Appendix H
Pedestrian-Level Wind Study

DRAFT REPORT

PEDESTRIAN WIND STUDY

GOLDEN SHORES MASTER PLAN
LONG BEACH, CALIFORNIA

Project Number: #0940879 **October 1, 2009**

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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).

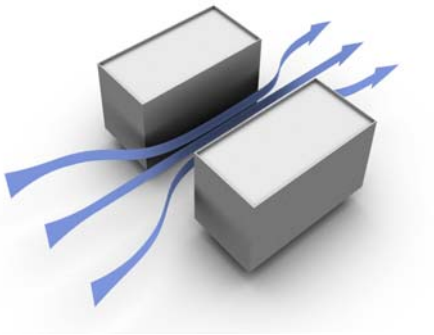


Image 1: *Channeling Flow*

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 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.

Image 4: *Trellis*

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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
1	A	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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	A	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	55	70	90	10	Walking	0	PASS
		Winter	70	80	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
6	A	Summer	80	90	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
	B	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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	A	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	0	PASS
	C	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	A	Summer	60	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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	A	Summer	70	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	B	Summer	60	75	85	15	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
11	A	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	C	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	A	Summer	85	100	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	B	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	C	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	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	B	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
16	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	80	90	10	Standing	0	PASS
		Winter	75	85	90	10	Standing	0	PASS
	C	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	A	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	55	80	95	5	Standing	0	PASS
		Winter	65	85	95	5	Standing	1	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	80	90	10	Standing	1	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	60	80	90	10	Standing	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	C	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	70	85	95	5	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
21	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	C	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	A	Summer	90	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	B	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	C	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	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	C	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	A	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	B	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	C	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	A	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	B	Summer	50	65	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
26	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	60	80	90	10	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	55	70	80	20	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
28	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	60	80	95	5	Standing	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
30	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
31	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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	A	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	60	80	90	10	Standing	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	C	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	A	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	C	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	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	B	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	C	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	A	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
36	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	80	95	100	0	Sitting	0	PASS
		Winter	80	95	100	0	Sitting	0	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
37	A	Summer	70	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
39	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	100	0	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
40	A	Summer	55	75	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						

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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
41	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
42	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	D	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
43	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	D	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
45	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
46	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
48	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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
49	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
51	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	65	90	95	5	Standing	0	PASS
		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
52	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	80	95	5	Standing	0	PASS
	D	Summer	60	75	95	5	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
53	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	70	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
54	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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	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						
	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
		Winter	70	80	90	10	Standing	2	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
56	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	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	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	60	80	90	10	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	B	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	70	80	90	10	Standing	0	PASS
		Winter	75	85	95	5	Standing	1	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
	C	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	A	Summer	55	75	90	10	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	75	90	10	Walking	1	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
61	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	0	PASS
	C	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	A	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	55	70	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
64	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	D	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	95	5	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
66	A	Summer	60	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	B	Summer	55	70	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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	A	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	90	10	Standing	2	PASS
	B	Summer	60	75	95	5	Walking	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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
	B	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	95	5	Sitting	0	PASS
	B	Summer	85	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	C	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	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	Summer	75	90	100	0	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

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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
71	A	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	85	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	C	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	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	70	90	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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	A	Summer	70	85	90	10	Standing	0	PASS
		Winter	75	85	90	10	Standing	0	PASS
	B	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	90	100	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	B	Summer	85	95	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	C	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	A	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	B	Summer	55	75	95	5	Walking	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
76	A	Summer	85	95	100	0	Sitting	0	PASS
		Winter	90	95	100	0	Sitting	0	PASS
	B	Summer	80	95	100	0	Sitting	0	PASS
		Winter	85	95	100	0	Sitting	0	PASS
	C	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	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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	A	Summer	75	90	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
81	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	D	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
82	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	1	PASS
83	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	50	70	85	15	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
84	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
85	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	45	70	85	15	Walking	1	PASS
		Winter	55	75	85	15	Walking	4	FAIL

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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
86	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	50	70	90	10	Walking	0	PASS
		Winter	60	75	90	10	Walking	1	PASS
87	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
88	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
89	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
90	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
91	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	80	90	95	5	Sitting	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
92	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	75	85	95	5	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
93	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	75	95	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
94	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	70	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
95	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	85	95	5	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
96	A	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	B	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	C	Summer	DATA NOT AVAILABLE						
		Winter	DATA NOT AVAILABLE						
	D	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
97	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	60	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	55	80	95	5	Standing	0	PASS
		Winter	65	80	90	10	Standing	0	PASS
	C	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	A	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	100	0	Standing	0	PASS
	B	Summer	65	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
101	A	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	100	0	Sitting	0	PASS
	B	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	80	95	5	Standing	1	PASS
	C	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	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	75	90	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	C	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	A	Summer	65	90	100	0	Standing	0	PASS
		Winter	70	90	95	5	Standing	0	PASS
	B	Summer	55	75	95	5	Walking	0	PASS
		Winter	65	85	95	5	Standing	0	PASS
	C	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	A	Summer	75	95	100	0	Standing	0	PASS
		Winter	80	90	95	5	Sitting	0	PASS
	B	Summer	70	90	100	0	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	C	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

Summer: May - October
Winter: November - April

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

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
106	A	Summer	55	75	90	10	Walking	0	PASS
		Winter	65	80	95	5	Standing	0	PASS
	B	Summer	55	75	90	10	Walking	0	PASS
		Winter	70	80	95	5	Standing	0	PASS
	C	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	A	Summer	70	85	95	5	Standing	0	PASS
		Winter	75	90	95	5	Standing	0	PASS
	B	Summer	60	75	90	10	Walking	0	PASS
		Winter	70	80	90	10	Standing	0	PASS
	C	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	A	Summer	60	75	85	15	Walking	0	PASS
		Winter	65	80	90	10	Standing	1	PASS
	B	Summer	60	80	90	10	Standing	0	PASS
		Winter	70	85	90	10	Standing	1	PASS
	C	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	A	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	B	Summer	65	85	95	5	Standing	0	PASS
		Winter	75	85	95	5	Standing	0	PASS
	C	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	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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

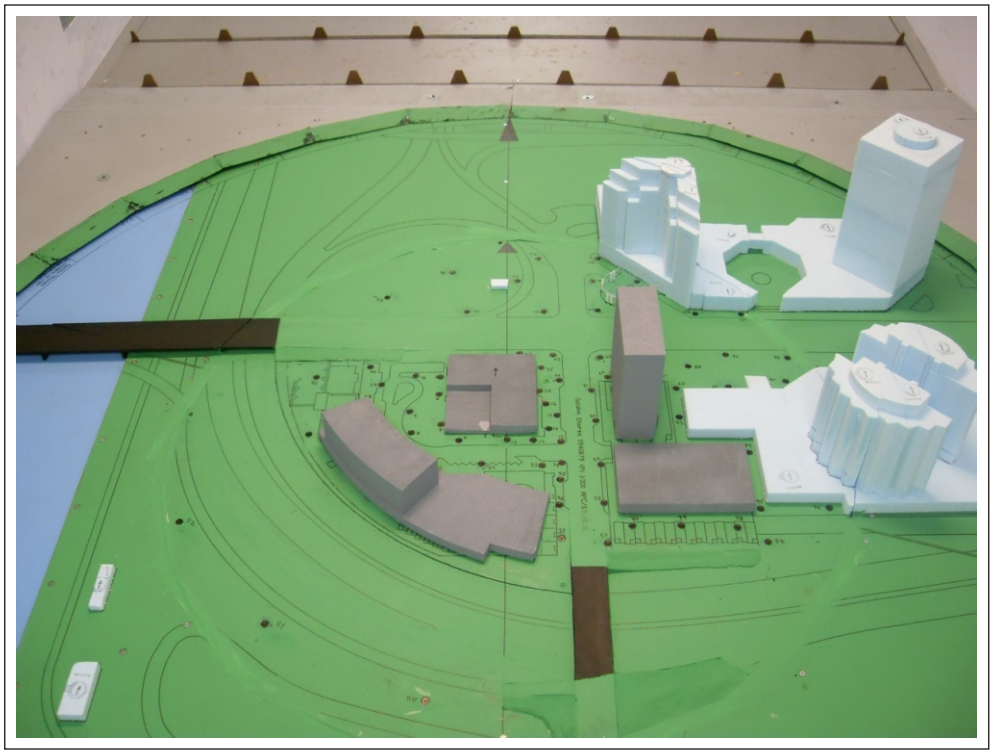
Configuration A - Existing
Configuration B - Phase 1
Configuration C - Phases 1 & 2
Configuration D - Phases 1, 2 & 3

Summer: May - October
Winter: November - April

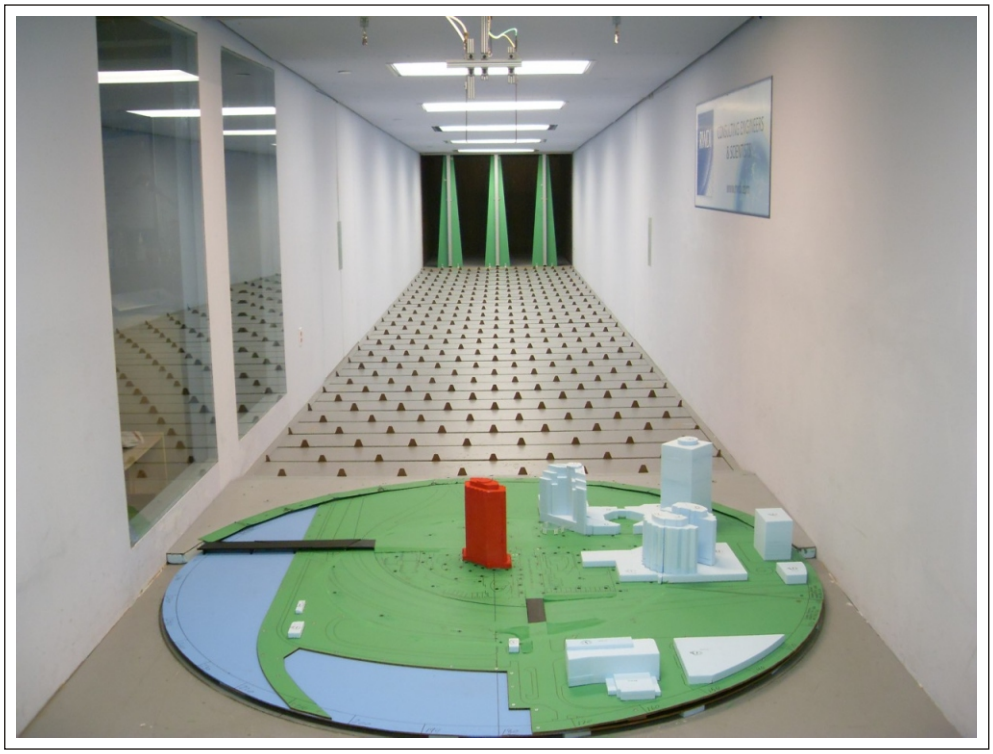
Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

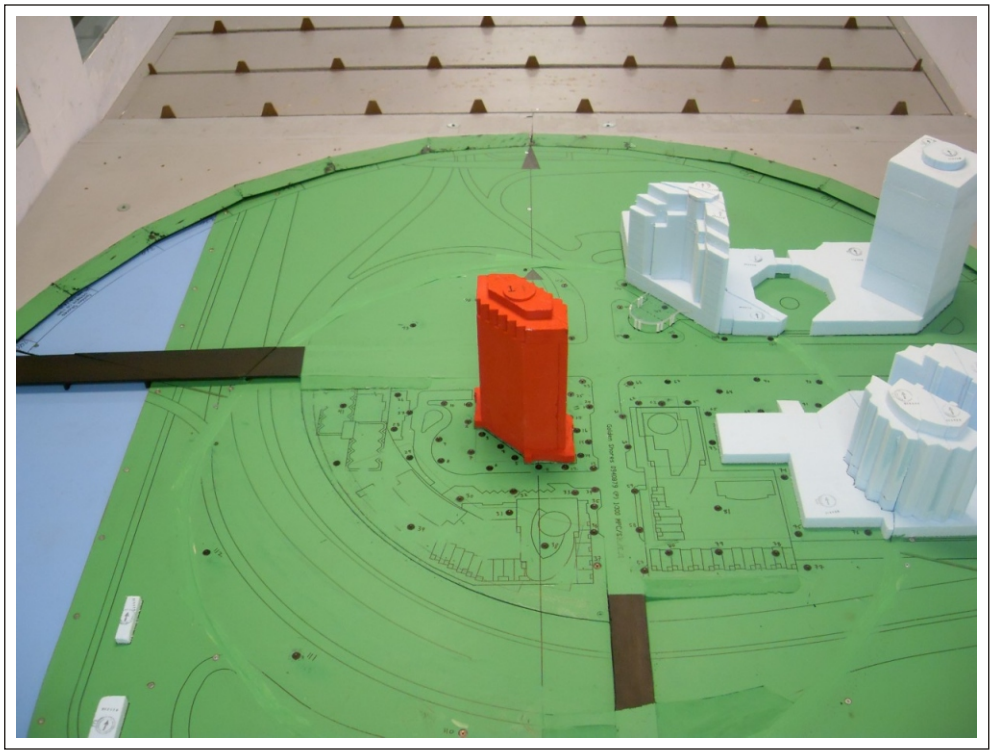
COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	>12		Gust Speed ≥55 (mph)	
Category Limit			≥80%	≥80%	≥80%	>20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	RATING	Events	RATING
111	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	55	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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	A	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	B	Summer	60	80	95	5	Standing	0	PASS
		Winter	70	85	95	5	Standing	0	PASS
	C	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

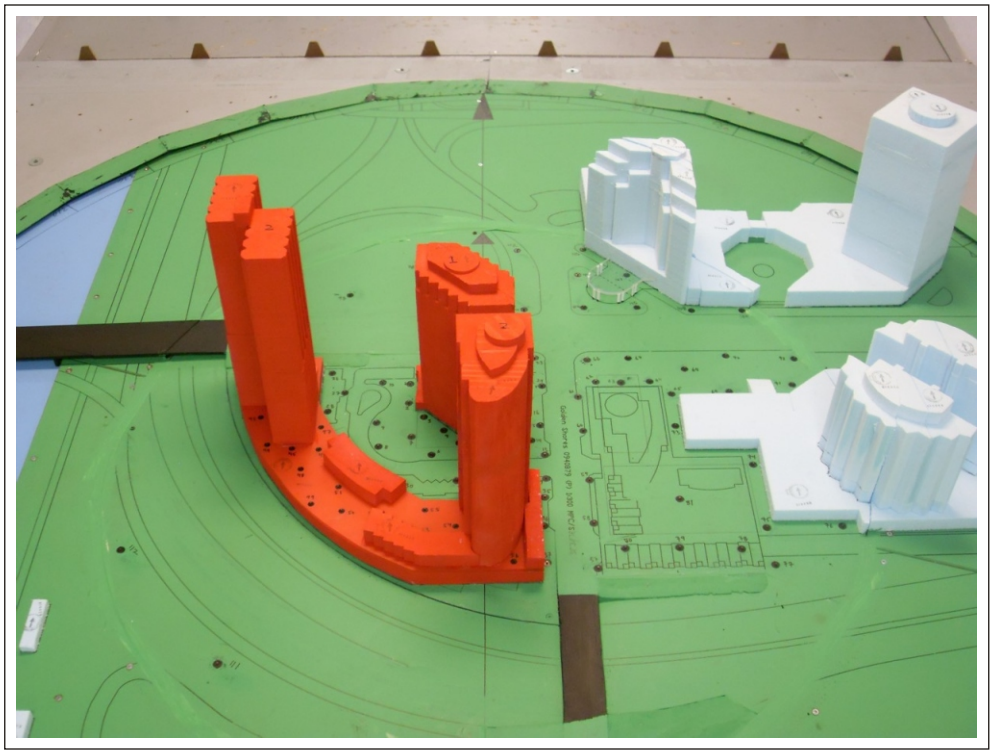


Wind Tunnel Study Model **Configuration - Existing** Golden Shores Master Plan - Long Beach, California Project #0940879	Figure: 1a Date: August 19, 2009	RWDI





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



Wind Tunnel Study Model
Configuration - Phases 1 & 2

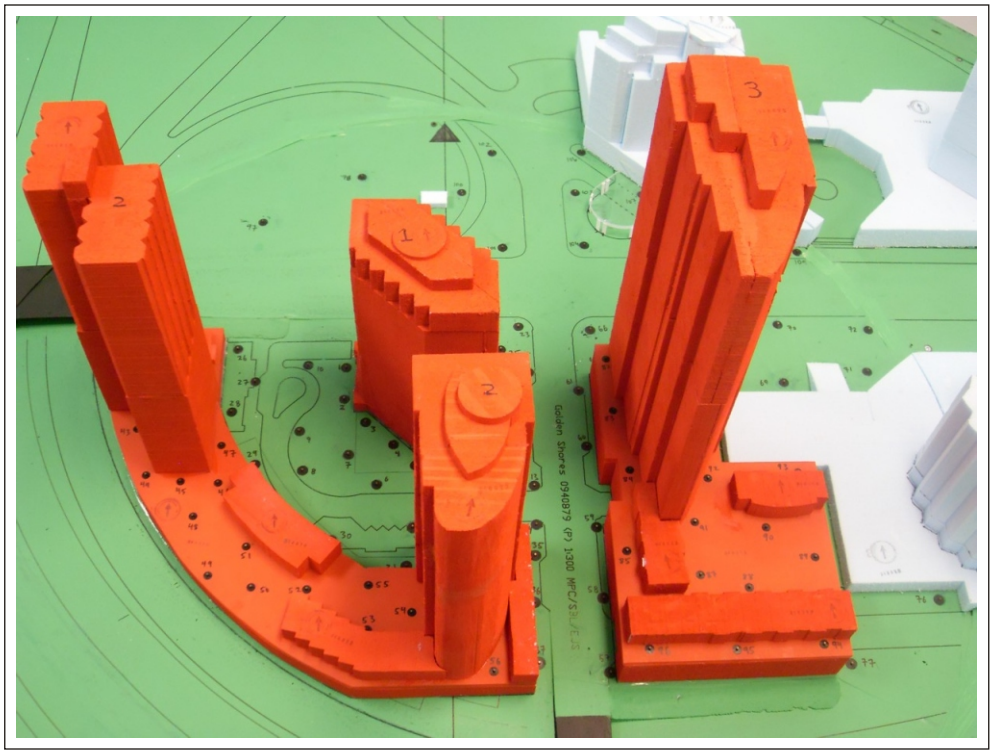
Golden Shores Master Plan - Long Beach, California

Project #0940879

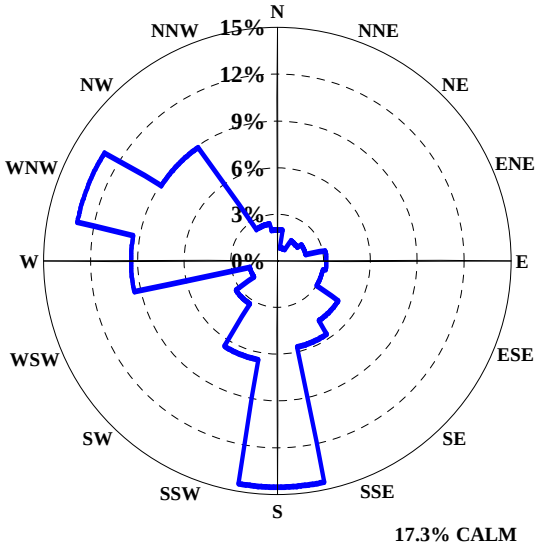
Figure: 1c

Date: August 19, 2009

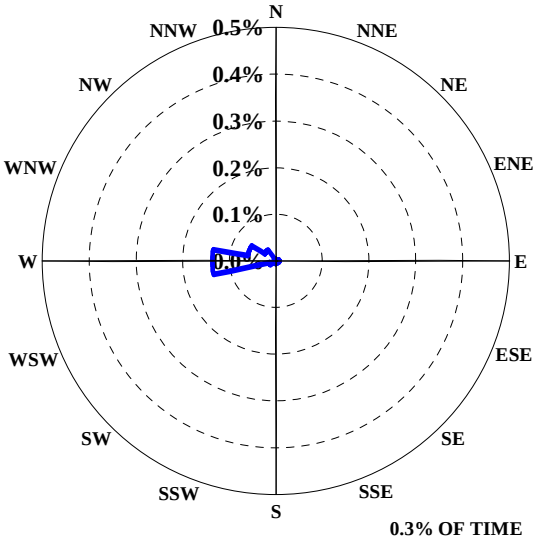
RWDI



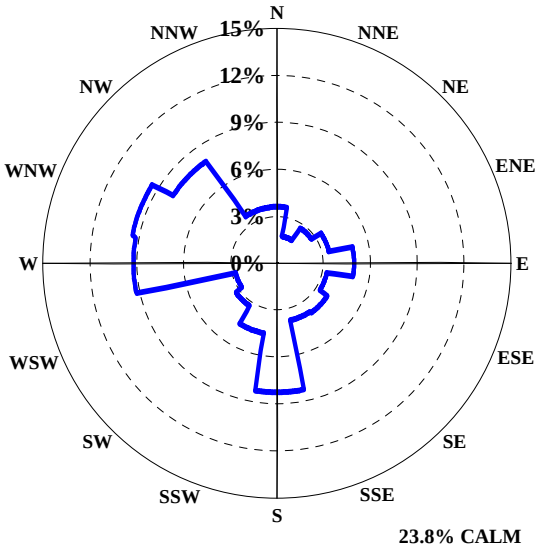
Wind Tunnel Study Model **Configuration - Phases 1, 2 & 3** Golden Shores Master Plan - Long Beach, California	Project #0940879	Figure: 1d Date: August 19, 2009	RWDI



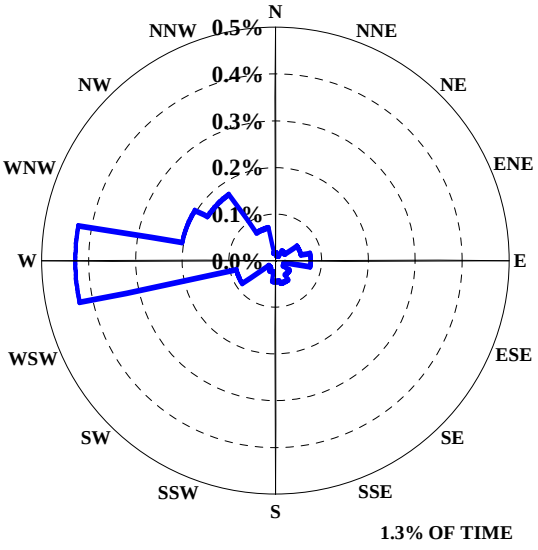
ALL SUMMER WINDS



SUMMER WINDS EXCEEDING 20 MPH

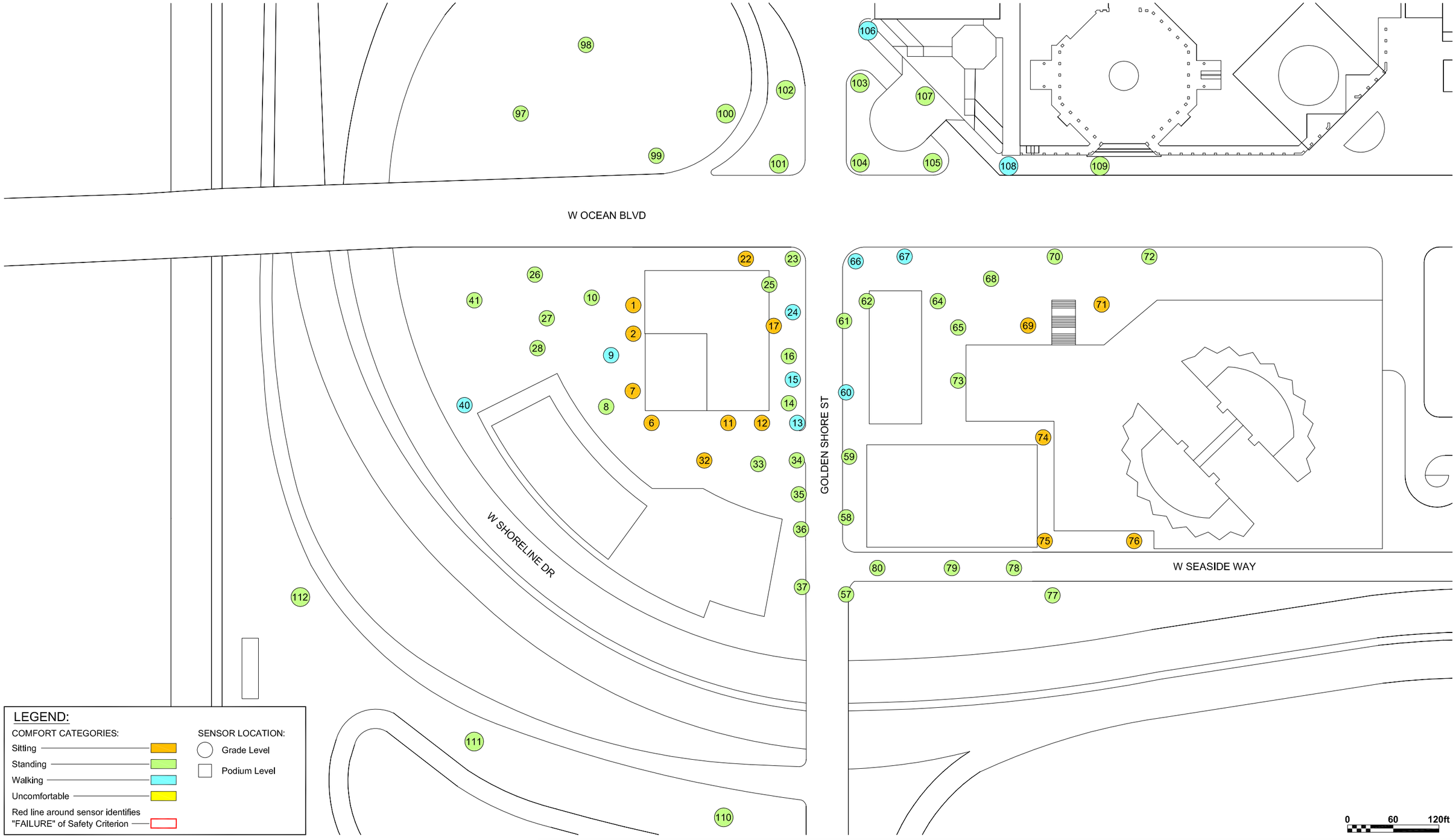


ALL WINTER WINDS



WINTER WINDS EXCEEDING 20 MPH

Directional Distribution (%) of Winds (Blowing From) **Station: Long Beach Airport, CA (1943 - 2008)**	Figure: **2**	RWDI
Golden Shores Master Plan - Long Beach, California Project #: 0940879	Date: August 19, 2009	



Pedestrian Wind Conditions - Existing
Summer (May to October)

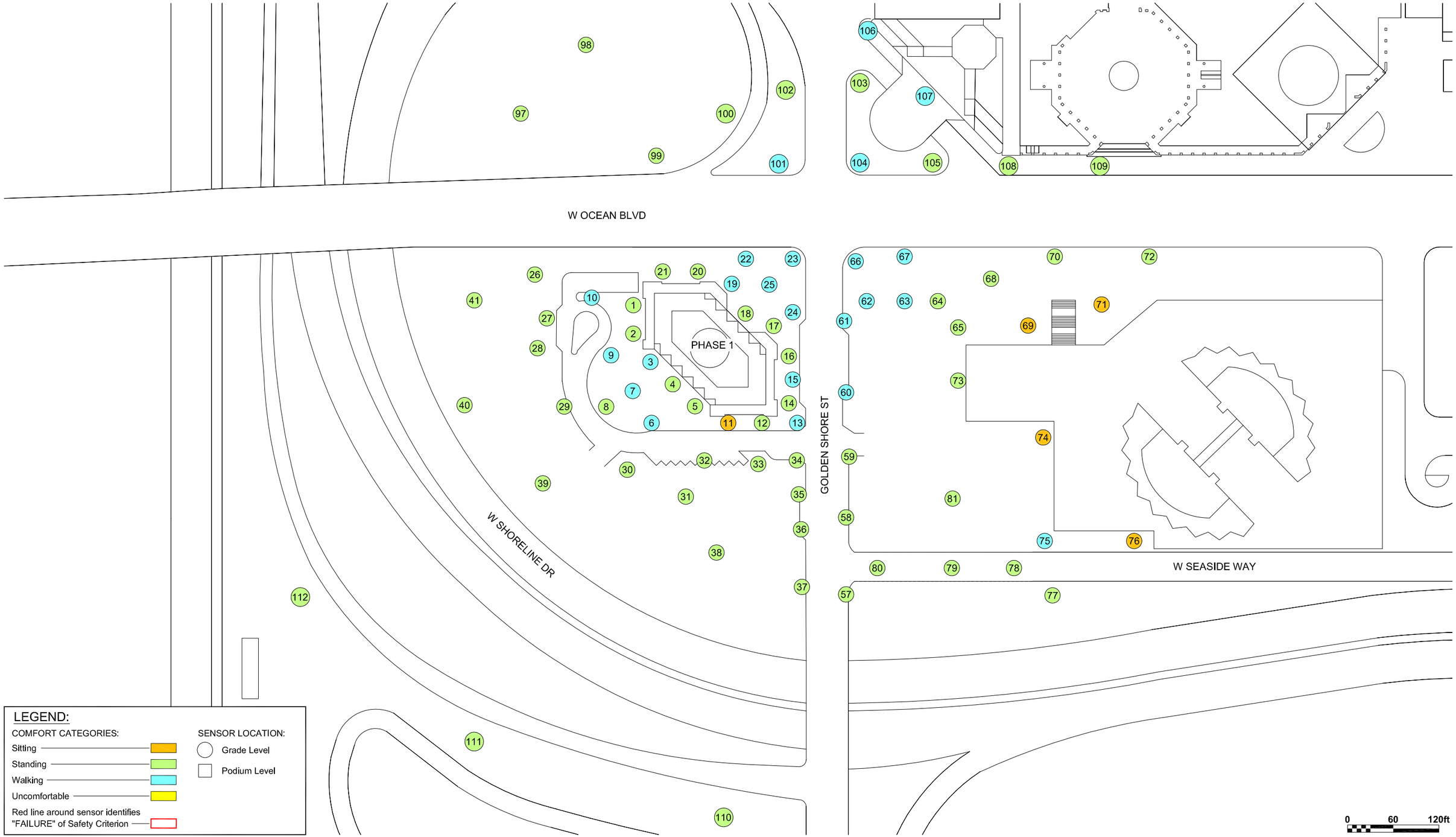
Golden Shores Master Plan - Long Beach, California

True North

Project #0940879

Drawn by:	EJS	Figure:	3a
Approx. Scale:			1"=120'
Date Revised:	Aug. 19, 2009		

RWDI



Pedestrian Wind Conditions - Phase 1
Summer (May to October)

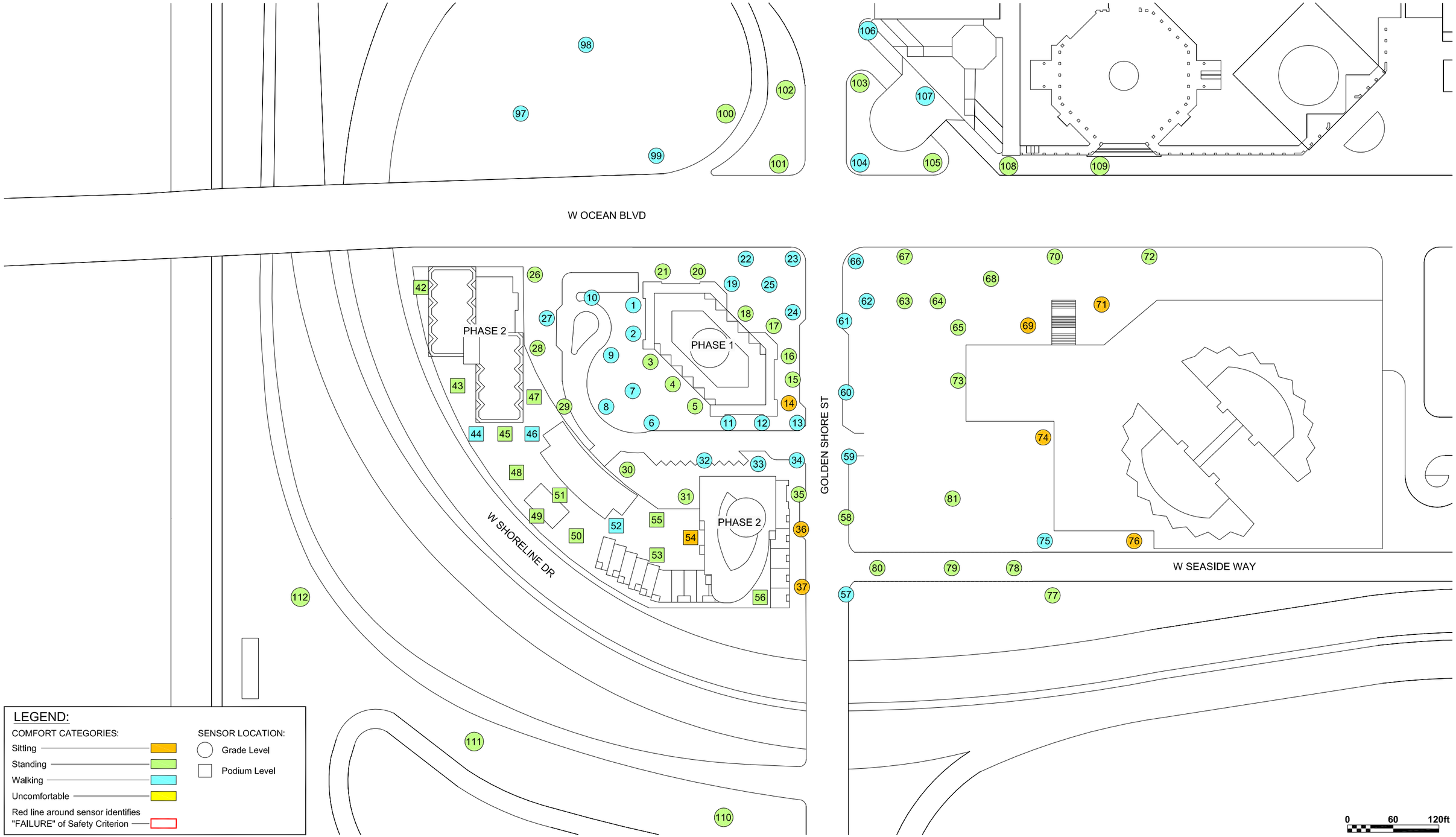
Golden Shores Master Plan - Long Beach, California

True North

Project #0940879

Drawn by:	EJS	Figure:	**3b**
Approx. Scale:		1"=120'	
Date Revised:		Aug. 19, 2009	

RWDI



Pedestrian Wind Conditions - Phases 1 & 2
Summer (May to October)

Golden Shores Master Plan - Long Beach, California

True North

Project #0940879

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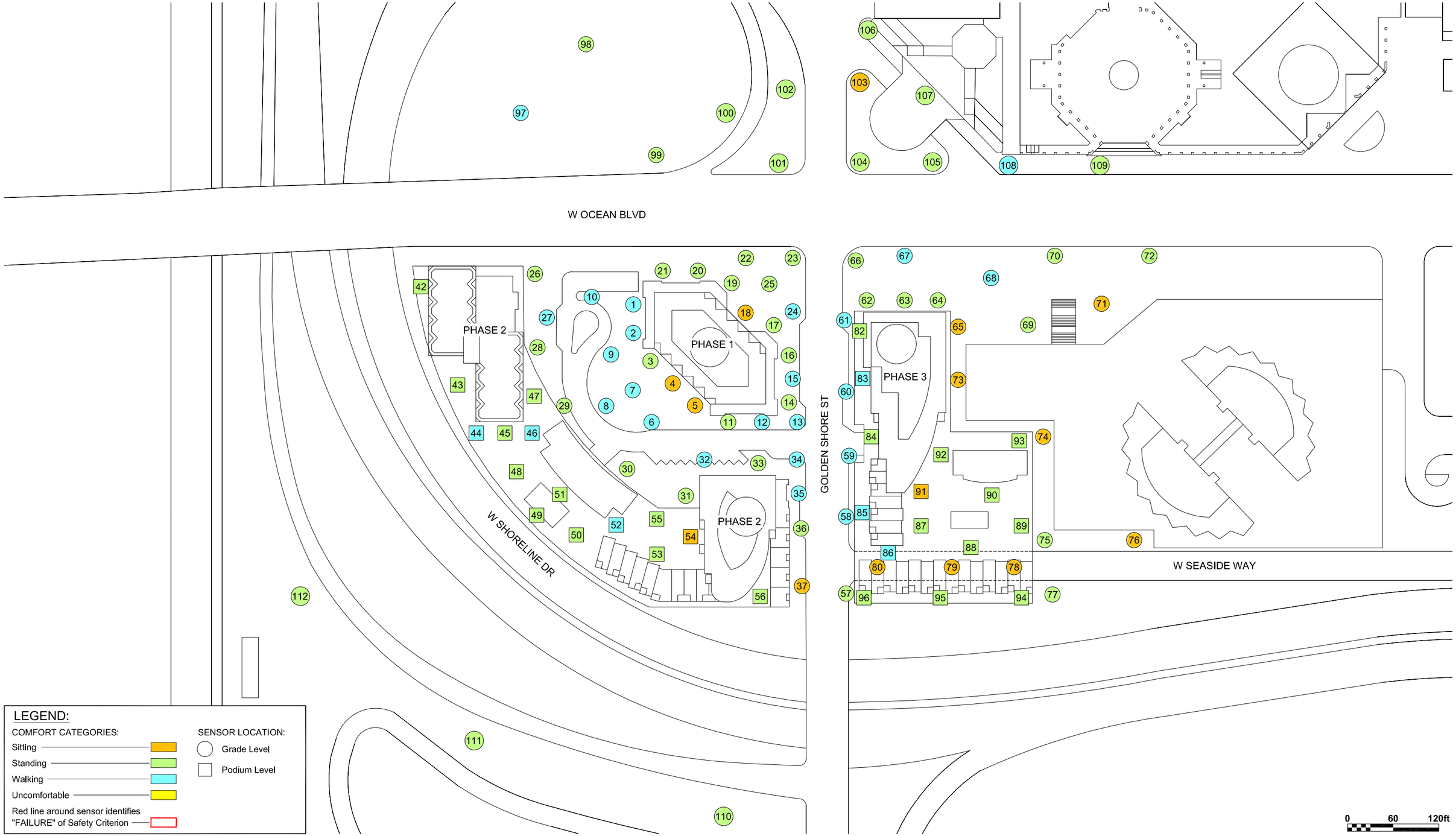
Approx. Scale:			1"=120'
Date Revised:	Aug. 19, 2009		

RWDI



Pedestrian Wind Conditions - Phases 1, 2 & 3
Summer (May to October)

Golden Shores Master Plan - Long Beach, California

Project #0940879

True North

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Approx. Scale:	1"=120'
Date Revised: Aug. 19, 2009	

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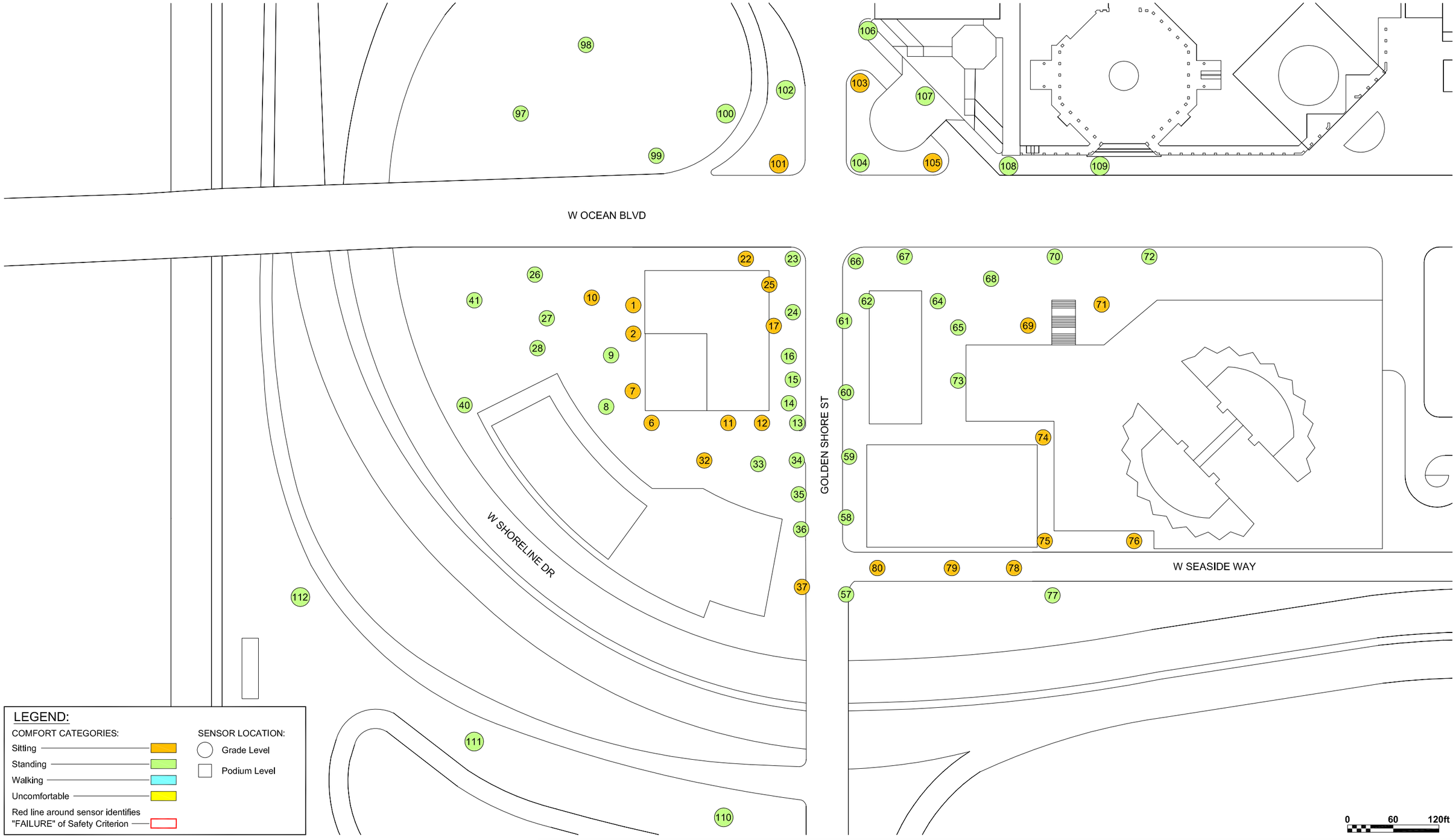

Pedestrian Wind Conditions - Existing
Winter (November to April)

Golden Shores Master Plan - Long Beach, California

True North

Project #0940879

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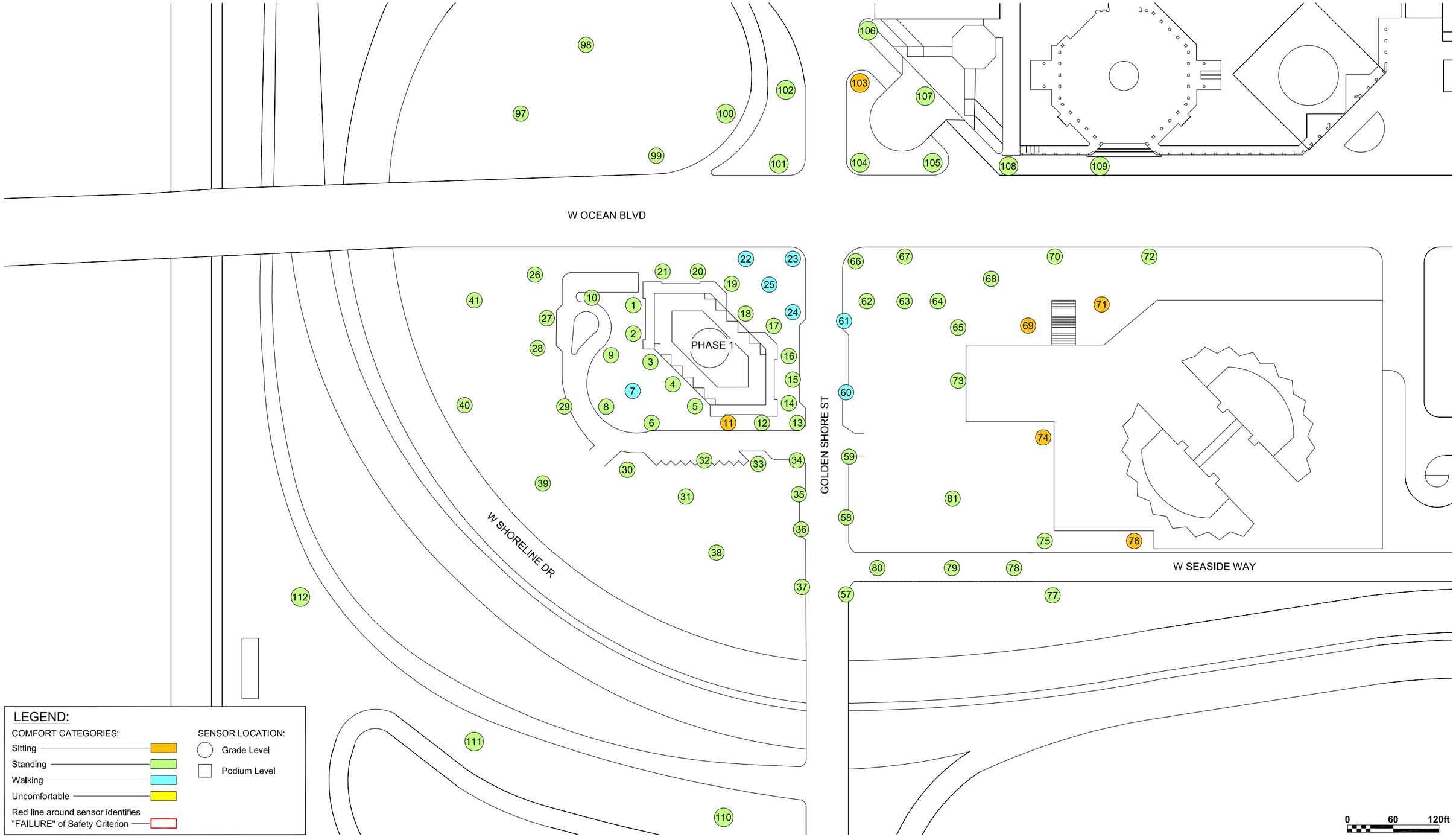
Date Revised:	Aug. 19, 2009		

RWDI



Pedestrian Wind Conditions - Phase 1
Winter (November to April)

Golden Shores Master Plan - Long Beach, California

Project #0940879

True North

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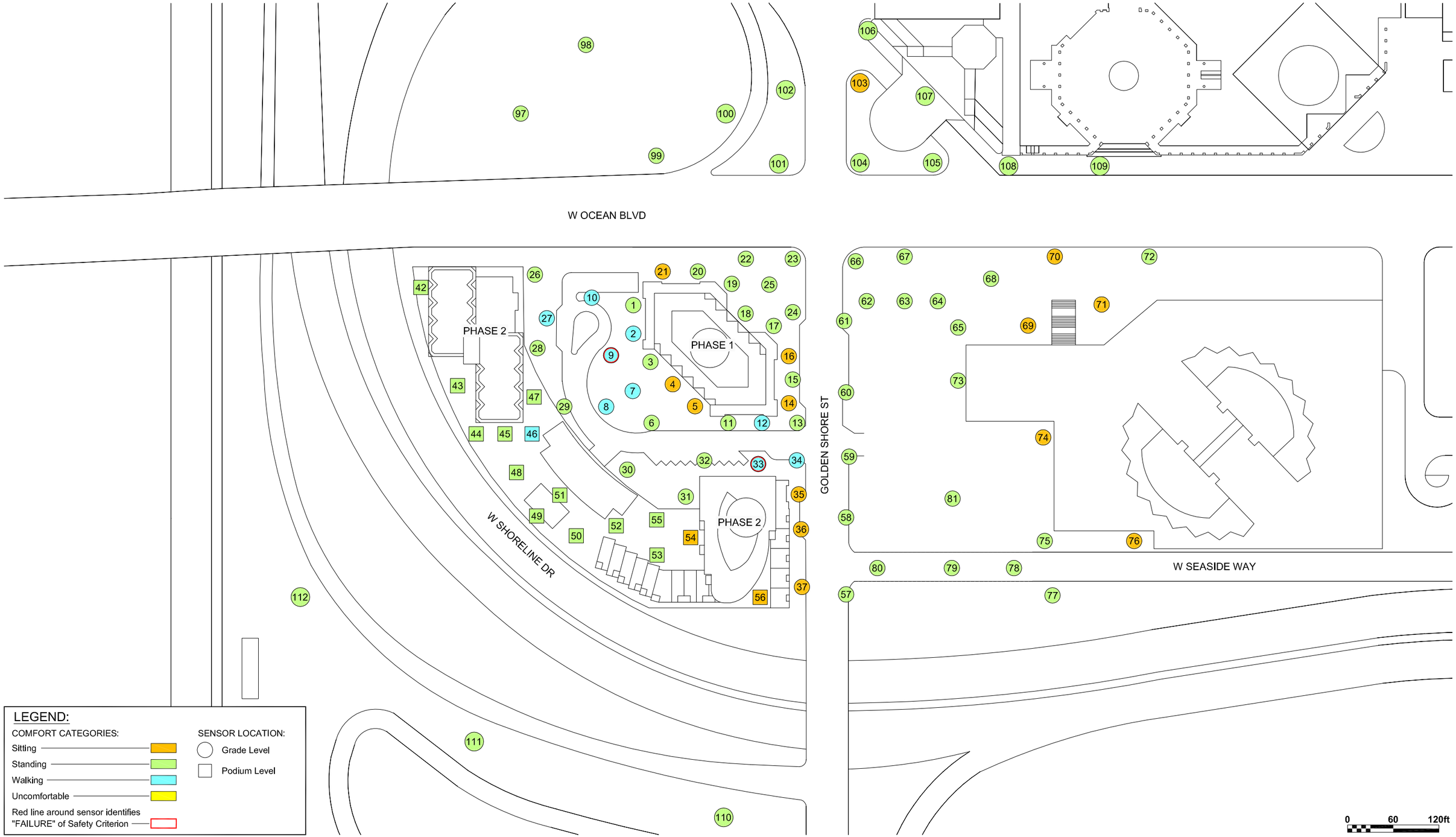
Date Revised:		Aug. 19, 2009	

RWDI



Pedestrian Wind Conditions - Phases 1 & 2
Winter (November to April)

Golden Shores Master Plan - Long Beach, California

Project #0940879

True North

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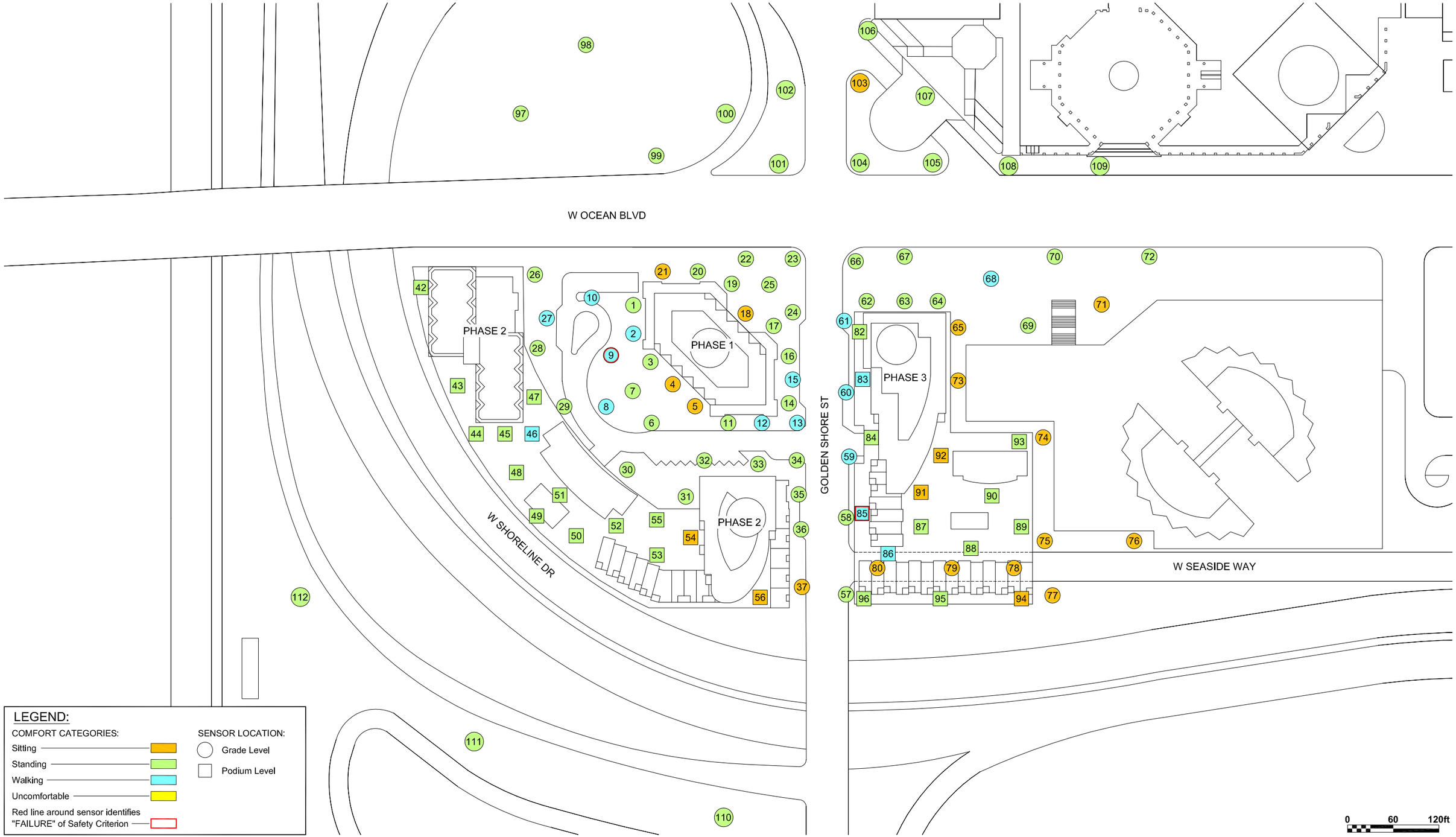
Approx. Scale:			1"=120'
Date Revised:			Aug. 19, 2009

RWDI



Pedestrian Wind Conditions - Phases 1, 2 & 3
Winter (November to April)

Golden Shores Master Plan - Long Beach, California

Project #0940879

True North

Drawn by:	EJS	Figure:	4d
Approx. Scale:		1"=120'	
Date Revised:		Aug. 19, 2009	

RWDI

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.

Example Table: Pedestrian Wind Comfort and Safety Categories

COMFORT CATEGORY			Sitting	Standing	Walking	Uncomfortable		**SAFETY CATEGORY**	
GEM Wind Speed (mph)			0 - 6	0 - 9	0 - 12	> 12		Gust Speed 55mph	
Category Limit			80%	80%	80%	> 20%		> 2 Events Seasonally	
Loc.	Config.	Season	%	%	%	%	**RATING**	Events	**RATING**
999	A	Summer	75	85	95	5	Standing	0	PASS
		Winter	50	70	85	15	Walking	1	PASS
	B	Summer	65	80	90	10	Standing	2	PASS
		Winter	45	65	75	25	Uncomfortable	4	FAIL

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

1) ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.

2) Williams, C.J., Hunter, M.A. and Waechter, W.F. (1990). "Criteria for Assessing the Pedestrian Wind Environment," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.36, pp.811-815.

3) Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.41-44, pp.2389-2390.

4) Soligo, M.J., Irwin, P.A., and Williams, C.J. (1993). "Pedestrian Comfort Including Wind and Thermal Effects," *Third Asia-Pacific Symposium on Wind Engineering*, Hong Kong.

5) Soligo, M.J., Irwin, P.A., Williams, C.J. and Schuyler, G.D. (1998). "A Comprehensive Assessment of Pedestrian Comfort Including Thermal Effects," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.77&78, pp.753-766.

6) Williams, C.J., Wu, H., Waechter, W.F. and Baker, H.A. (1999). "Experiences with Remedial Solutions to Control Pedestrian Wind Problems," *Tenth International Conference on Wind Engineering*, Copenhagen, Denmark.

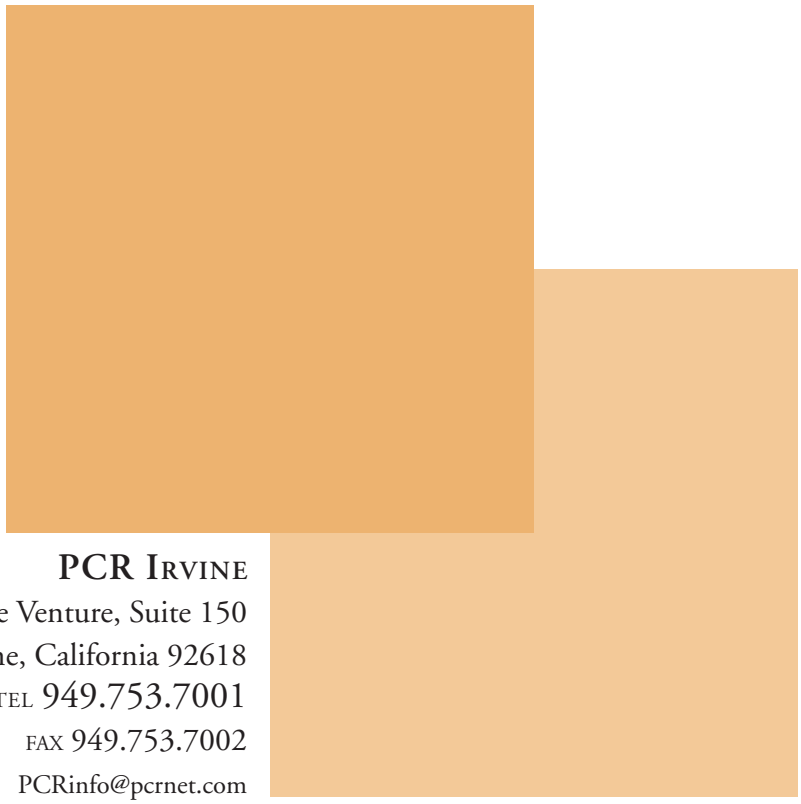
7) Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", *Report No. TVL 7321*, Department of Aeronautic Engineering, University of Bristol, Bristol, England.

8) Durgin, F. H. (1997). "Pedestrian Level Wind Criteria Using the Equivalent Average", *Journal of Wind Engineering and Industrial Aerodynamics,* Vol. 66, pp. 215-226.

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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