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1 INTRODUCTION

Background to the Study

- 1.1 The existing Siu Ho Wan Water Treatment Works (WTW) and the associated raw water and treated water transfer and distribution systems were commissioned in 1997 to provide treated water capacity of 150,000 m³/day. It provided treated water to the Hong Kong International Airport at Chek Lap Kok and the initial phases of North Lantau New Town and Discovery Bay.
- 1.2 In order to cope with the water demands of the developments in North Lantau New Town, northshore & north-east Lantau area and Discovery Bay, Water Supplies Department (WSD) conducted a Preliminary Project Feasibility Study (PPFS) in respect of the project "Siu Ho Wan Water Treatment Works Extension" (hereinafter referred to as the Project) in January 1999. The PPFS identified the requirements of the Project, describing the studies undertaken and the new works required, together with the outline design for principal elements of the Project, cost estimate, land requirements and implementation programme. Following the PPFS, WSD commissioned Metcalf & Eddy Ltd. to undertake the Extension of Siu Ho Wan Water Treatment Works - Investigation (the Assignment) that comprises the uprating of Siu Ho Wan WTW and the associated raw water and treated water transmission systems.

Purpose and Scope of the Environmental Impact Assessment

- 1.3 As the capacity of the Siu Ho Wan WTW is more than 100,000 m³ per day, the Project is a designated project under Schedule 2, Part I, Category E.2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499). An environmental permit is required for designated project during construction and operation phases under the EIAO.
- 1.4 As part of the Assignment, an Environmental Impact Assessment (EIA) study was undertaken to provide information on the nature and extent of potential environmental impacts arising from the construction and operation of the proposed Project, and to contribute to decisions on the overall environmental acceptability of the Project.
- 1.5 The EIA provided an assessment of the potential environmental impacts associated with the Project, in relation to the issues specified in the EIA Study Brief No. ESB-046/2000, including noise, air quality, water quality, waste management, ecology, cultural heritage, landscape and visual, and hazard to life.

2 PROJECT DESCRIPTION

Location and Scale of Project

- 2.1 The proposed Siu Ho Wan WTW extension is within the existing WTW site boundary (location refers to Figure 2.1), located at the foot of the Tai Che Tung hill in a Other Use (Water Treatment Works) area, with a Sewage Treatment Plant to the west, North Lantau Service Road to the north and North Lantau Highway about 100 m away. The layout plan of

the Siu Ho Wan WTW is shown in Figure 2.2. A Siu Ho Wan Raw Water Booster Pumping Station is also proposed and its location is shown in Figure 2.1.

2.2 The existing Pui O Raw Water Pumping Station and Pui O No. 2 Raw Water Pumping Station are located next to South Lantau Road. The demolition and reprovisioning of the Pui O Raw Water Pumping Station and uprating of the Pui O No. 2 Raw Water Pumping Station would take place within its existing boundary. A proposed alignment for the duplication of two sections of the existing raw water mains (about 2 km in length) at Pui O is mainly along the existing South Lantau Road, as shown in Figure 2.3.

2.3 The scope of this Project covered in the EIA comprises:

- (a) Extension of the existing Siu Ho Wan WTW within the existing Siu Ho Wan WTW compound from a capacity of 150,000 m³/day to 300,000 m³/day;
- (b) Uprating of treated/fresh water pumping capacity in the existing Siu Ho Wan Raw Water and Fresh Water Pumping Station within the existing Siu Ho Wan WTW compound from a capacity of 150,000 m³/day to 300,000 m³/day;
- (c) Construction of the proposed Siu Ho Wan Raw Water Booster Pumping Station together with the associated raw water mains, E&M plants and access road to increase the raw water transfer capacity from Tai Lam Chung Reservoir to Siu Ho Wan Water Treatment Works;
- (d) Demolition and reprovisioning of the Pui O Raw Water Pumping Station;
- (e) Uprating of the Pui O No. 2 Raw Water Pumping Station;
- (f) Laying of two sections, approximately 2 km long, of 1200 mm diameter raw water mains at Pui O; and
- (g) All other associated civil, building, structural, pipeworks, mechanical and electrical works, plant and equipment including pumping plant, power supply plant, and water treatment plant and equipment, site formation, geotechnical, landscaping, environmental assessment, surge protection facilities, control and monitoring works, Supervisory Control and Data Acquisition System, Distributed Control System, energy management system, permanent and temporary land issues necessary for completion and commissioning of the works element as listed in the above.

Project Programme

2.4 The construction of the Project is scheduled for commencement in late 2007 for completion and commissioning in late 2011.

3 ENVIRONMENTAL IMPACTS

- 3.1 Potential environmental impacts associated with the construction and operation phases of the proposed Project are summarized below.

Air Quality Impact

- 3.2 Air quality impacts from the construction works for the proposed extension of Siu Ho Wan WTW, Siu Ho Wan Raw Water Booster Pumping Station, Pui O raw water pumping stations and laying of raw water mains at Pui O would mainly be related to construction dust from excavation, demolition, materials handling and wind erosion. With the implementation of mitigation measures specified in the *Air Pollution Control (Construction Dust) Regulation* and Environmental Monitoring and Audit (EM&A) programme, dust impact on air sensitive receivers would be limited during the construction phase.
- 3.3 No operation air quality impact would be expected.

Noise Impact

- 3.4 Construction noise impacts from the laying of raw water mains, demolition and reprovisioning of Pui O Raw Water Pumping Station, if unmitigated, may exceed daytime noise criterion at noise sensitive receivers (NSRs). The use of silenced Powered Mechanical Equipment and movable noise barriers during the raw water mains construction at Pui O would be required to ensure compliance with the noise criterion and no adverse noise impact on the NSRs. No construction noise impact would be expected in the area of the Project at Siu Ho Wan as no NSR is identified in that area.
- 3.5 With the implementation of the recommended mitigation measures, potential noise impacts associated with the operation of the Pui O raw water pumping stations would be limited and within the noise criteria under the Noise Control Ordinance.

Water Quality Impact

- 3.6 Potential key water quality impact would be related to construction phase earthworks for the proposed extension of Siu Ho Wan WTW, Siu Ho Wan Raw Water Booster Pumping Station and trench excavation for the mainlaying works at Pui O, and demolition works for Pui O Raw Water Pumping Station. The nearest identified water bodies to the works areas at Siu Ho Wan and Pui O are the existing streams at Pui O and the drainage channel to the north of the Siu Ho Wan WTW. Potential sources of water quality impact comprise construction site runoff and drainage; debris, refuse and liquid spillages from general construction activities; and sewage effluents from the construction workforce. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures such as control measures on the runoff and drainage from the works areas to minimise construction run-off. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and materials would not enter the nearby watercourses. Sewage effluent arising from the construction workforce would also require appropriate treatment through provision of portable toilets. With the implementation of appropriate mitigation measures, the construction works for the proposed Project would not be anticipated to result in impacts on water quality.

Ecological Impact

- 3.7 After careful alignments selection, construction of the proposed raw water mains at Pui O would mainly be confined to the existing South Lantau Road. However at either end of the proposed alignment, these would unavoidably have direct impact on small areas of woodland habitat. Excavation of the proposed 2.5m wide trench would affect approximately 0.1ha of woodland habitat. This trench excavation would occur inside a 10m wide temporary works area encompassing approximately 0.4ha of woodland habitat. This reserved 10m wide temporary works area is primarily to allow minor adjustments of the raw water mains alignment subject to site conditions in the subsequent detailed design and construction stages.
- 3.8 During ecological field surveys, it was found that individuals of two locally common plant species of conservation interest (the protected shrub/tree *Pavetta hongkongensis* and International Union for Conservation of Nature and Natural Resources (IUCN) listed tree *Aquilaria sinensis*) were scattered throughout the woodland habitat in the Pui O area. Mitigation measures were recommended to minimise disturbance to the plant as much as practicable and where unavoidable, transplantation of affected individual plants would be undertaken. In addition, tree felling would also be minimised and replanting and landscaping would reinstate the works area.
- 3.9 With good site practice and implementation of environmental mitigation measures, other impacts, such as indirect impacts on stream water quality due to site runoff and indirect disturbance to wildlife would be very minor. It is anticipated that the Project would have no long-term residual impact on ecology of the Pui O Assessment Area.
- 3.10 Works at Siu Ho Wan would be mainly confined to existing site boundary and the proposed Siu Ho Wan Raw Water Booster Pumping Station would be built on very low ecological value developed/abandoned land, and therefore minimal ecological impact is anticipated.

Landscape and Visual Impact

- 3.11 The landscape and visual impact assessment identified potential impacts of the proposed works to the existing landscape and visual character of the study areas which would be mainly in terms of removal of existing vegetation and proximity of proposed structures to villagers and user of North Lantau Highway/Airport Express/mtr Tung Chung Line. As the scale of proposed works in terms of number of affected trees and dimension of structures are limited, landscape and visual impacts could be effectively mitigated eg. by compensatory planting and visually recessive colour scheme to an acceptable level.

Cultural Heritage Impact

- 3.12 The assessment found that there was no archaeological sites or areas of archaeological potential along the proposed raw water mains alignment under the Project. Therefore there would be no cultural heritage impacts associated with the construction works. However, as a good practice, mitigation measures in the form of a temporary fenced off buffer zone in proximity to a shrine at Pui O Lo Wai Tsuen with allowance for public access should be provided as far as practicable as the demolition and reprovisioning works for the Pui O Raw Water Pumping Station may restrict access or affect the structure. In case of site constraint,

the existing perimeter fence at Pui O Raw Water Pumping Station could be incorporated to protect the shrine and should form the limit of the buffer zone.

Hazard to Life

- 3.13 A Hazard and Operability (HAZOP) study was conducted to identify additional chlorine hazards initiated by construction activities within the Siu Ho Wan WTW compound for the extension of Siu Ho Wan WTW. A number of mitigation measures, such as monitoring and inspection of chlorine dosing facilities, management of materials and personnel, investigation and training, were identified to be included in the Contract document, as well as in the Safety Plan and Emergency Plan for the extension of Siu Ho Wan WTW, to avoid occurrence of deviations.
- 3.14 As there will be no increase of storage and on-site transport of chlorine to that of the allowable storage capacity for the Siu Ho Wan WTW, the hazard assessment for chlorine during the operation phase is not required in the EIA Report for the Project.

Waste Management Implications

- 3.15 Wastes generated by the construction activities are likely to include construction & demolition (C&D) material from the earthworks for the extension of the Siu Ho Wan WTW, Siu Ho Wan Raw Water Booster Pumping Station and the mainlaying works along South Lantau Road at Pui O, demolition works for the Pui O Raw Water Pumping Station, general refuse from the workforce and chemical wastes from plant and equipment maintenance. Provided that these identified waste arisings are to be handled, transported and disposed of using the recommended methods and that good site practices are to be strictly followed, adverse environmental impacts would not be anticipated during the construction works.
- 3.16 Waste management will be the contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures will form the basis of the site Waste Management Plan to be developed by the Contractor at the commencement of the construction phase.

Environmental Monitoring and Audit

- 3.17 An environmental monitoring and audit programme was recommended for dust, noise, ecology and landscape and visual during construction phase. Site inspection/audit was also recommended to check the implementation of the water quality, waste management, ecology and cultural heritage mitigation measures during the construction phase. Details of the programme are presented in a stand-alone Environmental Monitoring and Audit Manual.

4 OVERALL CONCLUSION

- 4.1 The findings of the EIA have provided information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The EIA Report for the Project has predicted that, the Project would be environmentally acceptable in compliance with environmental standards and legislation with the implementation of the construction and operation stage mitigation measures, as well as environmental monitoring and audit programme.