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1040 & 1050 Somerset Street
Ottawa, Ontario

Final Report

Pedestrian Wind Study

RWDI # 1501641
May 20, 2015

SUBMITTED TO

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1040 & 1050 Somerset Street – Ottawa, Ontario
Pedestrian Wind Consultation
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1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Claridge Homes to consult on the pedestrian wind conditions for the proposed developments at 1040 & 1050 Somerset Street in Ottawa, Ontario. The purpose of the study was to assess the wind environment around the two developments in terms of pedestrian comfort and safety as per the City of Ottawa's requirements.

This objective was achieved through wind tunnel testing of a 1:300 scale model of the proposed developments with all existing surrounding buildings. The wind tunnel model was constructed using the information listed in Appendix A.

1.1 Project Description

The development at 1040 Somerset Street will be 106.4 metres high (30 storeys plus mechanical penthouse) located to the west of a future station for the O-Train Trillium Line. Entrances to the building are on the north and west facades. There is a paved plaza to the north of the building. There is also proposed retail on the 1st floor that will front this plaza. There are outdoor amenity areas on the 2nd and 4th levels.

The development at 1050 Somerset Street will be 72.5 metres high (23 storeys plus mechanical penthouse) located west of 1040 Somerset development. The main entrance for 1050 Somerset will be on the east and north sides. The north side will also include outdoor patio seating. There are also outdoor terraces on the 3rd, 5th, 6th and 21st (roof) levels. Outdoor play areas for the Devonshire Public School are located south of this new development.

The proposed developments will be constructed separately: the development at 1040 Somerset Street will be constructed first followed soon after by the development at 1050 Somerset Street.

1.2 Test Configurations

The following three configurations were tested:

- **Existing:** The existing project site with existing surroundings (see Figure 1a).
- **Proposed:** The proposed 1040 Somerset Street development with existing surroundings (see Figure 1b). This represents the interim condition after the 1040 Somerset development is built and before the 1050 Somerset development is constructed.
- **Future:** The proposed 1040 & 1050 Somerset Street developments with existing surroundings (see Figure 1c).

It was beneficial to test the existing, proposed and future configurations so that it was possible to identify the impact of the proposed developments on the existing winds conditions in the area surrounding the developments.



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1.3 Methodology

The scale model was instrumented with 86 sensors to measure wind speeds at pedestrian locations on and around the proposed developments. The placement of the measurement locations (wind speed sensors) was based on our experience and understanding of the pedestrian usage for this site.

The wind tunnel data were combined with local wind climate data for Ottawa (see Figure 2) to predict the frequencies of occurrence of full scale wind speeds at each wind speed sensor, which were then assessed using RWDI's criteria for pedestrian wind comfort and safety.

Background information is provided in Appendix B including a description of wind tunnel testing and analysis methodology, a discussion of the local wind climate for the Ottawa area, an explanation of the wind criteria used by RWDI, and other reference materials.

2. SUMMARY OF RESULTS

Table 1 presents the predicted wind conditions for the spring (March through May), summer (June through August), fall (September through November) and winter (December through February) seasons. The results are also graphically presented on a site plan in Figures 3a through 7c. The principle findings are summarized as follows:

- In general, the wind speeds at grade are expected to be within appropriate ranges for the intended use of the areas. Isolated areas on the sidewalk to the east of the 1050 Somerset Street building and to the north of the 1040 Somerset Street building are predicted to have uncomfortable wind speeds in one or more seasons and configurations.
- Several entrances to the 1040 and 1050 Somerset Street buildings are anticipated to have marginally higher than desired wind speeds for these areas.
- Isolated areas on the podiums and amenity areas of the 1040 and 1050 Somerset buildings are predicted to have higher than desired wind speeds for the intended comfort rating. Both the 1040 and 1050 Somerset Street buildings are also anticipated to have one safety exceedance on each podium. Access to these two areas should be strictly prohibited in the winter months.
- Both the area of the future O-Train station to the east of the 1040 Somerset Street building and the Devonshire Public school yard to the south of the 1050 Somerset Street building are anticipated to meet both the comfort and safety criteria. The developments are anticipated to have marginal impacts on these areas when compared to the existing configuration.
- Improved wind conditions can be achieved in the areas of higher than desired wind speeds with the implementation of mitigation features, such as landscaping with dense vegetation, porous wind screens, porous parapets and canopies. Details on wind mitigation are provided in Section 3.



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3. PREDICTED PEDESTRIAN WIND CONDITIONS

The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area. As is expected when introducing a tall massing in the surroundings of low-rise buildings and relatively open surroundings, the wind speeds at grade are anticipated to become higher in the presence of the proposed 1040 and 1050 Somerset Street buildings. However, it is worth noting that for the majority of the test locations these increases are marginal, and the majority of the wind speeds remain within the range of what is considered appropriate.

3.1 Grade Level on and around 1040 & 1050 Somerset (Locations 1 to 36, 40 to 57, and 66 to 68)

In general, it is desirable for wind speeds along sidewalks to be comfortable for walking or better throughout the year. Main entrances tend to promote lingering, and wind speeds comfortable for sitting or standing are considered appropriate. The main entrances around the 1050 Somerset building are marked by Locations 1, 7, 8, 9 and 11, and the main entrances around the 1040 Somerset building are marked by Locations 27, 29 and 33.

The following points summarize the predicted wind conditions at grade level. It is worth noting that the wind conditions the future O-Train station to the east of the 1040 Somerset Street building and the Devonshire Public school yard to the south of the 1050 Somerset Street building are discussed separately in Sections 3.3 and 3.4, respectively.

- All areas at grade level are expected to meet the criterion used to assess wind safety.
- For the most part, wind speeds that range from being comfortable to sitting to being comfortable for walking are predicted at grade level. The summer and fall are anticipated to have calmer wind speeds than the winter and spring.
- In the Proposed Configuration, two areas to the north of the 1040 Somerset Street building (Locations 31 and 32) are anticipated to be uncomfortable in the spring (see Figure 3b) and winter (see Figure 6b), with an additional uncomfortable area (Location 34) in the winter (see Figure 6b). In the Future Configuration, one area on the sidewalk to the east of the 1050 Somerset Street building (Location 2) is predicted to be uncomfortable in the spring (Figure 3c).
- In the winter, the entrance marked by Location 7 on the 1050 Somerset Street building in the Future Configuration is anticipated to have wind speeds comfortable for strolling, and slightly exceeds the recommended comfort category. Similarly, the entrances marked by Locations 27, 29 and 33 on the 1040 Somerset Street building are expected to have higher than desired wind speeds in at least one season throughout the year.

The following measures can be implemented to help reduce the wind speeds in the areas mentioned above. As a general note, vertical features (landscaping, wind screens, etc.) are effective at mitigating horizontal wind flows while horizontal features (canopies, trellises, etc.) are effective at mitigating vertical



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(downwashing) winds. In regions where both horizontal and vertical flows are resulting in higher than desired wind speeds, it is important to have a combination of both vertical and horizontal features.

- Lower wind speeds can be achieved throughout the area to the north of the 1040 Somerset Street building (Locations 31 through 34) with the addition of coniferous or marcescent landscaping (see Image 1 for an example) with dense foliage or porous wind screens of approximately 70 to 80% solid material and at least 2.5 metres high (see Image 2 for an example) within the undercut and along the sidewalk. Additional benefit can be achieved by implementing a canopy extending at least 2.5 metres from the building façade (see Image 3 for an example) on the north side of the 1040 Somerset Street building that wraps around the northwest and northeast building corners. These features will also help reduce the wind speeds at the entrances marked by Locations 29 and 33.
- Lower wind speeds can be achieved along the sidewalk of Breezehill Avenue North (around Location 2) by implementing tall coniferous or marcescent landscaping with dense foliage around the south corner of the 1040 Somerset building and on the sidewalks along Breezehill Avenue North.
- Appropriate wind speeds comfortable for sitting or standing can be achieved at the entrance marked by Location 7 on the 1050 Somerset Street building by implementing landscaping (coniferous or marcescent) or a wind screen (of similar characteristics as those described above) along the building façade to the west of this entrance.
- Lower wind speeds at the entrances of the 1040 Somerset Street building marked by Locations 27 and 29 can be achieved by incorporating landscaping (coniferous or marcescent) with dense foliage or wind screens (of similar characteristics as those previously described) along the west façade of the 1040 Somerset building, around these entrances and along the adjacent sidewalk.



Image 1 – Example of Marcescent Landscaping

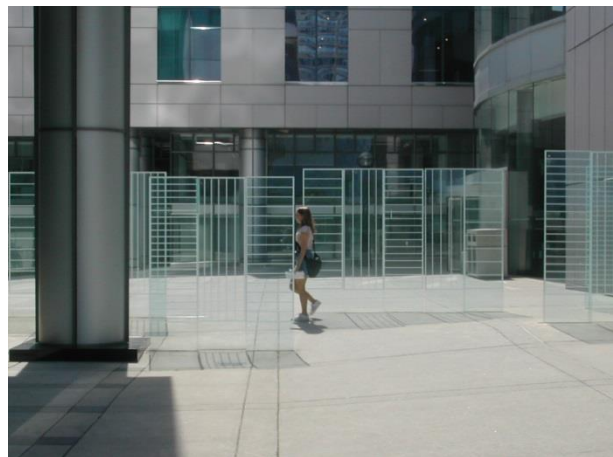


Image 2 – Example of a Wind Screen



Image 3 – Example of a Canopy Around a Building Corner

3.2 Terraces on 1040 & 1050 Somerset (Locations 69 through 86)

Generally, it is desirable that areas above grade be comfortable for sitting or standing in the summer. In the winter and shoulder seasons, access to outdoor podiums and terraces are often restricted and the wind conditions on these levels are of less importance. The following points summarize the wind conditions above grade:

- Overall, the wind comfort conditions above grade are anticipated to be comfortable in the summer (see Figures 4b and 4c), with a few marginal exceptions as described below.
- Locations 70 and 74 on the 1040 Somerset Street building podium are anticipated to have higher than desired wind speeds during the summer (see Figures 4b and 4c).
- Location 76 on the 5th floor terrace of the 1050 Somerset Street building is expected to have wind speeds comfortable for strolling. On the rooftop terrace, Locations 84 and 85 are anticipated to exceed the comfort criterion for outdoor amenity areas (see Figure 4c).
- In the Proposed Configuration, one safety exceedance is anticipated on the podium level of the 1040 Somerset Street building at Location 71 (see Figure 7b). In the Future Configuration, the safety conditions at Location 71 is removed but Location 84 on the rooftop terrace of the 1050 Somerset Street building is anticipated to exceed the safety criterion (see Figure 7c). Access to these two areas should be strictly prohibited in the winter months.

The following strategies can be employed to reduce the wind speeds in the areas mentioned above. It is worth mentioning that these features will help reduce the wind speeds in these areas throughout all the seasons, in the event these levels are accessible for a portion of the spring and fall.



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- Reduced wind speeds can be achieved at Location 70 and the surrounding vicinity by implementing a porous screen or landscaping with dense foliage to the west of this area. A standalone wind screen of approximately 70 to 80% solid material, at least 2.5 metres high will achieve localized wind reducing benefits, while a porous parapet of similar characteristics (see Image 4) along the west perimeter of this level will have a larger area of impact.
- Improved comfort can be achieved at Location 74 by reducing the speeds of winds approaching from the north-northwest and southwest. Implementing porous parapets, wind screens (with similar characteristics as those previously described) or landscaping with dense foliage to the southwest of Location 74 and/or at the southeast corner of the tower will help reduce the wind speeds in this region.
- On the 1050 Somerset Street building, reduced wind speeds can be achieved around Location 76 on the 5th floor terrace by including wind screens and/or landscaping with dense foliage to the west and across this level. Alternatively, the implementation of a canopy (extending at least 2.5 metres from the building façade) around the northeast corner of the tower in the vicinity of Location 76 will help redirect downwashing winds from this area. On the rooftop terrace, reduced wind speeds can be achieved by surrounding the perimeter with porous parapets (of similar characteristics as those previously described).



Image 4 – Example of a Porous Parapet around a Terrace

3.3 Future O-Train Station (Locations 37 through 39)

The future O-Train station, marked by Locations 37 through 39 in Figures 3a through 7c, is anticipated to be comfortable for sitting to strolling depending on the season and configuration, and meets the recommended comfort criteria for the area. No safety exceedances or uncomfortable wind conditions are expected in the region.

In general, the introduction of the proposed 1040 and 1050 Somerset Street buildings are predicted to result in slightly higher wind speeds, but remain within the appropriate comfort category range for this area.



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3.4 Devonshire Public School (Locations 58 through 65)

The school yard/play ground to the south of the 1050 Somerset Street building is anticipated to range from being comfortable for sitting to comfortable for strolling, depending on the configuration and season. While the addition of the proposed developments are anticipated to result in slightly higher wind speeds in the school yard/playground, these wind speeds are considered appropriate for the intended use of this area. There are no uncomfortable conditions or safety exceedances anticipated in this area.

4. APPLICABILITY OF RESULTS

The results presented in this report pertain to the models of the proposed 1040 and 1050 Somerset Street developments constructed using the architectural design drawings and information listed in Appendix A. Should there be any design changes that deviate 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 CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	37	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	11	Standing	55	Pass
	Future	14	Standing	12	Standing	13	Standing	14	Standing	54	Pass
2	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	42	Pass
	Proposed	18	Walking	14	Standing	15	Strolling	17	Strolling	65	Pass
	Future	21	Uncomfortable	16	Strolling	18	Walking	20	Walking	71	Pass
3	Existing	10	Sitting	7	Sitting	8	Sitting	9	Sitting	37	Pass
	Proposed	17	Strolling	12	Standing	14	Standing	15	Strolling	66	Pass
	Future	18	Walking	13	Standing	15	Strolling	17	Strolling	64	Pass
4	Existing	11	Standing	9	Sitting	10	Sitting	10	Sitting	41	Pass
	Proposed	18	Walking	13	Standing	15	Strolling	17	Strolling	65	Pass
	Future	20	Walking	15	Strolling	17	Strolling	19	Walking	71	Pass
5	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	48	Pass
	Proposed	16	Strolling	13	Standing	14	Standing	15	Strolling	62	Pass
	Future	17	Strolling	13	Standing	15	Strolling	16	Strolling	67	Pass
6	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	48	Pass
	Proposed	13	Standing	9	Sitting	11	Standing	12	Standing	52	Pass
	Future	16	Strolling	12	Standing	14	Standing	16	Strolling	64	Pass

<p>Seasons Spring = March to May Summer = June to August Fall = September to November Winter = December to February Annual = January to December</p>	<p>Hours 6:00 to 23:00 6:00 to 23:00 6:00 to 23:00 6:00 to 23:00 0:00 to 23:00 (for Safety)</p>	<p>Wind Comfort Category (20% Seasonal Exceedance)</p> <p>≤ 10 km/h Sitting 11 to 14 Standing 15 to 17 Strolling 18 to 20 Walking > 20 km/h Uncomfortable</p>	<p>Wind Safety Category (0.1% Annual Exceedance)</p> <p>≤ 90 km/h Pass > 90 km/h Exceeded</p>
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TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
7	Existing				Data Not Available						
	Proposed				Data Not Available						
	Future	14	Standing	12	Standing	13	Standing	15	Strolling	61	Pass
8	Existing				Data Not Available						
	Proposed				Data Not Available						
	Future	11	Standing	9	Sitting	10	Sitting	12	Standing	48	Pass
9	Existing				Data Not Available						
	Proposed				Data Not Available						
	Future	13	Standing	11	Standing	12	Standing	14	Standing	57	Pass
10	Existing	11	Standing	9	Sitting	10	Sitting	12	Standing	53	Pass
	Proposed	12	Standing	9	Sitting	10	Sitting	12	Standing	48	Pass
	Future	14	Standing	12	Standing	13	Standing	14	Standing	58	Pass
11	Existing				Data Not Available						
	Proposed				Data Not Available						
	Future	11	Standing	9	Sitting	10	Sitting	11	Standing	45	Pass
12	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	49	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	12	Standing	48	Pass
	Future	15	Strolling	12	Standing	13	Standing	14	Standing	58	Pass
13	Existing	13	Standing	10	Sitting	11	Standing	12	Standing	51	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category	
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)	
Summer = June to August	6:00 to 23:00			
Fall = September to November	6:00 to 23:00			
Winter = December to February	6:00 to 23:00			
Annual = January to December	0:00 to 23:00 (for Safety)			
		≤ 10 km/h	Sitting	
		11 to 14	Standing	
		15 to 17	Strolling	
		18 to 20	Walking	
		> 20 km/h	Uncomfortable	
			≤ 90 km/h	Pass
			> 90 km/h	Exceeded

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
	Proposed	13	Standing	10	Sitting	12	Standing	13	Standing	52	Pass
	Future	16	Strolling	13	Standing	14	Standing	15	Strolling	63	Pass
14	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	54	Pass
	Proposed	13	Standing	10	Sitting	12	Standing	13	Standing	52	Pass
	Future	13	Standing	10	Sitting	11	Standing	12	Standing	50	Pass
15	Existing	10	Sitting	9	Sitting	9	Sitting	11	Standing	50	Pass
	Proposed	12	Standing	9	Sitting	10	Sitting	12	Standing	51	Pass
	Future	14	Standing	11	Standing	13	Standing	14	Standing	54	Pass
16	Existing	8	Sitting	6	Sitting	7	Sitting	8	Sitting	32	Pass
	Proposed	9	Sitting	7	Sitting	8	Sitting	9	Sitting	35	Pass
	Future	16	Strolling	13	Standing	14	Standing	16	Strolling	66	Pass
17	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	51	Pass
	Proposed	14	Standing	11	Standing	12	Standing	13	Standing	54	Pass
	Future	18	Walking	14	Standing	16	Strolling	18	Walking	71	Pass
18	Existing				Data Not Available						
	Proposed				Data Not Available						
	Future	17	Strolling	13	Standing	15	Strolling	16	Strolling	67	Pass
19	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	40	Pass
	Proposed	13	Standing	10	Sitting	11	Standing	13	Standing	53	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Summer = June to August	6:00 to 23:00		
Fall = September to November	6:00 to 23:00		
Winter = December to February	6:00 to 23:00		
Annual = January to December	0:00 to 23:00 (for Safety)		
		≤ 10 km/h	≤ 90 km/h
		11 to 14	> 90 km/h
		15 to 17	
		18 to 20	
		> 20 km/h	
		Sitting	Pass
		Standing	Exceeded
		Strolling	
		Walking	
		Uncomfortable	

TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)		
		Spring		Summer		Fall		Winter		Annual		
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	
20	Future	11	Standing	9	Sitting	10	Sitting	11	Standing	46	Pass	
	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	43	Pass	
	Proposed	14	Standing	10	Sitting	12	Standing	13	Standing	53	Pass	
	Future	13	Standing	11	Standing	12	Standing	13	Standing	54	Pass	
21	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	45	Pass	
	Proposed	16	Strolling	12	Standing	14	Standing	15	Strolling	63	Pass	
	Future	16	Strolling	13	Standing	15	Strolling	16	Strolling	65	Pass	
22	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	44	Pass	
	Proposed	18	Walking	14	Standing	15	Strolling	18	Walking	72	Pass	
	Future	19	Walking	15	Strolling	17	Strolling	18	Walking	69	Pass	
23	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	49	Pass	
	Proposed	19	Walking	15	Strolling	16	Strolling	19	Walking	76	Pass	
	Future	18	Walking	14	Standing	16	Strolling	19	Walking	75	Pass	
24	Existing				Data Not Available							
	Proposed	15	Strolling	12	Standing	13	Standing	15	Strolling	62	Pass	
	Future	18	Walking	14	Standing	16	Strolling	18	Walking	66	Pass	
25	Existing	11	Standing	10	Sitting	10	Sitting	11	Standing	47	Pass	
	Proposed	16	Strolling	12	Standing	14	Standing	15	Strolling	59	Pass	
	Future	20	Walking	16	Strolling	17	Strolling	20	Walking	70	Pass	

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
26	Existing										
	Proposed	15	Strolling	12	Standing	13	Standing	15	Strolling	61	Pass
	Future	18	Walking	15	Strolling	16	Strolling	18	Walking	67	Pass
27	Existing										
	Proposed	14	Standing	11	Standing	13	Standing	14	Standing	53	Pass
	Future	17	Strolling	13	Standing	15	Strolling	16	Strolling	61	Pass
28	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	44	Pass
	Proposed	16	Strolling	12	Standing	14	Standing	14	Standing	70	Pass
	Future	18	Walking	14	Standing	15	Strolling	17	Strolling	67	Pass
29	Existing	11	Standing	9	Sitting	9	Sitting	10	Sitting	42	Pass
	Proposed	15	Strolling	13	Standing	14	Standing	15	Strolling	63	Pass
	Future	15	Strolling	12	Standing	13	Standing	14	Standing	60	Pass
30	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	50	Pass
	Proposed	18	Walking	14	Standing	16	Strolling	17	Strolling	69	Pass
	Future	16	Strolling	12	Standing	14	Standing	15	Strolling	61	Pass
31	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	42	Pass
	Proposed	22	Uncomfortable	18	Walking	19	Walking	22	Uncomfortable	89	Pass
	Future	18	Walking	14	Standing	16	Strolling	18	Walking	72	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category	
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)	
Summer = June to August	6:00 to 23:00			
Fall = September to November	6:00 to 23:00			
Winter = December to February	6:00 to 23:00			
Annual = January to December	0:00 to 23:00 (for Safety)			
		≤ 10 km/h	Sitting	
		11 to 14	Standing	
		15 to 17	Strolling	
		18 to 20	Walking	
		> 20 km/h	Uncomfortable	
			≤ 90 km/h	Pass
			> 90 km/h	Exceeded

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
32	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	39	Pass
	Proposed	22	Uncomfortable	17	Strolling	19	Walking	22	Uncomfortable	86	Pass
	Future	18	Walking	14	Standing	16	Strolling	18	Walking	72	Pass
33	Existing	10	Sitting	7	Sitting	8	Sitting	9	Sitting	44	Pass
	Proposed	19	Walking	14	Standing	16	Strolling	18	Walking	70	Pass
	Future	18	Walking	14	Standing	15	Strolling	18	Walking	68	Pass
34	Existing	11	Standing	8	Sitting	10	Sitting	11	Standing	49	Pass
	Proposed	20	Walking	15	Strolling	17	Strolling	21	Uncomfortable	78	Pass
	Future	20	Walking	15	Strolling	17	Strolling	20	Walking	75	Pass
35	Existing	12	Standing	9	Sitting	11	Standing	12	Standing	49	Pass
	Proposed	20	Walking	16	Strolling	18	Walking	20	Walking	82	Pass
	Future	17	Strolling	13	Standing	15	Strolling	18	Walking	71	Pass
36	Existing	15	Strolling	12	Standing	14	Standing	16	Strolling	61	Pass
	Proposed	19	Walking	15	Strolling	17	Strolling	20	Walking	75	Pass
	Future	18	Walking	14	Standing	15	Strolling	18	Walking	70	Pass
37	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	49	Pass
	Proposed	15	Strolling	13	Standing	15	Strolling	16	Strolling	65	Pass
	Future	15	Strolling	13	Standing	14	Standing	15	Strolling	64	Pass
38	Existing	14	Standing	11	Standing	13	Standing	14	Standing	54	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
	Proposed	17	Strolling	14	Standing	16	Strolling	17	Strolling	70	Pass
	Future	17	Strolling	14	Standing	15	Strolling	17	Strolling	68	Pass
39	Existing	13	Standing	11	Standing	12	Standing	13	Standing	52	Pass
	Proposed	15	Strolling	13	Standing	14	Standing	15	Strolling	65	Pass
	Future	15	Strolling	13	Standing	14	Standing	15	Strolling	63	Pass
40	Existing	15	Strolling	12	Standing	13	Standing	15	Strolling	60	Pass
	Proposed	18	Walking	15	Strolling	17	Strolling	19	Walking	71	Pass
	Future	17	Strolling	13	Standing	15	Strolling	18	Walking	67	Pass
41	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	44	Pass
	Proposed	16	Strolling	13	Standing	15	Strolling	16	Strolling	60	Pass
	Future	16	Strolling	13	Standing	14	Standing	15	Strolling	59	Pass
42	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	46	Pass
	Proposed	14	Standing	11	Standing	13	Standing	14	Standing	59	Pass
	Future	14	Standing	11	Standing	12	Standing	14	Standing	57	Pass
43	Existing	13	Standing	10	Sitting	11	Standing	12	Standing	52	Pass
	Proposed	15	Strolling	12	Standing	13	Standing	14	Standing	60	Pass
	Future	13	Standing	10	Sitting	11	Standing	13	Standing	53	Pass
44	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	42	Pass
	Proposed	10	Sitting	8	Sitting	9	Sitting	10	Sitting	44	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
45	Future	14	Standing	11	Standing	12	Standing	14	Standing	64	Pass
	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	48	Pass
	Proposed	12	Standing	9	Sitting	10	Sitting	11	Standing	49	Pass
46	Future	12	Standing	10	Sitting	11	Standing	12	Standing	51	Pass
	Existing	13	Standing	11	Standing	12	Standing	13	Standing	60	Pass
	Proposed	14	Standing	11	Standing	12	Standing	14	Standing	59	Pass
47	Future	14	Standing	11	Standing	13	Standing	13	Standing	59	Pass
	Existing	14	Standing	11	Standing	13	Standing	14	Standing	60	Pass
	Proposed	15	Strolling	11	Standing	13	Standing	14	Standing	61	Pass
48	Future	15	Strolling	12	Standing	13	Standing	15	Strolling	62	Pass
	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	53	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	12	Standing	52	Pass
49	Future	12	Standing	9	Sitting	10	Sitting	12	Standing	51	Pass
	Existing	13	Standing	10	Sitting	12	Standing	14	Standing	59	Pass
	Proposed	13	Standing	10	Sitting	11	Standing	13	Standing	59	Pass
50	Future	12	Standing	10	Sitting	11	Standing	12	Standing	52	Pass
	Existing	12	Standing	9	Sitting	10	Sitting	11	Standing	45	Pass
	Proposed	13	Standing	10	Sitting	12	Standing	13	Standing	51	Pass
	Future	16	Strolling	13	Standing	14	Standing	16	Strolling	59	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Summer = June to August	6:00 to 23:00		
Fall = September to November	6:00 to 23:00		
Winter = December to February	6:00 to 23:00		
Annual = January to December	0:00 to 23:00 (for Safety)		
		≤ 10 km/h	≤ 90 km/h
		11 to 14	> 90 km/h
		15 to 17	
		18 to 20	
		> 20 km/h	
		Sitting	Pass
		Standing	Exceeded
		Strolling	
		Walking	
		Uncomfortable	



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
51	Existing	12	Standing	9	Sitting	10	Sitting	12	Standing	47	Pass
	Proposed	13	Standing	10	Sitting	11	Standing	12	Standing	51	Pass
	Future	16	Strolling	13	Standing	14	Standing	15	Strolling	64	Pass
52	Existing	19	Walking	16	Strolling	17	Strolling	19	Walking	73	Pass
	Proposed	19	Walking	15	Strolling	17	Strolling	19	Walking	74	Pass
	Future	19	Walking	15	Strolling	17	Strolling	19	Walking	75	Pass
53	Existing	13	Standing	10	Sitting	11	Standing	13	Standing	54	Pass
	Proposed	14	Standing	11	Standing	12	Standing	14	Standing	57	Pass
	Future	18	Walking	14	Standing	16	Strolling	17	Strolling	69	Pass
54	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	46	Pass
	Proposed	13	Standing	10	Sitting	11	Standing	12	Standing	49	Pass
	Future	14	Standing	11	Standing	12	Standing	14	Standing	63	Pass
55	Existing	13	Standing	11	Standing	12	Standing	13	Standing	53	Pass
	Proposed	14	Standing	11	Standing	12	Standing	13	Standing	53	Pass
	Future	15	Strolling	12	Standing	13	Standing	15	Strolling	60	Pass
56	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	44	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	10	Sitting	42	Pass
	Future	11	Standing	9	Sitting	10	Sitting	12	Standing	51	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
57	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	42	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	11	Standing	46	Pass
	Future	13	Standing	10	Sitting	11	Standing	13	Standing	57	Pass
58	Existing	10	Sitting	8	Sitting	8	Sitting	9	Sitting	37	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	11	Standing	48	Pass
	Future	16	Strolling	12	Standing	14	Standing	15	Strolling	63	Pass
59	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	42	Pass
	Proposed	14	Standing	11	Standing	12	Standing	14	Standing	56	Pass
	Future	14	Standing	11	Standing	12	Standing	13	Standing	53	Pass
60	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	46	Pass
	Proposed	16	Strolling	12	Standing	13	Standing	15	Strolling	62	Pass
	Future	14	Standing	12	Standing	13	Standing	14	Standing	58	Pass
61	Existing	11	Standing	8	Sitting	9	Sitting	11	Standing	42	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	12	Standing	49	Pass
	Future	13	Standing	11	Standing	12	Standing	13	Standing	54	Pass
62	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	46	Pass
	Proposed	15	Strolling	12	Standing	13	Standing	15	Strolling	60	Pass
	Future	14	Standing	11	Standing	12	Standing	14	Standing	56	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
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Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)		
		Spring		Summer		Fall		Winter		Annual		
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	
63	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	45	Pass	
	Proposed	14	Standing	11	Standing	12	Standing	13	Standing	56	Pass	
	Future	13	Standing	10	Sitting	11	Standing	13	Standing	56	Pass	
64	Existing	12	Standing	9	Sitting	10	Sitting	11	Standing	47	Pass	
	Proposed	13	Standing	10	Sitting	11	Standing	13	Standing	52	Pass	
	Future	13	Standing	10	Sitting	11	Standing	13	Standing	53	Pass	
65	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	39	Pass	
	Proposed	10	Sitting	8	Sitting	9	Sitting	10	Sitting	41	Pass	
	Future	10	Sitting	8	Sitting	9	Sitting	10	Sitting	40	Pass	
66	Existing	13	Standing	11	Standing	12	Standing	13	Standing	53	Pass	
	Proposed	14	Standing	11	Standing	12	Standing	14	Standing	55	Pass	
	Future	14	Standing	11	Standing	12	Standing	14	Standing	58	Pass	
67	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	43	Pass	
	Proposed	14	Standing	11	Standing	13	Standing	14	Standing	62	Pass	
	Future	14	Standing	11	Standing	12	Standing	13	Standing	57	Pass	
68	Existing	12	Standing	10	Sitting	11	Standing	12	Standing	49	Pass	
	Proposed	15	Strolling	12	Standing	13	Standing	15	Strolling	65	Pass	
	Future	15	Strolling	12	Standing	13	Standing	15	Strolling	62	Pass	
69	Existing	Data Not Available										

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
	Proposed	8	Sitting	6	Sitting	7	Sitting	8	Sitting	38	Pass
	Future	8	Sitting	6	Sitting	7	Sitting	7	Sitting	36	Pass
70	Existing				Data Not Available						
	Proposed	21	Uncomfortable	16	Strolling	18	Walking	22	Uncomfortable	84	Pass
	Future	22	Uncomfortable	17	Strolling	19	Walking	22	Uncomfortable	81	Pass
71	Existing				Data Not Available						
	Proposed	18	Walking	14	Standing	16	Strolling	19	Walking	93	Exceeded
	Future	15	Strolling	12	Standing	14	Standing	15	Strolling	77	Pass
72	Existing				Data Not Available						
	Proposed	12	Standing	10	Sitting	11	Standing	12	Standing	56	Pass
	Future	11	Standing	9	Sitting	10	Sitting	11	Standing	49	Pass
73	Existing				Data Not Available						
	Proposed	16	Strolling	12	Standing	14	Standing	16	Strolling	76	Pass
	Future	15	Strolling	11	Standing	13	Standing	15	Strolling	75	Pass
74	Existing				Data Not Available						
	Proposed	20	Walking	15	Strolling	17	Strolling	18	Walking	72	Pass
	Future	18	Walking	14	Standing	16	Strolling	17	Strolling	70	Pass
75	Existing				Data Not Available						
	Proposed				Data Not Available						

Seasons	Hours	Wind Comfort Category	Wind Safety Category		
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)		
Summer = June to August	6:00 to 23:00				
Fall = September to November	6:00 to 23:00				
Winter = December to February	6:00 to 23:00				
Annual = January to December	0:00 to 23:00 (for Safety)				
		≤ 10 km/h	Sitting	≤ 90 km/h	Pass
		11 to 14	Standing	> 90 km/h	Exceeded
		15 to 17	Strolling		
		18 to 20	Walking		
		> 20 km/h	Uncomfortable		

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
76	Future	14	Standing	12	Standing	13	Standing	14	Standing	63	Pass
	Existing Proposed Future	21	Uncomfortable	15	Data Not Available Data Not Available Strolling	17	Strolling	20	Walking	77	Pass
77	Existing Proposed Future	11	Standing	8	Data Not Available Data Not Available Sitting	9	Sitting	11	Standing	48	Pass
	Existing Proposed Future	19	Walking	14	Data Not Available Data Not Available Standing	16	Strolling	19	Walking	73	Pass
79	Existing Proposed Future	16	Strolling	12	Data Not Available Data Not Available Standing	13	Standing	16	Strolling	67	Pass
	Existing Proposed Future	15	Strolling	12	Data Not Available Data Not Available Standing	13	Standing	15	Strolling	66	Pass
81	Existing Proposed Future	16	Strolling	13	Data Not Available Data Not Available Standing	14	Standing	17	Strolling	79	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category	
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)	
Summer = June to August	6:00 to 23:00			
Fall = September to November	6:00 to 23:00			
Winter = December to February	6:00 to 23:00			
Annual = January to December	0:00 to 23:00 (for Safety)			
		≤ 10 km/h	Sitting	
		11 to 14	Standing	
		15 to 17	Strolling	
		18 to 20	Walking	
		> 20 km/h	Uncomfortable	
			≤ 90 km/h	Pass
			> 90 km/h	Exceeded

Configuration
Existing = without the proposed developments
Proposed = with the 1040 Somerset Street development
Future = with the 1040 & 1050 Somerset Street developments



TABLE 1: PEDESTRIAN WIND COMFORT AND SAFETY CONDITIONS

Location	Configuration	Wind Comfort (20% Seasonal Exceedance)								Wind Safety (0.1% Exceedance)	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
82	Existing Proposed Future	14	Standing	11	Data Not Available Data Not Available Standing	12	Standing	14	Standing	64	Pass
83	Existing Proposed Future	18	Walking	14	Data Not Available Data Not Available Standing	15	Strolling	18	Walking	81	Pass
84	Existing Proposed Future	22	Uncomfortable	18	Data Not Available Data Not Available Walking	20	Walking	21	Uncomfortable	94	Exceeded
85	Existing Proposed Future	17	Strolling	15	Data Not Available Data Not Available Strolling	16	Strolling	17	Strolling	73	Pass
86	Existing Proposed Future	16	Strolling	14	Data Not Available Data Not Available Standing	15	Strolling	18	Walking	75	Pass

Seasons	Hours	Wind Comfort Category	Wind Safety Category
Spring = March to May	6:00 to 23:00	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Summer = June to August	6:00 to 23:00		
Fall = September to November	6:00 to 23:00		
Winter = December to February	6:00 to 23:00		
Annual = January to December	0:00 to 23:00 (for Safety)		
		≤ 10 km/h	Sitting
		11 to 14	Standing
		15 to 17	Strolling
		18 to 20	Walking
		> 20 km/h	Uncomfortable
Configuration			≤ 90 km/h Pass
Existing = without the proposed developments			> 90 km/h Exceeded
Proposed = with the 1040 Somerset Street development			
Future = with the 1040 & 1050 Somerset Street developments			

FIGURES



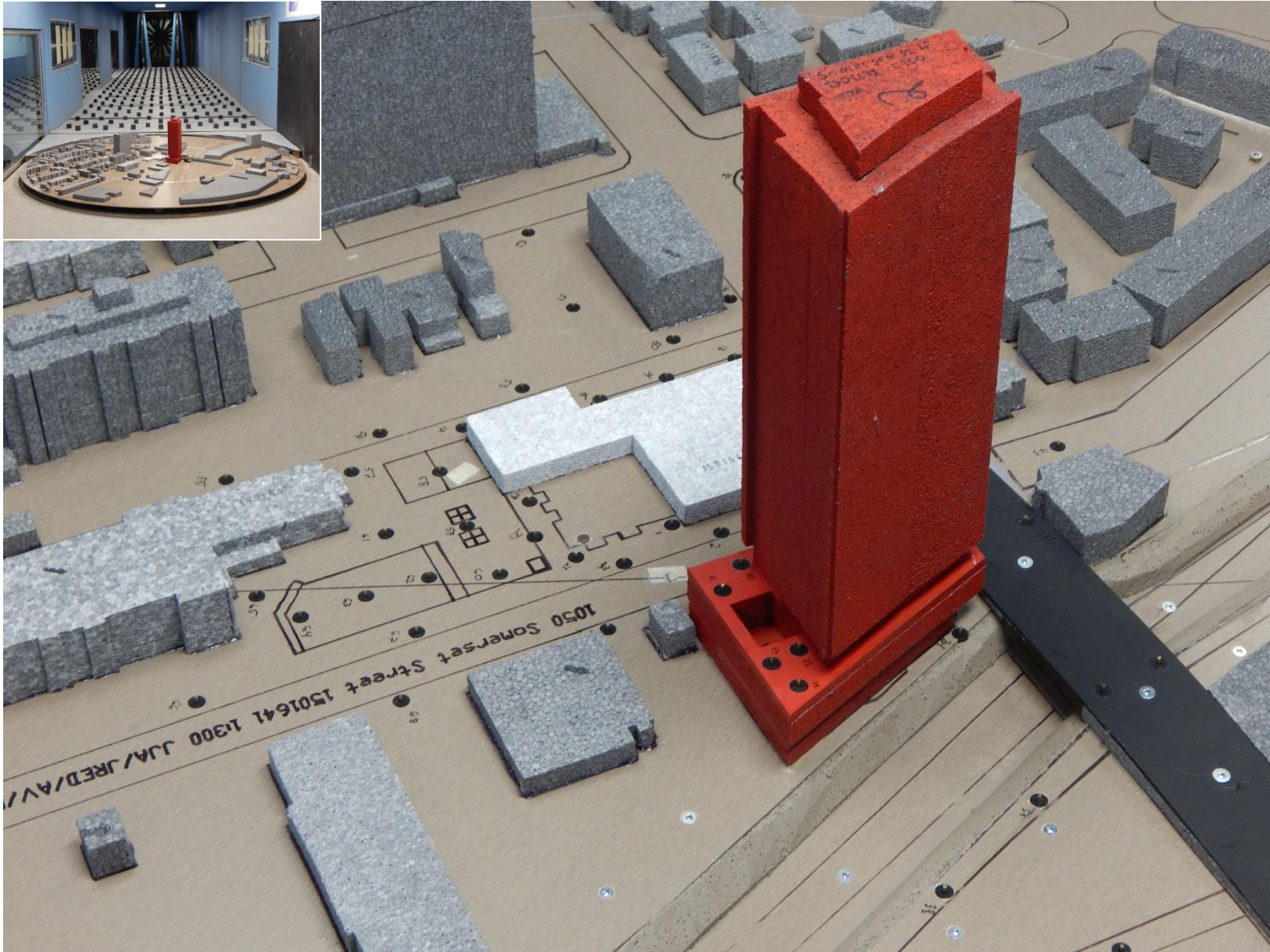
Wind Tunnel Study Model
Existing Configuration

1040 & 1050 Somerset Street – Ottawa, Ontario

Figure No. 1a

Date: May 20, 2015





**Wind Tunnel Study Model
Proposed Configuration**

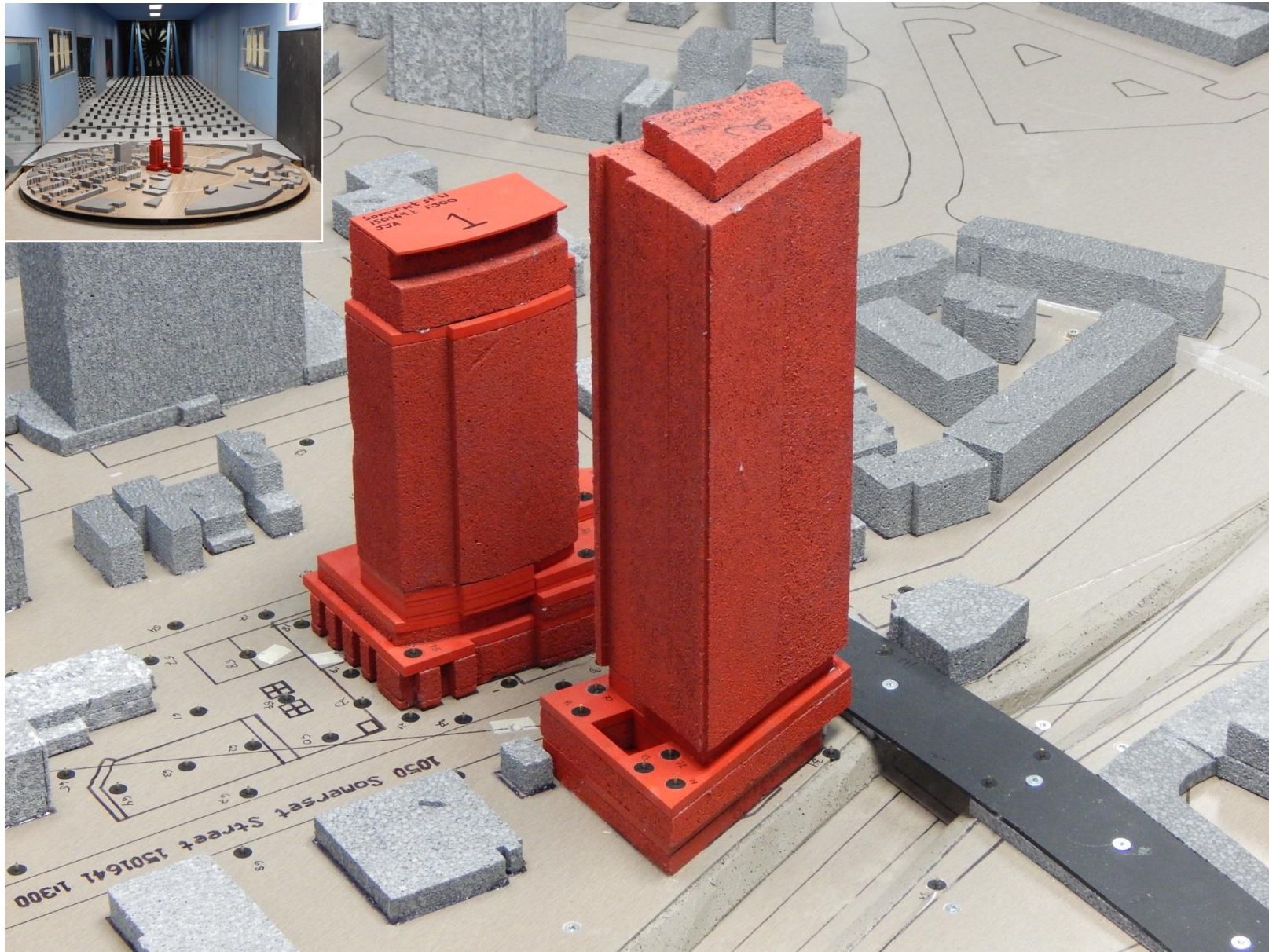
1040 & 1050 Somerset Street – Ottawa, Ontario

Figure No. 1b

Project #11501641

Date: May 20, 2015





**Wind Tunnel Study Model
Future Configuration**

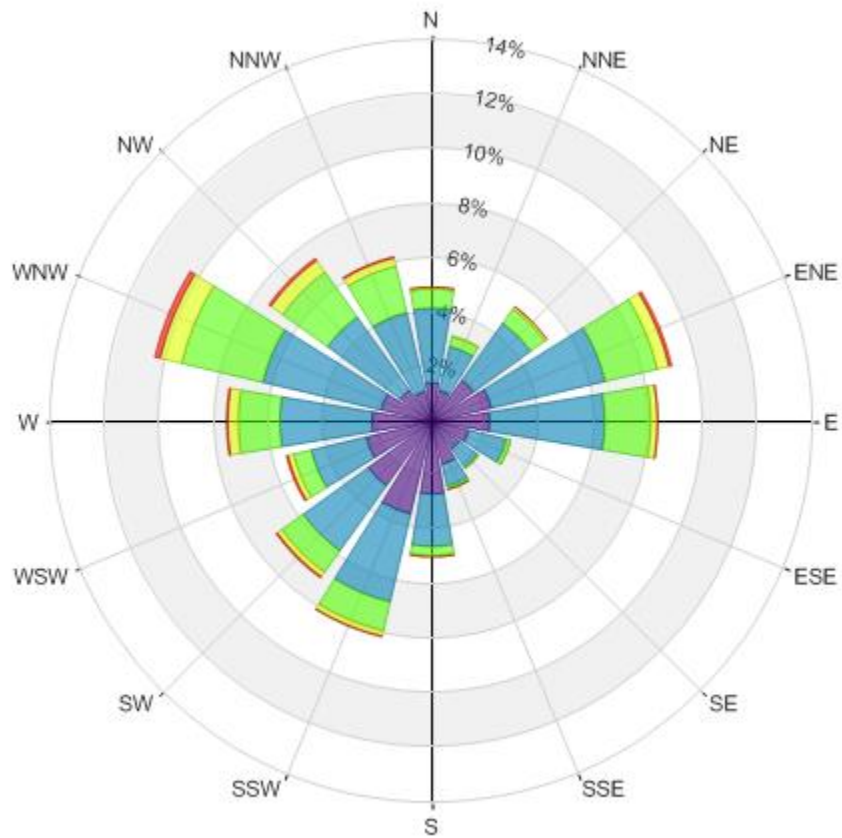
1040 & 1050 Somerset Street – Ottawa, Ontario

Figure No. 1c

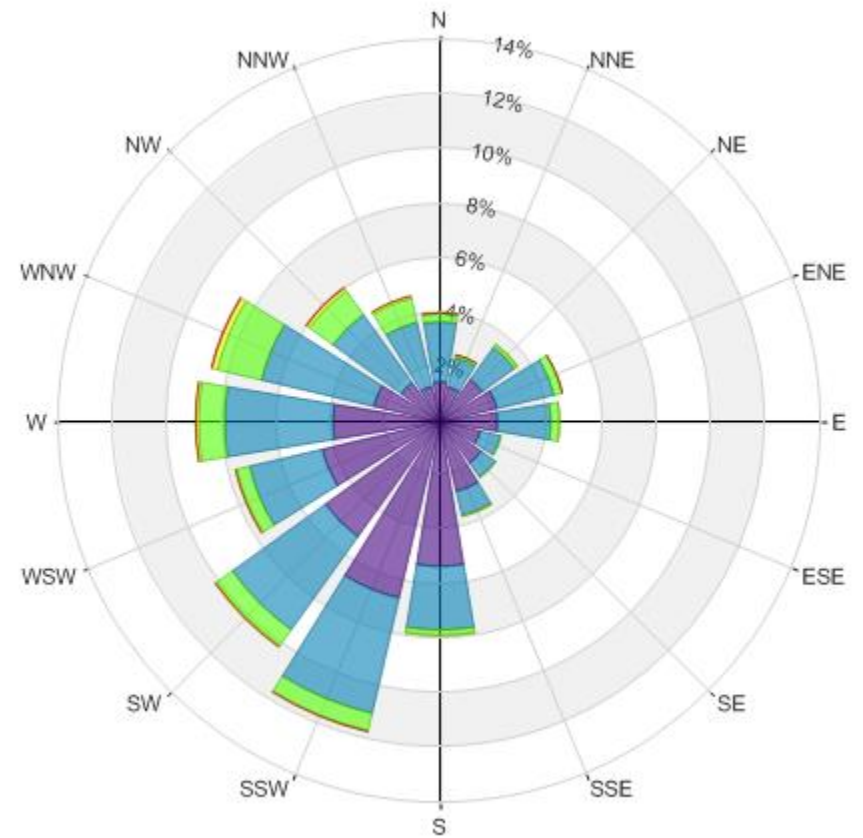
Date: May 13, 2015



Project #11501641



Spring
(March - May)



Summer
(June - August)

Wind Speed (km/h)	Probability (%)	
	Spring	Summer
Calm	4.4	6.7
1-10	31.3	46.0
11-20	42.9	38.6
21-30	17.1	7.9
31-40	3.6	0.7
>40	0.6	0.1

**Directional Distribution (%) of Winds (Blowing From)
Ottawa Macdonald-Cartier International Airport (1980 - 2015)**

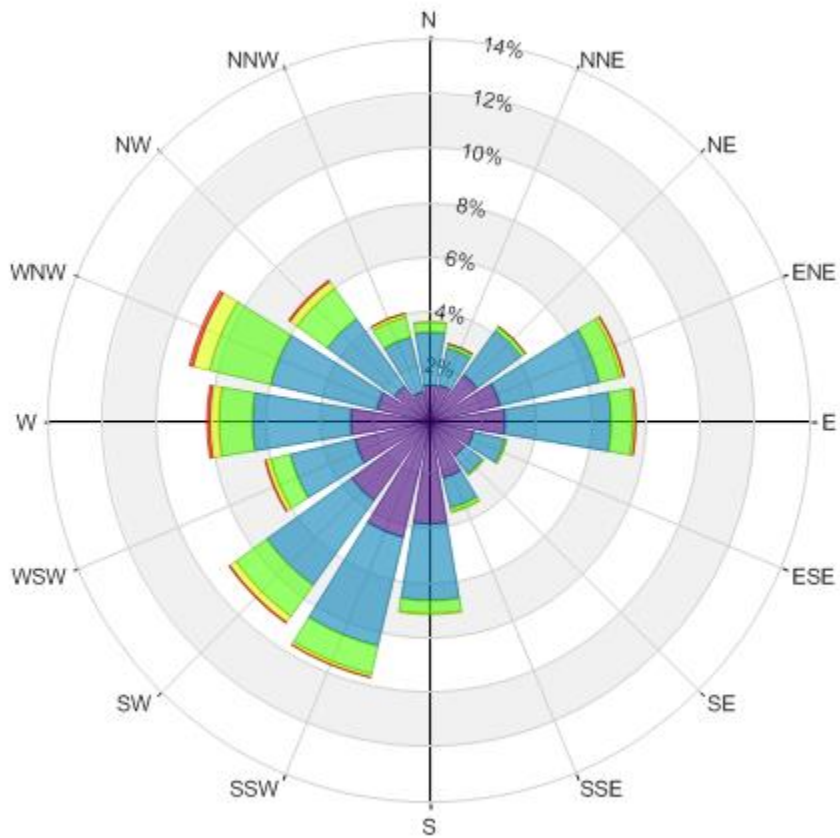
1040 & 1050 Somerset Street – Ottawa, ON

Project #1501641

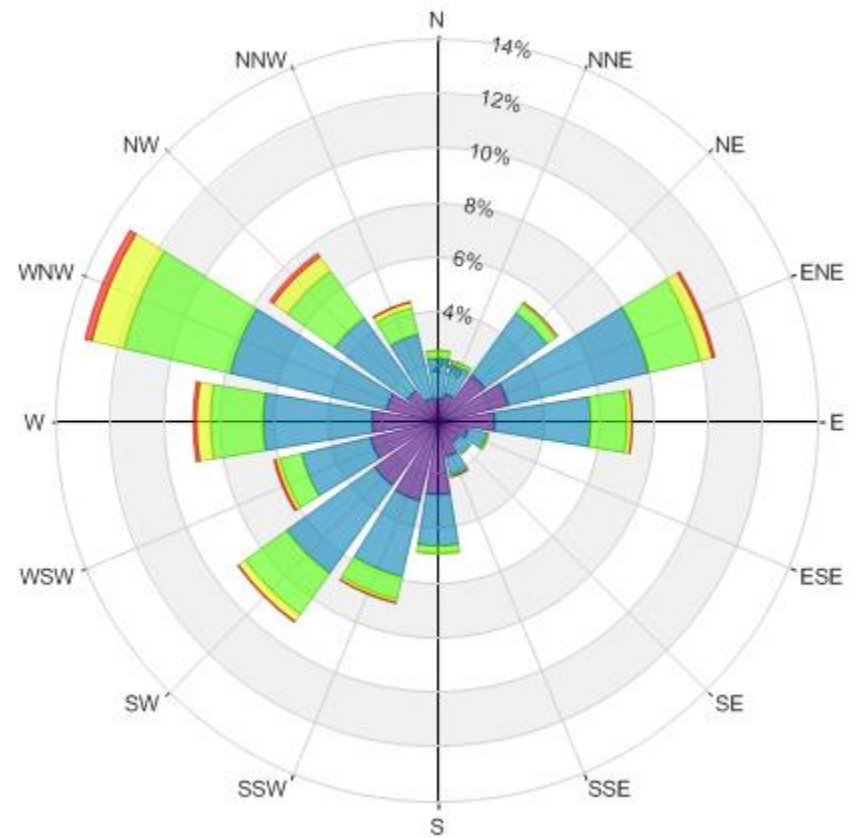
Figure No. 2

Date: May 20, 2015





Fall
(September - November)



Winter
(December - February)

Wind Speed (km/h)	Probability (%)	
	Fall	Winter
Calm	5.7	5.3
1-10	37.7	29.9
11-20	42.0	43.0
21-30	11.9	17.1
31-40	2.3	4.0
>40	0.4	0.8

**Directional Distribution (%) of Winds (Blowing From)
Ottawa Macdonald-Cartier International Airport (1980 - 2015)**

1040 & 1050 Somerset Street – Ottawa, ON

Project #1501641

Figure No. 2

Date: May 20, 2015





Pedestrian Wind Comfort Conditions - Existing
 Spring (March to May, 6:00 to 23:00)

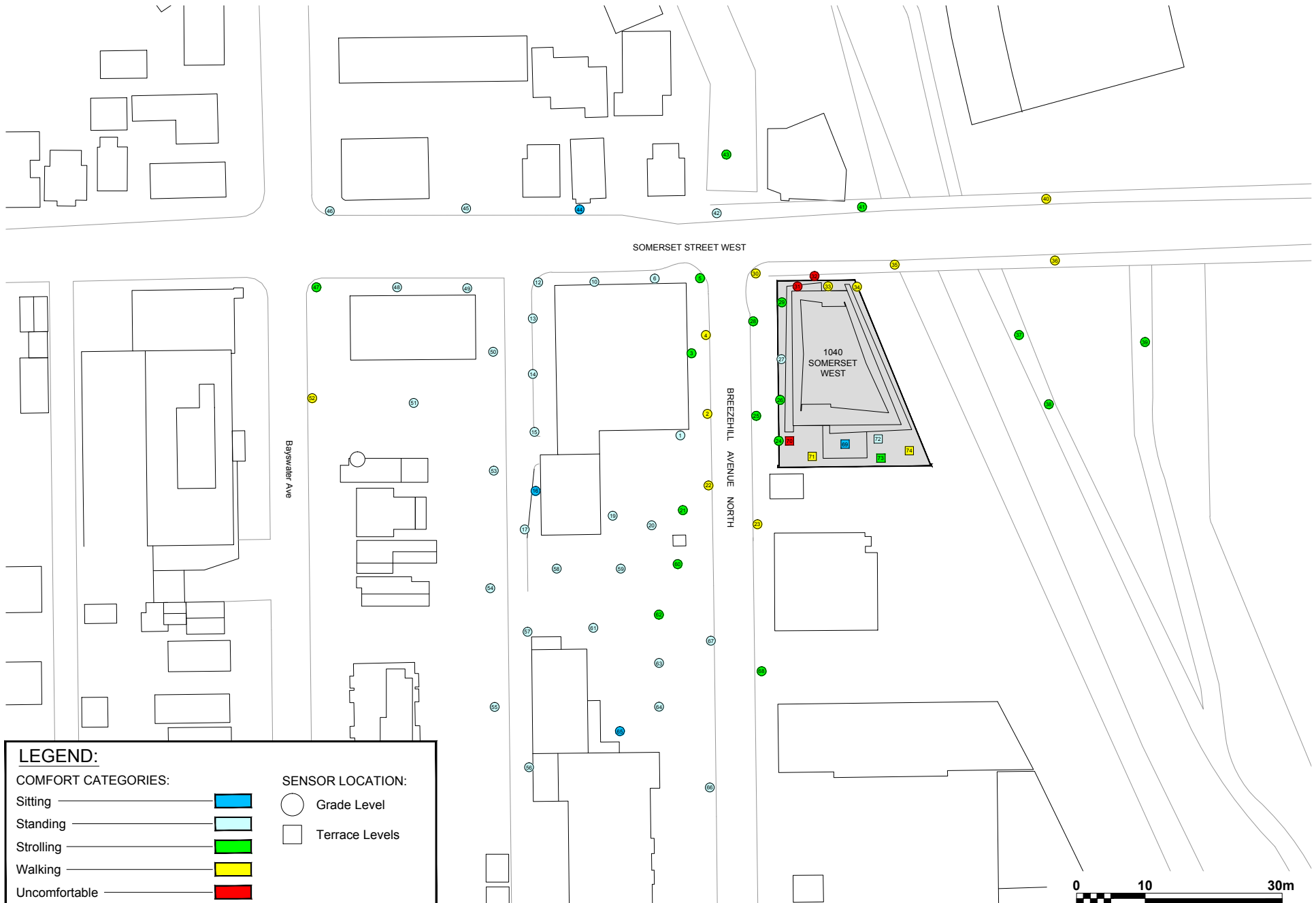
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 3a
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	

Project #1501641





Pedestrian Wind Comfort Conditions - Proposed
 Spring (March to May, 6:00 to 23:00)

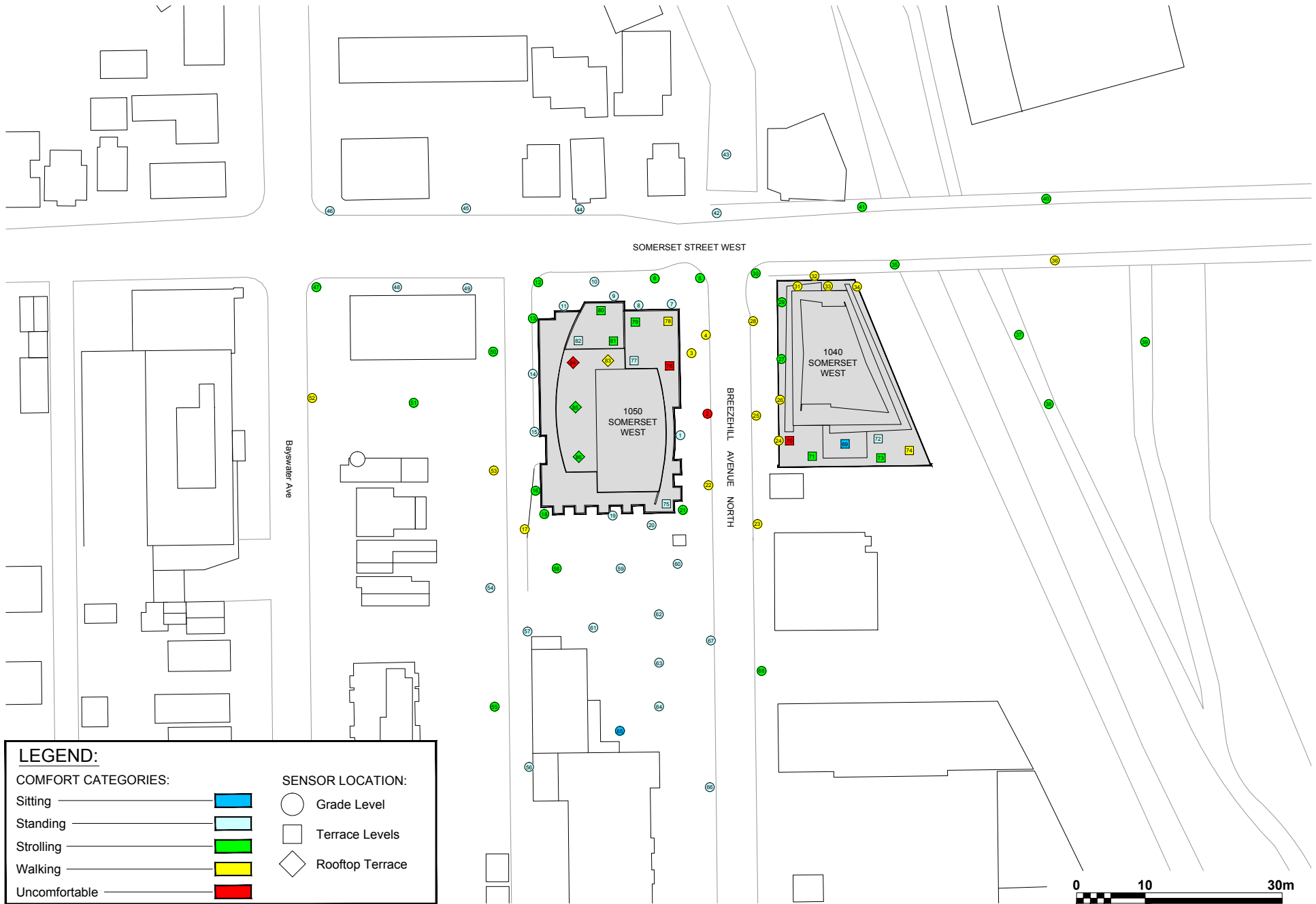
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 3b
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	

Project #1501641





Pedestrian Wind Comfort Conditions - Future
 Spring (March to May, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Project #1501641

Drawn by: ARM Figure: 3C

Approx. Scale: 1:1250

Date Revised: Apr. 9, 2015





Pedestrian Wind Comfort Conditions - Existing
 Summer (June to August, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 4a
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	



Project #1501641



Pedestrian Wind Comfort Conditions - Proposed
 Summer (June to August, 6:00 to 23:00)

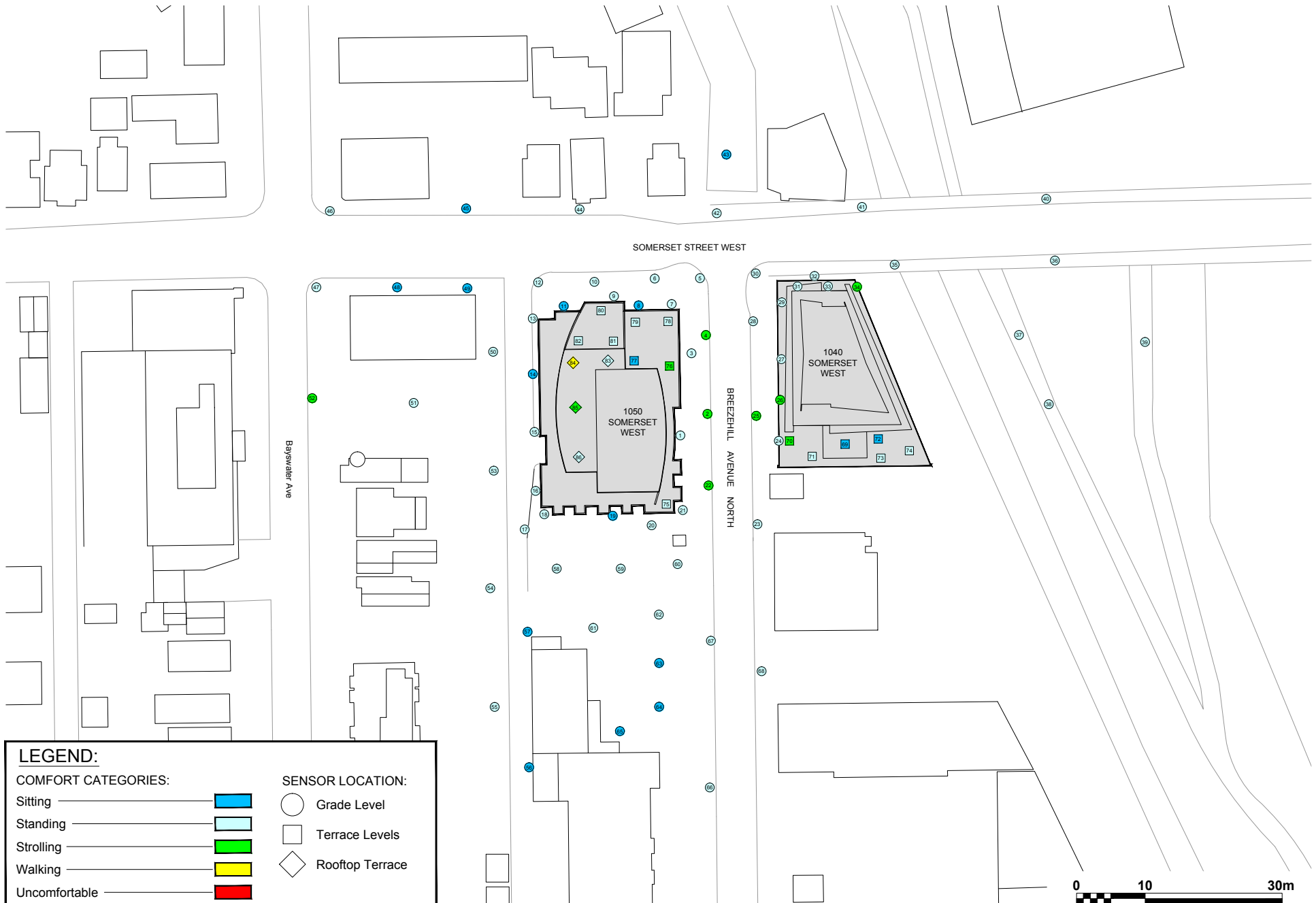
1040 Somerset Street - Ottawa, Ontario



Project #1501641

Drawn by: ARM	Figure: 4b
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	





LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Terrace Levels
- Rooftop Terrace

Pedestrian Wind Comfort Conditions - Future
 Summer (June to August, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM Figure: 4C

Approx. Scale: 1:1250

Date Revised: Apr. 9, 2015

Project #1501641





Pedestrian Wind Comfort Conditions - Existing
 Fall (September to November, 6:00 to 23:00)

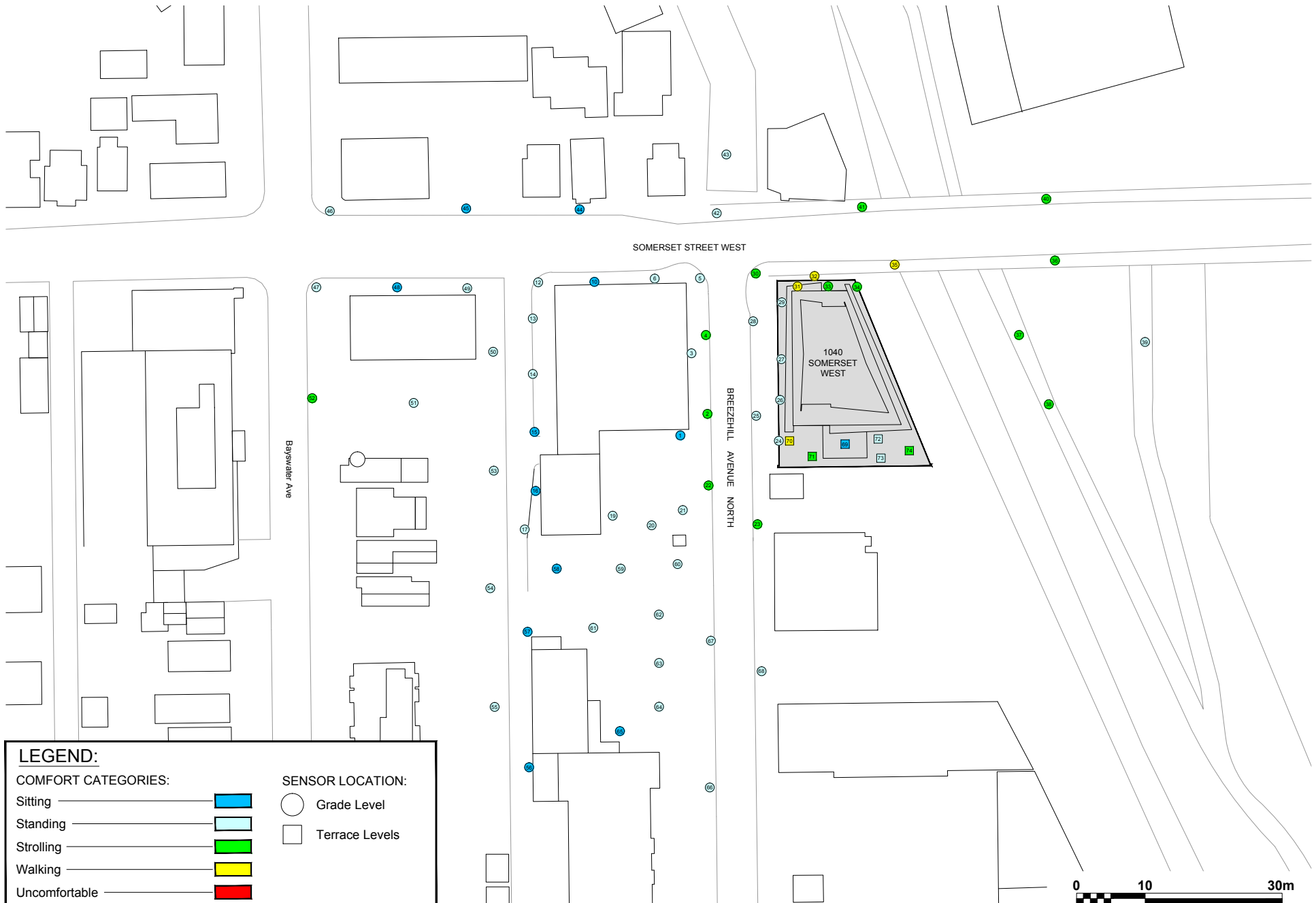
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 5a
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	



Project #1501641



LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Terrace Levels

Pedestrian Wind Comfort Conditions - Proposed
 Fall (September to November, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 5b
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	

Project #1501641





LEGEND:

COMFORT CATEGORIES:		SENSOR LOCATION:	
Sitting			Grade Level
Standing			Terrace Levels
Strolling			Rooftop Terrace
Walking			
Uncomfortable			

Pedestrian Wind Comfort Conditions - Future
 Fall (September to November, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 5C
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	



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LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level

Pedestrian Wind Comfort Conditions - Existing
 Winter (December to February, 6:00 to 23:00)

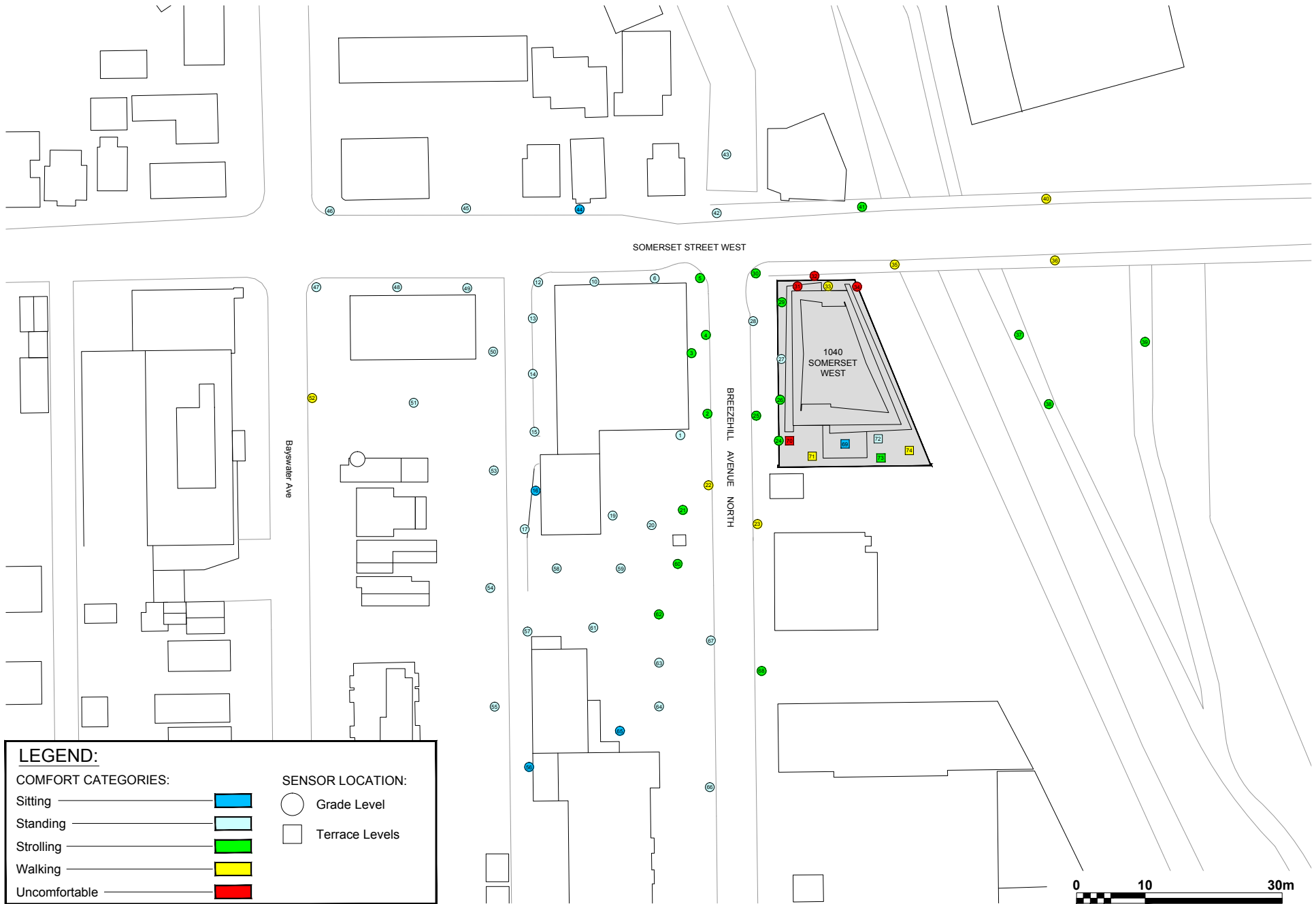
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 6a
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	

Project #1501641





Pedestrian Wind Comfort Conditions - Proposed
 Winter (December to February, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



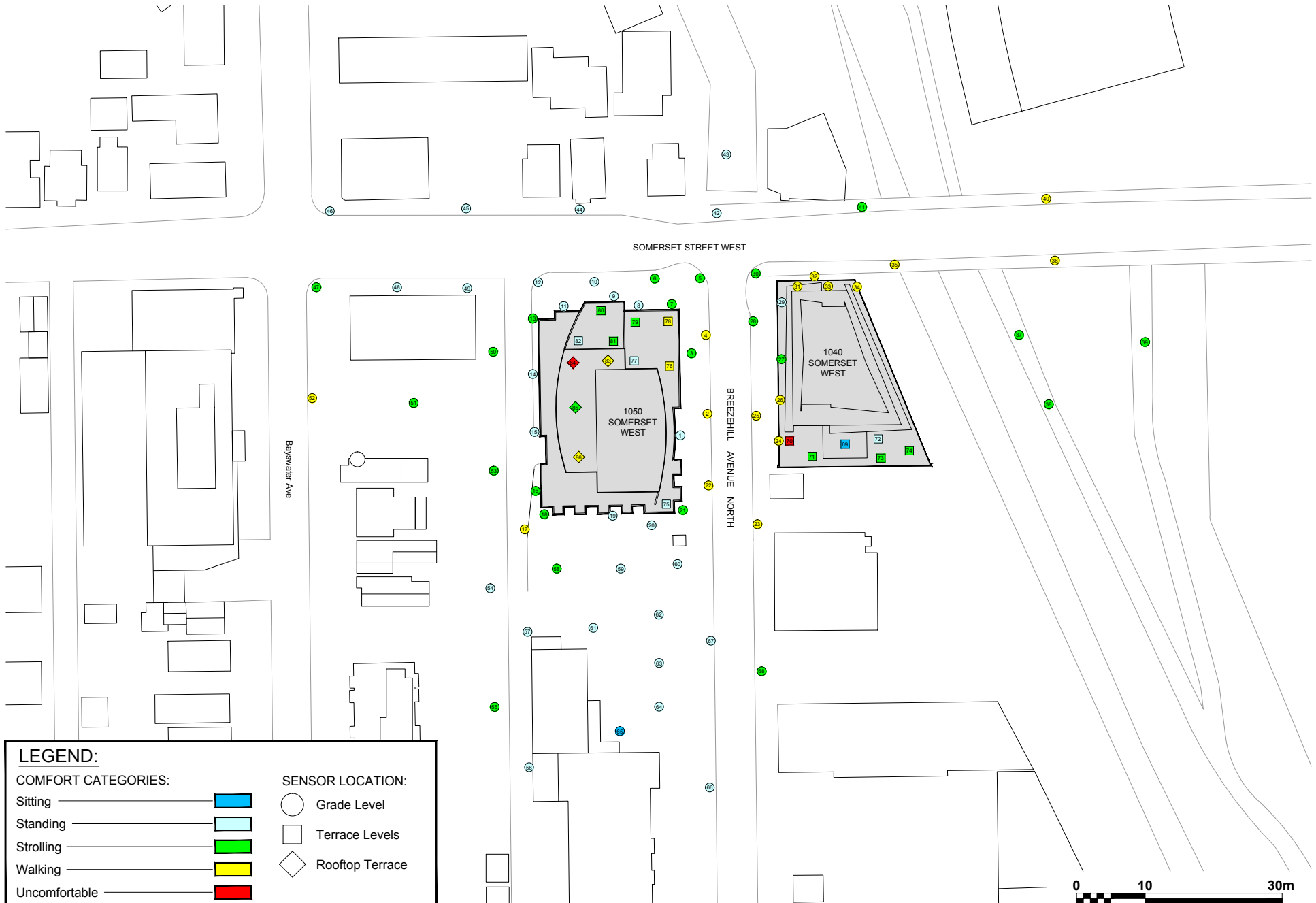
Drawn by: ARM Figure: 6b

Approx. Scale: 1:1250

Date Revised: Apr. 9, 2015

Project #1501641





LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Terrace Levels
- Rooftop Terrace

Pedestrian Wind Comfort Conditions - Future
 Winter (December to February, 6:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



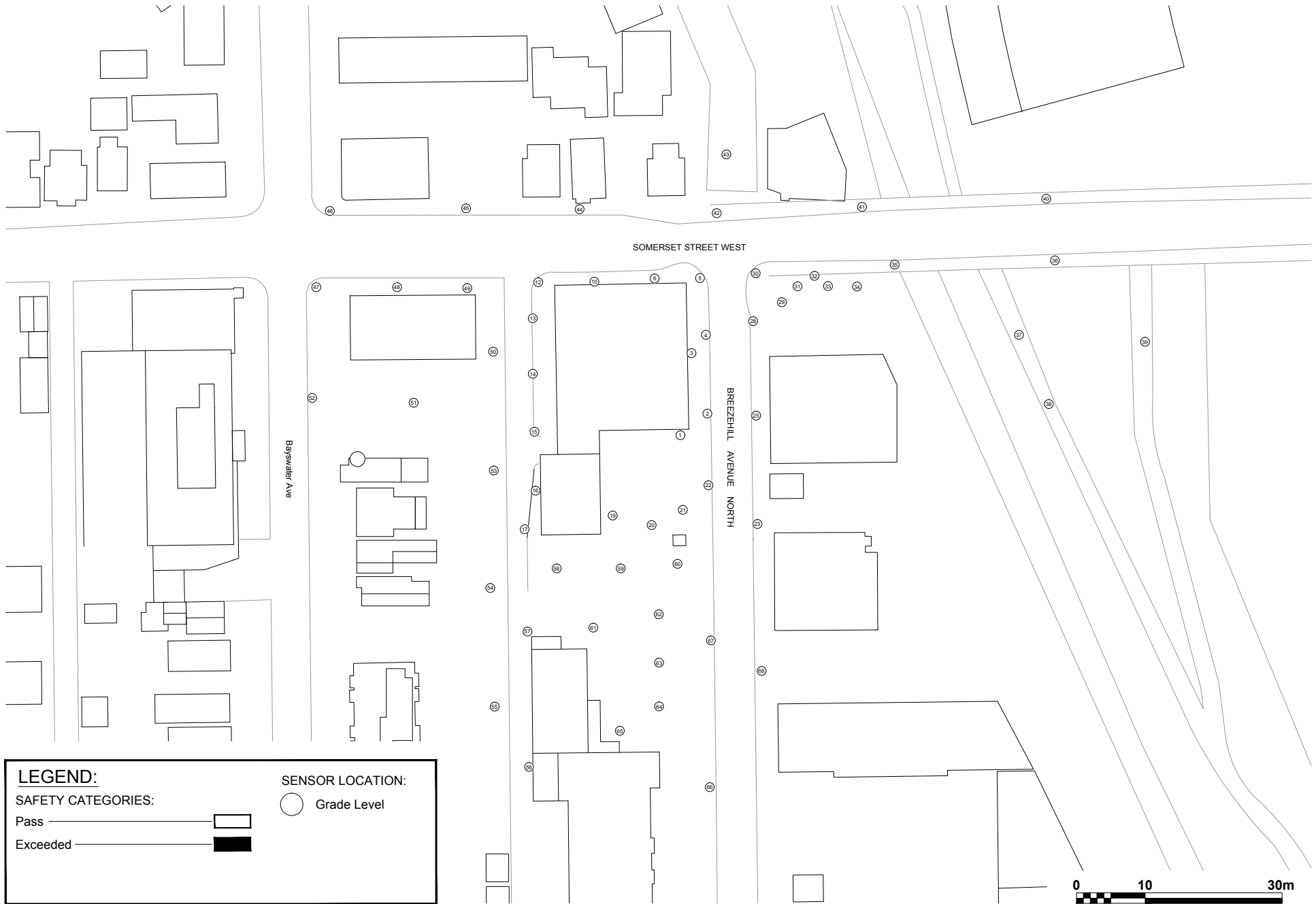
Drawn by: ARM Figure: 6C

Approx. Scale: 1:1250

Date Revised: Apr. 9, 2015


Project #1501641







LEGEND:

SAFETY CATEGORIES:

Pass 

Exceeded 

SENSOR LOCATION:

 Grade Level

Pedestrian Wind Safety Conditions - Existing
 Annual (January to December, 0:00 to 23:00)

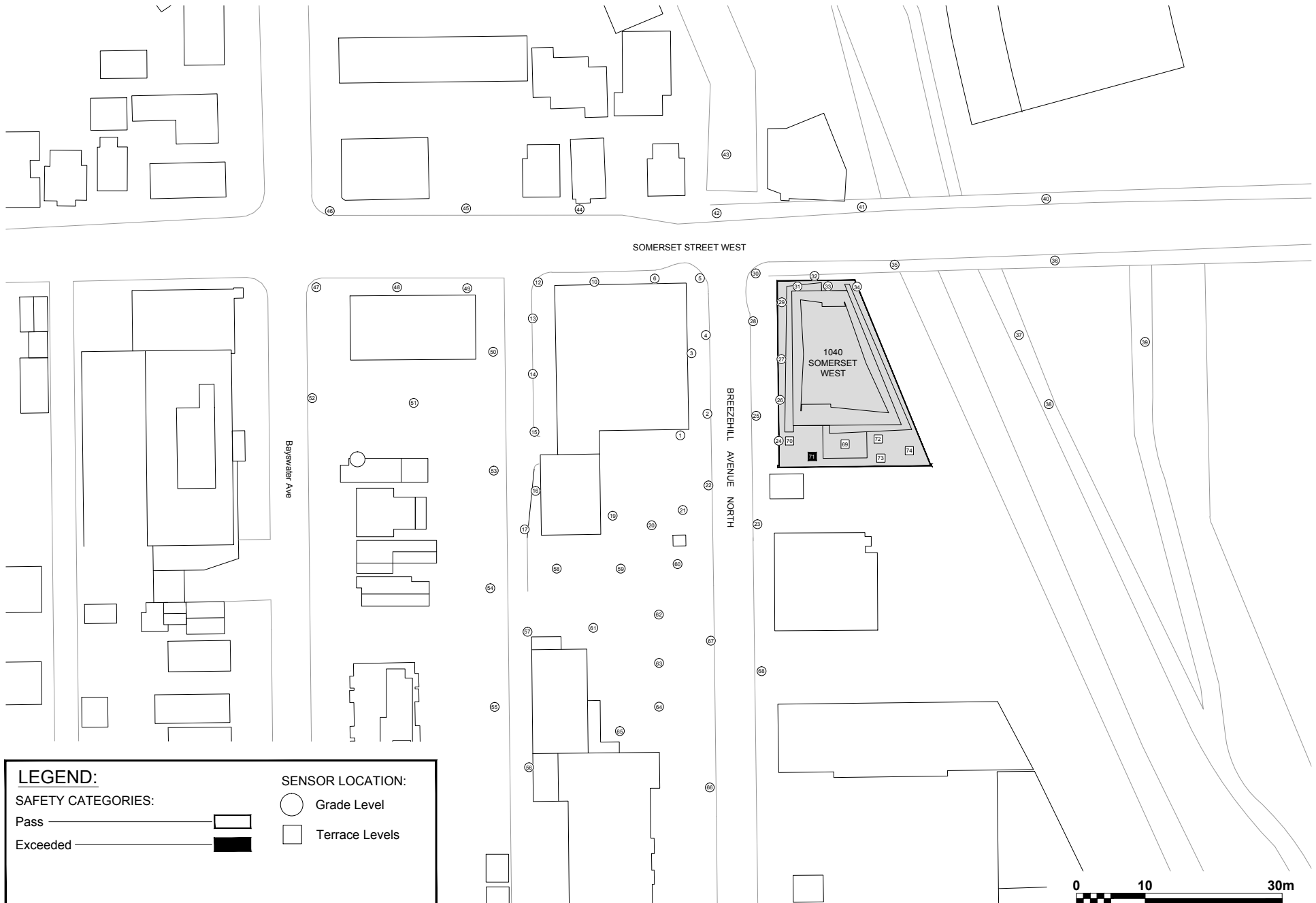
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 7a
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	



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LEGEND:

SAFETY CATEGORIES:

Pass

Exceeded

SENSOR LOCATION:

Grade Level

Terrace Levels

Pedestrian Wind Safety Conditions - Proposed
 Annual (January to December, 0:00 to 23:00)

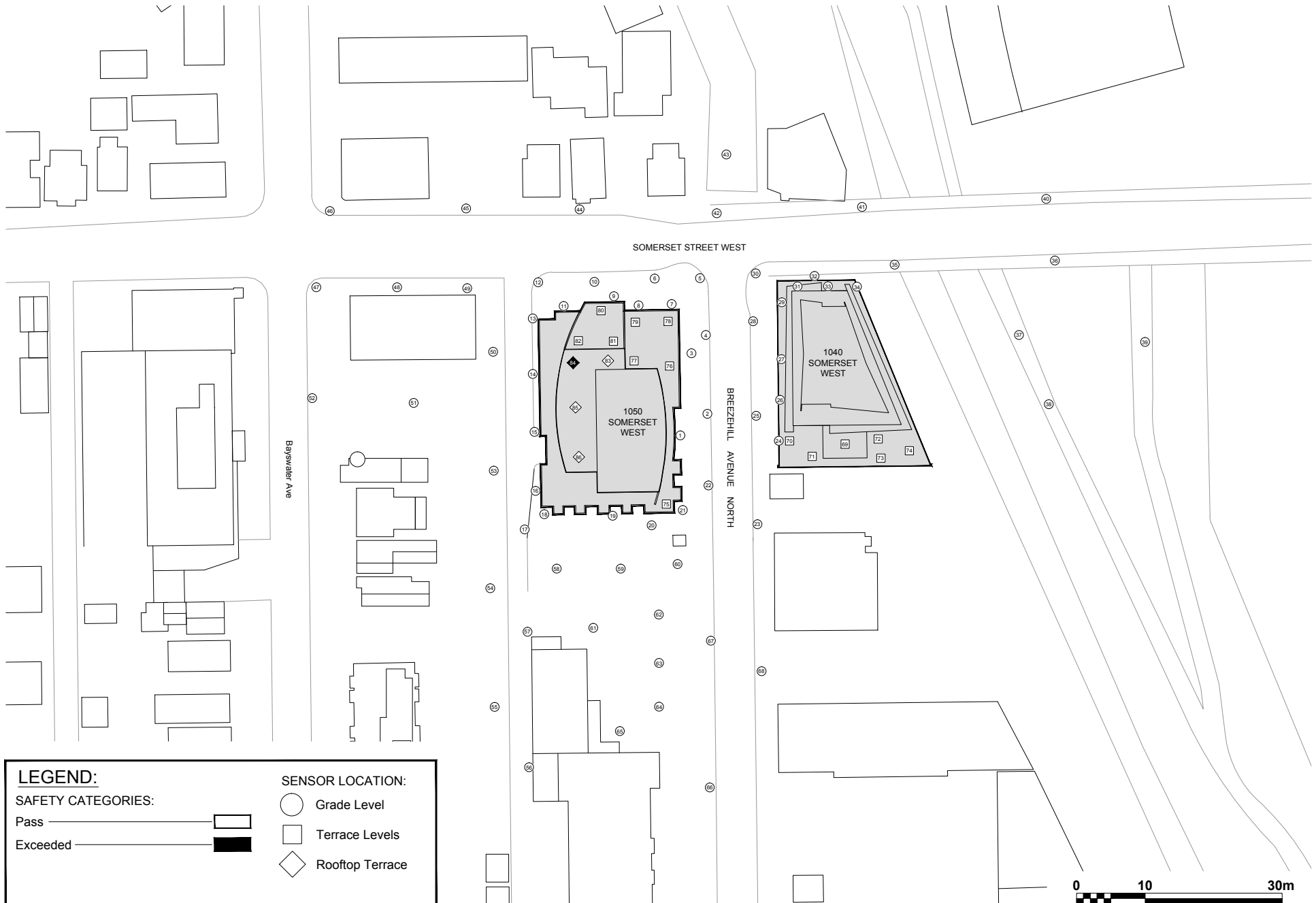
1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 7b
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	





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LEGEND:


SAFETY CATEGORIES:


Pass 

Exceeded 

SENSOR LOCATION:

 Grade Level

 Terrace Levels

 Rooftop Terrace

Pedestrian Wind Safety Conditions - Future
 Annual (January to December, 0:00 to 23:00)

1040 Somerset Street - Ottawa, Ontario



Drawn by: ARM	Figure: 7C
Approx. Scale: 1:1250	
Date Revised: Apr. 9, 2015	



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APPENDIX A

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APPENDIX A: DRAWING LIST FOR MODEL CONSTRUCTION

The drawings and information listed in the table below were used to construct the scale models of the proposed developments at 1040 and 1050 Somerset Streets in Ottawa, Ontario were received from Roderick Lahey Architects Inc. Should there be any design changes that deviate from this list of drawings used to construct the proposed development, the results may change. Therefore, if changes in the design area made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received
01 Mezz Plan	DWG	24/3/2015
01 Plan	DWG	24/3/2015
02 Plan	DWG	24/3/2015
03 Plan	DWG	24/3/2015
04 Plan	DWG	24/3/2015
05 typ tower Plan	DWG	24/3/2015
06 Mech tower Plan	DWG	24/3/2015
07 Roof Plan	DWG	24/3/2015
08 Elev N	DWG	24/3/2015
09 Elev W	DWG	24/3/2015
10 Elev S	DWG	24/3/2015
11 Elev N	DWG	24/3/2015
1122 Plans - floorplans June 6 2012	DWG	26/2/2015
1122 Site Plan June 2012	DWG	26/2/2015
1122 Elevations	DWG	25/2/2015

APPENDIX B

APPENDIX B: BACKGROUND INFORMATION

B.1 Methodology

Wind tunnel testing of a 1:300 scale model was conducted for the proposed developments at 1040 and 1050 Somerset Street in Ottawa, Ontario, with all existing and approved surrounding buildings. The photographs in Figures 1a through 1c in the report show the test model in one of RWDI's boundary-layer wind tunnels. The scale model included the proposed development and all relevant surrounding buildings and topography within a 340m radius of the project site. The mean speed profile and turbulence of the natural wind approaching the modelled area were also simulated in the wind tunnel. The scale model was instrumented with 86 wind speed sensors to measure mean and gust wind speeds at a full scale height of approximately 1.5 m. These measurements were recorded for 36 equally incremented wind directions.

Long-term wind data for Ottawa were analyzed to determine the local wind climate (see Section B.2). These wind statistics were combined with the wind tunnel data in order to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the RWDI criteria for pedestrian comfort and safety (see Section B.3).

B.2 Local Meteorological Data

Wind statistics recorded at the MacDonald-Cartier International Airport in Ottawa between 1980 and 2015 were analysed for the spring (March through May), summer (June through August), fall (September through November) and winter (December through February) seasons. Figure 2 in the report graphically shows the distribution of wind frequency and directionality for each of the four seasons. When all wind data are considered, winds from the west-northwest, east-northeast and south-southwest are dominant in the spring, fall, and winter seasons. In the summer, winds from the east are less frequent than winds from the southwest.

Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occurred for 4.2%, 0.8%, 2.7% and 4.8% of the time during the spring, summer, fall and winter seasons, respectively. Strong winds are most prevalent from the westerly, northwesterly and easterly directions, particularly in winter and spring seasons. The analysis methods have accounted for these and all wind directions. Also note strong winds, particularly during the spring and winter, could potentially be the source of uncomfortable wind conditions, depending upon site exposure or design of the proposed development being assessed.



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B.3 RWDI Wind Criteria

The RWDI pedestrian wind criteria are summarized in the table below. These criteria have been developed by RWDI through research and consulting practice since 1974 (References 1 through 6). They have also been widely accepted by municipal authorities and by the building design and city planning community including the City of Ottawa.

RWDI Pedestrian Wind Criteria

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 14	Gentle breezes suitable for main building entrances and bus stops
Strolling	≤ 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended
Notes: (1) Gust Equivalent Mean (GEM) speed = $\max(\text{mean speed, gust speed}/1.85)$; and (2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.		
Safety Criterion	Gust Speed (km/h)	Description
Exceeded	> 90	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.
Note: Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.		

A few additional comments are provided below to further explain the wind criteria and their applications.

- Both mean and gust speeds can affect pedestrian's comfort and their combined effect is typically quantified by a Gust Equivalent Mean (GEM) speed, with a gust factor of 1.85 (References 1, 5, 7 and 8).
- Nightly hours between midnight and 5 o'clock in the morning are excluded from the wind analysis for wind comfort since limited usage of outdoor spaces is anticipated.
- A 20% exceedance is used in these criteria to determine the comfort category, which suggests that wind speeds would be comfortable for the corresponding activity at least 80% of the time or four out of five days.



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- Only gust winds need to be considered in the wind safety criterion. These are usually rare events, but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.
- These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate. Comparisons of wind speeds for different building configurations are the most objective way in assessing local pedestrian wind conditions.

B.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.