

EXECUTIVE SUMMARY

BeeXergy Consulting Limited (BXG) was commissioned by the Planning Department (PlanD) of the Hong Kong Special Administrative Region Government to undertake an Air Ventilation Assessment (AVA) – Initial Study (IS) using Computational Fluid Dynamics (CFD) for an Instructed Project at Yau Kom Tau, Tsuen Wan. The Project Area involves two sites at Yau Kom Tau, namely Sites 1 with 0.84 ha and 2 with 4.92 ha (the Sites), which are zoned “Green Belt” (“GB”) on the approved Tsuen Wan Outline Zoning Plan No. S/TW/33.

The objectives of this Instructed Project is to assess the air ventilation impacts of the proposed medium-density residential developments with stipulated development parameters. It is also the purpose of this Project to recommend any design improvements and/or mitigation measures which may be adopted to minimize any adverse air ventilation impact.

A series of CFD simulations using realizable k- ϵ turbulence model were performed based on the AVA methodology for the IS as stipulated in the Technical Circular No. 1/06 on Air Ventilation Assessment (2006). Ten wind directions covering about 78.7% occurrence of annual wind and about 79.5% of summer wind were studied. The ventilation performance for the proposed development at the Project Area and all focus areas within the assessment area were assessed and summarized below:

- The annual weighted Site Spatial Average Velocity Ratio (SVR) for the Baseline Scheme and Proposed Scheme are 0.27 and 0.24 respectively. The summer weighted Site Spatial Average Velocity Ratio (SVR) for the Baseline Scheme and Proposed Scheme are 0.30 and 0.28 respectively.
- The annual weighted Local Spatial Average Velocity Ratio (LVR) for the Baseline Scheme and Proposed Scheme are 0.25 and 0.23 respectively. The summer weighted LVR for the Baseline Scheme and Proposed Scheme are 0.28 and 0.26 respectively.
- The Proposed Scheme is expected to have slightly adverse impact on the pedestrian wind environment when compared with the Baseline Scheme under both annual and summer wind conditions.

Nonetheless, the following good design features are incorporated in the Proposed Scheme to minimize adverse impact on the pedestrian wind environment:

- For Site 1, the building separation of approximately 15m along the NE-SW alignment is considered effective under NE, SSW, SW and WSW direction whilst the building separation of approximately 17m is considered effective under ENE, E, ESE, SE, SSE and S winds.
- For Site 2, the 60m-wide Drainage Tunnel Protection Zone is considered effective under

NE, ENE, E, SSE, S, SSW, SW and WSW direction, whilst the NW-SE aligned building separations are considered effective to increase the building permeability within the site.

Besides the aforementioned good design features in the Proposed Scheme, future developments should consider the following design principles at the detailed design stage:

- Provision of building separation(s) of at least 15m-wide along with the prevailing wind directions;
- Adopt building permeability equivalent to 20% to 33.3% with reference to PNAP APP-152;
- Minimize podium bulk with ground coverage of no more than 65% where feasible;
- Adopt building setback with reference to PNAP APP-152;
- Incorporate greening measures with a target of not less than 30% for sites larger than 1 ha, and not less than 20% for sites below 1 ha, preferably through tree planting at grade;
- Avoid long continuous façades; and
- Make reference to the recommendations of design measures in the Hong Kong Planning Standards and Guidelines.

行政摘要

香港特別行政區政府規劃署委託豐能顧問有限公司利用計算流體力學（CFD）為荃灣油柑頭一個指定項目進行空氣通風評估（AVA）－初步研究。此項目涉及兩個地盤，分別為佔地約 0.84 公頃的地盤 1 及約 4.92 公頃的地盤 2。根據荃灣分區計劃大綱核准圖（大綱圖）編號 S/TW/33，兩個地盤現時均被劃定為「綠化地帶」。

本項目的目標是評估擬議中密度住宅項目的規定開發規模對空氣通風的影響，本研究亦會建議一系列改善、設計及/或緩解措施，以改善項目區及其周邊地區的行人風環境，或盡量減少因重建而產生的不利通風影響。

根據技術通告第 1/06 號中規定對初步研究的空氣流通評估方法，本研究進行了一系列利用 **realizable k-ε** 湍流模型的 CFD 模擬。總共研究了十個風向包括全年盛行風（發生率約 78.7%）及夏季盛行風（發生率約 79.5%）。在評估範圍內所有重點領域及擬議發展的通風表現進行的評估和總結如下：

- 基線方案及擬議方案全年地盤空間的平均風速比（SVR）分別為 0.27 及 0.24。而基線方案及擬議方案夏季地盤空間的平均風速比（LVR）分別為 0.30 及 0.28。
- 基線方案及擬議方案全年地域性空間的平均風速比（LVR）分別為 0.25 及 0.23。而基線方案及擬議方案的夏季地域性空間的平均風速比（LVR）分別為 0.28 及 0.26。
- 與基線方案相比，預料擬議方案將會對行人風環境帶來輕微的負面影響。

擬議方案具備以下良好的設計特徵以減低對行人風環境的負面影響：

- 地盤 1 內約 15 米闊東北至西南向的樓宇間距能促進東北、西南偏南、西南及西南偏西風向的空氣通風，而約 17 米闊的樓宇間距則有助促進東北偏東、東、東南偏東、東南、東南偏南及南風的通風。
- 地盤 2 內的 60 米闊雨水排水隧道保護區能促進東北、東北偏東、東、東南偏南、南、西南偏南、西南及西南偏西風向的通風，而多條西北至東南的樓宇間距亦有效地增強擬議方案的通透性。

除以上提及地盤 1 及 2 的良好的設計特徵外，未來的發展亦應在詳細設計階段考慮以下設計原則：

- 沿盛行風方向提供至少 15 米闊的樓宇間距；
- 參考《認可人士、註冊結構工程師及註冊岩土工程師作業備考》APP-152，提供相當於 20% 至 33.3% 建築物滲透率；
- 盡可能縮減平台體積，使地面覆蓋率不超過 65%；
- 參考《認可人士、註冊結構工程師及註冊岩土工程師作業備考》APP-152 採用建築物後移；
- 大於 1 公頃的地盤需提供不低於 30% 綠化覆蓋率，而 1 公頃以下的地盤則需提供不低

於 20%綠化覆蓋率，並於地面種植樹木為佳;

- 避免過長的建築物; 及
- 參考《香港規劃標準與準則》中有關的良好通風設計措施的建議。