

P.O. Box 1749 Halifax, Nova Scotia B3J 3A5 Canada

Item No. 11.1.4 Halifax Regional Council September 20, 2011

TO:	Mayor Kelly and Members of Halifax Regional Council Original signed by
SUBMITTED BY:	Richard Butts, Chief Administrative Officer
	Original Signed by
	Mike Labrecque, Deputy Chief Administrative Officer, Operations
DATE:	August 25, 2011
SUBJECT:	Case 16656: Amendment to the Dartmouth Municipal Planning Strategy and Development Agreement, former Dartmouth YMCA, Lake Banook

<u>ORIGIN</u>

An application by United Gulf Developments Limited (UGDL), to amend the Dartmouth Municipal Planning Strategy (MPS) to allow buildings taller than 35 feet on the former Dartmouth YMCA property; and to enter into a development agreement for two 17 storey residential buildings on the property.

RECOMMENDATION

It is recommended that Halifax Regional Council <u>not</u> initiate the process to consider amending the Dartmouth Municipal Planning Strategy, to deny consideration of buildings over 35 feet in height on the former YMCA site.

BACKGROUND

Overview

UGDL has submitted an application to amend the MPS and enter into a development agreement to permit two 17 storey residential buildings with a total of 128 units on the former site of the Dartmouth YMCA. There is currently a site specific policy in the Dartmouth MPS, Policy H-16, which was adopted in 2002. It specifically supports multi-unit development on the property by development agreement. However, in 2005 Regional Council approved Policies IP-9 and IP-10 which established a 35 foot height limit for all new development within a defined area around Lake Banook, including the former YMCA property (Maps 1 and 2). Attachment A provides the policies. The purpose of the height limit is to prevent the development of tall buildings which might alter wind patterns in a manner that negatively impacts the Lake Banook canoe racing course. The policies establish that this height limit cannot be varied through the development agreement process.

In order for the proposed development to proceed, Halifax Regional Council must therefore amend the Dartmouth MPS to enable consideration of the proposed 17 storey buildings, and Harbour East Community Council (HECC) must subsequently approve a development agreement.

Subject Area

UGDL's Lake Banook site is approximately 3.79 acres in size, as shown on Maps 1 and 2. A number of multi-unit residential buildings, ranging in height from 2 - 10 storeys, are located in the immediate vicinity of the YMCA site on Brookdale Court and Brookdale Crescent (Maps 1 and 2). The site also abuts the Circumferential Highway (Hwy. 111). A portion of the public trail system that partially encompasses Lake Banook crosses the site via an easement to HRM, and there is also a small beach area along the lake shore.

Land Use Policy and Zoning

The site is designated Urban Settlement under the Regional MPS, and is located within the defined Regional Centre. Under the Dartmouth MPS, the site is designated for residential development, and zoned R-3 (Multiple Family Residential - Medium Density) under the Dartmouth Land Use By-law. Development of multiple unit dwellings on the site must go through the development agreement process under Policy H-16. As noted above, however, Policies IP-9 and IP-10 limit building height to 35'. There is "as of right" development potential for town housing, as the R-3 zone allows the use pursuant to the requirement of the TH (Town Housing) Zone. The allowable density of townhouses on the site, based on the TH (Town Housing) limit of 15 townhouse units per acre, is 56 units. However, given the required watercourse setbacks of 20m, it is unlikely that this unit count could be achieved. The provisions of the R-3 and TH zones are included as Attachment B.

Current Proposal

The proposed multi-unit development is comprised of a shared 1 storey podium base that supports two 16 storey residential buildings, which are each approximately 175 feet in height, as illustrated on Map 3 and Attachment C. UGDL is also proposing to install a geothermal heating and cooling system which they indicate will provide a renewable and affordable form of heating and cooling for the project.

Previous Proposal

In 2003 UGDL submitted a similar application for the site, for 168 units in two 12-storey buildings. The application did not proceed to council, due primarily to the results of a wind impact study which involved extensive wind modeling. This study, commissioned by HRM in cooperation with the Atlantic Division of Canoe/Kayak Canada (ADCKC), involved wind tunnel testing of a scale model to determine potential wind changes on the paddling course. Based on the criteria as developed at the time by ADCKC, it was determined that the proposal would have unacceptable impacts on the course.

DISCUSSION

Lake Banook Canoe Course

Lake Banook is one of the most renowned natural canoe courses in the world, and has a long history as a preeminent location for both recreational and competitive racing which provide significant cultural, social and economic benefits for the region. As an example, the economic impact assessment for the 2009 ICF Canoe Sprint World Championships which were held here supported an estimated \$14.5 million in gross economic activity. The starting area for the canoe racing course is located near the subject property toward the northern portion of the lake, and the course extends southwest, as illustrated on Maps 1 and 2. The first 150 metres of the 1000 metre canoe course is the potential area of influence, within which any changes in wind patterns on the race course that result from the proposed development would occur.

MPS Policy

Policy H-16 was established to enable applications for multi-unit buildings on the subject property by development agreement once it was no longer used by the YMCA. Subsequently, and partially in response to the 2003 application by UGDL for two 12 storey buildings on the YMCA site, Regional Council established a 35 foot height limit around Lake Banook for all development (Policies IP-9 and IP-10).

The purpose of the height limit is to protect the canoe course from changes in wind patterns resulting from the development of taller buildings. The policies state that, in addition to as-of-right development, the 35 foot height limit also applies to any development agreement proposal within the height limit area. Therefore, there is no ability to vary the 35 foot height limit through a development agreement. It should be noted that policies IP-9 and IP-10 do not address the potential wind impacts of buildings that are 35 feet in height or less. Prior to approving policies

IP-9 and IP-10, Regional Council considered, but chose not to approve, an alternative policy which would have enabled consideration of taller buildings by development agreement, and subject to a wind impact study that assessed the effects of changes in wind patterns on the canoe course. UGDL is essentially requesting that Regional Council approve a site specific version of the policy alternative that it chose not to approve in 2005.

2008 Wind Study

UGDL prepared a new concept in 2007, and then retained RWDI to undertake further wind tunnel testing to measure the changes in wind patterns which would result from the proposed 17 storey buildings. RWDI then worked with volunteer representatives from ADCKC to develop revised evaluative criteria that would assess how the changes in wind patterns would impact the canoe racing course. RWDI's report is included as Attachment E. The new criteria represent a more sophisticated approach to determining the extent of wind impacts, as compared to those used in 2004. The 2008/09 RWDI study compared the effects on the canoe course under four scenarios:

- 1. the existing Lake Banook area and YMCA site without the proposed development;
- 2. with the proposed buildings located on the YMCA site;
- 3. with the buildings proposed by UGDL in 2003 on the YMCA site; and
- 4. with a large footprint 35 foot tall multi unit building on the YMCA site. This scenario was presented as an "as-of-right" development option, however, since the building as modeled cannot be developed as-of-right on the property. This is due to the fact that all multi-unit buildings in Dartmouth must be considered by development agreement. Further, the building as modeled far exceeds the allowable lot coverage of 35%, and intrudes into the required 20 m watercourse setback. The building as modeled could be a school which is permitted as of right by the zone, however the lot coverage and watercourse setback requirements are not met. This issue was identified to RWDI who responded that the general conclusions related to a large footprint, 35 foot tall building with a flat smooth roof would remain valid even if the footprint and lake setback were revised to meet applicable zone provisions. This 35' high building could be considered through the development agreement process, under current policies, and Community Council would have to take the wind impacts into account before approving the project. In reality, the likely "as of right" scenario for the site would be several blocks of townhouse dwellings, as permitted by the zone. The potential wind impacts of such a development have not been modeled and are therefore unknown.

Analysis By RWDI and ADCKC

In considering new evaluative criteria for these scenarios, the ADCKC determined that the impact of sidewinds on racers, and the goal of maintaining fairness across lanes of the course, are the critical factors in assessing the real impacts of winds on the course. The assessment of modeling data therefore used a "worst case scenario" derived from a baseline situation experienced during a world championship canoe race where winds are known to have influenced the course. Side wind weighting at 1, 2, and 3 times that of tail winds were used to measure the transition time difference between lanes over the first 150 metres of the course. Both RWDI and

the ADCKC concluded that, based upon the test criteria, the UGDL proposal as now presented would not have a substantial negative impact upon the race course even under the "worst case scenario" for racing. The ADCKC also determined that under better than worst case conditions, the effects on the canoe course of the current proposal would decrease to insignificant. It should be noted that the ADCKC review represents an assessment of potential wind impacts only, and is not an endorsement of the proposed development.

The assessment noted that for each development scenario, including the existing vacant lot situation, the presence of a dense tree cover along the shore ameliorates impacts on the course. The development agreement process allows Council to require the planting and maintenance of such a buffer, however as of right development would not have to provide any such additional plantings.

The shortcoming with all of this information and analysis is that the impact of a realistic as of right development scenario, consisting of several blocks of townhouses with each block being 35' in height, is not known. The ADCKC has expressed concern about such a scenario (Attachment D-3), based on the modeling of the large 35' building on the site.

Conclusion

Generally, MPS amendments should only be considered where factors related to MPS policies have changed in a manner or to a degree that the MPS had not anticipated. The Dartmouth MPS identifies the economic, cultural and recreational importance of Lake Banook's stature as one of the preeminent natural canoe courses in the world. This is evident in the clear direction that Regional Council provided, by establishing an absolute height limit around Lake Banook that eliminates the risk for taller buildings to impact the canoe course.

The ADCKC representatives have determined that the proposed buildings would not have a substantial negative impact upon the race course in the "worst case scenario" and that the impacts would decrease to insignificant under better than worst case conditions. However, because this cannot be guaranteed and the proposed buildings would be impossible to remove if the course was impacted, the full weight of the risks must be carefully considered, especially in light of the zero risk tolerance of the existing policy.

Prior to approving the existing height limit policies, Regional Council did consider an alternative policy that would have enabled applications for buildings taller than 35 feet, subject to the development agreement process and submission of a detailed wind impact analysis. Essentially, UGDL is requesting that Regional Council approve the same policy, although on a site specific basis, which was rejected in 2005. Staff are of the opinion that although ADCKC's revised criteria and evaluation indicate that this new proposal would not have substantial impacts, the circumstances are not sufficiently different to warrant reconsideration of the existing policy. Therefore, staff recommend that Regional Council refuse the request and not initiate the process to consider amending the MPS.

BUDGET IMPLICATIONS

There are no budget implications. The Developer will be responsible for all costs, expenses, liabilities and obligations imposed under or incurred in order to satisfy the terms of this Agreement. The administration of the Agreement can be carried out within the existing budget with existing resources.

FINANCIAL MANAGEMENT POLICIES/BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Project and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Project and Operating reserves, as well as any relevant legislation.

COMMUNITY ENGAGEMENT

Amendments to the Dartmouth Municipal Planning Strategy would involve community engagement, and the engagement process would be consistent with the intent of the HRM Community Engagement Strategy, the Halifax Regional Municipality Charter, and the Public Participation Program as approved in 1997.

The proposed level of community engagement is consultation, achieved through public information meeting(s) early in the review process, distribution of the proposal information by mail and on the HRM website, as well as a public hearing before Regional Council can consider approval of any amendments.

The proposed MPS amendments and development agreement will potentially impact the following stakeholders: local residents, property owners, and individuals that utilize Lake Banook and the surrounding public trails for recreational purposes and competitive canoe racing.

ALTERNATIVES

- 1. Council may choose to not initiate the MPS amendment process. This is the recommended course of action as staff are of the opinion that circumstances have not changed sufficiently since the adoption of Policies IP-9 and IP-10 in 2005. A decision not to initiate the MPS amendment process is at the discretion of Council and the decision cannot be appealed.
- 2. Council may choose to initiate the MPS amendment process in order to enable consideration of the proposed residential development, and direct staff to follow the public participation program approved in February 1997. This is not the recommendation of staff for reasons set out in this report. A decision to initiate the MPS amendment process is at the discretion of Council and the decision cannot be appealed.

ATTACHMENTS

Map 1	Generalized Future Land Use Map
Map 2	Zoning, Location and Lake Banook Canoe Course Height Limit
	Area Map
Map 3	Proposed Site Plan
Attachment A	Excerpts from the Dartmouth MPS
Attachment B	Excerpts from the Dartmouth LUB
Attachment C	Proposed Building Elevations
Attachments D1 – D3	Correspondence from the Atlantic Division of Canoe/Kayak
	Canada
Attachment E	RWDI Wind Analysis Report

A copy of this report can be obtained online at http://www.halifax.ca/council/agendasc/cagenda.html then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by:	Mitch Dickey, Planner, 490-5719
Report Approved by:	Original Signed
	Austin French, Manager of Planning Services, 490-6717







Attachment A

Excerpts from the Dartmouth MPS

Former Dartmouth YMCA Property

The former Dartmouth YMCA property at the foot of Brookdale Crescent presents an opportunity for a higher intensity or cluster form of residential development, in addition to an opportunity for the dedication of recreational lands, including lakeshore and linkage for the developing Trans Canada Trail. Higher intensity development utilizing a smaller building footprint will enable the potential for shoreline protection, passive recreation and waterfront access opportunities to be maximized.

- Policy H 16 In addition to the requirements and provisions of Policy IP-5, and all additional referenced policies, the following shall be considered in the approval of any development agreement for multiple unit residential development on the former YMCA property at Brookdale Court:
 - (a) The height, mass and orientation of any buildings(s) on the site shall be designed such that any negative impacts of altered wind and air current patterns on the recreational use of Lake Banook are minimized. The developer shall provide a report, prepared by a qualified person, to detail and analyze the expected effects of the alteration of wind patterns resulting from the redevelopment of this site;
 - (b) Any negative impacts on surrounding developments as a result of changes to traffic volumes or patterns shall be minimized through a combination of alterations to the access and egress points and a reduction in the number of permitted units. The developer shall provide a report, prepared by a qualified person, to detail and analyze the expected effects on traffic volumes and patterns resulting form the redevelopment of this site;
 - (c) Except for the areas to be used as public beach areas, provisions shall be made to provide continuous shoreline tree cover as viewed from the lake similar to the adjacent properties and provide continuous public walkway connection along the shoreline area between the Trans Canada Trail and existing park parcel PID # 100511; and
 - (d) The density of the development shall be similar to the overall density of adjacent multiple unit residential developments.

Lake Banook Canoe Course

Lake Banook canoe course is one of the best natural canoe courses in the world and it hosts both national and international canoe events. It is the only course of its kind in Atlantic Canada. The paddling and rowing regattas that occur on the lake are major recreational events and have a significant historical, economic and social benefits to the region. In 2004, the importance of protecting the Lake Banook Canoe Course from large-scale development was highlighted in a Wind Impact Study on the Lake Banook Canoe Course for two developments abutting the lake. Thus, wind impacts resulting from large building developments which prevent the course from holding national and international regattas would have significant regional impacts.

Due to the importance of protecting the Lake Banook canoe course, the potential for large-scale buildings to negatively impact the course and the lack of height restrictions for most land uses, Council shall adopt regulations to restrict building heights around Lake Banook. Further, any height restriction shall apply to all buildings, regardless of how they are developed (by right or through a discretionary approval process).

- Policy IP-9 It shall be a policy of Council to apply a maximum height restriction through the Land Use By-law to all buildings situated within "Lake Banook Canoe Course Area" as identified on Map 9s"
- Policy IP-10 Further to Policy IP-9, Council shall not consider any rezoning or development agreement application for buildings having a height greater than 35 feet within the Lake Banook Canoe Course Area.

Within the Lake Banook Canoe Course Area, there are instances where buildings exceed the maximum height restriction. Generally such buildings would be made non-conforming structures and subject to the provisions of the <u>Municipal</u> <u>Government Act</u>. It is not the intention of Council to require these buildings to comply with the new height restriction nor be prevented from being replaced. Instead, Council objective is to maintain current height conditions and allow for modification and replacement of existing buildings.

Policy IP-11 Existing buildings situated within "Lake Banook Canoe Course Area", as identified on Map 9s, which exceed the height restriction under the Land Use Bylaw shall be recognized as existing structures." (RC-Feb 8/05;E-Apr 23/05)

Attachment B

Excerpts from the Dartmouth LUB

PART 4: R 3 (MULTIPLE FAMILY RESIDENTIAL) ZONE - MEDIUM DENSITY

- 34(1) The following uses only shall be permitted in an R 3 Zone:
 - (a) R 1, R 2 and TH uses as herein set out,
 - (b) apartment buildings,
 - (c) uses accessory to any of the foregoing uses.
 - (d) lodging houses (As amended by By-law C-657, Feb 2/89)
 - (e) A group home for not more than 12 residents, provided that the subject property does not abut a property that is zoned R-1 or R-2.(HECC-Nov 4/10; E-Nov 27/10)
- 34(2) Buildings used for R 1, R 2 and TH uses in an R 3 Zone shall comply with the requirements of an R 1, R 2 or TH Zone respectfully.
- 34(3) Buildings used for R 3 uses in an R 3 Zone shall comply with the following requirements:
 - (a) Lot coverage, maximum 25%
 - (b) Area of site required per dwelling unit:

Area of site required

<u>Type of dwelling unit</u>	per dwelling unit
One bedroom and bedsitting room	1,300 sq. ft.
Two or more bedrooms	1,800 sq. ft.

Provided that where the site area is greater than one acre, the area of the site required per dwelling unit shall be:

Area of site required	
Type of dwelling unit	per dwelling unit
One bedroom and bedsitting room	1,000 sq. ft.
Two or more bedrooms	1,350 sq. ft.

- (c) On all buildings a minimum side and rear yard clearance of 15 feet shall be maintained and if the building is more than fifty feet high on its highest side the sideyards and rearyards shall have a minimum clearance of not less than one half the height of the adjacent side of the building.
- (d) The yard area located between the street line and the minimum setback line shall be landscaped, and the entire site and all buildings maintained in a neat, tidy manner including the trimming and upkeep of landscaped areas.
- (e) Height Maximum -35 feet on all parcels of land situated within the Lake Banook Canoe Course Area as identified on Schedule AW. (RC-Feb 8/05;E-Apr 23/05)
- 34(4) No uses other than those permitted in R 1 and R 2 shall be permitted unless the lot area is equal to or greater than ten thousand square feet and unless the street frontage is equal to or greater than one hundred feet.
- 34(5) All developments including three or more dwelling units shall provide, in addition to the site requirements set out in sub section (3) of this section, amenity areas of not less than one hundred square feet for each bedsitting room or one bedroom dwelling unit; three hundred square feet for each two bedroom dwelling unit; and 500 square feet for each three or more bedroom dwelling units. An amenity area shall be a space set aside for recreational purposes such as communal play areas, recreational room, roof decks, balconies, swimming pools and tennis courts. An amenity area shall have no dimension less than thirty feet.
- 34(6) Buildings used for lodging house uses shall comply with the requirements of the Lodging House By law of the City of Dartmouth. (As amended by By-law C-657, Feb 2/89)

NOTE: Effective December 4, 1991, Multiple family residential developments in the City of Dartmouth are permitted only by development agreement.

PART 6: TH (TOWN HOUSING) ZONE

36(1) The following uses only shall be permitted in a TH Zone:

(a) Two or more one family dwellings, which are attached vertically and which have their own independent entrances and exits;

- (b) schools;
- (c) any use accessory to any of the foregoing uses.
- 36(2) Building used for TH uses in an TH Zone shall comply with the following requirements:
 - (a) Lot area minimum 2,000 sq. ft. per unit

(b) Lot frontage minimum 20 feet, except where the lot faces on the outside of a curve in a street in which case the minimum frontage shall be not less than 15 ft. and the dimension along the minimum set back for the lot shall be not less than 20 feet.

(c) Lot coverage maximum 35%

(d) Not more than eight individual housing units shall be included in any one building block.

(e) A sideyard at least 10 feet in width shall be provided at each end of each building block.

(f) Every building block shall be located at a distance of not less than 15 feet from the street line.

(g) Height Maximum -35 feet on all parcels of land situated within the Lake Banook Canoe Course Area as identified on Schedule AW. (RC-Feb 8/05;E-Apr 23/05)

36(3) No more than 15 one family dwelling houses which are attached vertically, as permitted in this zone shall be erected per acre.



Attachment D1: Correspondence from the Atlantic Division of Canoe/Kayak Canada



ATLANTIC DIVISION CANOEKAYAK CANADA May 6, 2010

United Gulf Developments Limited

380 Bedford Highway Halifax, Nova Scotia Canada B3M 2L3

Attention Mr. Patrick LeRoy

References: -RWDI Final Report 03-1451 - Wind Impact Study, Lake Banook, February 13, 2004
-RWDI Definition letter reference # 0940855 - Development of Guidelines & Criteria for the Assessment of Wind Tunnel Study Results, Lake Banook Canoe Course, July 29, 2009
-2807 A1 site plan-A1.pdf
-RWDI Spreadsheet with additions - Lanes_2009_Ralphs additions V2 HW.xls received February 11, 2010

Dear Mr. LeRoy,

This letter is to report the analysis and findings determined by the Atlantic Division CanoeKayak Canada on the wind studies undertaken by RWDI for the proposed United Gulf building to be located at the head of Lake Banook on what is locally known as the YMCA property.

I would like to thank you for your assistance in providing answers to all our questions and accepting our input into the analysis spreadsheet.

During the course of our involvement it has become apparent that the exact modeling parameters and criteria to apply in the study are complex and so reasonable "worst case" conditions were used. The results were compiled using the following parameters:

- Sustained wind speed of 7 m/s (25.2 km/h), a speed which would be a reasonable upper limit for normal racing conditions. Winds of this speed or above occur on average 16.4% of the time between July 15 and September 15 during the racing day of 8AM to 6PM for the angles stated in point 2.
- Wind direction from 320 to 60 degrees relative north, this encompassing tail wind and side winds from both sides of the course.

Office Location The Bell Aliant Racing Centre 34 Boathouse Lane Dartmouth, NS

Mailing Address Po Box 295 Main Postal Office Dartmouth, NS B2Y 3Y3

P: (902) 466-9925

www.adckc.ca

- Weighting of the effects of side wind vectors of 1, 2 and 3 times that of a tail wind vector to determine sensitivity of canoe transition time differences across all lanes for the first 150 meters of the course.
- Effects with and without buildings and trees (proposed 2003 design and 2008 design).
- Using an ICF race (Szeged 2006, mens 1000M) as an evaluative baseline where wind caused unexpected lane 9 wins due to wind conditions, an average 6 second advantage was calculated. This equates to 1 second over 150 meters. For the Lake Banook analysis, a 2 second value was used.

The criteria agreed upon was one of fairness across all lanes of the course. This was based on the premise that, when averaged, with the presence of the 2008 building design there will be no significant change of advantage or disadvantage across all lanes over the first 150 meters of the course under the worst case conditions defined above.

During the course of the evaluation of the data, several points of note became apparent.

The effect of a very large footprint building of 35 foot height, defined as an "As of Right" development by HRM, causes undesirable time variation with cross winds weighting. See Attachment 1. The "flatness" of the graphs for the 2003 and 2008 building designs indicate less sensitivity to wind weighting changes.

Trees, but no building, along the shoreline have a significant effect with wind angles from 320 to 10 degrees. See Attachment 2. The 2004 analysis modeled a large gap along the whole beach area whereas the 2009 analysis modeled a fully treed shoreline yielding a more uniform time difference result. The changes made in the actual tree plantation (removal then replanting) by HRM in order to accommodate sewerage conduit realignment as of summer 2009 tend towards the 2009 analysis.

Generally accepted practice for anemometry indicates that the downwind disturbance effect from an obstruction will rapidly decrease to zero over a distance equivalent to 10 diameters of the obstruction from the center of the obstruction. The proposed 2008 building design, twin 16 storey towers on a one storey podium shown in Attachment 2, has an approximately 25 meter diameter for each tower, therefore will have no wind effect 250 meters downwind from each tower center point. This corresponds to less than 150 meters of the course.

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In conclusion, after presentation to the Division Executive and Division Membership it is the determination of the Atlantic Division CanoeKayak Canada that, using the United Gulf 2008 building design as presented, the 2009 RWDI wind study data and methodology, the references listed and the estimated worst case conditions stated in this letter, there will be no substantial effect on the sprint racing course, and with less than worst case conditions, effects will decrease to insignificant.

The data analysis has been carried out, and recommendations presented by Mr. Steve Giles, P. Eng., an Olympic paddling champion and professional engineer, and Mr. Ralph Orton, BSc Electronics Engineering who works in the environmental and climatologically engineering field. Mr. Orton has served in several capacities within the canoeing community, and for the last 3 years has been Flag Officer for the Atlantic Division CanoeKayak Canada.

Sincerely,

P. 1 Li Colm

For the Atlantic Division, CanoeKayak Canada

Attachments:1. As of right 35 foot building (approved massing)2. Trees only 2003 and 2009, Proposed building 2008



Attachment 1 – As of right 35 foot building (approved massing)



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Attachment 2 – Trees only 2003 and 2009

Ph. 2 A. 8



Proposed building 2008



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Attachment D2: Correspondence from the Atlantic Division of Canoe/Kayak Canada



CANOEKAYAK CANADA

14 January 2011

For the attention of Mr. M. Dickey, Planner, Halifax Regional Municipality

Reference: HRM staff clarification questions of November 29th meeting between HRM staff Kurt Pyle, Mitch Dickey, United Gulf representative Patrick LeRoy, ADCKC representative Ralph Orton and RWDI representatives Hanqing Wu, Edyta Chruscinski.

Dear Mr. Dickey,

Please find below, on behalf of the ADCKC, the information needed to answer your questions of our meeting of November 29th 2010.

This meeting was called by HRM staff to assist with their understanding of the analysis, criteria and results of the 2007 wind testing. The Atlantic Division Canoe Kayak Canada (ADCKC) had provided a letter on May 6, 2010 to United Gulf stating that the Division's analysis of the data showed that the effect of the tested building would not substantively affect the racing course.

Background:

The proposal from United Gulf in 2003 to place a multi-storey development at the head of Lake Banook on what is locally known as the YMCA property led to a wind study being undertaken to evaluate the effects on the racing course. The outcome indicated that there were several points on the first 150 meters of the course where the result fell outside of the criteria set by ADCKC at that time. The 2003 building design was subsequently determined not to meet density MPS and by law requirements (Originally proposed 168 units including town houses vs. current proposal for 128 units -two towers, no townhouses), and therefore was redesigned by United Gulf. Due to this, another wind study was deemed to be required, however HRM stated that they would not be involved in this, but that United Gulf and ADCKC must negotiate any follow on analysis, determination of the results and provide a document defining the acceptability or otherwise of the results. The additional wind model testing was conducted in 2007 and discussions between United Gulf and ADCKC started in April 2009 with data analysis following. The outcome was the previously mentioned ADCKC letter which is the primary and definitive document stating the ADCKC decision. HRM has

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P. (902) 466-9925 F: (902) 466-0404 subsequently requested clarification prior to presentation of their staff report to Council, and this follows.

Sincerely,

Ralph Orton, Past Flag Officer, Atlantic Division CanoeKayak Canada

cc. P. LeRoy, S. Giles, R. Fair

HRM Questions and ADCKC response:

The following are the questions posed by HRM and the responses provided by Mr. Steve Giles, P. Eng., an Olympic paddling champion and professional engineer, and Mr. Ralph Orton, BSc Electronics Engineering who has worked in the environmental and climatologically engineering field. Mr. Orton has served in several capacities within the canoeing community, and between 2006 - 2009 (the period during which the analysis was performed) was Flag Officer for the Atlantic Division CanoeKayak Canada:

1. Why were the testing criteria from 2004 changed?

The criteria from 2004 addressed point by point absolute wind speeds and directions of the wind only, and did not calculate the quantitative wind force effects on the canoe and paddler such as tail versus side wind effects. The cross wind effect on a canoe is substantial because of the large side area of the boat versus the tail wind effect on the relatively small area of the boat from this direction. The aim of the criteria used in the 2009 analysis was that of fairness across all lanes of the course. This meant that if wind induced effects occurred between the test with a building and without building, the effects should not unduly provide advantage or disadvantage across the lane(s). The 2004 study stated that the wind angle change must not cross a set of sector angles determined by the ADCKC, however this did not take into account that the original wind direction may already be close to the sector boundary limit and a change of a few degrees would cross the sector boundary, where in practical racing terms the net effect would be unnoticeable. See Appendix A for an example.

2. What are the new criteria & how were they arrived at? What were the criteria changes 2004-09?

There were no changes in the recording of raw wind tunnel data output between the two studies and the 7 m/s (25 kph) threshold was used as in 2004. The wind angles were limited to angles 320 to 60 degrees relative North, as outside these angles there is no building induced effect. Wind data were gathered using sensors in lanes 1, 5 and 9. There were changes in the manner of analysis of the raw data for the 2009 study in that the wind speeds were converted to wind force indices on the canoe. The data was gathered for a tree line topology as in 2004, a continuous tree line as expected when the new trees planted after the sewer line construction become mature, then with the proposed building, and further with a block structure of 35 feet height.

-Wind speed and direction variances provided for?

The wind speed and angle for lanes was resolved into an along course vector and cross course vector and these were used to compute the wind force index on a canoe. See vector diagram in Appendix B. This was used with the Cumulative time change assumption below to calculate the variance of difference across all lanes for each wind angle.

-Cumulative time change assumption?

A practical example of the real effect of wind on a race was needed to provide a base time number to work with. The world championship 1000m races held at Szeged, Hungary 2006 were used. The racing was affected by winds from sectors to the rear and side of the racing boats causing boats in lane 9 to win by approximately 6 seconds. This is unusual as normal racing advancement would place the fastest racers in the center lanes. Using this fact, there would be approximately a 1 second advantage over 150m (the distance at the start of the Lake Banook racing course over which the proposed development would have an effect.) For the purposes of the wind study analysis we doubled the advantage to 2 seconds to make a worst possible case over the 150M distance, and assigned this time value to the angle that had the largest wind force index. (The worst case occurred at 10 degrees for the existing conditions in the 2007 test). Also, as side wind weighting has more effect than along the course, analysis was repeated with side wind weightings of 1, 2 and 3 times that of the along course. This provides worst case results and illustrates the progressive effects.

-What is the breaking point from acceptable to excessive?

It is unlikely that an expert canoe racer will be able to produce successive race times under similar conditions that would be closer than 0.5% repeatable at best. This represents 1.2 seconds on a typically 240 second (4 minute) 1000m canoe race. This is considered to be a reasonable breakpoint from acceptable to excessive. The time difference between the results for a model without a building and that with a building (worst 1.19 secs), and the model with trees and without trees (worst 1.12 secs), at any wind angle, are below this time.

2a. A question posed by HRM staff on December 17th subsequent to November 29th meeting.
 -Were the newly planted lakefront trees presumed at full growth in the 2008 model? What are the results without the trees? Given the period of time to get to full growth, that could be seen to be misleading. Also, we're seeing more often that trees are a temporary feature.

The tree lines that were used are shown in photographs of the wind tunnel models in Appendix C. Note that the models were produced and tested prior to the sewer trunk installation and the associated tree line changes of 2008/9 and so were based on the best information at that time. At the request of Mr. Patrick LeRoy of United Gulf, Mr. Hanqing Wu of RWDI provided a response to this question on December 21st as follows:

A detailed discussion was provided in our report (2004) regarding the impact of the trees. Our comparisons of wind conditions on the lake focused on different building configurations, not on tree conditions. Table 1 in our report presents the results for 2003 testing under the same tree conditions (i.e., with a large "opening" in trees along the shore line), and Table 2 is for the 2008 testing with a continuous tree line. It is our opinion that trees in the summer have a significant effect on wind conditions and they should be modeled in wind studies. For the current project, our conclusion that the proposed development has an insignificant impact on wind conditions would unlikely be any different, with or without the trees being modeled.

3. What were the modeling results on the course? Is pass/fail easily determined?

The modeling results are best viewed as graphs with descriptions as shown in Appendix C. Pass/fail is based on the difference between the two graphed lines on each graph not exceeding the breaking point described above in Question 2 bullet 3.

The results show that the time difference is less than the limit stated as the breaking point and therefore passes.

4. Is the current proposal (Building) shown to HRM identical to the one tested in 2007?

United Gulf was asked to provide this answer as ADCKC could not. Their reply, "Yes, excluding cladding materials."

5. Does Canoe/Kayak Canada (ADCKC) agree with both the methodology & findings? How were the criteria approved, and who will speak to this publicly on behalf of CKC (ADCKC)?

ADCKC was closely involved in the determination of the criteria, the analysis and results for the data in that Steve Giles, Olympic paddler, an ADCKC representative on the wind studies since 2004, and Ralph Orton, Past Flag Officer for ADCKC, were the individuals performing this work. With the ADCKC Executive's permission, these individuals will speak on this matter. The wind study results were presented to the ADCKC Executive who voted to recommend to the Division membership that the formal letter referenced above be released to United Gulf. The membership passed this at a vote taken at the April 2010 Semi-Annual General Meeting.

6. Are these criteria appropriate to use all around the lake?

While the wind study principles may be applicable, the criteria was tailored for the specific circumstances that apply to the area near to the proposed building and locale, including tree cover, and the fact that the racing boats are stationary (starting line) within the affected area. Therefore ADCKC does not feel that the specific criteria are appropriate for use all around the lake.

Appendix A



2004 criteria; Sector change due to small change in wind angle in sensor 205

Appendix B



Figure 4: Relative speeds along and cross the course

Appendix C

The calculation of the induced time differences for the wind study is an intensive mathematical procedure. The data has been reduced to graphs for ease of understanding, however they contain significant information which needs explanation.

Each data point is the induced time difference (Y axis) across all lanes when the wind is at the respective angle (X axis). The induced time difference number is calculated from a peak 2 second time difference at a wind angle of 10 degrees (The peak wind force index from all results occurs at this angle hence we set the worst case 2 second criteria here). The difference in time at any one angle between the blue and pink lines of the first graph is the effect of the change in tree cover between 2003 (open beach area) and 2009 (full tree cover, see proposed building picture).

The difference in time at any one angle between the blue and pink lines of the second graph is the effect of the proposed building and surrounding trees. This graph also has the number of racing days (X axis) in a racing season that the wind is blowing at this angle at up to 7m/sec. (criteria limit). A racing season is defined as July 15^{th} to September 15^{th} (63 days) and a racing day is between 8:00 AM and 6:00 PM.



Trees only 2003 (open beach area) and 2009 (full tree line along beach)



Tree line 2003



Proposed building 2007 and tree line



Induced time differences for proposed site, no building and building

Attachment D3: Correspondence from the Atlantic Division of Canoe/Kayak Canada



ATLANTIC DIVISION CANOEKAYAK CANADA Joseph Driscoll Senior Planner Planning Applications Community Development Halifax Regional Municipality

8 June 2011

References:

May 6 2010 ADCKC Letter to United Gulf – Opinion on wind study
 Wind Study analysis spreadsheet – Lanes_2009_Ralphs additions V2_HW.xls

Dear Mr. Driscoll

It has recently been brought to my attention by Mr. Patrick LeRoy of United Gulf that their application for the proposed twin tower building on the former YMCA property at the head of Lake Banook will not receive planning department recommendation to proceed. As I understand the situation, this leaves them with the ability to proceed only with a building of 35 foot maximum height and that this as of right building would be designed to maximize the number of living units allowable in the footprint.

In recent discussions between yourself and Atlantic Division Canoe Kayak Canada (ADCKC) representatives Ralph Orton and Steve Giles, the effect of a 35 foot height, large area building, as tested in the 2007-2008 RWDI wind study and included in the subsequent analysis by RWDI and the ADCKC, showed the potential to have noticeable variability in side wind effect relative to the direction of racing, when compared to the other tested structures. As a side wind effect is most disruptive at the starting line where the paddlers are stationary or moving at low speeds, this is the area of most concern to us.

As shown in the wind study analysis, there is an overall wind moderating effect by a well developed tree line between the building structures and the lake side. In any future development of the site, I would request that a screen of trees be considered to help mitigate the wind effects of any building structure at this site.

Thank you for your consideration of this matter.

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Per Janas 4d Fraternitatem

Sincerely,

Page 2

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Rick Fair, Flag Officer, Atlantic Division CanoeKayak Canada

cc. Patrick LeRoy, United Gulf



1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by United Gulf Developments Limited (UG) to undertake a wind study to determine the effects that the proposed condominium project on the north shore of Lake Banook may have on the Lake Banook Canoe Course in Dartmouth, Nova Scotia. This objective was achieved through wind tunnel testing of the existing, proposed and other building configurations and analysis of local wind climate on summer days to determine the potential variations of wind speeds and directions on the Canoe Course.

Since there are no established criteria available for assessing the wind effects on canoe/kayak competitions, considerable efforts have been made since 2003 by RWDI, UG, the Canadian Canoe Association (CCA) and Halifax Regional Municipality (HRM) to develop guidelines and criteria acceptable to all the parties involved. A report was issue by RWDI to HRM on February 13, 2004¹ based on the wind tunnel results for the existing and then-proposed building configurations. Another round of testing was conducted in 2008 for a revised building design as well as existing, approved and previously proposed configurations, due to changes in the building design and tree conditions along the shore line.

The current report summarizes the results of the wind study, with the focus on the establishment of wind criteria, the comparison of wind conditions for various building configurations and the potential wind impact of tree conditions in the area. Based on the results from the current study, it is our opinion that the wind effects that may be caused by the proposed condominium development on the canoe course are localized and their overall impact is likely to be insignificant.

¹ RWDI Final Report – Wind Impact Study – Lake Banook Canoe Course, Dartmouth, Nova Scotia, by Hanqing Wu, Dan Bacon and Harry A. Baker, submitted to Halifax Regional Municipality, February 13, 2004, RWDI project Number: 03-1451.



2. WIND STUDY CONDUCTED IN 2003/2004

2.1 General Findings

Based on the wind-tunnel results obtained in August 2003 and January 2004, it was generally agreed that:

- (1) Lake Banook is a natural racing course, and variations in wind speed and direction would be expected throughout the course and during the year, due to the nature of local weather, topography and surroundings.
- (2) The potential influence of the proposed development on the wind conditions on the lake is limited to an area from the start line to the 150 m point of the 1000 m course for winds from 320° to 60° only.
- (3) Winds from the 320° to 60° directions occur approximately 16.4% of the time on summer days from July 15 to September 15 for the hours of 8:00a.m. to 6:00p.m., based on the long-term data recorded at the Shearwater Airport. The prevailing winds are from the south through southwest directions, as indicated by the upper wind rose in Figure E on the next page. (Figure E was extracted from the 2004 report).
- (4) A mean speed of 7 m/s or 25 km/h can be used as a reference in this analysis. For some past Olympic Games and other international competitions races are postponed when wind speed is greater than 7 m/s. The speed is exceeded for approximately 10% of the time based on the local airport data for all directions, as indicated in the lower wind rose in Figure E. Lower wind speeds can be expected 90% of the time.
- (5) Wind sensors, developed by RWDI for use on scale models, are capable of measuring both the mean wind speed and direction at 1.5 m above the water surface. Figure 2a on Page 4 was extracted from the 2004 report as an example. These sensors were installed at every 25m along Lanes 1, 5 and 9 to measure the wind flow patterns on the course.

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Winds > 25 kph

Directional Distribution (%) of Winds (Blowin Station: Shearwater AP, NS (July 15 - Sept 15, 8:00au	Figure	No. E		
Lake Banook Canoe Course - Dartmouth, NS	Project #: 03-1451	Date:	Oct. 29, 2003	





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2.2 Development of Guidelines and Criteria

Without any established wind criteria available for the analysis, direct comparisons of wind speeds and directions have been made between the Existing and the 2003 Proposed wind conditions. These comparisons were made for the average speeds and directions along the measured lanes first through the entire course and then within the first 150 m. More detailed comparisons were also conducted for each measurement point within the first 150 m for both wind speed and direction. The results were presented in RWDI's final report to HRM, dated on February 13, 2004.

Discussions in 2004 between the CCA and RWDI led to a plot of six directional sectors for a typical canoe (Figure 3). It was determined that as long as the existing and proposed wind directions remained in the same sector at any given point on the course, the wind conditions would be considered acceptable. Also, the probability of the existing and proposed wind directions falling into different sectors was calculated. If the probability for a directional switch was high (exceeding 66% or 2 out of 3), it would mean a "failure" in the point-by-point assessment, as suggested by the CCA.



Figure 3: Six wind sectors for a typical canoe.



3. ESTABLISHMENT OF NEW CRITERIA

3.1 Further Thoughts

Discussions continued after the submission of RWDI's final report in 2004. Additional thoughts came out of the subsequent conference calls between RWDI, UG, CCA and HRM. Further analyses were carried out by RWDI with an intention to develop a simple wind criterion to ensure uniform wind and fair racing conditions on the lake.

- (1) One immediate question on the point-to-point comparison is how many points with a high probability of directional switch are allowed for each wind direction. Zero, one or two points (out of 21 measured points within the first 150 m) per wind direction? More importantly, it is our opinion that, if a directional switch at a point makes the proposed wind conditions more uniform between the lanes than those that currently exist, then the proposed wind conditions (or the directional switch) should not be considered a "failure".
- (2) When canoeists paddle along the course, they are affected by the <u>relative</u> wind speed (i.e., wind velocity minus the canoe speed). For instance, if the canoe speed is 15 km/h and winds of 18 km/h are from 40° (parallel to the course), the actual tail winds are only 3 km/h on the back of canoeists. If winds are from the opposite direction (220°), then the relative head winds on the face of canoeists would be 33 km/h.
- (3) The relative wind speeds can be divided into <u>along-</u> and <u>cross-</u>course components (Figure 4). Tail winds along the course would be advantageous to canoeists, while head winds and cross winds (in either direction) are considered disadvantageous.
- (4) Wind effects on canoes and paddlers are not directly proportional to the relative wind speed, but to the <u>wind force</u> or the <u>relative wind speed squared</u>. While the total wind effects may be complicated by numerous factors (e.g. aerodynamics of canoes and paddlers, wind directions, wind-induced waves, paddlers' capability of dealing with different wind/wave situations, etc.), the relative wind speeds squared will be a key indicator (Wind Force Index) and should be used in future analysis of wind effects.



3.2 A Spreadsheet for Wind Assessment

Following the above thoughts, a spreadsheet was developed to assess the potential wind impact on the canoe course. All the predicted wind speeds were first projected to the along- and crosscourse directions (see Figure 4). A single canoe speed of 15 km/h was used in the calculation for all points, except for the points on the start line where the canoe speed is set to be zero. These relative speeds were then squared in order to obtain values proportional to wind forces. Tail winds were defined to be positive, or advantageous, since they help canoeists in competitions, while both head winds and cross winds (in either direction) were negative, or disadvantageous.

In a canoe/kayak race, cross winds may cause more difficulties than head winds, depending upon a peddler's skills. However, it is difficult to quantify the relative importance of along- and crosswinds. In the spreadsheet, when the along- and cross-wind components are combined, their weights (Wa and Wc, respectively) can be adjusted. For instance, an equal weight can be assumed (Wa=Wc=1), or cross-winds can be twice as important as along-winds (Wa=1 and Wc=2). The spreadsheet analysis was conducted for both conditions for all test configurations.

For each test wind direction, a sum of relative wind speeds squared was calculated along Lanes 1, 5 and 9 to generate the overall Wind Force Index. The difference of these values along different lanes measures the non-uniformity of winds on the racing course and was used as an indicator of wind conditions on the lake (Range or Difference = Maximum – Minimum). For a given wind direction, if the three Wind Force Indices for Lanes 1, 5 and 9 were within a smaller



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range for the proposed configuration than that for the existing condition, then the potential wind effects on canoe racing are more uniform cross the lanes and, therefore, are considered satisfactory.

To help illustrate the potential impact on canoe/kayak competitions, these Indices were converted into an Equivalent Time Difference (ETD) in seconds, based on an analysis of time records from a recent international competition under calm and windy conditions (see details in the spreadsheet). The directional time differences between the lanes were then summed up, weighted by the wind probability from each direction to generate a single average ETD between lanes for the existing and proposed building configurations.

3.3 Wind-Tunnel Results

In 2003/2004, two building configurations were tested:

- **Existing**: the existing Lake Banook area and canoe course, without the proposed development; and
- **Proposed**: same as existing, with the proposed United Gulf development in place.

Table 1 below summarizes the directional and average Equivalent Time Differences for these two configurations.

Wind Direction Probability (%)	10 1.61	20 1.16	30 0.91	40 0.71	50 0.64	60 0.68	320 2.17	330 2.19	340 2.18	350 2.12	360 2.05	Total 16.42	
Equal weight on along- and cross-winds (Wa=Wc=1)													
	Direct	ional <u>E</u>	quivale	ent Time	e Differ	<u>ence in</u>	second	ds (Line	32)			(Line 37)	
Existing	2.00	1.34	1.72	1.73	1.15	0.89	0.63	0.85	1.91	0.87	0.95	1.22	
Proposed	0.81	1.48	2.46	1.85	1.35	1.25	0.42	0.47	0.27	0.88	0.46	0.83	
Cross-wind twice as important as along-wind (Wa=1 & Wc=2)												Average	
	Direct	ional <u>E</u>	quivale	ent Time	e Differ	<u>ence in</u>	second	ds (Line	: 32)			(Line 37)	
Existing	0.84	0.70	1.04	1.04	0.77	0.95	0.84	1.31	2.00	0.82	0.41	1.01	
Proposed	0.23	0.91	1.66	1.03	0.85	1.34	0.74	0.60	0.66	1.07	0.78	0.81	

TABLE 1: Equivalent Time Difference Based on 2003/2004 Measurements



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Locations of these data in the spreadsheet (Lines 32 and 37) are provided in the table for reference purposes. The table lists the wind probability for each test wind direction between 320° and 60° , for a total of 16.42%. As stated previously, the prevailing winds on summer days are from the south and southwest directions. The ETD values were calculated between Lanes 1, 5 and 9 with the maximum value for the Existing Condition being set at 2.00 seconds. These directional ETD's were then averaged, using the directional probability as weights, to generate the average ETD for each configuration. For the Existing and Proposed Conditions, the ETD values were 1.22 and 0.83 seconds, respectively, when an equal weight was assigned to the along- and cross-winds, and 1.01 and 0.81, respectively, when the cross-wind was assumed to be two times as important as the along-wind. In both cases, the ETD for the Proposed Configuration was lower than that for the Existing Configuration.

In 2008, four test configurations were tested due to changes in building design and tree conditions along the shore line:

- **Existing**: the current Lake Banook area and canoe course, without the proposed development;
- **Currently Proposed**: same as existing, with the 2008 proposed United Gulf development in place;
- **Previously Proposed:** including the existing surroundings as well as the version of the United Gulf development tested in 2003/2004; and
- **Approved Massing:** the building massing that would be allowed under the current zoning (35 ft. massing).

TABLE 2: Equivalent Time Difference Based on 2008 Measurements

Wind Direction Probability (%)	10 1.61	20 1.16	30 0.91	40 0.71	50 0.64	60 0.68	320 2.17	330 2.19	340 2.18	350 2.12	360 2.05	Total 16.42
Equal weight on along wind and cross wind (Wa=Wc=1)												Average
	Direct	ional E	quivale	ent Time	e Differ	ence in	secon	ds (Line	e 32)			(Line 37)
Existing Condition	2.00	1.04	1.28	1.43	1.30	0.97	0.91	0.63	0.78	0.41	1.14	1.00
Currently Proposed	2.91	2.22	2.41	2.41	2.35	2.02	0.21	0.52	0.39	0.56	1.49	1.26
Previously Proposed	1.02	0.93	1.24	1.54	1.90	1.79	0.45	1.38	1.74	1.13	1.13	1.21
Approved Massing	0.73	0.68	1.33	1.52	1.34	0.98	0.83	0.79	1.09	1.32	0.92	1.00



Cross-wind twice as important as along-wind (Wa=1 & Wc=2)												
Directional Equivalent Time Difference in seconds (Line 32)												
Existing Condition	2.00	1.07	1.31	1.40	1.18	0.74	1.04	1.08	1.22	0.50	1.06	1.12
Currently Proposed	2.77	2.15	2.31	2.39	2.62	2.45	0.59	0.60	0.42	0.43	1.18	1.28
Previously Proposed	1.32	0.87	1.09	1.34	1.78	1.89	0.45	1.20	1.74	1.21	1.47	1.25
Approved Massing	0.86	0.72	1.33	1.46	1.11	0.64	0.99	1.45	1.87	2.08	1.28	1.34

As shown in Table 2, the average ETD value for the Currently Proposed Configuration was higher than those for the other configurations, if an equal weight was assumed. When the cross-wind was set to be twice as important as the along-wind, the value for Currently Proposed Configuration was still higher than that for Existing, but lower than that for the Approved Massing.

3.4 Wind Criterion

The following criterion is adopted, based on consultations between all the parties involved:

- (1) If the Equivalent Time Difference between lanes is lower for the Proposed Configuration than that for the Existing Configuration, then the proposed wind conditions are considered satisfactory. This can be evaluated direction by direction, but the average ETD should be used as the final indicator; and
- (2) If a higher Equivalent Time Difference is detected for the Proposed Configuration, another comparison can be made with the results for the Approved Massing or As-of-Right (35') Configuration, since this is an approved building massing that does not require any wind assessment.

Based on the 2003/2004 test data, Table 1 shows the Equivalent Time Difference for the Proposed Configuration was lower than that for the Existing Configuration. Therefore the wind conditions for the Proposed Configuration are considered satisfactory.

When the 2008 test data were compared (Table 2), however, the Equivalent Time Difference for the Currently Proposed Configuration was higher than that for the Existing Configuration, for both weighting combinations. If the cross-wind was assumed to be twice as important as the along-wind, the Equivalent Time Difference for the Currently Proposed Configuration became lower than that for the Approved Massing.



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These comparisons based on the 2003/2004 and 2008 wind tunnel data are somewhat contradictory and they are primarily caused by the difference in simulations of trees along the shore line between the development site and the canoe course. This is examined in detail in the next section.

4. IMPACT OF TREES

A further examination of the site conditions revealed that the 2008 testing assumed a continuous, dense tree coverage along the shore line, while the 2003 testing had a large "opening" between the lake and the existing building. Unfortunately, neither setting is accurate when compared to the information we received after these tests. The actual tree conditions are "somewhere in between" (see photos in Figure 5).



Wind-tunnel model with a large "opening" in 2003/2004



Continuous tree line in the 2008 wind-tunnel model



Site photo in 2009 Figure 5: Tree conditions along the shore line



Site photo in 2009



The actual wind results therefore should also be "somewhere in between".

Table 3 is obtained when the average ETD's in Tables 1 and 2 are averaged for the Existing and Proposed Configurations. As shown by the data in Table 3, the "somewhere in between" results are similar for all configurations. In fact, the proposed conditions are slightly more uniform (or better) than the existing conditions. Based on these results, it is reasonable to conclude that the proposed building has no adverse wind impact on the lake.

Trees along the shore line have a significant impact on the wind conditions in the start line area. When there is a large opening in trees along the shore line (see Figure 5a for the wind tunnel model in 2003/2004), the northerly winds would rush through the opening into the start area of the canoe course, causing non-uniform wind conditions under the existing (baseline) configurations. On the other hand, continuous trees in this area, as modeled in 2008, would significantly reduce such a wind impact and, therefore, improve the existing (baseline) conditions. Changes in the baseline conditions will then affect the evaluation of wind conditions for other building configurations.

TABLE 3: Average Equivalent Time Difference (in sec.) of 2003/2004 and 2008 Wind Data

Equal weight on along wind and cross wind (Wa=Wc=1)

- 1.11 (2003/2004 Existing and 2008 Existing)
- 1.05 (2003/2004 Proposed and 2008 Currently Proposed)
- 1.02 (2003/2004 Proposed and 2008 Previously Proposed)

Cross-wind twice as important as along-wind (Wa=1 & Wc=2)

- 1.07 (2003/2004 Existing and 2008 Existing)
- 1.04 (2003/2004 Proposed and 2008 Currently Proposed)
- 1.03 (2003/2004 Proposed and 2008 Previously Proposed)

5. CONCLUDING REMAKS

Based on the wind tunnel measurements for various building configurations and local wind climate, the equivalent time differences between Lanes 1, 5 and 9 were calculated using the new wind criteria and a spreadsheet developed for the project. Both building design and tree conditions will affect the wind conditions on the canoe course. it is our opinion that the wind effects that may be caused by the proposed condominium development on the canoe course are localized and their overall impact is likely to be insignificant.