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TO: Planning Commission Ordinance Committee
FROM: Scott Gustin
DATE: March 2, 2017
RE: Green Roofs & Lot Coverage

At its January 10, 2017 meeting, the Planning Commission discussed the green roof zoning amendment forwarded by the Ordinance Committee. That amendment provided 100% lot coverage credit for fully at-grade green roofs, no lot coverage credit for fully above-grade green roofs, and partial lot coverage credit for partially at-grade green roofs. There was consensus as to the treatment of fully at- or above-grade green roofs. There was significant difference of opinion as to the treatment of partially at-grade green roofs. As forwarded by the Ordinance Committee, partially at-grade green roofs would receive lot coverage credit for at-grade portions of the green roof and none for above-grade portions. There was concern as to the variability of making such calculations, particularly in light of myriad iterations of partially at-grade green roofs. There was also a strong sense that partially at-grade green roofs should receive some consistent measure of incentive so long as they are accessible. The discussion also cited the need to define “green roof.” The Planning Commission sent the amendment back to Ordinance Committee for further discussion.

As part of its previous discussion of the amendment, the Ordinance Committee considered green roof guidelines from other municipalities in the United States. Examples of lot coverage credit for green roofs abounded, and almost all of them provided a set credit (i.e. 50%, 75%, etc. lot coverage credit). This set credit standard is consistent with the green roof lot coverage proposal by the UVM Medical Center that imitated this amendment.

The green roof lot coverage credit as revised by staff below incorporates the following:

- A set lot coverage credit
- Recognizes extensive vs. intensive green roofs
- Is contingent on accessibility
- Defines “green roof”

Proposed Ordinance Language:

Sec. 5.2.3, Lot Coverage Requirements

(b) *Exceptions to Lot Coverage*

(1)-(8) as written.

(9) For the purposes of lot coverage calculations, at-grade green roofs shall be counted as open space, and above-grade green roofs shall be counted as lot coverage. Partially at-grade green roofs shall be counted as lot coverage unless open and accessible to the public. Partially at-grade green roofs open and accessible to the public will be counted as lot coverage as follows:

- i. Intensive green roofs will be counted at 50% lot coverage of their total roof area.
- ii. Extensive green roofs will be counted at 75% lot coverage of their total roof area.
- iii. Walkways, equipment, and other un-vegetated areas within the green roof shall not receive lot coverage credit.
- iv. These lot coverage exceptions are contingent on continued maintenance and functionality of the green roof.

ARTICLE 13: DEFINITIONS

Green roof: A contained green space planted over a synthetic waterproofed membrane created by adding layers of growing medium and plants on top of a traditional roofing system which also includes a layer for drainage. The green space on the roof may partially or completely cover the traditional roofing system. There are two types of green roofs: extensive and intensive. Extensive green roofs generally have a soil depth of less than six inches, require little maintenance, and are lightweight. Intensive green roofs typically have a soil depth of more than six inches, require more frequent maintenance, and are heavier than extensive green roofs. In order to be classified as an intensive green roof for lot coverage credit, the green roof must have a minimum soil depth of six inches.

Some questions remain as to accessibility. Accessible by whom? As drafted above, accessibility is for the general public. Can it be accessible exclusively to the property owner? The property owner and tenants only? If it needs to be accessible to the general public, is such amendment appropriate in the residential zoning districts?

For reference, information as compiled by the American Planning Association planning advisory service is below:

Local ordinances: lot coverage calculations for green roofs

Asheville (North Carolina), City. 2016. *Code of Ordinances*. Chapter 7: Development.

Article XI: Development and Design Standards. Section 7-11-4 Open space standards.

- Green space standard: green roofs may be used for up to 100% of open space standard, at discretion of city.
- *Land used for stormwater retention, provided such land is natural in appearance and is not separately fenced, may be used for up to 50 percent of the required open space; green roofs are eligible to be counted as open space under this provision. Additionally, land used for stormwater retention, provided such land is natural in appearance and is not separately fenced, that is developed using best management practices (e.g., constructed wetlands, rain gardens, green roofs or similar features), and either exceeds the required amount of retention or treats off-site stormwater may be used for up to 100 percent of the required open space at the discretion of the planning and development director after consultation with the city engineer.*

Austin (Texas), City of. 2016. *Land Development Code*. Title 25: Land Development.

Chapter 25-2: Zoning. Subchapter E: Design Standards and Mixed Use. Article 2: Site Development Standards. Section 2.7: Private Common Open Space and Pedestrian. Section 2.7.3: Standards. Part D: Design Criteria. See, also:

Environmental Criteria Manual. ECM Appendix W: Vegetated ("Green") Roof Performance Standards.

- Allows for up to 50% of required private common open space can be located on green roof. Performance standards, in Appendix W.
- *Up to 50 percent of the required private common open space may be located on a roof, balcony, or other area above ground level if at least 50 percent of the open space above ground level is designed as a Vegetated or Green Roof. For the purpose of this section, a Vegetated or Green Roof is an assembly or system, over an occupied space, that supports an area of planted bed(s), built up on a waterproofed surface at any level that is contained separately from the natural ground by a human-made structure. A Vegetated or Green Roof must comply with the performance standards adopted by rule.*

Aventura (Florida), City of. 2016. Code of Ordinances. Chapter 14: Buildings and Building Regulations. Article VI: Green Building Program. Section 14-115: Incentives and bonuses; agreement and bond requirements.

- Green roof bonuses given in context of LEED standards.
- Lot coverage bonus provided that a green roof and/or green rooftop amenities are provided and maintained for the common benefit of building occupants; and; that increased Florida-Friendly tree canopy and Florida-Friendly plantings designed to calm the heat island effect are located on site, all in an amount equal to the requested increased lot coverage, using the conditional use approval standards in section 31-73 of the City Code rather than the variance approval standards in section 31-76 of the City Code.

Bothell (Washington), City of. 2016. Municipal Code. Title 12: Zoning. Chapter 12.52: Fitzgerald/35th Avenue SE Subarea Regulations. Section 12.52.040: Preservation of the hydrologic cycle within the North Creek Fish and Wildlife Critical Habitat Protection Area (NCFWCHPA). Part D: Supplemental Low Impact Storm Drainage Standards. Subpart 2(d): Vegetated Roofs. See also, Bothell, City of. 2015. Design and Construction Standards and Specifications. Chapter 7: Low Impact Development Supplement. Topic 2.6 LID BMP #4: Vegetated Roofs.

- Vegetated roofs are encouraged, and credits are given on an ad hoc basis.
- Standards are per a regional/state plan would need similar standards to replicate this system.
- Vegetated roof credit is "encouraged," but credit on "case-per-case basis."

Brooksville (Florida), City of. 2014. Code of Ordinances. Subpart B: Land Development Code. Article IV: General Requirements and Supplemental Regulations. Section 4-8.36: Green Roof. Article XI: Definitions. Part 11-1: Contents.

- Includes broad standards for roof (no irrigation with potable water, etc.). Defines "intensive" versus "extensive" green roofs.
- Green roof. *A contained green space (also known as an eco-roof, living or vegetated roof) planted over a synthetic waterproofed membrane created by adding layers of growing medium and plants on top of a traditional roofing system which also includes a layer for*

drainage. The green space on the roof may partially or completely cover the traditional roofing system. There are two types of green roofs: extensive and intensive. Extensive green roofs generally have a soil depth of less than six inches, require little maintenance, and are lightweight. Intensive green roofs typically have a soil depth of more than six inches, require more frequent maintenance, and are heavier than extensive green roofs. In order to be classified as an intensive green roof for open space credit, the green roof must have a minimum soil depth of six inches.

- Part (f) *The area taken up by the portion of a roof which is comprised of a green roof shall constitute open space for a maximum credit of 50 percent for extensive green roofs and a maximum credit of 75 percent for intensive green roofs towards the open space required on site.*

Chico (California), City of. 2016. *Municipal Code*. Title 15: Water and Sewers. Chapter 15.50: Storm Water Management and Discharge Controls. Section 15.50.08: Post construction storm water management.

- Square footage calculation, with green roof
- One of the mitigation measures is a green roof. Site Design Measures: *All projects that create and/or replace (including projects with no net increase in impervious footprint) between 2,500 square feet and 5,000 square feet of impervious surface, including detached single family homes that create and/or replace 2,500 square feet or more of impervious surface and are not part of a larger plan of development are required to implement one or more of the following site design measures to reduce project site runoff.*
- One of the measures allowed for impervious mitigation requirement: *Green roof, a vegetated, open-channel management practice designed specifically to treat and attenuate storm water runoff;*

Doral (Florida), City of. 2016. *Code of Ordinances*. Chapter 71: Landscaping and Buffers. Article IV: Green Roofs. Section 71-251: Area of "green roof"

- Neither defines green roof, nor gives standards. Offers open space incentives.
- *For multi-family, non-residential uses and mixed-uses, the area of a "green roof" may be counted as open space for the purpose of meeting the open space requirements herein. Green roof area may be substituted for ground level open space at a ratio of one square foot of open space for 1.5 square feet of green roof area. A "green roof" is defined as the area of a roof covered with soil and planted with landscape material.*

Hillsborough County (Florida). 2016. *Land Development Code*. Article VI: Design Standards and Improvement Requirements. Chapter 6.11.00: Special and Conditional Uses. Section 6.11.114: Green Roof. Article XII: Definitions. Part 12.01.00: Definitions.

- Defines standards, based on intensity of application, and requires maintenance throughout life for credit, which is 50% for shallower (extensive) and 75% for intensive (deeper).
- Definition: *Green Roof: A contained green space (also known as an eco-roof, living or vegetated roof) planted over a synthetic waterproofed membrane created by adding layers of growing medium and plants on top of a traditional roofing system which also includes a*

layer for drainage. The green space on the roof may partially or completely cover the traditional roofing system. There are two types of green roofs: extensive and intensive. Extensive green roofs generally have a soil depth of less than 6 inches, require little maintenance, and are lightweight. Intensive green roofs typically have a soil depth of more than 6 inches, require more frequent maintenance, and are heavier than extensive green roofs. In order to be classified as an intensive green roof for open space credit, the green roof must have a minimum soil depth of 6 inches.

- The area taken up by the portion of a roof which is comprised of a green roof shall constitute open space for a maximum credit of 50% for extensive green roofs and a maximum credit of 75% for intensive green roofs towards the open space required on site.

Madison (Wisconsin), City of. 2016. Code of Ordinances. Chapter 28: Zoning Code Ordinance. Section 28:211: Definitions.

- Excludes green roofs from all lot coverage calculations, but zoning code is posted as a single pdf. Perhaps easiest to download and navigate to page 320 of the PDF to find definition of "Lot Coverage."
- Lot Coverage. *The total area of all buildings, measured at grade, all accessory structures including pools, patios, etc., and all paved areas as a percentage of the total area of the lot, with the following exceptions: sidewalks or paved paths no wider than five (5) feet, pervious pavement, green roofs and decks.*

Port Orange (Florida), City of. 2016. Land Development Code. Chapter 16: Miscellaneous Regulations. Section 10: Green Roofs.

- Straightforward 1:1 provision for green roofs towards open space requirement.
- General provisions. *Nonresidential and mixed-use developments that include a green roof shall be permitted to count the green roof area toward the required open space for the development as follows:*
 - (1) *Each square foot of vegetated green roof earns a one-square-foot reduction in the required open space.*
 - (2) *Roof-top vegetation must be maintained for the life of the building. Contact information for the property owner or manager along with maintenance responsibilities shall be provided to the city with the building permit application. Green roofs are subject to periodic inspections by the community development department to ensure proper maintenance, as part of the city's commercial property maintenance program.*
 - (3) *A green roof must be certified by a licensed professional architect that it is in compliance with the Florida Building Code.*

Valparaiso (Indiana), City of. Unified Development Ordinance. Article 3 District Intensity and Bulk Standards. Section 3.207 Open Space Ratio and Landscape Surface Ratio. Part B(2): Calculation.

- Area of the green roof counts as 25% towards open space requirement.
- *LSR is calculated by dividing the total amount of landscaped and open space area on a parcel proposed for development by the area of the parcel proposed for development.*

- See Figure 3.207.B., Measurement of Landscape Surface Ratio. *Twenty-five percent of the area of a green roof counts as landscaped area in the calculation of LSR.*

Local and general standards for sloping or at grade green roofs

Bozeman (Montana), City of. 2016. *Code of Ordinances*. Chapter 38: Unified Development Code. Article 27: Park and Recreation Requirements. Section 38.27. 020: Park Area and Open Space Requirements. Part E: Residential site plans open space requirement

- At-grade and accessible green roofs count towards open space requirements.