August 23, 2016

EKISTICS PLANNING & DESIGN
Landscape Architecture | Engineering
1 Starr Lane, Dartmouth, NS
Canada, B2Y 4V7 | 902.461.2525
www.ekistics.net

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

To Whom It May Concern,

RE: Proposed 5972 Spring Garden Road – 1478 Carlton Street Wind Impact Qualitative Assessment and Shadow studies

The proposed 29.5 storey mixed use development project is located at the corner of Spring Garden Road and Carlton Street. To the north, east and south of the site, the Spring Garden Corridor has a range of mid and high rise building types (some up to 22 storeys) which typify the mixed use urban corridor. To the west of the site, the surrounding residential neighbourhood includes mostly low rise 2-3 storey residential.

The following assessment looks to interpret the likely wind impacts on surrounding properties and sidewalks as a result of the proposed development. Clearly a building this scale will require a more detailed wind tunnel assessment in later stages of the DA process. This desktop assessment is meant to provide a high level overview of some of the possible impacts that will need to be validated and quantified in a more detailed flume study or computer simulation. Generally tall buildings will interact with other neighboring tall buildings to create impacts between the buildings and at the ground level for some distance surrounding the development.

Wind data from the Shearwater Airport was assembled and analyzed (1953 -2000) using Windrose PRO 2.3 to understand the intensity, frequency and direction of winds at the development site. The resulting diagram (Fig. 1) shows that the highest and most frequent wind speeds come from the west and south. 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. This has visible implications for development on this site as is shown in Fig.2.

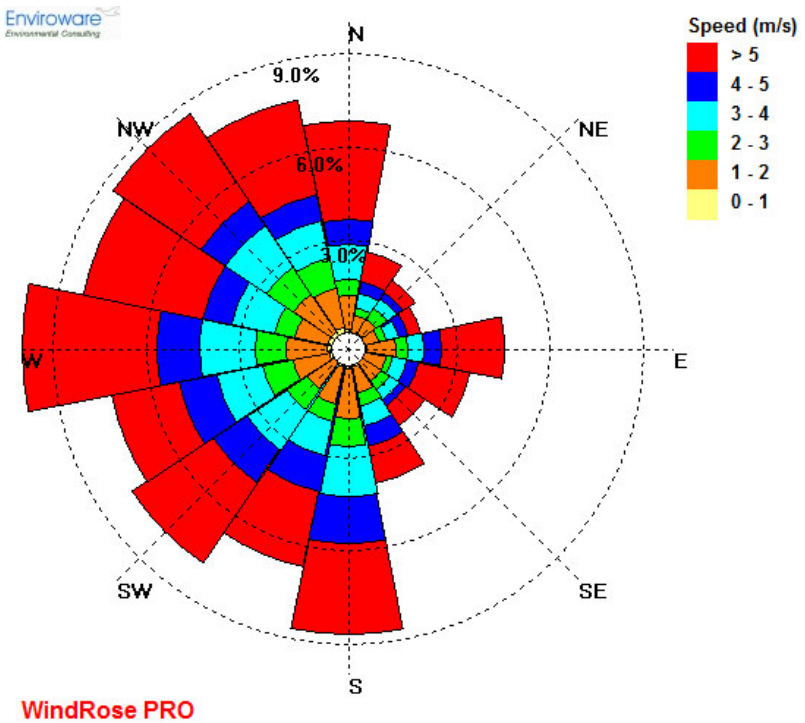
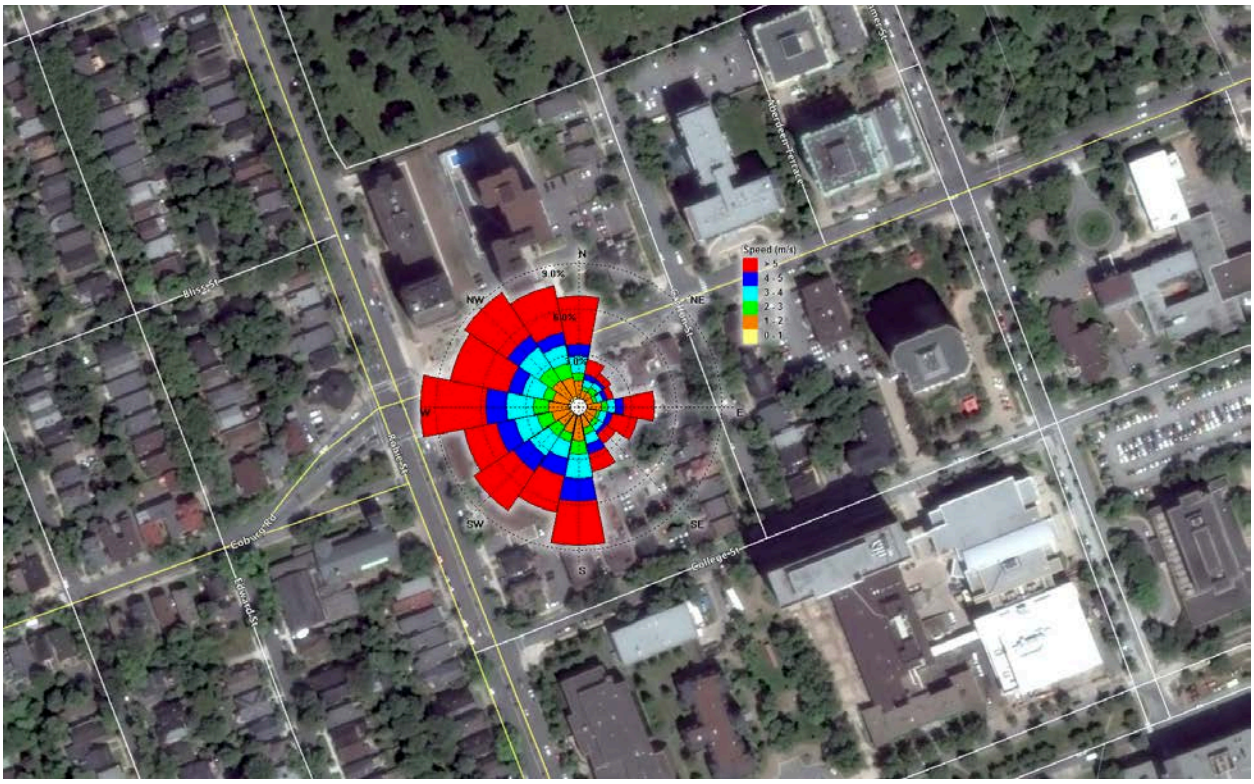


Fig 1. Wind Rose Shearwater 1953-2000

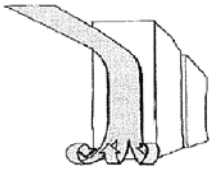
Fig 2. Wind Rose overlay on site

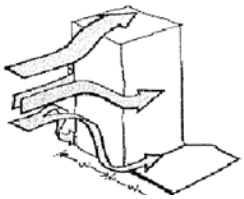


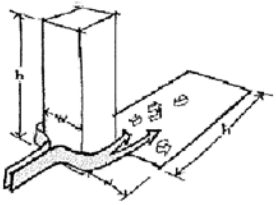
Wind Impacts from tall Buildings

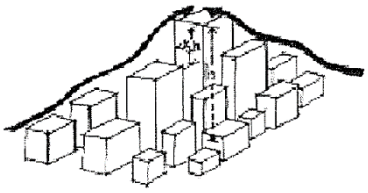
There will be a number of impacts from the new building including:

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 will receive the bulk of this downwash rather than Spring Garden Road. A 30 storey building can cause up to 100% 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 Spring Garden 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 leed 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.









Pedestrian Comfort:
Pedestrian comfort and safety is an important factor to consider in the design of a building and an area's built form, especially in a windier city such as Halifax. The design of a building will impact how wind interacts at the ground level, impacting the pedestrian experience. The Beaufort scale is an empirical measure that relates wind speed to observed conditions on land and sea. The attached Beaufort scale is a general summary of how wind affects people and different activities, and distinguishes at what points wind speeds can become uncomfortable or dangerous.
A building can impact both the wind speed and the wind turbulence at the pedestrian level. Wind turbulence not only creates uncomfortable environments through the rising of dust and other particles, it also decreases the temperature on the site. A properly designed building can mitigate some of the negative impacts of wind on the street level.

Seasonal Wind Impacts:
Looking at the seasonal wind impacts (Fig.3), during the summer, most of the wind comes from the south (12% of the time) and southwest (10% of the time). During the summer, the pedestrian realm along Spring Garden Road and Carlton Street will not be impacted by winds blowing from the south/southwest.

In the winter, the prevailing winds shift and come from the west, north-west, and north. These winds could elevate the wind speeds for the portion of Spring Garden to the west and east of the building due to corner effects. Additionally, high winter winds (>18 mi/hr) which are prevalent from the north-west and the east (which occur 1.75% and 1.25% of the time, respectively) could impact the west side of the building, and the corner of Carlton Road and Spring Garden. A large canopy will be needed over the main entry plaza to reduce the impacts of downwash in the winter.

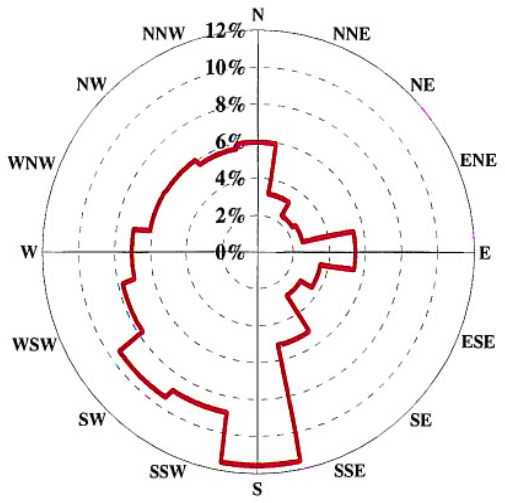
It should be noted that the building's stepped massing nature and podium-tower design (including the added benefit of the surrounding heritage properties as an extension of the podium) should significantly decrease pedestrian discomfort caused by downwash winds. The stepped terraces and podium act to deflect a large amount of downwash away and around the tower before it reaches ground level, decreasing the wind speed, but adding slightly more turbulence. In addition, canopies have been added to ground floor entrances, and patios will surround the façade of the building, again adding a second level of wind and weather protection.

Surrounding Development:
The taller surrounding buildings shown on Fig 4 already have wind implications on this site and the neighbouring residential area. Since there are a number of buildings that ring the site from the north and east of the development (the direction of winter, and high speed winter winds), the area is already in the wake zone of these surrounding buildings. The wake zone usually extends 8-30 times the height of a building. So, a 10 storey building will have reduced wind speeds for 800-3000 feet on the lee side of the building, depending on prevailing wind. Beyond the 8-30 wake zone there is typically more gusts and eddies as a result of more turbulent air.

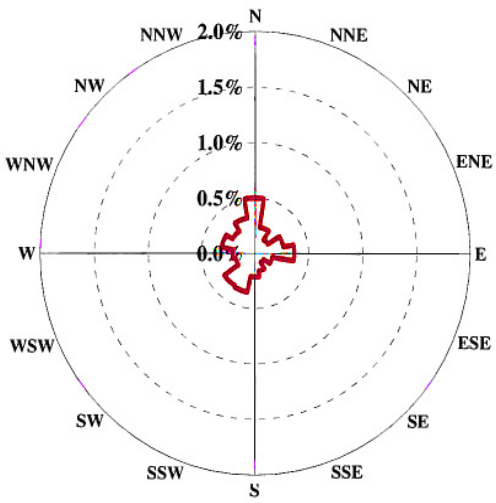
Fig 3. Wind Rose frequencies during 4 seasons

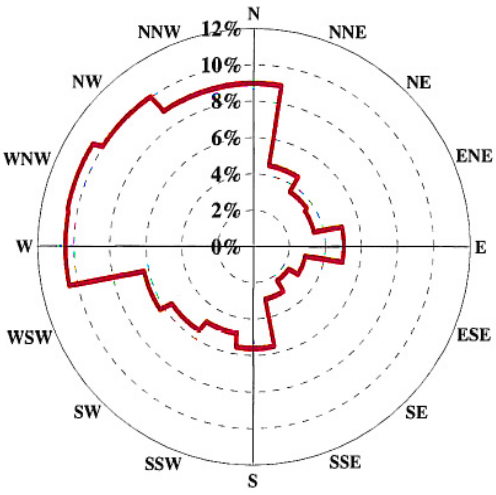
Shearwater, NS. 1953-2000

All Summer Winds

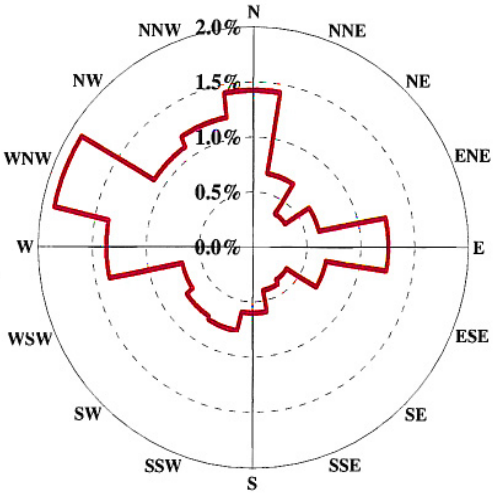


Summer Winds > 18 mi/hr





All Winter Winds



Winter Winds > 18 mi/hr

Figure 4. Tall surrounding buildings

Building Form:
Changes in wind speed as a result of buildings vary depending on wind direction and building morphology. On the upwind side of the building (west and north side; or on the Spring Garden towards Robie Street side) there can be more turbulent wind but little change in wind speed as the building is vertically terraced. On the downwind side of the building (south and east; the backlot of the building and Carlton Road), wind speed is often reduced up to 8X the height of the building in what is often referred to as the “quiet zone”. This means that the Carlton heritage street will not be adversely impacted in the summer (wind from the south and south-west) but could have more intense gusts in the winter as a result of corner effects. The main building entrance is recessed and canopied to protect the entrance from any turbulence which might arise on the north side of the building. Figure 5

With the terraced and podium design there should be reduced impacts from the 30-storey tower but the cumulative impacts of all the surrounding towers on the neighbourhood is to hard to speculate without a more in depth simulation.

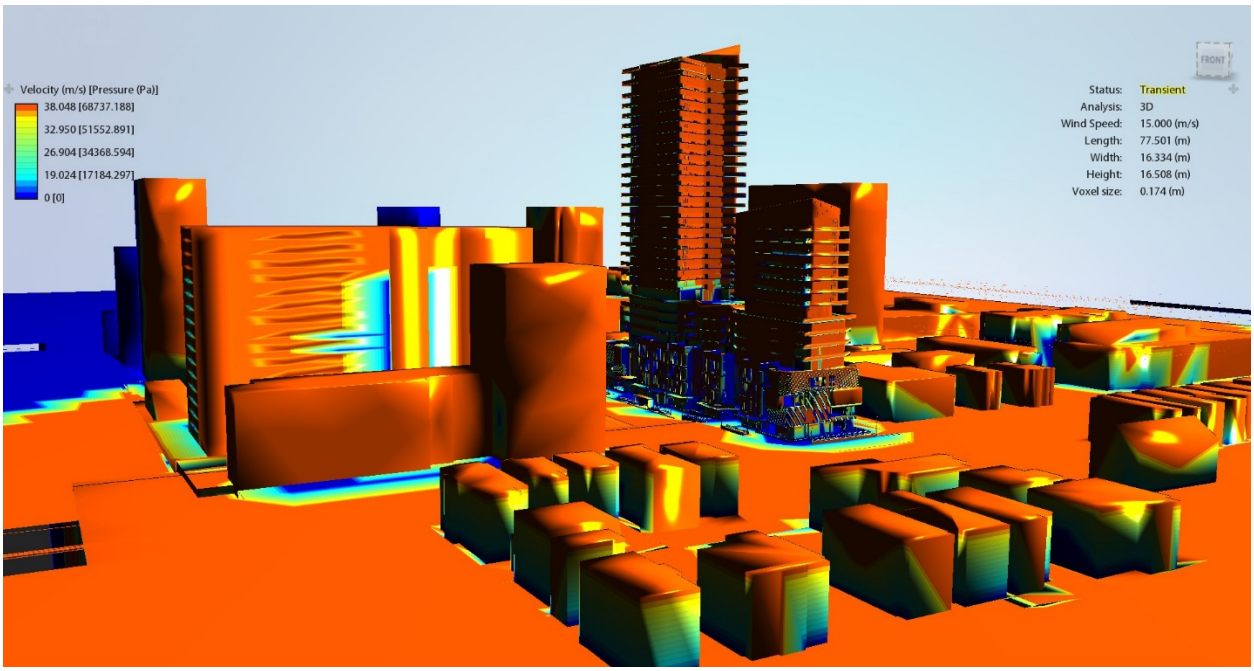


Figure 5. Predominant winter wind pressure simulation

Shadow Study

A shadow Study was undertaken to assess the impacts of the 30 storey and 16-storey towers on surrounding properties. A 3D computer model was placed in real-world space and assessed on an hourly basis for the winter solstice (Dec 21), Summer Solstice (June 21) and Equinox (Sept 21 and March 21) periods. These simulations provide a good overview of the best case conditions (summer solstice where the sun is high and shadows are short) and worst case scenario (winter solstice where days are short, sun angles are low and shadows are long).

Winter Solstice (Dec 21): In the winter sunrise is at 7:48 am and sundown is at 4:37 pm giving only about 8 hours of sunlight. At 8am and 4pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram confirms that within a few blocks of the development, the existing tall buildings in the Sub-Area already produce enough shade such that the impact of the new building will be fairly minimal. On exception is around 4pm in the public gardens where this building will cast some additional shade that currently doesn't exist. In the winter, the Gardens are closed and the shade will not impact vegetation growth or vigour.

Summer Solstice (Jun 21): In the summer, sunrise is at 5:29 am and sundown is at 9:04 pm giving about 15.5 hours of sunlight. At 6am and 9pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram shows that at 7am the building will cast shade on Coburg Road for a few blocks, and a few properties at the corner of Robie and Coburg from about 8-10am, and from 10am-2pm the south side of Spring Garden Road and some of the north side will be in shade. Note that the south side of the street is already in shade from the existing 3 storey buildings. The change will be some additional shade on the north side of Spring Garden (already partially in shade from trees) from 11am to 1pm. After 3pm much of Carlton Street will be in shade from the building however, the street is already in partial shade from the existing 3 storey buildings and the large trees that line the street. After 6pm, there will be some slight additional shade on College Street. There are no shade impacts on the public gardens.

Equinox (Sept 21 and Mar 21): In the equinox sunrise is at 7:00 am and sundown is at 7:22 pm giving only about 12 hours of sunlight. At 8am and 7pm the shadows are so long (sun angle so low) that even a tree can shade an area for very long distances up to 10x the height of the object. In a downtown, the impacts of any building on these hours should be discounted because virtually everything is in shade from surrounding buildings and trees. The shade diagram confirms that around 9am-10:30am there will be some new shade cast on the corner of Robie and Spring Garden, and some additional new shade on the north side of Spring Garden Road from 11am to 3pm. Generally the south side of Spring Garden stays in shade as it currently does today. There are no changes in shade from 3pm onwards due to existing buildings casting shadow. In the fall and winter there are no shadows cast on the Public Gardens from this development.

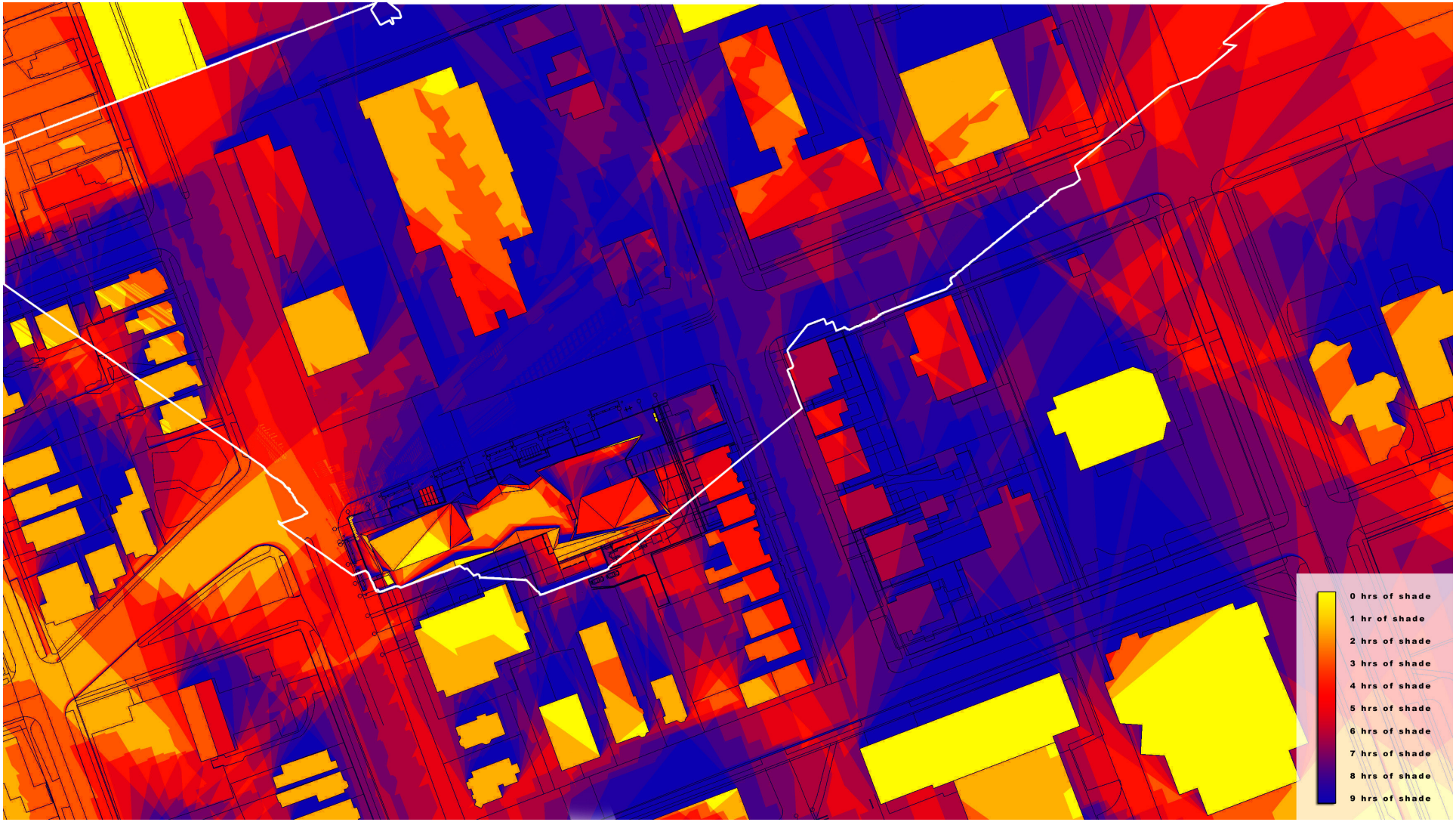
If you have any questions please contact me at your convenience.

Sincerely,

Original Signed

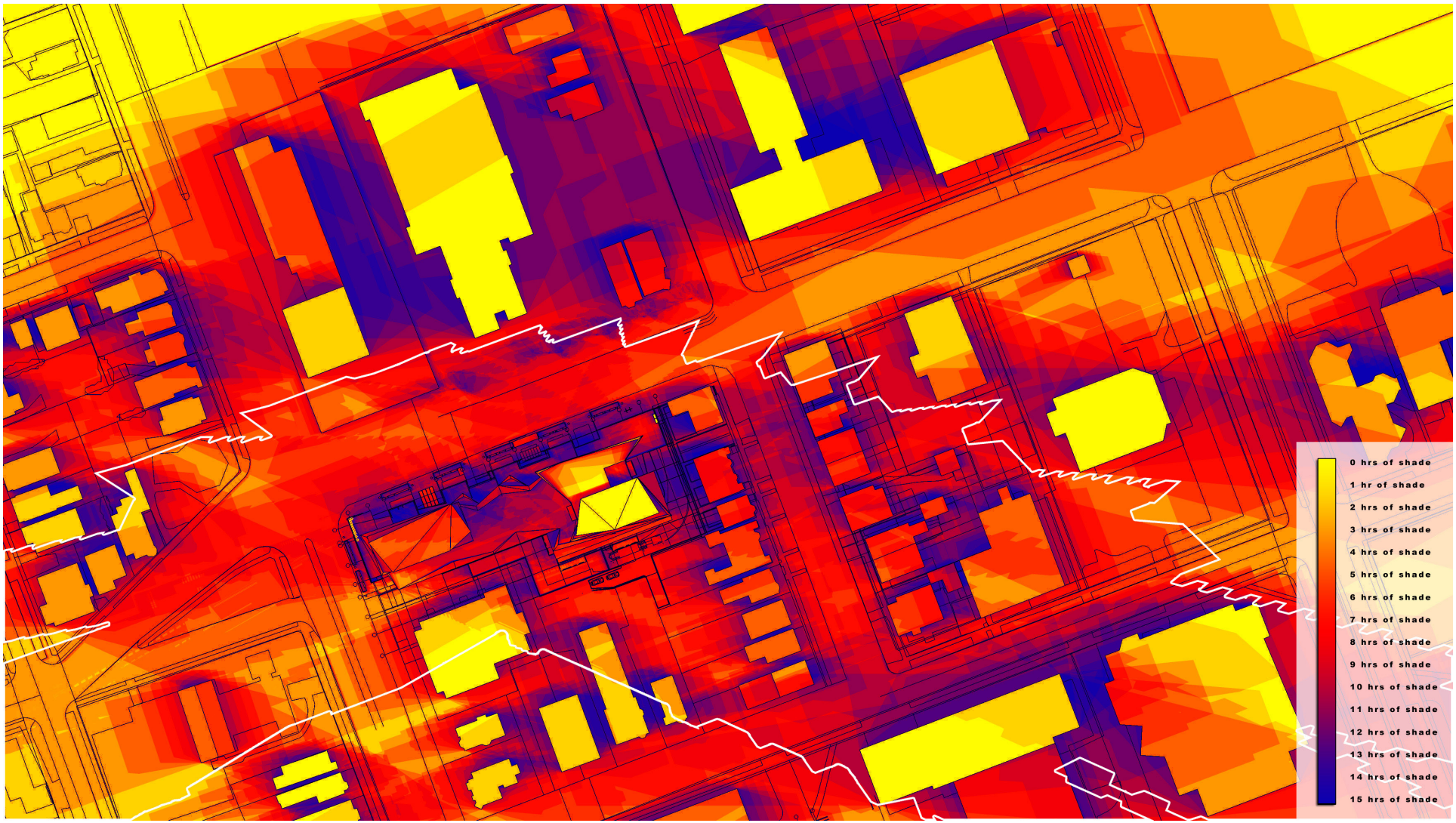
Rob LeBlanc
Ekistics Planning & Design

DECEMBER 21ST



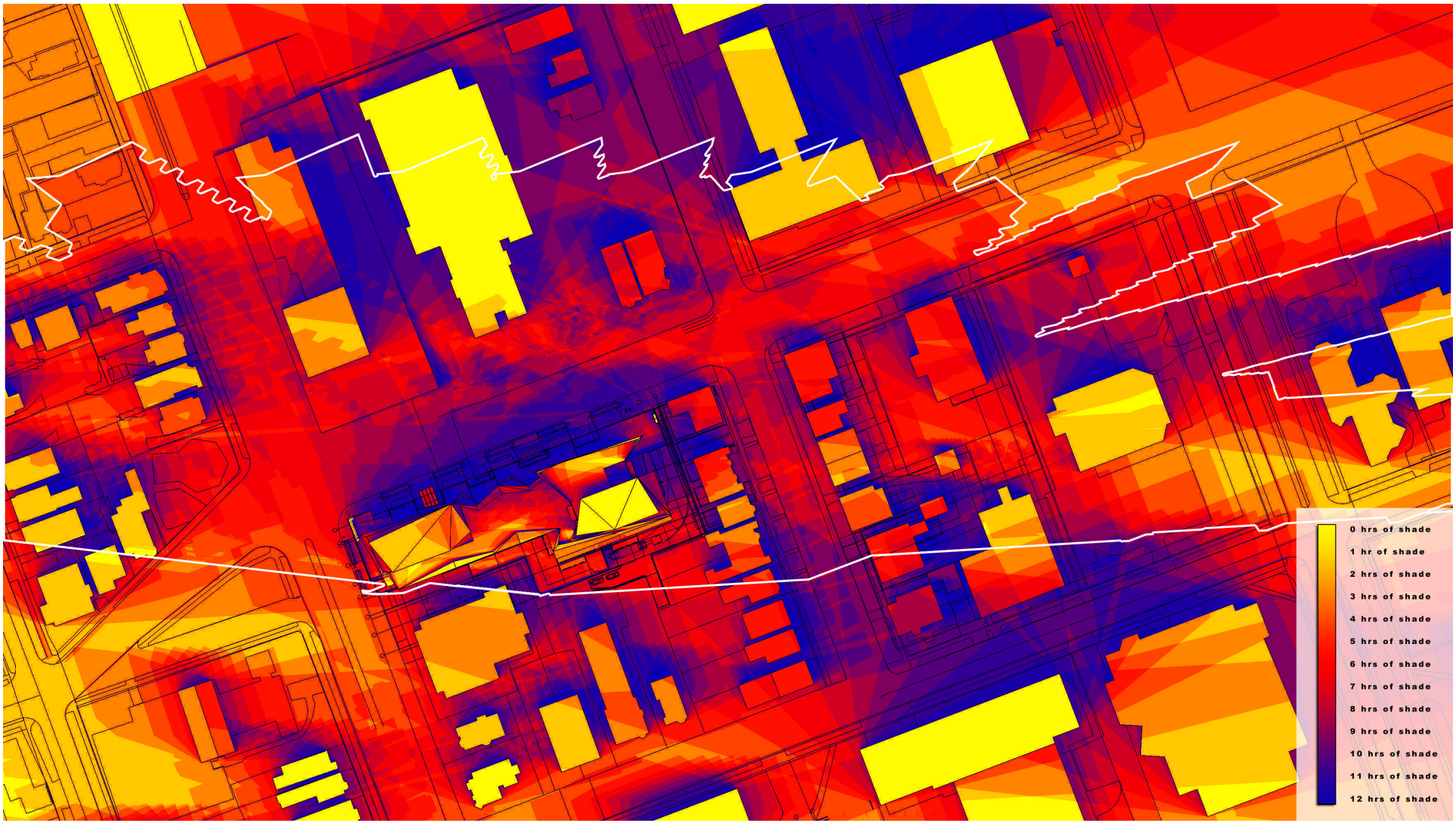
SPRING GARDEN WEST SHADOW STUDY

JUNE 21ST



SPRING GARDEN WEST SHADOW STUDY

MARCH & SEPTEMBER 21ST



SPRING GARDEN WEST SHADOW STUDY