

## SECTION III.G WIND

### III.G.1 Introduction

This section of the EIR discusses the existing wind conditions on and around the Project site and identifies factors that determine wind exposure and changes that would result in adverse effects on pedestrian-level wind. Wind conditions can affect pedestrian safety. The analysis in this section uses wind data from studies in the Project vicinity, historic climate data, and the Final Preliminary Pedestrian Wind Assessment prepared for the Project (CPP, Inc. 2007, 2008 Addendum; refer to Appendix G). This section identifies both Project-level and cumulative environmental impacts, as well as feasible mitigation measures that could reduce or avoid the identified impacts. Project and cumulative wind conditions that could affect offshore recreation activities, such as windsurfing in the Bay near the Project site, are discussed in Section III.P (Recreation).

### III.G.2 Setting

Planetary wind systems, normally called prevailing winds, are great moving air masses that dominate whole areas and show constant directional characteristics, varying only with the movement of high or low-pressure systems and with the seasons of the year. In many locations these are the dominant winds, particularly on exposed hilltops, shorelines facing the prevailing winds, an open plain, or plateau; the floor of an open valley running parallel to the prevailing winds, or the windward side of a gently sloping hill.<sup>142</sup> Local winds, by contrast, are caused by temperature differences created by local topographic conditions. Land-sea breezes, for example, will blow from the land towards the sea by night, simply because land temperatures are more subject to change than the great mass of the ocean. Mountain and valley breezes are caused by the same local effects. On a warm sunny day, winds may rise strongly off the floor of a valley and up the slopes of adjacent hills.<sup>143</sup>

Long-term wind data in San Francisco are available from historical wind gauge records from the US Weather Bureau weather station above the old Federal Building at 50 United Nations Plaza and San Francisco International Airport (SFO). Everyday wind climatology is defined using wind statistics of anemometers (that measure wind speed) in the northern portion of the San Francisco Bay. Limited wind data is also available from wind data recorded at HPS as part of *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) monitoring.<sup>144</sup> For wind analysis along the San Francisco Peninsula, it is customary to use data from SFO. HPS and downtown Civic Center data indicate a lesser influence of northwesterly winds than at SFO. The SFO data is affected by wind northwesterly through the San Bruno Gap in San Mateo County about four miles south of the Project site.

Existing development on the Candlestick Point site includes the Candlestick Park stadium and associated paved parking areas, the CPSRA, a recreational vehicle park on Gilman Avenue, and 256 housing units

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<sup>142</sup> Butz, Stephen D., *Science of Earth Systems*, Cengage Learning, 2007.

<sup>143</sup> Butz, Stephen D., 2007.

<sup>144</sup> Refer to Section III.K (Hazards and Hazardous Materials) for description of the CERCLA monitoring process required as part of the Navy Hunters Point Shipyard remediation effort.

on the Alice Griffith public housing site. The HPS Phase II site includes many structures associated with ship repair, piers, dry-docks, ancillary storage, administrative, and other former Navy uses, largely from the World War II era. Most structures are vacant. The only structure on the Project site greater than 100 feet tall is Candlestick Park stadium, which is approximately 120 feet tall. The Alice Griffith housing consists of 33 two-story, rectangular apartment buildings sited on a small hill overlooking surrounding development. Bayview Hill rises immediately west of Jamestown Avenue, west of and uphill from the stadium. Existing development on the HPS Phase II site consists of shipyard structures ranging from one to nine stories in height. The topography of HPS is generally flat, except for the area around Building 101 at the lower slope of Hunters Point Hill (refer to Figure II-2 [Project Site and Context]).

## ■ Wind Patterns

Wind patterns at SFO indicate that the dominant wind direction is west-northwest, with winds coming out of this direction 23 percent of the time. Two-thirds of winds from this direction exceed 12 miles per hour (mph). Winds come from directly west and northwest 13 percent of the time each, so that these three wind directions (west, northwest, and west-northwest) account for roughly half of the wind patterns.<sup>145</sup> Although reliable wind data indicate that the dominant wind direction at SFO is west-northwest, it should be noted that the dominant wind direction is known to shift with locations around the Bay, including at the Project site.<sup>146</sup>

Winds can fluctuate greatly depending on the time of year and the time of day. During the winter months winds change markedly, becoming milder and less dominated by the west-northwesterly winds. Winds also change significantly during the day, typically intensifying from late morning until reaching an average peak of 20 knots (23 mph) in the late afternoon, diminishing in the evening. High winds in the San Francisco Bay are most common in the late afternoon between March and October.<sup>147</sup>

Wind data were recorded over a 16-month period from the anemometer at HPS. Those data indicate a dominance of westerly winds, a result of local topography. On the basis of available data from the sources noted above, the predominant wind directions affecting the Project site would be westerly and west-northwesterly. Given the sensitivity of street orientation to wind direction, additional data were obtained for a three-month period from downtown San Francisco wind monitoring, which data were overlain with the SFO data. These data indicate that winds from the northwest are of less concern than winds from directly west.<sup>148</sup>

Hunters Point and Candlestick Point are known to be windy locations. Wind conditions at Candlestick Point and Hunters Point are influenced by the presence of the Bayview Hill and Hunters Point Hill, both of which are directly upwind of the Project site for prevailing westerly winds. These hills tend to accelerate the wind and change its direction from west towards west-northwest, resulting in eddying (a circular motion of wind that interrupts the flow and causes turbulence), resulting in gustiness (wind speeds that momentarily increase in speed). Accelerated wind flows around these hills are most

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<sup>145</sup> CPP, Inc., *Final Report, Preliminary Pedestrian Wind Assessment Candlestick Point and Hunters Point Developments, San Francisco California*, June 2007. (CPP, Inc., June 2007).

<sup>146</sup> CPP, Inc., June 2007.

<sup>147</sup> CPP, Inc., June 2007.

<sup>148</sup> CPP, Inc., *June, 2007*.

pronounced at the crests and near the slopes. For dominant west winds, the primary location of concern in the Project vicinity is at the south end of the hills. The average wind speed east of these hills would be expected to be somewhat reduced, with increased turbulence because of the variable wind speed.<sup>149</sup>

The full effects of the hills on local wind patterns are difficult to predict. However, one identifiable effect is that Candlestick Point is in the wake (a downwind area of weak wind caused by a “split” of wind around a substantial obstacle) of Bayview Hill. During most afternoons and evenings from spring to fall, wake areas tend to feature lower mean wind speeds but higher turbulence or gustiness. The wake effect typically diminishes with distance from the hill. The wake effect below Hunters Point Hill is less pronounced than the same effect below Bayview Hill because of its lower elevation<sup>150</sup>.

An example of the wind effects in the Project vicinity are the wind conditions at the existing Candlestick Park Stadium. A wind tunnel study of Candlestick Park performed shortly after the existing stadium was built revealed that the turbulence resulting from Bayview Hill causes wind gusting problems at Candlestick Park stadium. This study also noted that many of the wind problems experienced in the stadium could have been avoided if the stadium and the parking lot locations had been reversed, because that would have placed the stadium farther away from the wake area of Bayview Hill, where the effect would be diminished compared to its current location. This would have resulted in a decrease in gustiness at the stadium.<sup>151</sup>

## ■ Wind Effects

Winds vary at pedestrian levels within an urban area. In San Francisco, wind speeds are generally greater, on average, along streets that run east/west, as buildings are oriented with respect to the prevailing wind direction such that they tend to funnel winds along this street orientation. Wide streets bordered by tall buildings are especially vulnerable to wind funneling. The impact of wind funneling can often be reduced by the presence of tall, bushy trees along streets susceptible to wind to force the wind to stay above street level. Streets running north-south tend to have lighter winds, on average, due to the shelter from prevailing winds offered by buildings on the west side of the street. Winding streets that do not follow a grid pattern also tend to have lighter winds at pedestrian level, as the building orientations generally keep high winds above the buildings.<sup>152</sup>

Wind conditions can affect pedestrian safety on sidewalks and in other public areas. Winds up to 4 mph have no noticeable effect on pedestrians. Winds from 4 to 8 mph are felt on the face. Winds from 8 to 13 mph disturb hair, cause clothing to flap, and extend a light flag mounted on a pole. Winds from 13 to 19 mph raise loose paper, dust and dry soil, and disarrange hair. The force of winds from 19 to 26 mph is felt on the body. With winds of 26 to 34 mph, umbrellas are used with difficulty, hair is blown straight,

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<sup>149</sup> CPP, Inc., *June, 2007*.

<sup>150</sup> CPP, Inc., *June, 2007*.

<sup>151</sup> Cermak, J.E., Malhotra, R. C., and Plate, E. J., “Investigation of the Candlestick Park Wind Problem – Vol. II: Wind-Tunnel Model Study,” Technical Report CER63JEC-RCM-EJP27, Fluid Mechanics Program, Colorado State University, Fort Collins, Colorado, July 1963.

Garrison, J.A., “Wind-Tunnel Studies of Winds in Candlestick Park,” Technical Report CER70-71JAG-JEC5, Fluid Mechanics Program, Colorado State University, Fort Collins, Colorado, May 1970.

<sup>152</sup> CPP, Inc., *June 2007*.

walking steadily is difficult, and wind noise is unpleasant. Winds over 34 mph make it difficult for a person to maintain balance, and gusts can blow a person over.<sup>153</sup>

### III.G.3 Regulatory Framework

#### ■ Federal

There are no applicable federal regulations relating to wind.

#### ■ State

There are no applicable state regulations relating to wind.

#### ■ Local

##### **San Francisco Planning Code**

The *San Francisco Planning Code (Planning Code)* establishes wind comfort and wind hazard criteria used to evaluate new development in four areas of the City: the C-3 Downtown Commercial Districts (Section 148), the Van Ness Avenue SUD (Section 243(c)(9)), the Folsom-Main Residential/Commercial SUD (Section 249.1), and the Downtown Residential District (Section 825). As none of these areas includes the Project site, the wind comfort and wind hazard criteria established in the *Planning Code* would not be applicable. The cited *Planning Code* sections provide that any new building or addition in these areas of the City that would cause wind speeds to exceed the hazard level of 26-mph-equivalent wind speed (as defined in the *Planning Code*) more than one hour of any year must be modified to meet this criterion. (The 26 mph standard accounts for short-term—3-minute averaged—wind observations at 36 mph as equivalent to the frequency of an hourly averaged wind of 26 mph. As noted above, winds over 34 mph make it difficult for a person to maintain balance, and gusts can blow a person over.) The San Francisco Planning Department generally refers to the wind hazard criterion to determine the significance for CEQA purposes evaluate wind effects of new development in all areas of the City.

### III.G.4 Impacts

#### ■ Significance Criteria

The City and Agency have not formally adopted significance standards for impacts related to wind, but generally consider that implementation of the Project would have significant impacts if it were to:

- G.a Alter wind in a manner that substantially affects public areas

To assess whether a project would result in a significant impact under this criterion, the City and Agency uses the Planning Code's hazard standard, that is, it determines whether a project would cause equivalent wind speeds to reach or exceed the hazard level of 26 mph for a single hour of the year. If a project

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<sup>153</sup> Lawson, T.V. and A.D. Penwarden, "The Effects of Wind on People in the Vicinity of Buildings," Proceedings of the Fourth International Conference on Wind Effects on Buildings and Structures, London, 1975, Cambridge University Press, Cambridge, U.K., 605-622 1976.

would cause such an exceedance, the City and Agency requires a mitigation measure requiring that the project buildings be designed to avoid an exceedance.

## ■ Analytic Method

Ground-level wind accelerations near buildings are controlled by exposure, massing, and orientation. The Project's potential for accelerated winds was evaluated based on a review of proposed street layout, building heights, and building orientations to identify locations where exposure, massing or orientation to the prevailing winds would suggest that increased winds could affect pedestrian spaces.

Tall, slab-like buildings tend to deflect wind downward. As wind flow comes over the edge of a roof or around a corner, it separates into streams at about three-quarters of the building height.<sup>154</sup> Above this, the air flows up the face of the building and over the roof; below, it flows down to form a vortex in front of the building before rushing around the windward corners.<sup>155</sup> The resulting increased wind speeds and turbulence at ground level can represent a hazard to pedestrians. This phenomenon is greatest with a single tall building in an open area with no surrounding structures, and can vary substantially by building orientation, massing, and adjacency of other structures. A building that is surrounded by taller structures is not likely to cause adverse wind accelerations at ground level, while even a comparatively small building 100 feet tall could cause wind effects if it were freestanding and exposed.<sup>156</sup>

Massing is important in determining wind impacts 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 less noticeable wind effect. A general rule is that the more complex the building is geometrically, the less noticeable the probable wind impact at ground level.

Building orientation also affects 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.

Typically, for new buildings that would be taller than 80 feet to 100 feet, compliance with the wind thresholds can be determined through wind-tunnel testing of a scale model of a Project building and its surroundings. Project tower designs are preliminary, and wind-tunnel testing, if any, will occur prior to design approval of buildings over 100 feet. Accordingly, this EIR analysis qualitatively evaluates the Project's potential to create hazardous wind conditions at pedestrian level.

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<sup>154</sup> The exact location of this region of wind divergence depends on the effects of adjacent structures as well as the orientation of the building to the predominant wind direction; this is given as an example of potential wind action only.

<sup>155</sup> <http://www.buildinggreen.com/auth/article.cfm?fileName=180501a.xml> (accessed August 29, 2009).

<sup>156</sup> CPP, Inc., *June, 2007*.

The wind assessment prepared for the Project evaluated the proposed street alignments, overall massing of structures and location of taller buildings to identify potential wind problems, and suggested means of mitigating adverse wind impacts.<sup>157,158</sup>

Additionally, the Project's potential contribution to cumulative wind impacts are evaluated in the context of existing, proposed, and reasonably foreseeable future development expected in the Project vicinity.

## ■ Construction Impacts

The potential construction impacts due to wind have been analyzed in other sections of this EIR, where appropriate. For example, Section III.H (Air Quality) analyzes fugitive dust air emissions, and Section III.M (Hydrology and Water Quality) analyzes erosion from Project construction that could cause fugitive dust emissions.

## ■ Operational Impacts

### **Impact W-1: Wind Hazard Criterion**

#### **Impact of Candlestick Point**

**Impact W-1a**            **Implementation the Project at Candlestick Point would not include tall structures that would result in ground-level-equivalent wind speed exceeding 26 mph for a single hour of the year in pedestrian corridors and public spaces. (Less than Significant with Mitigation) [Criterion G.a]**

As explained above, building structures near or greater than 100 feet in height could create pedestrian-level conditions such that the wind hazard criterion of 26-mph-equivalent wind speed for a single hour of the year would be exceeded. There is no threshold height that triggers the need for wind-tunnel testing to determine whether the building design would result in street-level winds that exceed the standard. It is generally understood, however, from many prior wind-tunnel tests on a variety of projects in San Francisco that most, if not all, buildings under 100 feet do not result in adverse wind effects at street level, barring unusual circumstances.

The proposed building heights in the Candlestick Point development would range from 65 feet in the northwest and western portions of the Candlestick Point site, and 85 feet to 140 feet further east. The Project would also include up to 11 residential towers ranging from 170 feet to 420 feet in height (refer to Figure II-5 [Proposed Maximum Building Heights]). Based on the site map, due to the orientation of the street grid, buildings in the 65- to 85-foot height areas would not be substantially exposed to predominant west and northwest winds, nor would buildings in that height range create substantial wind funneling effects.<sup>159</sup>

Project structures approaching or over 100 feet would be located toward the interior of the development to maximize compatibility with existing adjacent neighborhoods. The CP North district would contain up

<sup>157</sup> CPP, Inc., *June, 2007*.

<sup>158</sup> CPP, Inc., *Preliminary Pedestrian Wind Assessment: Response to Comments Candlestick Point and Hunters Point Development, CPP Project 4139, Addendum 1*, March 10, 2008.

<sup>159</sup> Donald J. Ballanti, Certified Consulting Meteorologist, personal communication, August 31, 2009.

to five residential towers with heights from 170 feet to 270 feet. The CP South district would include six residential towers, consisting of two residential towers on the south half of the district with a maximum heights of up to 370 feet (approximately 40 stories) and one tower on the south end of the district with a maximum height of 420 feet (approximately 42 stories). The north half of the district would have three residential towers, one with maximum height up to 270 feet and two with maximum heights up to 320 feet.

The site design ensures that the towers on the Project site are not clustered, which would mitigate a number of wind effects.<sup>160</sup> In addition, the Project street pattern would have most streets oriented northwest/southeast and northeast/southwest, rather than north/south and east/west. That street pattern would not be directly exposed to prevalent westerly wind directions. The northwest-oriented streets would be exposed to northwesterly winds, but the streets would alignment would encourage the wind to flow over the top of the buildings, reducing wind speed at street level.<sup>161</sup> In the retail areas, Project features such as awnings, locating outdoor eating areas away from main crossroads areas, street plantings, articulated building façades, and screenings would reduce the effect of these winds at street level.<sup>162</sup>

Since the Project street grid would not align directly with predominant west and west-northwest wind directions, it would, not result in channeling of winds along street corridors. The street grid would orient building faces such that they would not face into the prevailing wind direction; that orientation would reduce potentially significant pedestrian-level wind acceleration. However, project structures between 100 feet and 420 feet in height would extend well above surrounding buildings and would intercept a large volume of wind. Because of that exposure, the tower structures would have the potential to accelerate winds in nearby pedestrian sidewalk areas or public open space. Project towers could affect pedestrian-level wind conditions in proposed parks—Candlestick Point Neighborhood Park; Bayview Gardens/Wedge Park; and Mini Wedge-Park—and in CPSRA areas near the towers (refer to Figure II-9 [Proposed Parks and Open Space] for Project open space areas.) Project plans have identified locations of towers, but tower designs are preliminary. The extent of changes in pedestrian-level wind conditions would be influenced by building design, such as building height, shape, massing, setbacks, and location of pedestrian areas.

As described below in MM W-1a, the design review process would include a preliminary evaluation by Agency staff to determine whether further specific study would be required. To ensure that this potential impact is reduced to a less-than-significant level, the following mitigation measure shall be implemented:

*MM W-1a      Building Design Wind Analysis. Prior to design approval of Project buildings, if recommended by Agency staff, the Applicant shall retain a qualified wind consultant to provide a wind review to determine if the exposure, massing, and orientation of the building would result in wind impacts that could exceed the threshold of 26-mph-equivalent wind speed for a single hour during the year. The wind analysis shall be conducted to assess wind conditions for the proposed building(s) in conjunction with the anticipated pattern of development on surrounding blocks to determine if the Project building(s) would cause an exceedance of the wind hazard standard. The analysis shall be conducted*

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<sup>160</sup> CPP, Inc., June, 2007.

<sup>161</sup> CPP, Inc., June, 2007.

<sup>162</sup> CPP, Inc., June, 2007.

*as directed by the City's wind study guidelines, including, if required, wind tunnel modeling of potential adverse effects relating to hazardous wind conditions. The Agency shall require the Applicant to identify design changes that would mitigate the adverse wind conditions to below the threshold of 26-mph-equivalent wind speed for a single hour of the year. These design changes could include, but are not limited to, wind-mitigating features, such as placing towers on podiums with a minimum 15-foot setback from street edges, placement of awnings on building frontages, street and frontage plantings, articulation of building facades, or the use of a variety of architectural materials.*

Implementation of appropriate design changes required by mitigation measure MM W-1a would reduce hazardous wind effects at pedestrian level by forcing wind downwash to tops of podium areas and/or into the street and away from pedestrian areas. These design changes would reduce the wind hazard to below the established threshold and would ensure safety in pedestrian-access areas. With implementation of mitigation measure MM W-1a, the potential impact would be reduced to a less-than-significant level.

## **Impact of Hunters Point Shipyard Phase II**

**Impact W-1b**            **Implementation of the Project at HPS Phase II would not include tall structures that would result in ground-level-equivalent wind speed exceeding 26 mph for a single hour of the year in pedestrian corridors and public spaces. (Less than Significant with Mitigation) [Criterion G.a]**

As discussed above, building structures near or greater than 100 feet in height could have effects on pedestrian-level conditions such that the wind hazard criteria of 26-mph-equivalent wind speed for a single hour of the year would be exceeded. There is no threshold height that triggers the need for wind-tunnel testing to determine whether the building design would result in street-level winds that exceed the standard. It is generally understood, however, from years of wind-tunnel testing on a variety of projects in San Francisco, that most, if not all, buildings under 100 feet do not result in adverse wind effects at street level barring unusual circumstances.

The proposed building heights for HPS Phase II would be 65 feet in most portions of the HPS Phase II site, with 85- to 105-foot limits farther east. HPS Phase II would include up to two residential towers ranging from 270 to 370 feet (refer to Figure II-5 [Proposed Maximum Building Heights]). The new 49ers Stadium would be approximately 156 feet to the top row of seating. Buildings in 65- to 85-foot height limit areas would not be substantially exposed to predominant west and northwest winds or wind funneling effects due to the orientation of the street grid, and would not have a significant impact on pedestrian-level wind conditions.

One residential tower with a maximum height up to 370 feet (approximately 40 stories) would be at the southeast corner of the HPS Phase II North district, adjacent to the Village Center, and a second tower, up to 270 feet would be located in the Research and Development district. Structures in the center of the Research and Development district in HPS Phase II would range from 85 to 105 feet tall. With regard to the new stadium, the top row of stadium seating would be at an elevation of approximately 156 feet (about 15 stories) above the playing field. These structures could cause acceleration of winds in nearby pedestrian sidewalk areas or public open space. Project plans have identified the locations of towers, but tower designs are preliminary. The degree of changes in pedestrian-level wind conditions would be influenced by building design, such as building height, shape, massing, setbacks, and location of pedestrian areas.

The Project street pattern would have most streets oriented northwest/southeast and northeast/southwest, rather than north/south and east/west. That street pattern would not be directly exposed to prevalent westerly wind directions. The streets in each of the sections are aligned in a manner to encourage the wind to flow over the top of the buildings, reducing wind speed at street level. In the retail areas, Project features such as awnings, locating outdoor eating areas away from main crossroads areas, street plantings, and screenings would reduce the potential adverse effects of these winds at street level.

As with development at Candlestick Point, the HPS Phase II street grid would not align with predominant west and west-northwest wind directions and would reduce the channeling of winds along street corridors. The street grid would orient building faces such that they would not face into the prevailing wind direction; that orientation would reduce potential pedestrian-level wind acceleration.

Implementation of mitigation measure MM W-1a and the appropriate design changes it requires would reduce hazardous wind effects at pedestrian level by forcing wind downwash to tops of podium areas and/or into the street and away from pedestrian areas. These design changes would reduce the wind hazard to below the established threshold, and would ensure safety in pedestrian-access areas. With implementation of mitigation measure MM W-1a, the potential impact would be reduced to a less-than-significant level.

## **Combined Impact of Candlestick Point and Hunters Point Shipyard Phase II**

**Impact W-1      Implementation of the Project would not include tall structures that would result in ground-level-equivalent wind speed exceeding 26 mph for a single hour of the year in pedestrian corridors and public spaces. (Less than Significant with Mitigation) [Criterion G.a]**

Please refer to the discussion for Impact W-1a and Impact W-1b, above. Structures above 100 feet in height and ranging up to 420 feet would extend well above surrounding buildings and would intercept a large volume of wind. Because of that exposure, the tower structures would have the potential to accelerate winds in nearby pedestrian sidewalk areas or public open space. The degree of changes in pedestrian-level wind conditions would be influenced by building design, such as building height, shape, massing, setbacks, and location of pedestrian areas. Structures nearing or over 100 feet in height could have effects on pedestrian-level conditions such that the wind hazard criteria of 26 mph for a single hour of the year would be exceeded. This is a potentially significant impact.

As discussed above, the Project street grid would not align with predominant west and west-northwest wind directions and would, therefore, not result in channeling of winds along street corridors. The street grid would orient building faces such that they would not face into the prevailing wind direction; that orientation would reduce potentially significant pedestrian-level wind acceleration. The Project street grid would not align with predominant west and west-northwest wind directions and would reduce the channeling of winds along street corridors. The street grid would orient building faces such that they would not face into the prevailing wind direction; that orientation would reduce potential pedestrian-level wind acceleration.

Implementation of mitigation measure MM W-1a would reduce the potential wind impact by requiring review by a qualified wind consultant for all buildings determined by Agency staff as potentially problematic with respect to wind and, where necessary, design changes to reduce any impact below the established threshold. Implementation of required design changes, if any, would reduce potential hazardous wind effects at pedestrian level by forcing wind downwash to tops of podium areas and/or into the street and away from pedestrian areas and would ensure pedestrian safety in pedestrian-access areas. With implementation of mitigation measure MM W-1a, the potential impact would be less than significant.

## ■ Cumulative Impacts

The geographic context for an analysis of cumulative impacts with regard to wind effects is limited to the immediate Project area. The past and present development in the City is described in the Setting section of this chapter, representing the baseline conditions for evaluation of cumulative impacts. Reasonably foreseeable future development includes the Project site, the Executive Park site (located immediately west of Candlestick Point), Bayview Hill, and all of Hunters Point. None of the related projects located in these areas include structures with heights greater than 100 feet, except for Executive Park, where demolition of 3 existing buildings and construction of 13 new buildings (with roof heights ranging from approximately 86 to 293 feet) is proposed.<sup>163</sup> As that development includes structures with heights greater than 100 feet, towers at the Executive Park site would intercept a large volume of wind which could have the potential to accelerate winds in nearby pedestrian sidewalk areas or public open spaces.

As noted above, the dominant wind direction in the project vicinity is west-northwest, and winds from the west, northwest, and west-northwest account for roughly half of the local wind patterns.<sup>164</sup> As the Executive Park site is directly west of the Candlestick Point, west-northwest and northwest winds would not have the potential to contribute to cumulative wind conditions within the Project site. However, west winds, which occur approximately 13 percent of the time,<sup>165</sup> could have the potential to contribute to cumulative wind conditions within the Project site. As discussed in Section III.P (Recreation), a cumulative wind analysis provided in a Technical Memorandum prepared for the Executive Park development concluded that cumulative development generally results in wind speed changes near the shoreline (generally within 300 feet) ranging from no change to a 10 to 20 percent decrease in wind speed.<sup>166</sup>

In addition, the distance between the Executive Park development (located at 150 and 250 Executive Park Boulevard and 5 Thomas Mellon Circle<sup>167</sup>), is approximately 1,000 feet west of the western border of the Candlestick Point Center and Candlestick Point districts, and approximately 1,500 feet would separate the eastern edge of the Executive Park development and closest residential tower within the Project site (a 360-foot residential tower located at Candlestick Point South). Given the presence of

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<sup>163</sup> Environmental Science Associates, *Potential Wind Conditions at Executive Park Development*, May 4, 2009.

<sup>164</sup> CPP, Inc., *June, 2007*.

<sup>165</sup> CPP, Inc., *June, 2007*.

<sup>166</sup> Environmental Science Associates, May 4, 2009.

<sup>167</sup> San Francisco Planning Department, *Notification of Preparation of an Environmental Impact Report and Public Scoping Meeting, Case No. 2006.0422 E - Executive Park Subarea Plan Amendments to the General Plan, Planning Code, and Zoning Map; Yerby Company Development; Universal Paragon Corporation Development*, October 27, 2006.

intervening structures between these two locations (The Cove residential development) and the orientation of the street grid pattern in Candlestick Point South, and the likely presence of street trees in all of these areas, winds generated by towers within the Executive Park development would not be funneled by development along the streets in the Project site, and the Project's contribution to cumulative wind impacts would not be considerable. Cumulative impacts would be less than significant.

