Sept. 28th, 2018

HRM Planning & Development
Eastern Region, Alderney Gate
40 Alderney Drive, 2nd Floor
Dartmouth, NS

To Whom It May Concern,

RE: Proposed Rosedale Development Wind & Solar Study

This proposed 9 and 11-storey mixed use development project is located in the vicinity of 20 Rosedale Drive (includes PID's 41054339, 00066936, 00044792) and Floral Avenue in Dartmouth. To the west, the site is bounded by R2 semi's and The Stairs Memorial Church, along Rosedale Drive by industrial and commercial uses and to the south and east by R1 residential uses. The entire area is one street removed from the growing Wyse Road corridor which is poised for growth with existing and proposed multi-unit developments and the proposed Wyse Road Corridor in the eventual Centre Plan. The site has excellent views of the Halifax Harbour from about the 3rd storey.

The following assessment looks to interpret the likely wind impacts on surrounding properties and public sidewalks as a result of the proposed development. Shadow impacts re also studied. Wind data recorded at the local Shearwater Airport between 1953 and 2000 was assembled and analyzed using Windrose Pro 2.3 to understand the intensity, frequency, and direction of winds at the proposed site. The resulting diagram (Fig. 1) shows that the highest and most frequent wind speeds from the west and south and Fig 2. Shows this pattern in the context of the site.

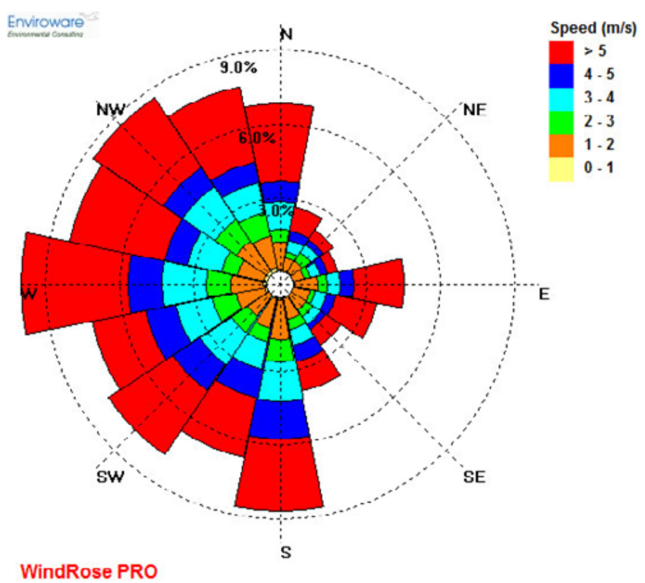


Figure 1. Wind Rose for Shearwater Airport. Diagram shows winds in the FROM direction.

During fall and winter months wind primarily blows from the north-west and west (See Fig 5). Throughout the spring and summer, south and south-westerly winds prevail. The relative distribution of higher wind speeds is somewhat constant from the north, north-west, and south-west. High winds from the north-east, east and south-east are substantially infrequent when compared to other directions. The proposed development replaces a series of 2-3-storey buildings along Rosedale Drive.

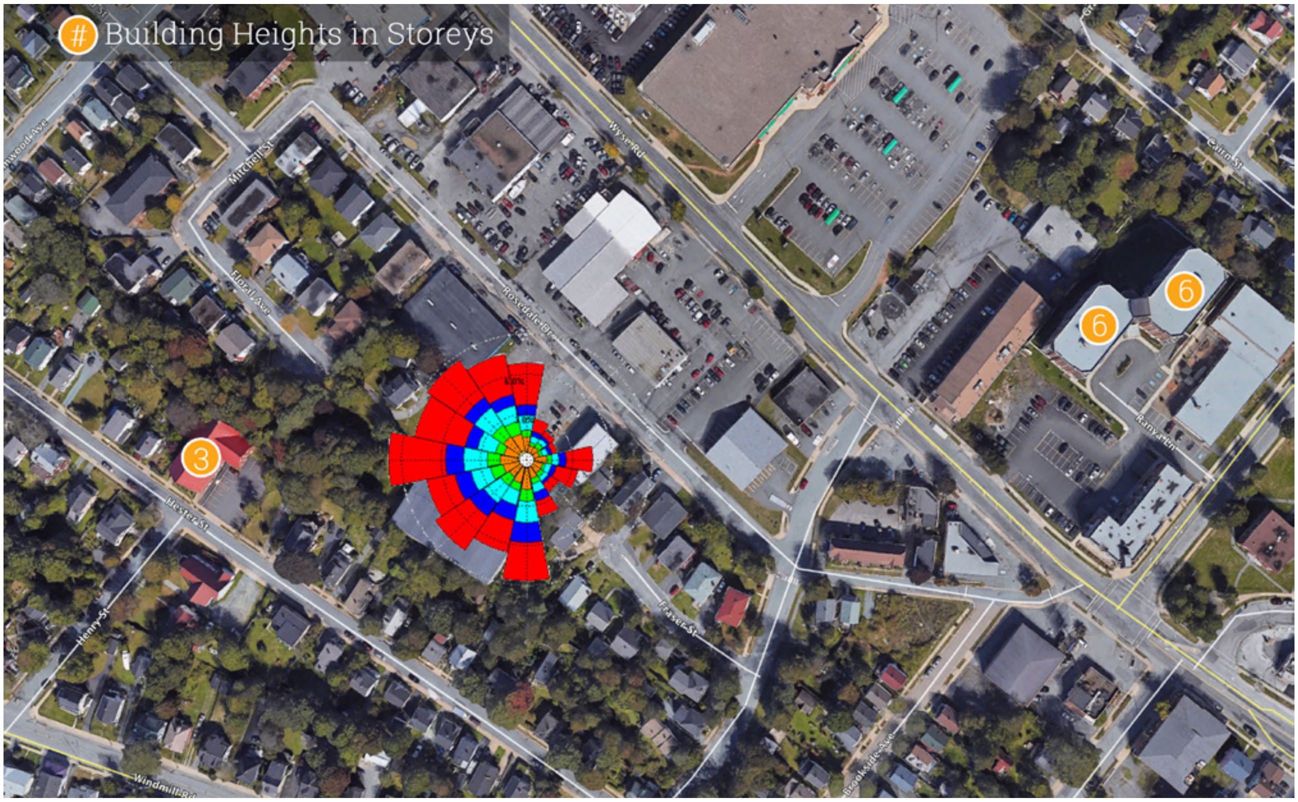


Figure 2. Wind Rose overlain on top of the proposed development site. Orange numbers denote building storeys.

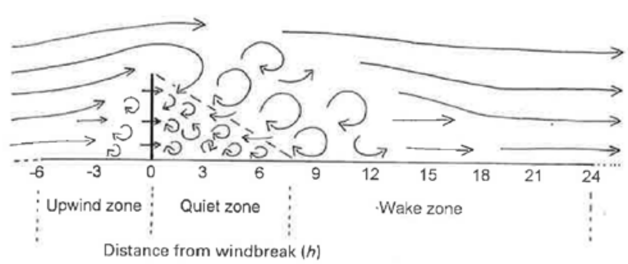
Urban Windbreak Impacts

As shown in Fig. 2 the new building will impact surrounding property conditions differently at different times of the year as indicated by the wind rose that shows wind speed, direction and frequency. Almost 90% of the winds come from the north-west-south direction (the half circle). Less than 10% of the winds come from the other more easterly directions

Wake zones for zero porosity structures can extend 8-30 times the height of a structure. A 9-storey building can generate increased wind speeds between 200-800 metres on the downwind side (see Fig. 3). Beyond the wake zone, there is typically more turbulence and eddies as a result of more turbulent air. This can be characterized as being slightly more gusty winds with quiet periods interspersed with gusts of wind. Directly behind the windbreak (i.e. the building), the quiet zone can extend from 0 to 8 times the height on the downwind side. In this quiet zone, wind speeds can actually be reduced. Around the edges of the building, wind speeds can increase as wind flows around the structure.

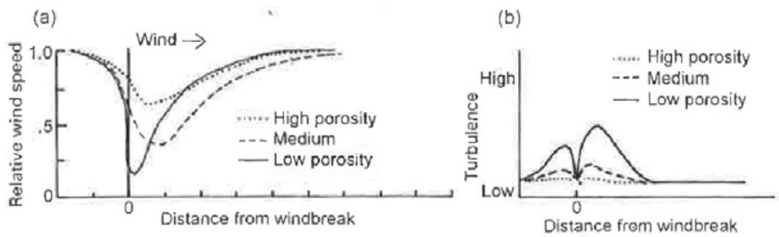
Wind Impacts from tall Buildings

There will be a number of impacts from the new building including:



Zones with altered airflow caused by a windbreak. Vertical dimension is magnified for illustration. Vertical line indicates windbreak; h = height of windbreak. Large eddies = strong turbulence. Uninterrupted airflow in the open is to the left of the upwind zone, and to the right of the wake zone. Widths of zones are approximate. Based on several sources.

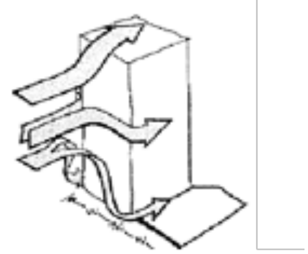
Figure 3. Windbreak Diagram



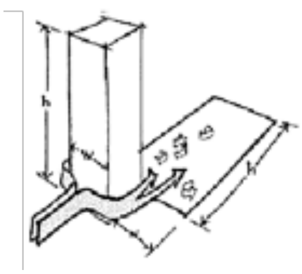
Effect of windbreak porosity on streamline and turbulent airflows. (a) Streamline airflow based on treebelts of different foliage densities; wind measurements at 1.4 m height. From Heisler & DeWalle (1988) with permission of Elsevier Science Publishers. (b) Generalized expected turbulence pattern based on Robinette (1972), Rosenberg *et al.* (1983), Heisler & DeWalle (1988), McNaughton (1988).

Figure 4. Porosity Diagram

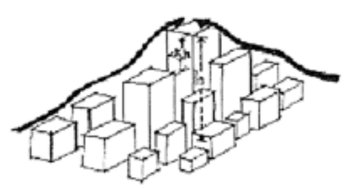
1. **Downwash**: Wind speed increases with height so when a tower is exposed to wind, the pressure differential between the top and the bottom of tower forces the high pressure at the top down the windward face dramatically increasing pedestrian wind speeds. The taller the exposed face is, the higher the wind speed will be at the base. The stepback at the 4th storey surrounding the two proposed towers will receive the bulk of this downwash rather than properties directly surrounding the towers. A 10 storey building can cause up to 70-80% increase in wind speeds at the base.



2. **The corner effect**: at the windward corners of buildings there can be unexpected increases in wind speeds as wind forces around the windward corners from high pressure on the windward face to low pressure on the lee side. Some of the ways to decrease this impact is to create pyramidal steps which increases the surface area of the edges. This has been designed into the Rosedale Street tower.



3. **The Wake Effect:** Wake is generally caused by both the downwash and corner effect. The greatest impact area occurs within an area of direct proportion to the tower height and width on the lee side of the wind. Impacts are minimized by creating a stepback base on the building.



4. **Building Groups:** The effects that occur individually around buildings cannot be applied directly to groups of buildings. The cumulative effect of many clustered tall buildings, like in this situation, can create a wide range of different wind scenarios that must be modelled as a group to understand the cumulative impacts.

A building can impact both the wind speed and the wind turbulence at the ground level behind the wind break (Fig 4). Wind turbulence not only creates uncomfortable environments through the rising of dust and other particles, it can also decrease the temperature on the site. A properly designed building can mitigate some of the negative impacts of wind on the street level.

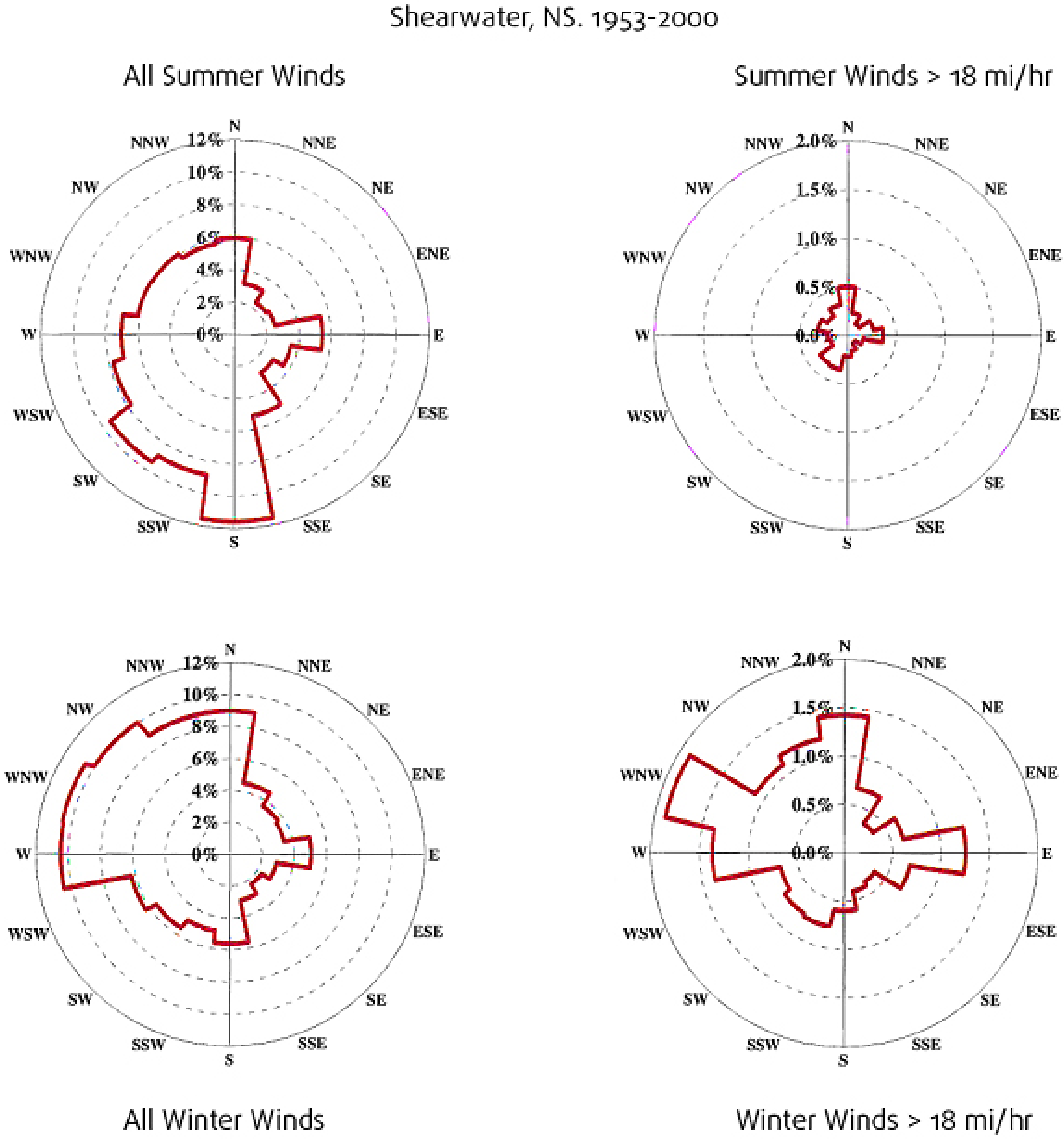


Figure 5. Seasonal Wind Direction for Shearwater Airport

Seasonal Wind Impacts

Looking at the seasonal wind impacts (Fig. 5), in the winter the northwest prevailing winds are the dominant occurrence. Approximately 48% of all winds come from the northwest. Winter winds are also stronger than those in the summer, with around fifteen percent of all winds reaching speeds above 29 kph.

During the summer the majority of winds come from the southwest quadrant, approximately 46%, with the remaining spread amongst the other three ordinal directions: roughly 20% from the southeast, 24% from the northwest, and 10% originating out of the northeast quadrant. Overall, the winds are mild, with just over two percent of all winds reaching speeds over 29 kph. Summer winds may mildly impact the space between the two towers near Rosedale Street slightly as winds accelerate through the towers.

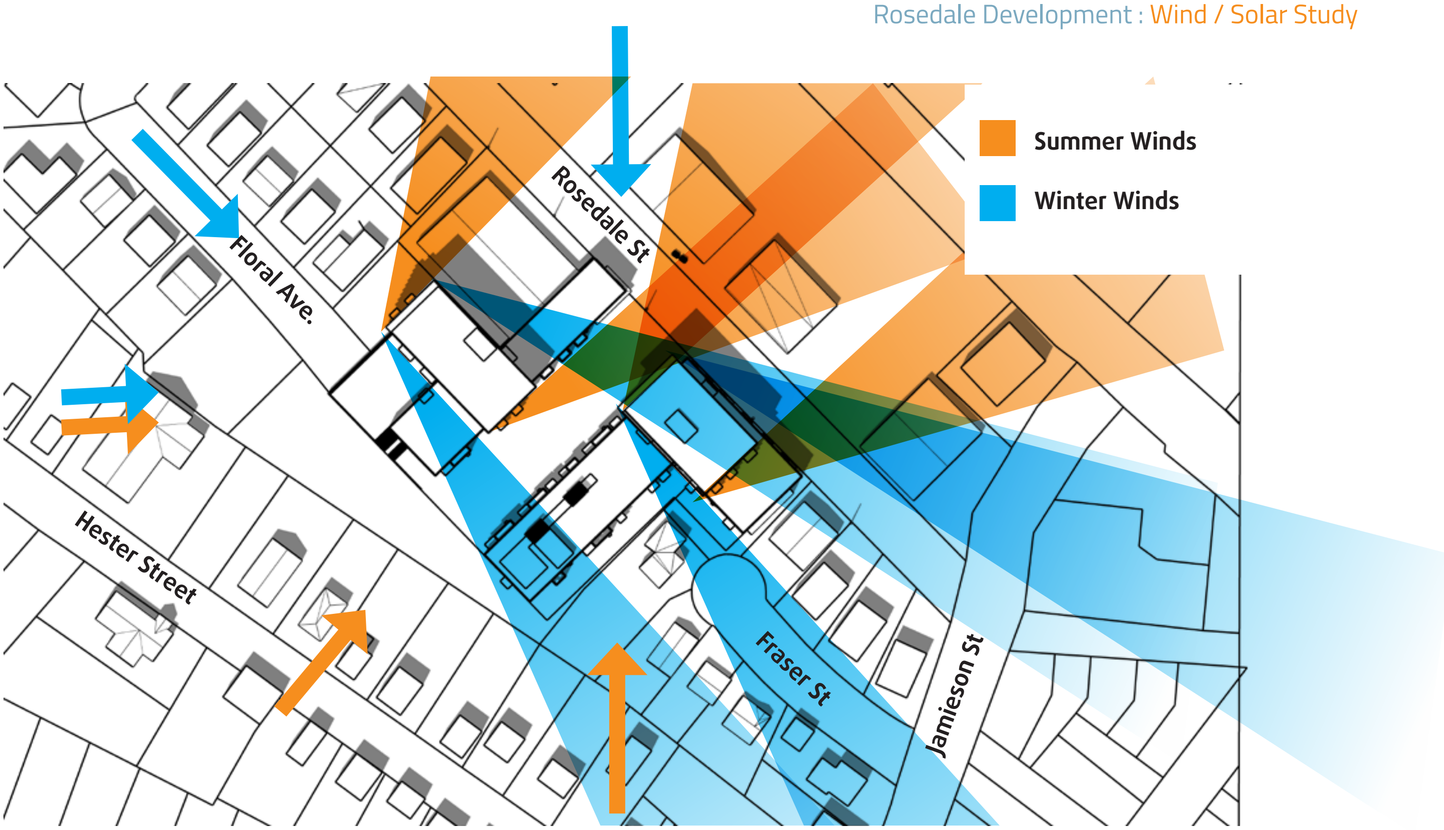


Figure 6. Seasonal Wind Direction for the Rosedale site.

In the winter, winds originate from the west, north and north-west (shown in fig 6 in blue arrows) creating a quiet zone in the proposed courtyard most of the time. Wind at the edge of the tower buildings will accelerate causing windier conditions at Fraser Street, on Rosedale Drive and to some extent Hester Street. In the winter, gusts and eddies may be noted on Fraser Street and Rosedale Street as a result of this development, but this impact may be somewhat mitigated by the mature street trees surrounding the site. The 4-storey low rise that surrounds the base of the towers will have a significant impact on reducing some of the winter winds that result from the tower. In fact, some of the properties on Freser Street will see reduced wind speeds sue to the lowrise portion of the development. The areas show in blue will be windier than what exists today in the winter. The designers have moved the higher 11-storey tower to the west side of the site to mitigate impacts to the east.

In the summer, the wind comes from the south, west and south-west (see fig 6 for orange arrows) most of the time which will increase wind speeds on the courtyard when winds originate from the south-west. The industrial lands to the north along Wyse Road will see increased wind speeds occasionally from this development. The areas show in orange will be windier than what exists today in the summer.

COMFA Model (Brown and Gillespie, 1995)

Dr. Robert Brown of the University of Guelph developed the COMFA model to model human thermal comfort as a result of a number of variables including wind speed. Human thermal comfort is more pronounced during low-activity situations like sitting than during high-activity situations like running. The model is explained in the paper by Brown and LeBlanc (2003). Mr. LeBlanc was also the co-author with Dr. Brown in the 2008 ed. “Landscape Architectural Graphic Standards”, Microclimate chapter. This model is the basis for the theoretical assessment of human thermal comfort changes as a result of the building explained below.

Wind Comfort Assessment

Changes in wind speed as a result of buildings vary depending on wind direction and building morphology. On Rosedale and Fraser street sides of the proposed building, 'streamlines' can occur where the wind is accelerated through the openings between buildings. In these areas windspeeds will increase at different times of the year. We do not anticipate 'uncomfortable' conditions in the summer as a result of the development unless winds come from the north-east (which does happen occasionally). In the winter, Fraser Street and parts of Rosedale will be windier and could occasionally experience uncomfortable wind conditions as a result of this development.

Shade Study

The proposed development will increase shade levels in some areas of west Fraser Street and along parts of Rosedale Street. These areas will add between 1-2 hours of shade in very select areas. Other areas on the south side of the development will see up to an hour of more shade in the early morning and late evening.

In the equinox season (March and Sept), the development will add 2-3 hours of additional shade on Fraser Street and along the south side of Rosedale Drive. In the early morning and late evening there could be an additional 1-2 hours of shade surrounding the development.

In the winter, the impacts of the 9 and 11 storey buildings will be most pronounced. During this time, the largest impacts will be on the east end of Floral Avenue, on the west end of Fraser Street and along Rosedale Drive (both sides of the street). In the winter, the buildings could add an extra hours of shade on Wyse Road as well.

Summary

This proposed building will have some microclimate and human thermal comfort impacts on Fraser Street and along select parts of Rosedale Street. Generally though, other parts of surrounding neighbourhood will see very little impact from the proposed development. Note that this study did not undertake a detailed flume study as part of its scope.

If you have any questions, please contact me at your convenience.

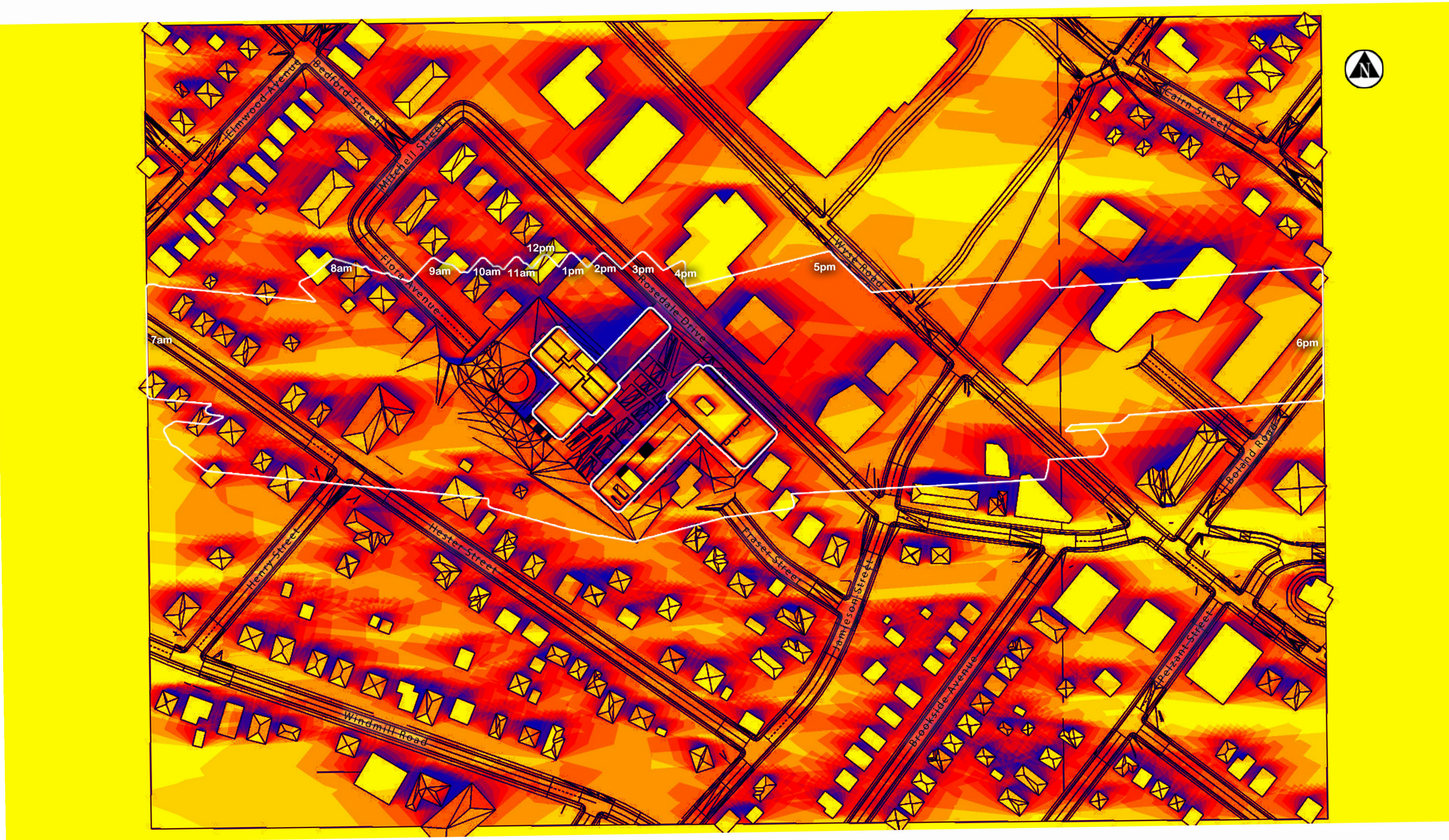
Sincerely,

Originally Signed

Robert LeBlanc, President
Ekistics Plan + Design

Rosedale Drive Development

Shade Study for March & September 21



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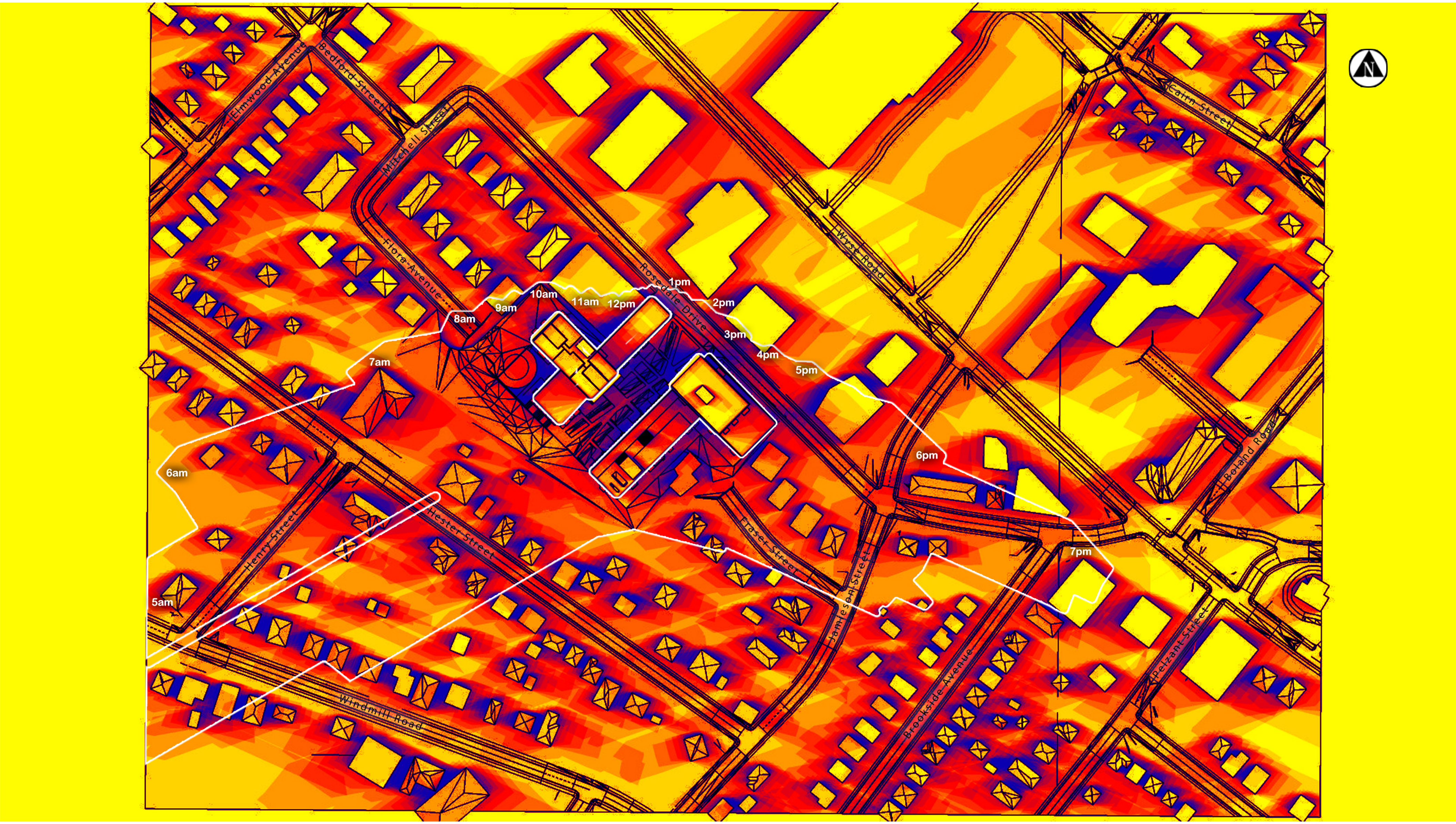
Rosedale Drive Development

Shade Study for June 21



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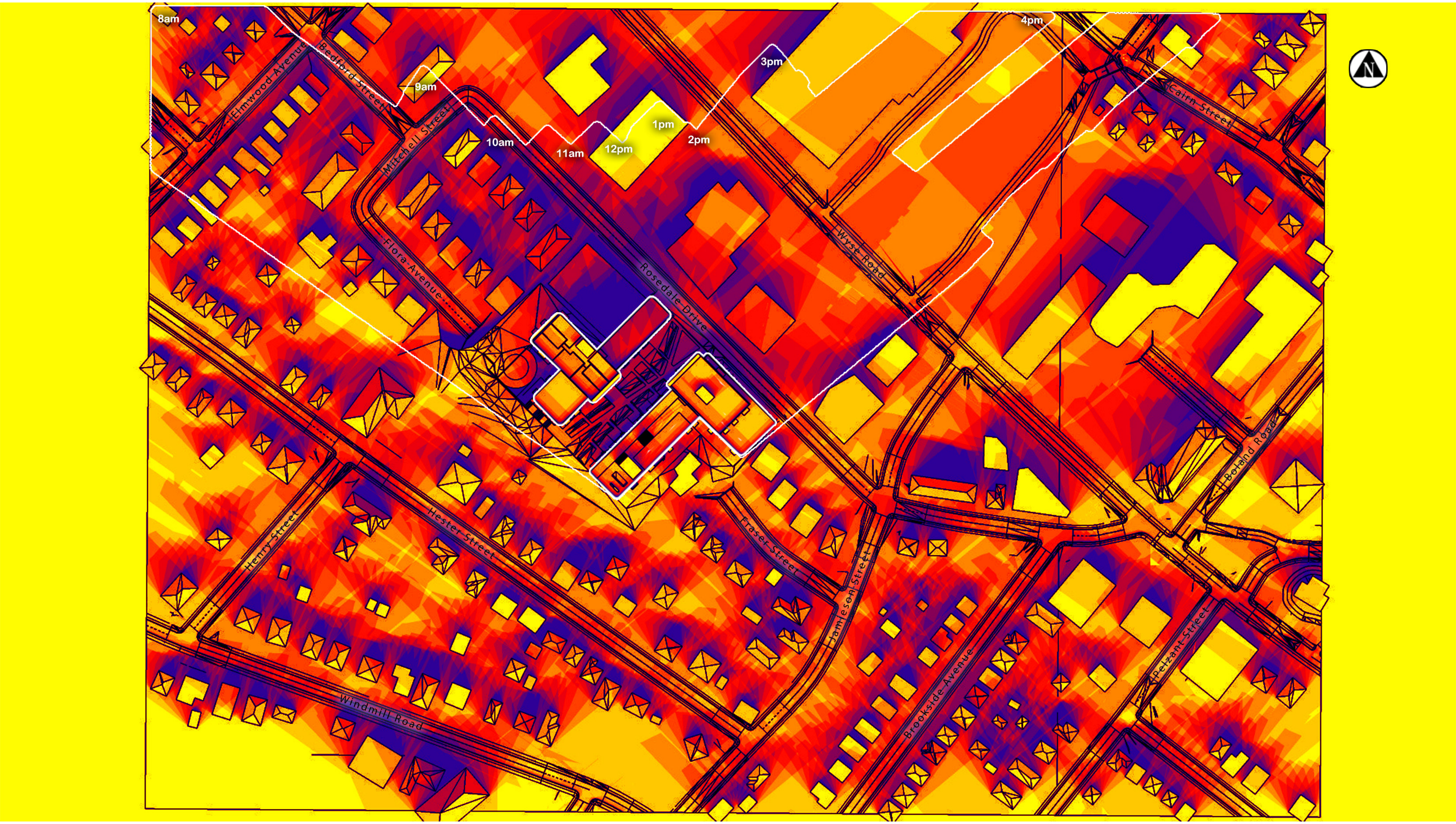
Rosedale Drive Development

Shade Study for December 21



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