Capco 青山發電有限公司 Castle Peak Power Co. Ltd.

ExxonMobil

中華電力 CLP Power

A Commercial Scale Wind Turbine Pilot Demonstration at Hei Ling Chau: *Environmental Impact Assessment*

喜靈洲商用風力發電試驗計劃: *環境影響評估*

Executive Summary
行政摘要

November 2006
二零零六年十一月

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REPORT
報告

CAPCO
青山發電有限公司

A Commercial Scale Wind Turbine Pilot Demonstration at Hei Ling Chau: *Environmental Impact Assessment*
喜靈洲商用風力發電試驗計劃 *環境影響評估*

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November 2006
二零零六年十一月

Reference 0019313
檔案編號

For and on behalf of 代表 ERM-Hong Kong, Limited 香港環境資源管理顧問有限公司	
Approved by: 批核:	Dr Andrew P Jackson 簡信安博士
Position: 職位:	Managing Director 董事總經理
Date: 日期:	22nd November 2006 二零零六年十一月廿二日

A Commercial Scale Wind Turbine Pilot Demonstration at Hei Ling Chau: *Environmental Impact Assessment*

Executive Summary

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The Castle Peak Power Company Limited (CAPCO), a joint venture between CLP Power Hong Kong Limited (CLP Power) and ExxonMobil Energy Limited (EMEL), recognises the Government of the Hong Kong Special Administrative Region (HKSARG)'s efforts in exploring alternative power sources, including renewable energy, and in promoting public awareness of these alternatives. To this end, CAPCO has launched a commercial scale wind turbine pilot demonstration (hereafter referred to as wind turbine) to:

- collect engineering and environmental information (including the necessary statutory permitting requirements) required for potential development of wind power generation in Hong Kong;
- investigate the economic, environmental and technical feasibility and practicality of wind energy application in Hong Kong, in support of HKSARG's renewable energy initiative; and
- educate and raise the community's awareness of the issues, costs, constraints, benefits, etc of wind energy generation in Hong Kong.

The project will take a grid-connected commercial scale wind turbine through the full site selection and regulatory process so that the community can gain more knowledge and experience about wind energy application in Hong Kong.

A rigorous site selection process has been conducted to identify suitable land based areas which have access to CLP Power's transmission network for the development of the wind turbine. The potential areas were assessed with respect to wind resource, grid interface; environmental, physical and social constraints. This Environmental Impact Assessment (EIA) study is for the development of a commercial scale wind turbine pilot demonstration at Hei Ling Chau (hereafter referred to as the Project).

1.2 OBJECTIVE AND SCOPE OF THE EIA

The Project is classified as a Designated Project by virtue of Item D.1 of Part I of Schedule 2 (ie public utility electricity power plant) under the *Environmental Impact Assessment Ordinance (Cap. 499) (EIAO).* The construction and operation of the wind turbine pilot demonstration at Hei Ling Chau will therefore require an Environmental Permit.

The main objective of this EIA Study is to provide a detailed assessment of the nature and extent of potential environmental impacts arising from the construction and operation of the Project in relation to the issues specified in the EIA Study Brief (*No. ESB-145/2006*), including noise, ecology, landscape

and visual, construction phase water quality and waste management, and cultural heritage impacts.

1.3 APPROACH TO THE STUDY

The EIA was conducted in accordance with the guideline on assessment methodologies provided in the Technical Memorandum on Environmental Impact Assessment Process (*EIAO-TM*). The general approach for the assessment included:

- Description of the baseline environmental conditions for the impact assessment;
- Identification of potential impacts;
- Evaluation of potential impacts; and
- Recommendation of mitigation measures and environmental and monitoring programme.

The assessments in this EIA Study are conducted using well-proven and internationally accepted methods based on the worst-case conditions associated with the construction and operation of the Project.

The location and site arrangement of the Project are shown in *Figures 2.1a* and *2.1b*, respectively. A brief description of the construction and operation of the Project is provided in the following sections.

2.1 THE WIND TURBINE

The proposed wind turbine will be a three-bladed horizontal axis machine (*Figure 2.1c* illustrates a typical three-bladed horizontal axis wind turbine). The main electrical and mechanical parts, including the gearbox, the generator with a rated capacity of between 800 kW and 1.3 MW and the yaw mechanism, will be housed in the nacelle, which is located on top of a tower. The tower will likely be a tubular steel structure, but may be fabricated from other materials such as concrete (1). The tower will stand upon a concrete base with approximate dimensions of 9 m x 9 m.

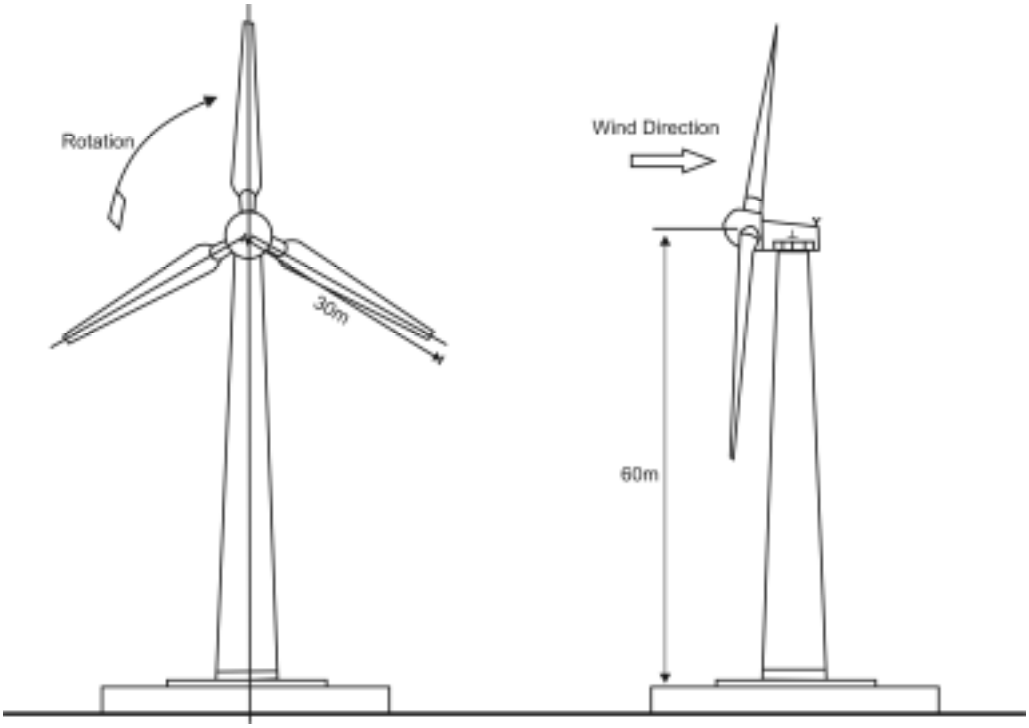

Figure 2.1c A Typical 3-bladed Wind Turbine

The rotor blades capture the wind and transfer its power to the rotor hub, which is connected to the electrical generator via the gearbox. The electrical power generated is transmitted via a step-up transformer to a substation, from where the power is fed into the nearest existing 11 kV power grid through overhead or underground transmission cables (see *Figure 2.1b*).

(1) If a concrete tower (constructed using pre-fabricated reinforced concrete rings) is used, it will be wider than a steel tower by around 1m over the full height.

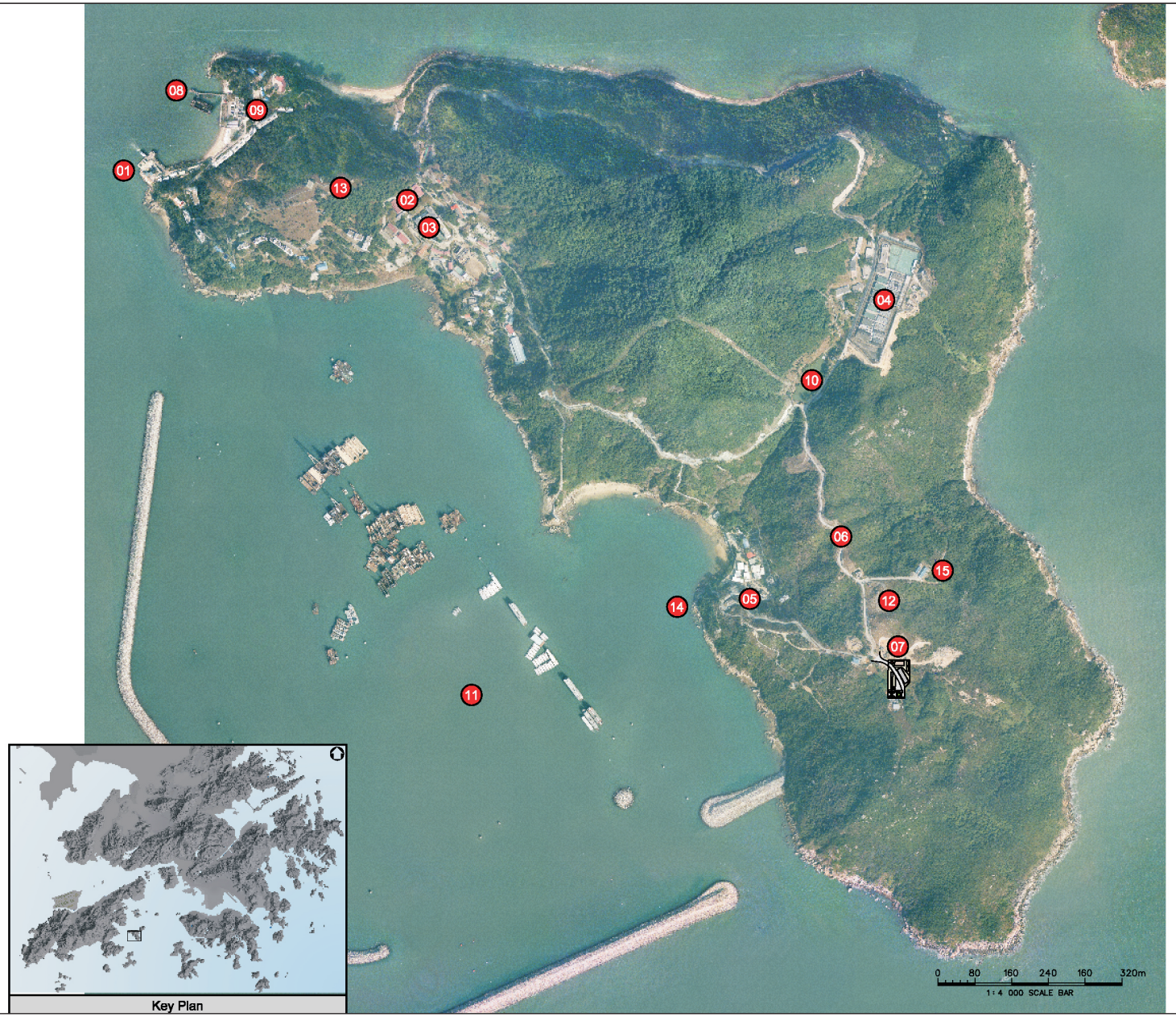

Figure 2.1a

Commerical Scale Wind Turbine Pilot Demonstration
Hei Ling Chau Project Site and its Surrounding Environment

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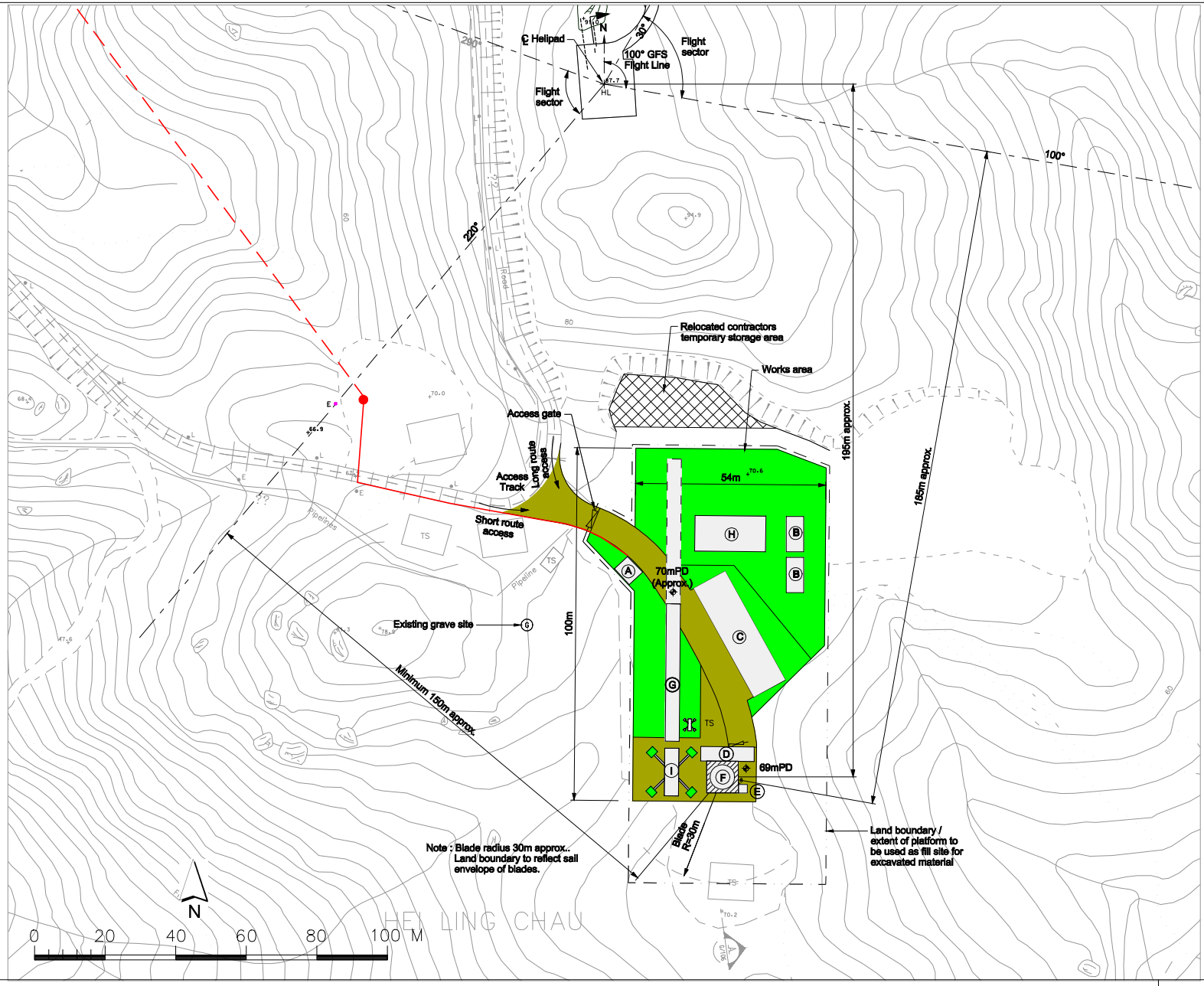

FIGURE 2.1b

Commercial Scale Wind Turbine Pilot Demonstration
Preliminary Site Arrangement for Hei Ling Chau Project Site

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DATE: 24/07/2006

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2.2 *CONSTRUCTION OF THE PROJECT*

The major construction activities for the Project will include upgrading of existing roads and creation of temporary access for the delivery of construction materials and equipment, formation of the platform for the erection of the tower, construction of the tower foundation, erection of the tower, installation of the nacelle and rotor and installation of the control and transmission systems.

Two access routes have been identified for the delivery of construction materials and equipment to the Project Site (*Figure 2.2a*). The first route, the long access route, makes use of the existing heavy load berthing facilities and road system. The route will take the northern part of the existing loop route and follow the existing alignment to the Project Site. Minor enabling works will be required at a few locations to facilitate vehicle passage. The long access route will be used for the delivery of construction plant items and materials.

Due to the size and weight of the wind turbine components, their transportation using the long access route will require significant road upgrading works (including major slope works) at many locations. An alternative route, the short access route, will therefore be used to transport these components to the Project Site. The turbine components will be delivered by a flat bed barge with an attendant crane and moored off-shore, adjacent to the existing pier at the southern part of the island, within the typhoon shelter. The barge will require a clear water depth of 2m. A hydrographical survey has been carried out in the area and confirmed that there is sufficient water depth and hence no dredging will be required.

The short access route (see *Figure 2.2a*) will involve the construction of a temporary steel platform at the existing jetty in the south-western part of the island and temporary steel bridge structure. The temporary platform will be constructed above the high tide level and no marine works will be required. The wind turbine components (including the blades, nacelle, and steel tower sections) will be lifted from the barge to the temporary steel platform using a floating crane. The components will be lifted to the deck of the temporary bridge by the crawler crane and then transported by the self-propelled transporter to the Project Site along the existing road. Minor widening or slope trimming may be required at certain locations of the short access route to allow the passage of long vehicles (see *Figures 2.2a*).

The Project Site (see *Figure 2.1b*) will occupy an approximate area of 54m x 100m, including the lay down areas for construction materials and wind turbine components. It is currently anticipated that only minor site clearance and formation will be required. The engineering design indicates that the materials underneath the Project Site comprise poor quality fill overlying rock. A reinforced concrete foundation with pre-bored H-piles will be required.

The main construction activities at the Project Site are:

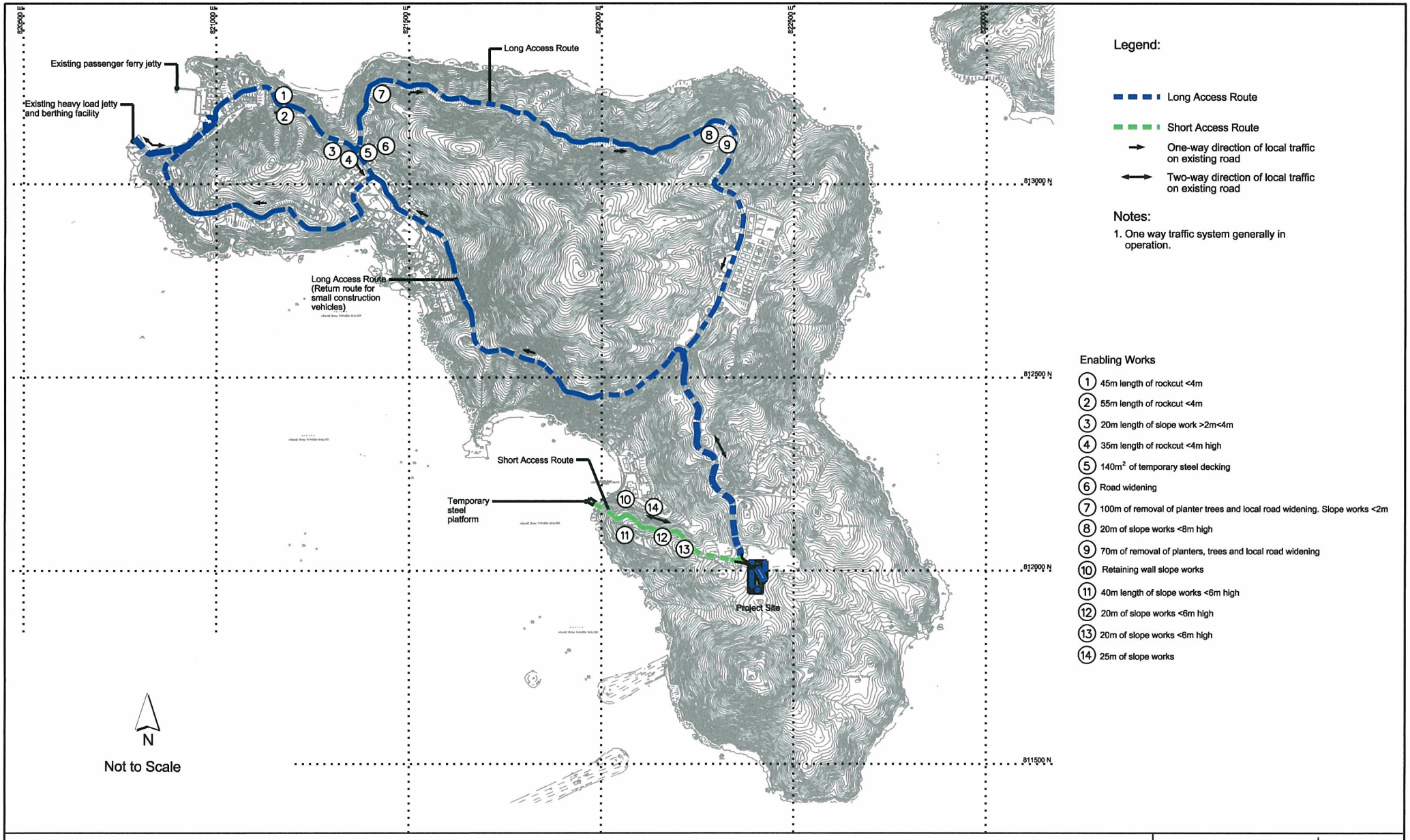

FIGURE 2.2a

Key Plan Showing Enabling Works for Construction Access Routes for Hei Ling Chau Project Site

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- site clearance and formation;
- pre-bored H-piling and construction of reinforced concrete foundation (about 9m x 9m x 2m) for the wind turbine;
- erection of wind turbine tower by assembling pre-fabricated steel tower sections;
- installation of nacelle and rotor blades using the cranes;
- installation of step up transformer and substation;
- installation of transmission cables between the substation and the 11 kV supply grid; and
- testing and commissioning of the wind turbine system.

2.3 *OPERATION OF THE PROJECT*

The operation of the wind turbine, including start-up and shut-down, will be automatic. It will produce electricity when the wind speeds are in the range of 3 to 25 m s^{-1}. The wind turbine brakes by full feathering of the blades. The blades of the wind turbine will be locked automatically when the wind speed is above 25 m s^{-1} to avoid damage.

The wind turbine will be unmanned and attendance by operational personnel will only be required during emergencies or routine maintenance. All functions of the wind turbine will be monitored and controlled remotely at the control room of one of CAPCO's power stations or CLP Power's sub-stations. Users with appropriate access rights can send a Stop, Pause, Start or Reset command to the turbine using the remote control system.

2.4 *PLANNING AND IMPLEMENTATION PROGRAMME*

The Project will be planned and implemented by CAPCO together with consultants and contractors. Subject to the review of the wind turbine feasibility assessment results and the ongoing regulatory discussions with the HKSAR government (**), the current envisaged key stages of Project are presented in *Table 2.4a*.

Table 2.4a Proposed Project Programme

Key Stage of the Project	Indicative Date
EIA and Permitting	Q2-Q4, 2006
Project construction **	2007
Operation of the wind turbine **	2008

3 ENVIRONMENTAL IMPACTS

The environmental impacts associated with the construction and operation of the Project are summarised in the following sections.

3.1 NOISE IMPACT

3.1.1 Construction Phase

The construction noise assessment indicates that the predicted day-time noise levels at the NSR N1 (Hei Ling Chau Correctional Institution) and NSR N2 (Hei Ling Chau Addition Treatment Centre (Annex)) range from 36 to 75 dB(A) and comply with the day-time construction noise criteria of 75 dB(A) (see *Figure 3.1a*).

Due to the close proximity of Correctional Services Department (CSD)'s Staff Quarters (NSR N3) to the enabling work areas, the predicted day-time noise level at this Noise Sensitive Receiver (NSR) will exceed the day-time construction noise criterion by about 4 to 8 dB(A) after implementation of the recommended mitigation measures. The duration of impact will be about one week. As the affected dwellings will be informed prior to the commencement of the construction and due to the comparatively short exceedance period, the residual construction noise impacts can be kept at reasonable levels. After consultation with CSD, the agreed mitigation measures will be implemented (eg the use of air-conditioners and avoidance of use of the affected staff quarter during the period when works are being undertaken in the area). The contractor will closely liaise with the CSD to programme the noisy construction works such that the noise impact to the CSD staff will be avoided or reduced.

Noise monitoring will be carried out at NSRs N2 and N3 during the construction phase.

It is not anticipated that construction work will be undertaken at night-time and hence night-time construction noise impact is not anticipated.

3.1.2 Operational Phase

The noise assessment indicates that under the worst-case scenario (covering a full range of operation including start-up, shut-down, cut-in, cut-out, braking and yawing; and the full range of wind speeds), with a wind turbine of typical sound power level of 104 dB(A) and with no tone, impulse and intermittence characteristics, the predicted facade noise levels at the identified NSRs will comply with the day-time and night-time noise limits at all NSRs.

Noise monitoring will be carried out at N2 for a period of 12 months during the operation phase.

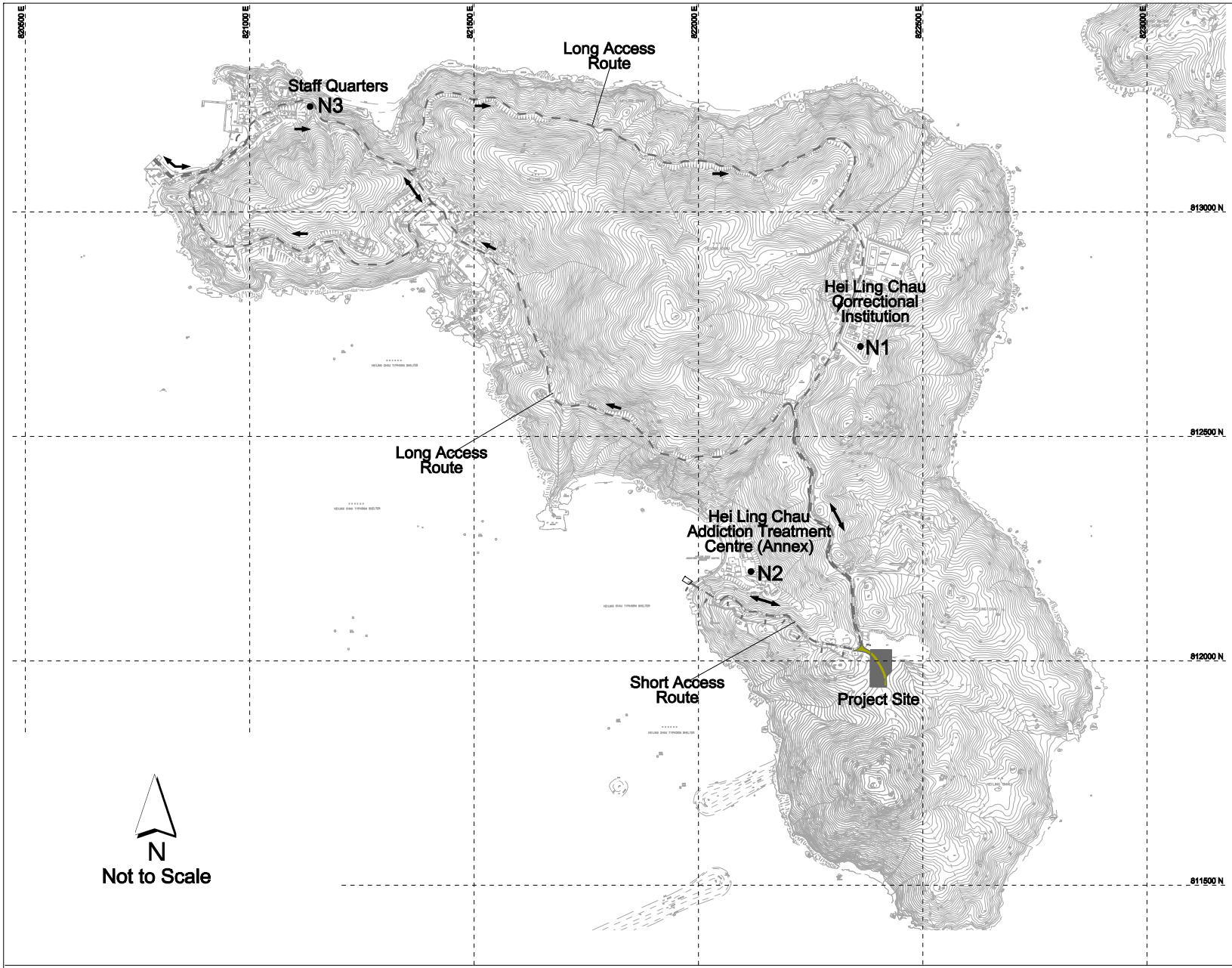

FIGURE 3.1a

Location of Noise Sensitive Receivers (NSRs)

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3.2 ECOLOGICAL IMPACT

3.2.1 Construction Phase

The ecological impact assessment concluded that the ecological value of the affected habitat ranged from low to moderate. The direct ecological impact due to the construction of the wind turbine is expected to be low, and will not contribute to any potential cumulative impact. In view of the generally poor vegetation cover, it is anticipated that the Project Site does not provide an optimal habitat for the Common Rat Snake and Bogadek's Burrowing Lizard and the impacts on these species are expected to be low. It is recommended that a search of the Common Rat Snake and Bodagek's Burrowing Lizard within the Project Site and the impacted area of the access routes be undertaken immediately prior to the commencement of the construction works. If these reptiles are identified, they will be translocated to the adjacent shrubland by a qualified person.

3.2.2 Operational Phase

Bird collisions are perceived as an ecological concern during the operation of the wind turbine. The results of the literature review and baseline surveys indicate that the Project Site and the areas in the vicinity are not important bird habitats as there is no wetland habitat within or in the vicinity of the Project Site to attract water birds and the Project Site is not within the travelling path of the migratory birds. The potential risk of bird collision will be low. It is therefore considered that the operation of a single wind turbine will not cause adverse impact to birds. Nevertheless, monthly bird collision survey will be carried out during the first 12 months of operation to confirm the findings of this EIA Study.

3.3 LANDSCAPE AND VISUAL IMPACT

3.3.1 Landscape Impact

Of the eight Landscape Resources (including Shrubland, Plantation, Abandoned Wet Agricultural Land, Stream, Reservoir, Developed Area, Rocky Shoreline, and Sandy Shoreline) on Hei Ling Chau there will only be residual impacts on the Shrubland resources. This will result in a residual impact of 0.15 ha. This impact is classified as slight adverse. With the implementation of the recommended landscape mitigation measures, the long term impacts of the Project on landscape resource of Hei Ling Chau will be negligible. The impacts on the developed areas after construction will be negligible as they will be replaced by new developed areas (ie wind turbine site). The impacts on the Landscape Resources are acceptable with mitigation measures.

The impacts on the Landscape Character Areas of Hei Ling Chau will vary from slight for LCAs 2 to 5 (including Institutional Landscape, Reservoir, Typhoon Shelter and Coastal Waters, respectively) to moderate for LCA1

(Island Landscape) during construction and operation. The impacts on the Landscape Character Area are acceptable as the assessment indicates that there will be no significant impacts caused by the construction and operation of the wind turbine.

3.3.2 Visual Impact

The potential visual impacts due to the construction and operation of the wind turbine on visual sensitive receivers within 10km radius of the Project Site have been assessed. The wind turbine with the proposed aviation warning marking scheme (ie alternative orange and white bands) is in contrast to the surrounding natural landscape. For Disneyland Hong Kong, the visual impact will be negligible. VSRs from Discovery Bay, Cheung Chau – Mui Wo Ferry, Lamma Island and Hong Kong Island will experience slight to moderate adverse impact. VSRs from Cheung Chau, Peng Chau, Mui Wo, Chi Ma Wan Peninsula, and Lantau Hikers will experience moderate adverse impact. VSRs on Hei Ling Chau will experience moderate to significant visual impact (see *Figure 3.3a*). Although the visual impact to VSRs on Hei Ling Chau is unable to mitigate practically, the adverse effects are not considered too excessive in view of the size of land take and form of the structure. Hence, the visual impact is not unacceptable. There are no significant visual impacts for other VSRs and there will be no interference with key views. Therefore, the visual impacts will be acceptable.

3.4 CONSTRUCTION PHASE WATER QUALITY IMPACT

No marine works are associated with the construction and operation of the Project. Due to the small scale of the land-based construction works and the short duration of construction period, the potential water quality impacts are negligible with the implementation of general good construction site management practices. However, it is recommended that monthly site audits be conducted to confirm no prohibited or polluted flows be discharged from the works areas as described in the EIA Report.

3.5 CONSTRUCTION WASTE MANAGEMENT IMPLICATIONS

The anticipated quantities of construction waste (400 m^3), chemical wastes (a few hundred litres, mainly consist of used lube oils), sewage (1 m^3 per day) and general refuse (26 kg per day) to be generated during the construction phase of the Project will be small. With the implementation of general good construction site practices, the construction of the Project will not cause adverse waste management or environmental impacts with respect to the criteria specified in the Technical Memorandum on Environmental Impact Assessment Process (*EIAO-TM)*.

It is recommended that monthly audits of the waste management practices be carried out during the construction phase to determine if wastes are being managed in accordance with the good construction site practices described in

1. Existing View Looking Southeast Towards the Development from Hei Ling Chau Block F

2. View Displaying the 3D Model of the Proposed Development Day 1 Operation Without Mitigation.

3. View Displaying the 3D Model of the Proposed Development Day 1 Operation With Mitigation.

4. View Displaying the 3D Model of the Proposed Development Year 10 Operation With Mitigation.

Figure 3.3a

Photomontage Visually Sensitive Receiver 8 View Hei Ling Chau

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the *EIA Report*. The audits should examine all aspects of waste management, including waste generation, storage, recycling, transport and disposal.

3.6 CULTURAL HERITAGE IMPACT

The literature review and field surveys confirmed the absence of any Declared Monuments, Deemed Monuments, graded buildings or known archaeological sites on Hei Ling Chau. None of the identified pre-1950 and post-1950 potential standing sites of cultural heritage will be impacted by the Project. The field surveys at the Project Site and the areas of the enabling works indicate that they have no archaeological potential. The Project will not cause either direct or indirect adverse impacts to the cultural heritage resources on the island.

3.7 ENVIRONMENTAL MONITORING AND AUDIT

3.7.1 Construction Phase

Noise monitoring and monthly construction site audits will be carried out during the construction phase to check for compliance with the relevant criteria.

3.7.2 Operation Phase

It is recommended to monitor noise levels at monthly intervals for first 12 months of the operation of the wind turbine. The monitoring frequency will increase to biweekly intervals for the higher wind speed months (ie winter months - from December to January, and storm season -July) within this 12-month monitoring period.

A bird collision survey (for a period of 12 months) will be carried out during the operation phase.

3.8 OVERALL CONCLUSIONS

The environmental impact assessment has concluded that no unacceptable environmental impacts are envisaged due to the construction and operation of the Project.

Residual impacts associated with construction noise have been evaluated and considered as low/negligible and acceptable in terms of the magnitude and effects on health. No long term unacceptable impact on the environment is anticipated.

喜靈洲商用風力發電試驗計劃
環境影響評估

行政摘要

目錄

1 引言

1.1 背景

青山發電有限公司（以下簡稱「青電」）是中華電力有限公司（以下簡稱「中電」）及埃克森美孚能源有限公司（以下簡稱「埃克森美孚」）的聯營機構。青電理解香港特別行政區政府（以下簡稱「特區政府」）在探索另類發電來源，包括可再生能源，以及促進公眾對另類發電來源的認識而作出的努力。爲了作出實質支持，青電已展開一項商用風力發電試驗計劃（以下簡稱「本工程項目」），以便達到下列目的：

- 收集有關香港發展風力發電所需的工程及環保資料（包括必要法定審批要求）；
- 探討香港應用風力發電在經濟、環保和技術方面的可行性，藉以支持特區政府在發展可再生能源方面的努力；
- 教育及提高社會大眾對香港風力發電所涉及的問題、成本、限制、效益等事項的認識。

本工程項目會通過完整的選址和規管程序，裝設一台商用風力發電機組，並連接至現有供電網，以便社會大眾能夠獲得更多有關本港應用風力能源的知識和經驗。

爲了物色能夠連接中電現有供電網，並適合發展風力發電系統的陸上適當地點，本工程項目進行了嚴格的選址程序。同時，亦評估了每個候選地點的風力資源多寡、電網連接容易程度，以及在環境、地理和社會上的限制。是項環境影響評估（以下簡稱「環評」）研究，是爲了在喜靈洲發展一個商用風力發電試驗計劃（以下簡稱「本工程項目」）而進行。

1.2 環評的目的和範圍

根據《環境影響評估條例》（香港法例第 499 章）（以下簡稱《環評條例》）附表 2 第 I 部份第 D 類（能源供應）的 D.1 項（公用事業電力廠），本工程項目屬於「指定工程項目」。因此，在喜靈洲建造和營運一項商用風力發電試驗計劃，需先取得環境許可證。

是次環評研究的主要目的，是要就本工程項目在施工和運作期間對環境可能造成的影響，按照環評研究大綱（*ESB-145/2006 號*）所述的事項，包括噪音、生態、景觀及視覺、施工階段的水質和廢物管理，以及文化遺產影響等範疇，詳細評估影響的性質和範圍。

1.3 研究取向

是次環評是根據《環境影響評估程序的技術備忘錄》提供的指引和評估方法進行，其評估的大致取向包括：

- 進行影響評估的環境和基線情況說明；
- 識別潛在影響；
- 評估潛在影響；及
- 建議緩解措施及環境監察計劃。

本環評內的評估，乃根據和本工程項目有關的最壞估算的情況下，以經驗證可靠及國際認受的方法進行。

2 *工程項目說明*

圖 2.1a 和 *2.1b* 分別展示本工程項目的位置和布局。下文會闡述本工程的施工和運作情形。

2.1 風力發電機組

擬採用的風力發電機組爲水平軸心的三葉片渦輪機（*圖 2.1c* 展示了一個典型的水平軸心三葉片風力發電機），其主要電力及機械部份，包括齒輪箱、備有額定功率約爲 800 千瓦至 1.3 兆瓦的發電機和轉向裝置等，將會安放在風車塔頂部的機件艙內。風車塔將可能是管狀鋼材建造，但亦可用其他物料，例如混凝土(1)。塔身會建於一個約爲 9 米 x 9 米的混凝土基座上。

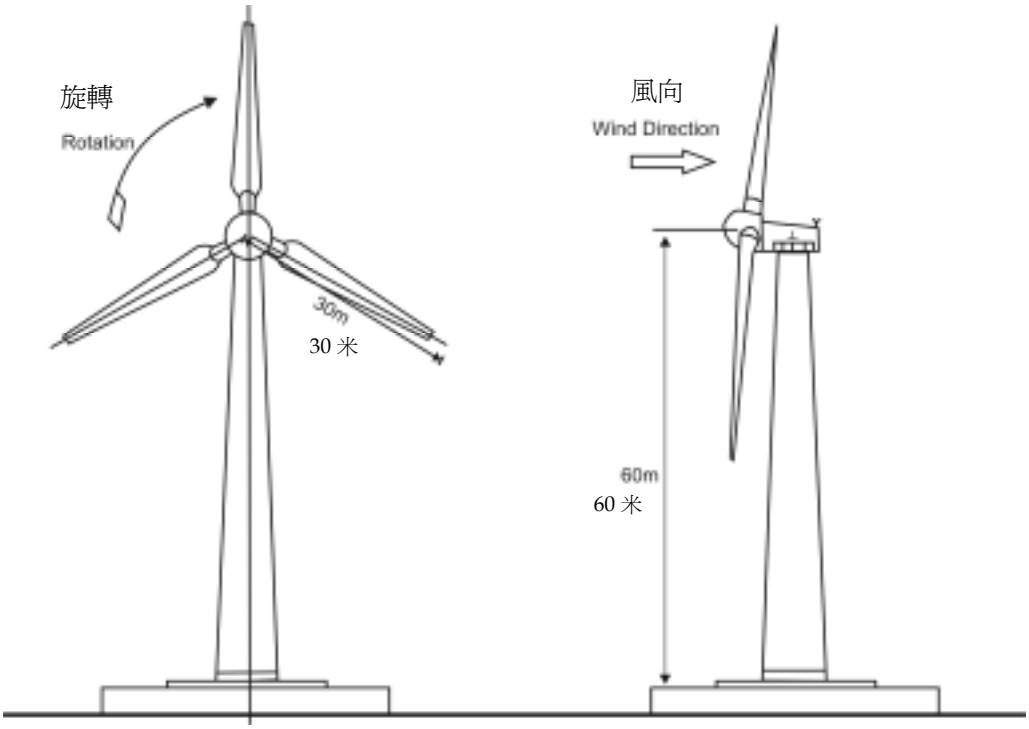

圖 2.1c 典型的三葉片風力發電機組

風車葉被風力吹動，並把動力傳送至轉軸，再透過齒輪帶動發電機。發電機所產生的電力經由增壓變壓器傳送至變電站，再經過架空或地底電纜輸進最接近的現有 11 千伏電網（見*圖 2.1b*）。

2.2 工程項目施工

本工程項目的主要建造工程包括：改良現有道路及建造臨時通道以便運送建造物料和設備、建造平台以便豎起風車塔、建造塔基、豎起風車塔、裝設機件艙及車葉，以及安裝控制及傳送系統。

(1) 若採用混凝土風車塔（以預製的鋼筋混凝土環建成），整個塔身會比鋼質風車塔闊約 1 米。

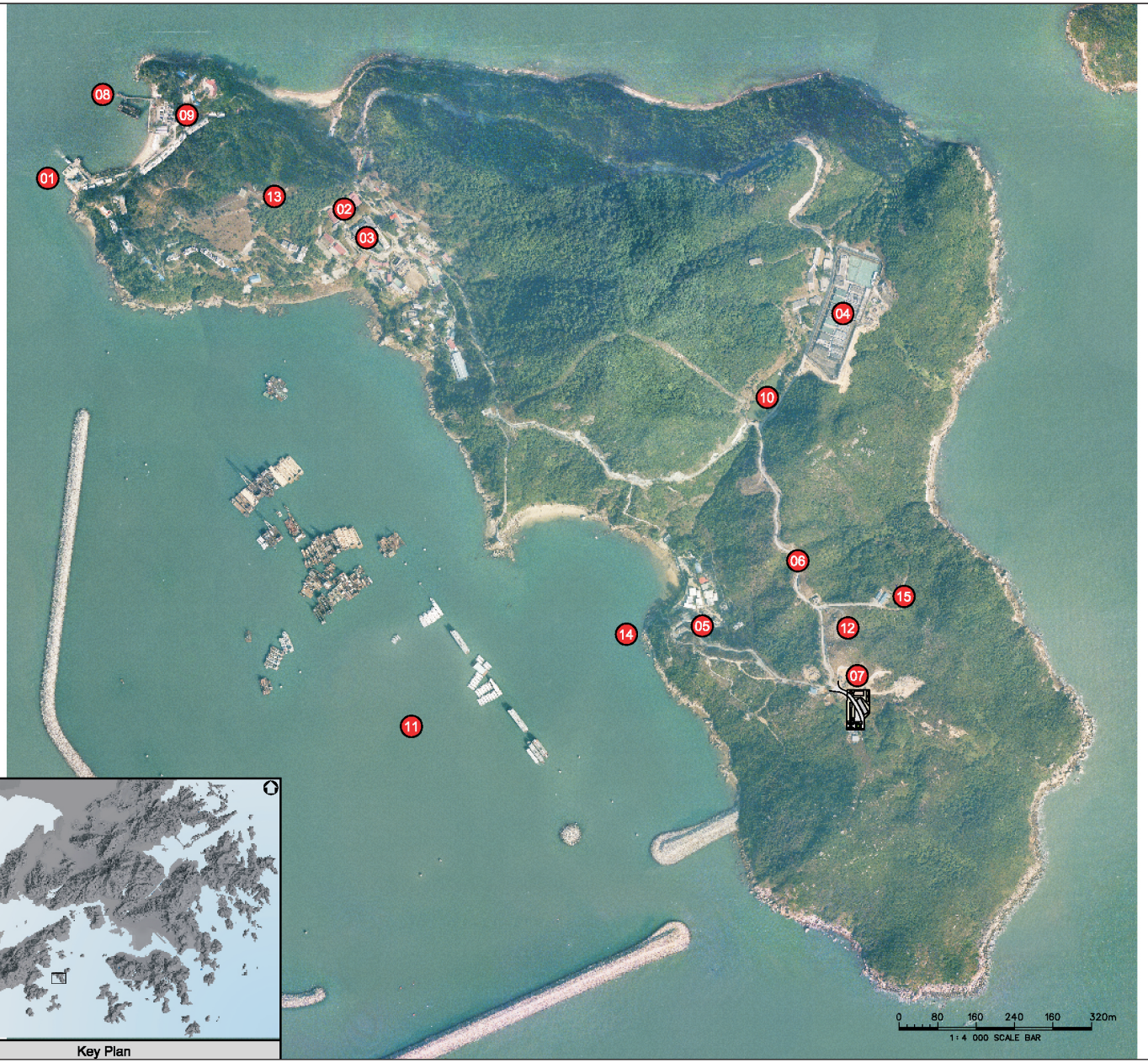

圖2.1a

商用風力發電試驗計劃
喜靈洲的工程項目地點及周圍環境

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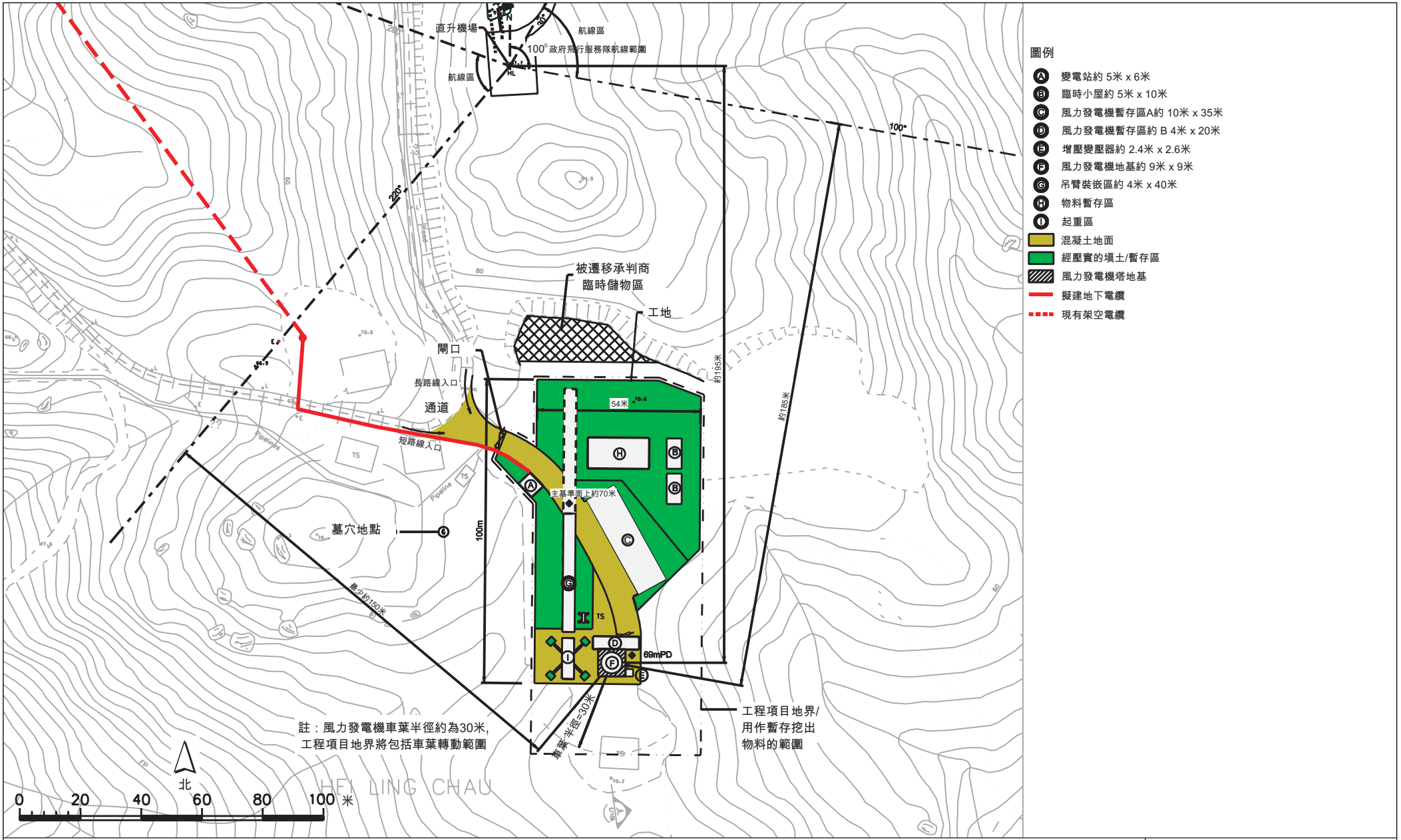

圖2.1b

商用風力發電試驗計劃
喜靈洲工程項目地點初部布局

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是項研究已找到兩條路線，可以運送建造物料和設備至工程項目地點（*圖 2.2a*）。第一條屬長路線，是利用現有的重型碇泊設施和道路系統。這條通道會使用現有環迴通道的北段，沿著現有路線直至工程項目地點。通道上有多個地點都需要進行小型道路改善工程。這條長路線會用作運送建造機器和物料。

由於風力發電機組件龐大而且沉重，若用長路線運送，便會需要在多處地點進行重大道路改良工程（包括重大斜坡工程）。因此，將會使用另一條短路線把這些組件運往工程項目地點。風力發電機的組件會以附有起重機的躉船運送，並在島南避風塘內的現有碼頭旁離岸碇泊。躉船需要有 2 米的水深。根據水文調查結果，確定區內有足夠水深，無需挖泥。

這條短路線（見*圖 2.2a*）需要在該島西南面的現有碼頭建造一個臨時鋼質平台，以及一條臨時鋼橋。臨時平台會建於高潮水位之上，因此無需進行海上工程。風力發電機的組件（包括風車葉、機件艙和鋼質塔身段落）會由水上起重機從躉船吊至臨時鋼質平台上，然後由履帶起重機吊至臨時鋼橋的橋面，再由自動推進拖車沿著現有道路運送至工程項目地點。這條短路線上的部份地點可能需要進行小型路面擴闊工程或斜坡修改工程，以便長身車輛通過（見*圖 2.2a*）。

工程項目地點（見*圖 2.1b*）將佔地面積約爲 54 米 x 100 米，包括建造物料和風力發電機組件的卸貨區。現時估計，工地只需進行小型的清理和平整工程。工程設計顯示，工程項目地點下的物料，是由劣質填料覆蓋著的石塊。因此需要用鋼筋混凝土地基，以及預鑽孔的 H 型樁柱支撐風力發電機組。

工程項目地點的主要建造工程包括：

- 工地清理和平整；
- 爲風力發電機組進行預先鑽孔的 H 型樁柱工程，以及建造鋼筋混凝土地基（約 9 米 x 9 米 x 2 米）；
- 以履帶起重機組合各段預製的鋼質塔身，藉此豎立風力發電機組的風車塔；
- 以起重機安裝機件艙和風車葉；
- 安裝增壓變壓器和變電站；
- 安裝變電站和 11 千伏供電網之間的電纜；及
- 測試和啓用風力發電機組。

2.3 工程項目運作

風力發電機組的運作，包括啓動和停止都會自動操作。當風速達到每秒 3 至 25 米時，發電機組便會產生電力。風力發電機的減速方法，是把車葉調成完全順流的角度。當風速超過每秒 25 米時，車葉便會自動鎖定，以免受損。

風力發電機組完全無需人手操作，只有在緊急情況或例行維修時才需要操作人員介入。風力發電機組的所有功能，都會由青電其中一個電廠或中電其中一個

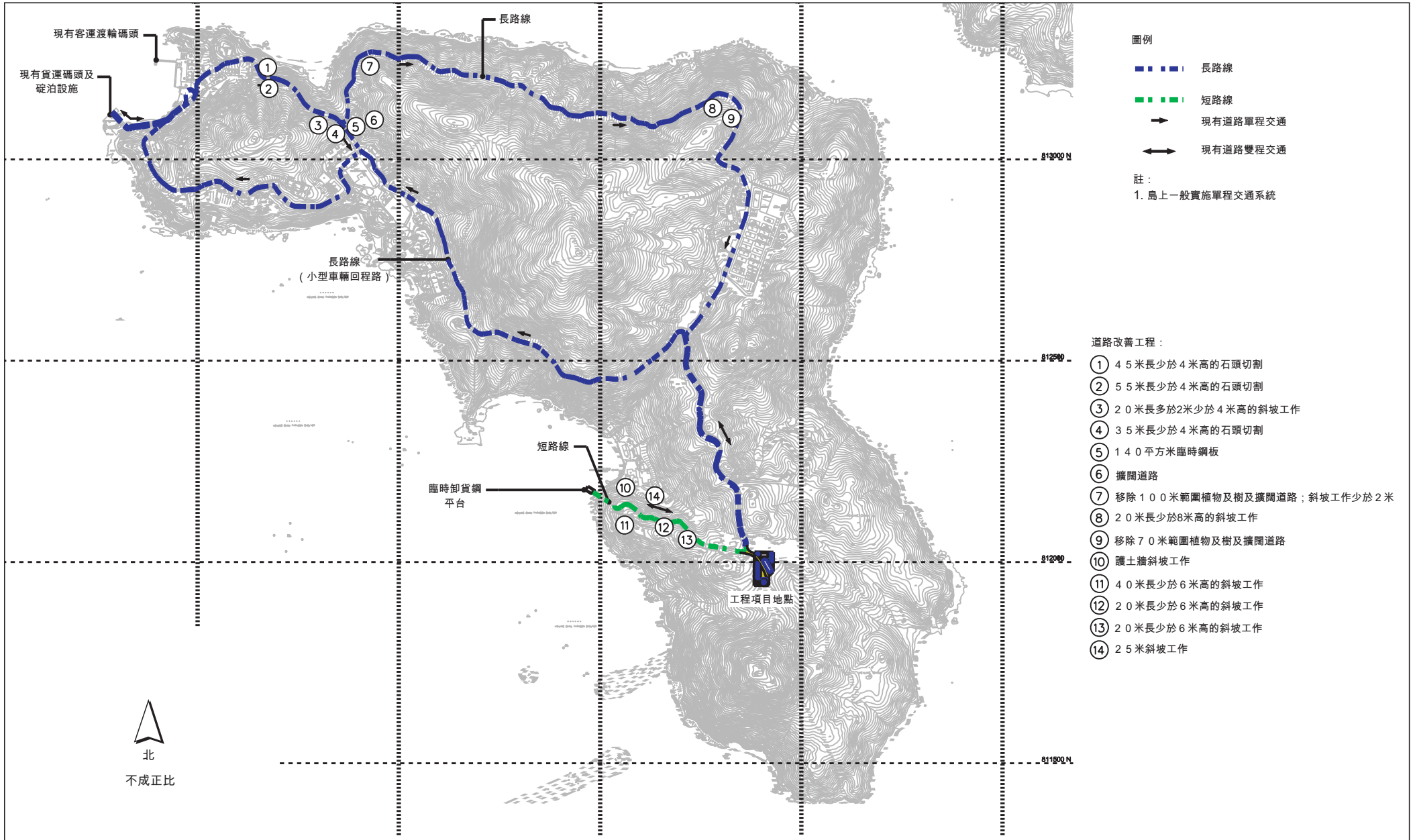

圖2.2a

喜靈洲工程項目所須道路改善工程的主要平面圖

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變電站的控制室加以遙控。有適當使用權的控制人員，可以利用遙遠控制室向發電機發出停止、暫停、啓動或重新設定等指令。

2.4 規劃及實施計劃

本工程項目會由青電連同顧問及承判商進行規劃和實施。視乎青電與特區政府在風力發電的可行性評估結果的檢討及就規管的持續討論(**)，預計現時本工程項目的主要階段列於*表 2.4a*。

表2.4a 建議工程計劃

工程項目主要階段	指標日期
環評及許可證審批	2006 年第 2-4 季
工程施工**	2007 年
風力發電機組投產 **	2008 年

3 環境影響

本工程項目的施工和運作對環境可能造成的影響均於下文闡述。

3.1 噪音影響

3.1.1 施工階段

施工噪音評估結果顯示，噪音感應強的地點 N1（喜靈洲懲教所）和 N2（喜靈洲戒毒所（附屬中心））的預計日間噪音聲級約爲 36 至 75 分貝 (A) 之間，均符合日間建造噪音的 75 分貝(A) 標準（見*圖 3.1a*）。

由於懲教署的職員宿舍（噪音感應強的地點N3）貼近工地，預計在實施建議的緩解措施後，這裏的日間噪音聲級仍會超過相關標準約4至8分貝(A)。影響的時間約爲一個星期。由於受影響的居所會在施工前獲得通知，而且超標的時間較短，因此可以把剩餘建造噪音影響保持在合理水平。青電咨詢過懲教署後，將會實施緩解措施（如在該區施工期間使用空調及避免使用受影響的員工宿舍）。青電的承判商會與懲教署緊密聯繫，適當地安排嘈吵的施工時間，以防止或減少對懲教署員工宿舍的影響。

在施工階段內，將在噪音感應強的地點 N2 和 N3 進行噪音監察。

預計本工程項目不會在晚間施工，因此不會造成晚間施工噪音影響。

3.1.2 運作階段

噪音評估結果顯示，在最壞的情況下（包括啓動、停止、加入、退出、減速和轉向等全部操作，以及各種風速），風力發電機組發出的典型聲功率級爲 104 分貝 (A)，沒有任何音調、衝量和間斷特徵。在這種情況下，已知噪音感應強的地點的預測正面噪音聲級會符合日間和晚間的噪音上限。

在運作階段會在噪音感應強的地點 N2 進行爲期十二個月的噪音監察。

3.2 生態影響

3.2.1 施工階段

根據生態影響評估結果，受影響的生境具有低至中等的生態價值。預計因本工程項目施工而造成的直接生態影響屬於低，亦不會造成任何潛在的累積影響。鑒於工程項目地點的植物覆蓋情況欠佳，預計該區未能爲非滑鼠蛇（水律）和鮑氏雙足蜥提供一個理想的生境，對牠們的影響預計爲低。建議在施工前，在工程項目地點內及受影響的路線進行一個非滑鼠蛇（水律）和鮑氏雙足蜥的搜索，若有發現這些爬蟲類動物，將會由一位合資格人士把牠們遷移至鄰近的灌木叢。

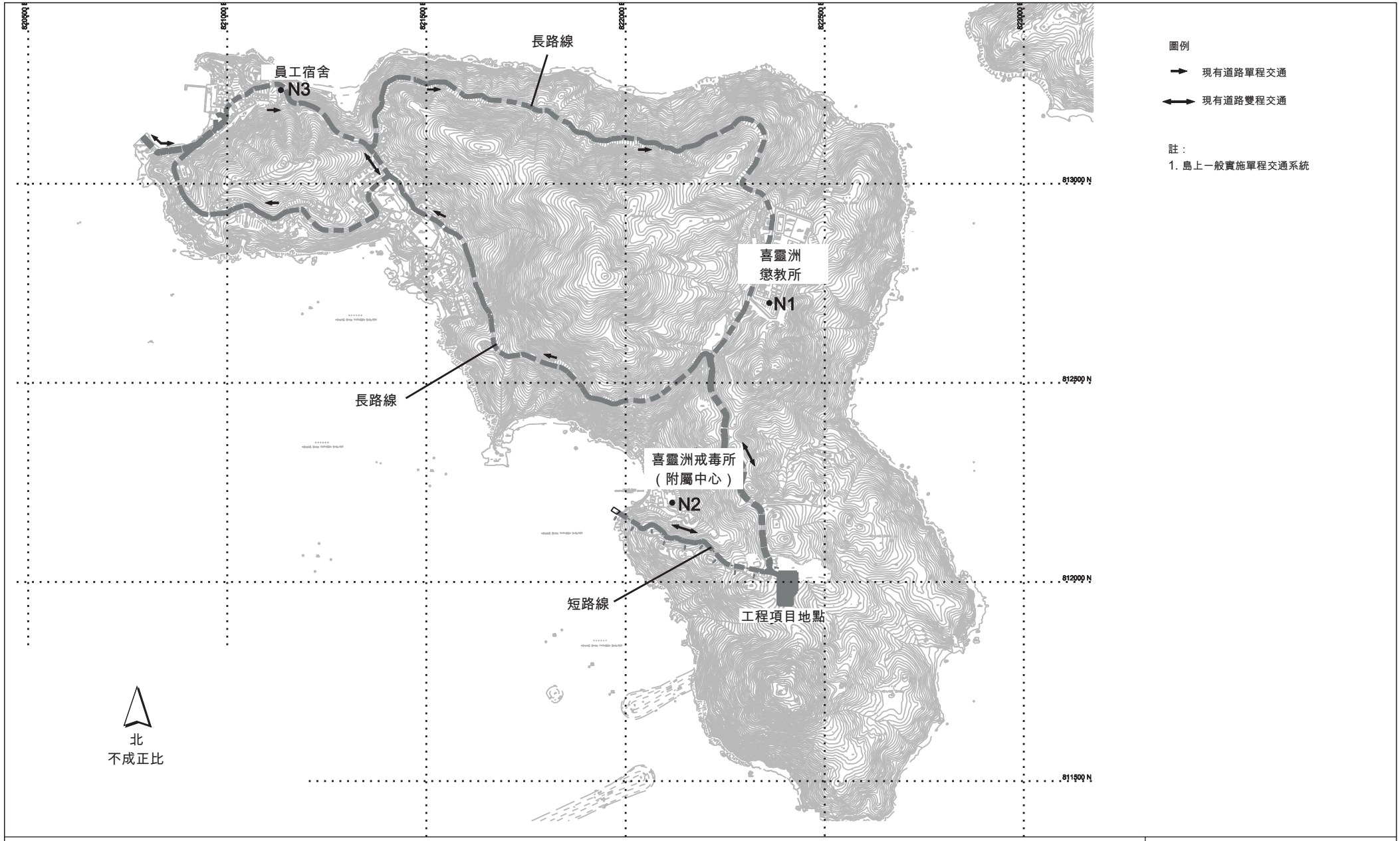

圖3.1a

噪音感應強的地點

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3.2.2 運作階段

是項研究認爲，鳥類碰撞是風力發電機組運作期所關注的生態問題。文獻回顧及基線調查結果顯示， 由於工程項目地點及其鄰近地區沒有濕地生境可吸引水鳥，而工程項目地點亦不在季候鳥的飛行路線內，因此並非重要的鳥類生境。鳥類碰撞的潛在危機將會低。是次研究認爲，一台風力發電機組的運作不會對鳥類造成不良影響。然而，在機組運作的首十二個月內，會進行每月一次的鳥類碰撞調查，以確認這次環評研究的結果。

3.3 景觀及視覺影響

3.3.1 景觀影響

在喜靈洲的八種景觀資源（包括灌木林、植林、棄置了的水耕農地、溪流、水塘、已發展土地、岩岸和沙岸）中，只有對灌木林會造成 0.15 公頃的累積影響，此影響評爲輕微不良影響。實施了所建議的景觀緩解措施後，本工程項目對喜靈洲的景觀資源的長期影響爲微不足道。由於新的發展面積（即風力發電機組）會取代已發展土地，施工期後對已發展地的影響將會是微不足道。實施了緩解措施，本工程項目對景觀資源的影響爲可接受。

本工程項目在施工期和運作期對喜靈洲景象特色區域（景區）的影響將會分別由景區２至５（順序爲機構景區、水塘、避風塘及沿海水域）之輕微的影響增至景區 1(島嶼景象)之中度不良影響。由於評估顯示，此風力發電機組的施工與運作將不會引致嚴重的影響，這些對景區的影響是可以接受的。

3.3.2 視覺影響

是項研究評估了本工程項目因興建及運作風力發電機組對十公里範圍以內易受視覺影響滋擾的受體的潛在視覺影響。塗上建議之航行警告顯示（即橙白間）的風力發電機組是與附近的自然景觀成對比。香港廸士尼將會有微不足道的視覺影響；愉景灣、來往長洲至梅窩的渡輪、南丫島和香港島等易受視覺影響滋擾的受體將會有輕微至中度不良影響；長洲、坪洲、梅窩、芝麻灣半島以及大嶼山遠足人士等易受視覺影響滋擾的受體會經驗到中度不良影響；在喜靈洲的易受視覺影響滋擾的受體會經驗到中度至嚴重不良的視覺影響(見*圖 3.3a*)。雖然對喜靈洲的易受視覺影響滋擾的受體之視覺影響沒有可行的緩解措施，但是從所需用地的面積及其結構形狀而論，其不良影響並不太嚴重。因此，這並不是不能接受的影響。本工程項目沒有對其它易受視覺影響滋擾的受體造成嚴重的視覺影響，亦將不會對主要觀景有所干擾，因此，其視覺影響將會是可以接受的。

3.4 施工階段水質影響

本工程項目的施工和運作都無需進行海上工程。至於陸上建造工程方面，由於規模細小，而且爲時短暫，在實施一般的良好工地管理方法後，本工程項目可能造成的水質影響只屬微不足道。然而，建議每月進行工地審核工作，以確認在環評所述的工地範圍沒有違法或排出污染的水。

1. 從喜靈洲F座向東南方向望見的發展地點現時景觀

2. 擬發展風車在沒有援解措施下運作第一天的三維模擬景觀

3. 擬發展風車實施了援解措施下運作第一天的三維模擬景觀

4. 擬發展風車實施了援解措施下運作第十年的三維模擬景觀

圖3.3a

從喜靈洲易受視覺影響滋擾的受體8之集成相片

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3.5 建造廢物管理影響

預計本工程項目在施工階段只會產生小量的建造廢物（約 400 立方米）、化學廢物（約數百公升，主要是舊潤滑油）、污水（每天約 1 立方米）和一般垃圾（每天約 26 公斤）。本工程項目若在施工期間實施一般建造工地良好管理方法，便不會造成環境影響評估程序技術備忘錄的準則所述的不良廢物管理影響或環境影響。

報告建議在施工階段內，每月進行一次廢物管理方法審核，以便確定廢物的管理是否符合*環評報告*所闡述的良好工地管理方法。審核工作應該涵蓋所有廢物管理環節，包括廢物的產生、存放、循環再造、運送和處置。

3.6 文化遺產影響

文獻檢閱和實地調查的結果證實，喜靈洲沒有任何法定古蹟、認定古蹟、經評定等級的建築物或已知的考古遺址。所有 1950 年以前和以後的已知潛在文化遺產地點都不會受到本工程項目影響。在工程項目地點和道路改善工程區內進行的調查結果顯示，這些地區都沒有考古潛力。因此，本工程項目對島上的文化遺產資源不會造成直接或間接的不良影響。

3.7 環境監察與審核

3.7.1 施工階段

在施工階段會進行噪音監察和每月工地審核，藉以檢查這兩方面的情況是否符合有關標準。

3.7.2 運作階段

建議在運作階段首十二個月進行每月噪音水平監察。在這十二個月期間，監察密度會在較高風速的月份（即冬季——十二月至一月和雨季——七月）增加至每兩星期一次。

在運作階段會進行一個雀鳥碰撞調查（爲期十二個月）。

3.8 總結

是次環境影響評估認爲，本工程項目在施工和運作期間，都不會對環境造成不能接受的影響。

評估施工噪音剩餘影響的結果顯示，剩餘影響的程度及對健康的影響都屬低或微不足道及可接受水平。預計本工程項目不會對環境造成長遠而不能接受的不良影響。