Appendix 7

Wind and Comfort Impact Analysis

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Abe Leider
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Subject: Wind and Comfort Impact Analysis of the Proposed 2190 Shattuck Avenue Project, Berkeley

Dear Mr. Leider:

This letter-report summarizes my findings concerning potential wind and comfort impacts of the proposed 2190 Shattuck Avenue Project in Berkeley. I have based this analysis on a review of project plans and sections, a site visit, and my knowledge of comfort conditions and basic building aerodynamics gained from over 40 years of wind tunnel studies and analysis of building-generated wind problems throughout the Bay Area.

Wind is an important factor in determing pedestrian comfort and safety. The Bay Area is noted for its cool, windy climate that, combined with frequent stratus clouds, can make outdoor space uncomfortably cool. The usability of outdoor space, parks and even the success of retail space is partially determined by wind conditions.

The following analysis examines wind qualitatively. The proposed project is examined to determine where the most important factors that determine wind exposure combine to accelerate winds that can adversely affect pedestrians and users of outdoor space.

PROJECT DESCRIPTION

The project site is a generally flat, roughly rectangular lot at the northwest corner of the intersection of Shattuck Avenue and Allston Way in downtown Berkeley.

The site is fully urbanized, and generally level, sloping slightly downward towards the west. The site is currently occupied by a two-story retail/commercial office structure.

The proposed building would be an 18-story mixed-use project with ground floor commercial/retail uses and 274 residential units on floors 2 through 18. Two levels of parking garage would be located below grade. Residential units would be accessed from a residential lobby on Allston Way.

The massing would consist of a low-rise base of 7 stories that would occupy almost all the site. At the eighth level the building would step back 15 feet on the south (Allston Way) side of the building and the east (Shattuck Avenue) side of the building. This setback would continue along the north side of the building, although the setback would be only 5 feet for a portion of this building face.

A mid-rise component would rise another 5 stories to a height of 120 feet. At the 12th floor the high-rise tower would extend up from the west end of the site, with the large set-back from Shattuck Avenue creating a rooftop deck. The high-rise tower at the west end of the site would reach a height of 180 feet in 18 stories.

WIND SETTING

Wind Climatology

The project site is located directly east of the Golden Gate. As the only sea-level gap in the coastal mountains, the Golden Gate is the site of strong westerly winds for much of the year as cool marine air is brought inland by lowered atmospheric pressure created by warm temperatures in the Sacramento/San Joaquin Valley to the east.

Berkeley is located at the base of the Oakland-Berkeley Hills running north-south and having a ridge line height of approximately 1500 feet. The Oakland-Berkeley Hills are a significant barrier to air flow. The Oakland-Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland.

The closest source of long-term wind data to the project site is the former Alameda Naval Air Station, located about 6 miles southwest of the project site. Records from this site shows that westerly winds are the most frequent and strongest winds during all seasons.[1] This is the primary wind direction during the spring and summer months when sea breezes

[1]Wind direction refers to the direction from which the wind is moving. Thus, a westerly or west wind moves from west to east.

predominate. A secondary maxima in wind direction frequency is evident for southerly winds. This the wind direction associated with winter storms. While the average wind speed for southerly winds is not the highest of all wind directions, this is a likely wind direction of peak winds measured over the year. Calm winds occur about 9% of the time. The annual average wind speed at Alameda Naval Air Station is 7.7 miles per hour and annual average wind speed at the project site would be somewhat less than this.

Site Analysis

The project site is generally surrounded by commercial, public and institutional land uses. To the north of the project site is the 3-story Constitution Square building and the 179-foot tall Chase Building. A five-level parking garage is located west and northwest of the project site, and the Berkeley YMCA complex occupies the west end of the project block.

The block to the south contains Hotel Shattuck, a City of Berkeley historic landmark building, whose main lobby and entrance are on Allston Way. The block is the proposed site of the 2211 Harold Way project, which would demolish two existing buildings and replace them with a proposed building that would have components of various heights, the highest portion reaching 180 feet in 18 stories.

The block south and west of the project site contains the Dharma College and the Mangalam Center.

Building heights in the vicinity range from two-story construction to the 12-story (173 and 180 feet, respectively) office towers at Center Street and Shattuck Avenue. The adjacent Hotel Shattuck Plaza is five stories in height. Most buildings around the project site are in the two- to five-story range.

The project area has no significant terrain features and gently slopes down to the west.. The project is partially wind-sheltered by existing structures for the important westerly and southeasterly wind directions.

REGULATORY FRAMEWORK

CEQA guidance does not list any specific criterion for the evaluation of wind effects of a project. Two cities in the Bay Area (City of San Francisco and City of Oakland) have established both standards and criteria for the evaluation of wind impacts. CEQA significance levels in San Francisco and Oakland are based on pedestrian hazard. For the purposes of CEQA, San Francisco and Oakland have established a pedestrian wind hazard criterion of 1 occurrence per year of winds greater than 36 mph as representing a significant adverse impact.

The above wind hazard criterion developed by San Francisco and adopted by Oakland is based on research conducted in several locations and would be appropriate for a project located in Berkeley. Since the ambient wind (undisturbed by buildings) in Berkeley seldom exceeds 36 mph, a project must substantially increase winds at pedestrian levels for this threshold to be exceeded. For this analysis, the project is considered to have a potentially significant climate impact if the exposure, orientation and massing of the structure can be expected to substantially increase ground-level winds in pedestrian corridors or public spaces near the project site.

IMPACTS

Generalized Effects of Buildings

The construction of a building or buildings results in severe distortions of the wind field because the building acts as an obstacle to wind flow. The deceleration of wind on the upwind side of the structure creates an area of increased atmospheric pressure, while an area of decreased atmospheric pressure develops on the downwind side. Accelerated winds generally occur on the upwind face of the building, particularly near the upwind corners. The downwind site has generally light, variable winds. Where two buildings are close together, the areas of accelerated wind may overlap within the gap between the two structures.

The strength of ground-level wind accelerations near buildings is controlled by exposure, massing and orientation. The potential for accelerated winds was evaluated based on a review of site exposure, building heights and building orientations to identify locations where exposure, massing or orientation to the prevailing winds would suggest that increased winds would affect pedestrian spaces.

Exposure is a measure of the extent that the building extends above surrounding structures or terrain into the wind stream. A building that is surrounded by taller structures or sheltered by terrain is not likely to cause adverse wind accelerations at ground level, while even a comparatively small building could cause wind effects if it is freestanding and exposed.

Massing is important in determining wind impact because it controls how much wind is intercepted by the structure and whether building-generated wind accelerations occur above-ground or at ground level. In general, slab-shaped buildings have the greatest potential for wind acceleration effects. Buildings that have an unusual shape, rounded faces or utilize set-backs have a lesser wind effect. A general rule is that the more complex the building is geometrically, the lesser the probable wind impact at ground level.

Building orientation determines how much wind is intercepted by the structure, a factor that directly determines wind acceleration. In general, buildings that are oriented with the wide axis across the prevailing wind direction will have a greater impact on ground-level winds than a building oriented with the long axis along the prevailing wind direction.

Project Impact Analysis

The narrow face of the building would face west which is the prevailing wind direction. The Allston Way facade of the building would face south which is historically the direction of the strongest winds in the Bay Area. Strong westerly winds generally occur during late spring through early fall and typically peak in the afternoon. Strong southerly winds occur in winter and are associated with winter storms, and can occur at any time during the day.

The west facade of the proposed building would be partially sheltered by existing parking garage and YMCA buildings that are roughly 4 stories in height. The Allston Way facade would be sheltered by the Shattuck Hotel (5 stories) and other 2 story buildings on the south side of Allston Way.

The massing of the proposed project is complex. A low-rise base of 7 stories would cover almost all the site. At the 8th level the building would step back with a mid-rise element of 5 stories. The high-rise tower would extend to 18 stories at the west portion of the site. All building faces would be somewhat discontinuous, with a cut-out along the Allston Way at the west end of the site creating a small plaza, indentations creating patio decks within the low-rise base and projections creating patio decks in the mid-rise and high-rise portions of the building.

For prevailing west winds, the project building is aligned with its narrow face towards the west, which would minimize the amount of wind intercepted by this building face. While this west facade is exposed to wind from the west above the fourth level, a setback in the facade at the lower levels and the adjacent parking garage deck would intercept wind any wind accelerations generated by this building face and would redirect it at a level well above pedestrian areas.

For southerly winds, the low-rise base would extend a couple stories above the 5-story Shattuck Hotel to the south. Because of the limited exposure of this lower base of the building, any pedestrian wind accelerations generated by the base structure building faces would be minor. The building above the low-rise base would be completely exposed to southerly winds, but because of the building massing any wind accelerations would be located over adjacent buildings or at decks/terraces with the site itself.

In summary, the lower tower would only be partially exposed to prevailing winds and would not be expected to significantly affect ground level winds. The upper portions of the building would be exposed to prevailing winds, but the massing of the project is such that the wind accelerations generated would be located over rooftops of adjacent buildings or at decks/terraces within the project itself.

Cumulative Impact Analysis

There are several developments planned or under construction near the project site. A parking garage at 2025 Center Street, in the block north of the project site is currently under construction. Naturally-ventilated parking garages generally have little wind effect as their sides are partially open so that the wind pressure differences that result in wind accelerations cannot develop, so this development would have no cumulative impacts with the proposed project.

The proposed 2129 Shattuck Avenue Project is planned for the northeast corner of Shattuck Avenue and Center Street reaching 180 feet and 16 stories. Since wind effects propagate in the down-wind direction, any wind impacts of that project would not affect the project area. Under southwesterly winds, the wind shadow created by the proposed project could extend toward the 2129 Shattuck Avenue site. The cumulative effect would be a slight reduction in wind strength at the 2129 Shattuck site.

The proposed 2211 Harold Way project would be located within the block directly south of the project site. This proposed building would have components of various heights, the highest portion reaching 180 feet in 18 stories. Since wind effects propagate in the down-wind direction, the proposed 2190 Shattuck Avenue project would not affect wind conditions at the 2211 Harold Way site. Under southwesterly wind, the wind shadow created by the 2211 Harold Way could affect parts of the 2190 Shattuck Avenue project site. The cumulative effect would be a slight reduction in wind strength at the 2190 Shattuck site.

Mitigation

The project has a complex design that avoids pedestrian impacts by elevating wind accelerations above ground level. Some of these wind accelerations will occur within decks and terraces created by the project. All rooftop decks would be windy for some wind directions and would need to be carefully landscaped to reduce wind and improve usability. Porous materials or structures (vegetation, hedges, screens, latticework, perforated or expanded metal) offer superior wind shelter compared to a solid surface, and should be used to create pockets of shelter where the most sensitive uses are proposed (sitting and dining areas, for example). Vegetation, sculptures, planter boxes, fences and hedges can

all be used to reduce winds. For safety, any outdoor furniture used on terraces that could fall over should be anchored.

I hope you find this analysis useful. Please call me if you have any questions.

Sincerely,

Donald Ballanti
Consulting Meteorologist