

11. SHADOW STANDARDS

11.1. DEFINITIONS

For the purposes of this section, the following definitions shall apply:

- **Shadow:** A shadow is defined as the circumstance in which a built structure blocks the sun from the land.
- **Adverse Shadow Impact:** An adverse shadow impact occurs when the shadow cast by a proposed development falls on publicly accessible open space or other important natural features where such a shadow impact would adversely affects its use and/or the viability of existing landscaping and vegetation. For the purposes of this section, the above locations shall also be referred to as “significant public resources”.
- **Shadow Analysis:** A shadow analysis refers to a document and its supporting graphics, which illustrate how the shadow cast by a proposed development, will impact adjacent properties and land uses.

11.2. APPLICABILITY

All Level II or Level III proposals **outside the B3, B5 B6 and B7 zones** that would result in new shadows long enough to reach significant public resources (except within an hour and a half of sunrise or sunset) are required to submit a preliminary shadow analysis to the Planning Authority for review. If a preliminary analysis indicates the potential for adverse shadow impact, applicants are then required to submit a shadow analysis, as outlined below. In many cases, it may be appropriate to use the services of an architect or other professional skilled in use of computer analysis to perform a shadow analysis; however, this is not a requirement. Anyone undertaking a shadow analysis must use the longitude, latitude and time information for Portland, Maine.

11.3. REQUIRED SUBMITTALS:

Preliminary Shadow Analysis: A preliminary shadow analysis shall be required for all Level II or Level III developments that include new structures or additions to structures greater than 45 ft tall, in order to determine if additional shadow analysis is required.

- a) **Shadow Length:** The longest shadow that any structure will cast in Portland, Maine during the year (except within an hour of sunrise or sunset) is 4.26 times its height. To conduct a preliminary analysis, multiply this factor by the height of each proposed structure. If no significant public resources, as defined above, are located within that distance from the project site in any direction, no further analysis is required. If a resource is identified, the location of the site in relationship to the resource shall be evaluated to determine the potential for adverse shadow impact and the need for further analysis.

For example, if a development would result in a 48 ft tall building, its longest shadow would be approximately 192 feet. If there are no significant public resources within 192 feet of the project site, then no further shadow analysis is required.

- b) Evaluate Site Location: Because of the path that the sun travels across the sky, no shadow can be cast in a triangular area to the south of any given project site. Therefore, if the resource in question is located within that triangular area, no further shadow analysis is required. In Portland, Maine that area lies between -122 degrees from true north and 122 degrees from true north. Thus, any significant public resource would have to be at an angle from true north greater than -122 degrees or 122 degrees in order to be shaded at any time by the proposed development.
- c) Evaluate Significant Public Resource: Finally, the preliminary shadow analysis shall consider the sensitivity of the significant public resource(s) to shadow. Open spaces or natural features that require direct sunlight for a portion of the day to sustain existing vegetation or to maintain the viability of its current use (e.g. - sitting or sunning areas, public gathering spaces, turf sports fields or children's play areas) require further analysis.

Some significant open space resources may not be sensitive to sunlight, such as paved areas or landscaped areas with all shade-tolerant species. For these types of conditions, no further shadow analysis is needed.

If the above steps are not able to determine that shadows from a proposed development would not reach a shadow-sensitive significant public resource during any time of the year, a full shadow analysis is required.

11.3.1. SHADOW ANALYSIS:

A shadow analysis shall define the extent and duration of additional shadow that a proposed development would cast on significant public resources in the project vicinity during the year, along with the effect that new shadowing would have on any sun-sensitive aspects of the resource(s). Applicants are encouraged to use professional resources and/or computer analysis to calculate and graphically display shadows; especially if proposed structures are irregularly shaped or if the project site is located in a densely developed area. A shadow analysis shall include the following times of year:

- March 21st or September 21st
- June 21st
- May 6th or August 6th
- December 21st

A shadow analysis should identify the types of significant public resources, types of vegetation and common use(s) of the site, along with discussion of the corresponding sunlight requirements for each. The uses and vegetation of open space areas establish its susceptibility to adverse shadow impact. Uses that rely on sunlight include sitting areas, gardens, and play areas. Vegetation that relies on

sunlight includes tree canopy, shade-intolerant flowering plants and turf. Shadow-sensitive landscapes and uses generally require a minimum of four to six hours of sunlight a day. If necessary, applicants are encouraged to use the professional services of a landscape architect or recreation planner to inventory and assess the sensitivity of various landscape features to shadow.

In presenting the results of a shadow analysis, the following information shall be included for each date:

- Duration of incremental shadow on affected features
- Times of shadow penetration
- Description of affected features (e.g.- landscaping, seating, active uses, historic resource)
- Time of sunrise and sunset for the date being analyzed.

In addition to a narrative description, the analysis shall include clear graphic representations of the following, as applicable:

- Relationship between the project site and significant public resources,
- Calculation of the angles from north for project shadows entering and existing the affected areas of the resource(s)
- A map showing pre-development condition shadows and the incremental shadows from the proposed structure(s) on all significant public resource(s) on each representative date.
- In the case of public open space resources, a site plan of the open space should be used to illustrate the placement of incremental shadows to allow for clear presentation of any impact to sensitive features. The length of time of the project's shadows should be indicated on each map.
- Photographs of the resource(s), focusing on elements sensitive to sunlight loss that may be impacted by new shadows from the development.
- Plan of the significant public resource, showing composite shadows and the location and duration of sunlight.
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11.4. DETERMINING SIGNIFICANCE OF SHADOW IMPACT

A significant shadow impact occurs if the new shadow added by the development proposal reduces sunlight to a level where it would have an adverse impact on existing sunlight-sensitive uses. This includes but is not limited to the following scenarios:

- Substantial reduction in sunlight where a sensitive use is already subject to substandard sunlight.
- Reduction in sunlight to vegetation resulting in less available sunlight than the minimum necessary for its survival.
- Substantial reduction in the usability of an open space area.

11.5. Reserved.

11.6. ALTERNATIVES AND MITIGATION

Where an adverse shadow impact is identified, mitigation must be assessed. Types of mitigation that may be appropriate include but are not limited to relocating facilities within an open space to avoid sunlight loss, relocating or replanting vegetation, undertaking additional maintenance to reduce the likelihood of species loss, replacement facilities on another nearby site. Where affected open space is a City park, it is appropriate for the applicant to coordinate mitigation options with the Parks Division of the City of Portland Department of Public Services.

Alternatives that may reduce shadow impacts include but are not limited to

- Reorientation of the structure(s) bulk to avoid adverse shadow impacts on sensitive significant public resources.
- Reorientation of the site plan to include replacement facilities.
- Where possible, reorientation of the sun sensitive features of the resource itself.
- Incorporation of architectural design techniques and/or reflective façade materials to increase available light.