RWDI
CONSULTING ENGINEERS & SCIENTISTS

Tel: 519.823.1311
Fax: 519.823.1316

Rowan Williams Davies & Irwin Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada
N1K 1B8

Exhibit D

May 17, 2013

Randy Mason
URS Corporation
310 Golden Shore, Suite 100
Long Beach, CA 90802
randy.mason@urs.com

Re: Wind Effect Review
Leeway Sailing Center
Long Beach, CA
RWDI Project #1301554

Dear Randy,

Rowan Williams Davies & Irwin Inc. (RWDI) has reviewed the potential surface level wind conditions around the proposed redevelopment of the Leeway Sailing Center in Long Beach, California. This letter summarizes our findings of the qualitative review based on the local wind data, current design drawings and our knowledge and experience with wind flows around buildings.

Background Information

The proposed project involves replacing a one-storey building at the existing Leeway Sailing Center with another of similar design. Concerns have been raised regarding the potential for wind conditions in the Bay area to be affected by the new construction, in such a way as to influence wind conditions for sailing Alamitos Bay (Bay).

The current Leeway Sailing Center consists of a one-story building and an outdoor boat storage area, located on the north side of E Ocean Boulevard in Long Beach (Images 1a and 1b). To the north of the building is an existing deck and pier, leading to the Bay in Alamitos Bay, on which wind conditions are of interest to the current assessment.

The proposed development will consist of a one-story classroom and a one-storey covered boat storage and work area. The classroom and covered storage will have a similar height to the existing building, but with a combined south façade, which is wider and more solid than the existing – see Images 2 for the plan and south elevation of the proposed replacement.

We understand that the building height and roof shape for the classroom, the breezeway between the classroom and the storage area, and the porosity of the south façade of the storage area are subject to change, if deemed necessary for a reduced wind impact on sailing conditions.

Image 1a - Aerial photo of the site and surroundings (Courtesy of Google earth™)

Image 1b - Street view of the existing building (Courtesy of Google earth™)

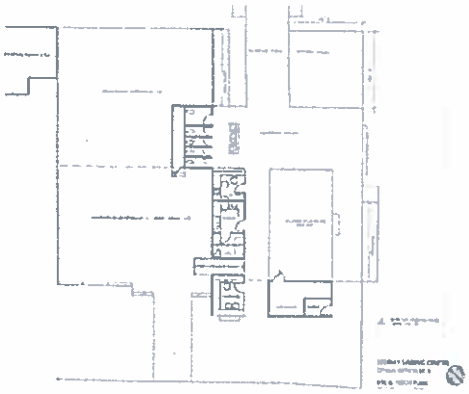


Image 2a – Plan of the proposed buildings

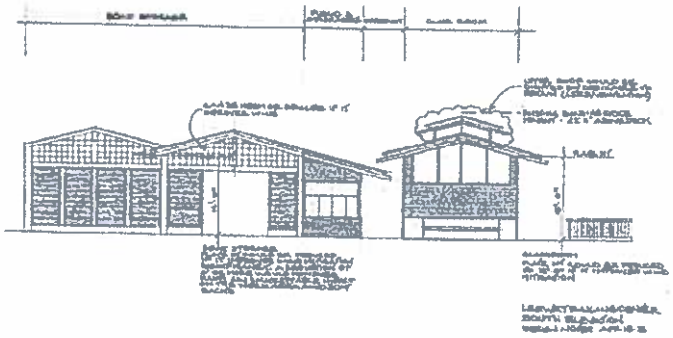
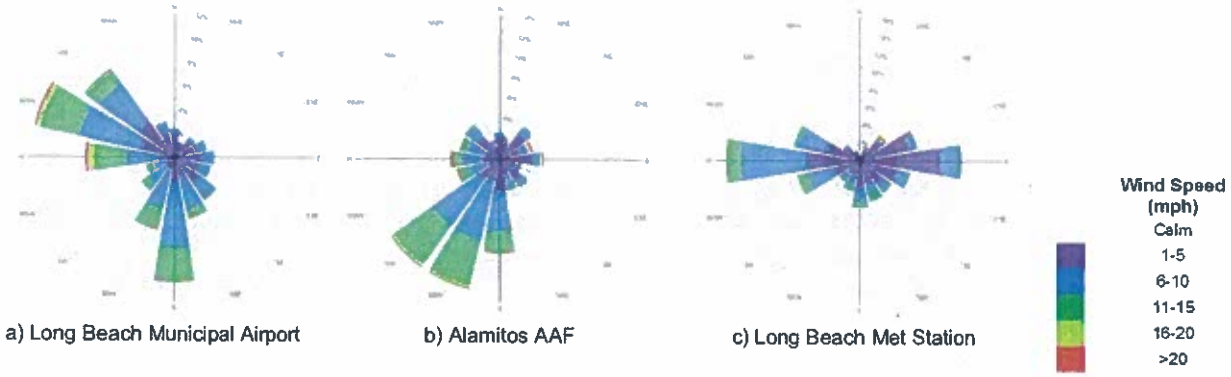


Image 2b – South elevation

Local Wind Data

Long-term wind data from three nearby weather stations are collected, analyzed and presented in Image 3a, 3b and 3c. The Long Beach Municipal Airport is located to the north-northwest of the site, where winds are primarily from the south and west through northwest directions (Image 3a). Winds at the Los Alamitos AAF (northeast of the site) are most frequent from the south through southwest directions (Image 3b). The third station is located on the beach near the Long Beach Lifeguards Headquarters to the west-northwest of the site and winds at that station are more likely from the westerly and easterly directions (Image 3c).

Wind roses in Image 3 indicate winds on the development site may potentially from many directions. However, based on the relative position of the development and the Bay (see Image 1a), the wind conditions in the Bay may be affected by the proposed development in theory, only when winds are from the south-southeast through west directions. The impacts are however minimal and similar to those created by the existing building, as detailed in the following section.



a) Long Beach Municipal Airport b) Alamitos AAF c) Long Beach Met Station

Image 3 – Directional Distribution (%) of Winds (blowing from)

Potential Wind Impact

When winds approach a low building, they will be blocked by the windward façade of the building and re-directed toward the sides and roof of the building, where wind flow accelerations will occur adjacent to the building surfaces. Behind the building, a wake zone will form, typically with low wind speeds and high turbulence, as shown in Image 4. Beyond the wake zone, wind speeds will recover and turbulence will decline, resulting in wind conditions that become similar to those in the approaching (undisturbed) flows.

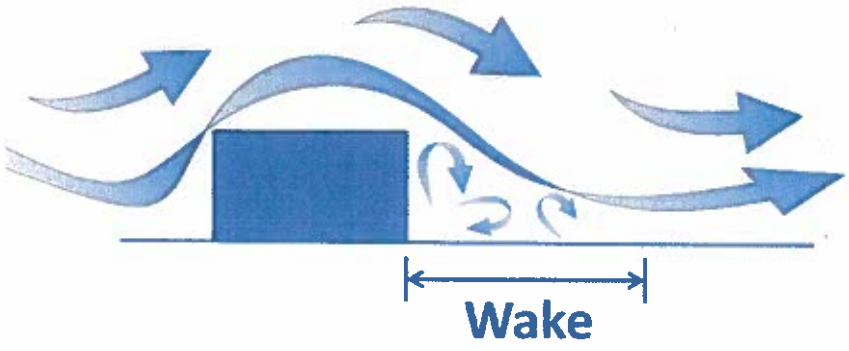


Image 4 – Wake area behind a building

The length of the wake zone along the wind direction may be dependent upon many factors, but can be estimated by the windward dimensions (height and width) of the building. Table 1 lists the building dimensions and the potential wake lengths for the existing and proposed buildings, based on the estimation method described in ASHRAE Handbook Fundamentals (2009). These estimates have been validated by RWDI through wind tunnel tests of many buildings, particularly those with regular shapes such as this one.

Table 1 - Building dimensions and wake length (in feet)

	Height	Width	Wake Length
Existing	15	36	20
Proposed	15	87	27

The above calculation is based the average roof height and the maximum width of the building's south façade. Due to the increased width in building façade, the wake length will increase from 20 to 27 ft from the back of the proposed building. If the maximum height of the classroom roof of 22'11" is used in the calculation, the wake length will be longer (approximately 36 ft). If the breezeway between the buildings is considered, the wake length behind each building will be shorter than that for the combined façade. In any case, all wake lengths are significantly shorter than the distance from the back of the building to the north end of pier, which is estimated to be approximately 170 ft, as shown in Image 5.

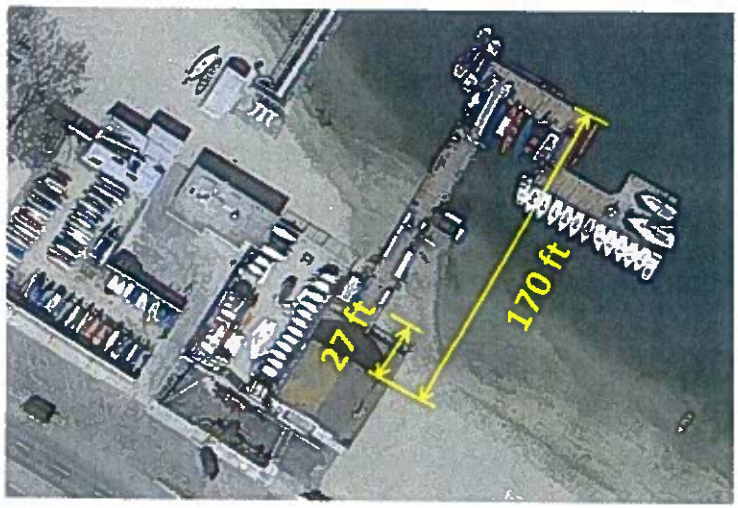


Image 5 – Wake length and distance to the pier (Courtesy of Google earth™)

Therefore, any potential wind effects will be limited to a small zone immediately behind the proposed building on the deck and on part of the pier, where reduced wind speeds and increased turbulence will be experienced, when compared to undisturbed wind flows in the area. These effects will be similar to the existing conditions on and around the site and they will not reach the Bay area, which is outside of the wake of the one-story building(s).

Effects of Building Height, Roof Shape, Breezeway and Façade Porosity

It is our understanding that the design team is willing to reduce the height and remove the upper roof of the classroom for reducing the potential wind effects. These measures will slightly reduce the length of the wake zone behind the classroom, but, in our opinion, are unnecessary given the distance from the building to the sailing area.

The inclusion of a breezeway between the classroom and the storage area will produce two separate wake zones behind the two buildings, which are smaller than the single wake length estimated in Table 1. Therefore, the breezeway will not have a negative effect on wind conditions in the Bay.

Wind flows may be affected by façade porosity. Typically, a solid façade will cause a more significant wind reduction in a smaller area behind the building, when compared to a porous façade. In other words, a porous façade will see less wind reduction, but a longer wake length in general. Because of the long distance between the building and the sailing area, the effect of façade porosity will be negligible.

Conclusion

The current review is qualitative in nature. It is based on the local wind climate, current design drawings as well as our knowledge and experience with wind flows around buildings. The proposed development at the Leeway Sailing Center has a similar height to the existing building, but a wider south facade. A slight increase in the wake length is estimated for winds from the south and southwest directions, based on the method provided in ASHRAE Handbook Fundamentals, but the resultant wake length is much shorter than the distance from the building to the end of the pier. Therefore, it is our conclusion that the wind effects on the sailing conditions in the Bay will be negligible for both existing and proposed building configurations.

Effects of the height and roof shape of the classroom, the breezeway and the façade porosity on the sailing wind conditions are also considered negligible.

We trust the above discussions satisfy your current needs. Should you have any questions, please do not hesitate to contact us.

Yours very truly,

ROWAN WILLIAMS DAVIES & IRWIN Inc.

Hanqing Wu, Ph.D., P.Eng.
Technical Director / Principal

Bill Smeaton, P.Eng.
Principal / Senior Project Manager

HW/jls