



Technical Memorandum

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Subject: Potential Wind Conditions –
Transbay Redevelopment Area, Block 1 – 160 Folsom Street
San Francisco, California
ESA 140514

I. Introduction, Summary, and Conclusions

A wind-tunnel test was performed for the proposed design of the 160 Folsom Street development on Block 1 of the Transbay Redevelopment Area to define the wind environment that would exist in pedestrian areas within and around the proposed Project.

The Project would occupy Transbay Block 1, which is the southern one-third of AB 3740, which is bounded by Main, Folsom, Spear and Howard Streets in San Francisco.



See Figure 1, Block 1 Site Location.

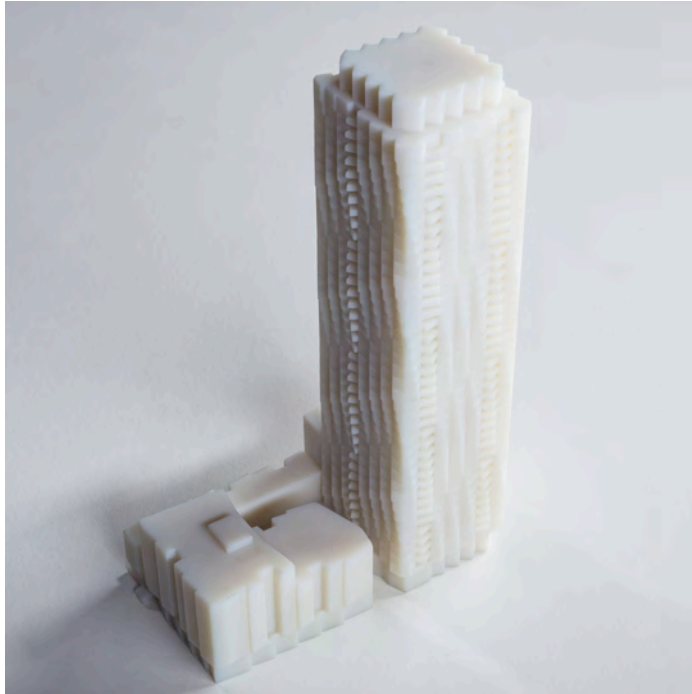
Source: San Francisco Planning Department
Property Information Map

Transbay Block 1 / 140514

Figure 1
Block 1 Site Location

The 160 Folsom Street development would include a 400-foot high-rise tower, with a 25-foot high mechanical penthouse, for a total height of 425 feet above street level. Alternatively, the tower could be lower, at 300-feet in height. However, the 400-foot tower height was wind tunnel tested.

The Block 1 development at 400 feet in height is shown in Figure 2, which is a photograph of the wind test model viewing the Folsom Street frontage of the Project.



Source: Steelblue

Transbay Block 1 / 140514

Figure 2
Folsom Street frontage of the Wind Test Model

Requirement for Wind Tunnel Testing

The study was conducted in response to the Transbay Redevelopment Plan requirement to identify and mitigate significant impacts of pedestrian-level winds, as explicitly stated in the Mitigation Measure (from Exhibit 7 of the *2010 REEVALUATION OF TRANSBAY PROGRAM FINAL EIS/EIR*) that requires wind testing of each new high-rise Project:

1. WIND

See discussion of wind impacts in Section 5.1.2 of the Final EIS/EIR. Mitigation measures include:

W 1 – The San Francisco Redevelopment Agency (Agency) shall consider potential wind effects of an individual project for the Redevelopment area. If necessary, perform wind tunnel testing in accordance with City Planning Code Section 148. If exceedences of the wind hazard criterion should occur for any individual project, require design modifications or other mitigation measures to mitigate or eliminate these exceedences. Tailor mitigation measures to the individual needs of each project. Examples of mitigation measures include articulation of building sides and softening of sharp building edges.



Thus, the primary objective of the study is to determine design-specific impacts based only on the San Francisco Planning Code’s Hazard Criterion¹ and to provide a basis for design modifications to mitigate or avoid any such impacts. A secondary objective of the study is to characterize the wind speeds² that would be exceeded only 10% of the time at pedestrian level and compare them to the Planning Code’s comfort criteria. The wind study examines the potential future wind conditions on and around the Project site and also is able to provide information that the site architects can use in the design of the Project to benefit the comfort and enjoyment of site occupants and visitors.

Project Background and Content of Report

The Project site is in the Transbay Redevelopment Area, which will be developed according to the approved Redevelopment Plan. At present, the Project site consists of vacant land that is now used for parking and two structures with a total of approximately 15,000 square feet of space.

Located southeast³ of the Transbay Transit Center (under construction), the Project site is at the southern edge of the Transit Center District Plan (TCDP) area and within a cluster of existing and under-construction high-rise buildings.

Details of the background and test methods are presented in **Section II, Background**. Test results and discussions are presented in **Section III, Test Cases and Results**.

A **summary** of the test results and the **conclusions** of this study follows.

¹ The Mitigation Measure **W 1** hazard criterion, a wind that is 26-miles-per-hour for a single full hour of the year, is based on the hazard standard in City Planning Code Section 148. See Section II.

² Unless stated otherwise, “wind speeds” in this Memorandum refer to “equivalent” wind speeds that are exceeded only 10% of the time, as defined by the Planning Code. Note that these speeds are not arithmetic mean or average speeds. See Section II and the text contained in ATTACHMENT 1

³ In the Project area, the local “compass” directions used here follow the convention that local north and south run along Main Street and local east and west run along Folsom Street. On the other hand, wind directions, when used here, refer only to the true compass directions from which wind blows.



Summaries of Wind Tunnel Tests

Three development scenarios were modeled and tested. They are: 1) Existing Setting; 2) Project in the Existing Setting; and, 3) Cumulative Development. To satisfy the San Francisco wind test protocol in this area south of Market Street, each scenario was tested for four key wind directions: Northwest, West-Northwest, West and Southwest.

Existing Setting Scenario

The existing setting consists of the existing building on the Project site and the other existing buildings in the vicinity. In addition, the Transbay Transit Center is modeled as if completed, although that project has progressed only to the stage of ground clearing and excavation⁴, and also the approved 41 Tehama Street, the 222 Second Street, and the 201 Folsom Street high-rise developments are modeled as if completed. The Existing Setting also includes major high-rise buildings that were considered in the Transit Center EIR Cumulative Scenario, but that are now under construction, including 181 Fremont Street and the Blocks 6/7 development.

Existing Comfort Criterion Conditions

Existing 10% exceeded wind speeds measured at the 24 test points in public areas range from 6 to 11 mph, while the average of these is about 8.6 mph. The highest wind speed (11 mph) occurs on the southwest corner of Folsom and Main Streets. Winds at all 24 test points would not exceed the pedestrian-comfort criterion of 11 mph.

Existing Hazard Conditions

The Planning Code's wind hazard criterion is currently not exceeded at any of the 24 test locations.

Project Scenario

The Project setting consists of the Project Block 1 development added to the Existing Setting.

Comfort Criterion Conditions

With the Project, the average of the wind speeds measured at all 24 test points would be 8.1 mph, a decrease of 0.5 mph from the existing average. Wind speeds would range from 6 to 11 mph. All 24 test points would not exceed the Planning Code's pedestrian-comfort criterion of 11 mph.

With the Project, compared to existing conditions, either no change or insubstantial wind speed changes of ± 1 mph or less would occur at 19 of the 24 test points. On Folsom Street, no change or insubstantial increases in wind speed would occur at the six points upwind of the Project and

⁴ This approach is conservative, because it accounts for the completed Transbay Transit Center and the high-rise towers now under construction in the vicinity that likely will be completed prior to the proposed project at 160 Folsom Street. Therefore, the resulting setting wind conditions isolate the wind effects caused by the Project and enable their measurement.



similarly insubstantial decreases would occur at 8 points downwind of the Project. One speed increase of 2 mph would occur at the northeast corner of the Project site, but the wind speed would not exceed the pedestrian comfort criterion. Changes of ± 2 mph are considered minor. The wind effects of the Project with a tower height of 300 feet would be the same.

Hazard Conditions

Just as under existing conditions, the Planning Code's wind hazard criterion would not be exceeded at any pedestrian location under the Project scenario.

Cumulative Development Scenario

The Cumulative Scenario consists of the Project in the Existing Setting, plus a number of approved and foreseeable high-rise projects. These include major high-rise buildings considered in the Transit Center EIR Cumulative Scenario, including the Block 8 and Block 9 developments located along Folsom Street, as well as Transbay Blocks 2, 3, 4, and 5, all north of Block 1.

Comfort Criterion Conditions

With Cumulative development, wind speeds would generally decrease compared to existing conditions, as well as compared to Project conditions; the average of the 10% exceeded wind speeds measured for all 24 test points would be 7.5 mph, which would be 0.6 mph less than with the Project and 1.1 mph less than in existing conditions. Speeds would range from 5 to 12 mph.

Although the Cumulative Scenario would decrease wind speeds overall, it would increase wind speeds by 5 mph to create a new 12 mph pedestrian-comfort exceedance at the northeast corner of Folsom and Beale Streets. It would also decrease wind speeds by 2 to 3 mph at six other test point locations. Wind speed changes at other locations would be insubstantial.

Wind Hazard Conditions

As under the Existing and Project conditions, the Planning Code's wind hazard criterion would not be exceeded at any pedestrian location under the Cumulative scenario.



Study Conclusions

The primary object of the study was to respond to the Transbay Redevelopment Area requirement to identify and mitigate any significant impacts of pedestrian-level winds in public areas of substantial pedestrian use. Those impacts are winds that exceed the wind hazard criterion of Planning Code Section 148.

Wind Hazard Conditions

Wind tunnel testing identified no wind hazards that would occur in public areas of substantial pedestrian use under the Existing, Project or Cumulative Development conditions. For this reason, I conclude that the project satisfies Mitigation Measure W1, the Mitigation Measure from Exhibit 7 of the *2010 REEVALUATION OF TRANSBAY PROGRAM FINAL EIS*.

Wind Comfort Conditions

A secondary objective of the study was to characterize the winds that would be exceeded only 10% of the time at pedestrian level and compare them to the Planning Code's comfort criteria. The wind tunnel testing shows that all pedestrian locations would have wind speeds that would not exceed the pedestrian comfort criteria of Planning Code Section 148, both under the existing conditions and with the Project in place.

Overall, the Project decreases wind speeds and also decreases the amount of time during which the pedestrian comfort criterion is exceeded. For this reason, I conclude that the project would satisfy the pedestrian comfort requirements of Planning Code Section 148.

Agreement with TRANSBAY EIS/EIR Wind Testing

The current test results are in good agreement with the TRANSBAY EIS/EIR wind test results.

The Transbay wind testing found that wind speeds at test points in the Mission, Main, Folsom, and Beale Streets Wind Study Subarea (including Transbay Blocks 3-5) would not exceed the wind hazard criterion and would not exceed the pedestrian-comfort criterion of the Planning Code. Those wind tests found higher speed winds in the Folsom Street Wind Study Subarea, the vicinity of Transbay Block 1, where some test points on the north and South sidewalks of Folsom Street were found to exceed the comfort criterion, but none were found to exceed the wind hazard criterion. This agrees with the results of the current Block 1 – 160 Folsom Street wind test for the Existing Setting and the Project scenario tests. Although there are substantive differences between the test scenarios and building models used in the original Transbay test and in the current wind test, the relatively small differences in wind speeds and pedestrian-comfort criterion exceedences between the Transbay tests and the current test are inconsequential. However, the more accurate models used in the current tests provide more accurate and reliable results than the earlier wind testing.

Effect of Tower Height of 300 feet vs 400 feet

The wind effects reported here were measured for a Project with a tower height of 400 feet. The wind effects would be the essentially the same if the tower height were reduced to 300 feet.

II. Background

Tall buildings and large structures can strongly affect the wind environment for pedestrians. In cities, groups of structures tend to slow the winds near ground level, due to the friction and drag of the structures themselves. Buildings that are much taller than the surrounding buildings intercept and redirect winds that might otherwise flow overhead, and bring them down the vertical face of the building to ground level, where they create ground-level wind and turbulence. These redirected winds can be relatively strong and also relatively turbulent, and can be incompatible with the intended uses of nearby ground-level spaces.

Moreover, structure designs that present tall flat surfaces square to strong winds can create ground-level winds that can prove to be hazardous to pedestrians in the vicinity. It is worth noting, however, that structural measures can be developed (usually overhead structures) to reduce the speed of the winds to levels that are acceptable.

Existing Climate and Wind Conditions

Average winds speeds in San Francisco are the highest in the summer and lowest in winter. However, the strongest peak winds occur in winter. The highest average wind speeds occur in mid-afternoon and the lowest in the early morning. Westerly to northwesterly winds are the most frequent and strongest winds during all seasons. Of the 16 primary wind directions, four have the greatest frequency of occurrence and subsequently make up the majority of the strong winds that occur. These winds include the northwest, west-northwest, west, and west-southwest winds.

Data describing the speed, direction, and frequency of occurrence of winds were gathered at the old San Francisco Federal Building at 50 United Nations Plaza (at a height of 132 ft.) during the six-year period, 1945 to 1950. Measurements taken hourly and averaged over one-minute periods have been tabulated for each month (averaged over the six years) in three-hour periods using seven classes of wind speed and 16 compass directions. Analysis of these data shows that during the hours from 6:00 a.m. to 8:00 p.m., about 70% of all winds blow from five of the 16 directions as follows: Northwest (NW), 10%; West-Northwest (WNW), 14%; West (W), 35%; West-Southwest (WSW), 2%; Southwest (SW), 9%; and all other winds, 28%. Calm conditions occur 2% of the time. More than 90% of measured winds over 13 mph come from these directions.

Wind Speed and Pedestrian Comfort

The comfort⁵ of pedestrians varies under different conditions of sun exposure, temperature, clothing, and wind speed. Winds up to four miles per hour (mph) have no noticeable effect on pedestrian comfort. With speeds from 4 to 8 mph, wind is felt on the face. Winds from 8 mph to 13 mph will disturb hair, cause clothing to flap, and extend a light flag mounted on a pole. Winds from 13 to 19 mph will raise loose paper, dust, and dry soil, and will disarrange hair. For winds from 19 to 26 mph, the force of the wind will be felt on the body. With 26 to 34 mph winds, umbrellas are used with difficulty, hair is blown straight, there is difficulty in walking steadily, and

⁵ 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.



wind noise is unpleasant. Winds over 34 mph increase difficulty with balance and gusts can blow people over.

San Francisco Planning Code Section 148

San Francisco Planning Code Section 148, Reduction of Ground-Level Wind Currents, outlines wind reduction criteria for C-3 zoning districts. The Block 1 Site is not subject to Planning Code Section 148, a copy of which is attached to this memorandum. However, Section 148 requirements are suitable for evaluation of wind impacts for the purposes of CEQA in San Francisco.

The Planning Code requires buildings to be shaped so as not to cause ground-level wind currents to exceed defined comfort and hazard criteria. The comfort criteria are that wind speeds will not exceed, more than 10% of the time, 11 mph in substantial pedestrian use areas, and 7 mph in public seating areas. The Planning Code defines these wind speeds in terms of equivalent wind speeds⁶, an average wind speed adjusted to include the level of wind gustiness and turbulence. Similarly, the hazard criterion requires that buildings not cause the equivalent wind speeds to reach or exceed the hazard level of 26 mph as averaged for a single full hour of the year.

Comfort criteria of Section 148 are based on wind speeds measured and averaged for one minute; this is the basis of the meteorological record that provides the extensive wind speed data for San Francisco. In contrast, the hazard criterion is based on winds that are measured and averaged for one hour; when stated on the same averaging time basis as the comfort criteria winds and the wind data in the meteorological record, the hazard criterion speed is restated as a one-minute⁷ average of 36 mph.

Successor Agency Requirements

The Office of Community Investment and Infrastructure, the Successor Agency to the San Francisco Redevelopment Agency, is now responsible for development of the Transbay Redevelopment Area and the Block 1 site. The Successor Agency enforces the Transbay Redevelopment Plan requirement to identify and mitigate any significant impacts of pedestrian-level winds, as explicitly stated in the Mitigation Measure (from Exhibit 7 of the *2010 REEVALUATION OF TRANSBAY PROGRAM FINAL EIS/EIR*) that requires wind testing of each new high-rise Project:

1. WIND

See discussion of wind impacts in Section 5.1.2 of the Final EIS/EIR. Mitigation measures include:

W 1 – The San Francisco Redevelopment Agency (Agency) shall consider potential wind effects of an individual project for the Redevelopment area. If necessary, perform wind tunnel testing in accordance with City Planning Code Section 148. If exceedences of the wind hazard criterion should occur for any individual project, require design modifications or other mitigation measures to mitigate or eliminate these exceedences. Tailor mitigation measures to the individual needs of each project. Examples of mitigation measures include articulation of building sides and softening of sharp building edges.

⁶ Equivalent mean wind speed is defined as the mean wind speeds, multiplied by the quantity (one plus three times the turbulence intensity) divided by 1.45. This amplifies the wind speeds when turbulence intensity is greater than 15%.

⁷ Arens, E. *et al.*, “Developing the San Francisco Wind Ordinance and its Guidelines for Compliance,” Building and Environment, Vol. 24, No. 4, p. 297-303, 1989.



Thus, the primary objective of this study is to determine design-specific impacts based only on the San Francisco Planning Code's Hazard Criterion⁸ and to provide a basis for design modifications to mitigate any wind hazard. The Hazard Criterion is applied only to, and so wind testing is concerned only with, public areas of substantial pedestrian use, such as sidewalks and publicly accessible open spaces.

The wind study also provides information about the potential future wind conditions on and around the project site that the site architects can use in the design of the project to benefit the comfort and enjoyment of site occupants and visitors.

Model and Wind Testing Protocols

A 1-inch to 50-foot scale model of the Project site and vicinity was constructed in order to simulate the Project and its existing and future contexts. The scale model of the Project was provided by the Architect; the model of the surrounding area was provided by ESA. The scale models were then tested in a boundary layer wind-tunnel facility at the University of California, Davis, under the direction of Bruce White, Ph.D. These wind tests, however, were performed independent of the University.

Three development scenarios were modeled and tested in the wind tunnel. The scenarios are: 1) Existing Setting, 2) Project, and 3) Project with Cumulative development.

The existing setting⁹ represents the site and vicinity, as it presently exists; in addition, the Transbay Transit Center and all other buildings that are under construction are modeled as complete, although some projects have progressed only to ground clearing and excavation. The result of this modeling approach is conservative, in that if the Project were to cause local increases in wind speeds, those increases will be exaggerated.

For the cumulative development scenario, approved buildings that have not yet begun construction as well as proposed buildings in the vicinity are all modeled and included as though fully constructed.

⁸ The Mitigation Measure hazard criterion, a wind that is 26-miles-per-hour for a single full hour of the year, is based on the hazard standard in City Planning Code Section 148.

⁹ The protocol for this test is the same as the protocol used for many (but not all) prior wind tests. In those tests, approved buildings, under construction or not, were treated as "existing", while only projects under City review were "cumulative". This difference is important only for approved building projects that have not been constructed, because in the current test they are "cumulative" rather than "existing" buildings. Therefore, care must be used when comparing results from past wind-tunnel tests with the results from this test.



Test Procedure

In accordance with the protocol for wind tunnel testing under Planning Code Section 148, configurations were tested for each of four primary wind directions: northwest (NW), west-northwest (WNW), west (W), and southwest (SW). The test procedure consisted of orienting the selected configuration of the model in the atmospheric boundary layer wind-tunnel to represent the specific wind direction and measuring the wind speed at each of the test locations with a hot-wire anemometer. Hot-wire measurements were taken at most of the same surface points for all test configurations and wind directions.

The wind tunnel allows testing of natural atmospheric boundary layer flow past surface objects such as buildings and other structures. The tunnel has an overall length of 22 meters (m) (72 feet), a test section of 1.22 m (4 feet) wide by 1.83 m (6 feet) high, and an adjustable false ceiling. The adjustable ceiling and turbulence generators allow speeds within the tunnel to vary from 1 meter per second (m/s) to 8 m/s, or 2.2 mph to 17.9 mph.

Wind-speed measurements at each test location were made with a hot-wire anemometer, an instrument that directly relates rates of heat transfer to wind speeds by electronic signals that are proportional to the magnitude and steadiness of the wind. The hot-wire probe was calibrated to an accuracy of within 2% before the test procedure was begun. The hot-wire probe measured the analog voltage for approximately 30 seconds at each test location. When converted to digital signals, this measurement provided approximately 30,000 individual voltage samples that were averaged and the root mean square calculated for each test location. These data, when converted to velocity using the calibration curves, provided the mean velocity and turbulence¹⁰ values used to calculate the equivalent wind speed.

By measuring both the mean wind speeds and corresponding turbulence intensities, high wind speeds and gustiness (changes in wind speeds over short periods of time) could be determined. The ratio of near-surface speed to reference wind speed was calculated from the hot-wire measurements. The inherent uncertainty of measurements made with the hot-wire anemometer close to the surface of the model is $\pm 5\%$ of the true values.

These values were compared with the free stream wind as measured in the wind tunnel. As a result, each wind-tunnel measurement resulted in a ratio that relates the speed of ground-level wind to the speed at the reference elevation, in this case the height of the Old San Francisco Federal Building. These ratios were the output data from the wind-tunnel tests.

These output data were reduced using a computer program that evaluated the contribution from each tested wind direction to the total wind speed output ratios to account for the differences between the boundary layer profile in the wind-tunnel and the profile as measured at the Old Federal Building located at 50 United Nations Plaza. The program then computed the equivalent wind speed that conforms to the selected criterion; either the wind speed exceeded 10% of the time or the wind speed exceeded one hour or more per year. The program also computed the percentage

¹⁰ Turbulence is expressed as Turbulence Intensity = Root Mean Square / Mean Velocity



of time that the wind would exceed the speed criterion selected, and further computed the percentage contribution of each wind direction to the equivalent wind speed and to the excess of the criterion. In addition to the computations for each tested wind direction, the program computed an average ratio and used this to compute statistics for "Other" winds, which accounted for all remaining wind directions.

The output of the computer program is presented in the Wind-Tunnel Test Results listings for normal winds and for hazardous winds. These tables, appended to this Memorandum, provide the detail of the data and of the intermediate results that are described above. The wind tunnel ratios were included in the program input, and the results evaluated in the discussions that follow.

Wind Speed Profile Adjustments

The Section 148 wind test methodology implicitly assumes that the relationship between height above the ground and wind speed (referred to hereafter as the wind speed profile) is the same in the test area as at the Civic Center weather station. Although sited in the South of Market area, similar wind speed profiles in the two areas make an adjustment.



III. Test Cases and Results

Test Locations

The Project site is in the south end of Assessor's Block 3740. Winds were measured at a total of 24 test points¹¹ positioned closely around and downwind of the Project. The test points were distributed along the sidewalks of Folsom, Main, and Spear Streets. See Figure 3, Block 1 Test Point Location Map. The test points were selected to sample an area that is larger than the area within which winds may be adversely affected by the Project.

Each test point is considered with respect to winds from four directions and may be discussed more than once in the commentaries. For example, test point #4 is at the corner of Main and Folsom Streets, so its wind speed may be discussed in comments on Main Street winds and also in comments on Folsom Street winds. The test point locations are as follows:

East-West Streets:

Fourteen test points, seven on the north side (#1, 3, 5, 7, 9, 11, 66) and seven on the south side (#2, 4, 6, 8, 10, 12, 67), on Folsom Street, between Beale Street and The Embarcadero, as follows:

- Two (#1, 2) on the northeast and southeast corners of the intersection with Beale Street;
- Four (#3, 4, 5, 6) on the northwest, southwest, northeast and southeast corners, respectively, at Main Street;
- Two (#66, 67) mid-block on the north and south sides between Main and Spear Streets;
- Four (#7, 8, 9, 10) on the northwest, southwest, northeast and southeast corners at Spear Street; and,
- Two (#11, 12) on the northwest and southwest corners of The Embarcadero.

North-South Streets:

Ten points (#3-6, 15, 16, 19, 20, 64, 65) on Main Street, with four (#3, 4, 20, 64) on the west side:

- One (#16) on the southeast corner of the intersection with Howard Street;
- One (#15) on the east side, mid-block between Howard and the Project site;
- Two (#64, 65) on the west and east sides, near the base of the Project tower;
- Four (#3, 4, 5, 6) on the northwest, southwest, northeast and southeast corners, respectively, at Folsom Street; and,
- Two (#20, 19) on the west and east sides of Main Street, mid-block between Folsom and Harrison Streets.

¹¹ The numbers assigned to the test points are arbitrarily assigned and hold no significance to the analysis.

Eight points (#7-10, 13, 14, 17, 18) on Spear Street, with five (#7, 8, 13, 14, 18) on the west side:

- One (#14) on the west side, mid-block between Howard and the Project site;
- One (#13) on the west side, at the northeast corner of the Project site;
- Four (#7, 8, 9, 10) on the northwest, southwest, northeast and southeast corners at Folsom Street; and,
- Two (#18, 17) on the west and east sides of Spear Street, mid-block between Folsom and Harrison Streets.

In addition, two points (#1, 2) on the northeast and southeast corners of the intersection of Folsom and Beale Streets indicate winds on Beale Street while the two test points (#11, 12) on the northwest and southwest corners of Folsom and The Embarcadero indicate winds on The Embarcadero.

For the purposes of identifying the applicable wind comfort criterion of the Planning Code, all of the test locations were considered pedestrian areas, rather than seating areas.



Source: Map Base - San Francisco Planning Department, Property Information Map

Transbay Block 1 / 140514

Figure 3
Block 1 Test Point Location Map



Wind Evaluation and Criteria

Just as the wind tunnel testing was performed in accordance with the test protocols of Planning Code Section 148, the performance requirements of Section 148 were used to evaluate the results of the tests for CEQA purposes. The mean wind speeds were compared to the Code's comfort criterion of 11 mph for areas of substantial pedestrian use, not to be exceeded more than 10% of the time. Separate calculations evaluated compliance with the hazard criterion. As previously noted, the wind data observed at the Old San Francisco Federal Building were not full hour average speeds as identified by the Code, so it is necessary to adjust the wind criterion speed to obtain a valid comparison with the available data and the equivalent wind speeds based on short-duration measurements. When normalized to the equivalent wind speeds used here, the hazard criterion speed is equal to 36 mph, the value used in the tables.

Test Output

The basic wind-tunnel test data and the detailed outputs of the computer program are presented in table listings of comfort criteria and hazard criteria evaluations for each of the three scenarios, Existing, Project and Cumulative. These output tables provide the detail of the data and the intermediate results described above. The wind-tunnel ratios and the standard wind profile adjustment factors for each wind direction were included. The results were evaluated here.

Figure 3 identifies the measurement point locations. Summary information about the wind-tunnel test results and evaluations of compliance with the comfort and hazard criteria were presented for the three scenarios in summary Tables 1 and 2.

Table 1 presents the Pedestrian-Comfort Analysis results, namely the measured 10% exceeded speed and the percentage of time that the comfort criterion is exceeded for each test location and test scenario.

Table 2 presents the Wind Hazard Analyses results, the equivalent wind speed, and the number of hours per year that the hazard criterion is exceeded for each test location and test scenario.

Throughout the following discussion, references are made to values from these tables. Note that the times in hours and wind speeds in mph presented in those tables were rounded to the nearest integer value. The sums, differences, and averages presented also were rounded after calculations that were made using the unrounded values. As a result, what may appear to be discrepancies in the tabular results, such as sums for each column or differences between values for Project and existing conditions, are simply due to rounding the results. However, those rounded differences in wind speeds and in hours of exceedance best represent the measured changes in those quantities.

Throughout the following discussion the wind speeds reported refer to the equivalent wind speeds that would be exceeded 10% of the time when referring to the Pedestrian-Comfort Criterion, and winds exceeded 1 hour per year when referring to the Wind Hazard Criterion.

Note that these values are not the numerical average or mean speeds, and in fact, the winds exceeded 10% of the time are substantially higher than actual average wind speeds.

Test 1: Existing Setting

The existing setting consists of the existing vacant project site and the existing buildings in the vicinity around the site. In addition, the Transbay Transit Center is represented as completed, although that project has progressed only to the stage of ground clearing and excavation, and the approved 41 Tehama Street, the 222 Second Street, and the 201 Folsom Street high-rise developments, all under construction. The Existing Setting also includes under-construction major high-rise buildings considered in the Transit Center EIR Cumulative Scenario, including 181 Fremont Street and Transbay Blocks 6/7 located to the west of the Project on Folsom Street. These buildings under construction are included because they are expected to be complete prior to the construction of the proposed project at 160 Folsom Street.

As stated previously in **Section II, Background**, under **Model and Wind Testing Protocols**, the result of this modeling approach is conservative, in that if the project causes local increases in wind speeds, those increases will be isolated and accurately compared to the slowed existing wind speeds due to the presence of the under-construction buildings.

Existing Comfort Conditions

The test results show that the average of the existing 10% exceeded wind speeds measured at the 24 test points is about 8.6 mph. Wind speeds at the 24 test points range from 6 to 11 mph. The highest 10% exceeded wind speed (11 mph) occurs at location #4, on the southwest corner of Folsom and Main Streets. Winds at all 24 test points do not exceed the pedestrian-comfort criterion of 11 mph; see Figure 3 and Table 1. Wind speeds at points along Folsom Street range from 8 to 11 mph, while wind speeds on Main and Spear Streets, away from Folsom Street, range from 6 to 10 mph.

This test shows that existing winds in the site vicinity are generally moderate.

Existing Hazard Conditions

The Code's 36 mph wind hazard criterion is currently not exceeded at all 24 test locations. See Table 2.



**TABLE 1 WIND COMFORT ANALYSIS: EXISTING, PROJECT, AND CUMULATIVE SCENARIOS
TRANSBAY BLOCK 1 – WIND-TUNNEL TEST, NOVEMBER 2014**

References		Existing			Project			Cumulative				
Test Location Number	Wind Comfort Criterion Speed, miles/hour	Equivalent Wind Speed Exceeded 10% of Time, miles/hour	Percent of Time Wind Exceeds Criterion	S O U R C E	Equivalent Wind Speed Exceeded 10% of Time, miles/hour	Percent of Time Wind Exceeds Criterion	Speed Change Relative to Existing, miles/hour	S O U R C E	Equivalent Wind Speed Exceeded 10% of Time, miles/hour	Percent of Time Wind Exceeds Criterion	Speed Change Relative to Project, miles/hour	S O U R C E
1	11	8	1		7	1			12	14	5	s
2	11	8	1		8	1			7	1		
3	11	10	5		9	2	-1		8	1	-1	
4	11	11	10		11	10			10	6	-1	
5	11	9	4		10	6			6	0	-3	
6	11	9	2		8	1			7	0	-1	
7	11	8	1		7	1	-1		8	1	1	
8	11	10	6		9	3	-1		6	0	-3	
9	11	10	6		10	4	-1		8	5	-1	
10	11	10	6		8	1	-2		9	2	1	
11	11	9	4		7	4	-2		7	3	-1	
12	11	10	5		8	3	-1		7	2	-1	
13	11	6	1		8	3	2		8	3		
14	11	6	0		6	1			5	0	-1	
15	11	6	0		7	0			8	1	1	
16	11	8	2		8	1			8	1		
17	11	8	1		8	2			7	2	-1	
18	11	7	0		7	1			7	0		
19	11	8	2		9	3	1		7	0	-2	
20	11	10	5		10	5			7	1	-3	
64	11	9	2		7	0	-2		5	0	-2	
65	11	9	3		7	0	-3		7	0		
66	11	9	2		8	2			9	2		
67	11	10	5		9	3			8	1	-2	
Ave. of 10% Percent:		8.6 mph	3%		8.1 mph	2%	-0.5 mph		7.5 mph	1%	-1.1 mph	
Total Exceedances:		Total	0		Total	0			Total	1		
<i>Subtotals by type:</i>		<i>Existing</i>	0	e	<i>Existing</i>	0	e		<i>Existing or Project</i>	0	e/p	
					<i>New, due to Project</i>	0	p		<i>New, due to Cumulative</i>	1	s	
					<i>New, at new location</i>	0	n		<i>New, at new location</i>	0	n	
					<i>Eliminated by Project</i>	0	-		<i>Eliminated by Cumulative</i>	0	-	

Notes: e = Existing exceedance; p = Exceedance due to Project; s = Exceedance due to Cumulative
Wind speeds and durations are rounded, so column totals and row differences may not add.

Test 2: Project

The Project setting consists of the Project in the existing setting. The Project model was provided by the architects. The Project model was added to the Existing Setting described under Test 1.

Project Comfort Conditions

With the Project, the average of the 10% exceeded wind speeds measured at all 24 test points would be 8.1 mph, a decrease of 0.5 mph from the existing average. Wind speeds would range from 6 to 11 mph. All 24 test points would not exceed the Planning Code’s pedestrian-comfort criterion of 11 mph. The Project would add no new pedestrian-comfort exceedance.



**TABLE 2 WIND HAZARD ANALYSIS: EXISTING, PROJECT, AND CUMULATIVE
TRANSBAY BLOCK 1 – WIND-TUNNEL TEST, NOVEMBER 2014**

References		Existing			Project			Cumulative				
Test Location Number	Wind Hazard Criterion Speed, miles/hour	1-hour/year Equivalent Wind Speed, miles/hour	Wind Hazard Criterion Exceeded, hours/year	S O U R C E	1-hour/year Equivalent Wind Speed, miles/hour	Wind Hazard Criterion Exceeded, hours/year	Hazard Hours Change Relative to Existing	S O U R C E	1-hour/year Equivalent Wind Speed, miles/hour	Wind Hazard Criterion Exceeded, hours/year	Hazard Hours Change Relative to Project	S O U R C E
1	36	20			18				22			
2	36	15			16				13			
3	36	19			17				16			
4	36	20			19				19			
5	36	19			18				12			
6	36	18			17				17			
7	36	16			17				16			
8	36	20			20				16			
9	36	21			17				21			
10	36	25			15				15			
11	36	21			24				24			
12	36	20			20				20			
13	36	19			23				22			
14	36	17			19				14			
15	36	16			15				16			
16	36	20			21				20			
17	36	15			16				16			
18	36	15			16				14			
19	36	16			16				11			
20	36	22			23				19			
64	36	16			12				14			
65	36	18			11				12			
66	36	18			22				20			
67	36	20			21				19			
Ave. 1-hr:		19 mph			18 mph				17 mph			
Total hrs:		0 hr			0 hr		0 hr		0 hr		0 hr	
Total Exceedances:		Total 0			Total 0		0		Total 0		0	
Subtotals by type:		Existing 0		e	Existing 0		0	e	Existing or Project 0		0	e/p
					New or increased time 0		0	p	New or increased time 0		0	s
					New, at new location 0		0	n	New, at new location 0		0	n
					Eliminated by Project 0		-		Eliminated by Cumulative 0		-	

SOURCE: Environmental Science Associates

Notes: **e** = Existing exceedence; **p** = Exceedance due to Project; **s** = Exceedance due to Cumulative
Wind speeds and durations are rounded, so column totals and row differences may not add.

With the Project, compared to existing conditions, either no change or insubstantial wind speed changes of ± 1 mph or less would occur at 19 of the 24 test points. On Folsom Street, no change or insubstantial increases in wind speed would occur at the six points upwind of the Project and similarly insubstantial decreases would occur at 8 points downwind of the Project. Wind speed increases of 2 mph would occur at point #13, at the northeast corner of the Project site, would not exceed the pedestrian comfort criterion. Wind speed changes of ± 2 mph or less are generally considered minor. The wind effects of the Project with a tower height of 300 feet would be the same as these effects of the Project with a 400 foot tower.

Project Hazard Conditions

Just as under existing conditions, the Planning Code’s wind hazard criterion would not be exceeded at any pedestrian location under the Project scenario.



Test 3: Cumulative Scenario

The Cumulative Scenario consists of the Project in to the Existing Setting, described under Test 1, plus a number of approved and potential high-rise projects. These include major high-rise buildings considered in the Transit Center EIR Cumulative Scenario. Because the existing high-rise buildings on the project block immediately north and west of the site can divert and slow winds that approach from the direction of the Transit Tower, the wind effects of those high-rise buildings around the Transit Center are substantially diminished.

Those buildings included in the cumulative testing are massing models of the following:

- Parcel “F” and 524 Howard Street high-rises, on Assessor’s Block (AB) 3721; and
- Transbay Blocks 2, 4, 5, and 8.

The following texts describe wind comfort and wind hazard conditions that might result from Cumulative development that includes the Project. The comparisons of the Cumulative wind conditions with Project wind conditions in the following discussions show how the wind effects of the Project might subsequently be changed by future development.

Cumulative Comfort Conditions

With Cumulative development, wind speeds would generally decrease compared to existing conditions, as well as compared to Project conditions; the average of the 10% exceeded wind speeds measured for all 24 test points would be 7.5 mph, which would be 0.6 mph less than with the Project and 1.1 mph less than in existing conditions. Speeds would range from 5 to 12 mph.

Although the Cumulative Scenario would decrease wind speeds overall, it would increase wind speeds by 5 mph to create a new pedestrian-comfort exceedence at location #1, at the northeast corner of Folsom and Beale Streets. It would also decrease wind speeds by 2 to 3 mph at six other test point locations (#5, 8, 19, 20, 64, 67). Wind speed changes at other locations would be insubstantial. Wind speed changes of ± 2 mph or less are generally considered minor; even larger changes are not important unless they result in exceedences of wind criteria. The wind speeds under the Cumulative conditions would be unchanged or lower than the Project wind conditions at most test locations.

These differences can be seen on Table 1 by directly comparing the listed wind speeds for the Existing and Cumulative Scenarios. Table 1 directly shows the speed changes for the Cumulative scenario compared to Project wind speeds.

Cumulative Hazard Conditions

As under Existing and Project conditions, the Planning Code’s wind hazard criterion would not be exceeded at any pedestrian location under the Cumulative scenario.



Comparison with Prior Cumulative Scenario Wind Tests

A number of wind tests have been performed during the planning and environmental review of the Transbay Redevelopment Plan, in order to understand the wind characteristics that would result from the substantial high-rise development in this area. Although the first such test, the 2001 test for the Transbay Terminal / Caltrain Downtown Extension Project¹², considered the entire area and examined 2 options for overall development, subsequent tests have typically focused on the limited-area wind effects of specific buildings and have not provided data on wind conditions over the entire Transbay area. The 2001 wind testing considered a “Full Build Alternative” (Study #1), with approximately 7.6 million gross square-feet of new development with heights ranging from 80 feet (Block 3749 south) to 500 feet (Block 3720), and a Reduced Scope Alternative (Study #2). For each, the high-rise buildings were modeled as bulk masses, because the buildings had not been designed. That test showed that wind speeds at 8 points on and adjacent to Block 1 would be relatively low under either alternative, with wind speeds ranging from 4 mph to 7 mph for the Full Build Alternative and 3 mph to 6 mph for the Reduced Scope Alternative. Wind speeds on Folsom Street at the Beale Street and Fremont Street intersections were higher, ranging from 6 mph to 13 mph for the Full Build Alternative and 5 mph to 10 mph for the Reduced Scope Alternative. Despite the fact that the models tested were noticeably different, the 2001 results are in general agreement with the results of the current Cumulative Scenario test. This is expected because the low speeds of the winds approaching Block 1 result from not from the shape of upwind buildings, but rather result from the density of upwind high-rise buildings that substantially slow the approaching wind for all predominant wind directions.

In contrast to the 2001 test, the current wind test used models of known building designs for high-rise buildings inside the Transbay area, as well as new buildings outside the Transbay area and therefore not included in the Transbay tests. Although there is a better match between the building models wind tested in the current Cumulative scenario and the models tested for the Transit Center EIR, the Transit Center EIR wind testing measured winds only between Stevenson, Beale, Howard, and 2nd Streets, and therefore, provides no data to compare with the current test.

More recent wind tests, first for the Blocks 6/7¹³ and then for Block 9¹⁴ provide updated wind data along Folsom Street, with the Blocks 6/7 test indicating wind speeds at Folsom and Main Streets of 8 to 10 mph, and of 7 to 10 mph at Folsom and Beale Streets. The Block 9 test measured wind speeds on Folsom Street only as far as Beale Street, but it confirmed the earlier Blocks 6/7 tests. The current more-detailed Cumulative scenario test showed an exceedence of the pedestrian comfort criterion at the northeast corner of the intersection of Folsom and Beale Streets (the southwest corner of Block 2). However, this is likely due to the fact that the current test has developments (Blocks 1-5) not in other recent tests, so wind speeds along Folsom near Transbay Blocks 1 and 2 are expected to differ from prior results. Allowing for these important model differences, these wind data confirm the consistency of results among all of these wind tests.

¹² Potential Wind Conditions, Proposed Transbay Terminal/Caltrain Downtown Extension, ESA 201050, August 22, 2001

¹³ Potential Wind Conditions, Transbay Redevelopment Area Blocks 6/7, ESA 120967, February 14, 2013

¹⁴ Potential Wind Conditions, Transbay Redevelopment Area Block 9, ESA 130774, January 14, 2014



IV. Study Conclusions

Wind Hazard

The primary object of the study was to respond to the Transbay Redevelopment Area requirement to identify and mitigate any significant impacts of pedestrian-level winds in public areas of substantial pedestrian use. Those impacts are winds that exceed the wind hazard criterion of Planning Code Section 148.

Wind tunnel testing identified no wind hazards that would occur in public areas of substantial pedestrian use under the Existing, Project or Cumulative Development conditions. For this reason, I conclude that the project satisfies Mitigation Measure W1, the Mitigation Measure from Exhibit 7 of the 2010 REEVALUATION OF TRANSBAY PROGRAM FINAL EIS.

Wind Comfort

A secondary objective of the study was to characterize wind speeds that are exceeded only 10% of the time at pedestrian level and to compare them to the Planning Code's pedestrian-comfort criterion. The wind tunnel testing shows that all pedestrian locations would have wind speeds that do not exceed the pedestrian comfort criteria of Planning Code Section 148, both under the existing conditions and with the Project in place.

Agreement with TRANSBAY EIS/EIR

The current Transbay Block 1 – 160 Folsom Street test results are in good agreement with the TRANSBAY EIS/EIR wind test results and the findings of the EIS/EIR, allowing for the important differences in the building models used.

The Transbay wind testing found that wind speeds at test points in the Mission, Main, Folsom, and Beale Streets Wind Study Subarea (including Blocks 3-5) would not exceed the wind hazard criterion or the pedestrian-comfort criterion of the Planning Code for either Transbay alternative. The Transbay wind testing found higher winds in the Folsom Street Wind Study Subarea, where test points on the north and South sidewalks of Folsom Street were found to exceed the comfort criterion, but none were found to exceed the wind hazard criterion.

These results of the current wind test for the Block 1 – 160 Folsom Street project are fully consistent with the results of the Transbay wind testing. The differences in wind speeds and pedestrian-comfort criterion exceedences between the Transbay test results and the current test results appear to be due to the added local detail in the wind test models used and these differences in the results are not substantial.

Effect of Tower Height of 300 feet vs 400 feet

The wind effects reported here were measured for a Project with a tower height of 400 feet. The wind effects would be the essentially the same if the tower height were reduced to 300 feet.

ATTACHMENT 1 – Planning Code, Section 148

San Francisco Planning Code Section 148, Reduction of Ground-level Wind Currents in C-3 Districts

(a) **Requirement and Exception.** In C-3 Districts, buildings and additions to existing buildings shall be shaped, or other wind-baffling measures shall be adopted, so that the developments will not cause ground-level wind currents to exceed, more than 10 percent of the time year round, between 7:00 a.m. and 6:00 p.m., the comfort level of 11 m.p.h. equivalent wind speed in areas of substantial pedestrian use and seven m.p.h. equivalent wind speed in public seating areas.

When preexisting ambient wind speeds exceed the comfort level, or when a proposed building or addition may cause ambient wind speeds to exceed the comfort level, the building shall be designed to reduce the ambient wind speeds to meet the requirements. An exception may be granted, in accordance with the provisions of Section 309, allowing the building or addition to add to the amount of time that the comfort level is exceeded by the least practical amount if (1) it can be shown that a building or addition cannot be shaped and other wind-baffling measures cannot be adopted to meet the foregoing requirements without creating an unattractive and ungainly building form and without unduly restricting the development potential of the building site in question, and (2) it is concluded that, because of the limited amount by which the comfort level is exceeded, the limited location in which the comfort level is exceeded, or the limited time during which the comfort level is exceeded, the addition is insubstantial.

No exception shall be granted and no building or addition shall be permitted that causes equivalent wind speeds to reach or exceed the hazard level of 26 miles per hour for a single hour of the year.

(b) **Definition.** The term “equivalent wind speed” shall mean an hourly mean wind speed adjusted to incorporate the effects of gustiness or turbulence on pedestrians.

(c) **Guidelines.** Procedures and Methodologies for implementing this section shall be specified by the Office of Environmental Review of the Department of City Planning. (Added by Ord. 414-85, App. 9/17/85)



ATTACHMENT 2 – Wind-Tunnel Data / Calculations

Pedestrian Comfort Analysis

10% Exceeded Winds

In the following tables for the Comfort Criterion tests, the output for each location is presented in three-line groups. The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedence from each wind direction. The SUMs are the equivalent number of events.

Wind Hazard Analysis

1 Hour per Year Exceeded Winds

In the following tables for the Hazard Criterion tests, the output for each location is presented in three-line groups. The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested. Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 36 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedence from each wind direction. The SUMs are the equivalent number of events.

Transbay Block 1 / 160 Folsom St
San Francisco, California

Wind Hazard Analysis

Existing

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
1	20.4	36.0	0.0000000	RATIOS	0.2914	0.3271	0.3656	0.6690	0.4133
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
2	15.2	36.0	0.0000000	RATIOS	0.2238	0.3302	0.4047	0.4978	0.3641
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
3	19.0	36.0	0.0000000	RATIOS	0.3595	0.2942	0.5453	0.6230	0.4555
				CONTRIB	0.00%	0.00%	0.03%	99.97%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
4	19.8	36.0	0.0000000	RATIOS	0.2825	0.3805	0.6272	0.6076	0.4745
				CONTRIB	0.00%	0.00%	45.01%	54.99%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
5	18.8	36.0	0.0000000	RATIOS	0.3582	0.3508	0.5139	0.6185	0.4603
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
6	18.4	36.0	0.0000000	RATIOS	0.3835	0.3054	0.4570	0.6045	0.4376
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
7	16.0	36.0	0.0000000	RATIOS	0.3522	0.2910	0.4578	0.5262	0.4068
				CONTRIB	0.00%	0.00%	0.02%	99.98%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
8	19.8	36.0	0.0000000	RATIOS	0.3878	0.3630	0.5620	0.6508	0.4909
				CONTRIB	0.00%	0.00%	0.01%	99.99%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
9	21.3	36.0	0.0000000	RATIOS	0.3323	0.4385	0.5339	0.6996	0.5011
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

Transbay Block 1 / 160 Folsom St
San Francisco, California

Wind Hazard Analysis

Existing

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
10	25.2			RATIOS	0.7735	0.3721	0.4800	0.5548	0.5451
				CONTRIB	100.00%	0.00%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
11	21.4			RATIOS	0.6490	0.2298	0.4238	0.6579	0.4901
				CONTRIB	43.90%	0.00%	0.00%	56.10%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
12	20.0			RATIOS	0.5237	0.3283	0.5007	0.6572	0.5025
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
13	19.2			RATIOS	0.2962	0.2271	0.2623	0.6312	0.3542
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
14	17.2			RATIOS	0.2184	0.2192	0.2819	0.5636	0.3208
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
15	15.6			RATIOS	0.2599	0.3217	0.2859	0.5137	0.3453
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
16	20.0			RATIOS	0.5119	0.2221	0.3735	0.6571	0.4411
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
17	14.5			RATIOS	0.4402	0.3917	0.3955	0.3087	0.3840
				CONTRIB	42.03%	57.97%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
18	14.6			RATIOS	0.3086	0.3098	0.3107	0.4804	0.3524
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

Transbay Block 1 / 160 Folsom St
 San Francisco, California

Wind Hazard Analysis

Existing

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
19	16.3			RATIOS	0.3620	0.4518	0.4038	0.4064	0.4060
				CONTRIB	0.00%	100.00%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
20	22.2			RATIOS	0.3632	0.3069	0.5274	0.7289	0.4816
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
64	16.4			RATIOS	0.2954	0.3126	0.4967	0.5397	0.4111
				CONTRIB	0.00%	0.00%	1.33%	98.67%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
65	18.0			RATIOS	0.3369	0.3184	0.5077	0.5904	0.4384
				CONTRIB	0.00%	0.00%	0.01%	99.99%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
66	18.3			RATIOS	0.3496	0.2820	0.4803	0.6009	0.4282
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
67	20.1			RATIOS	0.2337	0.2966	0.5402	0.6614	0.4330
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

Transbay Block 1 / 160 Folsom St
 San Francisco, California

Wind Comfort Analysis

Project
 Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

Loca- tion	10.0% Exc. Ground Speed	---Criterion--- Speed Exc.	% Time Exc.		NW	WNW	W	WSW	OTHER	SUM
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000	
1	7.2	11.0	0.52	RATIOS	0.2422	0.3128	0.3571	0.6054	0.3794	
				CONTRIB	0.65%	22.08%	39.51%	29.95%	7.82%	3,280
				CONTRIB	0.00%	4.02%	7.77%	85.01%	3.21%	170
2	7.6	11.0	0.51	RATIOS	0.2334	0.3175	0.4025	0.5101	0.3659	
				CONTRIB	0.18%	18.73%	62.95%	13.35%	4.78%	3,280
				CONTRIB	0.00%	5.55%	65.16%	27.27%	2.03%	168
3	8.6	11.0	1.66	RATIOS	0.3225	0.3138	0.4674	0.5506	0.4136	
				CONTRIB	2.37%	6.83%	74.82%	11.23%	4.74%	3,280
				CONTRIB	0.03%	1.33%	81.62%	13.97%	3.04%	544
4	10.8	11.0	9.53	RATIOS	0.3686	0.4167	0.6069	0.5985	0.4977	
				CONTRIB	0.71%	10.21%	81.02%	4.49%	3.56%	3,280
				CONTRIB	0.63%	9.46%	82.21%	4.27%	3.44%	3,125
5	9.9	11.0	5.64	RATIOS	0.3541	0.3644	0.5661	0.5232	0.4519	
				CONTRIB	1.28%	7.01%	84.95%	3.33%	3.43%	3,280
				CONTRIB	0.67%	5.07%	88.53%	2.91%	2.82%	1,849
6	8.2	11.0	1.07	RATIOS	0.3391	0.3059	0.4372	0.5599	0.4105	
				CONTRIB	5.59%	8.30%	65.92%	14.22%	5.97%	3,280
				CONTRIB	1.56%	1.22%	68.60%	24.32%	4.30%	350
7	7.0	11.0	0.96	RATIOS	0.4775	0.2986	0.2987	0.5411	0.4039	
				CONTRIB	34.23%	19.66%	13.49%	21.49%	11.13%	3,280
				CONTRIB	73.94%	0.81%	0.00%	21.38%	3.87%	316
8	9.3	11.0	3.34	RATIOS	0.3622	0.3221	0.5062	0.6519	0.4606	
				CONTRIB	3.38%	4.11%	71.94%	15.20%	5.37%	3,280
				CONTRIB	1.47%	1.15%	69.68%	21.64%	6.07%	1,097
9	9.6	11.0	4.38	RATIOS	0.3197	0.4558	0.5054	0.5208	0.4504	
				CONTRIB	0.57%	32.70%	58.68%	4.01%	4.04%	3,280
				CONTRIB	0.01%	40.22%	52.66%	3.64%	3.47%	1,436

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Wind Comfort Analysis

Project
Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

10.0% Exc. ---Criterion---									
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.	NW	WNW	W	WSW	OTHER	SUM
Profile Ratios:				2.0000	2.0000	2.0000	2.0000	2.0000	
10	7.9	11.0	0.74	RATIOS 0.3270	0.3375	0.4215	0.4776	0.3909	
				CONTRIB 5.29%	19.79%	61.65%	8.01%	5.27%	3,280
				CONTRIB 0.18%	13.91%	70.21%	12.38%	3.31%	241
11	7.3	11.0	3.62	RATIOS 0.7396	0.2419	0.2935	0.5078	0.4457	
				CONTRIB 61.72%	2.73%	7.76%	14.60%	13.18%	3,280
				CONTRIB 92.60%	0.00%	0.00%	3.74%	3.66%	1,187
12	8.2	11.0	2.86	RATIOS 0.6278	0.3121	0.3849	0.4867	0.4529	
				CONTRIB 44.81%	9.85%	27.70%	7.59%	10.05%	3,280
				CONTRIB 82.45%	0.69%	7.58%	3.59%	5.69%	939
13	8.4	11.0	2.70	RATIOS 0.4917	0.2539	0.3966	0.7418	0.4710	
				CONTRIB 25.02%	0.78%	28.11%	35.69%	10.40%	3,280
				CONTRIB 31.11%	0.00%	10.70%	49.29%	8.90%	886
14	6.3	11.0	0.52	RATIOS 0.3051	0.2150	0.2809	0.6196	0.3551	
				CONTRIB 13.82%	3.94%	19.80%	51.69%	10.76%	3,280
				CONTRIB 0.00%	0.00%	0.00%	99.51%	0.49%	169
15	6.9	11.0	0.39	RATIOS 0.2399	0.3606	0.3183	0.5019	0.3552	
				CONTRIB 0.95%	50.59%	23.99%	17.64%	6.83%	3,280
				CONTRIB 0.00%	67.14%	0.00%	32.20%	0.66%	128
16	7.7	11.0	1.42	RATIOS 0.2893	0.2179	0.3986	0.6997	0.4014	
				CONTRIB 2.23%	0.18%	51.34%	39.07%	7.18%	3,280
				CONTRIB 0.00%	0.00%	21.44%	76.13%	2.42%	464
17	8.1	11.0	1.96	RATIOS 0.4933	0.4252	0.3465	0.3154	0.3951	
				CONTRIB 27.45%	52.22%	14.71%	0.47%	5.15%	3,280
				CONTRIB 43.70%	54.67%	0.20%	0.01%	1.43%	643
18	6.7	11.0	0.93	RATIOS 0.4870	0.2952	0.2627	0.4874	0.3831	
				CONTRIB 40.15%	23.90%	6.82%	17.94%	11.19%	3,280
				CONTRIB 86.09%	0.66%	0.00%	11.22%	2.03%	304

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Wind Comfort Analysis

Project
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The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

Loca- tion	10.0% Exc. Ground Speed	---Criterion--- Speed Exc.	% Time Exc.		NW	WNW	W	WSW	OTHER	SUM
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000	
19	8.9	11.0	2.81	RATIOS	0.4302	0.4436	0.4429	0.3593	0.4190	
				CONTRIB	13.36%	41.19%	40.70%	0.58%	4.18%	3,280
				CONTRIB	12.96%	54.94%	29.58%	0.39%	2.13%	920
20	9.7	11.0	4.71	RATIOS	0.3719	0.3297	0.5235	0.7434	0.4921	
				CONTRIB	2.74%	3.43%	66.90%	20.85%	6.07%	3,280
				CONTRIB	1.42%	1.32%	62.21%	28.51%	6.53%	1,544
64	7.0	11.0	0.22	RATIOS	0.3262	0.2716	0.3787	0.4015	0.3445	
				CONTRIB	10.40%	10.68%	68.15%	5.64%	5.13%	3,279
				CONTRIB	0.53%	0.07%	86.08%	13.15%	0.17%	71
65	6.5	11.0	0.02	RATIOS	0.2744	0.2810	0.3473	0.3743	0.3192	
				CONTRIB	5.92%	20.87%	62.38%	5.78%	5.06%	3,279
				CONTRIB	0.00%	5.39%	21.97%	72.63%	0.01%	7
66	8.4	11.0	2.01	RATIOS	0.2983	0.3148	0.4274	0.7320	0.4431	
				CONTRIB	1.25%	8.59%	47.77%	34.40%	7.98%	3,280
				CONTRIB	0.00%	1.18%	29.41%	63.27%	6.14%	658
67	9.2	11.0	3.36	RATIOS	0.2809	0.2960	0.5039	0.6814	0.4406	
				CONTRIB	0.07%	2.18%	74.79%	18.53%	4.43%	3,279
				CONTRIB	0.00%	0.19%	67.32%	29.08%	3.40%	1,100

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Wind Comfort Analysis

Cumulative

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

Loca- tion	10.0% Exc. Ground Speed	---Criterion--- Speed Exc.	% Time Exc.		NW	WNW	W	WSW	OTHER	SUM
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000	
1	12.2			RATIOS	0.2128	0.4755	0.7123	0.3606	0.4403	
				CONTRIB	0.00%	11.18%	88.53%	0.01%	0.28%	3,280
		11.0	13.58	CONTRIB	0.00%	15.71%	83.38%	0.08%	0.83%	4,454
2	7.5			RATIOS	0.1897	0.3451	0.4007	0.4055	0.3352	
				CONTRIB	0.00%	28.35%	64.66%	3.92%	3.07%	3,280
		11.0	0.51	CONTRIB	0.00%	31.77%	62.16%	6.05%	0.01%	168
3	7.7			RATIOS	0.4009	0.1966	0.4097	0.5229	0.3825	
				CONTRIB	19.31%	0.01%	61.67%	13.55%	5.47%	3,279
		11.0	0.74	CONTRIB	21.72%	0.00%	53.55%	22.22%	2.50%	242
4	9.9			RATIOS	0.3064	0.2934	0.5796	0.5921	0.4429	
				CONTRIB	0.16%	0.45%	88.91%	7.48%	3.00%	3,280
		11.0	6.36	CONTRIB	0.00%	0.08%	92.05%	5.95%	1.92%	2,087
5	6.5			RATIOS	0.3535	0.2787	0.3278	0.3874	0.3368	
				CONTRIB	21.32%	20.59%	43.53%	7.53%	7.03%	3,280
		11.0	0.06	CONTRIB	63.05%	1.20%	0.09%	35.51%	0.15%	19
6	6.7			RATIOS	0.3117	0.2970	0.3177	0.5602	0.3716	
				CONTRIB	10.30%	23.42%	27.76%	28.64%	9.88%	3,280
		11.0	0.28	CONTRIB	0.02%	2.48%	0.00%	92.97%	4.53%	92
7	8.0			RATIOS	0.4880	0.3466	0.3964	0.4483	0.4198	
				CONTRIB	27.24%	21.57%	38.67%	4.98%	7.55%	3,280
		11.0	1.39	CONTRIB	57.81%	12.78%	20.66%	4.34%	4.40%	457
8	6.4			RATIOS	0.3720	0.3084	0.2168	0.5375	0.3587	
				CONTRIB	24.43%	34.45%	1.56%	29.30%	10.26%	3,280
		11.0	0.28	CONTRIB	23.58%	5.41%	0.00%	69.32%	1.69%	93
9	8.4			RATIOS	0.3144	0.5728	0.3584	0.4404	0.4215	
				CONTRIB	2.09%	75.51%	13.57%	3.09%	5.73%	3,280
		11.0	5.11	CONTRIB	0.00%	96.65%	1.03%	1.06%	1.26%	1,675

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Wind Comfort Analysis

Cumulative

Wind Test Date: Nov 2014

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The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

10.0% Exc. ---Criterion---									
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.	NW	WNW	W	WSW	OTHER	SUM
Profile Ratios:				2.0000	2.0000	2.0000	2.0000	2.0000	
10	8.6	11.0	1.73	RATIOS 0.2817	0.3594	0.4702	0.4305	0.3854	
				CONTRIB 0.47%	18.36%	75.73%	2.33%	3.12%	3,280
				CONTRIB 0.00%	14.67%	81.47%	2.69%	1.17%	568
11	6.7	11.0	3.32	RATIOS 0.7283	0.2333	0.2557	0.4121	0.4073	
				CONTRIB 66.81%	4.64%	5.30%	9.73%	13.52%	3,280
				CONTRIB 97.69%	0.00%	0.00%	1.06%	1.25%	1,089
12	7.5	11.0	2.49	RATIOS 0.6186	0.3381	0.2957	0.4211	0.4184	
				CONTRIB 51.16%	26.26%	7.08%	5.18%	10.32%	3,280
				CONTRIB 91.79%	4.24%	0.00%	1.62%	2.35%	818
13	8.3	11.0	2.55	RATIOS 0.4937	0.2719	0.3882	0.7244	0.4696	
				CONTRIB 25.94%	2.66%	26.44%	34.26%	10.71%	3,280
				CONTRIB 33.70%	0.01%	9.21%	47.83%	9.25%	838
14	5.2	11.0	0.06	RATIOS 0.2506	0.1971	0.2556	0.4475	0.2877	
				CONTRIB 12.78%	8.96%	36.23%	32.14%	9.89%	3,279
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	20
15	7.6	11.0	0.70	RATIOS 0.3947	0.3728	0.3454	0.5280	0.4102	
				CONTRIB 19.11%	36.93%	20.77%	14.59%	8.60%	3,280
				CONTRIB 18.96%	49.36%	0.44%	24.79%	6.45%	231
16	7.6	11.0	1.02	RATIOS 0.3393	0.2915	0.3727	0.6596	0.4158	
				CONTRIB 8.60%	10.49%	37.23%	33.92%	9.75%	3,279
				CONTRIB 1.70%	0.46%	15.66%	76.87%	5.30%	334
17	7.3	11.0	1.60	RATIOS 0.4347	0.4302	0.2834	0.2897	0.3595	
				CONTRIB 26.13%	61.79%	6.13%	0.53%	5.42%	3,280
				CONTRIB 25.64%	74.01%	0.00%	0.00%	0.35%	525
18	6.5	11.0	0.41	RATIOS 0.4261	0.3099	0.2725	0.4417	0.3625	
				CONTRIB 31.60%	32.79%	11.93%	13.58%	10.10%	3,280
				CONTRIB 80.02%	4.18%	0.00%	13.53%	2.27%	133

Transbay Block 1 / 160 Folsom St
 San Francisco, California

Wind Comfort Analysis

Cumulative

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded 10% of the time for each measurement location. Section 148 of the Planning Code sets comfort criteria of 11 mph for areas of substantial public pedestrian use and 7 mph for public seating areas. These criteria are not to be exceeded more than 10% of the time.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

Loca- tion	10.0% Exc. Ground Speed	---Criterion--- Speed Exc.	% Time Exc.		NW	WNW	W	WSW	OTHER	SUM
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000	
19	6.6			RATIOS	0.3190	0.2730	0.3482	0.3732	0.3283	
				CONTRIB	13.03%	17.42%	58.75%	5.24%	5.56%	3,280
		11.0	0.02	CONTRIB	1.16%	0.94%	26.69%	71.12%	0.08%	7
20	7.2			RATIOS	0.3684	0.2451	0.3536	0.6213	0.3971	
				CONTRIB	18.00%	3.59%	36.10%	32.50%	9.81%	3,279
		11.0	0.63	CONTRIB	9.49%	0.00%	2.96%	82.82%	4.73%	207
64	4.7			RATIOS	0.4433	0.1812	0.2131	0.2419	0.2699	
				CONTRIB	57.37%	9.60%	19.65%	2.61%	10.78%	3,280
		11.0	0.47	CONTRIB	100.00%	0.00%	0.00%	0.00%	0.00%	153
65	6.9			RATIOS	0.3262	0.2872	0.3673	0.3036	0.3211	
				CONTRIB	11.85%	18.37%	64.82%	1.02%	3.94%	3,279
		11.0	0.14	CONTRIB	0.80%	2.41%	96.79%	0.01%	0.00%	47
66	8.5			RATIOS	0.3018	0.3644	0.4402	0.6599	0.4415	
				CONTRIB	1.11%	20.03%	50.18%	21.77%	6.90%	3,280
		11.0	1.97	CONTRIB	0.00%	14.50%	39.66%	39.87%	5.96%	646
67	7.6			RATIOS	0.2349	0.3018	0.3923	0.6145	0.3859	
				CONTRIB	0.25%	14.16%	52.88%	26.26%	6.45%	3,280
		11.0	0.78	CONTRIB	0.00%	1.26%	33.53%	62.56%	2.66%	255

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Wind Hazard Analysis

Existing

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.0114152512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
1	20.4	36.0	0.0000000	RATIOS	0.2914	0.3271	0.3656	0.6690	0.4133
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
2	15.2	36.0	0.0000000	RATIOS	0.2238	0.3302	0.4047	0.4978	0.3641
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
3	19.0	36.0	0.0000000	RATIOS	0.3595	0.2942	0.5453	0.6230	0.4555
				CONTRIB	0.00%	0.00%	0.03%	99.97%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
4	19.8	36.0	0.0000000	RATIOS	0.2825	0.3805	0.6272	0.6076	0.4745
				CONTRIB	0.00%	0.00%	45.01%	54.99%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
5	18.8	36.0	0.0000000	RATIOS	0.3582	0.3508	0.5139	0.6185	0.4603
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
6	18.4	36.0	0.0000000	RATIOS	0.3835	0.3054	0.4570	0.6045	0.4376
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
7	16.0	36.0	0.0000000	RATIOS	0.3522	0.2910	0.4578	0.5262	0.4068
				CONTRIB	0.00%	0.00%	0.02%	99.98%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
8	19.8	36.0	0.0000000	RATIOS	0.3878	0.3630	0.5620	0.6508	0.4909
				CONTRIB	0.00%	0.00%	0.01%	99.99%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
9	21.3	36.0	0.0000000	RATIOS	0.3323	0.4385	0.5339	0.6996	0.5011
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

Transbay Block 1 / 160 Folsom St
San Francisco, California

Wind Hazard Analysis

Existing
Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---									
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.	NW	WNW	W	WSW	OTHER	SUM
Profile Ratios:				2.0000	2.0000	2.0000	2.0000	2.0000	
10	25.2	36.0	0.0000000	RATIOS 0.7735	0.3721	0.4800	0.5548	0.5451	
				CONTRIB 100.00%	0.00%	0.00%	0.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
11	21.4	36.0	0.0000000	RATIOS 0.6490	0.2298	0.4238	0.6579	0.4901	
				CONTRIB 43.90%	0.00%	0.00%	56.10%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
12	20.0	36.0	0.0000000	RATIOS 0.5237	0.3283	0.5007	0.6572	0.5025	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
13	19.2	36.0	0.0000000	RATIOS 0.2962	0.2271	0.2623	0.6312	0.3542	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
14	17.2	36.0	0.0000000	RATIOS 0.2184	0.2192	0.2819	0.5636	0.3208	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
15	15.6	36.0	0.0000000	RATIOS 0.2599	0.3217	0.2859	0.5137	0.3453	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
16	20.0	36.0	0.0000000	RATIOS 0.5119	0.2221	0.3735	0.6571	0.4411	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
17	14.5	36.0	0.0000000	RATIOS 0.4402	0.3917	0.3955	0.3087	0.3840	
				CONTRIB 42.03%	57.97%	0.00%	0.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
18	14.6	36.0	0.0000000	RATIOS 0.3086	0.3098	0.3107	0.4804	0.3524	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0

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 San Francisco, California

Wind Hazard Analysis

Existing

Wind Test Date: Nov 2014

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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
19	16.3			RATIOS	0.3620	0.4518	0.4038	0.4064	0.4060
				CONTRIB	0.00%	100.00%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
20	22.2			RATIOS	0.3632	0.3069	0.5274	0.7289	0.4816
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
64	16.4			RATIOS	0.2954	0.3126	0.4967	0.5397	0.4111
				CONTRIB	0.00%	0.00%	1.33%	98.67%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
65	18.0			RATIOS	0.3369	0.3184	0.5077	0.5904	0.4384
				CONTRIB	0.00%	0.00%	0.01%	99.99%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
66	18.3			RATIOS	0.3496	0.2820	0.4803	0.6009	0.4282
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
67	20.1			RATIOS	0.2337	0.2966	0.5402	0.6614	0.4330
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

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 San Francisco, California

Wind Hazard Analysis

Project
 Wind Test Date: Nov 2014

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Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
1	18.4	36.0	0.0000000	RATIOS	0.2422	0.3128	0.3571	0.6054	0.3794
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
2	15.5	36.0	0.0000000	RATIOS	0.2334	0.3175	0.4025	0.5101	0.3659
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
3	16.8	36.0	0.0000000	RATIOS	0.3225	0.3138	0.4674	0.5506	0.4136
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
4	19.2	36.0	0.0000000	RATIOS	0.3686	0.4167	0.6069	0.5985	0.4977
				CONTRIB	0.00%	0.00%	37.52%	62.48%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
5	17.7	36.0	0.0000000	RATIOS	0.3541	0.3644	0.5661	0.5232	0.4519
				CONTRIB	0.00%	0.00%	94.23%	5.77%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
6	17.0	36.0	0.0000000	RATIOS	0.3391	0.3059	0.4372	0.5599	0.4105
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
7	16.5	36.0	0.0000000	RATIOS	0.4775	0.2986	0.2987	0.5411	0.4039
				CONTRIB	1.70%	0.00%	0.00%	98.29%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
8	19.9	36.0	0.0000000	RATIOS	0.3622	0.3221	0.5062	0.6519	0.4606
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
9	17.1	36.0	0.0000000	RATIOS	0.3197	0.4558	0.5054	0.5208	0.4504
				CONTRIB	0.00%	48.48%	0.30%	51.22%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

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 San Francisco, California

Wind Hazard Analysis

Project
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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM	
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.							
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000	
10	14.6	36.0	0.0000000	RATIOS	0.3270	0.3375	0.4215	0.4776	0.3909	
				CONTRIB	0.00%	0.03%	0.05%	99.92%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
11	24.1	36.0	0.0000000	RATIOS	0.7396	0.2419	0.2935	0.5078	0.4457	
				CONTRIB	100.00%	0.00%	0.00%	0.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
12	20.5	36.0	0.0000000	RATIOS	0.6278	0.3121	0.3849	0.4867	0.4529	
				CONTRIB	100.00%	0.00%	0.00%	0.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
13	22.6	36.0	0.0000000	RATIOS	0.4917	0.2539	0.3966	0.7418	0.4710	
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
14	18.9	36.0	0.0000000	RATIOS	0.3051	0.2150	0.2809	0.6196	0.3551	
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
15	15.3	36.0	0.0000000	RATIOS	0.2399	0.3606	0.3183	0.5019	0.3552	
				CONTRIB	0.00%	0.09%	0.00%	99.91%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
16	21.3	36.0	0.0000000	RATIOS	0.2893	0.2179	0.3986	0.6997	0.4014	
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
17	16.2	36.0	0.0000000	RATIOS	0.4933	0.4252	0.3465	0.3154	0.3951	
				CONTRIB	65.74%	34.26%	0.00%	0.00%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0
18	16.0	36.0	0.0000000	RATIOS	0.4870	0.2952	0.2627	0.4874	0.3831	
				CONTRIB	57.05%	0.00%	0.00%	42.95%	0.00%	4
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%	0

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Wind Hazard Analysis

Project
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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
19	16.1			RATIOS	0.4302	0.4436	0.4429	0.3593	0.4190
				CONTRIB	0.01%	99.99%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
20	22.6			RATIOS	0.3719	0.3297	0.5235	0.7434	0.4921
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
64	12.3			RATIOS	0.3262	0.2716	0.3787	0.4015	0.3445
				CONTRIB	0.00%	0.00%	5.73%	94.26%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
65	11.5			RATIOS	0.2744	0.2810	0.3473	0.3743	0.3192
				CONTRIB	0.00%	0.88%	1.86%	97.25%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
66	22.3			RATIOS	0.2983	0.3148	0.4274	0.7320	0.4431
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
67	20.7			RATIOS	0.2809	0.2960	0.5039	0.6814	0.4406
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

Transbay Block 1 / 160 Folsom St
San Francisco, California

Wind Hazard Analysis

Cumulative

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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
1	22.3	36.0	0.0000000	RATIOS	0.2128	0.4755	0.7123	0.3606	0.4403
				CONTRIB	0.00%	0.00%	100.00%	0.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
2	13.1	36.0	0.0000000	RATIOS	0.1897	0.3451	0.4007	0.4055	0.3352
				CONTRIB	0.00%	36.38%	3.53%	60.09%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
3	15.9	36.0	0.0000000	RATIOS	0.4009	0.1966	0.4097	0.5229	0.3825
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
4	18.5	36.0	0.0000000	RATIOS	0.3064	0.2934	0.5796	0.5921	0.4429
				CONTRIB	0.00%	0.00%	21.01%	78.99%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
5	11.9	36.0	0.0000000	RATIOS	0.3535	0.2787	0.3278	0.3874	0.3368
				CONTRIB	9.21%	0.04%	0.00%	90.74%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
6	17.0	36.0	0.0000000	RATIOS	0.3117	0.2970	0.3177	0.5602	0.3716
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
7	15.9	36.0	0.0000000	RATIOS	0.4880	0.3466	0.3964	0.4483	0.4198
				CONTRIB	99.70%	0.00%	0.00%	0.30%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
8	16.3	36.0	0.0000000	RATIOS	0.3720	0.3084	0.2168	0.5375	0.3587
				CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%
9	20.7	36.0	0.0000000	RATIOS	0.3144	0.5728	0.3584	0.4404	0.4215
				CONTRIB	0.00%	100.00%	0.00%	0.00%	0.00%
				CONTRIB	0.00%	0.00%	0.00%	0.00%	0.00%

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Wind Hazard Analysis

Cumulative

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0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
Profile Ratios:				2.0000	2.0000	2.0000	2.0000	2.0000	
10	14.7	36.0	0.0000000	RATIOS 0.2817	0.3594	0.4702	0.4305	0.3854	
				CONTRIB 0.00%	0.62%	96.21%	3.16%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
11	23.8	36.0	0.0000000	RATIOS 0.7283	0.2333	0.2557	0.4121	0.4073	
				CONTRIB 100.00%	0.00%	0.00%	0.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
12	20.2	36.0	0.0000000	RATIOS 0.6186	0.3381	0.2957	0.4211	0.4184	
				CONTRIB 100.00%	0.00%	0.00%	0.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
13	22.1	36.0	0.0000000	RATIOS 0.4937	0.2719	0.3882	0.7244	0.4696	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
14	13.6	36.0	0.0000000	RATIOS 0.2506	0.1971	0.2556	0.4475	0.2877	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
15	16.1	36.0	0.0000000	RATIOS 0.3947	0.3728	0.3454	0.5280	0.4102	
				CONTRIB 0.00%	0.03%	0.00%	99.97%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
16	20.1	36.0	0.0000000	RATIOS 0.3393	0.2915	0.3727	0.6596	0.4158	
				CONTRIB 0.00%	0.00%	0.00%	100.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
17	15.6	36.0	0.0000000	RATIOS 0.4347	0.4302	0.2834	0.2897	0.3595	
				CONTRIB 0.16%	99.84%	0.00%	0.00%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0
18	14.1	36.0	0.0000000	RATIOS 0.4261	0.3099	0.2725	0.4417	0.3625	
				CONTRIB 33.42%	0.00%	0.00%	66.58%	0.00%	4
				CONTRIB 0.00%	0.00%	0.00%	0.00%	0.00%	0

Transbay Block 1 / 160 Folsom St
San Francisco, California

Wind Hazard Analysis

Cumulative

Wind Test Date: Nov 2014

The ratios of pedestrian-level wind speeds to the 132-ft. height reference wind speeds at the old Civic Center meteorological station are shown in the first line of output for each location.

The second line of the output shows the pedestrian level wind speeds, in mph, which would be exceeded one hour per year (0.01141552512% of the time) for each measurement location tested.

Section 148 of the Planning Code sets a wind hazard criterion that an hourly average speed of 26 mph for a full hour (a one-minute average speed of 36 mph) not be reached or exceeded one hour per year.

The third line of output for each location shows the criterion speed and the percentage of the time the criterion would be exceeded. The rows labeled CONTRIB tabulate the percentage contribution to the total or the exceedance from each wind direction. The SUMS are the equivalent number of events.

0.011415% Exc. ---Criterion---				NW	WNW	W	WSW	OTHER	SUM
Loca- tion	Ground Speed	Speed Exc.	% Time Exc.						
				Profile Ratios:	2.0000	2.0000	2.0000	2.0000	2.0000
19				RATIOS	0.3190	0.2730	0.3482	0.3732	0.3283
	11.4			CONTRIB	0.18%	0.20%	3.09%	96.52%	0.01%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0
20				RATIOS	0.3684	0.2451	0.3536	0.6213	0.3971
	18.9			CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0
64				RATIOS	0.4433	0.1812	0.2131	0.2419	0.2699
	14.5			CONTRIB	100.00%	0.00%	0.00%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0
65				RATIOS	0.3262	0.2872	0.3673	0.3036	0.3211
	11.5			CONTRIB	0.46%	2.53%	97.01%	0.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0
66				RATIOS	0.3018	0.3644	0.4402	0.6599	0.4415
	20.1			CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0
67				RATIOS	0.2349	0.3018	0.3923	0.6145	0.3859
	18.7			CONTRIB	0.00%	0.00%	0.00%	100.00%	0.00%
		36.0	0.0000000	CONTRIB	0.00%	0.00%	0.00%	0.00%	0