

Appendix H Pedestrian-Level Wind Study



# DRAFT REPORT

## PEDESTRIAN WIND STUDY

# GOLDEN SHORES MASTER PLAN LONG BEACH, CALIFORNIA

CONSULTING ENGINEERS & SCIENTISTS

Project Number: #0940879

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SUBMITTED TO:

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### 1 INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by PCR Services Corporation, to conduct a Pedestrian Wind Study for the proposed Golden Shores development, in Long Beach, California. The purpose of the study was to assess the wind environment around the development in terms of pedestrian comfort and safety. This objective was achieved through wind tunnel testing of a 1:300 scale model of the proposed phases of the development and existing surrounding buildings.

The photographs in Figures 1a through 1d show the test model in RWDI's boundary-layer wind tunnel for the existing configuration and proposed phasing configurations. The wind tunnel data were combined with local wind climate data (Figure 2) to predict the frequencies of occurrence of full scale wind speeds, which were then assessed using RWDI's criteria for pedestrian wind comfort and safety.

Background information is provided in Appendix A, including a description of wind tunnel testing and analysis methodology, a discussion of the local wind climate for the Long Beach area, an explanation of RWDI's wind criteria and other reference materials. The wind tunnel model was constructed using the architectural information listed in Appendix B.

The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site, and reviewed by PCR Services Corporation.



### 2 SUMMARY OF RESULTS

The RWDI criteria for wind conditions are explained in detail in Appendix A. Generally, wind conditions suitable for walking are appropriate for sidewalks; lower wind speeds comfortable for standing are preferred for building entrances where pedestrians are more apt to linger. For amenity and pool areas, low wind speeds conducive to sitting are recommended. However, for a warmer climate such as that in Long Beach, a breeze is often considered pleasant, and, therefore, slightly higher wind speeds suitable for standing should be deemed appropriate.

Table 1 presents the predicted wind conditions for the summer (May through October) and winter seasons (November through April) for each test configuration. These results are also graphically presented on site plans for each test configuration in Figures 3a through 4d and can be summarized as follows:

#### 2.1 EXISTING CONFIGURATION

Existing pedestrian wind comfort conditions on and around the development site were suitable for walking or better during the summer season, and for standing or sitting during the winter (see Figures 3a and 4a). These conditions are considered appropriate for these areas.

#### 2.2 PROPOSED CONFIGURATIONS

In general, the proposed development had a minimal effect on pedestrian wind comfort conditions on off-site areas surrounding the development site. These off-site conditions are considered appropriate.



#### 2.2.1 Phase 1 Tower

#### 2.2.1.1 Surrounding Walkways and Building Entrances (Locations 1 through 25)

Wind conditions were suitable for walking or better year-round along pedestrian walkways and plazas surrounding the Phase 1 tower, and generally suitable for standing or better around the base of the tower (see Figures 3b to 3d and 4b to 4d). The increased wind speeds measured in the plaza area at the southwest corner of West Ocean Blvd. and Golden Shore St. (Locations 22 through 25) were primarily due to the acceleration of southeasterly and northwesterly winds

around the northeast side of the Phase 1 tower. Increased wind speeds were also measured in the plaza on the southwest side of the Phase 1 tower (Locations 6 through 10). The safety criterion was exceeded on the western edge of this plaza at Location 9 in the winter season with the Phase 2 development in place (see Figures 4c and 4d). In general, the higher wind speeds in this area were more prevalent with the Phase 2 development in place, and were primarily due to the

channeling of southerly and southwesterly winds between the two Phase 2 towers (see Image 1) and over the Phase 2 podium. Landscaping oriented primarily in an east-west direction in this plaza could help alleviate these stronger winds and improve wind comfort in the area. If seating is planned in this area, localized measures such as trellises and wind screens may be utilized around seating areas (see Image 2).



Image 1: Channeling Flow



Image 2: Wind Screens



#### 2.2.2 Phase 2 Buildings

#### 2.2.2.1 Surrounding Walkways (Locations 26 through 37)

Wind conditions along the pedestrian walkways surrounding the Phase 2 Towers and Podium were suitable for walking or better in both the summer and winter seasons. These wind conditions are considered appropriate for these areas.



Image 3: Downwashing Flow

The safety criterion was marginally exceeded along the walkway near the northeast corner of the Phase 2 podium in the winter season (see Location 33 in Figure 4c) without the Phase 3 development in place. This was primarily due to downwashing easterly and westerly winds channelling along the north side of the Phase 2 tower (see Image 3). If desired, the addition of canopy trees along the walkway between Locations 32 to 34 could improve pedestrian wind comfort conditions in this area. With the proposed Phase 3 tower and podium in place, wind conditions at Location 33 were improved to be comfortable for standing and meet the safety criterion throughout the year (Figures 3d and 4d).

#### 2.2.2.2 Podium (Locations 42 through 56)

Wind conditions on the Phase 2 podium were suitable for standing or better, with the exception of Locations 44, 46 and 52 in summer, and Location 46 in winter, where conditions were suitable for walking (Figures 3c, 3d, 4c and 4d). The higher wind speeds at Locations 44 and 46 were due to downwashing southerly and westerly winds accelerating around the southern base of the Phase 2 tower. It is recommended that entrances to the tower be located away from the building corners. A wrap-around canopy and/or recessed entrances can be considered to improve wind comfort conditions for pedestrians entering and exiting the tower. The criterion for standing was only marginally exceeded at Location 52 (see Table 1).



#### 2.2.3 Phase 3 Tower

#### 2.2.3.1 Surrounding Walkways (Locations 57 through 80)

Pedestrian wind comfort conditions were suitable for walking or better along sidewalks and walkways surrounding the Phase 3 development in both the summer and winter seasons (see Figures 3d and 4d). These wind conditions are considered appropriate.

#### 2.2.3.2 Podium (Locations 82 to 96)

Wind conditions on the Phase 3 podium were suitable for walking or better in both the summer and winter seasons (see Figures 3d and 4d). The safety criterion was exceeded along the west edge of the podium at Location 85 during the winter season (see Figure 4d and Table 1). This was due to downwashing northwesterly and southeasterly winds accelerating around the south edge of the Phase 3 tower. The addition of



Image 4: Trellis

partitions or privacy fences for the townhouse units along the west edge of the podium in this area will help improve wind conditions. Trellises above these patios could also help to mitigate these stronger winds (see Image 4). Conditions on the pool deck were suitable for standing or better year round (see Locations 87 through 93 in Figures 3d and 4d), which is considered appropriate for this climate.

#### 3. APPLICABILITY OF RESULTS

The results presented in this report pertain to the following items: 1) the scale model of the proposed Golden Shores development, constructed using the architectural information listed in Appendix B; and, 2) the phasing of the proposed development, as reflected in the test configurations. Should there be any design changes that deviate substantially from this list of drawings, the results presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

# TABLES

GEM V	<b>COMFORT CATEGORY</b> GEM Wind Speed (mph) Category Limit			Standing 0 - 9 ≥80%	9 0 - 12	Uncomfo >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
1	А	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
	D	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
2	А	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	50	65	80	20	Walking	0	PASS
		Winter	60	75	85	15	Walking	1	PASS
	D	Summer	55	65	85	15	Walking	0	PASS
		Winter	60	75	85	15	Walking	1	PASS
3	А	Summer Winter		OT AVAII OT AVAII					
	В	Summer	55	70	90	10	Walking	0	PASS
		Winter	70	80	95	5	Standing	0	PASS
	С	Summer	65	80	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	D	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
4	А	Summer Winter		OT AVAII OT AVAII					
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	95	5	Sitting	0	PASS
5	А	Summer Winter	DATA N	OT AVAII OT AVAII	LABLE				
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3 Summer: May - October Winter: November - April

COMFORT CATEGORY GEM Wind Speed (mph) Category Limit			SittingStandin $0 - 6$ $0 - 9$ $\geq 80\%$ $\geq 80\%$		g Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	<b>Y CATEGORY</b> eed $\geq$ 55 (mph) its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
6	А	Summer	80	90	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
	В	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	55	70	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
7	А	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	0	PASS
	С	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	2	PASS
	D	Summer	55	70	90	10	Walking	0	PASS
		Winter	60	80	90	10	Standing	2	PASS
8	А	Summer	60	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	50	70	80	20	Walking	0	PASS
		Winter	60	75	85	15	Walking	2	PASS
	D	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	75	85	15	Walking	2	PASS
9	А	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	45	60	80	20	Walking	1	PASS
		Winter	55	70	80	20	Walking	4	FAIL
	D	Summer	50	65	80	20	Walking	1	PASS
		Winter	60	70	85	15	Walking	4	FAIL
10	А	Summer	70	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	В	Summer	60	75	85	15	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
	С	Summer	55	65	80	20	Walking	0	PASS
		Winter	60	75	85	15	Walking	2	PASS
	D	Summer	55	70	80	20	Walking	0	PASS
		Winter	65	75	85	15	Walking	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit			Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfe >12 >20%	ortable	Gust Spe	Y CATEGOR eed ≥55 (mph) nts Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
11	А	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
12	А	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
C D	С	Summer	50	70	85	15	Walking	0	PASS
		Winter	65	75	85	15	Walking	1	PASS
	D	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	75	85	15	Walking	1	PASS
13 A	А	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	В	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
14	А	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	80	90	95	5	Sitting	0	PASS
		Winter	85	90	100	0	Sitting	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
15	А	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	В	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	85	15	Walking	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



GEM Wind Speed (mph) Category Limit		0 - 6 ≥80%	0 - 9 ≥80%	0 - 12 ≥80%	>12 >20%		Gust Spe	eed $\geq 55$ (mph) the seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
16	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	80	90	10	Standing	0	PASS
		Winter	75	85	90	10	Standing	0	PASS
	С	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
17	А	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	55	80	95	5	Standing	0	PASS
		Winter	65	85	95	5	Standing	1	PASS
	С	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
18	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	80	90	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
19	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	ABLE				
	В	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	80	90	10	Standing	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
20	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	_	-							

Standing Walking Uncomfortable

Sitting

COMFORT CATEGORY

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3

В

С

D

Summer 60

Summer 65

Summer 70

65

75

75

Winter

Winter

Winter

80

80

85

85

85

90

Summer: May - October Winter: November - April

90

90

95

95

95

95

10

10

5

5

5

5

Standing

Standing

Standing

Standing

Standing

Standing

0

1

0

0

0

0

PASS

PASS

PASS

PASS

PASS

PASS

SAFETY CATEGORY



GEM V	COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) nts Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
21	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	С	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
22	А	Summer	90	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	В	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
23	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
24	А	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	В	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
25	А	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	В	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit			Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomf >12 >20%	ortable	Gust Spe	Y CATEGOF eed ≥55 (mph) nts Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
26	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	70	80	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	70	80	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
27	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer		80	90	10	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
C D	Summer	55	70	80	20	Walking	0	PASS	
	Winter	65	75	85	15	Walking	1	PASS	
	Summer	55	70	85	15	Walking	0	PASS	
		Winter	65	75	85	15	Walking	1	PASS
28 A	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	65	90	100	0	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	65	85	100	0	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
29	А	Summer Winter		NOT AVAII NOT AVAII					
	В	Summer	60	85	95	5	Standing	0	PASS
	-	Winter	70	85	95	5	Standing	0	PASS
	С	Summer	60	80	95 95	5	Standing	0	PASS
	e	Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
	D	Winter	70	80	90	10	Standing	0	PASS
30	А	Summer	DATA I	NOT AVAII	LABLE				
		Winter	DATA I	NOT AVAII	LABLE				
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	60	80	90	10	Standing	0	PASS
		Winter	65	80	90	10	Standing	2	PASS
	D	Summer	65	80	90	10	Standing	0	PASS
		Winter	70	80	90	10	Standing	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3 Summer: May - October Winter: November - April



GEM V	F <b>ORT CATI</b> Wind Speed ( ry Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) ats Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
31	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	65	80	90	10	Standing	0	PASS
		Winter	70	80	90	10	Standing	2	PASS
	D	Summer	65	80	90	10	Standing	0	PASS
		Winter	75	85	90	10	Standing	1	PASS
32	А	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	60	80	90	10	Standing	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	С	Summer	50	75	90	10	Walking	0	PASS
		Winter	60	80	90	10	Standing	0	PASS
	D	Summer	60	75	95	5	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
33	А	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	С	Summer	55	70	85	15	Walking	0	PASS
		Winter	60	75	85	15	Walking	3	FAIL
	D	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
34	А	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	В	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	С	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	85	15	Walking	2	PASS
	D	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
35	А	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	С	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



GEM V	COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		Sitting 0 - 6	Standing 0 - 9	0 - 12	>12	fortable	Gust Spe	<b>Y CATE</b> eed $\geq 55$ (n
Catego	ry Limit		$\geq 80\%$	$\geq 80\%$	≥80%	>20%		> 2 Ever	nts Season
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATIN
36	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
	C	Winter	70	85	95 100	5	Standing	0	PASS
	С	Summer	80	95 05	100	0	Sitting	0	PASS
	D	Winter Summer	80 65	95 85	100 95	0 5	Sitting Standing	0 0	PASS PASS
	D	Winter	03 75	85 85	93 95	5	Standing	0	PASS
37	А	Summer	70	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
	D	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
38	А	Summer Winter		NOT AVAII NOT AVAII					
	В	Summer	65	85	95	5	Standing	0	PASS
	D	Winter	03 70	85	95 95	5	Standing	0	PASS
	С	Summer		NOT AVAII		5	Standing	0	17100
	-	Winter		NOT AVAII					
	D	Summer	DATA I	NOT AVAII	LABLE				
		Winter	DATA	NOT AVAII	LABLE				
39	А	Summer		NOT AVAII					
		Winter		NOT AVAII			~		
	В	Summer	65 70	85 85	100	0	Standing	0	PASS
	С	Winter Summer	70 Data 1	85 NOT AVAII	95 ABLE	5	Standing	0	PASS
	C	Winter		NOT AVAII NOT AVAII					
	D	Summer		NOT AVAI					
	_	Winter		NOT AVAII					
40	А	Summer	55	75	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
	G	Winter	70	85	95	5	Standing	0	PASS
	С	Summer		NOT AVAI					
	D	Winter Summer		NOT AVAII NOT AVAII					
	U	Summer Winter		NOT AVAII NOT AVAII					
	Enterior			<b>C</b>					
	- Existing - Phase 1			Summe Winter:	r: May - C Noveml	October ber - Apr	il		
	- Phase 1 - Phases 1 &	× 2		winter:	noveini	sei - Apr	11		
manon C	- Phases 1 a								



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	<b>Y CATEGO</b> eed $\geq$ 55 (mph) its Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
41	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer		NOT AVAII					
		Winter		NOT AVAII					
	D	Summer		NOT AVAII					
		Winter	DATA N	NOT AVAII	LABLE				
42	А	Summer		NOT AVAII					
	P	Winter		NOT AVAII					
	В	Summer		NOT AVAII					
	C	Winter		NOT AVAII		F	Ctore I'm	0	DAGG
	С	Summer	70 75	90 85	95 05	5	Standing Standing	0	PASS
	р	Winter Summer	75 70	85	95 05	5	Standing Standing	0	PASS
	D	Winter	70 75	90 90	95 95	5 5	Standing Standing	0 0	PASS PASS
43	А	Summer	<b>DATA</b> Ν	NOT AVAII	ABLE				
		Winter		NOT AVAII					
	В	Summer		NOT AVAII					
		Winter		NOT AVAII					
	С	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
44	А	Summer		NOT AVAII					
		Winter		NOT AVAII					
	В	Summer		NOT AVAII					
	a	Winter		NOT AVAII		1.7	XX7 11 ·	0	DAGG
	С	Summer	55	70 80	85	15	Walking	0	PASS
	D	Winter	65	80	90 90	10	Standing	1	PASS
	D	Summer Winter	55 65	75 80	90 90	10 10	Walking Standing	0 1	PASS PASS
45	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	В	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	С	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	D	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



Table 1: Pedestrian Wind Comfort and	Safety Categories - Multiple Seasons
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GEM W	ORT CATH Vind Speed ( ry Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfe >12 >20%	ortable	Gust Spe	Y CATEGOR eed $\geq$ 55 (mph) its Seasonally			
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING			
16	А	Summer	DATA N	IOT AVAII	LABLE							
		Winter	DATA N	OT AVAII	LABLE							
	В	Summer	DATA N	DATA NOT AVAILABLE								
		Winter	DATA N	OT AVAII	LABLE							
	С	Summer	50	65	80	20	Walking	0	PASS			
		Winter	60	75	85	15	Walking	2	PASS			
	D	Summer	50	65	80	20	Walking	0	PASS			
		Winter	60	75	85	15	Walking	2	PASS			
47	А	Summer		DATA NOT AVAILABLE								
	_	Winter		OT AVAII								
	В	Summer		OT AVAII								
	a	Winter		IOT AVAII		_	a	0	D + 66			
	С	Summer	65	80	95 95	5	Standing	0	PASS			
	D.	Winter	70	85	95 95	5	Standing	1	PASS			
	D	Summer	60 70	80 85	95 95	5	Standing	0	PASS			
		Winter	70	85	95	5	Standing	1	PASS			
48	А	Summer		IOT AVAII								
	D	Winter		OT AVAII								
	В	Summer Winter		IOT AVAII IOT AVAII								
	С	Summer	60	80	90	10	Standing	0	PASS			
		Winter	65	80	90	10	Standing	1	PASS			
	D	Summer	60	80	90	10	Standing	0	PASS			
		Winter	70	85	90	10	Standing	1	PASS			
19	А	Summer	DATA N	IOT AVAII	LABLE							
		Winter	DATA NOT AVAILABLE									
	В	Summer	DATA N	DATA NOT AVAILABLE								
		Winter	DATA N	OT AVAII	LABLE							
	С	Summer	65	80	95	5	Standing	0	PASS			
		Winter	70	85	95	5	Standing	0	PASS			
	D	Summer	65	80	95	5	Standing	0	PASS			
		Winter	70	85	95	5	Standing	0	PASS			
50	А	Summer	DATA N	IOT AVAII	LABLE							
		Winter		OT AVAII				1				
	В	Summer		OT AVAII				1				
		Winter		IOT AVAII				1				
	С	Summer	65	85	95	5	Standing	0	PASS			
		Winter	70	85	95	5	Standing	0	PASS			
	D	Summer	60	80	95	5	Standing	0	PASS			
		Winter	70	85	95	5	Standing	0	PASS			

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3

$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	COMFOI GEM Win	nd Speed (		Sitting 0 - 6	Standing 0 - 9	0 - 12	Uncomf >12	ortable	Gust Spe	Y CATEGOI ed $\geq 55 \text{ (mph)}$
51 A Summer DATA NOT AVAILABLE   B Summer DATA NOT AVAILABLE   B Summer DATA NOT AVAILABLE   C Summer DATA NOT AVAILABLE   C Summer 65 90 95 5 Standing 0 PASS   D Summer 65 95 5 Standing 0 PASS   D Summer 65 95 5 Standing 0 PASS   Summer DATA NOT AVAILABLE Winter 0 PASS   D Summer DATA NOT AVAILABLE 0 PASS   S Standing 0 PASS DATA NOT AVAILABLE   B Summer DATA N	Category	Limit		≥80%	≥80%	≥80%	>20%		>2 Even	its Seasonally
	Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
B   Summer   DATA NOT AVAILABLE   0   PASS     C   Summer   65   90   95   5   Standing   0   PASS     D   Summer   65   85   95   5   Standing   0   PASS     D   Summer   65   85   95   5   Standing   0   PASS     D   Summer   DATA NOT AVAILABLE   0   PASS   0   PASS     Summer   DATA NOT AVAILABLE   DATA NOT AVAILABLE   0   PASS     B   Summer   DATA NOT AVAILABLE   0   PASS     Winter   DATA NOT AVAILABLE   0   PASS     D   Summer   DATA NOT AVAILABLE   0   PASS     D   Summer   DATA NOT AVAILABLE   0   PASS     D   Summer   DATA NOT AVAILABLE   0   PASS     Winter   70   85   95   5   Standing   0   PASS     Summer   DATA NOT AVAILABLE   Vinter   75   85   95   Standing   1   PASS	51	А	Summer	DATA N	NOT AVAII	LABLE				
Winter     DATA NOT AVAILABLE     PASS       C     Summer     65     90     95     5     Standing     0     PASS       D     Summer     65     85     95     5     Standing     0     PASS       D     Summer     65     85     95     5     Standing     0     PASS       52     A     Summer     DATA NOT AVAILABLE     Standing     0     PASS       B     Summer     DATA NOT AVAILABLE     VallABLE     VallABLE     PASS       C     Summer     DATA NOT AVAILABLE     VallABLE     PASS       Winter     70     80     95     Standing     0     PASS       D     Summer     60     75     95     Standing     0     PASS       D     Summer     DATA NOT AVAILABLE     VallAING     PASS     PAS       D     Summer     DATA NOT AVAILABLE     VallAING     PASS       Summer     DATA NOT AVAILABLE     VallAING     PASS     PASS			Winter	DATA N	NOT AVAII					
C     Summer     65     90     95     5     Standing     0     PASS       D     Summer     65     85     95     5     Standing     0     PASS       D     Summer     65     85     95     5     Standing     0     PASS       52     A     Summer     DATA NOT AVAILABLE     Valtable		В	Summer	DATA N	NOT AVAII					
Winter     70     85     95     5     Standing     0     PASS       D     Summer     65     85     95     5     Standing     0     PASS       52     A     Summer     DATA NOT AVAILABLE     -     -     -     -     -     -     PASS       52     A     Summer     DATA NOT AVAILABLE     -     -     -     -     -     PASS       B     Summer     DATA NOT AVAILABLE     -			Winter	DATA N	NOT AVAII	LABLE				
DSummer6585955Standing0PASS52ASummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE Winter0PASS52ASummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE DATA NOT AVAILABLE0PASSCSummer6075955Walking Winter0PASSDSummer6075955Standing0PASSDSummer075955Standing0PASSSSummer075955Standing0PASSDSummer075955Standing0PASSSiSummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE DATA NOT AVAILABLEPASSPASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSDSummerDATA NOT AVAILABLE DATA NOT AVAILABLEPASS1PASSS951000Sitting0PASSDSummerDATA NOT AVAILABLEPASS1PASSDSummerDATA NOT AVAILABLEPASS0PASSDSummerDATA NOT AVAILABLEVAILABLE0PASSDSumme		С	Summer	65	90	95	5	Standing	0	PASS
Winter7585955Standing0PASS52ASummerDATA NOT AVAILABLE DATA NOT AVAILABLEDATA NOT AVAILABLE DATA NOT AVAILABLEPASSBSummerDATA NOT AVAILABLE DATA NOT AVAILABLEValking0PASSCSummer6075955Walking0PASSDSummer6075955Walking0PASSDSummer6075955Standing0PASSS3ASummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE DATA NOT AVAILABLEPASSBSummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE DATA NOT AVAILABLEPASSDSummer7085955Standing0PASSDSummer7085955Standing1PASSDSummerDATA NOT AVAILABLE DATA NOT AVAILABLEPASS1PASSS4ASummerDATA NOT AVAILABLE DATA NOT AVAILABLEPASPASSS54ASummerDATA NOT AVAILABLE DATA NOT AVAILABLE0PASSDSummerB51000Sitting0PASSDSummerB51000Sitting0PASSDSummerB4NOT AVAILABLE DATA NOT AVAILABLEVinterPASSDSummerDATA NOT AVAILABLE DATA NOT AVAILABLEVinter <td< td=""><td></td><td></td><td>Winter</td><td>70</td><td>85</td><td>95</td><td>5</td><td>Standing</td><td>0</td><td>PASS</td></td<>			Winter	70	85	95	5	Standing	0	PASS
		D	Summer	65	85	95	5	Standing	0	PASS
			Winter	75	85	95	5	Standing	0	PASS
BSummer WinterDATA NOT AVAILABLE VINTERValuableCSummer6075955Walking0PASSDSummer6075955Standing0PASSDSummer7085955Standing0PASS53ASummerDATA NOT AVAILABLE WinterValuableValuableValuableBSummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLEValuableValuableCSummerDATA NOT AVAILABLE WinterValuableValuableValuableCSummer7085955Standing0PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSDSummer7585955Standing1PASSS4ASummerDATA NOT AVAILABLE WinterValuableValuableValuableBSummerBATA NOT AVAILABLEValuable0PASSS5ASummerBATA NOT AVAILABLEValuableValuableBSummerDATA NOT AVAILABLEValuableValuableValuableS5ASummerDATA NOT AVAILABLEValuableValuableBSummerDATA NOT AVAILABLE </td <td>52</td> <td>А</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	52	А								
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DSummer6075955Walking0PASS53ASummerDATA NOT AVAILABLEStanding0PASS53ASummerDATA NOT AVAILABLEValueValueValueBSummerDATA NOT AVAILABLEValueValueValueBSummerDATA NOT AVAILABLEValueValuePASSCSummer7085955Standing0DSummer7085955Standing0DSummer7085955Standing1PASSWinter7585955Standing1PASSWinter7585955Standing1PASSWinterDATA NOT AVAILABLEValuePASSS4ASummerDATA NOT AVAILABLEValuePASSWinterDATA NOT AVAILABLEValue0PASSDSummerB5951000Sitting0DSummer85951000Sitting0PASSDSummerBATA NOT AVAILABLEValue0PASSSitting0951000Sitting0PASSDSummerDATA NOT AVAILABLEValueValue0PASSDSummerDATA NOT AVAILABLEValueValue0PASSSitting095<		С						U		
Winter7085955Standing0PASS53ASummerDATA NOT AVAILABLE $VAILABLE$ $VAILABLE$ $VAILABLE$ $VAILABLE$ BSummerDATA NOT AVAILABLE $VAILABLE$ $V$ $VAILABLE$ $V$ CSummer7085955Standing1DSummer7085955Standing0PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASS54ASummerDATA NOT AVAILABLE $VAILABLE$ $V$ $V$ $V$ BSummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ VinterDATA NOT AVAILABLE $V$ $V$ $V$ $V$ $V$ BSummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ $V$ Minter85951000Sitting0PASSDSummerS1001000Sitting0PASS55ASummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ 55ASummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ 55ASummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ 55ASummerDATA NOT AVAILABLE $V$ $V$ $V$ $V$ $V$ 55A								0		
53   A   Summer   DATA NOT AVAILABLE     B   Summer   DATA NOT AVAILABLE     B   Summer   DATA NOT AVAILABLE     B   Summer   DATA NOT AVAILABLE     C   Summer   DATA NOT AVAILABLE     C   Summer   70   85   95   5     D   Summer   70   85   95   5   Standing   1   PASS     D   Summer   70   85   95   5   Standing   1   PASS     D   Summer   70   85   95   5   Standing   1   PASS     SWinter   75   85   95   5   Standing   1   PASS     SWinter   DATA NOT AVAILABLE           S4   A   Summer   DATA NOT AVAILABLE           B   Summer   DATA NOT AVAILABLE		D								
WinterDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEWinterDATA NOT AVAILABLECSummer7085955Standing0PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSDSummer7085955Standing1PASSSummer7085955Standing1PASSDSummerDATA NOT AVAILABLEValicable7PASSSummerDATA NOT AVAILABLEValicable7PASSSummerDATA NOT AVAILABLE7PASSPASSOSummerS951000Sitting0PASSDSummerS951000Sitting0PASSDSummerBATA NOT AVAILABLEValicable0PASSDSummerDATA NOT AVAILABLEValicable0PASSS5ASummerDATA NOT AVAILABLEValicable0PASSS5ASummerDATA NOT AVAILABLEValicableVinterPASSS5ASummerDATA NOT AVAILABLEValicableVinterPASSS5ASummerDATA NOT AVAILABLEValicableVinterPASSS5ASummerDATA NOT AVAILABLEValicableValicableVinter <td></td> <td></td> <td>Winter</td> <td>70</td> <td>85</td> <td>95</td> <td>5</td> <td>Standing</td> <td>0</td> <td>PASS</td>			Winter	70	85	95	5	Standing	0	PASS
B Summer DATA NOT AVAILABLE Winter DATA NOT AVAILABLE Winter 75 85 95 5 Standing 0 PASS Winter 75 85 95 5 Standing 1 PASS D Summer 70 85 95 5 Standing 0 PASS Winter 75 85 95 5 Standing 1 PASS D Summer DATA NOT AVAILABLE Winter DATA NOT AVAILABLE B Summer DATA NOT AVAILABLE C Summer 85 95 100 0 Sitting 0 PASS Winter 85 95 100 0 Sitting 0 PASS D Summer 85 95 100 0 Sitting 0 PASS Winter 90 95 100 0 Sitting 0 PASS Winter 90 95 100 0 Sitting 0 PASS Standing 0 PASS D Summer 85 95 100 0 Sitting 0 PASS Winter 90 95 100 0 Sitting 0 PASS Winter 0ATA NOT AVAILABLE C Summer 0ATA NOT AVAILABLE C Summer 60 80 90 10 Standing 0 PASS D Summer 60 80 90 10 Standing 2 PASS D Summer 60 80 90 10 Standing 0 PASS	53	А								
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CSummer7085955Standing0PASSWinter7585955Standing0PASSDSummer7085955Standing0PASSWinter7585955Standing1PASS54ASummerDATA NOT AVAILABLEValueValueValueValue54ASummerDATA NOT AVAILABLEValueValueValue64SummerDATA NOT AVAILABLEValueValueValueValue55ASummerBATA NOT AVAILABLEValue0PASS55ASummerDATA NOT AVAILABLEValue0PASS55ASummerDATA NOT AVAILABLEValue0PASS55ASummerDATA NOT AVAILABLEValue0PASS55ASummerDATA NOT AVAILABLEValueValue0PASS55ASummerDATA NOT AVAILABLEValueValueValueValue55ASummerDATA NOT AVAILABLEValueValueValueValue55ASummerDATA NOT AVAILABLEValueValueValueValue55ASummerDATA NOT AVAILABLEValueValueValueValueValue55ASummerDATA NOT AVAILABLEValueValueValueValueValueValu		В								
Winter7585955Standing1PASSDSummer7085955Standing0PASSWinter7585955Standing1PASS54ASummerDATA NOT AVAILABLE WinterVinterDATA NOT AVAILABLE WinterVinterPATA NOT AVAILABLE WinterVinterPASS64SummerDATA NOT AVAILABLE WinterVinterDATA NOT AVAILABLE WinterVinterPASSCSummerS951000Sitting0PASSDSummer85951000Sitting0PASSDSummer851001000Sitting0PASS55ASummerDATA NOT AVAILABLE WinterVinter0PASS55ASummerDATA NOT AVAILABLE WinterVinter0PASS55ASummerDATA NOT AVAILABLE WinterVinterVinterPASS55ASummerDATA NOT AVAILABLE WinterVinterVinterPASS55ASummerO809010Standing055ASummerG809010Standing255DSummer60809010Standing0PASS		_					_			
DSummer7085955Standing0PASS54ASummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLE DATA NOT AVAILABLEPASSBSummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLEPASSCSummer85951000Sitting0DSummer85951000Sitting0PASSDSummer85951000Sitting0PASSDSummer851001000Sitting0PASSDSummerBATA NOT AVAILABLE WinterDATA NOT AVAILABLE Winter0PASS55ASummerDATA NOT AVAILABLE Winter0PASS55ASummerDATA NOT AVAILABLE Winter0PASSCSummerDATA NOT AVAILABLE Winter0PASSCSummer60809010Standing0DSummer60809010Standing0DSummer60809010Standing0DSummer60809010Standing0DSummer60809010Standing0		С						-		
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Winter	75	85	95	5	Standing	1	PASS
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	54	А								
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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		В								
Winter   85   95   100   0   Sitting   0   PASS     D   Summer   85   100   100   0   Sitting   0   PASS     Winter   90   95   100   0   Sitting   0   PASS     55   A   Summer   DATA NOT AVAILABLE   -   -   -     Winter   DATA NOT AVAILABLE   -   -   -   -     B   Summer   DATA NOT AVAILABLE   -   -   -     Winter   DATA NOT AVAILABLE   -   -   -   -     Winter   DATA NOT AVAILABLE   -   -   -   -     Winter   DATA NOT AVAILABLE   -   -   -   -   -     C   Summer   60   80   90   10   Standing   0   PASS     D   Summer   60   80   90   10   Standing   0   PASS		C					0	G	0	DAGG
DSummer851001000Sitting0PASSWinter90951000Sitting0PASS55ASummerDATA NOT AVAILABLE WinterVariableVariableVariableBSummerDATA NOT AVAILABLE WinterVariableVariableVariableCSummer60809010Standing0DSummer60809010Standing2DSummer60809010Standing0DSummer60809010Standing0DSummer60809010Standing0PASS9010Standing0PASS		C								
Winter90951000Sitting0PASS55ASummerDATA NOT AVAILABLE WinterVAILABLE DATA NOT AVAILABLEBSummerDATA NOT AVAILABLE WinterDATA NOT AVAILABLECSummer60809010Standing0PASSWinter65809010Standing2PASSDSummer60809010Standing0PASS		5								
55   A   Summer   DATA NOT AVAILABLE   Vailable     b   DATA NOT AVAILABLE   DATA NOT AVAILABLE     B   Summer   DATA NOT AVAILABLE     Winter   DATA NOT AVAILABLE     Winter   DATA NOT AVAILABLE     C   Summer   60   80   90   10   Standing   0   PASS     Winter   65   80   90   10   Standing   0   PASS     D   Summer   60   80   90   10   Standing   0   PASS		D								
WinterDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEWinterDATA NOT AVAILABLECSummer6080Winter65809010Summer60809010StandingDSummer60809010Summer60809010StandingDSummer60809010			Winter	90	95	100	0	Sitting	0	PASS
BSummerDATA NOT AVAILABLE WinterPATA NOT AVAILABLECSummer60809010Standing0PASSWinter65809010Standing2PASSDSummer60809010Standing0PASS	55	А								
Winter DATA NOT AVAILABLECSummer60809010Standing0PASSWinter65809010Standing2PASSDSummer60809010Standing0PASS		D								
C     Summer     60     80     90     10     Standing     0     PASS       Winter     65     80     90     10     Standing     2     PASS       D     Summer     60     80     90     10     Standing     0     PASS		В								
Winter65809010Standing2PASSDSummer60809010Standing0PASS		a					10	<b>a</b> . <b>r</b>		D. 67
D Summer 60 80 90 10 Standing 0 PASS		С						-		
		-								
Winter 70 80 90 10 Standing 2 PASS		D						-		
			Winter	70	80	90	10	Standing	2	PASS
ation A - Existing Summer: May - October	ation A - H ation B - F					Novemł			1	

Config Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3

Winter: November - April

GEM V	<b>COMFORT CATEGORY</b> GEM Wind Speed (mph) Category Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
56	А	Summer	DATA N	OT AVAII	LABLE				
		Winter	DATA N	OT AVAII	LABLE				
	В	Summer		OT AVAII					
		Winter		OT AVAII					
	С	Summer	75	85	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
57	А	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	1	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
58	А	Summer	60	80	90	10	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	В	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
59	А	Summer	70	80	90	10	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	С	Summer	55	70	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	45	65	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
60	А	Summer	55	75	90	10	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	75	90	10	Walking	1	PASS
	С	Summer	55	70	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



GEM W	<b>ORT CATI</b> Vind Speed ( ry Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncom >12 >20%	fortable	Gust Spe	Y CATEGOR eed $\geq$ 55 (mph) its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
61	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
	D	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	75	85	15	Walking	2	PASS
62	А	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
	D	Summer	70	90	100	0	Standing	0	PASS
	_	Winter	75	90	95	5	Standing	0	PASS
63	А	Summer		NOT AVAII					
	D	Winter		NOT AVAII		10	XX7 11 ·	0	DAGG
	В	Summer	55	75	90 90	10	Walking	0	PASS
	G	Winter	65	80	90 95	10	Standing	0	PASS
	С	Summer	60 70	80	95 95	5	Standing	0	PASS
	D	Winter	70	85	95 95	5	Standing	0	PASS
	D	Summer	65	85	95 95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
64	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
	~	Winter	70	85	95	5	Standing	0	PASS
	С	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	60	80	90	10	Standing	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
65	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	C	07	07	100	0	a	0	DAGG

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3

D

Summer: May - October Winter: November - April

0

5

100

95

Sitting

Sitting

Summer 85

Winter 85

95

95

**RWDI** 

PASS

PASS

0

0

GEM W	Yind Speed ( ry Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomf >12 >20%	ortable	Gust Spe	Y CATEGOR eed ≥55 (mph) its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
66	А	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	В	Summer	55	70	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
67	А	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	2	PASS
	В	Summer		75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	55	75	90	10	Walking	0	PASS
		Winter	60	80	90	10	Standing	1	PASS
68 A	Summer	60	80	90	10	Standing	0	PASS	
		Winter	70	80	90	10	Standing	1	PASS
	В	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
69	А	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	95	5	Sitting	0	PASS
	В	Summer	85	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	С	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	D	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
70	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
В	Summer	70	90	100	0	Standing	0	PASS	
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	D	Summer		80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3 Summer: May - October Winter: November - April



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	SAFETY CATEGO Gust Speed ≥55 (mph > 2 Events Seasonally		
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
71	А	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	С	Summer	90	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	D	Summer	90	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
72	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
73	А	Summer	70	85	90	10	Standing	0	PASS
		Winter	75	85	90	10	Standing	0	PASS
	В	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	95	100	100	0	Sitting	0	PASS
		Winter	95	100	100	0	Sitting	0	PASS
74	А	Summer	90	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	В	Summer	85	95	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	С	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	D	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
75	А	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	В	Summer	55	75	95	5	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
	D	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		Sitting 0 - 6 ≥80%	Standing 0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomfo >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) ats Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
76	А	Summer	85	95	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	В	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	С	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	D	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
77	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
78	А	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
79	А	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
80	А	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	60	85	95	5	Standing	0	PASS
D	Winter	70	85	95	5	Standing	0	PASS	
	С	Summer	65	80	95	5	Standing	0	PASS
	-	Winter	70	85	95	5	Standing	0	PASS
	D	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	90	95	5	Sitting	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



Limit Config. A B C D A B C D D	Season Summer Winter Summer Winter Summer Winter Summer Winter Summer Winter Summer	DATA N 65 75 60 70 DATA N DATA N DATA N	≥80% % NOT AVAII 85 85 80 85 NOT AVAII NOT AVAII	ABLE 95 95 95 95 ABLE	>20% % 5 5 5 5 5	RATING Standing Standing	Events 0 0 0	RATING PASS PASS PASS PASS
A B C D A B C	Summer Winter Summer Winter Summer Winter Summer Winter Summer Winter	DATA N 65 75 60 70 DATA N DATA N DATA N	NOT AVAII 85 85 80 85 NOT AVAII NOT AVAII	ABLE ABLE 95 95 95 95 ABLE	5 5 5	Standing Standing Standing	0 0 0	PASS PASS
B C D A B C	Winter Summer Winter Summer Winter Summer Winter Summer Winter Winter	DATA N 65 75 60 70 DATA N DATA N DATA N	NOT AVAII 85 85 80 85 NOT AVAII NOT AVAII	ABLE 95 95 95 95 ABLE	5 5	Standing Standing	0 0	PASS
C D A B C	Summer Winter Summer Winter Summer Winter Summer Winter Winter	65 75 60 70 DATA N DATA N DATA N	85 85 80 85 NOT AVAII NOT AVAII	95 95 95 95 ABLE	5 5	Standing Standing	0 0	PASS
D A B C	Summer Winter Winter Summer Winter Summer Winter	60 70 DATA M DATA M DATA M	80 85 NOT AVAII NOT AVAII	95 95 ABLE	5	Standing	0	
A B C	Summer Winter Summer Summer Winter	DATA N DATA N DATA N DATA N	NOT AVAII NOT AVAII NOT AVAII	ABLE	5			
B C	Winter Summer Winter	DATA N				Standing	0	PASS
С	Summer Winter			LABLE				
			NOT AVAII NOT AVAII					
			NOT AVAII NOT AVAII					
	Winter	DATA N	NOT AVAII	ABLE	5	Standing	0	PASS
-	Winter	70	85	95 95	5	Standing	1	PASS
А	Summer							
В	Summer	DATA N	NOT AVAII	ABLE				
С	Summer	DATA N	NOT AVAII	ABLE				
D	Summer	50	70	85	15	Walking	0	PASS
	Winter	60	75	90	10	Walking	1	PASS
А	Summer Winter							
В	Summer Winter							
С	Summer Winter							
D	Summer Winter	60 70	80 85	95 95	5 5	Standing Standing	0 0	PASS PASS
А	Summer							
В	Summer	DATA N	NOT AVAII	ABLE				
С	Summer	DATA N	NOT AVAII	ABLE				
D	Summer	45	70	85	15	Walking	1	PASS
	Winter	55	75	85	15	Walking	4	FAIL
Existing Phase 1 Phases 1 &	: 2			•		l		
F F	B C D A B C D A B C D A B C D Existing Phase 1 Phases 1 &	D Summer Winter A Summer Winter B Summer Winter D Summer Winter D Summer Winter C Summer Winter D Summer Winter D Summer Winter D Summer Winter D Summer Winter D Summer Winter D Summer Winter D Summer Winter	DSummer65 WinterASummerDATA N WinterBSummerDATA N WinterBSummerDATA N WinterCSummerDATA N WinterDSummer50 WinterDSummer50 WinterASummerDATA N WinterBSummerDATA N WinterBSummerDATA N WinterBSummerDATA N WinterCSummerDATA N WinterDSummer60 WinterDSummer60 WinterASummerDATA N WinterBSummerDATA N WinterBSummerDATA N WinterDSummerAA N WinterDSummerAA N WinterDSummerDATA N VinterDSummerAA N N MinterDSummer45 WinterExisting Phase 1 Phases 1 & 22	DSummer6580ASummerDATA NOT AVAIIWinterDATA NOT AVAIIBSummerDATA NOT AVAIIWinterDATA NOT AVAIIWinterDATA NOT AVAIIWinterDATA NOT AVAIIWinterDATA NOT AVAIIWinterDATA NOT AVAIIDSummer5070WinterBATA NOT AVAIIDSummer5070WinterDATA NOT AVAIIBSummerDATA NOT AVAIIWinterDATA NOT AVAIIDSummerDATA NOT AVAIIWinterDSummerASummerASummerASummerASummerASummerBSummerDSummerASummerASummerASummerASummerASummerBSummerBSummer	DSummer658095ASummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEWinterDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummer5070ASummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerANOT AVAILABLEDSummerANOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerANOT AVAILABLEDSummerSo<	DSummer6580955ASummerDATA NOT AVAILABLEyinterDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEHereBSummerDATA NOT AVAILABLEHereCSummerDATA NOT AVAILABLEHereCSummerDATA NOT AVAILABLEHereDSummer50708515WinterDATA NOT AVAILABLEHereHereDSummerDATA NOT AVAILABLEHereBSummerDATA NOT AVAILABLEHereBSummerDATA NOT AVAILABLEHereCSummerDATA NOT AVAILABLEHereDSummerDATA NOT AVAILABLEHereDSummerDATA NOT AVAILABLESDSummerDATA NOT AVAILABLESDSummerDATA NOT AVAILABLESBSummerDATA NOT AVAILABLESBSummerDATA NOT AVAILABLEHereDSummerDATA NOT AVAILABLEHereD <td>DSummer6580955StandingASummerDATA NOT AVAILABLEStandingBSummerDATA NOT AVAILABLESummerDATA NOT AVAILABLEWinterDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummer50708515WinterDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLE&lt;</td> <td>DSummer6580955Standing0ASummerDATA NOT AVAILABLEStanding1BSummerDATA NOT AVAILABLESummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEValuableValuableCSummerDATA NOT AVAILABLEValuable0DSummerDATA NOT AVAILABLE00MinterDATA NOT AVAILABLE00DSummer50708515WalkingDSummerDATA NOT AVAILABLEValuable1ASummerDATA NOT AVAILABLEValuable1BSummerDATA NOT AVAILABLEValuable1ASummerDATA NOT AVAILABLEValuable1CSummerDATA NOT AVAILABLEValuable0WinterDATA NOT AVAILABLEValuable0DSummerDATA NOT AVAILABLEValuable0OSummerDATA NOT AVAILABLEValuable0OSummerDATA NOT AVAILABLEValuable0MinterDATA NOT AVAILABLEValuableValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableBSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLE&lt;</td>	DSummer6580955StandingASummerDATA NOT AVAILABLEStandingBSummerDATA NOT AVAILABLESummerDATA NOT AVAILABLEWinterDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummer50708515WinterDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLECSummerDATA NOT AVAILABLEDSummerDATA NOT AVAILABLE<	DSummer6580955Standing0ASummerDATA NOT AVAILABLEStanding1BSummerDATA NOT AVAILABLESummerDATA NOT AVAILABLEBSummerDATA NOT AVAILABLEValuableValuableCSummerDATA NOT AVAILABLEValuable0DSummerDATA NOT AVAILABLE00MinterDATA NOT AVAILABLE00DSummer50708515WalkingDSummerDATA NOT AVAILABLEValuable1ASummerDATA NOT AVAILABLEValuable1BSummerDATA NOT AVAILABLEValuable1ASummerDATA NOT AVAILABLEValuable1CSummerDATA NOT AVAILABLEValuable0WinterDATA NOT AVAILABLEValuable0DSummerDATA NOT AVAILABLEValuable0OSummerDATA NOT AVAILABLEValuable0OSummerDATA NOT AVAILABLEValuable0MinterDATA NOT AVAILABLEValuableValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableBSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLEValuableDSummerDATA NOT AVAILABLE<



Table 1: Pedestrian Wind Comfort and	Safety Categories - Multiple Seasons
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GEM V	<b>ORT CATI</b> Vind Speed ( ry Limit		Sitting 0 - 6 ≥80%	0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomt >12 >20%	lonuole	Gust Spe	Y CATEG eed ≥55 (m its Seasona
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATIN
	8								
86	А	Summer		NOT AVAII					
	В	Winter Summer		NOT AVAII NOT AVAII					
	С	Winter Summer		NOT AVAII NOT AVAII					
		Winter	DATA N	NOT AVAII	LABLE				
	D	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
87	А	Summer		NOT AVAII					
	D	Winter		NOT AVAII					
	В	Summer Winter		NOT AVAII					
	С	Winter Summer		NOT AVAII					
	U	Winter		NOT AVAII NOT AVAII					
	D	Summer	65	85	95	5	Standing	0	PASS
	D	Winter	03 70	85	95 95	5	Standing	0	PASS
		winter	70	05	)5	5	Standing	0	1 455
88	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	С	Summer		NOT AVAII					
	P	Winter		NOT AVAII		-	<b>a</b> . <b>r</b>	0	<b>D</b> 4 G G
	D	Summer	65 75	85 85	95 05	5	Standing Standing	0	PASS
		Winter	15	85	95	5	Standing	0	PASS
89	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	С	Summer		NOT AVAII					
	5	Winter		NOT AVAII		-	<b>a</b> . <b>1</b>	C.	D
	D	Summer	70 75	85 85	95 05	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
90	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	В	Summer		NOT AVAII					
		Winter		NOT AVAII					
	С	Summer		NOT AVAII					
	D	Winter		NOT AVAII		~	G. 1	0	DAGG
	D	Summer	65 75	85 85	95 05	5	Standing	0	PASS
		Winter	15	85	95	5	Standing	0	PASS
	- Existing				r: May - C		_		
	- Phase 1			Winter:	Novemb	per - Apri	1		
	- Phases 1 &								
iration D	- Phases 1, 2	2 & 3							



Table 1: Pedestrian Wind Comfort and	Safety Categories - Multiple Seasons
--------------------------------------	--------------------------------------

	ind Speed (	E <b>GORY</b> mph)	Sitting 0 - 6 ≥80%	0 - 9 ≥80%	Walking 0 - 12 ≥80%	Uncomf >12 >20%	onable	-	ed ≥55 (m its Seasona
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATIN
Loc.	Coning.	Season	70	70	70	70	KAIINO	Events	KATIN
91	А	Summer		NOT AVAII					
	В	Winter Summer		NOT AVAII NOT AVAII					
		Winter		NOT AVAII					
	С	Summer		NOT AVAII					
		Winter		NOT AVAII					
	D	Summer	80	90	95	5	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
92	А	Summer		NOT AVAII					
	r.	Winter		NOT AVAII					
	В	Summer		NOT AVAII					
	C	Winter		NOT AVAII					
	С	Summer		NOT AVAII					
	D	Winter Summer		NOT AVAII		5	Standing	0	DAGO
	D	Summer Winter	75 80	85 90	95 95	5 5	Standing Sitting	0 0	PASS PASS
		w mier	00	50	73	J	Sitting	0	газэ
93	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	С	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII					
	D	Summer	75	95	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
94	А	Summer	DATA N	NOT AVAII	LABLE				
		Winter	DATA N	NOT AVAII	LABLE				
	В	Summer	DATA N	NOT AVAII	LABLE				
		Winter		NOT AVAII					
	С	Summer		NOT AVAII					
	~	Winter		NOT AVAII			~ ~ ~	-	
	D	Summer	70	90 90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
95	А	Summer		NOT AVAII					
	л	Winter		NOT AVAII					
	В	Summer		NOT AVAII					
	C	Winter		NOT AVAII					
	С	Summer Winter		NOT AVAII					
	D	Winter Summer	65	NOT AVAII 85	95	5	Standing	0	PASS
	U	Summer Winter	65 75	85 90	95 95	5 5	Standing Standing	0	PASS
uration $A$ - uration $B$ -	-			Summe Winter:	r: May - C	October ber - April	1		
	Phase 1 Phases 1 &	- 2		winter:	noveint	er - April	L		
	- Phases 1 &								
	1 mases 1, 1	- 0. 5						1	

COMFORT CATEGORY GEM Wind Speed (mph) Category Limit		0-6 0-9 0-12		Walking 0 - 12 ≥80%	g Uncomfortable >12 >20%		Gust Spe	<b>EXACTEGORY</b> eed $\geq$ 55 (mph) its Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
96	А	Summer	DATA N	JOT AVAII	LABLE				
		Winter	DATA N	JOT AVAII	LABLE				
	В	Summer		NOT AVAII					
		Winter		NOT AVAII					
	С	Summer		JOT AVAII					
		Winter		NOT AVAII					
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
97	А	Summer	60	80	95	5	Standing	0	PASS
	_	Winter	70	85	95	5	Standing	0	PASS
	В	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	1	PASS
98	А	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
99	А	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	55	80	95	5	Standing	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	С	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
100	А	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	100	0	Standing	0	PASS
	В	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3 Summer: May - October Winter: November - April

COMFORT CATEGORY GEM Wind Speed (mph) Category Limit			SittingStanding $0 - 6$ $0 - 9$ $\geq 80\%$ $\geq 80\%$		Walking 0 - 12 ≥80%	Uncomfe >12 >20%	ortable	Gust Spe	Y CATEGORY eed ≥55 (mph) nts Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
101	А	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	В	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	95	5	Standing	1	PASS
	С	Summer	55	80	95	5	Standing	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
	D	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
102	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
103	А	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	С	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	D	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
104	А	Summer	65	90	100	0	Standing	0	PASS
		Winter	70	90	95	5	Standing	0	PASS
	В	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
	С	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
105	А	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	В	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	С	Summer	70	90	100	0	Standing	0	PASS
	-	Winter	75	90	95	5	Standing	0	PASS
	D	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS

Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3



COMFORT CATEGORY GEM Wind Speed (mph) Category Limit			SittingStanding $0 - 6$ $0 - 9$ $\geq 80\%$ $\geq 80\%$		Walking 0 - 12 ≥80%	Uncomfortable >12 >20%		Gust Spe	Y CATEGOI eed $\geq 55 \text{ (mph)}$ its Seasonally
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
106	А	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
	В	Summer	55	75	90	10	Walking	0	PASS
		Winter	70	80	95	5	Standing	0	PASS
	С	Summer	55	75	90	10	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
107	А	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	В	Summer		75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
	С	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	1	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
108	А	Summer	60	75	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	В	Summer	60	80	90	10	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	С	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
109	А	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	В	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	С	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
110	А	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	В	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	С	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS

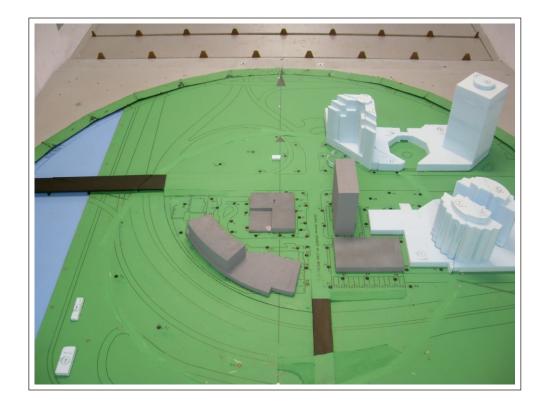
Configuration A - Existing Configuration B - Phase 1 Configuration C - Phases 1 & 2 Configuration D - Phases 1, 2 & 3 Summer: May - October Winter: November - April

<b>COMFORT CATEGORY</b> GEM Wind Speed (mph) Category Limit		Sitting     Standing       0 - 6     0 - 9       ≥80%     ≥80%		Walking 0 - 12 ≥80%	Uncomfor >12 >20%			SAFETY CATEGORY Gust Speed ≥55 (mph) > 2 Events Seasonally		
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING	
111	А	Summer	60	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	В	Summer	55	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	С	Summer	60	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	D	Summer	60	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
112	А	Summer	60	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	В	Summer	60	80	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	С	Summer	60	85	100	0	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
	D	Summer	60	85	95	5	Standing	0	PASS	
		Winter	70	85	95	5	Standing	0	PASS	
							-			



# FIGURES





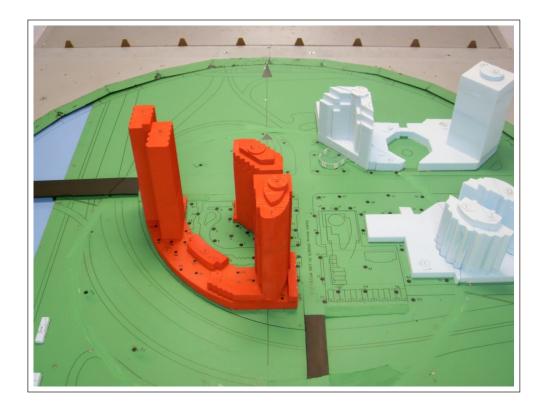
Wind Tunnel Study Model Configuration - Existing	Figure: 1		RWDI	
Golden Shores Master Plan - Long Beach, California	Project #0940879	Date:	August 19, 2009	





Wind Tunnel Study Model Configuration - Phase 1	Figure:	1b	RWD	
Golden Shores Master Plan - Long Beach, California	Project #0940879	Date:	August 19, 2009	



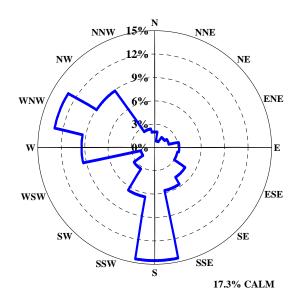


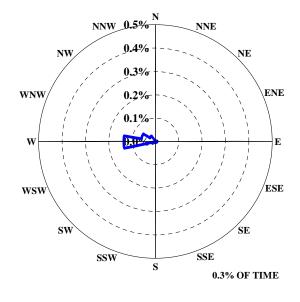
Wind Tunnel Study Model Configuration - Phases 1 & 2	Figure:	1c	RWDI	
Golden Shores Master Plan - Long Beach, California	Project #0940879	Date:	August 19, 2009	





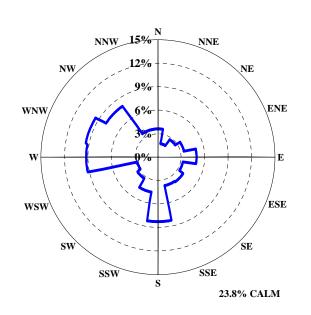
Wind Tunnel Study Model Configuration - Phases 1, 2 & 3	Figure:	1d	RWDI	
Golden Shores Master Plan - Long Beach, California	Project #0940879	Date:	August 19, 2009	



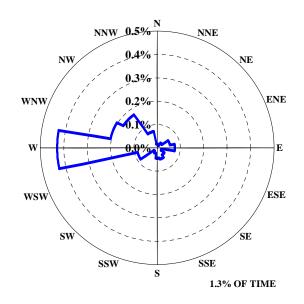


ALL SUMMER WINDS



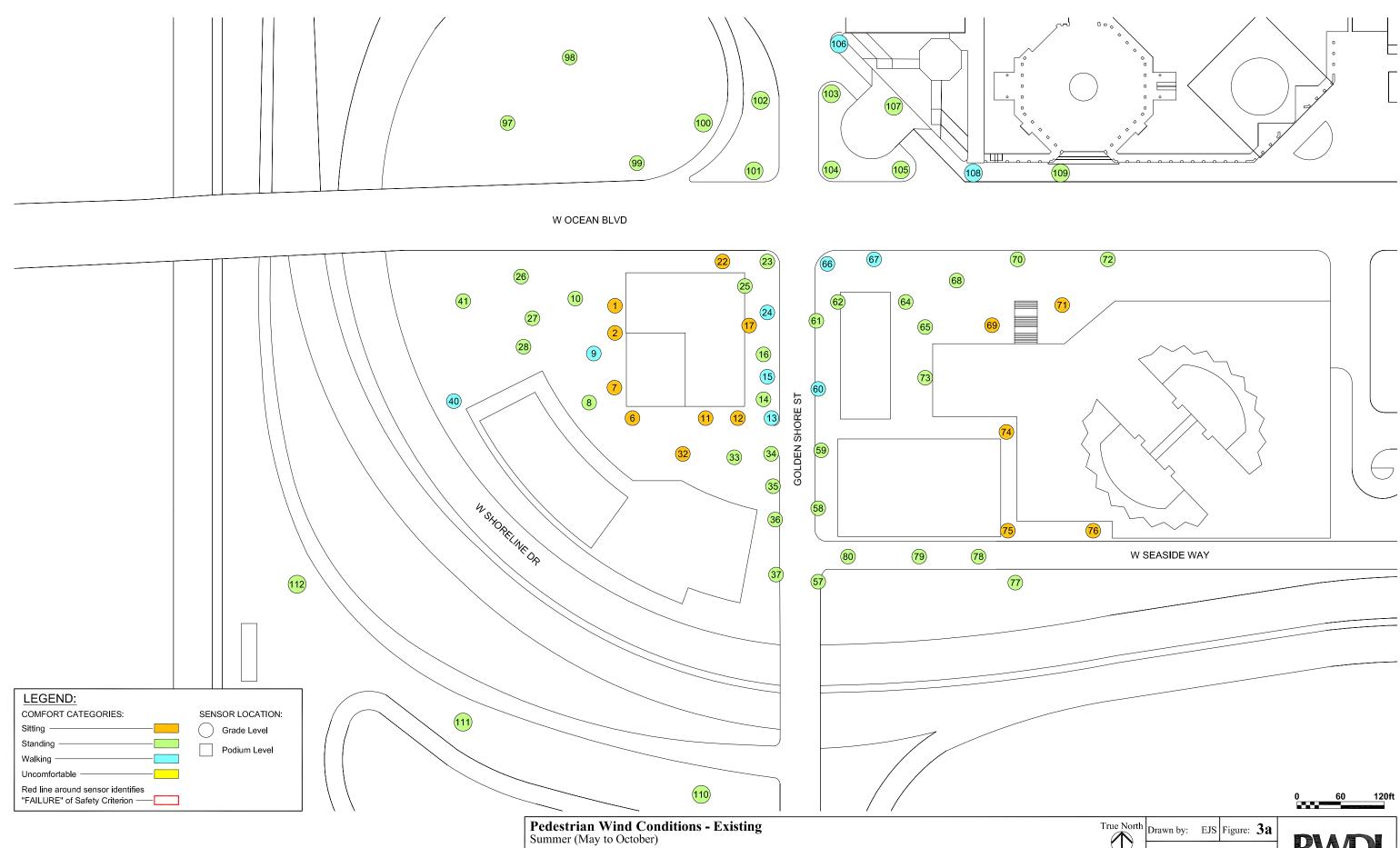


ALL WINTER WINDS

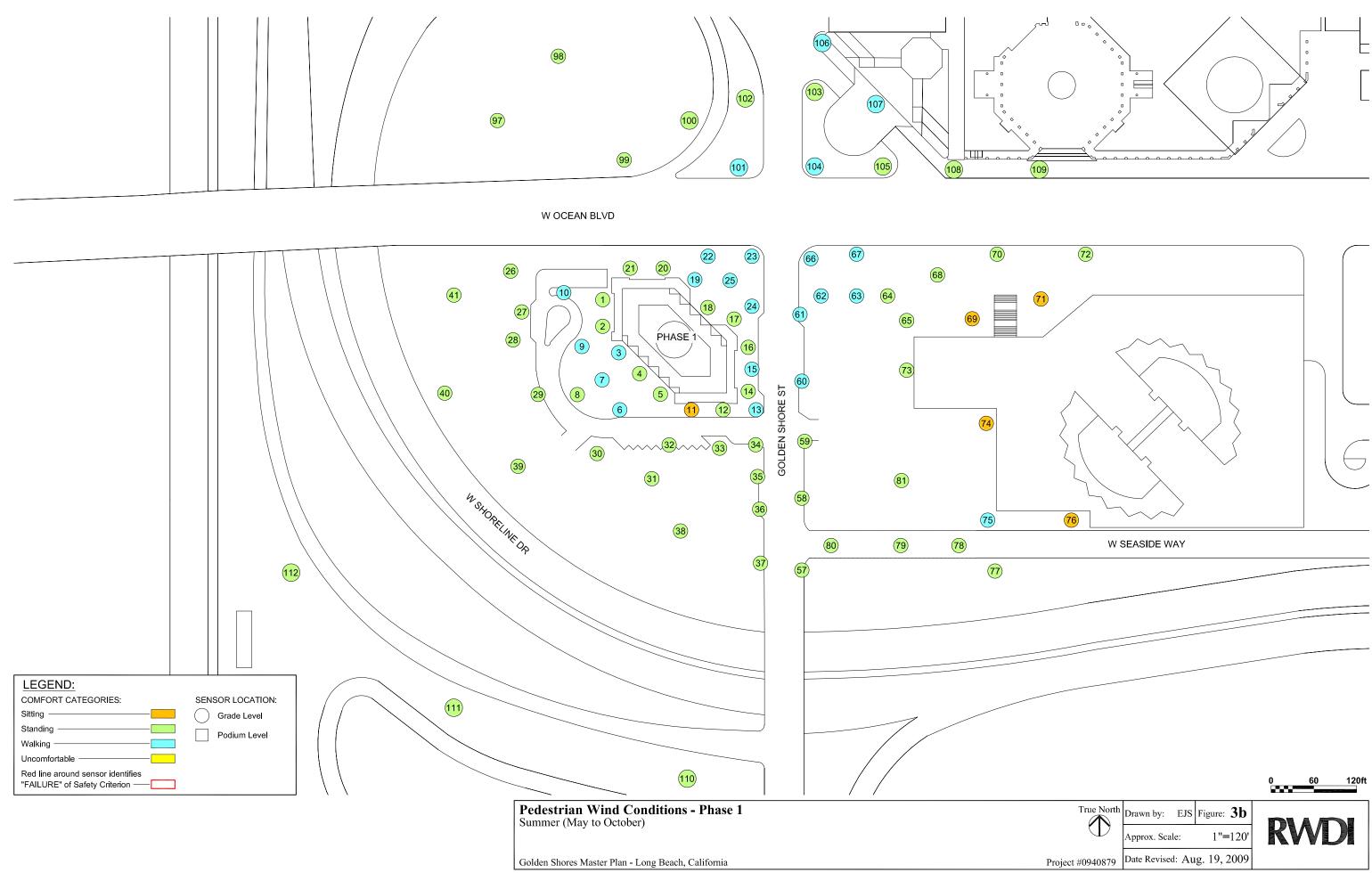


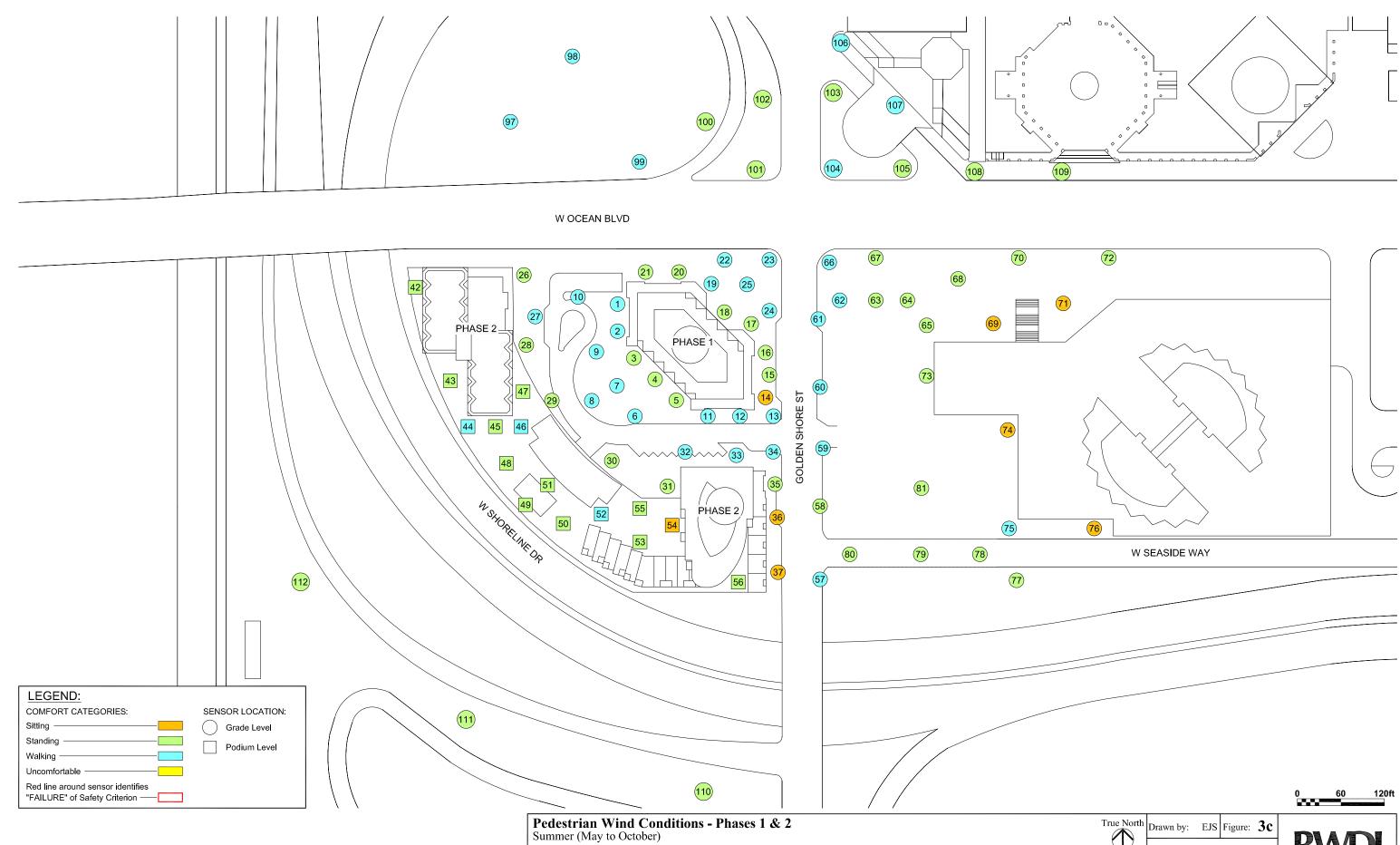
WINTER WINDS EXCEEDING 20 MPH

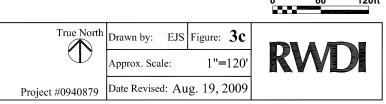
Directional Distribution (%) of Winds (Blowing Fro Station: Long Beach Airport, CA (1943 - 2008)	Figure:	2	RWDI		
Golden Shores Master Plan - Long Beach, California	Project #:	0940879	Date: August 19		

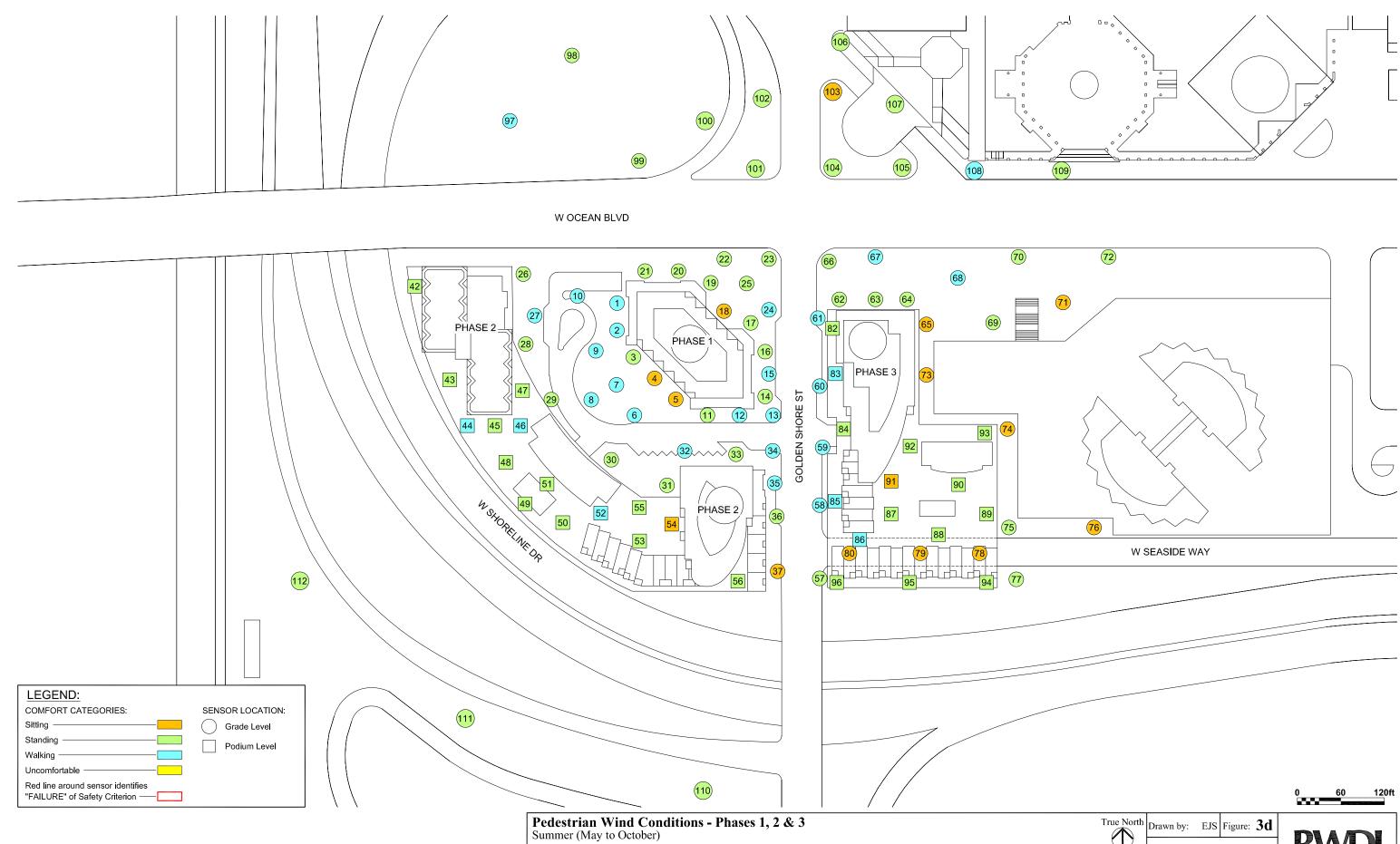


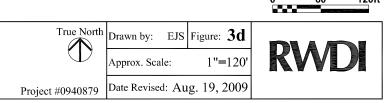
True North	Drawn by: EJS	Figure: <b>3a</b>	
$\oplus$	Approx. Scale:	1"=120'	
Project #0940879	Date Revised: Au	g. 19, 2009	

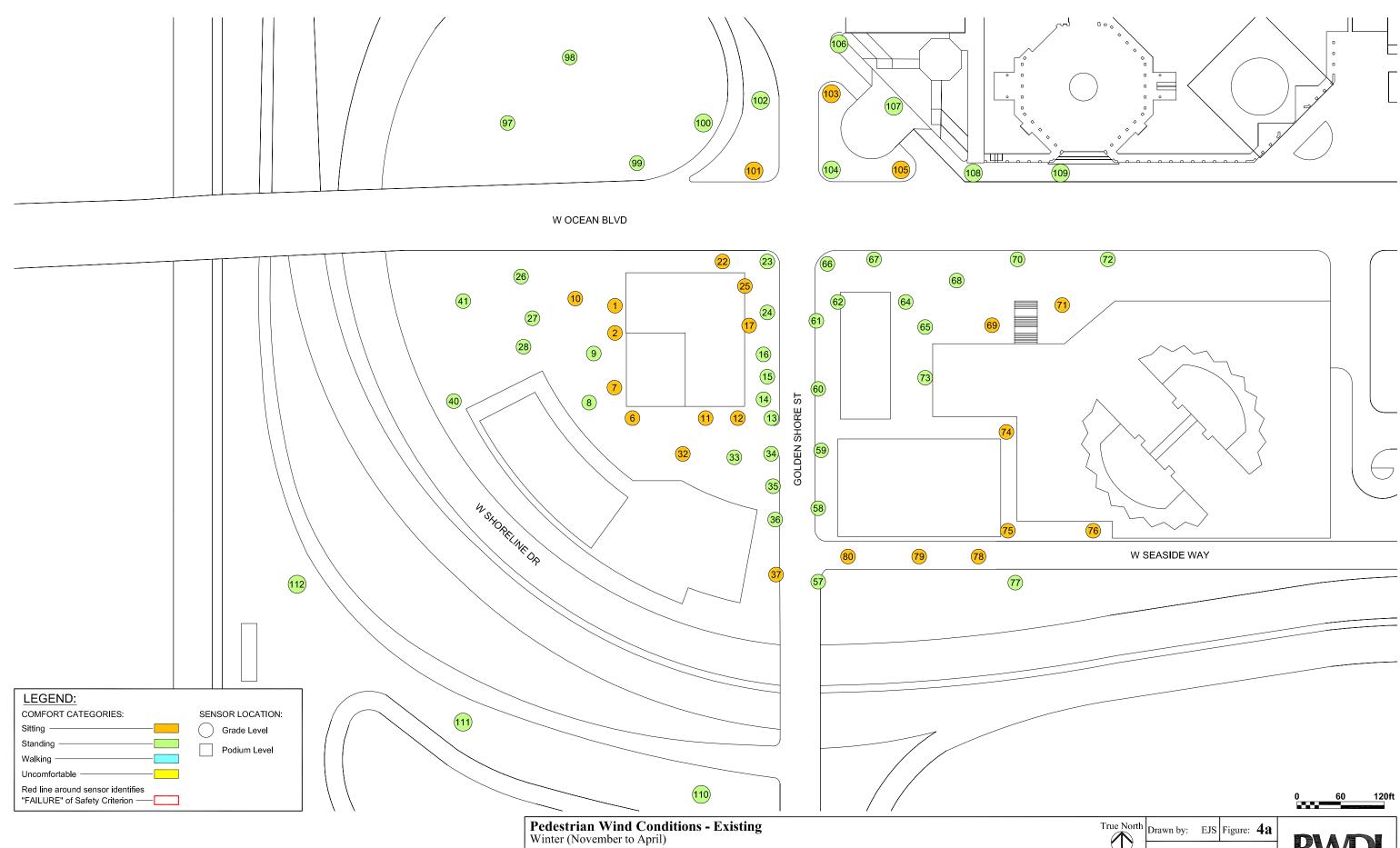


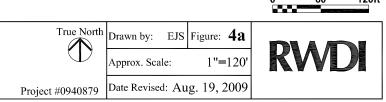


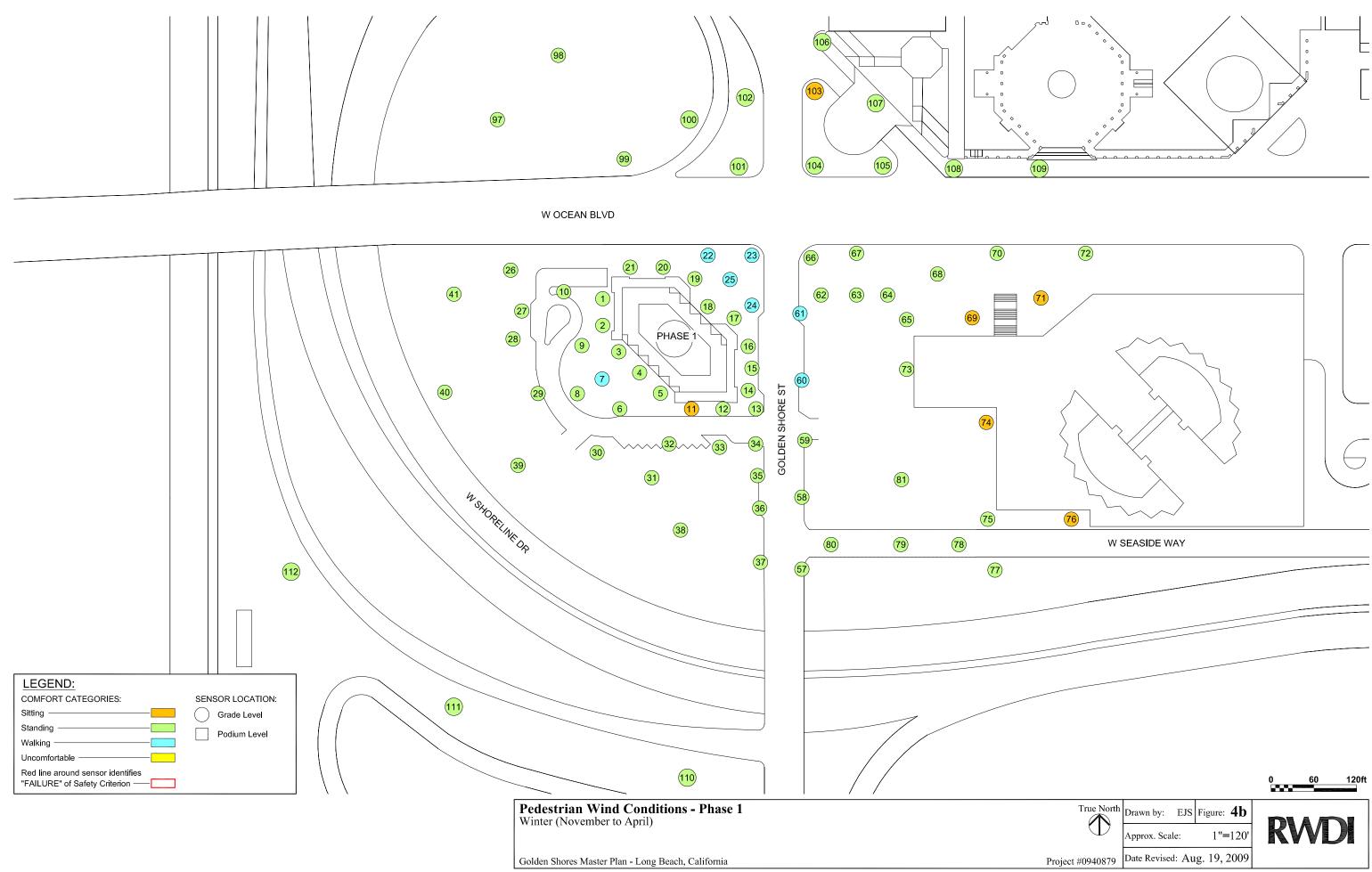


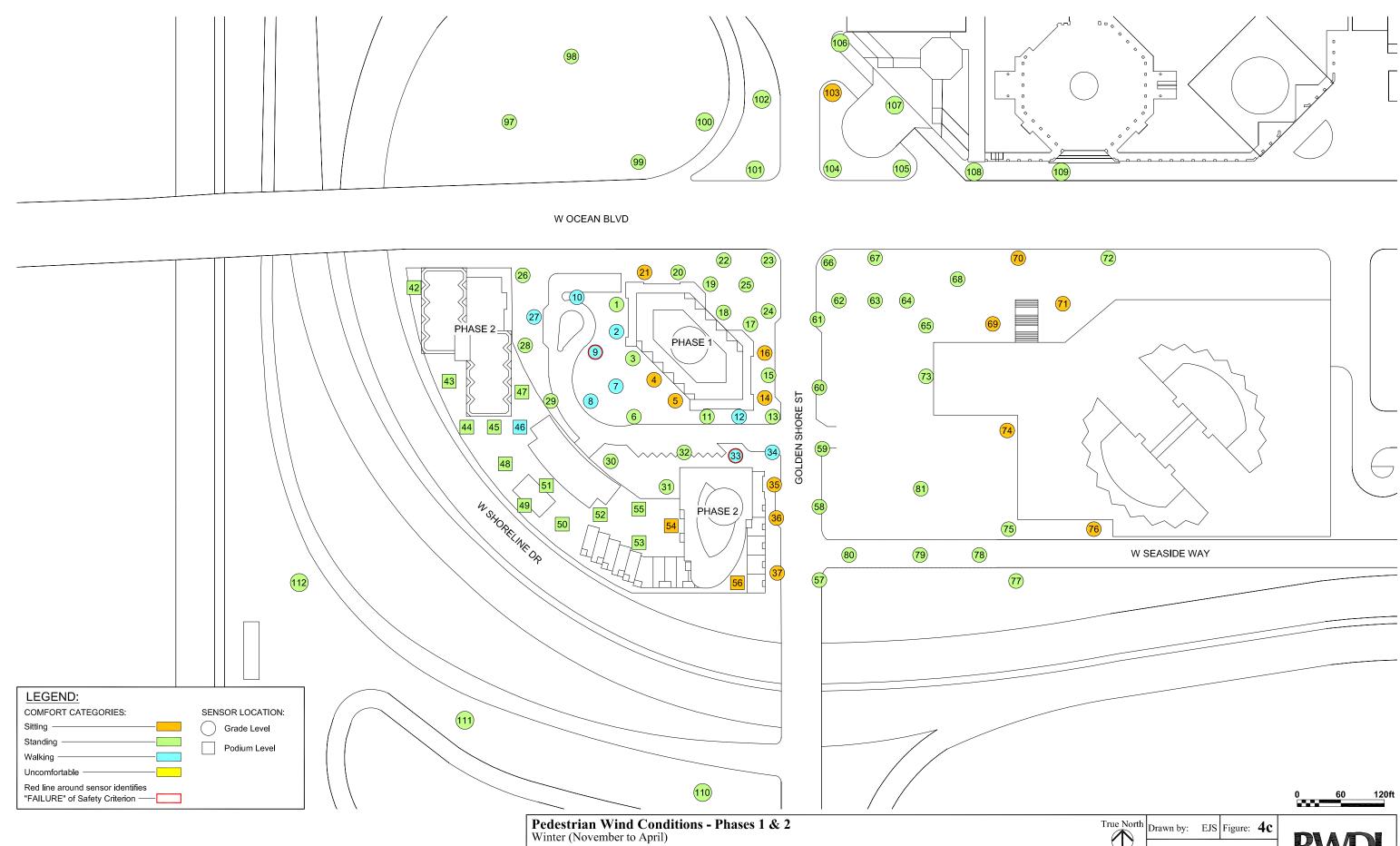




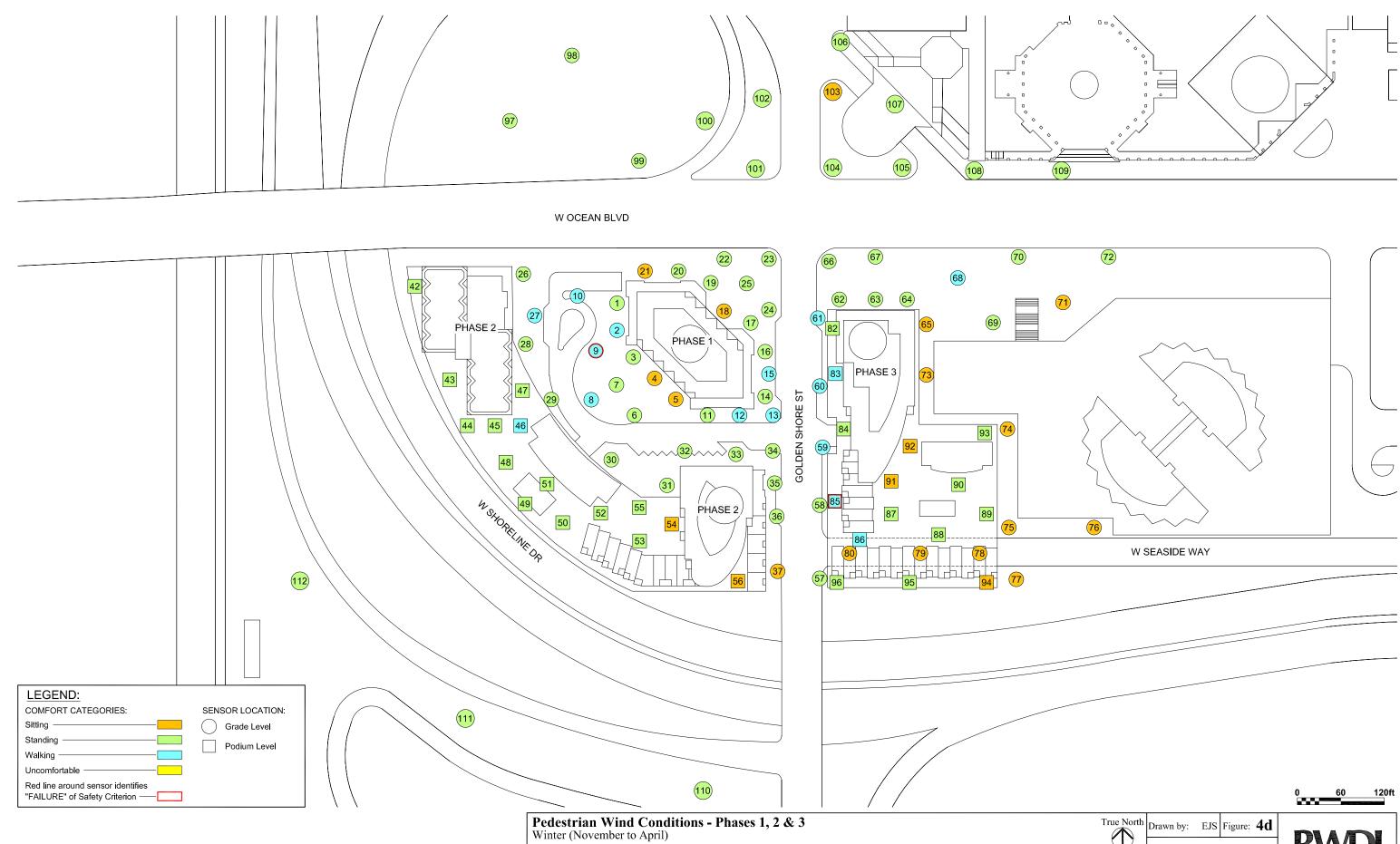


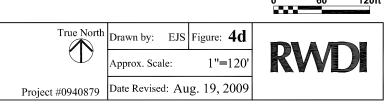






True North	Drawn by: EJS	Figure: 4c	
$\oplus$	Approx. Scale:	1"=120'	
Project #0940879	Date Revised: Au	g. 19, 2009	





## APPENDICES



### **APPENDIX A – BACKGROUND INFORMATION**

#### A.1 METHODOLOGY

Wind tunnel testing of a 1:300 scale model was conducted for the proposed Golden Shores development in Long Beach, California for the following test configurations:

- **Configuration A** Existing on-site and surrounding buildings.
- Configuration B Phase 1 of the proposed development with existing surrounding buildings.
- **Configuration** C– Phases 1 and 2 of the proposed development with existing surrounding buildings.
- Configuration D Phases 1, 2 and 3 of the proposed development with existing surrounding buildings.

Photographs of the scale models in the boundary layer wind tunnel are shown in Figures 1a through 1d, corresponding to test Configurations A, B, C and D, respectively. The models included the proposed development and all relevant surrounding buildings and topography within a 1200 ft radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modeled area were also simulated in RWDI's boundary layer wind tunnel. The model was instrumented with 112 wind speed sensors to measure mean and gust wind speeds at a full scale height of approximately 5 ft. These measurements were recorded for 36 equally incremented wind directions.

Long-term wind data are analyzed to determine the local wind climate. These wind statistics are combined with the wind tunnel data in order to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions are then compared with the RWDI criteria for pedestrian comfort and safety.

#### A.2 LOCAL METEOROLOGICAL DATA

Wind statistics recorded at the Long Beach International Airport between 1943 and 2008 were analyzed for the summer (May through October) and winter (November through April) seasons. Figure 2 graphically shows the distribution of wind frequency and directionality for the two seasons. When all wind data is considered, winds from the south and west-northwest directions



are dominant in the summer, with secondary winds from the west and northwest directions, as indicated by the upper-left wind rose (labeled All Summer Winds in Figure 2). The wind rose labeled All Winter Winds in Figure 2 illustrates the winter data. This wind rose indicates the dominance of winds from the south and west through northwest directions during the winter season. Calm winds occur for 17.3% and 23.8% of the time in summer and winter, respectively.

Strong winds of a mean speed great than 20 mph measured at the airport (at an anemometer height of 30 ft) occur for 1.3% of the time during the winter season, and are negligible during the summer. Strong winds tend to be westerly throughout the year, as demonstrated by the two right-hand wind roses in Figure 2. However, the analysis methods have accounted for these and all wind directions.

#### A.3 EXPLANATION OF RWDI WIND CRITERIA

The RWDI wind criteria, developed by RWDI through research and consulting practice since 1974, have been published in numerous academic journals and conference proceedings (References 1 through 6). They have also been widely accepted by municipal authorities as well as by the building design and city planning community. RWDI's criteria have been used in thousands of pedestrian wind projects and adopted as part of environmental planning guidelines by several major cities around the world.

The RWDI wind criteria deal with both pedestrian safety and comfort, as they relate to the force of the wind. Thermal effects (e.g., temperature, humidity, sun/shade, etc.) are not considered in these comfort criteria. Gust speeds over a short period are critical in some circumstances, particularly where winds are very strong and pedestrians' footing and balance are involved. The mean wind speed can also affect pedestrian comfort in areas such as an outdoor café. The combined effect of mean and gust speeds can be quantified by a Gust Equivalent Mean (GEM) speed. GEM is the greater of either the mean speed, or the gust speed divided by 1.85, which is a gust factor typically used for wind comfort (References 1, 5, 7 and 8).

The GEM wind speed predicted for each test location on the model is compared to the RWDI wind criteria to determine pedestrian comfort, while the gust speed is used for the wind safety evaluation. The following table is an example of how these predicted results are presented in this report.



<b>COMFORT C</b> GEM Wind Sp Category Limit	eed (mph)	Sitting 0 - 6 80%	Standing 0 - 9 80%	Walking 0 - 12 80%	Uncomf > 12 > 20%	òrtable	Gust Spee	<b>CATEGORY</b> ed. 55mph s Seasonally
Loc. Config.	Season	%	%	%	%	RATING	Events	RATING
999 A B	Summer Winter Summer Winter	75 50 65 45	85 70 80 65	95 85 90 75	5 15 10 25	Standing Walking Standing Uncomfortable	0 1 2 4	PASS PASS PASS FAIL

**Example Table:** Pedestrian Wind Comfort and Safety Categories

Across the top of the Example Table there are four comfort categories:

- Sitting: Wind speeds up to 6 mph Low wind speeds during which one can read a newspaper without having it blown away. Recommended for outdoor cafes and other amenity spaces that promote sitting.
- Standing: Wind speeds up to 9 mph Slightly higher wind speeds that are strong enough to rustle leaves. These wind speeds are appropriate at major building entrances, bus stops or other areas, such as a bench along a sidewalk, where people may want to linger but not necessarily sit for extended periods of time.
- Walking: Wind speeds up to 12 mph Winds that would lift leaves, move litter, hair and loose clothing. Appropriate for sidewalks, intersections, plazas, parks or playing fields where people are more likely to be active and receptive to some wind activity.
- Uncomfortable: Wind speeds greater than 12 mph The effects of wind speeds at this level range from small trees swaying and wind force being felt on the body to whole trees being in motion and inconvenience being felt when walking. Winds of this magnitude are considered a nuisance for most activities, but can be acceptable depending upon the season and use of an area.

Along the left side of the Example Table, the sensor location, test configuration and season are listed. The subsequent four columns show the percentage of time that the winds are predicted to fall within the wind speed ranges for each comfort category. The percentage has been rounded to the closest 5% to reflect the general public's insensitivity to a small change in wind speed.



Wind conditions are considered acceptable for sitting, standing or walking if the wind speeds are within their specified ranges at least 80% of the time. Using this criterion, each location has been given a comfort RATING on the right side of the "COMFORT CATEGORY" section of the table. Pedestrian activities other than the wind comfort category rating can still take place in the area; however, the percentages of time that the wind will be comfortable for other activities may be less than the desired 80% criterion.

For example, at Location 999 in the Example Table, the summer wind conditions are identified as comfortable for sitting 75% of the time and suitable for standing 85% of the time for Configuration A. While these percentages become lower in Configuration B (65% and 80%, respectively), the summer wind conditions for both configurations are considered to be in the same category, i.e., comfortable for standing. The winter wind conditions for Configuration B are rated uncomfortable, since the 80% criterion is not satisfied for walking. Wind speed reduction may be needed if the comfort designation is uncomfortable or if the wind conditions are not consistent with the intended use of an area.

Safety is also considered by the criteria. Gust speeds in excess of 55 mph can adversely affect a pedestrian's balance and footing. If winds of this magnitude occur more than two times per season, a "FAIL" RATING is indicated in the "SAFETY CATEGORY" section. Location 999 for Configuration B in the Example Table fails the safety criterion in the winter. Wind control measures are typically required at locations that receive the "FAIL" RATING.

These guidelines represent average wind tolerance. Regional differences in wind climate and variations in age, health, clothing, etc. can affect people's perception of the wind climate. For example, on very hot days, higher winds can be tolerated because the cooling effect of the wind would be considered pleasant. On colder days, people's tolerance of wind would be reduced, especially if they are unprepared or without appropriate clothing.



#### A.4 REFERENCES

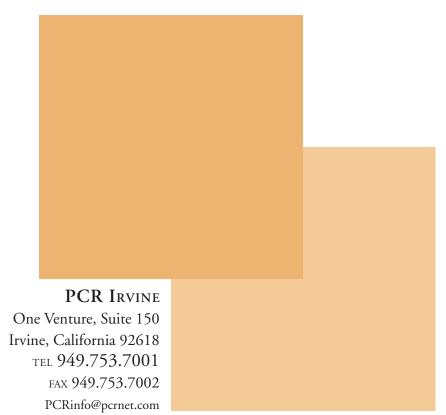
- ASCE Task Committee on Outdoor Human Comfort (2004). Outdoor Human Comfort and Its Assessment, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.
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# APPENDIX B – DRAWINGS AND INFORMATION FOR MODEL CONSTRUCTION

The drawings and information listed below were received from PCR Services Corporation and were used to construct the scale model of the proposed Golden Shores Master Plan development.

Description	File Name	File type	Date Received
Site Plan	Golden Shore Hotel Option B Plans.pdf	PDF	July 8, 2009
Building Sections	Hotel Option B Cross Sections.pdf	PDF	July 8, 2009



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