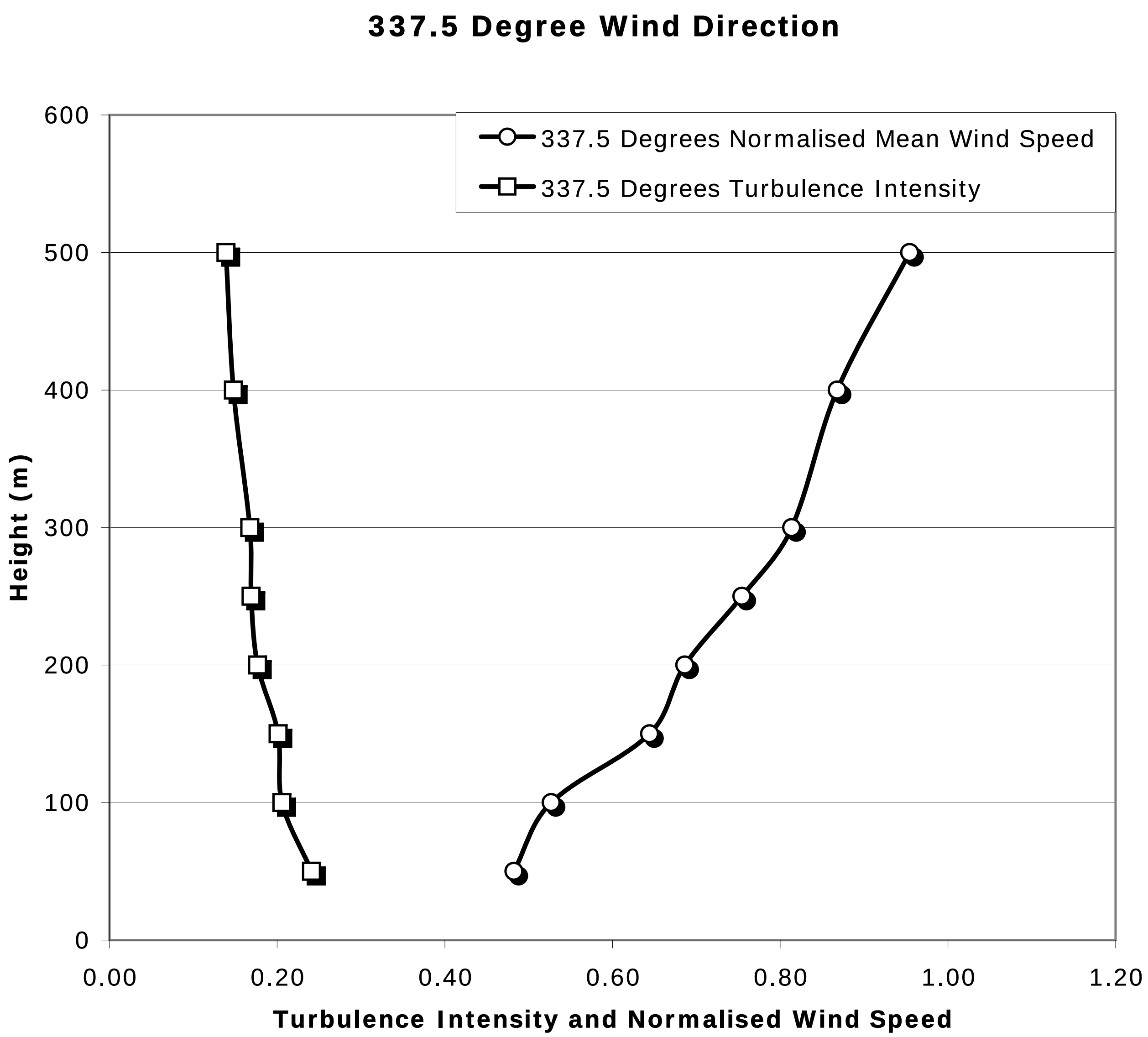


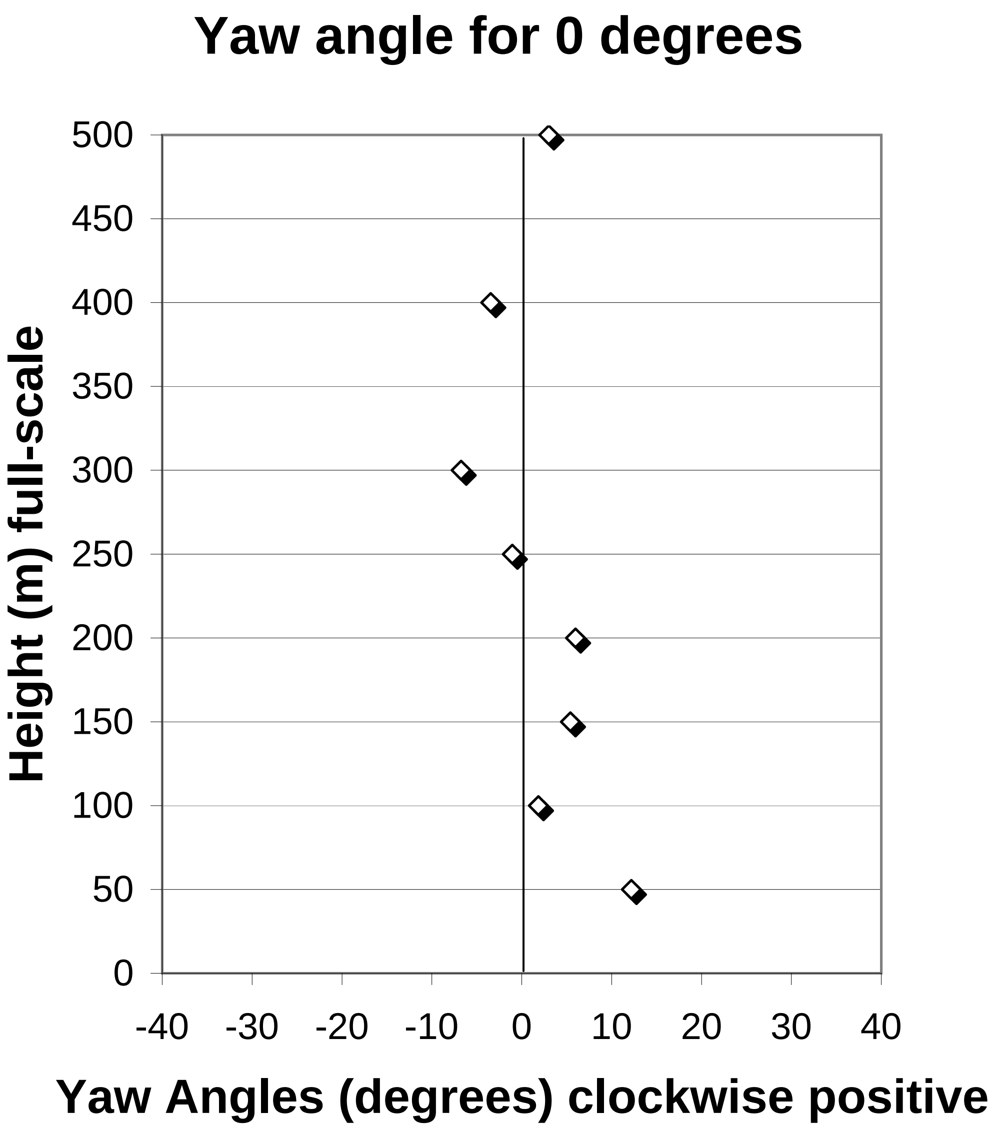
270 Degree Wind Direction
270 Degrees Normalised Mean Wind Speed
270 Degrees Turbulence Intensity
Height (m)
0
100
200
300
400
500
600
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed

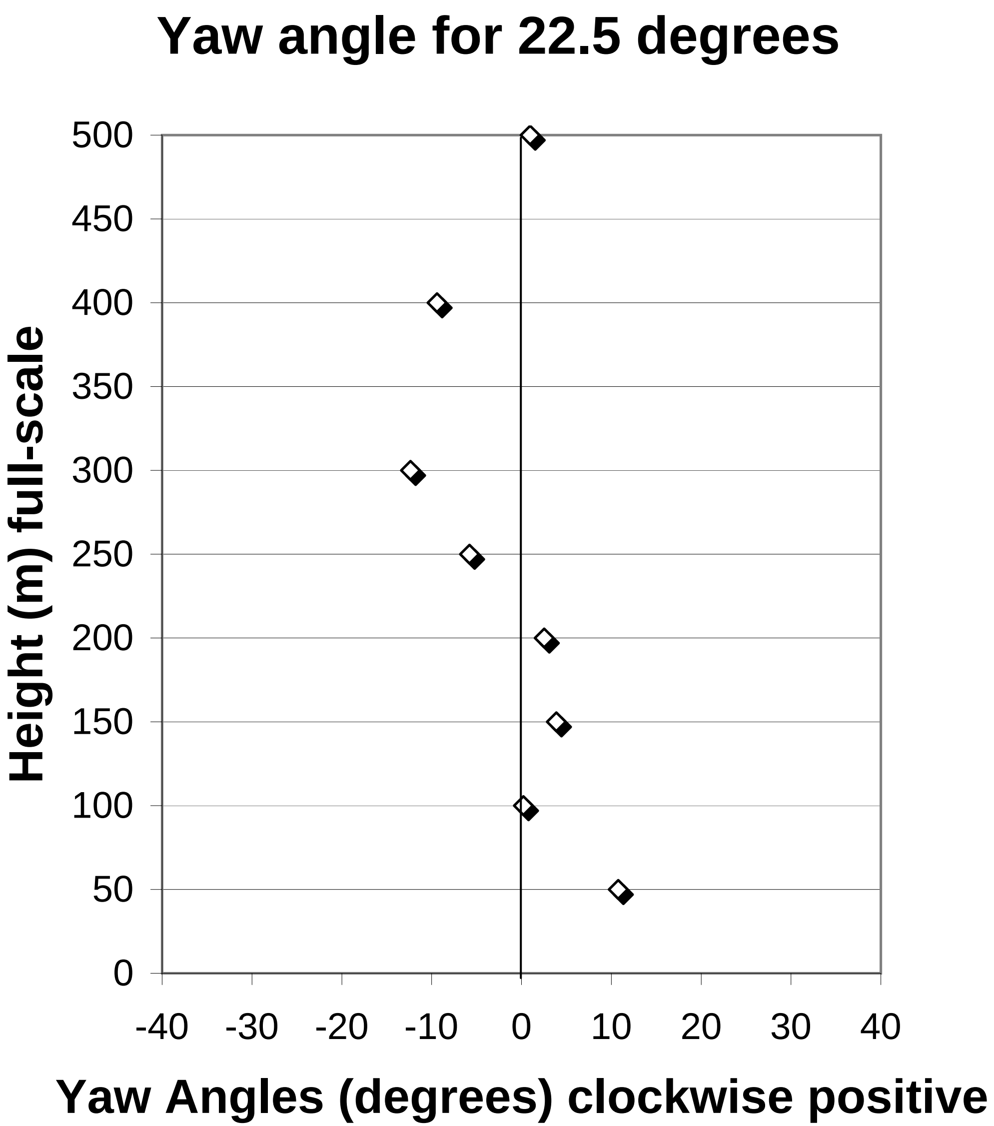

292.5 Degree Wind Direction
292.5 Degrees Normalised Mean Wind Speed
292.5 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed

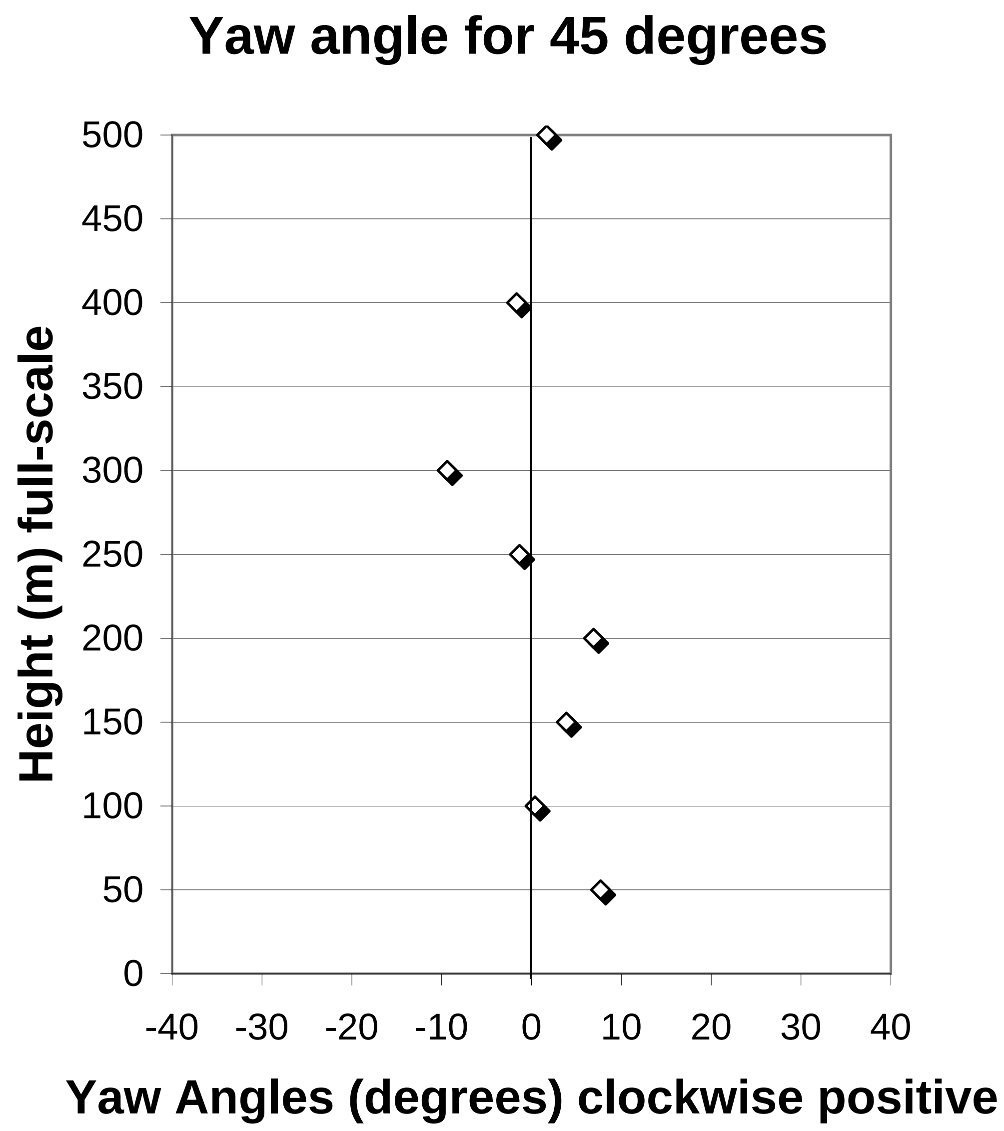


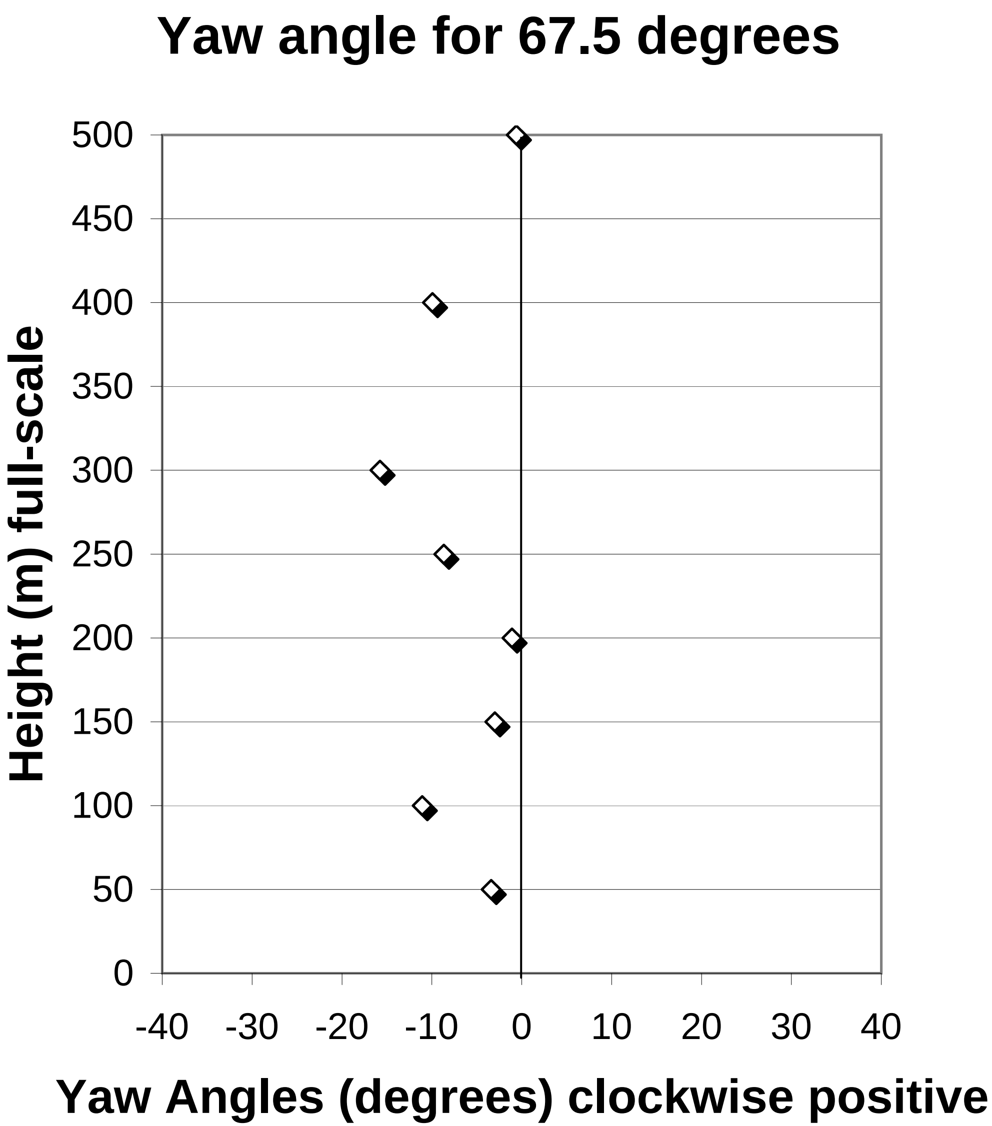
315 Degree Wind Direction
315 Degrees Normalised Mean Wind Speed
315 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed


337.5 Degree Wind Direction
337.5 Degrees Normalised Mean Wind Speed
337.5 Degrees Turbulence Intensity
Height (m)
600
500
400
300
200
100
0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Turbulence Intensity and Normalised Wind Speed

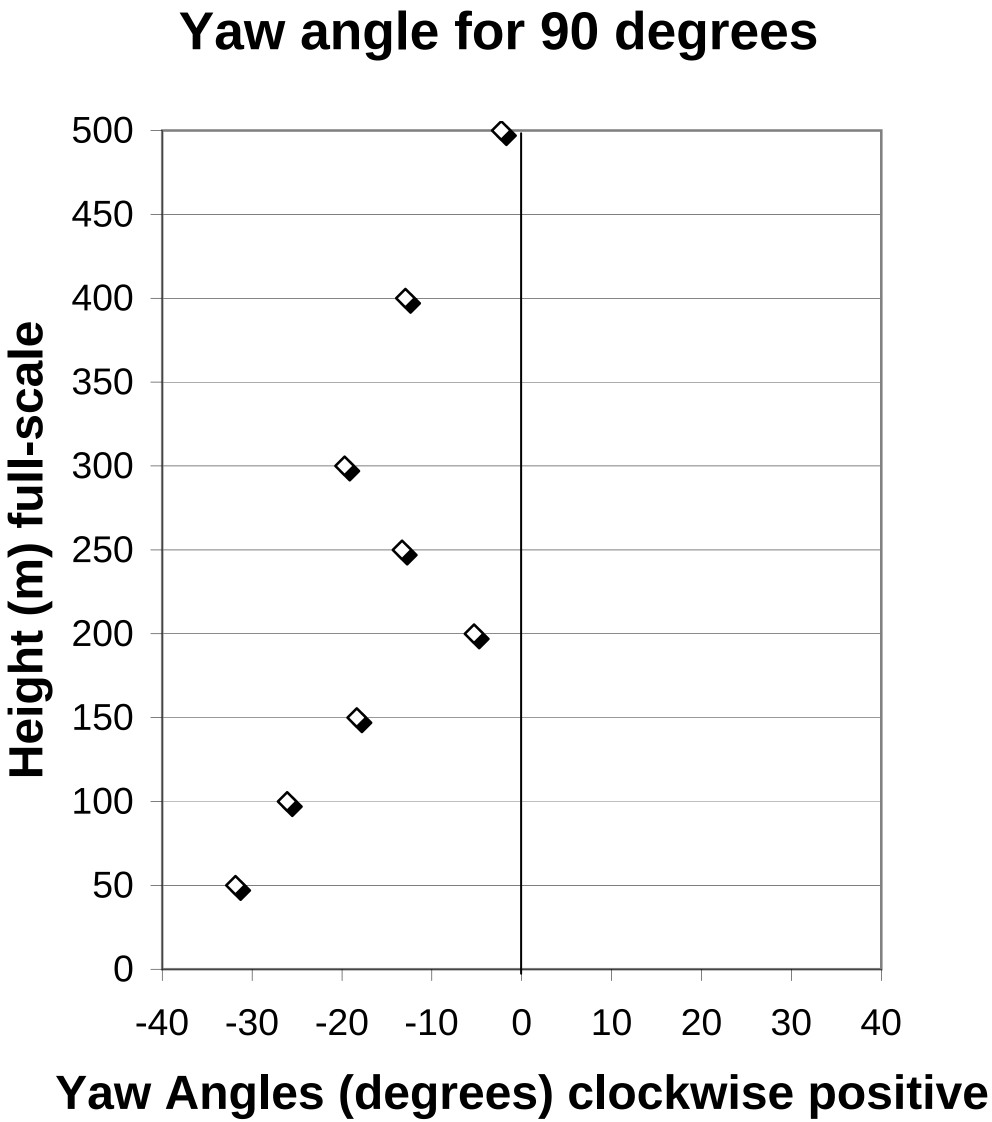

Yaw angle for 0 degrees
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Height (m) full-scale
Yaw Angles (degrees) clockwise positive

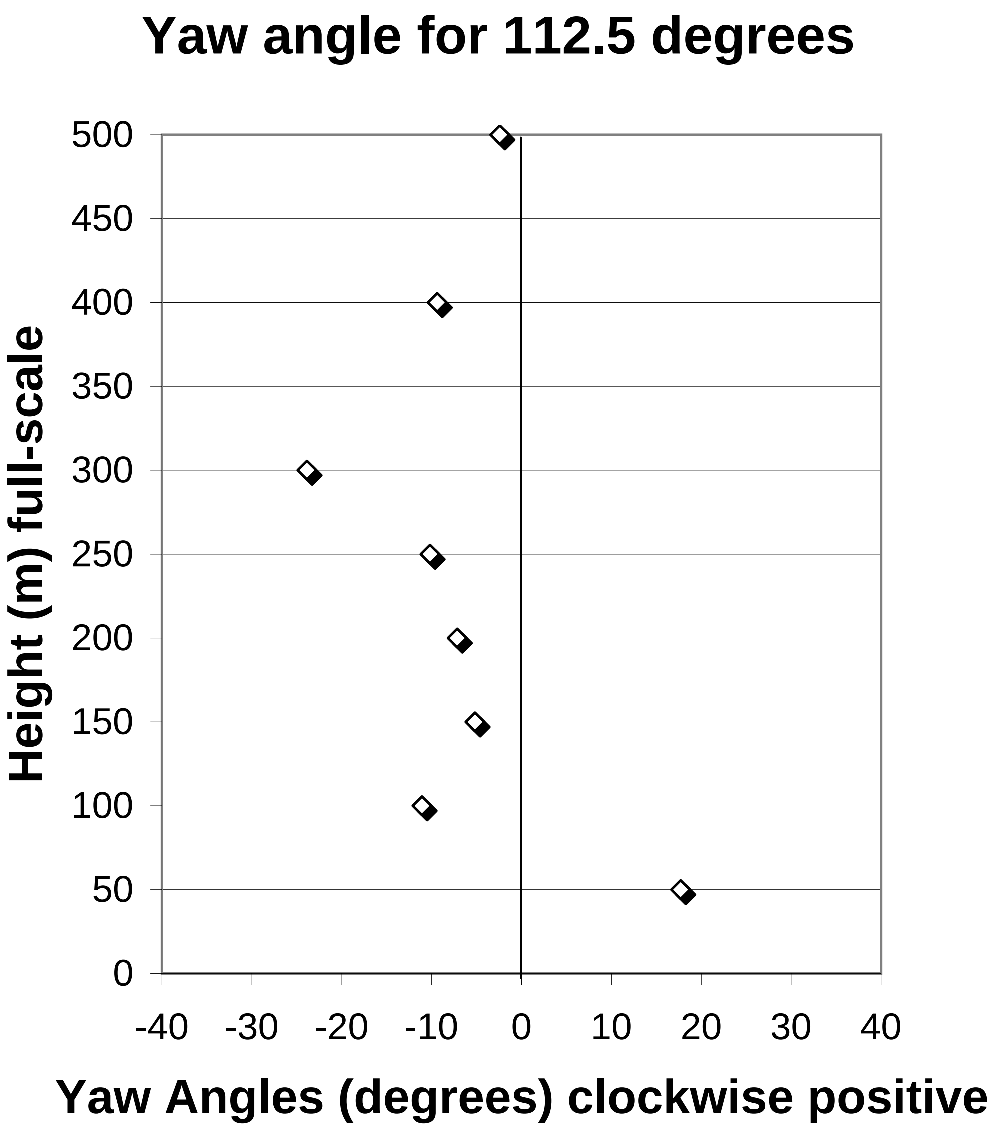

Yaw angle for 22.5 degrees
Height (m) full-scale
0
50
100
150
200
250
300
350
400
450
500
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive


Yaw angle for 45 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

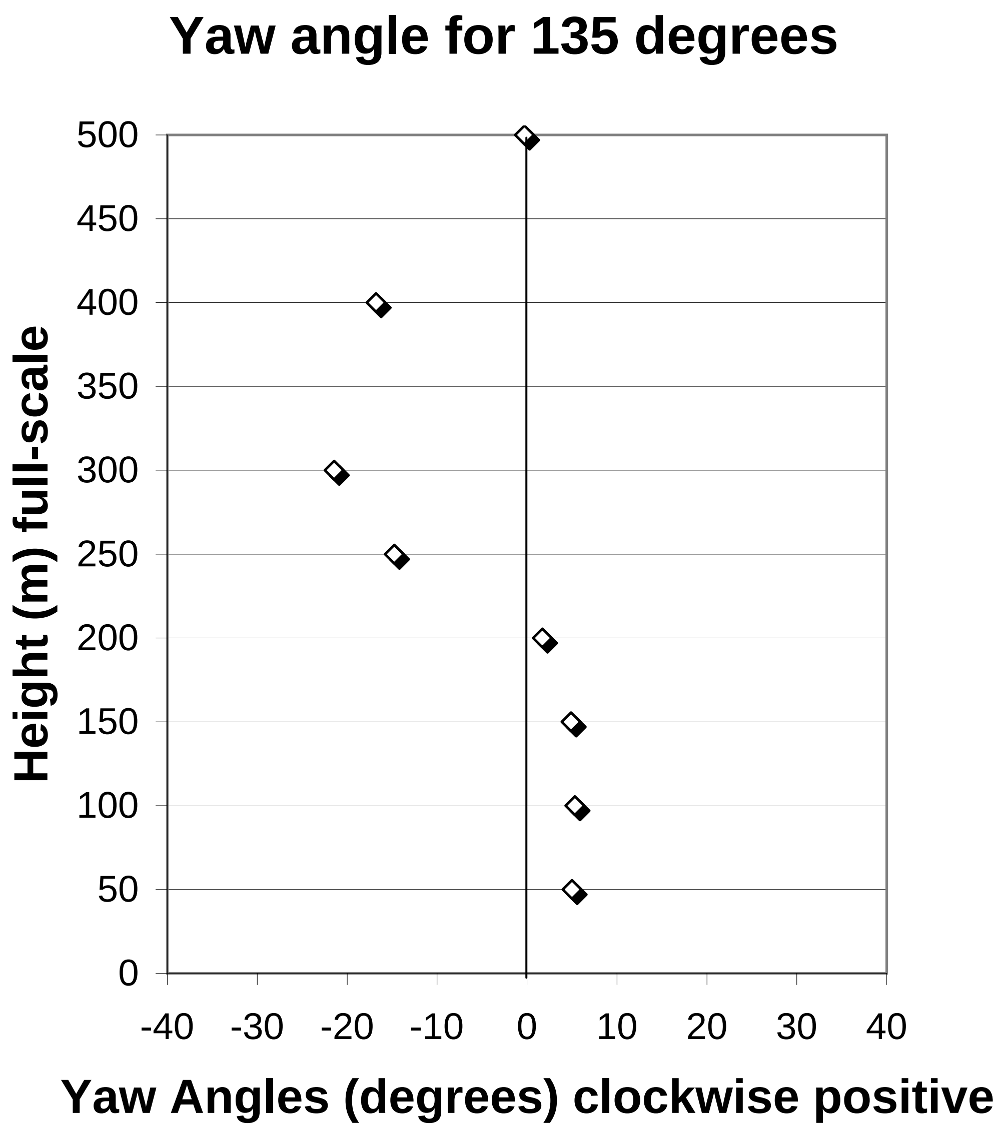


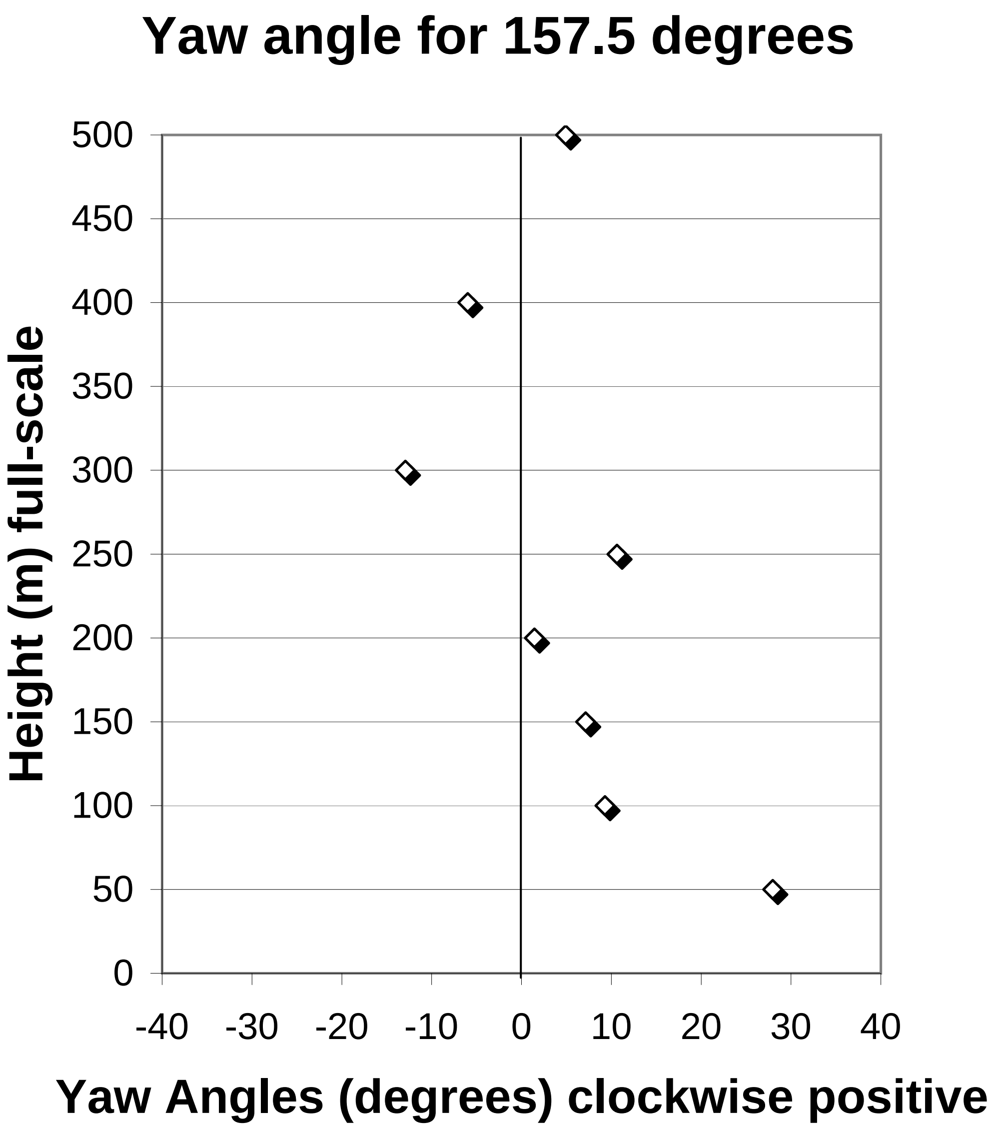
Yaw angle for 67.5 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

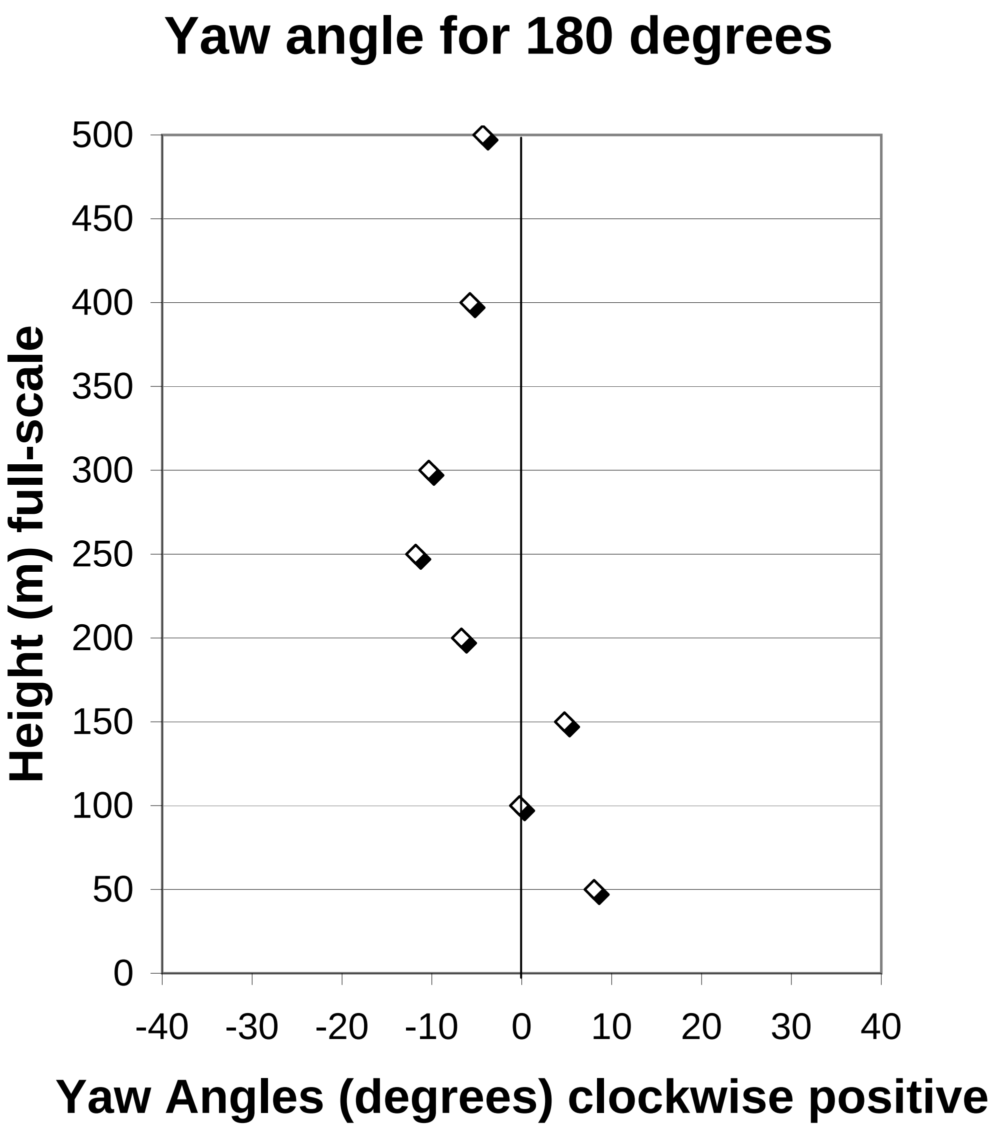

Yaw angle for 90 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive



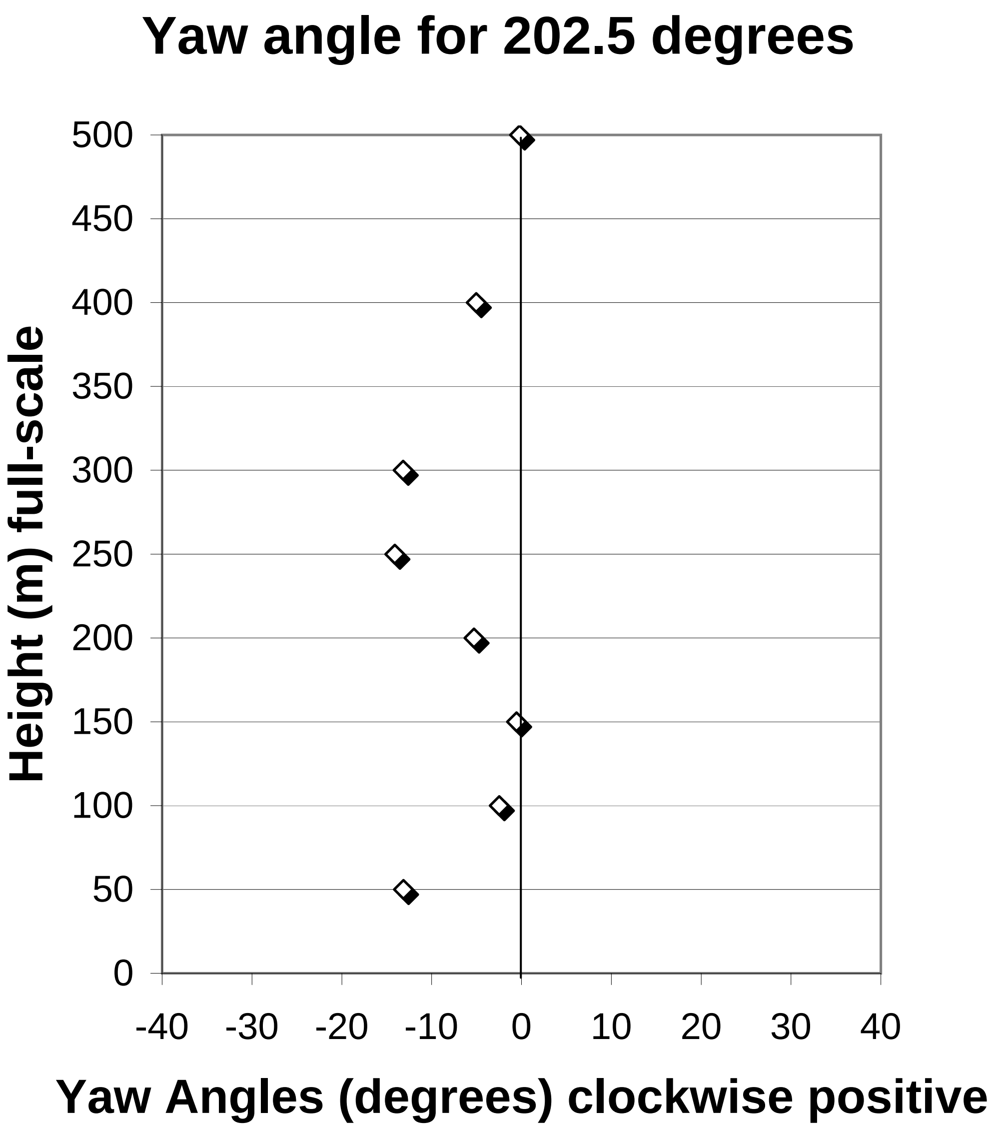
Yaw angle for 112.5 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

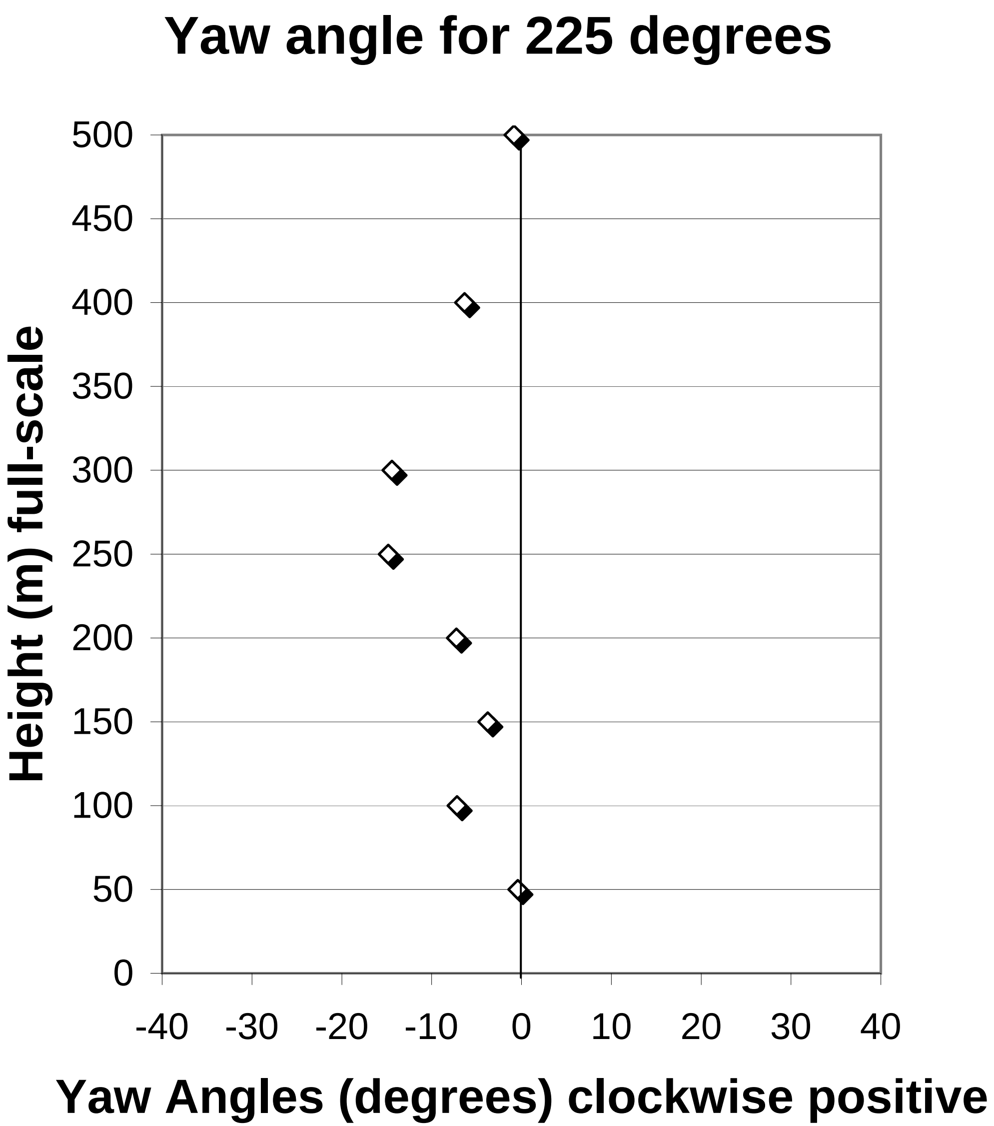

Yaw angle for 135 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

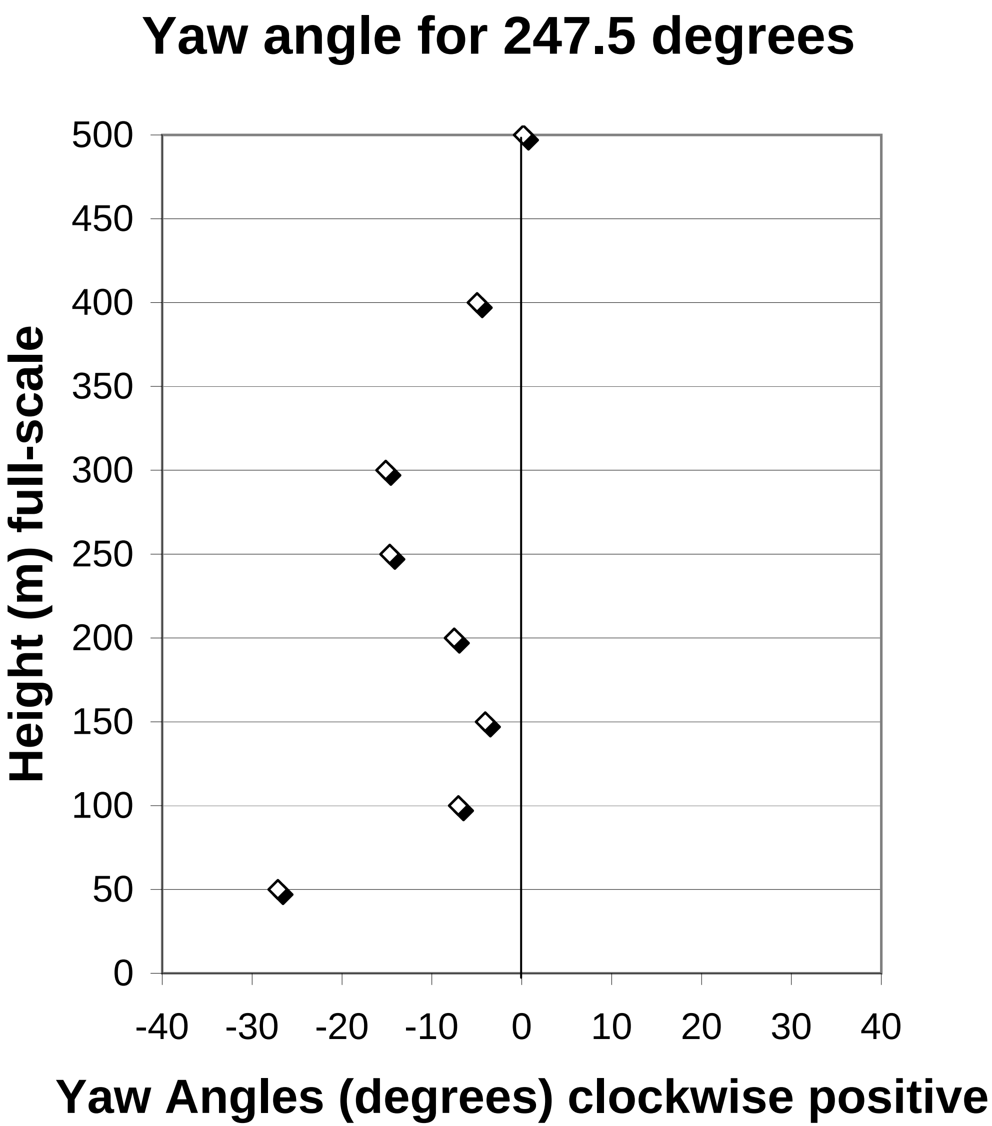

Yaw angle for 157.5 degrees
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Height (m) full-scale
Yaw Angles (degrees) clockwise positive

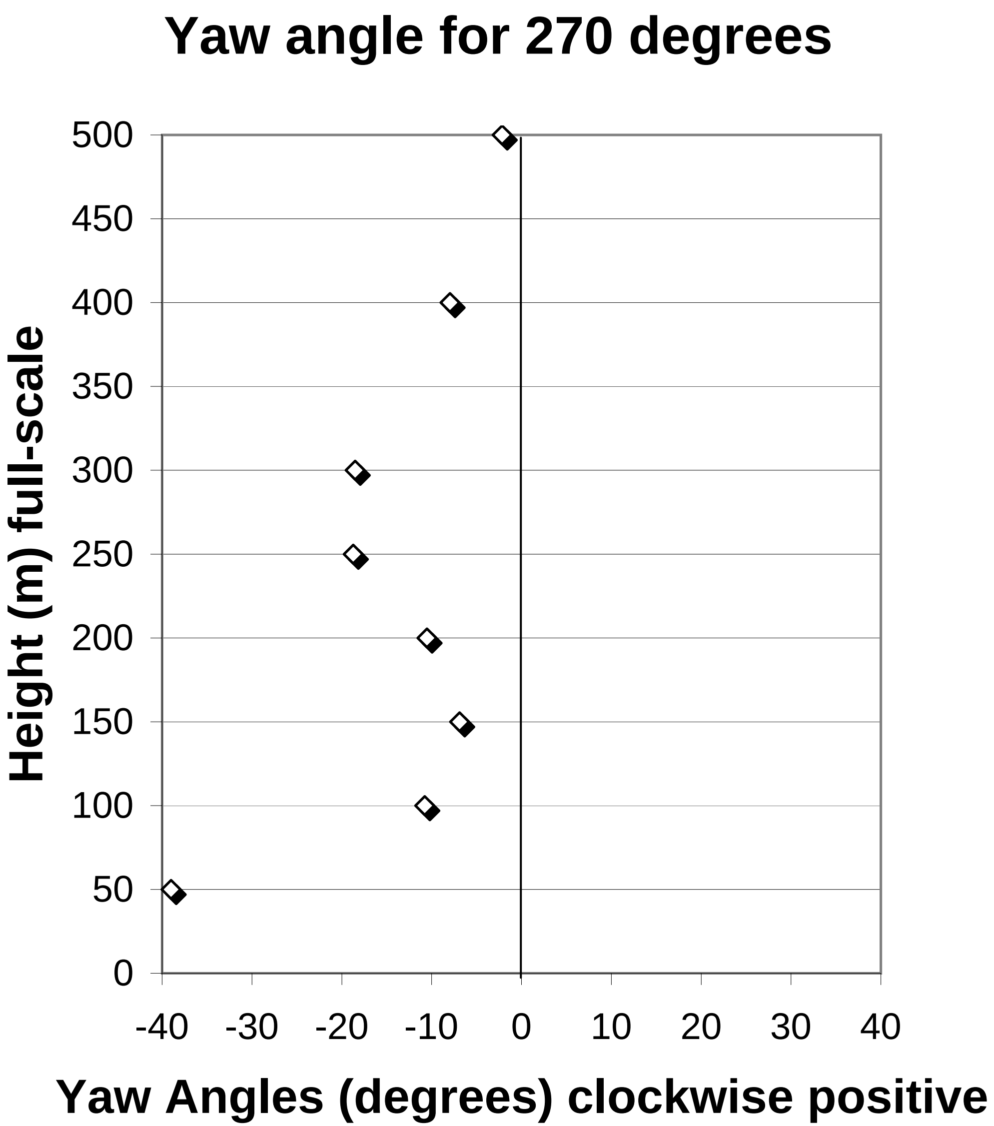


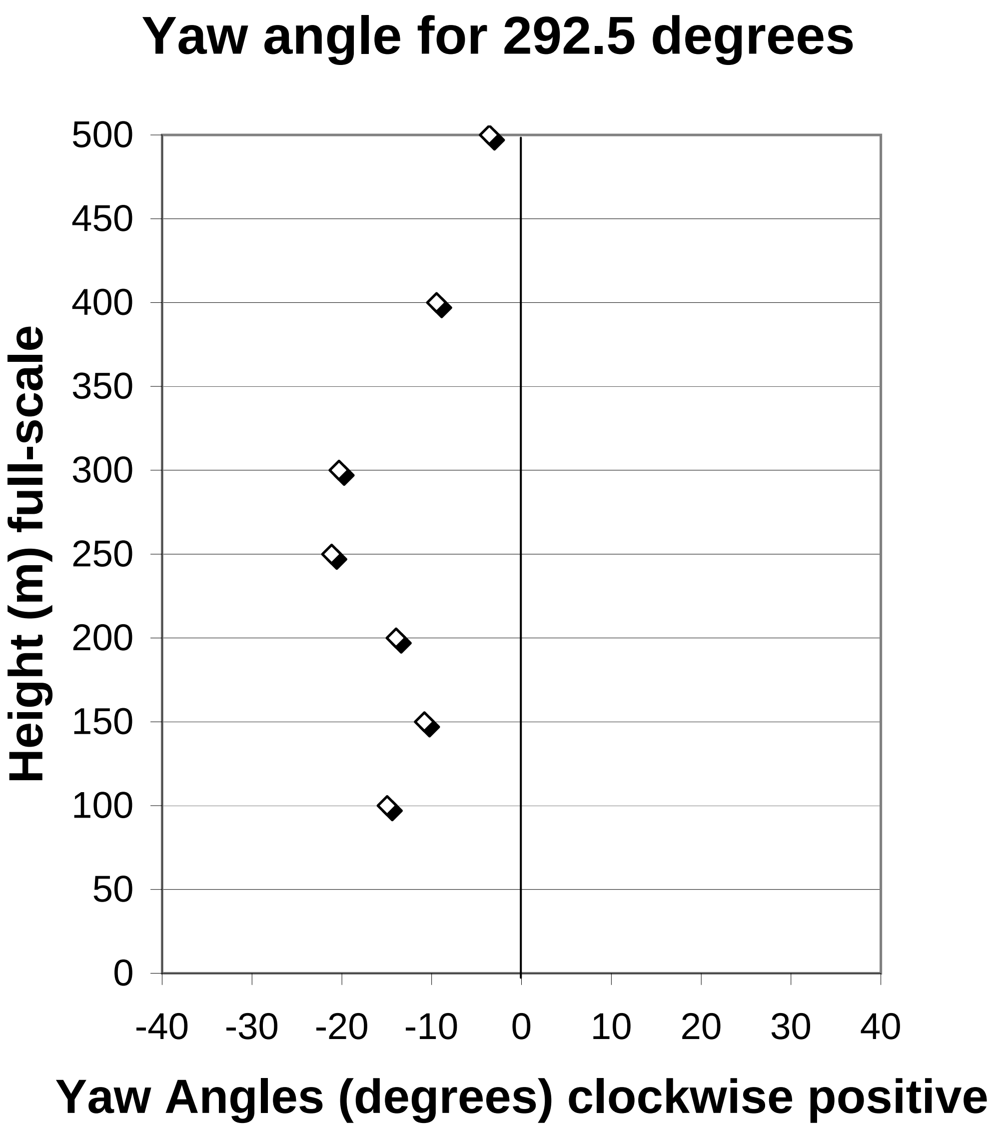
Yaw angle for 180 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive


Yaw angle for 202.5 degrees
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Height (m) full-scale
Yaw Angles (degrees) clockwise positive

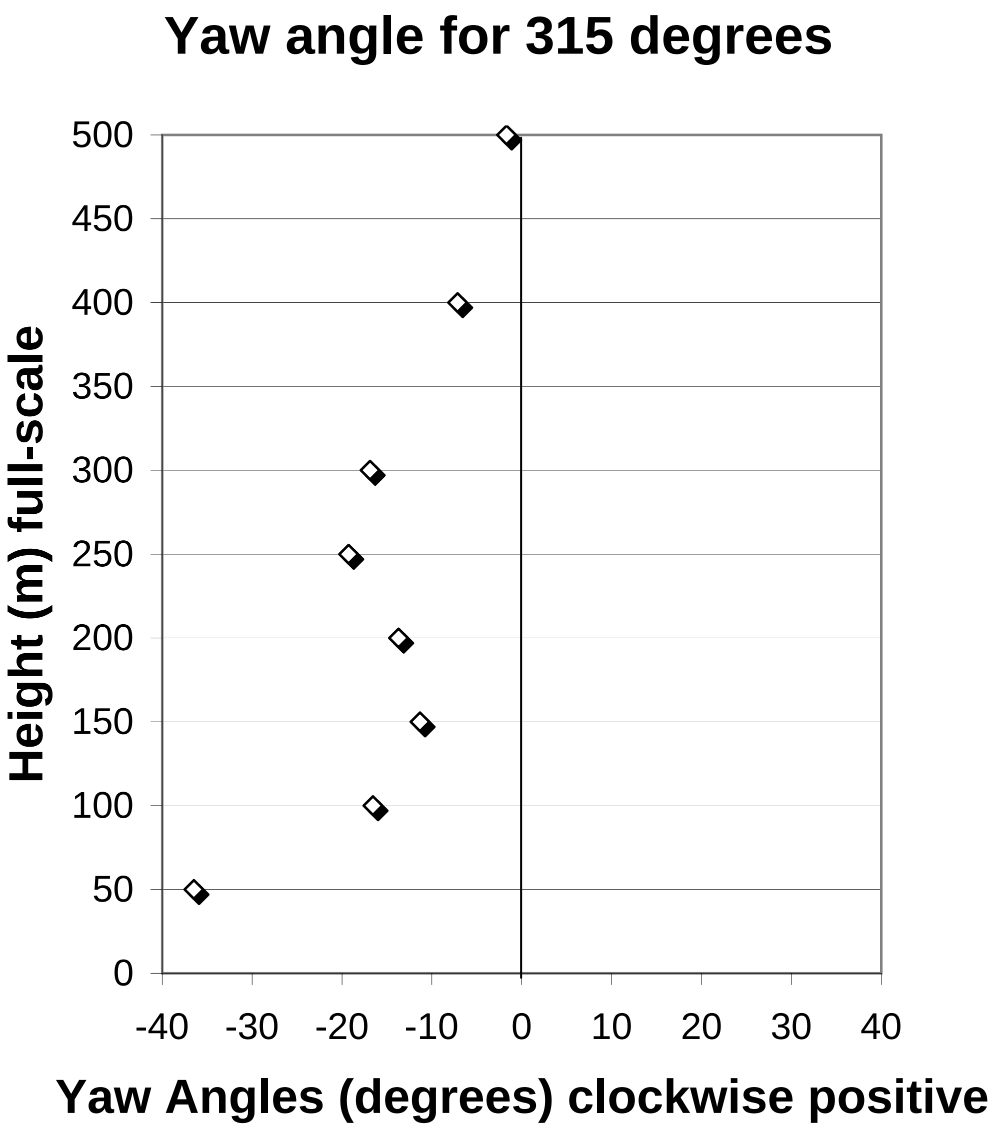

Yaw angle for 225 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

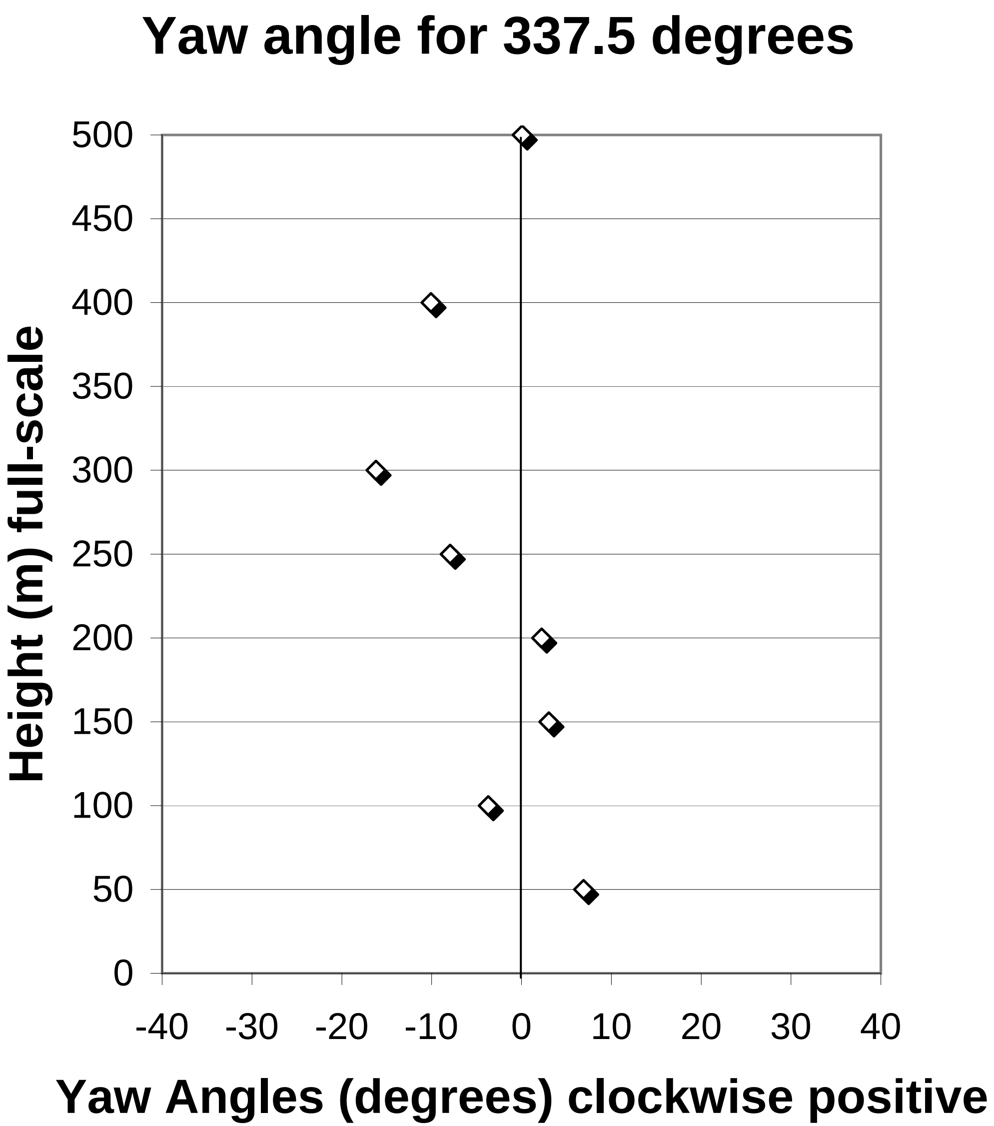

Yaw angle for 247.5 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive


Yaw angle for 270 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive



Yaw angle for 292.5 degrees
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Height (m) full-scale
Yaw Angles (degrees) clockwise positive


Yaw angle for 315 degrees
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Height (m) full-scale
Yaw Angles (degrees) clockwise positive



Yaw angle for 337.5 degrees
Height (m) full-scale
500
450
400
350
300
250
200
150
100
50
0
-40
-30
-20
-10
0
10
20
30
40
Yaw Angles (degrees) clockwise positive

Appendix III

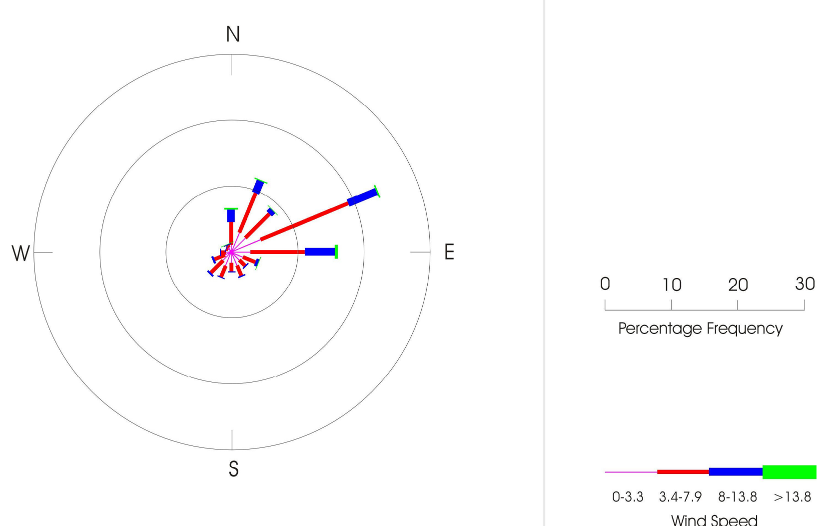
Result of Frequency of Wind for the Oil Street Site

APPENDIX III
WIND SPEED FREQUENCY TABLES & WIND ROSE FOR OIL STREET SITE

Table 1: Percentage occurrence of directional winds at 200m (with the effect of Yaw Angle)

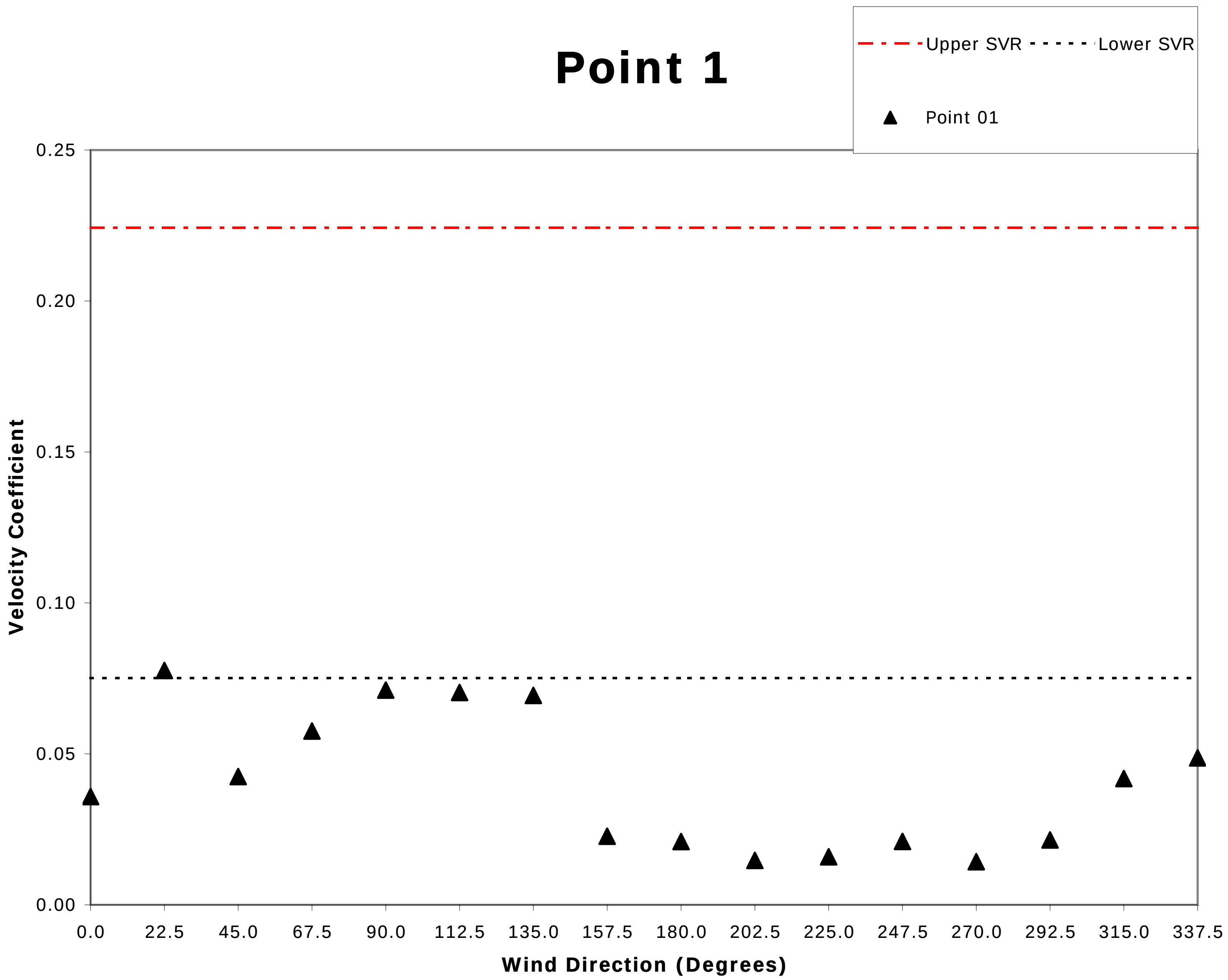
Wind Angle (°)	Percentage Occurrence (%) for wind speed ranges:				
	0-3.3 m/s	3.4-7.9 m/s	8.0-13.8 m/s	>13.8 m/s	Total
0	1.2%	3.6%	2.0%	0.2%	6.9%
22.5	3.3%	6.7%	2.1%	0.1%	12.2%
45	3.1%	5.3%	0.7%	0.0%	9.1%
67.5	5.0%	14.9%	4.9%	0.2%	24.9%
90	3.0%	8.4%	4.7%	0.4%	16.5%
112.5	2.0%	2.0%	0.4%	0.0%	4.5%
135	1.8%	1.2%	0.2%	0.0%	3.2%
157.5	2.2%	1.6%	0.2%	0.0%	4.0%
180	1.6%	1.3%	0.1%	0.0%	3.0%
202.5	2.2%	1.9%	0.1%	0.0%	4.2%
225	1.7%	2.7%	0.3%	0.0%	4.7%
247.5	1.0%	1.8%	0.3%	0.0%	3.1%
270	0.9%	0.7%	0.1%	0.0%	1.7%
292.5	0.6%	0.2%	0.0%	0.0%	0.8%
315	0.2%	0.1%	0.0%	0.0%	0.3%
337.5	0.8%	0.4%	0.1%	0.0%	1.3%

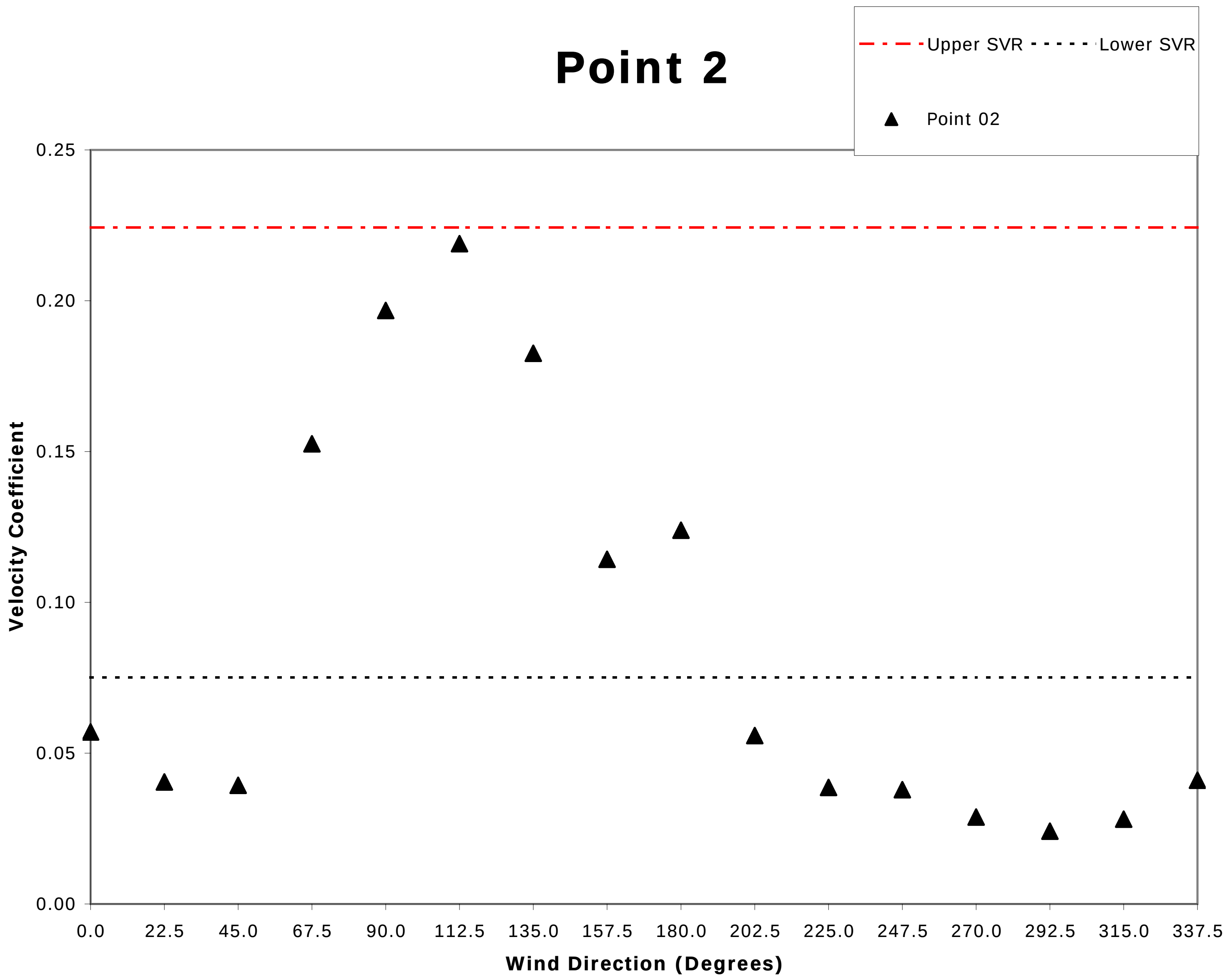
Corresponding wind rose (with the effect of Yaw Angle).



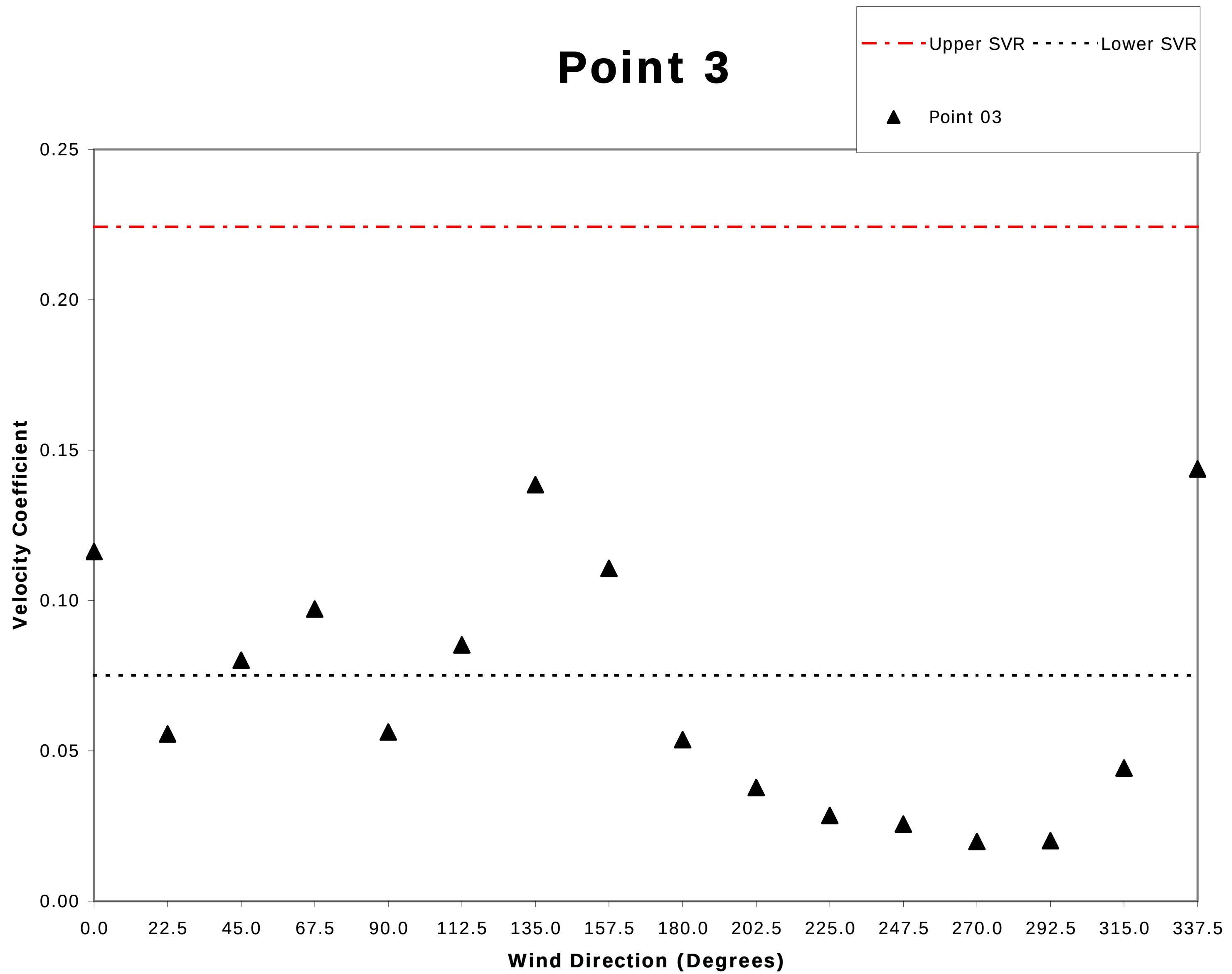
Appendix IV

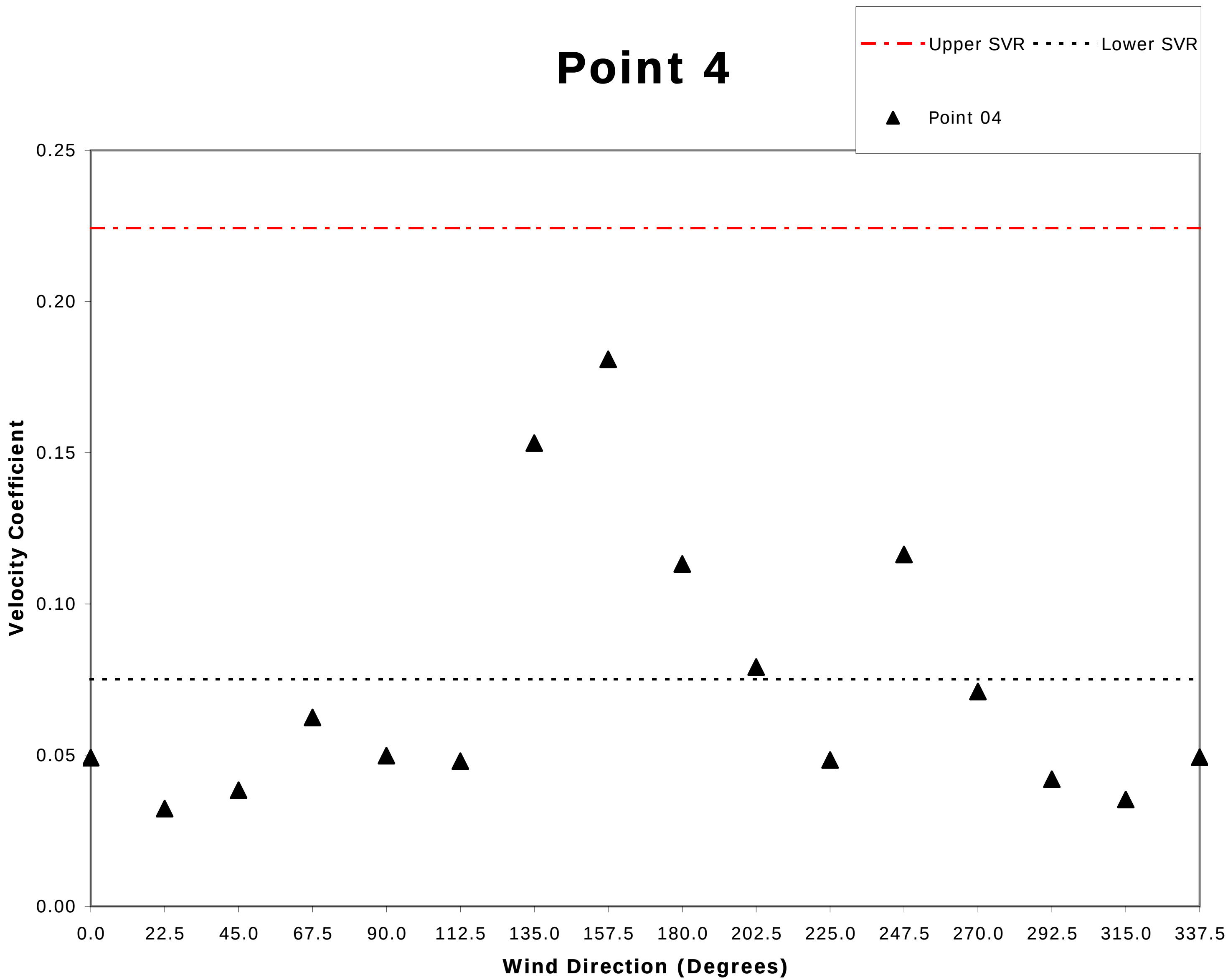
Directional Result at Individual Test Points for the Base Scheme

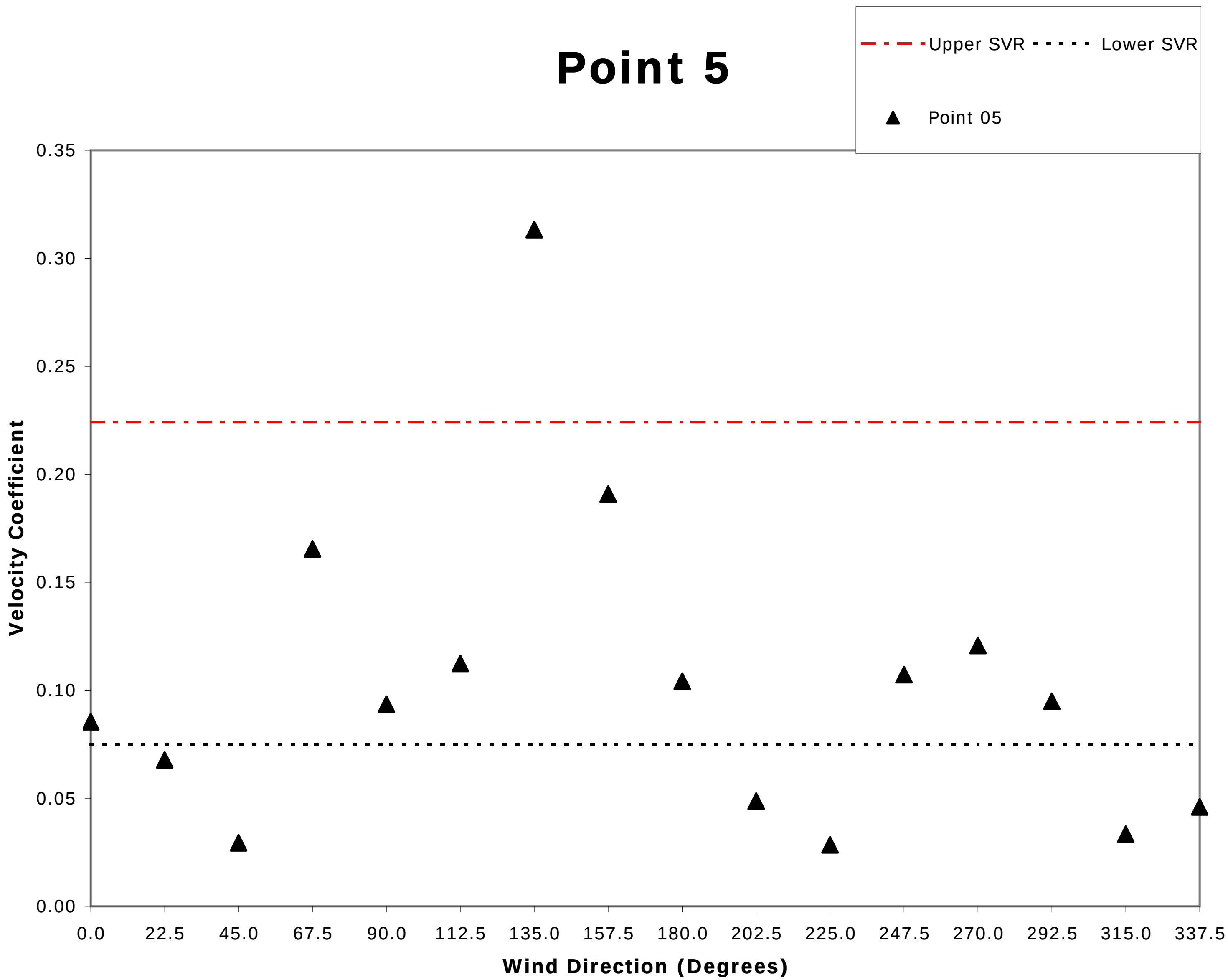

Point 1
Upper SVR
Lower SVR
Point 01
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

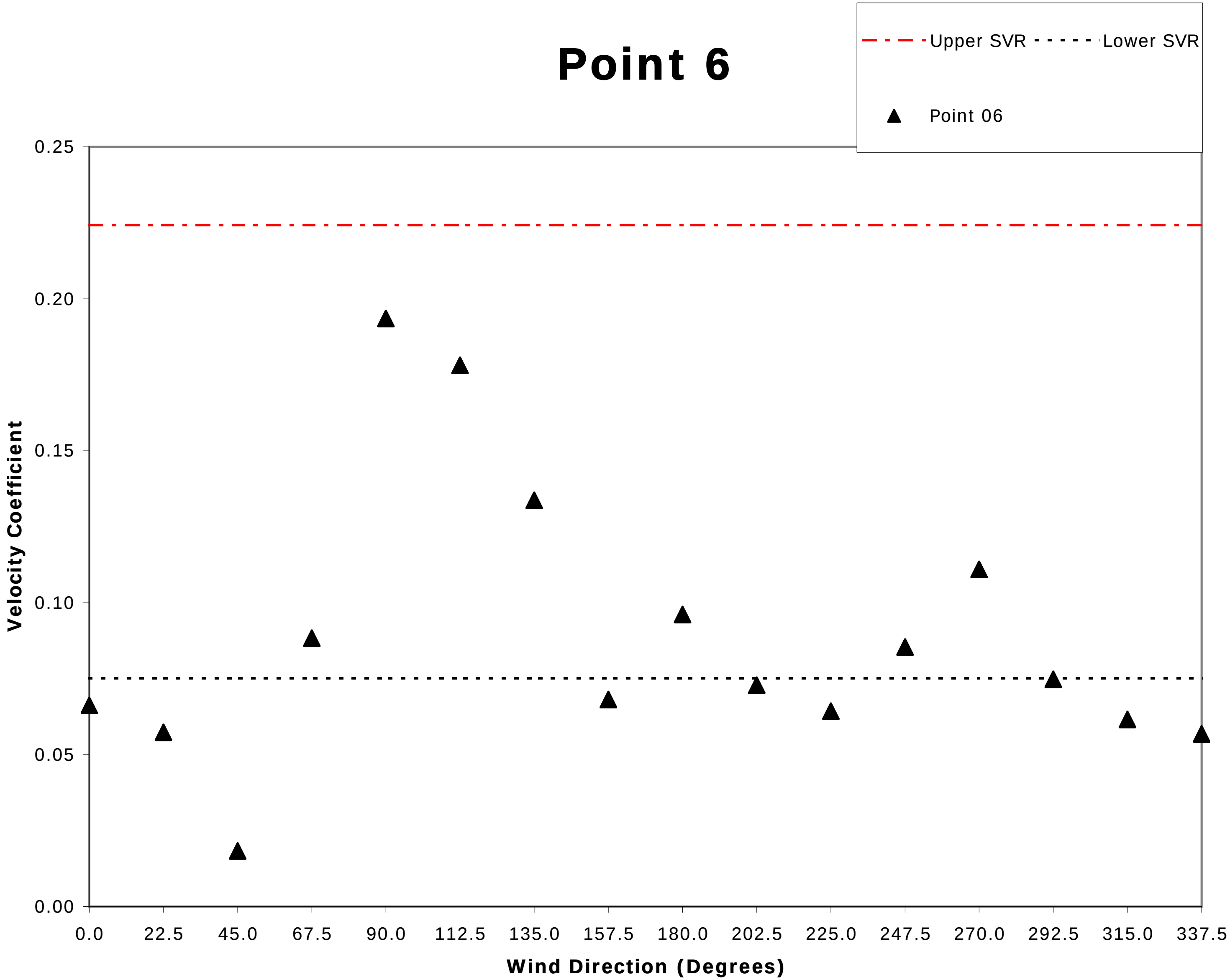


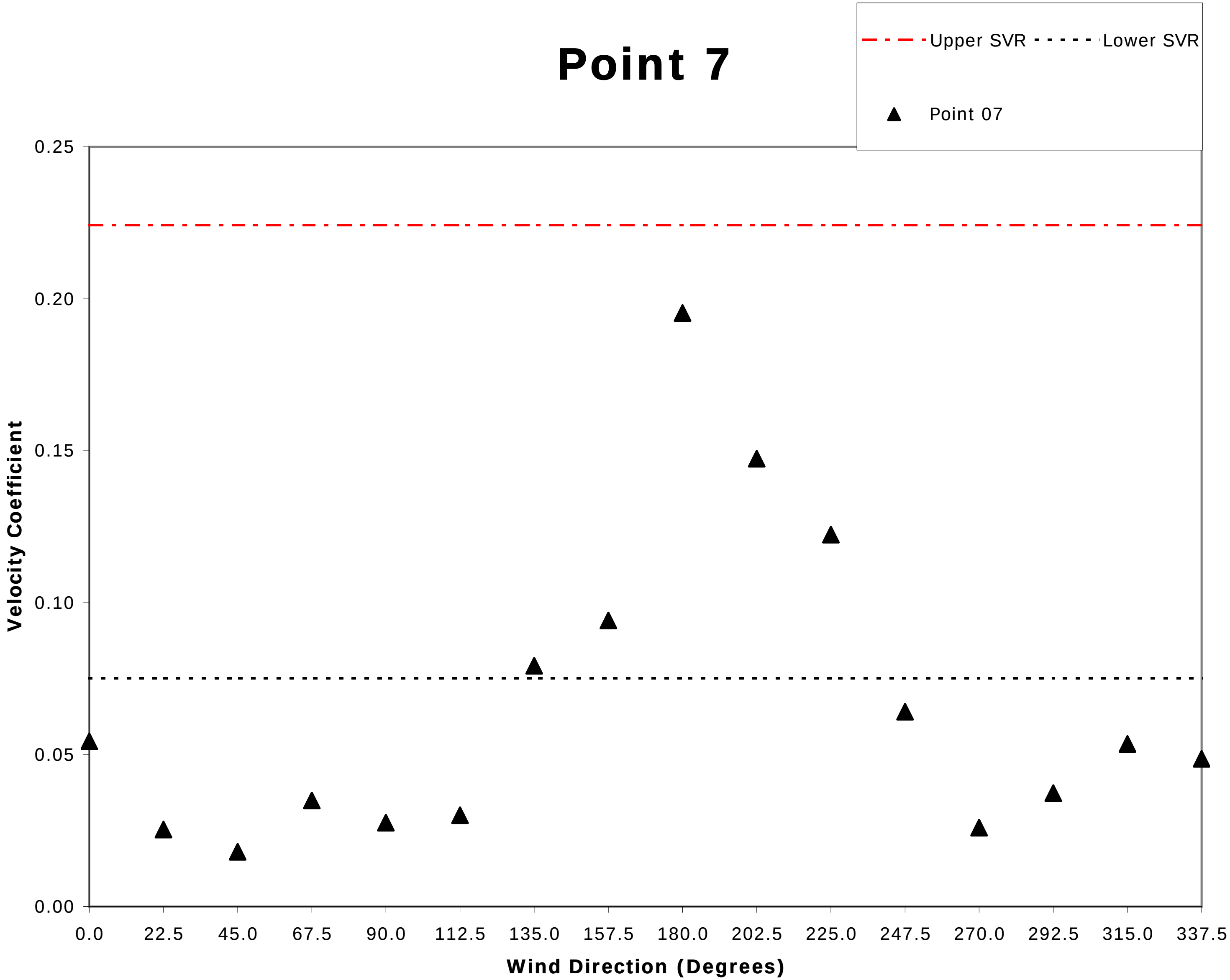
Point 2
Upper SVR
Lower SVR
Point 02
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

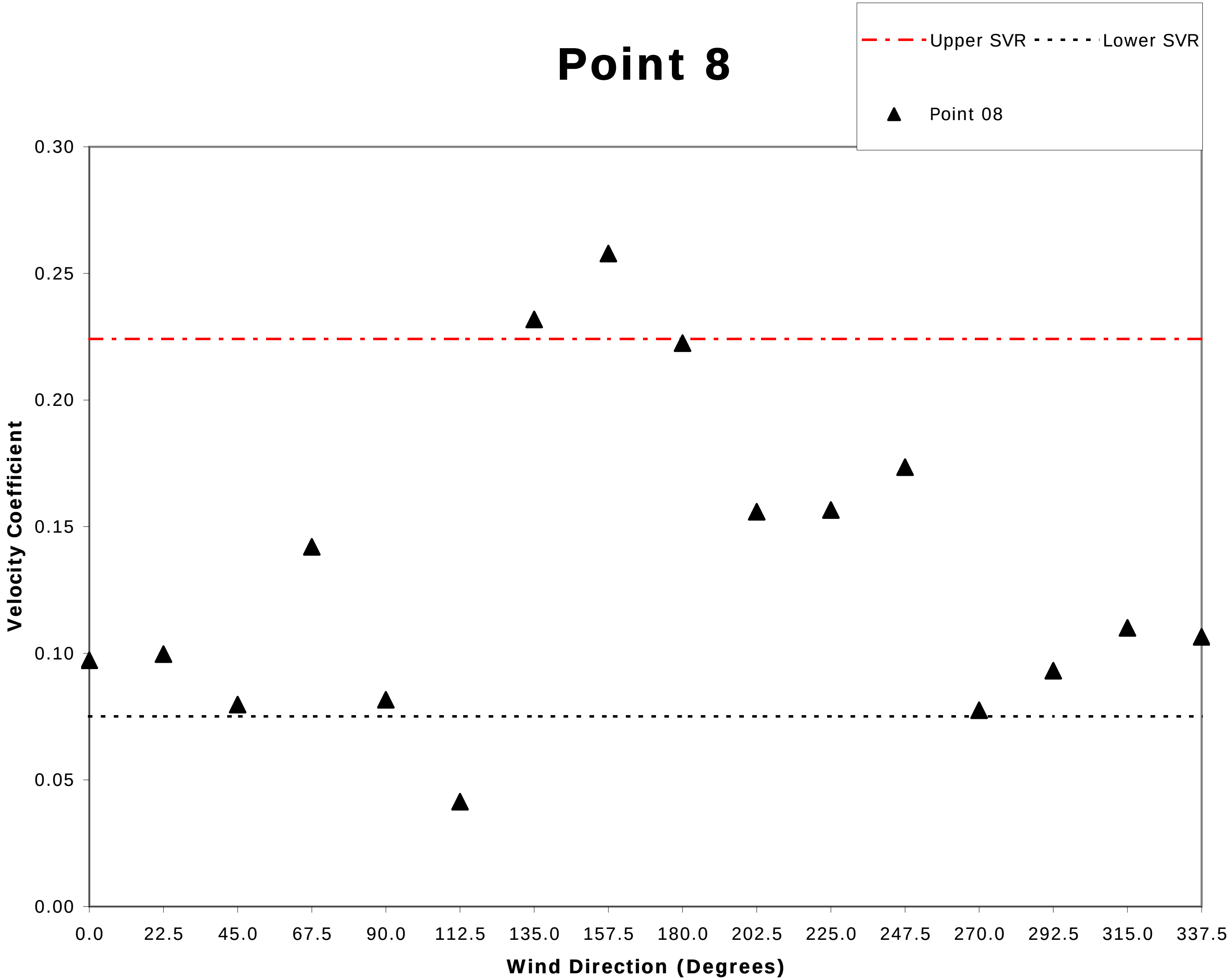

Point 3
Upper SVR
Lower SVR
Point 03
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

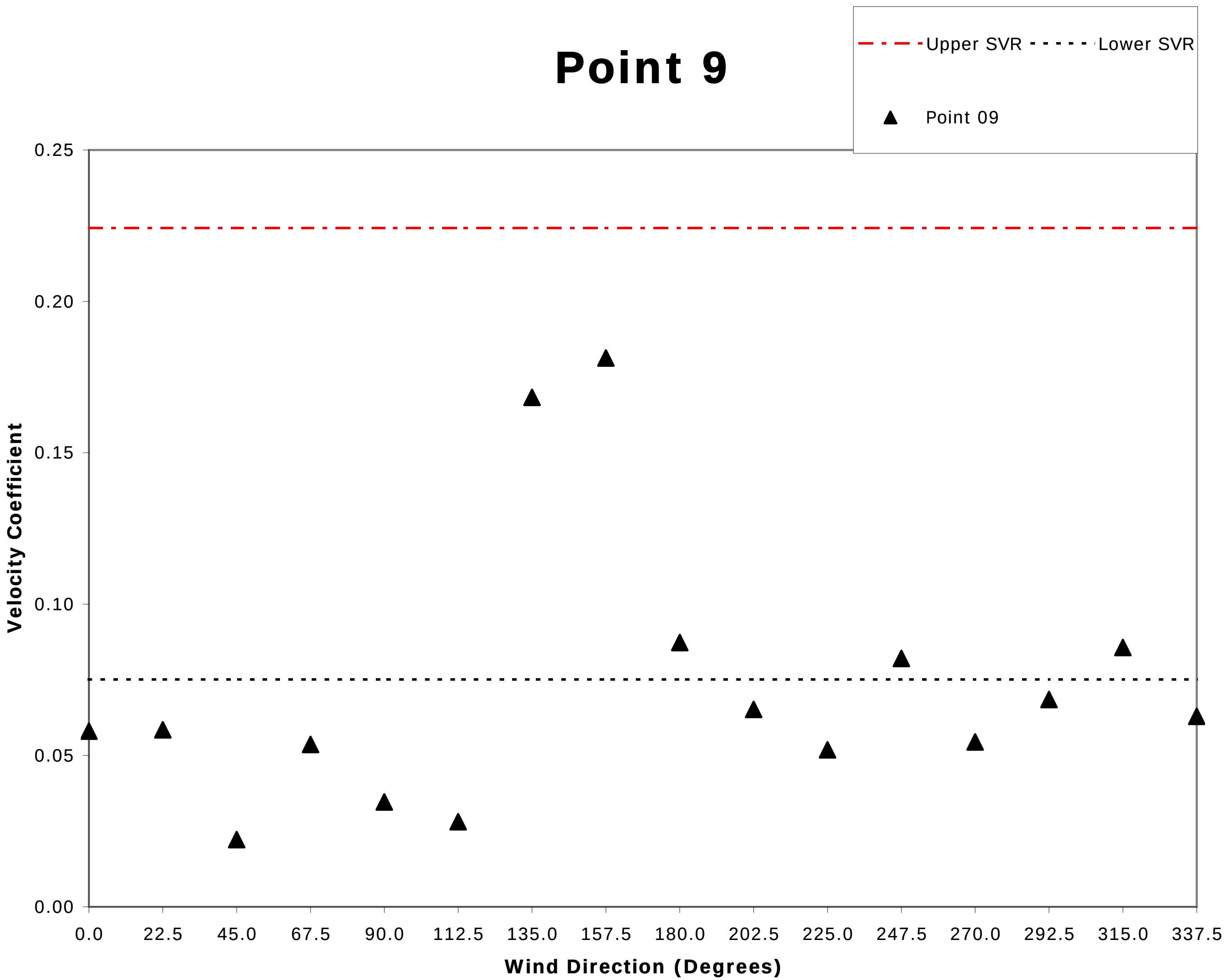

Point 4
Upper SVR
Lower SVR
Point 04
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

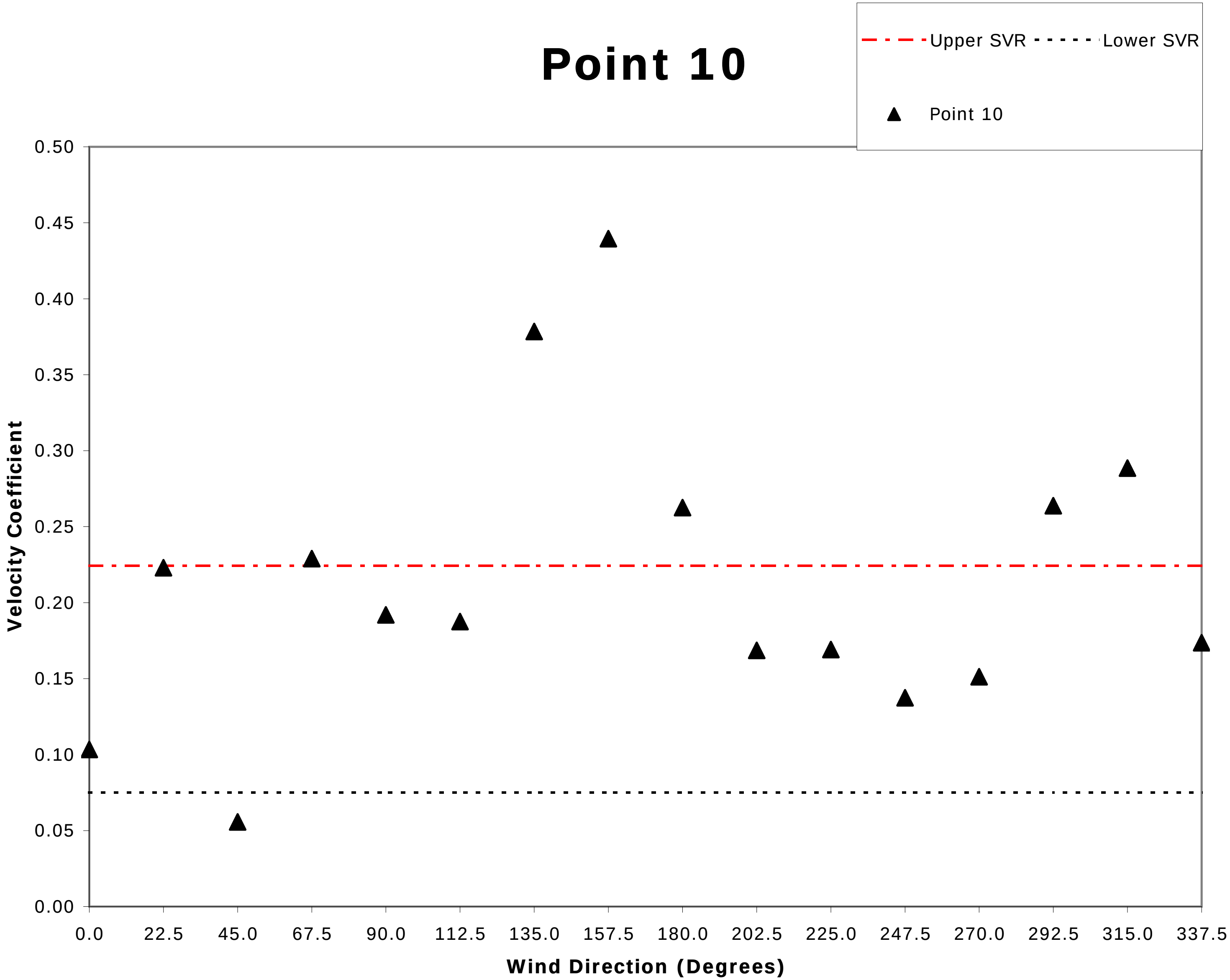

Point 5
Upper SVR
Lower SVR
Point 05
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 6
Upper SVR
Lower SVR
Point 06
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

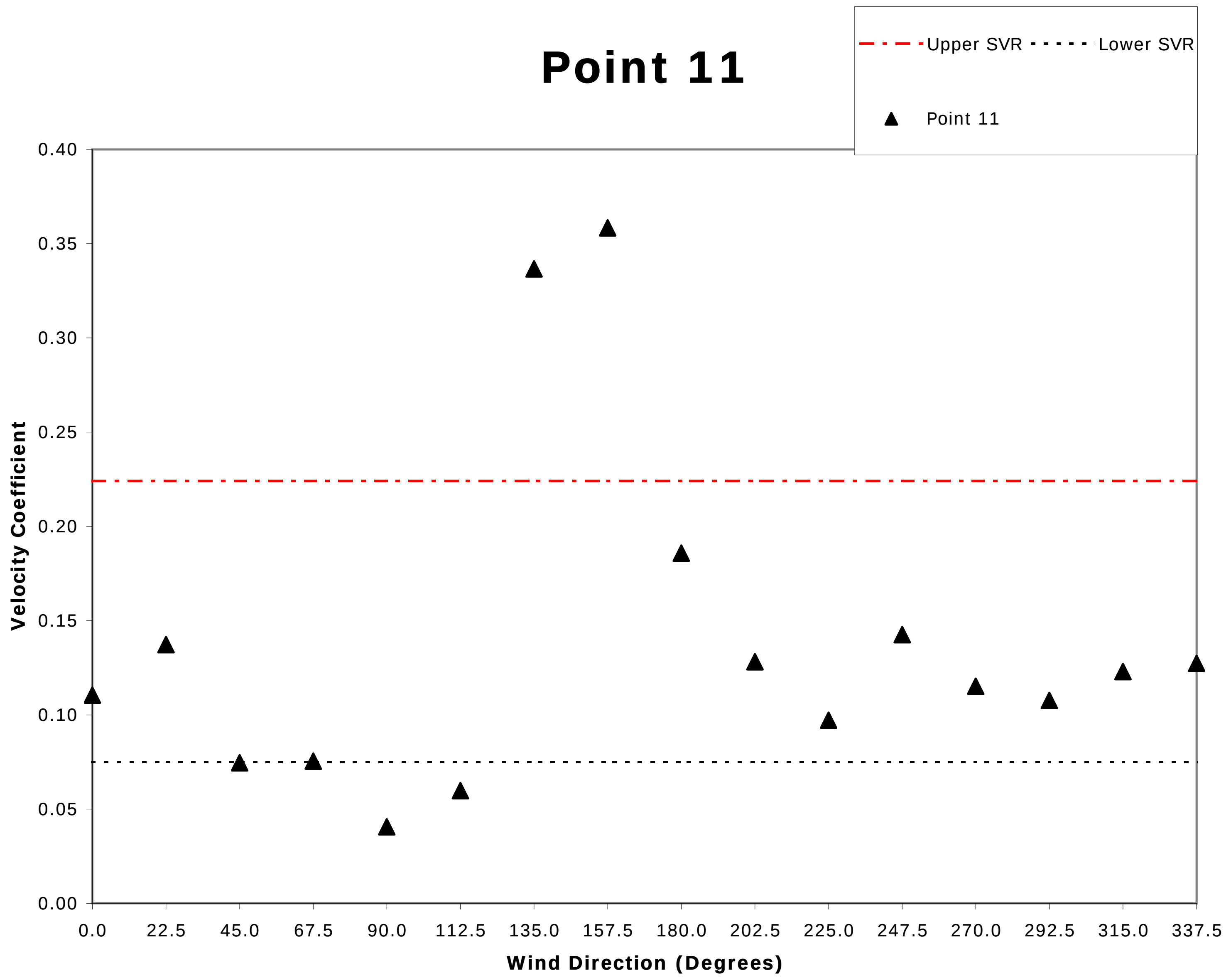

Point 7
Upper SVR
Lower SVR
Point 07
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 8
Upper SVR
Lower SVR
Point 08
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

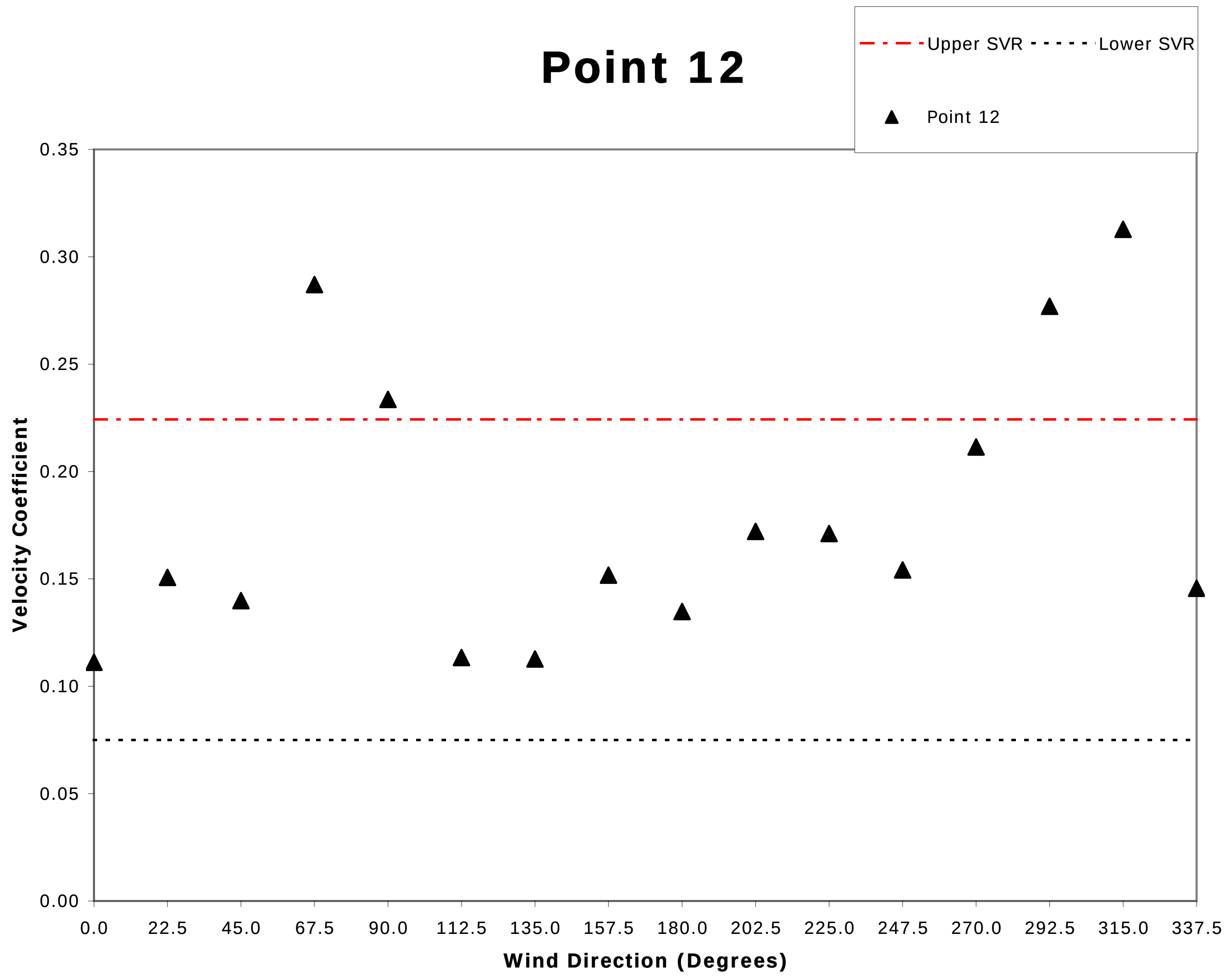

Point 9
Upper SVR
Lower SVR
Point 09
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

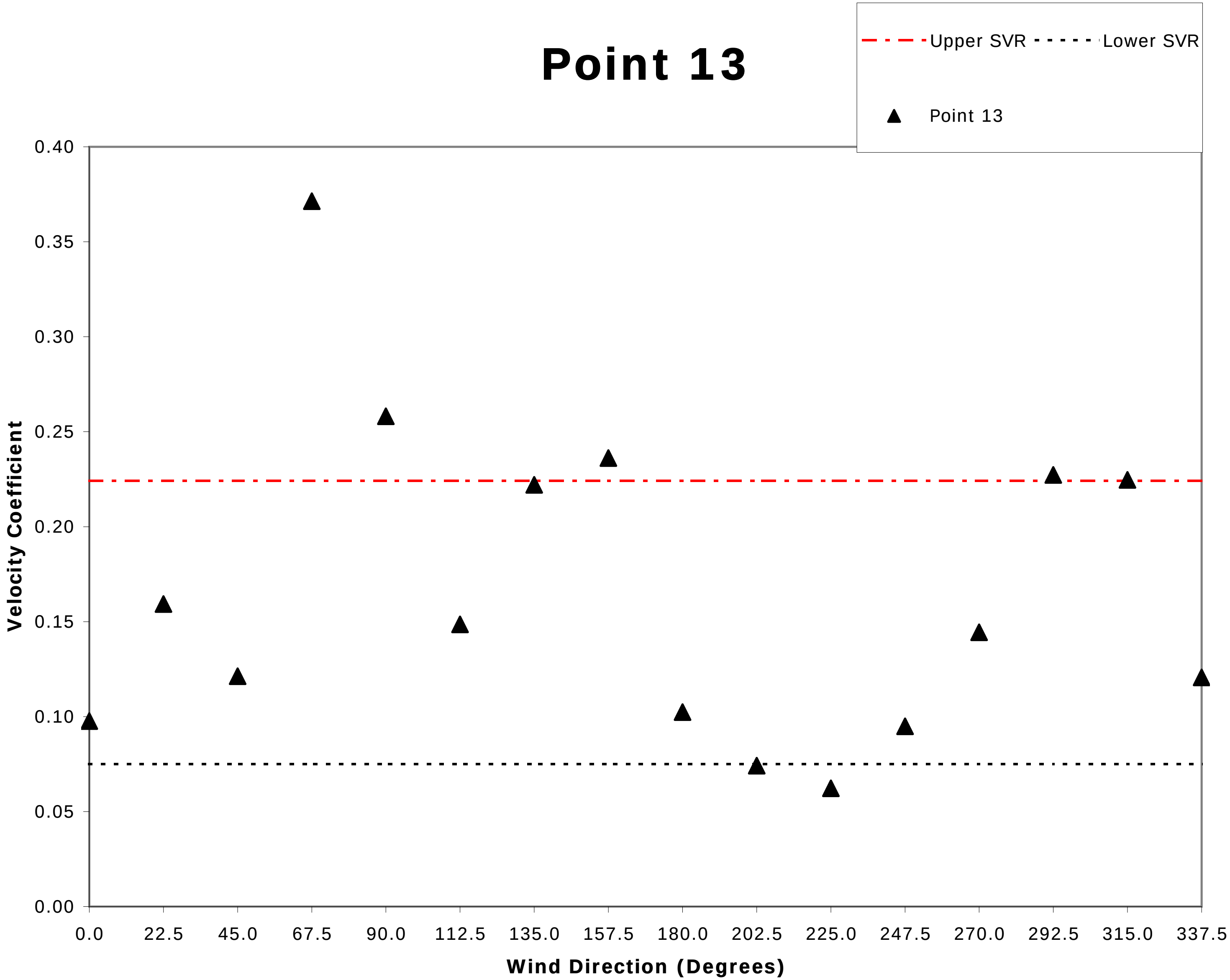


Point 10
Upper SVR
Lower SVR
Point 10
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

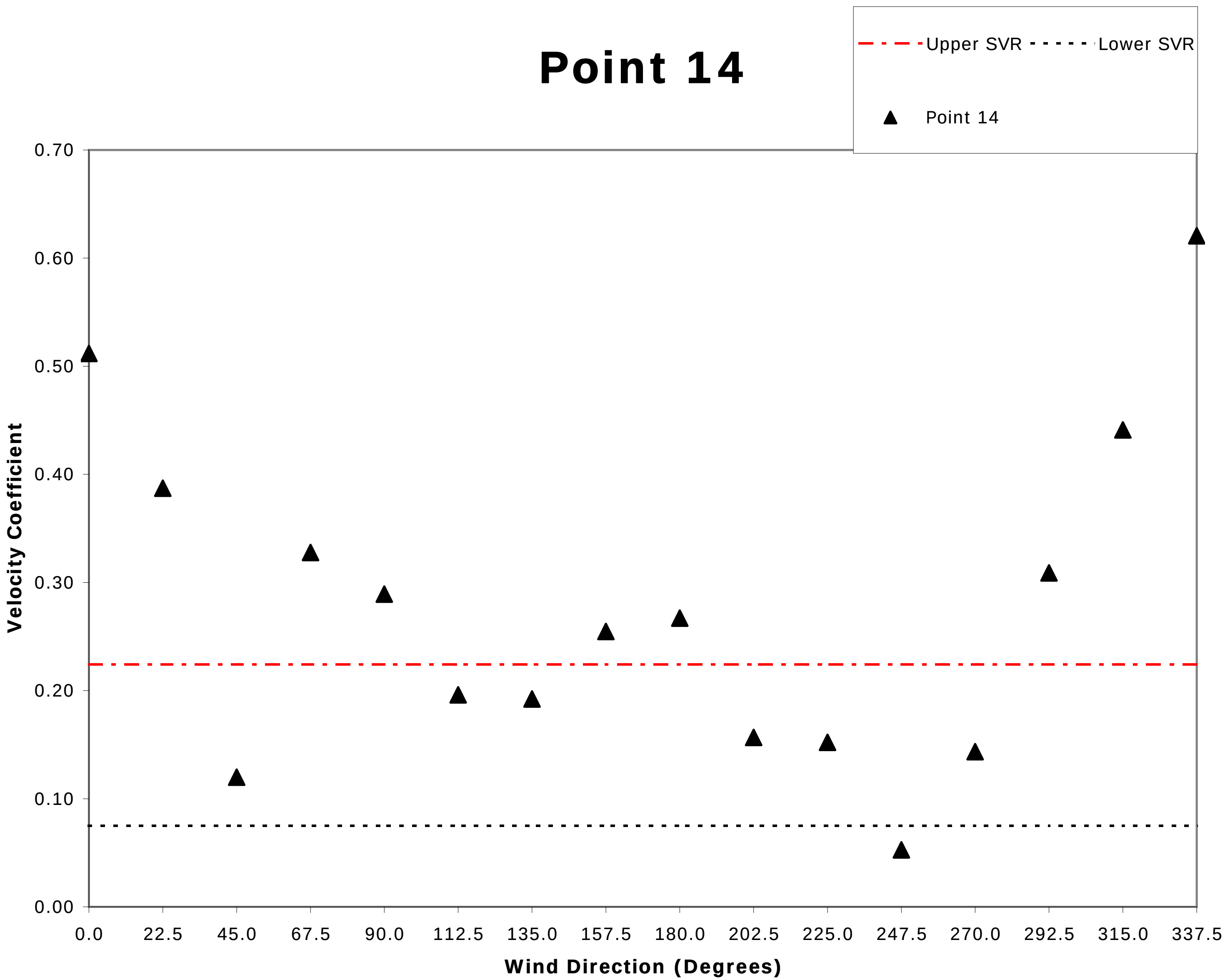


Point 11
Upper SVR
Lower SVR
Point 11
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

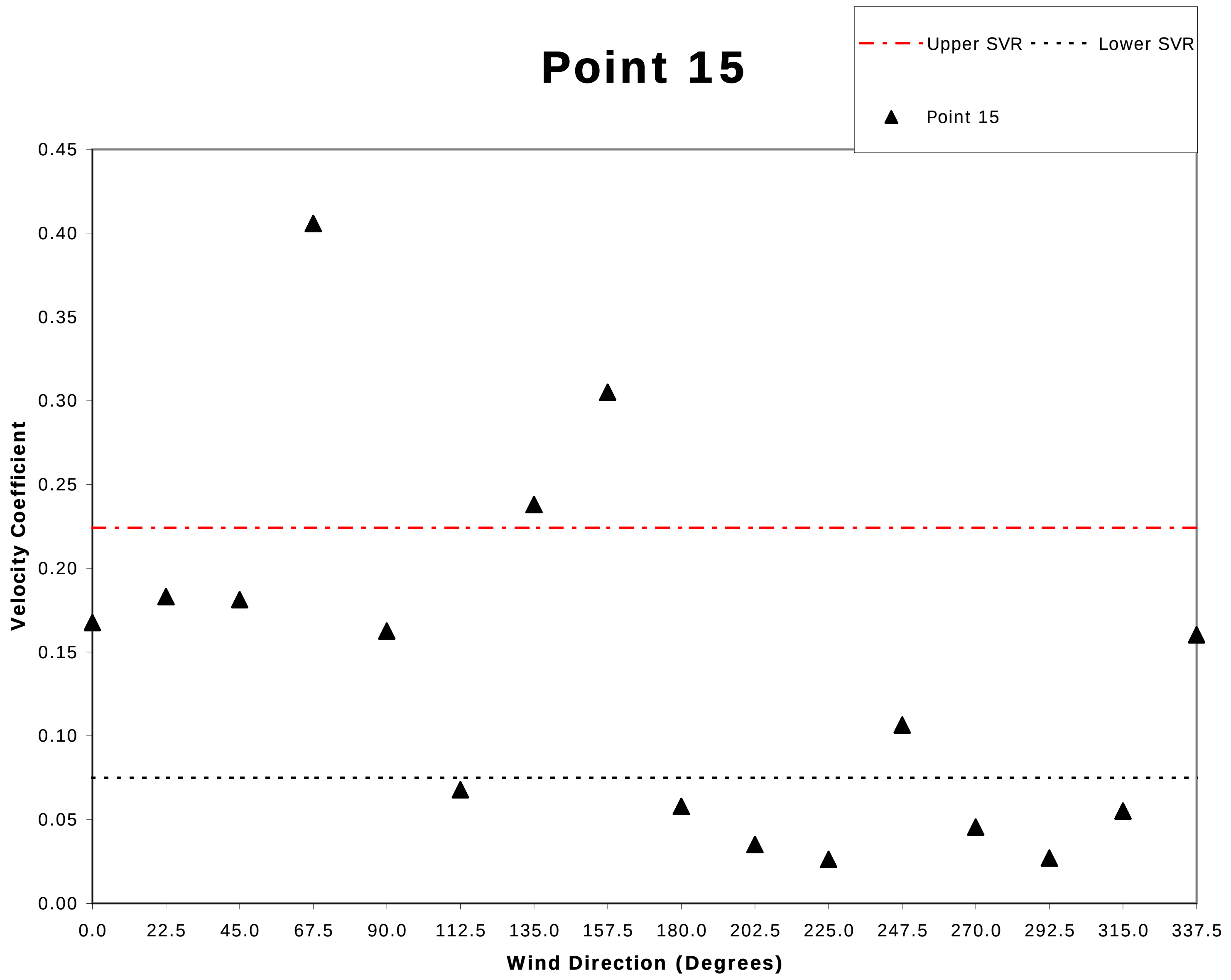

Point 12
Upper SVR
Lower SVR
Point 12
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



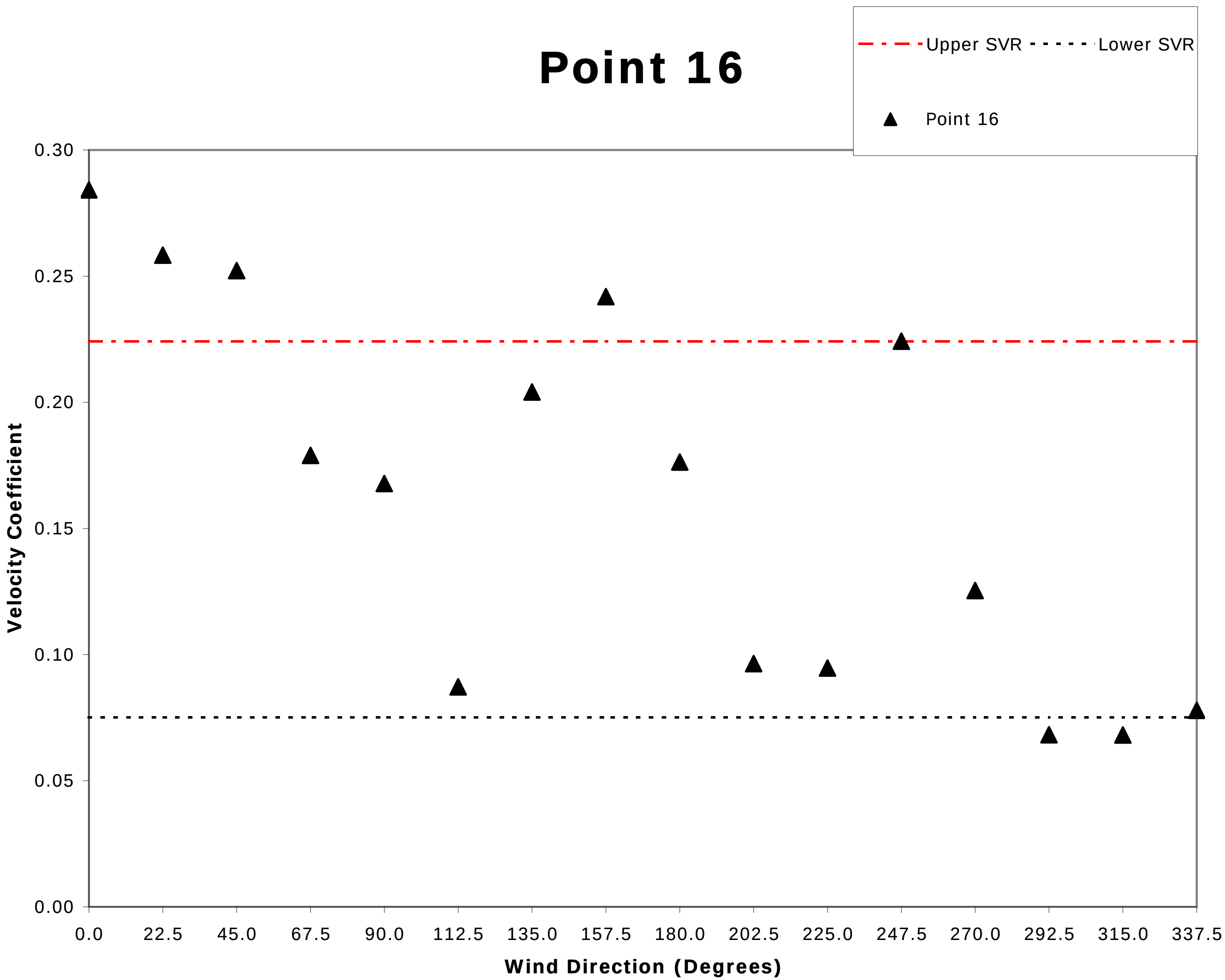
Point 13
Upper SVR
Lower SVR
Point 13
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

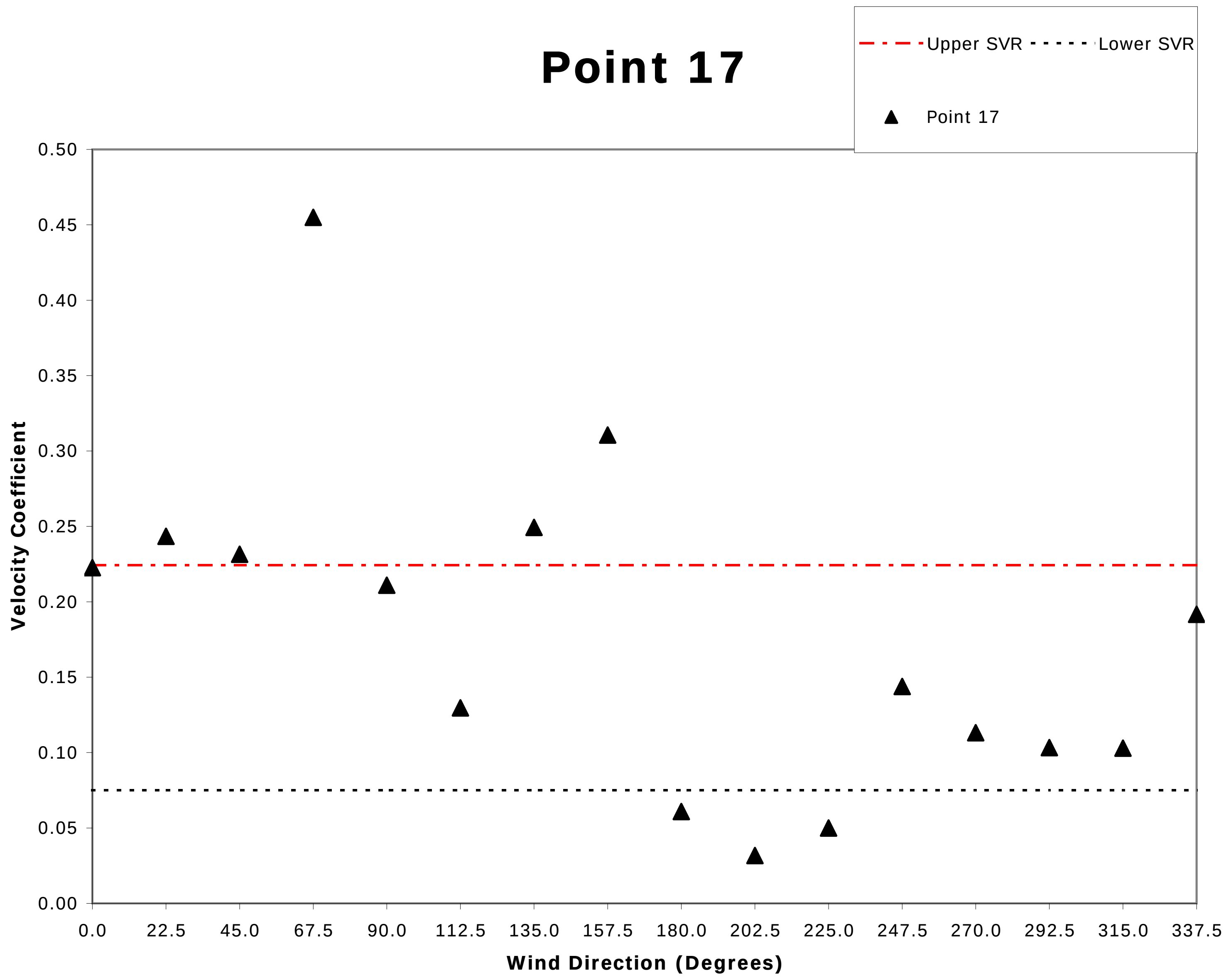


Point 14
Upper SVR
Lower SVR
Point 14
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

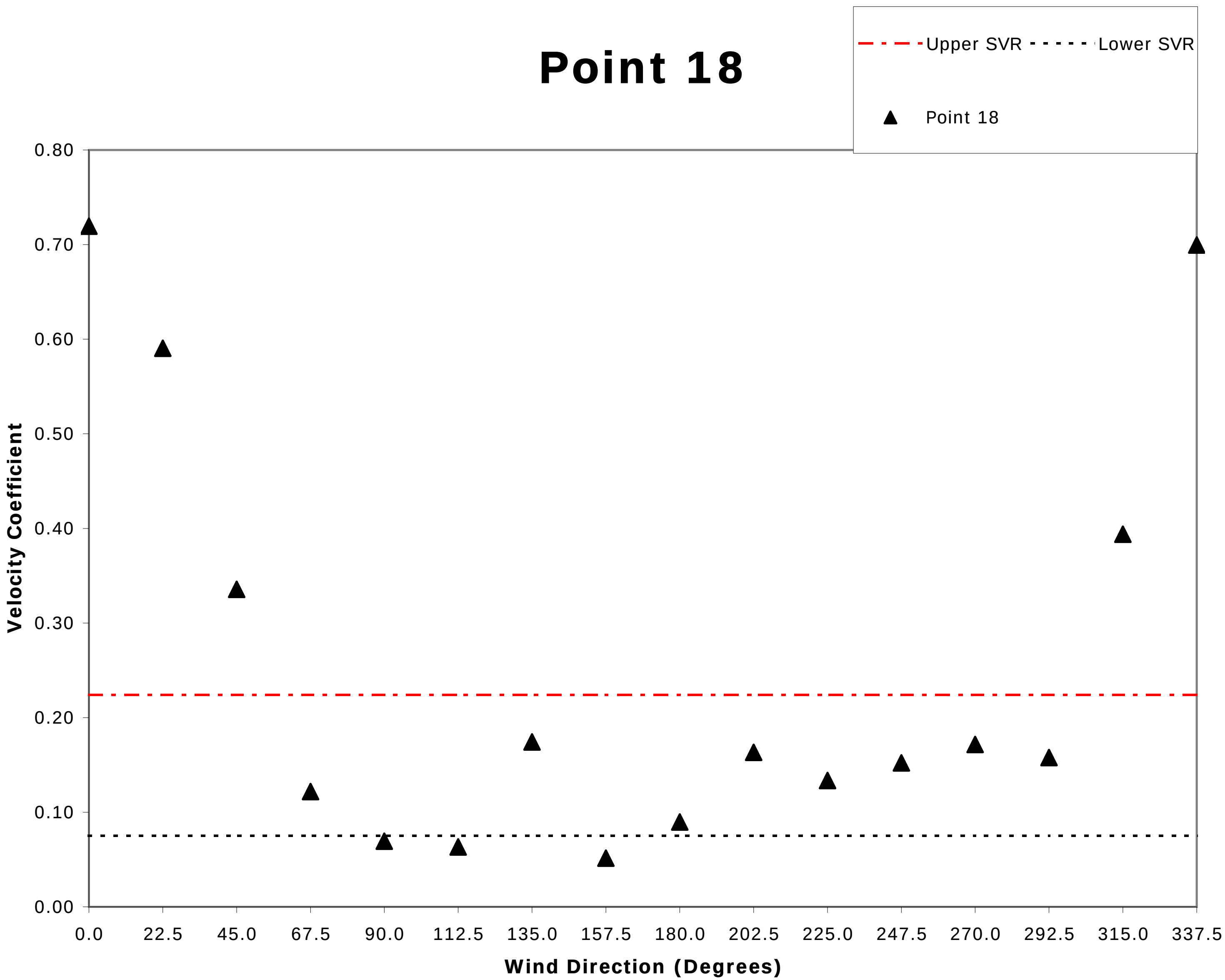


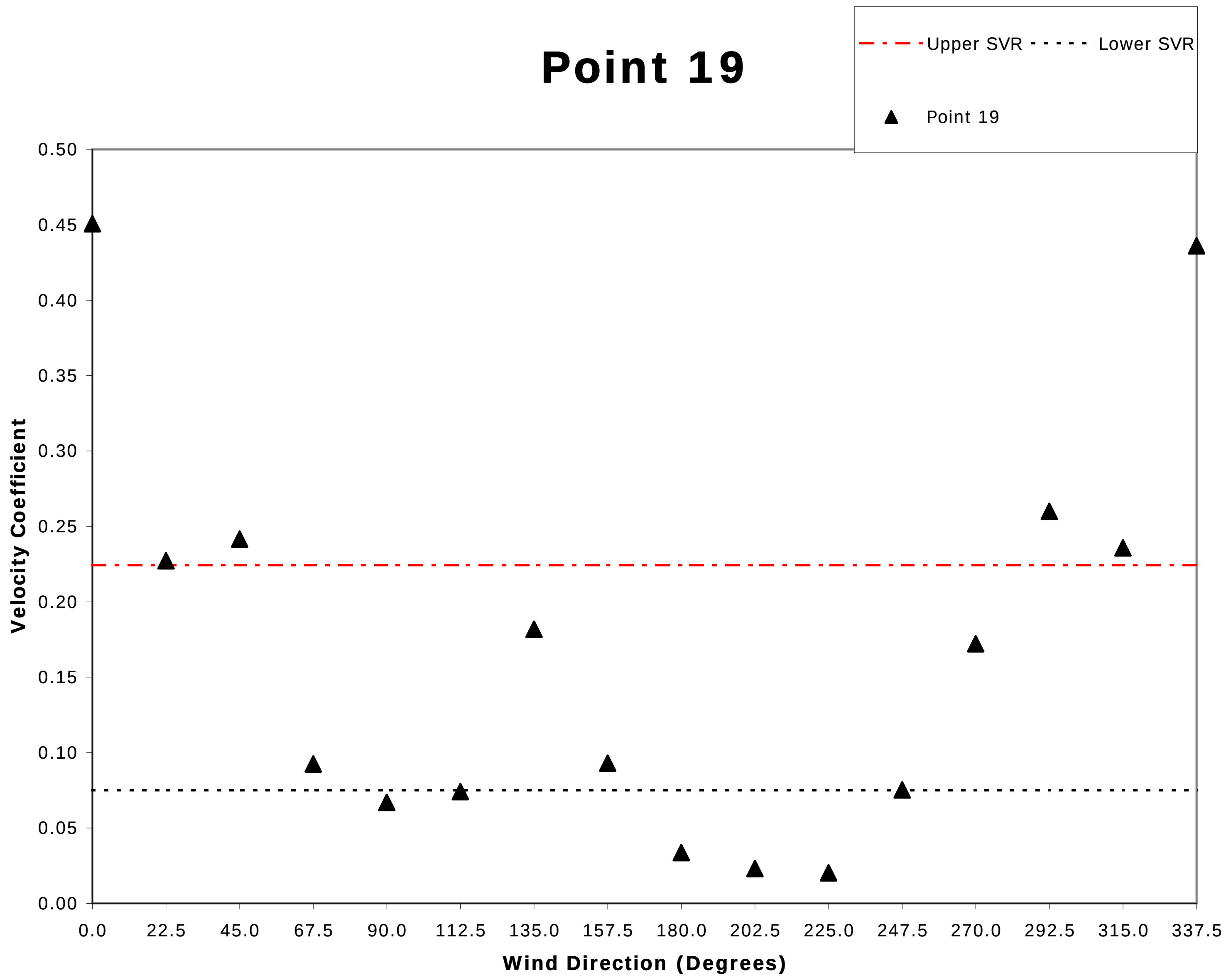
Point 15
Upper SVR
Lower SVR
Point 15
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 16
Upper SVR
Lower SVR
Point 16
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

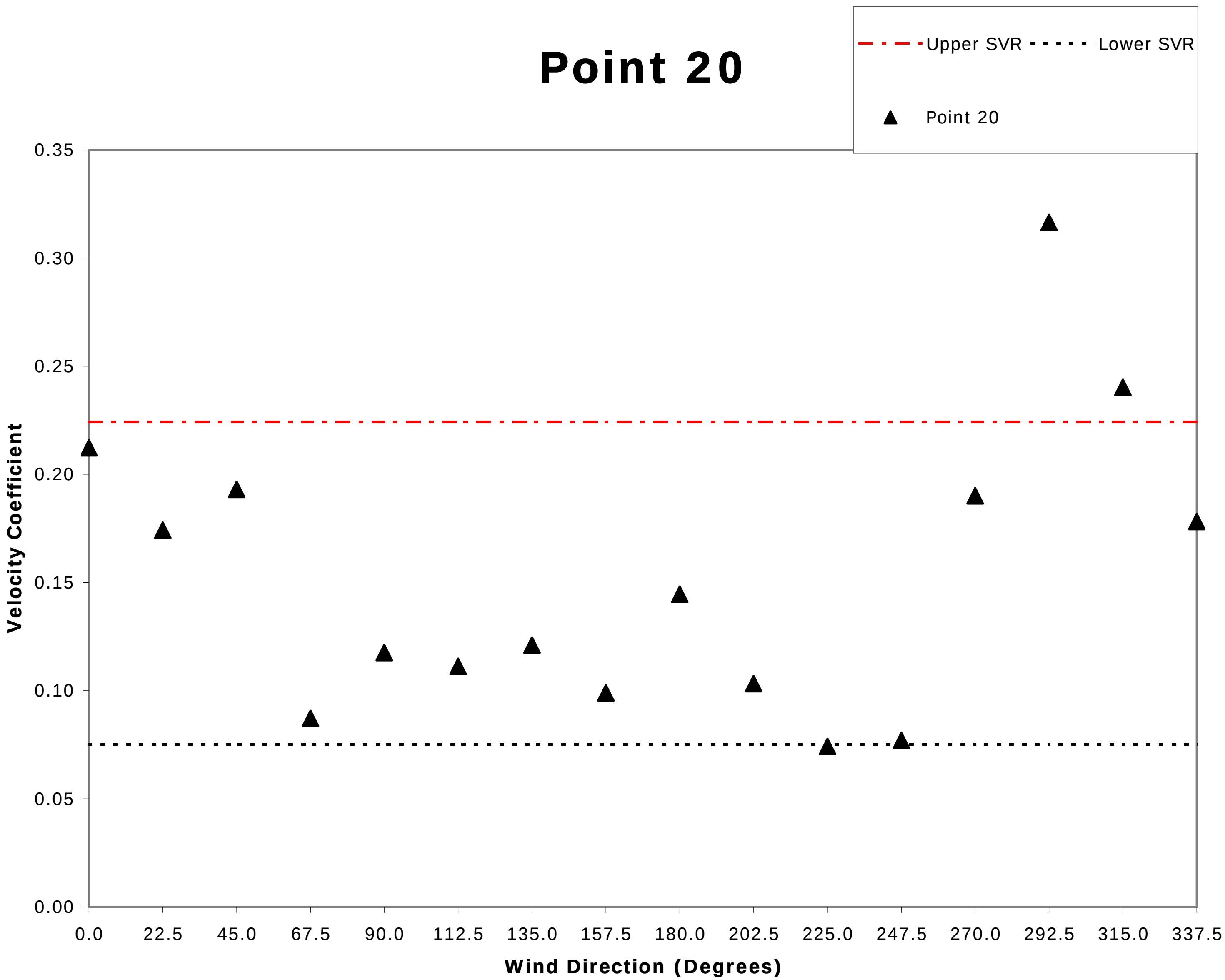


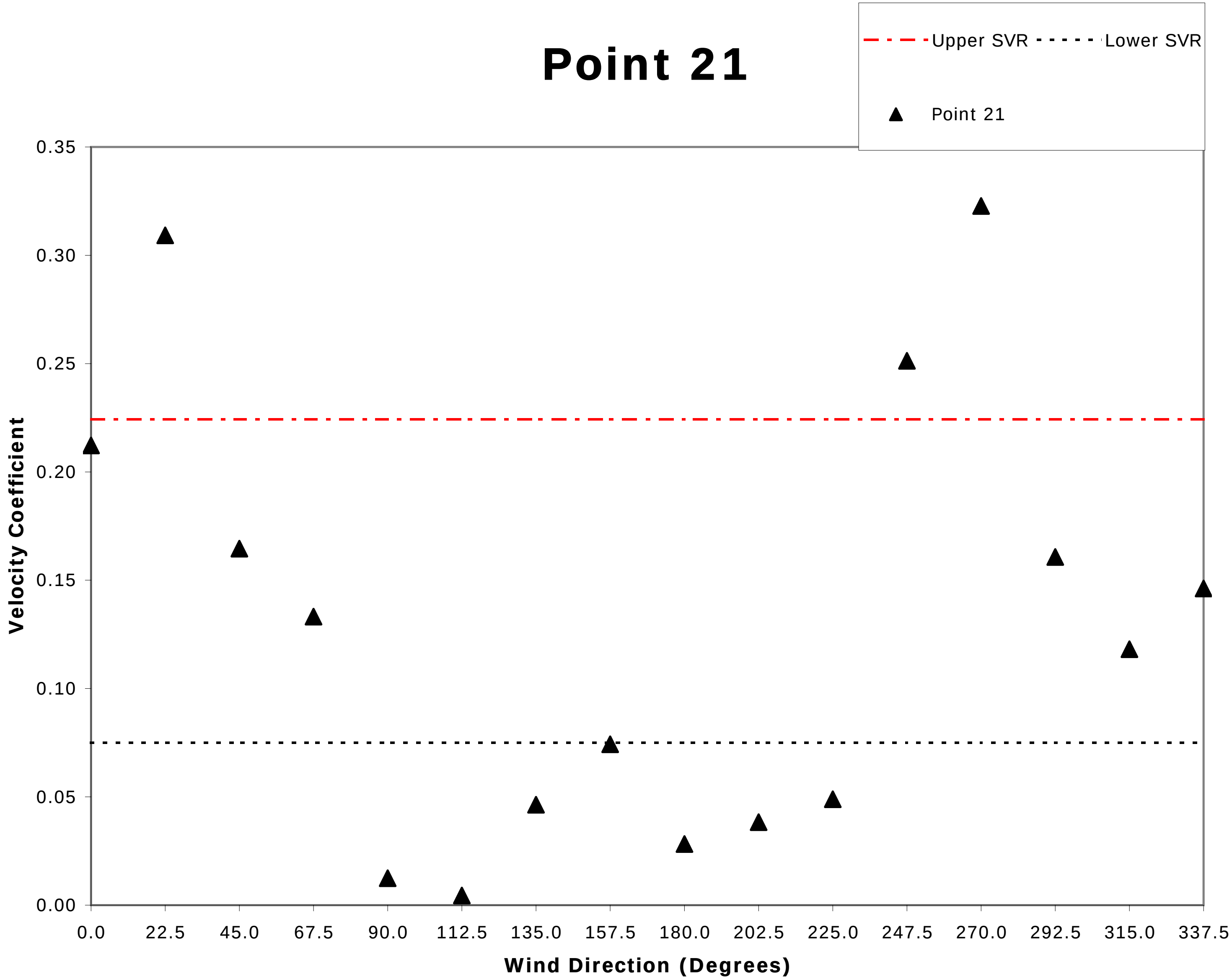
Point 17
Upper SVR
Lower SVR
Point 17
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 18
Upper SVR
Lower SVR
Point 18
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

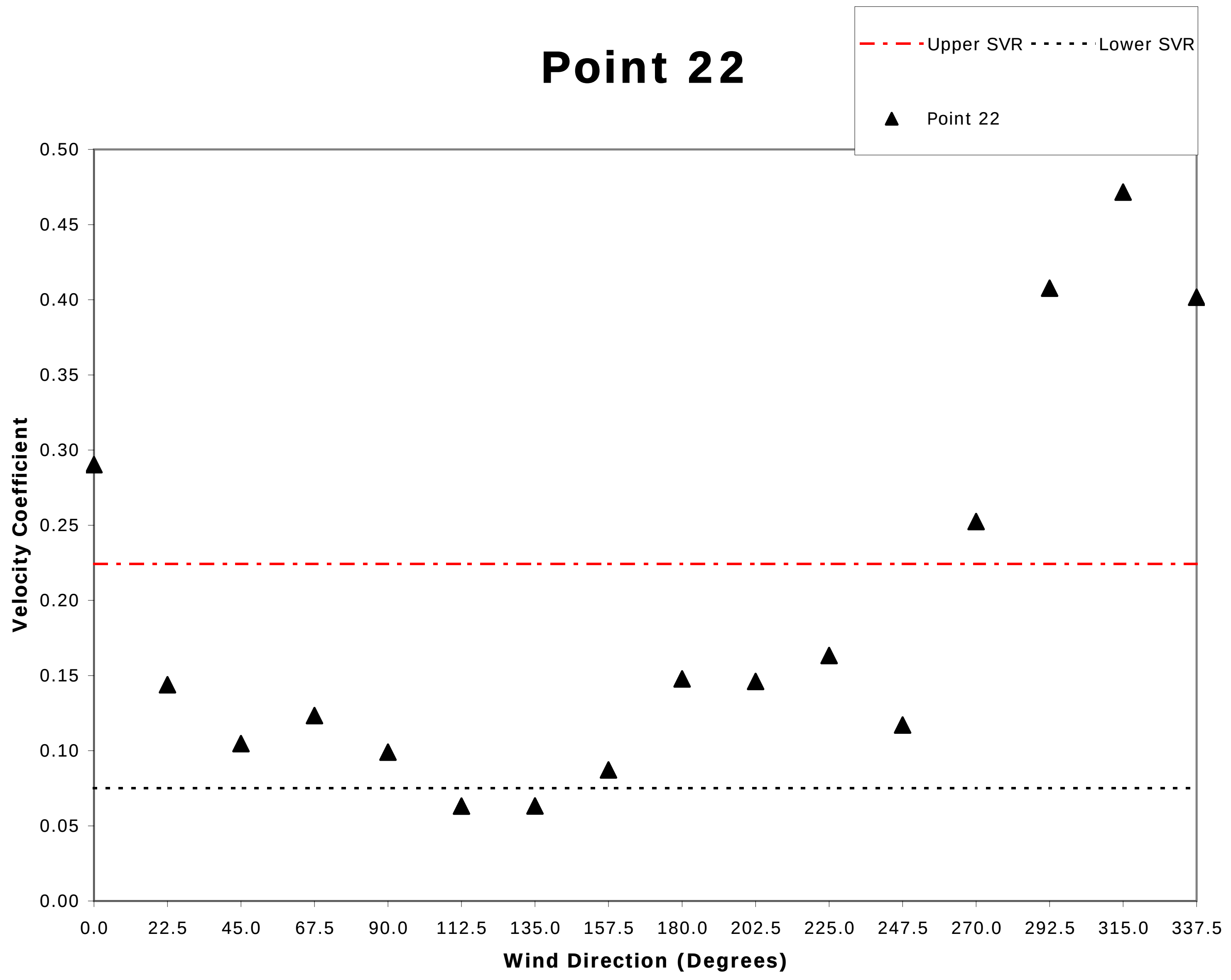


Point 19
Upper SVR
Lower SVR
Point 19
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

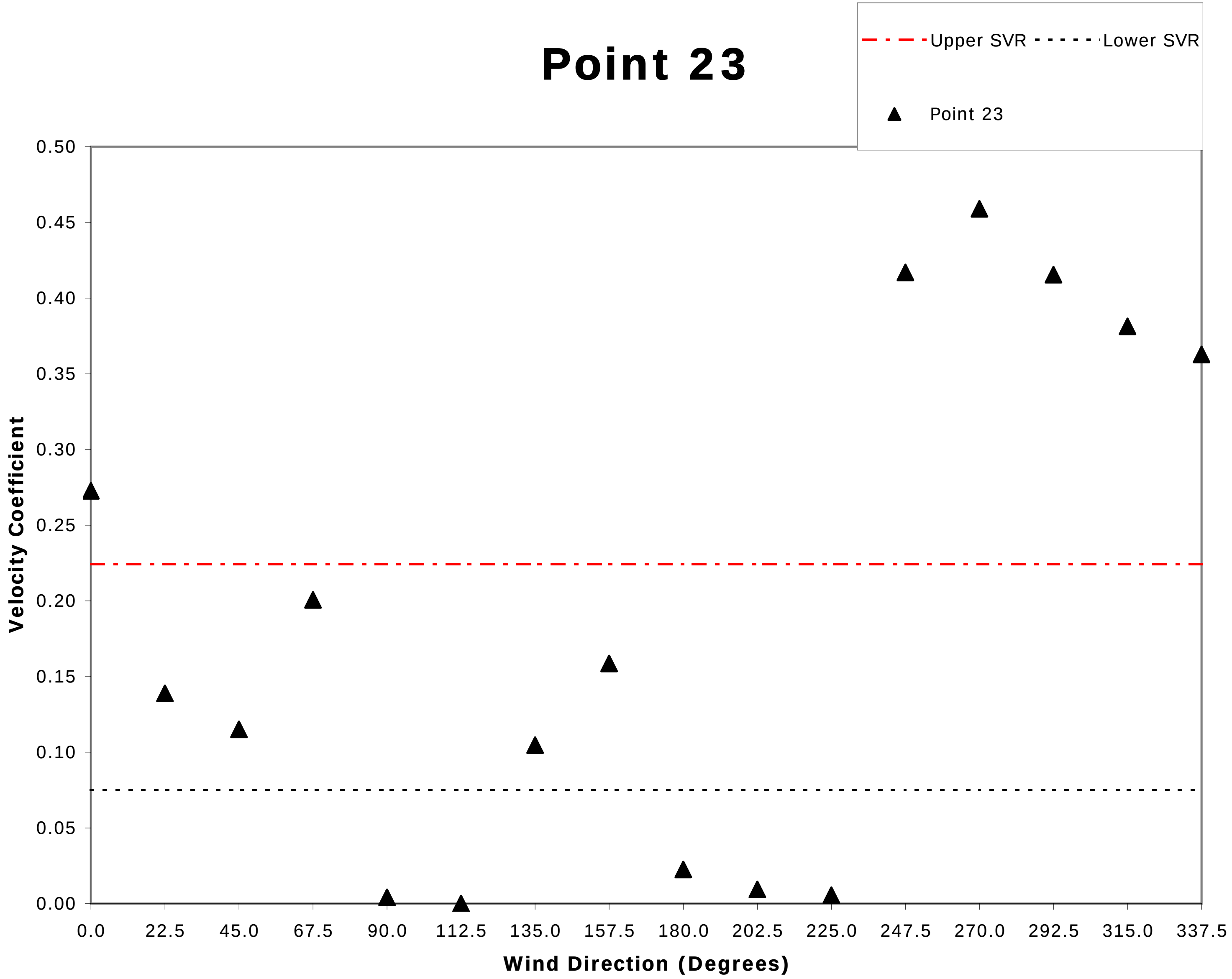

Point 20
Upper SVR
Lower SVR
Point 20
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

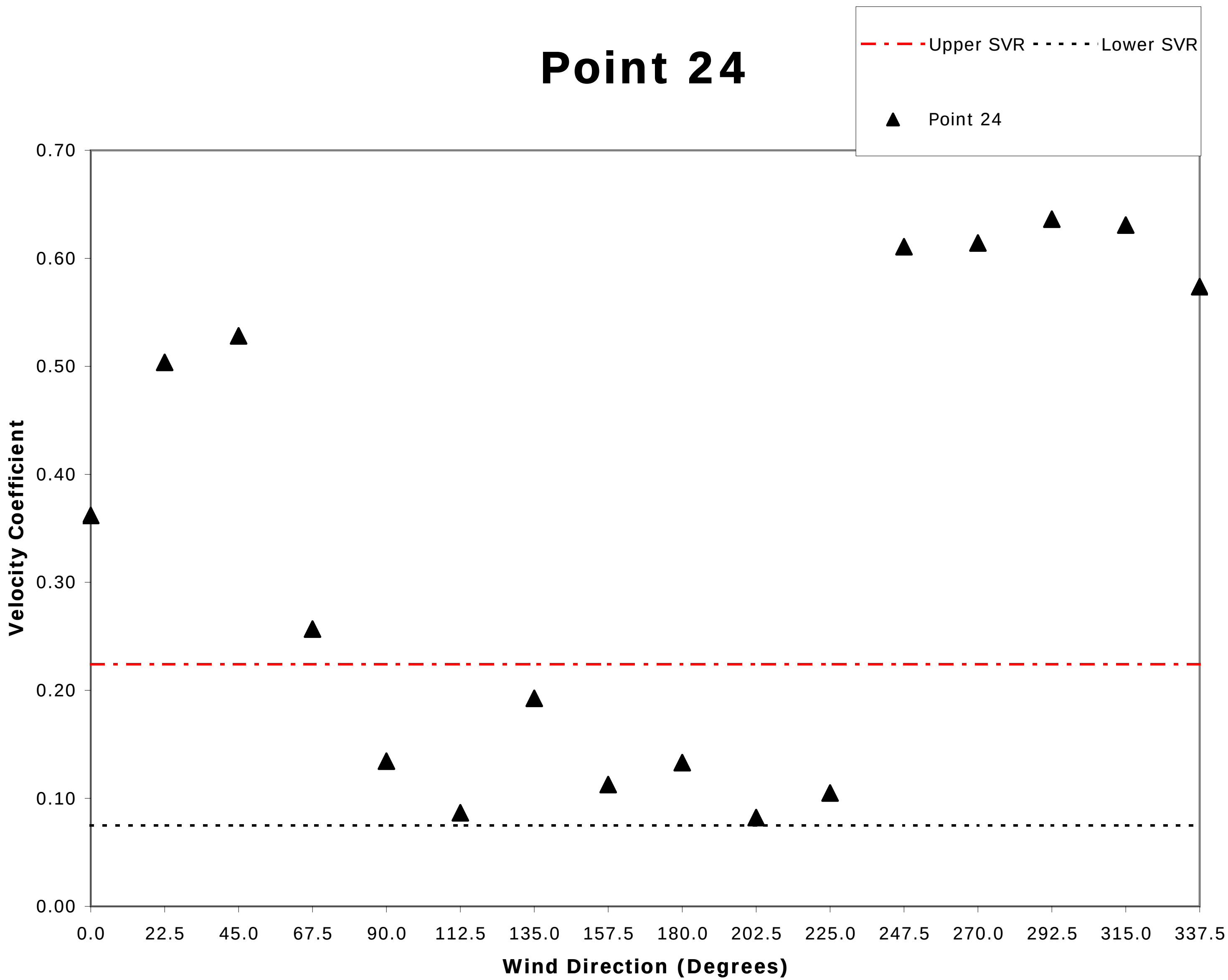


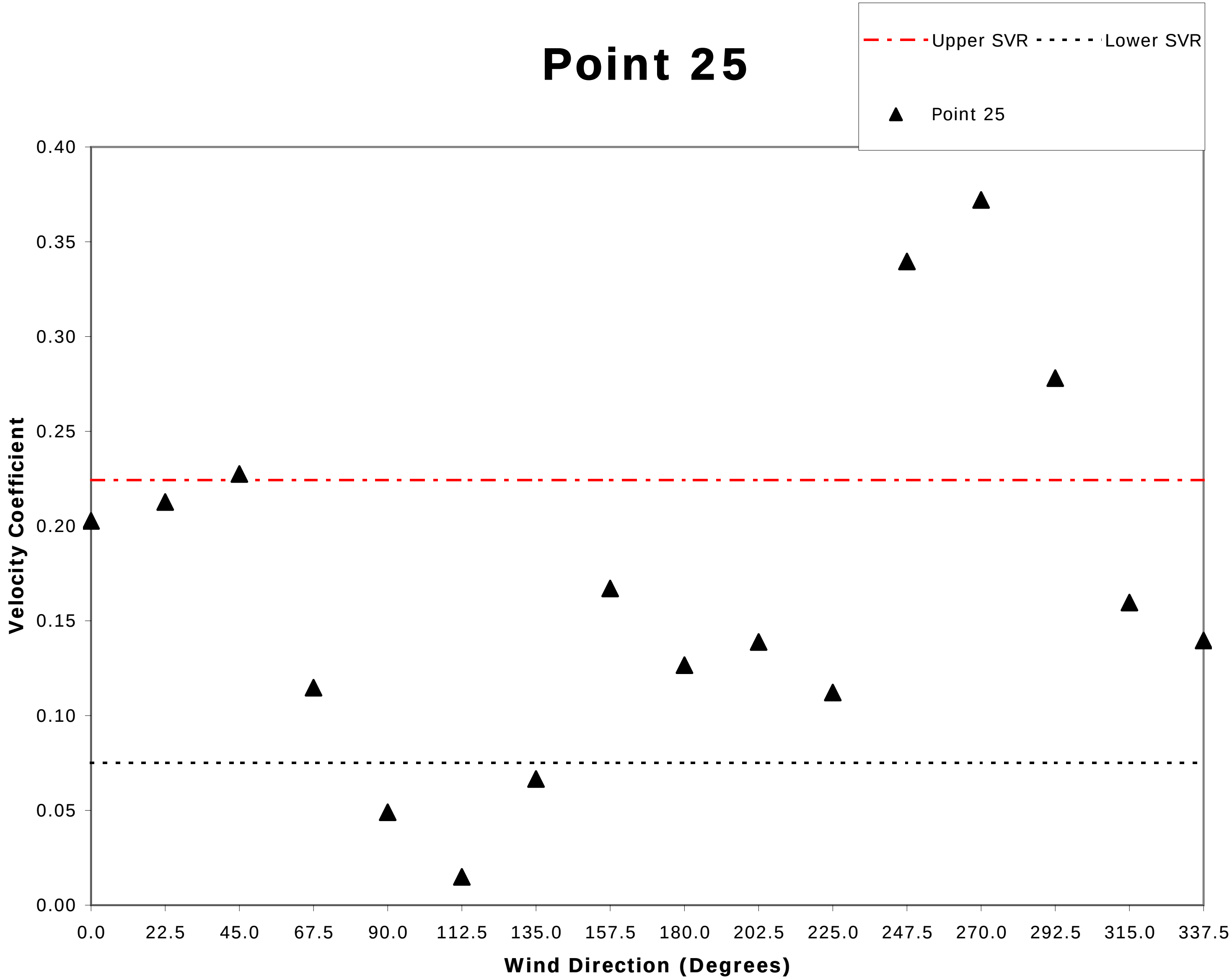
Point 21
Upper SVR
Lower SVR
Point 21
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



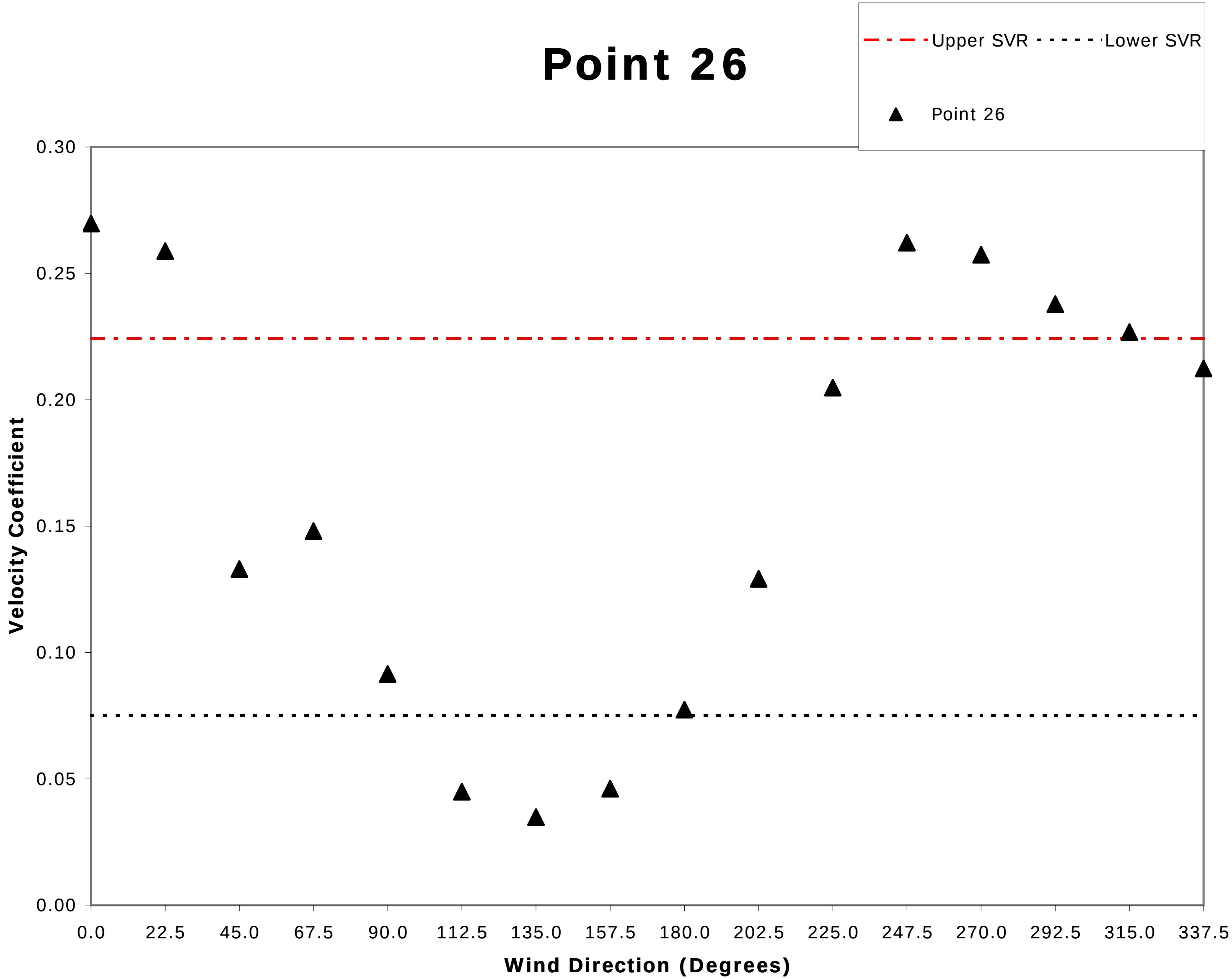
Point 22
Upper SVR
Lower SVR
Point 22
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

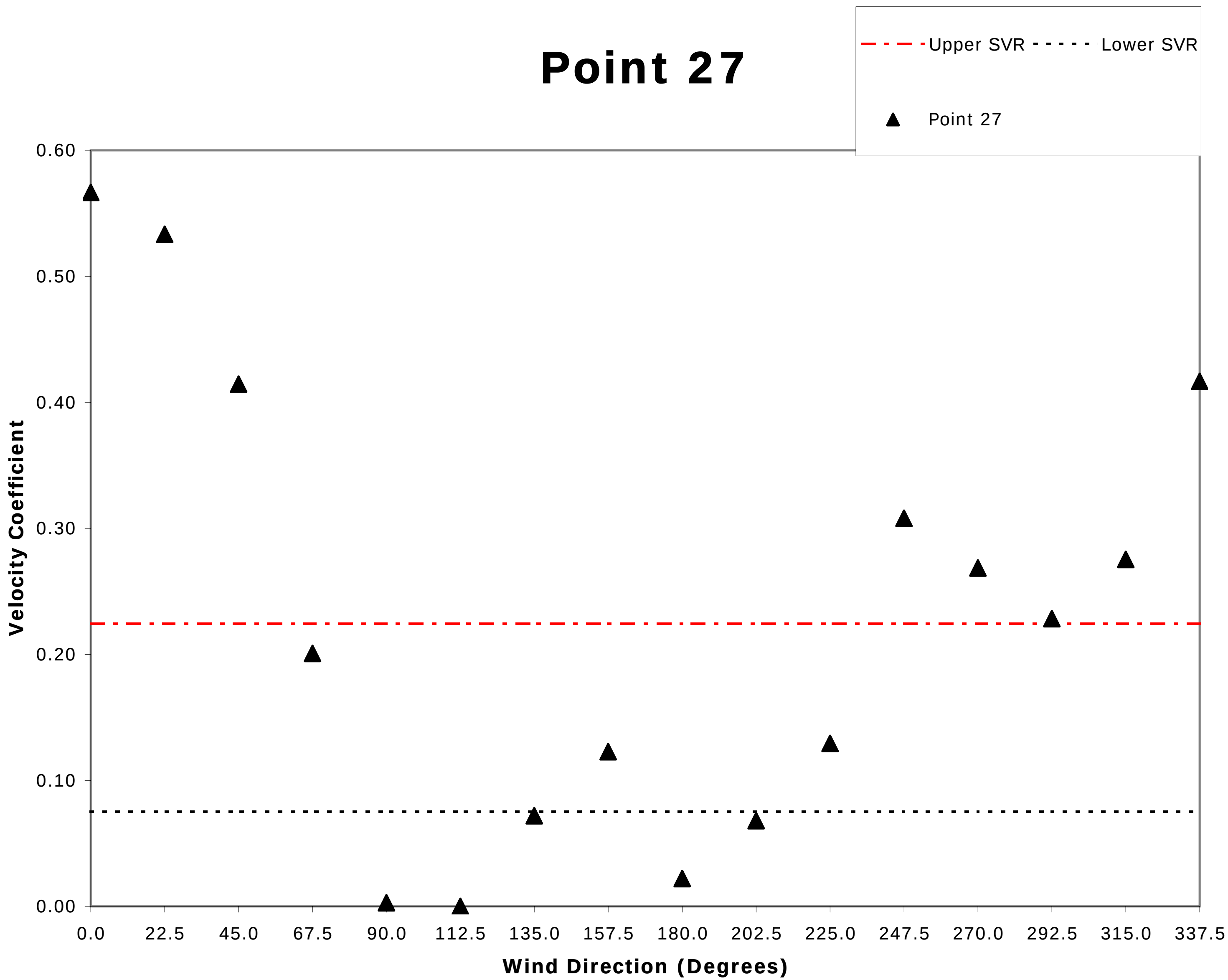

Point 23
Upper SVR
Lower SVR
Point 23
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 24
Upper SVR
Lower SVR
Point 24
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

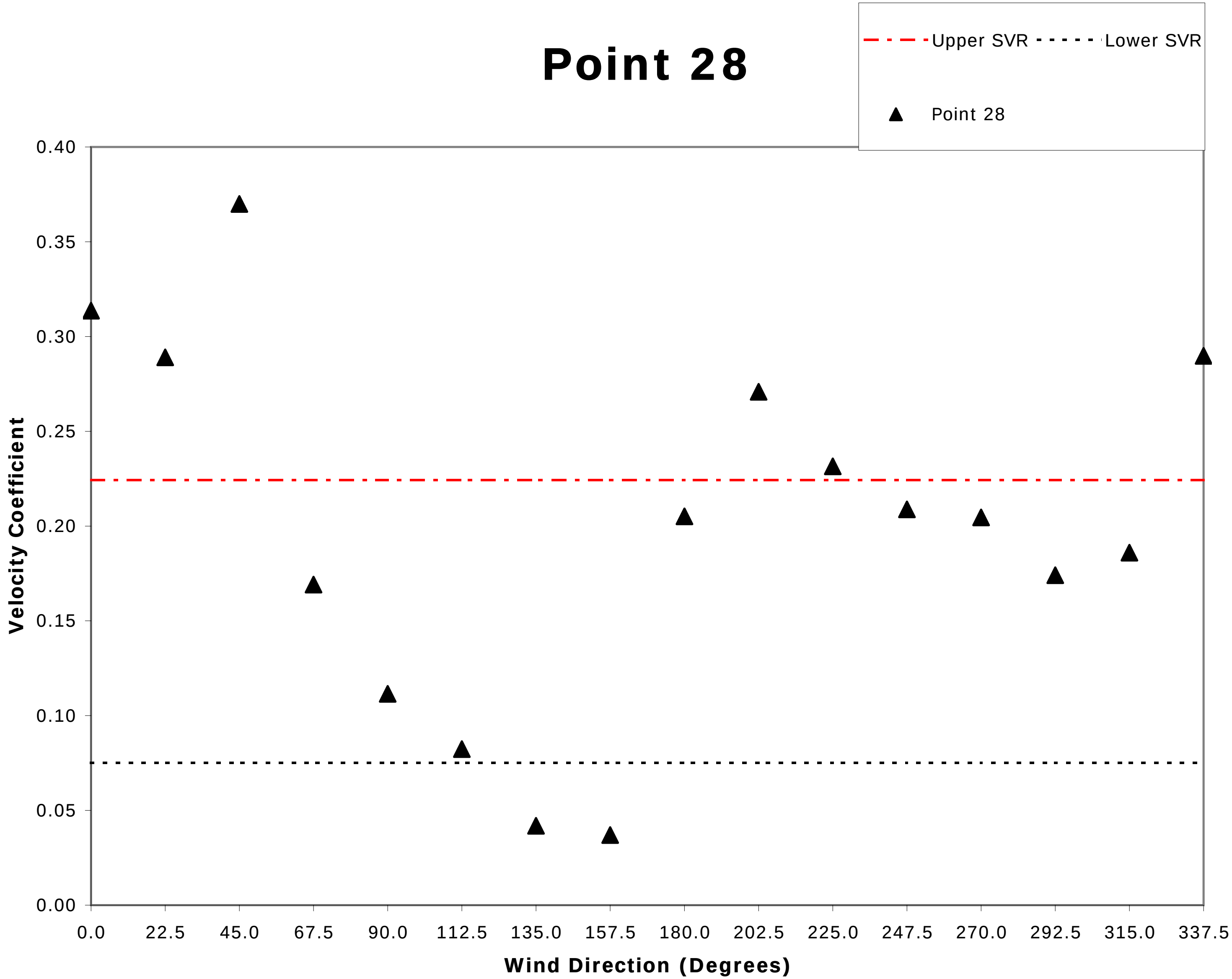


Point 25
Upper SVR
Lower SVR
Point 25
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

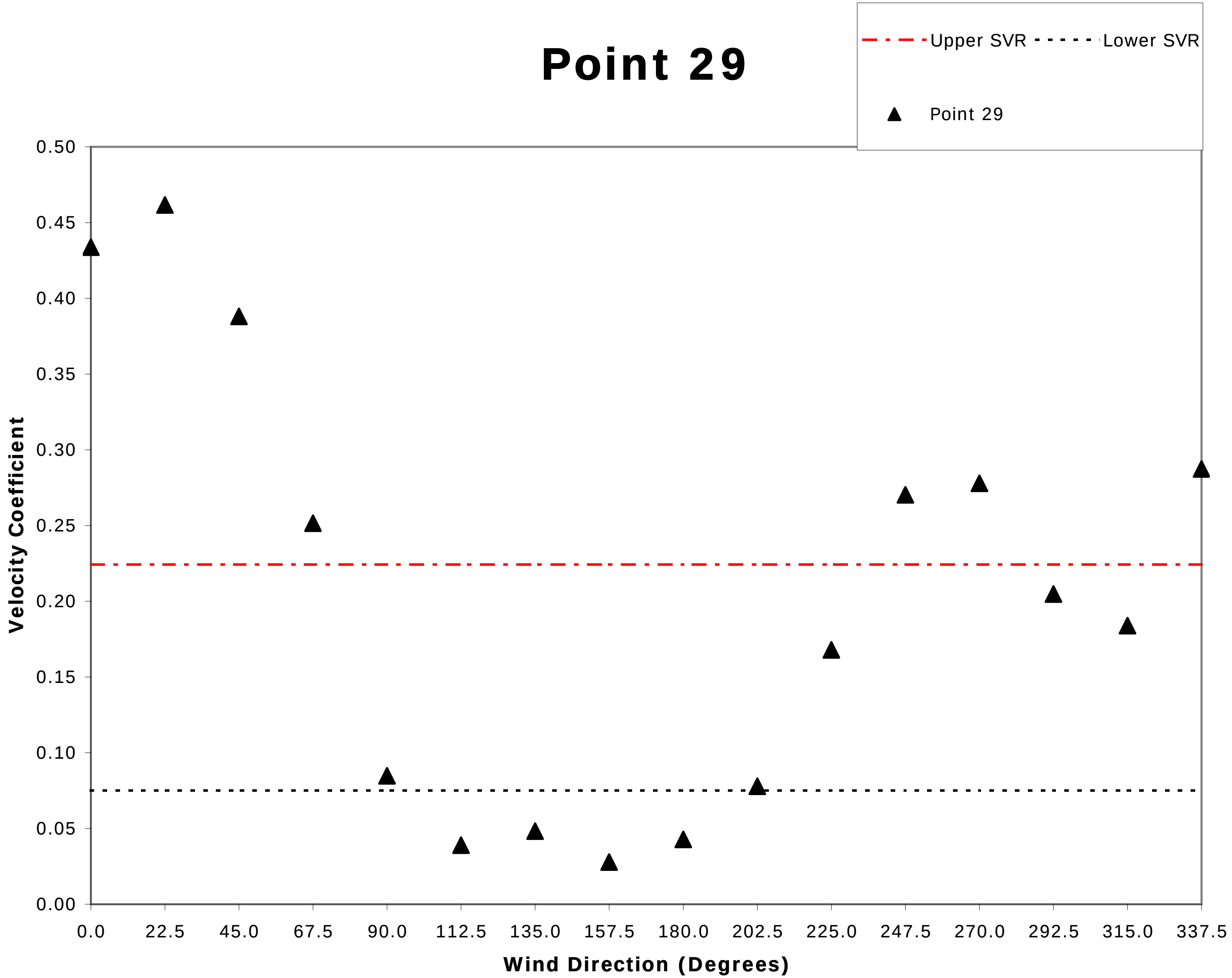

Point 26
Upper SVR
Lower SVR
Point 26
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

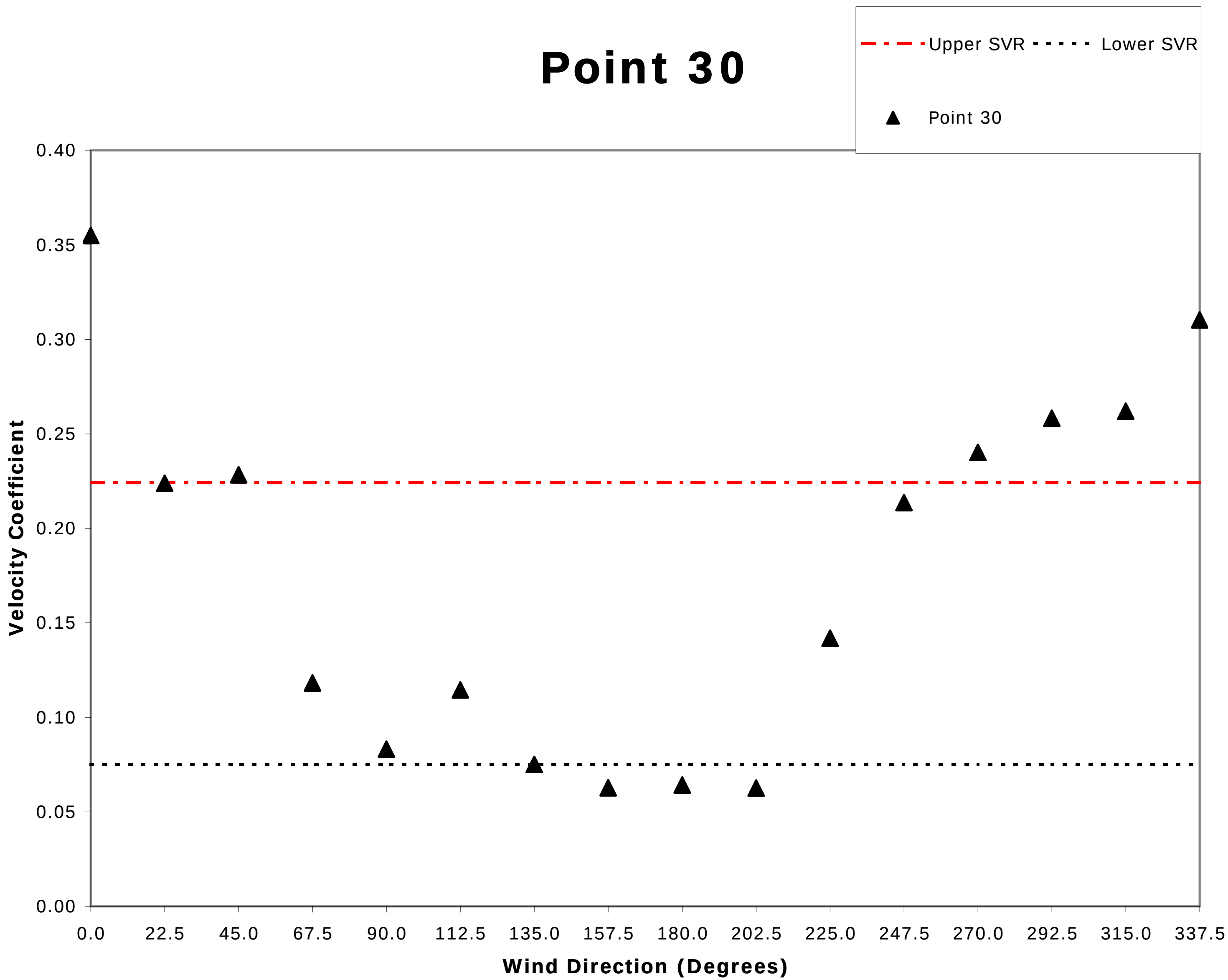


Point 27
Upper SVR
Lower SVR
Point 27
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

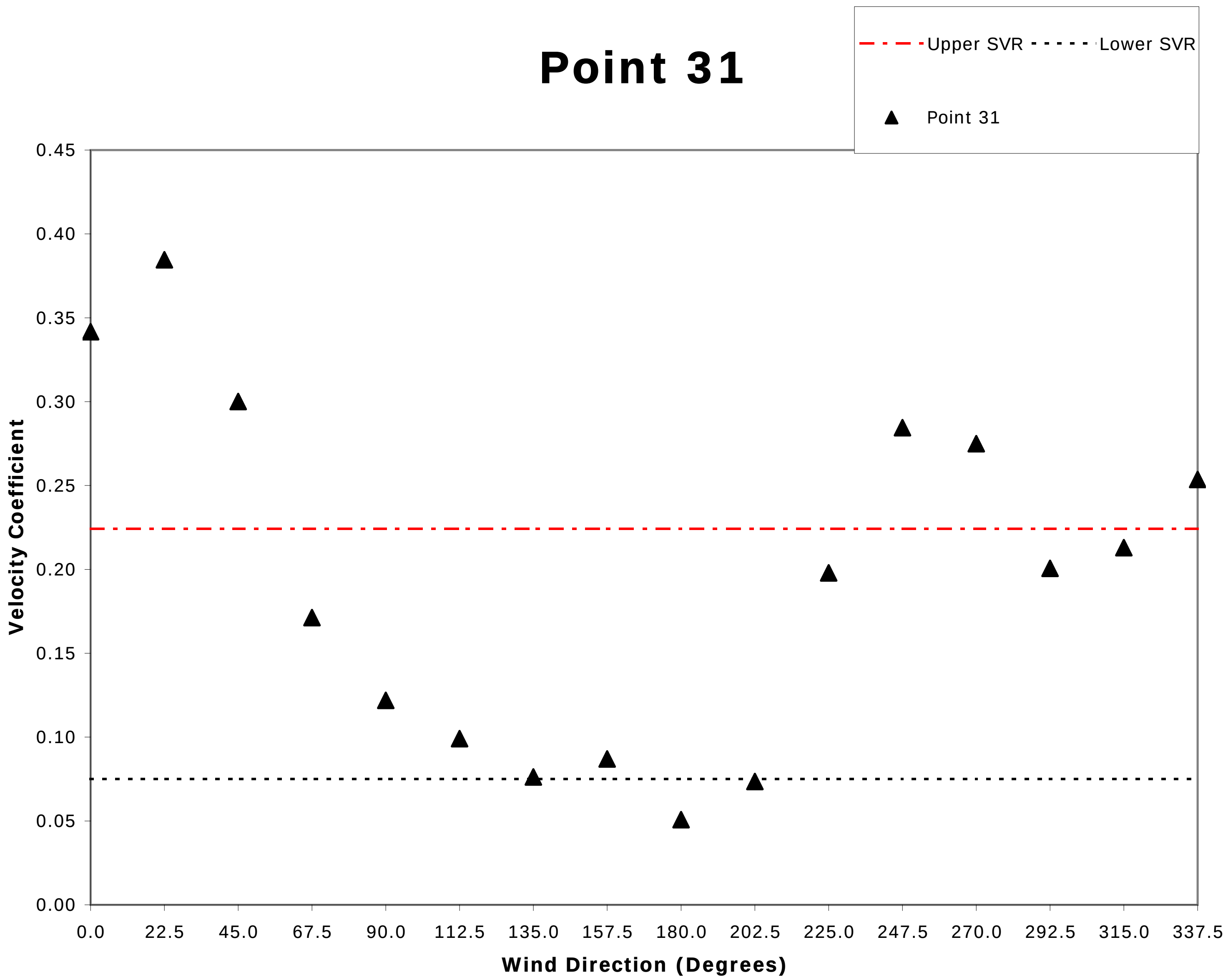


Point 28
Upper SVR
Lower SVR
Point 28
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

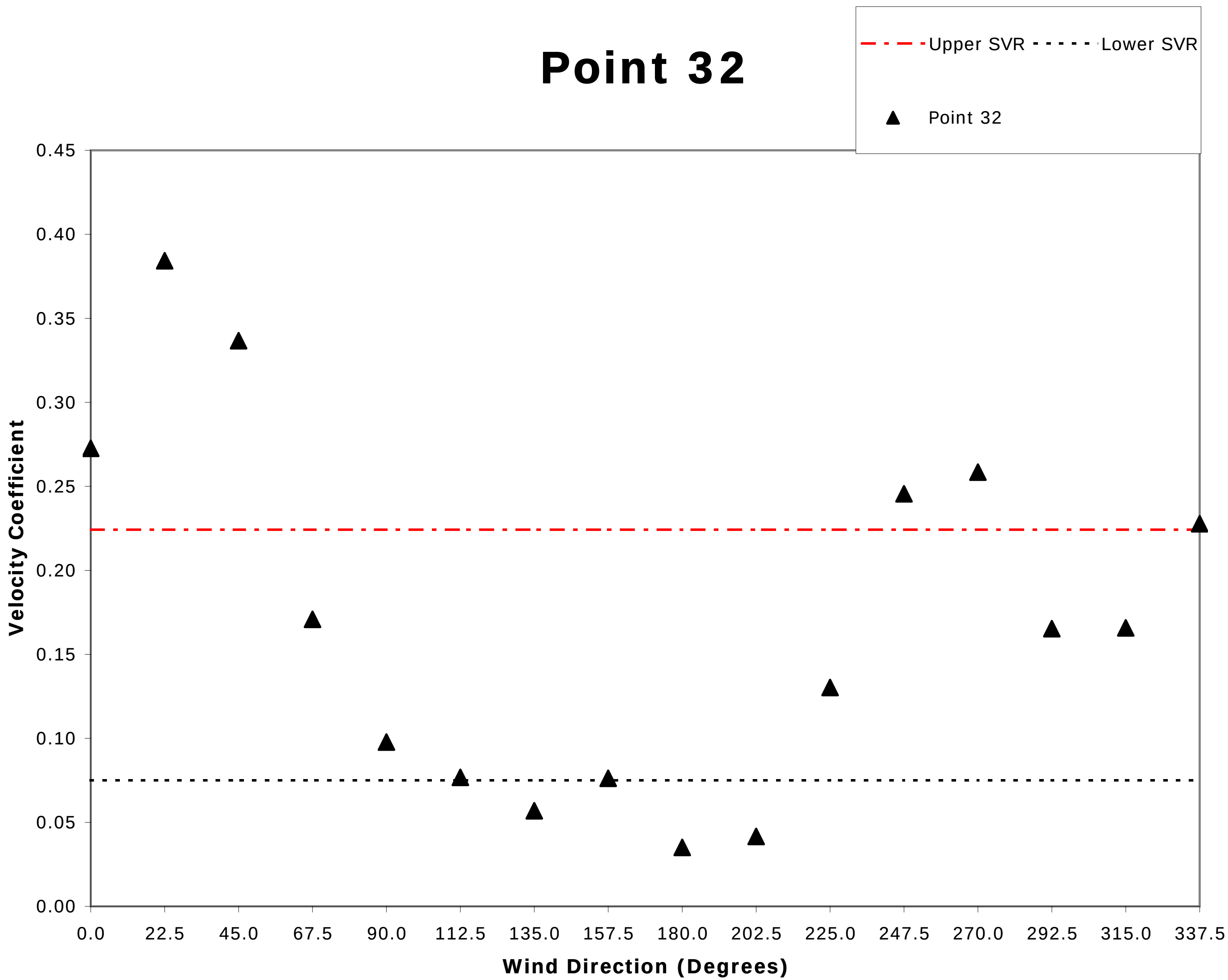

Point 29
Upper SVR
Lower SVR
Point 29
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

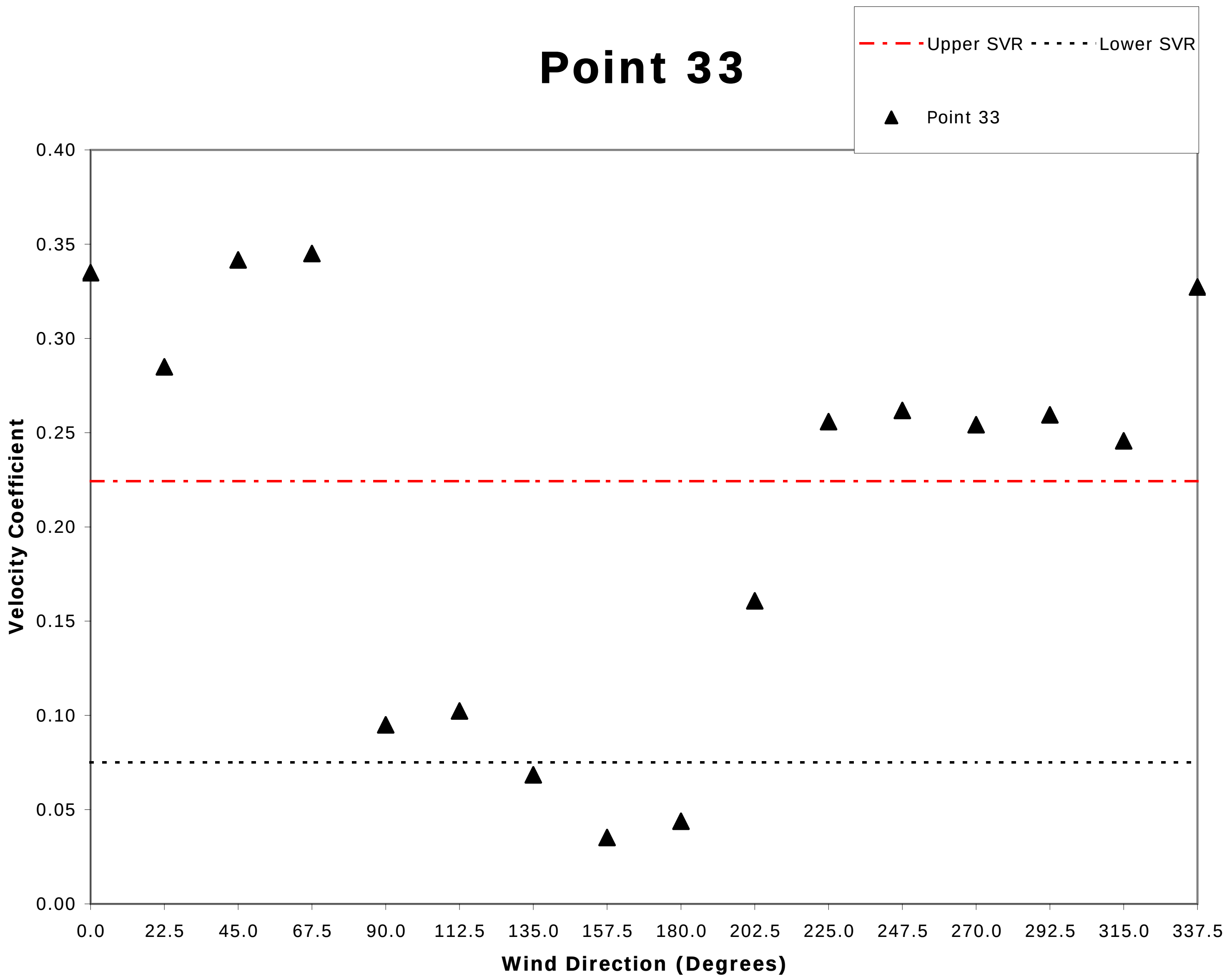


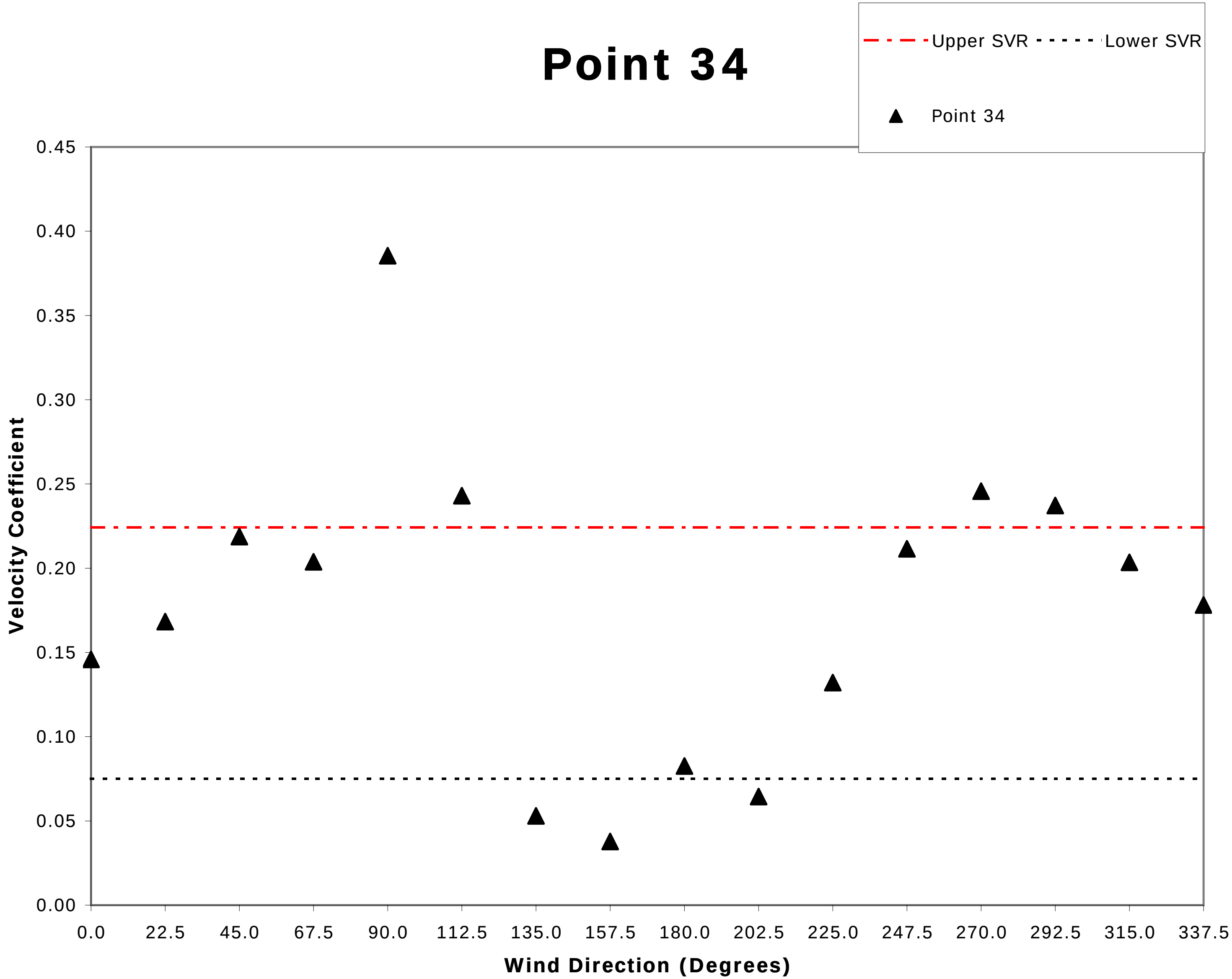
Point 30
Upper SVR
Lower SVR
Point 30
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

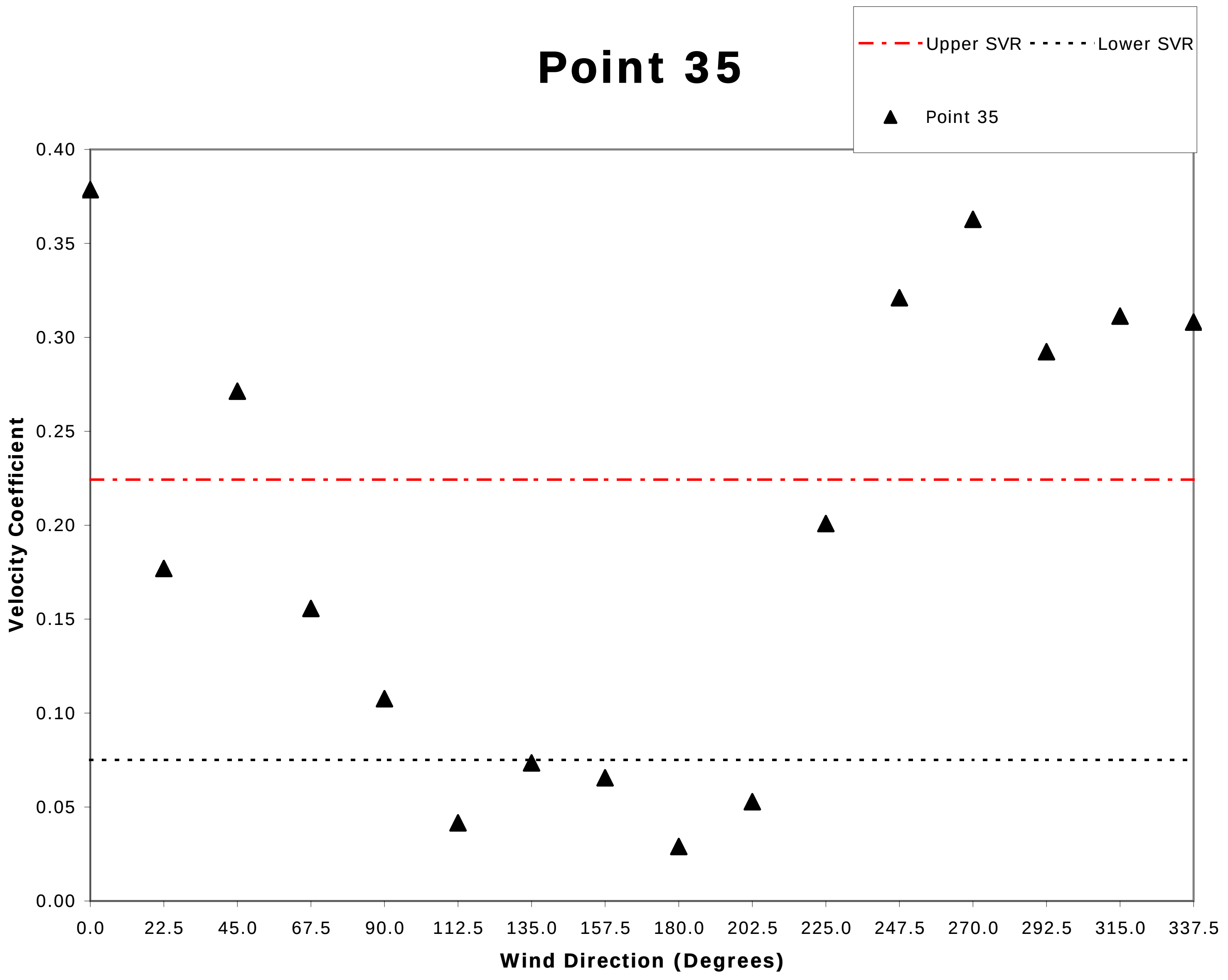


Point 31
Upper SVR
Lower SVR
Point 31
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

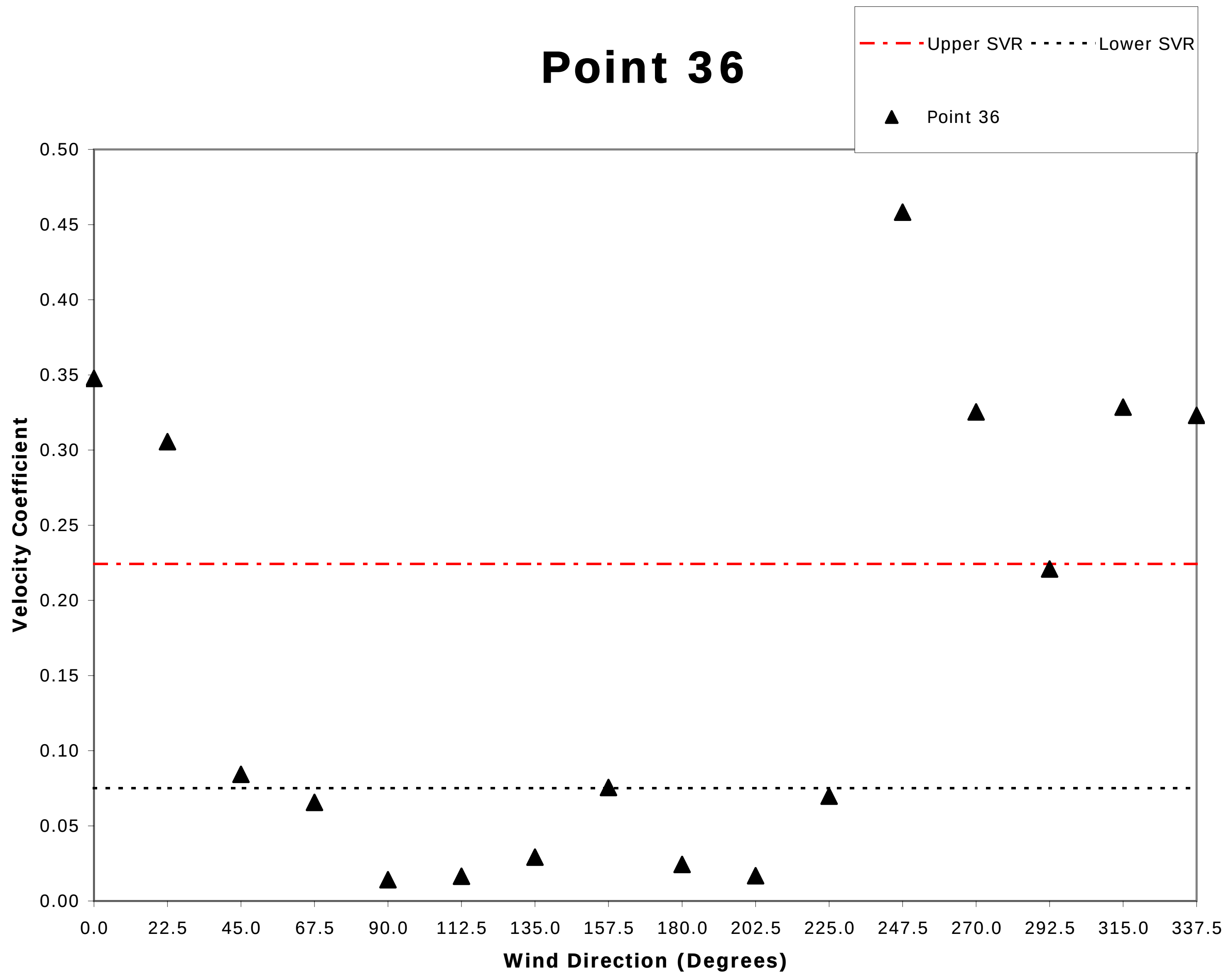

Point 32
Upper SVR
Lower SVR
Point 32
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 33
Upper SVR
Lower SVR
Point 33
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

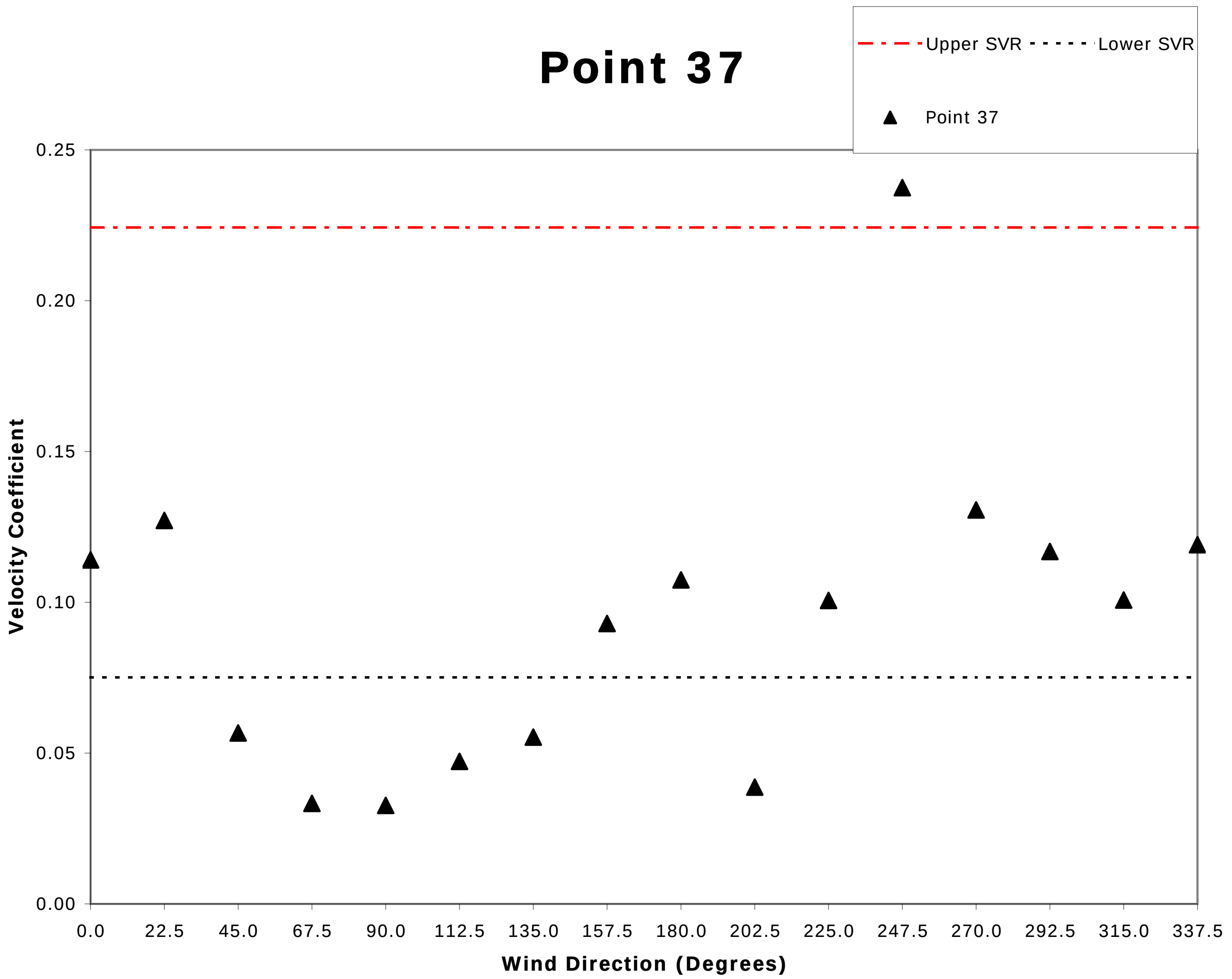

Point 34
Upper SVR
Lower SVR
Point 34
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

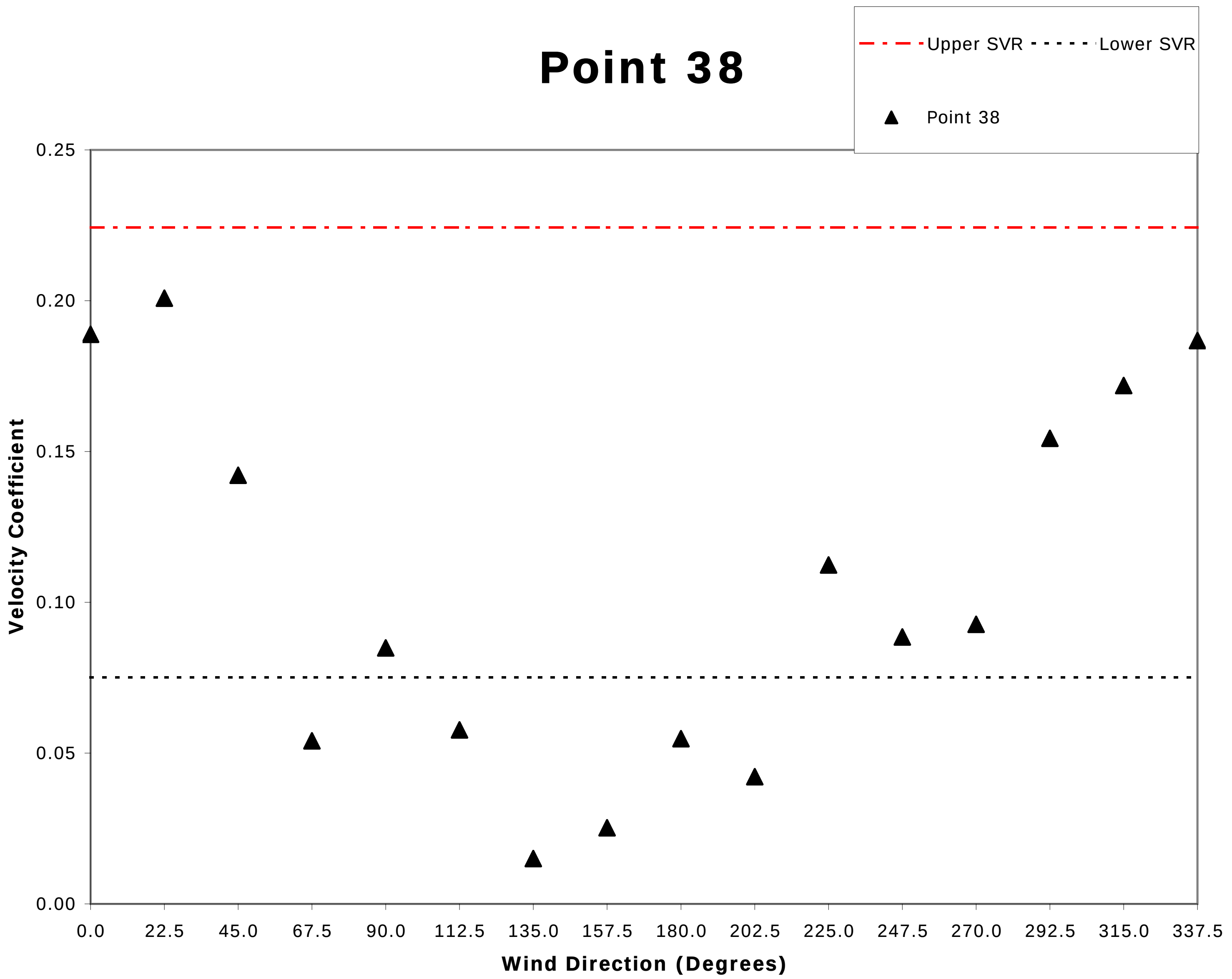


Point 35
Upper SVR
Lower SVR
Point 35
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

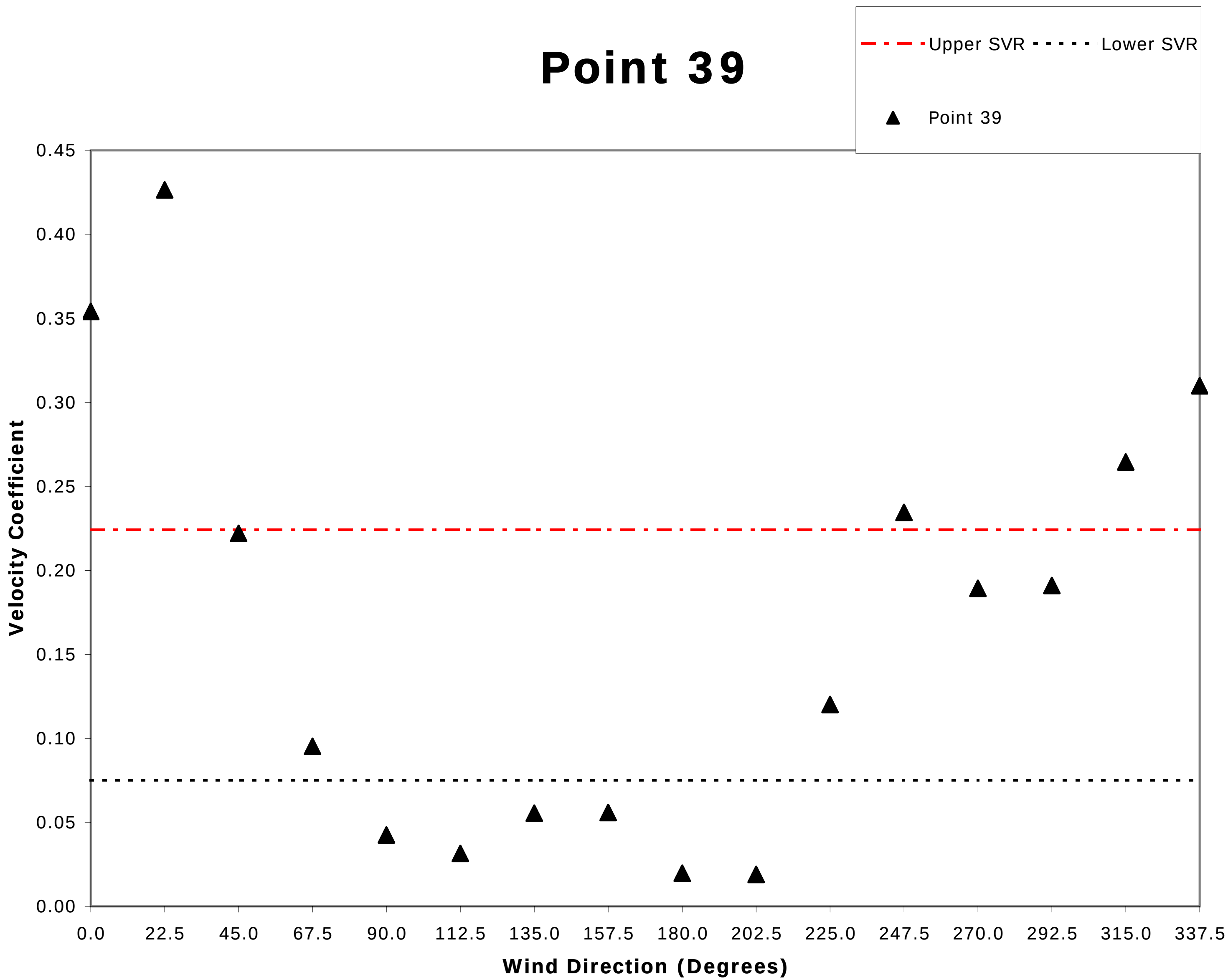


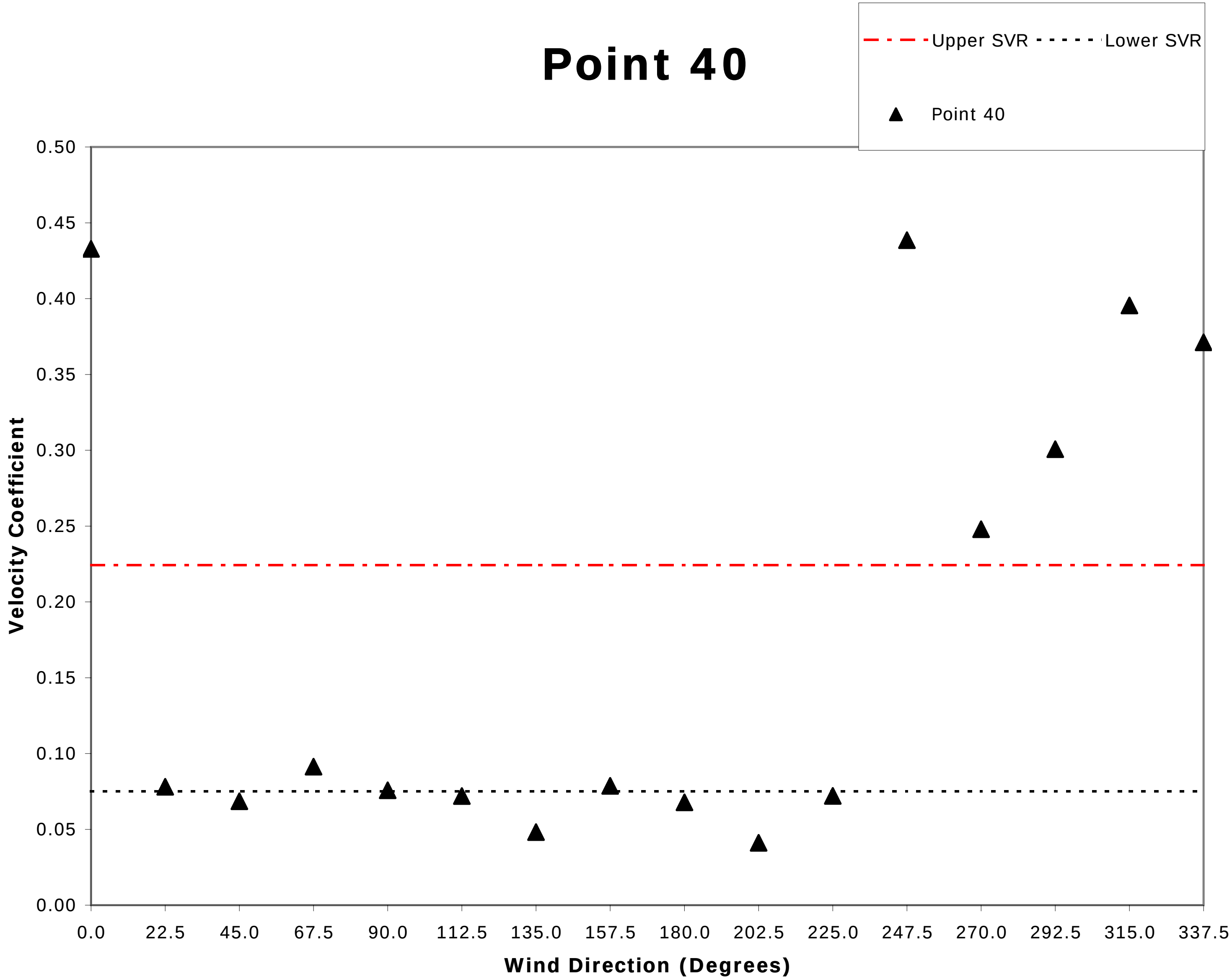
Point 36
Upper SVR
Lower SVR
Point 36
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

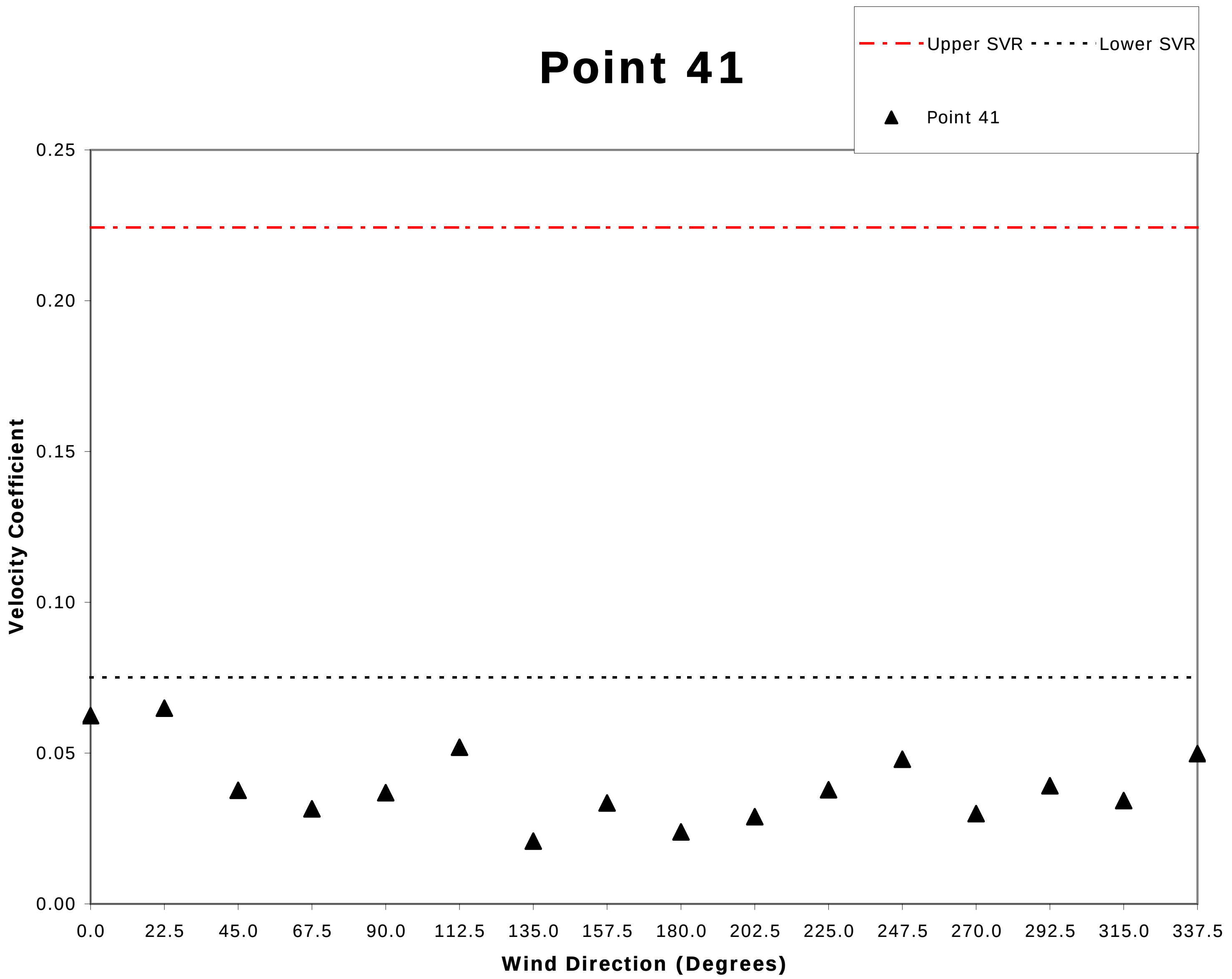

Point 37
Upper SVR
Lower SVR
Point 37
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

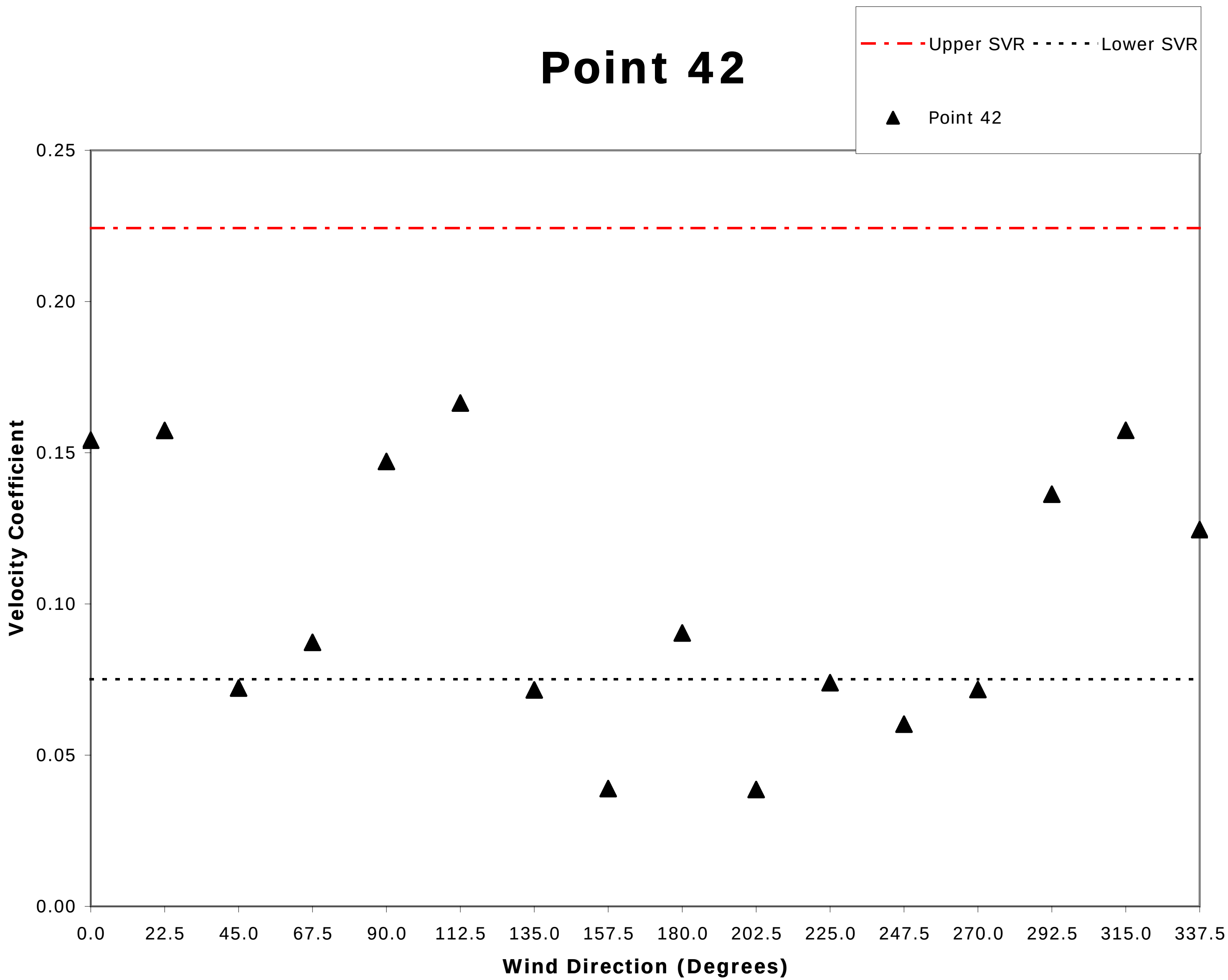


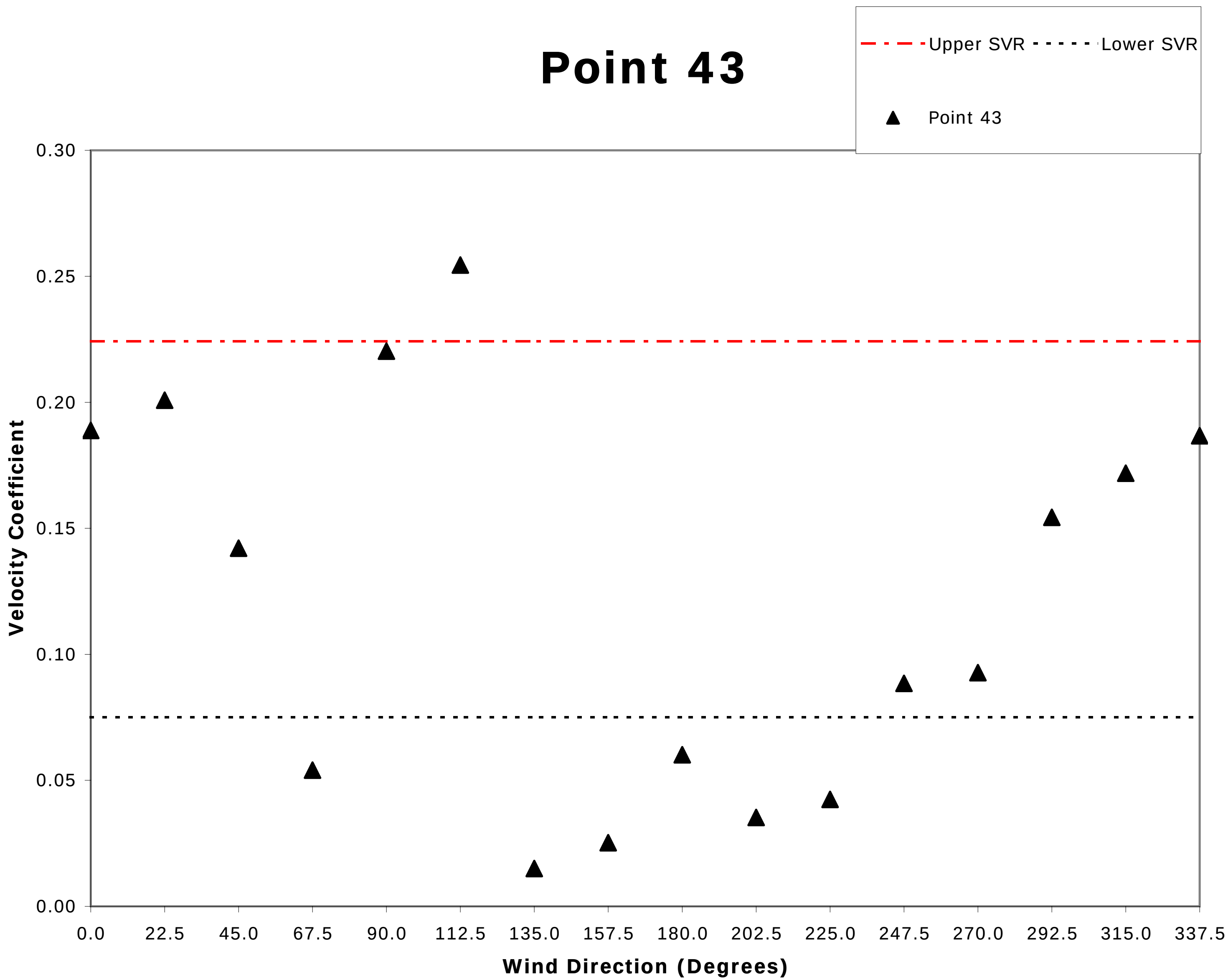
Point 38
Upper SVR
Lower SVR
Point 38
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 39
Upper SVR
Lower SVR
Point 39
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

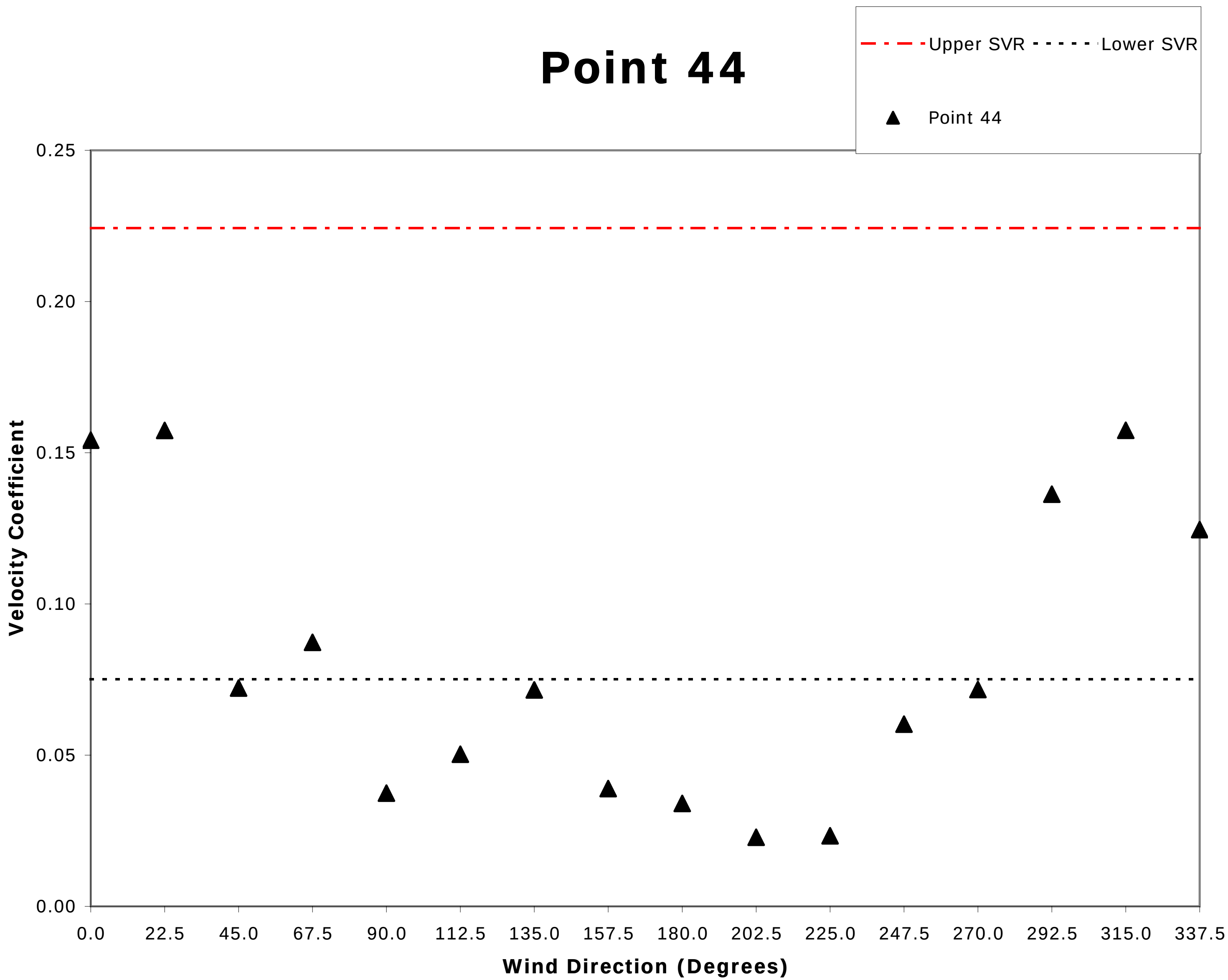

Point 40
Upper SVR
Lower SVR
Point 40
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 41
Upper SVR
Lower SVR
Point 41
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

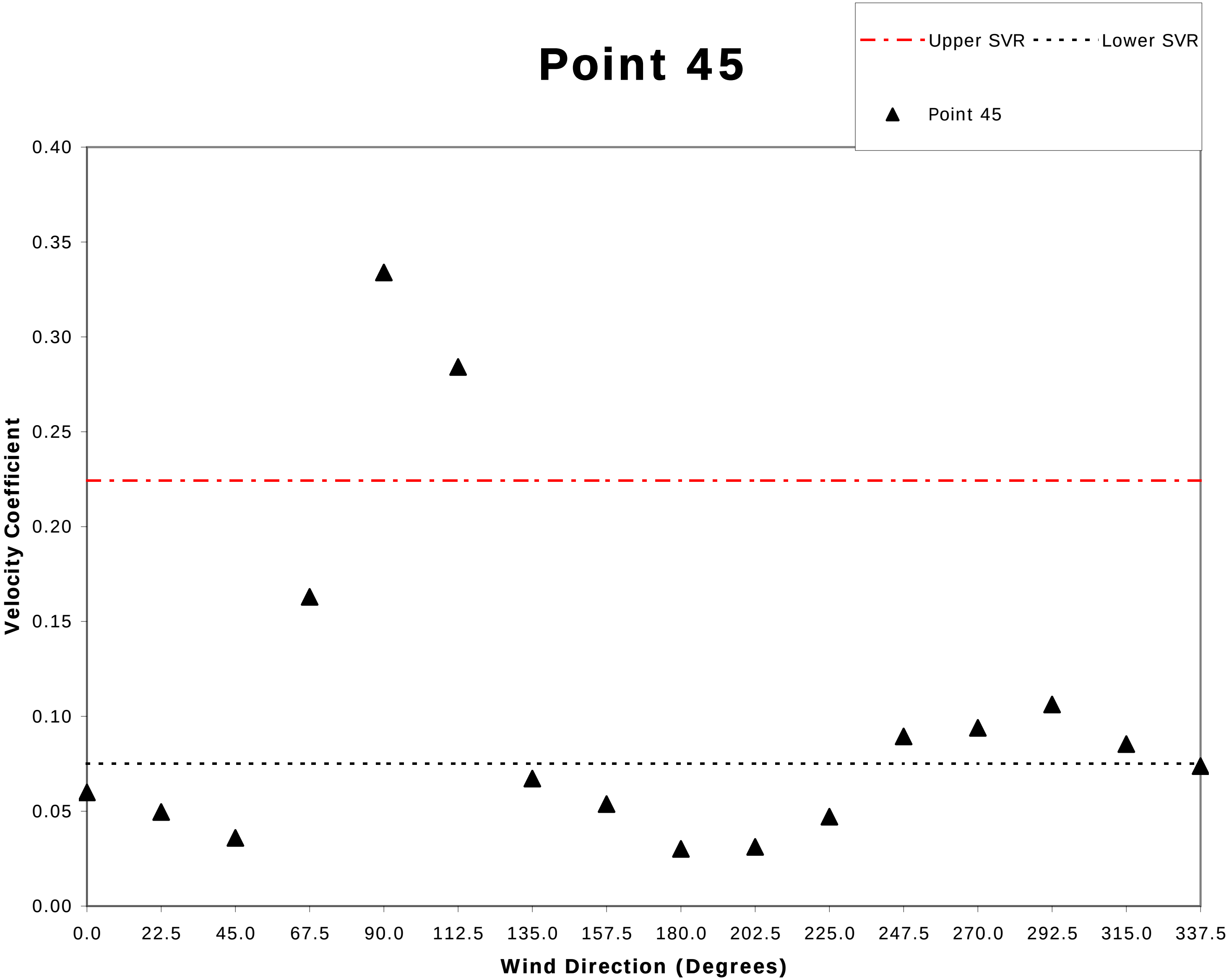

Point 42
Upper SVR
Lower SVR
Point 42
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

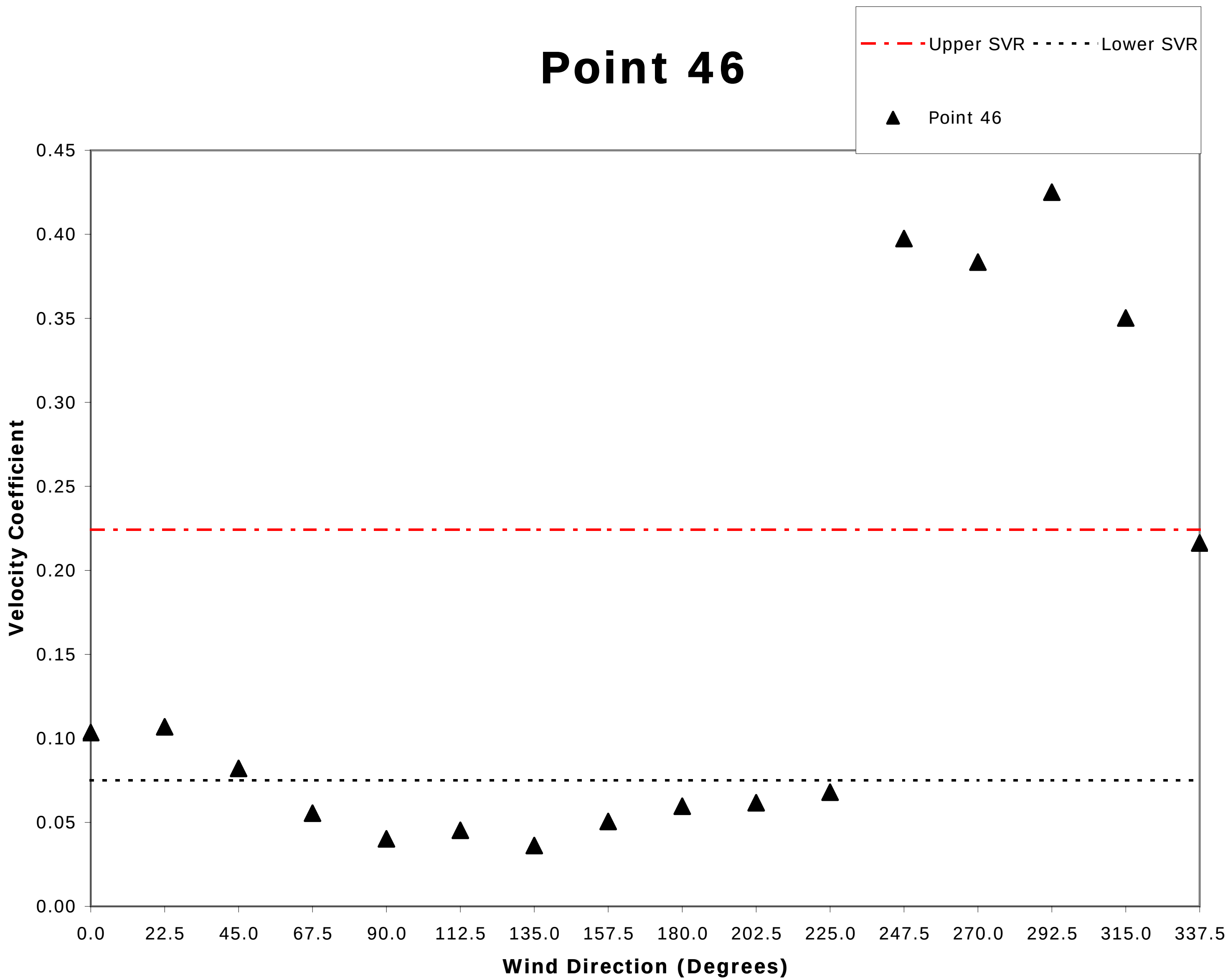


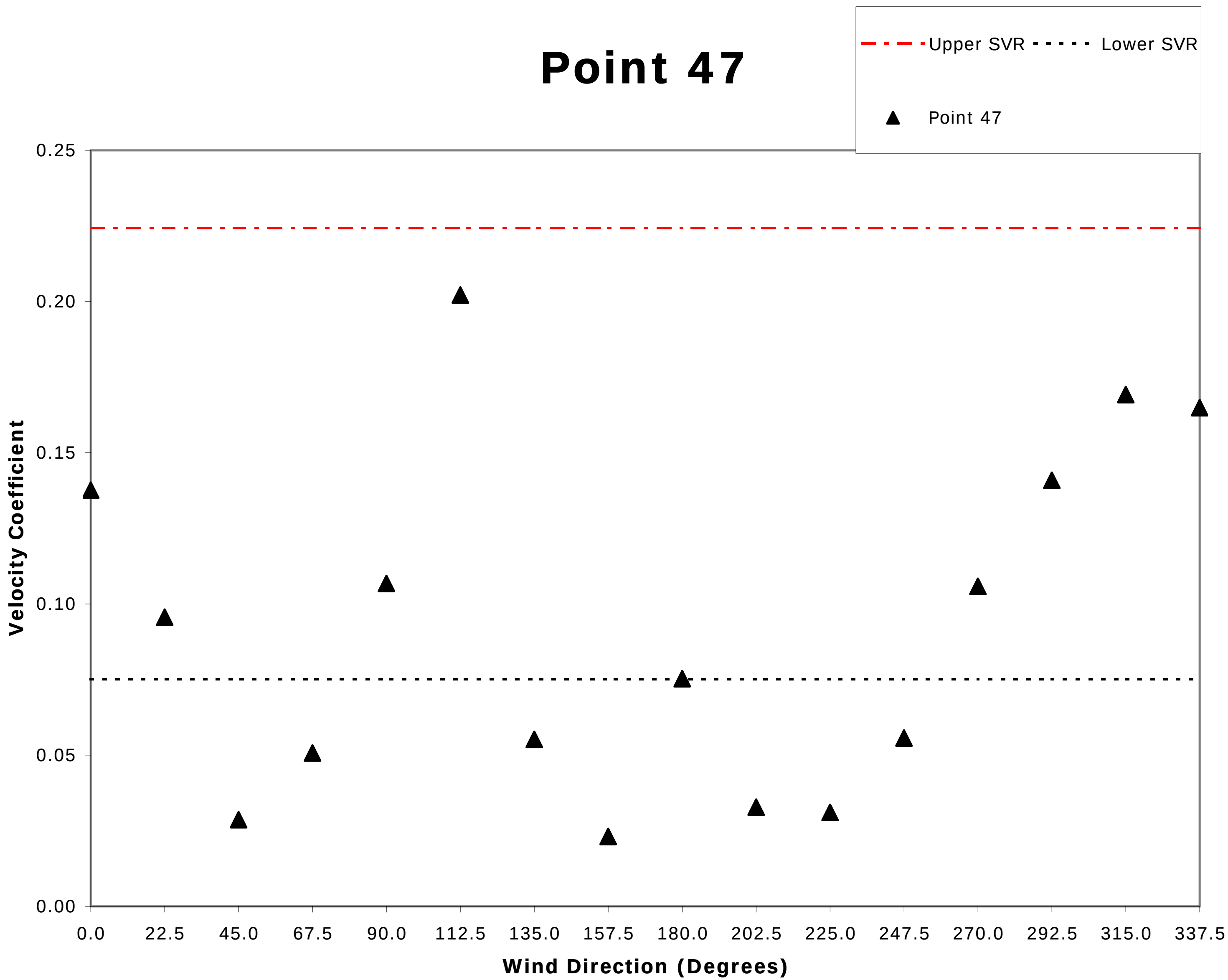
Point 43
Upper SVR
Lower SVR
Point 43
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

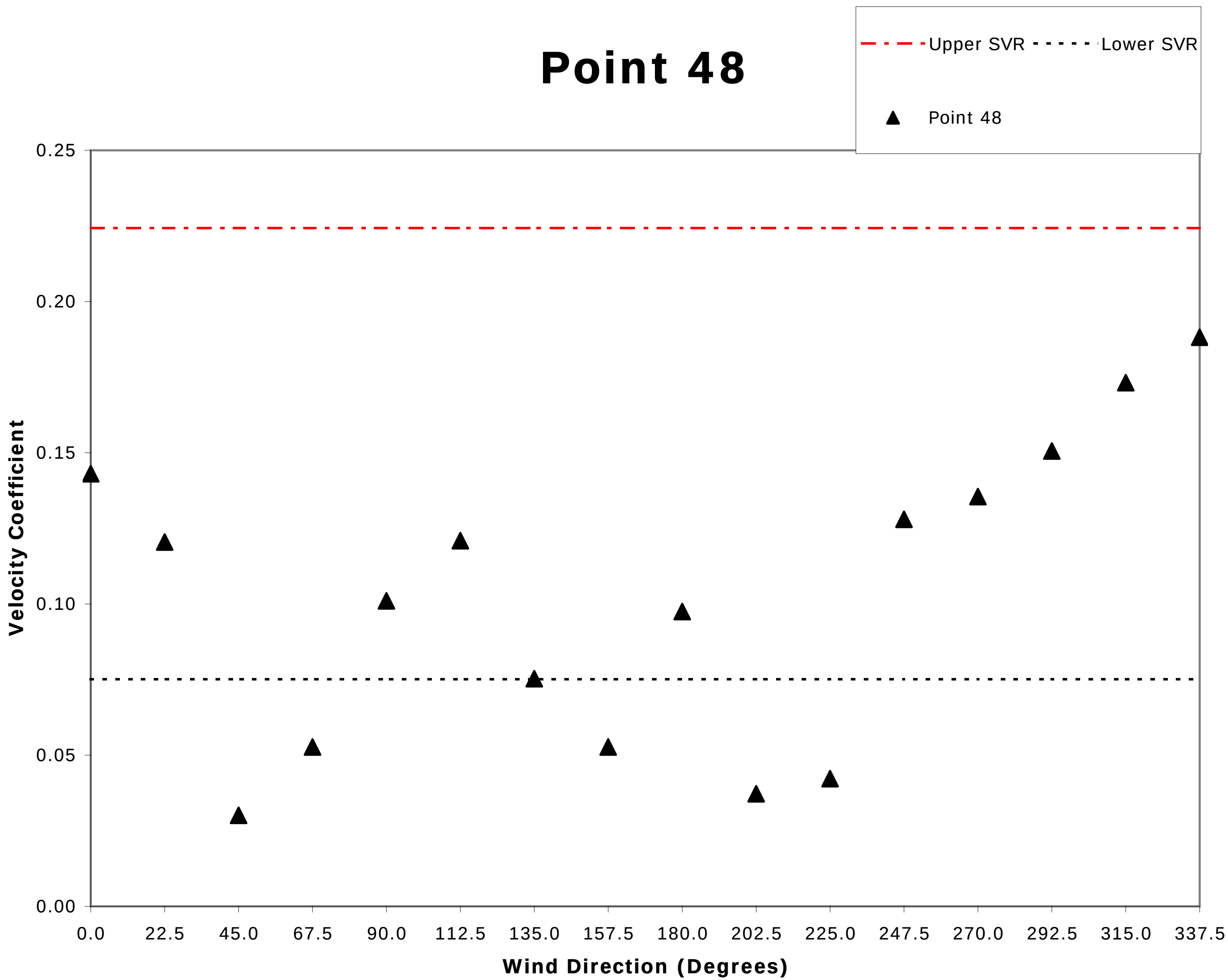


Point 44
Upper SVR
Lower SVR
Point 44
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

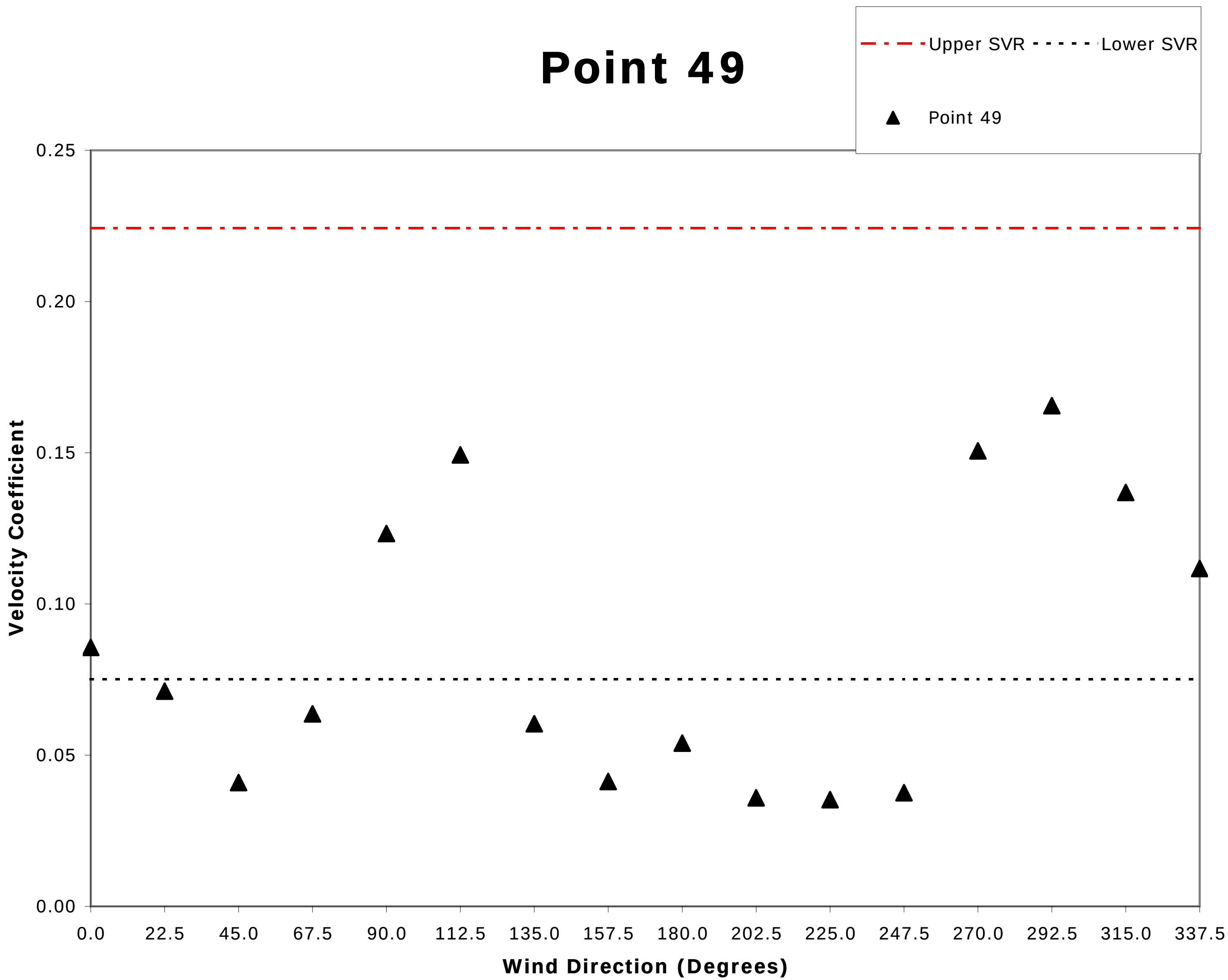

Point 45
Upper SVR
Lower SVR
Point 45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

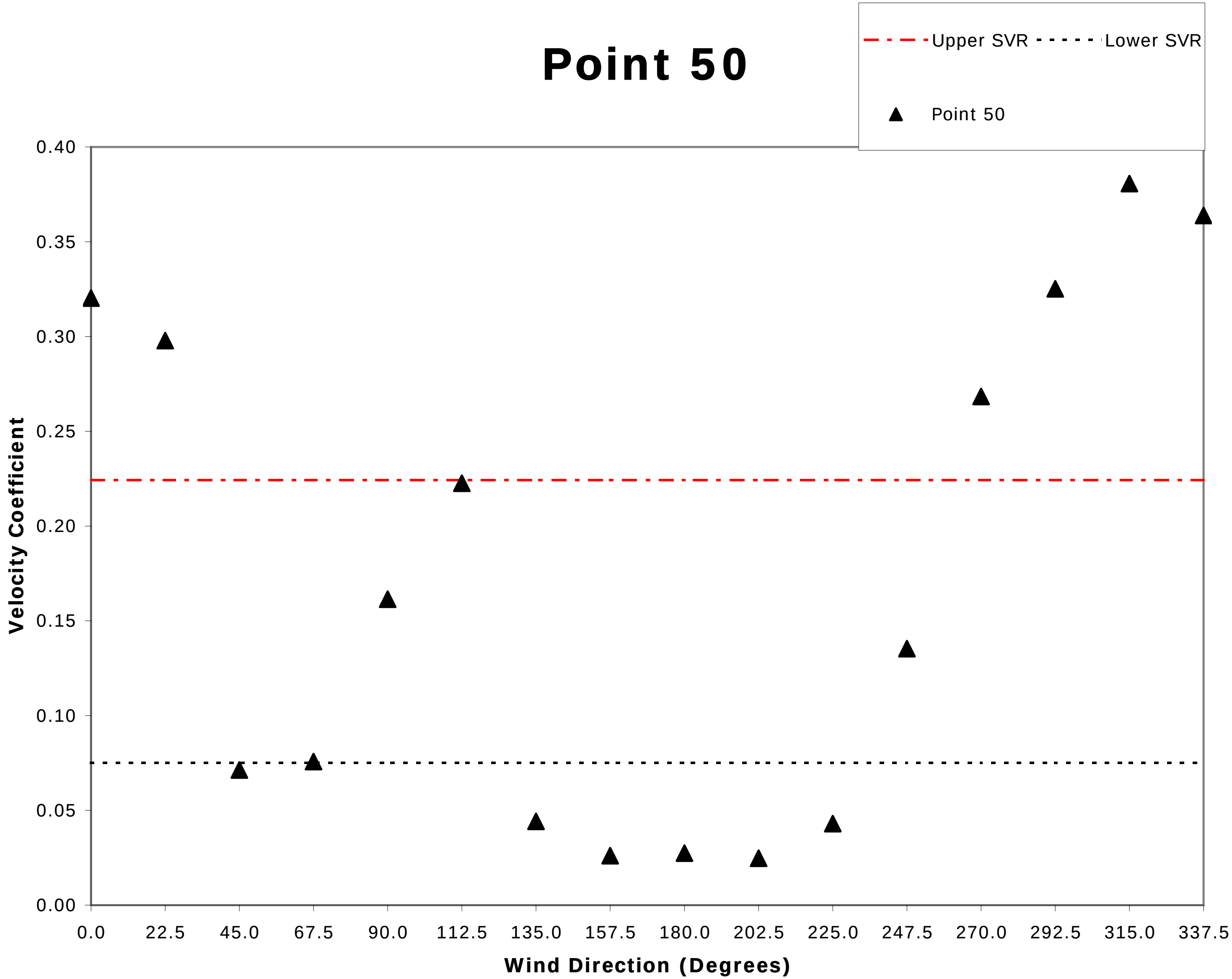

Point 46
Upper SVR
Lower SVR
Point 46
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 47
Upper SVR
Lower SVR
Point 47
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

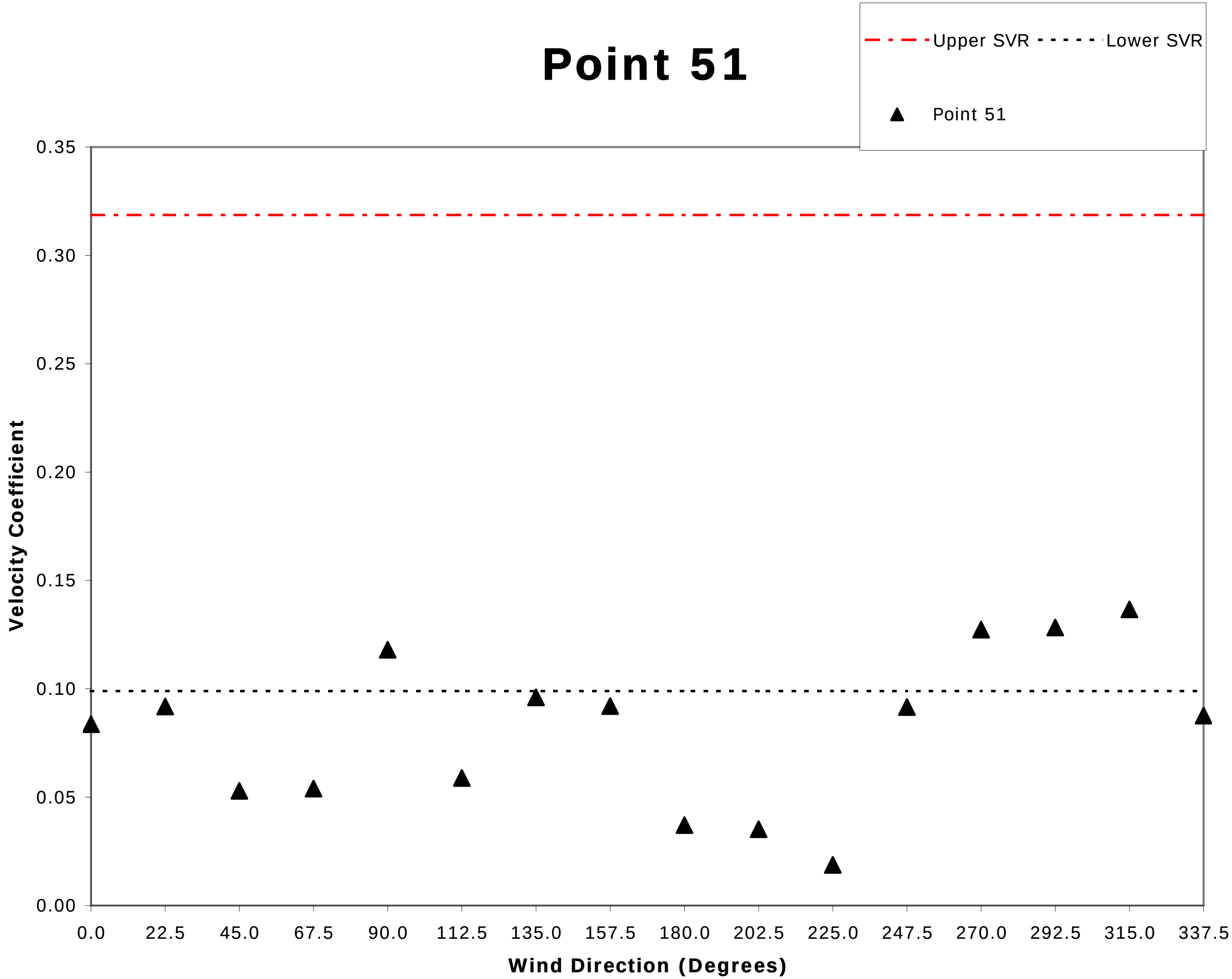


Point 48
Upper SVR
Lower SVR
Point 48
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

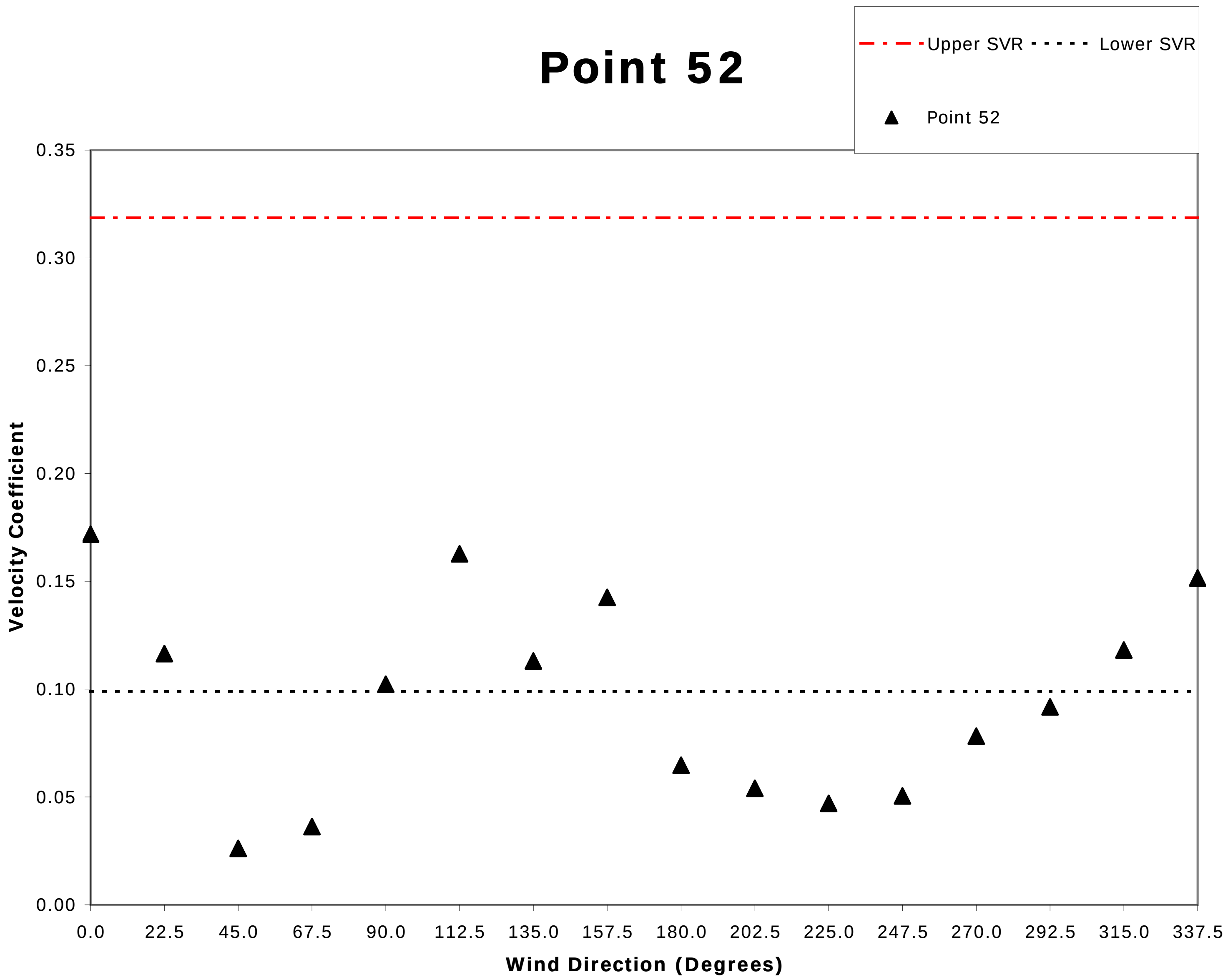

Point 49
Upper SVR
Lower SVR
Point 49
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



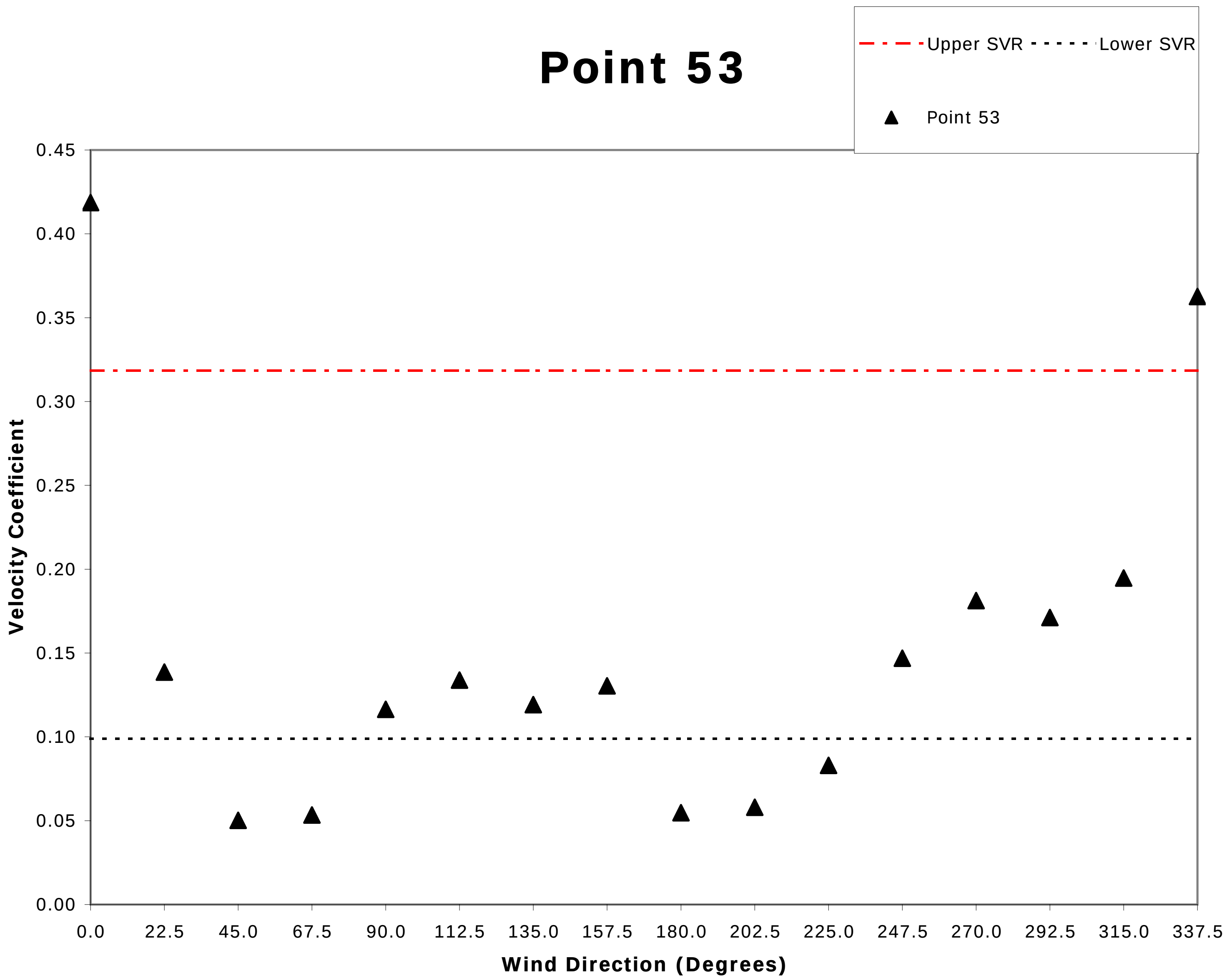
Point 50
Upper SVR
Lower SVR
Point 50
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

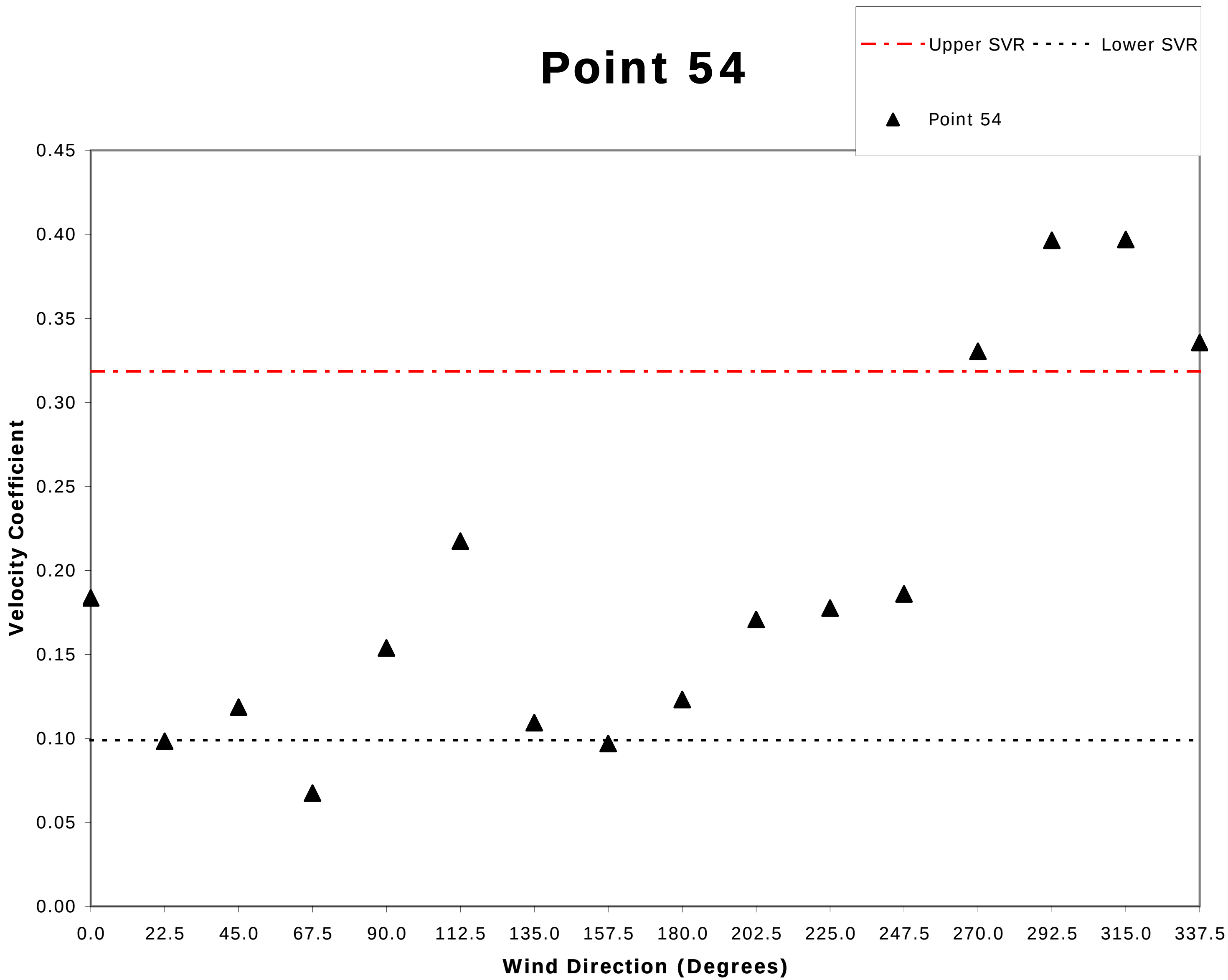


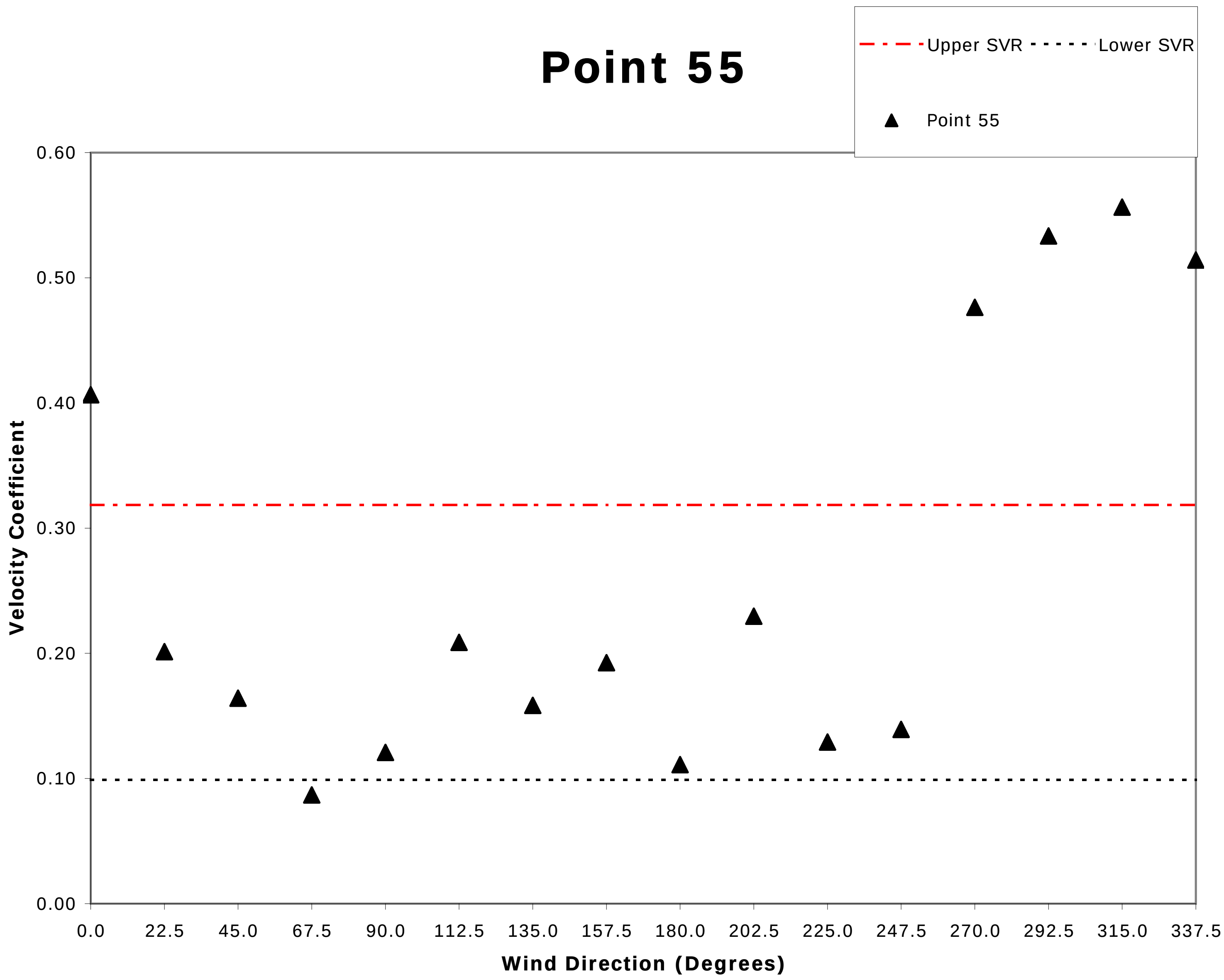
Point 51
Upper SVR
Lower SVR
Point 51
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

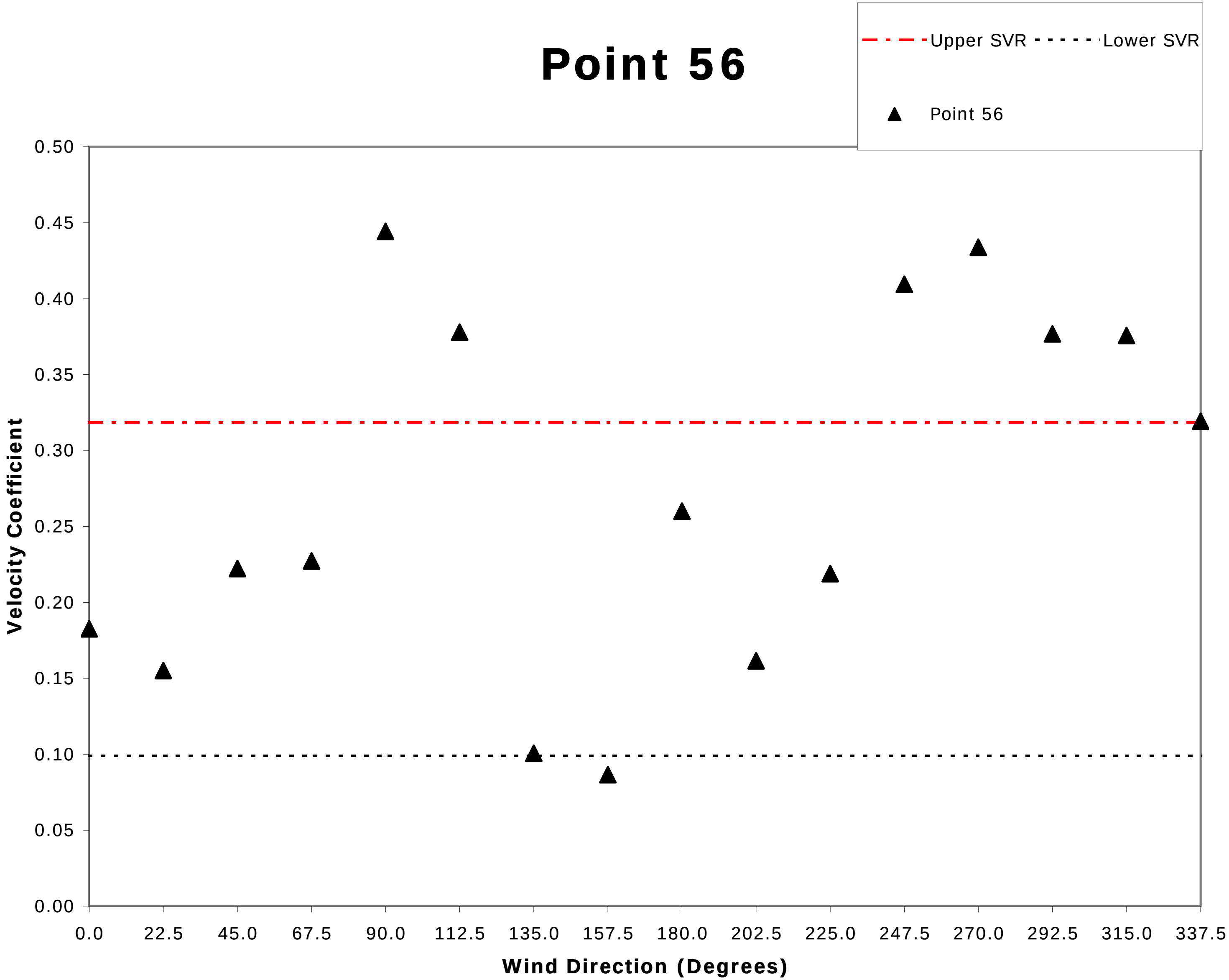


Point 52
Upper SVR
Lower SVR
Point 52
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

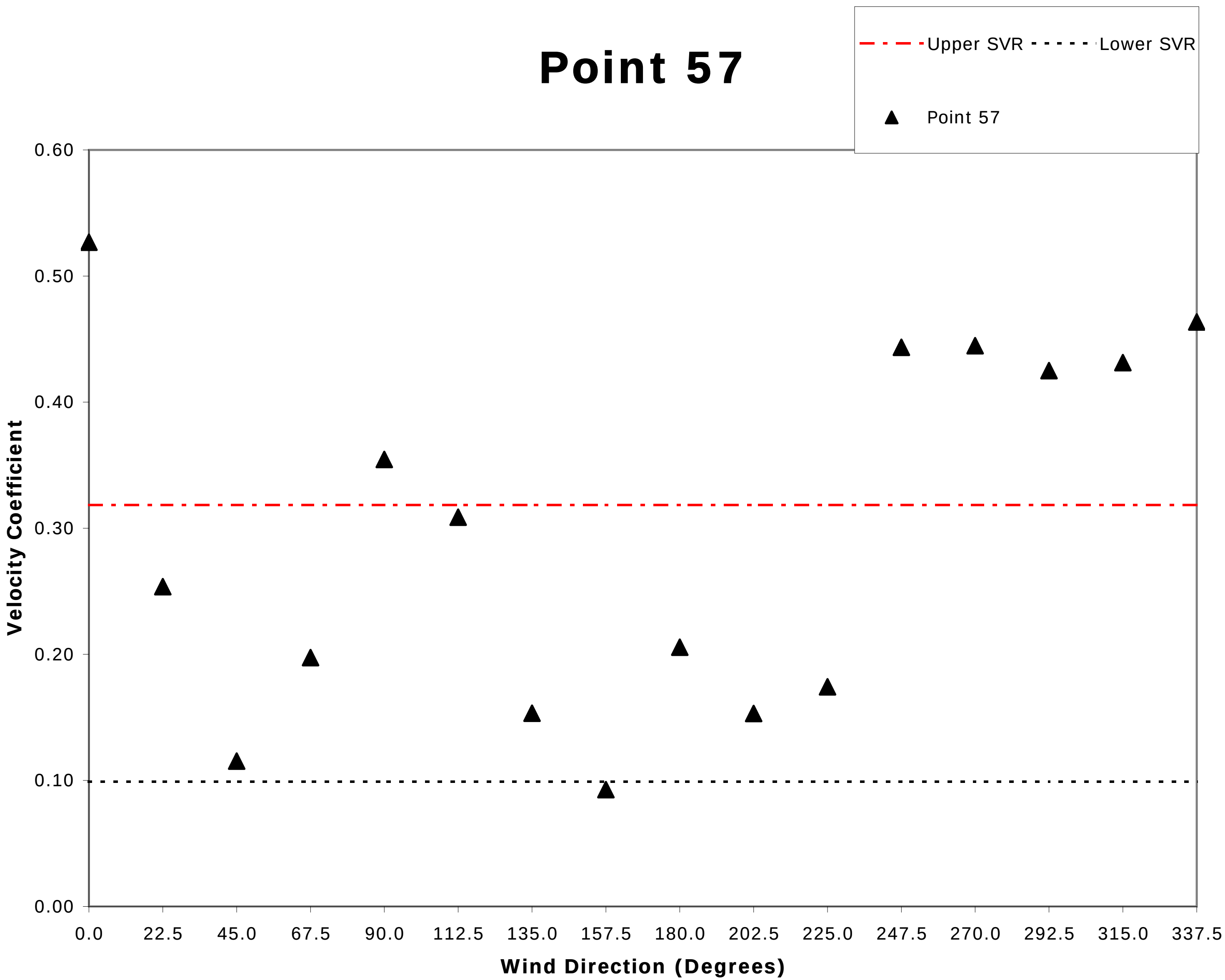

Point 53
Upper SVR
Lower SVR
Point 53
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

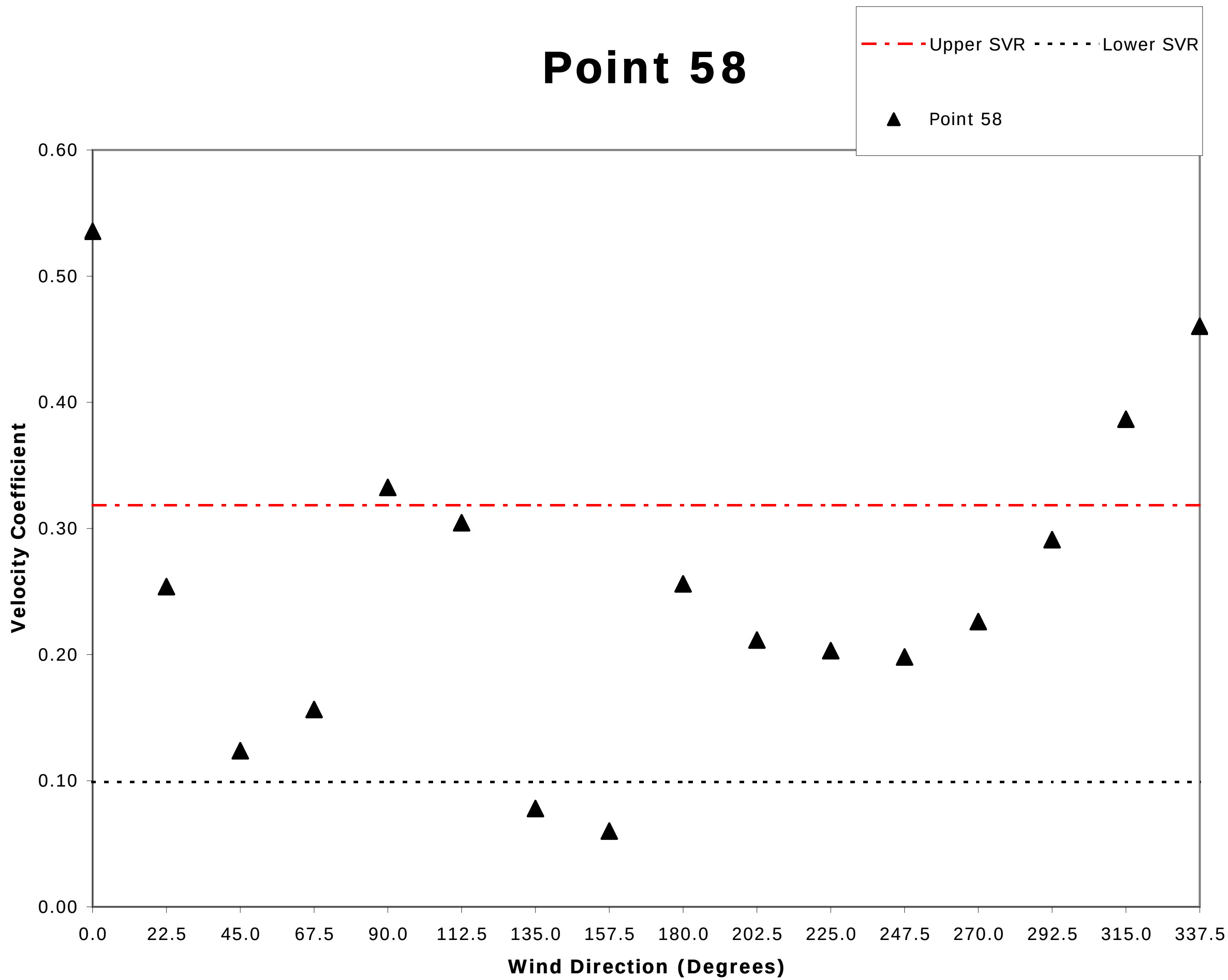

Point 54
Upper SVR
Lower SVR
Point 54
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

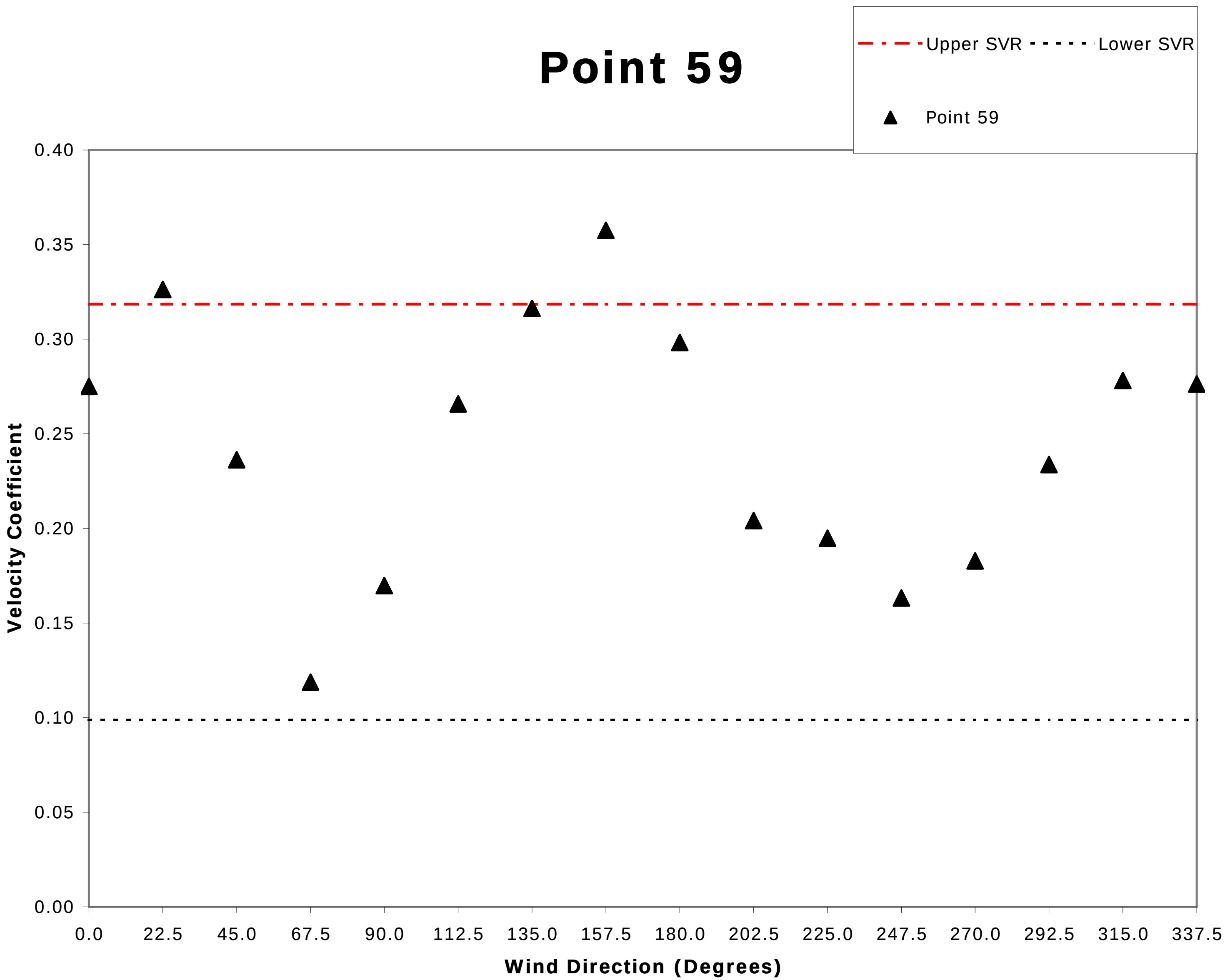

Point 55
Upper SVR
Lower SVR
Point 55
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



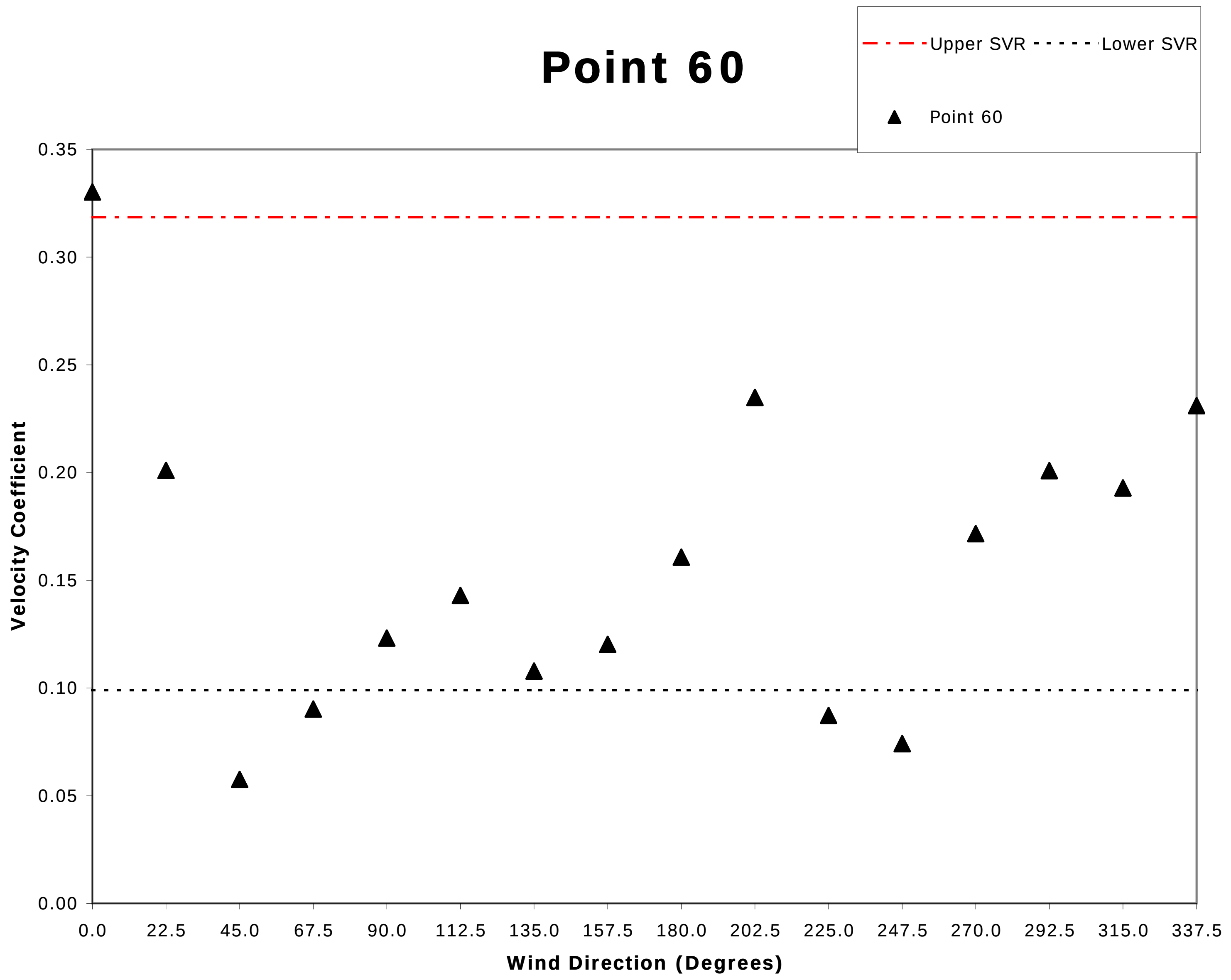
Point 56
Upper SVR
Lower SVR
Point 56
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

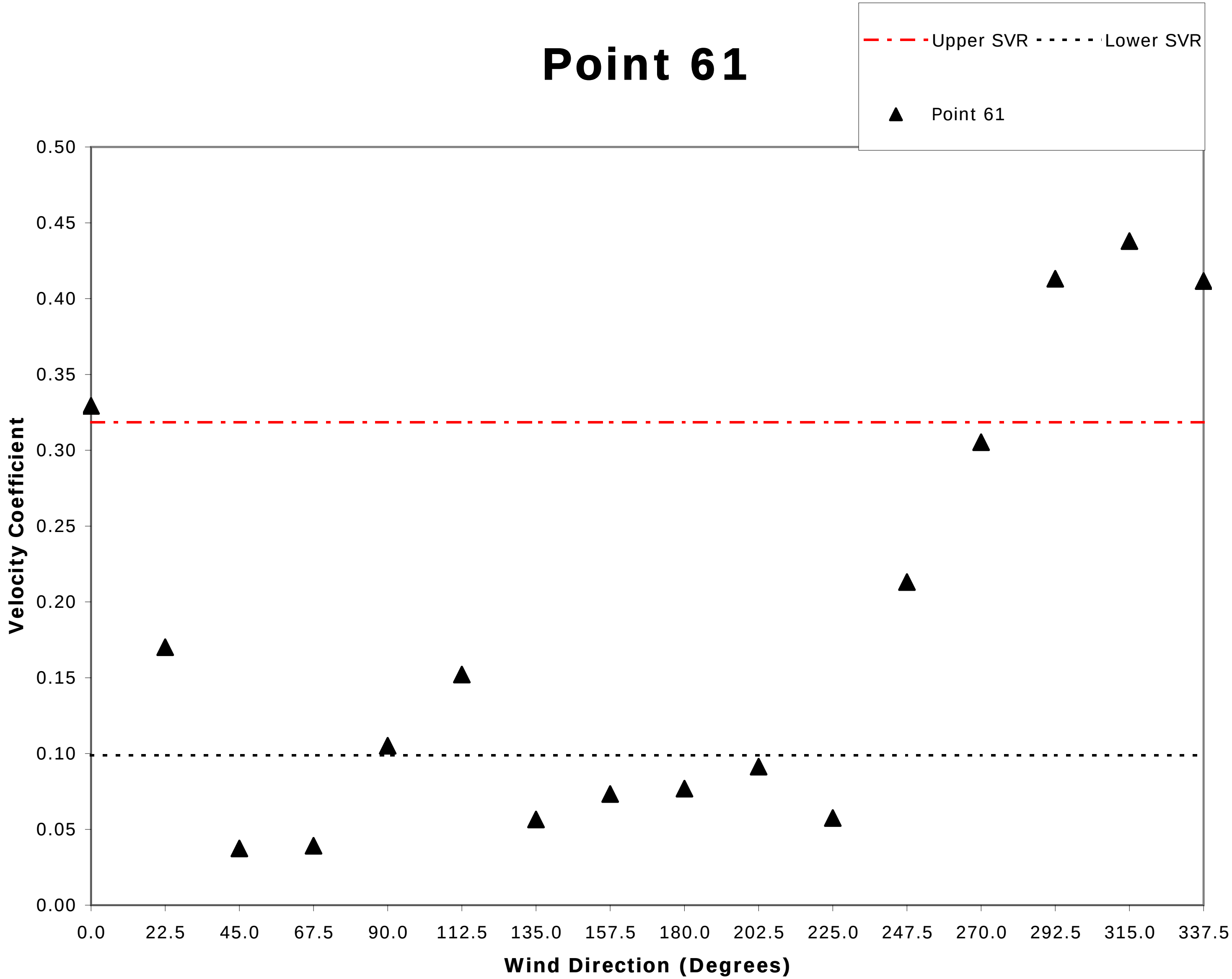

Point 57
Upper SVR
Lower SVR
Point 57
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 58
Upper SVR
Lower SVR
Point 58
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

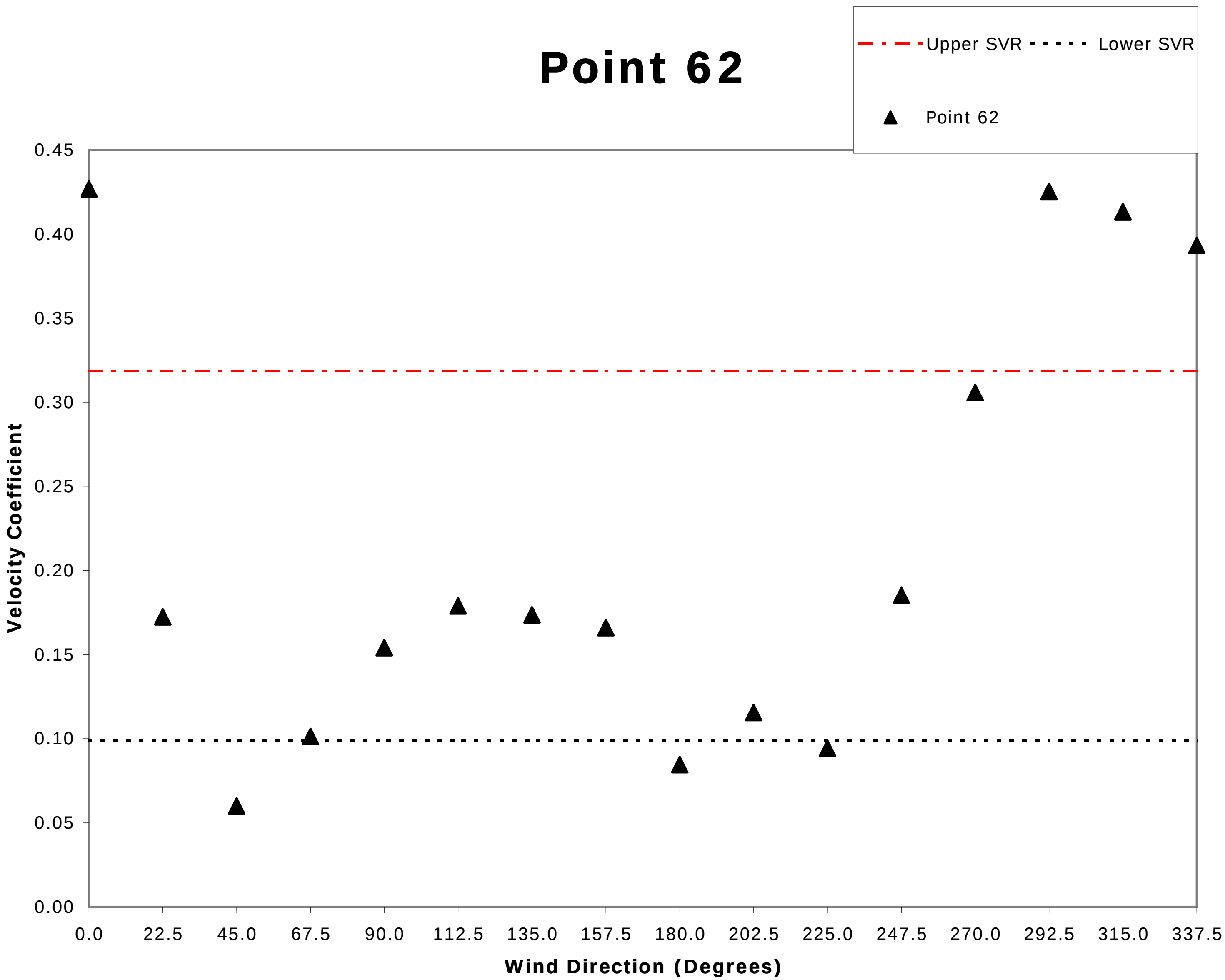


Point 59
Upper SVR
Lower SVR
Point 59
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

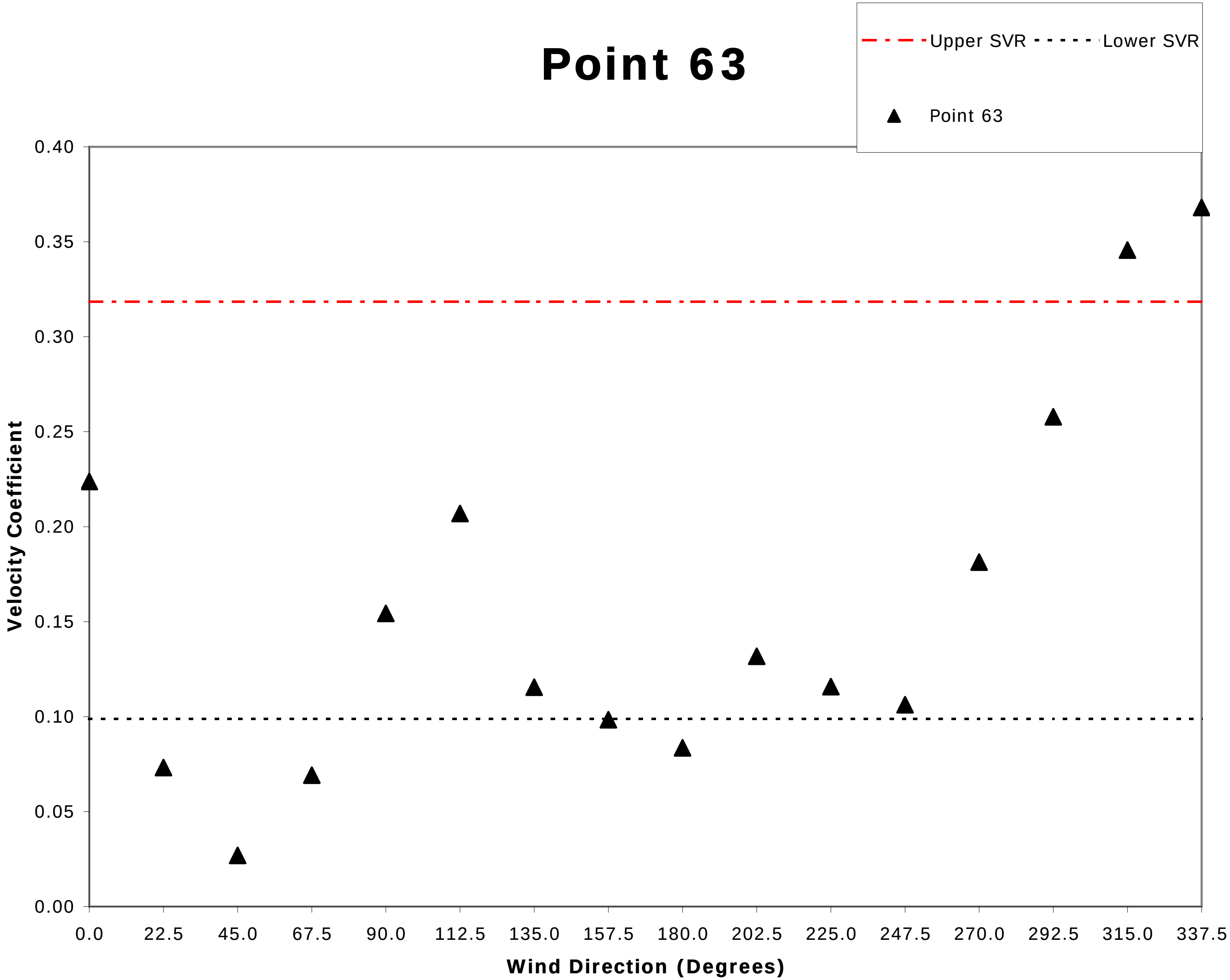

Point 60
Upper SVR
Lower SVR
Point 60
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



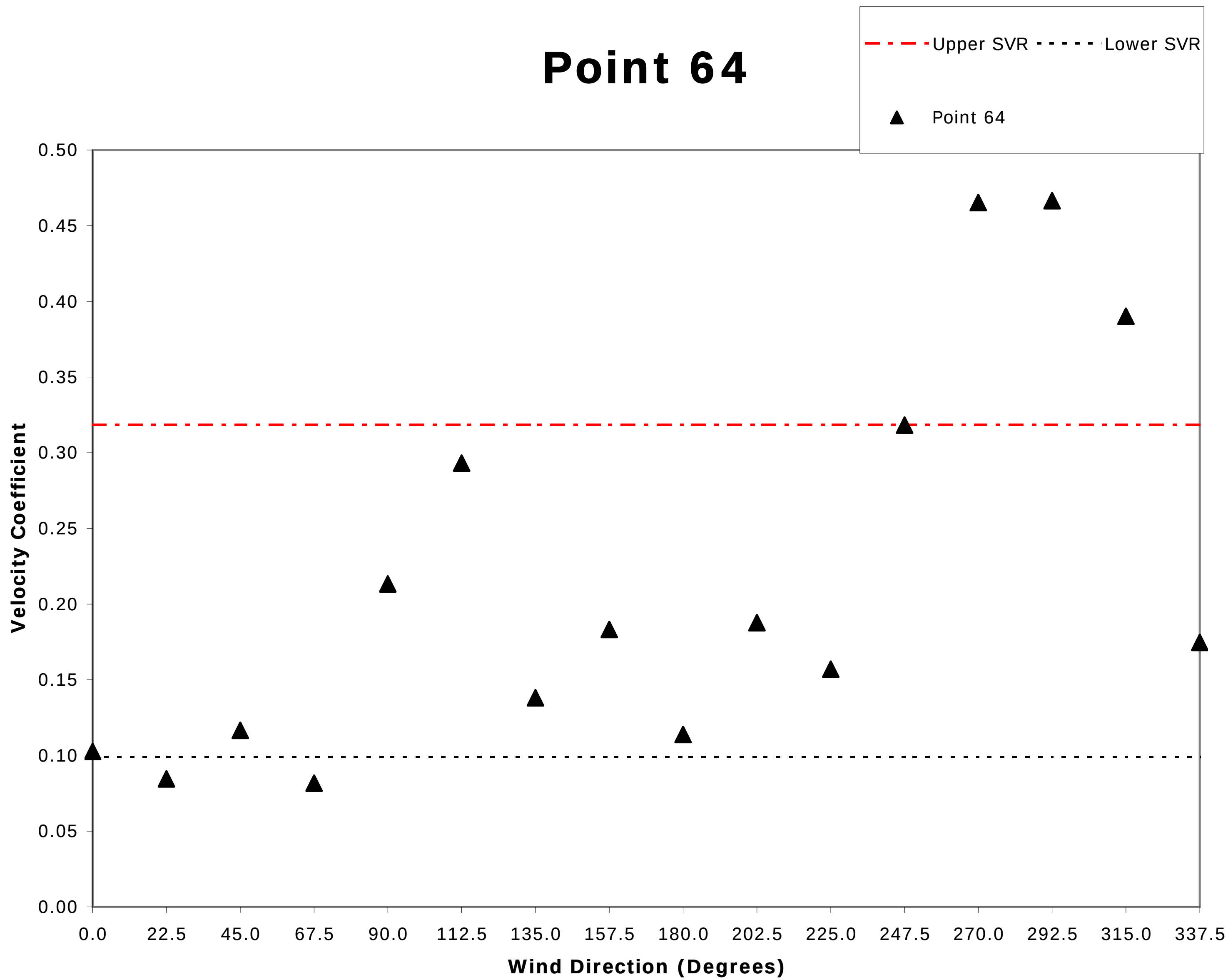
Point 61
Upper SVR
Lower SVR
Point 61
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

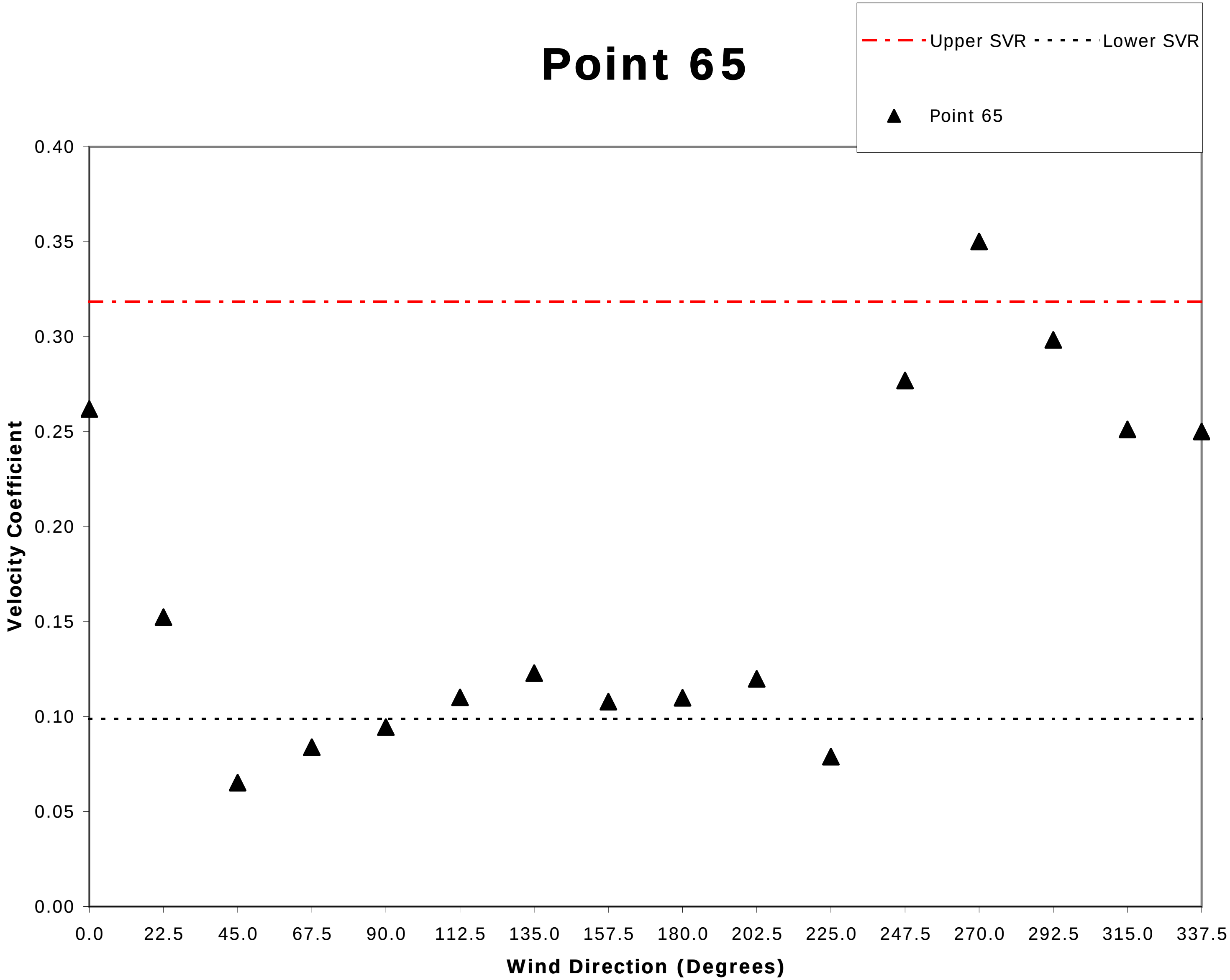


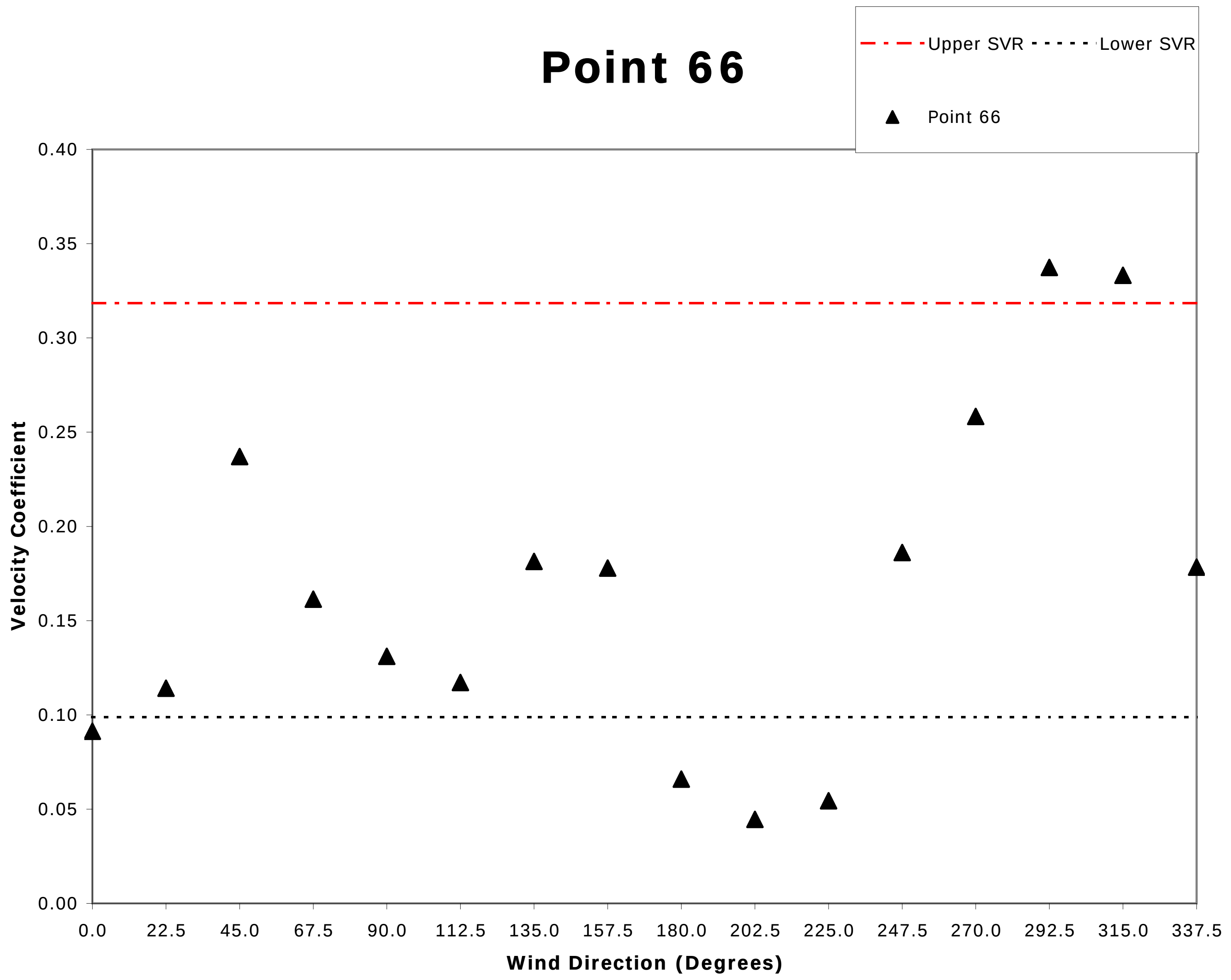
Point 62
Upper SVR
Lower SVR
Point 62
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

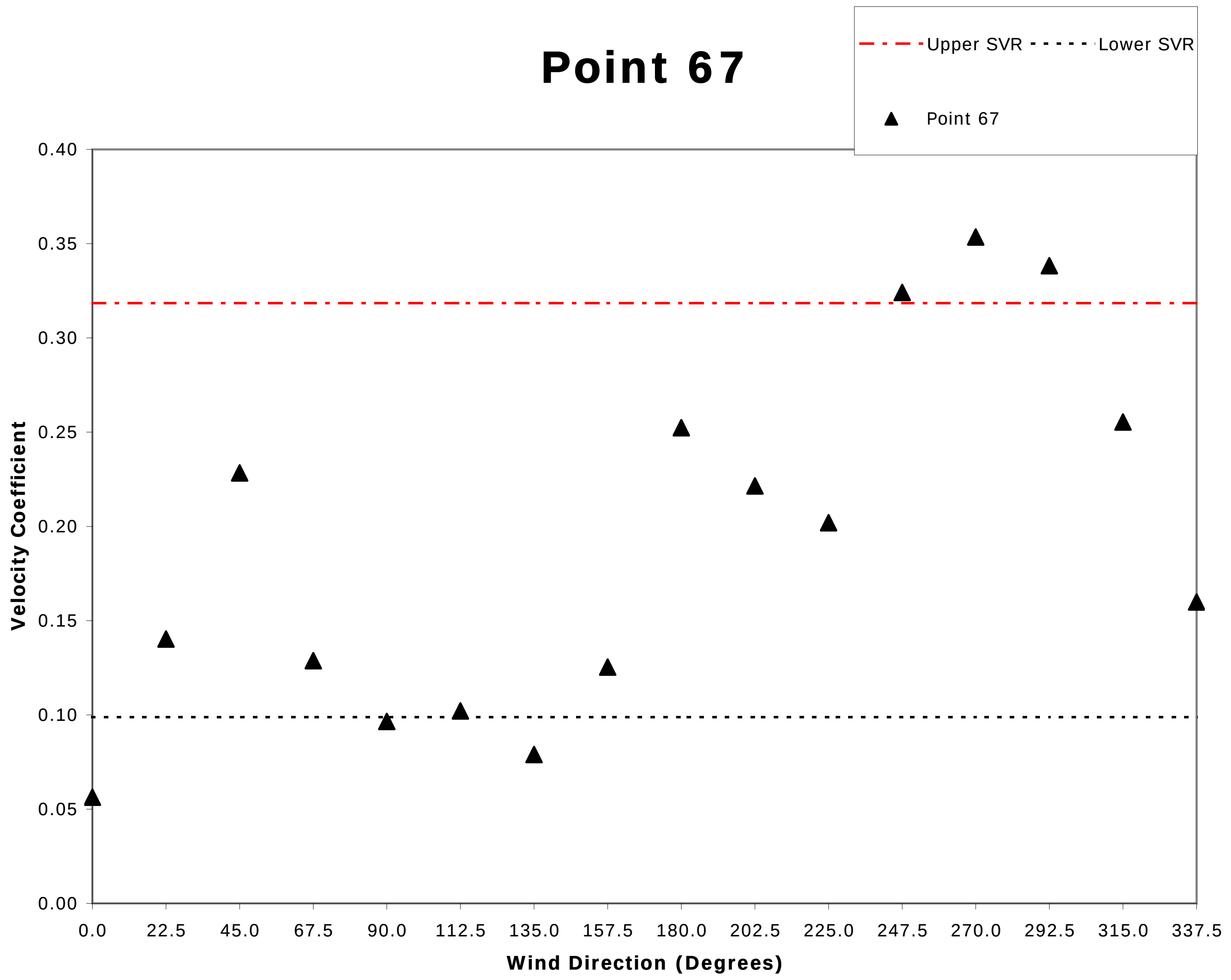


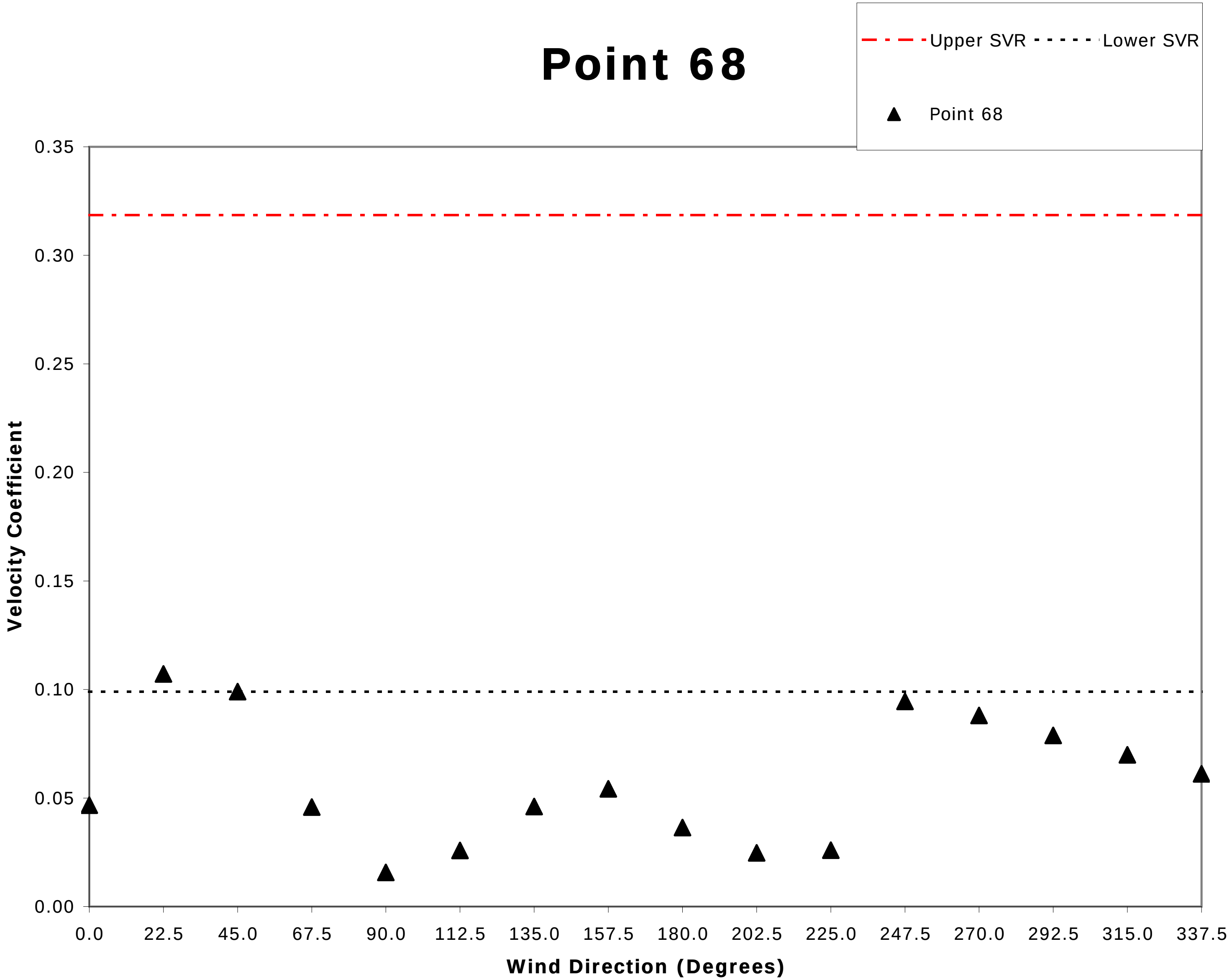
Point 63
Upper SVR
Lower SVR
Point 63
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 64
Upper SVR
Lower SVR
Point 64
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

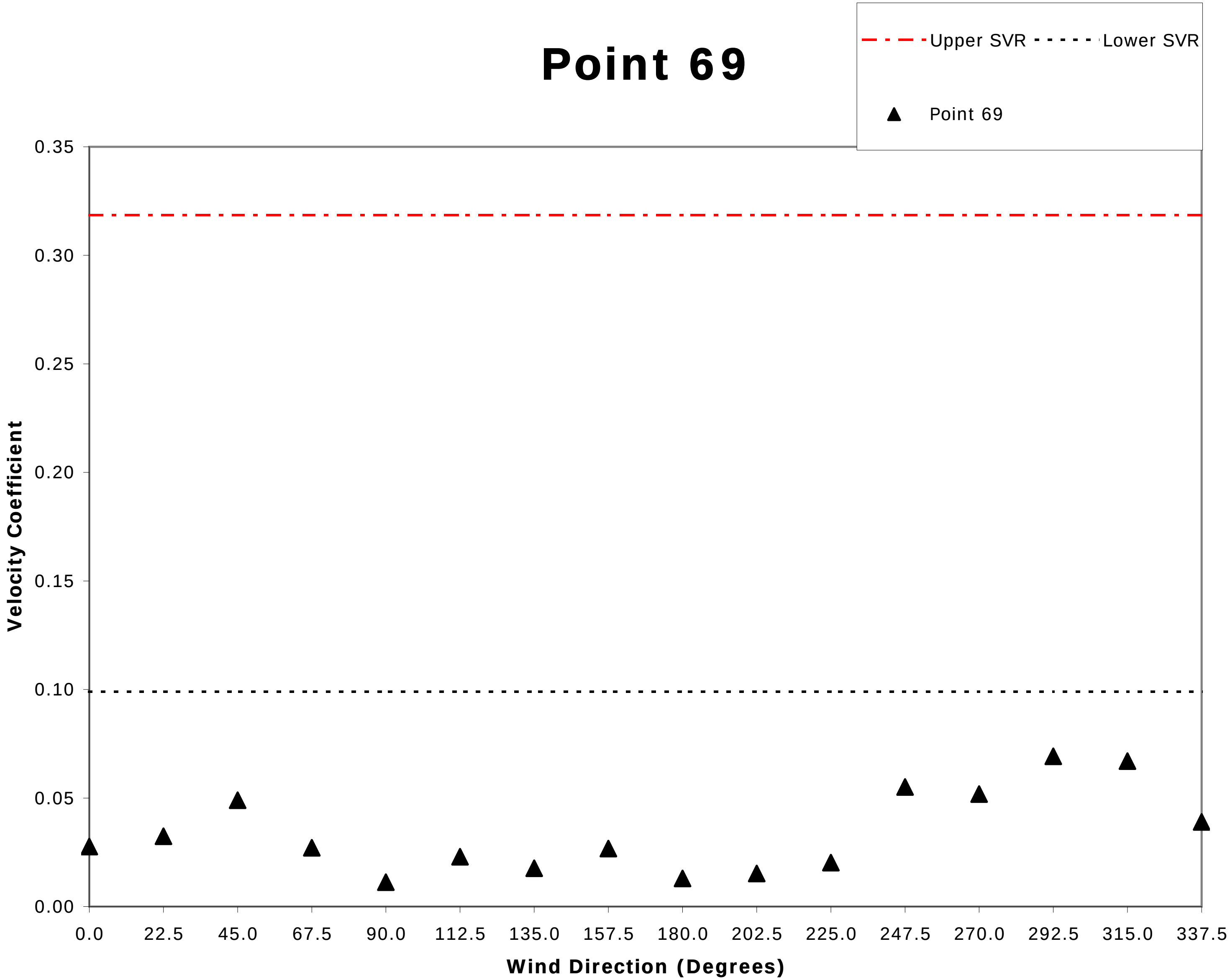

Point 65
Upper SVR
Lower SVR
Point 65
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

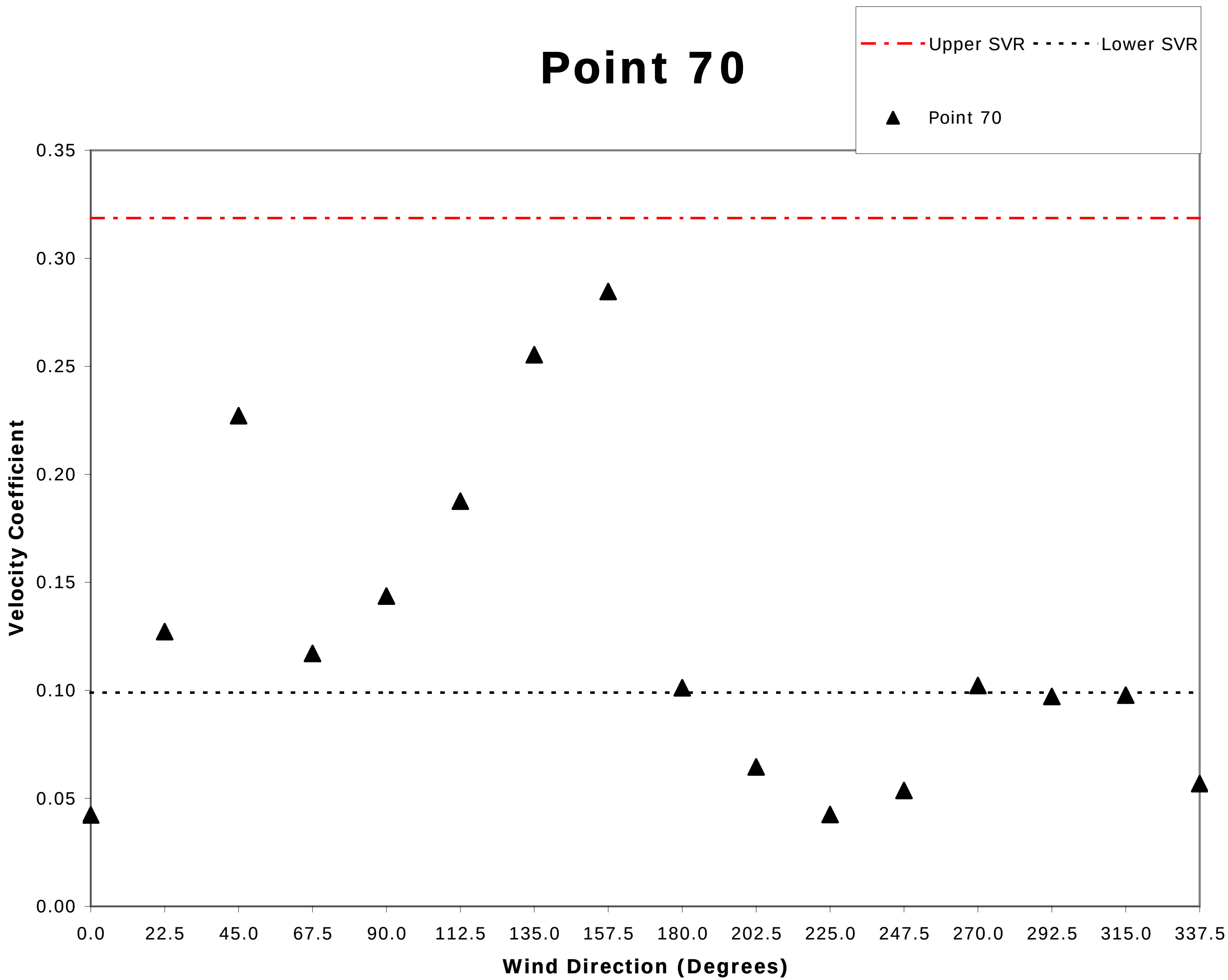

Point 66
Upper SVR
Lower SVR
Point 66
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

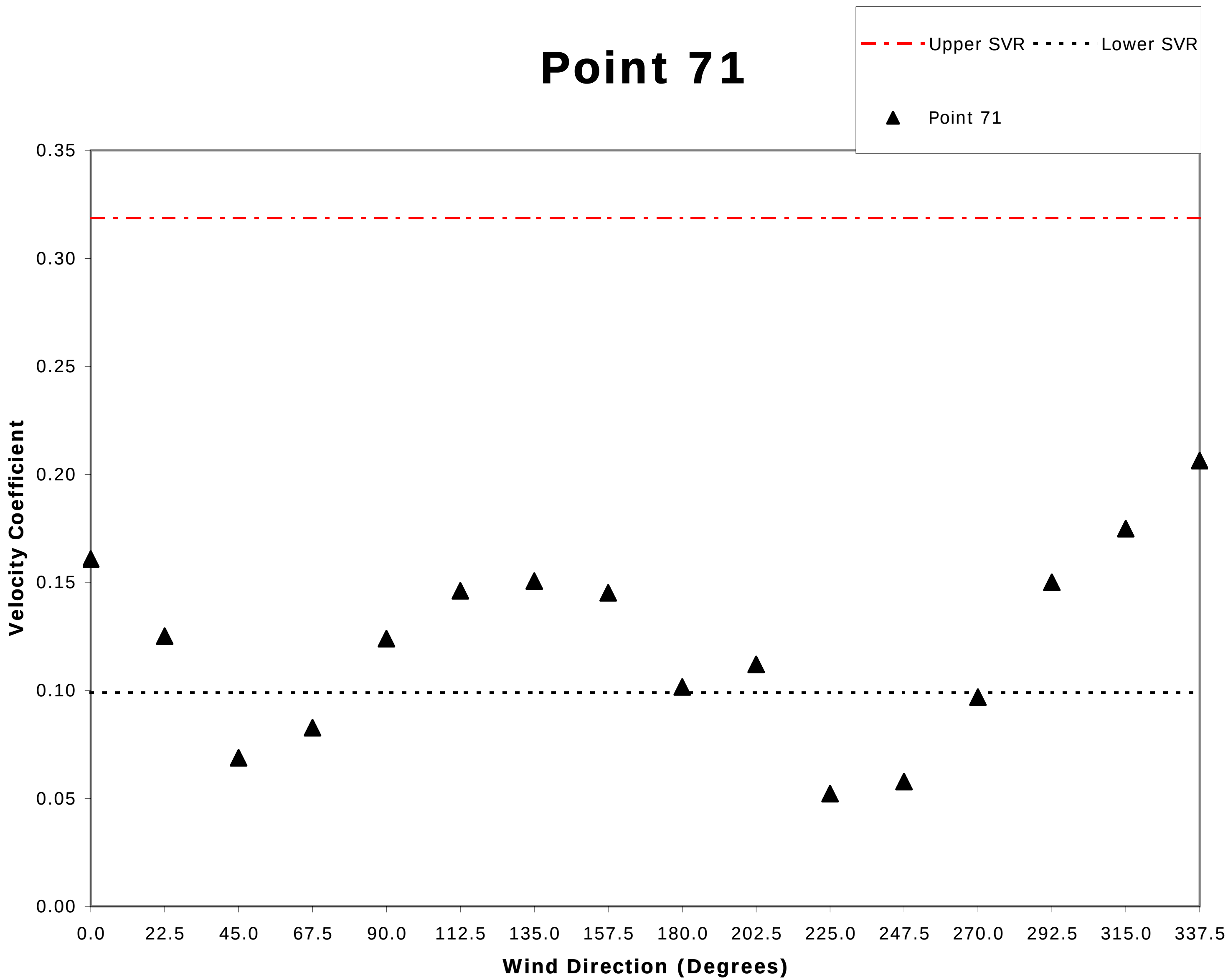

Point 67
Upper SVR
Lower SVR
Point 67
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



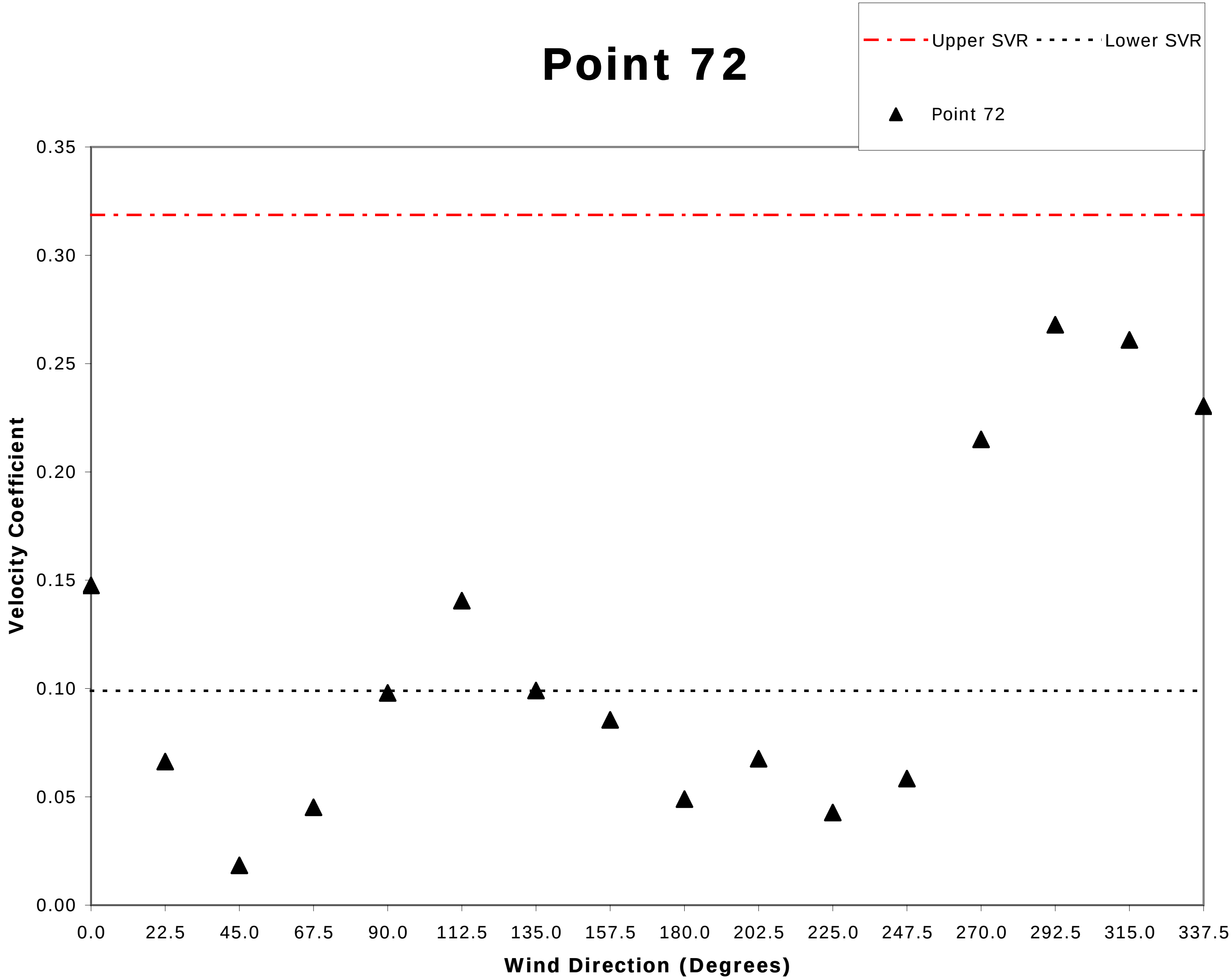
Point 68
Upper SVR
Lower SVR
Point 68
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

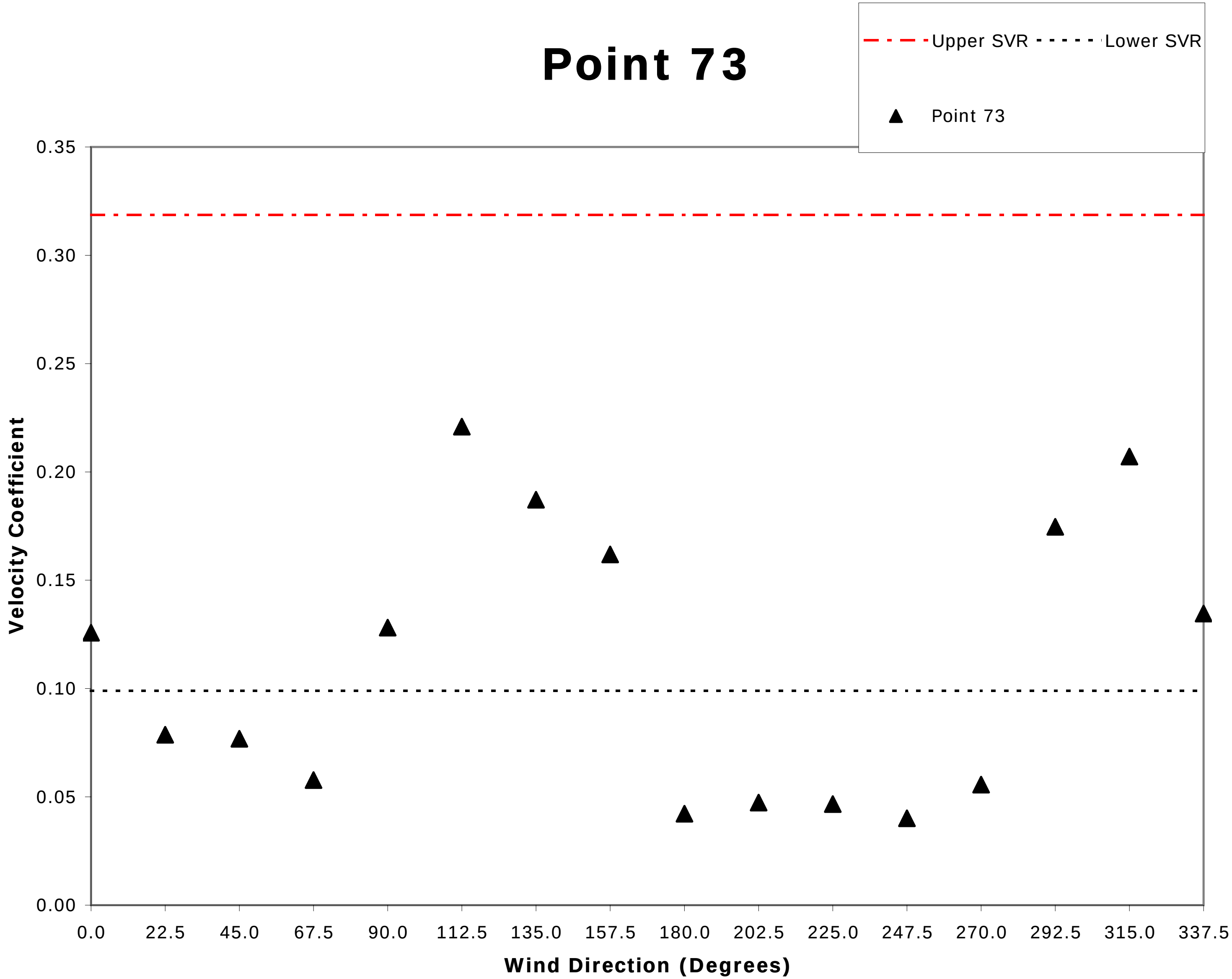

Point 69
Upper SVR
Lower SVR
Point 69
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

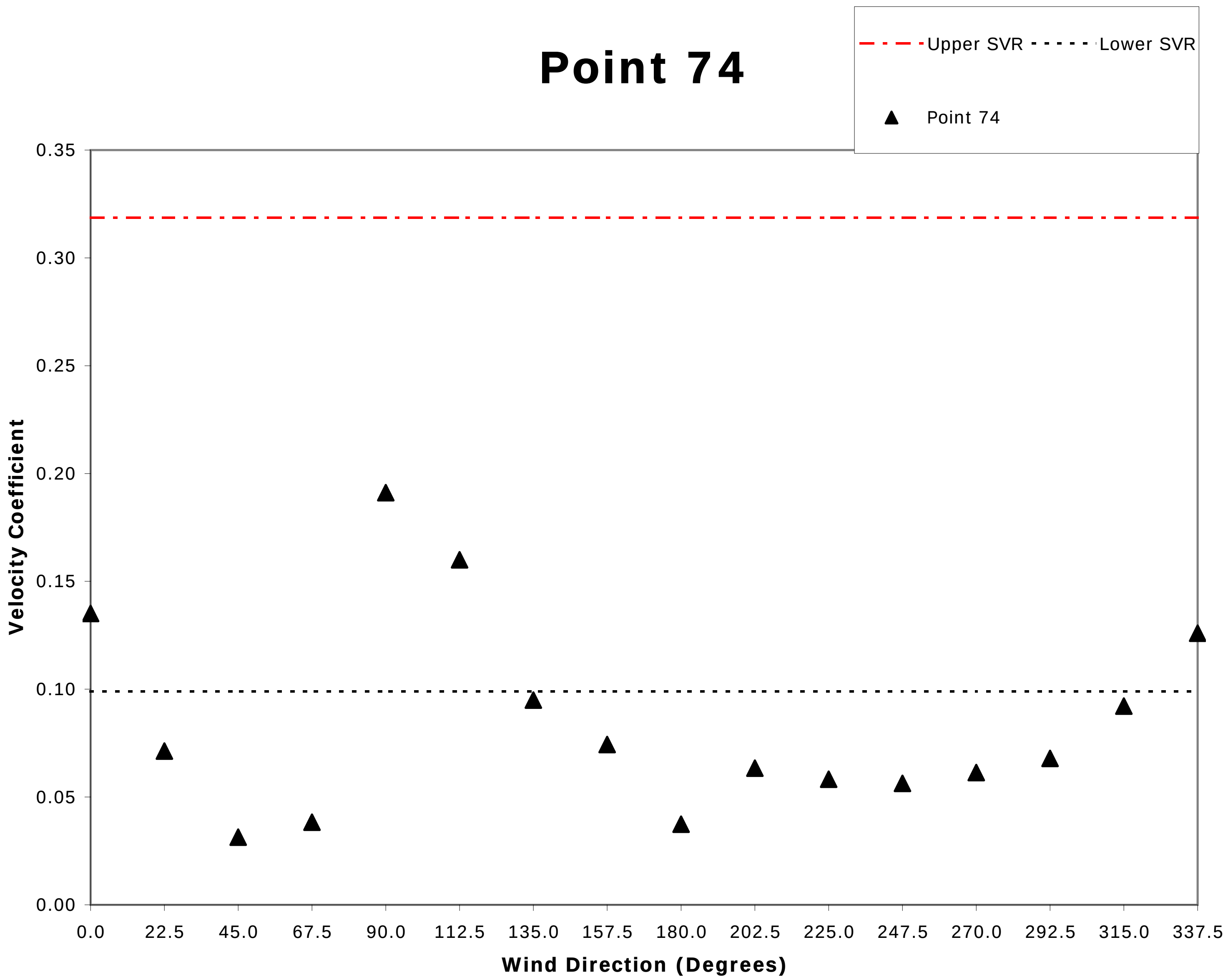

Point 70
Upper SVR
Lower SVR
Point 70
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

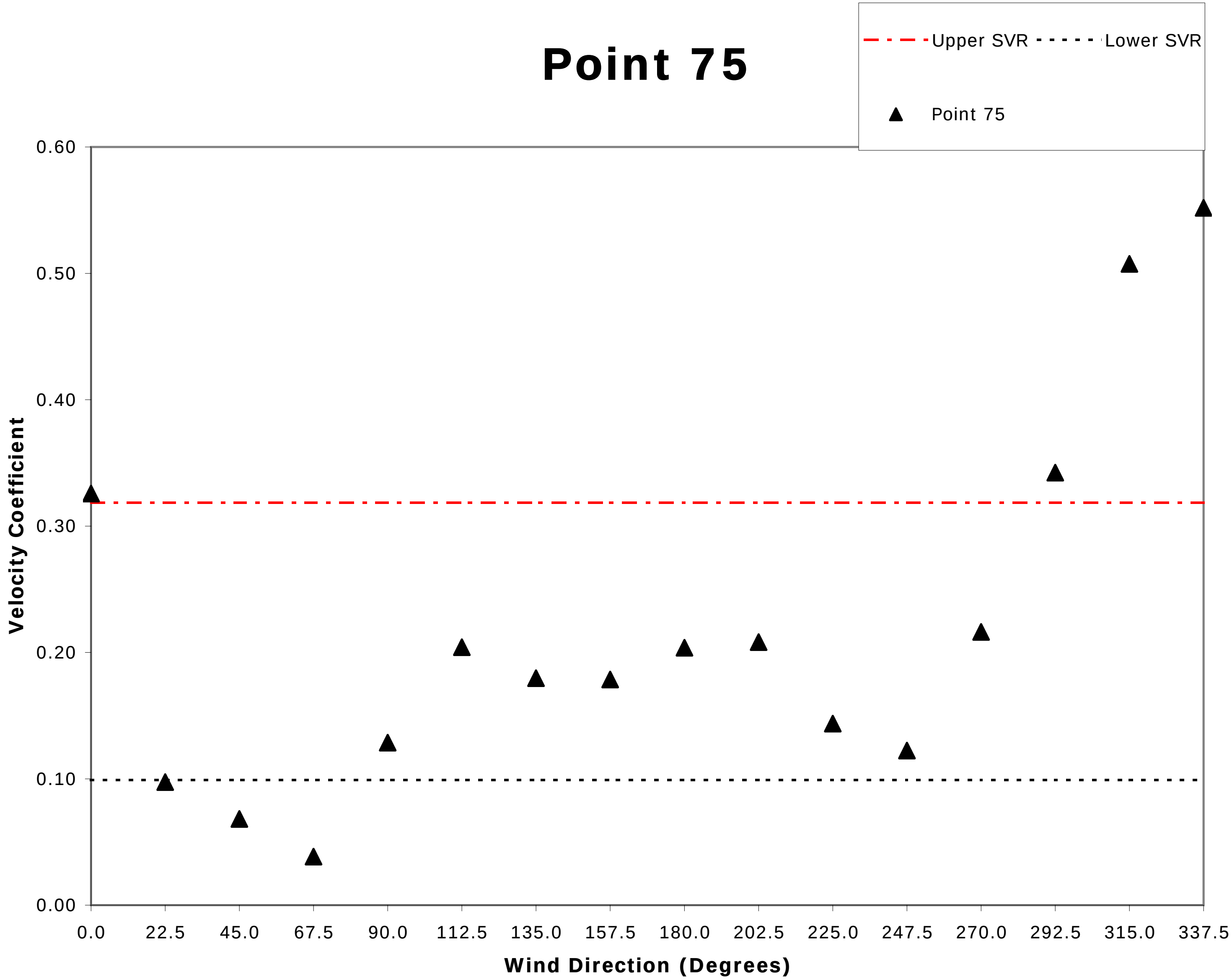


Point 71
Upper SVR
Lower SVR
Point 71
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

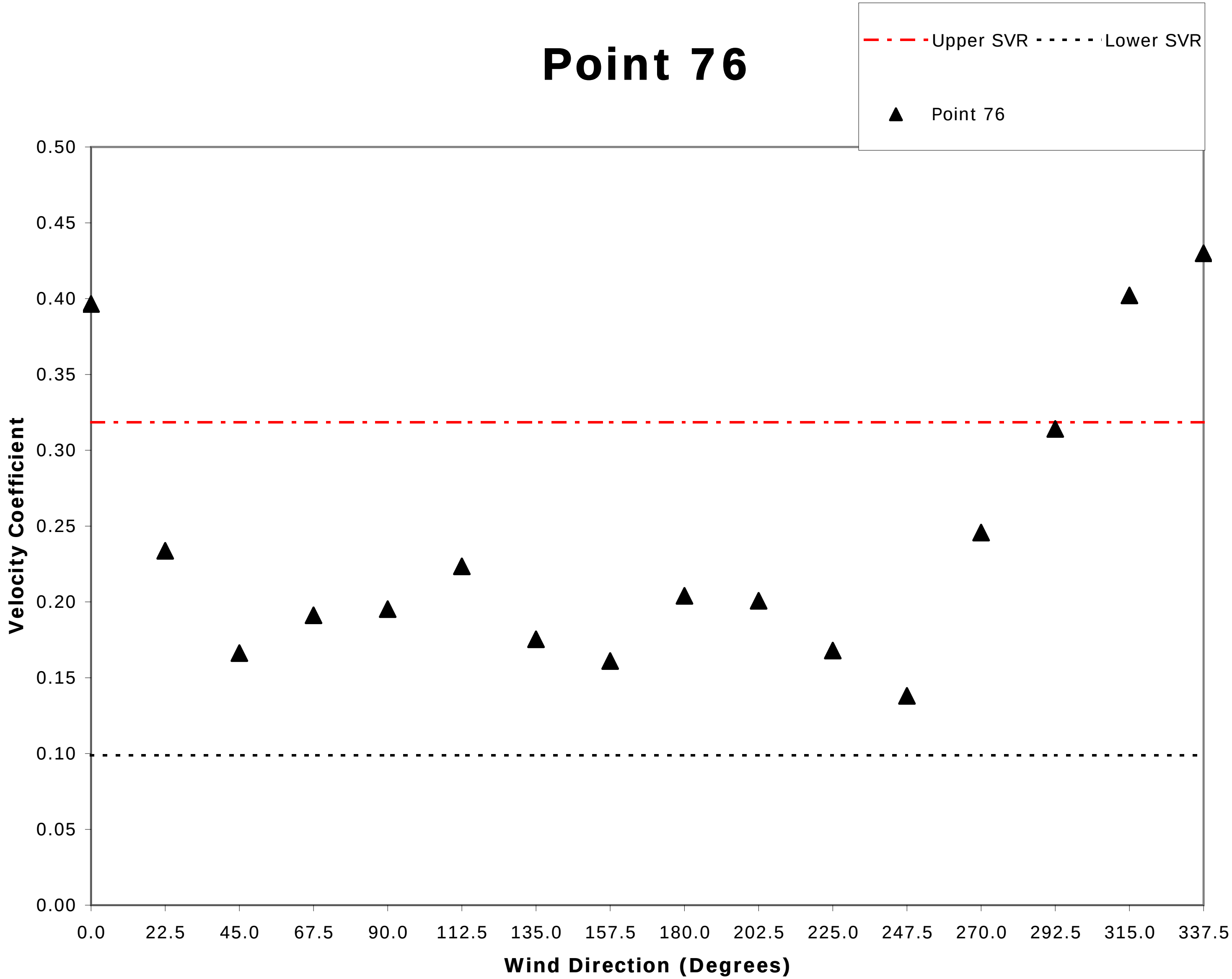

Point 72
Upper SVR
Lower SVR
Point 72
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 73
Upper SVR
Lower SVR
Point 73
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

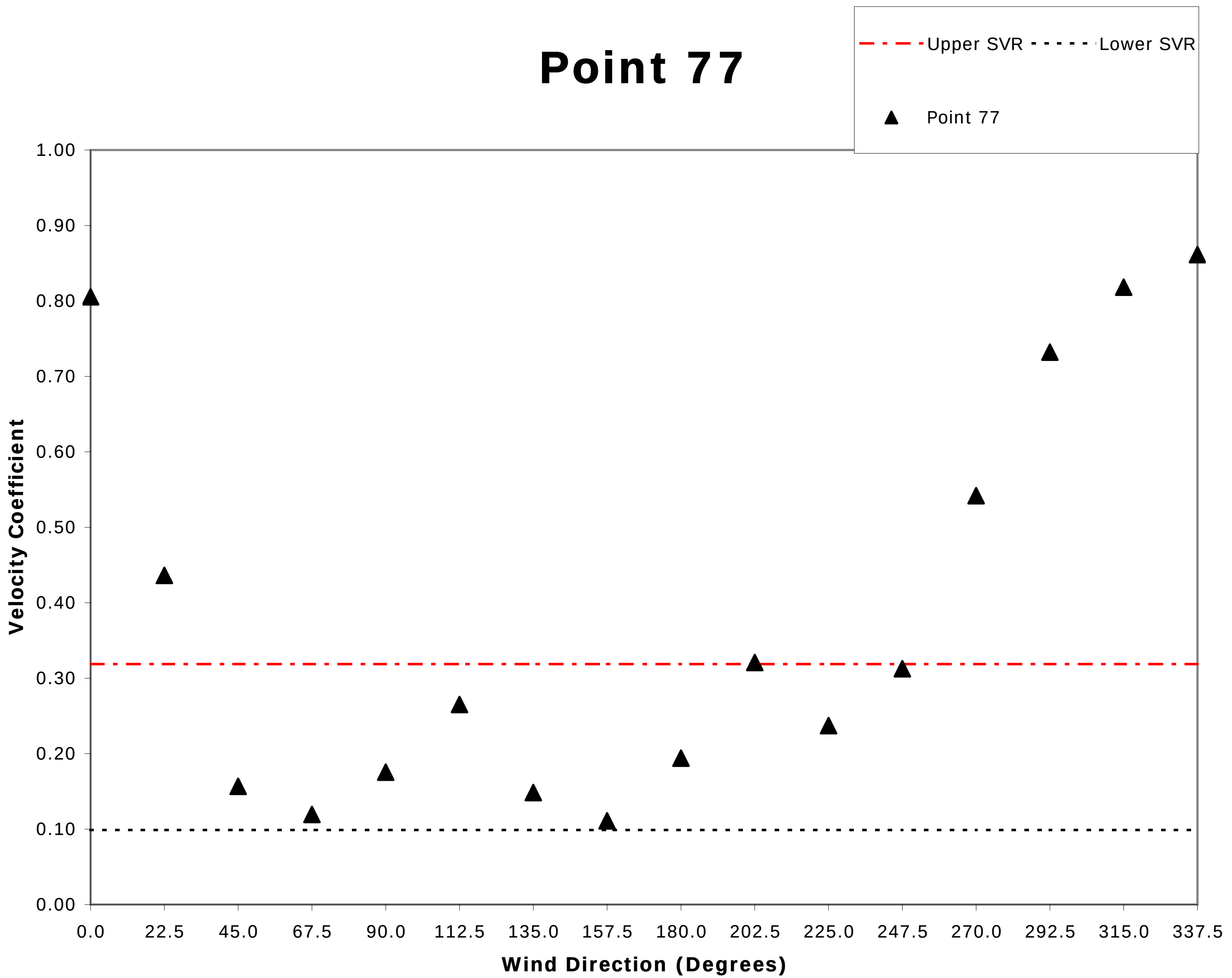

Point 74
Upper SVR
Lower SVR
Point 74
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



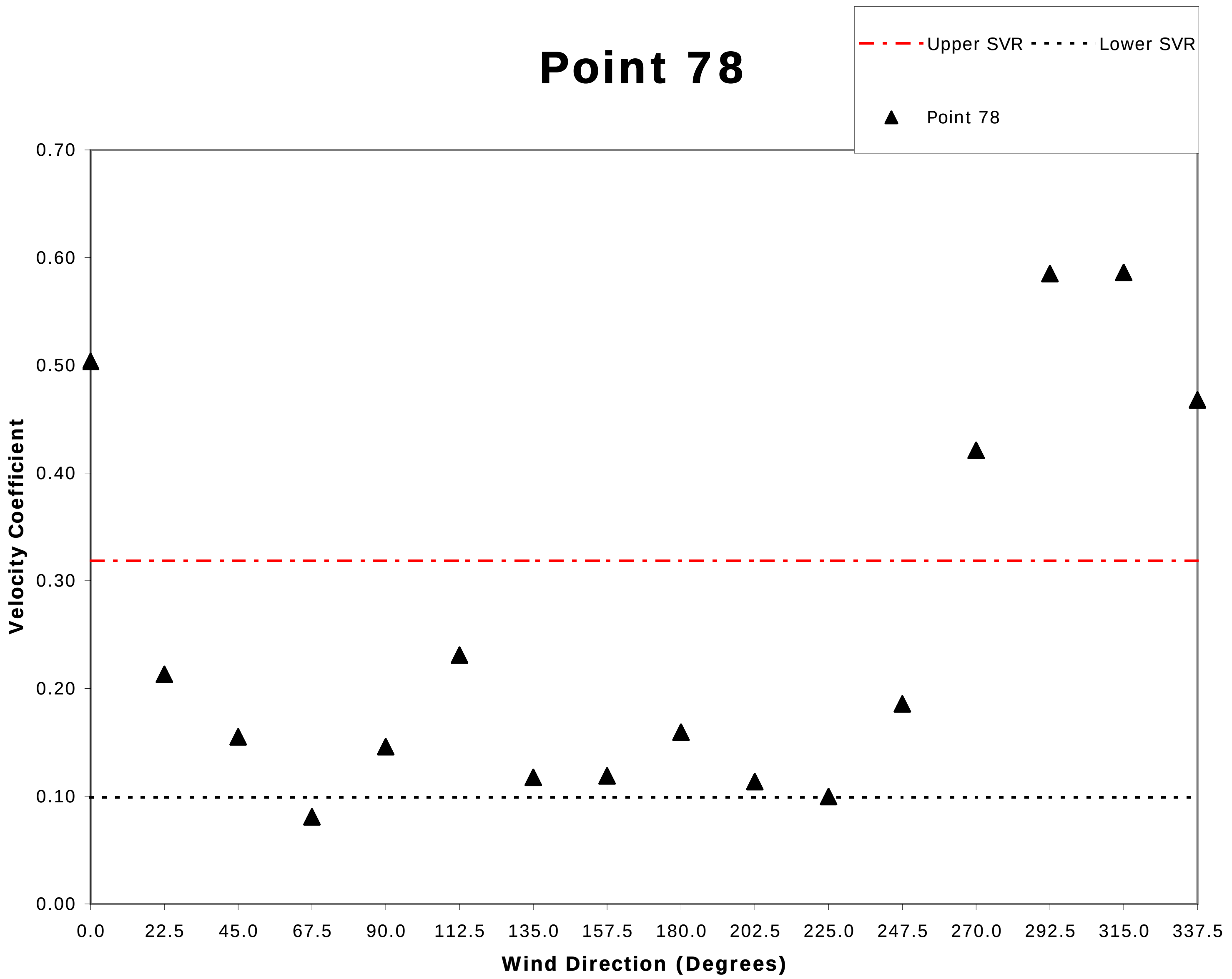
Point 75
Upper SVR
Lower SVR
Point 75
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



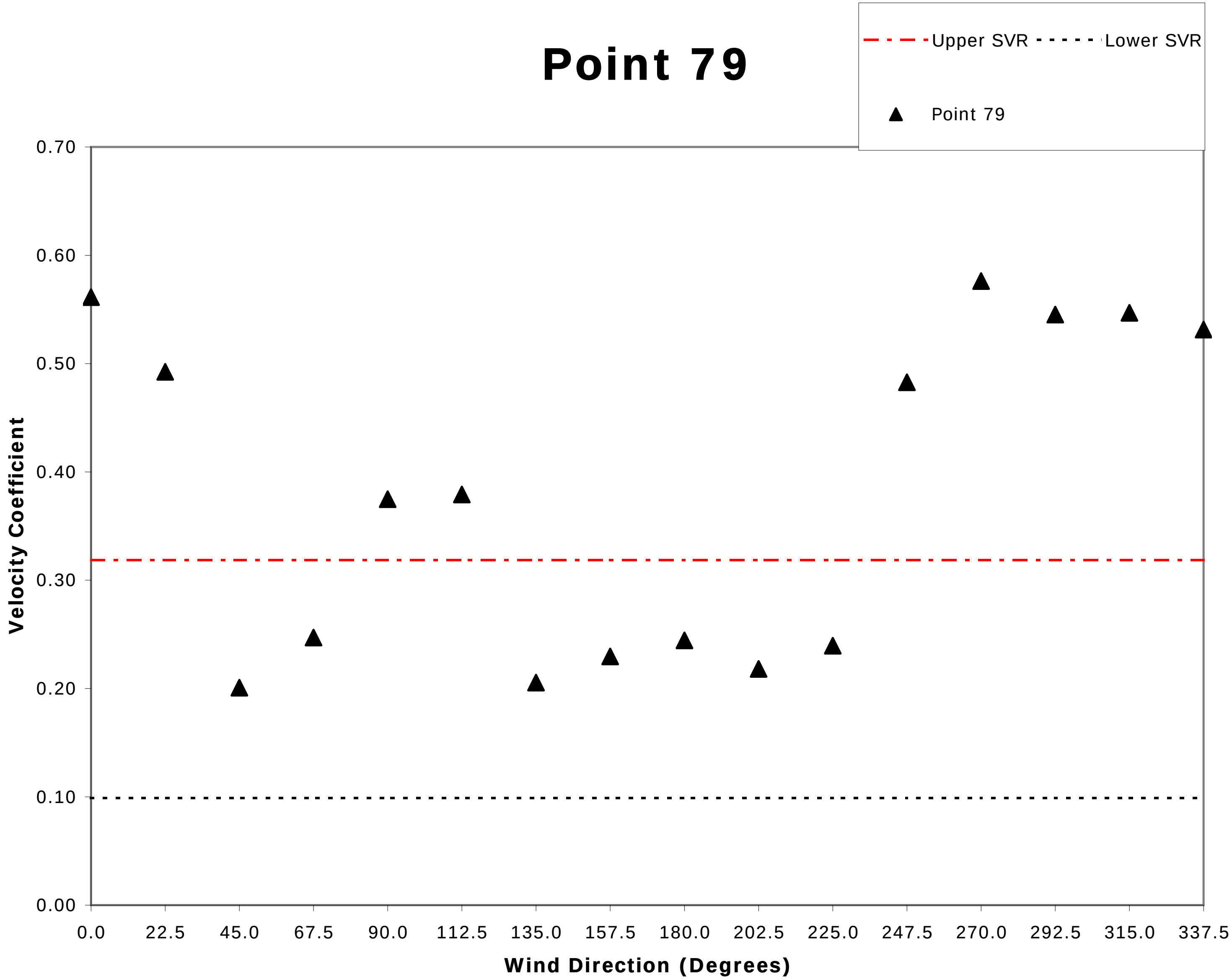
Point 76
Upper SVR
Lower SVR
Point 76
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



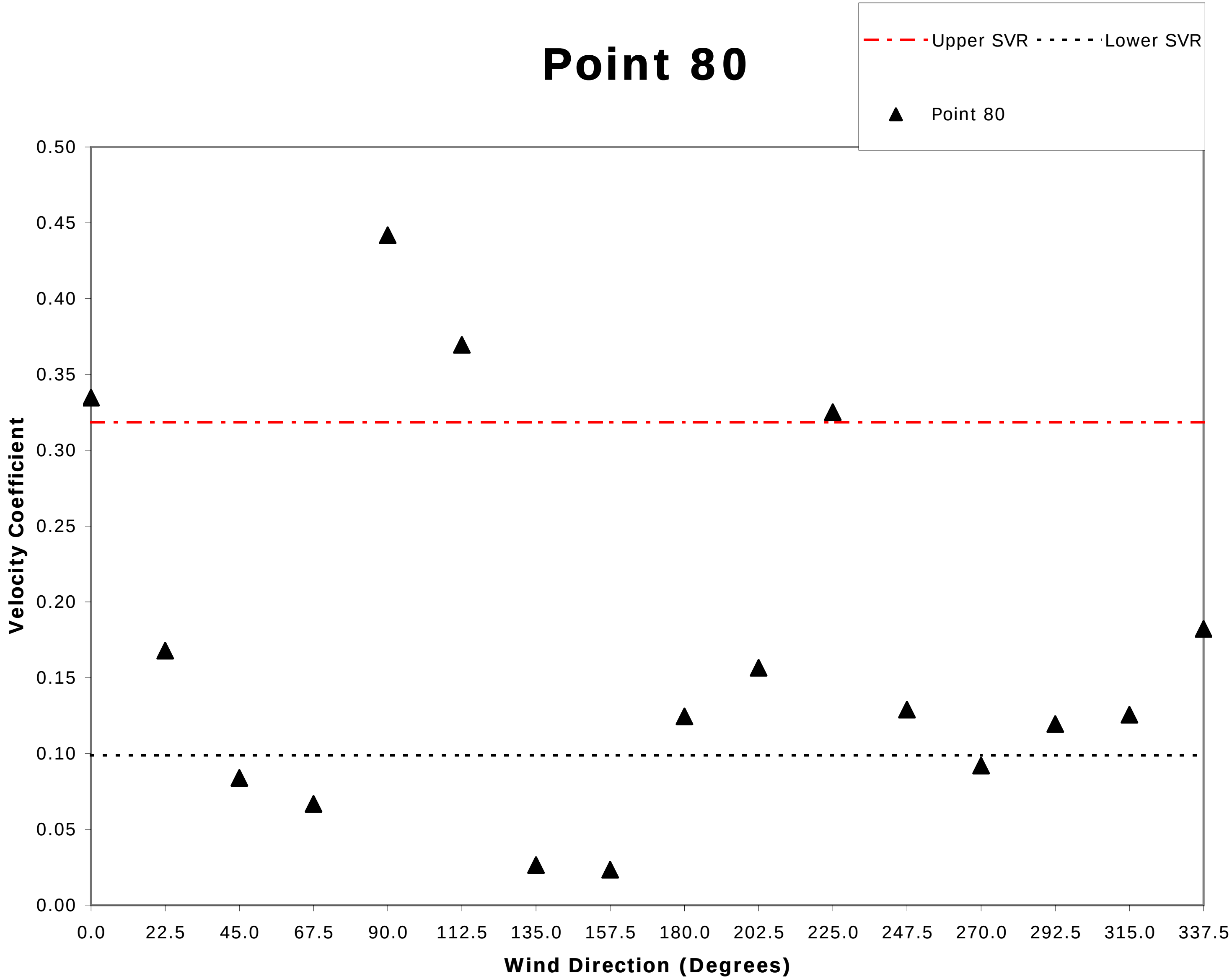
Point 77
Upper SVR
Lower SVR
Point 77
Velocity Coefficient
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



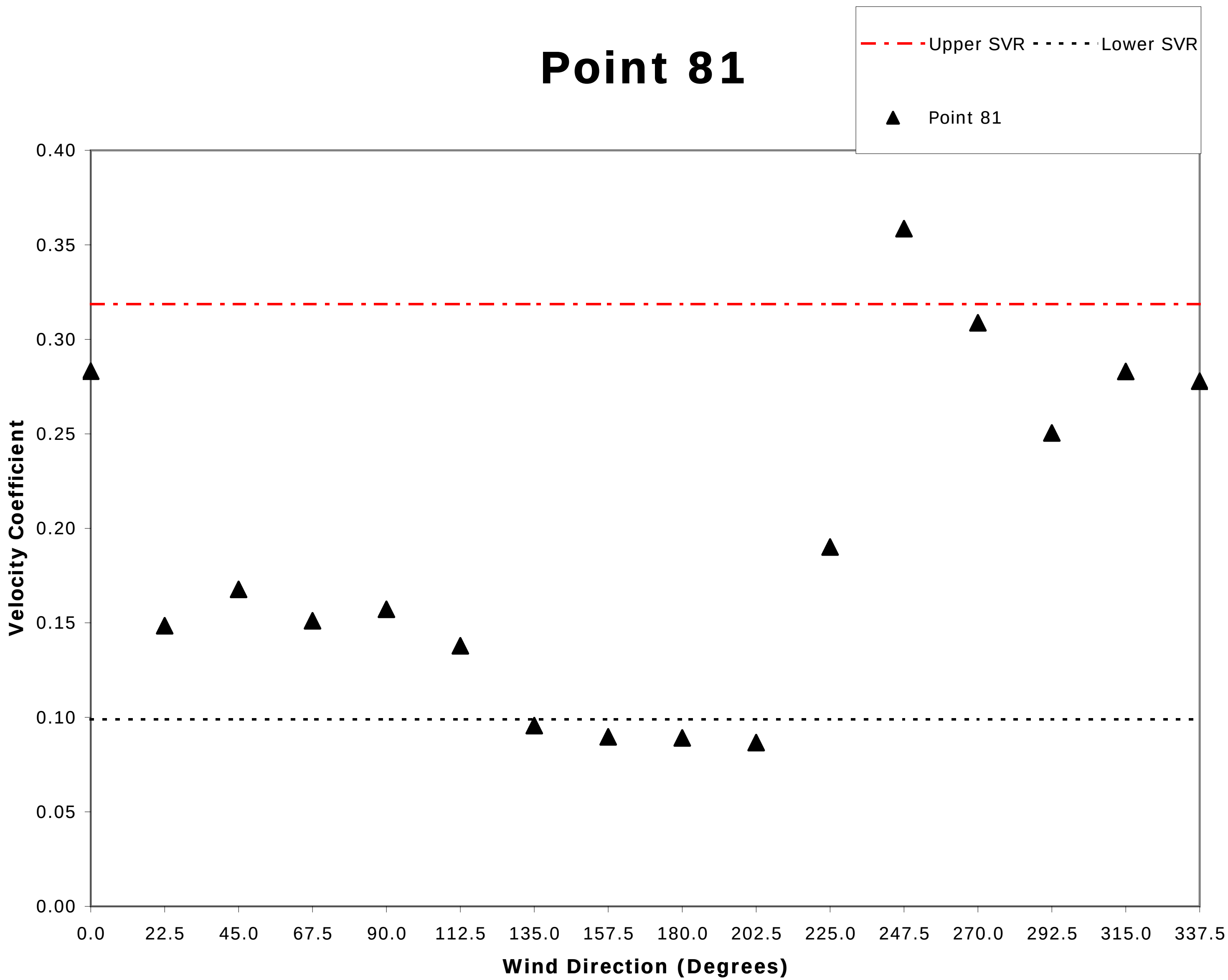
Point 78
Upper SVR
Lower SVR
Point 78
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

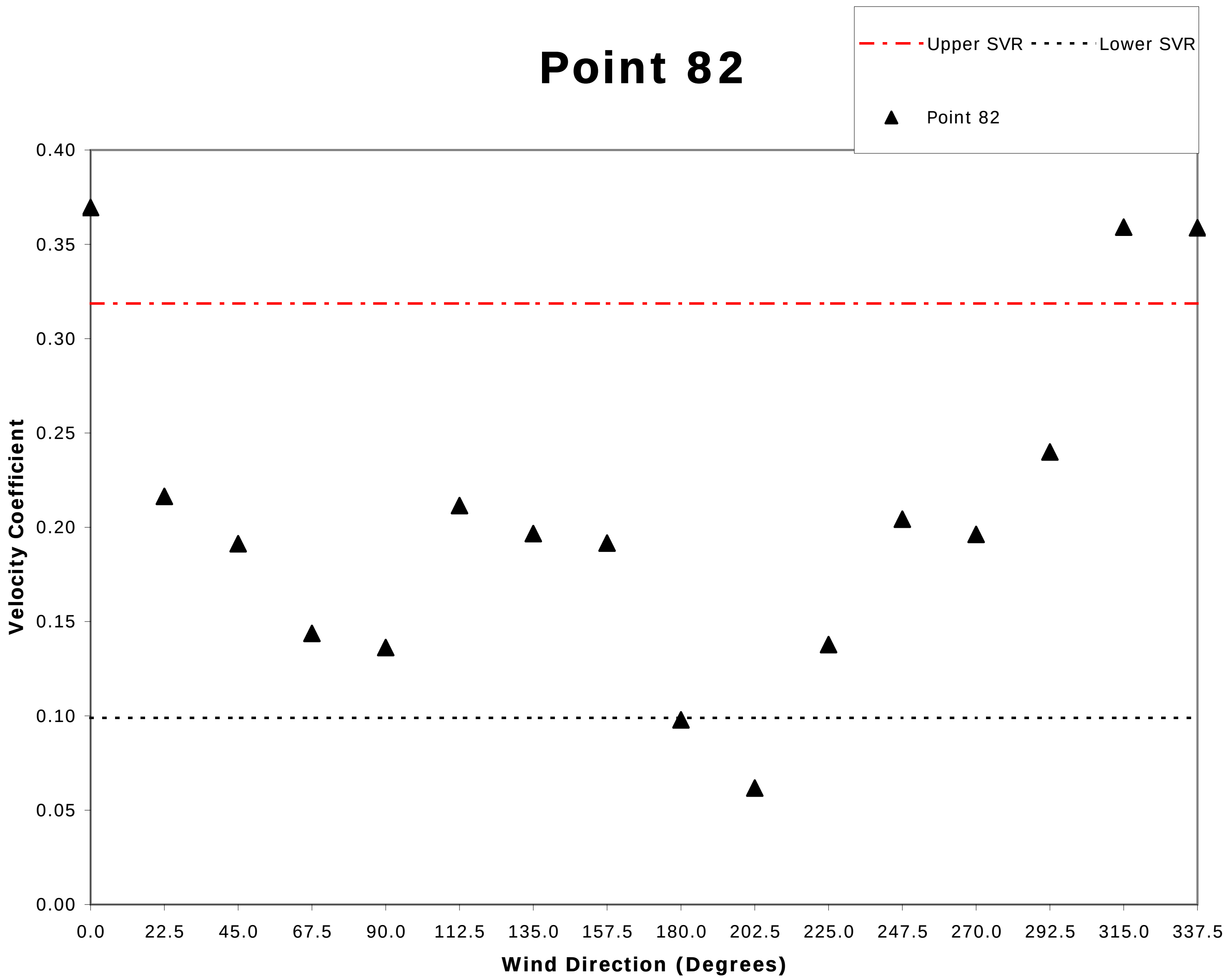


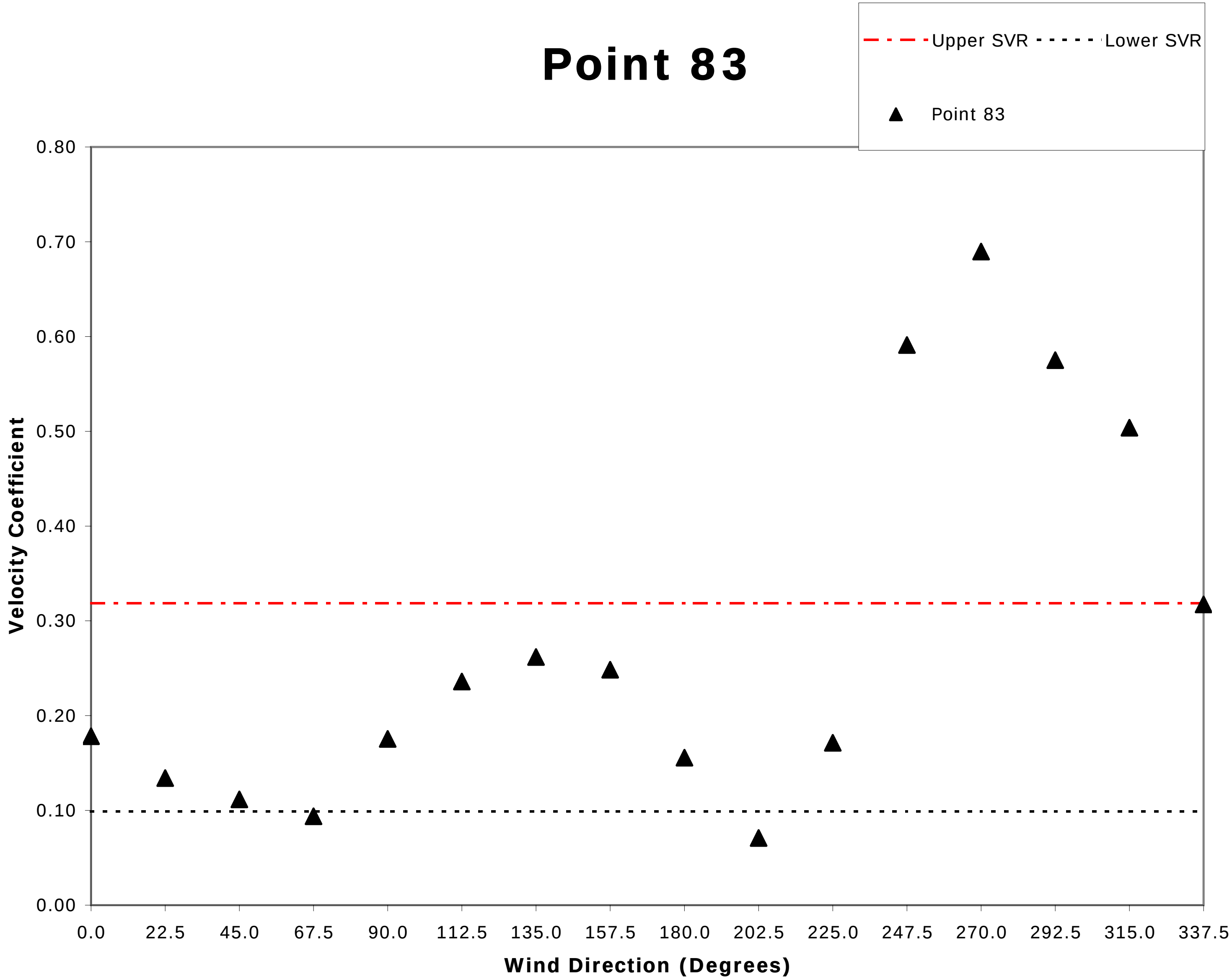
Point 79
Upper SVR
Lower SVR
Point 79
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

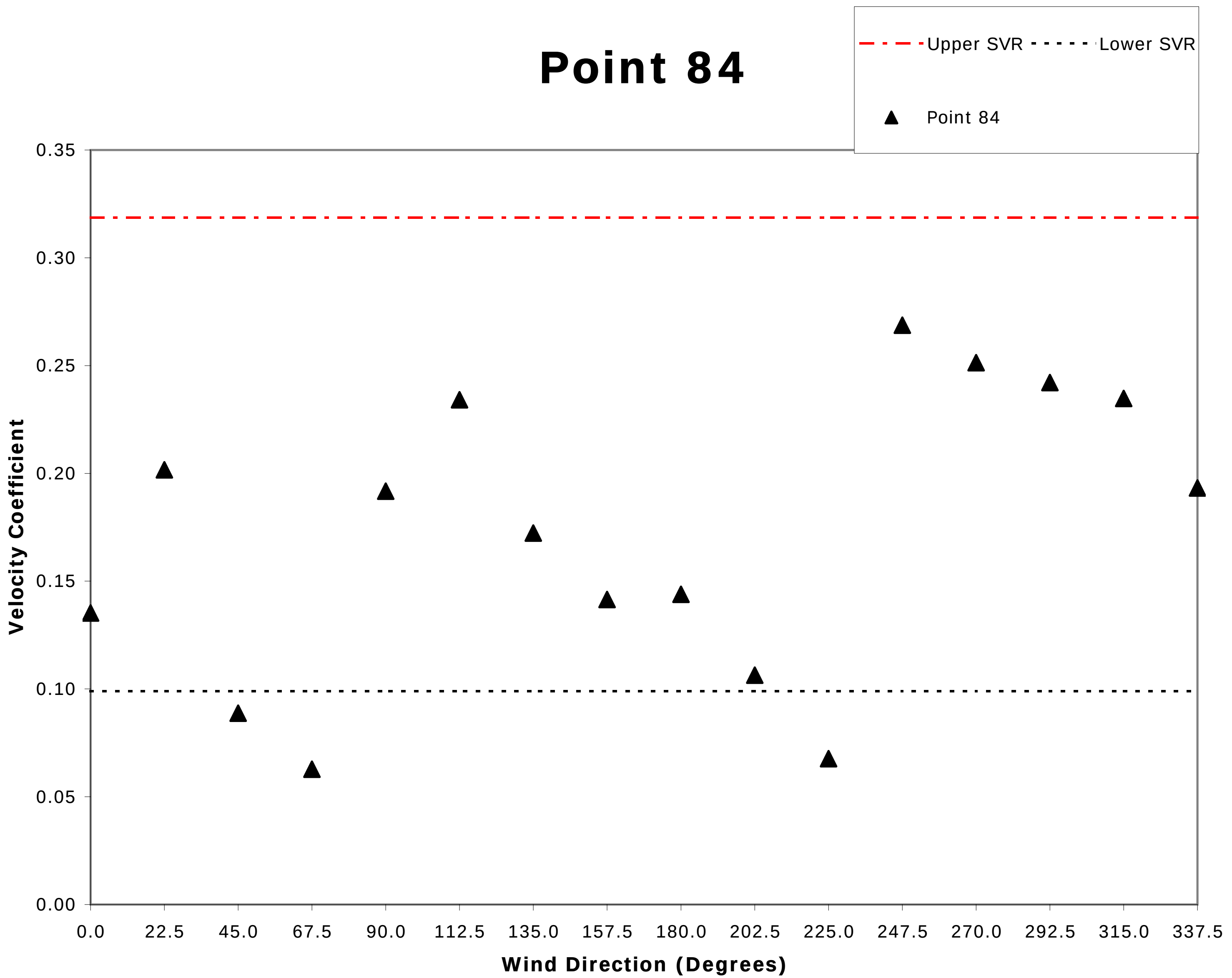


Point 80
Upper SVR
Lower SVR
Point 80
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 81
Upper SVR
Lower SVR
Point 81
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

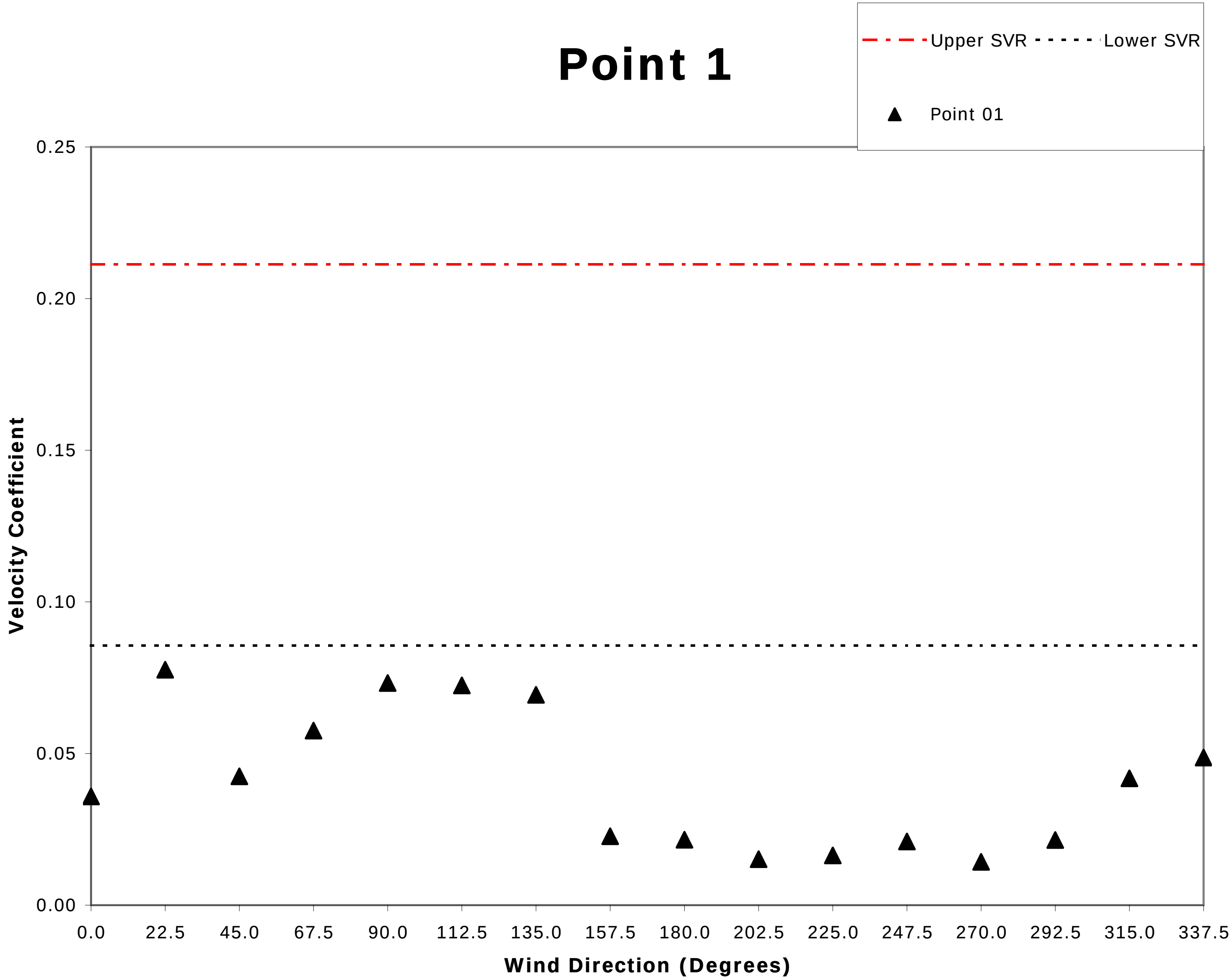

Point 82
Upper SVR
Lower SVR
Point 82
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 83
Upper SVR
Lower SVR
Point 83
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

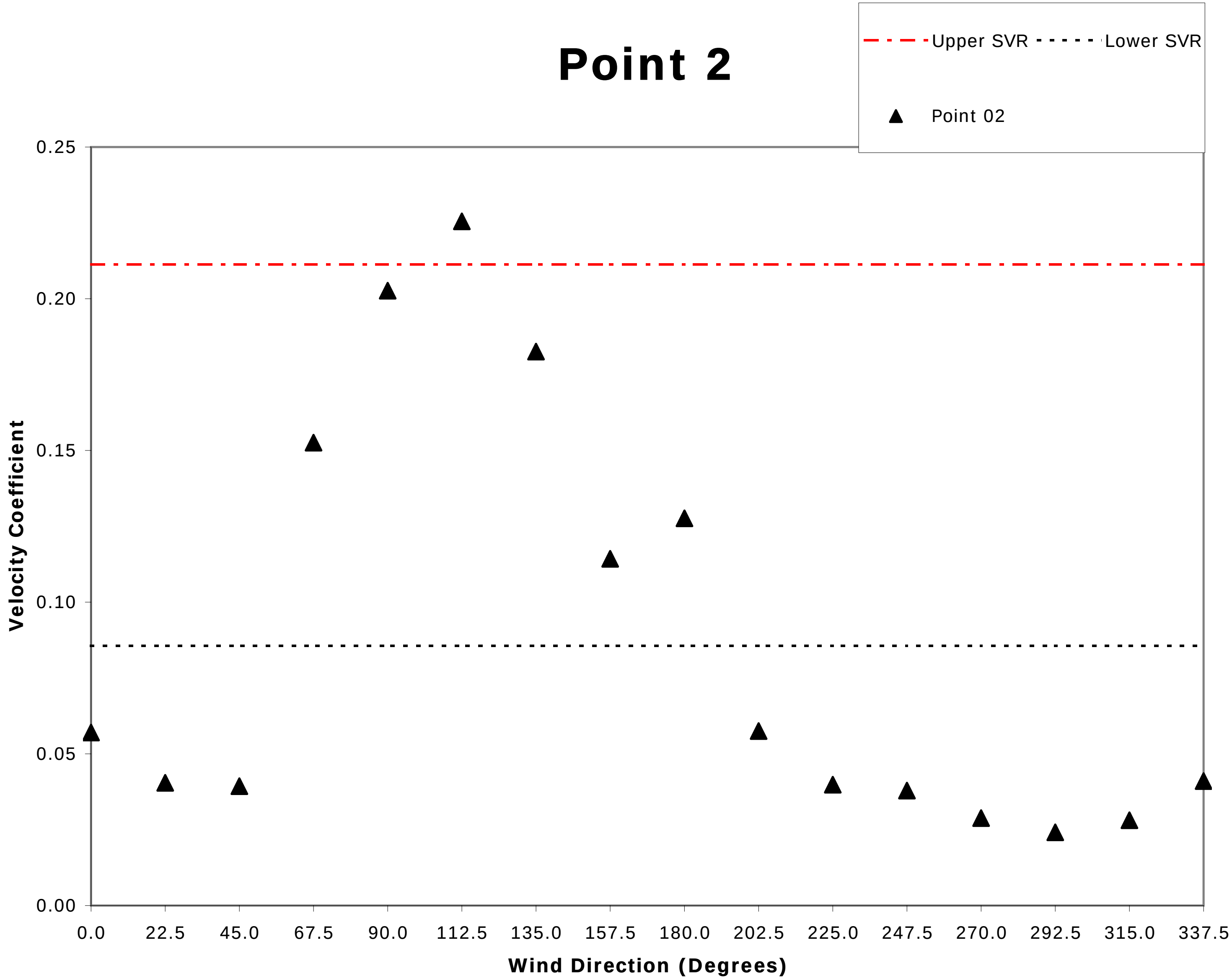

Point 84
Upper SVR
Lower SVR
Point 84
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

Appendix V

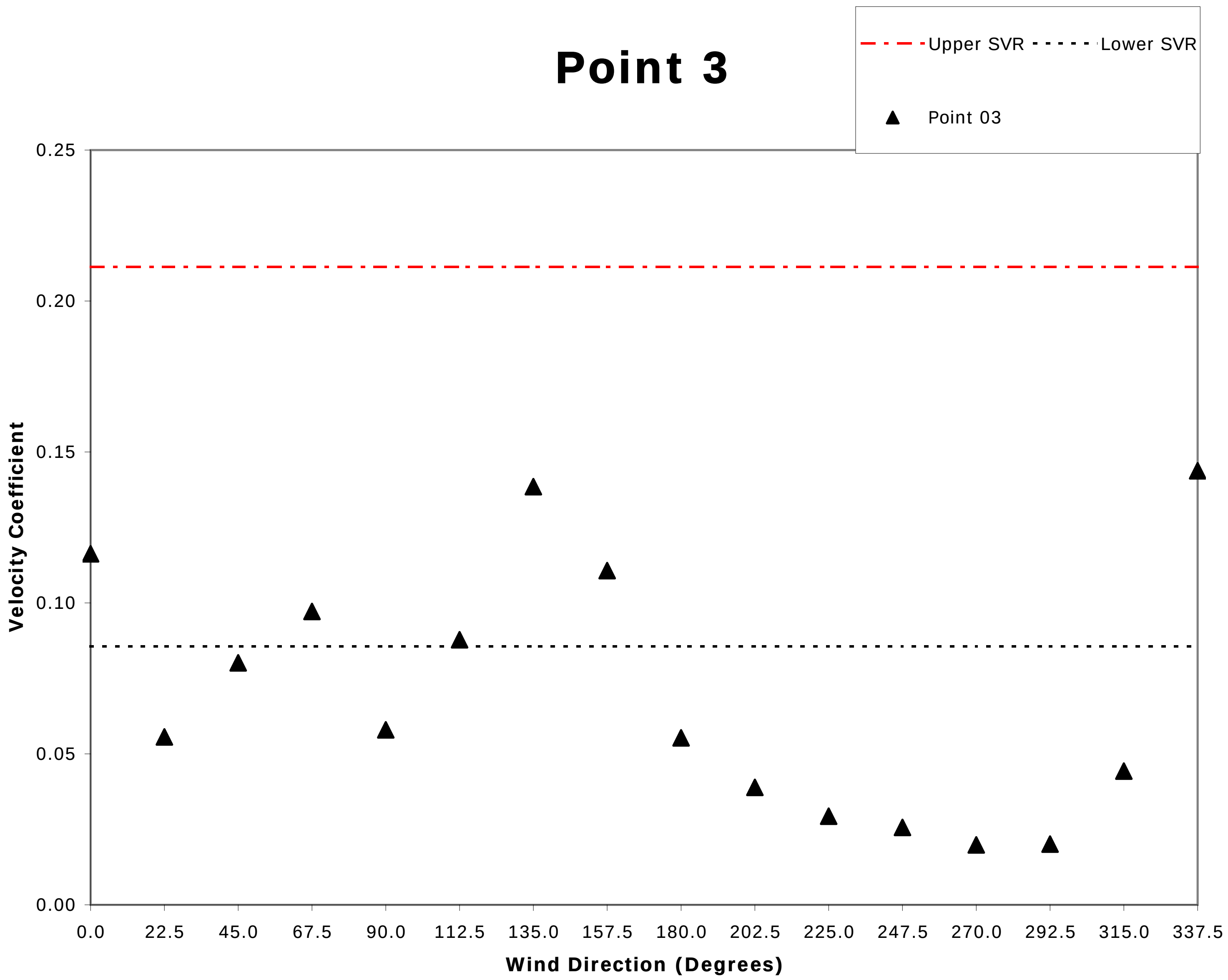
Directional Result at Individual Test Points for the Revised Scheme

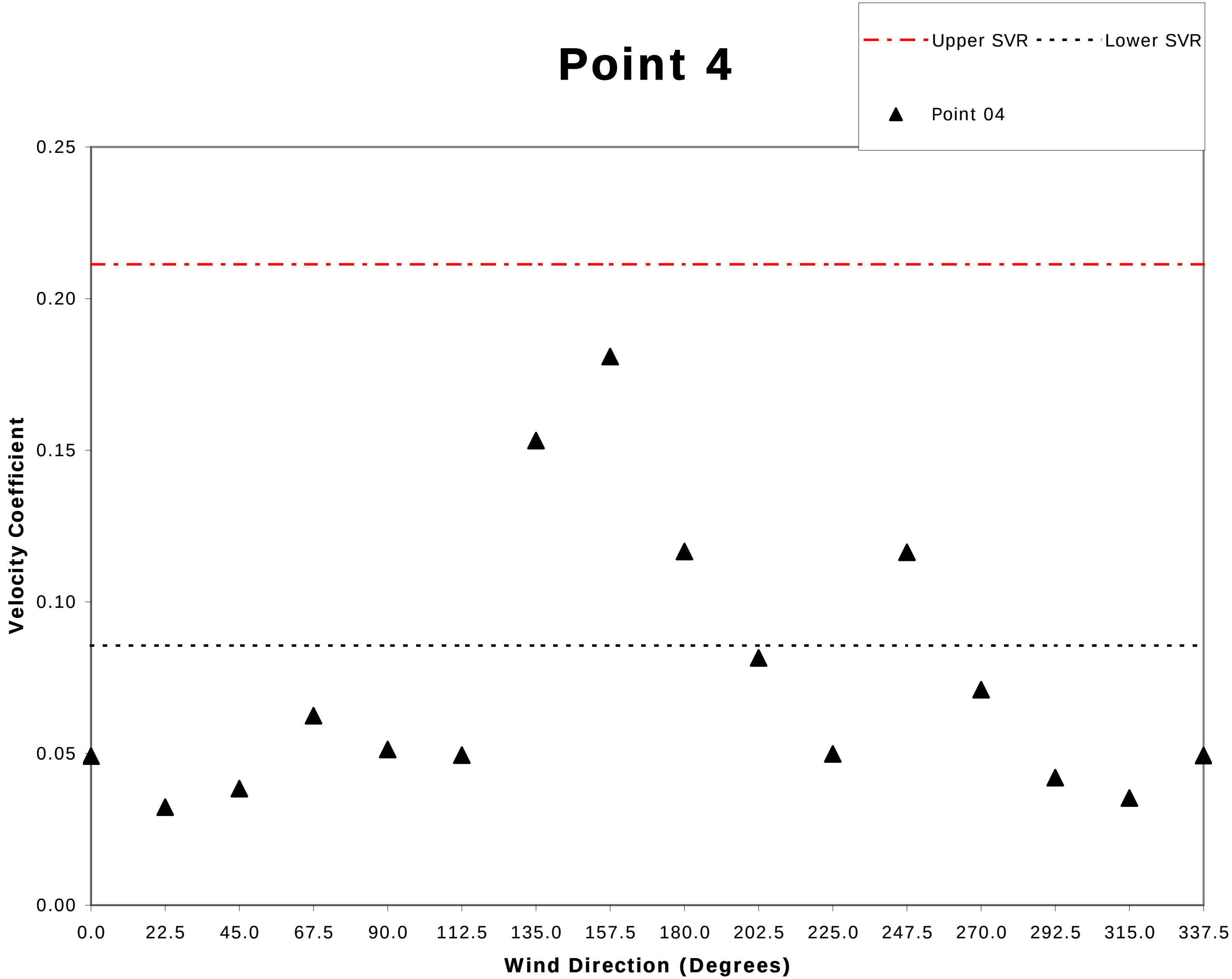


Point 1
Upper SVR
Lower SVR
Point 01
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

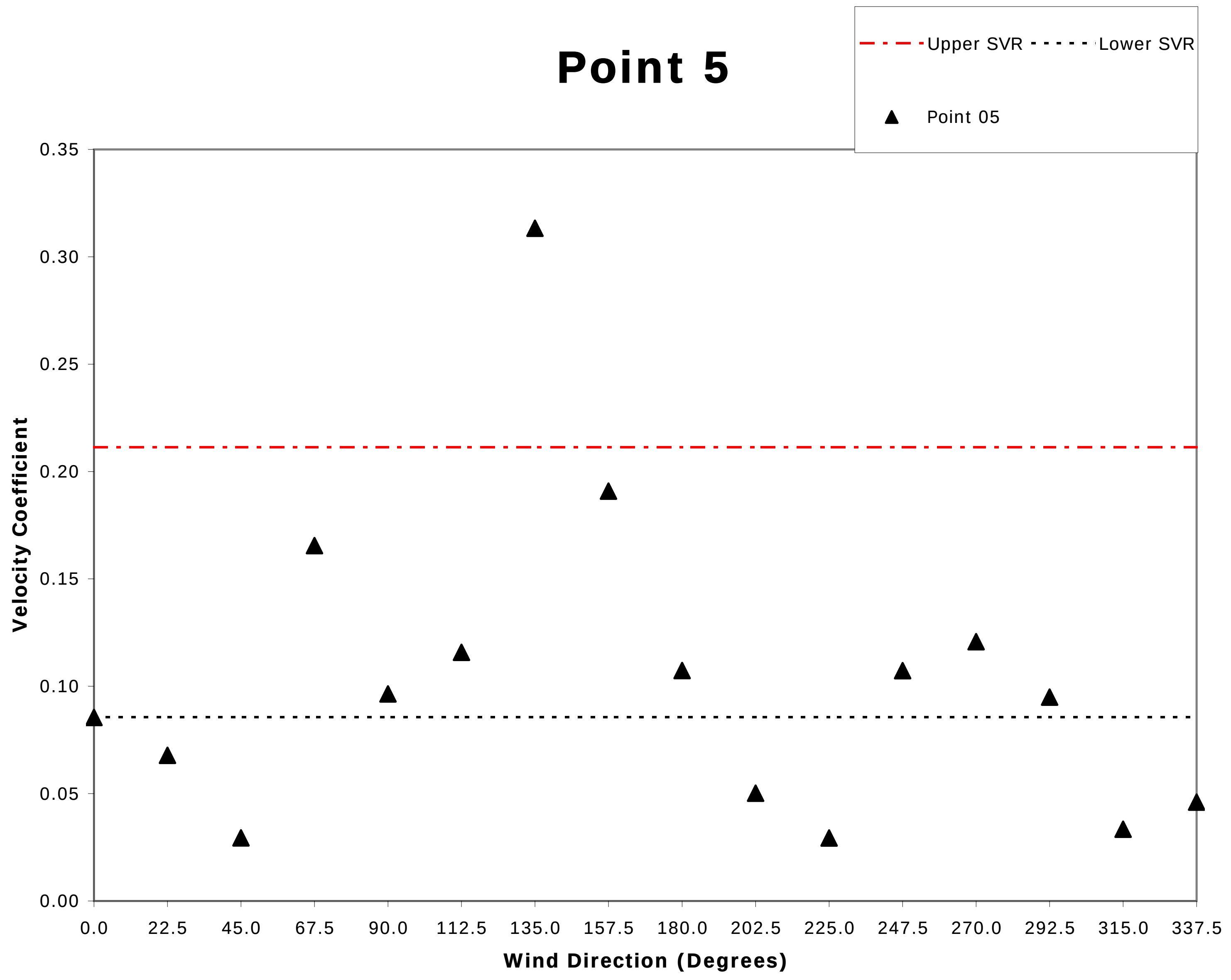


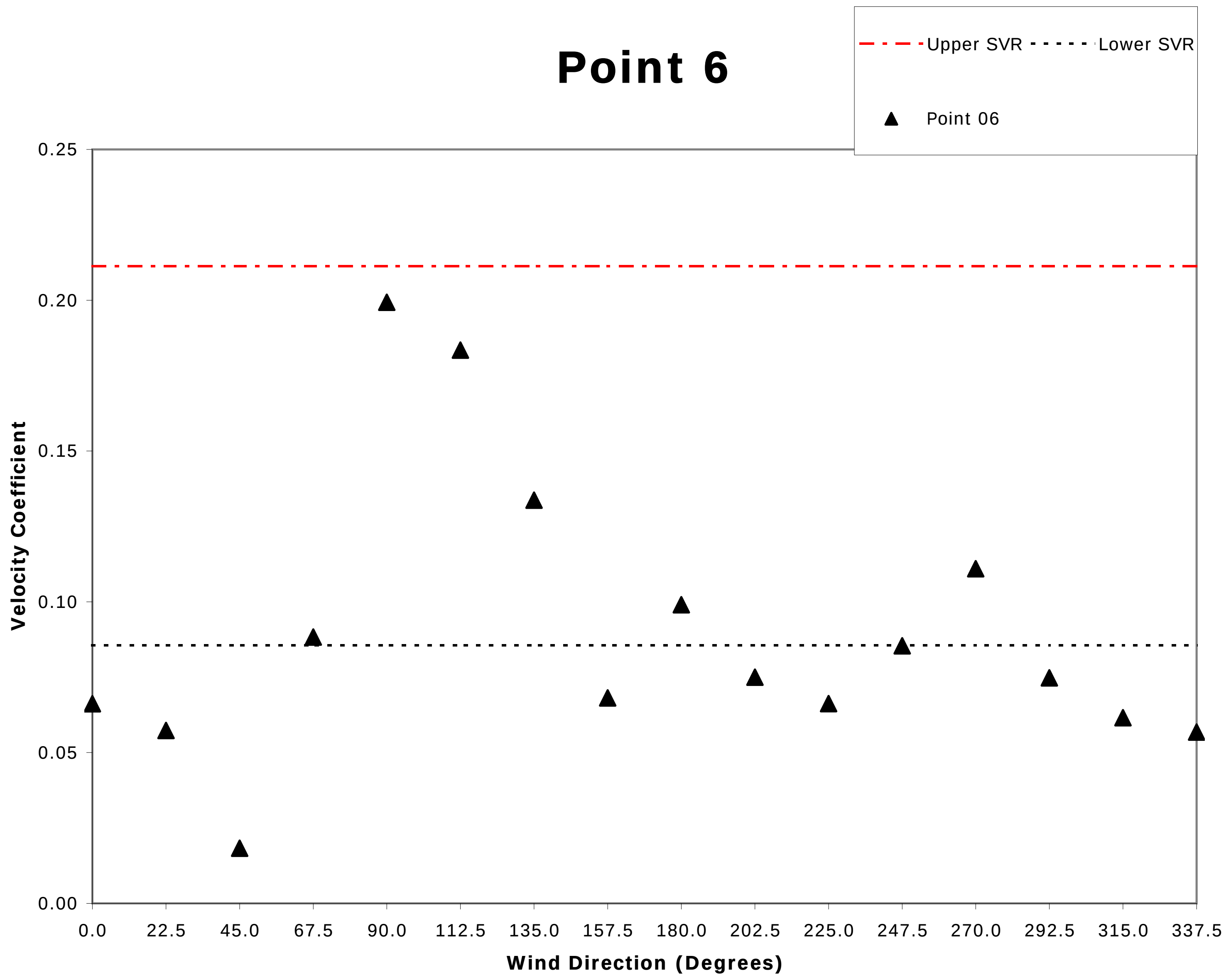
Point 2
Upper SVR
Lower SVR
Point 02
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 3
Upper SVR
Lower SVR
Point 03
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

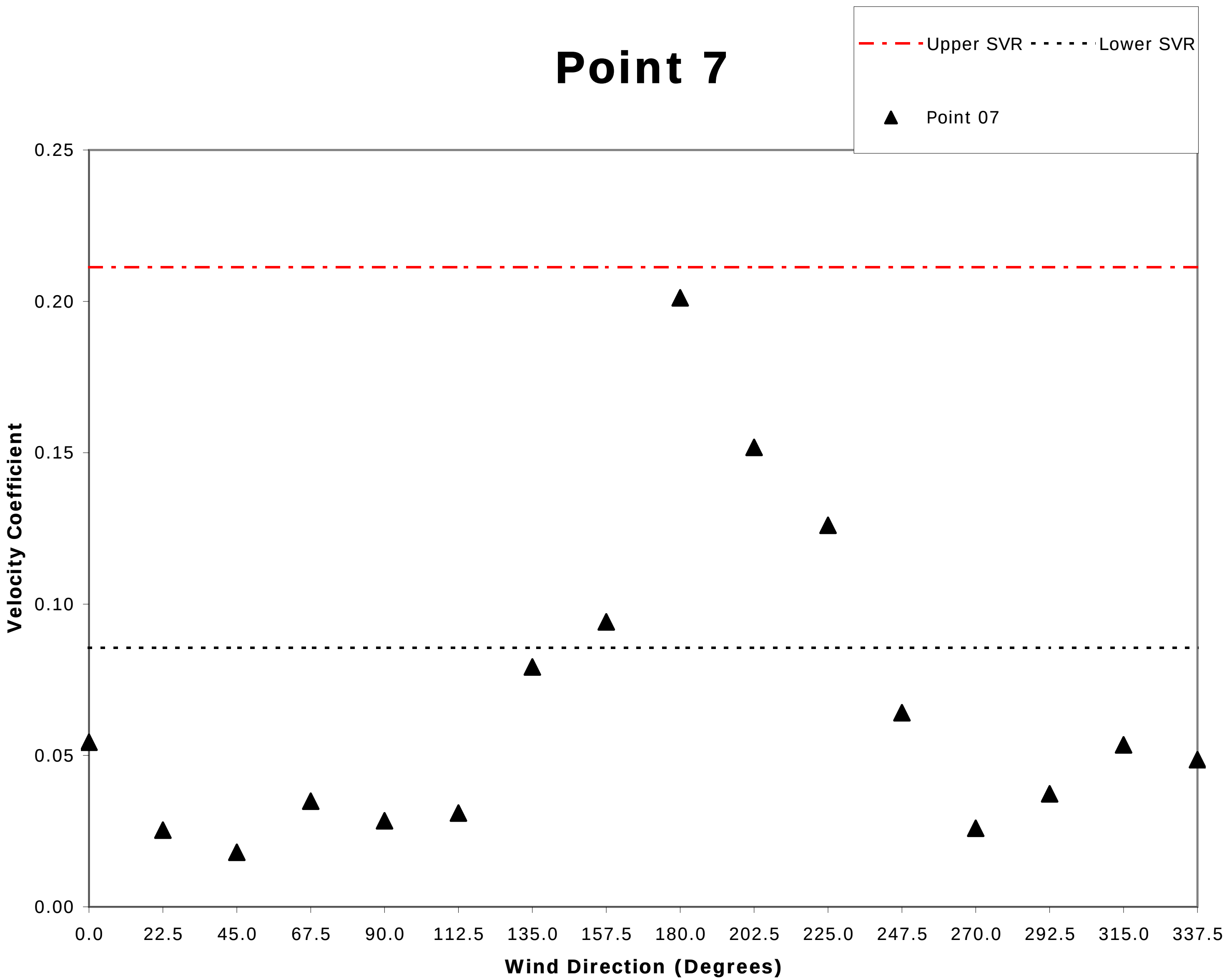


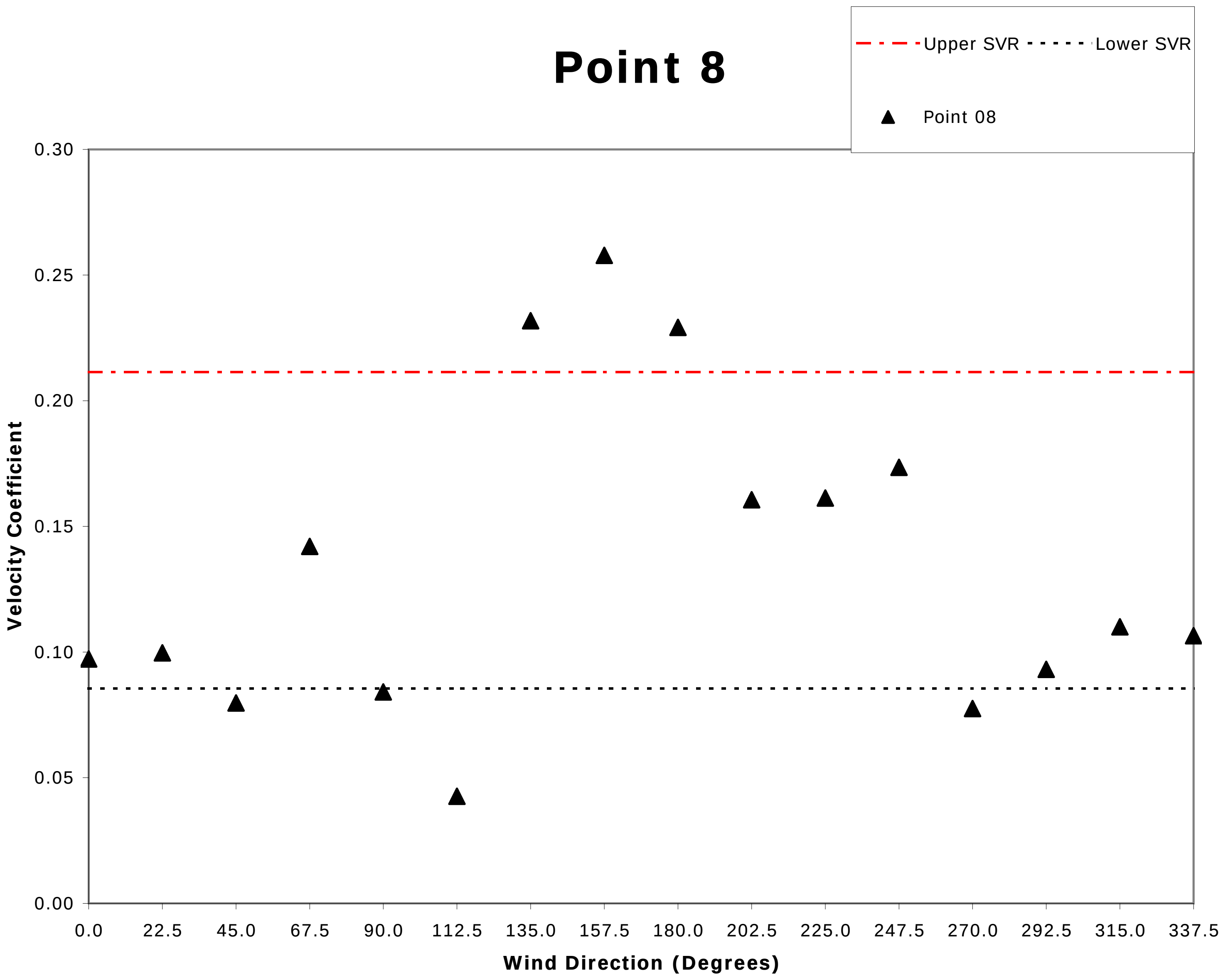
Point 4
Upper SVR
Lower SVR
Point 04
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 5
Upper SVR
Lower SVR
Point 05
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

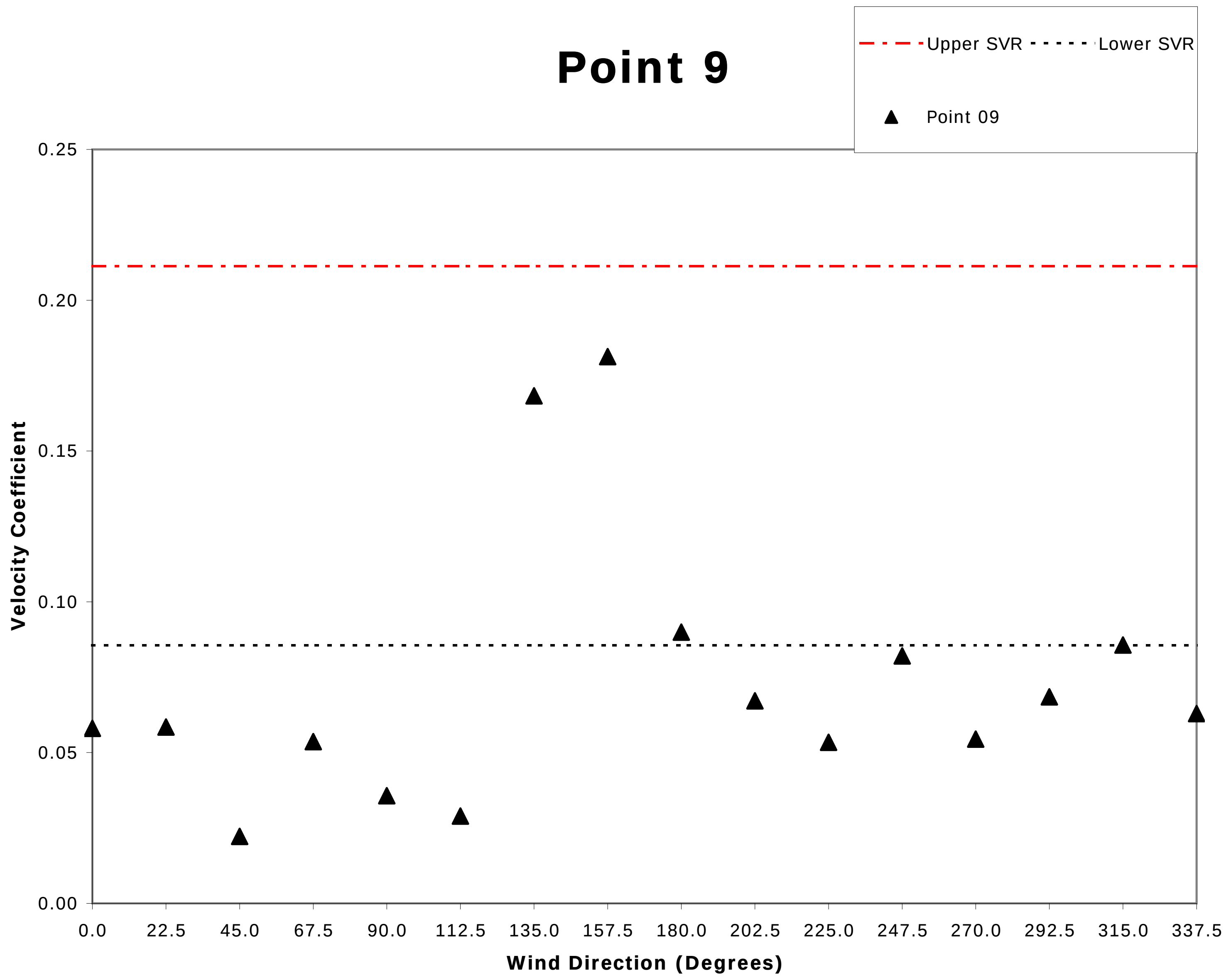


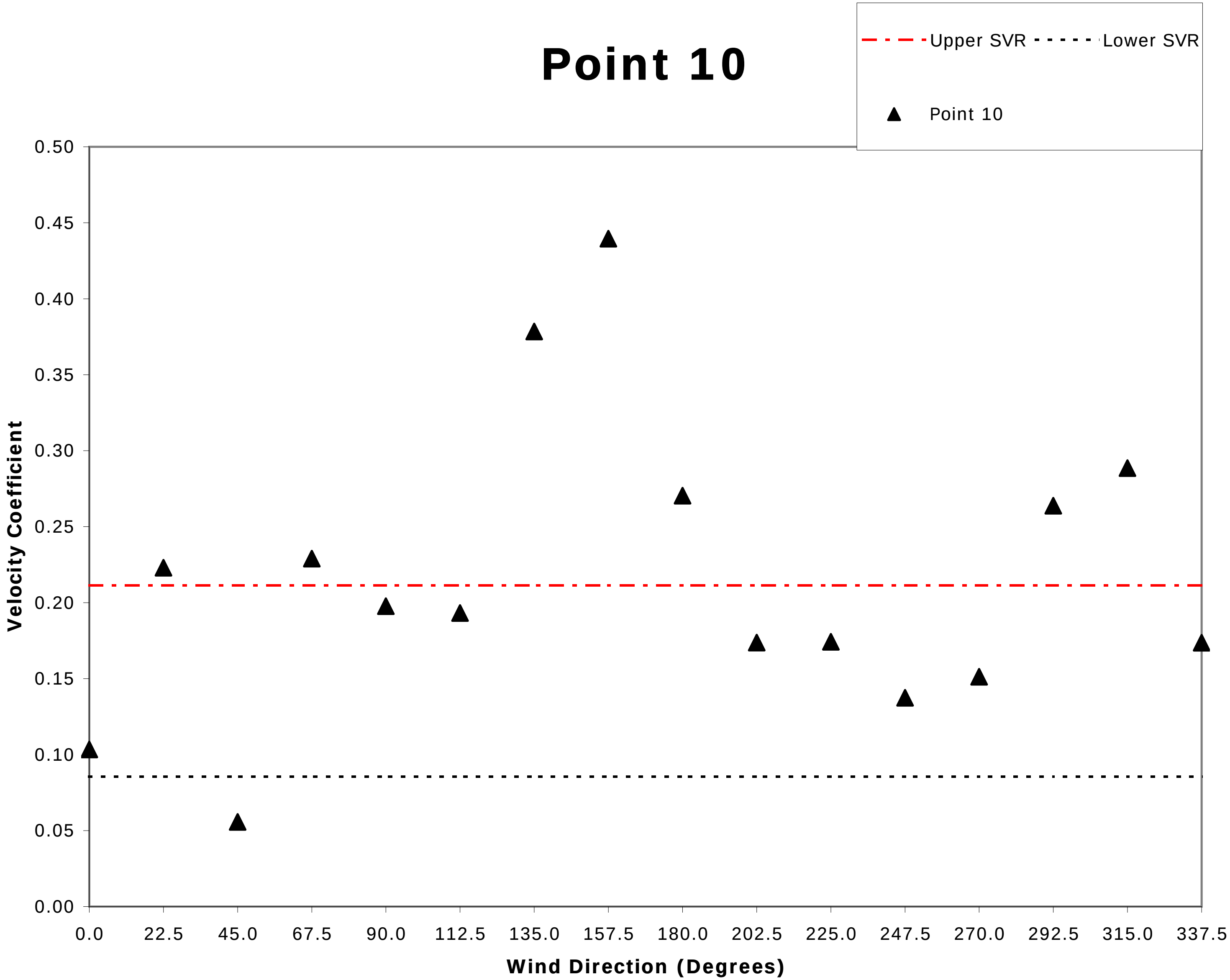
Point 6
Upper SVR
Lower SVR
Point 06
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 7
Upper SVR
Lower SVR
Point 07
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

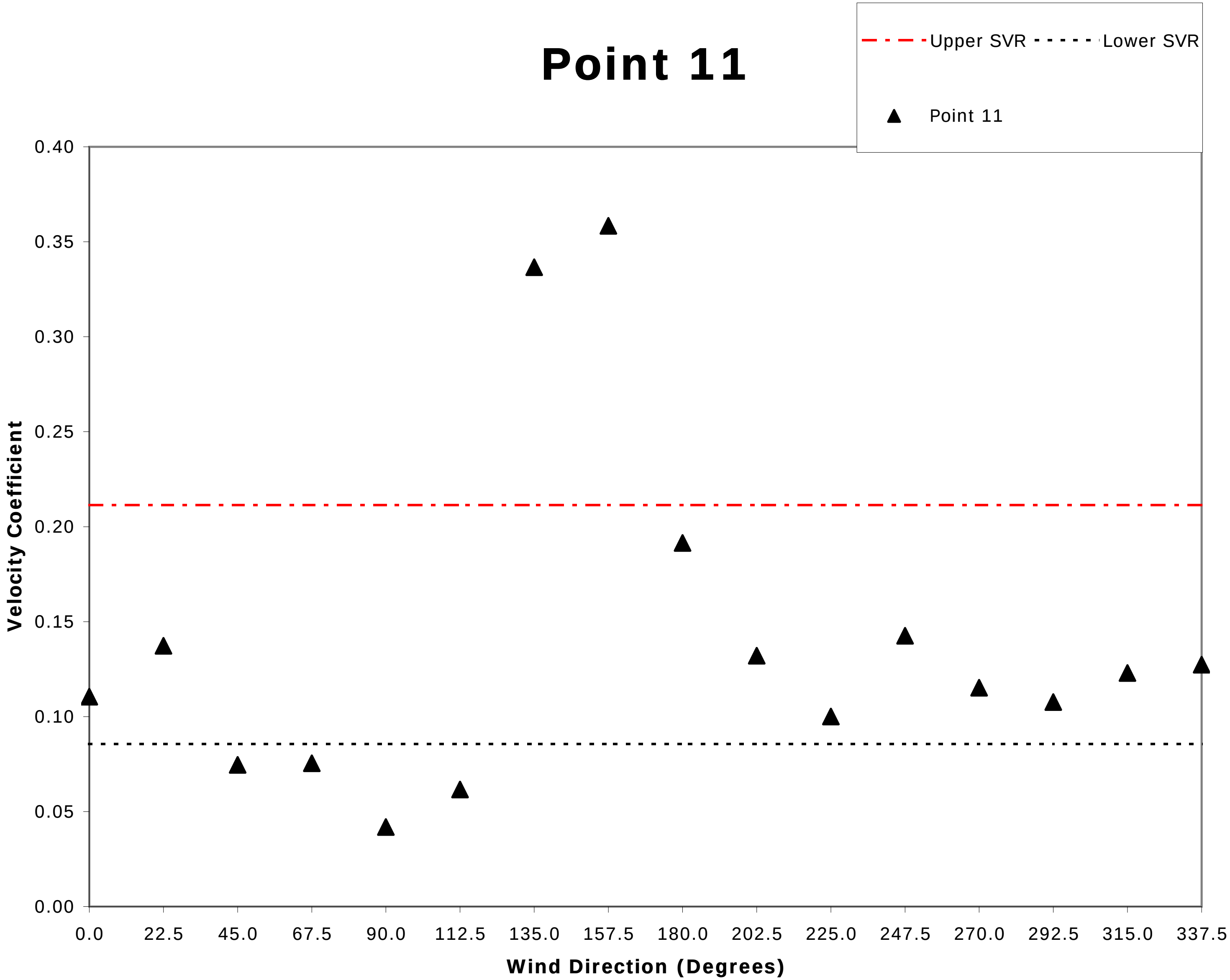


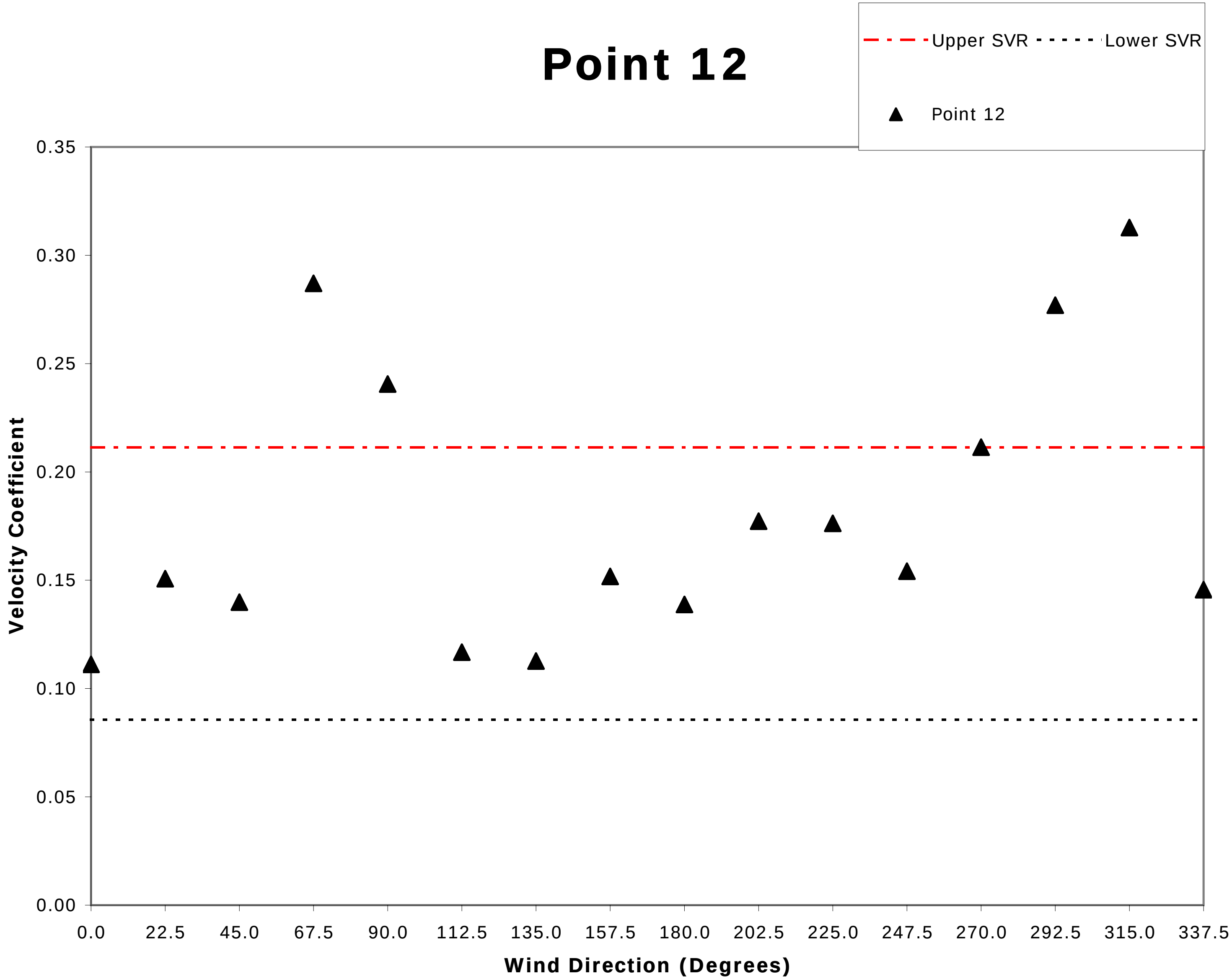
Point 8
Upper SVR
Lower SVR
Point 08
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

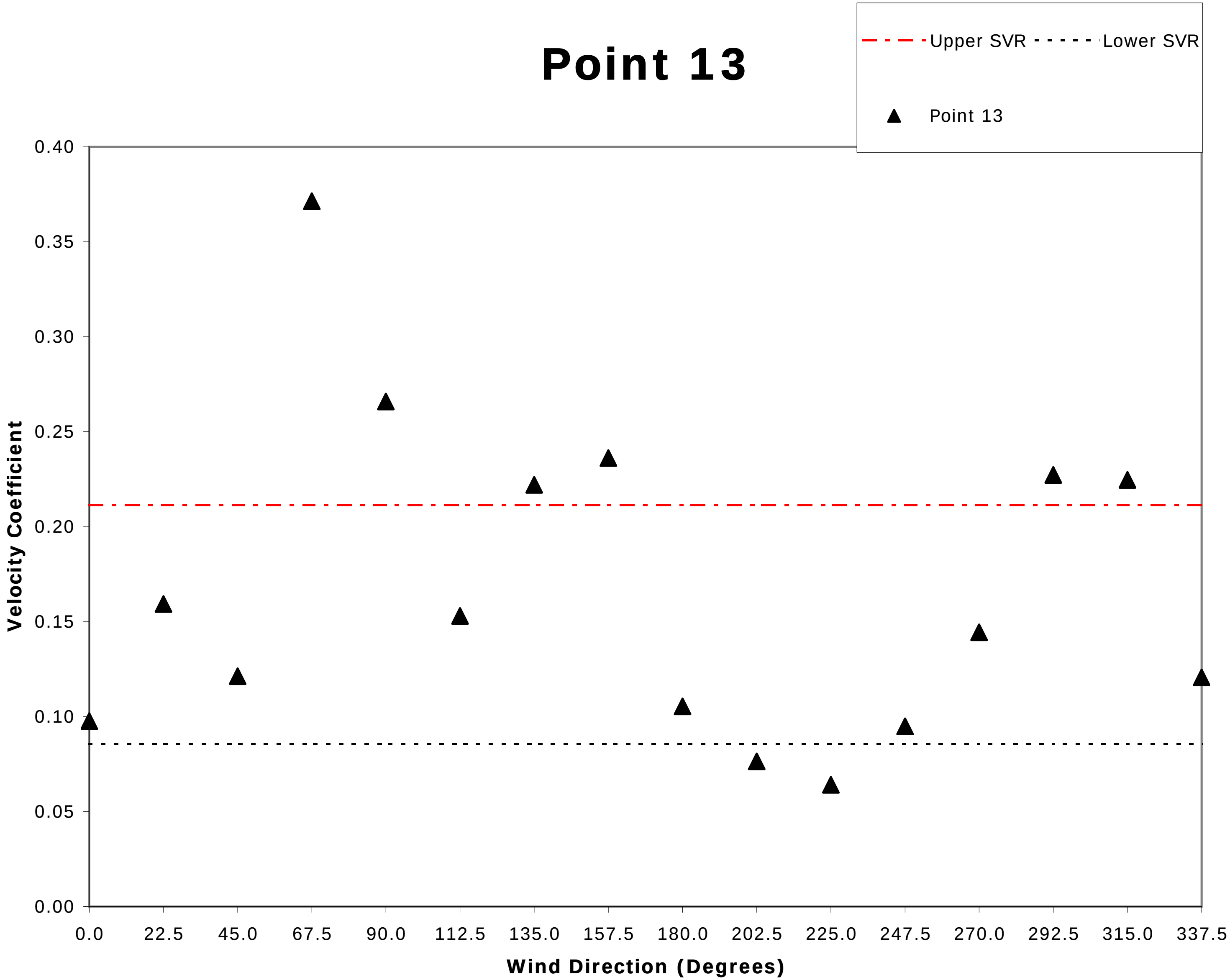

Point 9
Upper SVR
Lower SVR
Point 09
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



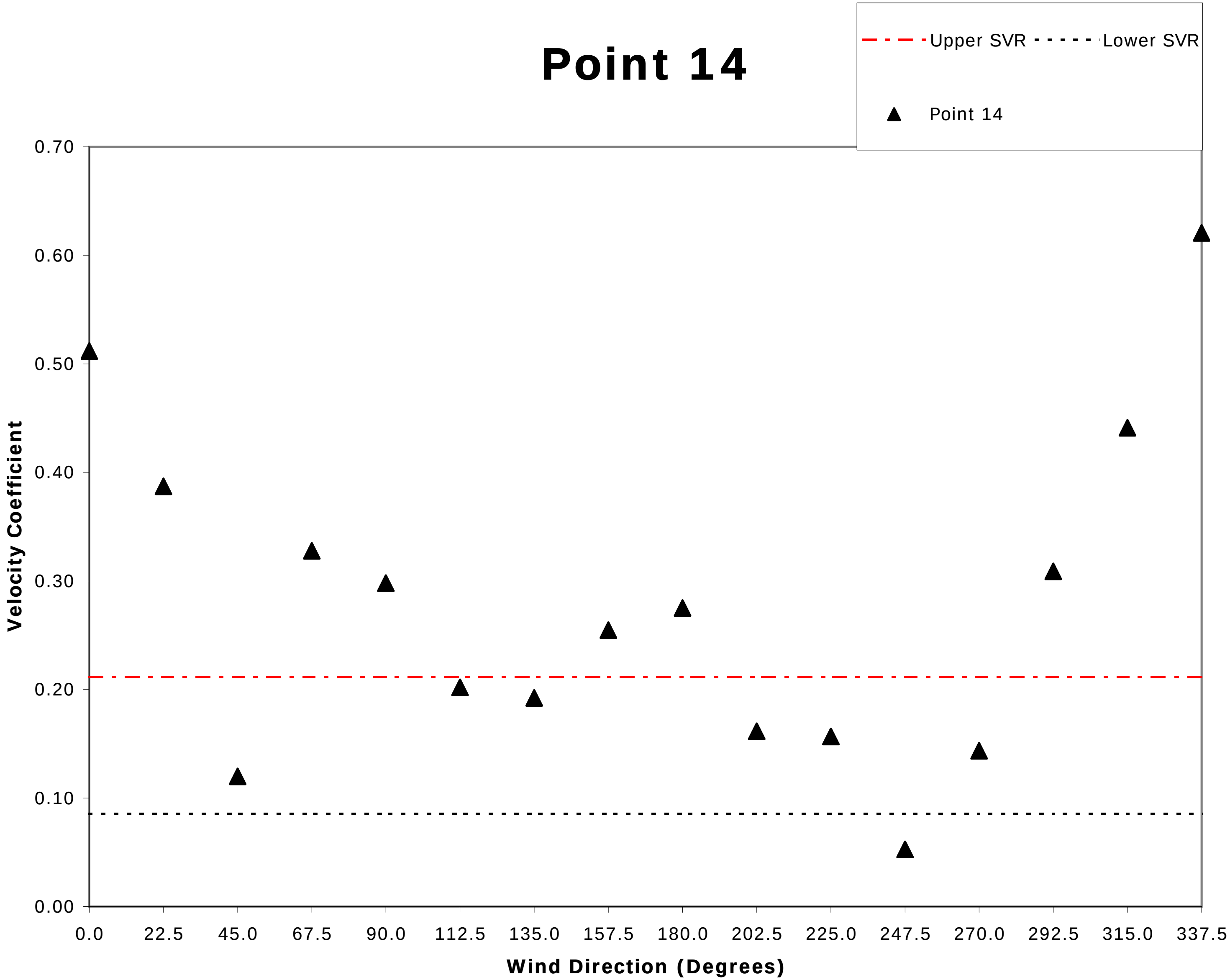
Point 10
Upper SVR
Lower SVR
Point 10
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

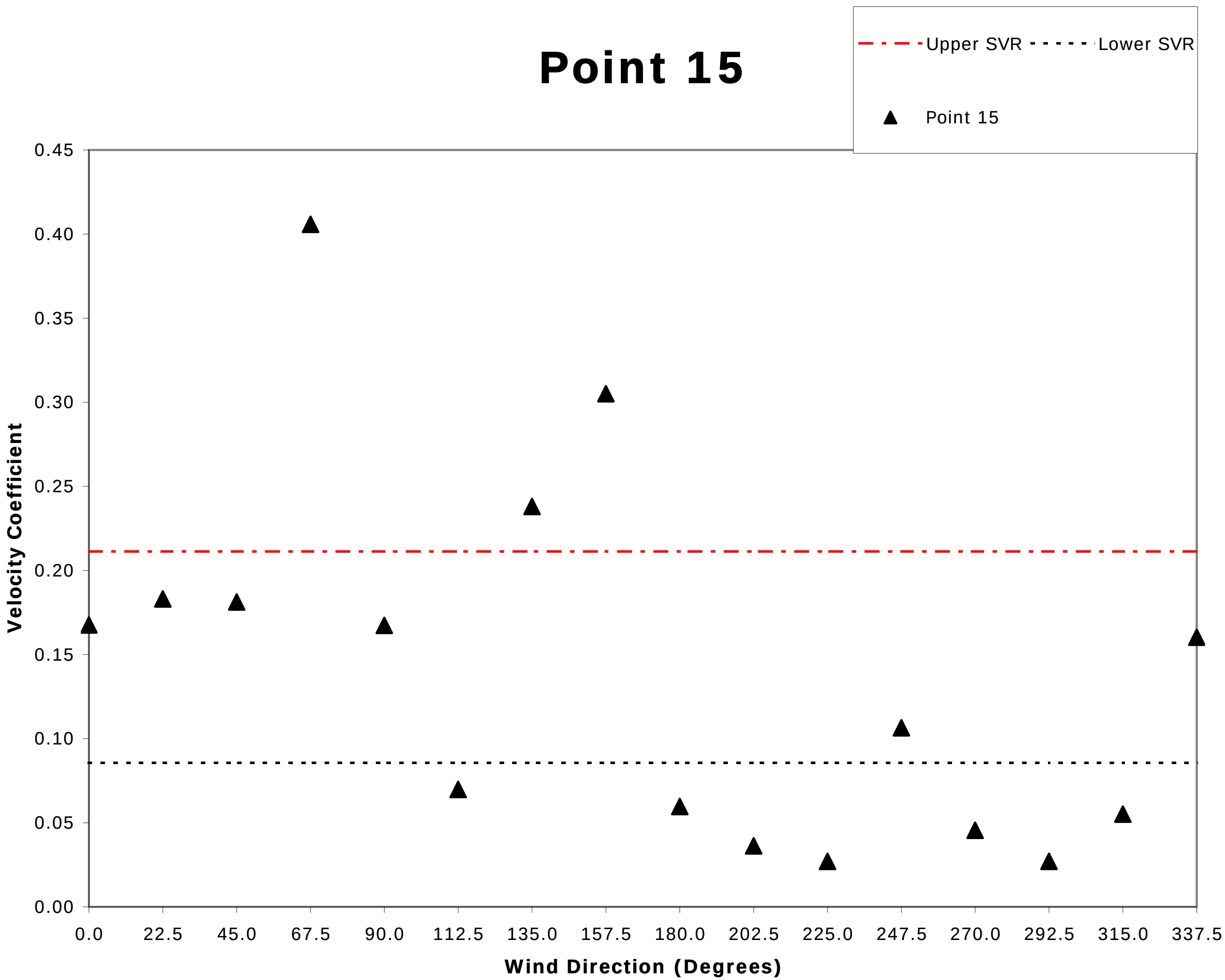

Point 11
Upper SVR
Lower SVR
Point 11
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

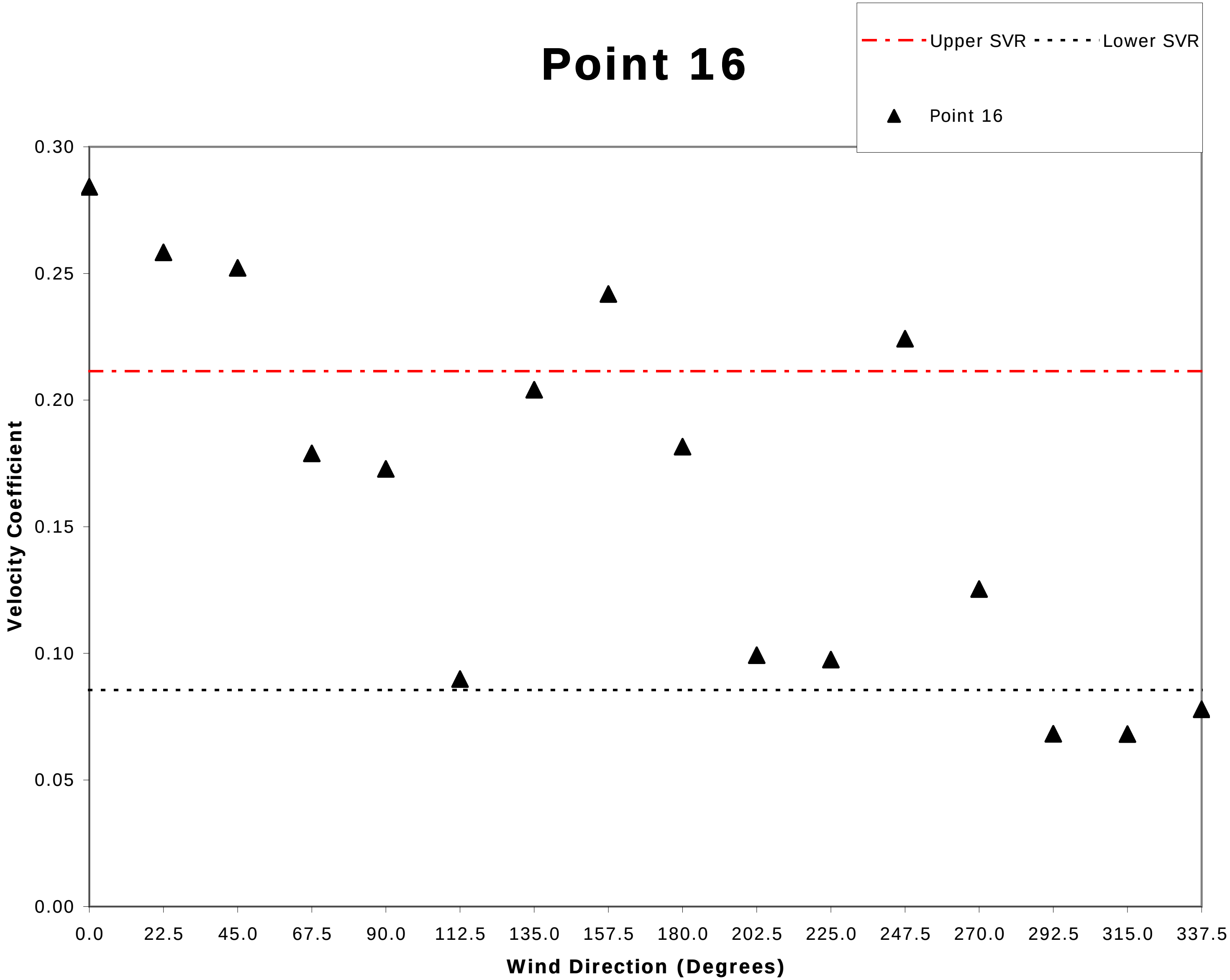

Point 12
Upper SVR
Lower SVR
Point 12
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 13
Upper SVR
Lower SVR
Point 13
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

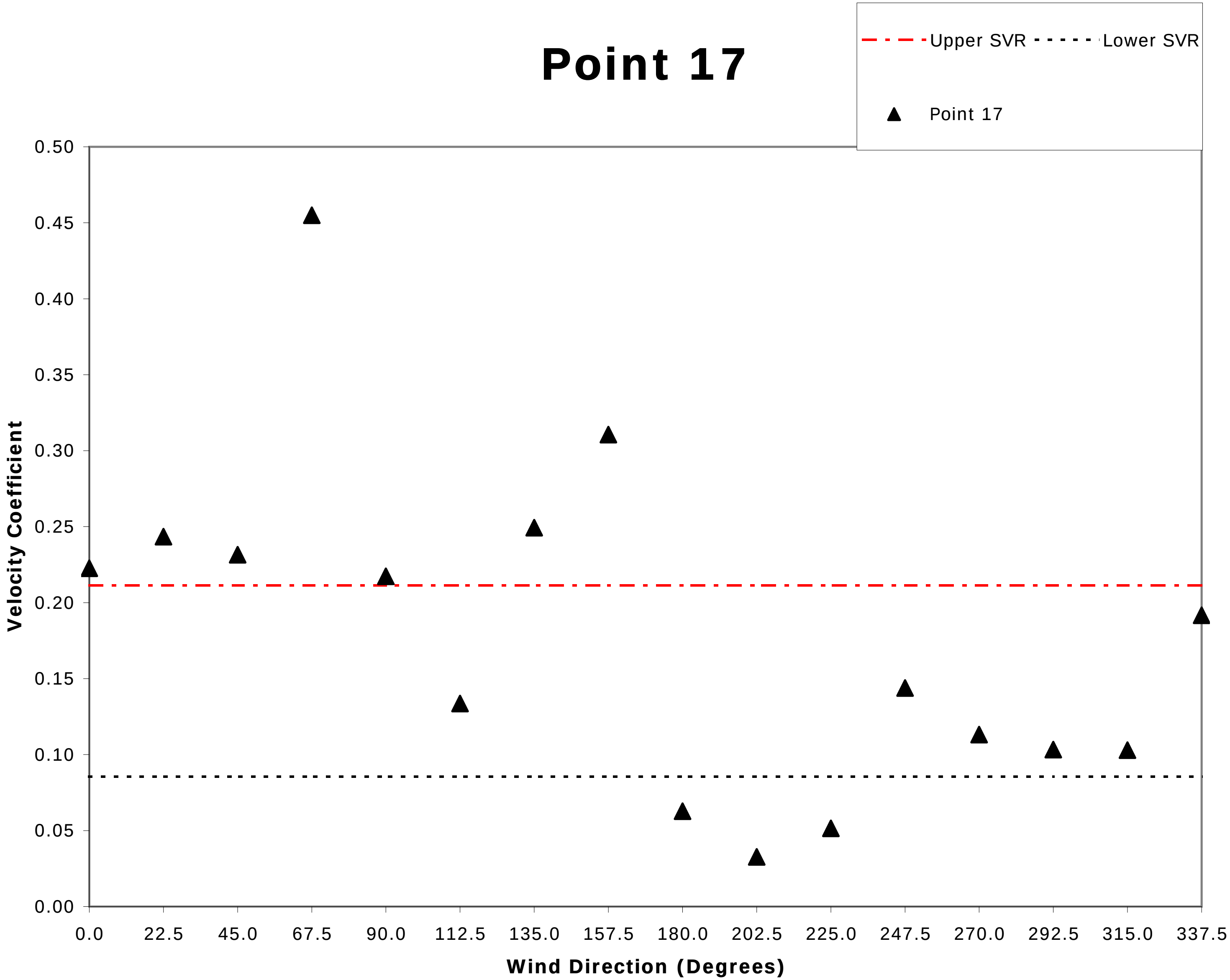
Point 14

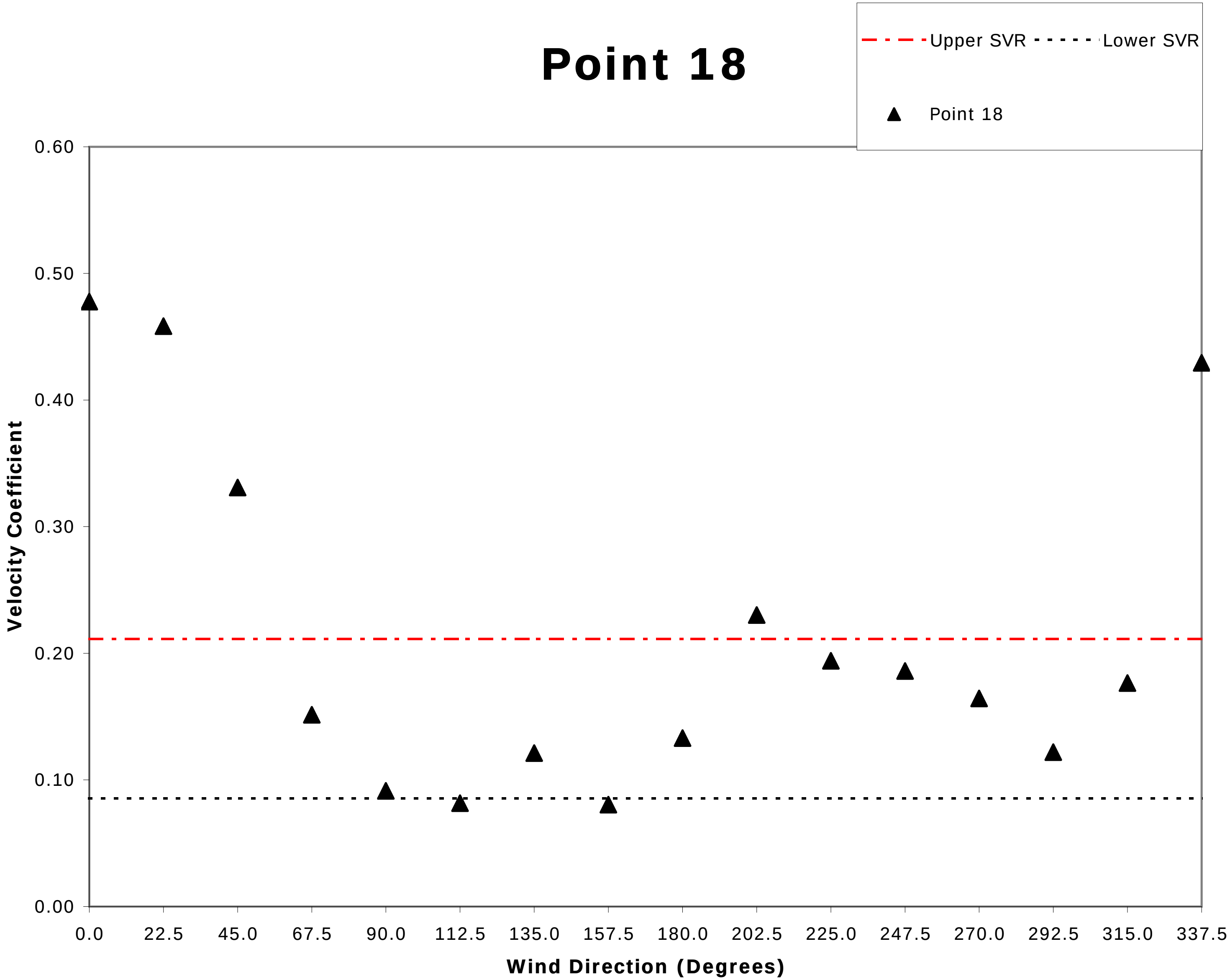

Upper SVR
Lower SVR
Point 14
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 15
Upper SVR
Lower SVR
Point 15
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

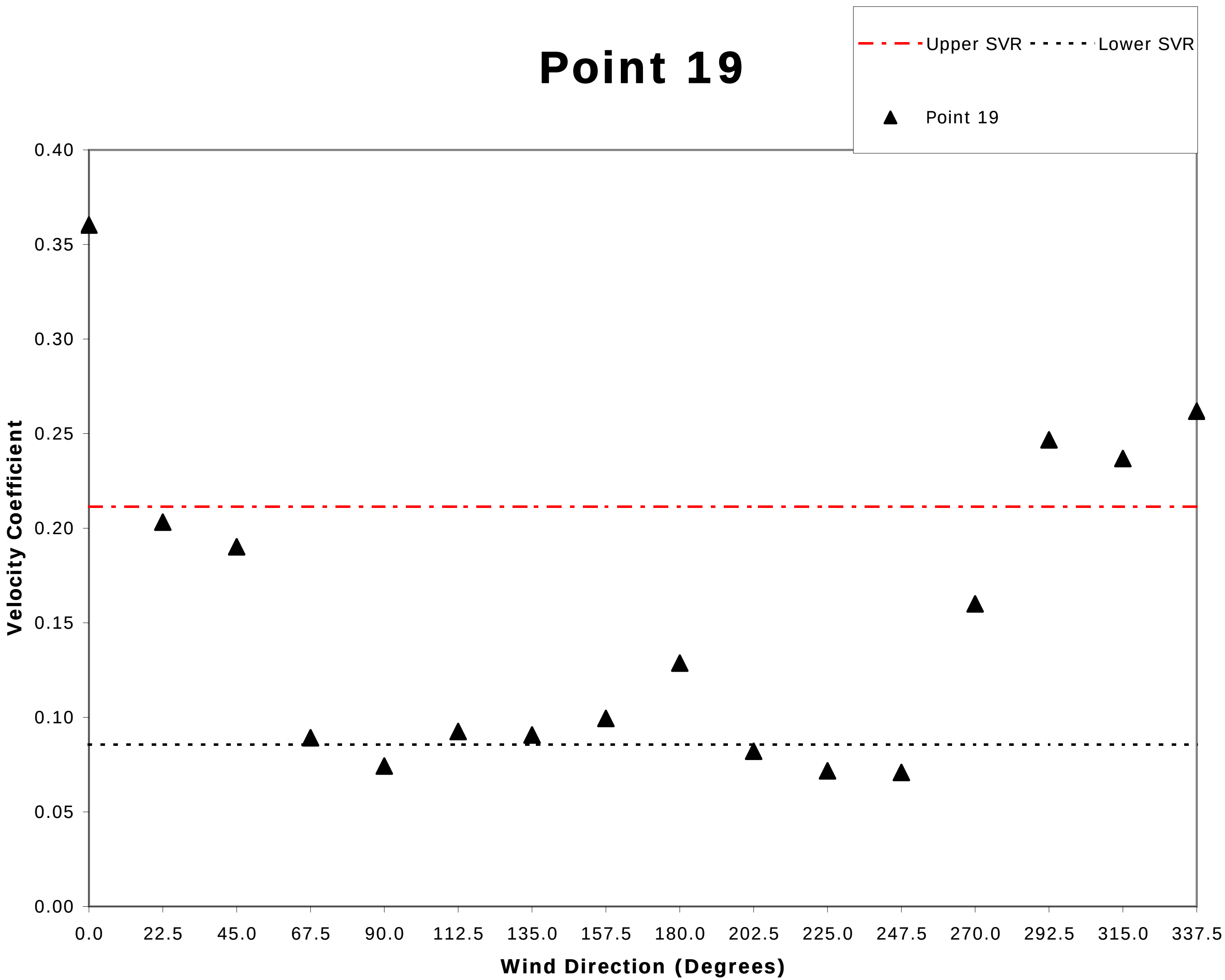


Point 16
Upper SVR
Lower SVR
Point 16
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

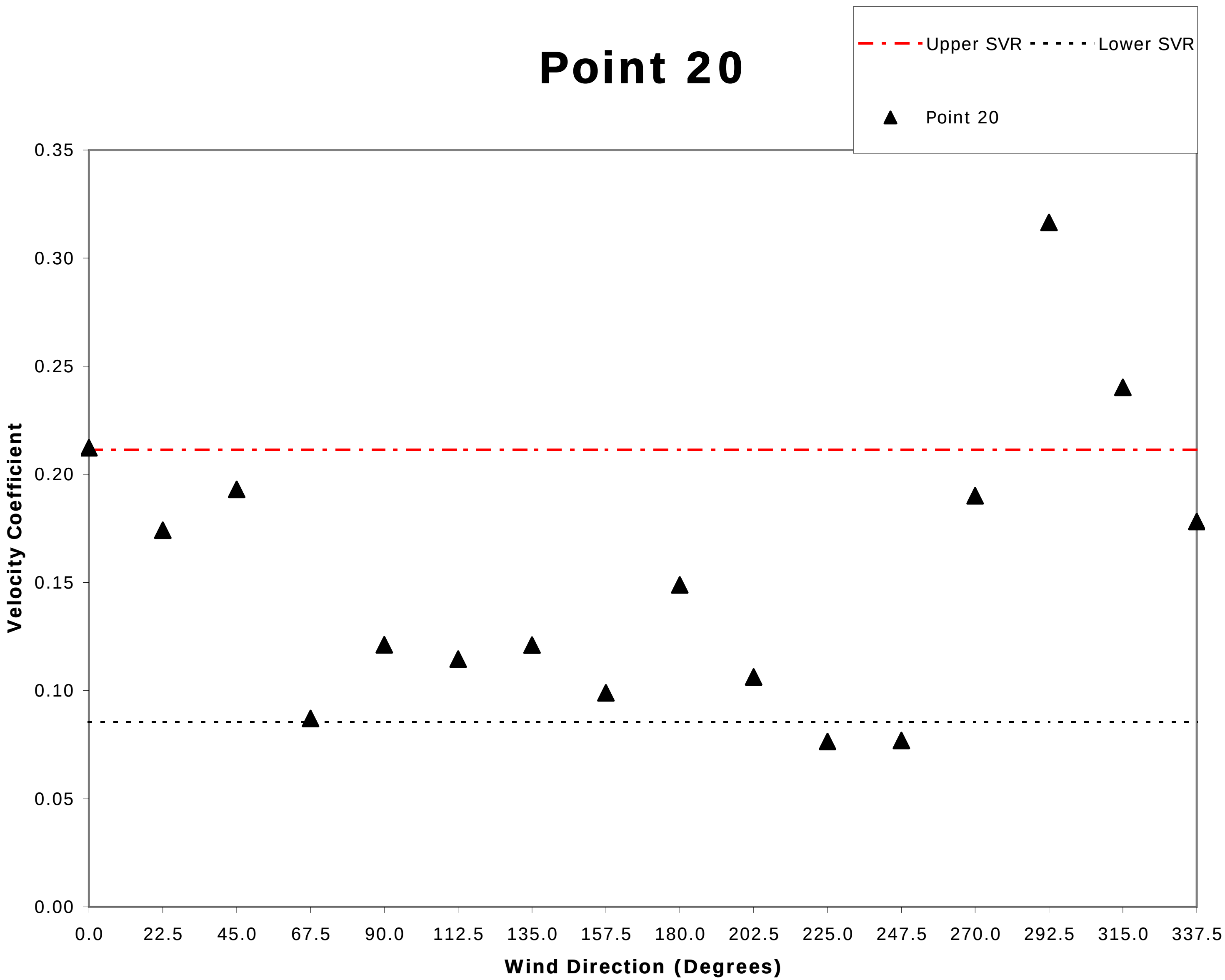

Point 17
Upper SVR
Lower SVR
Point 17
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



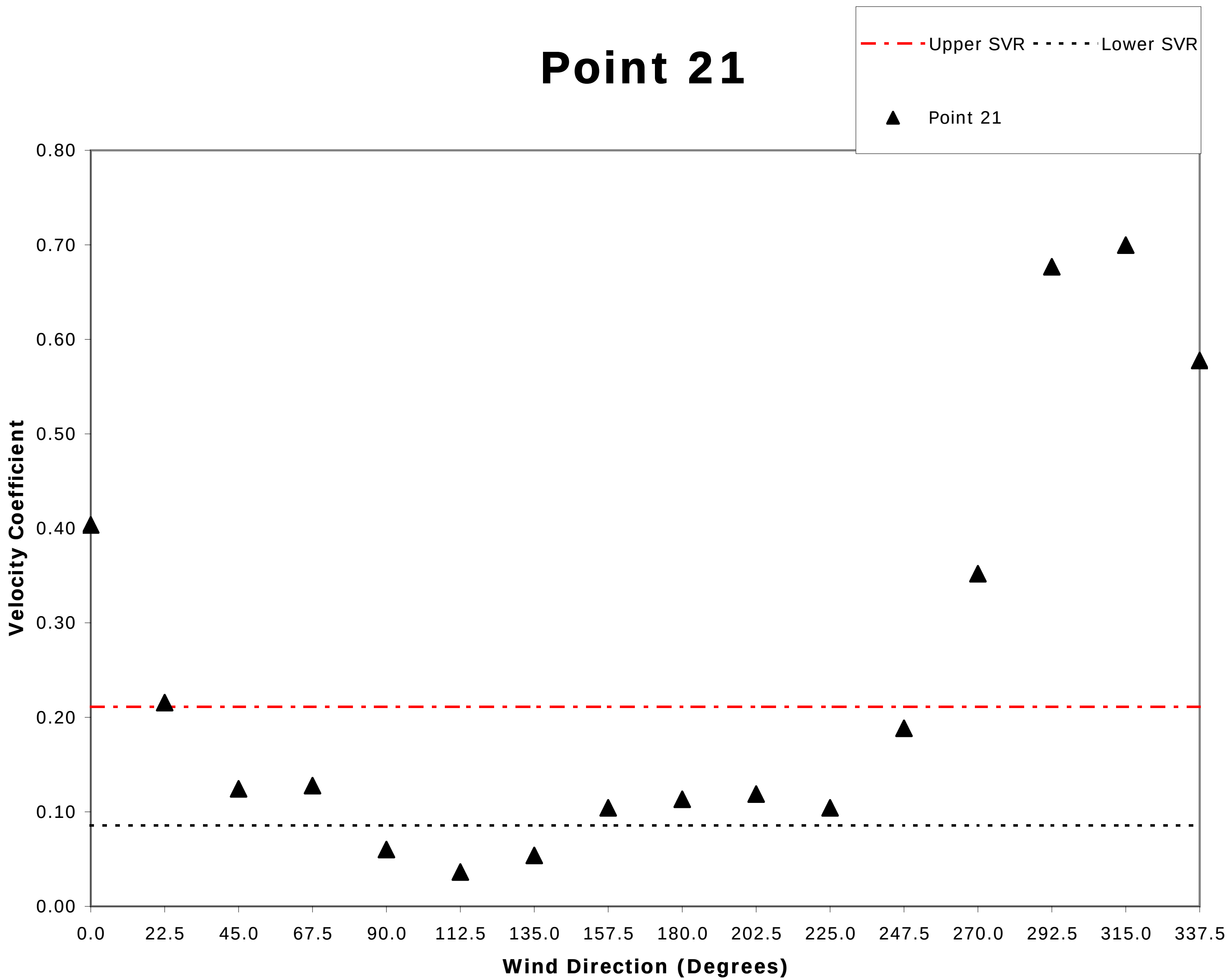
Point 18
Upper SVR
Lower SVR
Point 18
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



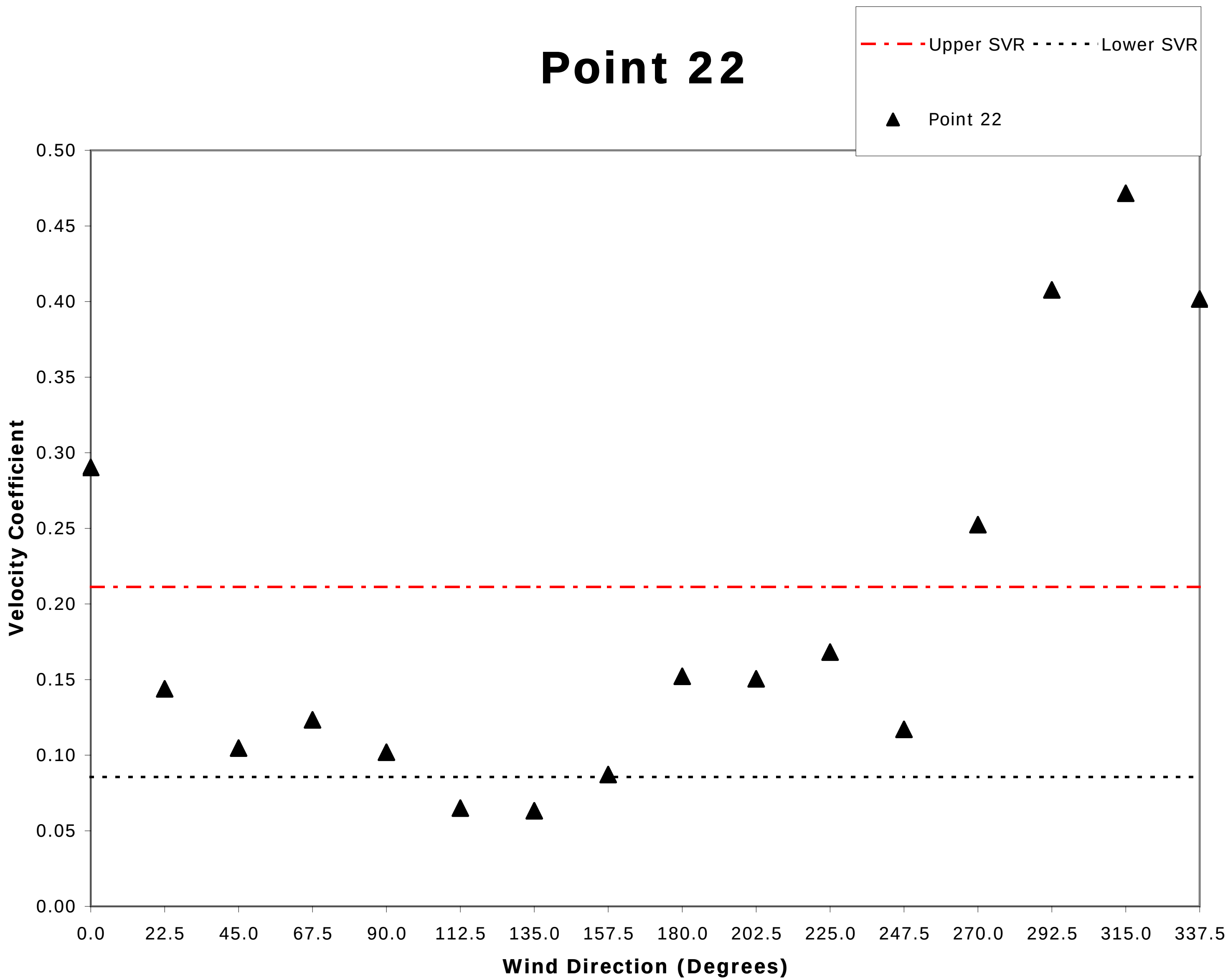
Point 19
Upper SVR
Lower SVR
Point 19
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

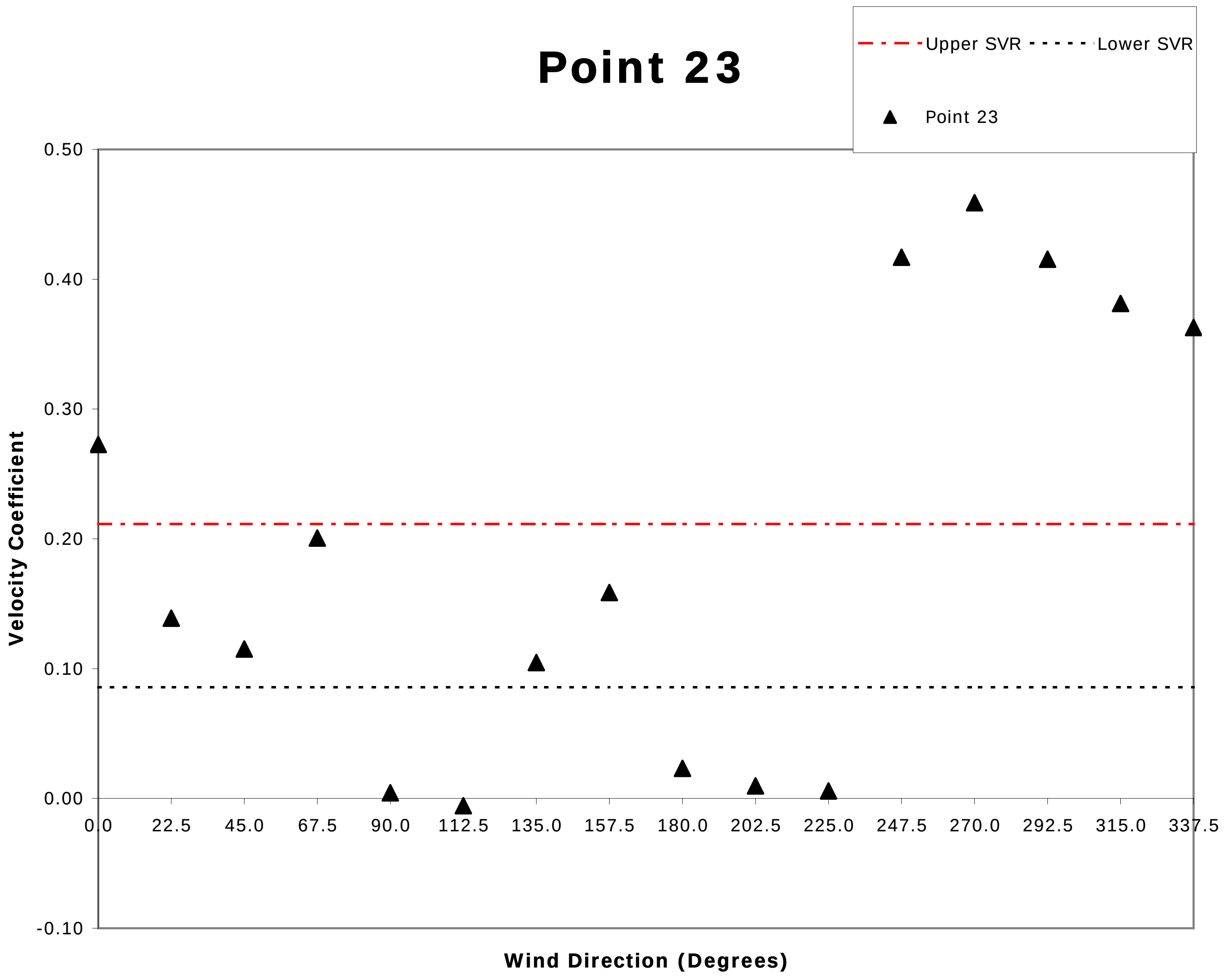


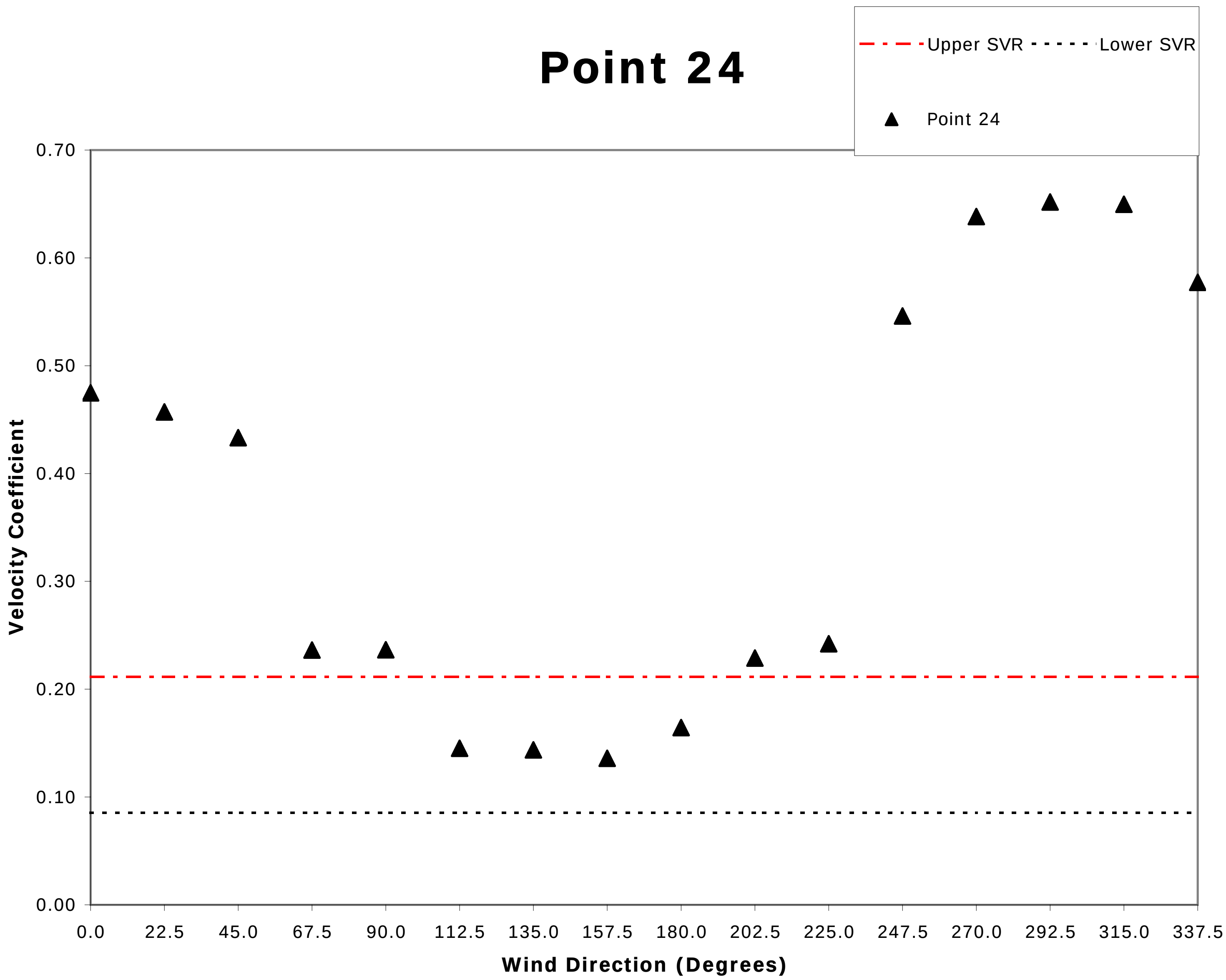
Point 20
Upper SVR
Lower SVR
Point 20
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

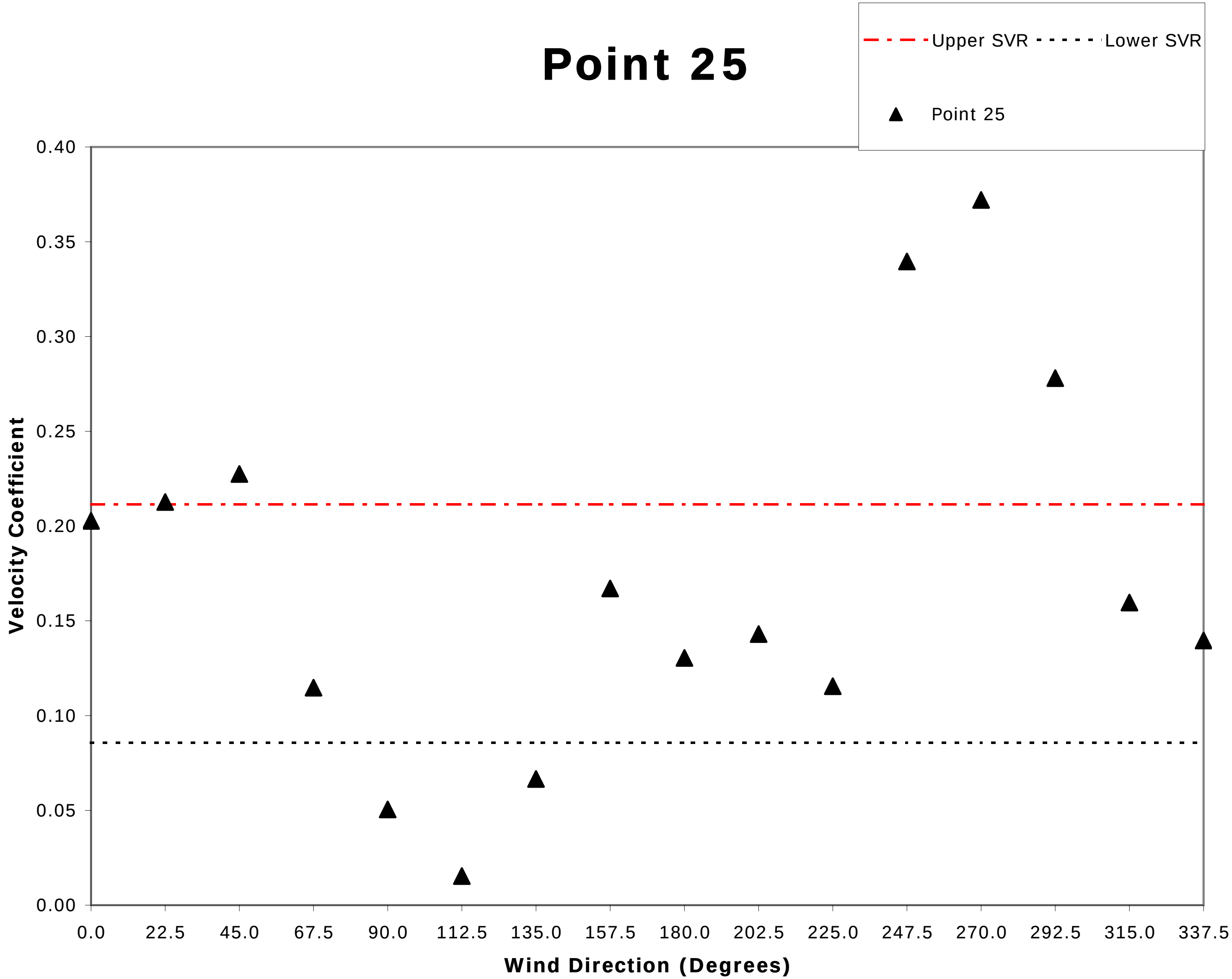


Point 21
Upper SVR
Lower SVR
Point 21
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

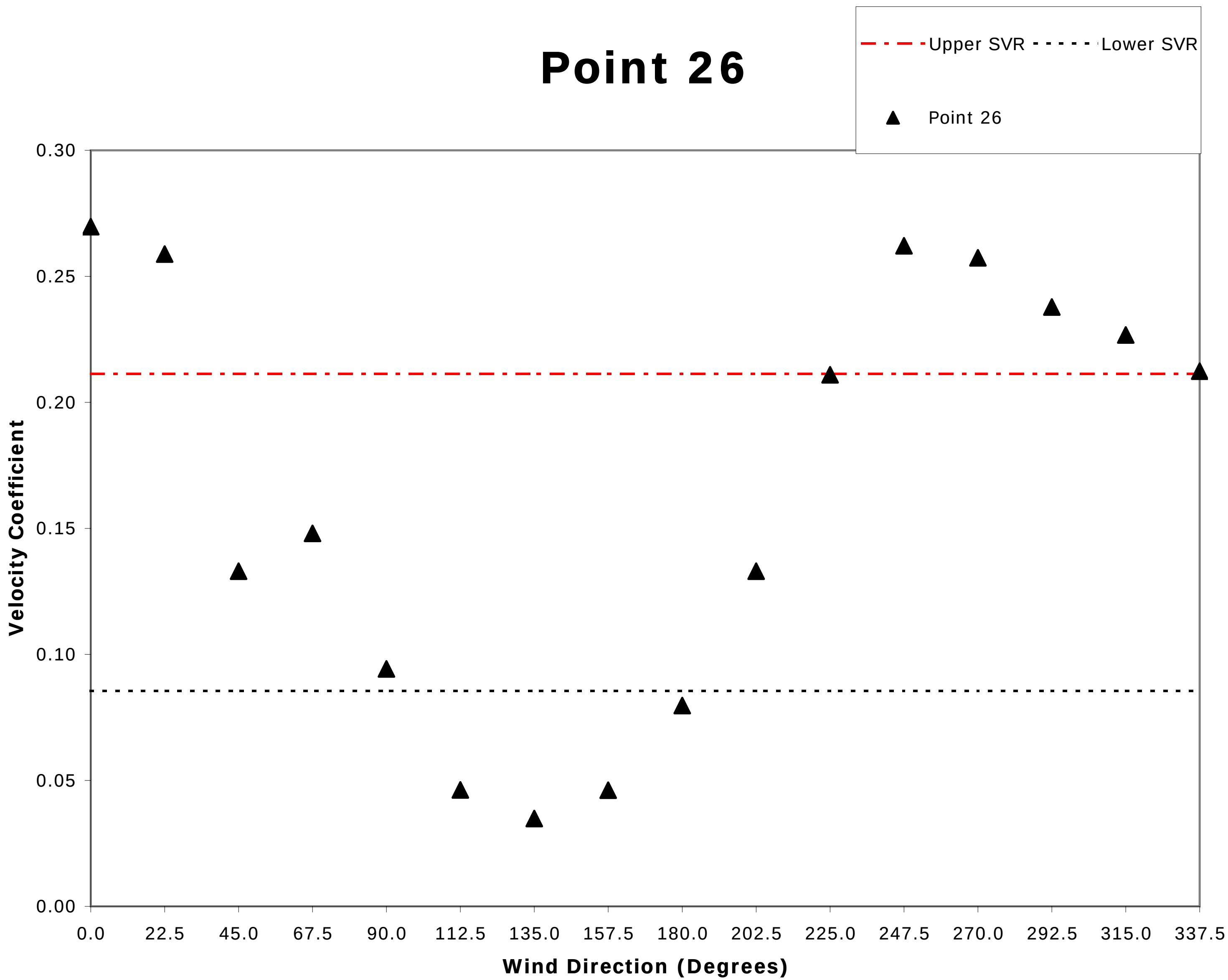

Point 22
Upper SVR
Lower SVR
Point 22
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

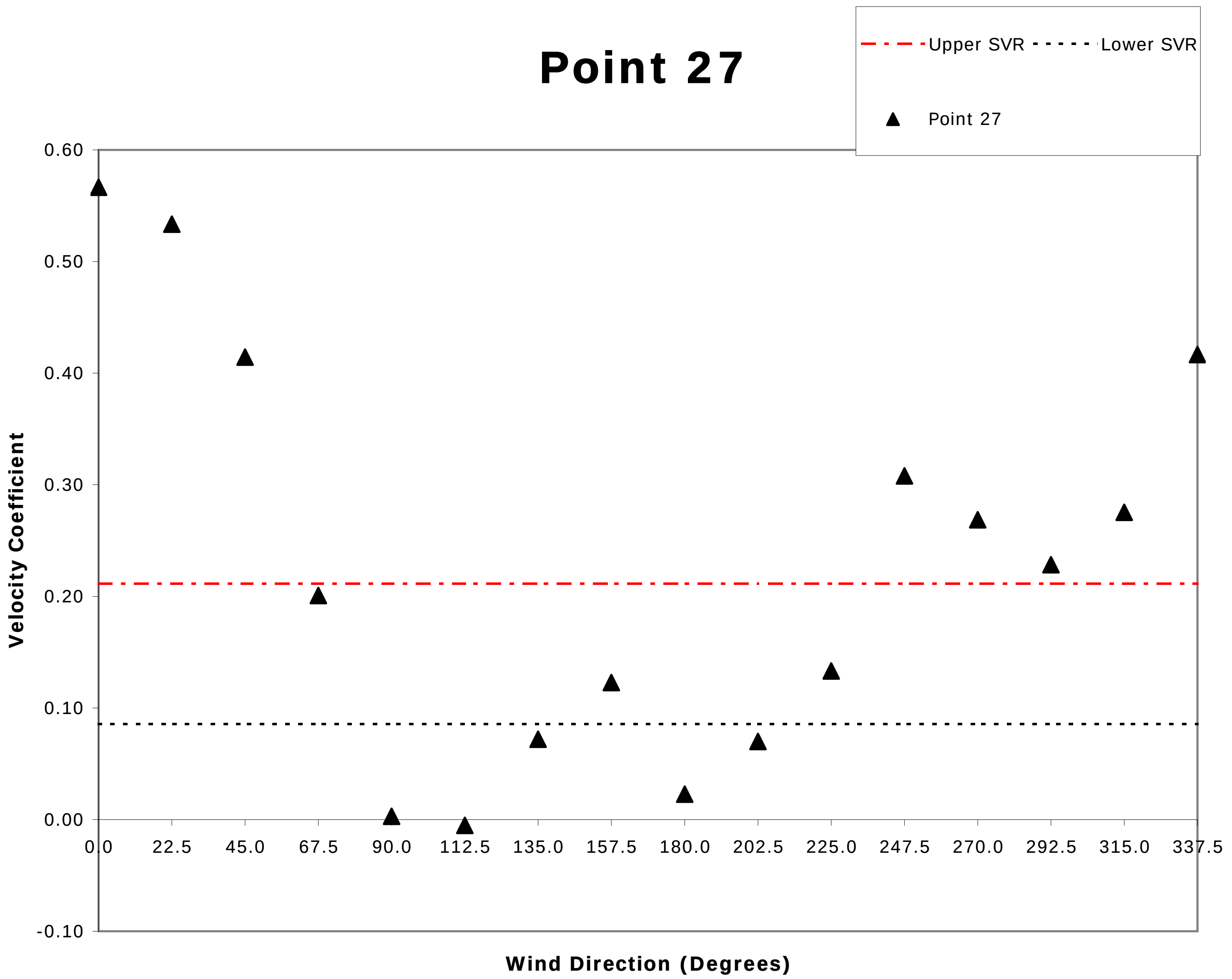

Point 23
Upper SVR
Lower SVR
Point 23
Velocity Coefficient
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 24
Upper SVR
Lower SVR
Point 24
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

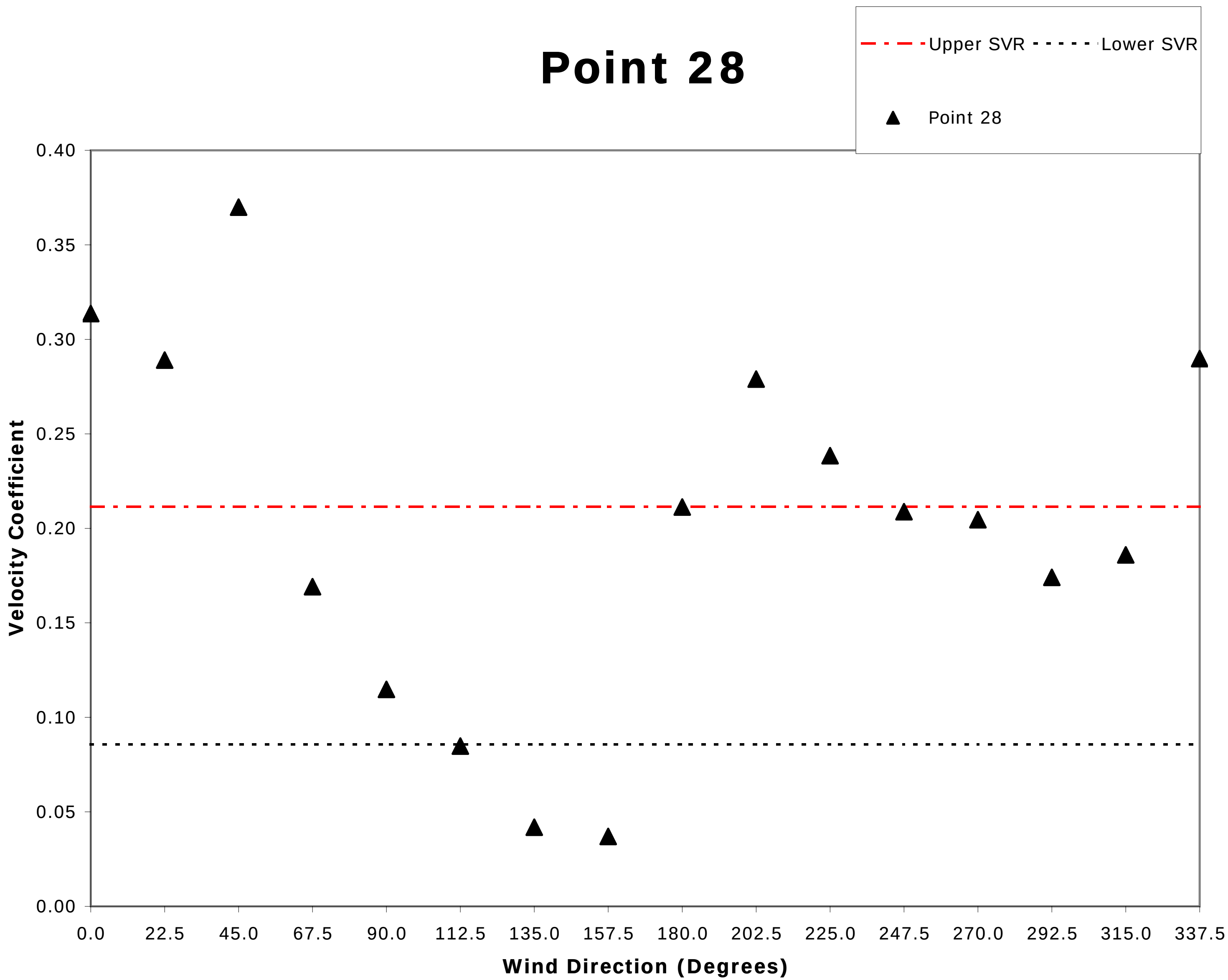


Point 25
Upper SVR
Lower SVR
Point 25
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

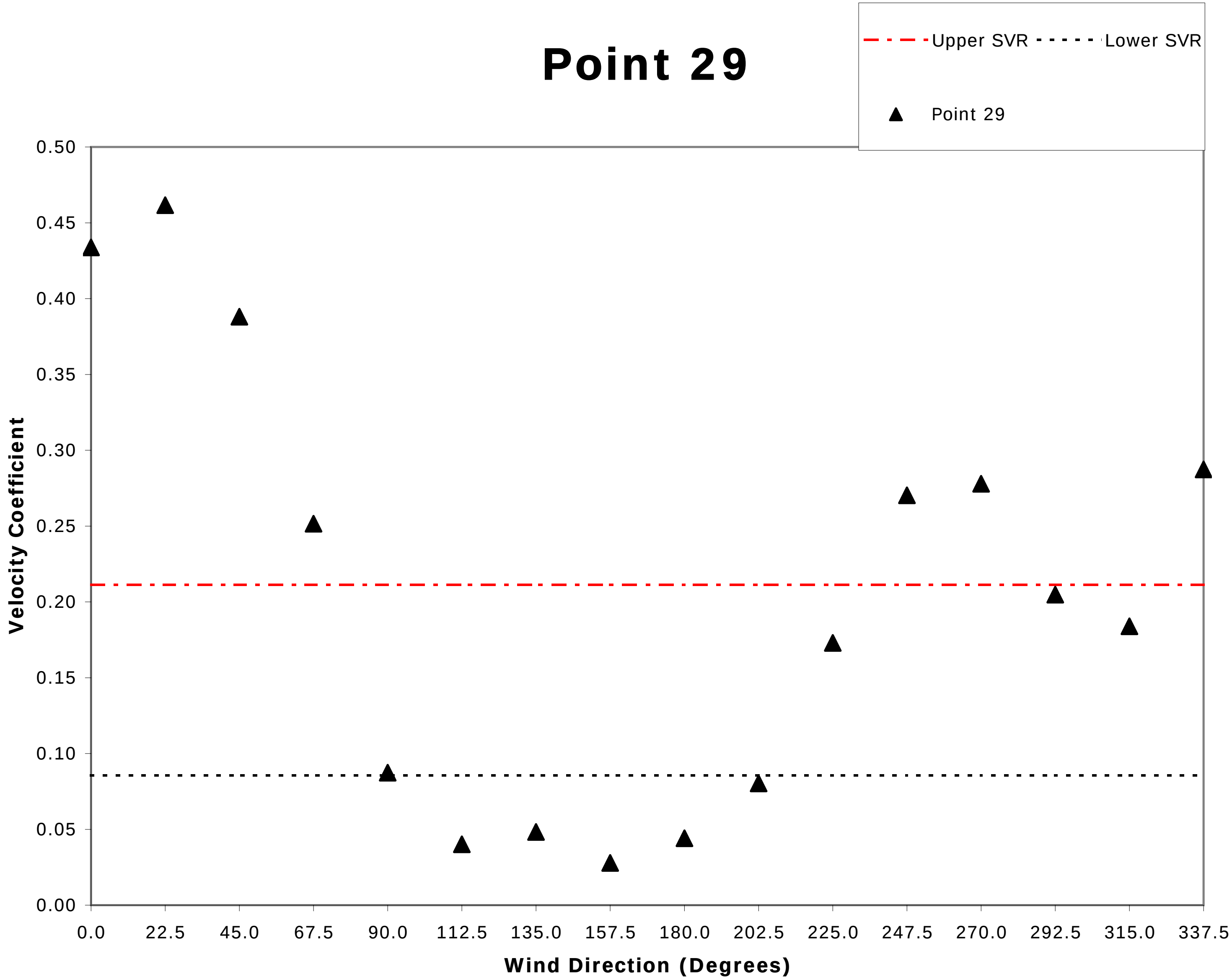

Point 26
Upper SVR
Lower SVR
Point 26
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



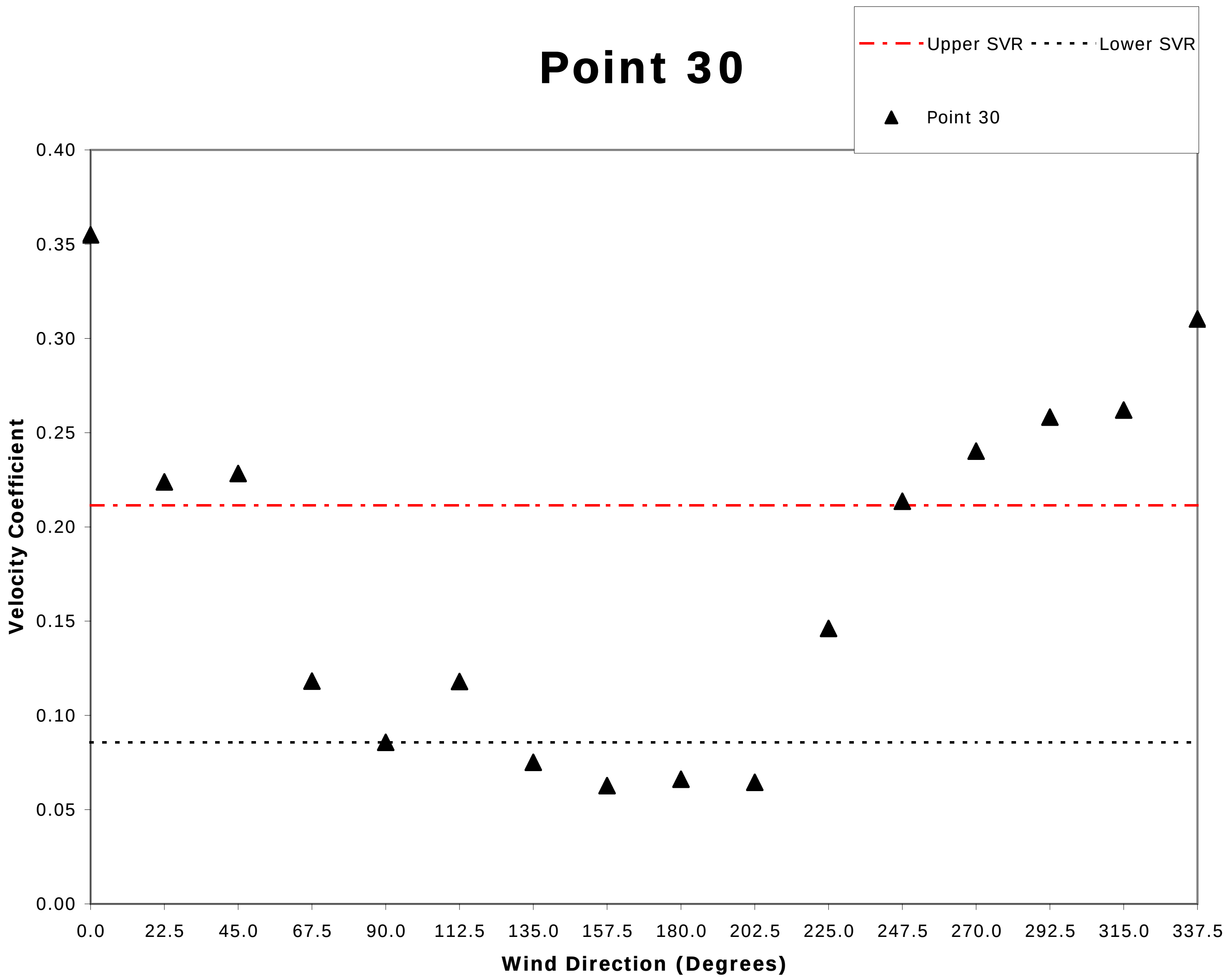
Point 27
Upper SVR
Lower SVR
Point 27
Velocity Coefficient
Wind Direction (Degrees)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5



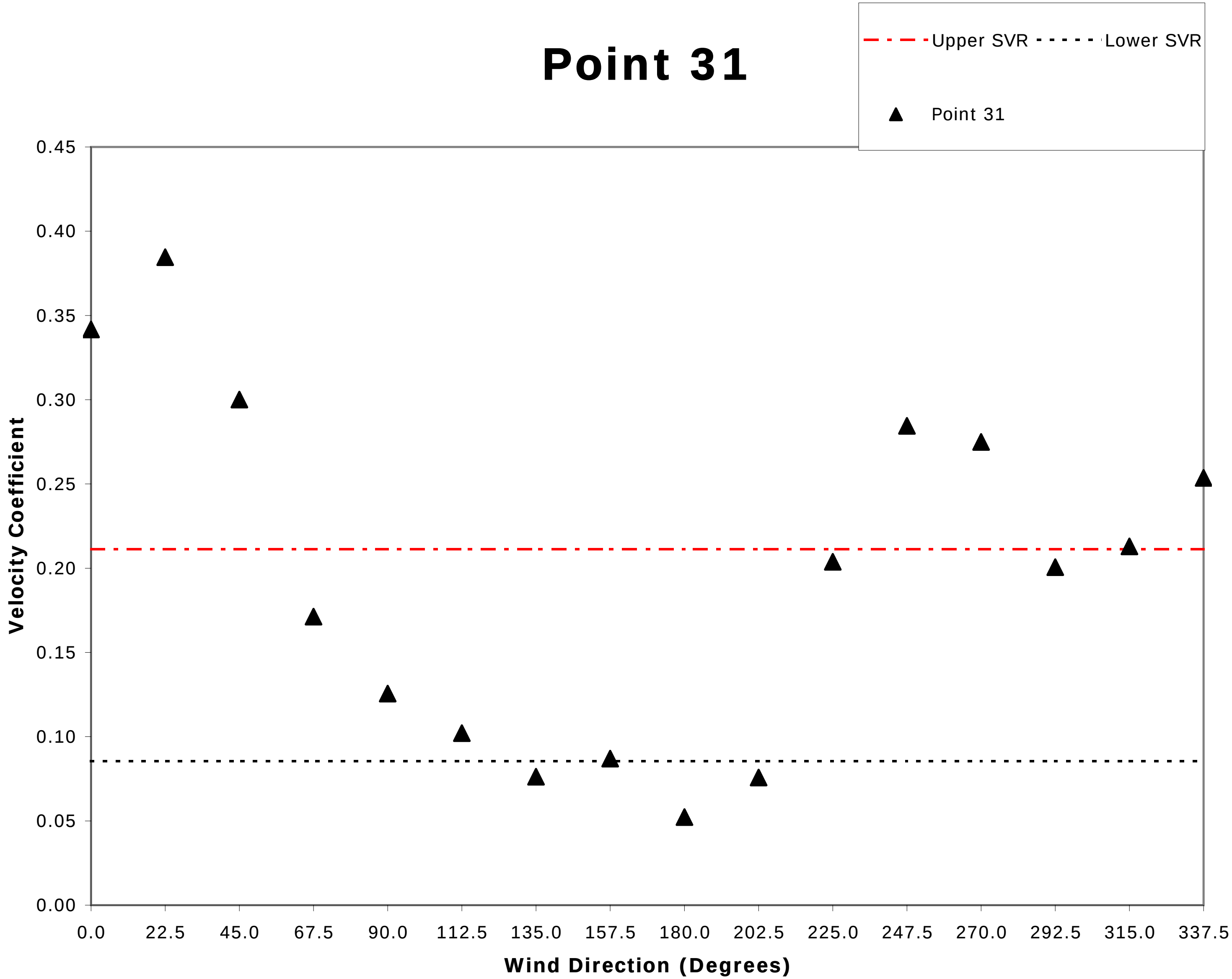
Point 28
Upper SVR
Lower SVR
Point 28
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

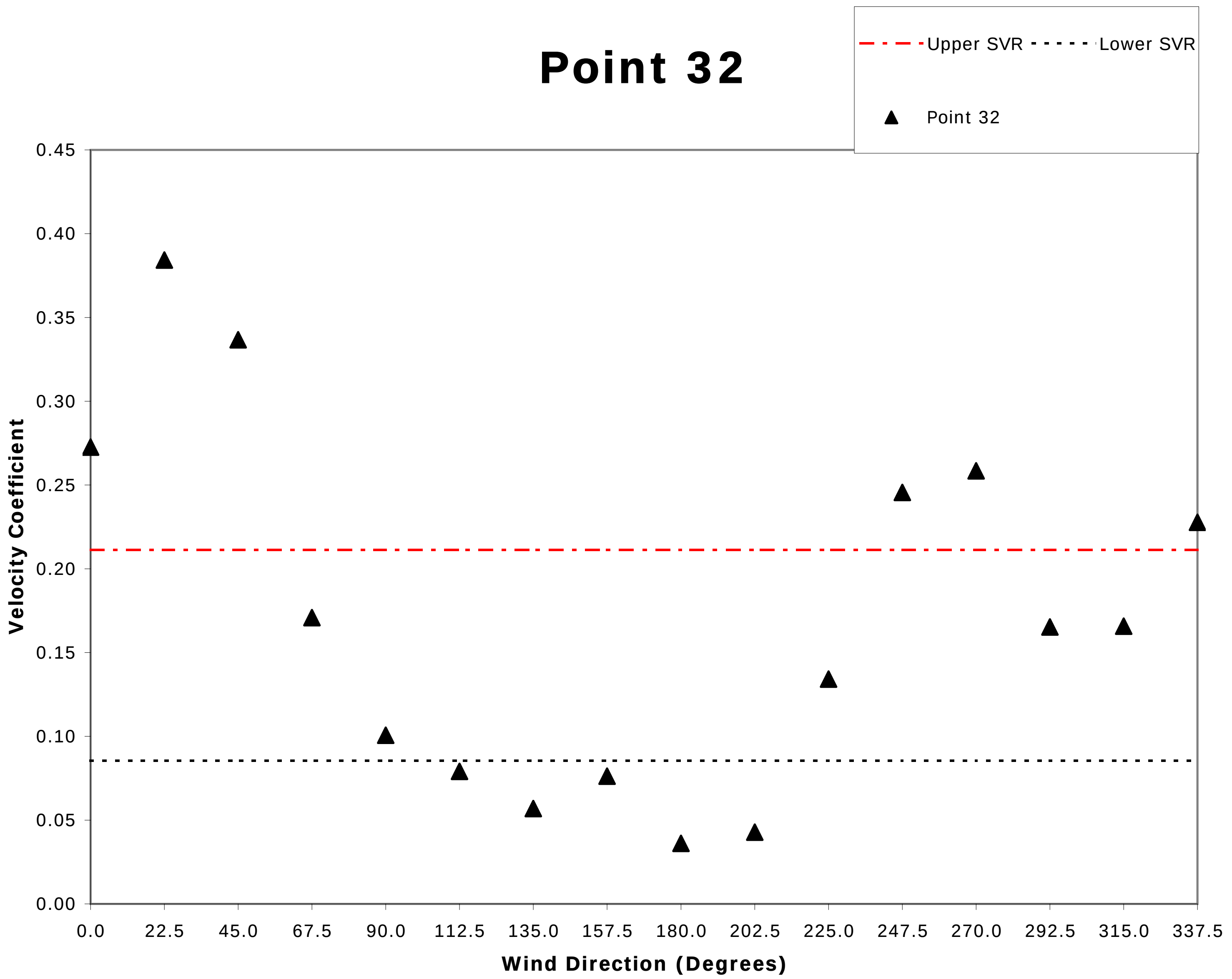


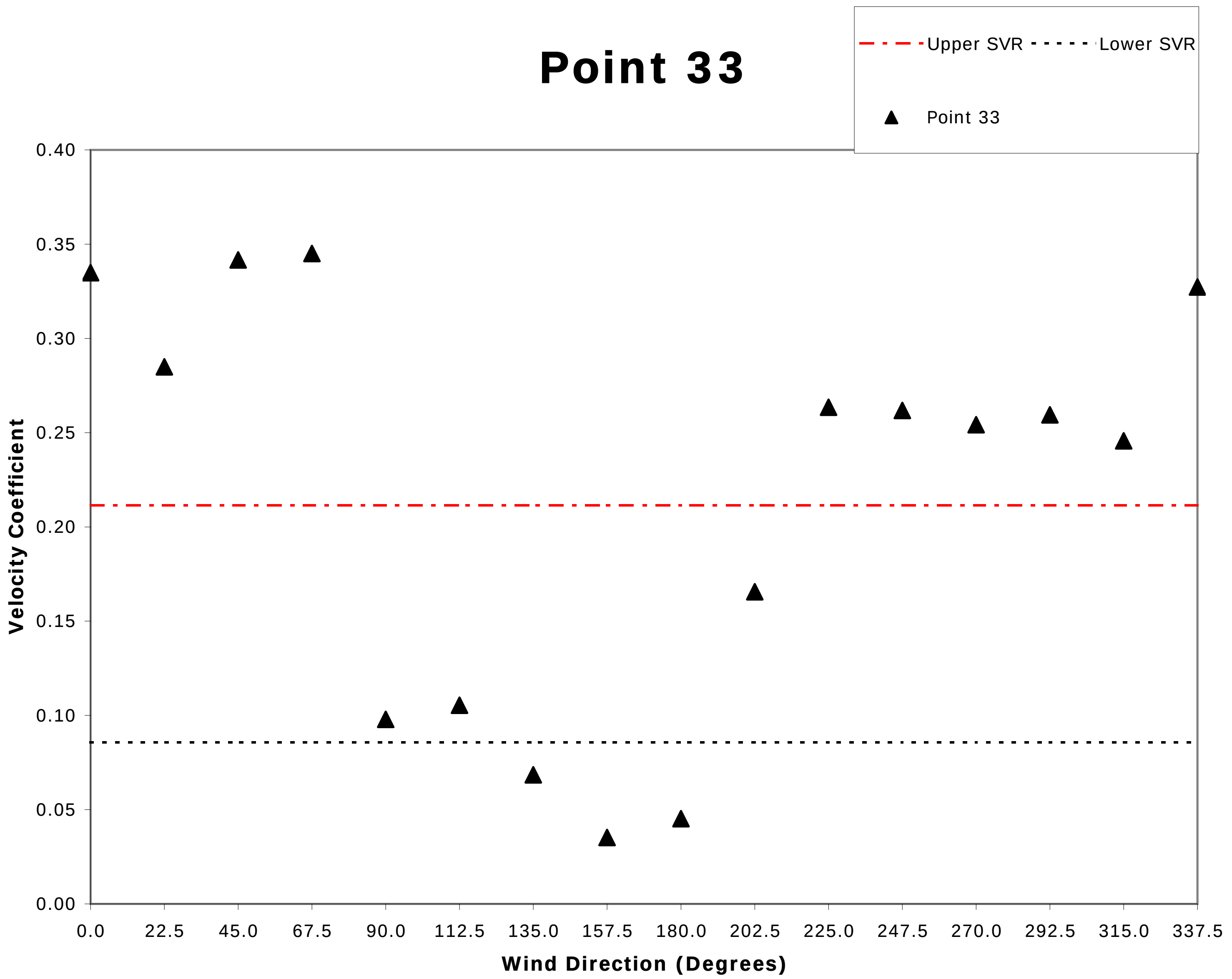
Point 29
Upper SVR
Lower SVR
Point 29
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



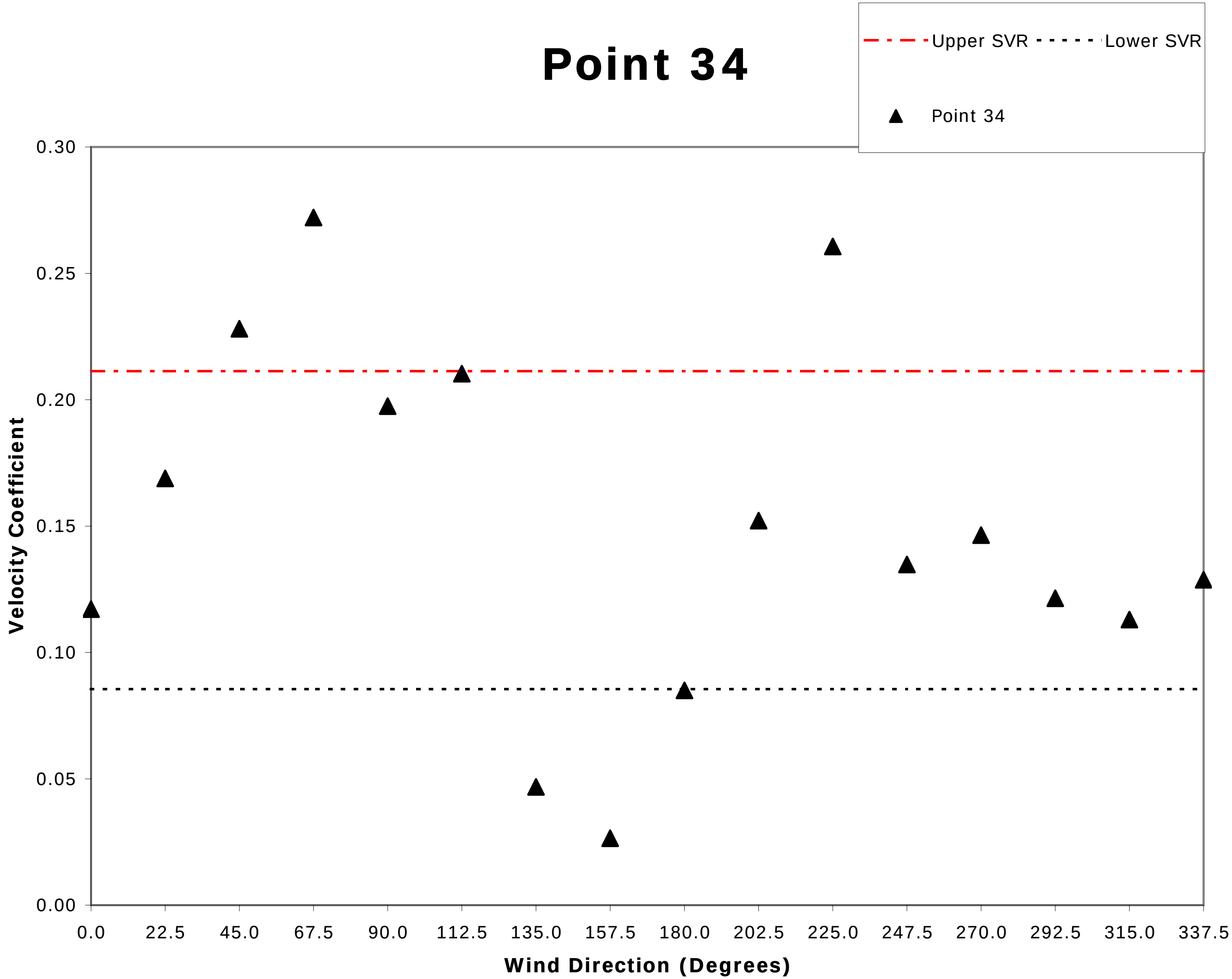
Point 30
Upper SVR
Lower SVR
Point 30
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

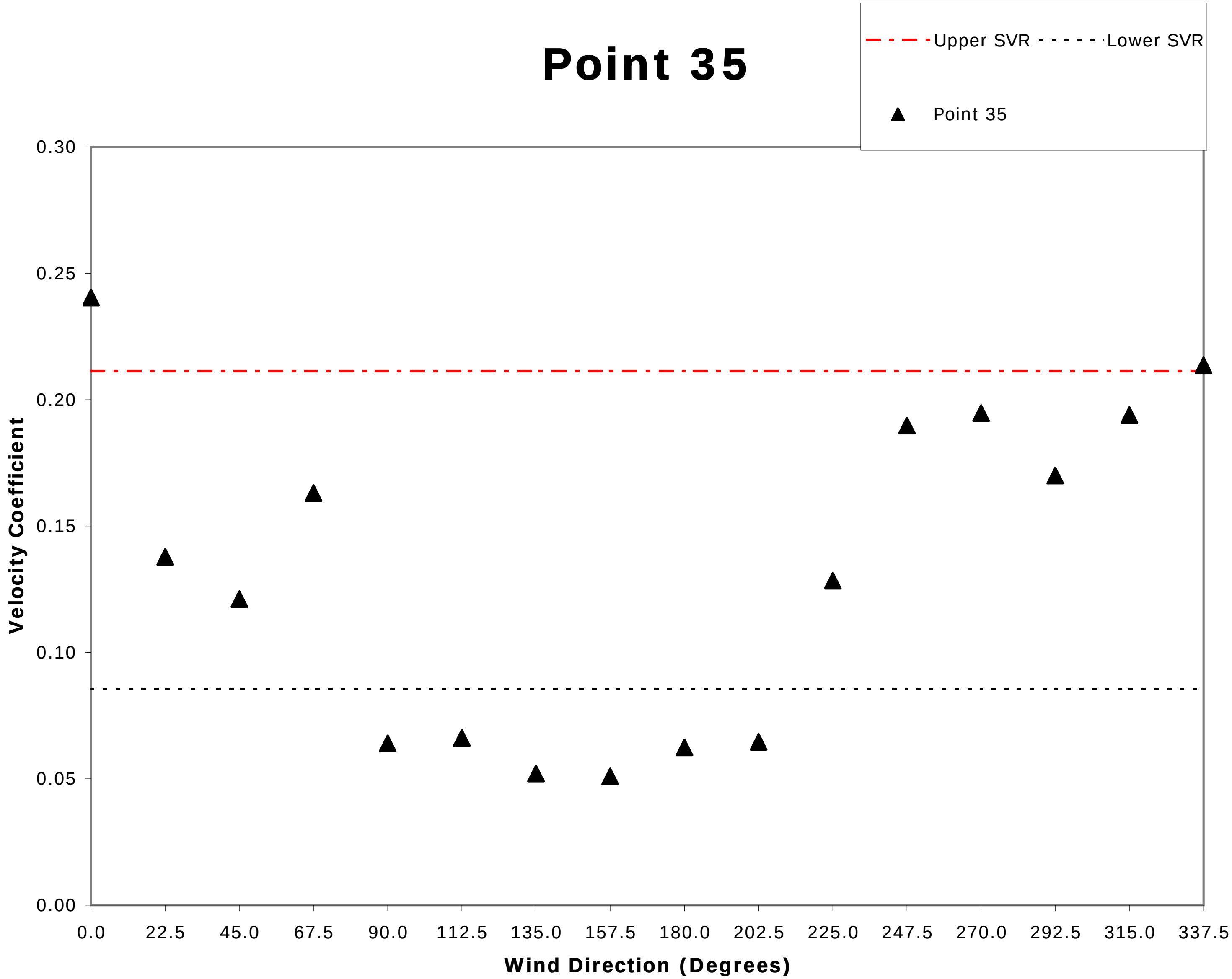

Point 31
Upper SVR
Lower SVR
Point 31
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

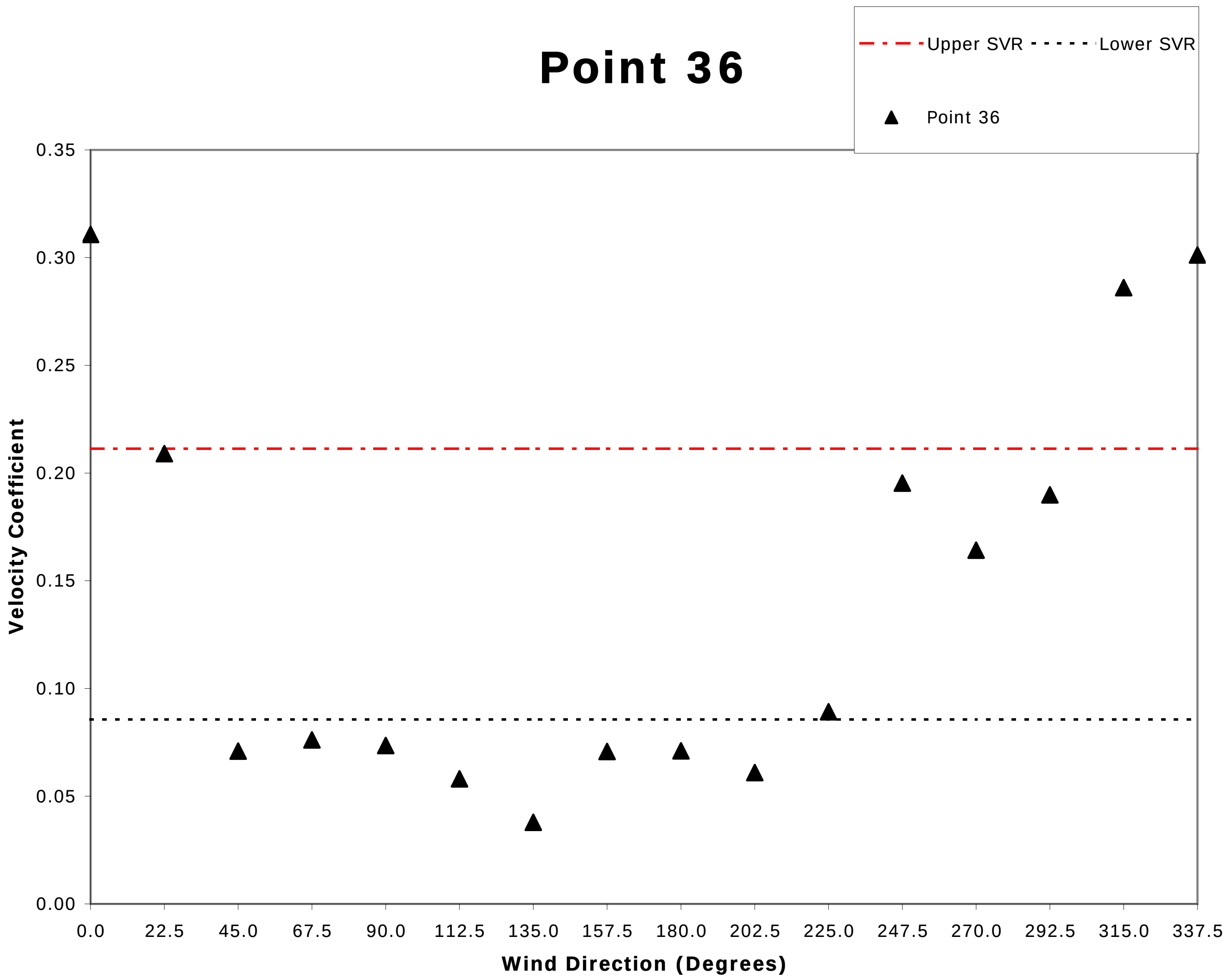

Point 32
Upper SVR
Lower SVR
Point 32
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

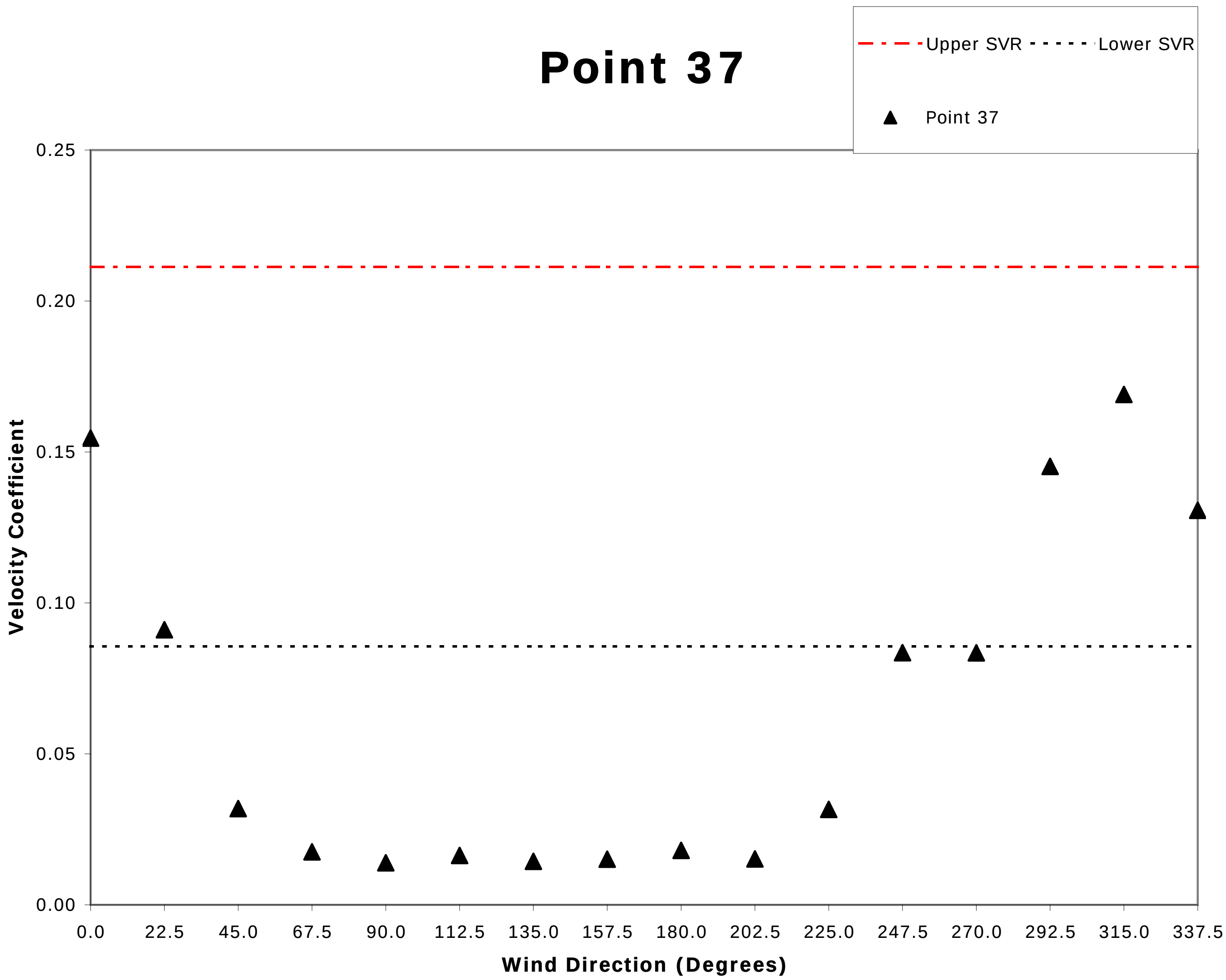


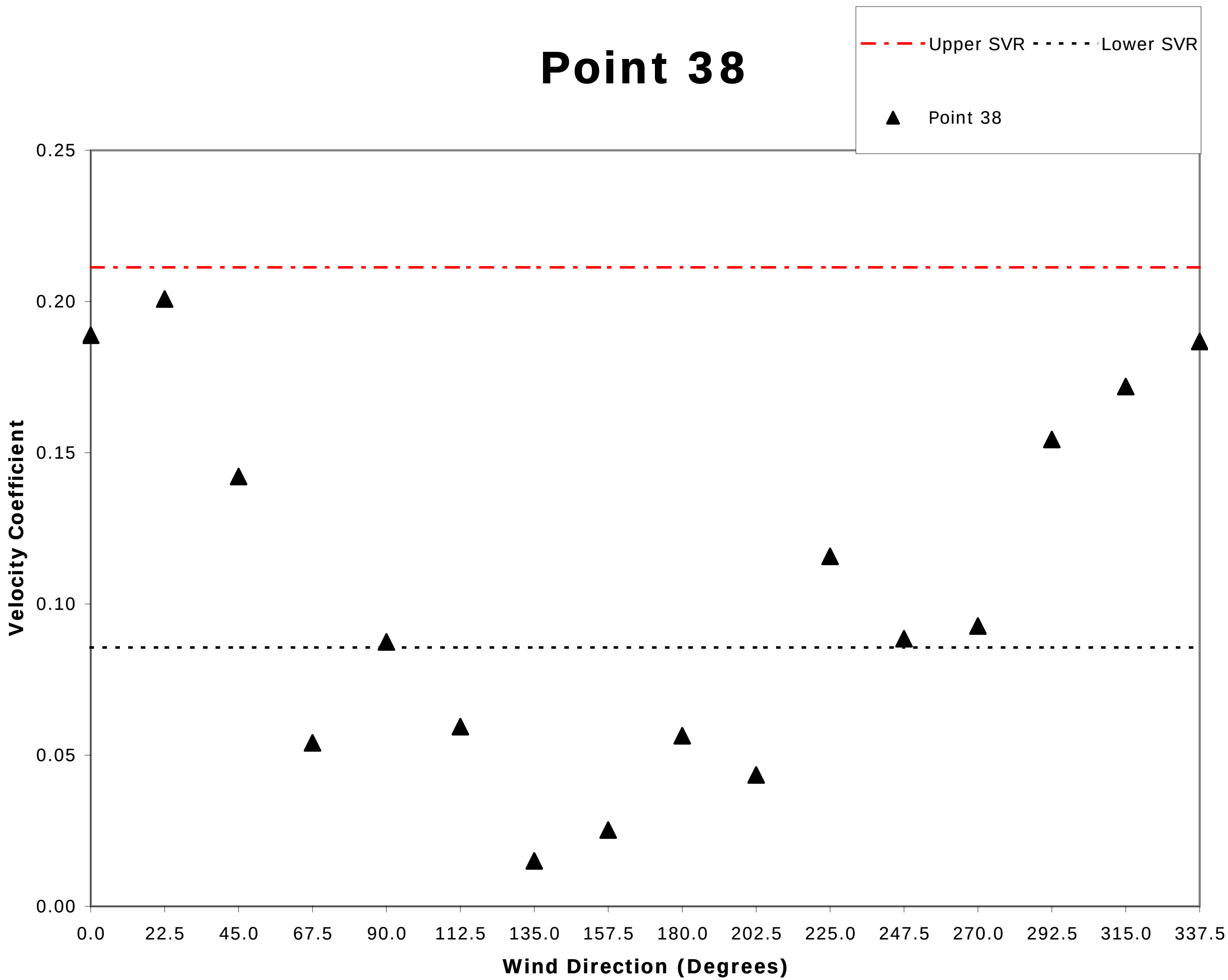
Point 33
Upper SVR
Lower SVR
Point 33
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

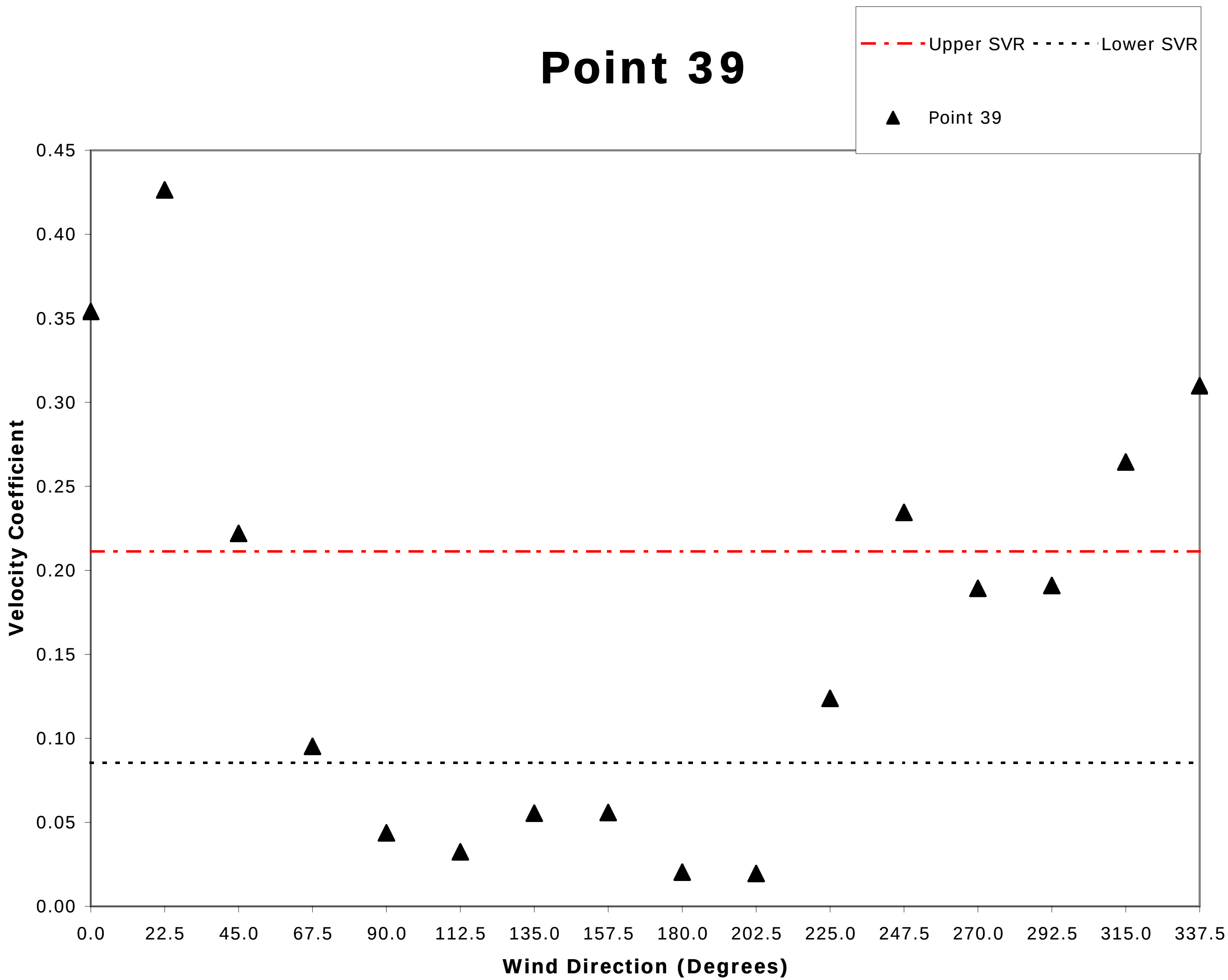

Point 34
Upper SVR
Lower SVR
Point 34
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

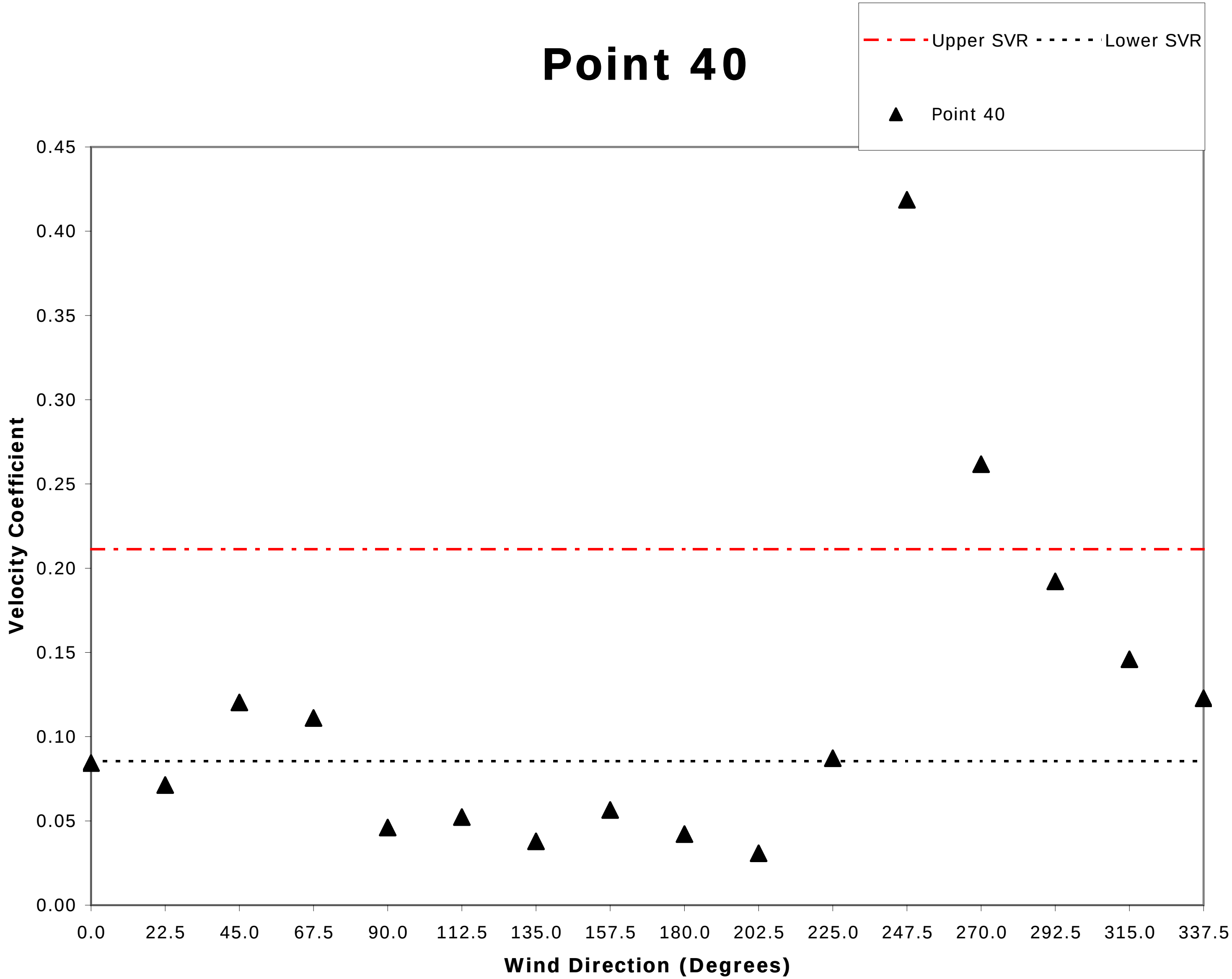

Point 35
Upper SVR
Lower SVR
Point 35
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

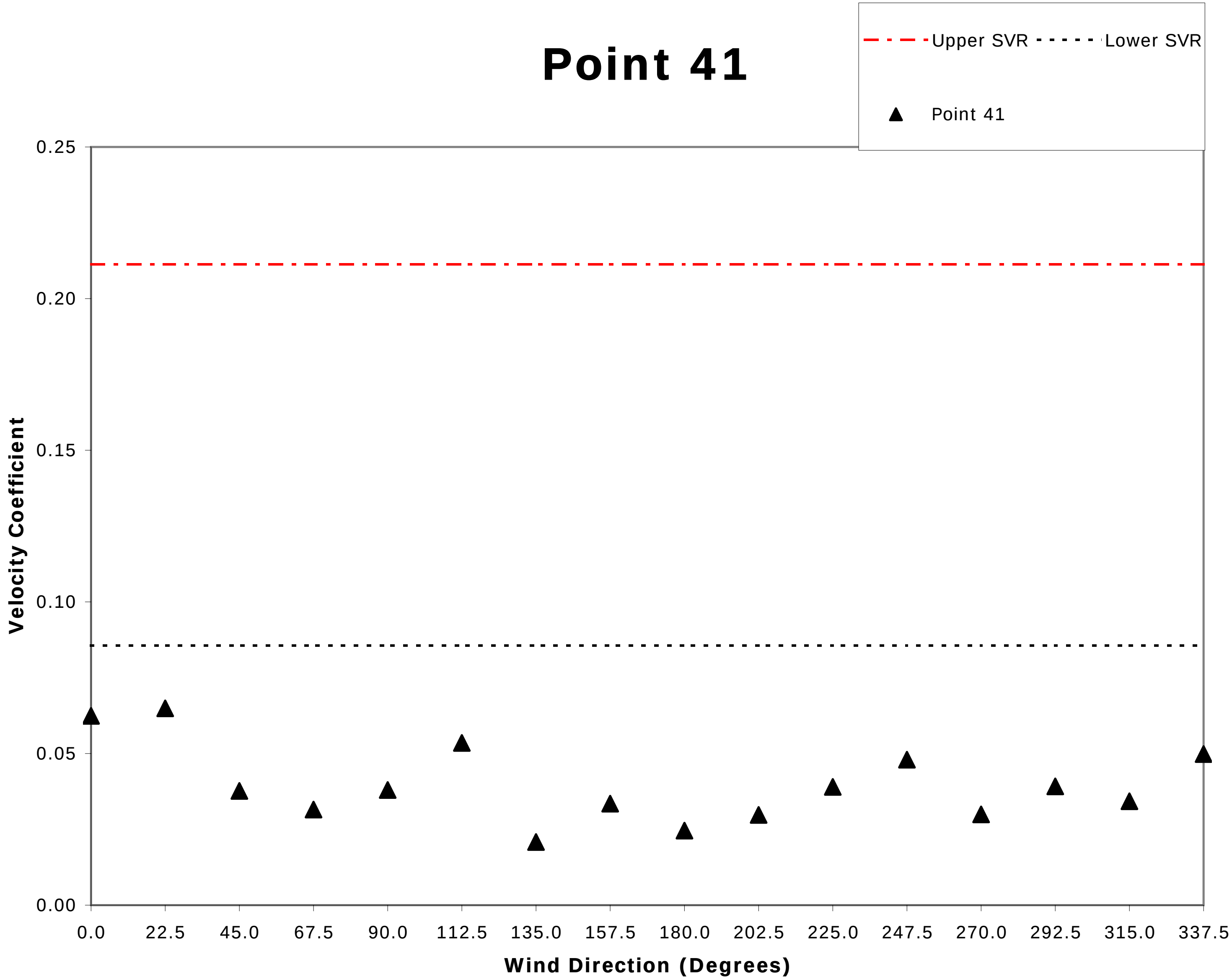

Point 36
Upper SVR
Lower SVR
Point 36
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

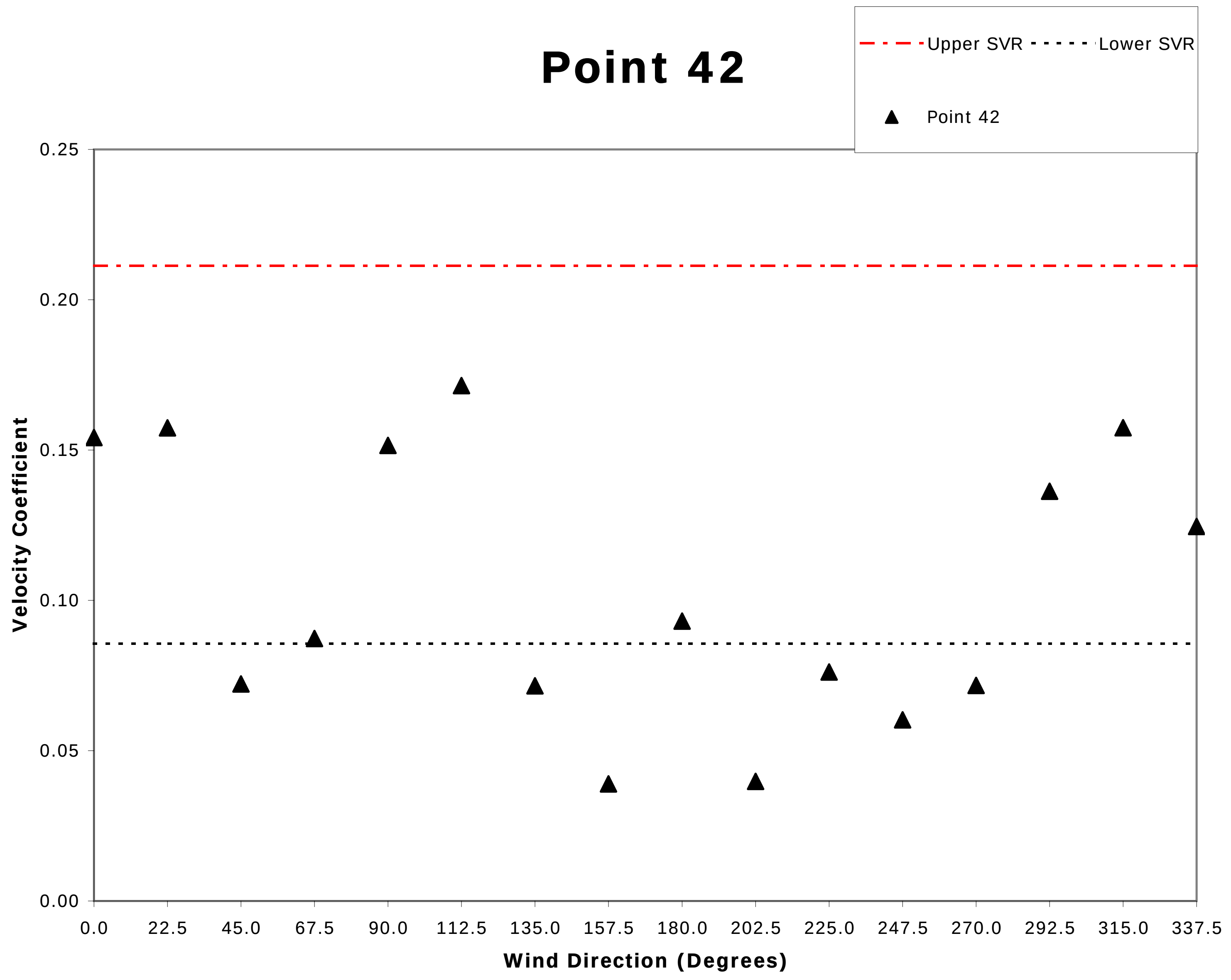

Point 37
Upper SVR
Lower SVR
Point 37
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

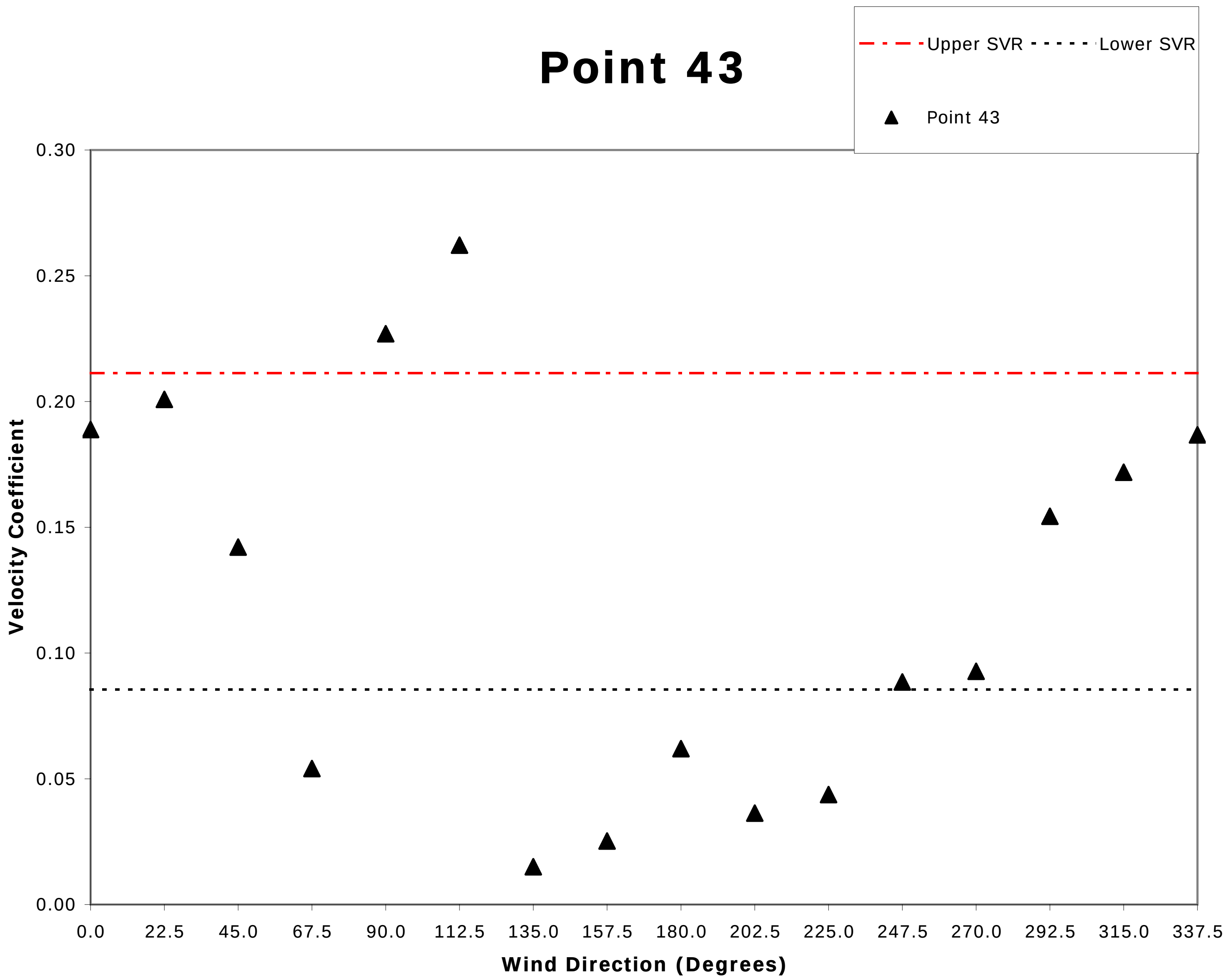

Point 38
Upper SVR
Lower SVR
Point 38
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

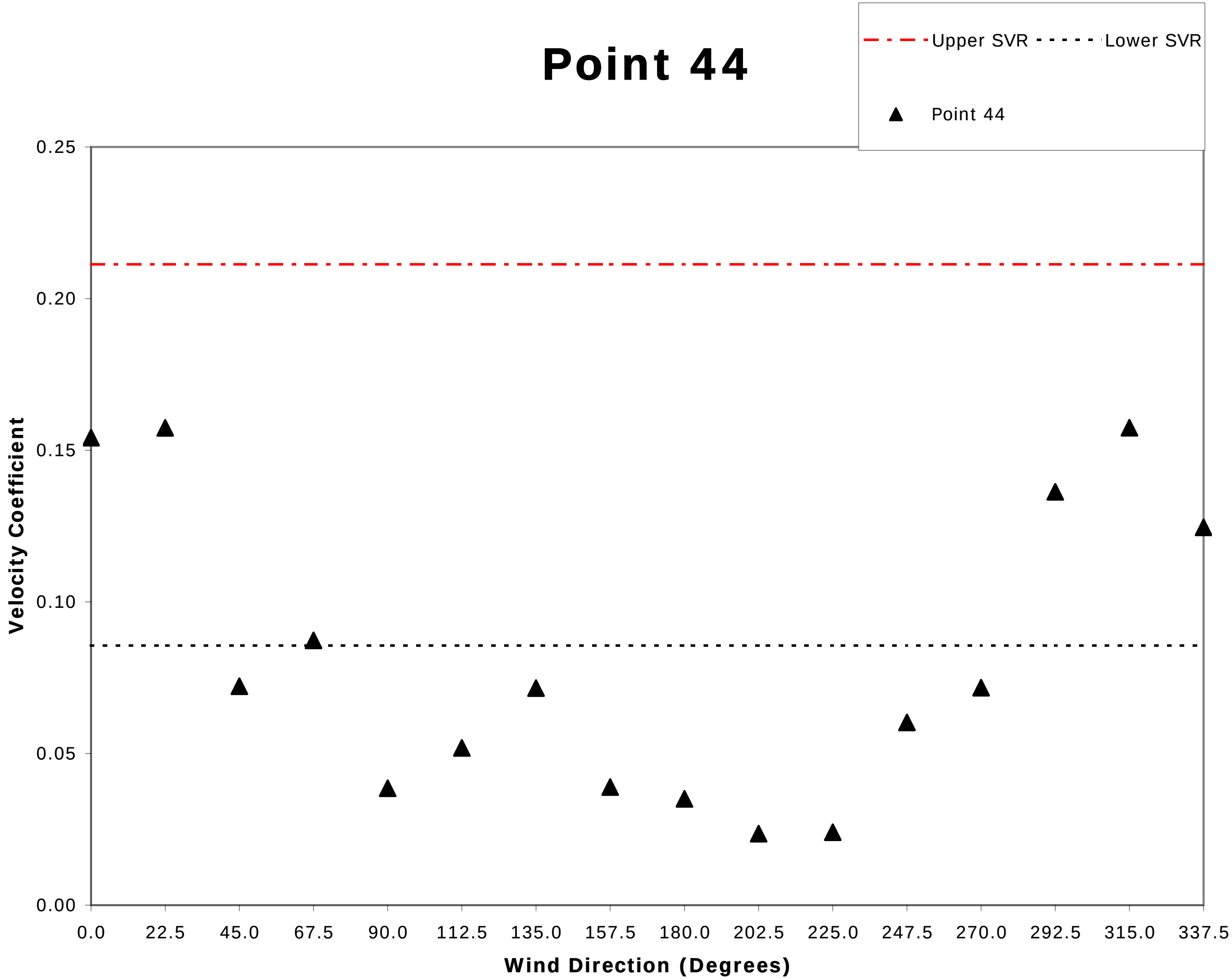

Point 39
Upper SVR
Lower SVR
Point 39
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 40
Upper SVR
Lower SVR
Point 40
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

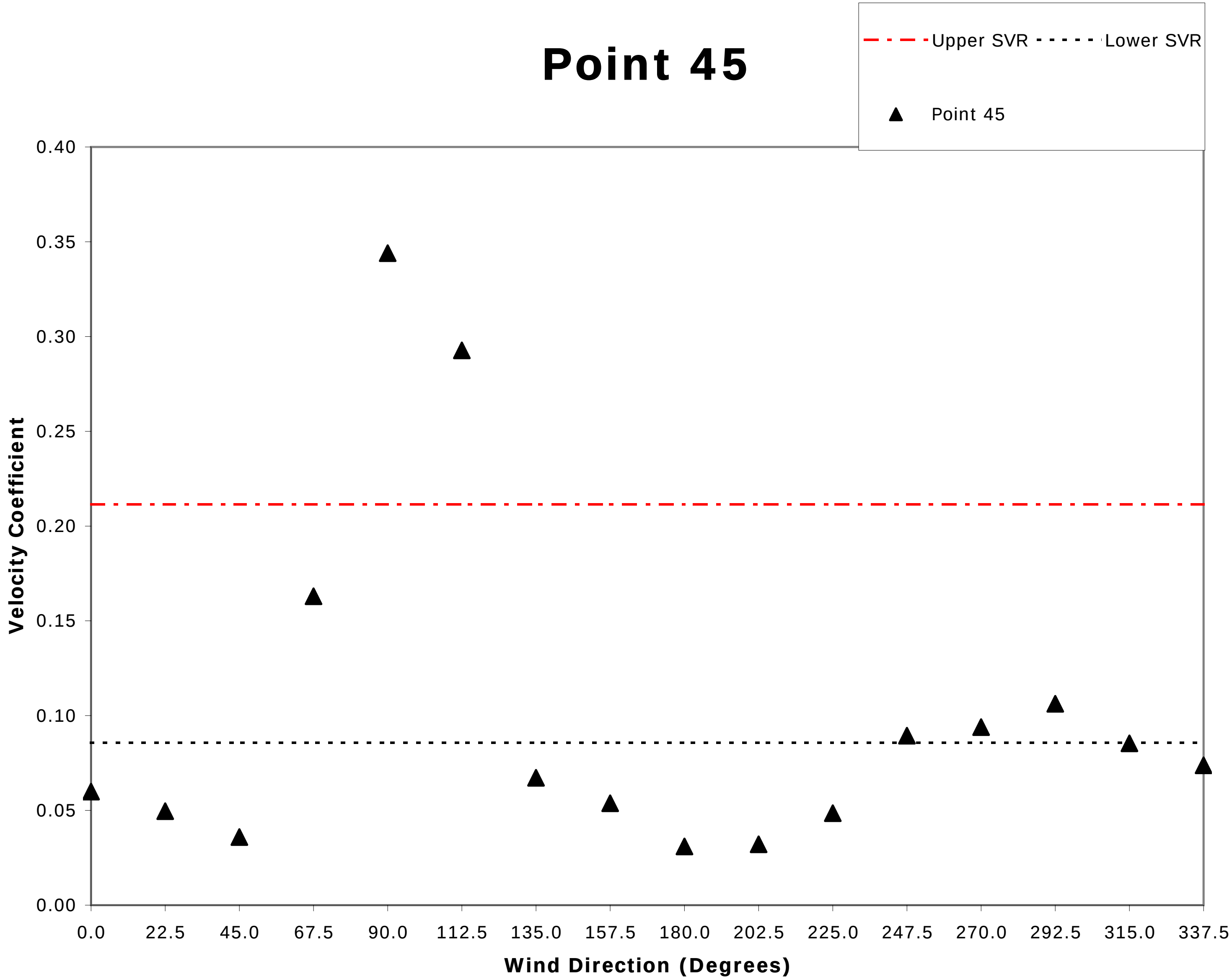

Point 41
Upper SVR
Lower SVR
Point 41
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

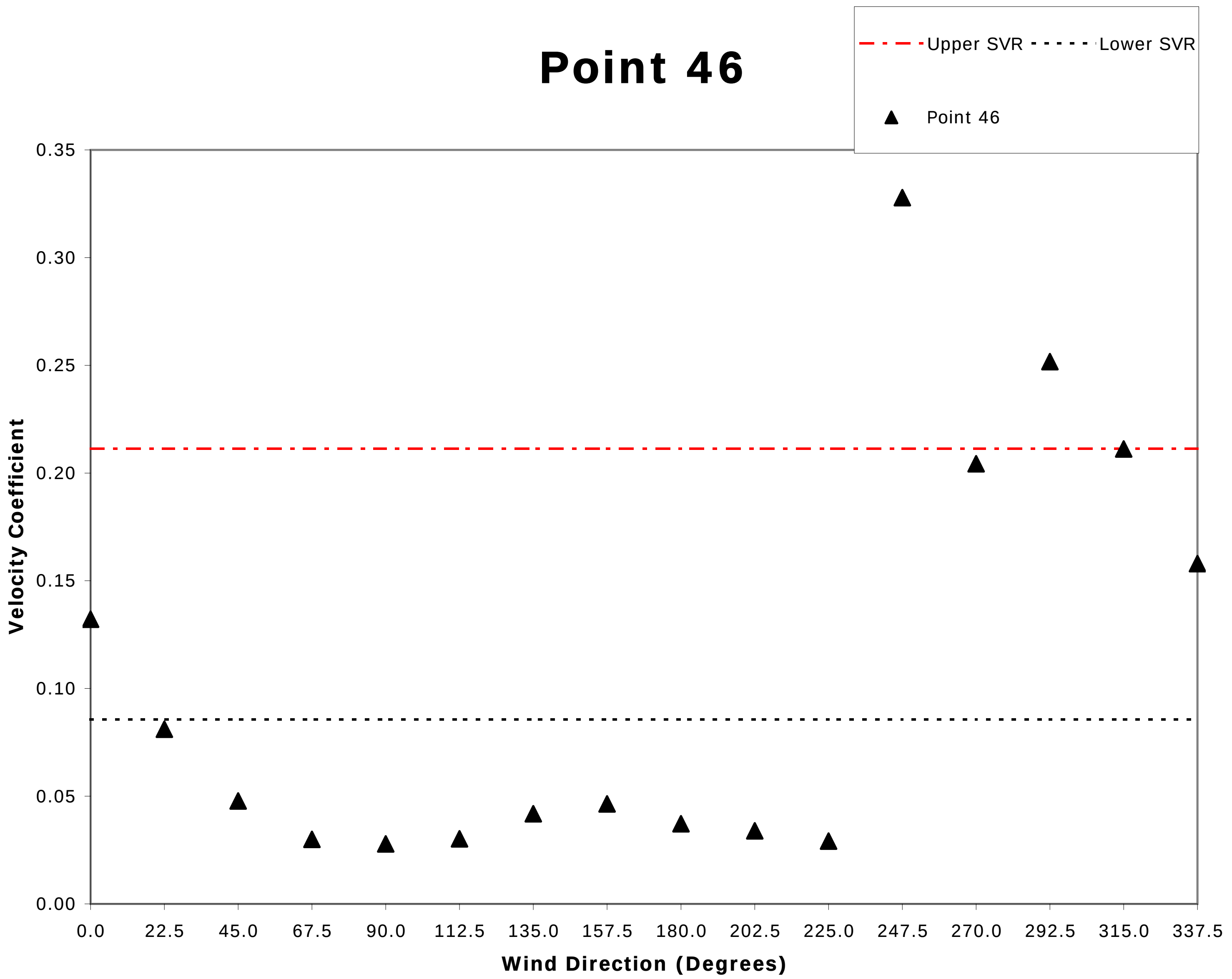

Point 42
Upper SVR
Lower SVR
Point 42
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

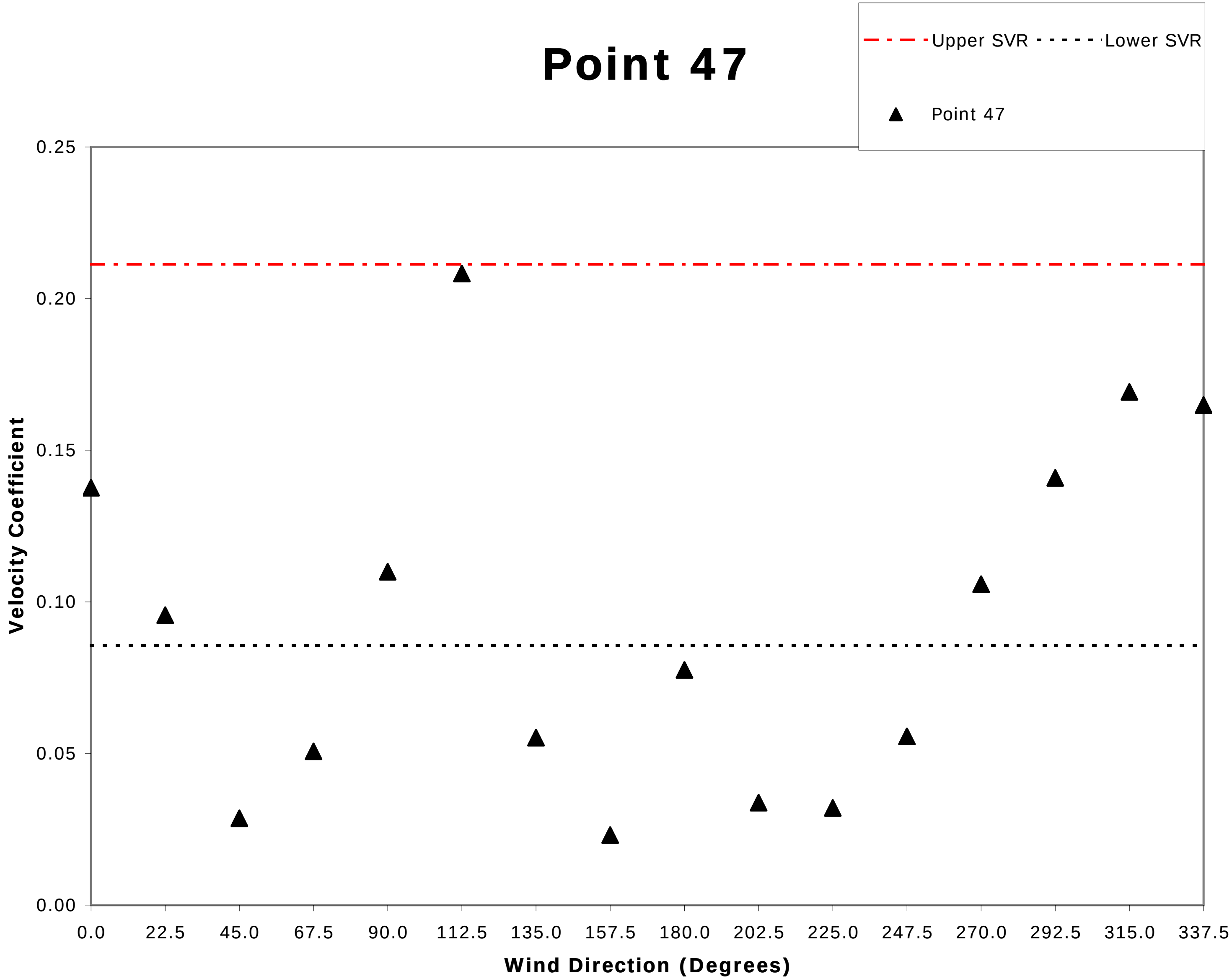

Point 43
Upper SVR
Lower SVR
Point 43
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



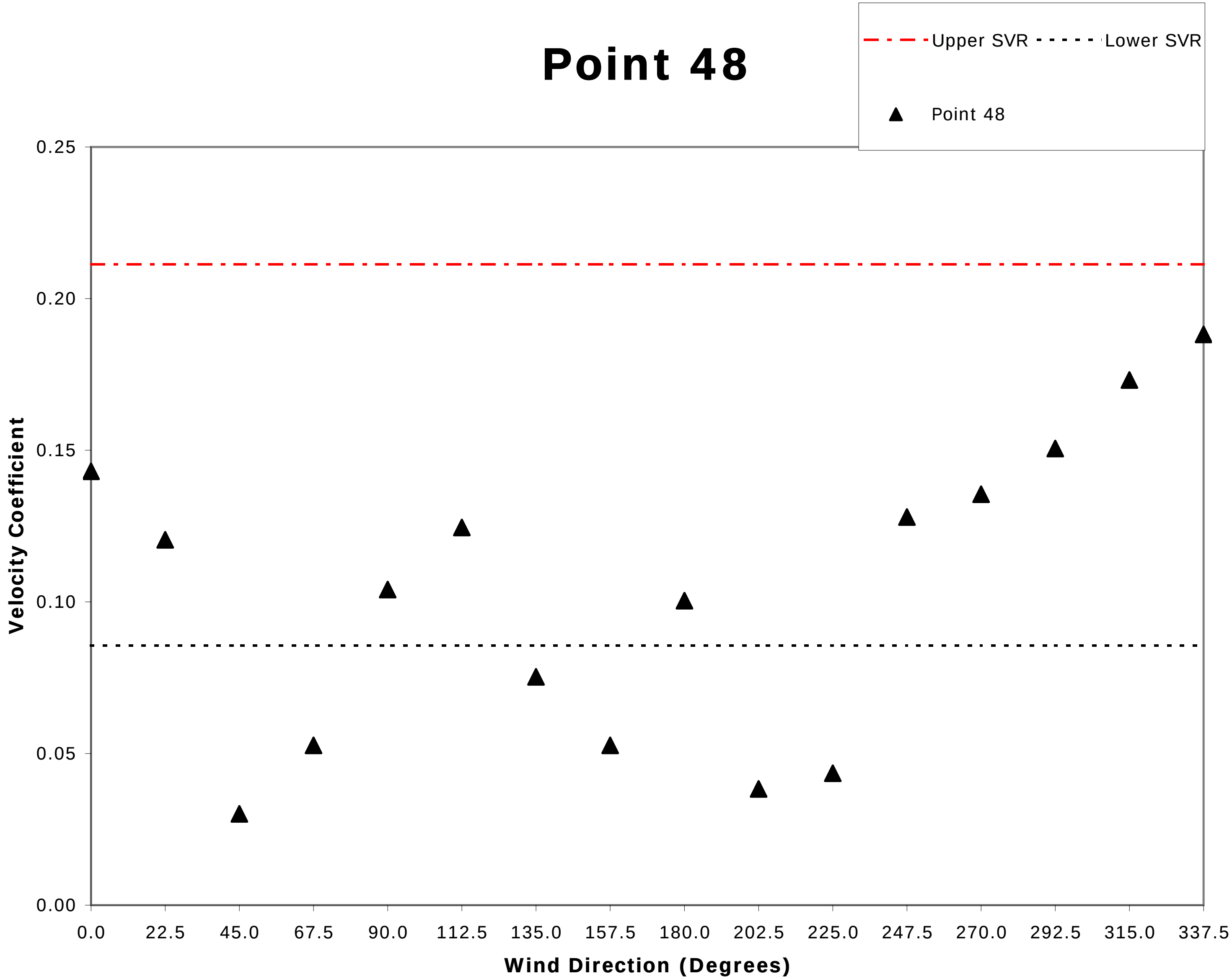
Point 44
Upper SVR
Lower SVR
Point 44
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

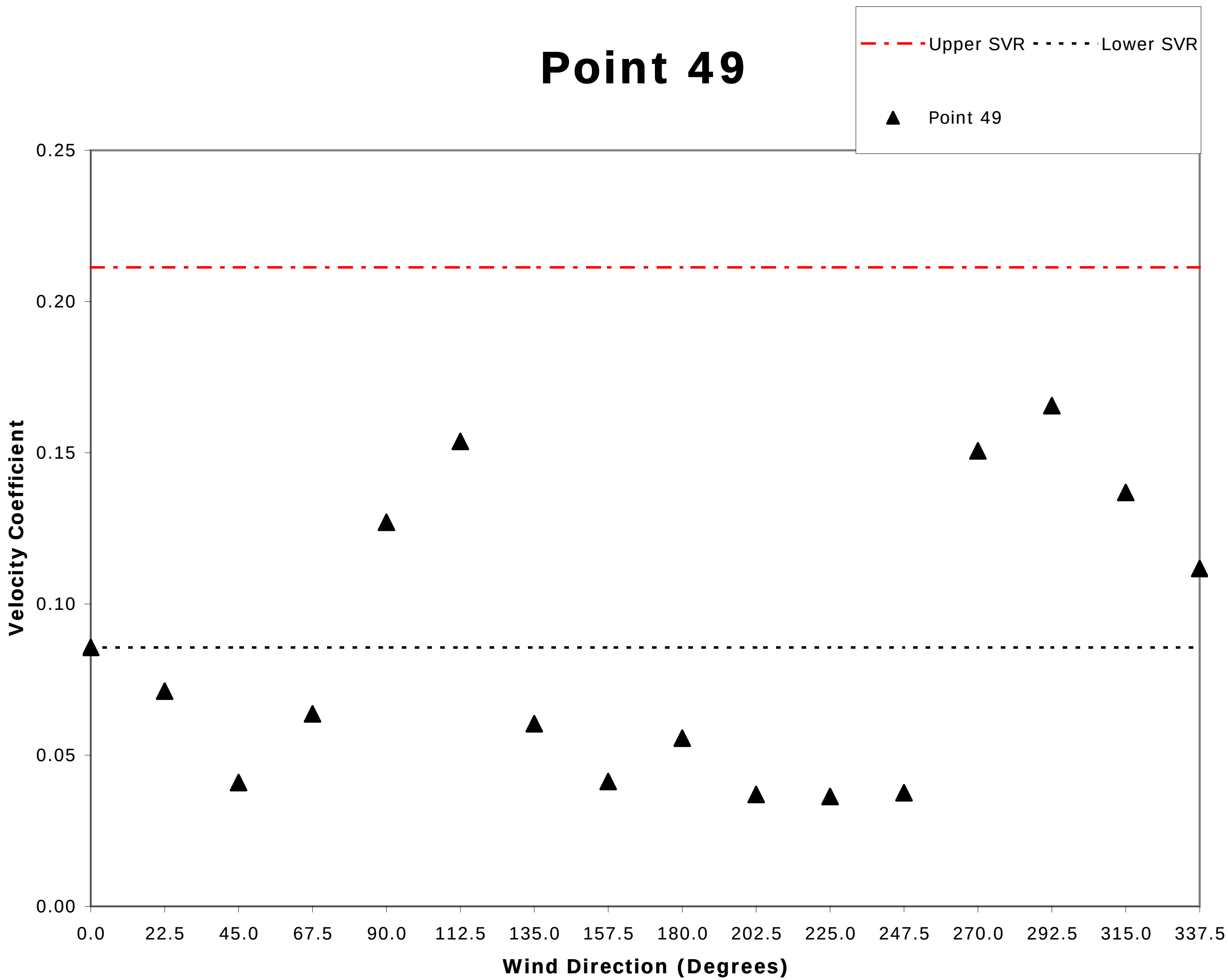

Point 45
Upper SVR
Lower SVR
Point 45
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

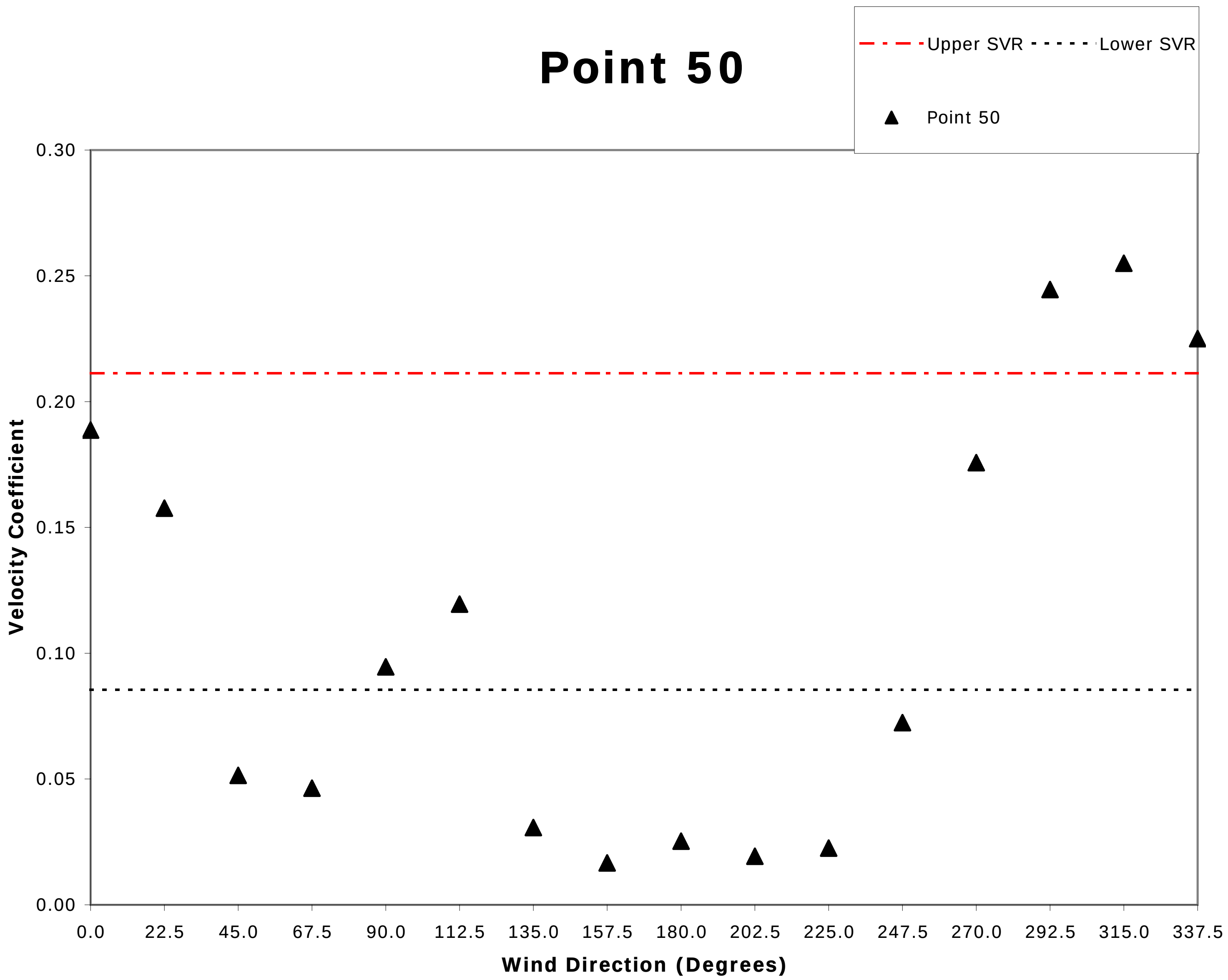

Point 46
Upper SVR
Lower SVR
Point 46
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



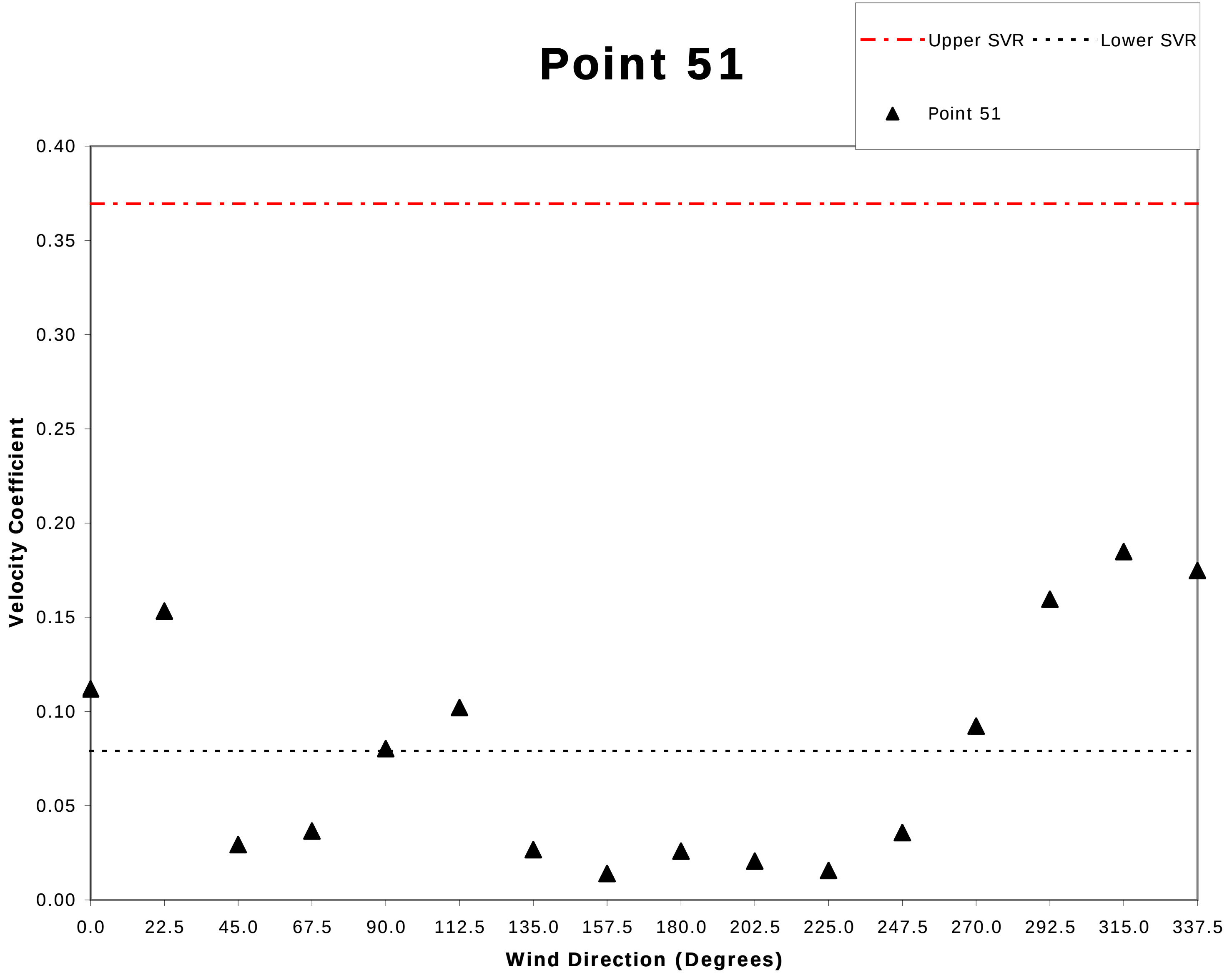
Point 47
Upper SVR
Lower SVR
Point 47
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 48
Upper SVR
Lower SVR
Point 48
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

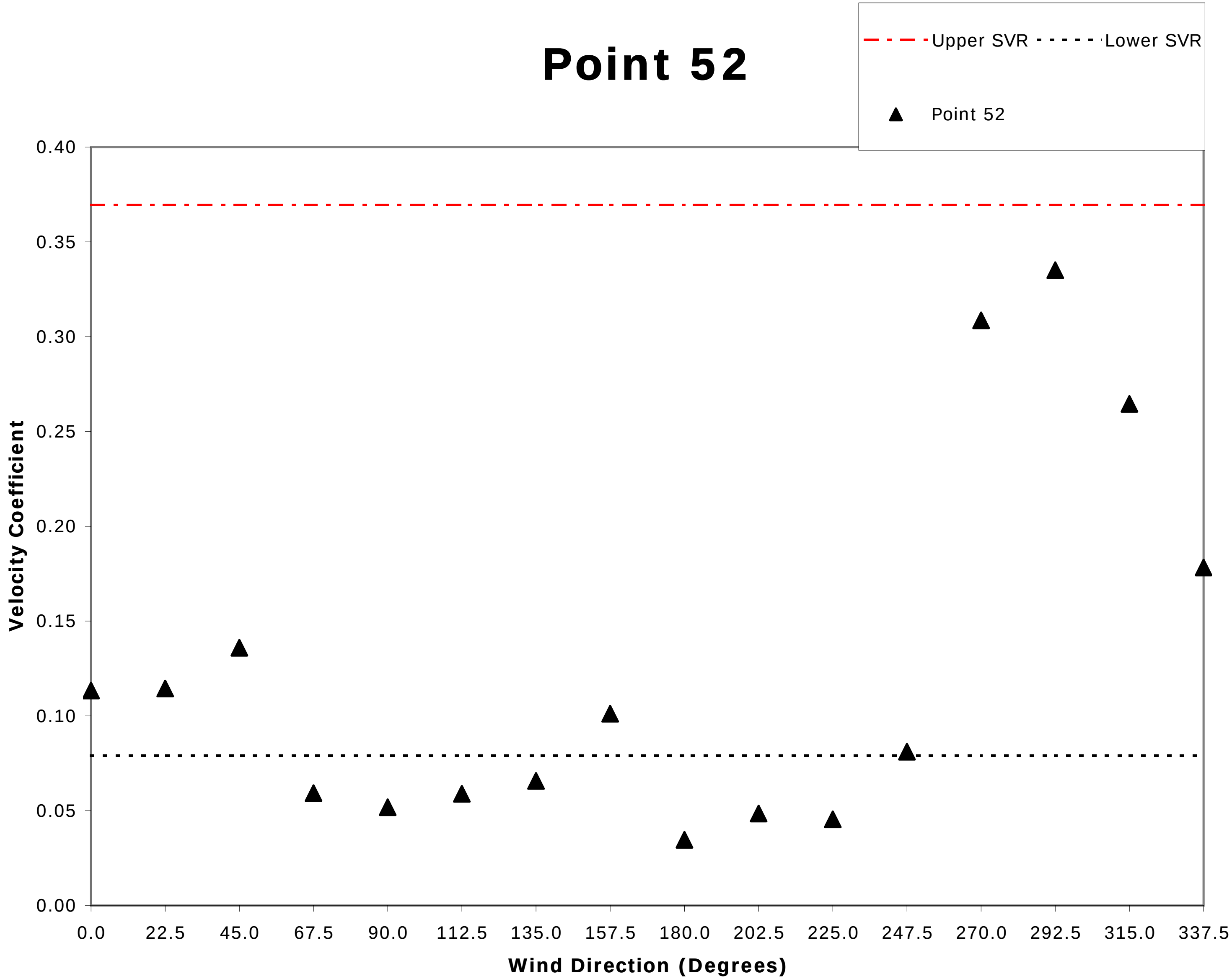

Point 49
Upper SVR
Lower SVR
Point 49
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



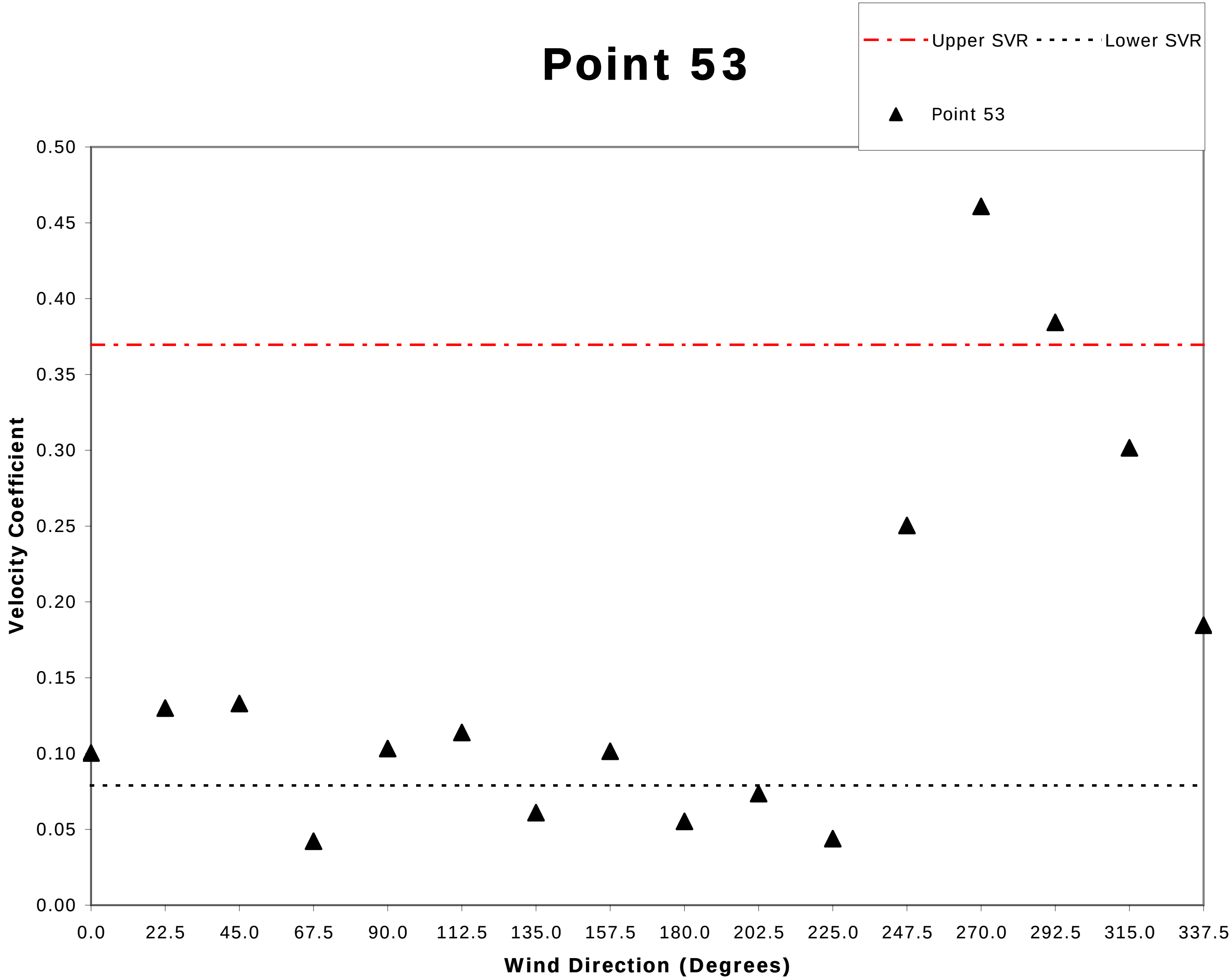
Point 50
Upper SVR
Lower SVR
Point 50
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



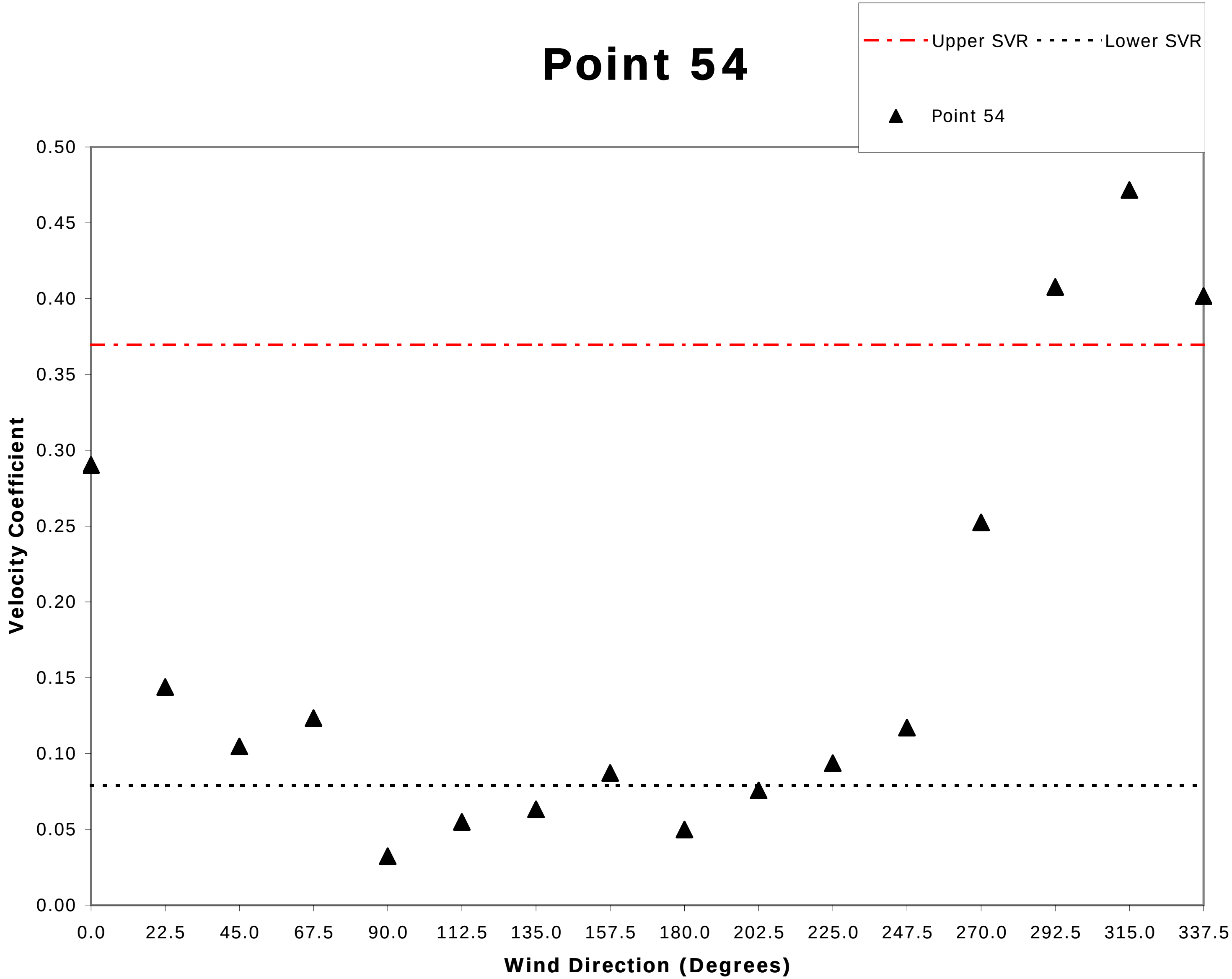
Point 51
Upper SVR
Lower SVR
Point 51
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

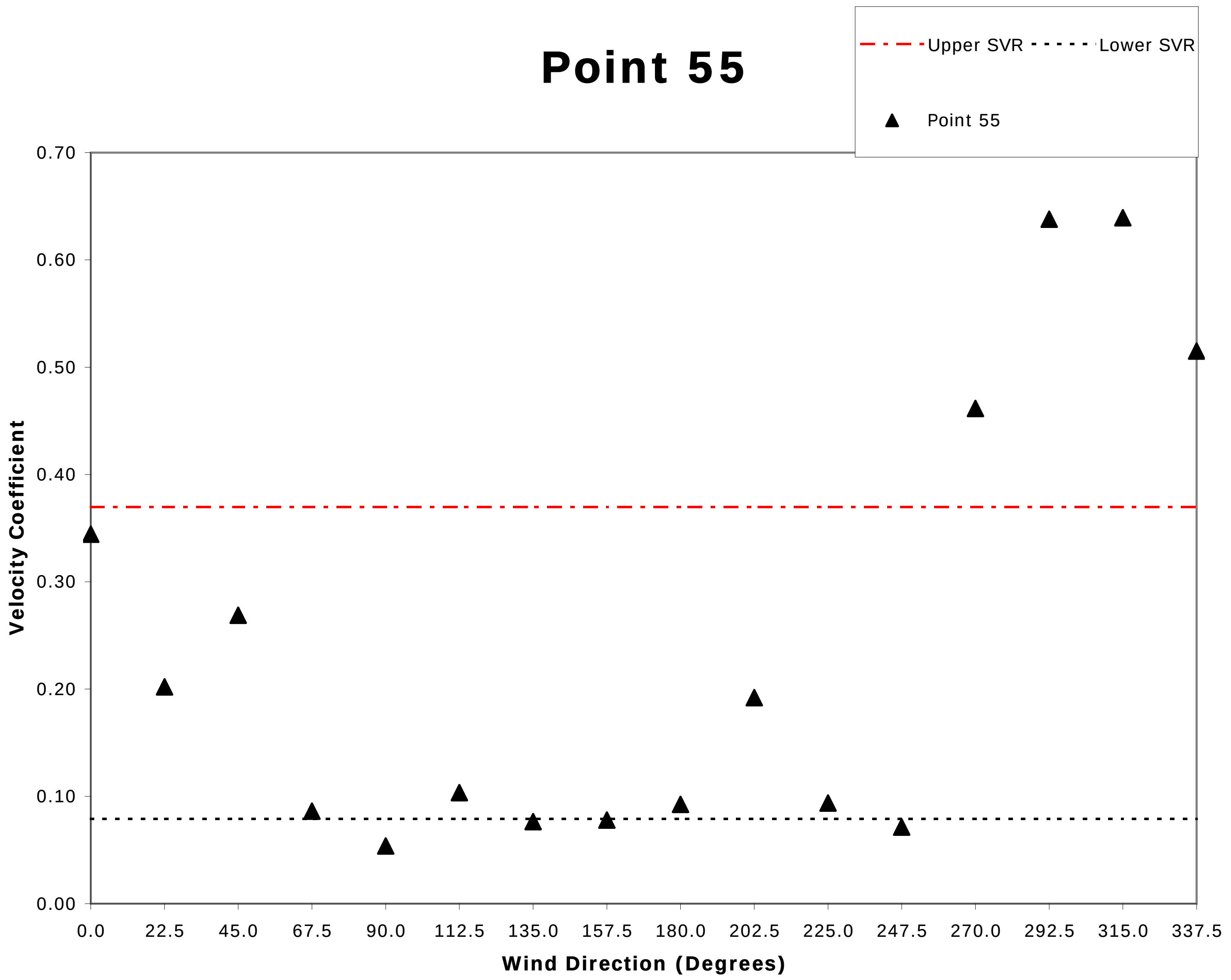


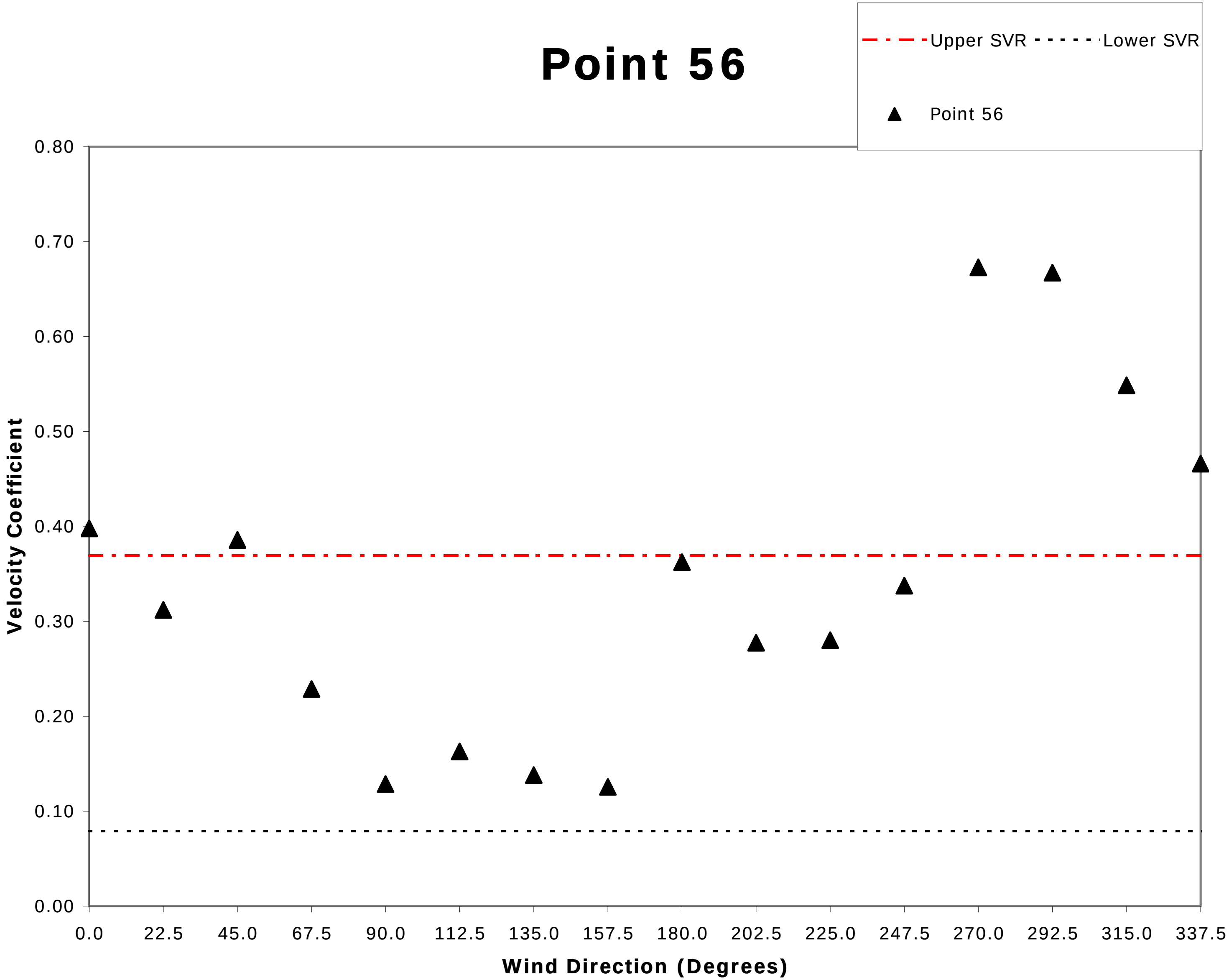
Point 52
Upper SVR
Lower SVR
Point 52
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

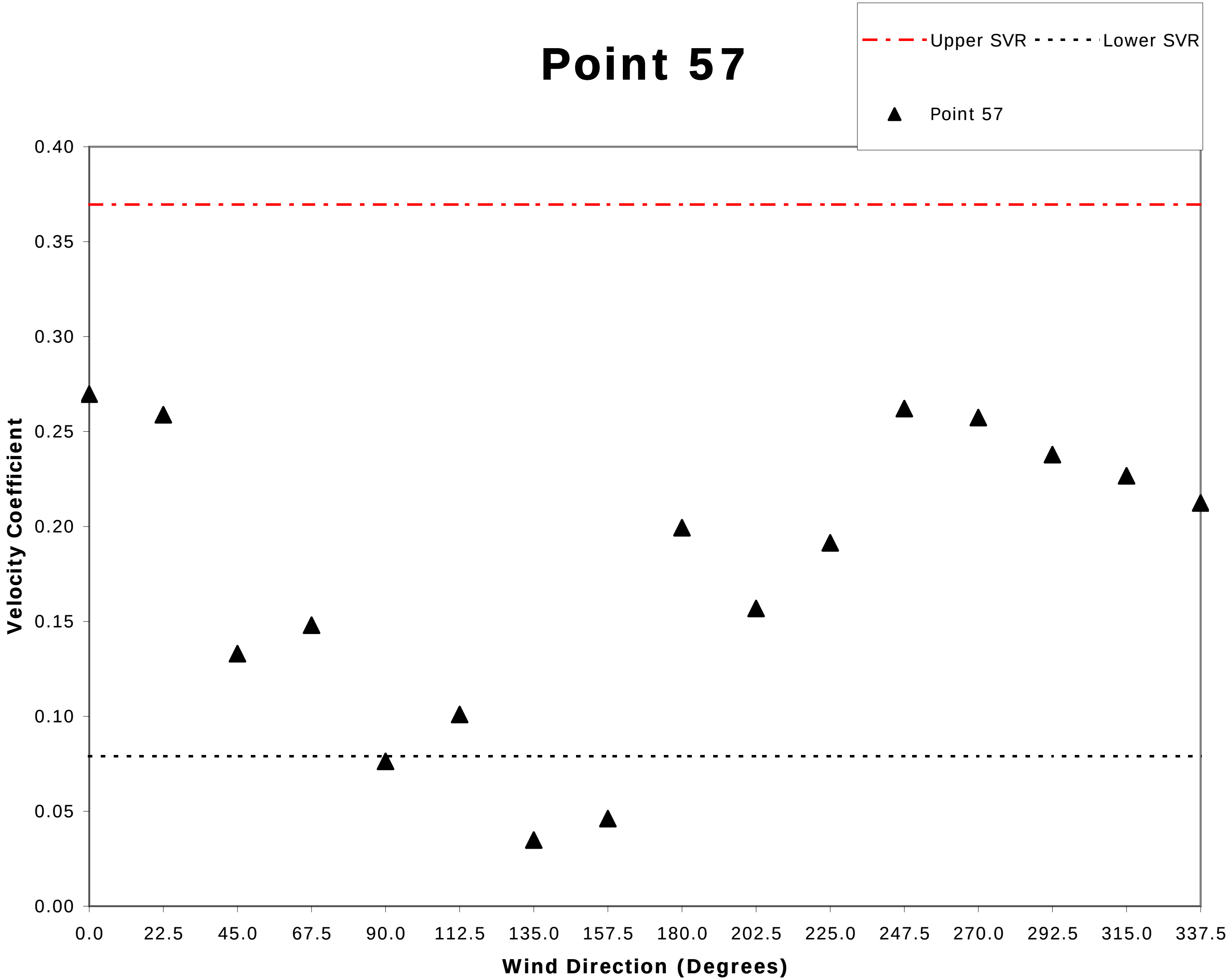


Point 53
Upper SVR
Lower SVR
Point 53
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

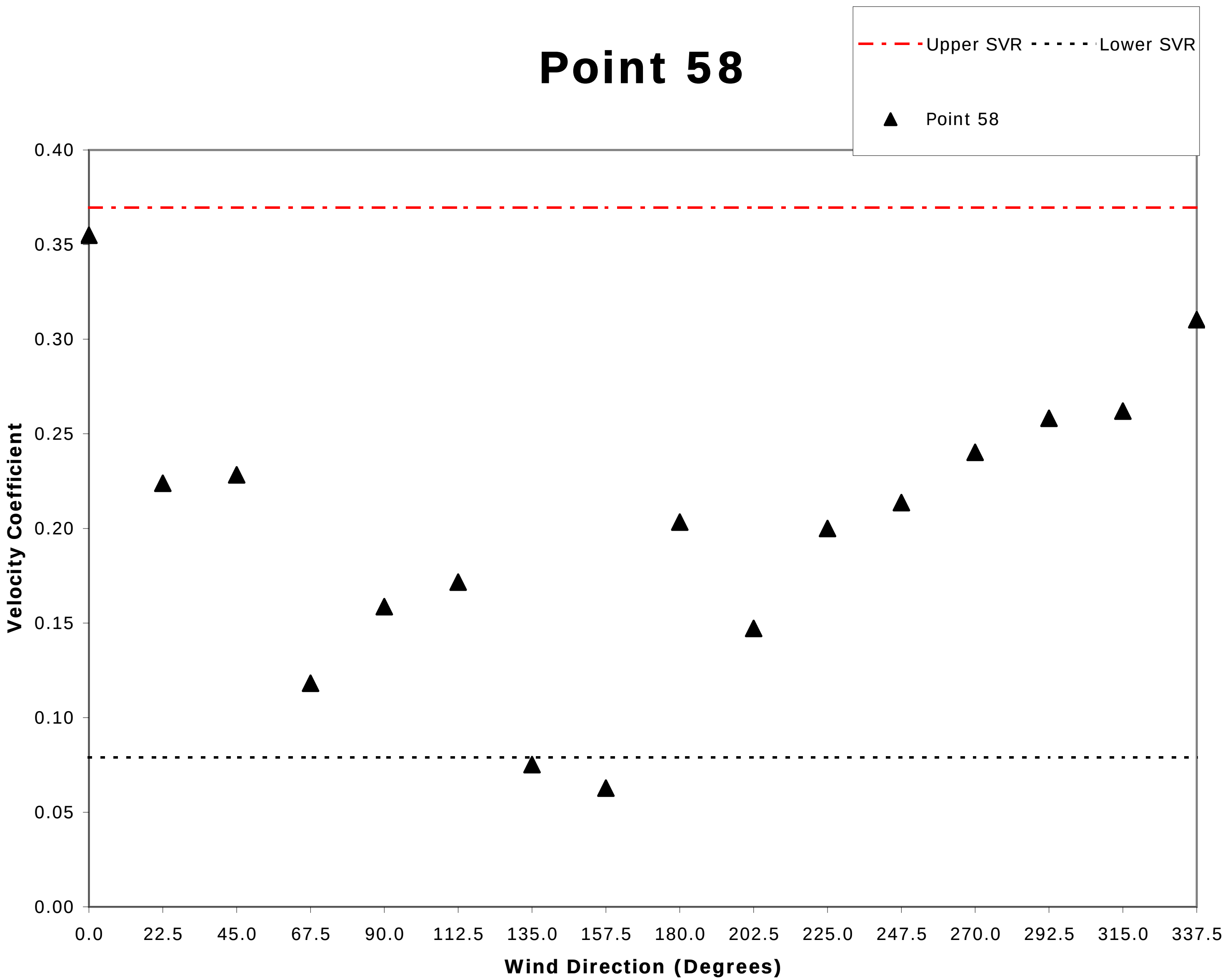

Point 54
Upper SVR
Lower SVR
Point 54
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

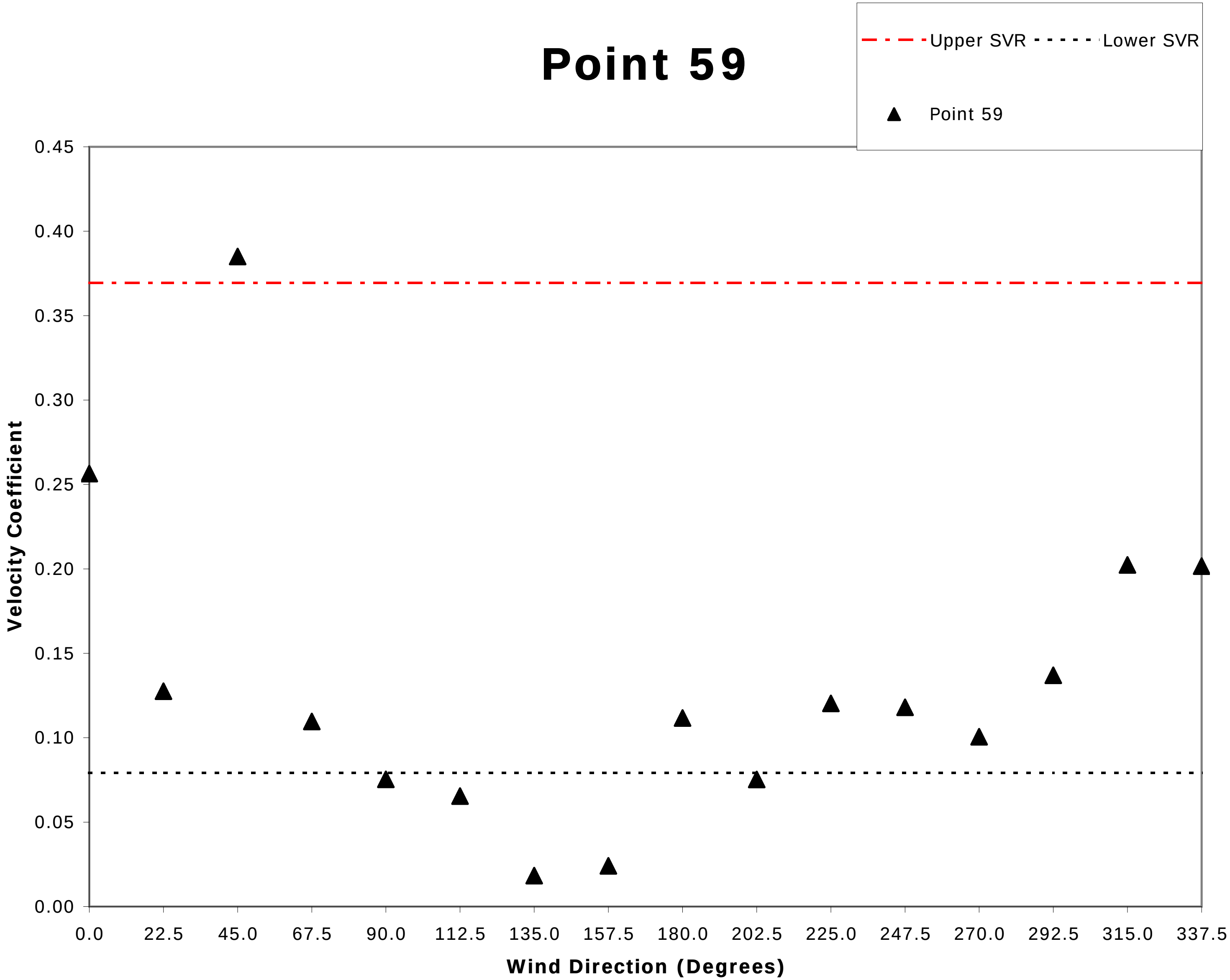

Point 55
Upper SVR
Lower SVR
Point 55
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 56
Upper SVR
Lower SVR
Point 56
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

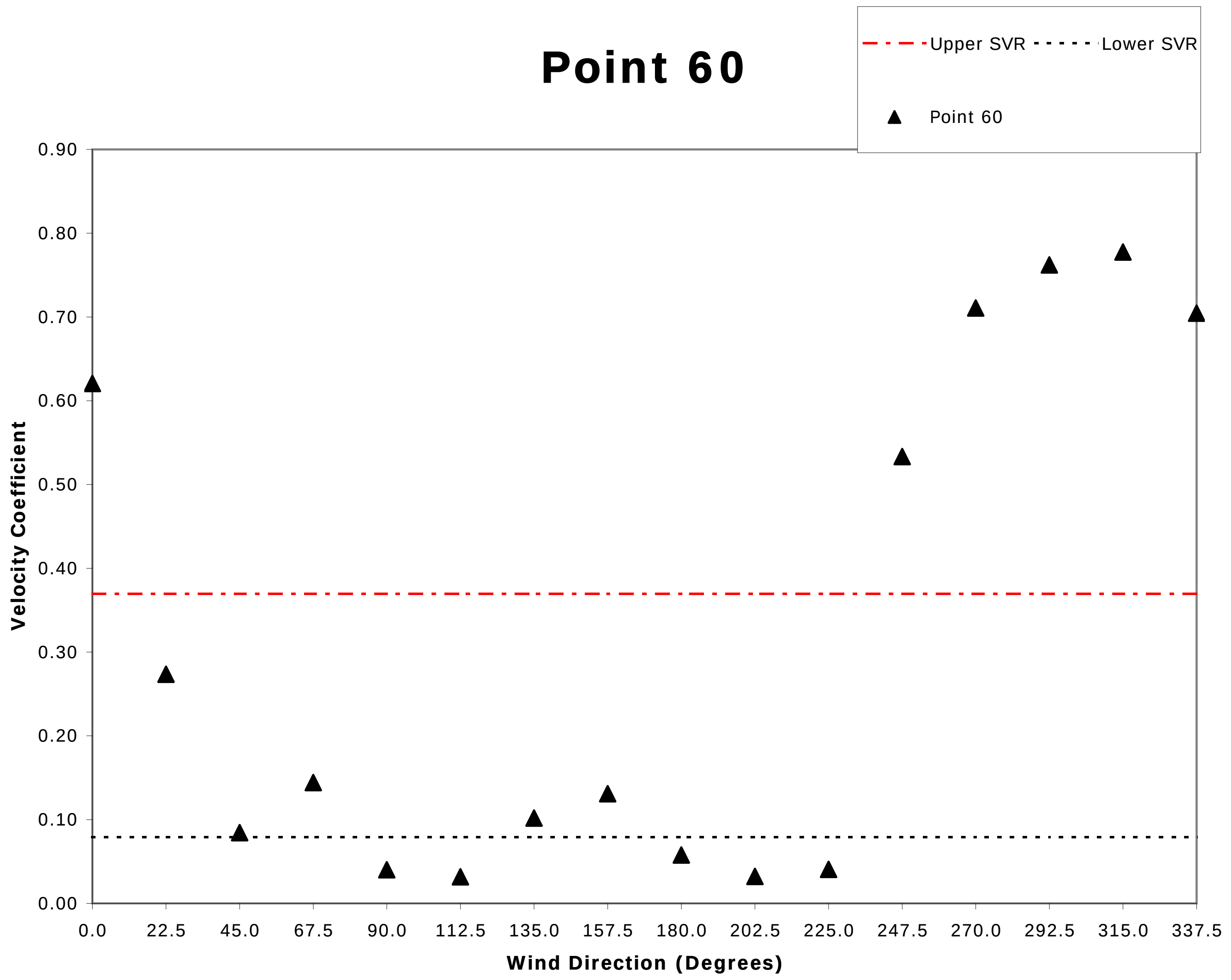


Point 57
Upper SVR
Lower SVR
Point 57
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

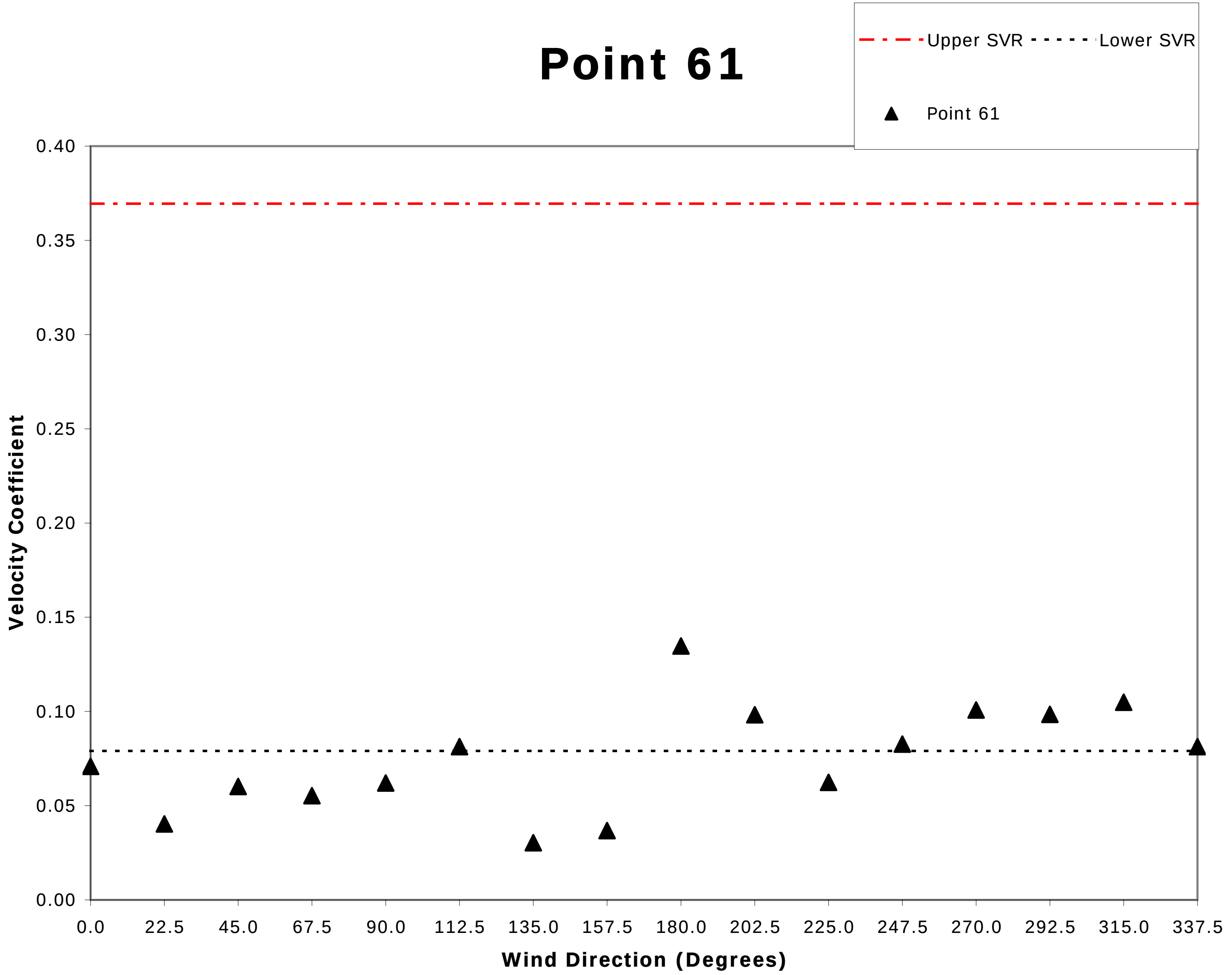

Point 58
Upper SVR
Lower SVR
Point 58
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

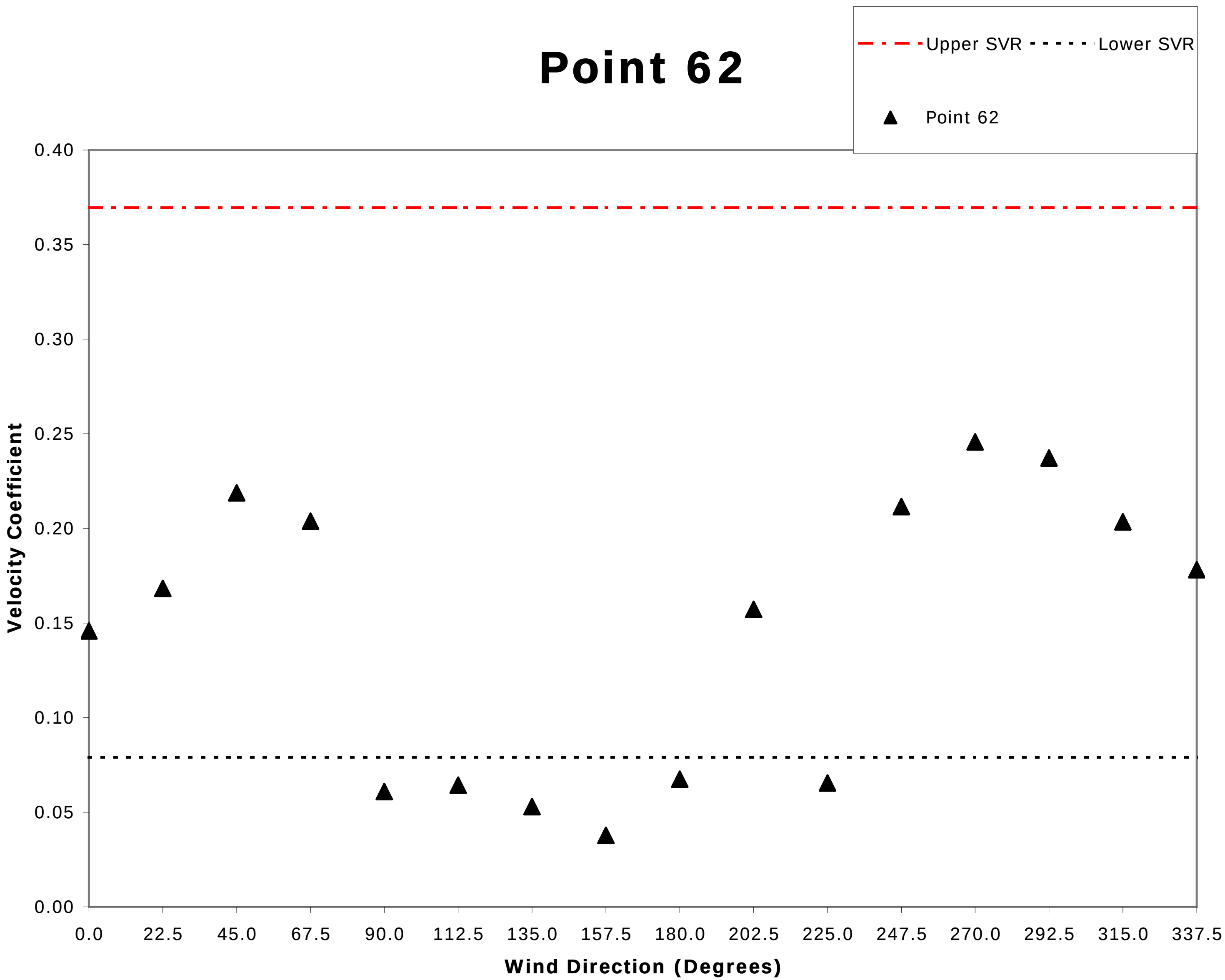


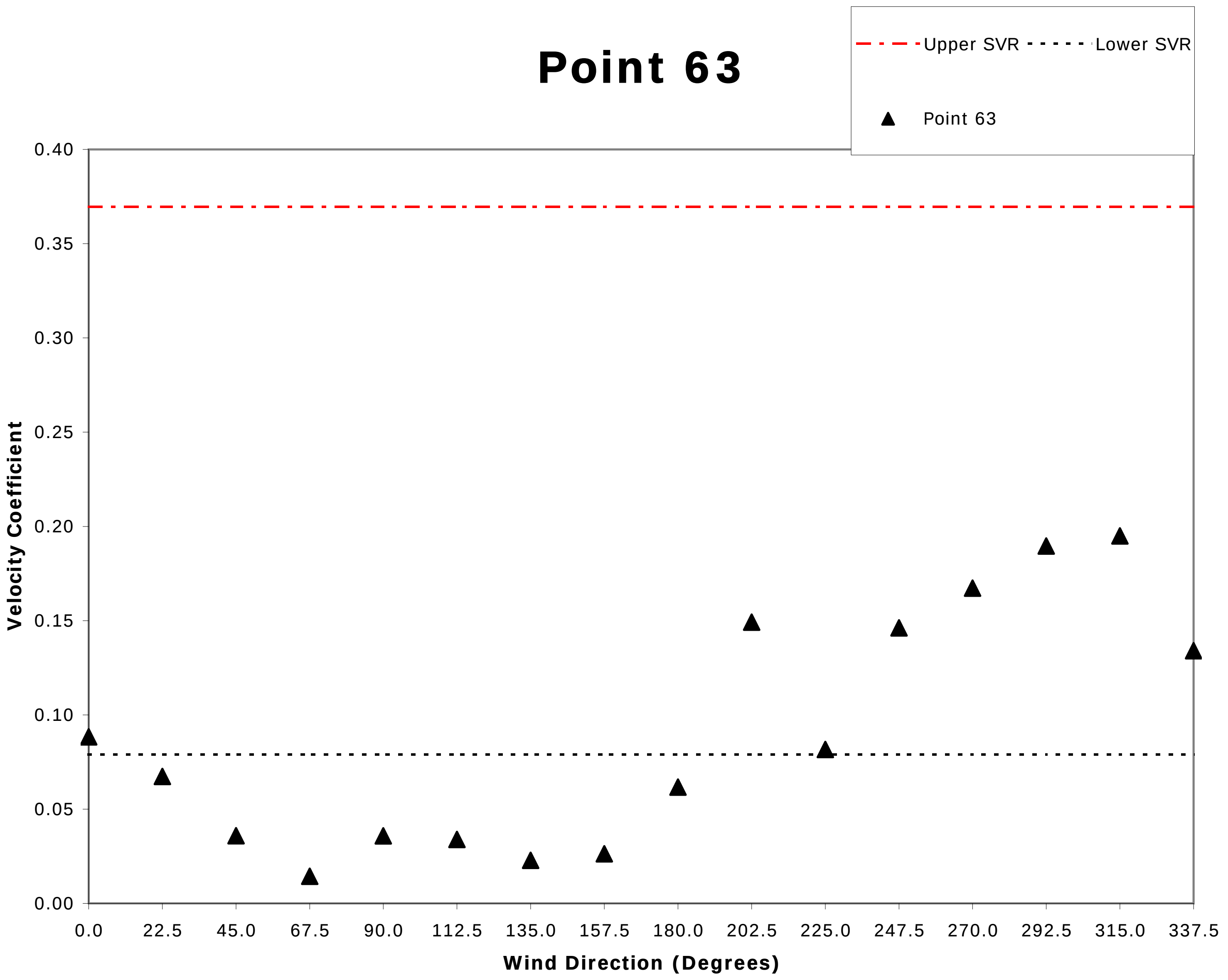
Point 59
Upper SVR
Lower SVR
Point 59
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



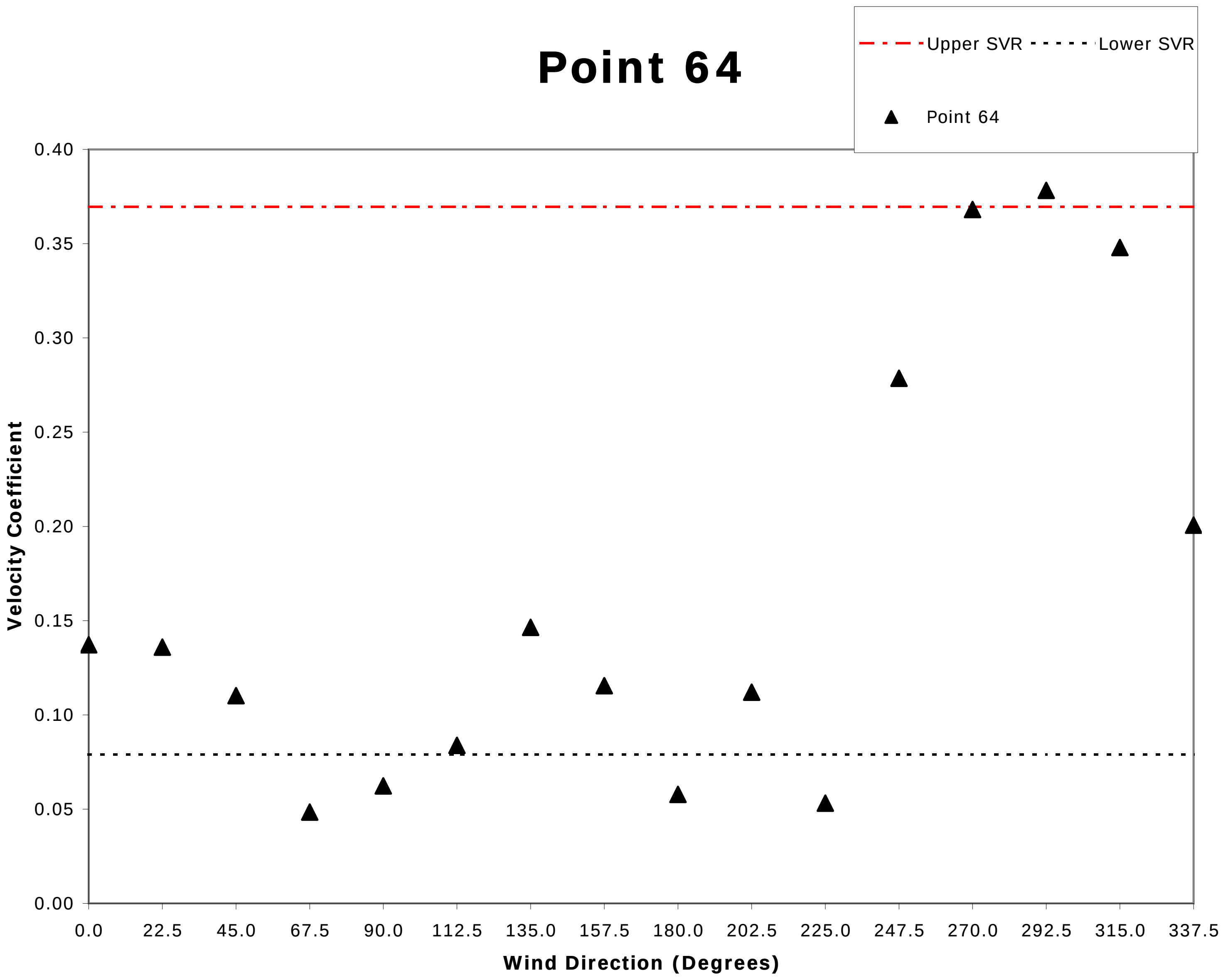
Point 60
Upper SVR
Lower SVR
Point 60
Velocity Coefficient
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

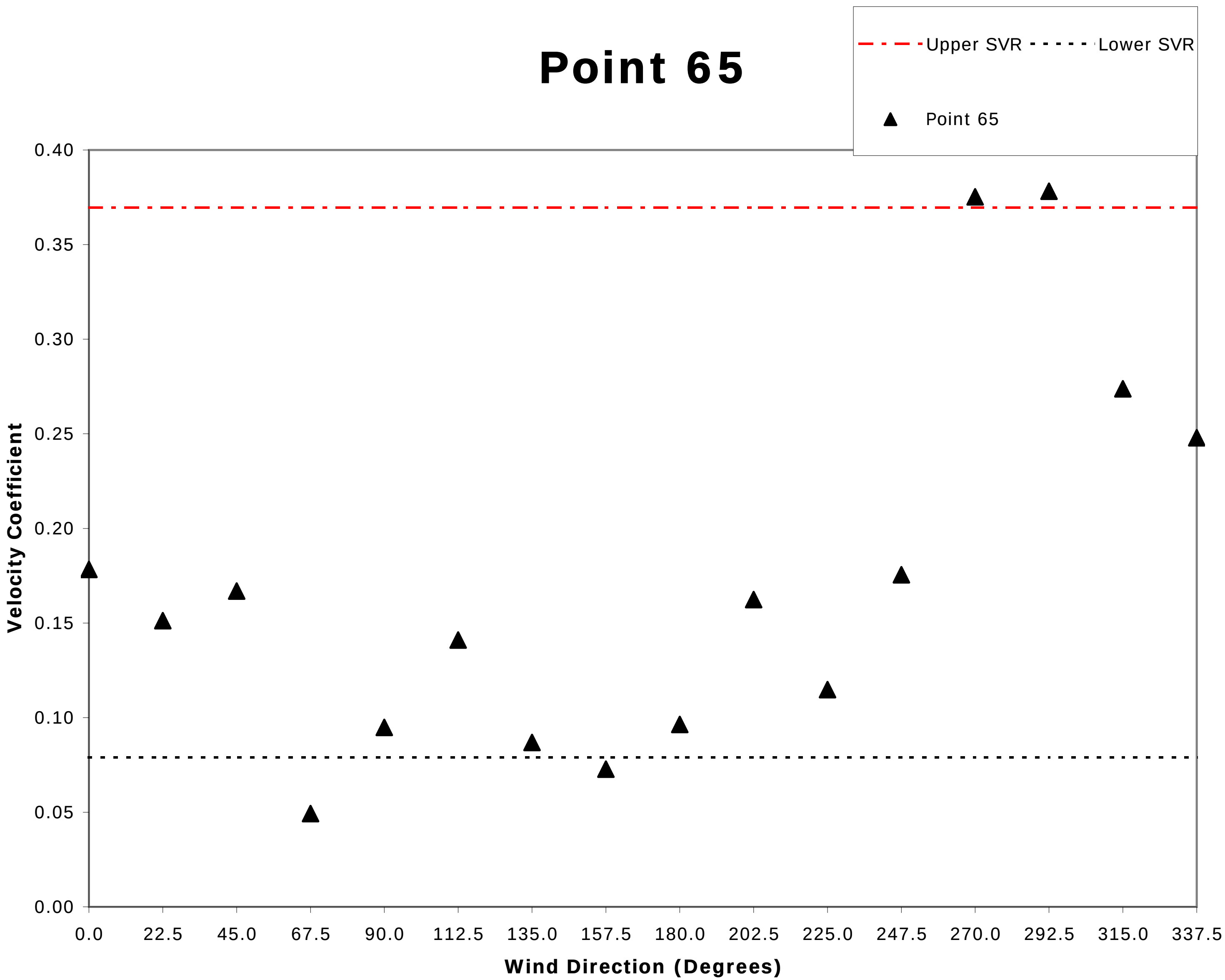

Point 61
Upper SVR
Lower SVR
Point 61
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 62
Upper SVR
Lower SVR
Point 62
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

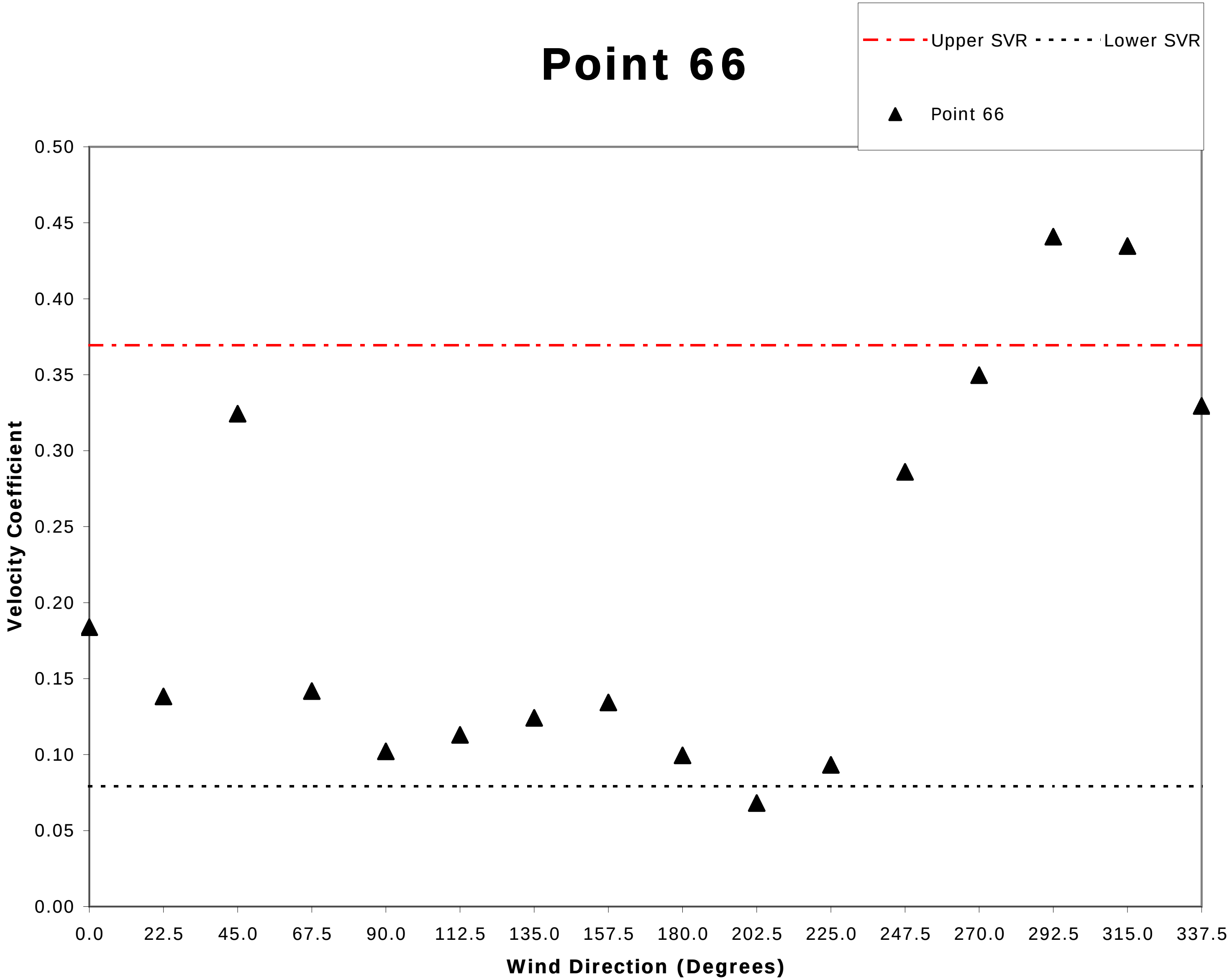


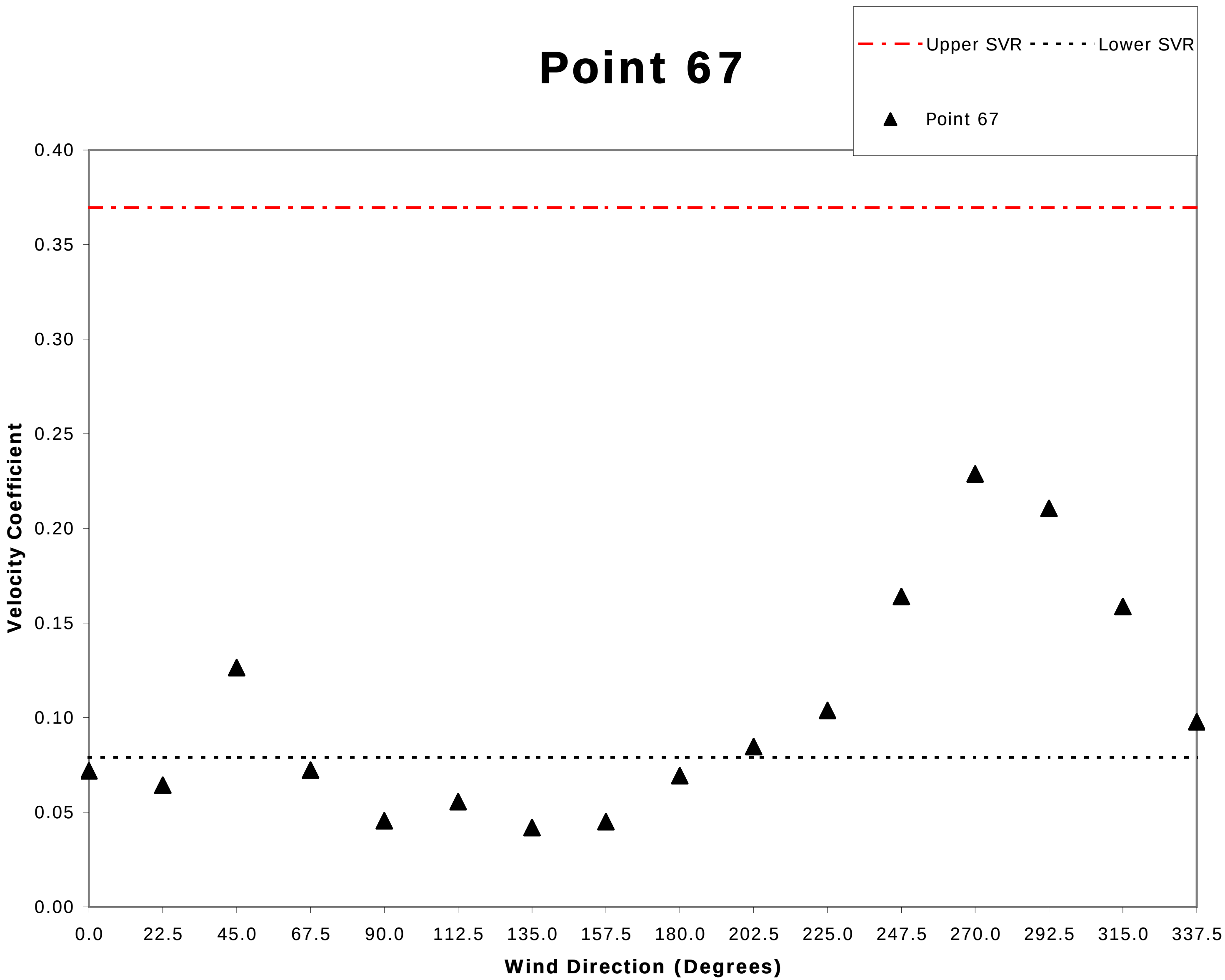
Point 63
Upper SVR
Lower SVR
Point 63
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

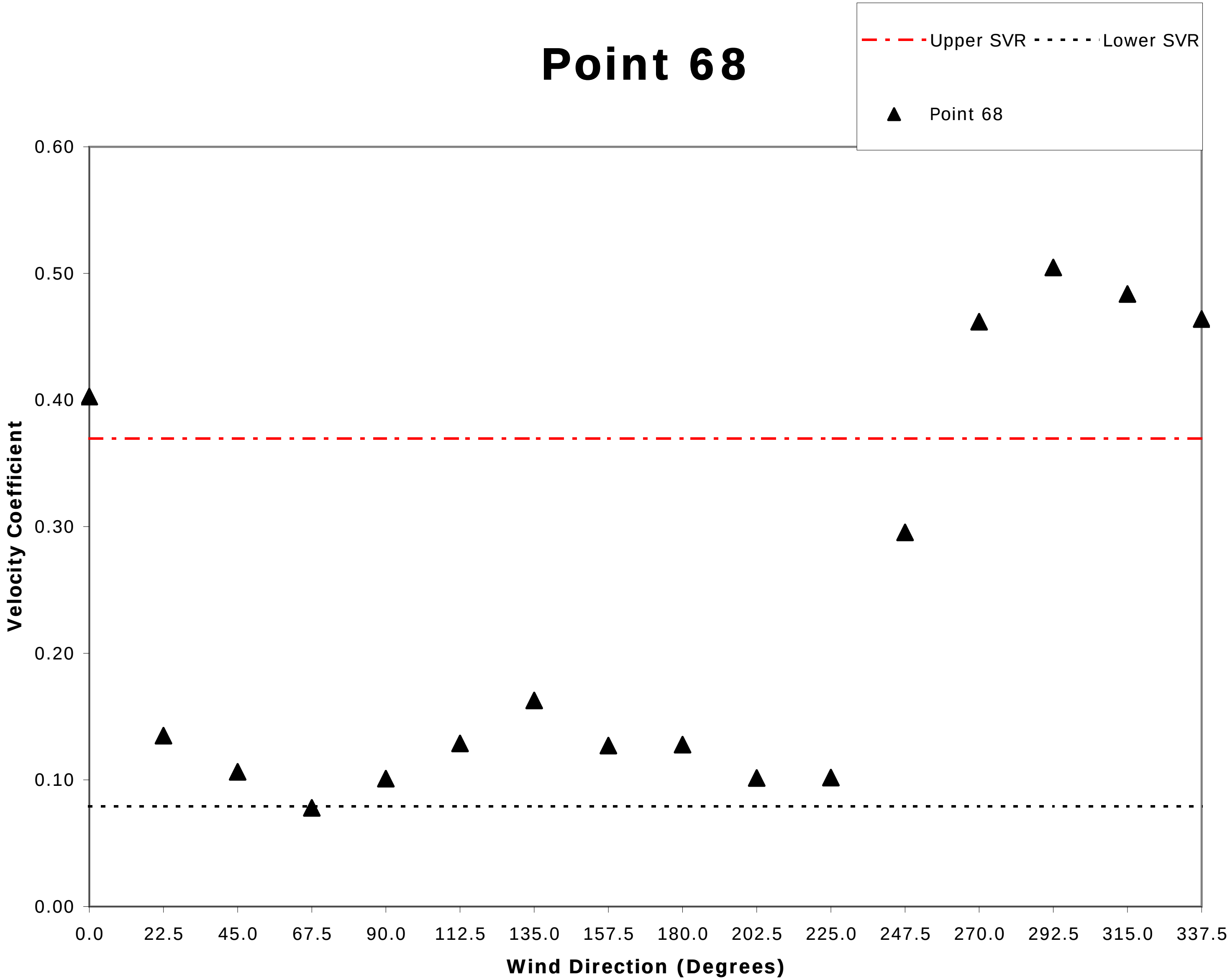

Point 64
Upper SVR
Lower SVR
Point 64
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



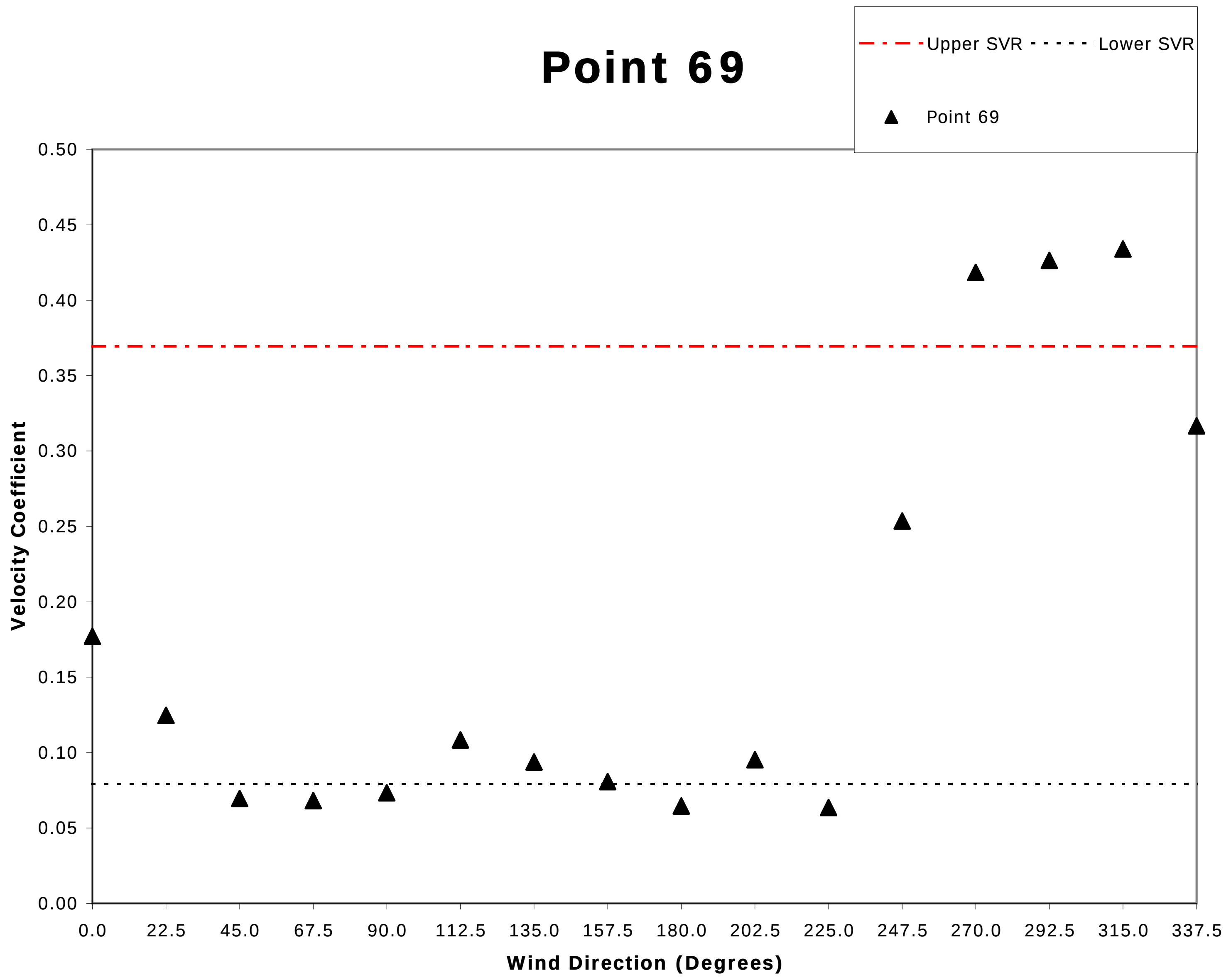
Point 65
Upper SVR
Lower SVR
Point 65
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

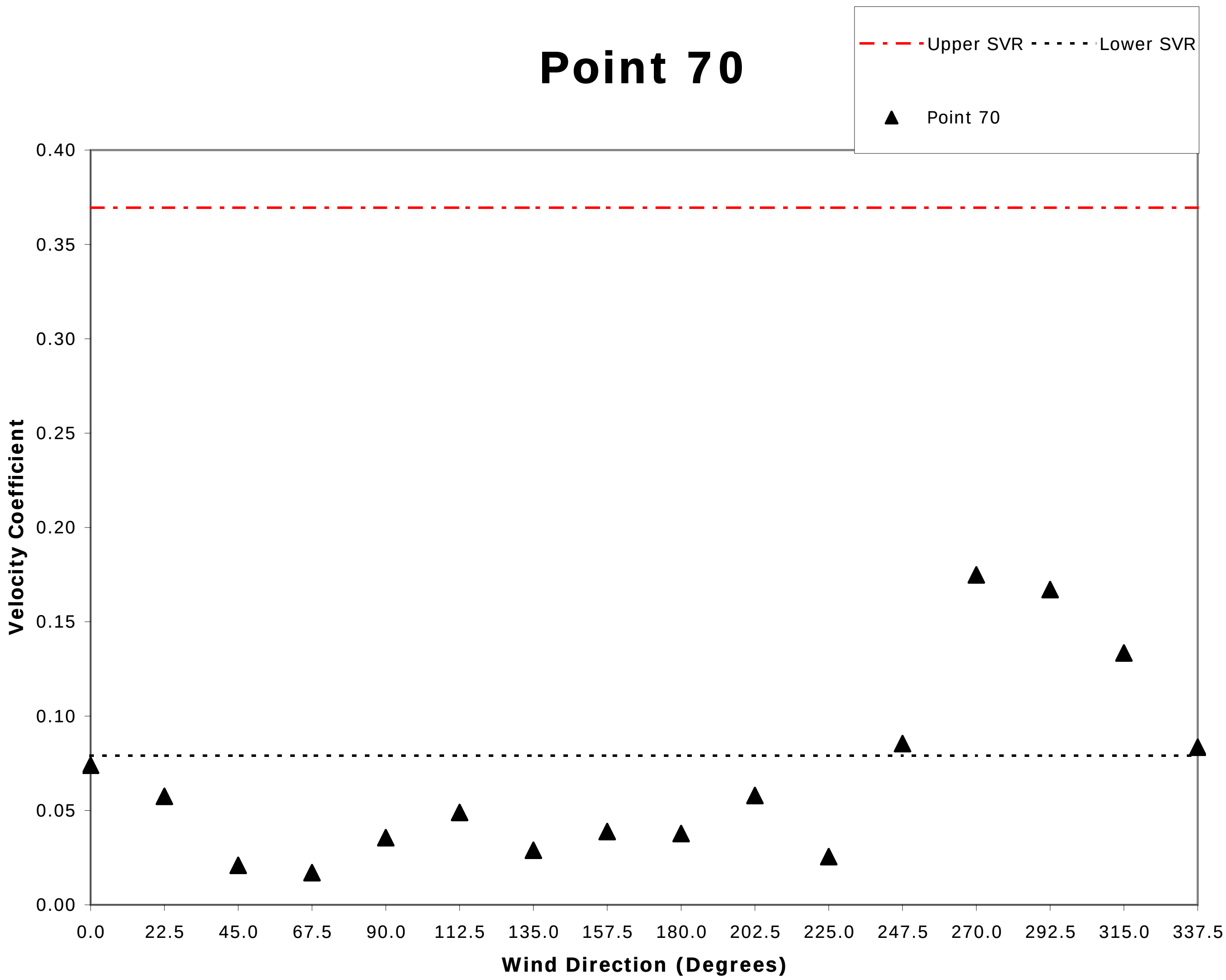

Point 66
Upper SVR
Lower SVR
Point 66
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 67
Upper SVR
Lower SVR
Point 67
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

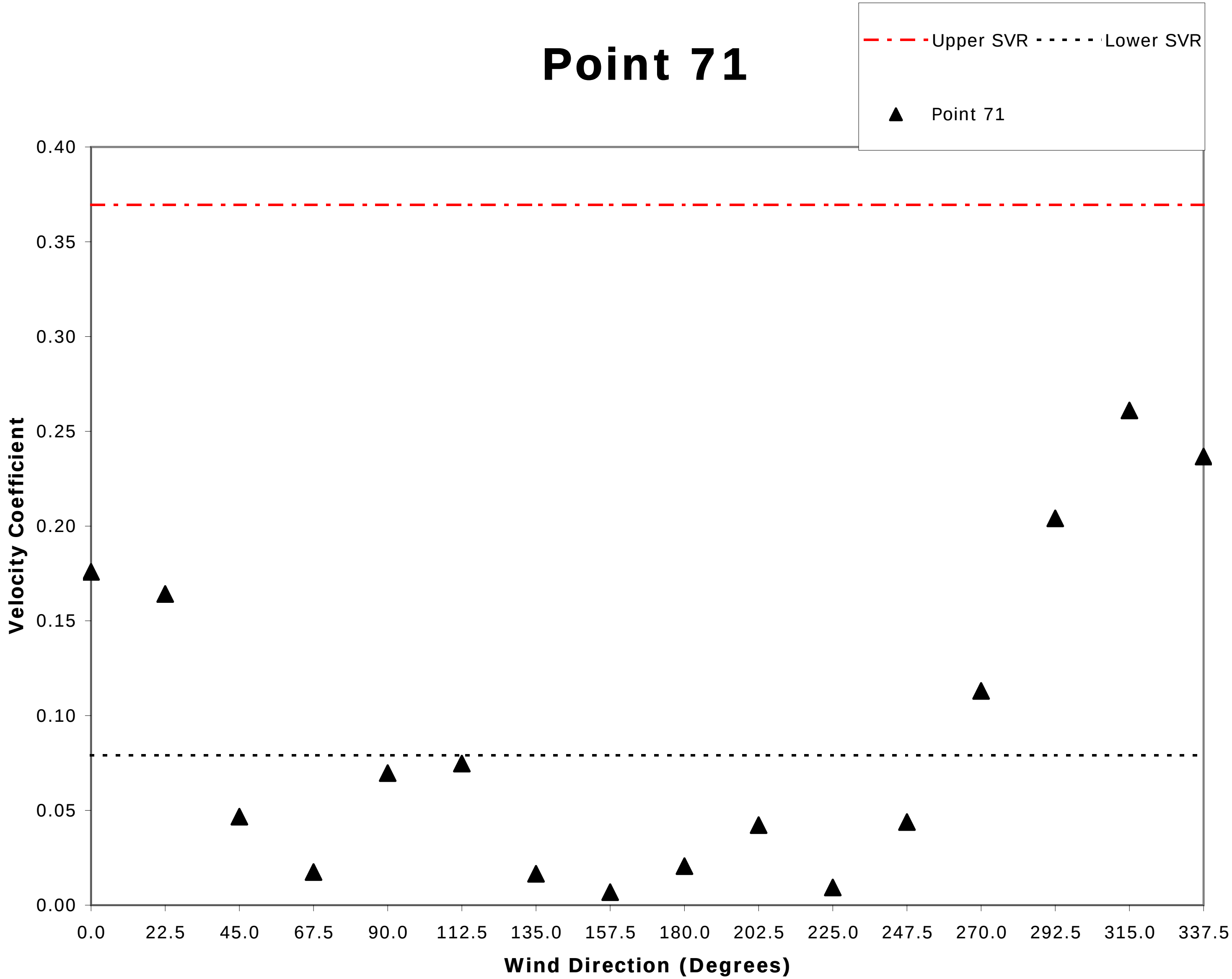


Point 68
Upper SVR
Lower SVR
Point 68
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

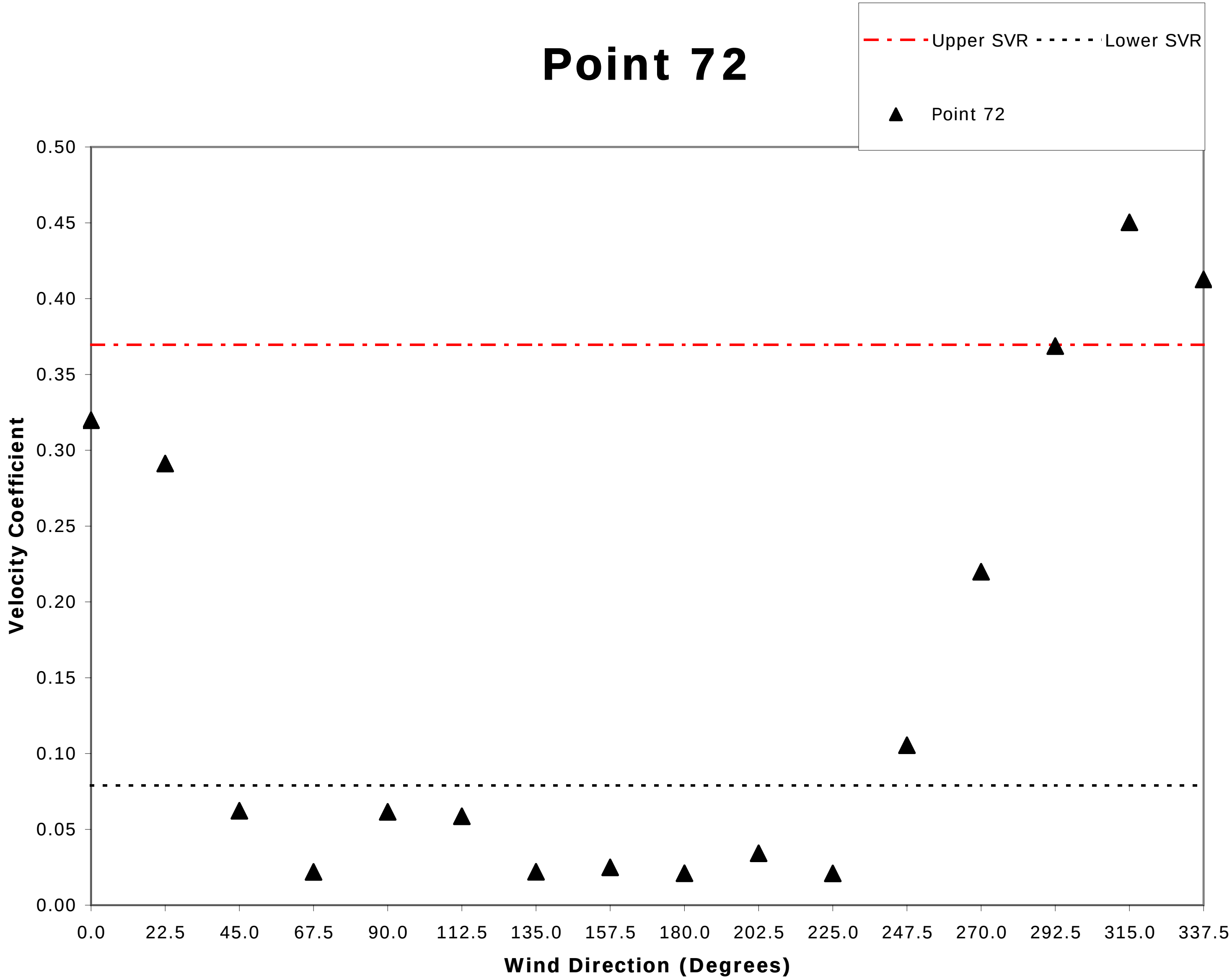

Point 69
Upper SVR
Lower SVR
Point 69
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



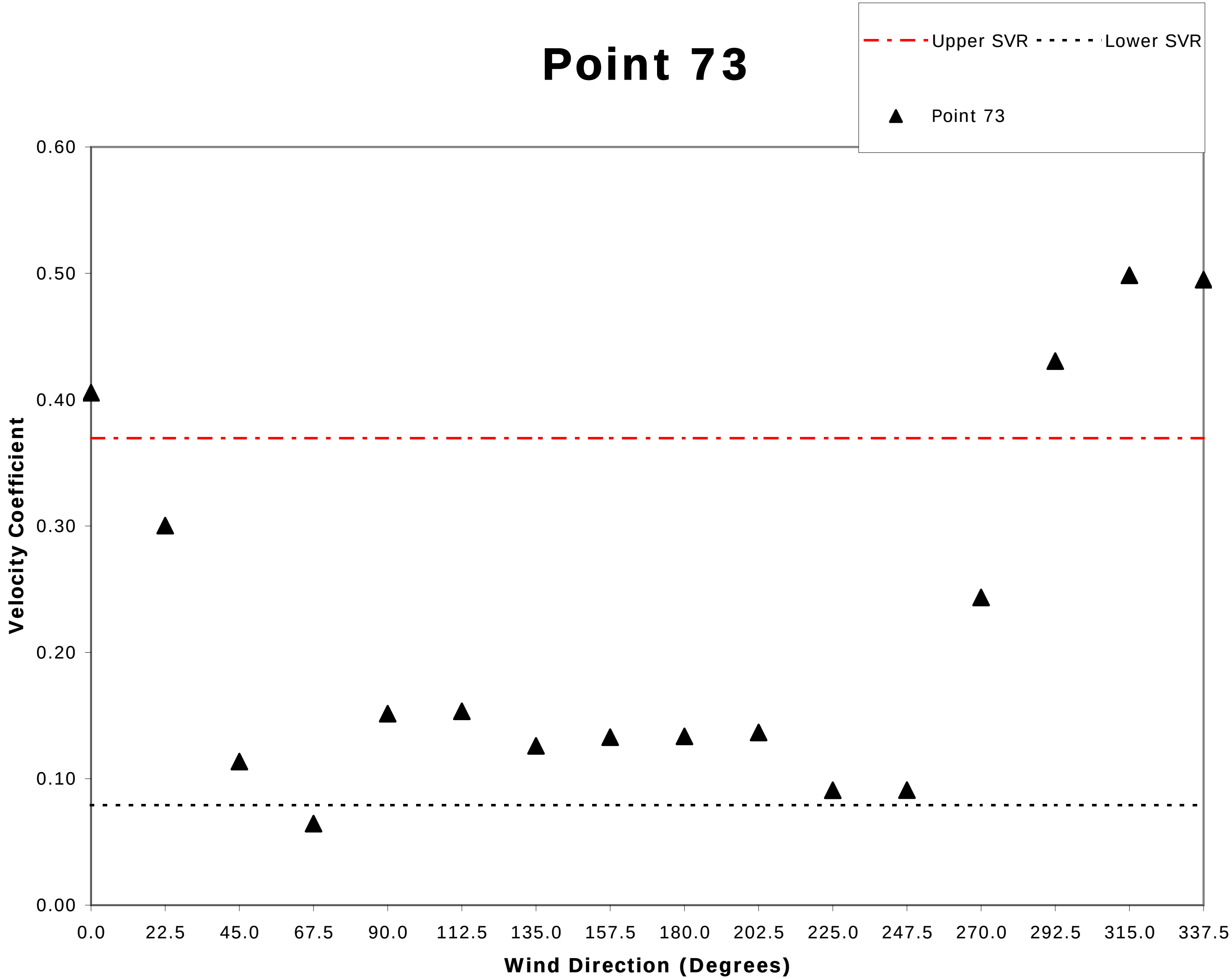
Point 70
Upper SVR
Lower SVR
Point 70
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

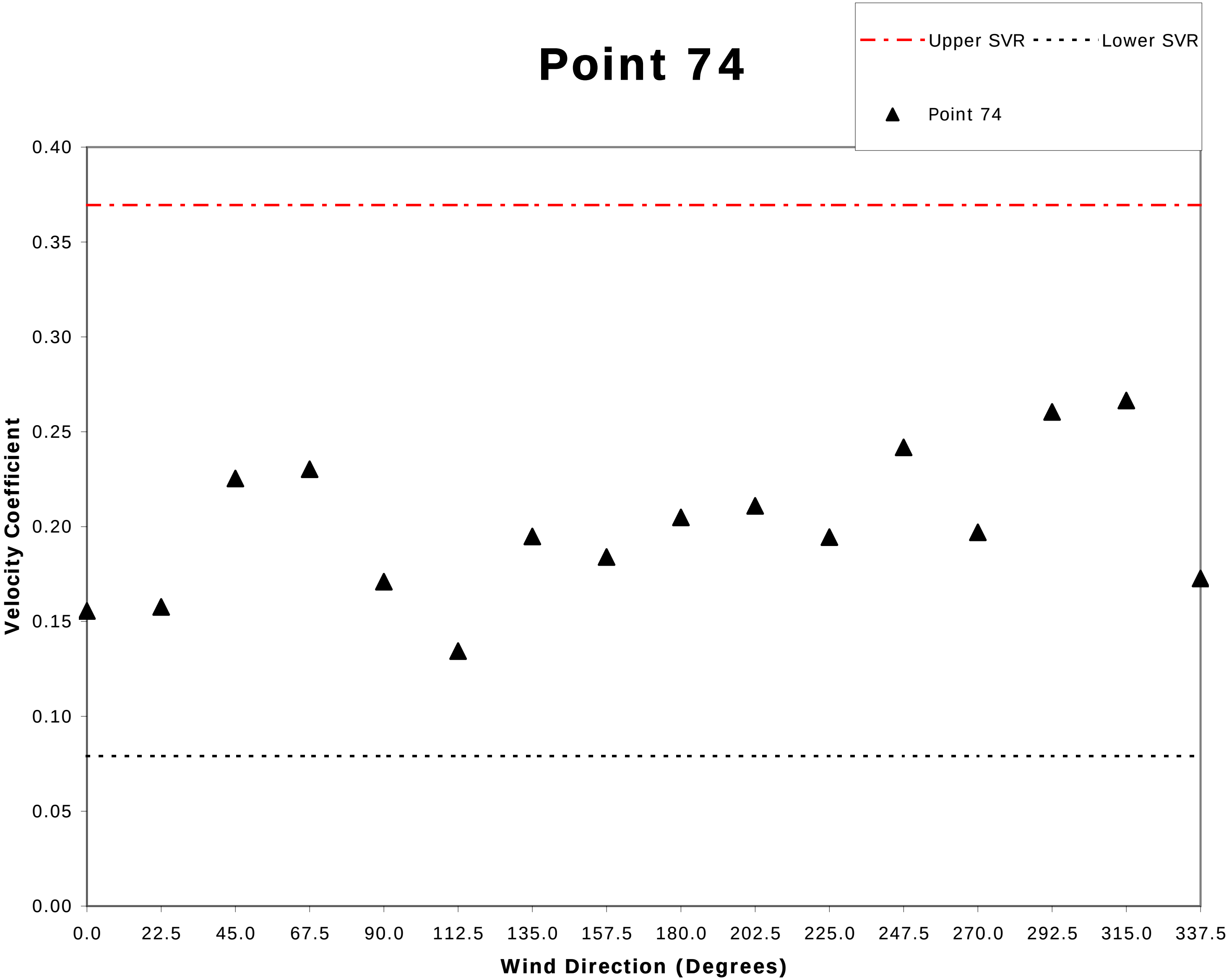


Point 71
Upper SVR
Lower SVR
Point 71
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

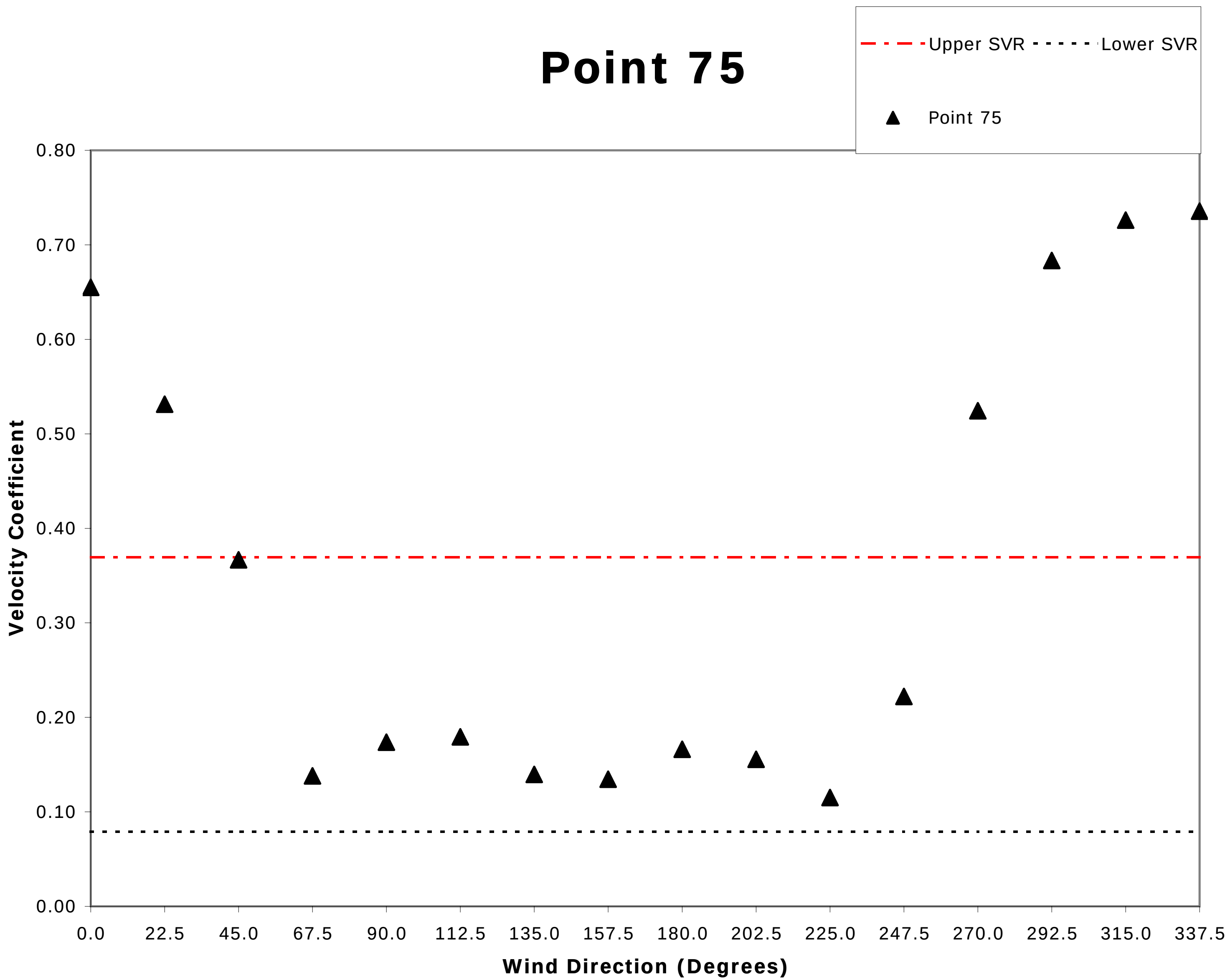


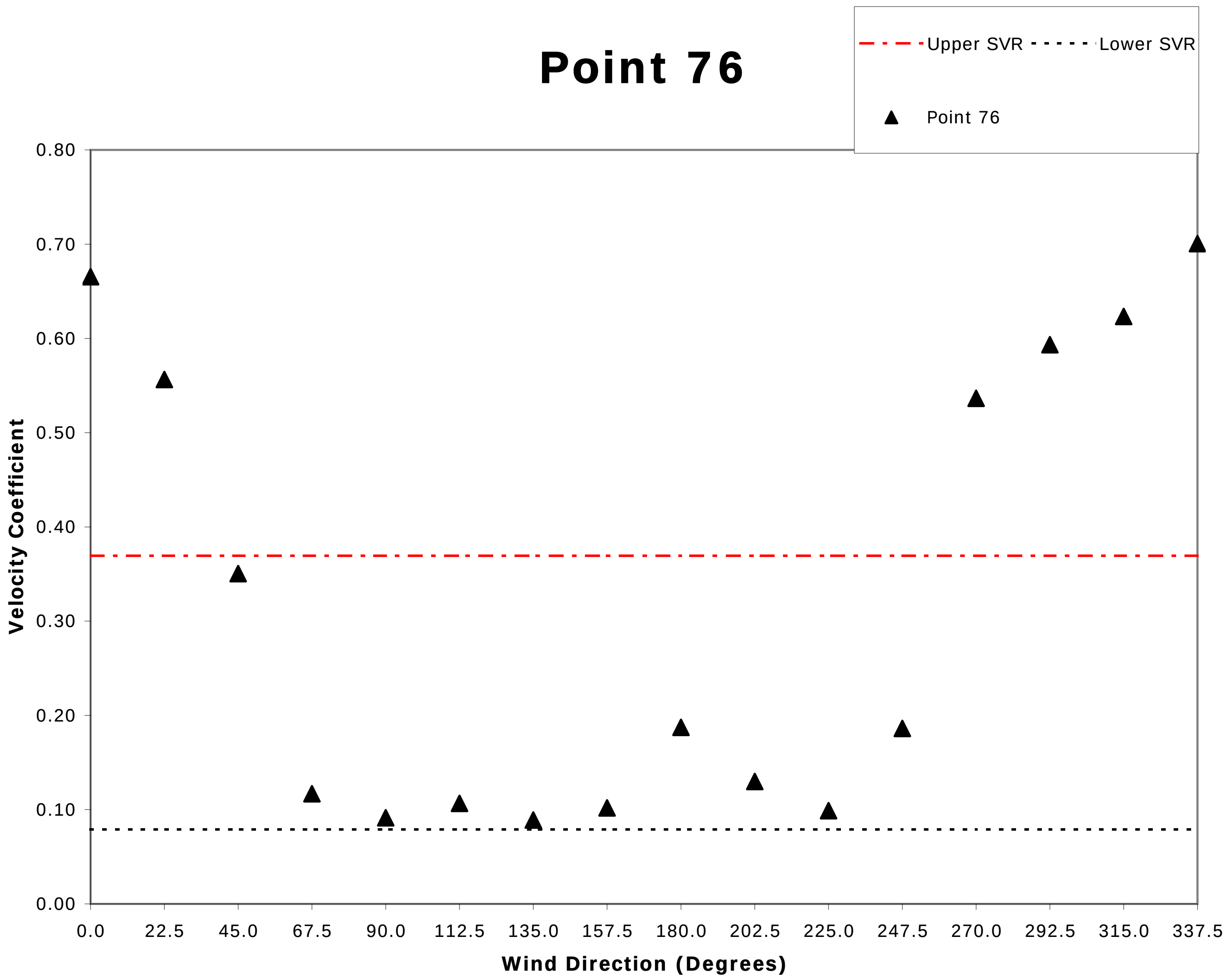
Point 72
Upper SVR
Lower SVR
Point 72
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

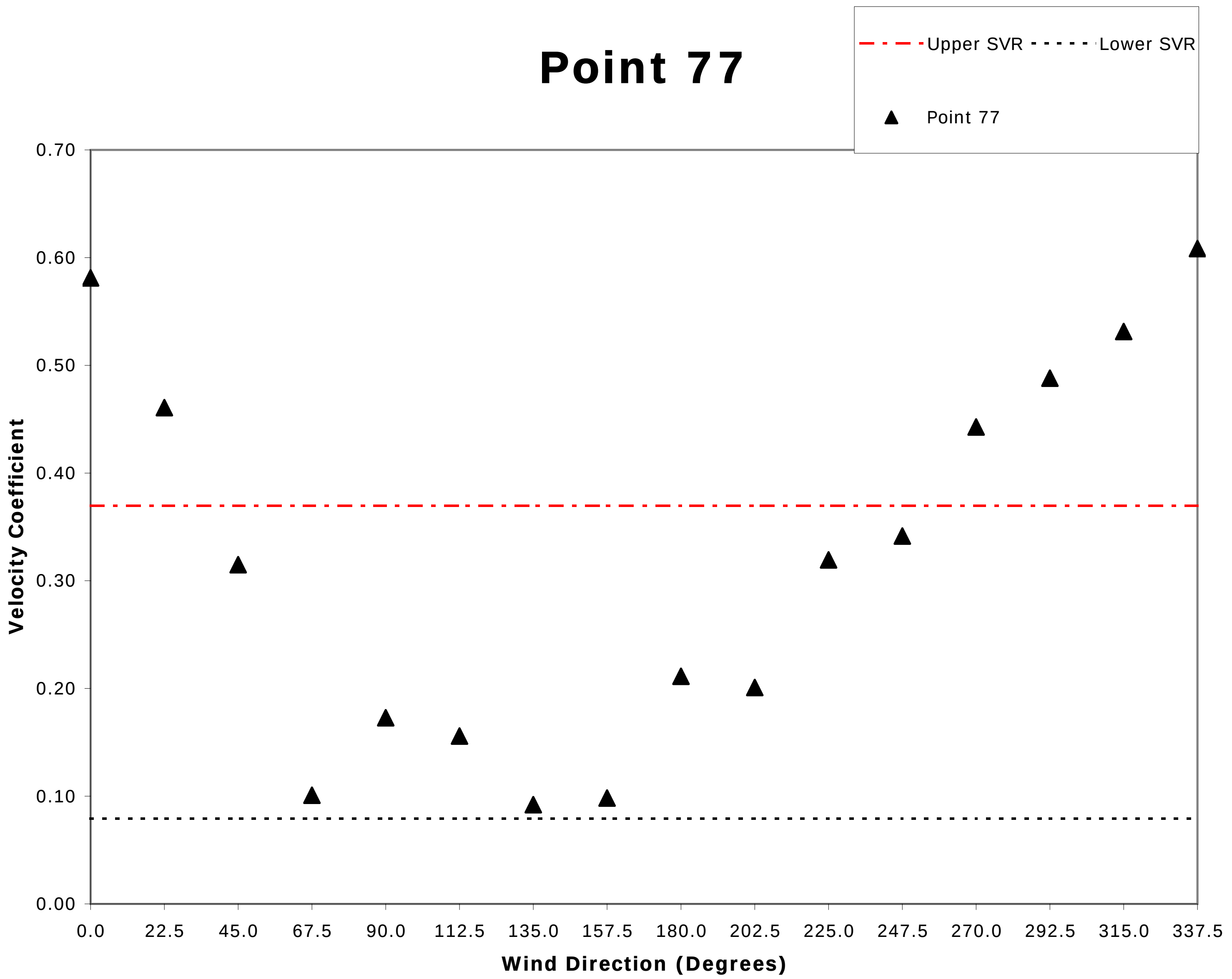

Point 73
Upper SVR
Lower SVR
Point 73
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



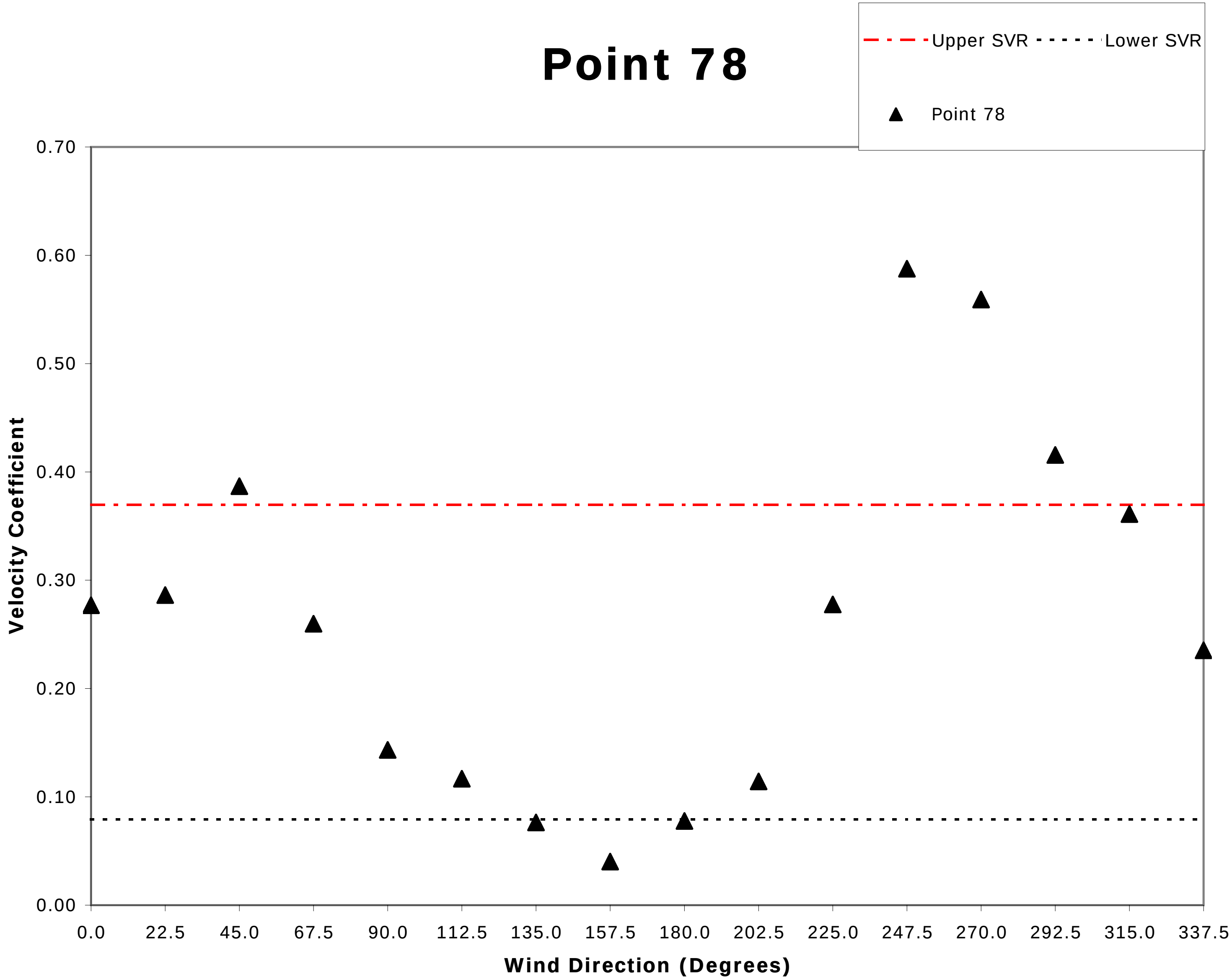
Point 74
Upper SVR
Lower SVR
Point 74
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 75
Upper SVR
Lower SVR
Point 75
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

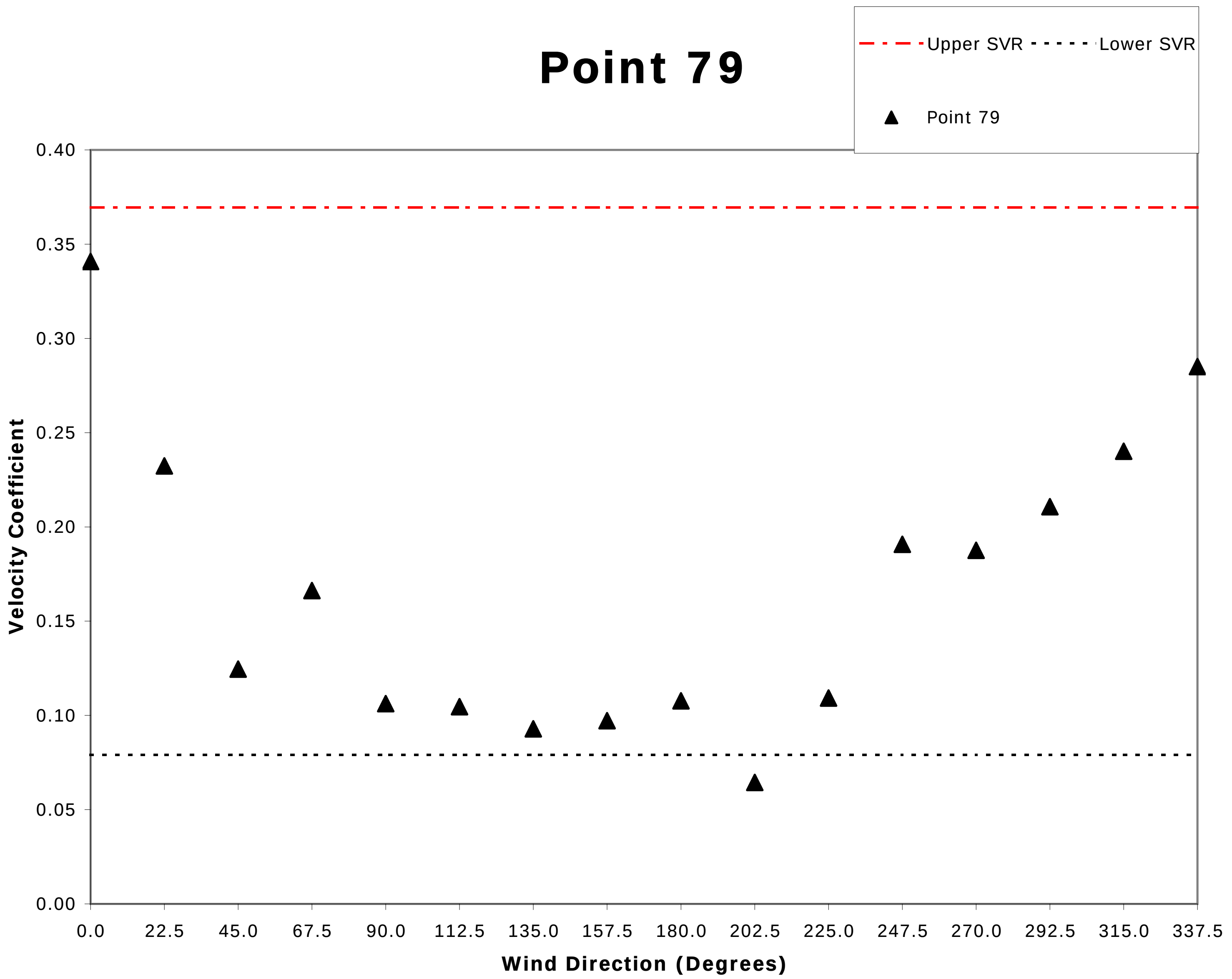

Point 76
Upper SVR
Lower SVR
Point 76
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

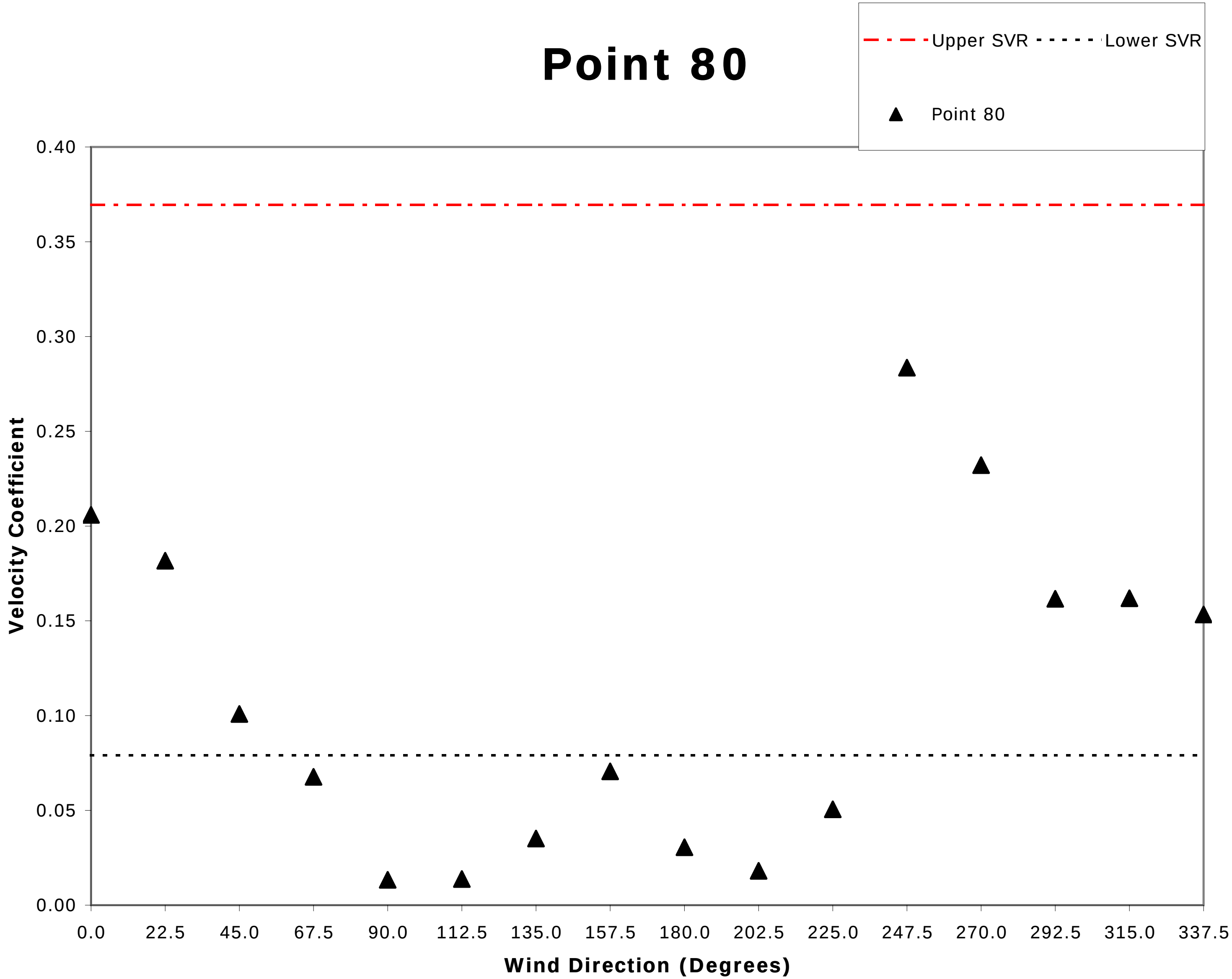


Point 77
Upper SVR
Lower SVR
Point 77
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

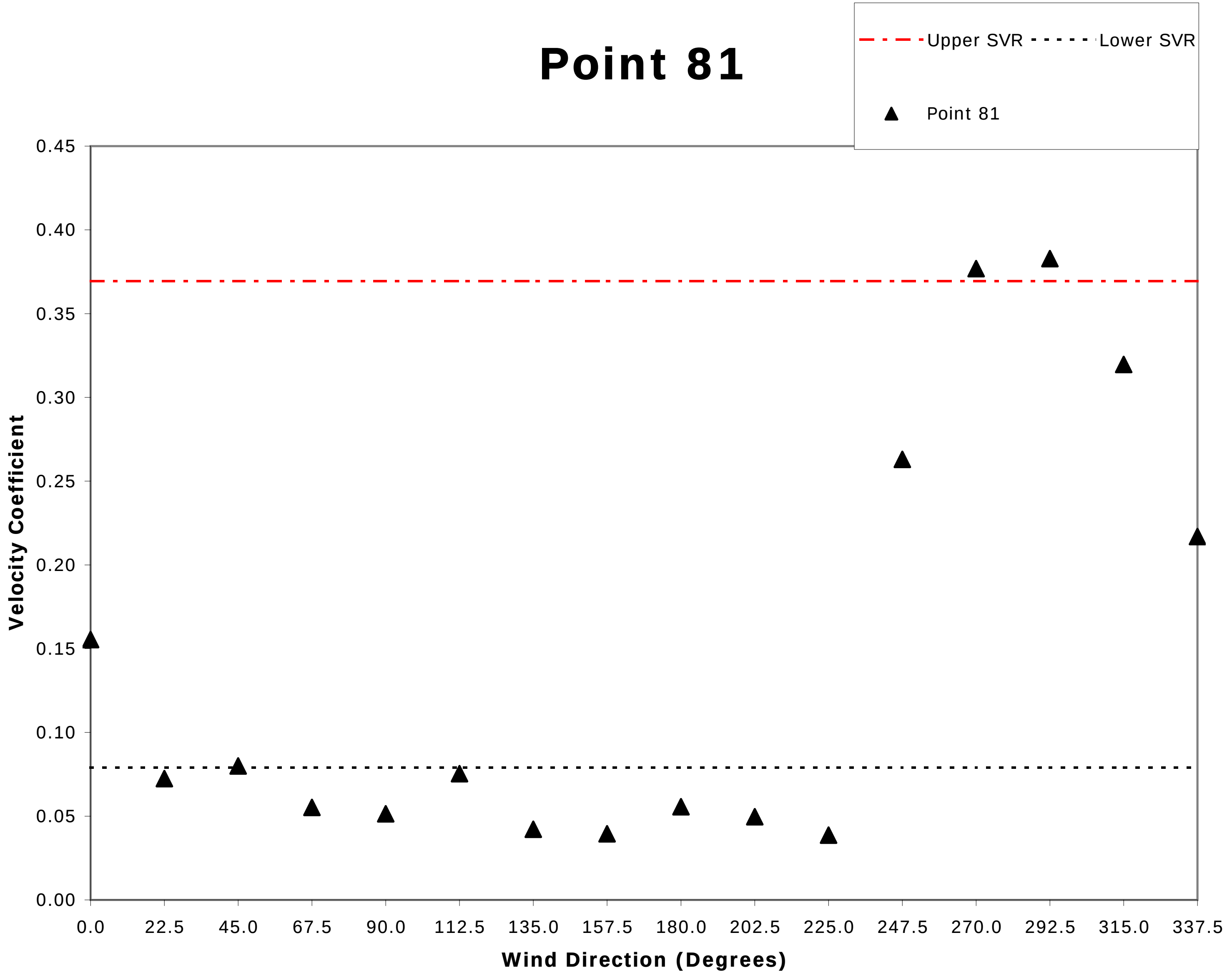


Point 78
Upper SVR
Lower SVR
Point 78
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

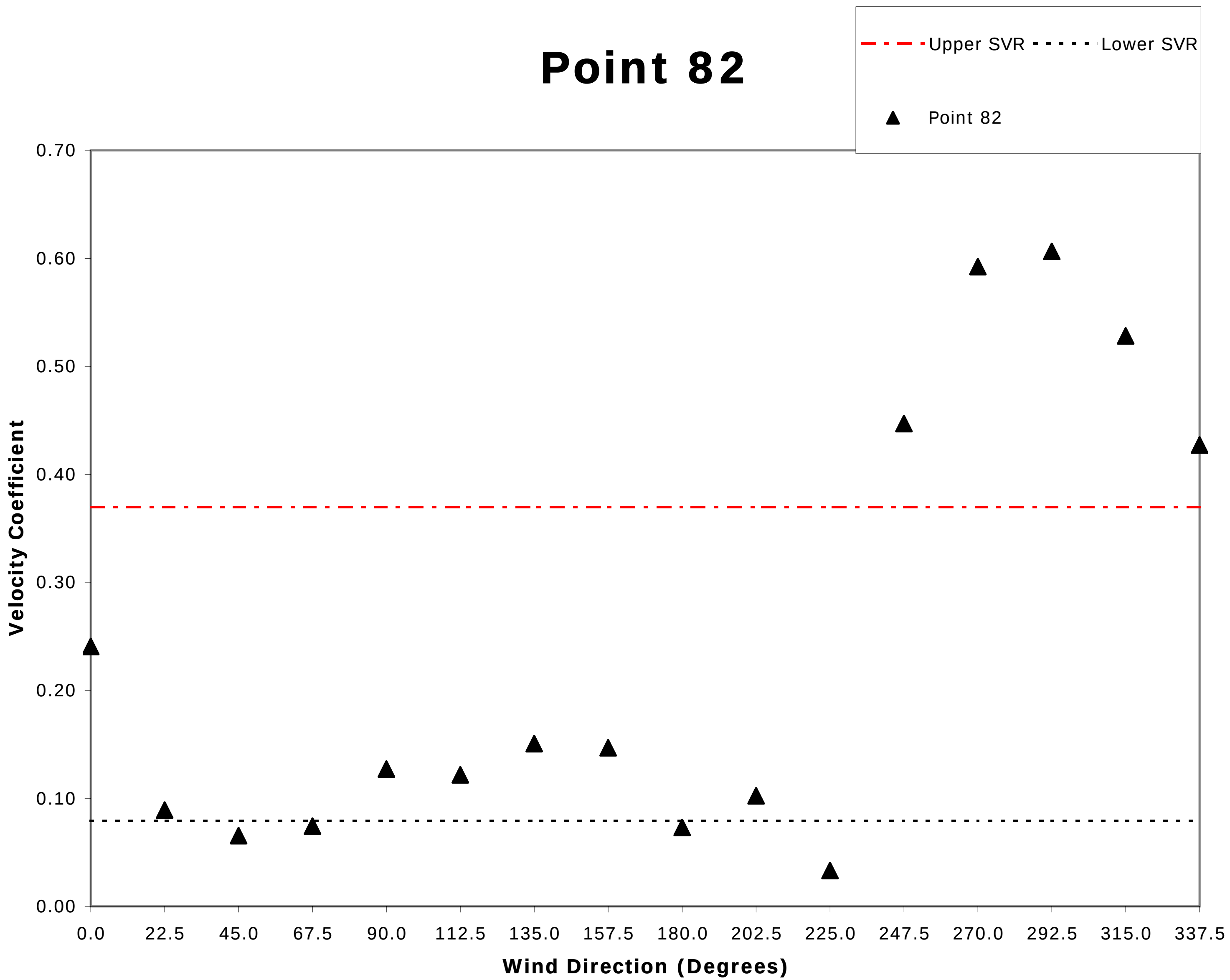

Point 79
Upper SVR
Lower SVR
Point 79
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 80
Upper SVR
Lower SVR
Point 80
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

Point 81



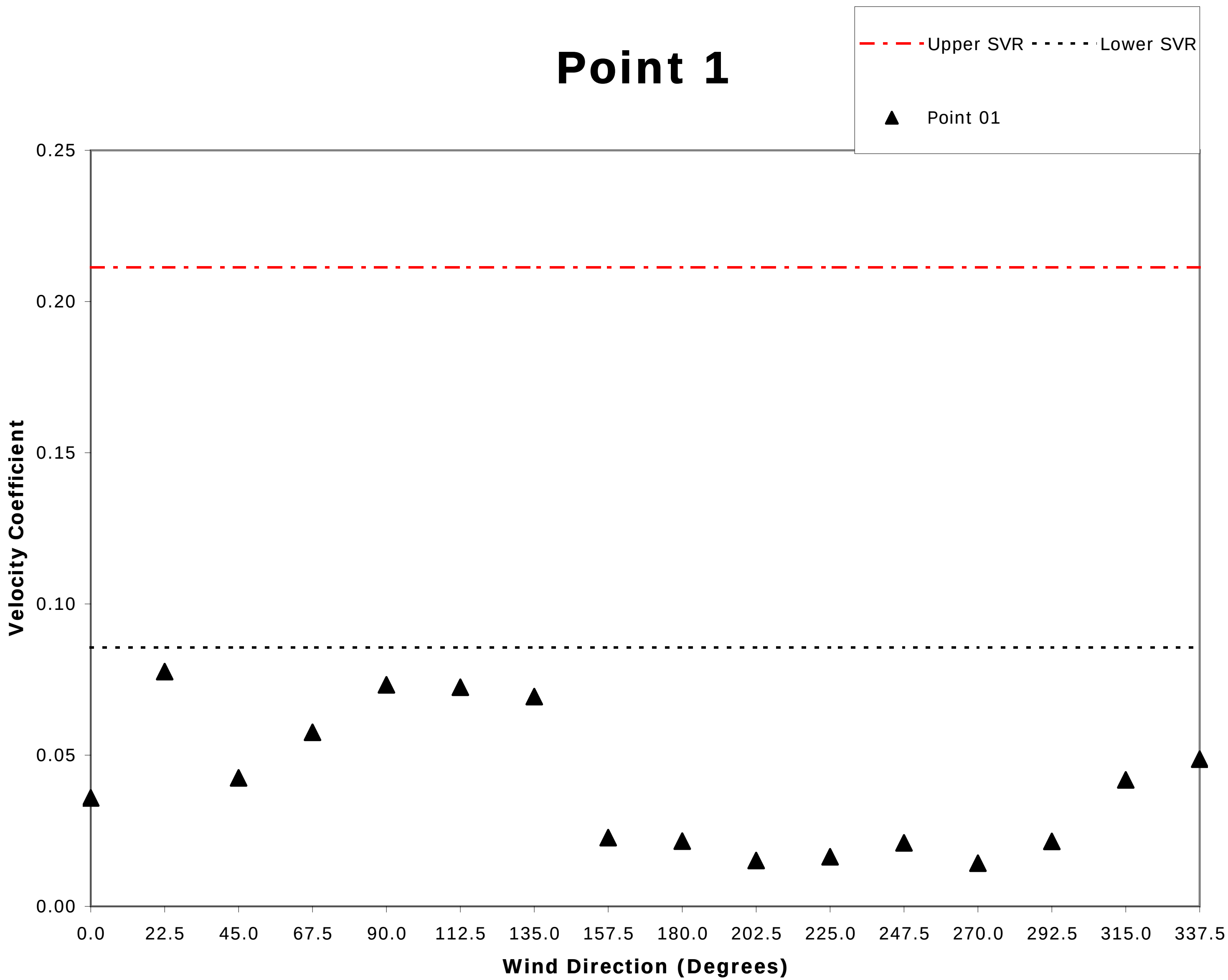
Upper SVR
Lower SVR
Point 81
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



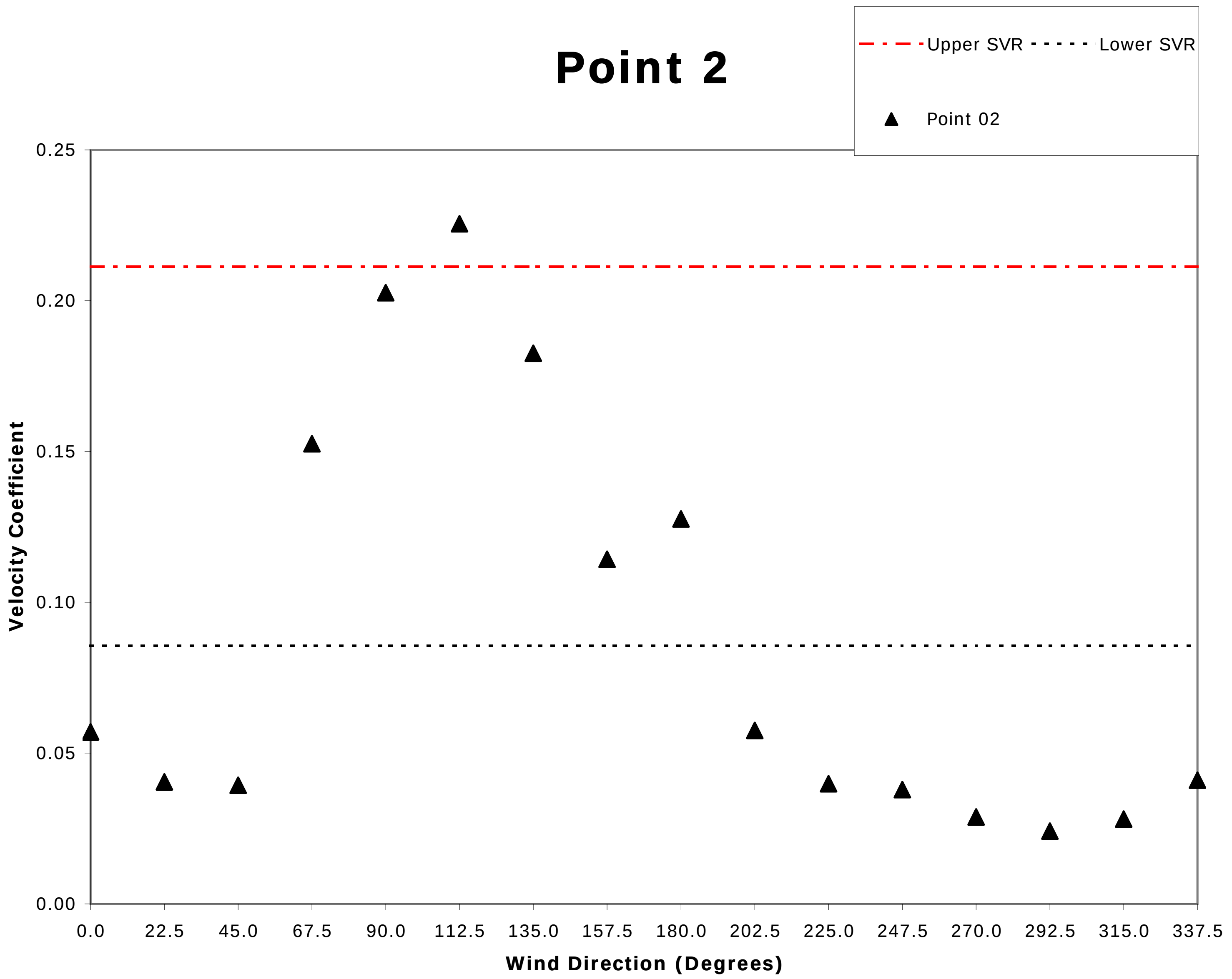
Point 82
Upper SVR
Lower SVR
Point 82
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

Appendix VI

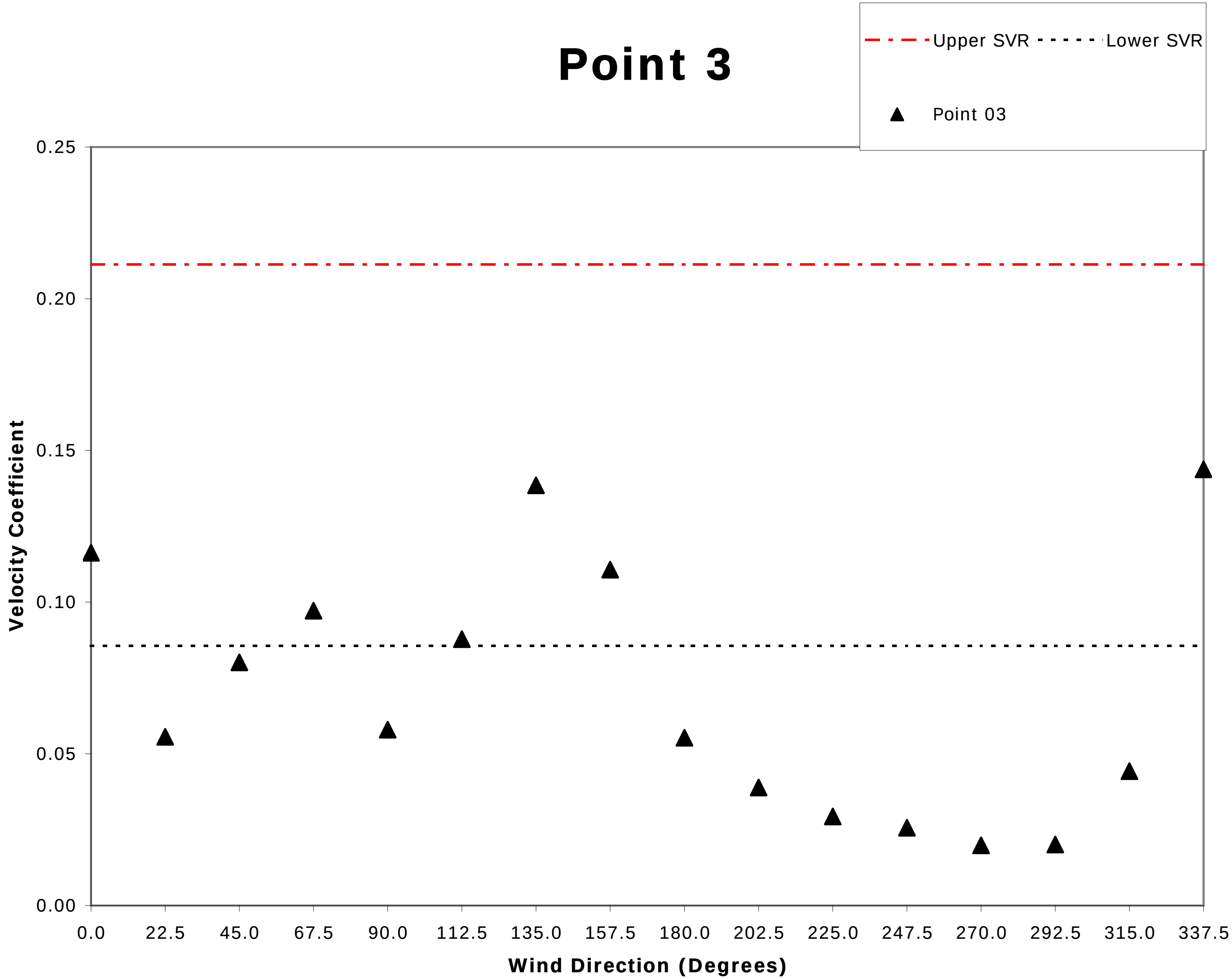
Directional Result at Individual Test Points for the Second Revised Scheme



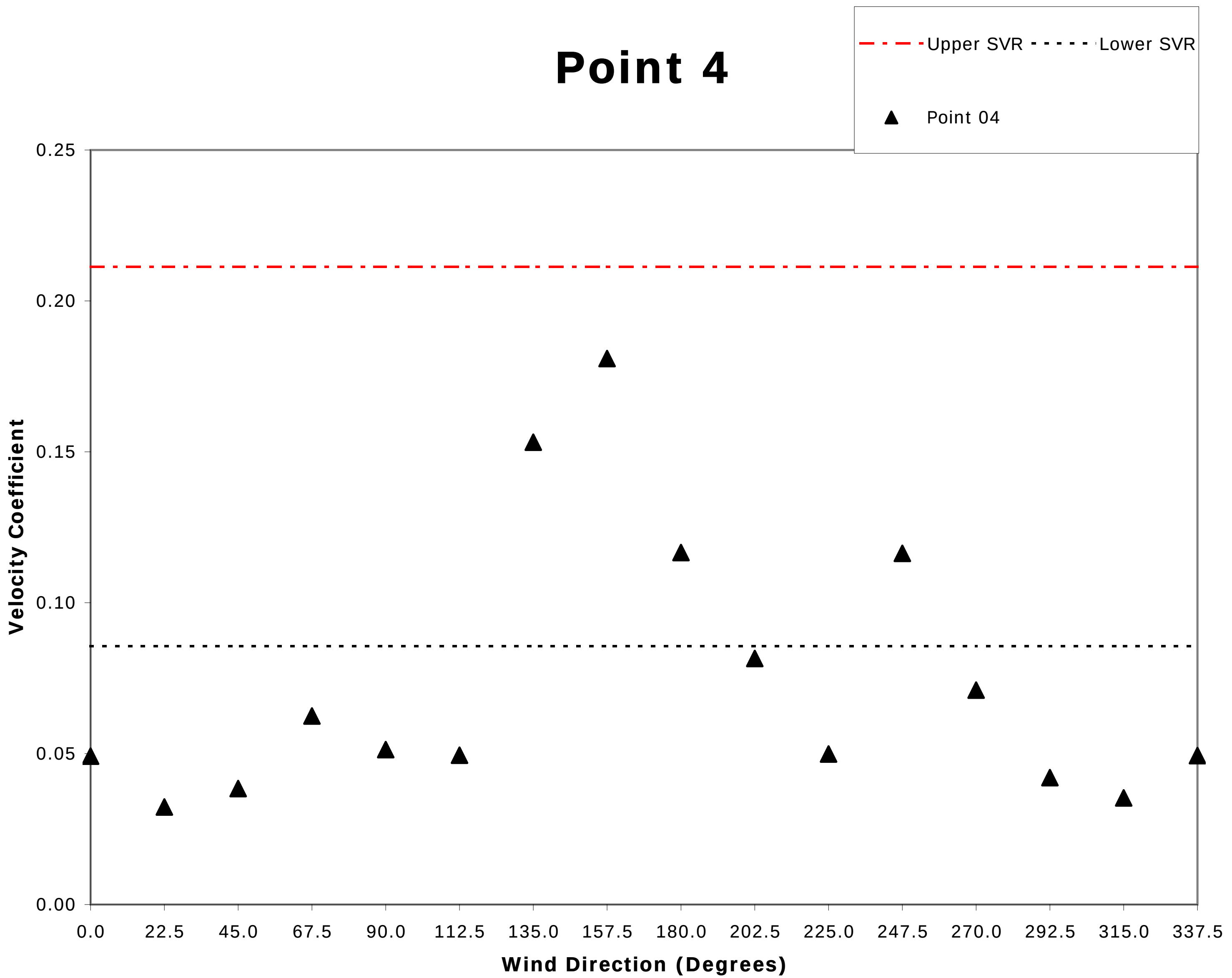
Point 1
Upper SVR
Lower SVR
Point 01
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

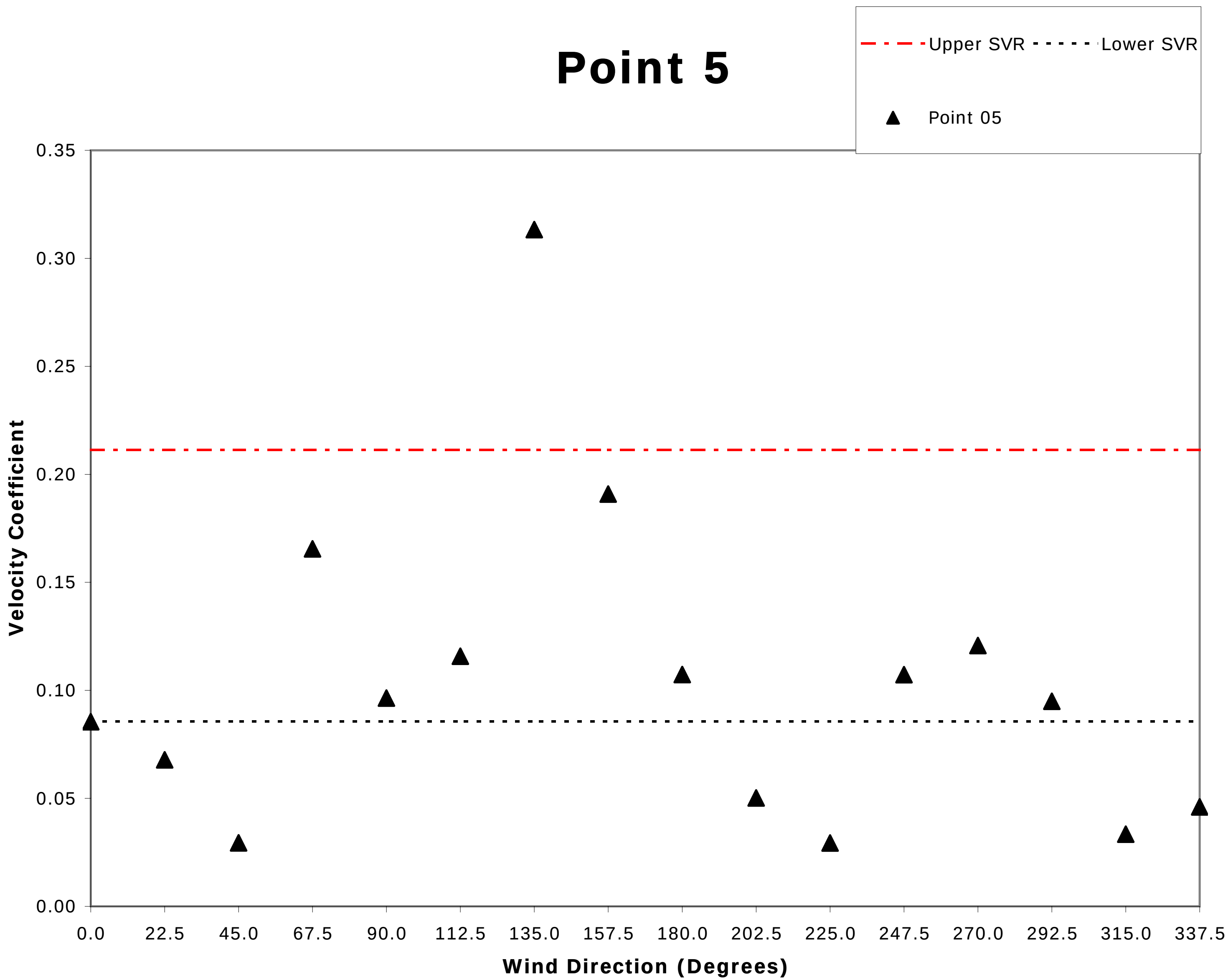


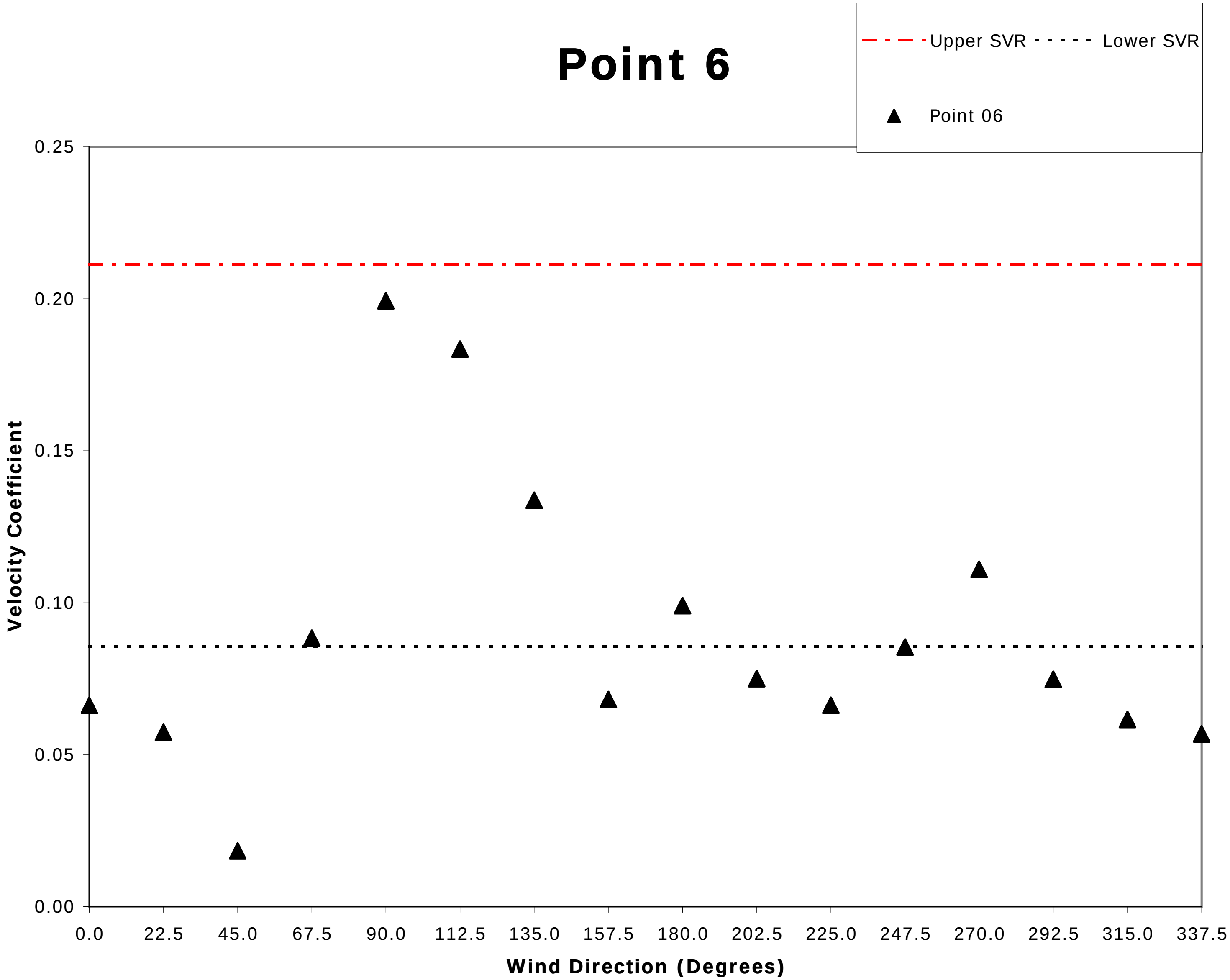
Point 2
Upper SVR
Lower SVR
Point 02
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

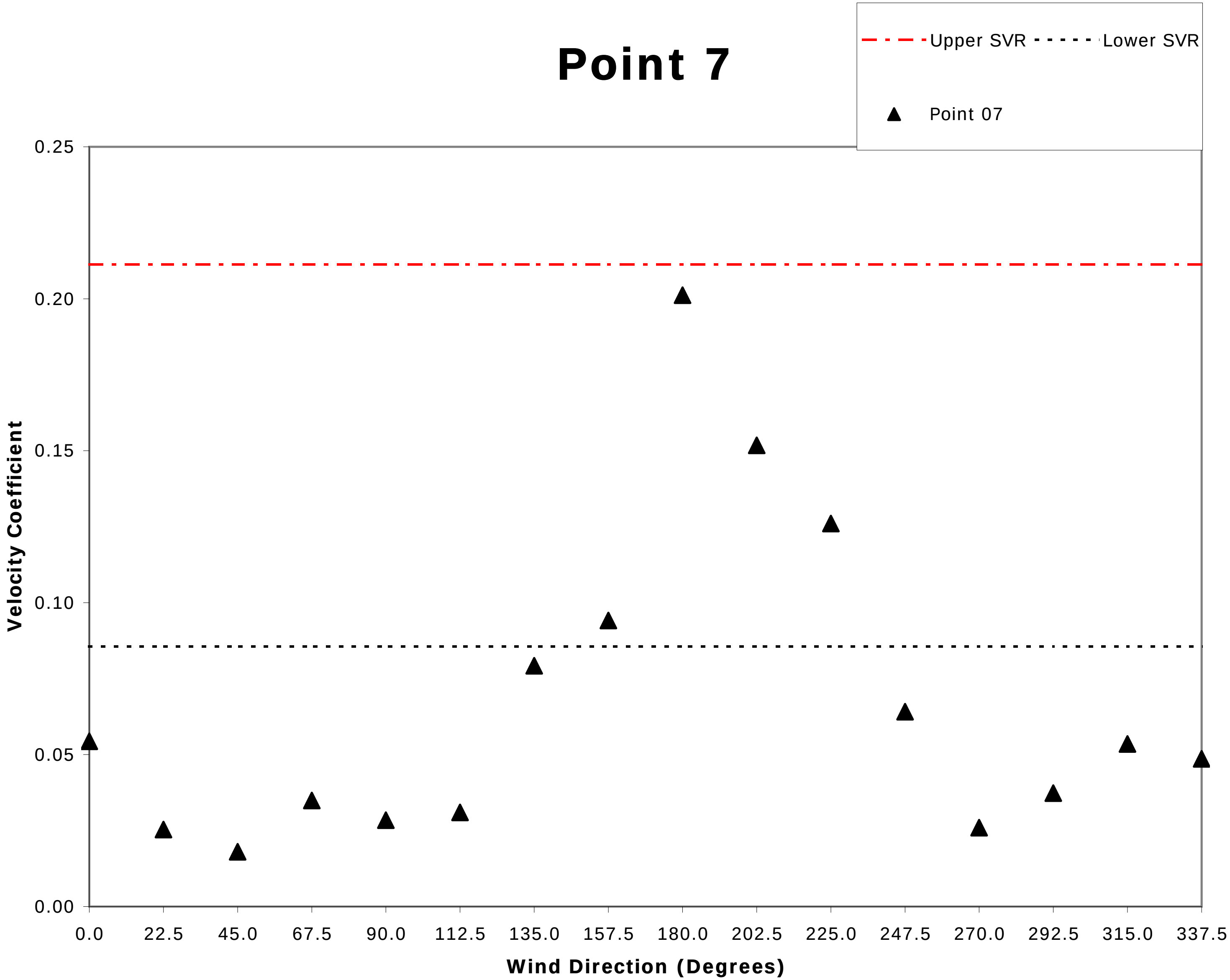


Point 3
Upper SVR
Lower SVR
Point 03
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

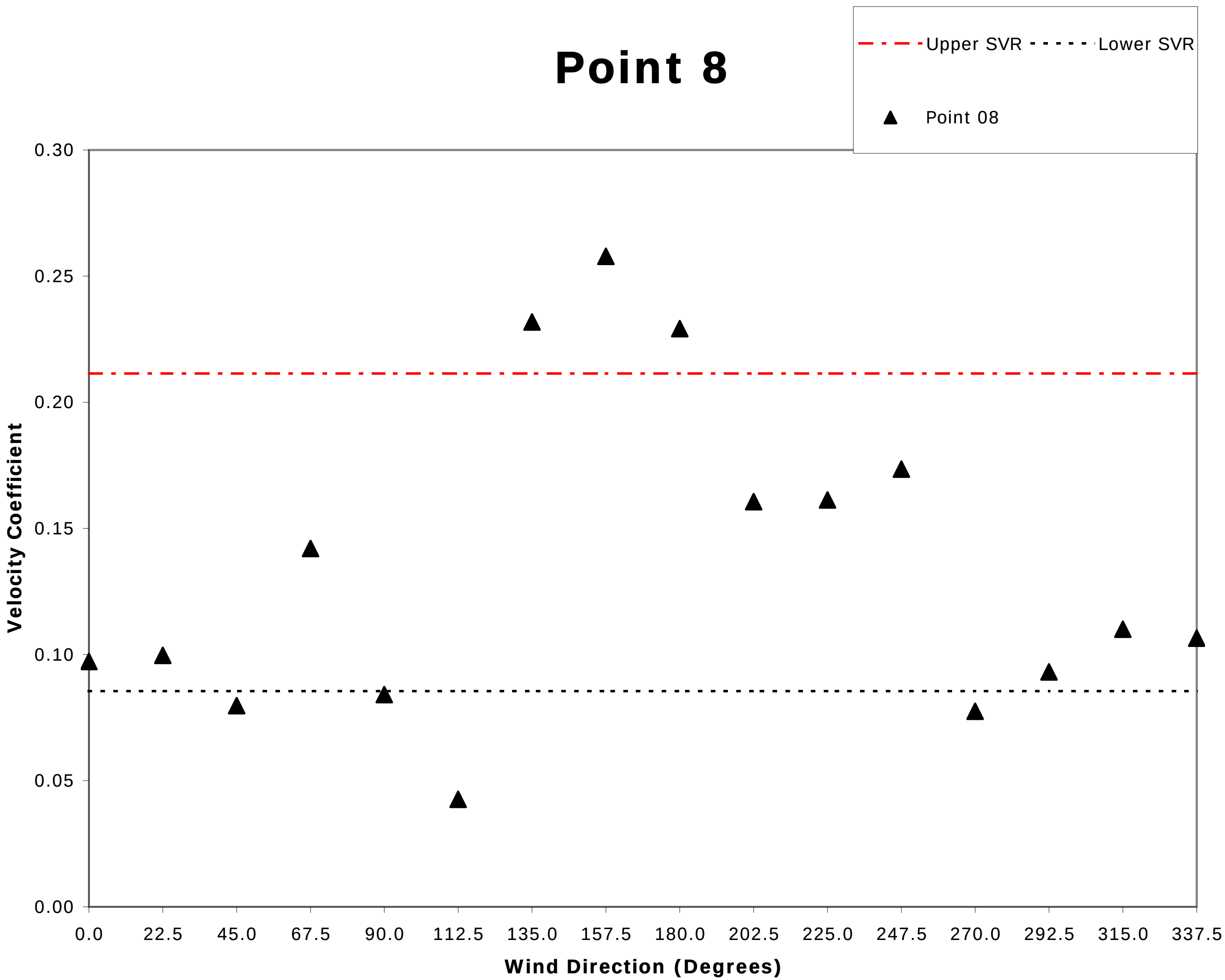

Point 4
Upper SVR
Lower SVR
Point 04
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 5
Upper SVR
Lower SVR
Point 05
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

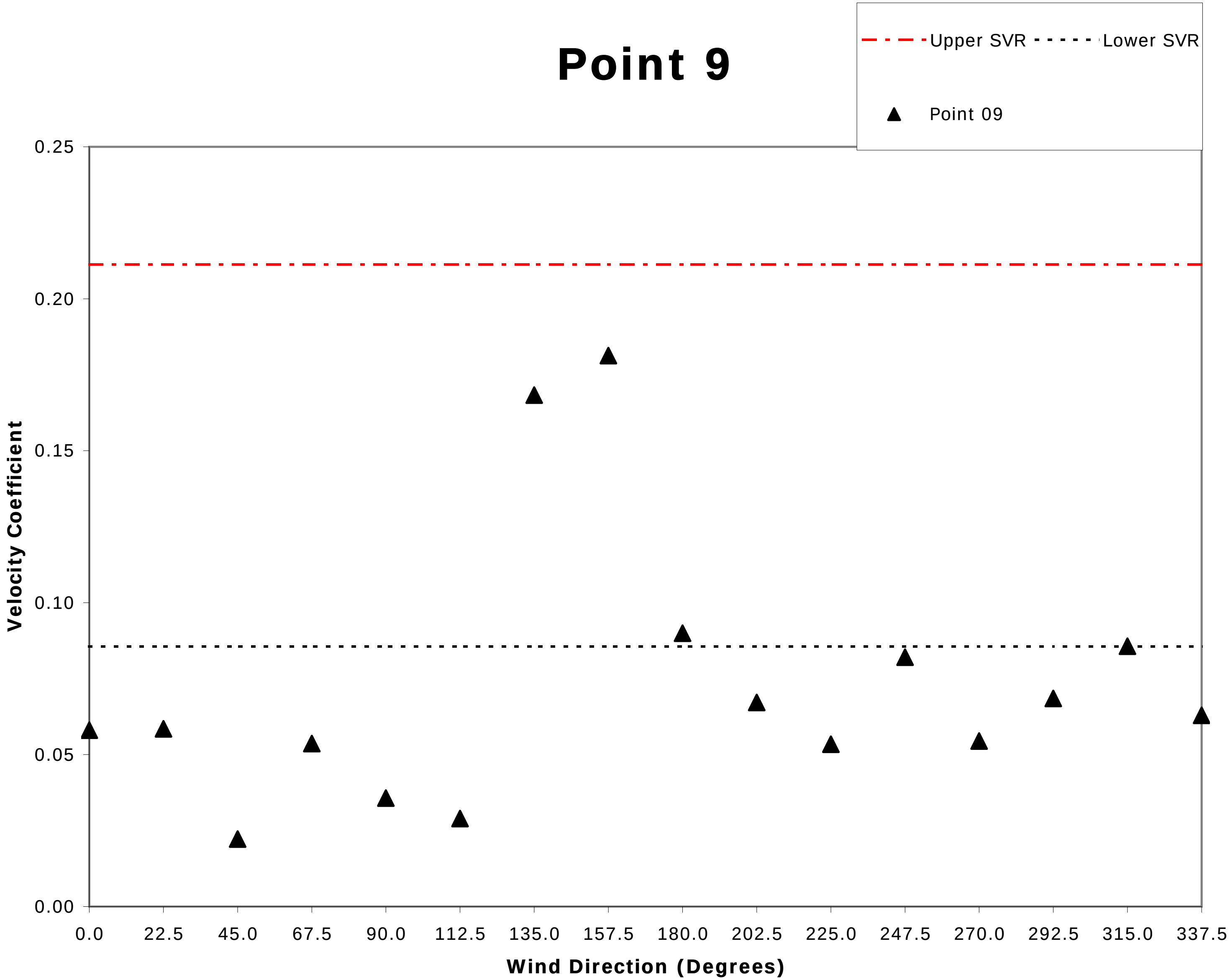

Point 6
Upper SVR
Lower SVR
Point 06
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



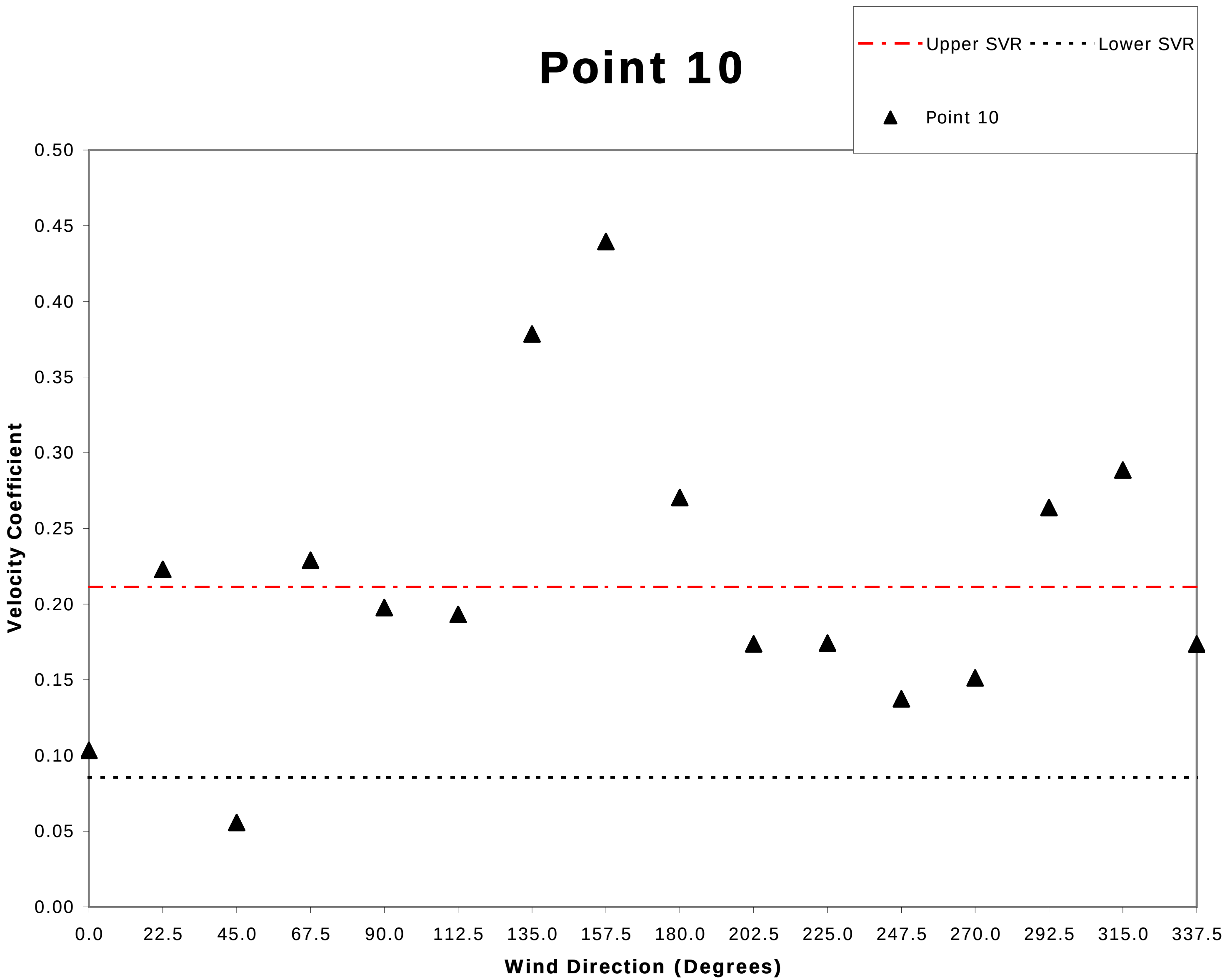
Point 7
Upper SVR
Lower SVR
Point 07
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



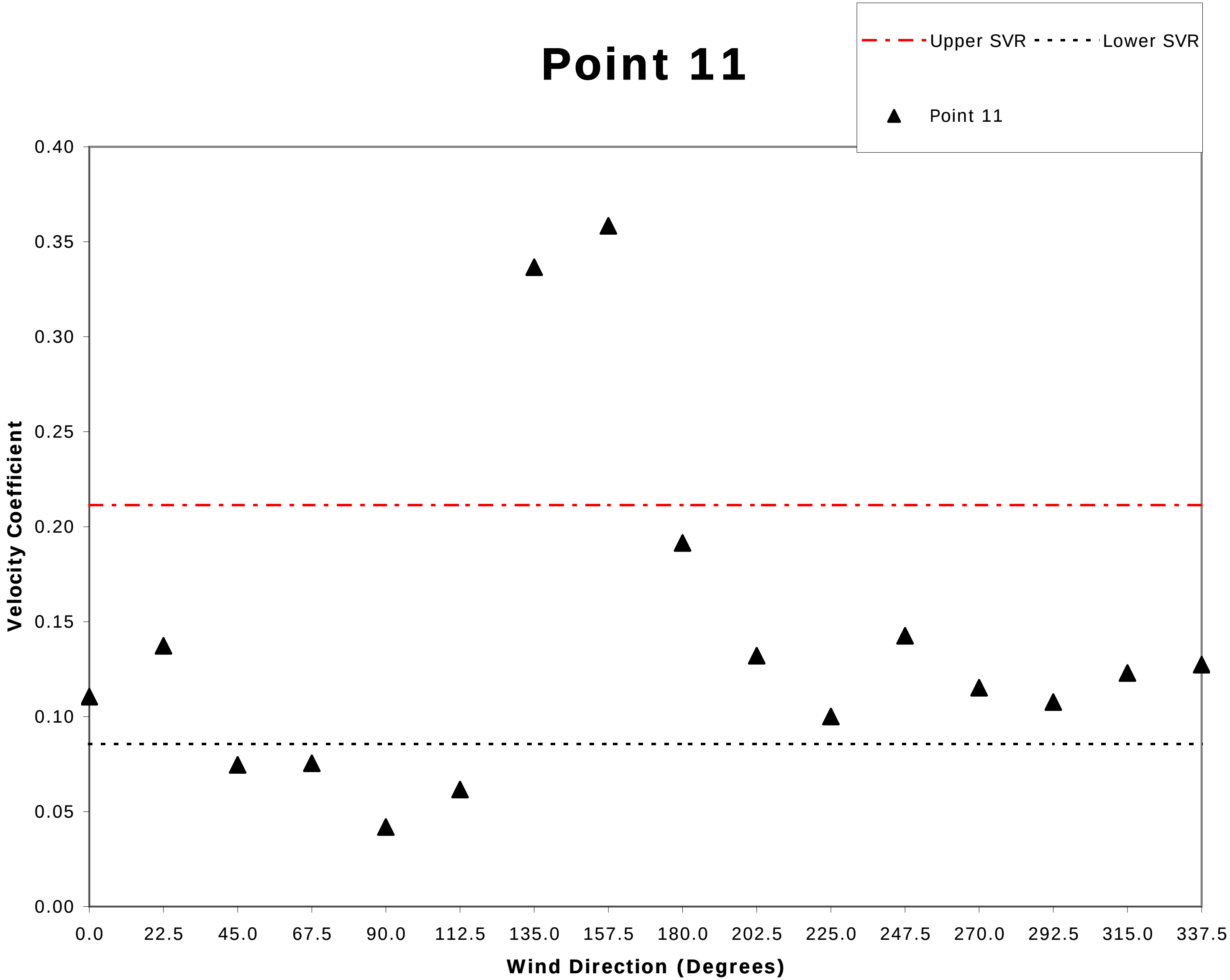
Point 8
Upper SVR
Lower SVR
Point 08
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



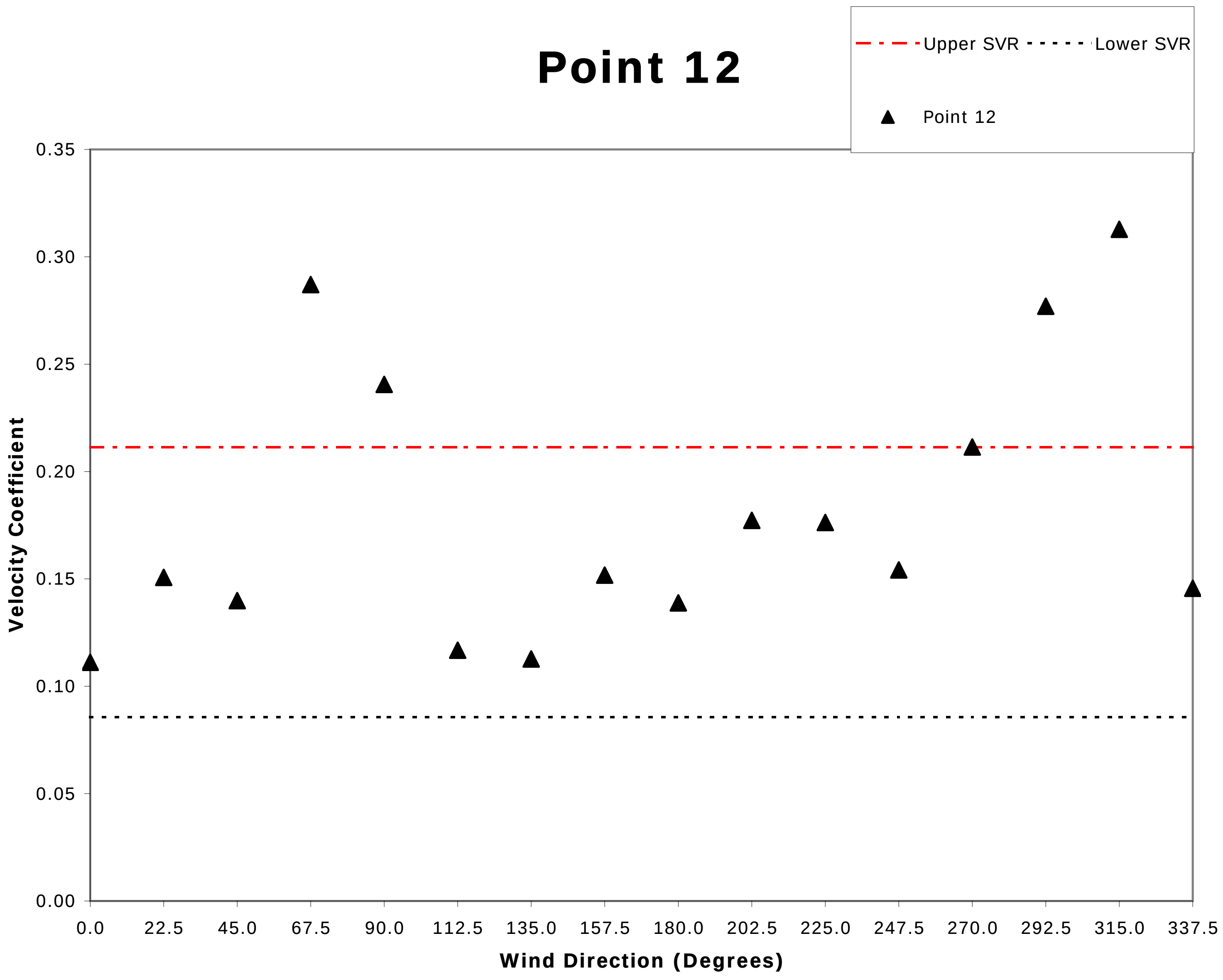
Point 9
Upper SVR
Lower SVR
Point 09
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



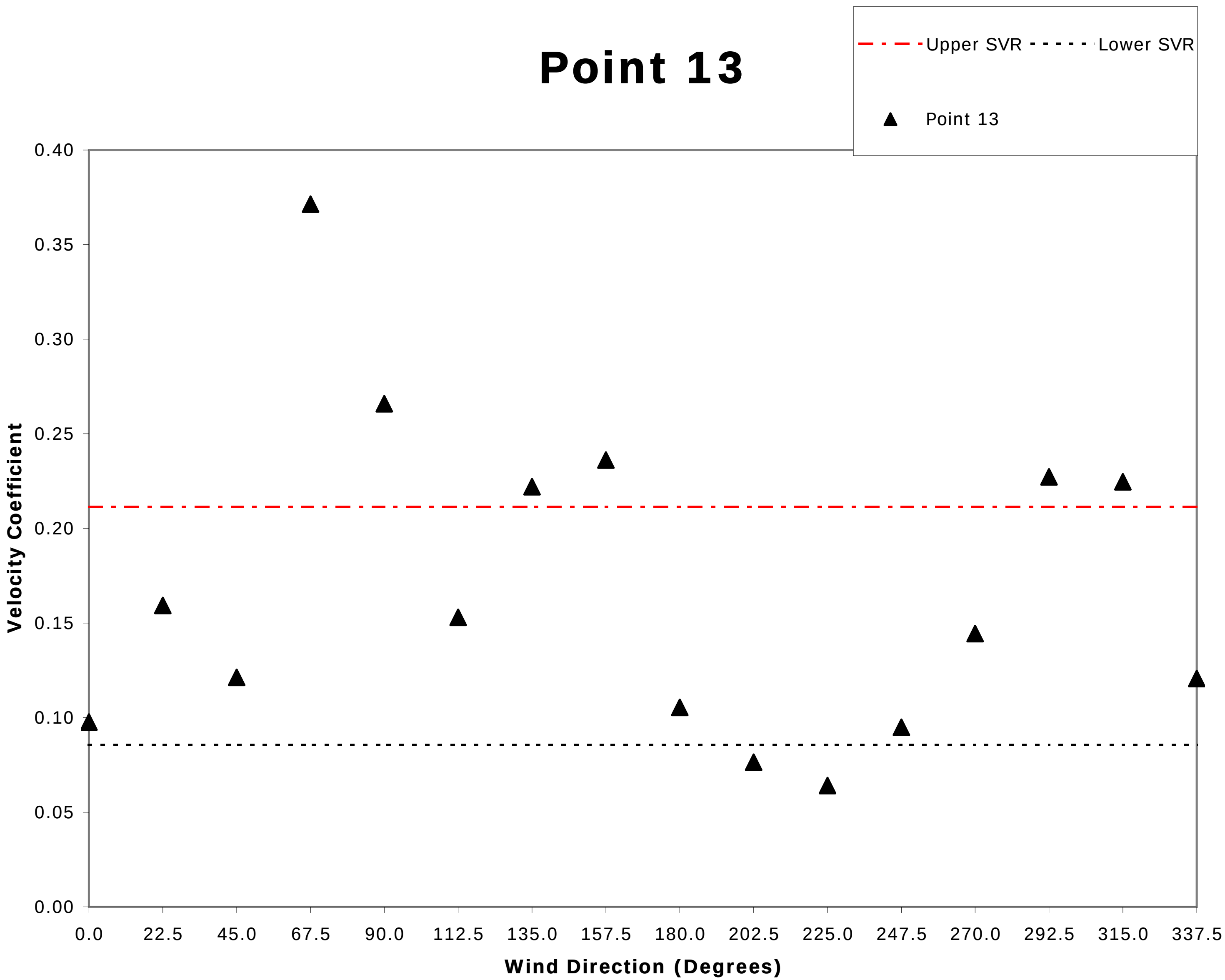
Point 10
Upper SVR
Lower SVR
Point 10
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

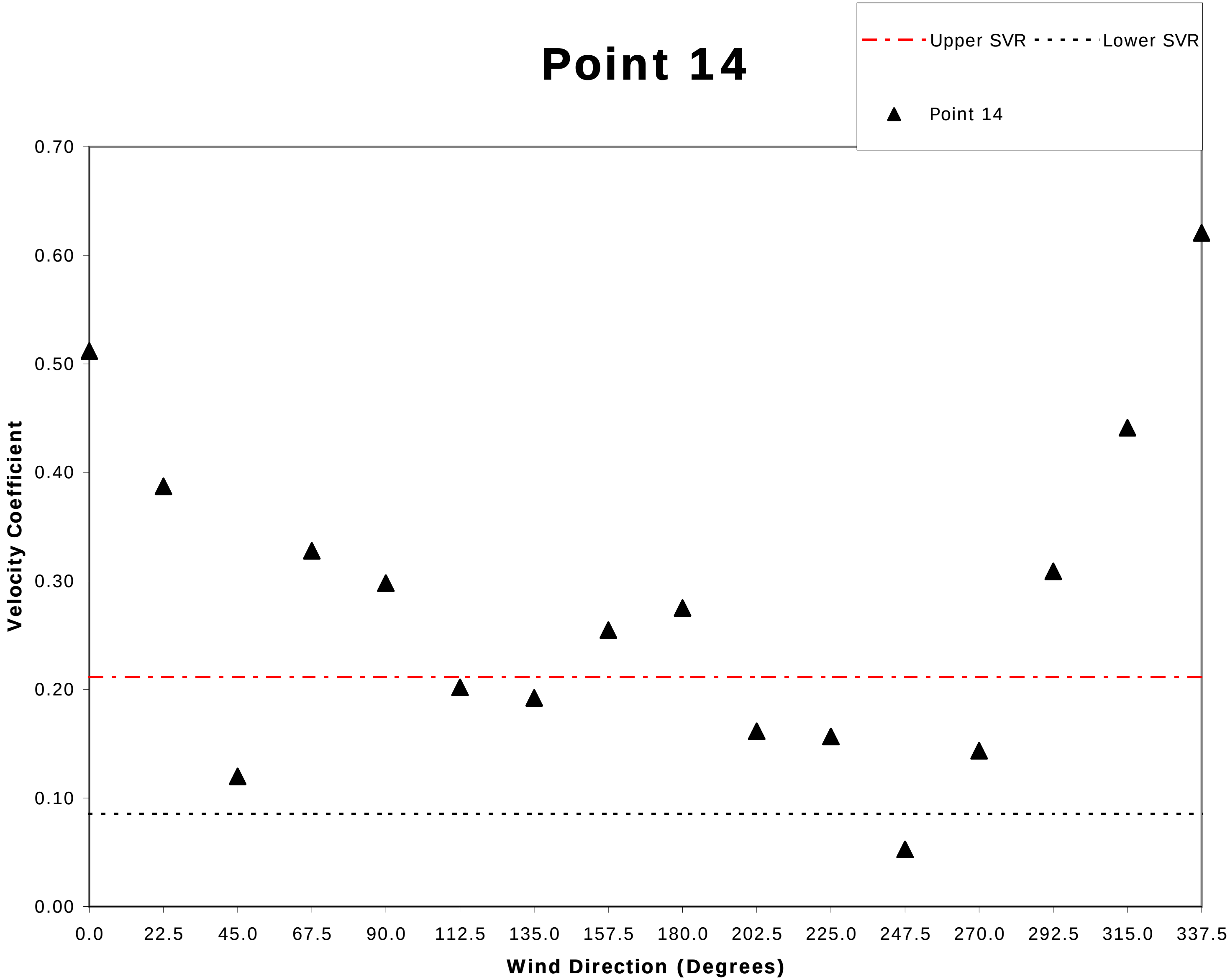


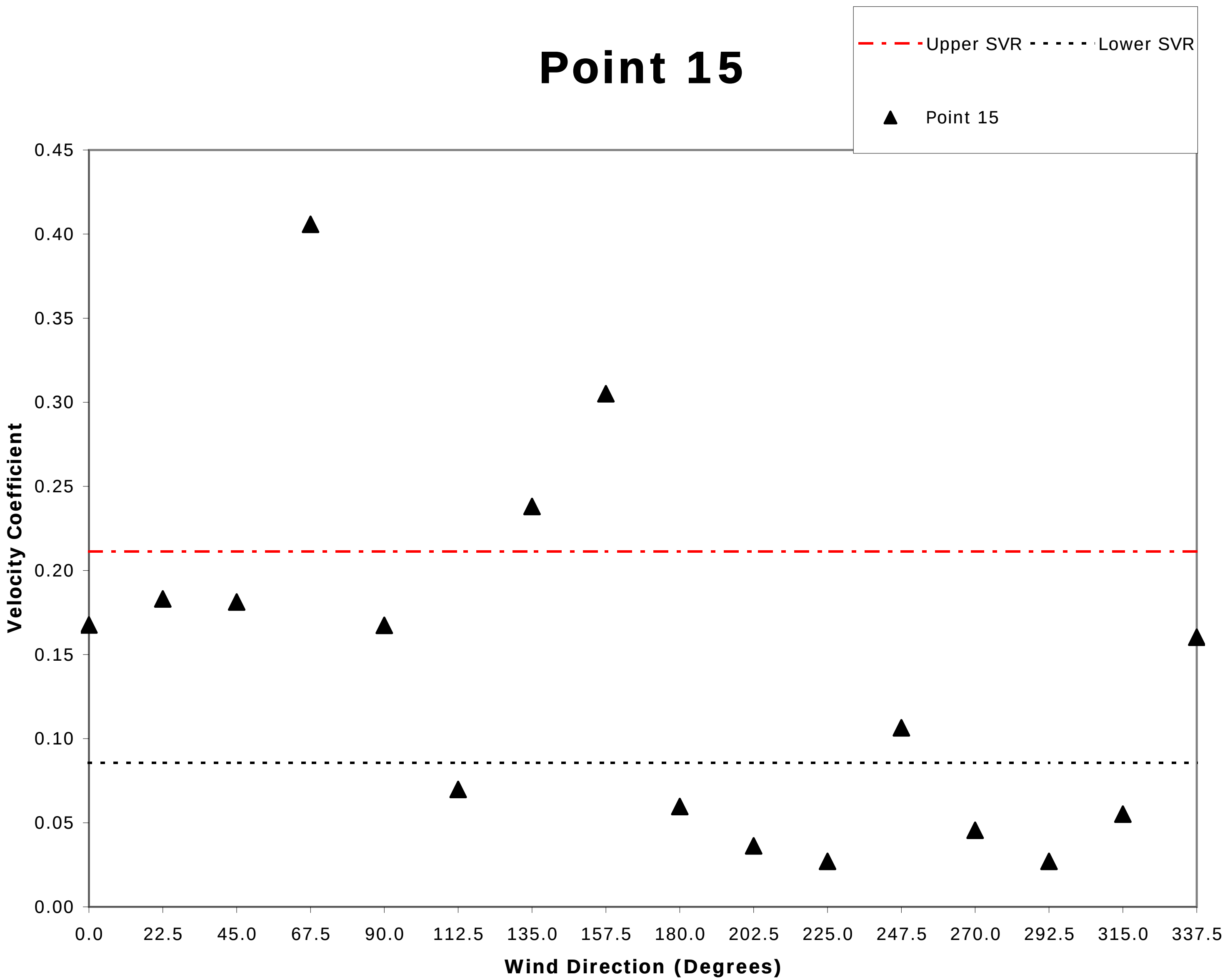
Point 11
Upper SVR
Lower SVR
Point 11
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



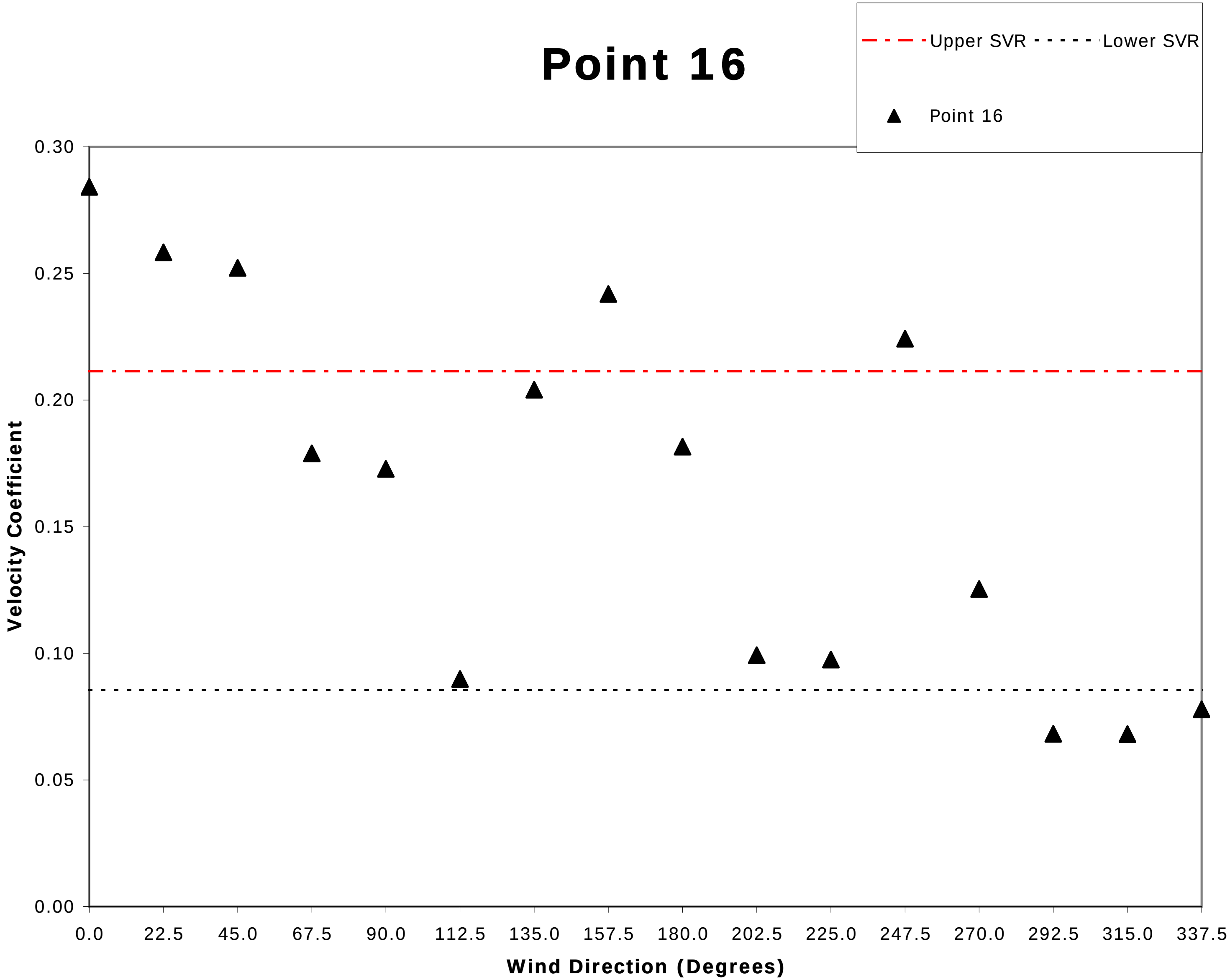
Point 12
Upper SVR
Lower SVR
Point 12
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

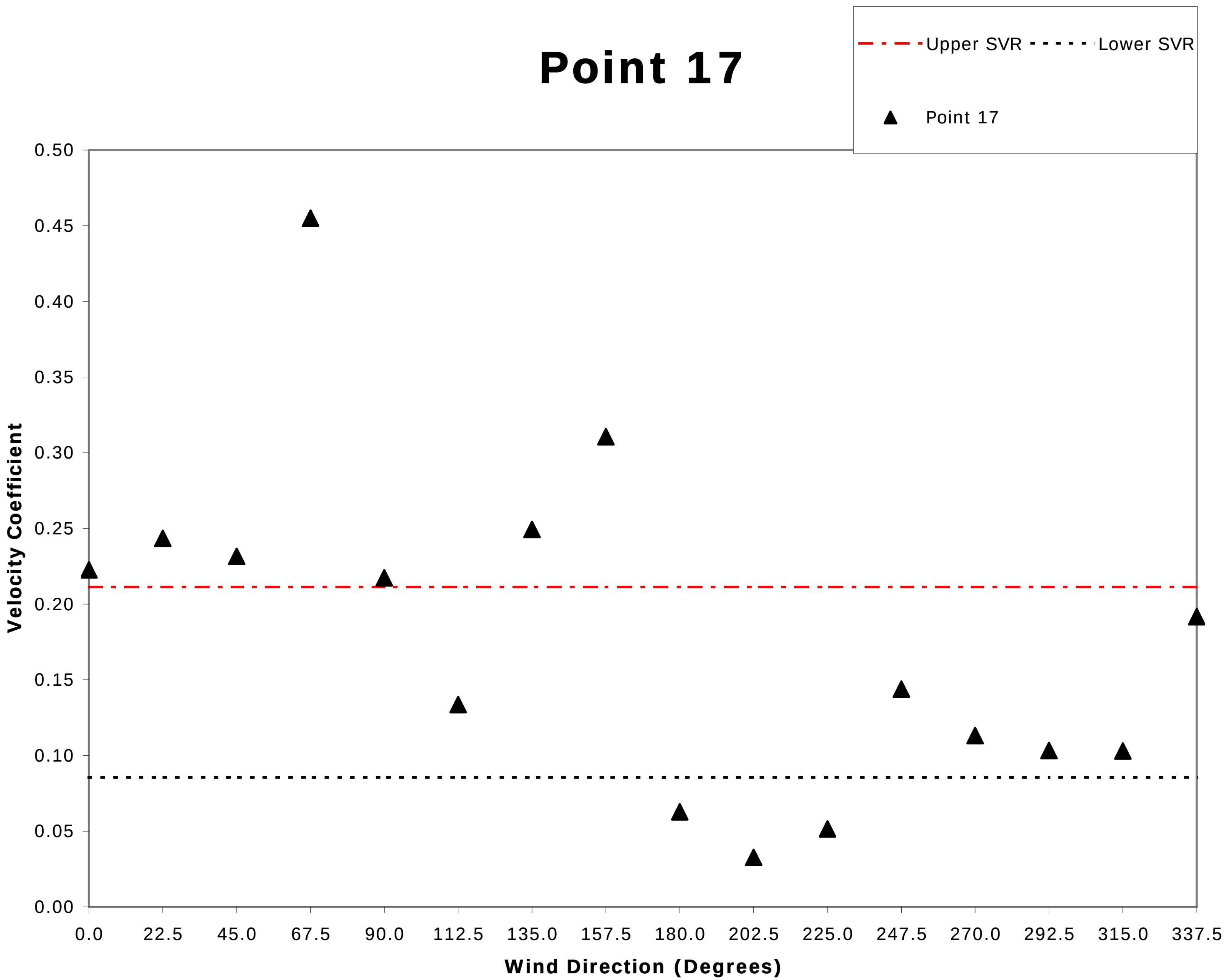

Point 13
Upper SVR
Lower SVR
Point 13
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

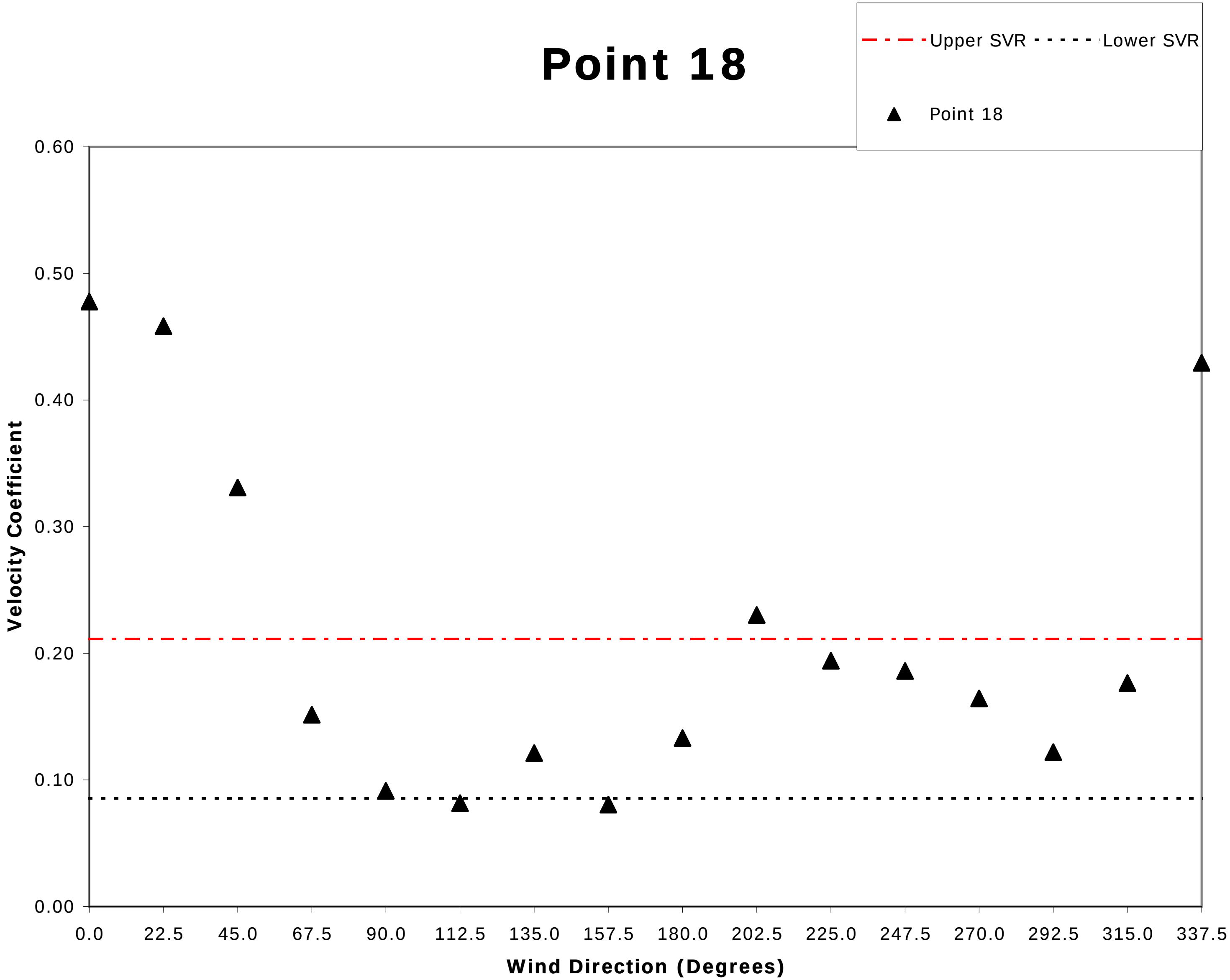

Point 14
Upper SVR
Lower SVR
Point 14
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



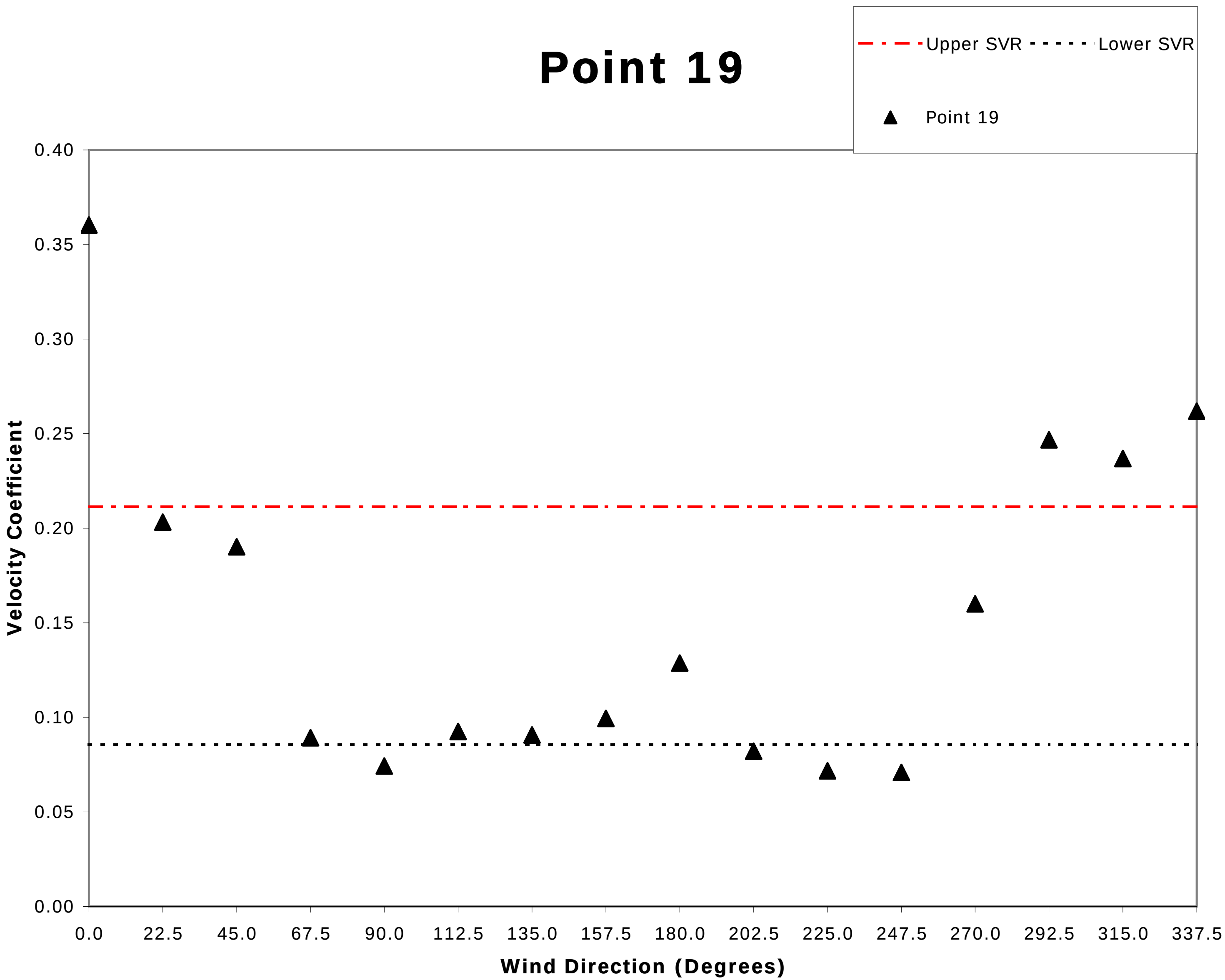
Point 15
Upper SVR
Lower SVR
Point 15
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

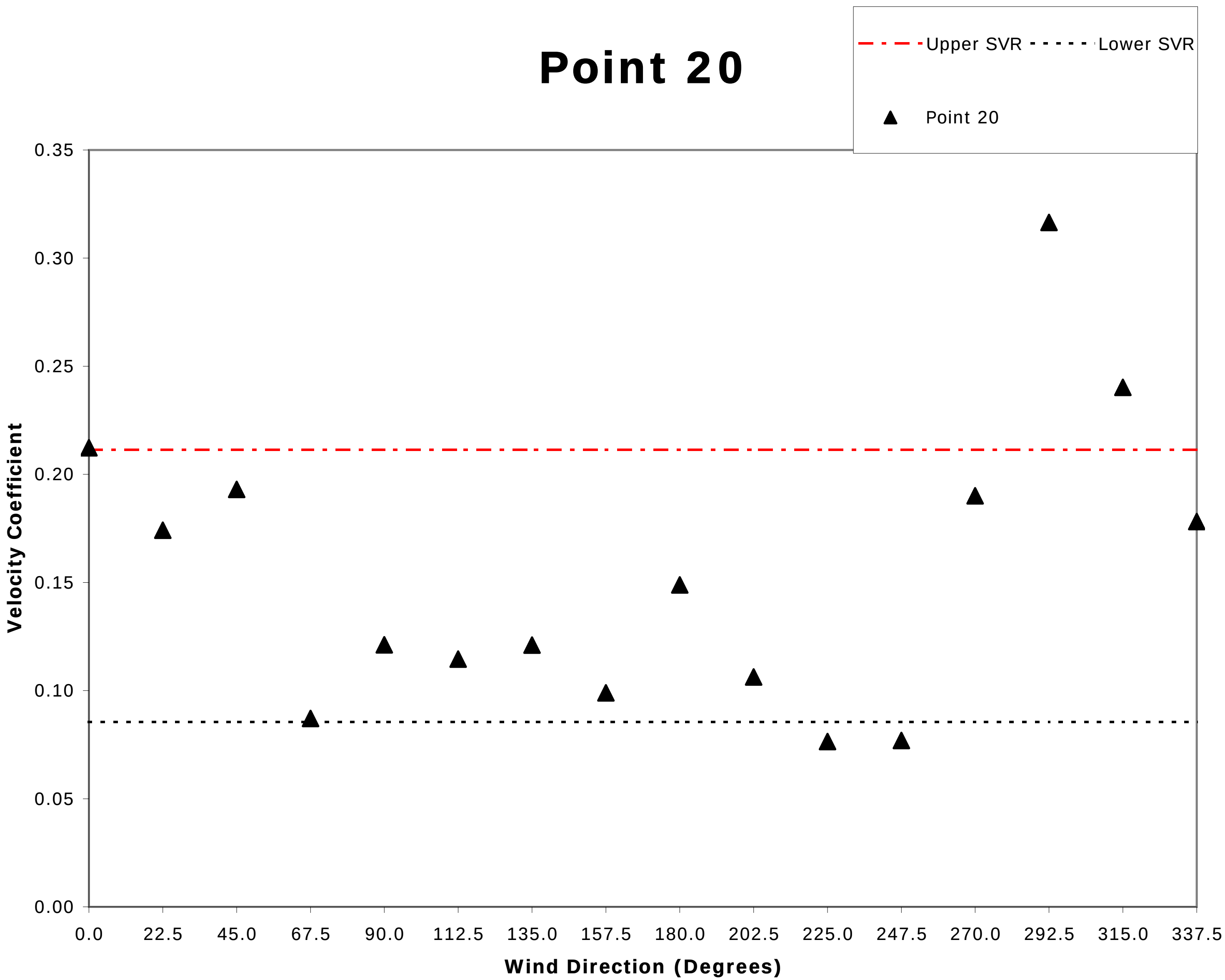

Point 16
Upper SVR
Lower SVR
Point 16
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

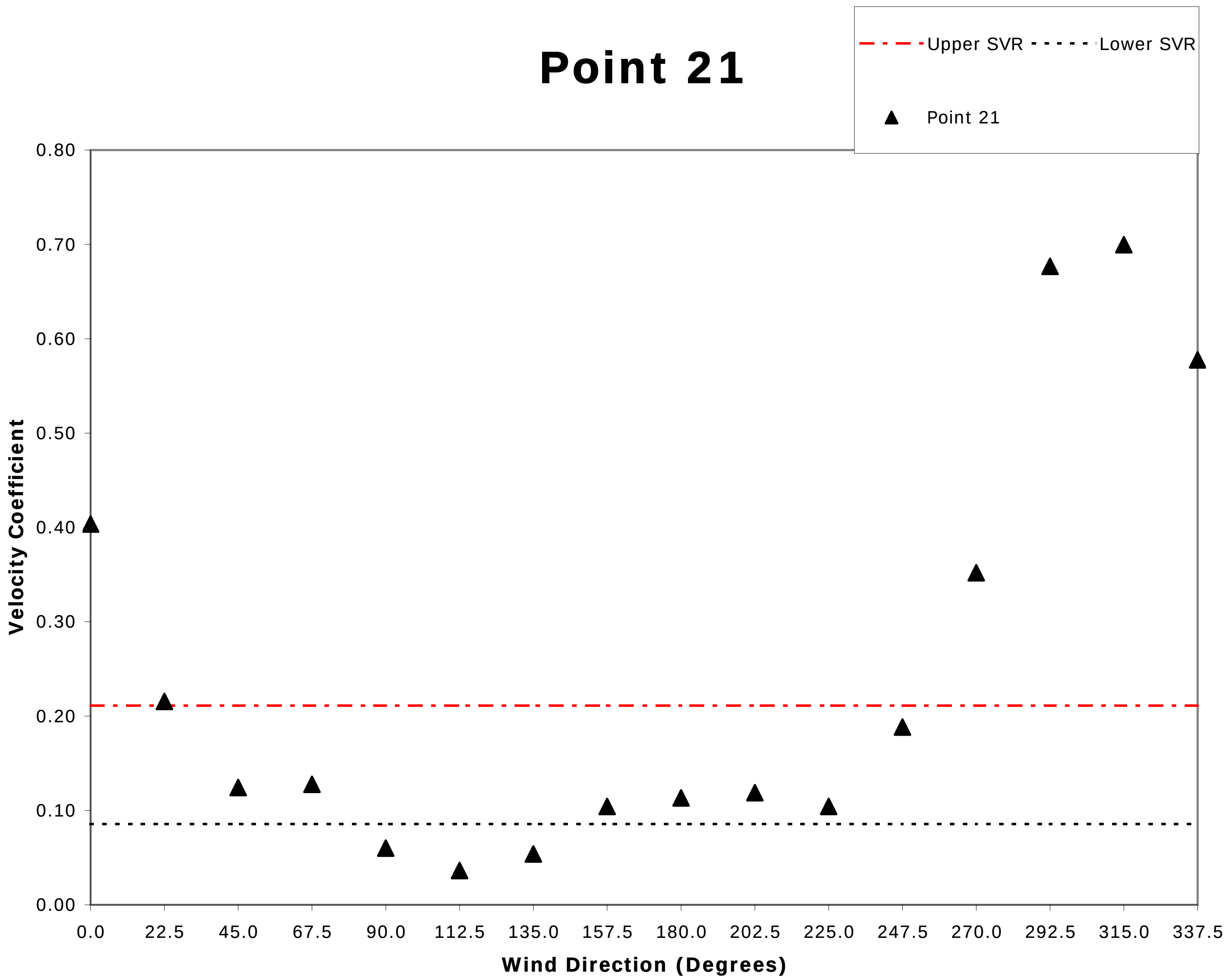

Point 17
Upper SVR
Lower SVR
Point 17
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

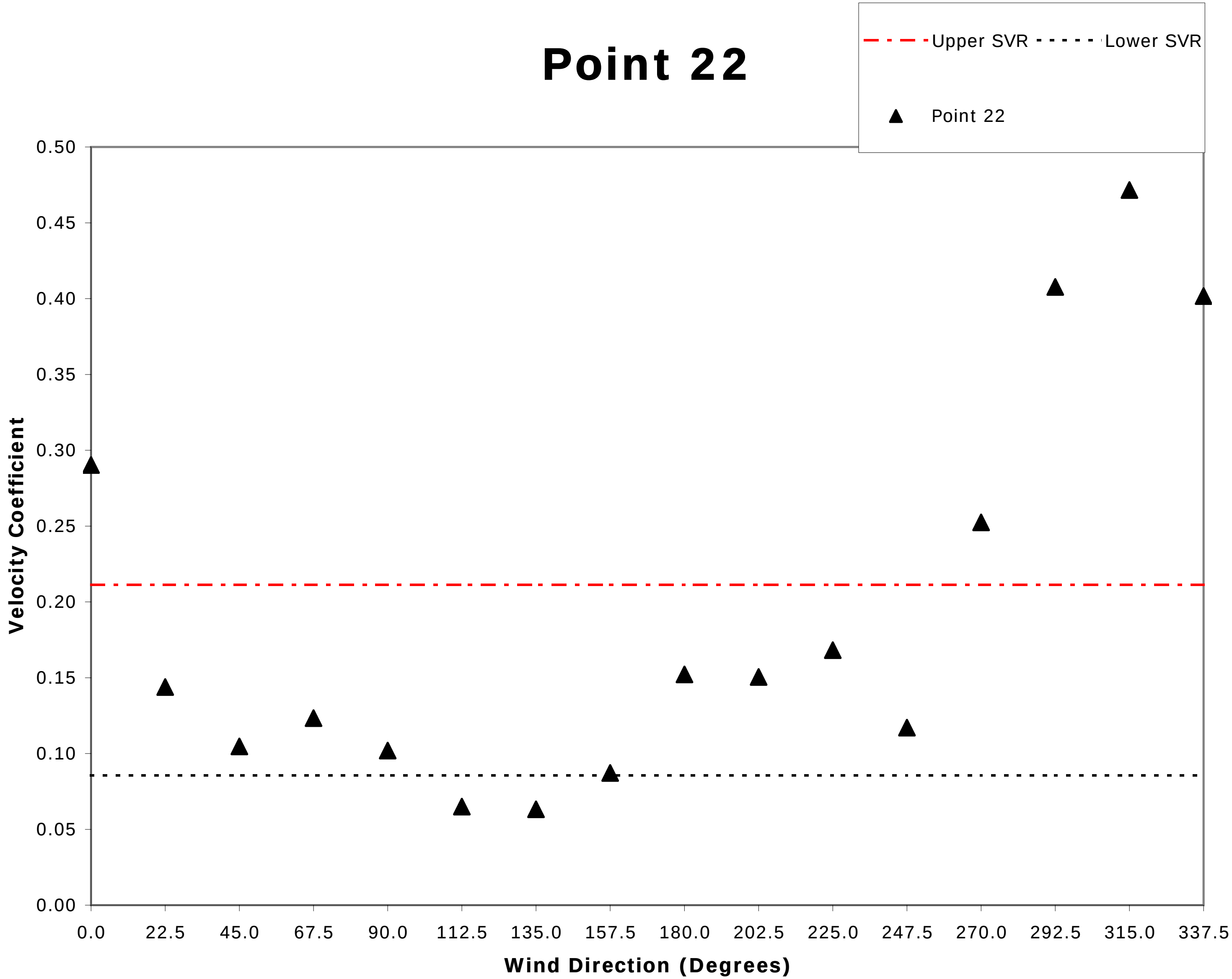


Point 18
Upper SVR
Lower SVR
Point 18
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

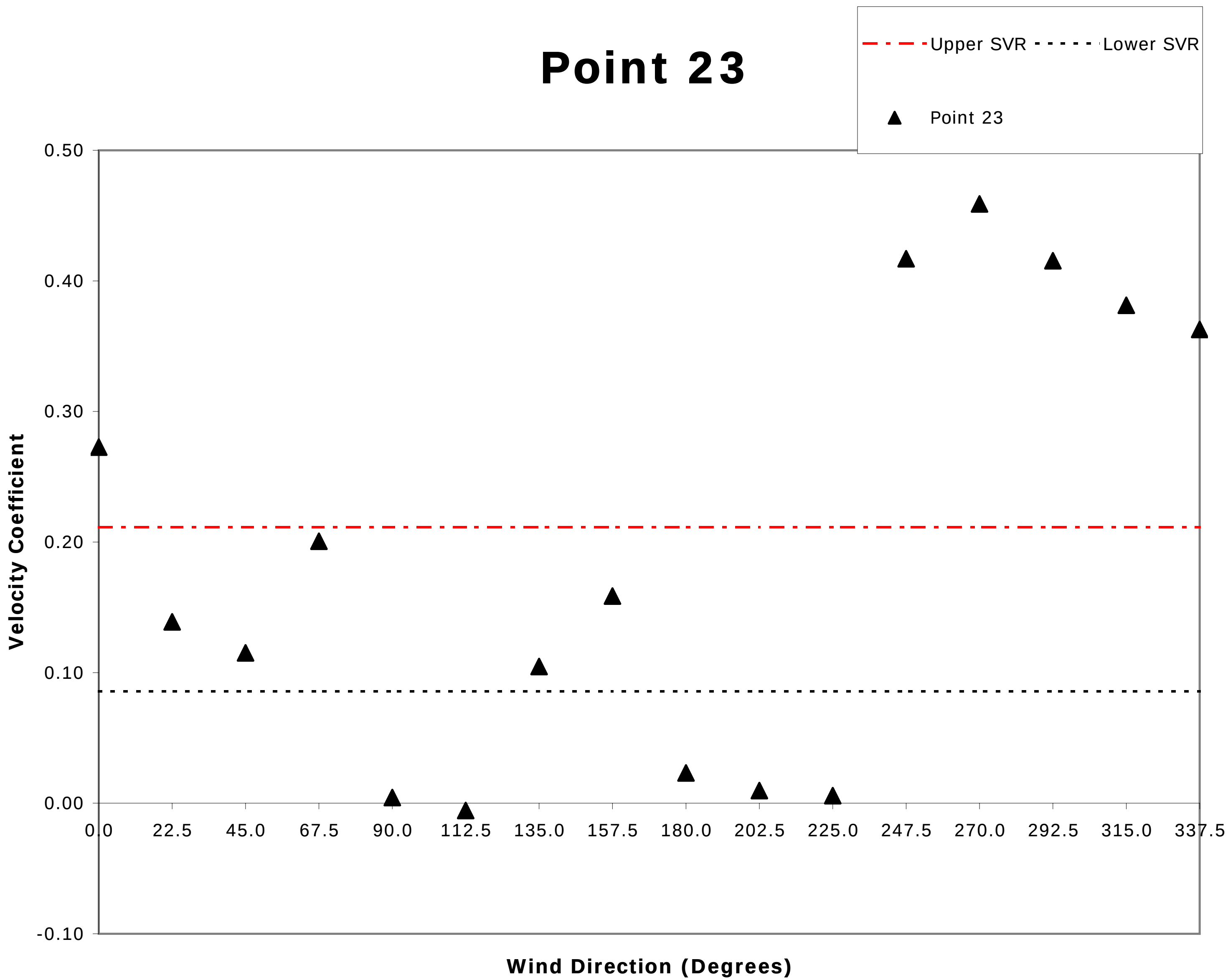

Point 19
Upper SVR
Lower SVR
Point 19
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

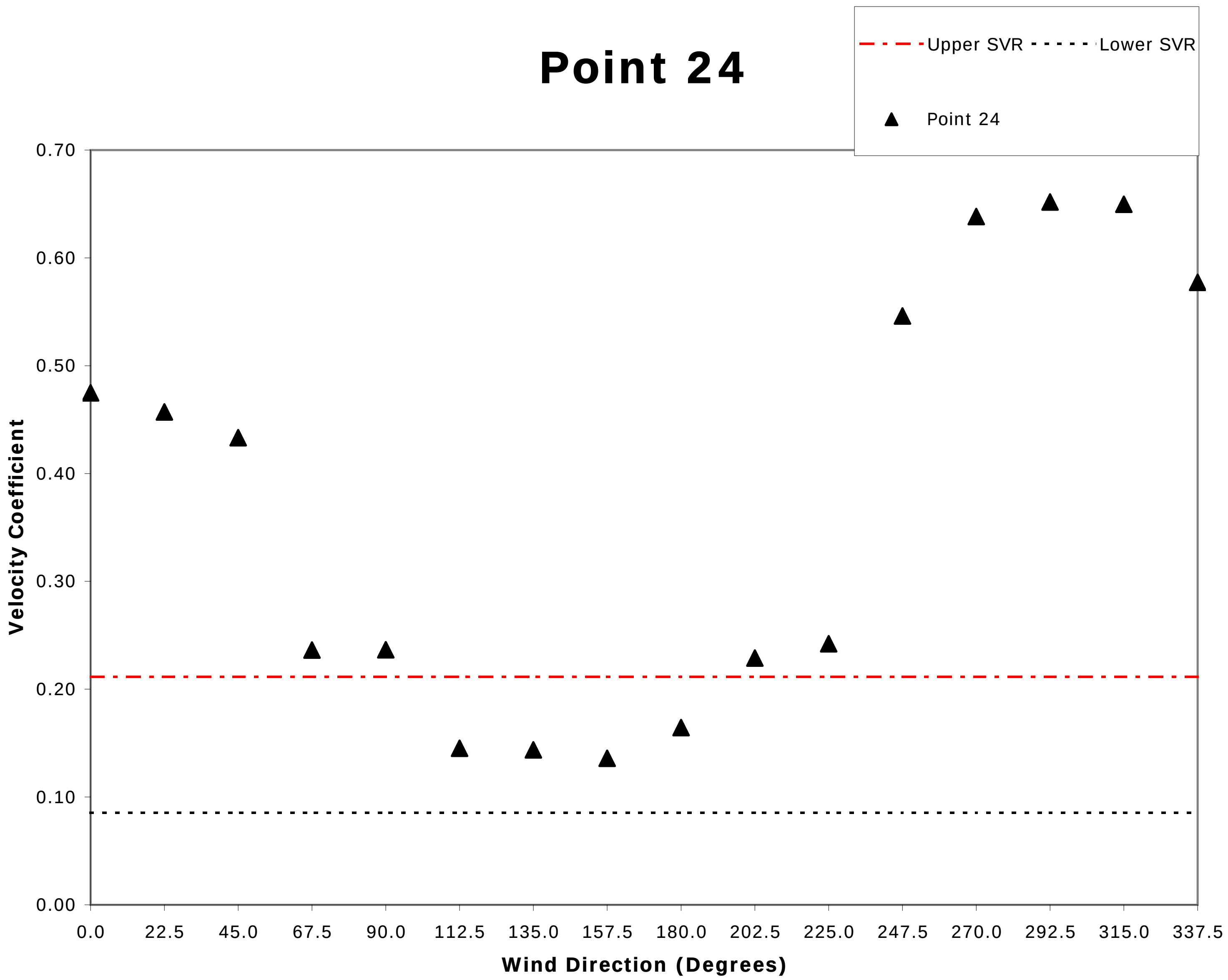

Point 20
Upper SVR
Lower SVR
Point 20
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 21
Upper SVR
Lower SVR
Point 21
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

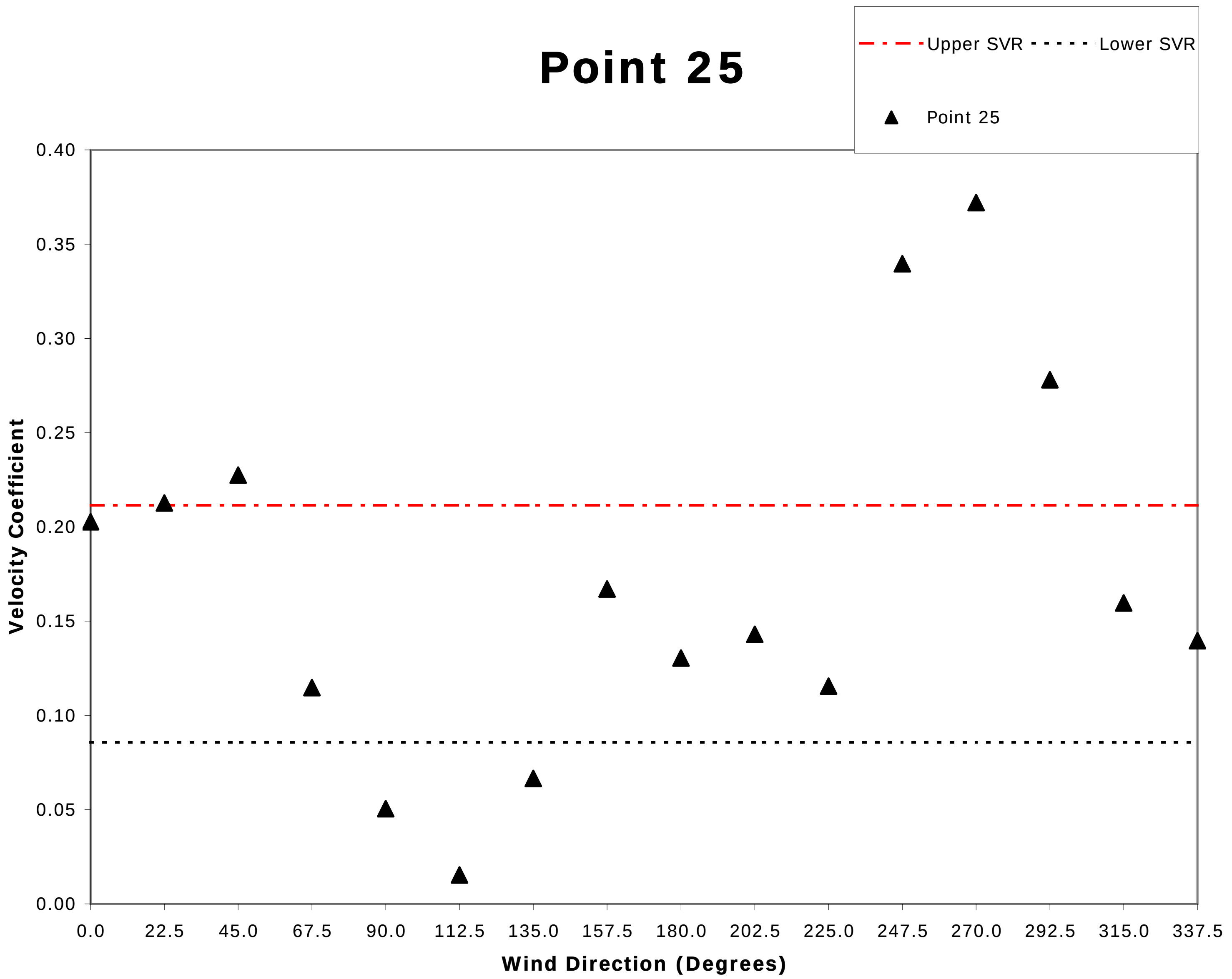


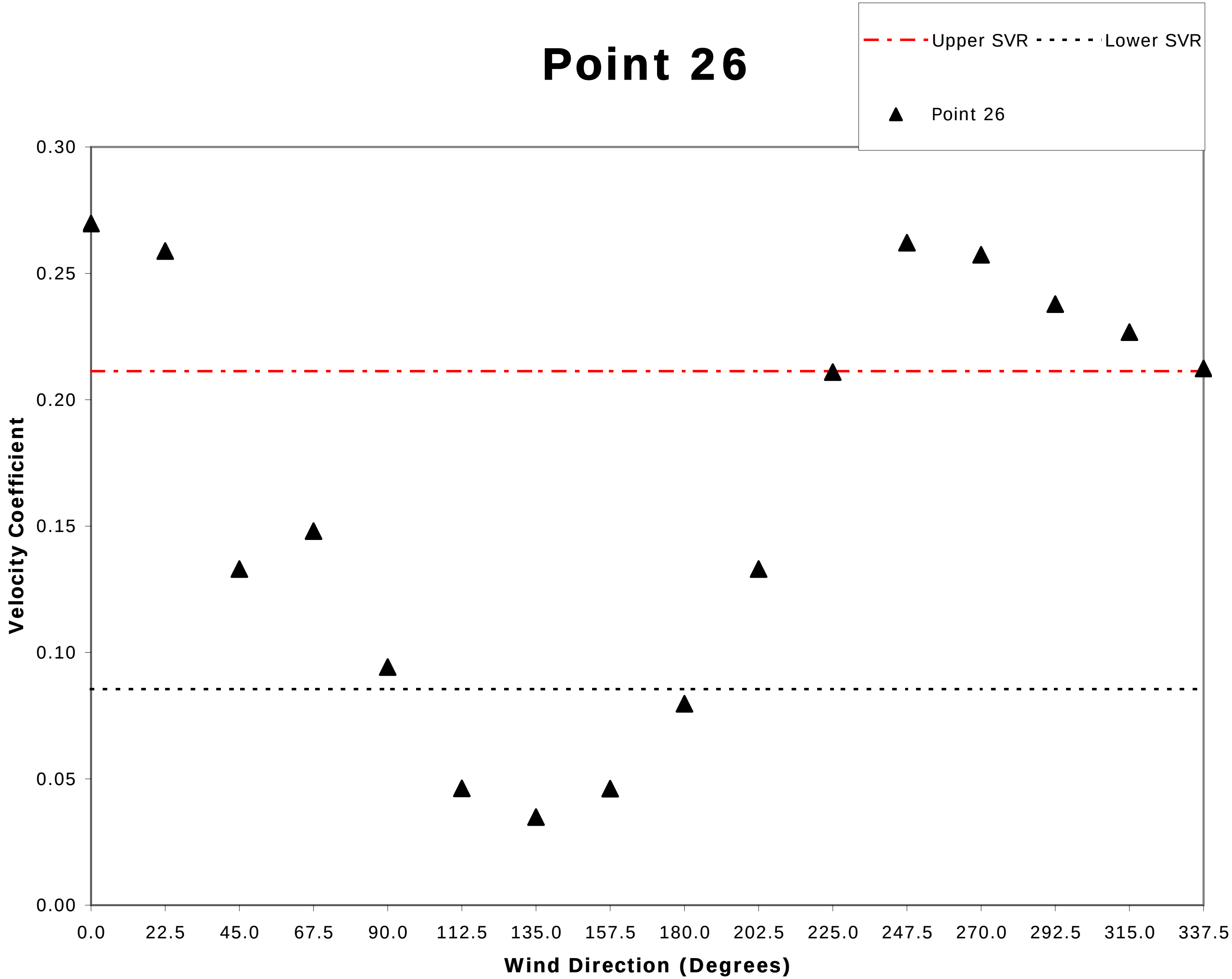
Point 22
Upper SVR
Lower SVR
Point 22
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 23
Upper SVR
Lower SVR
Point 23
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

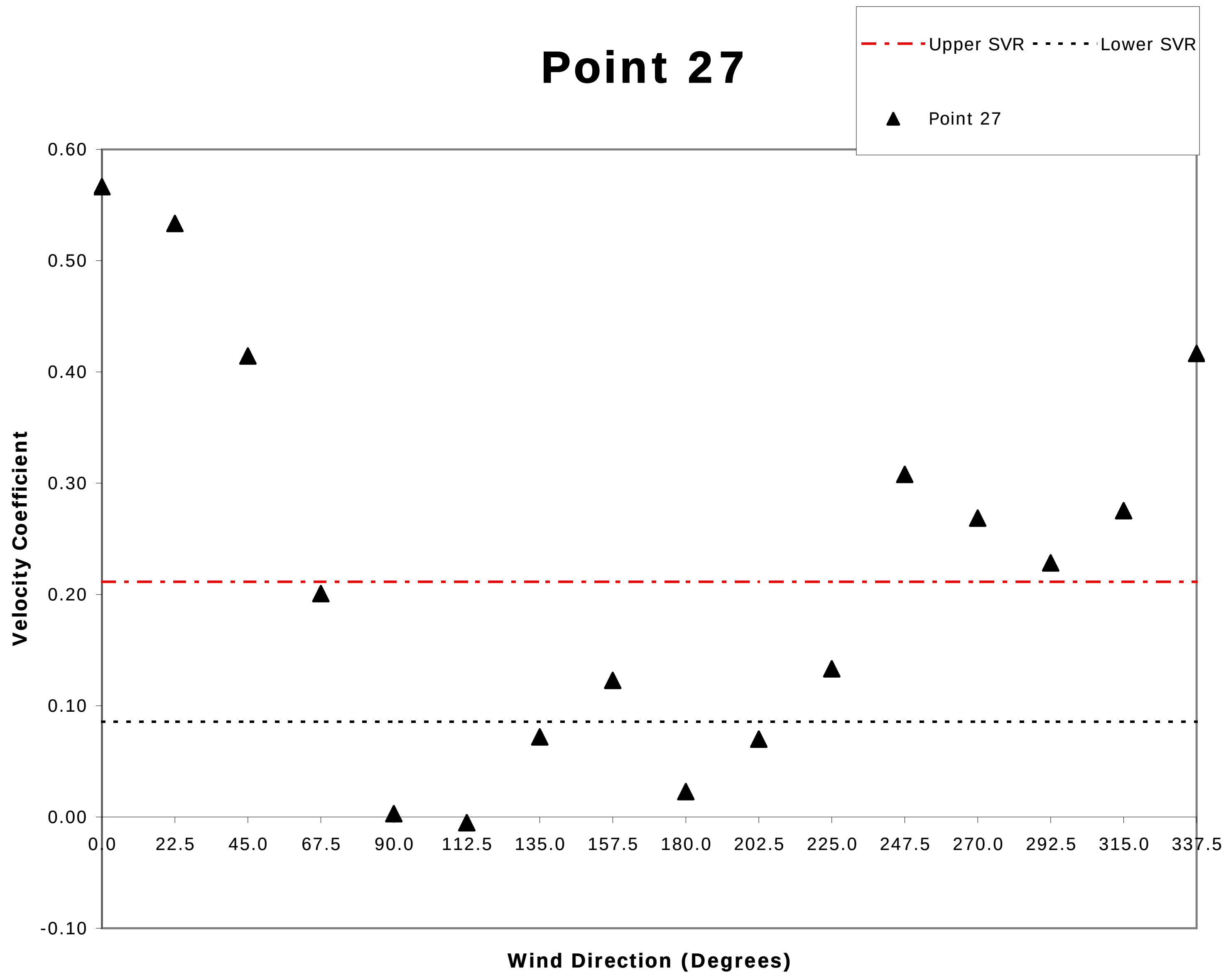


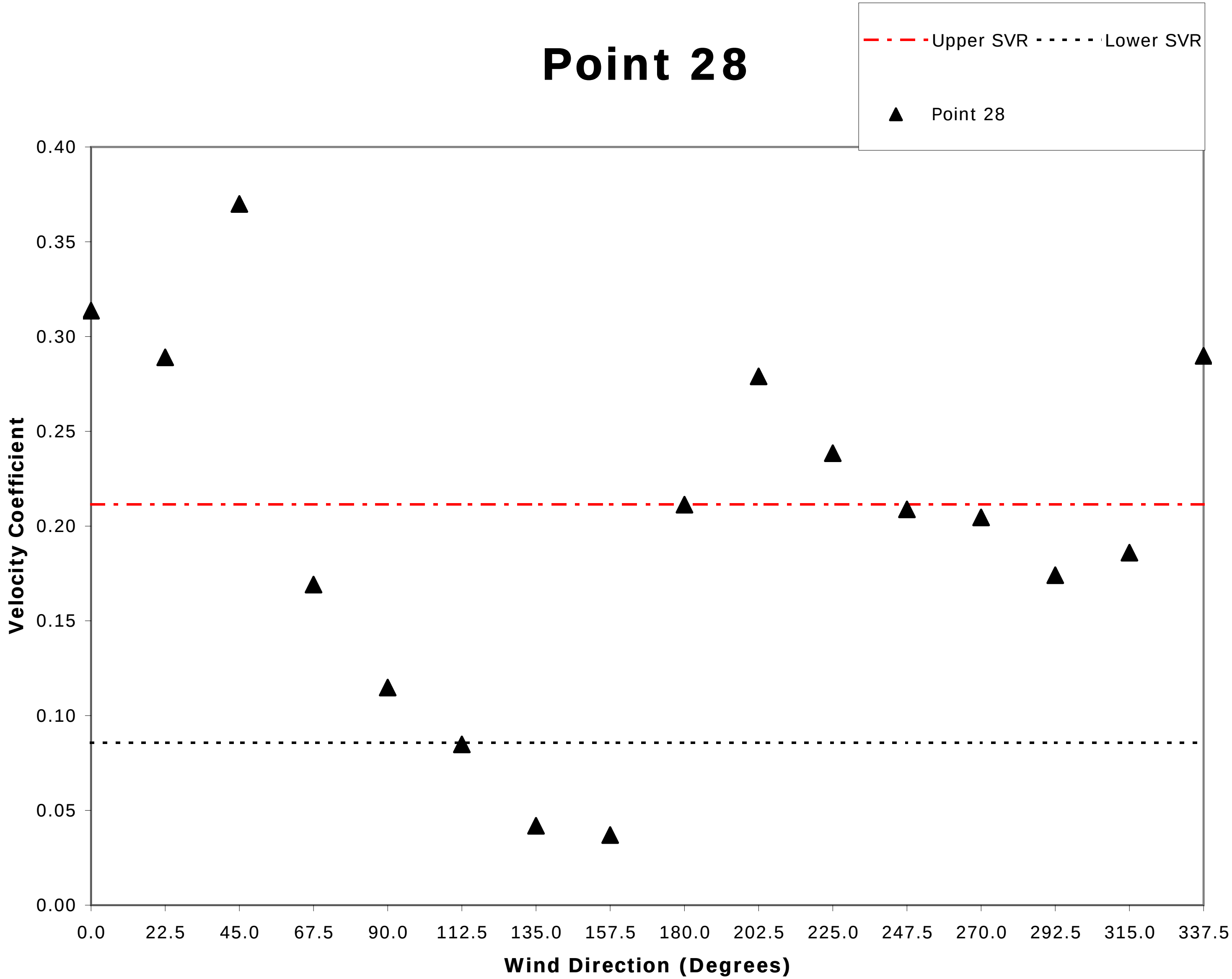
Point 24
Upper SVR
Lower SVR
Point 24
Velocity Coefficient
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 25
Upper SVR
Lower SVR
Point 25
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

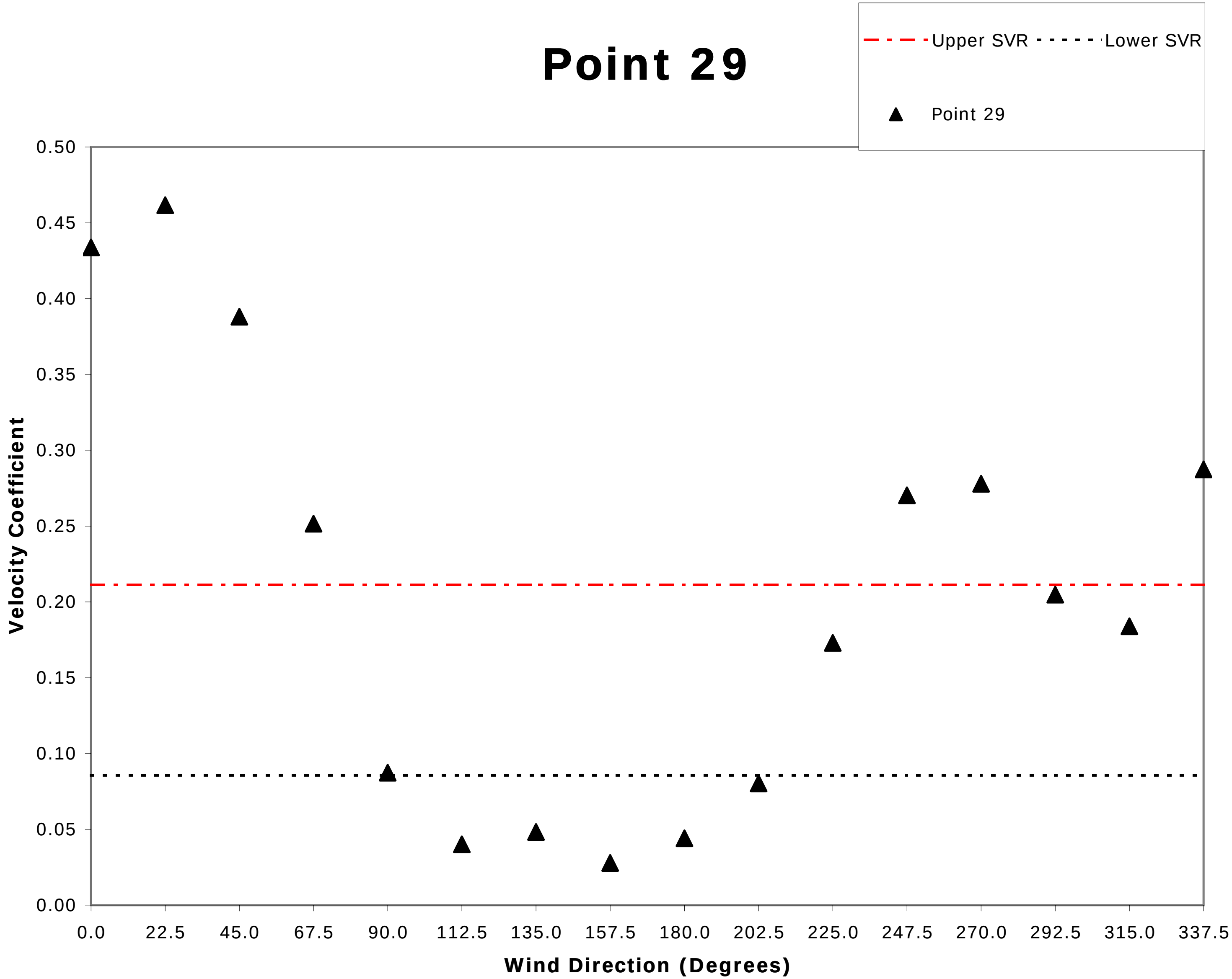


Point 26
Upper SVR
Lower SVR
Point 26
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

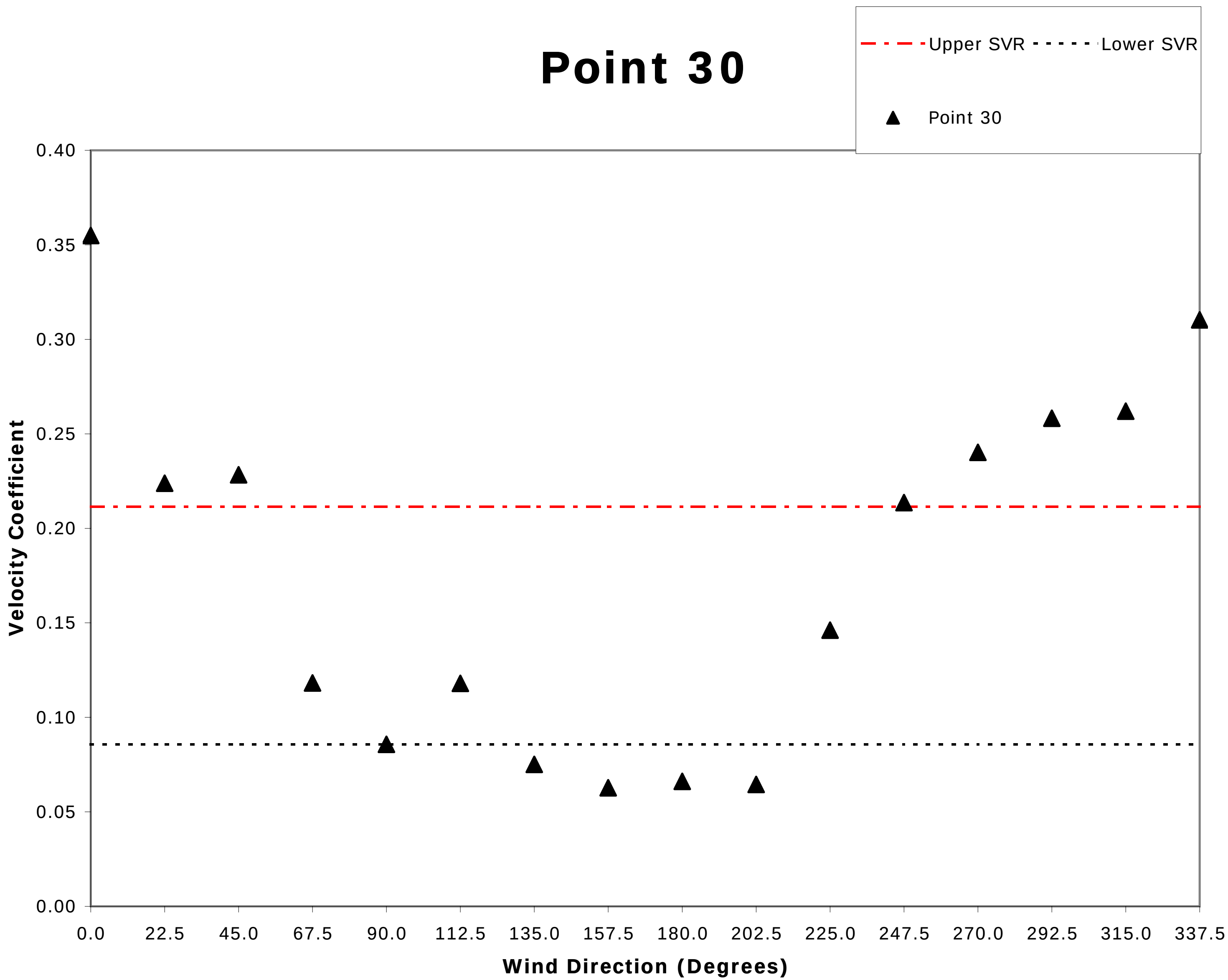

Point 27
Upper SVR
Lower SVR
Point 27
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

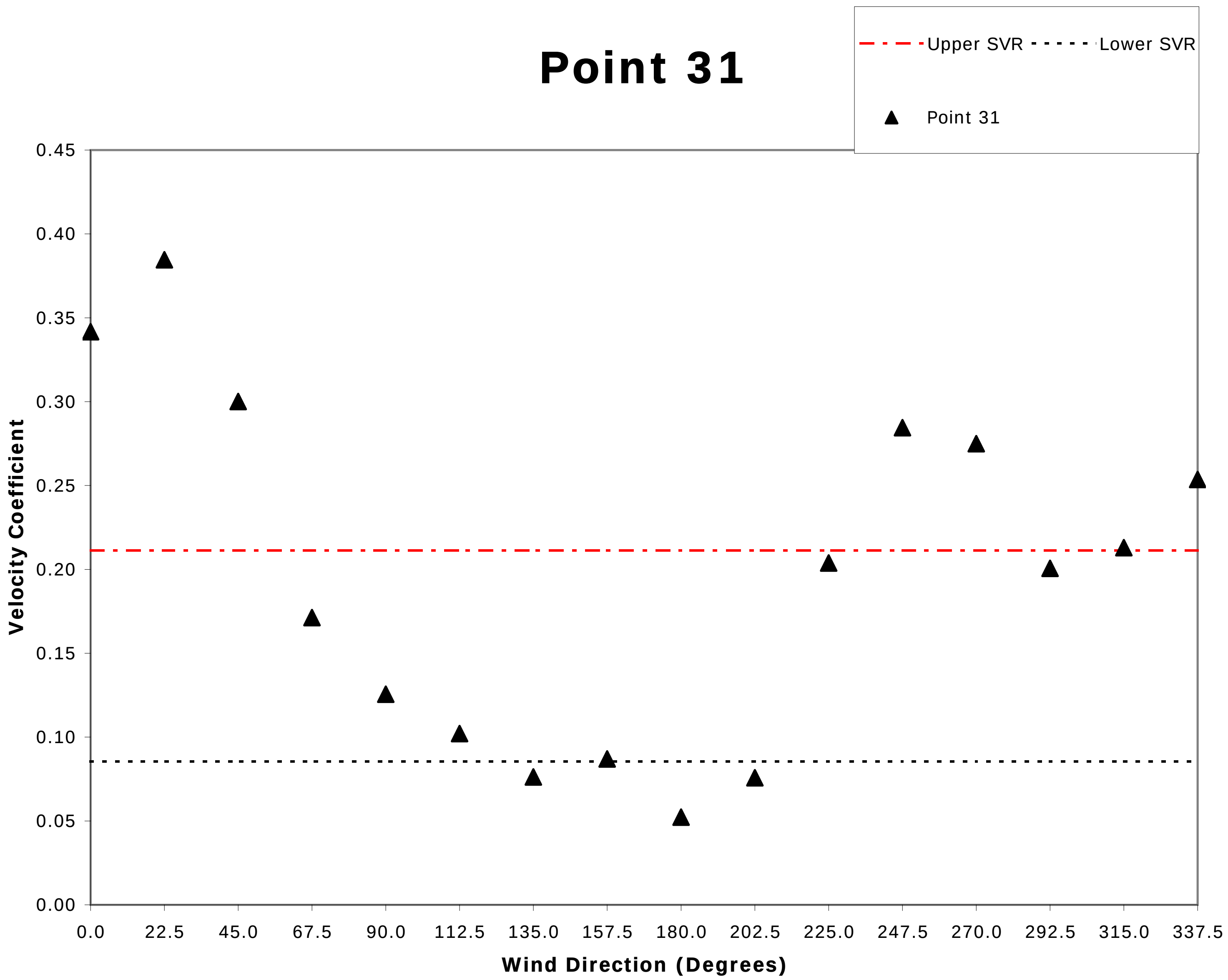


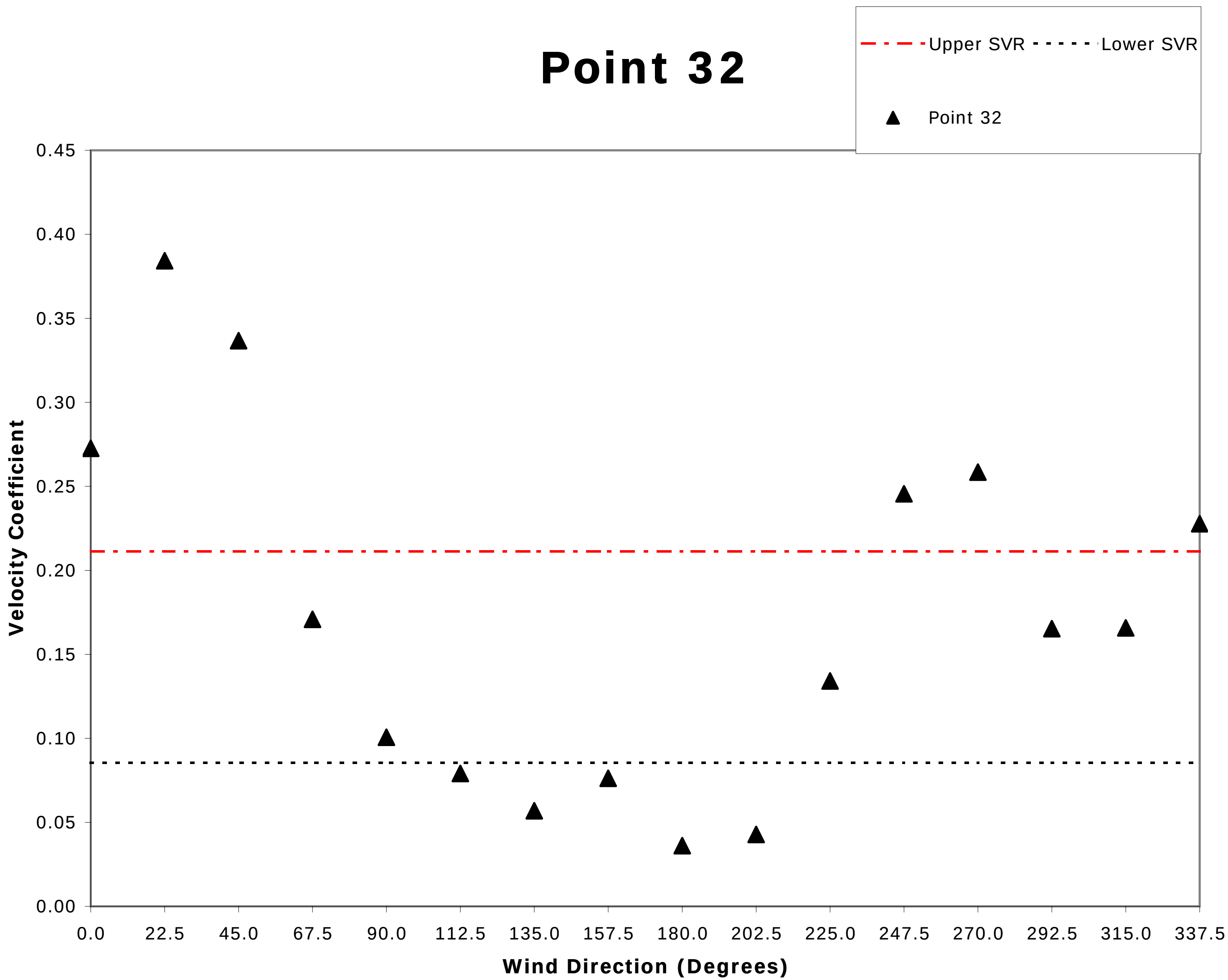
Point 28
Upper SVR
Lower SVR
Point 28
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



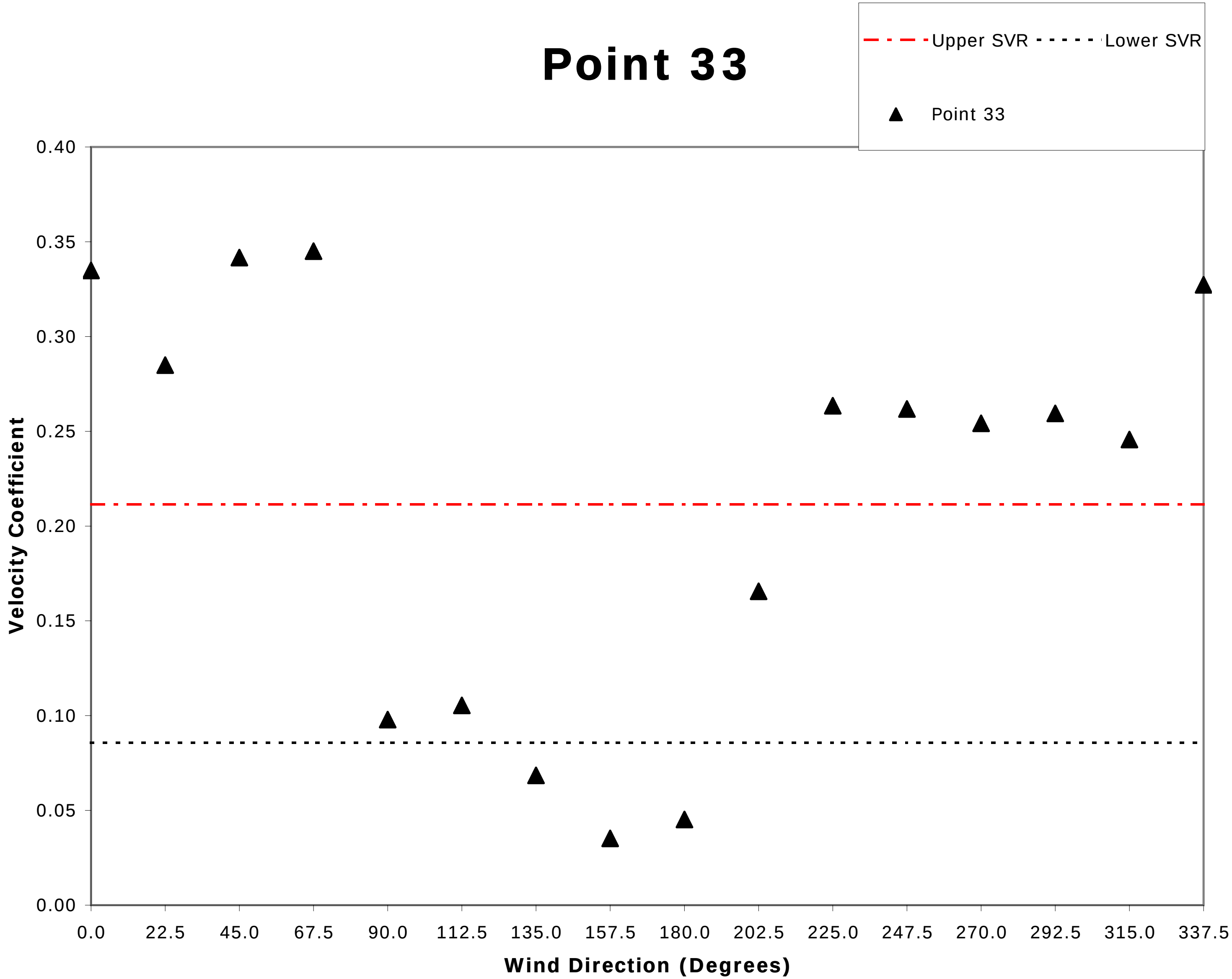
Point 29
Upper SVR
Lower SVR
Point 29
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

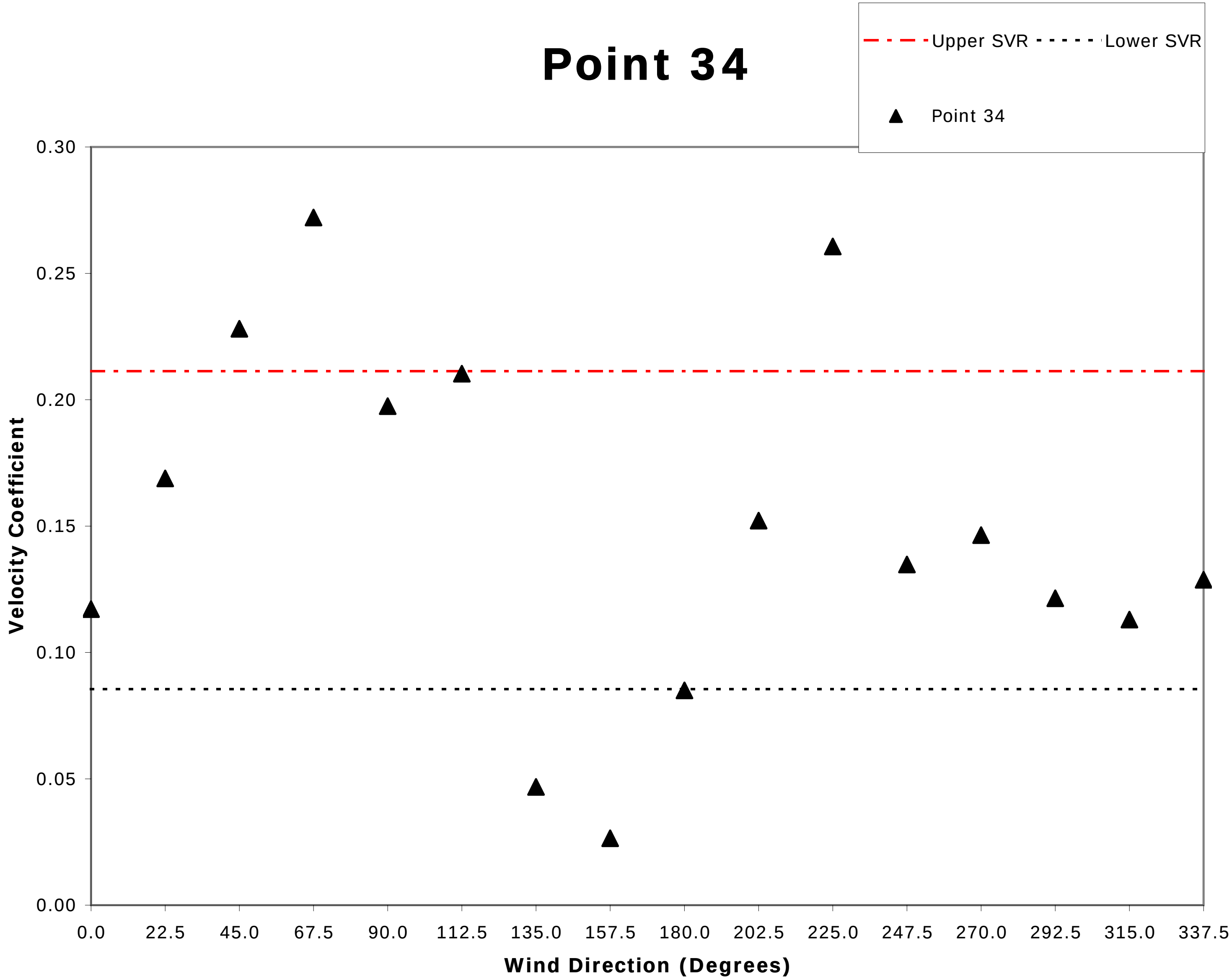

Point 30
Upper SVR
Lower SVR
Point 30
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 31
Upper SVR
Lower SVR
Point 31
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

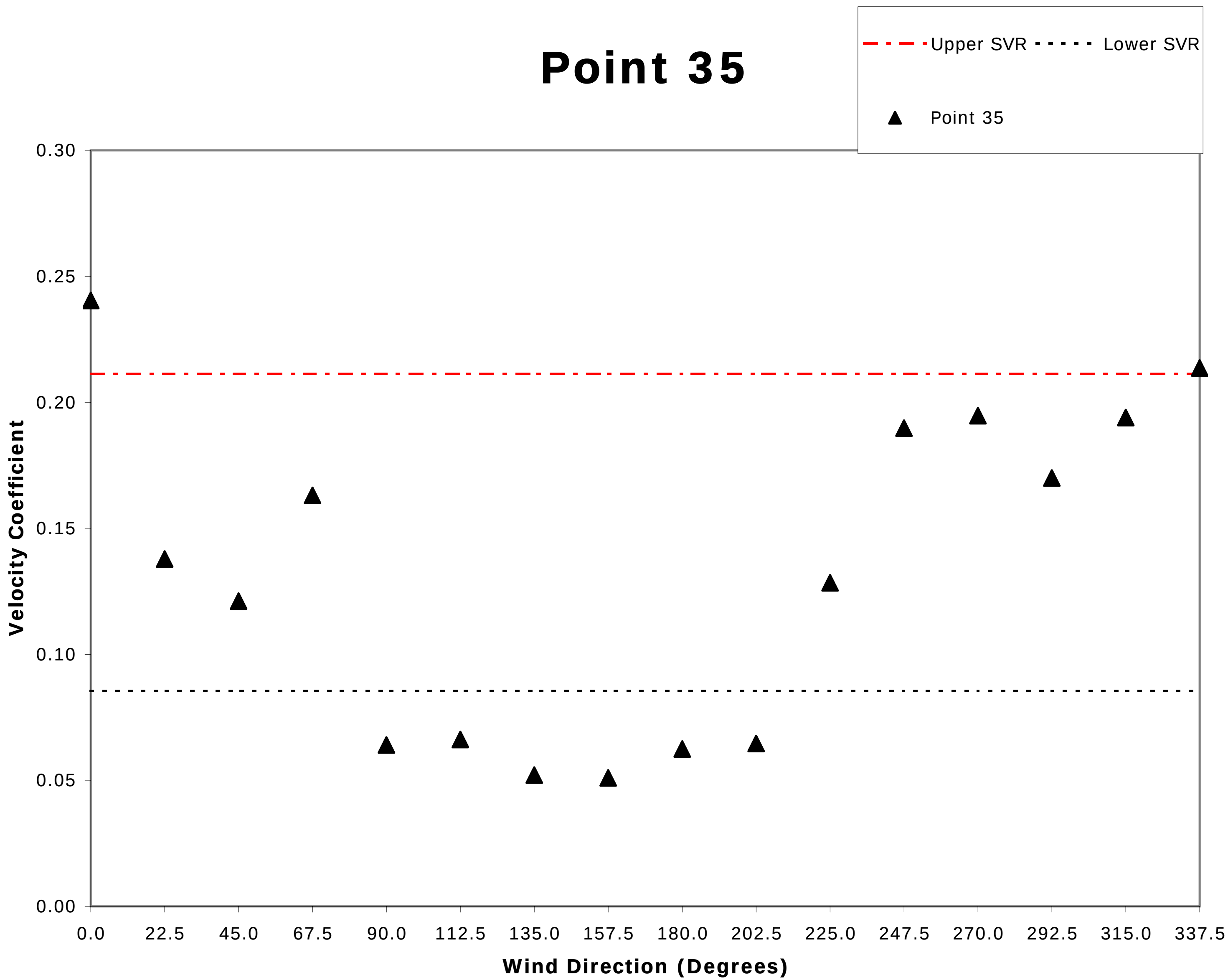


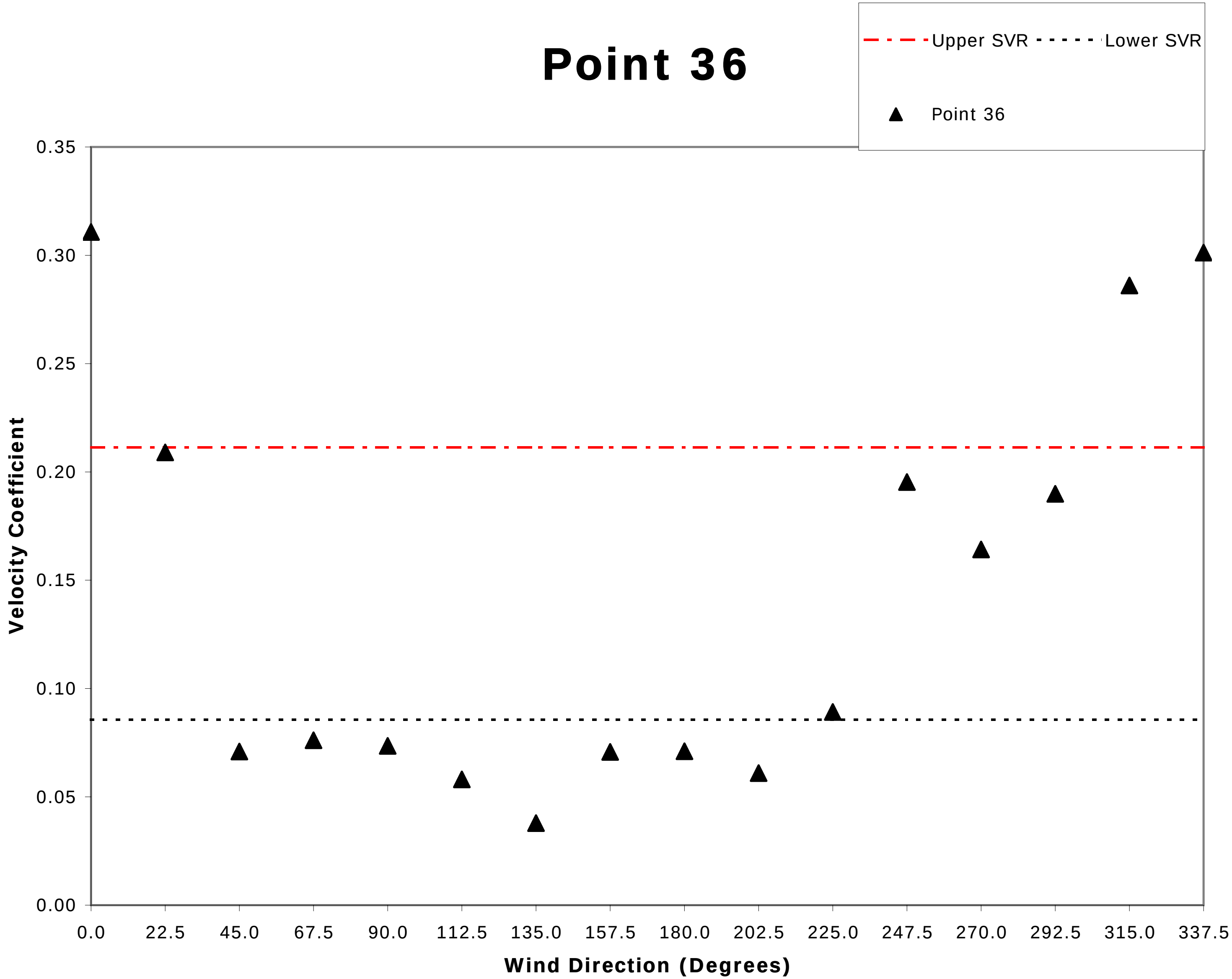
Point 32
Upper SVR
Lower SVR
Point 32
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 33
Upper SVR
Lower SVR
Point 33
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

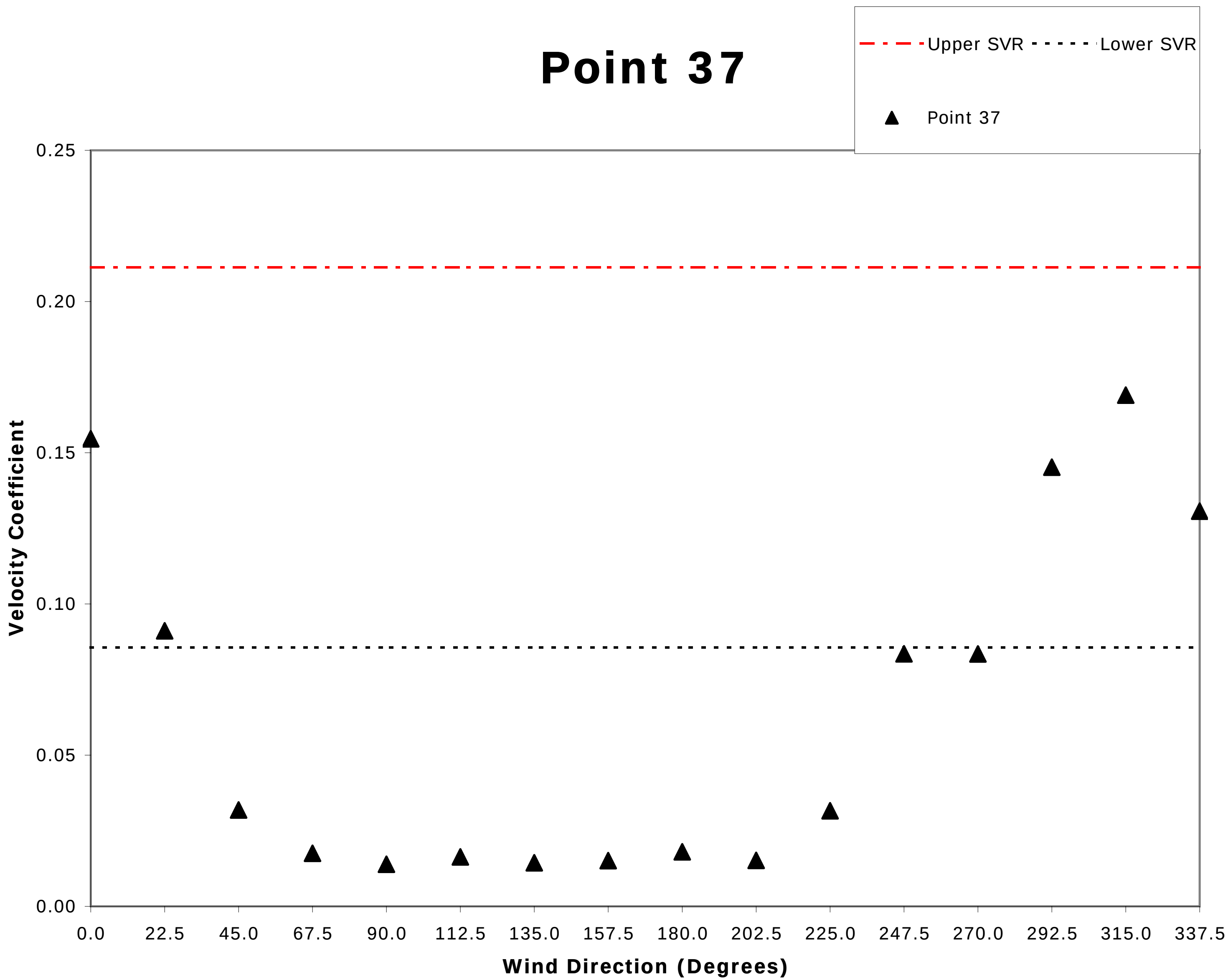


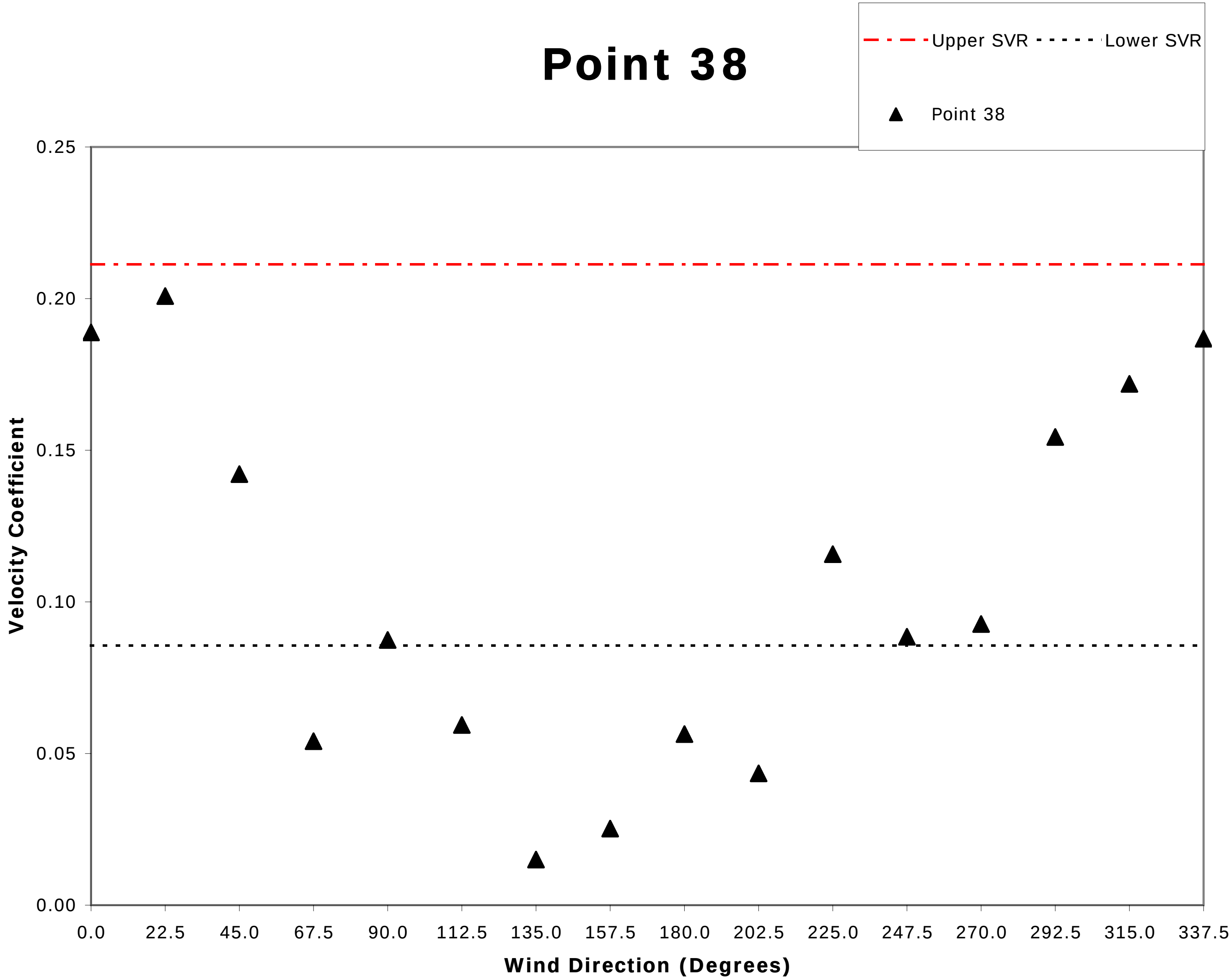
Point 34
Upper SVR
Lower SVR
Point 34
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 35
Upper SVR
Lower SVR
Point 35
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

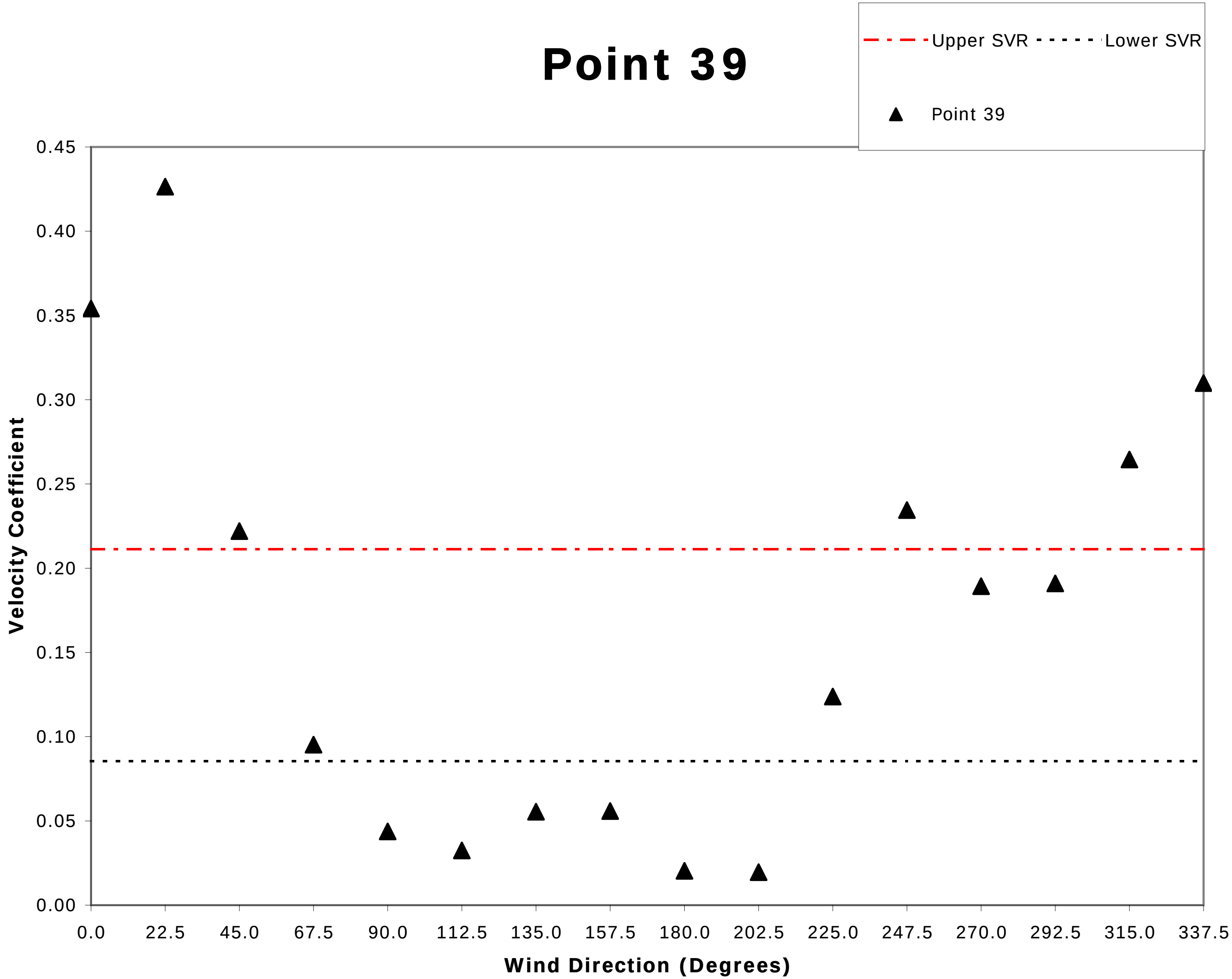


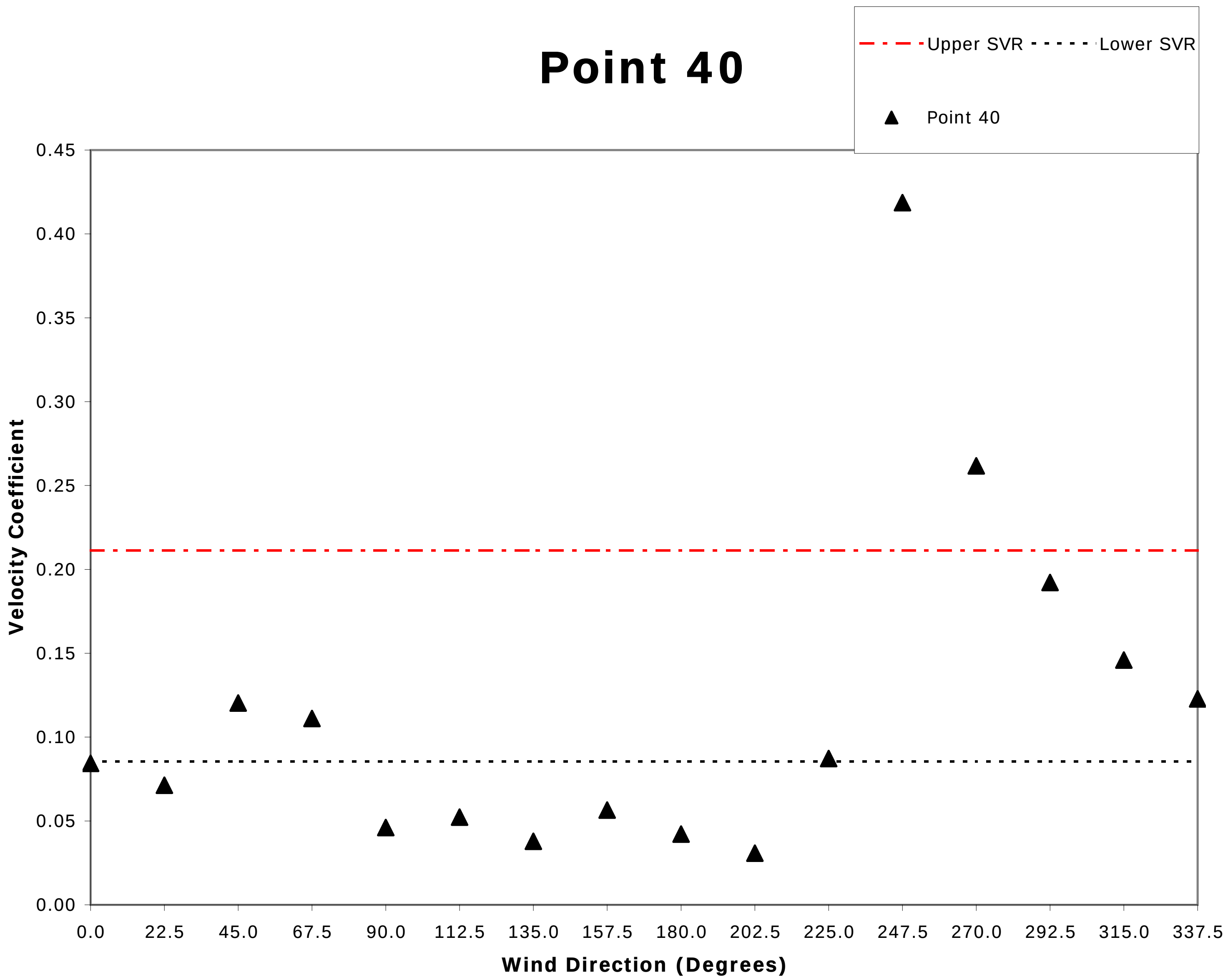
Point 36
Upper SVR
Lower SVR
Point 36
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

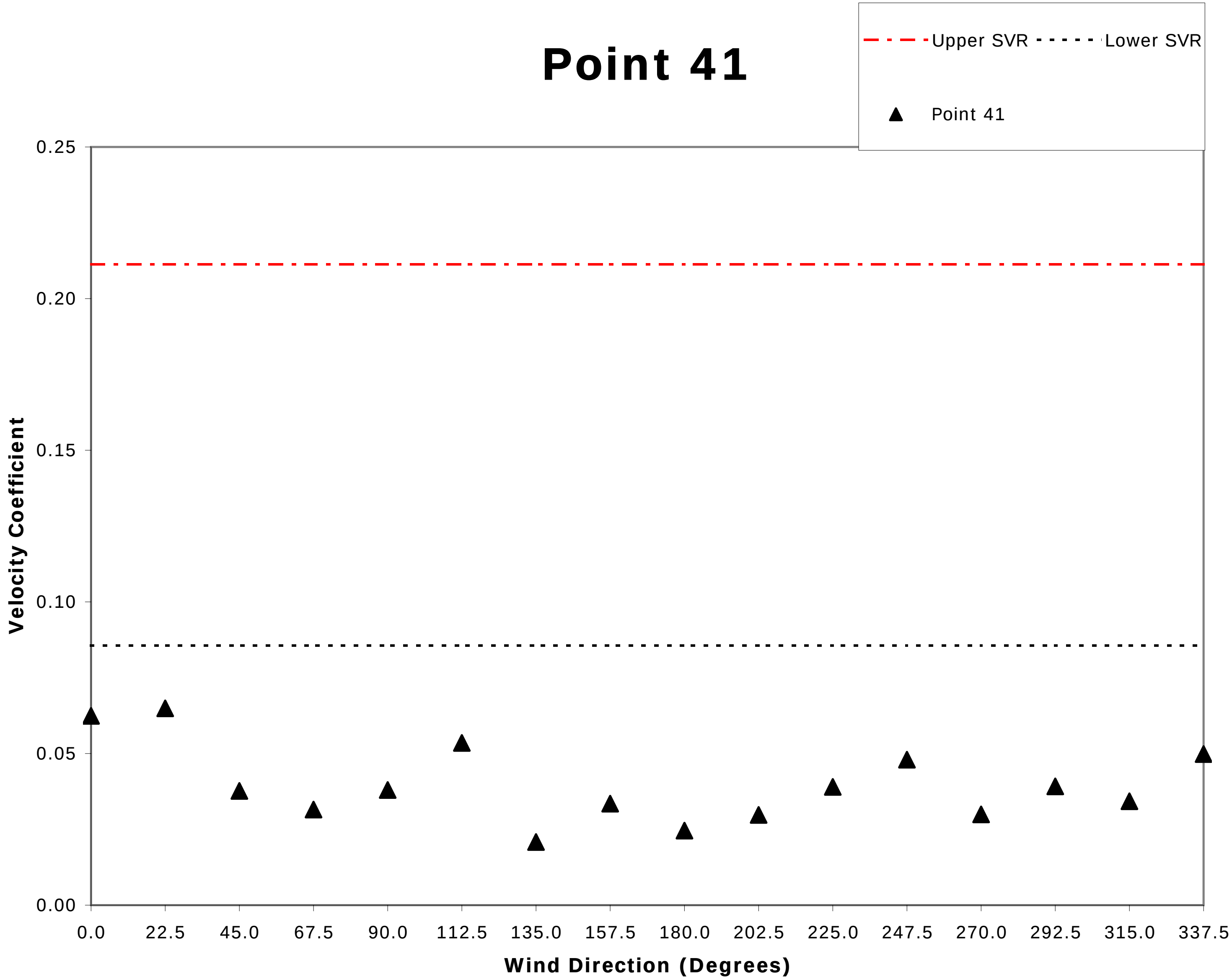

Point 37
Upper SVR
Lower SVR
Point 37
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



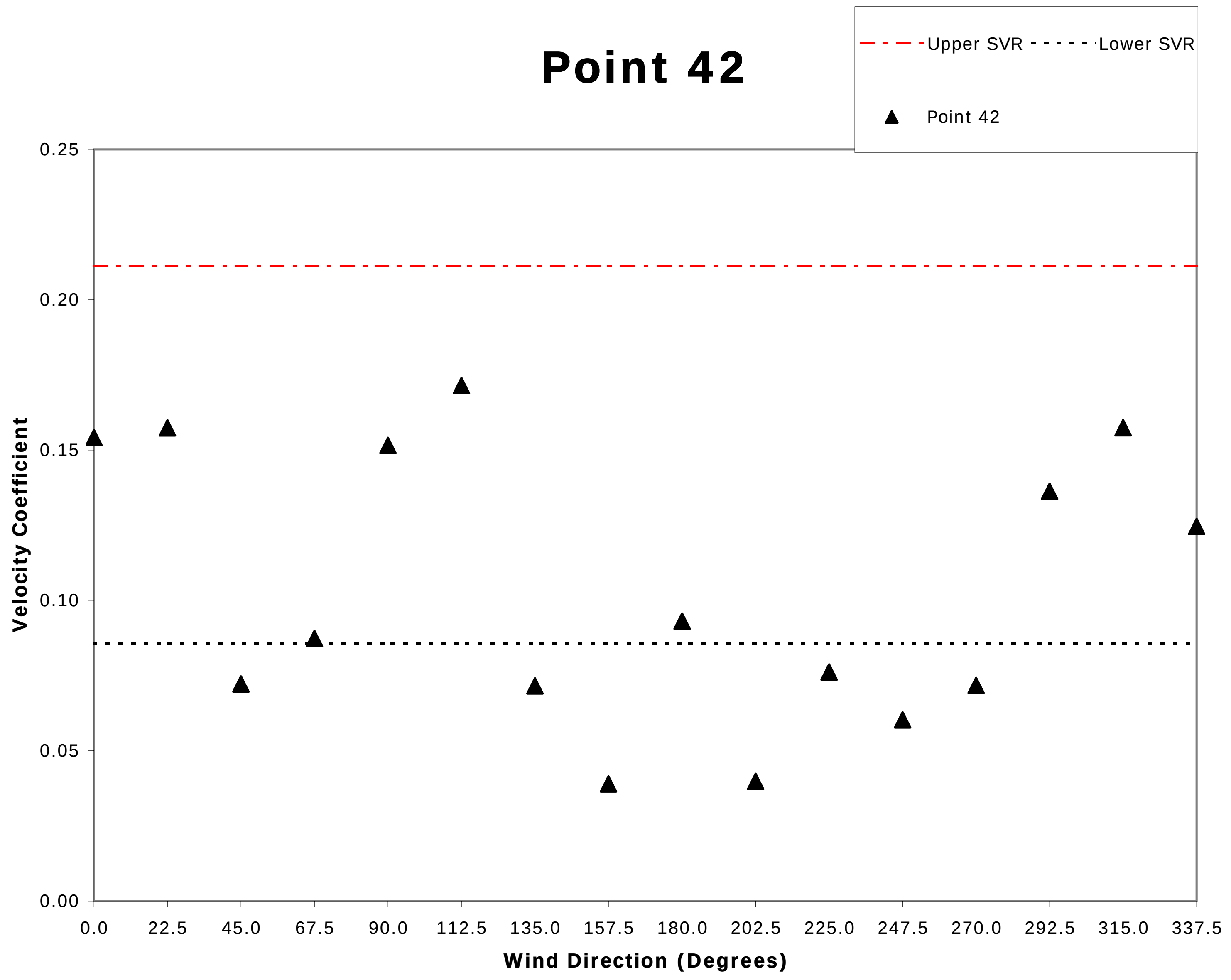
Point 38
Upper SVR
Lower SVR
Point 38
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

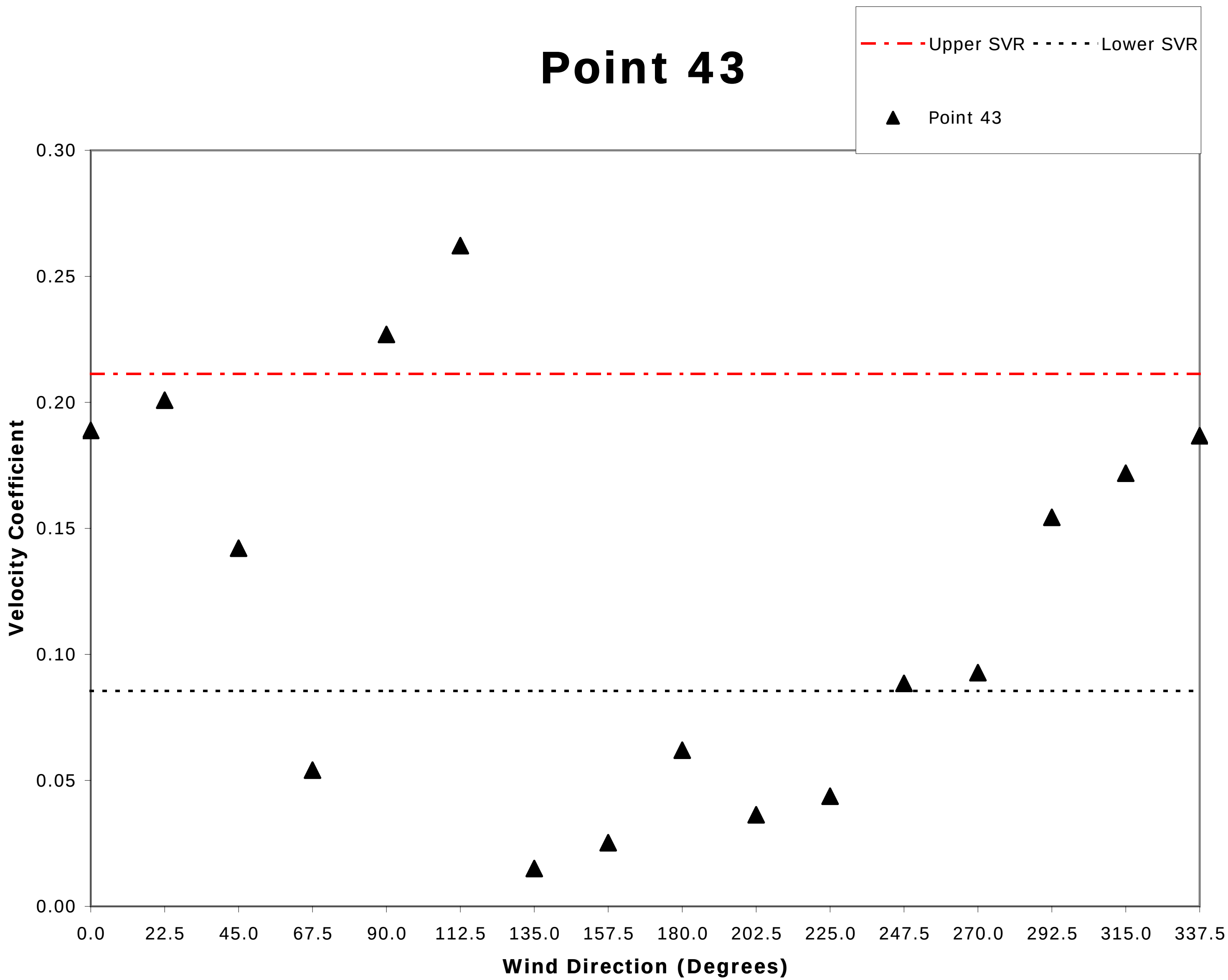

Point 39
Upper SVR
Lower SVR
Point 39
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

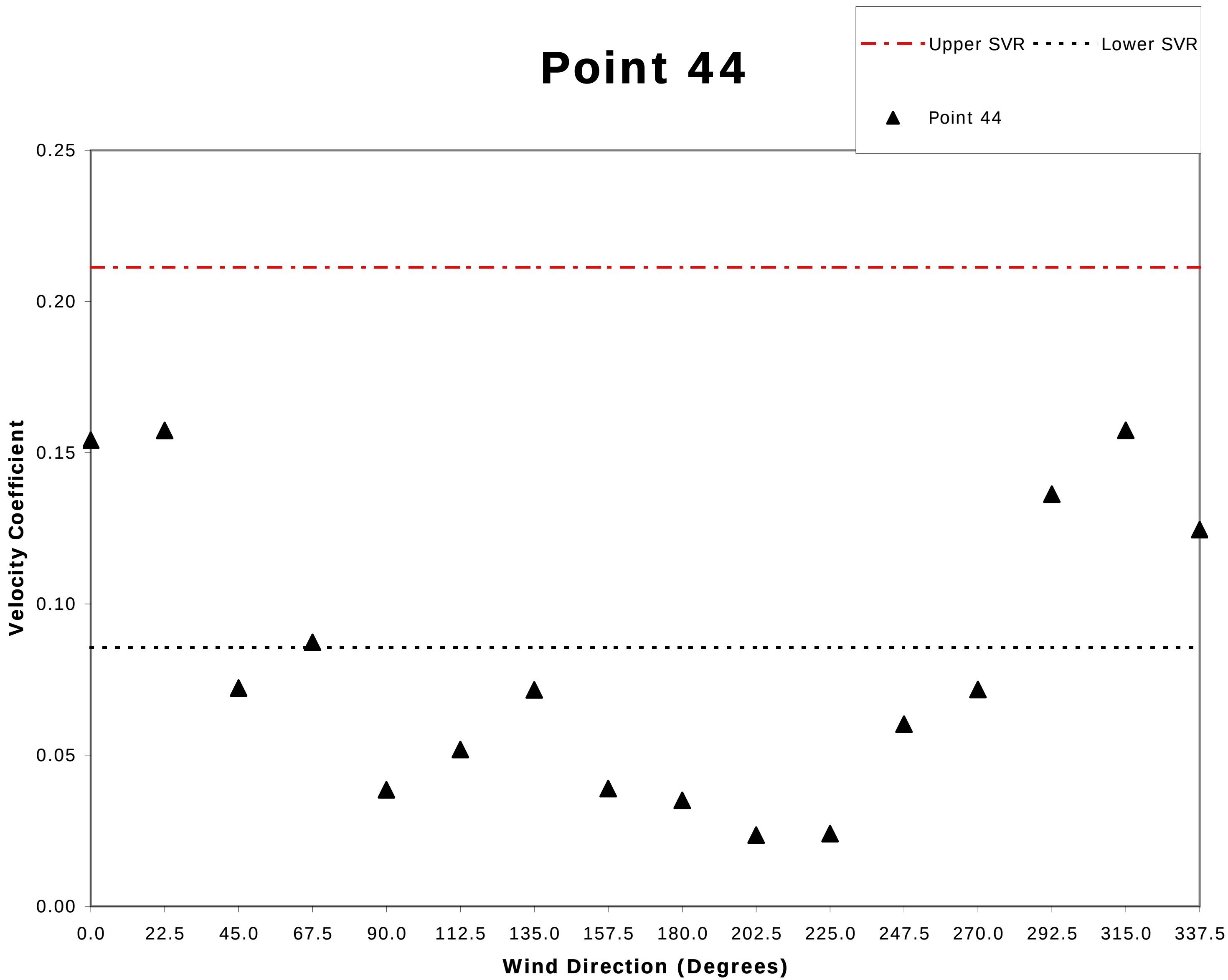

Point 40
Upper SVR
Lower SVR
Point 40
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

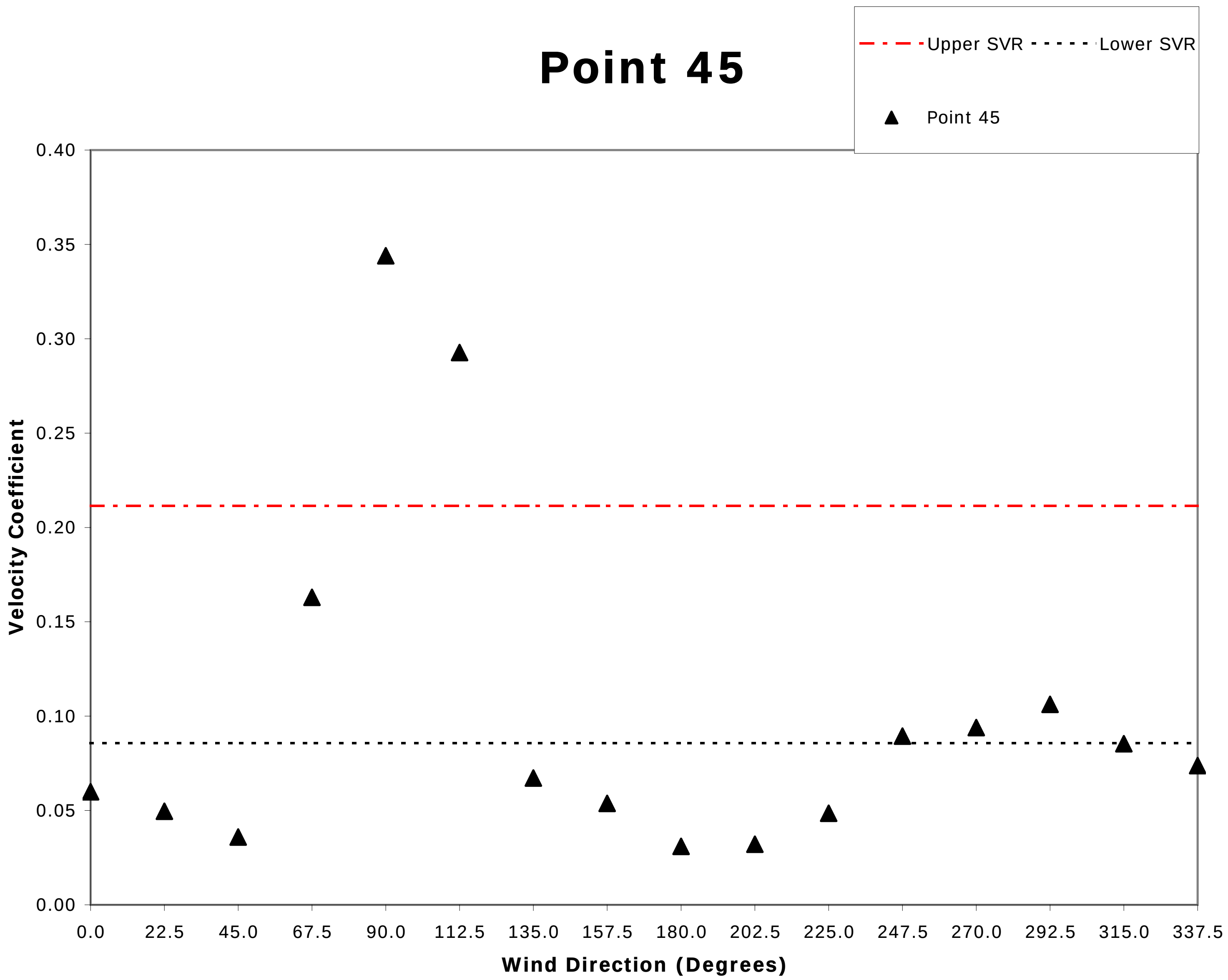


Point 41
Upper SVR
Lower SVR
Point 41
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

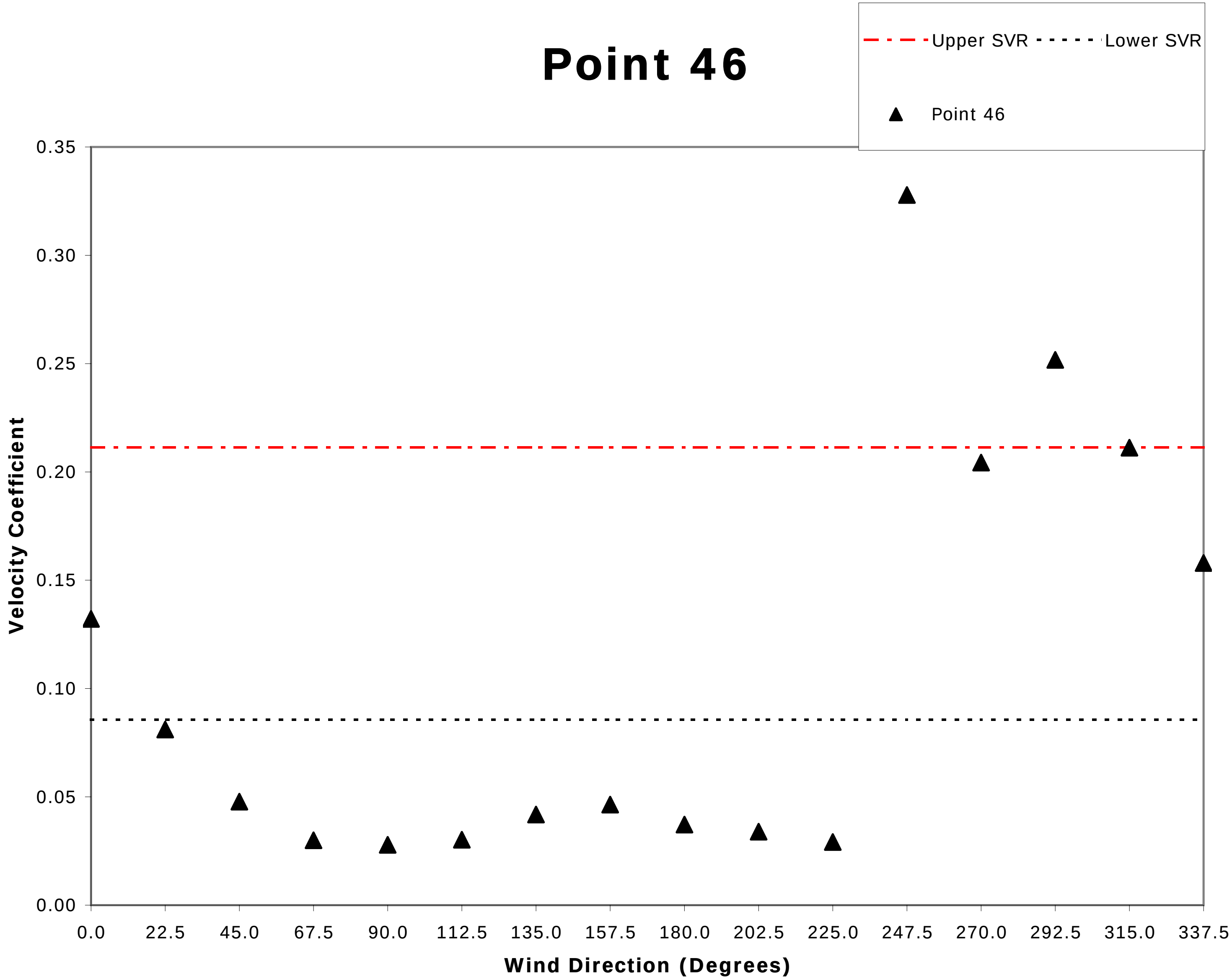

Point 42
Upper SVR
Lower SVR
Point 42
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 43
Upper SVR
Lower SVR
Point 43
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

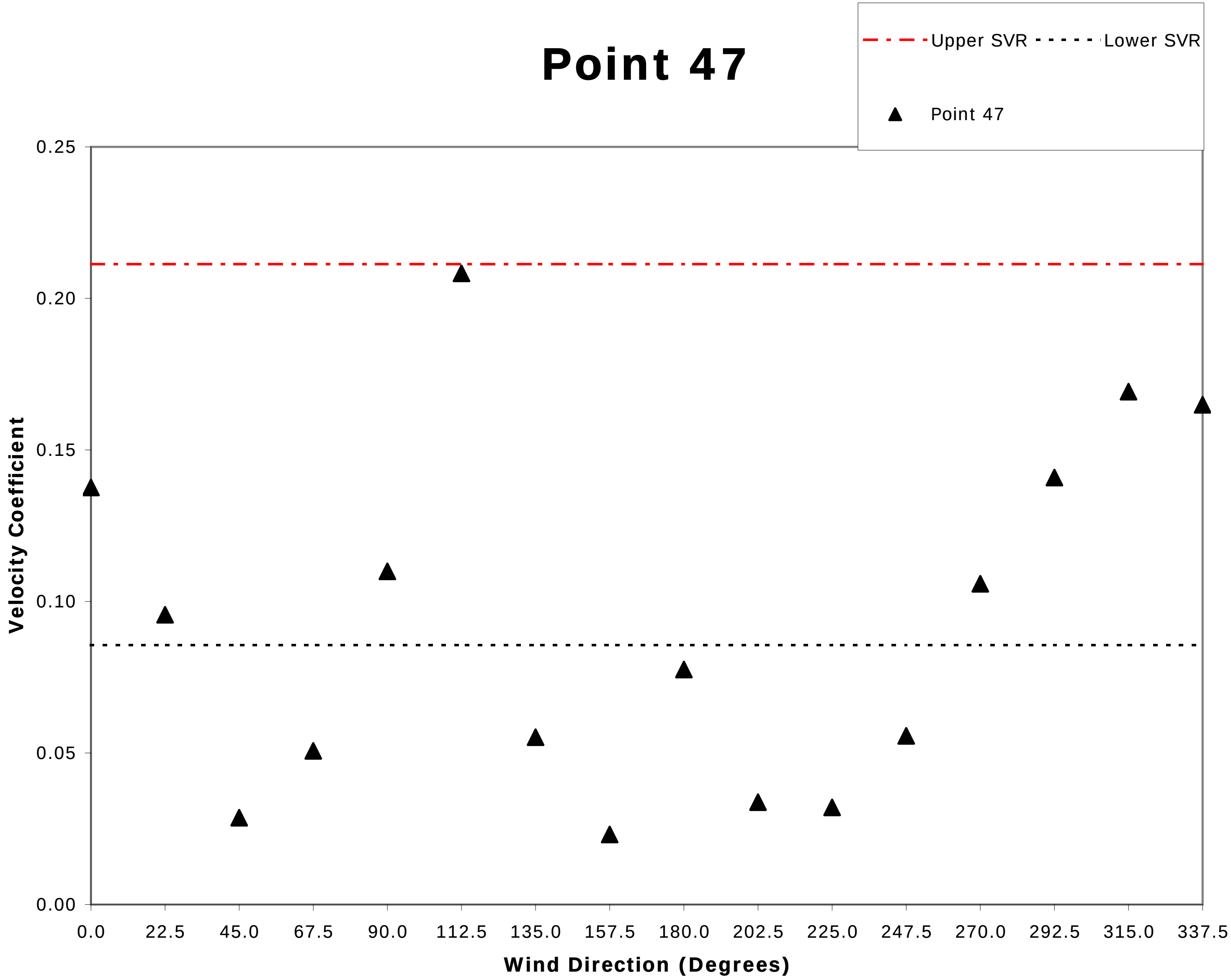

Point 44
Upper SVR
Lower SVR
Point 44
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



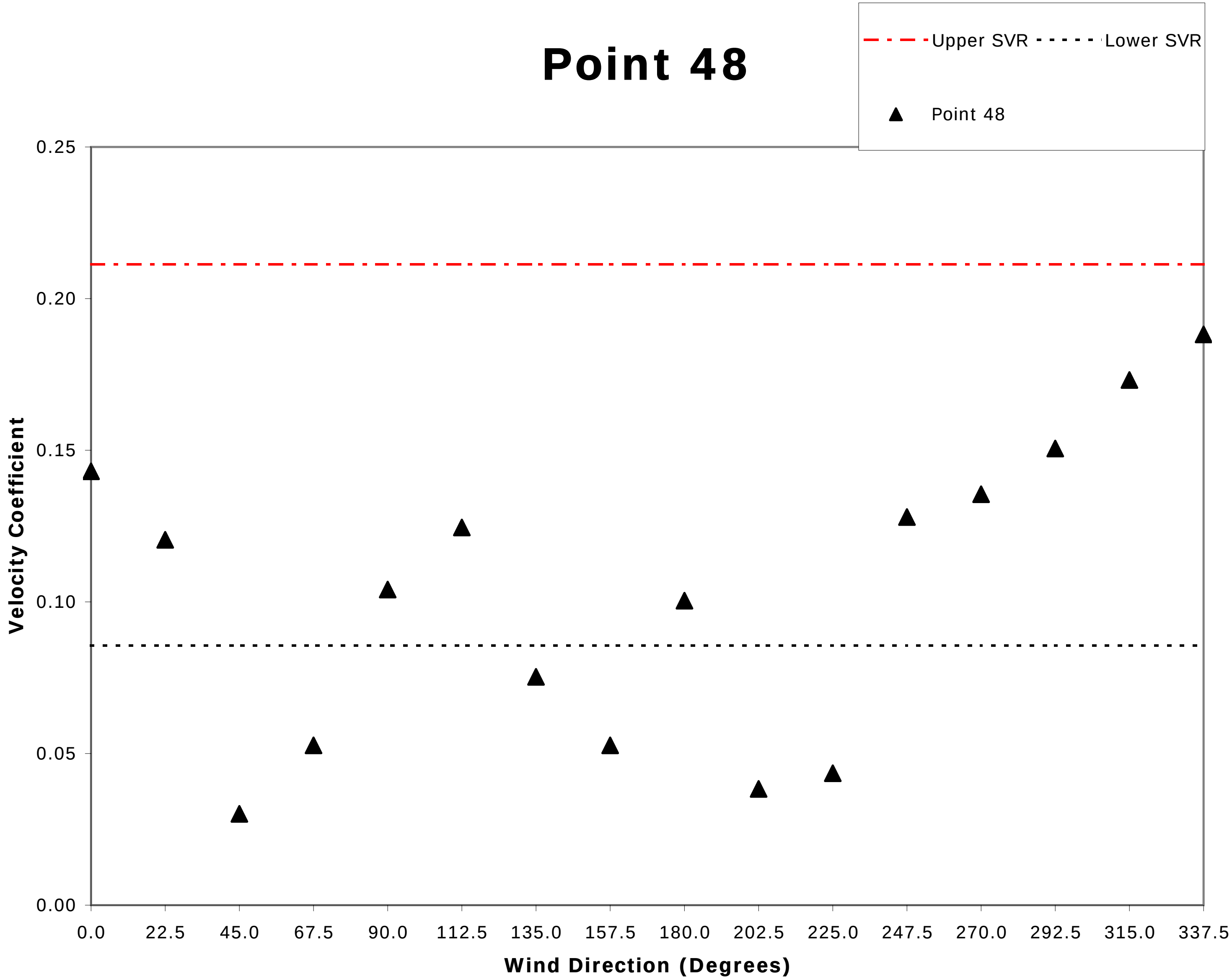
Point 45
Upper SVR
Lower SVR
Point 45
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



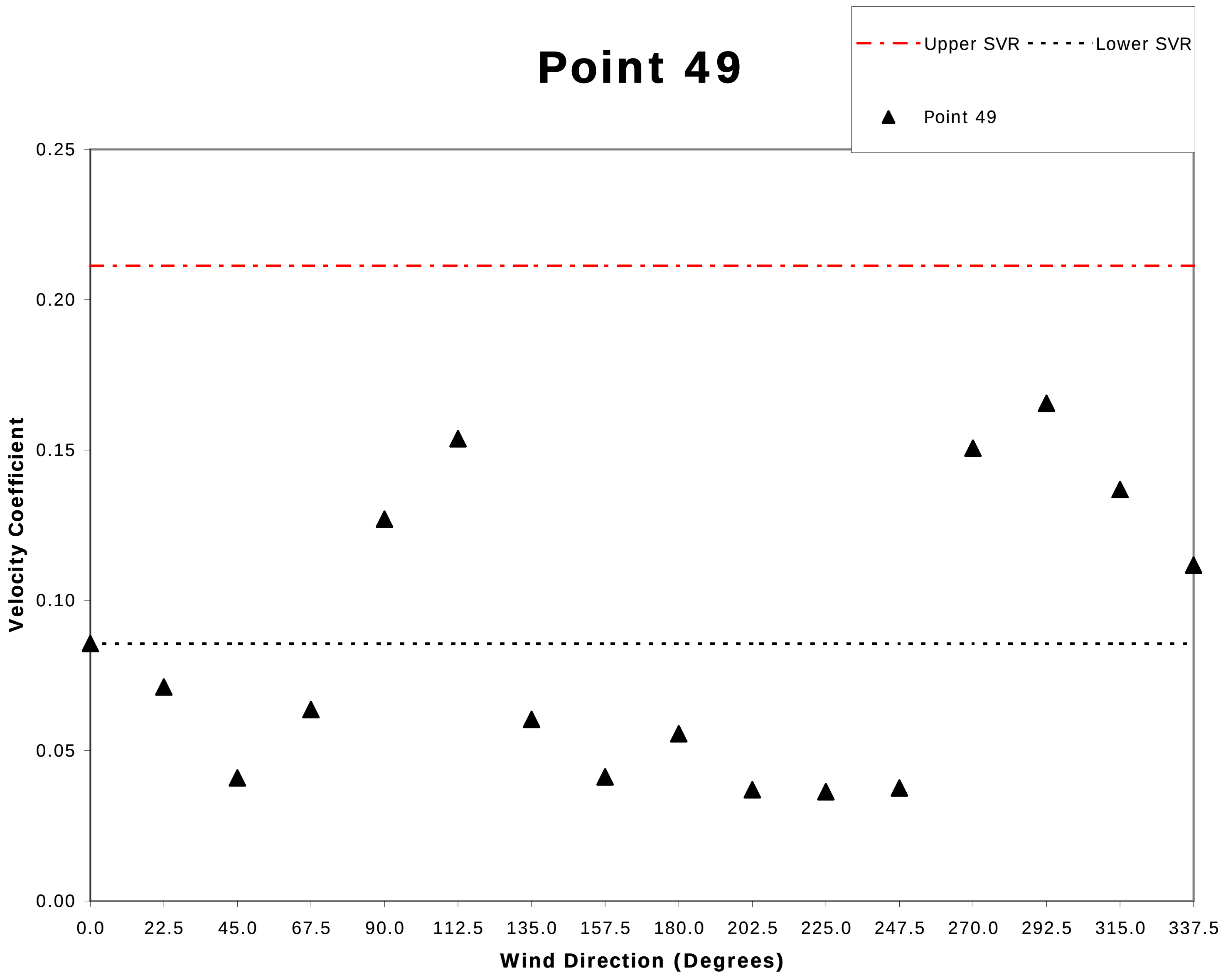
Point 46
Upper SVR
Lower SVR
Point 46
Velocity Coefficient
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



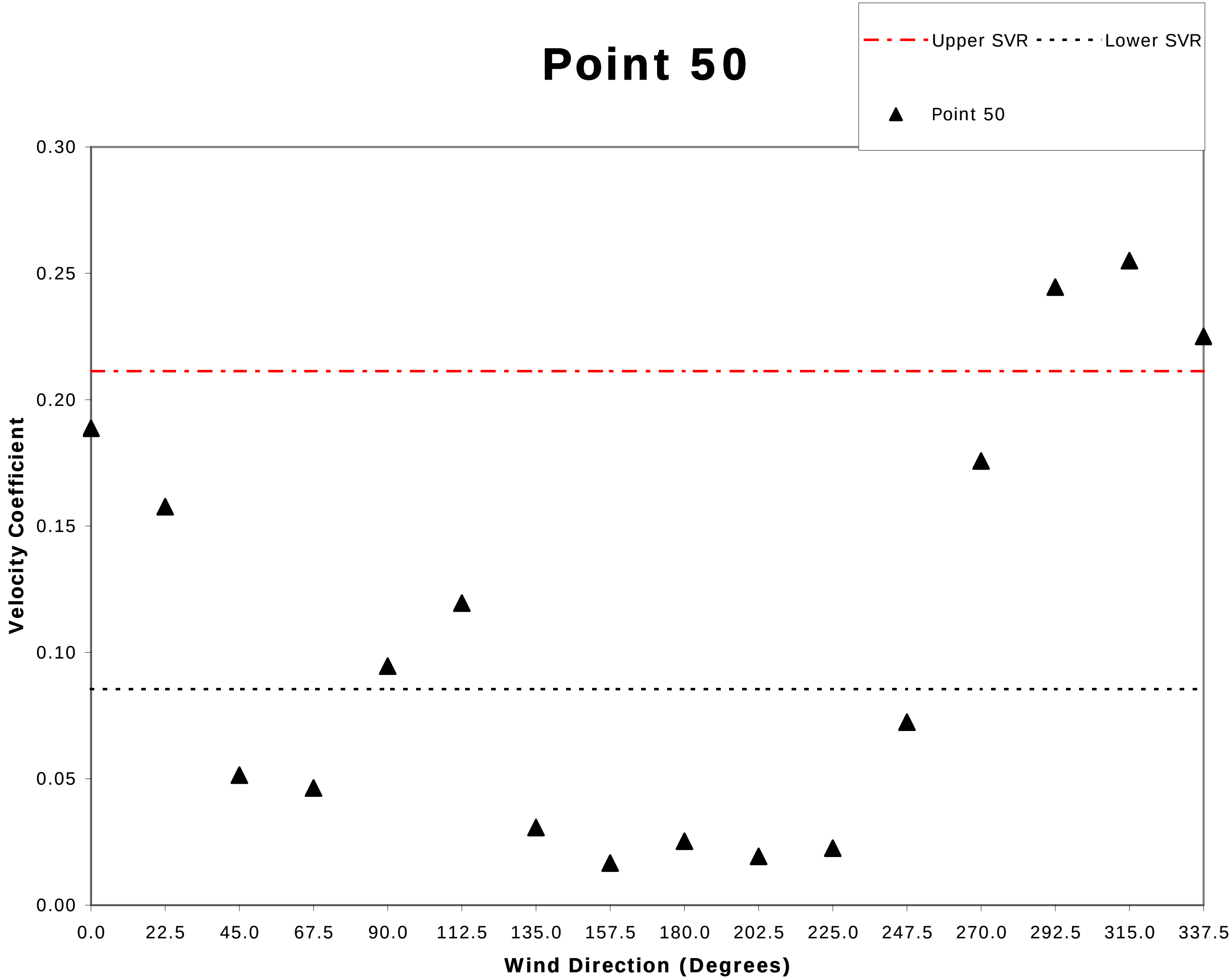
Point 47
Upper SVR
Lower SVR
Point 47
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



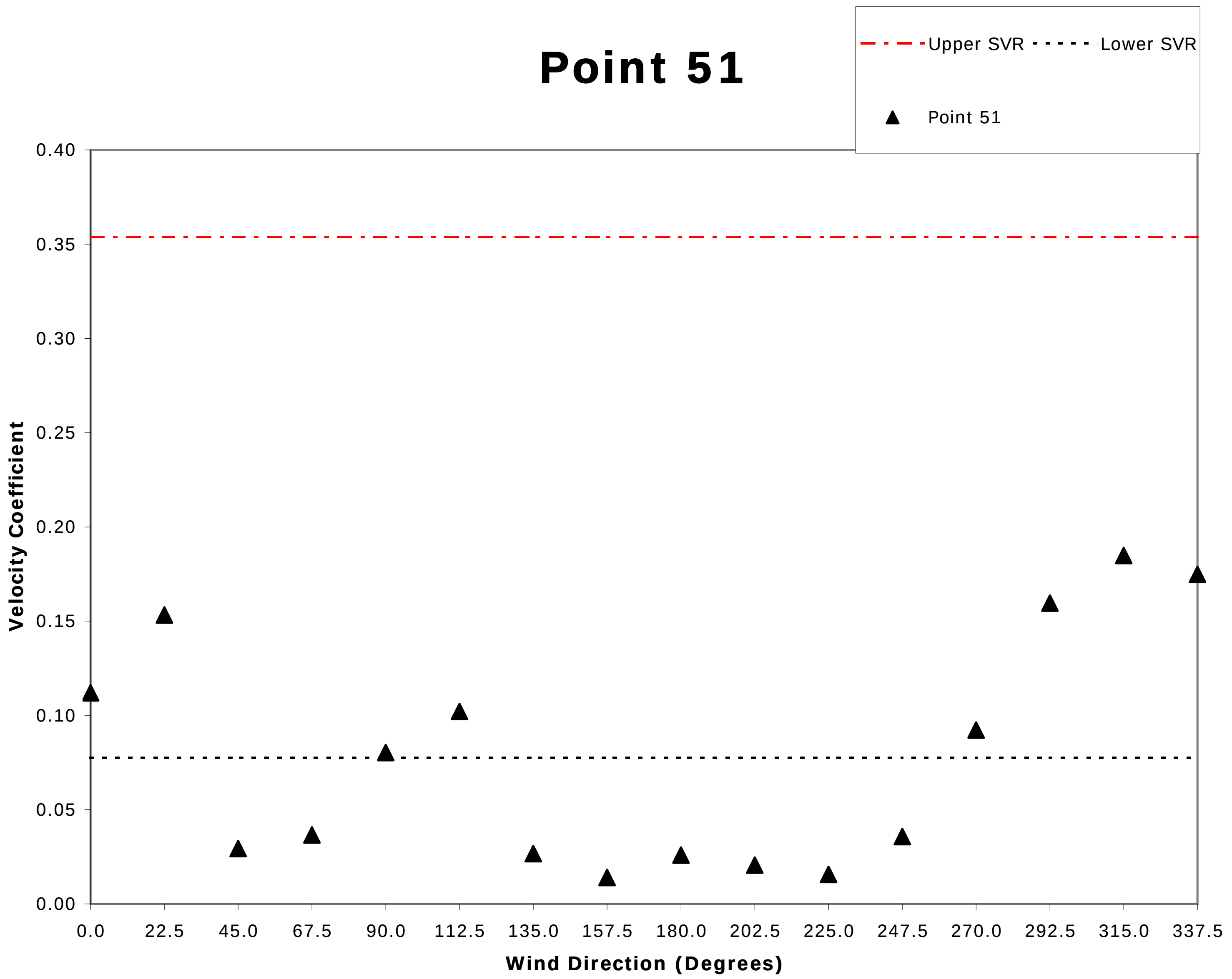
Point 48
Upper SVR
Lower SVR
Point 48
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



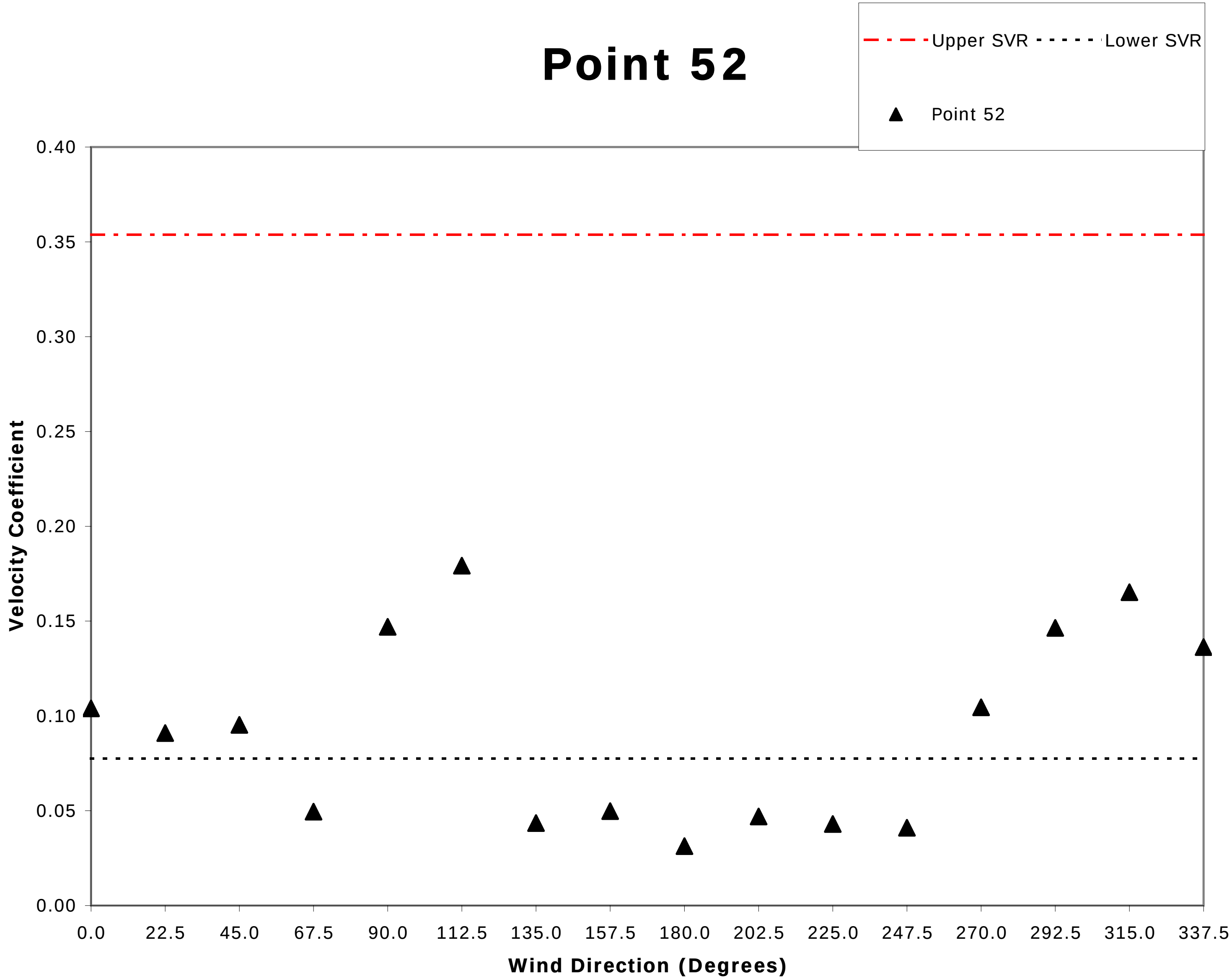
Point 49
Upper SVR
Lower SVR
Point 49
Velocity Coefficient
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

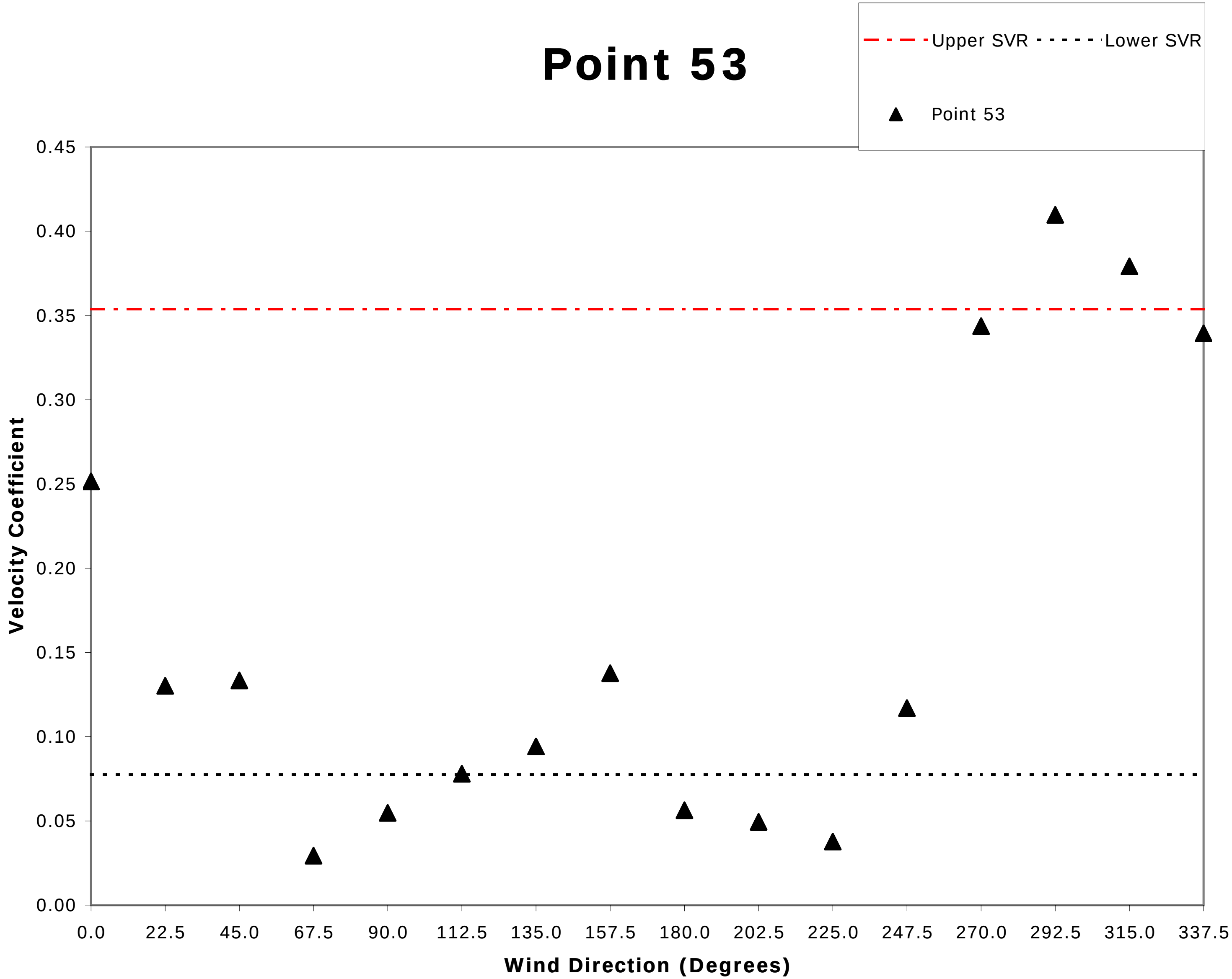


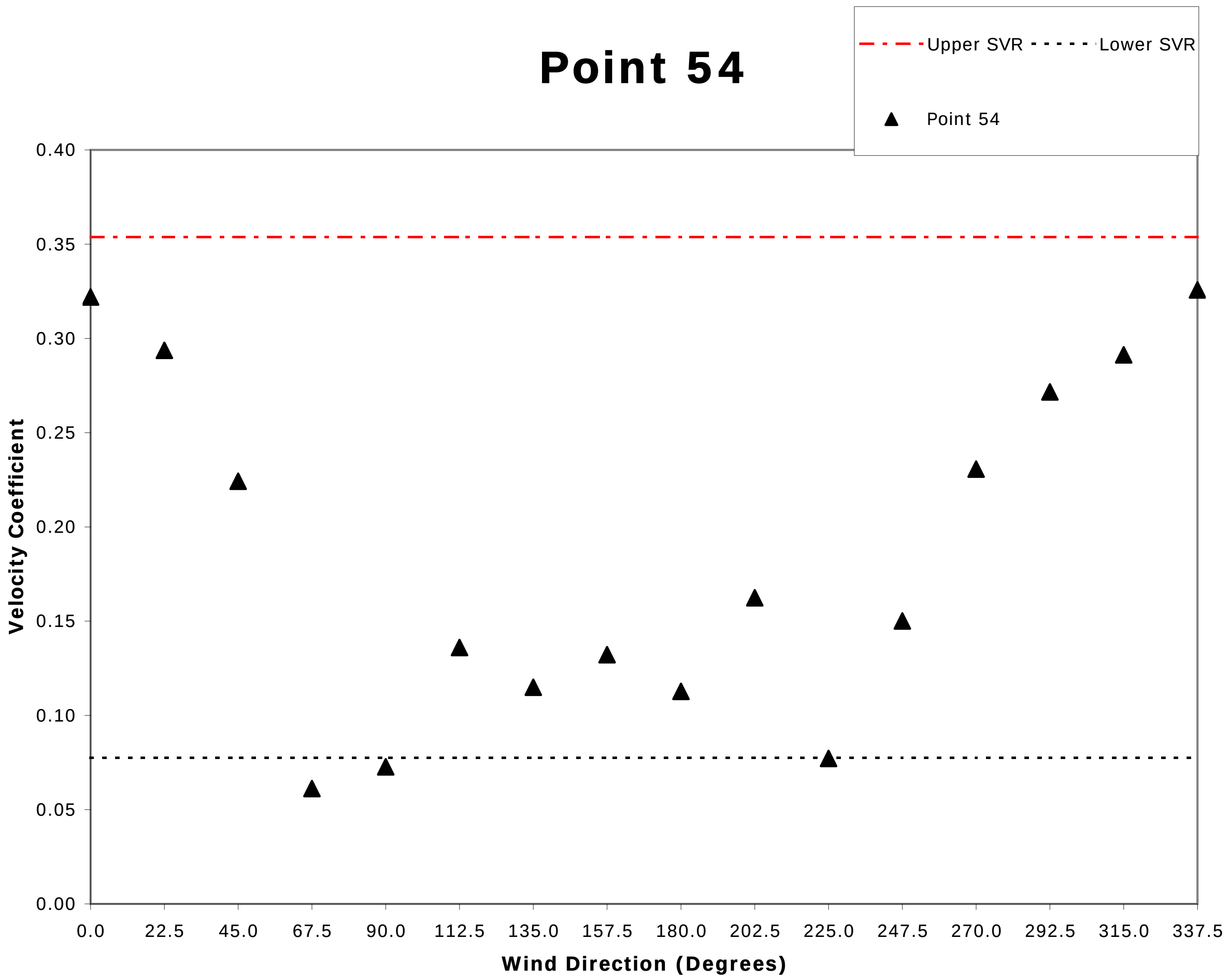
Point 50
Upper SVR
Lower SVR
Point 50
Velocity Coefficient
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

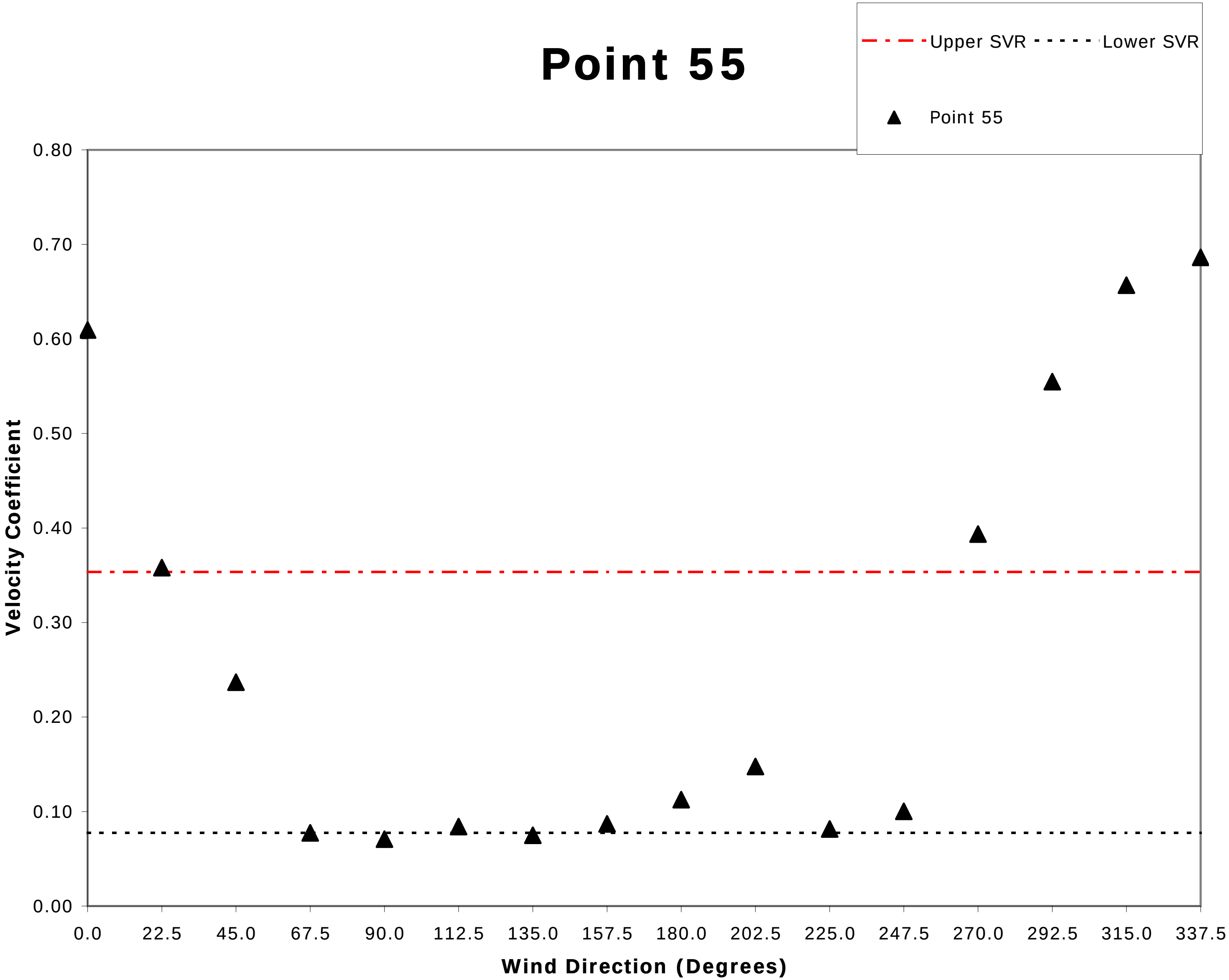


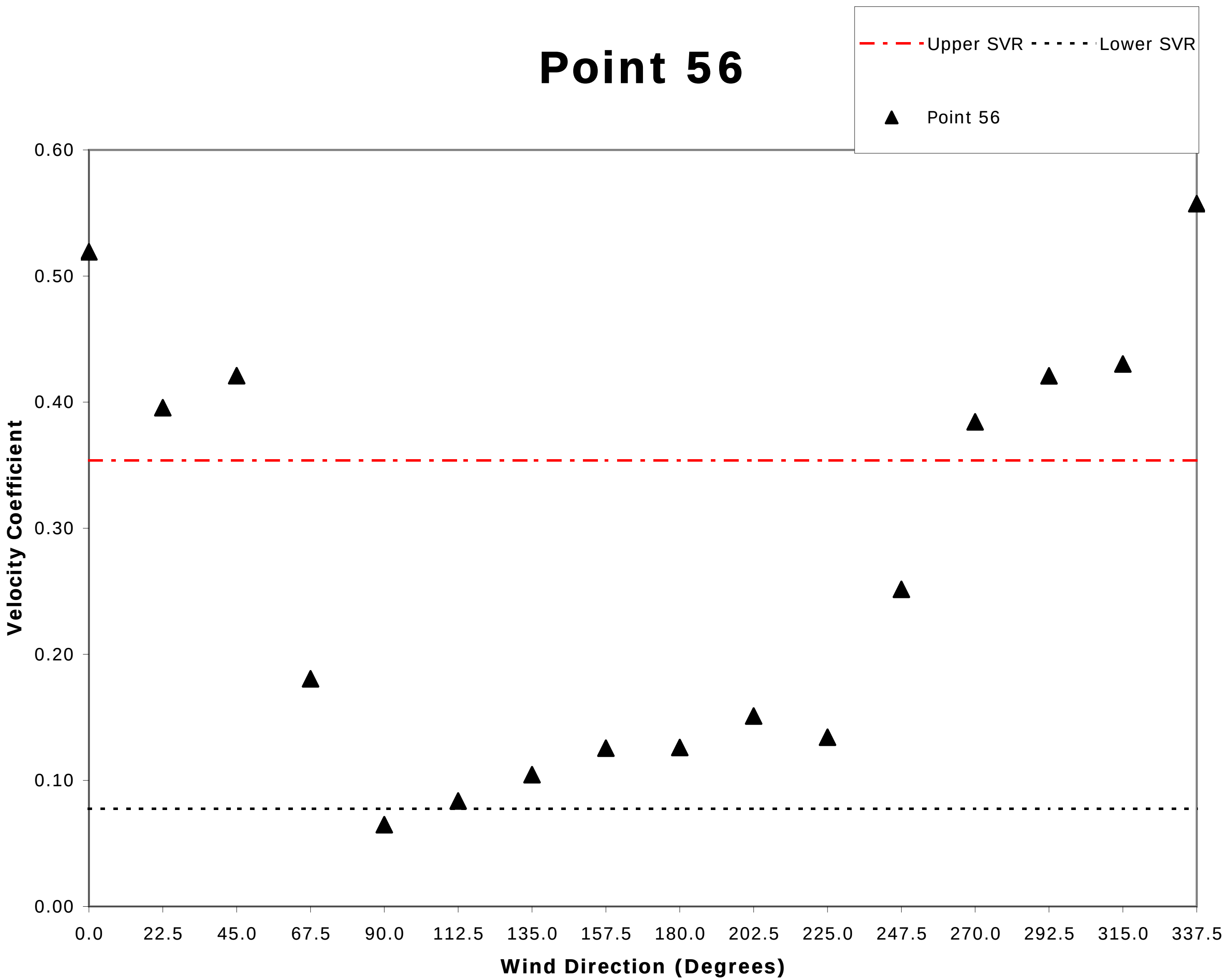
Point 51
Upper SVR
Lower SVR
Point 51
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

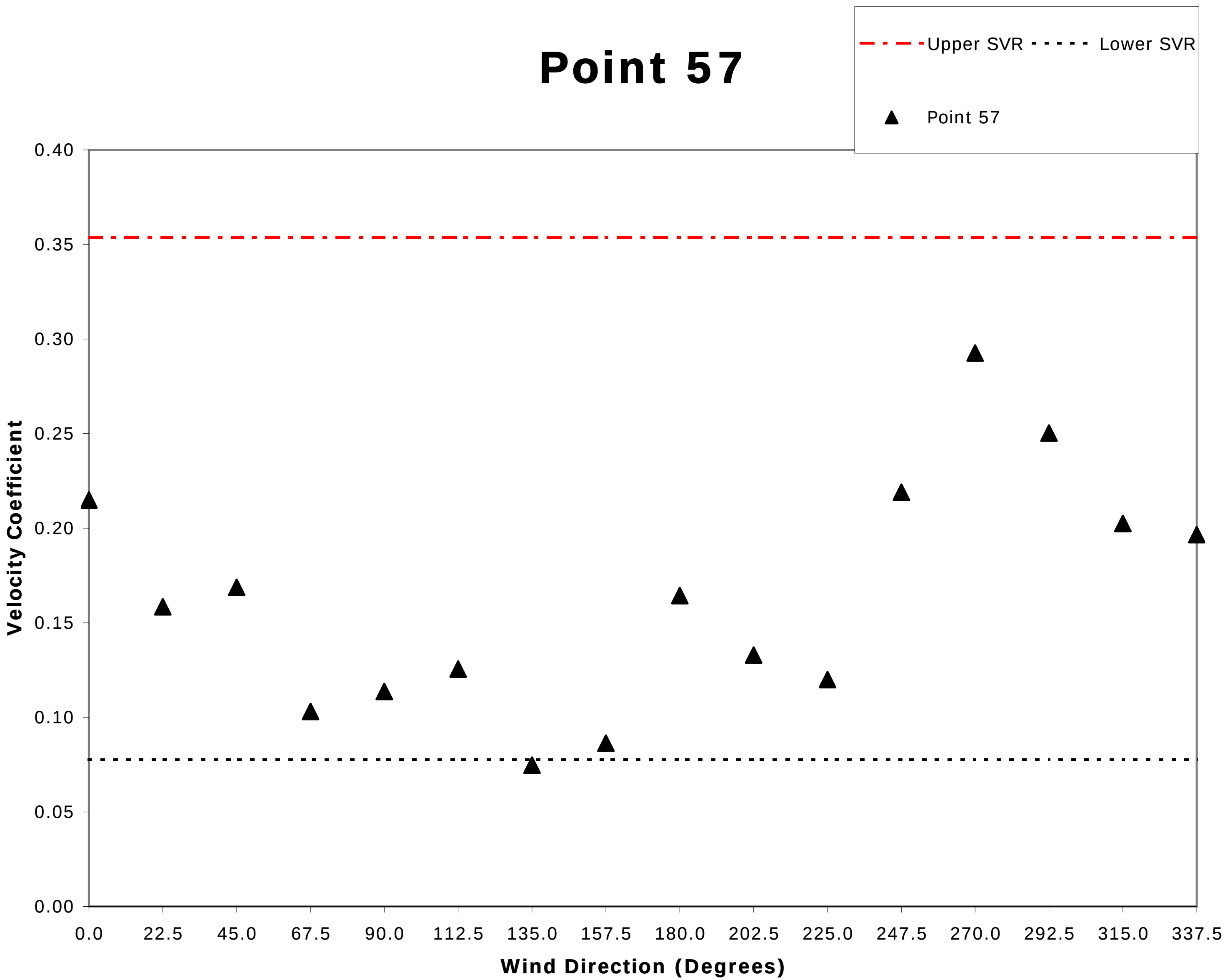

Point 52
Upper SVR
Lower SVR
Point 52
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 53
Upper SVR
Lower SVR
Point 53
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 54
Upper SVR
Lower SVR
Point 54
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

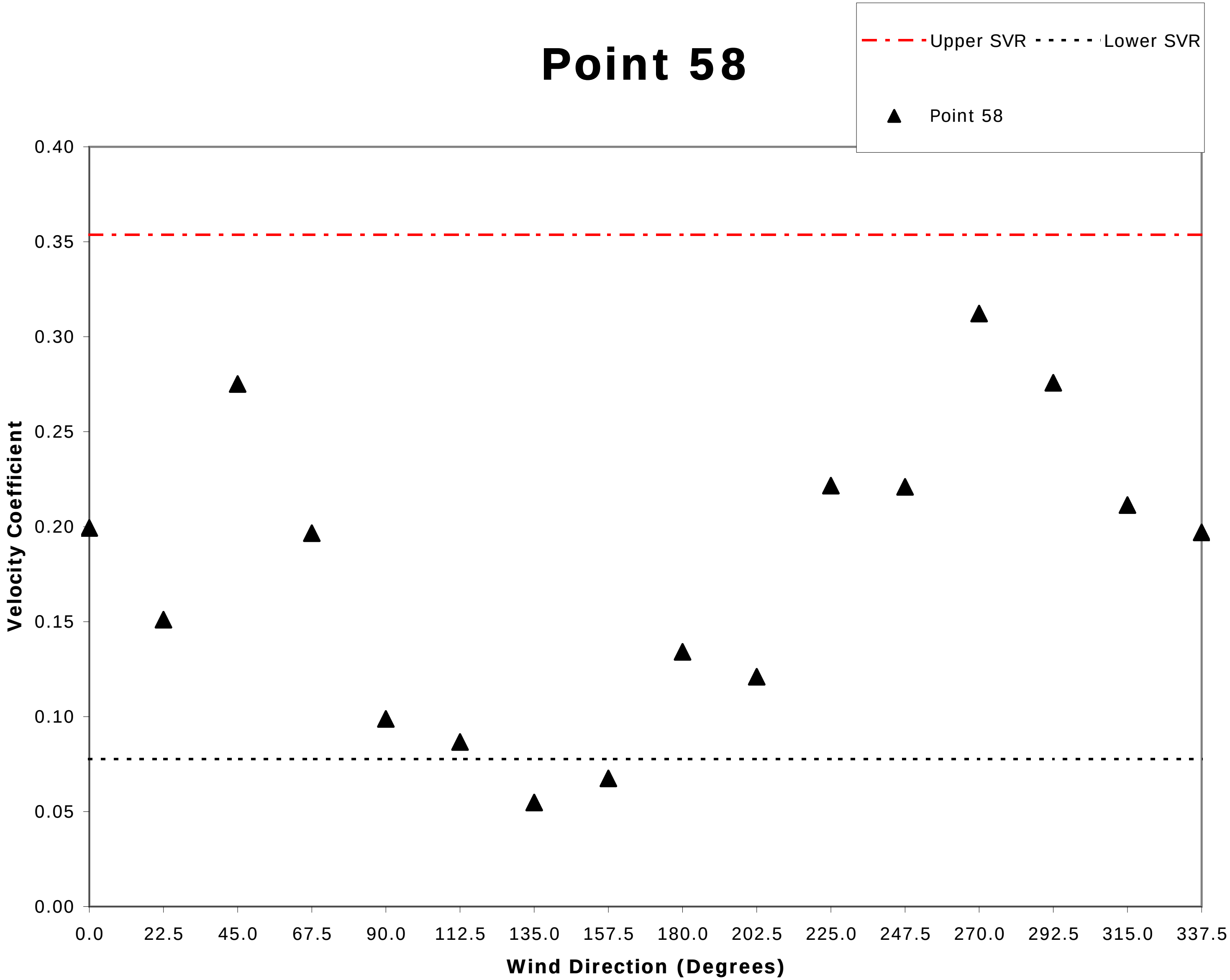

Point 55
Upper SVR
Lower SVR
Point 55
Velocity Coefficient
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 56
Upper SVR
Lower SVR
Point 56
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

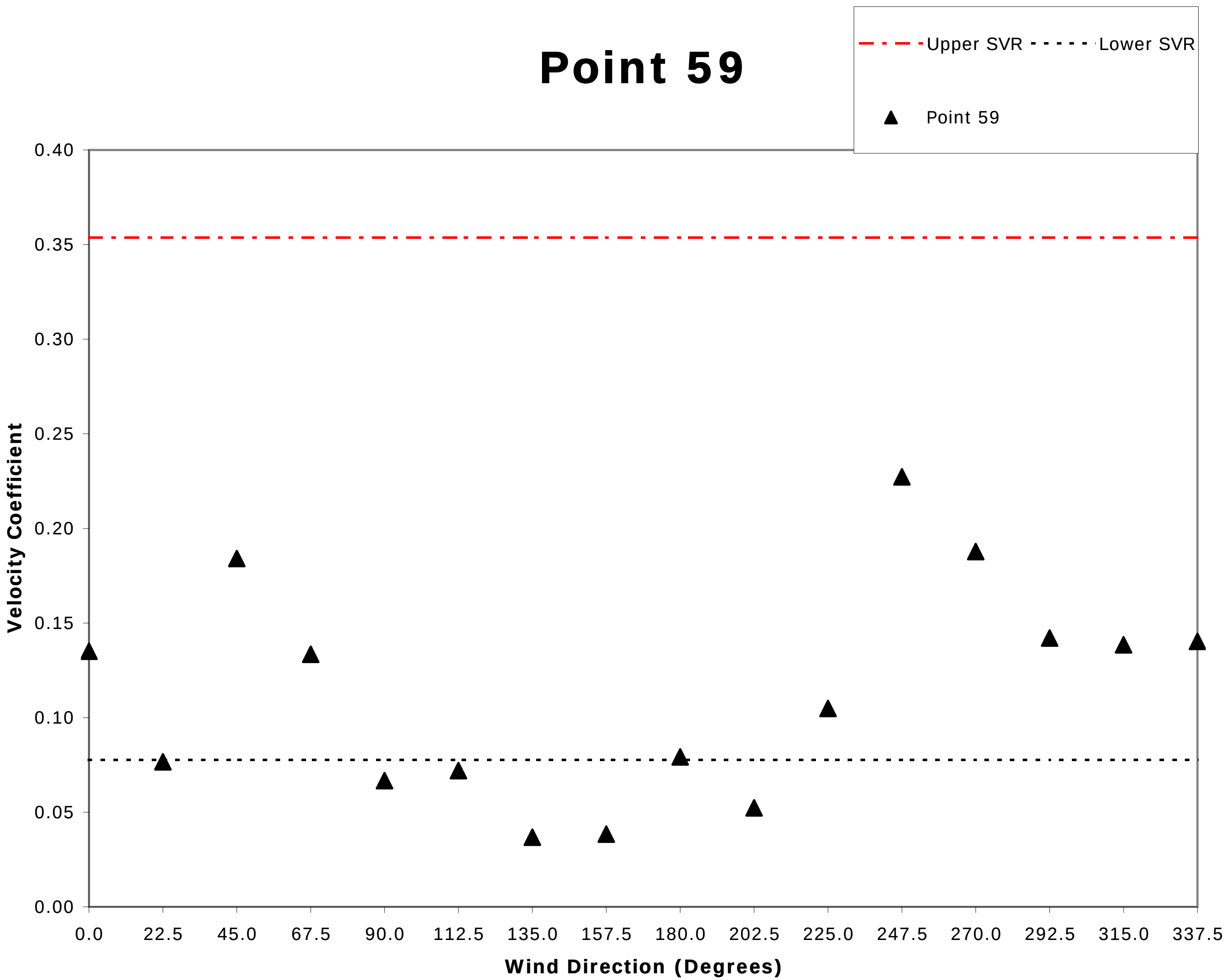


Point 57
Upper SVR
Lower SVR
Point 57
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

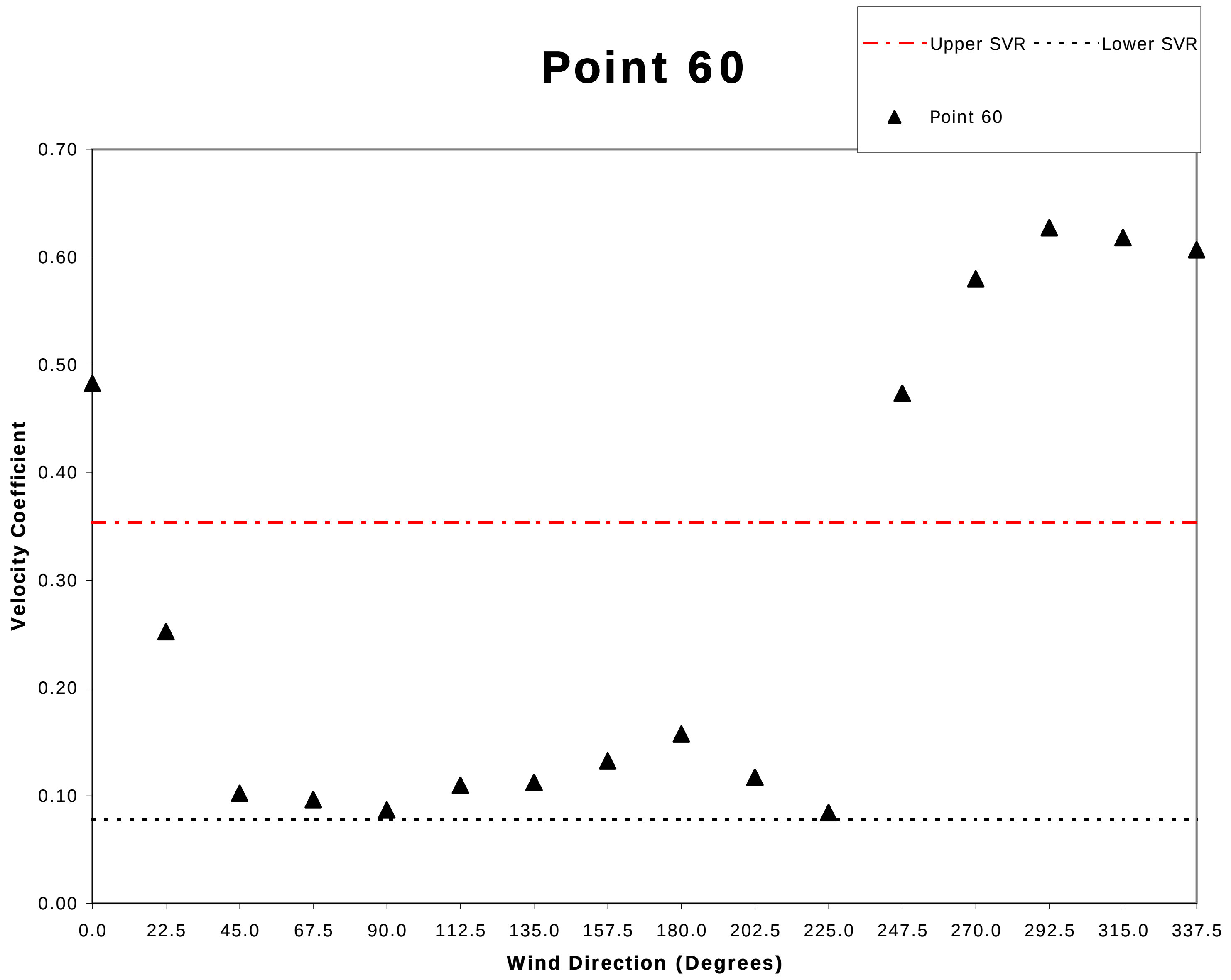
Point 58



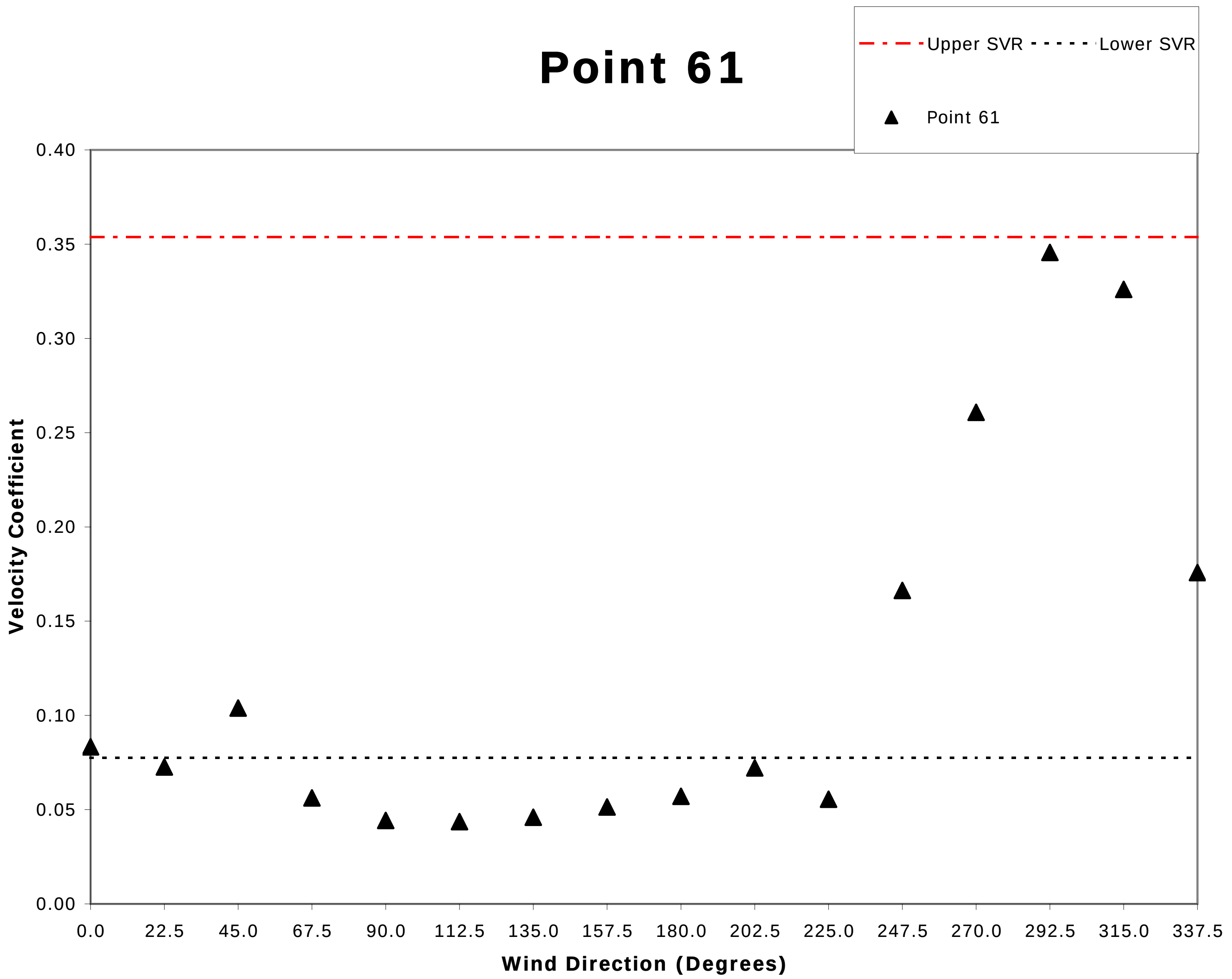
Upper SVR
Lower SVR
Point 58
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)



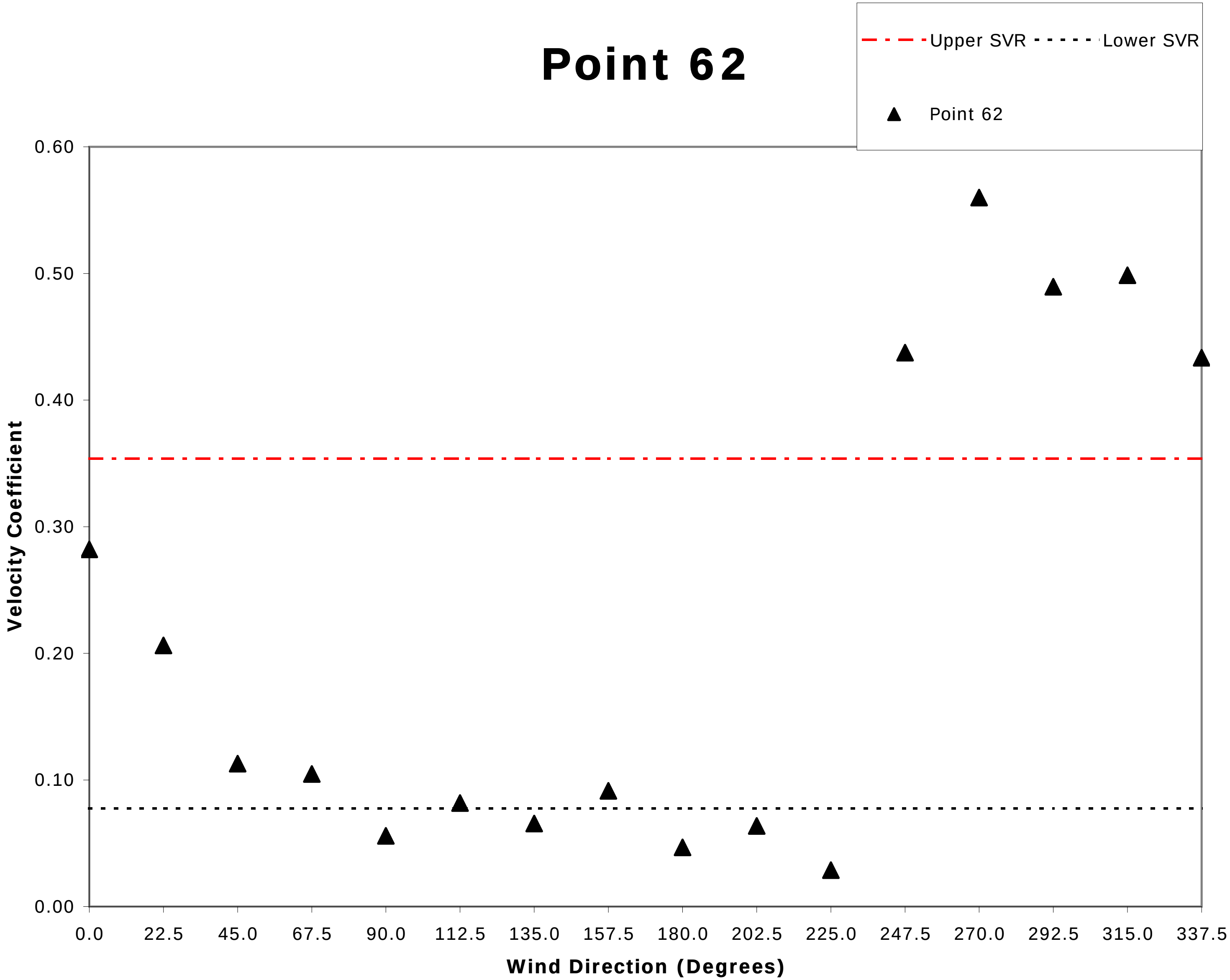
Point 59
Upper SVR
Lower SVR
Point 59
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

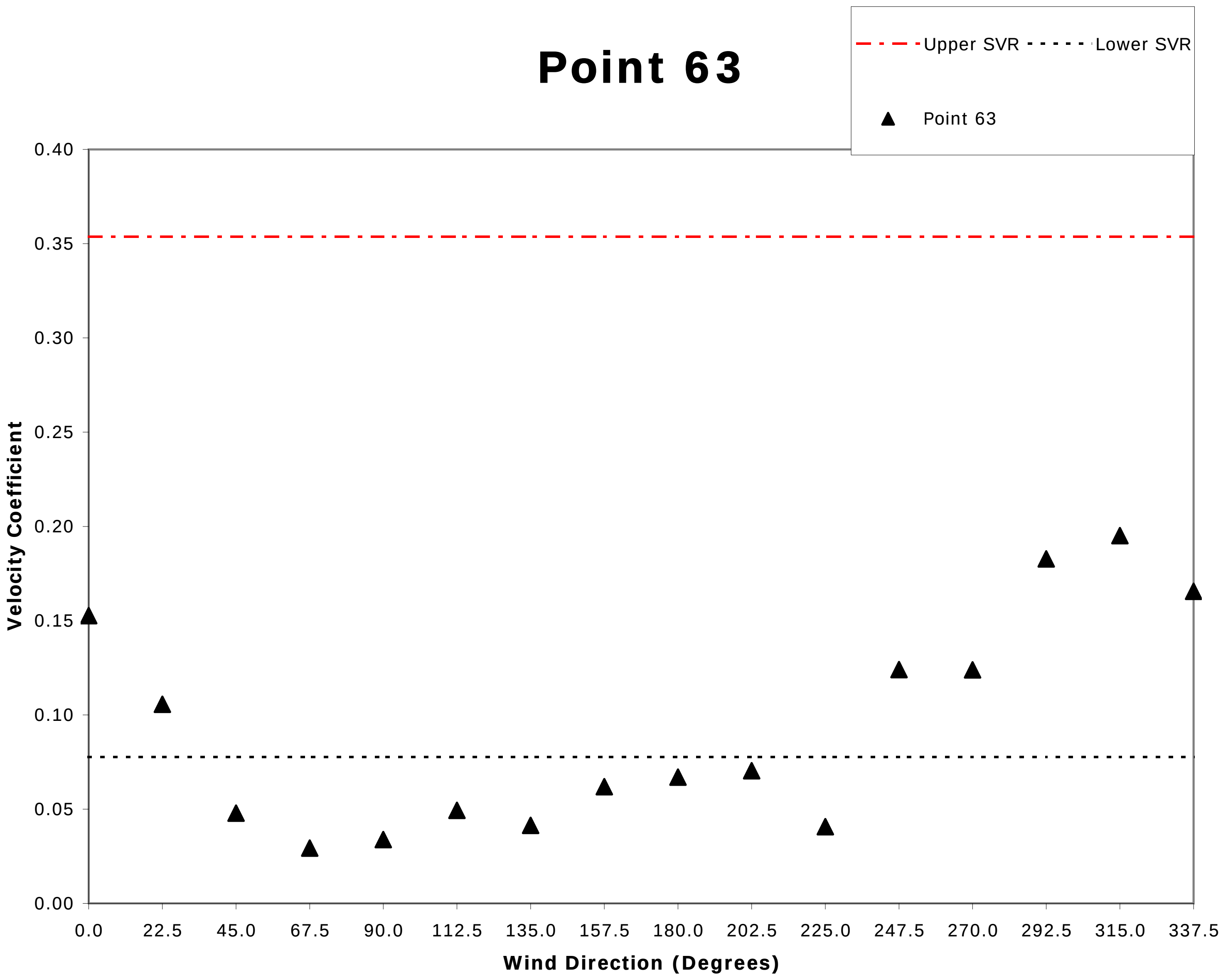


Point 60
Upper SVR
Lower SVR
Point 60
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

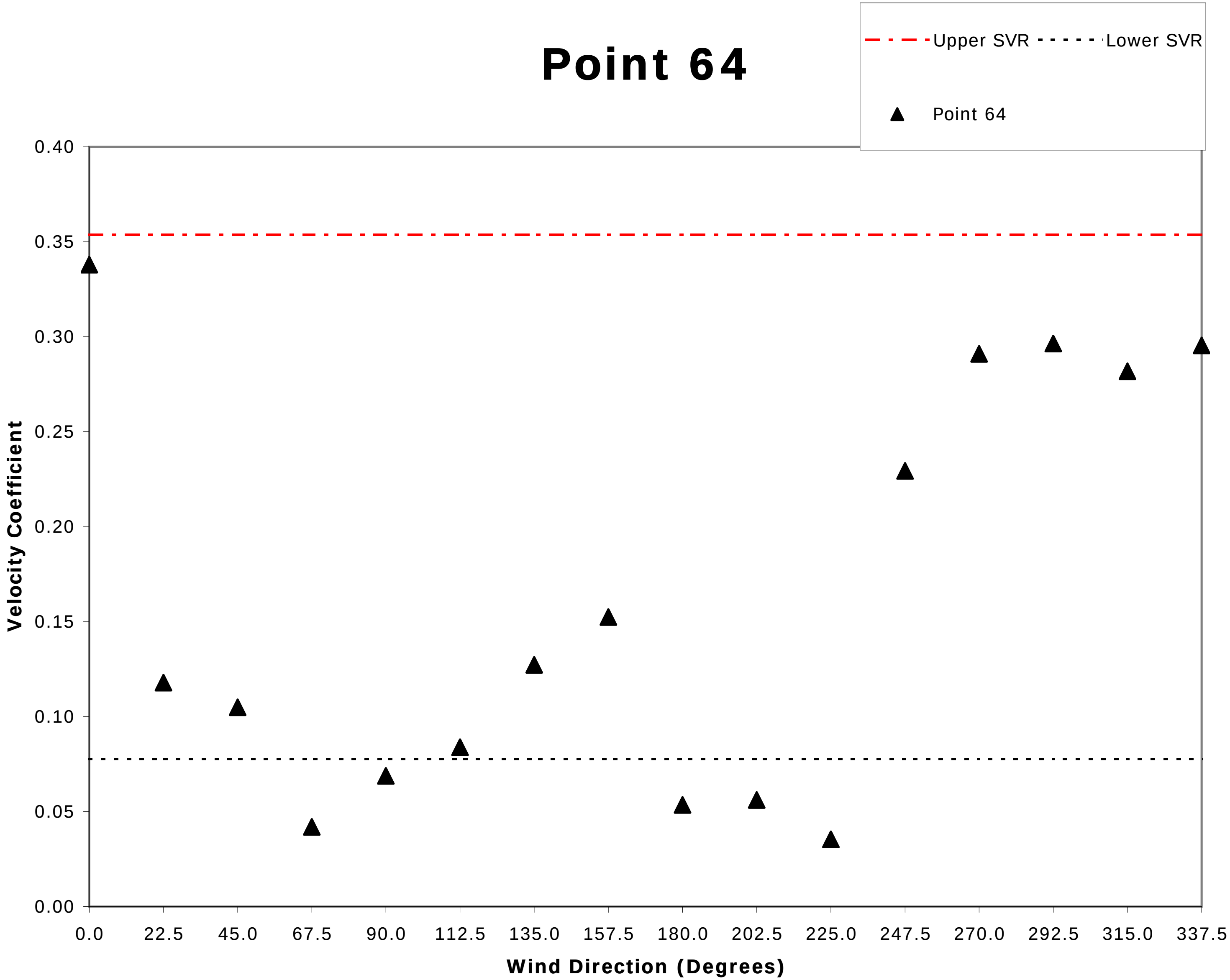


Point 61
Upper SVR
Lower SVR
Point 61
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

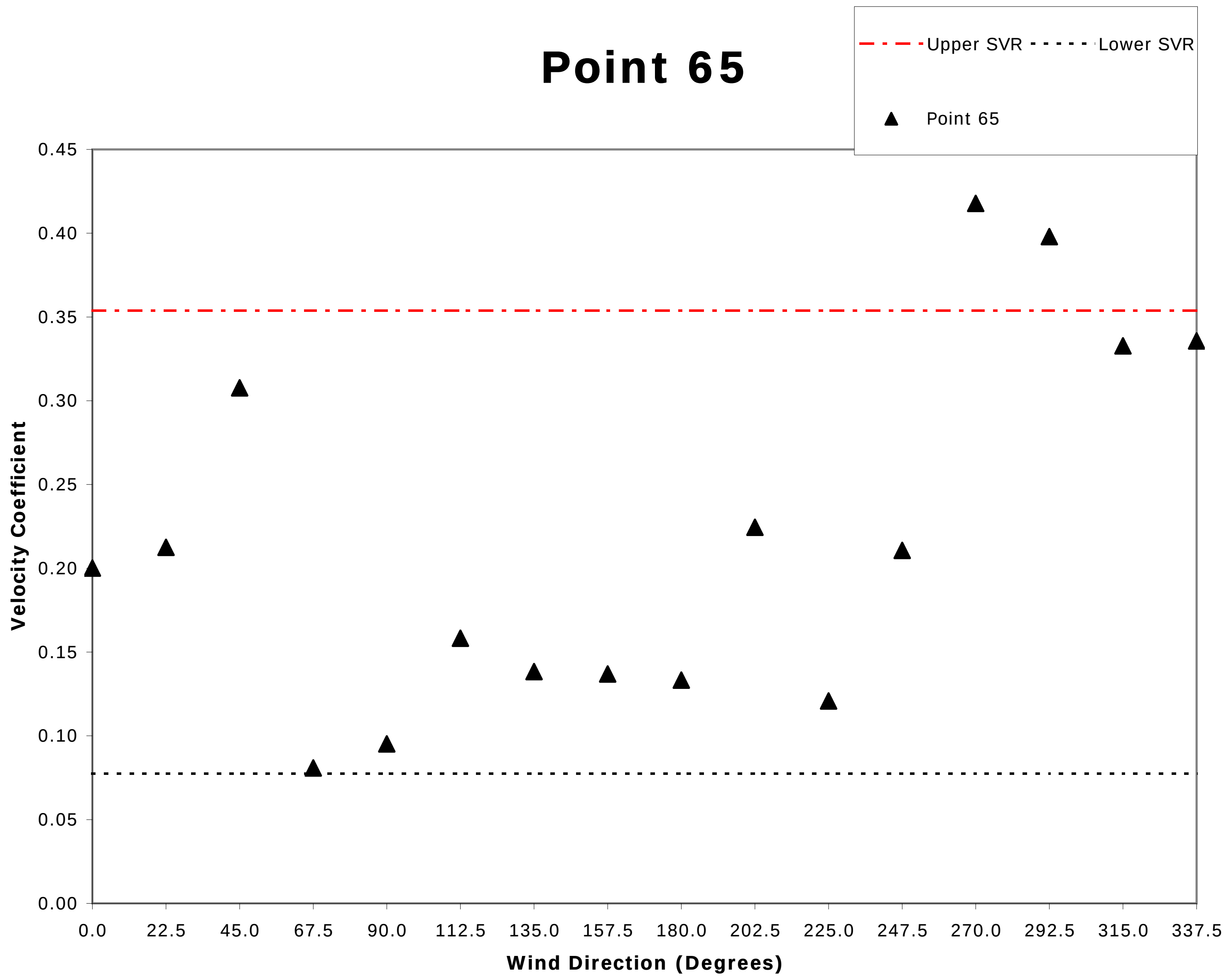

Point 62
Upper SVR
Lower SVR
Point 62
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

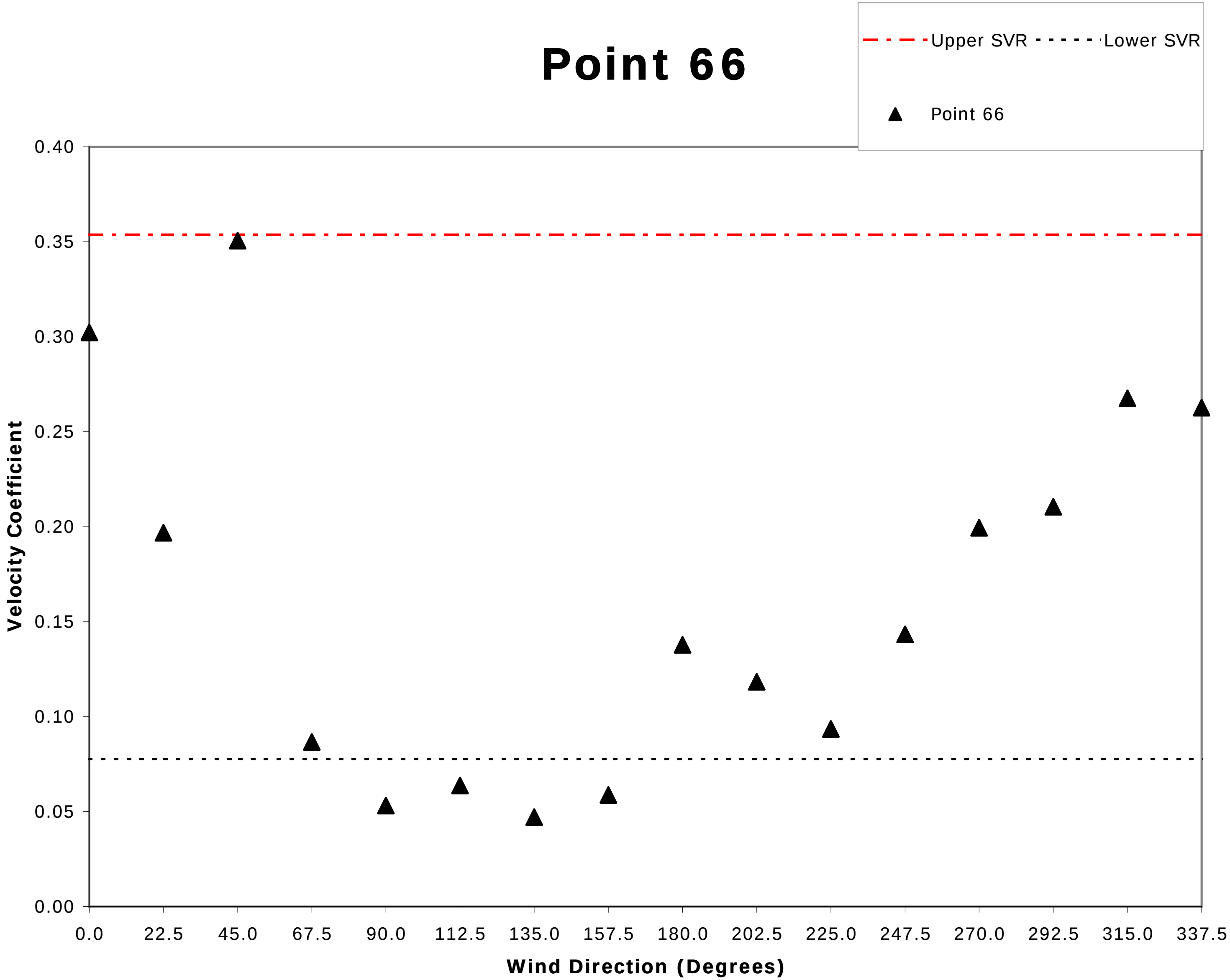


Point 63
Upper SVR
Lower SVR
Point 63
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

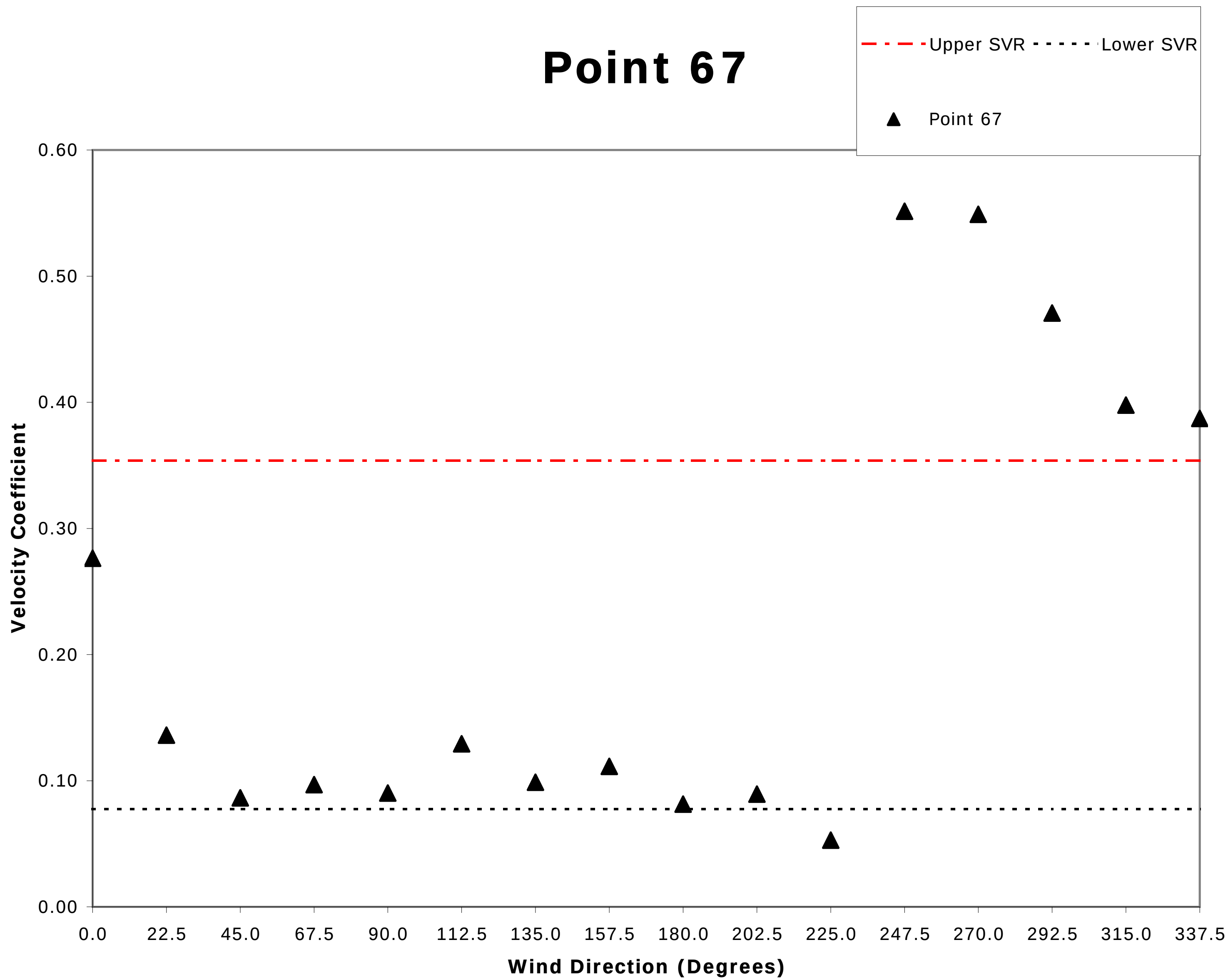


Point 64
Upper SVR
Lower SVR
Point 64
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

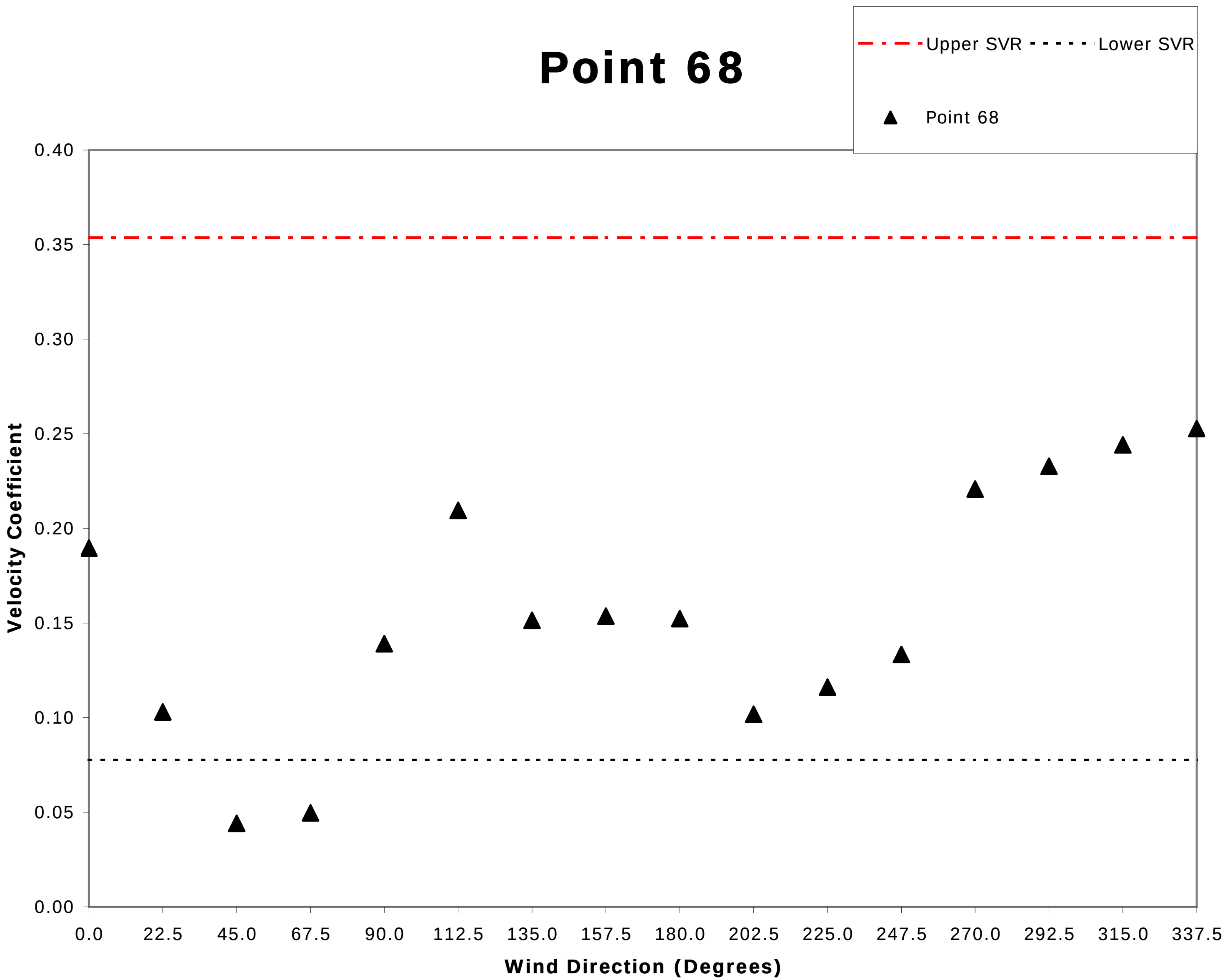

Point 65
Upper SVR
Lower SVR
Point 65
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

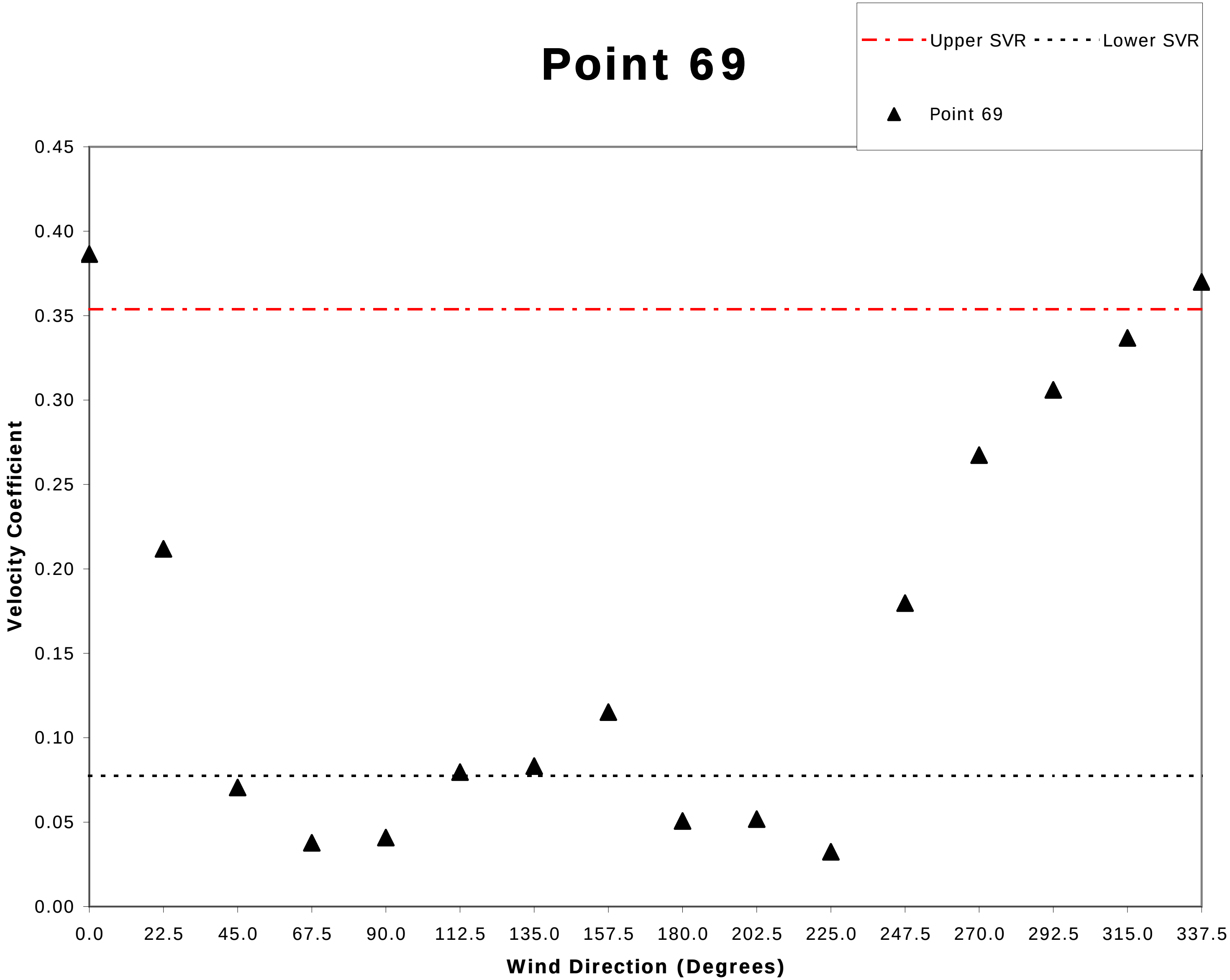


Point 66
Upper SVR
Lower SVR
Point 66
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

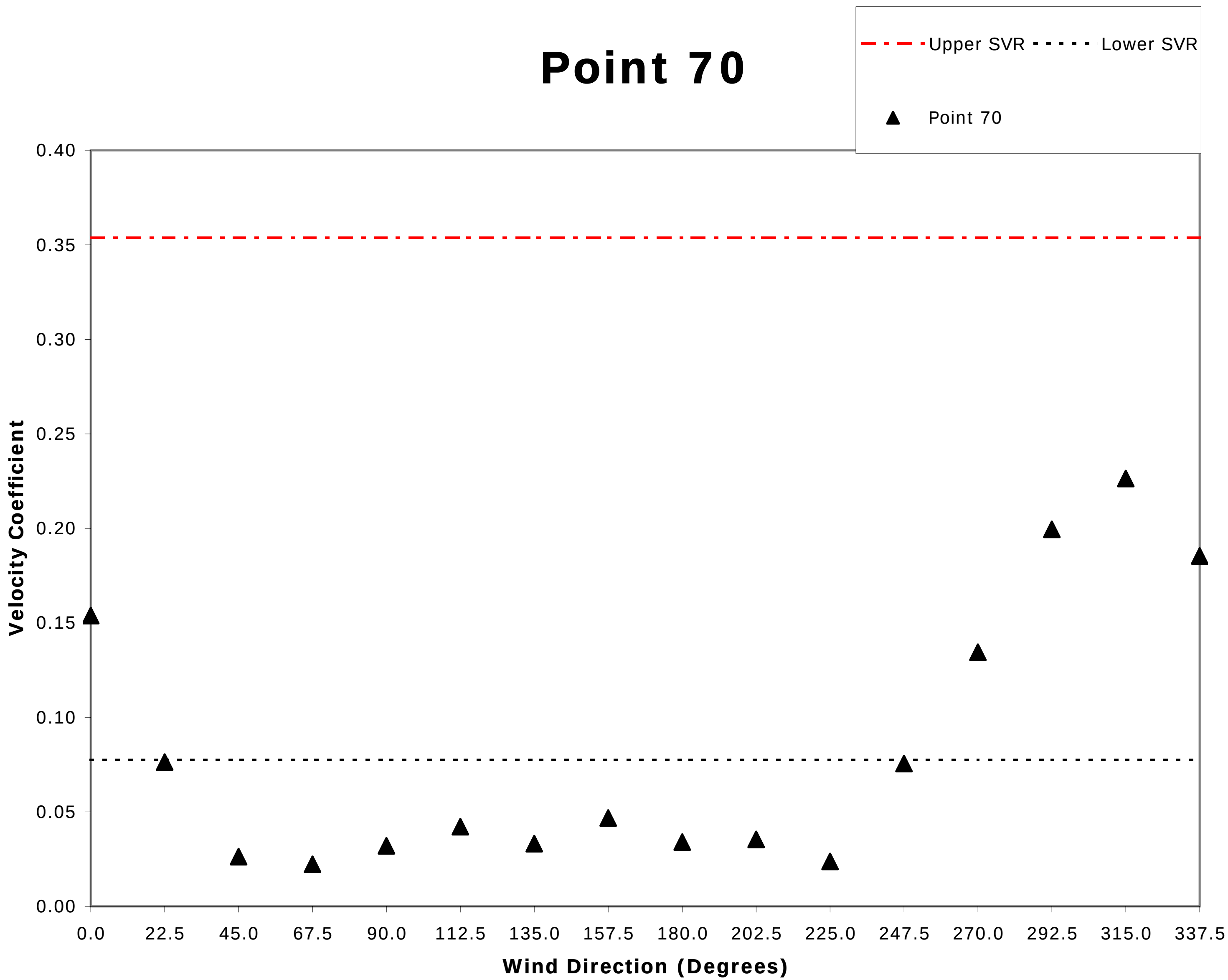


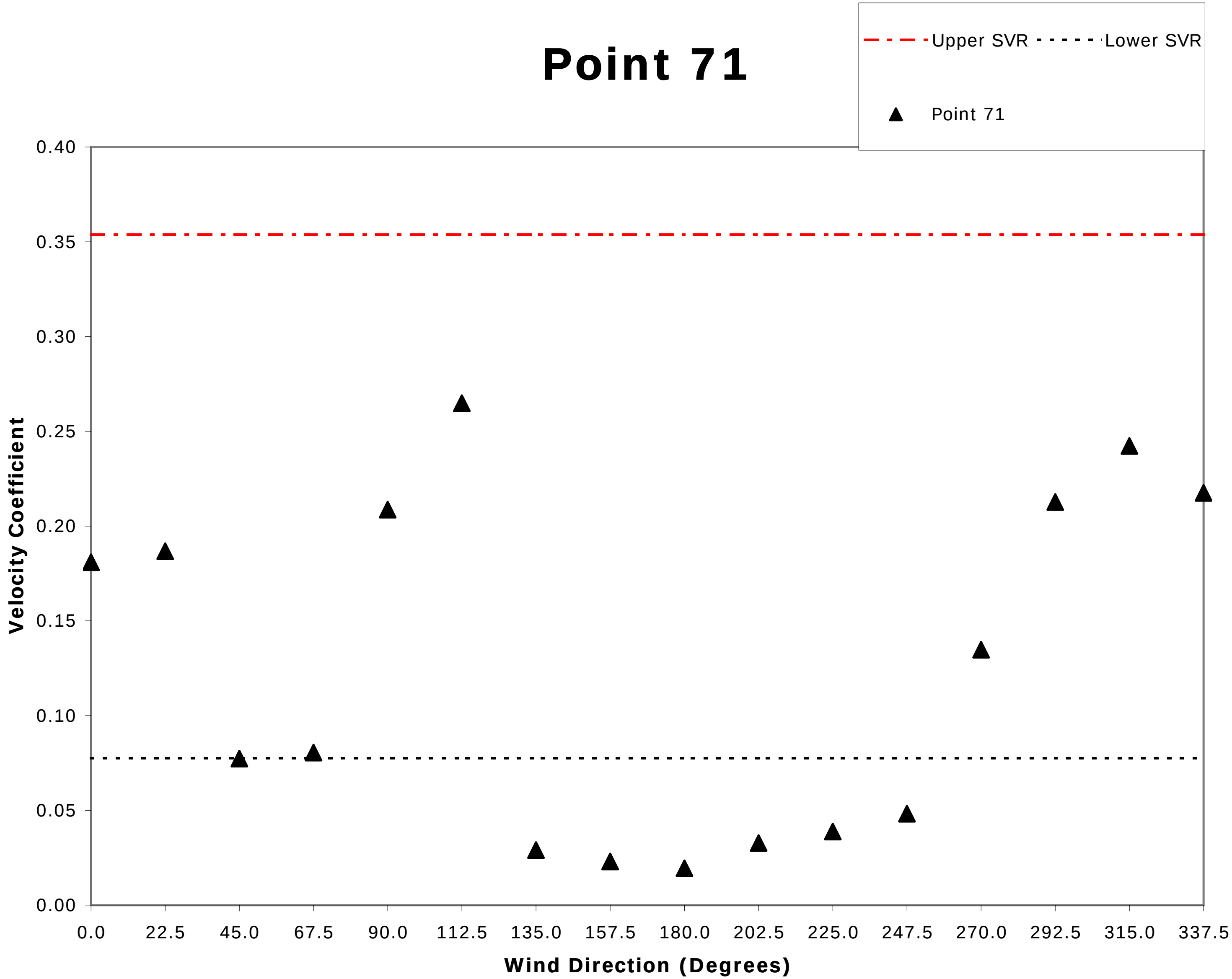
Point 67
Upper SVR
Lower SVR
Point 67
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

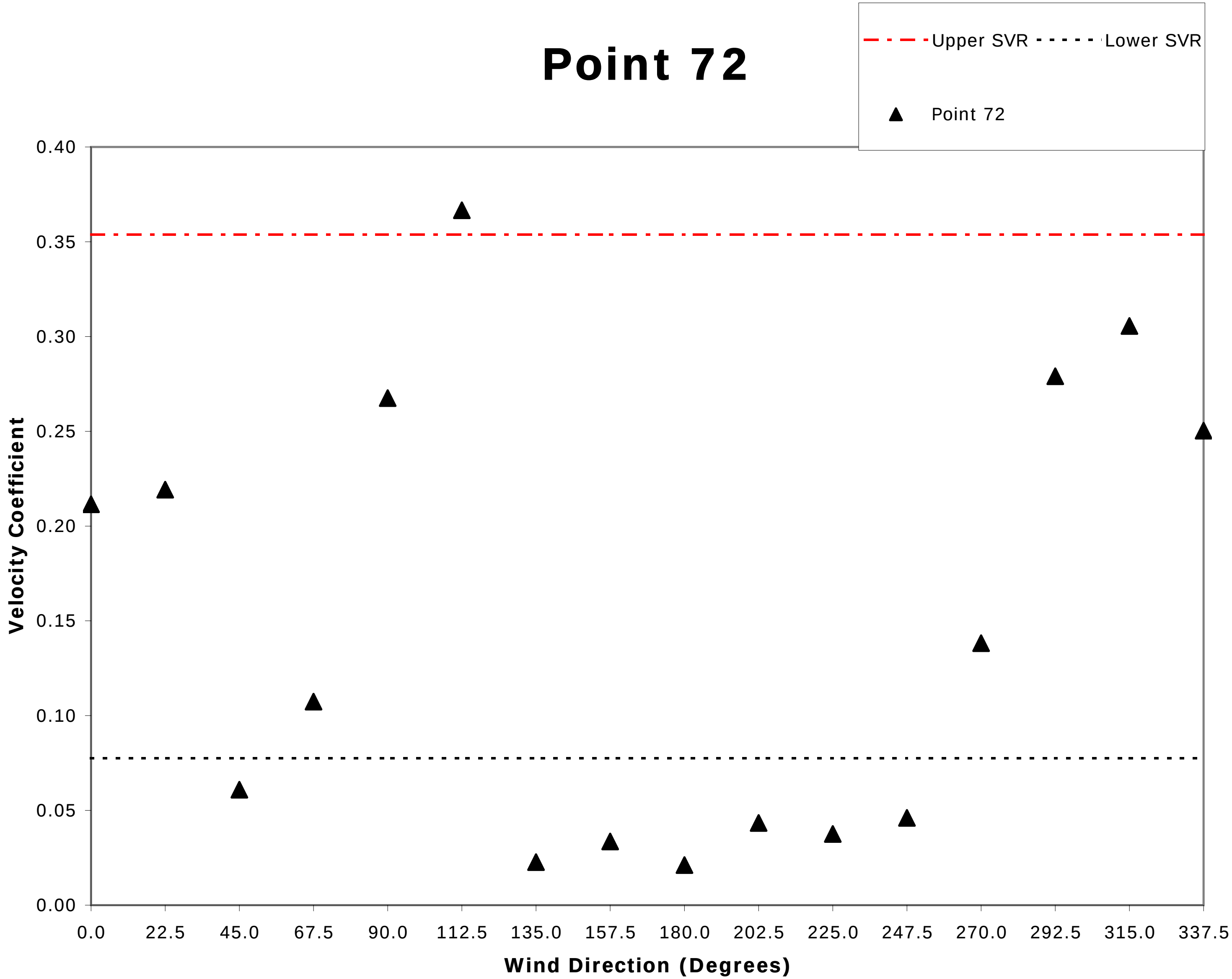

Point 68
Upper SVR
Lower SVR
Point 68
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

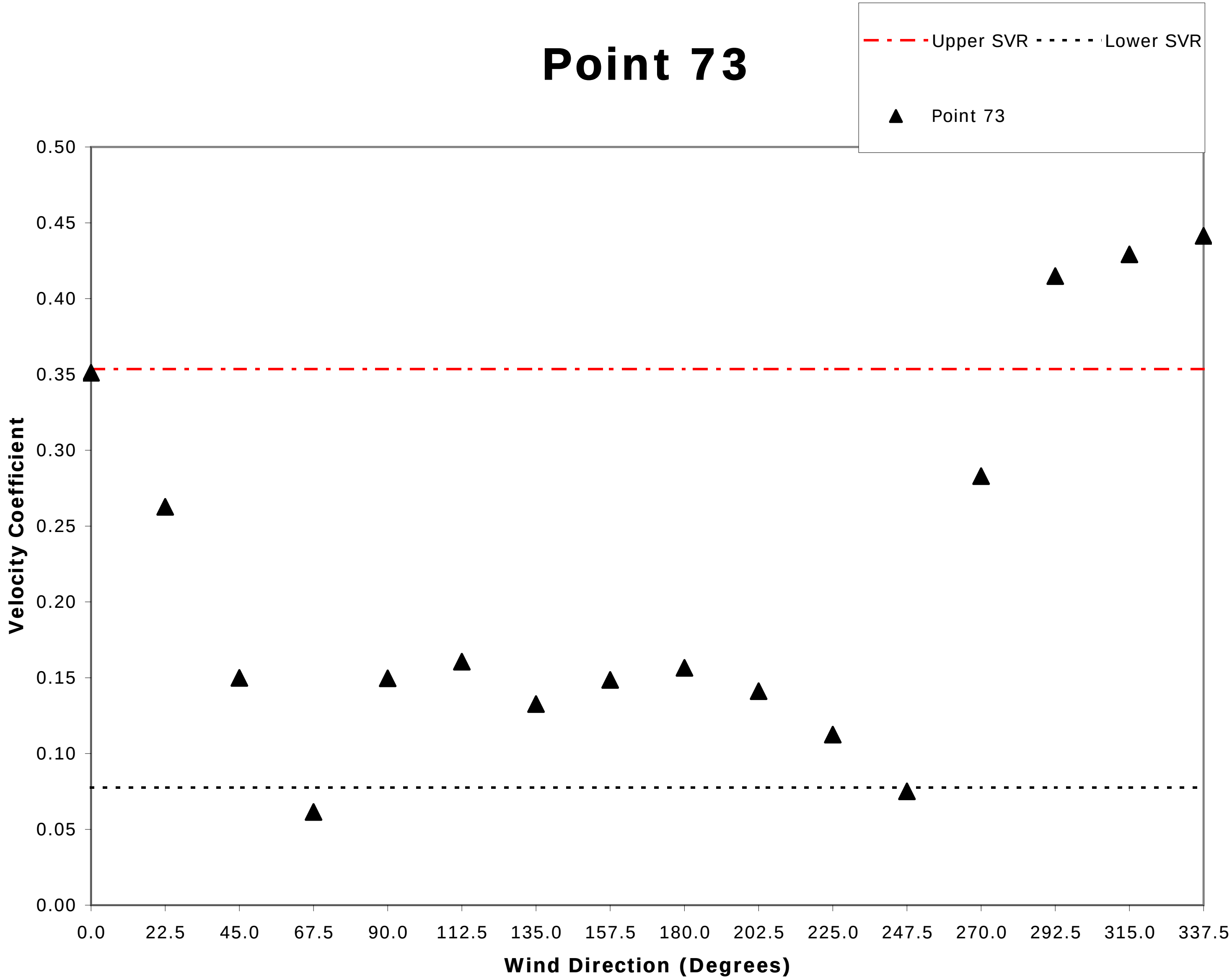


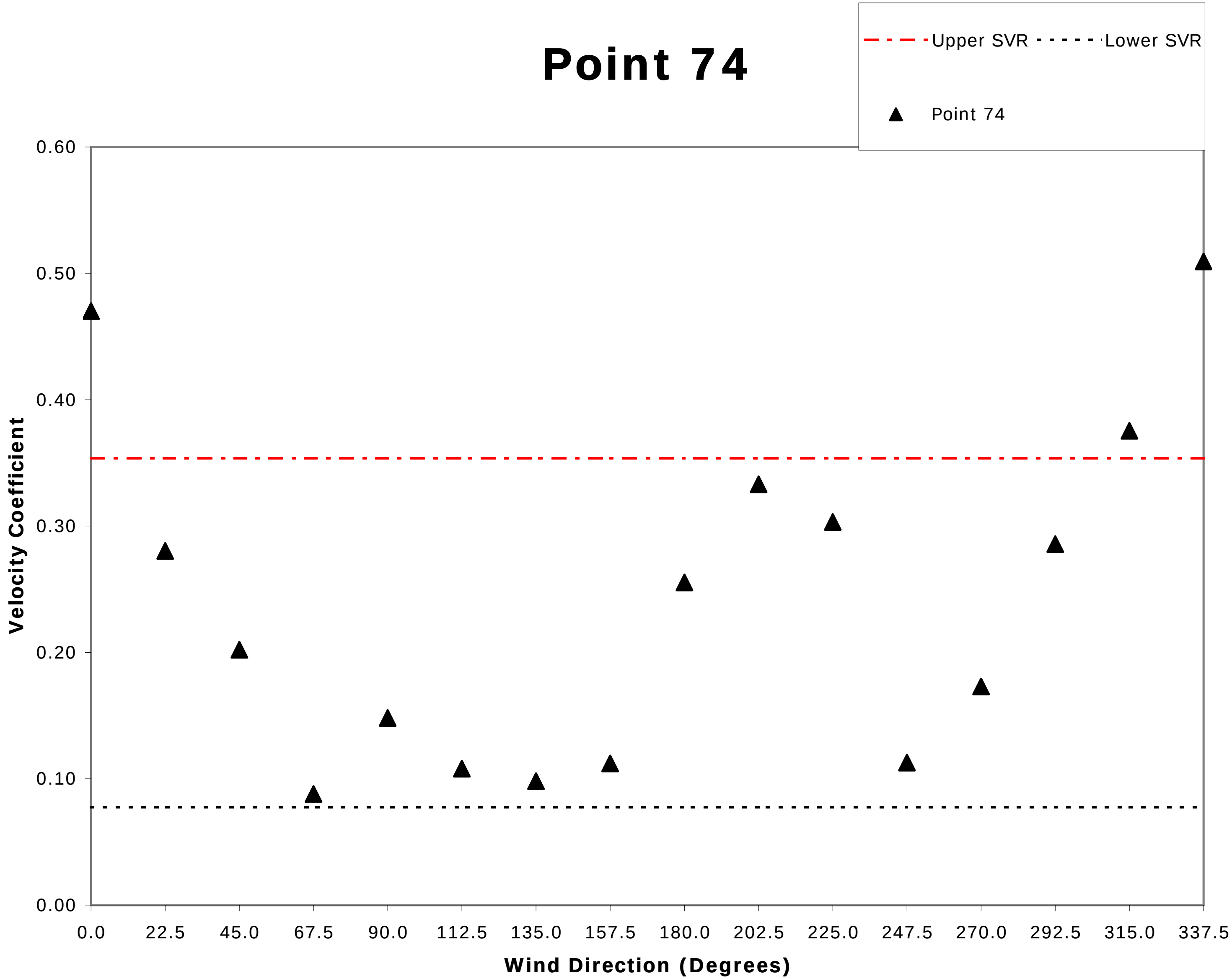
Point 69
Upper SVR
Lower SVR
Point 69
Velocity Coefficient
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 70
Upper SVR
Lower SVR
Point 70
Velocity Coefficient
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

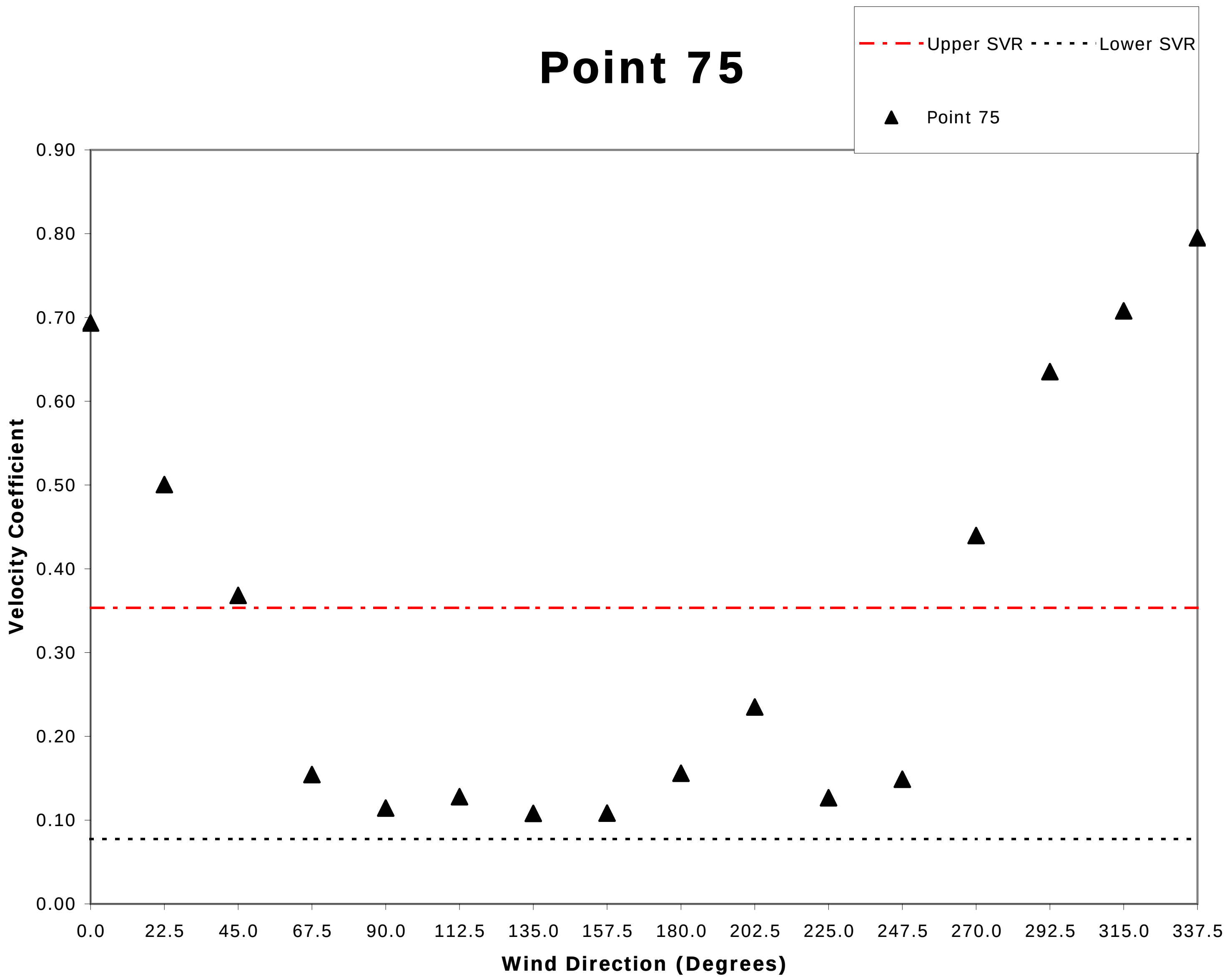

Point 71
Upper SVR
Lower SVR
Point 71
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

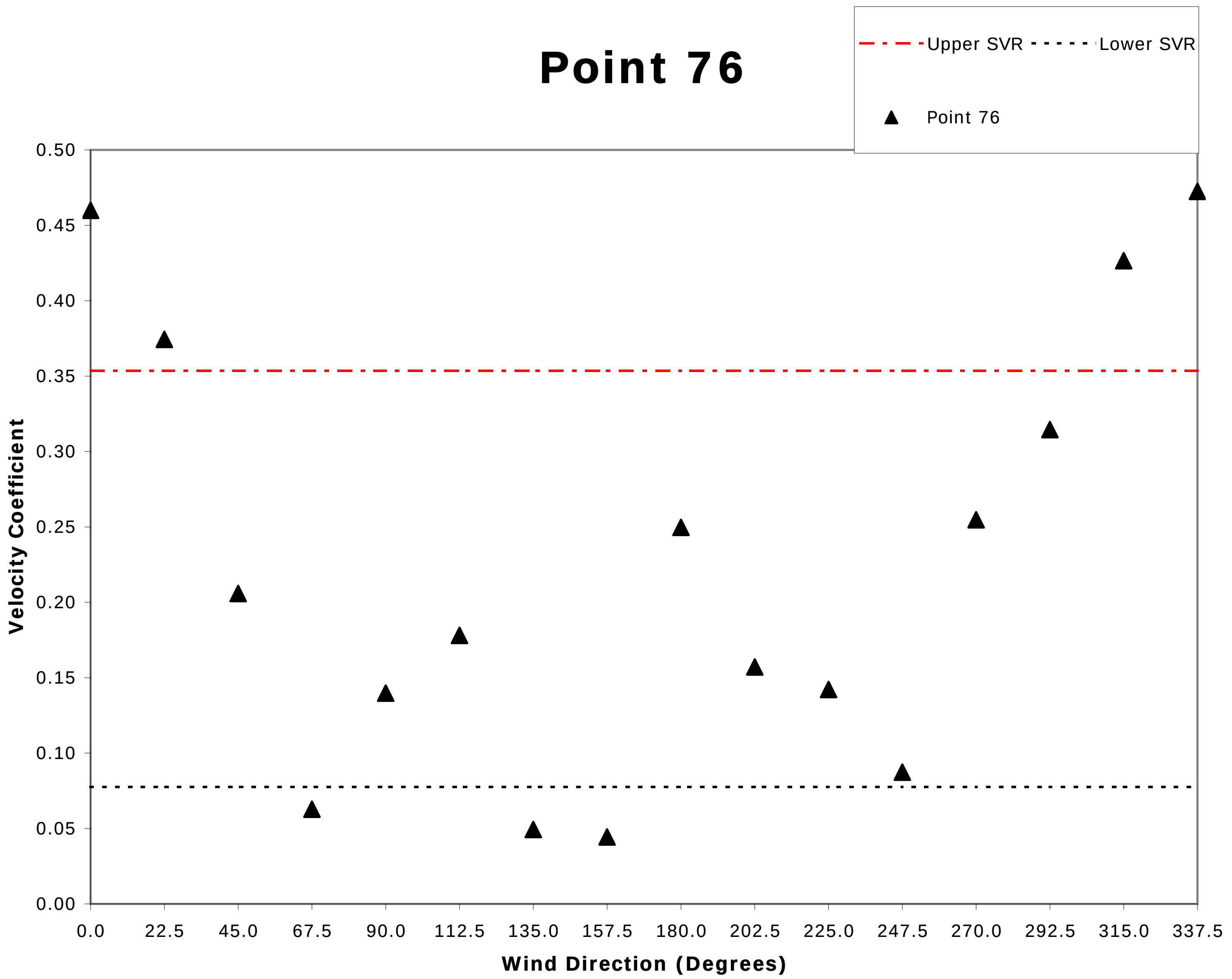

Point 72
Upper SVR
Lower SVR
Point 72
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 73
Upper SVR
Lower SVR
Point 73
Velocity Coefficient
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

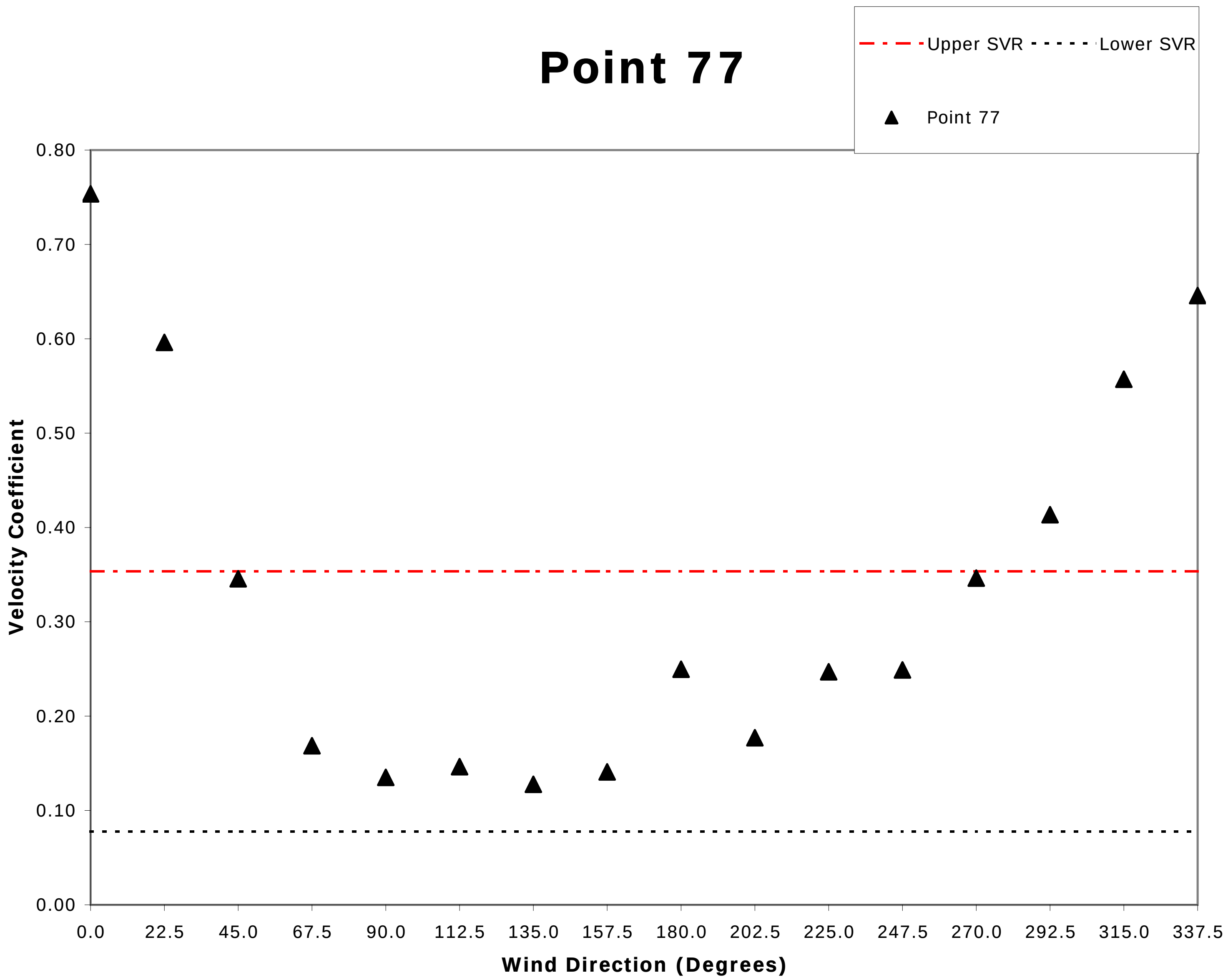


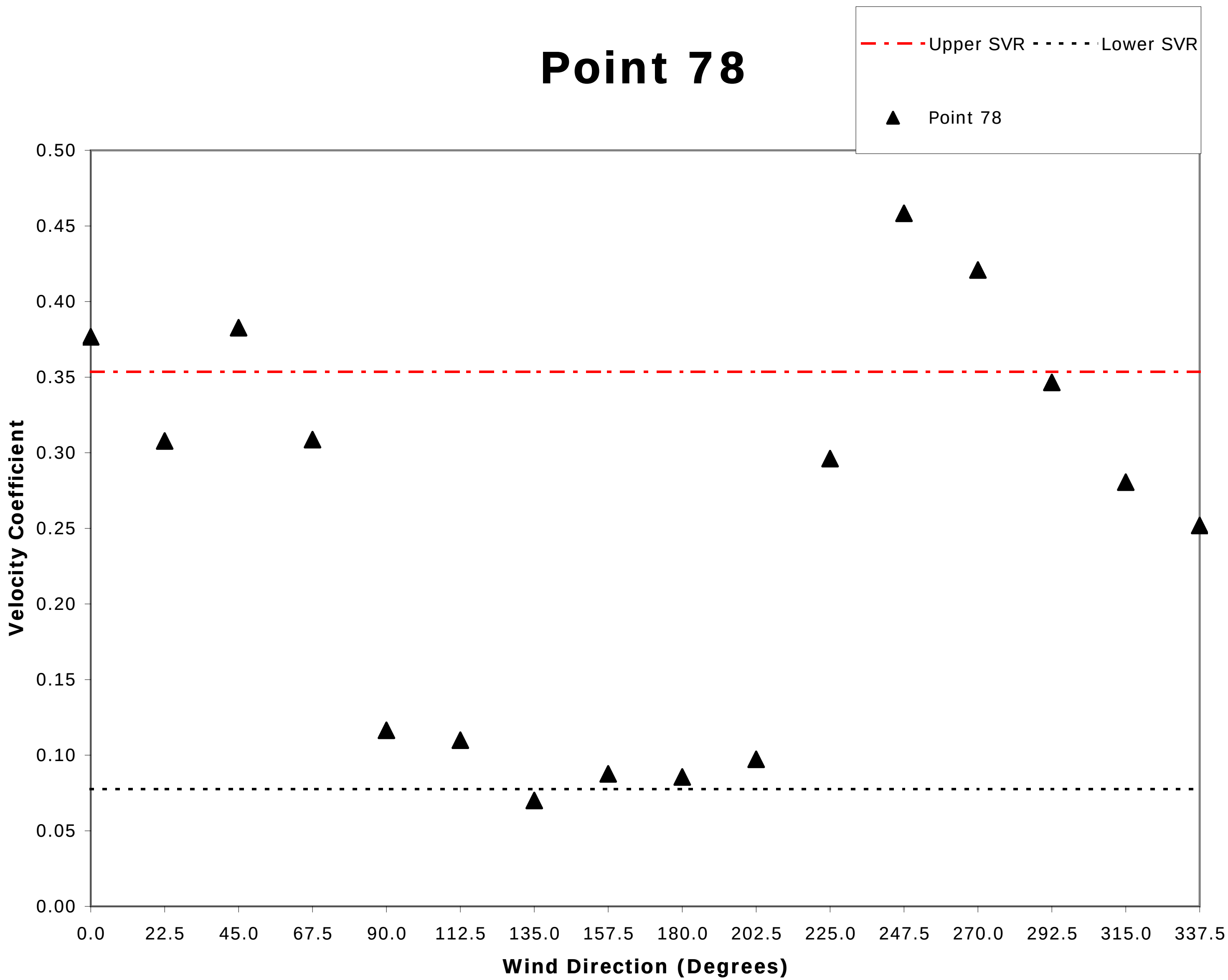
Point 74
Upper SVR
Lower SVR
Point 74
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

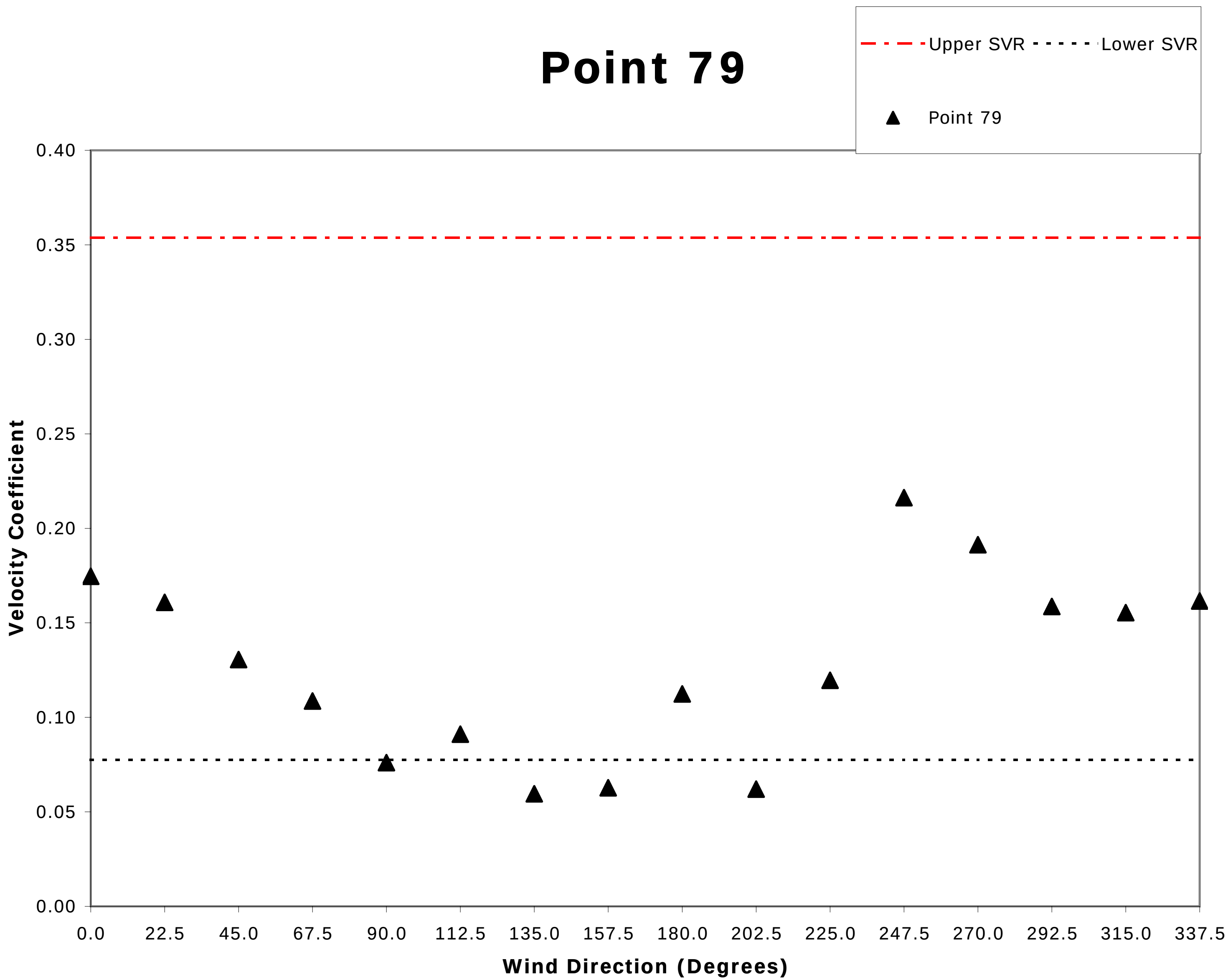

Point 75
Upper SVR
Lower SVR
Point 75
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

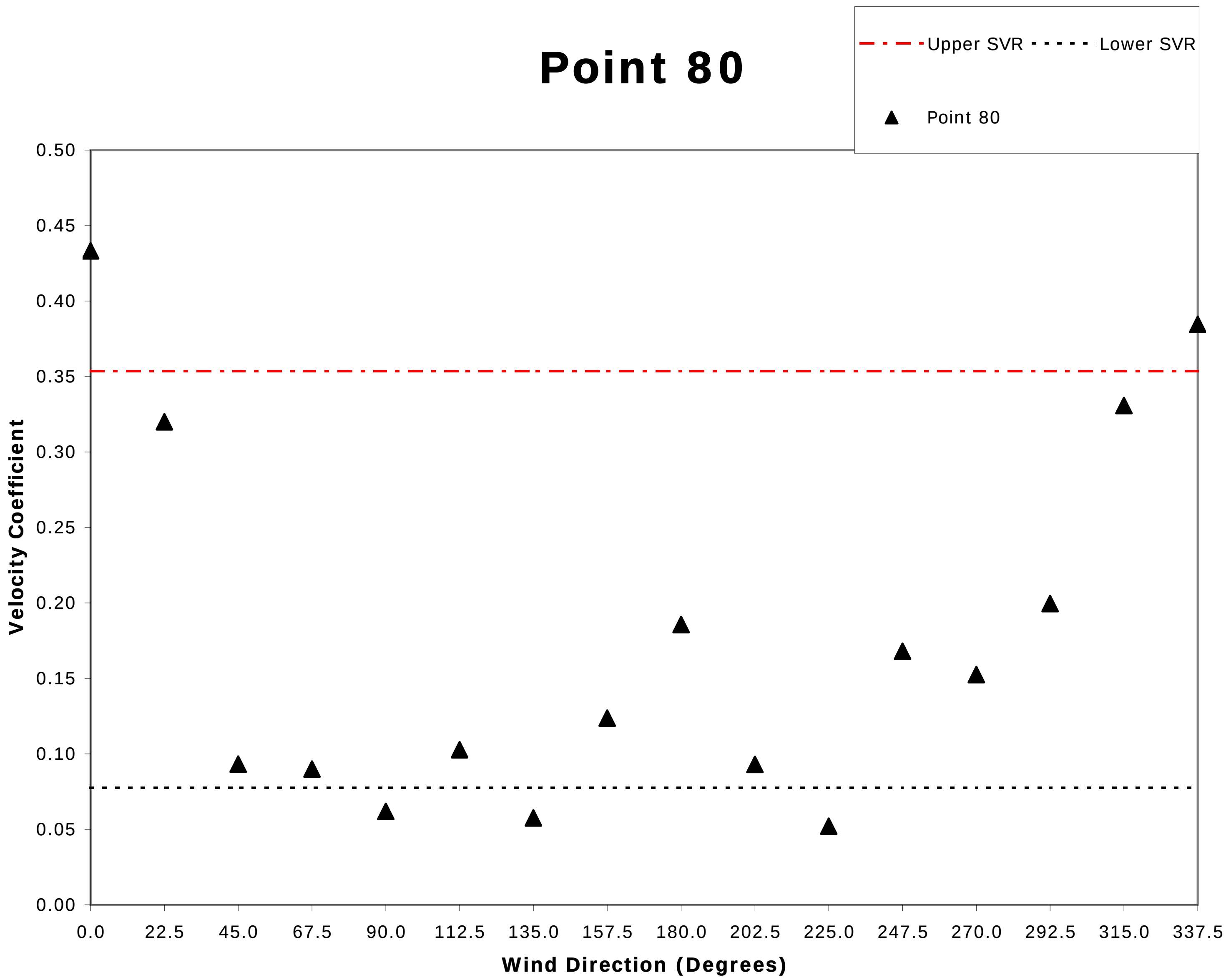


Point 76
Upper SVR
Lower SVR
Point 76
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 77
Upper SVR
Lower SVR
Point 77
Velocity Coefficient
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

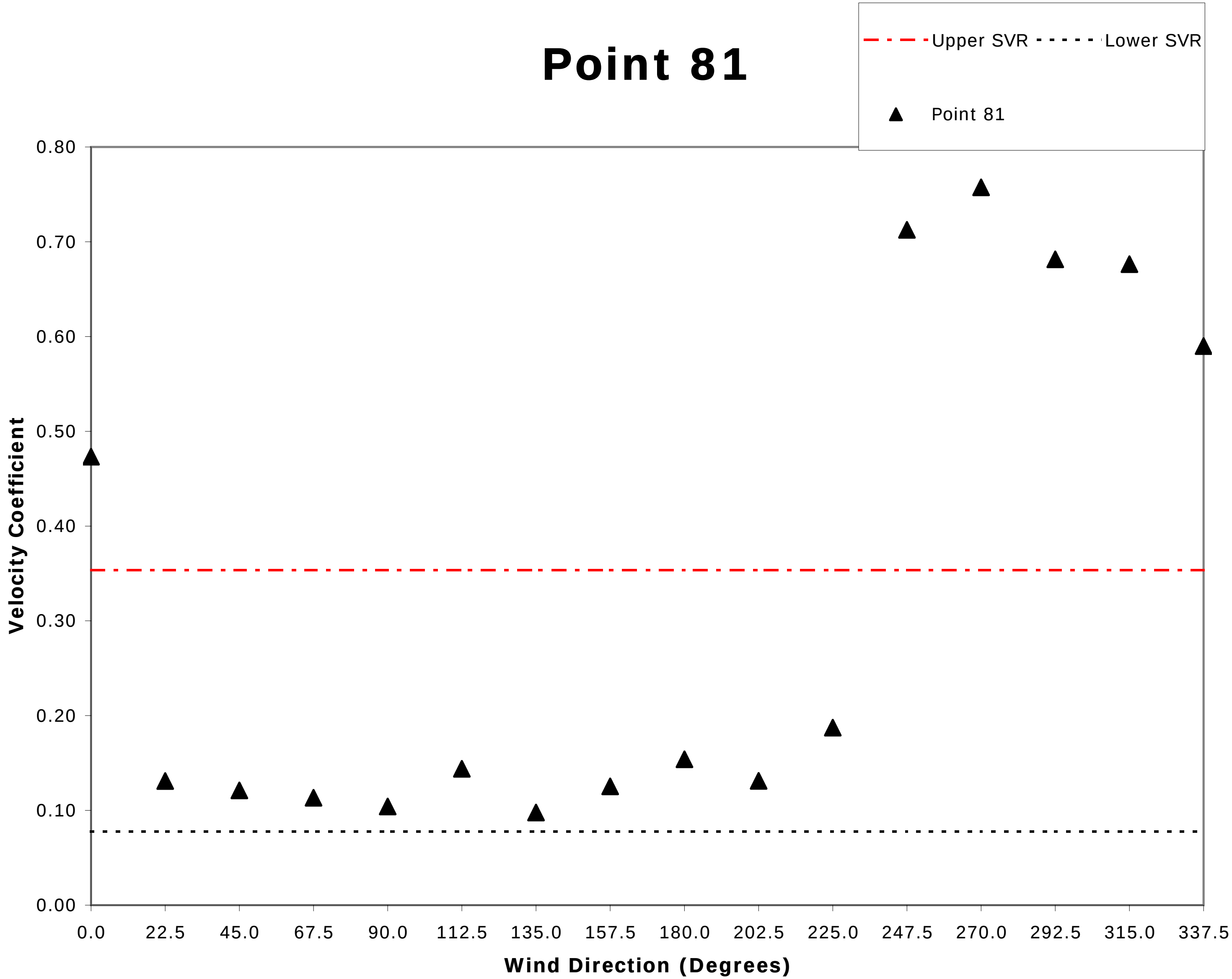

Point 78
Upper SVR
Lower SVR
Point 78
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 79
Upper SVR
Lower SVR
Point 79
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

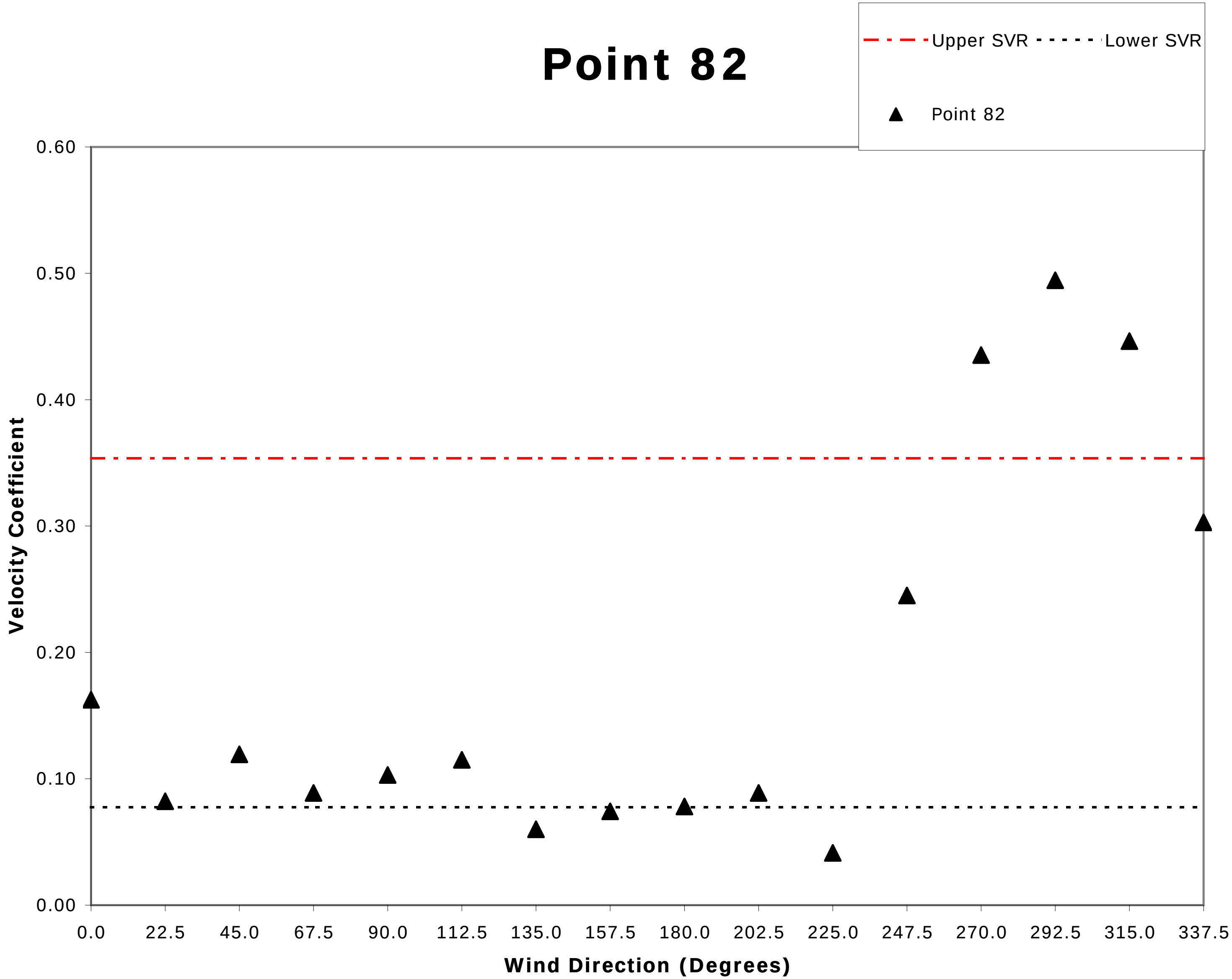


Point 80
Upper SVR
Lower SVR
Point 80
Velocity Coefficient
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

Point 81



Upper SVR
Lower SVR
Point 81
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Velocity Coefficient
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)


Point 82
Upper SVR
Lower SVR
Point 82
Velocity Coefficient
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
Wind Direction (Degrees)

Appendix VII

Detailed Breakdown of Velocity Ratios for All Test Points for the Three Design Schemes

Appendix VII - Base Scheme - Detailed Breakdown of Velocity Ratios

	Wind Direction																
Test Pt	**0**	**22.5**	**45**	**67.5**	**90**	**112.5**	**135**	**157.5**	**180**	**202.5**	**225**	**247.5**	**270**	**292.5**	**315**	**337.5**	**VR**
1	0.04	0.08	0.04	0.06	0.07	0.07	0.07	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.04	0.05	0.05
2	0.06	0.04	0.04	0.15	0.20	0.22	0.18	0.11	0.12	0.06	0.04	0.04	0.03	0.02	0.03	0.04	0.11
3	0.12	0.06	0.08	0.10	0.06	0.09	0.14	0.11	0.05	0.04	0.03	0.03	0.02	0.02	0.04	0.14	0.08
4	0.05	0.03	0.04	0.06	0.05	0.05	0.15	0.18	0.11	0.08	0.05	0.12	0.07	0.04	0.04	0.05	0.06
5	0.09	0.07	0.03	0.17	0.09	0.11	0.31	0.19	0.10	0.05	0.03	0.11	0.12	0.09	0.03	0.05	0.11
6	0.07	0.06	0.02	0.09	0.19	0.18	0.13	0.07	0.10	0.07	0.06	0.09	0.11	0.07	0.06	0.06	0.10
7	0.05	0.03	0.02	0.03	0.03	0.03	0.08	0.09	0.20	0.15	0.12	0.06	0.03	0.04	0.05	0.05	0.05
8	0.10	0.10	0.08	0.14	0.08	0.04	0.23	0.26	0.22	0.16	0.16	0.17	0.08	0.09	0.11	0.11	0.12
9	0.06	0.06	0.02	0.05	0.03	0.03	0.17	0.18	0.09	0.07	0.05	0.08	0.05	0.07	0.09	0.06	0.06
10	0.10	0.22	0.06	0.23	0.19	0.19	0.38	0.44	0.26	0.17	0.17	0.14	0.15	0.26	0.29	0.17	0.20
11	0.11	0.14	0.07	0.08	0.04	0.06	0.34	0.36	0.19	0.13	0.10	0.14	0.12	0.11	0.12	0.13	0.11
12	0.11	0.15	0.14	0.29	0.23	0.11	0.11	0.15	0.13	0.17	0.17	0.15	0.21	0.28	0.31	0.15	0.20
13	0.10	0.16	0.12	0.37	0.26	0.15	0.22	0.24	0.10	0.07	0.06	0.09	0.14	0.23	0.22	0.12	0.21
14	0.51	0.39	0.12	0.33	0.29	0.20	0.19	0.25	0.27	0.16	0.15	0.05	0.14	0.31	0.44	0.62	0.28
15	0.17	0.18	0.18	0.41	0.16	0.07	0.24	0.31	0.06	0.04	0.03	0.11	0.05	0.03	0.06	0.16	0.21
16	0.28	0.26	0.25	0.18	0.17	0.09	0.20	0.24	0.18	0.10	0.09	0.22	0.13	0.07	0.07	0.08	0.19
17	0.22	0.24	0.23	0.45	0.21	0.13	0.25	0.31	0.06	0.03	0.05	0.14	0.11	0.10	0.10	0.19	0.26
18	0.72	0.59	0.34	0.12	0.07	0.06	0.17	0.05	0.09	0.16	0.13	0.15	0.17	0.16	0.39	0.70	0.24
19	0.45	0.23	0.24	0.09	0.07	0.07	0.18	0.09	0.03	0.02	0.02	0.08	0.17	0.26	0.24	0.44	0.14
20	0.21	0.17	0.19	0.09	0.12	0.11	0.12	0.10	0.14	0.10	0.07	0.08	0.19	0.32	0.24	0.18	0.13
21	0.21	0.31	0.16	0.13	0.01	0.00	0.05	0.07	0.03	0.04	0.05	0.25	0.32	0.16	0.12	0.15	0.13
22	0.29	0.14	0.10	0.12	0.10	0.06	0.06	0.09	0.15	0.15	0.16	0.12	0.25	0.41	0.47	0.40	0.14
23	0.27	0.14	0.12	0.20	0.00	0.00	0.10	0.16	0.02	0.01	0.01	0.42	0.46	0.42	0.38	0.36	0.14
24	0.36	0.50	0.53	0.26	0.13	0.09	0.19	0.11	0.13	0.08	0.11	0.61	0.61	0.64	0.63	0.57	0.29
25	0.20	0.21	0.23	0.11	0.05	0.01	0.07	0.17	0.13	0.14	0.11	0.34	0.37	0.28	0.16	0.14	0.14
26	0.27	0.26	0.13	0.15	0.09	0.04	0.03	0.05	0.08	0.13	0.20	0.26	0.26	0.24	0.23	0.21	0.15
27	0.57	0.53	0.41	0.20	0.00	0.00	0.07	0.12	0.02	0.07	0.13	0.31	0.27	0.23	0.28	0.42	0.23
28	0.31	0.29	0.37	0.17	0.11	0.08	0.04	0.04	0.21	0.27	0.23	0.21	0.20	0.17	0.19	0.29	0.20
29	0.43	0.46	0.39	0.25	0.08	0.04	0.05	0.03	0.04	0.08	0.17	0.27	0.28	0.20	0.18	0.29	0.23
30	0.35	0.22	0.23	0.12	0.08	0.11	0.08	0.06	0.06	0.06	0.14	0.21	0.24	0.26	0.26	0.31	0.15
31	0.34	0.38	0.30	0.17	0.12	0.10	0.08	0.09	0.05	0.07	0.20	0.28	0.27	0.20	0.21	0.25	0.20
32	0.27	0.38	0.34	0.17	0.10	0.08	0.06	0.08	0.04	0.04	0.13	0.25	0.26	0.17	0.17	0.23	0.19
33	0.33	0.28	0.34	0.35	0.10	0.10	0.07	0.04	0.04	0.16	0.26	0.26	0.25	0.26	0.25	0.33	0.24
34	0.15	0.17	0.22	0.20	0.39	0.24	0.05	0.04	0.08	0.06	0.13	0.21	0.25	0.24	0.20	0.18	0.21
35	0.38	0.18	0.27	0.16	0.11	0.04	0.07	0.07	0.03	0.05	0.20	0.32	0.36	0.29	0.31	0.31	0.17
36	0.35	0.31	0.08	0.07	0.01	0.02	0.03	0.08	0.02	0.02	0.07	0.46	0.33	0.22	0.33	0.32	0.12
37	0.11	0.13	0.06	0.03	0.03	0.05	0.06	0.09	0.11	0.04	0.10	0.24	0.13	0.12	0.10	0.12	0.07
38	0.19	0.20	0.14	0.05	0.08	0.06	0.02	0.03	0.05	0.04	0.11	0.09	0.09	0.15	0.17	0.19	0.10
39	0.35	0.43	0.22	0.10	0.04	0.03	0.06	0.06	0.02	0.02	0.12	0.23	0.19	0.19	0.26	0.31	0.16
40	0.43	0.08	0.07	0.09	0.08	0.07	0.05	0.08	0.07	0.04	0.07	0.44	0.25	0.30	0.40	0.37	0.12
41	0.06	0.06	0.04	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.04	0.05	0.03	0.04	0.03	0.05	0.04
42	0.15	0.16	0.07	0.09	0.15	0.17	0.07	0.04	0.09	0.04	0.07	0.06	0.07	0.14	0.16	0.12	0.11
43	0.19	0.20	0.14	0.05	0.22	0.25	0.02	0.03	0.06	0.04	0.04	0.09	0.09	0.15	0.17	0.19	0.13
44	0.15	0.16	0.07	0.09	0.04	0.05	0.07	0.04	0.03	0.02	0.02	0.06	0.07	0.14	0.16	0.12	0.08
45	0.06	0.05	0.04	0.16	0.33	0.28	0.07	0.05	0.03	0.03	0.05	0.09	0.09	0.11	0.09	0.07	0.14
46	0.10	0.11	0.08	0.06	0.04	0.05	0.04	0.05	0.06	0.06	0.07	0.40	0.38	0.43	0.35	0.22	0.09
47	0.14	0.10	0.03	0.05	0.11	0.20	0.06	0.02	0.08	0.03	0.03	0.06	0.11	0.14	0.17	0.16	0.08
48	0.14	0.12	0.03	0.05	0.10	0.12	0.08	0.05	0.10	0.04	0.04	0.13	0.14	0.15	0.17	0.19	0.08
49	0.09	0.07	0.04	0.06	0.12	0.15	0.06	0.04	0.05	0.04	0.04	0.04	0.15	0.17	0.14	0.11	0.08
50	0.32	0.30	0.07	0.08	0.16	0.22	0.04	0.03	0.03	0.02	0.04	0.14	0.27	0.33	0.38	0.36	0.14
51	0.08	0.09	0.05	0.05	0.12	0.06	0.10	0.09	0.04	0.04	0.02	0.09	0.13	0.13	0.14	0.09	0.07
52	0.17	0.12	0.03	0.04	0.10	0.16	0.11	0.14	0.06	0.05	0.05	0.05	0.08	0.09	0.12	0.15	0.08
53	0.42	0.14	0.05	0.05	0.12	0.13	0.12	0.13	0.05	0.06	0.08	0.15	0.18	0.17	0.19	0.36	0.12
54	0.18	0.10	0.12	0.07	0.15	0.22	0.11	0.10	0.12	0.17	0.18	0.19	0.33	0.40	0.40	0.34	0.13
55	0.41	0.20	0.16	0.09	0.12	0.21	0.16	0.19	0.11	0.23	0.13	0.14	0.48	0.53	0.56	0.51	0.17
56	0.18	0.16	0.22	0.23	0.44	0.38	0.10	0.09	0.26	0.16	0.22	0.41	0.43	0.38	0.38	0.32	0.26
57	0.53	0.25	0.12	0.20	0.35	0.31	0.15	0.09	0.21	0.15	0.17	0.44	0.44	0.42	0.43	0.46	0.26
58	0.54	0.25	0.12	0.16	0.33	0.30	0.08	0.06	0.26	0.21	0.20	0.20	0.23	0.29	0.39	0.46	0.24
59	0.28	0.33	0.24	0.12	0.17	0.27	0.32	0.36	0.30	0.20	0.19	0.16	0.18	0.23	0.28	0.28	0.21
60	0.33	0.20	0.06	0.09	0.12	0.14	0.11	0.12	0.16	0.23	0.09	0.07	0.17	0.20	0.19	0.23	0.14
61	0.33	0.17	0.04	0.04	0.11	0.15	0.06	0.07	0.08	0.09	0.06	0.21	0.31	0.41	0.44	0.41	0.12
62	0.43	0.17	0.06	0.10	0.15	0.18	0.17	0.17	0.08	0.12	0.09	0.19	0.31	0.43	0.41	0.39	0.16
63	0.22	0.07	0.03	0.07	0.15	0.21	0.12	0.10	0.08	0.13	0.12	0.11	0.18	0.26	0.35	0.37	0.11
64	0.10	0.08	0.12	0.08	0.21	0.29	0.14	0.18	0.11	0.19	0.16	0.32	0.47	0.47	0.39	0.17	0.15
65	0.26	0.15	0.07	0.08	0.09	0.11	0.12	0.11	0.11	0.12	0.08	0.28	0.35	0.30	0.25	0.25	0.12
66	0.09	0.11	0.24	0.16	0.13	0.12	0.18	0.18	0.07	0.04	0.05	0.19	0.26	0.34	0.33	0.18	0.14
67	0.06	0.14	0.23	0.13	0.10	0.10	0.08	0.13	0.25	0.22	0.20	0.32	0.35	0.34	0.26	0.16	0.15
68	0.05	0.11	0.10	0.05	0.02	0.03	0.05	0.05	0.04	0.02	0.03	0.09	0.09	0.08	0.07	0.06	0.05
69	0.03	0.03	0.05	0.03	0.01	0.02	0.02	0.03	0.01	0.02	0.02	0.06	0.05	0.07	0.07	0.04	0.03
70	0.04	0.13	0.23	0.12	0.14	0.19	0.26	0.28	0.10	0.06	0.04	0.05	0.10	0.10	0.10	0.06	0.13
71	0.16	0.13	0.07	0.08	0.12	0.15	0.15	0.15	0.10	0.11	0.05	0.06	0.10	0.15	0.17	0.21	0.11
72	0.15	0.07	0.02	0.05	0.10	0.14	0.10	0.09	0.05	0.07	0.04	0.06	0.21	0.27	0.26	0.23	0.08
73	0.13	0.08	0.08	0.06	0.13	0.22	0.19	0.16	0.04	0.05	0.05	0.04	0.06	0.17	0.21	0.13	0.09
74	0.14	0.07	0.03	0.04	0.19	0.16	0.09	0.07	0.04	0.06	0.06	0.06	0.06	0.07	0.09	0.13	0.09
75	0.33	0.10	0.07	0.04	0.13	0.20	0.18	0.18	0.20	0.21	0.14	0.12	0.22	0.34	0.51	0.55	0.13
76	0.40	0.23	0.17	0.19	0.20	0.22	0.18	0.16	0.20	0.20	0.17	0.14	0.25	0.31	0.40	0.43	0.21
77	0.81	0.44	0.16	0.12	0.18	0.27	0.15	0.11	0.19	0.32	0.24	0.31	0.54	0.73	0.82	0.86	0.27
78	0.50	0.21	0.16	0.08	0.15	0.23	0.12	0.12	0.16	0.11	0.10	0.19	0.42	0.59	0.59	0.47	0.18
79	0.56	0.49	0.20	0.25	0.37	0.38	0.21	0.23	0.24	0.22	0.24	0.48	0.58	0.55	0.55	0.53	0.34
80	0.33	0.17	0.08	0.07	0.44	0.37	0.03	0.02	0.12	0.16	0.33	0.13	0.09	0.12	0.13	0.18	0.19
81	0.28	0.15	0.17	0.15	0.16	0.14	0.10	0.09	0.09	0.09	0.19	0.36	0.31	0.25	0.28	0.28	0.17
82	0.37	0.22	0.19	0.14	0.14	0.21	0.20	0.19	0.10	0.06	0.14	0.20	0.20	0.24	0.36	0.36	0.18
83	0.18	0.13	0.11	0.09	0.18	0.24	0.26	0.25	0.16	0.07	0.17	0.59	0.69	0.58	0.50	0.32	0.18
84	0.14	0.20	0.09	0.06	0.19	0.23	0.17	0.14	0.14	0.11	0.07	0.27	0.25	0.24	0.23	0.19	0.14
Average VR under a given wind direction	0.24	0.19	0.14	0.13	0.14	0.13	0.12	0.12	0.10	0.10	0.11	0.18	0.21	0.23	0.24	0.25	0.15

Appendix VII - Revised Scheme - Detailed Breakdown of Velocity Ratios

	Wind Direction																
Test Pt	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	VR
1	0.04	0.08	0.04	0.06	0.07	0.07	0.07	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.04	0.05	0.05
2	0.06	0.04	0.04	0.15	0.20	0.23	0.18	0.11	0.13	0.06	0.04	0.04	0.03	0.02	0.03	0.04	0.11
3	0.12	0.06	0.08	0.10	0.06	0.09	0.14	0.11	0.06	0.04	0.03	0.03	0.02	0.02	0.04	0.14	0.08
4	0.05	0.03	0.04	0.06	0.05	0.05	0.15	0.18	0.12	0.08	0.05	0.12	0.07	0.04	0.04	0.05	0.06
5	0.09	0.07	0.03	0.17	0.10	0.12	0.31	0.19	0.11	0.05	0.03	0.11	0.12	0.09	0.03	0.05	0.11
6	0.07	0.06	0.02	0.09	0.20	0.18	0.13	0.07	0.10	0.08	0.07	0.09	0.11	0.07	0.06	0.06	0.10
7	0.05	0.03	0.02	0.03	0.03	0.03	0.08	0.09	0.20	0.15	0.13	0.06	0.03	0.04	0.05	0.05	0.05
8	0.10	0.10	0.08	0.14	0.08	0.04	0.23	0.26	0.23	0.16	0.16	0.17	0.08	0.09	0.11	0.11	0.12
9	0.06	0.06	0.02	0.05	0.04	0.03	0.17	0.18	0.09	0.07	0.05	0.08	0.05	0.07	0.09	0.06	0.06
10	0.10	0.22	0.06	0.23	0.20	0.19	0.38	0.44	0.27	0.17	0.17	0.14	0.15	0.26	0.29	0.17	0.20
11	0.11	0.14	0.07	0.08	0.04	0.06	0.34	0.36	0.19	0.13	0.10	0.14	0.12	0.11	0.12	0.13	0.11
12	0.11	0.15	0.14	0.29	0.24	0.12	0.11	0.15	0.14	0.18	0.18	0.15	0.21	0.28	0.31	0.15	0.20
13	0.10	0.16	0.12	0.37	0.27	0.15	0.22	0.24	0.11	0.08	0.06	0.09	0.14	0.23	0.22	0.12	0.22
14	0.51	0.39	0.12	0.33	0.30	0.20	0.19	0.25	0.28	0.16	0.16	0.05	0.14	0.31	0.44	0.62	0.29
15	0.17	0.18	0.18	0.41	0.17	0.07	0.24	0.31	0.06	0.04	0.03	0.11	0.05	0.03	0.06	0.16	0.21
16	0.28	0.26	0.25	0.18	0.17	0.09	0.20	0.24	0.18	0.10	0.10	0.22	0.13	0.07	0.07	0.08	0.19
17	0.22	0.24	0.23	0.45	0.22	0.13	0.25	0.31	0.06	0.03	0.05	0.14	0.11	0.10	0.10	0.19	0.26
18	0.48	0.46	0.33	0.15	0.09	0.08	0.12	0.08	0.13	0.23	0.19	0.19	0.16	0.12	0.18	0.43	0.22
19	0.36	0.20	0.19	0.09	0.07	0.09	0.09	0.10	0.13	0.08	0.07	0.07	0.16	0.25	0.24	0.26	0.13
20	0.21	0.17	0.19	0.09	0.12	0.11	0.12	0.10	0.15	0.11	0.08	0.08	0.19	0.32	0.24	0.18	0.13
21	0.40	0.22	0.12	0.13	0.06	0.04	0.05	0.10	0.11	0.12	0.10	0.19	0.35	0.68	0.70	0.58	0.15
22	0.29	0.14	0.10	0.12	0.10	0.07	0.06	0.09	0.15	0.15	0.17	0.12	0.25	0.41	0.47	0.40	0.14
23	0.27	0.14	0.12	0.20	0.00	-0.01	0.10	0.16	0.02	0.01	0.01	0.42	0.46	0.42	0.38	0.36	0.14
24	0.47	0.46	0.43	0.24	0.24	0.15	0.14	0.14	0.16	0.23	0.24	0.55	0.64	0.65	0.65	0.58	0.31
25	0.20	0.21	0.23	0.11	0.05	0.02	0.07	0.17	0.13	0.14	0.12	0.34	0.37	0.28	0.16	0.14	0.14
26	0.27	0.26	0.13	0.15	0.09	0.05	0.03	0.05	0.08	0.13	0.21	0.26	0.26	0.24	0.23	0.21	0.15
27	0.57	0.53	0.41	0.20	0.00	-0.01	0.07	0.12	0.02	0.07	0.13	0.31	0.27	0.23	0.28	0.42	0.23
28	0.31	0.29	0.37	0.17	0.11	0.08	0.04	0.04	0.21	0.28	0.24	0.21	0.20	0.17	0.19	0.29	0.20
29	0.43	0.46	0.39	0.25	0.09	0.04	0.05	0.03	0.04	0.08	0.17	0.27	0.28	0.20	0.18	0.29	0.23
30	0.35	0.22	0.23	0.12	0.09	0.12	0.08	0.06	0.07	0.06	0.15	0.21	0.24	0.26	0.26	0.31	0.15
31	0.34	0.38	0.30	0.17	0.13	0.10	0.08	0.09	0.05	0.08	0.20	0.28	0.27	0.20	0.21	0.25	0.20
32	0.27	0.38	0.34	0.17	0.10	0.08	0.06	0.08	0.04	0.04	0.13	0.25	0.26	0.17	0.17	0.23	0.19
33	0.33	0.28	0.34	0.35	0.10	0.11	0.07	0.04	0.05	0.17	0.26	0.26	0.25	0.26	0.25	0.33	0.24
34	0.12	0.17	0.23	0.27	0.20	0.21	0.05	0.03	0.08	0.15	0.26	0.13	0.15	0.12	0.11	0.13	0.19
35	0.24	0.14	0.12	0.16	0.06	0.07	0.05	0.05	0.06	0.06	0.13	0.19	0.19	0.17	0.19	0.21	0.13
36	0.31	0.21	0.07	0.08	0.07	0.06	0.04	0.07	0.07	0.06	0.09	0.20	0.16	0.19	0.29	0.30	0.11
37	0.15	0.09	0.03	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.03	0.08	0.08	0.15	0.17	0.13	0.04
38	0.19	0.20	0.14	0.05	0.09	0.06	0.02	0.03	0.06	0.04	0.12	0.09	0.09	0.15	0.17	0.19	0.10
39	0.35	0.43	0.22	0.10	0.04	0.03	0.06	0.06	0.02	0.02	0.12	0.23	0.19	0.19	0.26	0.31	0.16
40	0.08	0.07	0.12	0.11	0.05	0.05	0.04	0.06	0.04	0.03	0.09	0.42	0.26	0.19	0.15	0.12	0.09
41	0.06	0.06	0.04	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.04	0.05	0.03	0.04	0.03	0.05	0.04
42	0.15	0.16	0.07	0.09	0.15	0.17	0.07	0.04	0.09	0.04	0.08	0.06	0.07	0.14	0.16	0.12	0.11
43	0.19	0.20	0.14	0.05	0.23	0.26	0.02	0.03	0.06	0.04	0.04	0.09	0.09	0.15	0.17	0.19	0.13
44	0.15	0.16	0.07	0.09	0.04	0.05	0.07	0.04	0.04	0.02	0.02	0.06	0.07	0.14	0.16	0.12	0.08
45	0.06	0.05	0.04	0.16	0.34	0.29	0.07	0.05	0.03	0.03	0.05	0.09	0.09	0.11	0.09	0.07	0.14
46	0.13	0.08	0.05	0.03	0.03	0.03	0.04	0.05	0.04	0.03	0.03	0.33	0.20	0.25	0.21	0.16	0.06
47	0.14	0.10	0.03	0.05	0.11	0.21	0.06	0.02	0.08	0.03	0.03	0.06	0.11	0.14	0.17	0.16	0.08
48	0.14	0.12	0.03	0.05	0.10	0.12	0.08	0.05	0.10	0.04	0.04	0.13	0.14	0.15	0.17	0.19	0.08
49	0.09	0.07	0.04	0.06	0.13	0.15	0.06	0.04	0.06	0.04	0.04	0.04	0.15	0.17	0.14	0.11	0.08
50	0.19	0.16	0.05	0.05	0.09	0.12	0.03	0.02	0.03	0.02	0.02	0.07	0.18	0.24	0.25	0.23	0.08
51	0.11	0.15	0.03	0.04	0.08	0.10	0.03	0.01	0.03	0.02	0.02	0.04	0.09	0.16	0.18	0.17	0.07
52	0.11	0.11	0.14	0.06	0.05	0.06	0.07	0.10	0.03	0.05	0.05	0.08	0.31	0.34	0.26	0.18	0.08
53	0.10	0.13	0.13	0.04	0.10	0.11	0.06	0.10	0.06	0.07	0.04	0.25	0.46	0.38	0.30	0.18	0.10
54	0.29	0.14	0.10	0.12	0.03	0.05	0.06	0.09	0.05	0.08	0.09	0.12	0.25	0.41	0.47	0.40	0.12
55	0.34	0.20	0.27	0.09	0.05	0.10	0.08	0.08	0.09	0.19	0.09	0.07	0.46	0.64	0.64	0.52	0.15
56	0.40	0.31	0.39	0.23	0.13	0.16	0.14	0.13	0.36	0.28	0.28	0.34	0.67	0.67	0.55	0.47	0.26
57	0.27	0.26	0.13	0.15	0.08	0.10	0.03	0.05	0.20	0.16	0.19	0.26	0.26	0.24	0.23	0.21	0.16
58	0.35	0.22	0.23	0.12	0.16	0.17	0.08	0.06	0.20	0.15	0.20	0.21	0.24	0.26	0.26	0.31	0.18
59	0.26	0.13	0.39	0.11	0.08	0.07	0.02	0.02	0.11	0.08	0.12	0.12	0.10	0.14	0.20	0.20	0.13
60	0.62	0.27	0.08	0.14	0.04	0.03	0.10	0.13	0.06	0.03	0.04	0.53	0.71	0.76	0.78	0.70	0.19
61	0.07	0.04	0.06	0.06	0.06	0.08	0.03	0.04	0.13	0.10	0.06	0.08	0.10	0.10	0.10	0.08	0.06
62	0.15	0.17	0.22	0.20	0.06	0.06	0.05	0.04	0.07	0.16	0.07	0.21	0.25	0.24	0.20	0.18	0.14
63	0.09	0.07	0.04	0.01	0.04	0.03	0.02	0.03	0.06	0.15	0.08	0.15	0.17	0.19	0.19	0.13	0.05
64	0.14	0.14	0.11	0.05	0.06	0.08	0.15	0.12	0.06	0.11	0.05	0.28	0.37	0.38	0.35	0.20	0.10
65	0.18	0.15	0.17	0.05	0.09	0.14	0.09	0.07	0.10	0.16	0.11	0.18	0.38	0.38	0.27	0.25	0.12
66	0.18	0.14	0.32	0.14	0.10	0.11	0.12	0.13	0.10	0.07	0.09	0.29	0.35	0.44	0.43	0.33	0.16
67	0.07	0.06	0.13	0.07	0.05	0.06	0.04	0.04	0.07	0.08	0.10	0.16	0.23	0.21	0.16	0.10	0.08
68	0.40	0.13	0.11	0.08	0.10	0.13	0.16	0.13	0.13	0.10	0.10	0.30	0.46	0.50	0.48	0.46	0.15
69	0.18	0.12	0.07	0.07	0.07	0.11	0.09	0.08	0.06	0.10	0.06	0.25	0.42	0.43	0.43	0.32	0.11
70	0.07	0.06	0.02	0.02	0.04	0.05	0.03	0.04	0.04	0.06	0.03	0.09	0.17	0.17	0.13	0.08	0.04
71	0.18	0.16	0.05	0.02	0.07	0.07	0.02	0.01	0.02	0.04	0.01	0.04	0.11	0.20	0.26	0.24	0.07
72	0.32	0.29	0.06	0.02	0.06	0.06	0.02	0.02	0.02	0.03	0.02	0.11	0.22	0.37	0.45	0.41	0.10
73	0.41	0.30	0.11	0.06	0.15	0.15	0.13	0.13	0.13	0.14	0.09	0.09	0.24	0.43	0.50	0.49	0.16
74	0.16	0.16	0.23	0.23	0.17	0.13	0.19	0.18	0.20	0.21	0.19	0.24	0.20	0.26	0.27	0.17	0.19
75	0.66	0.53	0.37	0.14	0.17	0.18	0.14	0.13	0.17	0.16	0.12	0.22	0.52	0.68	0.73	0.74	0.27
76	0.67	0.56	0.35	0.12	0.09	0.11	0.09	0.10	0.19	0.13	0.10	0.19	0.54	0.59	0.62	0.70	0.25
77	0.58	0.46	0.31	0.10	0.17	0.16	0.09	0.10	0.21	0.20	0.32	0.34	0.44	0.49	0.53	0.61	0.25
78	0.28	0.29	0.39	0.26	0.14	0.12	0.08	0.04	0.08	0.11	0.28	0.59	0.56	0.42	0.36	0.24	0.24
79	0.34	0.23	0.12	0.17	0.11	0.10	0.09	0.10	0.11	0.06	0.11	0.19	0.19	0.21	0.24	0.29	0.16
80	0.21	0.18	0.10	0.07	0.01	0.01	0.04	0.07	0.03	0.02	0.05	0.28	0.23	0.16	0.16	0.15	0.09
81	0.16	0.07	0.08	0.06	0.05	0.08	0.04	0.04	0.06	0.05	0.04	0.26	0.38	0.38	0.32	0.22	0.08
82	0.24	0.09	0.07	0.07	0.13	0.12	0.15	0.15	0.07	0.10	0.03	0.45	0.59	0.61	0.53	0.43	0.13
Average VR under a given wind direction	0.23	0.20	0.16	0.13	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.18	0.23	0.25	0.26	0.25	0.14

Appendix VII - Second Revised Scheme - Detailed Breakdown of Velocity Ratios

	Wind Direction																
Test Pt	**0**	**22.5**	**45**	**67.5**	**90**	**112.5**	**135**	**157.5**	**180**	**202.5**	**225**	**247.5**	**270**	**292.5**	**315**	**337.5**	**VR**
1	0.04	0.08	0.04	0.06	0.07	0.07	0.07	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.04	0.05	0.05
2	0.06	0.04	0.04	0.15	0.20	0.23	0.18	0.11	0.13	0.06	0.04	0.04	0.03	0.02	0.03	0.04	0.11
3	0.12	0.06	0.08	0.10	0.06	0.09	0.14	0.11	0.06	0.04	0.03	0.03	0.02	0.02	0.04	0.14	0.08
4	0.05	0.03	0.04	0.06	0.05	0.05	0.15	0.18	0.12	0.08	0.05	0.12	0.07	0.04	0.04	0.05	0.06
5	0.09	0.07	0.03	0.17	0.10	0.12	0.31	0.19	0.11	0.05	0.03	0.11	0.12	0.09	0.03	0.05	0.11
6	0.07	0.06	0.02	0.09	0.20	0.18	0.13	0.07	0.10	0.08	0.07	0.09	0.11	0.07	0.06	0.06	0.10
7	0.05	0.03	0.02	0.03	0.03	0.03	0.08	0.09	0.20	0.15	0.13	0.06	0.03	0.04	0.05	0.05	0.05
8	0.10	0.10	0.08	0.14	0.08	0.04	0.23	0.26	0.23	0.16	0.16	0.17	0.08	0.09	0.11	0.11	0.12
9	0.06	0.06	0.02	0.05	0.04	0.03	0.17	0.18	0.09	0.07	0.05	0.08	0.05	0.07	0.09	0.06	0.06
10	0.10	0.22	0.06	0.23	0.20	0.19	0.38	0.44	0.27	0.17	0.17	0.14	0.15	0.26	0.29	0.17	0.20
11	0.11	0.14	0.07	0.08	0.04	0.06	0.34	0.36	0.19	0.13	0.10	0.14	0.12	0.11	0.12	0.13	0.11
12	0.11	0.15	0.14	0.29	0.24	0.12	0.11	0.15	0.14	0.18	0.18	0.15	0.21	0.28	0.31	0.15	0.20
13	0.10	0.16	0.12	0.37	0.27	0.15	0.22	0.24	0.11	0.08	0.06	0.09	0.14	0.23	0.22	0.12	0.22
14	0.51	0.39	0.12	0.33	0.30	0.20	0.19	0.25	0.28	0.16	0.16	0.05	0.14	0.31	0.44	0.62	0.29
15	0.17	0.18	0.18	0.41	0.17	0.07	0.24	0.31	0.06	0.04	0.03	0.11	0.05	0.03	0.06	0.16	0.21
16	0.28	0.26	0.25	0.18	0.17	0.09	0.20	0.24	0.18	0.10	0.10	0.22	0.13	0.07	0.07	0.08	0.19
17	0.22	0.24	0.23	0.45	0.22	0.13	0.25	0.31	0.06	0.03	0.05	0.14	0.11	0.10	0.10	0.19	0.26
18	0.48	0.46	0.33	0.15	0.09	0.08	0.12	0.08	0.13	0.23	0.19	0.19	0.16	0.12	0.18	0.43	0.22
19	0.36	0.20	0.19	0.09	0.07	0.09	0.09	0.10	0.13	0.08	0.07	0.07	0.16	0.25	0.24	0.26	0.13
20	0.21	0.17	0.19	0.09	0.12	0.11	0.12	0.10	0.15	0.11	0.08	0.08	0.19	0.32	0.24	0.18	0.13
21	0.40	0.22	0.12	0.13	0.06	0.04	0.05	0.10	0.11	0.12	0.10	0.19	0.35	0.68	0.70	0.58	0.15
22	0.29	0.14	0.10	0.12	0.10	0.07	0.06	0.09	0.15	0.15	0.17	0.12	0.25	0.41	0.47	0.40	0.14
23	0.27	0.14	0.12	0.20	0.00	-0.01	0.10	0.16	0.02	0.01	0.01	0.42	0.46	0.42	0.38	0.36	0.14
24	0.47	0.46	0.43	0.24	0.24	0.15	0.14	0.14	0.16	0.23	0.24	0.55	0.64	0.65	0.65	0.58	0.31
25	0.20	0.21	0.23	0.11	0.05	0.02	0.07	0.17	0.13	0.14	0.12	0.34	0.37	0.28	0.16	0.14	0.14
26	0.27	0.26	0.13	0.15	0.09	0.05	0.03	0.05	0.08	0.13	0.21	0.26	0.26	0.24	0.23	0.21	0.15
27	0.57	0.53	0.41	0.20	0.00	-0.01	0.07	0.12	0.02	0.07	0.13	0.31	0.27	0.23	0.28	0.42	0.23
28	0.31	0.29	0.37	0.17	0.11	0.08	0.04	0.04	0.21	0.28	0.24	0.21	0.20	0.17	0.19	0.29	0.20
29	0.43	0.46	0.39	0.25	0.09	0.04	0.05	0.03	0.04	0.08	0.17	0.27	0.28	0.20	0.18	0.29	0.23
30	0.35	0.22	0.23	0.12	0.09	0.12	0.08	0.06	0.07	0.06	0.15	0.21	0.24	0.26	0.26	0.31	0.15
31	0.34	0.38	0.30	0.17	0.13	0.10	0.08	0.09	0.05	0.08	0.20	0.28	0.27	0.20	0.21	0.25	0.20
32	0.27	0.38	0.34	0.17	0.10	0.08	0.06	0.08	0.04	0.04	0.13	0.25	0.26	0.17	0.17	0.23	0.19
33	0.33	0.28	0.34	0.35	0.10	0.11	0.07	0.04	0.05	0.17	0.26	0.26	0.25	0.26	0.25	0.33	0.24
34	0.12	0.17	0.23	0.27	0.20	0.21	0.05	0.03	0.08	0.15	0.26	0.13	0.15	0.12	0.11	0.13	0.19
35	0.24	0.14	0.12	0.16	0.06	0.07	0.05	0.05	0.06	0.06	0.13	0.19	0.19	0.17	0.19	0.21	0.13
36	0.31	0.21	0.07	0.08	0.07	0.06	0.04	0.07	0.07	0.06	0.09	0.20	0.16	0.19	0.29	0.30	0.11
37	0.15	0.09	0.03	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.03	0.08	0.08	0.15	0.17	0.13	0.04
38	0.19	0.20	0.14	0.05	0.09	0.06	0.02	0.03	0.06	0.04	0.12	0.09	0.09	0.15	0.17	0.19	0.10
39	0.35	0.43	0.22	0.10	0.04	0.03	0.06	0.06	0.02	0.02	0.12	0.23	0.19	0.19	0.26	0.31	0.16
40	0.08	0.07	0.12	0.11	0.05	0.05	0.04	0.06	0.04	0.03	0.09	0.42	0.26	0.19	0.15	0.12	0.09
41	0.06	0.06	0.04	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.04	0.05	0.03	0.04	0.03	0.05	0.04
42	0.15	0.16	0.07	0.09	0.15	0.17	0.07	0.04	0.09	0.04	0.08	0.06	0.07	0.14	0.16	0.12	0.11
43	0.19	0.20	0.14	0.05	0.23	0.26	0.02	0.03	0.06	0.04	0.04	0.09	0.09	0.15	0.17	0.19	0.13
44	0.15	0.16	0.07	0.09	0.04	0.05	0.07	0.04	0.04	0.02	0.02	0.06	0.07	0.14	0.16	0.12	0.08
45	0.06	0.05	0.04	0.16	0.34	0.29	0.07	0.05	0.03	0.03	0.05	0.09	0.09	0.11	0.09	0.07	0.14
46	0.13	0.08	0.05	0.03	0.03	0.03	0.04	0.05	0.04	0.03	0.03	0.33	0.20	0.25	0.21	0.16	0.06
47	0.14	0.10	0.03	0.05	0.11	0.21	0.06	0.02	0.08	0.03	0.03	0.06	0.11	0.14	0.17	0.16	0.08
48	0.14	0.12	0.03	0.05	0.10	0.12	0.08	0.05	0.10	0.04	0.04	0.13	0.14	0.15	0.17	0.19	0.08
49	0.09	0.07	0.04	0.06	0.13	0.15	0.06	0.04	0.06	0.04	0.04	0.04	0.15	0.17	0.14	0.11	0.08
50	0.19	0.16	0.05	0.05	0.09	0.12	0.03	0.02	0.03	0.02	0.02	0.07	0.18	0.24	0.25	0.23	0.08
51	0.11	0.15	0.03	0.04	0.08	0.10	0.03	0.01	0.03	0.02	0.02	0.04	0.09	0.16	0.18	0.17	0.07
52	0.10	0.09	0.10	0.05	0.15	0.18	0.04	0.05	0.03	0.05	0.04	0.04	0.10	0.15	0.17	0.14	0.09
53	0.25	0.13	0.13	0.03	0.05	0.08	0.09	0.14	0.06	0.05	0.04	0.12	0.34	0.41	0.38	0.34	0.10
54	0.32	0.29	0.22	0.06	0.07	0.14	0.11	0.13	0.11	0.16	0.08	0.15	0.23	0.27	0.29	0.33	0.15
55	0.61	0.36	0.24	0.08	0.07	0.08	0.07	0.09	0.11	0.15	0.08	0.10	0.39	0.55	0.66	0.69	0.19
56	0.52	0.40	0.42	0.18	0.06	0.08	0.10	0.13	0.13	0.15	0.13	0.25	0.38	0.42	0.43	0.56	0.23
57	0.21	0.16	0.17	0.10	0.11	0.13	0.07	0.09	0.16	0.13	0.12	0.22	0.29	0.25	0.20	0.20	0.14
58	0.20	0.15	0.28	0.20	0.10	0.09	0.05	0.07	0.13	0.12	0.22	0.22	0.31	0.28	0.21	0.20	0.17
59	0.14	0.08	0.18	0.13	0.07	0.07	0.04	0.04	0.08	0.05	0.10	0.23	0.19	0.14	0.14	0.14	0.11
60	0.48	0.25	0.10	0.10	0.09	0.11	0.11	0.13	0.16	0.12	0.08	0.47	0.58	0.63	0.62	0.61	0.18
61	0.08	0.07	0.10	0.06	0.04	0.04	0.05	0.05	0.06	0.07	0.06	0.17	0.26	0.35	0.33	0.18	0.07
62	0.28	0.21	0.11	0.10	0.06	0.08	0.07	0.09	0.05	0.06	0.03	0.44	0.56	0.49	0.50	0.43	0.14
63	0.15	0.11	0.05	0.03	0.03	0.05	0.04	0.06	0.07	0.07	0.04	0.12	0.12	0.18	0.20	0.17	0.06
64	0.34	0.12	0.10	0.04	0.07	0.08	0.13	0.15	0.05	0.06	0.04	0.23	0.29	0.30	0.28	0.30	0.11
65	0.20	0.21	0.31	0.08	0.10	0.16	0.14	0.14	0.13	0.22	0.12	0.21	0.42	0.40	0.33	0.34	0.16
66	0.30	0.20	0.35	0.09	0.05	0.06	0.05	0.06	0.14	0.12	0.09	0.14	0.20	0.21	0.27	0.26	0.14
67	0.28	0.14	0.09	0.10	0.09	0.13	0.10	0.11	0.08	0.09	0.05	0.55	0.55	0.47	0.40	0.39	0.14
68	0.19	0.10	0.04	0.05	0.14	0.21	0.15	0.15	0.15	0.10	0.12	0.13	0.22	0.23	0.24	0.25	0.11
69	0.39	0.21	0.07	0.04	0.04	0.08	0.08	0.12	0.05	0.05	0.03	0.18	0.27	0.31	0.34	0.37	0.11
70	0.15	0.08	0.03	0.02	0.03	0.04	0.03	0.05	0.03	0.04	0.02	0.08	0.13	0.20	0.23	0.19	0.05
71	0.18	0.19	0.08	0.08	0.21	0.26	0.03	0.02	0.02	0.03	0.04	0.05	0.13	0.21	0.24	0.22	0.12
72	0.21	0.22	0.06	0.11	0.27	0.37	0.02	0.03	0.02	0.04	0.04	0.05	0.14	0.28	0.31	0.25	0.15
73	0.35	0.26	0.15	0.06	0.15	0.16	0.13	0.15	0.16	0.14	0.11	0.08	0.28	0.41	0.43	0.44	0.16
74	0.47	0.28	0.20	0.09	0.15	0.11	0.10	0.11	0.26	0.33	0.30	0.11	0.17	0.29	0.38	0.51	0.20
75	0.69	0.50	0.37	0.15	0.11	0.13	0.11	0.11	0.16	0.24	0.13	0.15	0.44	0.64	0.71	0.80	0.26
76	0.46	0.37	0.21	0.06	0.14	0.18	0.05	0.04	0.25	0.16	0.14	0.09	0.25	0.31	0.43	0.47	0.18
77	0.75	0.60	0.35	0.17	0.14	0.15	0.13	0.14	0.25	0.18	0.25	0.25	0.35	0.41	0.56	0.65	0.29
78	0.38	0.31	0.38	0.31	0.12	0.11	0.07	0.09	0.09	0.10	0.30	0.46	0.42	0.35	0.28	0.25	0.25
79	0.17	0.16	0.13	0.11	0.08	0.09	0.06	0.06	0.11	0.06	0.12	0.22	0.19	0.16	0.16	0.16	0.12
80	0.43	0.32	0.09	0.09	0.06	0.10	0.06	0.12	0.19	0.09	0.05	0.17	0.15	0.20	0.33	0.38	0.15
81	0.47	0.13	0.12	0.11	0.10	0.14	0.10	0.13	0.15	0.13	0.19	0.71	0.76	0.68	0.68	0.59	0.19
82	0.16	0.08	0.12	0.09	0.10	0.12	0.06	0.07	0.08	0.09	0.04	0.25	0.44	0.49	0.45	0.30	0.11
Average VR under a given wind direction	0.25	0.20	0.16	0.13	0.11	0.11	0.10	0.10	0.10	0.09	0.10	0.17	0.21	0.24	0.25	0.26	0.14