

Tree Canopy Cover Calculation Methodology

In order to develop a plan for targeting up to 40% of tree canopy cover on the Ottawa Hospital New Civic Development Site, we established an average canopy width at maturity for the proposed trees based on four trees recommended by the following City of Ottawa website.

<https://ottawa.ca/en/living-ottawa/environment/trees-plants-and-forests/plants/garden-care#native-plants>

That resulting canopy diameter upon averaging the following four trees was 12m. See mature width in feet below and the rate of growth as per selectree.calpoly.edu, below.

Tree - Mature Width (40-Years Growth)	Mature Width * (in Feet)	Growth Rate * (Inches / Year)
Acer rurbum - 40'	40	36
Quercus rubra - 70' (50'-70')	60	30
Betula papyrifera - 35' (25'-35')	30	36
Prunus serotina - 30' (25'-30')	27.5	30

Average Shade Tree	39.375	33
in Meters	12.001	

* Source: <https://selectree.calpoly.edu/>

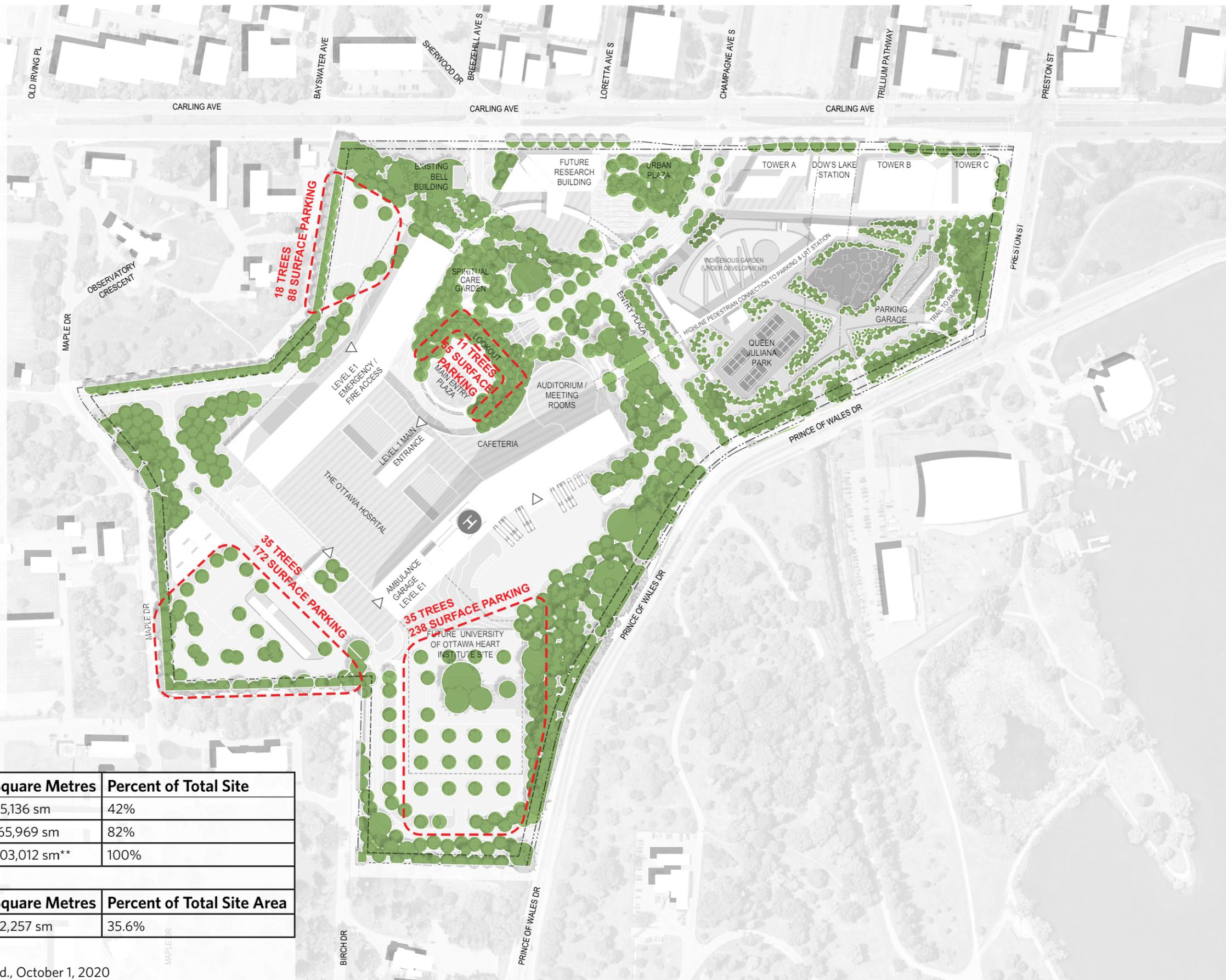
Our workflow consisted of the following to apply the findings above to the New Civic Development Site.

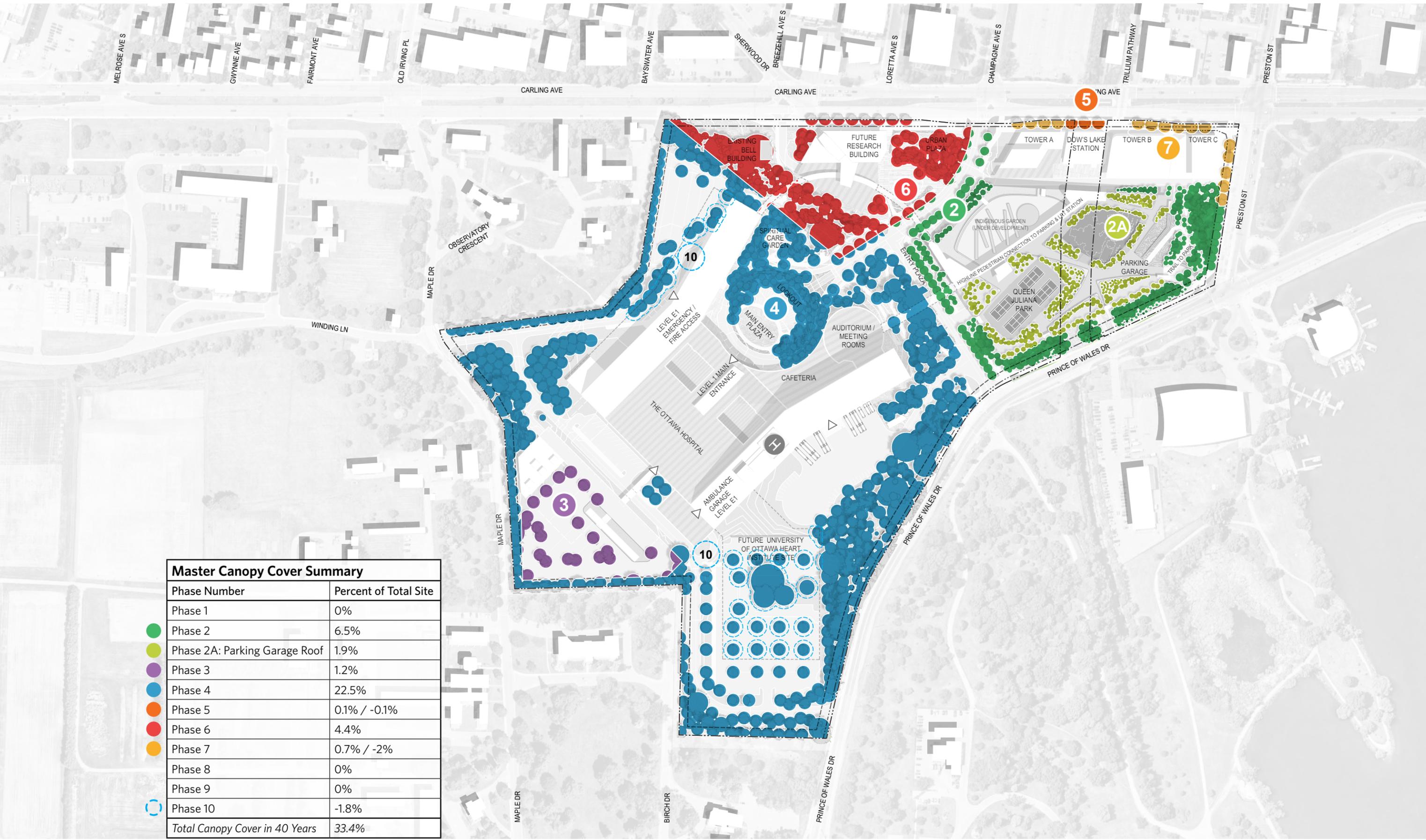
- With the use of grasshopper, we inserted new circles at this 12m diameter at the center of all proposed trees.
 - We did not apply a growth factor to the existing trees because we were not sure what that growth factor would be. This is a conservative approach.
- We took the area of the new trees and divided it by the overall area of the site, and that results in the tree canopy coverage in 40 years.
- Due to the nature of the development on-site, we are planning on a 30% tree canopy cover in 40 years. Additional tree canopy cover will come from the trees on the roof, which are not factored into this estimate at this time.

Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Building Coverage	85,136 sm	42%
Open Space	165,969 sm	82%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Tree Canopy Cover Target in 40 Years	72,257 sm	35.6%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020





Master Canopy Cover Summary

Phase Number	Percent of Total Site
Phase 1	0%
Phase 2	6.5%
Phase 2A: Parking Garage Roof	1.9%
Phase 3	1.2%
Phase 4	22.5%
Phase 5	0.1% / -0.1%
Phase 6	4.4%
Phase 7	0.7% / -2%
Phase 8	0%
Phase 9	0%
Phase 10	-1.8%
Total Canopy Cover in 40 Years	33.4%

Tree Canopy Cover Calculation Methodology

In order to develop a plan for targeting tree canopy cover of up to 40% of the Phase 2 Parking Garage site, we established tree canopy diameters at 2/3 maturity for each proposed tree. The tree canopy is comprised of 1) existing trees to remain and 2) 35 different proposed tree species as outlined in the plant list below. The tree species are selected based on the ecology and culture of Ottawa. Ottawa is in the Eastern Great Lakes Lowlands Region of the Mixed Wood Plains Ecozone, dominated by sugar maple, red oak, basswood, white pine, birch, and other species. Proposed tree and canopy diameters at 2/3 maturity in the table below.

Trees	Botanical/Common	Tree Diameter at 2/3rd Maturity
Large Trees		
AN	Acer nigrum / Black Maple	7m
AR	Acer rubrum / Red Maple	7m
AS2	Acer saccharinum / Silver Maple	8m
AS	Acer saccharum / Sugar Maple	7m
AC5	Acer saccharum 'Caddo' / Caddo Sugar Maple	7m
CO2	Carya ovata / Shagbark Hickory	7m
EXT	Existing Tree / Existing Tree	7m
GT	Gleditsia triacanthos / Honey Locust	7m
GK	Gymnocladus dioica / Kentucky Coffeetree	7m
JN	Juglans nigra / Black Walnut	7m
MA	Magnolia acuminata / Cucumber Tree Magnolia	6m
QA	Quercus alba / White Oak	7m
QM	Quercus macrocarpa / Burr Oak	7m
QR	Quercus rubra / Red Oak	8m

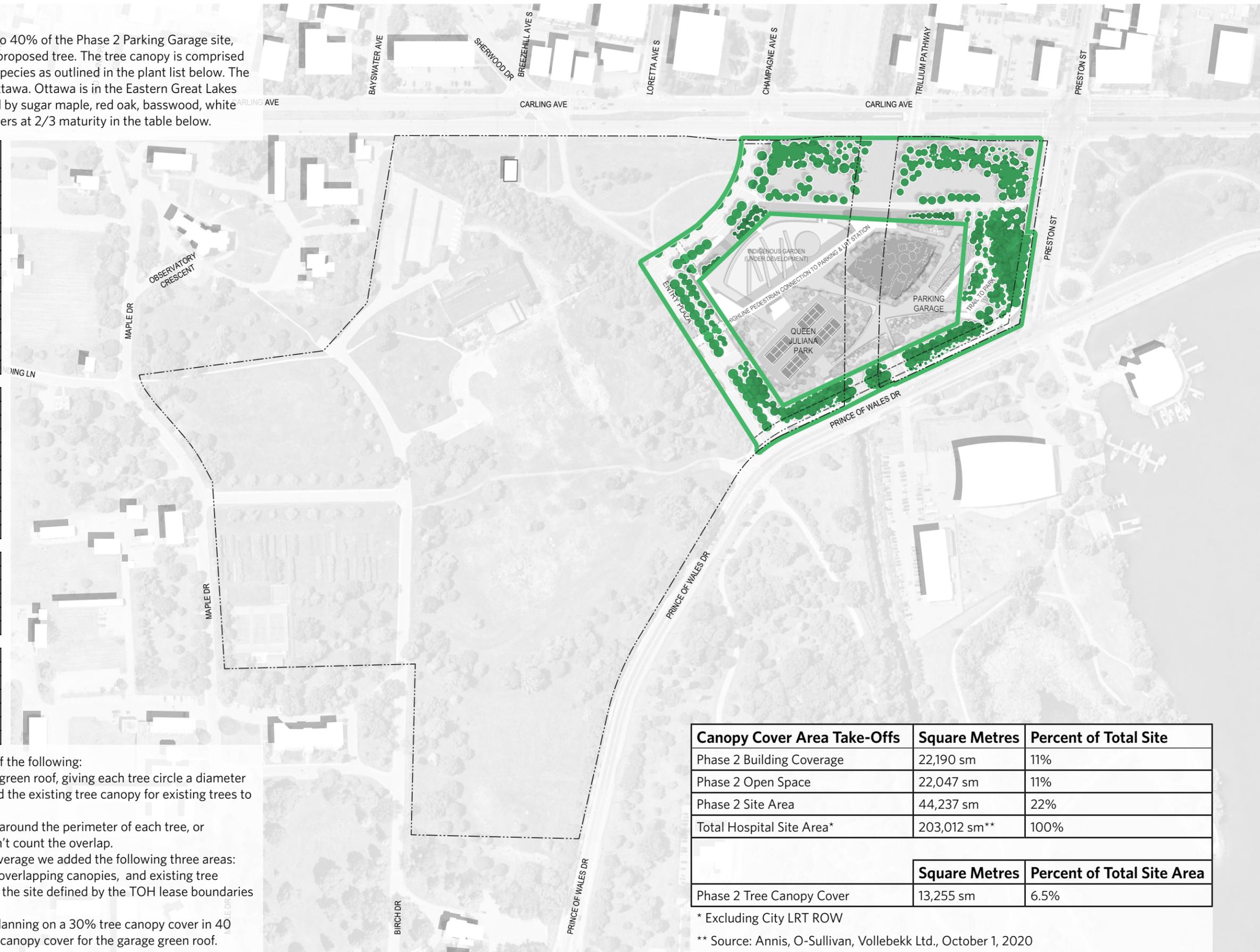
Medium Trees	Botanical/Common	Symb dia.
AP	Acer pensylvanicum / Striped Maple	5m
BL	Betula lenta / Sweet Birch	5.5m
BN	Betula neolaskana / Alaska Birch	5.5m
BN2	Betula nigra / River Birch Multi-Trunk	5m
BP3	Betula papyrifera / Paper Birch	6m
BP4	Betula populifolia / Gray Birch	5.5m
CO	Celtis occidentalis / Common Hackberry	5m
OV	Ostrya virginiana / American Hophornbeam	4m
PT	Populus tremuloides / Quaking Aspen	5m
PC	Populus x canadensis / Canada Poplar	5m

Conifers	Botanical/Common	Symb dia.
JE	Juniperus virginiana / Eastern Redcedar	5m
LL	Larix laricina / Tamarack	4m
PG	Picea glauca / White Spruce	3m
PS	Pinus strobus / White Pine	5m
TO	Thuja occidentalis / Northern White-Cedar	5m

Small Trees	Botanical/Common	Symb dia.
AS3	Acer spicatum / Mountain Maple	4m
AC2	Amelanchier canadensis / Canadian Serviceberry	3m
BP	Betula papyrifera / Paper Birch	4m
BP2	Betula papyrifera / Paper Birch	4.5m
CE	Cercis canadensis / Eastern Redbud	3m
CA	Cornus alternifolia / Alternate-leaved Dogwood	3m

To apply the method described above, our workflow consisted of the following:

1. Placed proposed trees on the ground plane and garage green roof, giving each tree circle a diameter that equates to 2/3 maturity for each species. We used the existing tree canopy for existing trees to remain, without applying a future growth factor.
2. To find the area of the tree canopy, we drew a polyline around the perimeter of each tree, or groupings of trees with overlapping canopies so we don't count the overlap.
3. To find the ground plane and green roof tree canopy coverage we added the following three areas: individual proposed tree canopies, tree groupings with overlapping canopies, and existing tree canopies to remain. We divided this sum by the area of the site defined by the TOH lease boundaries (excluding the City-owned LRT area).
4. Due to the nature of the development on-site, we are planning on a 30% tree canopy cover in 40 years for the ground plane, and approximately 8% tree canopy cover for the garage green roof.



Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 2 Building Coverage	22,190 sm	11%
Phase 2 Open Space	22,047 sm	11%
Phase 2 Site Area	44,237 sm	22%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 2 Tree Canopy Cover	13,255 sm	6.5%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020

Tree Canopy Cover Calculation Methodology

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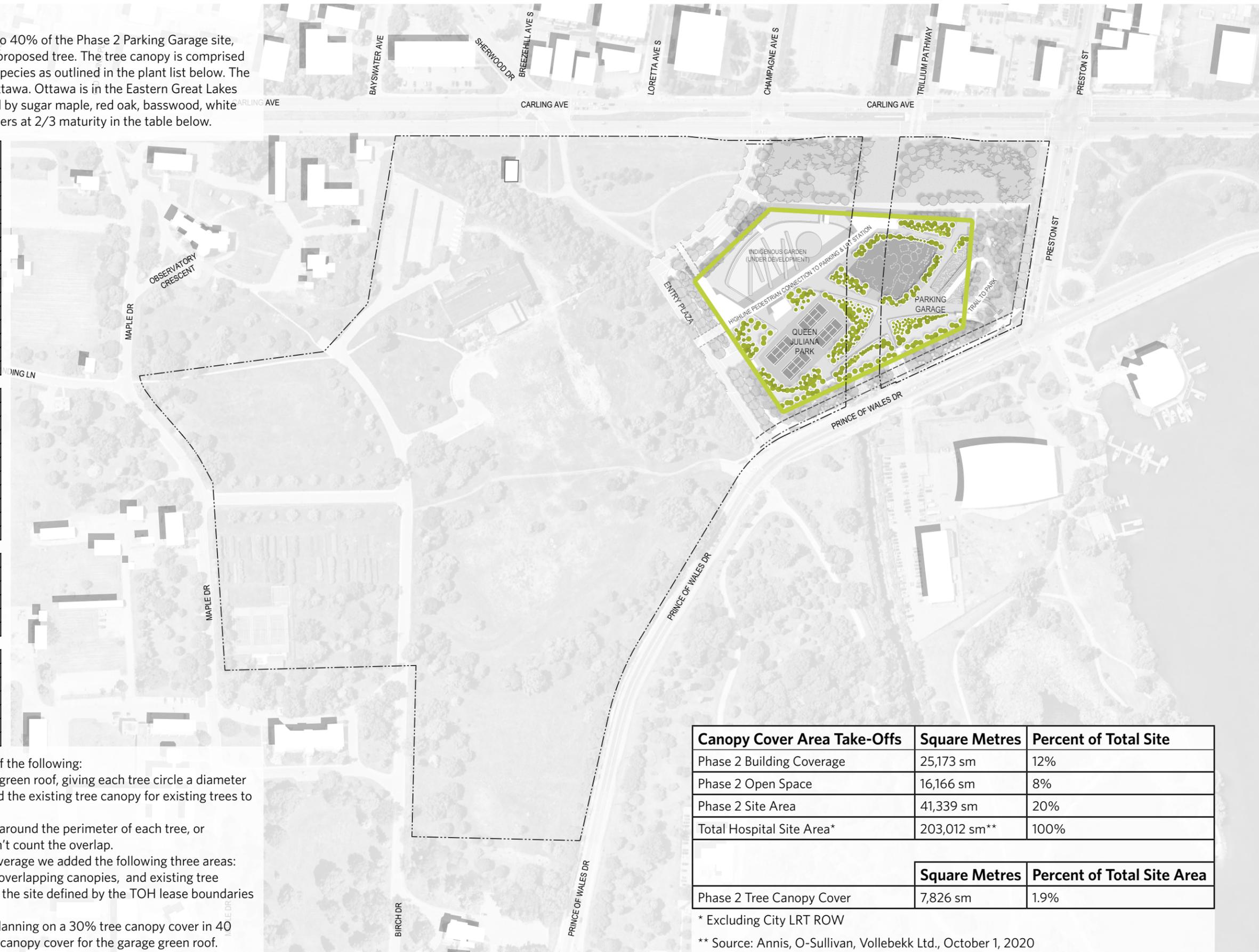
Medium Trees	Botanical/Common	Symb dia.
AP	Acer pensylvanicum / Striped Maple	5m
BL	Betula lenta / Sweet Birch	5.5m
BN	Betula neolaskana / Alaska Birch	5.5m
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- Due to the nature of the development on-site, we are planning on a 30% tree canopy cover in 40 years for the ground plane, and approximately 8% tree canopy cover for the garage green roof.



Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 2 Building Coverage	25,173 sm	12%
Phase 2 Open Space	16,166 sm	8%
Phase 2 Site Area	41,339 sm	20%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 2 Tree Canopy Cover	7,826 sm	1.9%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020

Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 3 Building Coverage	2,143 sm	1%
Phase 3 Open Space	10,234 sm	5%
Phase 3 Site Area	12,377 sm	6%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 3 Tree Canopy Cover	2,388 sm	1.2%

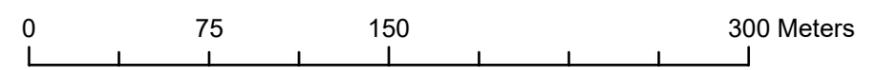
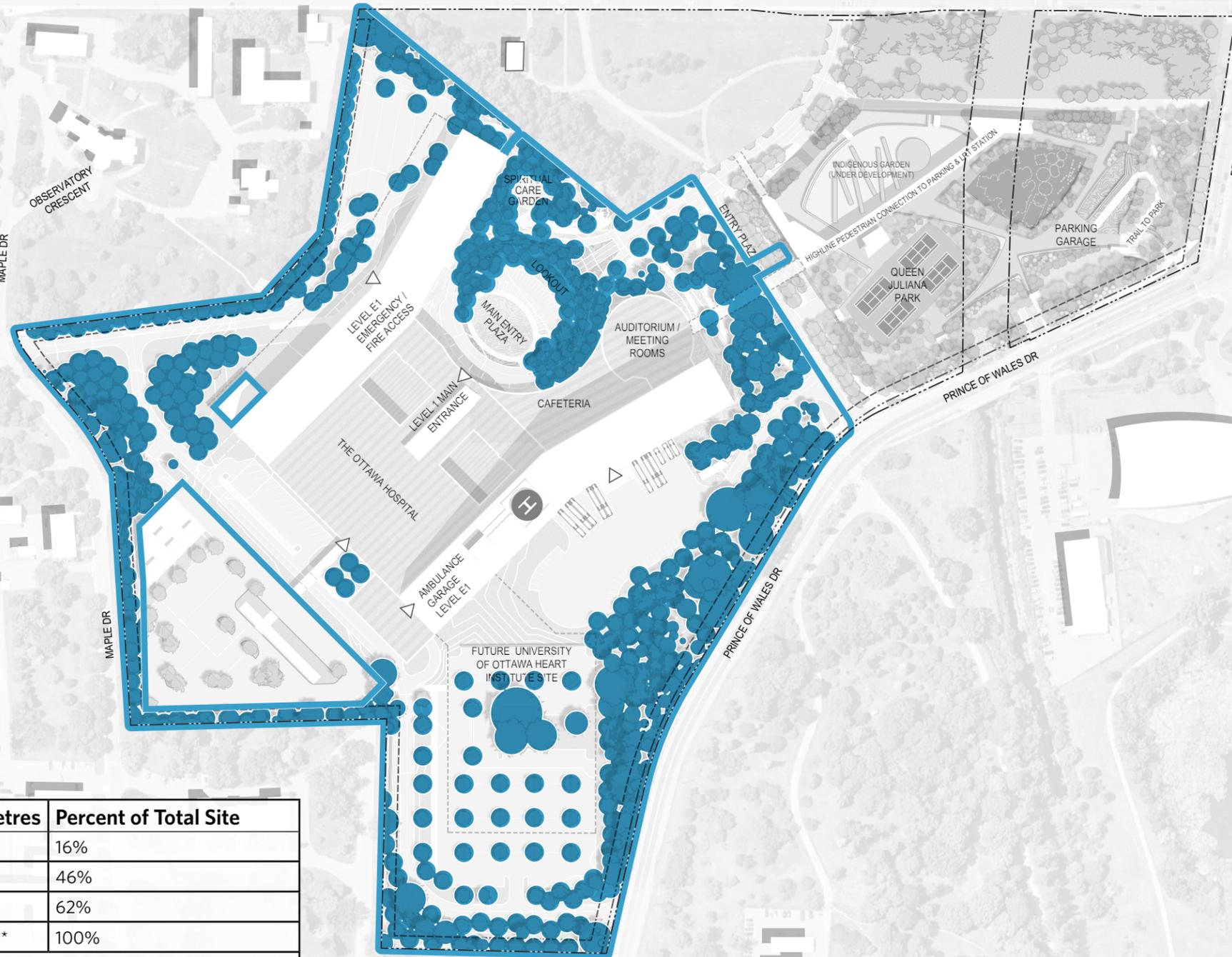
* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020

Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 4 Building Coverage	32,870 sm	16%
Phase 4 Open Space	93,570 sm	46%
Phase 4 Site Area	126,440 sm	62%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 4 Tree Canopy Cover	45,767 sm	22.5%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020

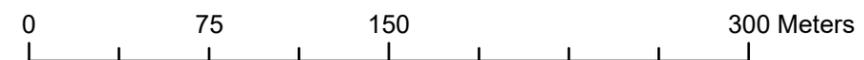


Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 5 Building Coverage	921 sm	0.5%
Phase 5 Open Space	556 sm	0.3%
Phase 5 Site Area	1,476 sm	1%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 5 Tree Canopy Cover	189 sm	0.1%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020

NEW CIVIC DEVELOPMENT FOR THE OTTAWA HOSPITAL
MASTER CANOPY COVER PLAN: PHASE 5
 FEBRUARY 28, 2021



Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 6 Building Coverage	4,133 sm	2%
Phase 6 Open Space	15,162 sm	7%
Phase 6 Site Area	19,295 sm	10%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 6 Tree Canopy Cover	9,026 sm	4.4%

* Excluding City LRT ROW

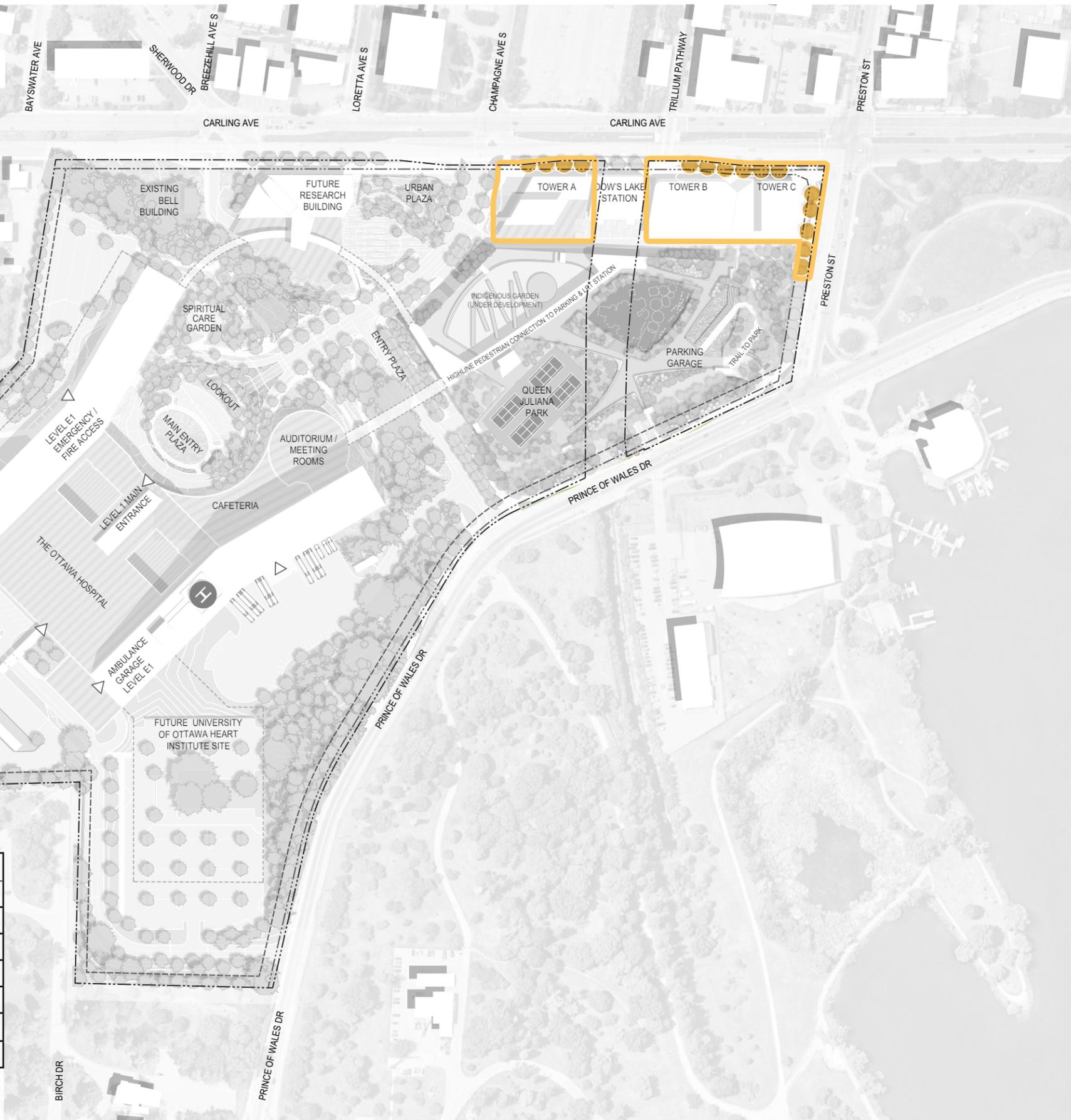
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Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 7 Building Coverage	5,571 sm	3%
Phase 7 Open Space	4,041 sm	2%
Phase 7 Site Area	9,612 sm	5%
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 7 Tree Canopy Cover	1,455 sm	0.7%

* Excluding City LRT ROW

** Source: Annis, O-Sullivan, Vollebakk Ltd., October 1, 2020



Canopy Cover Area Take-Offs	Square Metres	Percent of Total Site
Phase 10 Building Coverage	15,477 sm	8%
Phase 10 Open Space	15,477 sm	8%
Phase 10 Site Area	-	-
Total Hospital Site Area*	203,012 sm**	100%
	Square Metres	Percent of Total Site Area
Phase 10 Tree Canopy Cover	(3,652) sm	-1.8%

* Excluding City LRT ROW

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