Annex A

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Environmental Impact Assessment Ordinance (Cap. 499)
Environmental Impact Assessment Report
Desalination Plant at Tseung Kwan O

PURPOSE

This paper presents the key findings and recommendations of the Environmental Impact Assessment (EIA) report for the proposed "Desalination Plant at Tseung Kwan O (TKO)" (hereafter known as "the Project") submitted under section 6(2) of the Environmental Impact Assessment Ordinance (EIAO) (Application No. EIA-229/2015). Water Supplies Department (the Applicant) and their consultants will present the EIA report at the meeting of EIA Subcommittee.

ADVICE SOUGHT

2. Members' views are sought on the findings and recommendations of the EIA report.

BACKGROUND AND SITE SELECTION

3. Prior to the preparation of the EIA report, the Applicant conducted a feasibility study and a pilot plant study on development of desalination facilities in Hong Kong in 2002 and 2007 respectively. These studies confirmed the technical feasibility of desalination technologies using reverse osmosis under local conditions for producing potable water complying with the World Health Organization guidelines for drinking water quality.

4. Having taken into account the functionality, cost, environmental benefits and dis-benefits, a subsequent review with reference to the findings of the pilot study recommended that Tseung Kwan O (TKO) Area 137 would be the most preferred location among the four shortlisted locations, namely (a) Siu Ho Wan, (b) Tuen Mun Area 38, (c) Tsang Tsui Ash Lagoon and (d) TKO Area 137, for the development of the desalination plant in Hong Kong. A site of about 10 hectares (ha) at TKO Area 137 has been reserved for the construction of a desalination plant. In 2012, the Applicant commissioned a planning and investigation (P&I) study of desalination plant at TKO. The P&I study confirmed that TKO Area 137 is a suitable location for siting the proposed desalination plant in terms of the quality of nearby seawater and its close proximity to a strategic water supply network, with an output capacity of 135 million litre per day (Mld) with provision for future expansion to 270 Mld, which is equivalent to about 5% and 10% respectively of the total freshwater demand in Hong Kong.

5. The Applicant has submitted an EIA report on the ultimate capacity of 270 Mld of the Project for approval and the Director of Environmental Protection (DEP), in conjunction with the relevant authorities, considers that the EIA report meets the requirements of the EIA Study Brief and the Technical Memorandum on Environmental Impact Assessment Process (TM), for the purpose of exhibiting the report for public inspection, under Section 7(4) of the EIAO.

NEED FOR THE PROJECT

6. The Applicant advised that at present, the freshwater resources in Hong Kong comes from the yield collected from local water gathering grounds and freshwater supply from Dongjiang (DJ) in Guangdong Province. A secure freshwater supply is of paramount importance in sustaining Hong Kong's development and economic growth. However, Hong Kong's freshwater resources are facing various challenges, including increasing water demand arising from population and economic growth, fluctuating local yield, climate change, as well as keen competition for DJ water resource due to the rapid economic development in the Pearl River Delta Region.

7. Climate change will bring about extremely dry weather at more frequent intervals and increase the likelihood of consecutive droughts. When a severe drought happens, the whole region of Dongjiang River Basin likely will face water shortage. To safeguard water security in Hong Kong, there is a need to develop an alternative water resource by seawater desalination which is not susceptible to climate change.

ENVIRONMENTAL BENEFITS OF THE PROJECT

8. The Total Water Management (TWM) strategy was presented at the 151st Meeting of the Advisory Council on the Environment (ACE) on 14 April 2008. To tackle the potential freshwater shortage problem, two alternative new water resources, namely (a) expansion of water gathering ground and reservoir storage, and (b) implementation of desalination plant were identified and evaluated under the TWM strategy. The former will entail enormous land requirement and such a development scenario will inevitably require encroachment upon substantial environmental sensitive areas affecting ecologically important habitats and loss of trees such as those in the country parks. On the contrary, the latter will have the benefit of easy operation in a small footprint in an environmentally less sensitive location. The TWM strategy concluded that expanding the water gathering ground and reservoir storage would have negative impacts on the environment, in particular the ecology of some sensitive downstream resources and thus, should be of very low priority.

9. The Applicant advised that the desalination plant would provide a new potable water source and alleviate the shortage of freshwater resources due to climate change and therefore provide a stable alternative water resource which is not susceptible to climate change.

DESCRIPTION OF THE PROJECT

10. The Project is to construct and operate a new desalination plant using Seawater Reverse Osmosis technology in TKO Area 137. Its location and layout are shown in the attached **Figure 1** and **Figure 2** respectively. The Project comprises the following key components/works:

(i) A new desalination plant in TKO Area 137 with a water production capacity of 135 Mld expandable to an ultimate water production capacity up to 270 Mld when necessary.

(ii) A dedicated 9 km long trunk feed system for the transfer of fresh water output from the desalination plant to the existing Tseung Kwan O Fresh Water Primary Service Reservoir in Po Lam.

(iii) Natural slope mitigation works within the Clear Water Bay Country Park, which overlooks the northeast boundary of the new desalination plant at TKO Area 137.

(iv) Associated civil, structural, geotechnical, landscaping, electrical and mechanical works.

11. The Project covers the following designated project elements under Part I, Schedule 2 of the EIAO :

(i) Item E.2 – Water treatment works with a capacity of more than 100 000 m^3 per day (i.e. 100 Mld).

(ii) Item K.13 – A dangerous goods godown with a storage capacity exceeding 500 tonnes.

(iii) Item Q.1 – Earthworks partly or wholly in an existing country park.

CONSIDERATION OF ALTERNATIVE OPTIONS

12. In order to avoid and minimize potential environmental impacts, the EIA report has undergone a detailed evaluation of different options for the development of the Project. These include the footprint of the desalination plant, extent of slope mitigation works, layout of the desalination plant including location of chlorine store, alignment and location of submarine intake and outfall; trunk feed system, alternative construction methods and sequence of works, etc. The environmental benefits and dis-benefits of the options have been evaluated. The recommended option has taken into account environmental considerations, landslide/rock fall hazards to life, site constraints and other factors such as operational requirements and engineering considerations. Some of the key environmental benefits arising from the alternative options are highlighted below.

Avoidance and Minimization of Impacts

(i) Adopting a hybrid of active and passive protection measures of soil nailing, rock stabilization and flexible barrier design to avoid/minimize potential ecological impacts within the Clear Water Bay Country Park.

(ii) Locating the chlorine store, which is a Potentially Hazardous Installation (PHI), at around the centre of the site to avoid risk from nearby explosive off-loading pier and minimize risk to surrounding population at TKO Industrial Estate and Lohas Park.

(iii) Designing suitable alignment and appropriate length of submarine utilities to

provide adequate buffer distances from water/ecological sensitive receivers (e.g. coral communities) to minimize potential impacts on water quality, marine ecology and fisheries associated with dredging activities during construction and effluent, reverse osmosis (RO) concentrates [1], discharges from the plant during operation.

(iv) Adopting the use of "Seawater Reverse Osmosis" as the desalination technology to reduce energy consumption and avoid production of air emissions as compared to that of "Multi-stage Flash" distillation using brine heater.

(v) Employing trenchless method for construction of the submarine utilities has significantly reduced the extent of seabed dredging and the dredging volume (from 18,000m^3 to 6,330m^3) to minimize impacts on water quality, marine ecology and fisheries associated with dredging activities.

SPECIFIC ENVIRONMENTAL ASPECTS TO HIGHLIGHT

Water Quality Impact

Construction Phase

13. The Project involves localized marine dredging for construction of the proposed submarine utilities. To minimize water quality impacts arising from dredging activities, environmentally-friendly trenchless method will be adopted for the installation of submarine pipelines except for the submarine outfall diffusers and intake structures. With the implementation of mitigation measures such as avoiding conducting dredging for both intake and outfall structures concurrently, using closed grab dredger, controlling a lower dredging rate and installing silt curtains and implementing good site practices, no adverse water quality impacts at all water sensitive receivers are anticipated during construction of the Project.

Operational Phase

14. The effluent, RO concentrates, containing various residual chemicals will be discharged from the desalination plant to the Eastern Buffer Water Control Zone via submarine outfall diffusers during operation. The proposed effluent discharge standards of the plant would be subject to the licensing control under the Water Pollution Control Ordinance. The EIA Report evaluated quantitatively, the water

[1] RO concentrates include residual chemicals such as iron, Total Inorganic Nitrogen (TIN) and anti-scalant due to dosing of a number of chemicals such as ferric chloride, polymer, sulphuric acid, sodium hydroxide, etc upstream in the desalination process.

quality impact of the effluent discharge based on the design of the plant by computer modeling. The model results predicted that the effluent plume of RO concentrates would be highly localized and the increase in salinity and other chemicals would be diluted soon after discharging from the submarine outfall and the increased levels at all water sensitive receivers would meet the TM requirements. No adverse water quality impact due to the discharge of RO concentrates would be expected.

Ecological Impact

Terrestrial Ecology

15. The footprint of the desalination plant in TKO Area 137 will not encroach directly upon any ecologically important habitats including country parks, natural woodlands and stream courses. However, the natural slope overlooking the northeast boundary of the desalination plant has a history of minor landslides and contains some potentially unstable boulders. In order to provide a safe environment for the development and its operators, slope mitigation measures to prevent landslide and rock fall hazards are required within the Clear Water Bay Country Park. To reduce the potential ecological impacts on the country park, extent of the slope mitigation works will be minimized as far as practicable. To this end, a hybrid of aforementioned active and passive protection measures will be adopted so as to significantly reduce the works area within the country park from 3.3 ha (using active measures alone) to 0.49 ha.

16. The EIA predicts that about 0.18 ha of mixed woodland and 0.31 ha of shrubland/grassland will be affected by the proposed slope works. Ten number of *Marsdenia lachnostoma* which is a species of Rare and Precious Plants of Hong Kong are identified within the upper part of the slope mitigation area. The EIA recommends that before commencement of the slope mitigation works, a detailed vegetation survey shall be carried out to identify and further confirm the location of each individual of *M. lachnostoma* and other flora species of conservation importance so that the flexible barriers in the upper part of the slope mitigation area will be positioned at a minimum distance of 1.5m away from each individual of the flora species of conservation importance which will be retained and undisturbed as a result. No direct impact on the flora species of conservation importance is anticipated and no trees will be felled for the implementation of slope mitigation works within the country park. In sum, with aforementioned measures in place, the impacts on terrestrial habitats are considered to be low.

Marine Ecology

17. The ecological impacts on marine ecological resources will be avoided and

minimized through optimizing the length and alignment of the submarine facilities and adopting the trenchless method for the construction of submarine utilities.

18. By adopting the trenchless method for the construction of submarine utilities, loss of subtidal soft bottom habitat of low to moderate ecological value will be limited to about 0.11 ha. As confirmed by the dive surveys, no corals of conservation importance were identified within or in close proximity to the footprint of the submarine utilities except for two coral communities consisting of 13 and 10 nos. of hard coral species found along the shoreline of Tit Cham Chau and Kwun Tsai respectively which are about 75 to 90 m away from the dredging site. With the implementation of silt curtain and controlled dredging rate, no adverse water quality impact to the coral colonies and fisheries resources is anticipated during the dredging operation.

19. Based on the water quality modeling results, the concentrated saline water would be localized and diluted soon after discharging from the submarine outfall and therefore there will be no unacceptable impacts on the coral communities and marine ecological resources.

Hazard to Life

20. The Project is classified as a PHI which is designed to store a maximum 37 tonnes of liquid chlorine. A cumulative risk assessment of the Project together with the operation of explosives off-loading pier at TKO Area 137 was carried out to assess the hazard to life arising from the storage, use and transport of chlorine and other dangerous goods during the operation phase of the Project. The assessment results concluded that the associated individual and societal risks will be acceptable.

Other Environmental Impacts

21. Other impacts including construction noise, waste management, land contamination, landscape and visual impacts have also been addressed in the EIA report. With the implementation of recommended mitigation measures, the Project will comply with the relevant requirements under the TM.

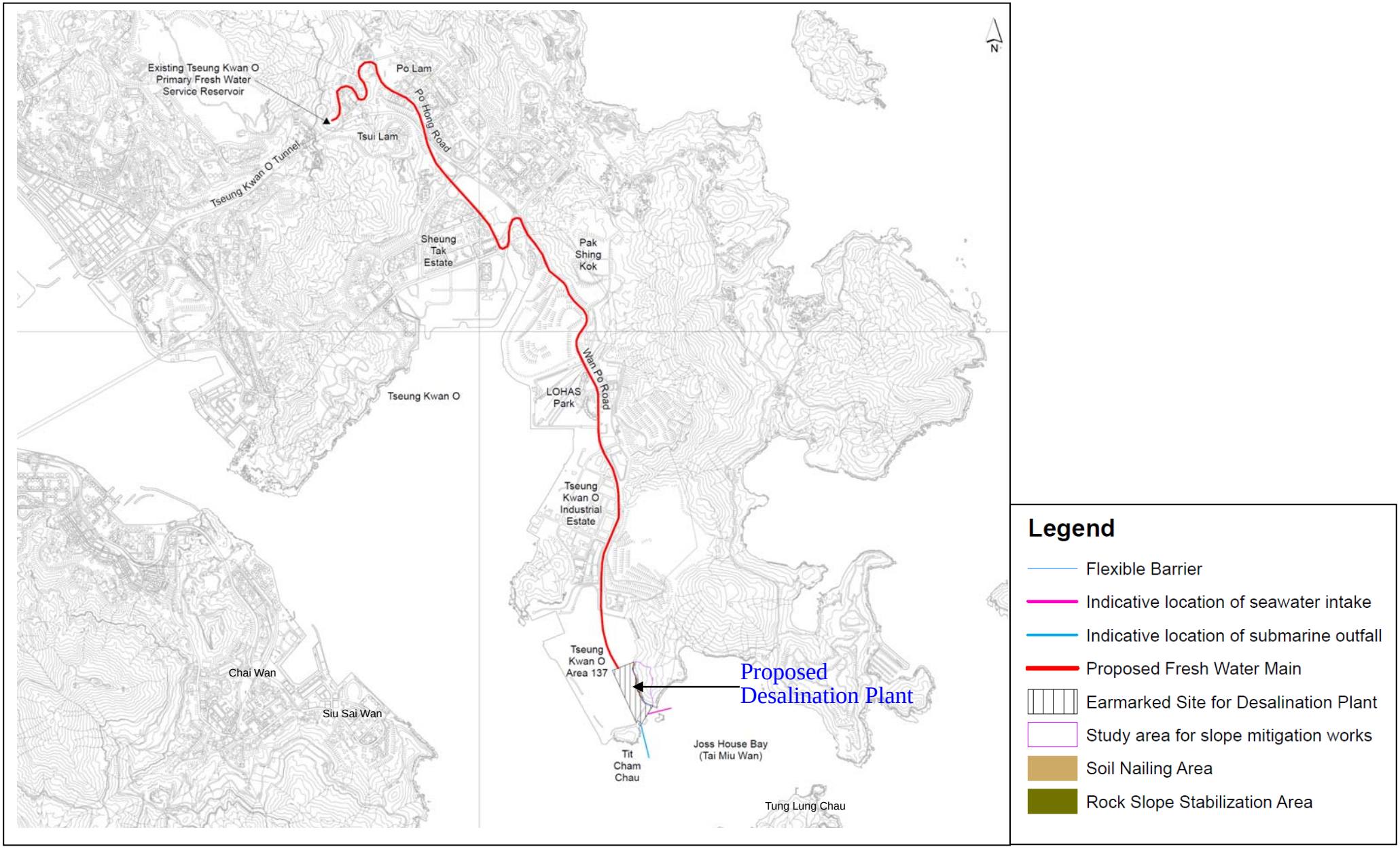
ENVIRONMENTAL MONITORING AND AUDIT

22. The EIA report includes an Environmental Monitoring and Audit (EM&A) Manual which recommends an EM&A programme during both the construction and operation phases of the Project. Key recommended EM&A requirements cover the noise, water quality and landfill gas hazard monitoring.

PUBLIC CONSULTATION

23. The applicant has made the EIA report, EM&A Manual and Executive Summary available for public inspection under the EIAO from 30 July 2015 to 28 August 2015. Members will be informed of any public comments received by the Environmental Protection Department separately.

Environmental Assessment Division
Environmental Protection Department
August 2015



Project Title: Desalination Plant at Tseung Kwan O

Figure 1: Project Location Plan

Application No. : EIA-229/2015

[Note: This figure is extracted from the EIA Report (Figure 1.1)]

Project Title: Desalination Plant at Tseung Kwan O

Figure 2: Desalination Plant Layout Plan

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[Note: This figure is extracted from the EIA Report (Figure 3.1)]