

**For discussion
on 24 January 2017**

Legislative Council Panel on Development

357WF – Design and Construction for First Stage of Desalination Plant at Tseung Kwan O – Mainlaying

PURPOSE

This paper seeks Members' views on the proposal to upgrade part of **357WF**, entitled "Design and Construction for First Stage of Desalination Plant at Tseung Kwan O" (the Project), to Category A at an estimated cost of \$1,111.8 million¹ in money-of-the-day (MOD) prices for the laying of a 10-kilometre (km) water main to convey the fresh water produced at a proposed desalination plant at Tseung Kwan O (TKO) to the TKO Fresh Water Primary Service Reservoir.

PROJECT SCOPE

2. The part of **357WF** which we propose to upgrade to Category A comprises the laying of a 1 200 millimetre (mm) diameter fresh water main of about 10 km in length, connecting a proposed desalination plant at TKO to the existing TKO Fresh Water Primary Service Reservoir, and associated works². The location of the proposed mainlaying works is shown on the plan at **Enclosure 1**.

3. Subject to the funding approval of the Finance Committee (FC), we plan to commence the proposed mainlaying works in the second quarter of 2017 for completion in the fourth quarter of 2021.

4. We will retain the remainder of **357WF** in Category B and will seek funding for the works at a later stage. The scope of the remainder mainly comprises –

- (a) construction of the seawater treatment components for the first stage of the proposed desalination plant with a water production capacity at 135 000 cubic metres (m³) per day with provision for future expansion to the ultimate water production

¹ This figure represents the latest estimates of capital cost. We will finalise the cost estimates before submission to the Public Works Subcommittee.

² The associated works mainly include the environmental mitigation works and landscaping works.

capacity up to 270 000 m³ per day when necessary, and associated facilities³;

- (b) formation of a 10-hectare site in TKO Area 137 for the construction of the proposed desalination plant and associated facilities with the ultimate water production capacity at 270 000 m³ per day;
- (c) construction of the intake and outfall facilities of the proposed desalination plant with capacities catering for the ultimate water production capacity of the proposed desalination plant at 270 000 m³ per day; and
- (d) associated works including engineering, environmental mitigation works and landscaping works.

JUSTIFICATION

5. A reliable fresh water supply is of paramount importance in sustaining Hong Kong's development and economic growth. However, our fresh water resources, which come from the yield collected from local gathering ground and raw water imported from Dongjiang (DJ) in Guangdong Province, are both vulnerable to climate change. That aside, the reliability of fresh water supply to Hong Kong is also facing other challenges such as increasing water demand arising from population and economic growth and keen competition for DJ water resource due to the rapid economic development in the Pearl River Delta Region.

6. With the increasing water demand and the unforeseen extremely dry weather brought about by climate change, we need to develop the strategic alternative water resource by seawater desalination which is not susceptible to climate change to safeguard water security in Hong Kong.

7. A 10-hectare site in TKO Area 137 has been reserved for the construction of a medium-sized desalination plant. The planning and investigation study for the proposed desalination plant confirmed that TKO Area 137 is a suitable location for siting the proposed desalination plant in terms of the quality of nearby seawater. The use of the reverse osmosis technology⁴ for the proposed desalination plant has also been proved technically feasible with an

³ The associated facilities include administration building, laboratory and maintenance workshop etc. which are common facilities for the first stage and the ultimate stage of the proposed desalination plant.

⁴ Reverse osmosis has become a mature technology and is used in most of overseas desalination plants in recent years. According to the International Desalination Association, there are over 17 000 desalination plants worldwide with a total water production capacity of more than 80 000 000 m³ per day and reverse osmosis technology accounts for approximately 60 per cent of the installed capacity. The number of desalination plant using reverse osmosis technology is on the increase.

estimated unit water production cost at about \$12 to \$13 per m³ at 2016 price level⁵.

8. In order to convey the fresh water produced from the proposed desalination plant to the existing water distribution network, we propose to lay a fresh water main of about 10 km in length for connecting the proposed desalination plant to the existing TKO Fresh Water Primary Service Reservoir. As the construction time required for the mainlaying works will be longer than that for the proposed desalination plant, we propose to commence the mainlaying works first to match with the programme for the commissioning of the desalination plant.

FINANCIAL IMPLICATIONS

9. We estimate the cost of the proposed mainlaying works to be \$1,111.8 million in MOD prices.

10. While the construction of the proposed mainlaying works will be supervised by in-house staff, we plan to engage consultants to provide advisory services for New Engineering Contract (NEC)⁶ administration for the mainlaying works.

PUBLIC CONSULTATION

11. We consulted the Sai Kung District Council on 6 January 2015 and 5 July 2016. Members supported the Project in principle.

ENVIRONMENTAL IMPLICATIONS

12. The proposed mainlaying works is not a designated project (DP) under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499), but forms part of the Project which is a DP requiring an environmental permit (EP) for its construction and operation. The Director of Environmental

⁵ The estimated unit production cost of the proposed desalination plant in Hong Kong covers the energy cost, capital cost, treatment cost, distribution cost and customer service cost. The unit cost for producing fresh water by seawater desalination using reverse osmosis technology overseas ranges from \$3.2/m³ to \$46.2/m³ (at 2015 price level) according to the International Desalination Association. The unit water production costs in Hong Kong and other countries cannot be compared directly as they are affected by various factors such as the energy cost, the seawater quality and temperature, intake arrangement, environmental measures, financing details, and specific details of the water purchase agreement, etc.

⁶ NEC is a suite of contracts developed by the Institution of Civil Engineers, United Kingdom. It is a contract form that emphasises cooperation, mutual trust and collaborative risk management between contracting parties.

Protection approved the EIA report in November 2015 and issued an EP for the construction and operation of the Project in December 2015. With implementation of the recommended pollution control measures, the approved EIA report concluded that the proposed mainlaying works will not cause any adverse environmental impacts. We shall implement these measures which include frequent watering of the site, covering of materials on trucks, use of silenced construction plant, temporary noise barriers and acoustic enclosures and environmental monitoring and audit programme recommended in the approved EIA report. We have included a sum of \$9 million (in September 2016 prices) in the project estimates for the implementation of these measures.

13. At the planning and design stages, we have considered the design of the proposed mainlaying works to reduce the generation of construction waste where possible. In addition, we will require the contractor to reuse inert construction waste (e.g. demolished concrete and excavated soil and rock) on site or in other suitable construction sites as far as possible, in order to minimise the disposal of inert construction waste to public fill reception facilities⁷. We will encourage the contractor to maximise the use of recycled or recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste.

14. At the construction stage, we will require the contractor to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation means to avoid, reduce, reuse and recycle inert construction waste. We will ensure that the day-to-day operations on site comply with the approved plan. We will require the contractor to separate the inert portion from non-inert construction waste on site for disposal at appropriate facilities. We will control the disposal of inert and non-inert construction waste at public fill reception facilities and landfills respectively through a trip-ticket system.

15. We estimate that the proposed mainlaying works will generate in total 161 320 tonnes of construction waste. Of these, we will reuse about 118 930 tonnes (74%) of inert construction waste on site and deliver 38 100 tonnes (23%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 4 290 tonnes (3%) of non-inert construction waste at landfills. The total cost for accommodating construction waste at public fill reception facilities and landfill sites is estimated to be \$3.6 million for the proposed mainlaying works based on a unit charge rate of \$71 per tonne for disposal at public fill reception facilities and \$200 per tonne at landfills as stipulated in the Waste Disposal (Charges for Disposal of Construction Waste) Regulation.

⁷ Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of inert construction waste in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

HERITAGE IMPLICATIONS

16. The proposed mainlaying works will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites or buildings, sites of archaeological interest and government historic sites identified by the Antiquities and Monuments Office.

LAND ACQUISITION

17. The proposed mainlaying works do not involve resumption of private land.

TRAFFIC IMPLICATIONS

18. We have carried out a Traffic Impact Assessment (TIA) for the proposed mainlaying works. The TIA concluded that the proposed mainlaying works would not cause any significant impact on the traffic through implementation of appropriate temporary traffic management schemes and by carrying out the mainlaying works during night time as needed. We will adopt trenchless methods as needed for laying of the water main at busy road junctions and sections.

BACKGROUND

19. We upgraded **357WF** to Category B in September 2014.

20. Since November 2014, we have engaged contractors to carry out ground investigation and engaged consultants to undertake the TIA study, the tree preservation and removal proposal and the advisory services for preparation of NEC for the proposed mainlaying works at an estimated cost of \$7.9 million in MOD prices. We have charged this amount to block allocation **Subhead 9100WX** "Waterworks, studies and investigations for items in Category D of the Public Works Programme". We have substantially completed the detailed design of the proposed mainlaying works by in-house resources.

21. Of the 1 057 trees within the project boundary of the proposed mainlaying works, 1 022 trees will be preserved and 35 trees will be felled. All

trees to be removed are not important trees⁸. We will incorporate planting proposal as part of the project, including estimated quantities of 35 trees.

22. We estimate that the proposed mainlaying works will create about 200 jobs (170 for labourers and another 30 for professional or technical staff) providing a total employment of 9 500 man-months.

PROGRESS OF THE DESALINATION PLANT

23. In 2007, we completed a pilot study on development of desalination facilities in Hong Kong (the pilot study). The total cost of the pilot study was about \$13.9 million in MOD prices. We charged this amount to block allocation **Subhead 9100WX** “Waterworks, studies and investigations for items in Category D of the Public Works Programme”. The pilot study included the operation of pilot desalination plant in Ap Lei Chau and Tuen Mun which confirmed the technical feasibility of seawater desalination using reverse osmosis under local conditions for producing potable water complying with the World Health Organisation Guidelines for Drinking-water Quality. A subsequent review with reference to the findings of the pilot study recommended that TKO Area 137 might be a suitable location for the proposed desalination plant. Since then, we have kept track of the latest development in desalination technology for taking forward further detailed study of the initiative.

24. On 8 June 2012, FC approved upgrading **345WF** “Planning and Investigation Study of Desalination Plant at TKO” (the Study) to Category A with an Approved Project Estimate of \$34.3 million in MOD prices. In December 2012, we engaged consultants to commence a planning and investigation study for the proposed desalination plant in TKO Area 137. The study scope comprises detailed investigation of the feasibility and cost-effectiveness, preliminary design, formulation of the implementation strategy and programme, and impact assessments for the proposed desalination plant. We completed the Study in 2015.

⁸ “Important trees” refer to trees in the Register of Old and Valuable Trees, or any other trees that meet one or more of the following criteria-

- (a) trees of 100 years old or above;
- (b) trees of cultural, historical or memorable significance e.g. Fung Shui trees, trees as landmark of monastery or heritage monument, and trees in memory of important persons or events;
- (c) trees of precious or rare species;
- (d) trees of outstanding form (taking account of overall tree sizes, shape and any special features) e.g. trees with curtain like aerial roots, trees growing in unusual habitat; or
- (e) trees with trunk diameter equal to or exceeding 1.0 metre (m) (measured at 1.3 m above ground level), or with height/canopy spread equal to or exceeding 25 m.

A common tree refers to trees not classified as “important tree”.

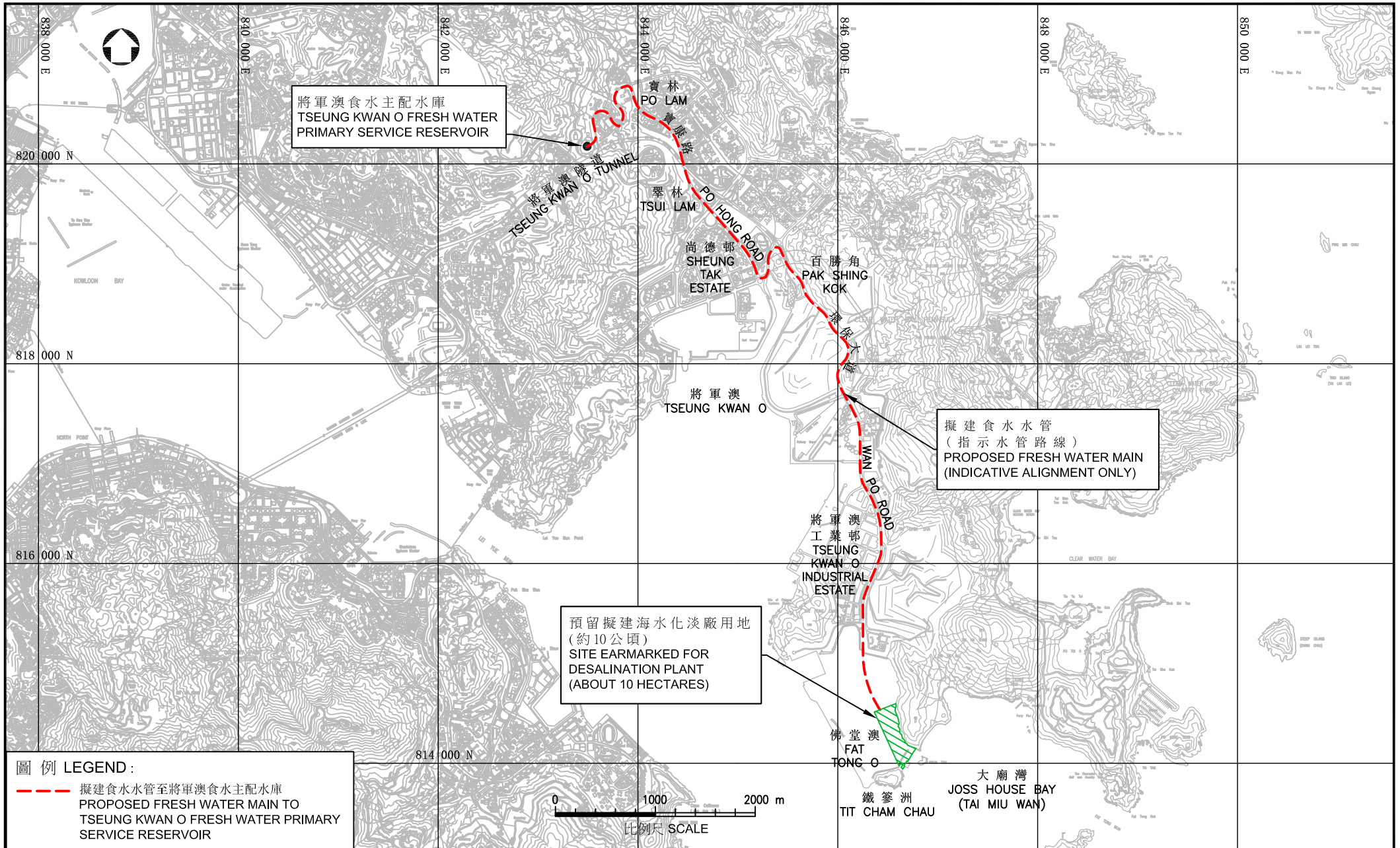
25. On 26 June 2015, FC approved upgrading part of **357WF** to Category A as **359WF** “Design and construction for first stage of desalination plant at TKO – investigation study review, design and site investigation” at an Approved Project Estimate of \$154.5 million in MOD prices. In November 2015, we engaged consultants to carry out the investigation study review, design and associated site investigation works for the first stage of the desalination plant. The consultants have completed the investigation study review and the field works of the ground investigation. The consultants are now preparing a reference design⁹ for the first stage of the proposed desalination plant and target for completion in 2017.

WAY FORWARD

26. We will seek support of the Public Works Subcommittee for the approval from the FC to upgrade part of **357WF** to Category A and will invite tenders in parallel to enable early commencement of the proposed mainlaying works. We will only award the contract after obtaining FC’s funding approval.

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Water Supplies Department
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⁹ We intend to implement the works for the first stage of the desalination plant via a ‘Design-Build-Operate’ approach in which the contractor will be responsible for the detailed design of the proposed works. The reference design to be produced by the consultants will be used to establish the project requirements and as a reference for the detailed design.



工務計劃項目第357WF號 - 將軍澳海水化淡廠第一階段設計及建造 -
水管敷設工程

P.W.P. ITEM NO. 357WF - DESIGN AND CONSTRUCTION FOR FIRST STAGE OF DESALINATION PLANT
AT TSEUNG KWAN O - MAINLAYING



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