Appendix 2: Shadow Impact Assessment Protocol and Performance Standards

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Introduction

A shadow study is a report, containing supporting shadow diagrams and a written analysis, which demonstrates what impact a proposed development will have on access to sunlight within spaces recognized as important to the community.

Policy UD-20 of the Regional Centre Secondary Municipal Planning Strategy requires the provision of a shadow study for certain sites in proximity to areas shown on Schedule 51 of this By-law.

Definitions

***Astronomic North*:** Also known as 'true' north, this is the north direction as determined by the rotational axis of the Earth. This *does not* mean magnetic north, which is based on the Earth's magnetic field and changes with time. This is also different from the north used in map grid systems due to the inherent limitations of 2-dimensional map projections. Grid or magnetic north shall not be used as the basis for solar positioning.

Building Height*:** Means the maximum height of a development as measured from average finished grade in metres. Features listed under ***Exemptions are excluded from building height and excluded from the shadow impact assessment protocol and performance standards contained in this Appendix.

HRM Open Data Portal: Means the Halifax Regional Municipality data, mapping and analytics hub website as may be changed from time-to-time.

Identified Area(s): Means all lots identified in Schedule 51.

Net-New Shadow: The shadow created by a proposed development, less any shadows at the same time and location caused by existing or previously approved buildings.

***Qualified Person*:** Means a licensed architect, professional engineer, professional planner, surveyor, or landscape architect with sufficient experience in the prediction and analysis of urban shadows.

Exemptions

1 Subject to section **9,** the following features are excluded from any calculation or model required by the shadow impact assessment protocol and performance standards contained in this Appendix:

(a) Antennas;
(b) Chimneys and stovepipes;

(c) Clear glass guard and railing systems;
(d) Communication towers required to support uses and activities in the building;
(e) Cooling towers;
(f) Flag poles;
(g) Heating, ventilation, and air conditioning (HVAC) equipment and enclosures;
(h) High-plume laboratory exhaust fans;
(i) Lighting rods;
(j) Hard landscaping or soft landscaping; and
(k) Solar collectors.

Standards

2 Where a shadow study is required by a proposed development, it must meet the following standards:

(a) Must be completed by, or under the direct supervision of, a *Qualified Person*. The Development Officer may request proof of qualifications in a format suitable to the Development Officer.
(b) The study must be based on the solar position data for the date and times described in Table A2-1.5. Additional times and/or dates may be requested by the Development Officer.
(c) A proposed development is deemed compliant where:
i. no portion of an *identified area* is shadowed by *net-new shadow* for more than four continuous hours; and
ii. every portion of an *identified area* receives at least six hours of total sunlight exposure.
(d) The Municipality reserves the right to verify that the shadow study complies with these terms through a peer review conducted by an external organization at the proponent's expense.

Analysis Requirements

3 The shadow analysis must be conducted through 3-dimensional (3D) computational simulation tools. The tool(s) used must meet the following criteria:

(a) Accurately locate the sun's position using a site-specific elevation, latitude and longitude at the times defined in Table A2-1.5 for the year of the initial submission.
(b) Clearly differentiate existing shadow from *net-new shadow* which is newly created by the proposed development.
(c) Where required, properly account for topographic changes including self-shadowing effects of the terrain.

4 To capture the full extent of possible shadowing on *identified areas*, the simulated domain should extend at a minimum:
(a) 5 times the proposed *building height* to the north, east and west from the boundaries of the proposed development; and

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(b) 2 times the proposed *building height* to the south.

5 All buildings which currently exist on and off-site, and any buildings that have an approved development permit within the distances identified in section **4** shall be deemed sources of existing shadow.

6 Trees, hedges and other landscaping as well as small scale ground-level shading structures (pavilions, pergolas, etc.) shall not be included in the simulations.

7 Changes in ground topography within the distances identified in section **4** shall be included in the shadow analysis and shall employ topographic data made available through the *HRM Open Data Portal*. The submission of a flat ground surface shall be considered under the following conditions:

(a) Where the average slope of land within the distances identified in section **4** is less than 5%; or
(b) Where the overall change in elevation within the distances identified in section **4** is less than 2.0m.

8 The 3D model of the proposed development shall be modelled so that all building features, aside from those identified in the Exemptions, are included and treated as opaque.

9 Where rooftop features including penthouses, screening, HVAC equipment, non-occupied architectural features, elevator overruns and stair enclosures are within 5 times their height from the rooftop of the north, east or west edges of the roof or within 2 times their height from the rooftop of the south edge of the roof, they shall be included in the 3D model and treated as opaque.

Refer to Diagram A2-1.5 for a sample illustrating the concepts included above.

Deliverable Requirements

10 One shadow diagram shall be produced for each test time as provided in Table A2-1.5 illustrating the existing and net-new shadows predicted at that time. All diagrams shall:

(a) Be presented with at most two images per page (11”x17” page size)
(b) Be at an appropriate scale to illustrate the entire test area and avoid shadows being “cut off”.
(c) Be oriented such that *Astronomic North* is “up” on the page.
(d) Show existing, proposed, and approved but not constructed buildings in contrasting colours.
(e) Show existing and net-new shadows in contrasting colours.
(f) Include outlines of all streets (at the curb) and labels for streets.
(g) Show and identify property boundaries of the proposed development.
(h) Outline and label all *Identified Areas*.

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(i) Select colours for the above that maximize contrast for readers, including those with forms of colour blindness.
(j) Include a legend describing the above.
(k) Include a north arrow and metric scale bar.
(l) Include a title bar with the time and date the image represents as well as the name of the individual and firm who prepared the shadow drawing.

11 The diagrams must be submitted along with a technical report stamped and signed by a *Qualified Person* which includes the following:

(a) Contact information of the firm and author(s) of the report.
(b) Confirmation of the latitude and longitude used for the analysis.
(c) The source(s) of information used to generate 3D models of the existing and proposed buildings as well as surface topography, if used. For measured data (e.g. LiDAR data) horizontal and vertical accuracy should also be included.
(d) If a flat ground surface was used, a description of why this was considered appropriate and how building heights were corrected to account for the flattened ground surface.
(e) Elevation and isometric views of the full 3D model of the proposed development with the *Building Height* indicated.
(f) An isometric view of the full 3D analysis.
(g) A description of how *Astronomic North* was determined and any corrections that were needed to the sources described above.
(h) A narrative summarizing how the proposed development meets the standards.

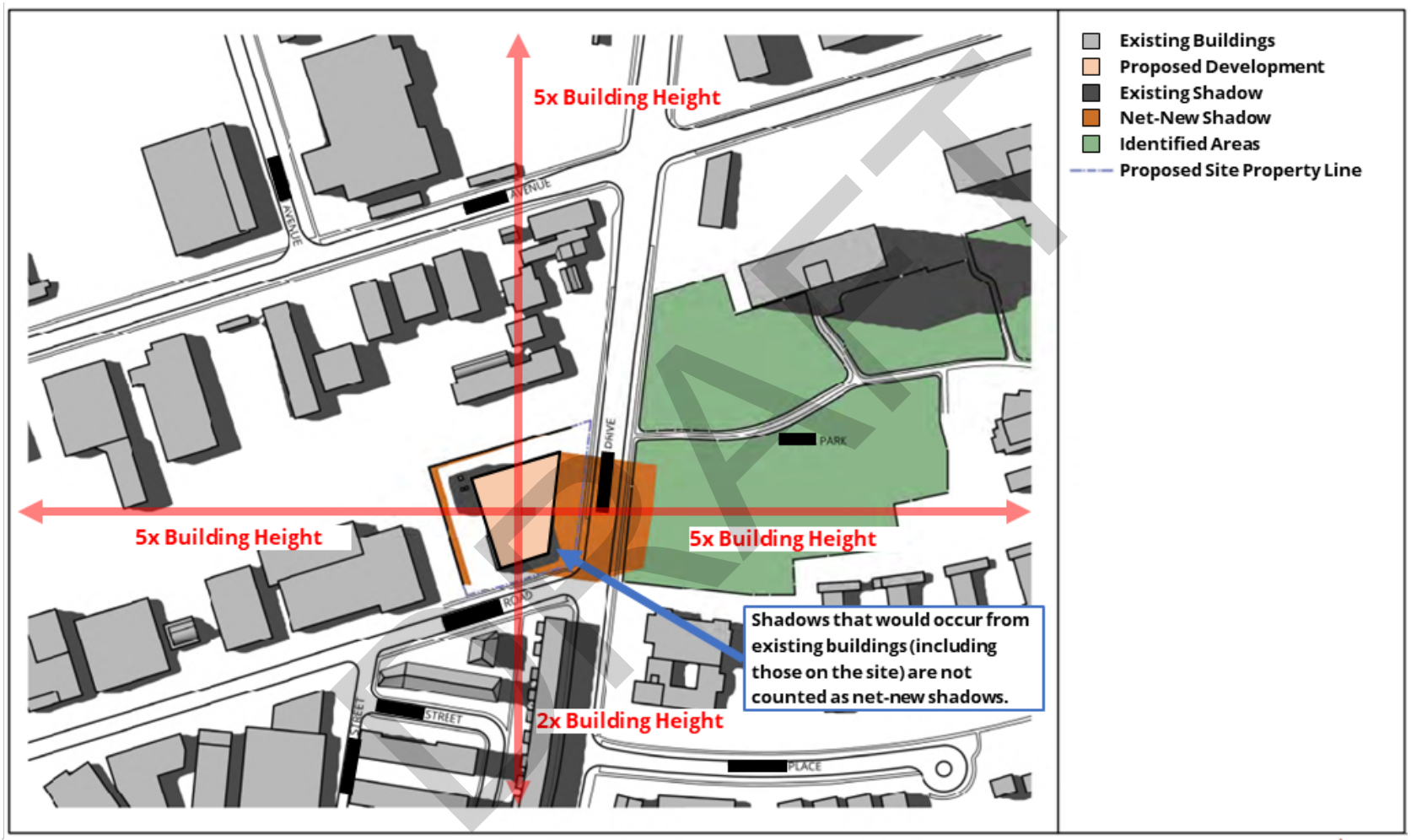
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Table A2-1.5: Test Times, September 21

Date: September 21
Time (ADT / UTC-3)
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18:00

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Diagram A2-1.5



Sun/Shadow Analysis

Proposed Site Configuration | Sept. 21 18:00 ADT

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