

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 709 – WATERWORKS

Water Supplies – Fresh water supplies

357WF – Design and construction for first stage of desalination plant at Tseung Kwan O

Members are invited to recommend to the Finance
Committee –

- (a) the upgrading of part of **357WF**, entitled “Design and construction for first stage of desalination plant at Tseung Kwan O – investigation study review, design and site investigation” to Category A at an estimated cost of \$154.5 million in money-of-the-day prices; and
- (b) the retention of the remainder of **357WF** in Category B.

PROBLEM

We need to develop seawater desalination which is not susceptible to climate change to safeguard the security of fresh water resources in Hong Kong after 2020.

/PROPOSAL

PROPOSAL

2. The Director of Water Supplies, with the support of the Secretary for Development, proposes to upgrade part of **357WF** to Category A at an estimated cost of \$154.5 million in money-of-the-day (MOD) prices for carrying out an investigation study review (the review), design and associated site investigation works for the first stage of the proposed desalination plant at Tseung Kwan O (TKO) (the Project).

PROJECT SCOPE AND NATURE

3. The part of **357WF** which we propose to upgrade to Category A comprises -

- (a) review on the findings of the planning and investigation study (the P&I study) of the proposed desalination plant;
- (b) further environmental and traffic impact assessments, geotechnical, drainage and hydraulic assessments;
- (c) design¹ of the works described in paragraph 5(a) to 5(d) below;
- (d) associated site investigation works and supervision;
and
- (e) preparation of tender documents and assessment of tenders for the works described in paragraph 5(a) to 5(d) below.

— A location plan of the Project and a diagram on the seawater desalination process are at Enclosures 1 and 2 respectively.

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¹ We intend to implement the works for the first stage of the proposed desalination plant via a 'Design and Build' or 'Design-Build-Operate' approach in which the contractor will be responsible for the detailed design of the proposed works. The design to be produced from the proposed consultancy for the review and design will be used to establish the project requirements and as a reference for detailed design by the contractor.

4. Subject to funding approval of the Finance Committee (FC), we plan to engage consultants to carry out the review, design and associated site investigation works in late 2015 for completion in the second half of 2017. In order to meet the tight programme for completion of the proposed works, we will invite tenders for the consultancy service in the second quarter of 2015. Tender will only be awarded after we have secured funding approval from FC.

5. We will retain the remainder of **357WF** in Category B and will seek funding for the works according to the implementation programme of the Project. 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 capacity up to 270 000 m³ per day when necessary, and associated facilities²;
- (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;
- (d) associated works including engineering, environmental mitigation works and landscaping works; and
- (e) associated water main laying works for conveying the fresh water produced at the proposed desalination plant to existing fresh water service reservoirs³.

/JUSTIFICATION

² 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.

³ The review and detailed design for the water main laying works will be carried out by in-house resources and will not be included in this part of **357WF** proposed to be upgraded to Category A.

JUSTIFICATION

6. The fresh water resources in Hong Kong come from the yield collected from local gathering ground and raw water imported from Dongjiang (DJ) in Guangdong Province. A reliable fresh water supply is of paramount importance in sustaining Hong Kong's development and economic growth. However, our fresh water 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. The total quantity of water extracted from DJ for water supply is increasing every year and has nearly reached the volume that can be extracted from the river for consumption during a drought with a return period of 1 in 20 years. With increasing water demand, the water resources available in DJ and the yield collected from the local water gathering ground may not be able to meet the water demand of Hong Kong during a more severe drought with a return period of 1 in 100 years after 2020. Moreover, climate change will bring about extremely dry weather at more frequent intervals and increase the likelihood of consecutive droughts. To safeguard water security in Hong Kong, we need to develop the alternative water resource by seawater desalination which is not susceptible to climate change.

8. A 10-hectare site in TKO Area 137 has been reserved for the construction of a medium-sized desalination plant. We have largely completed the P&I study for the proposed desalination plant. 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. The use of the reverse osmosis technology⁴ for the proposed desalination plant has also been proved technically feasible with an estimated unit water production cost⁵ at about \$12 to 13 per m³ (at 2013-14 price level).

/9.

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 accounts for approximately 60 per cent of the installed capacity. The number of seawater reverse osmosis desalination plants is on the increase.

⁵ The unit cost for producing fresh water by seawater desalination using reverse osmosis technology overseas ranges from \$4.1 to \$23.7/m³ (at 2010 price level) according to the International Desalination Association.

9. We therefore propose to carry out the review, design and associated site investigation works for the first stage of the proposed desalination plant for commencement of its operation in 2020.

FINANCIAL IMPLICATIONS

10. We estimate the cost of the proposed review, design and associated site investigation works to be \$154.5 million in MOD prices (see paragraph 12 below), broken down as follows –

	\$ million	
(a) Consultants' fees for	109.5	
(i) review on the findings of the P&I study	4.2	
(ii) further environmental and traffic impact assessments, geotechnical, drainage and hydraulic assessments	16.9	
(iii) design	54.9	
(iv) preparation of tender documents and assessment of tenders	33.4	
(v) management of resident site staff (RSS) for site investigation works	0.1	
(b) Remuneration of RSS for site investigation works	3.4	
(c) Site investigation works	11.7	
(d) Contingencies	12.4	
Sub-total	137.0	(in September 2014 prices)
(e) Provision for price adjustment	17.5	
Total	154.5	(in MOD prices)

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11. Due to the highly specialised nature of the proposed review and design as well as the lack of adequate in-house resources, we propose to engage consultants to conduct the proposed review, design and supervision of the associated site investigation works. A detailed breakdown of the estimates for the consultants' fees and RSS costs by man-months is at Enclosure 3.

12. Subject to funding approval, we will phase the expenditure as follows –

Year	\$ million (Sept 2014)	Price adjustment factor	\$ million (MOD)
2015 – 16	25.1	1.05725	26.5
2016 – 17	82.7	1.12069	92.7
2017 – 18	20.4	1.18793	24.2
2018 – 19	8.8	1.25920	11.1
	137.0		154.5

13. We have derived the MOD estimates on the basis of the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period from 2015 to 2019. We will deliver the proposed consultancy for the review and design under a lump sum contract as the scope of the consultancy can be well defined. The consultancy will provide for price adjustment. We will deliver the site investigation works under re-measurement contracts because the quantities of works involved may vary depending on the actual ground and marine conditions. The contracts will provide for price adjustment.

14. The proposed review, design and associated site investigation works will not give rise to any recurrent expenditure.

15. The proposed review, design and associated site investigation works will lead to an increase in the production cost of water by 0.05% in real terms by 2019⁶.

/PUBLIC

⁶ The increase in production cost of water is calculated at the present price level and on the assumption that the water demand remains static during the period from 2015 to 2019.

PUBLIC CONSULTATION

16. We consulted the Sai Kung District Council on 6 January 2015 on the proposed review, design and associated site investigation works. Members generally supported the proposal and some members urged for its early implementation. We will maintain close liaison with the parties concerned during the review and design phase.

17. We consulted the Legislative Council Panel on Development on 24 March 2015. Members generally supported our submission of the funding proposal to the Public Works Subcommittee for consideration.

ENVIRONMENTAL IMPLICATIONS

18. The proposed review, design and associated site investigation works are not designated projects under the Environmental Impact Assessment (EIA) Ordinance (Cap. 499). They will not cause any adverse environmental impacts. We will implement suitable mitigation measures to control short-term environmental impacts arising from the site investigation works.

19. The proposed site investigation works will only generate very little construction waste. We will require the consultants to fully consider measures to minimise the generation of construction waste and to reuse or recycle construction waste as much as possible during the construction phase of the Project.

20. The proposed desalination plant is a designated project under Schedule 2 of the EIA Ordinance and an environmental permit is required for the construction and operation of the desalination plant. We are carrying out an EIA study to address the potential environmental impacts from the construction and operation of the desalination plant. We will submit the EIA report to the Environmental Protection Department for approval under the EIA Ordinance and will follow the statutory procedures of making the EIA report available for comments by the public and the Advisory Council on the Environment.

HERITAGE IMPLICATIONS

21. The proposed review, design and associated site investigation 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 Antiquities and Monuments Office.

LAND ACQUISITION

22. The proposed review, design and associated site investigation works will not require any land acquisition.

BACKGROUND INFORMATION

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. 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.

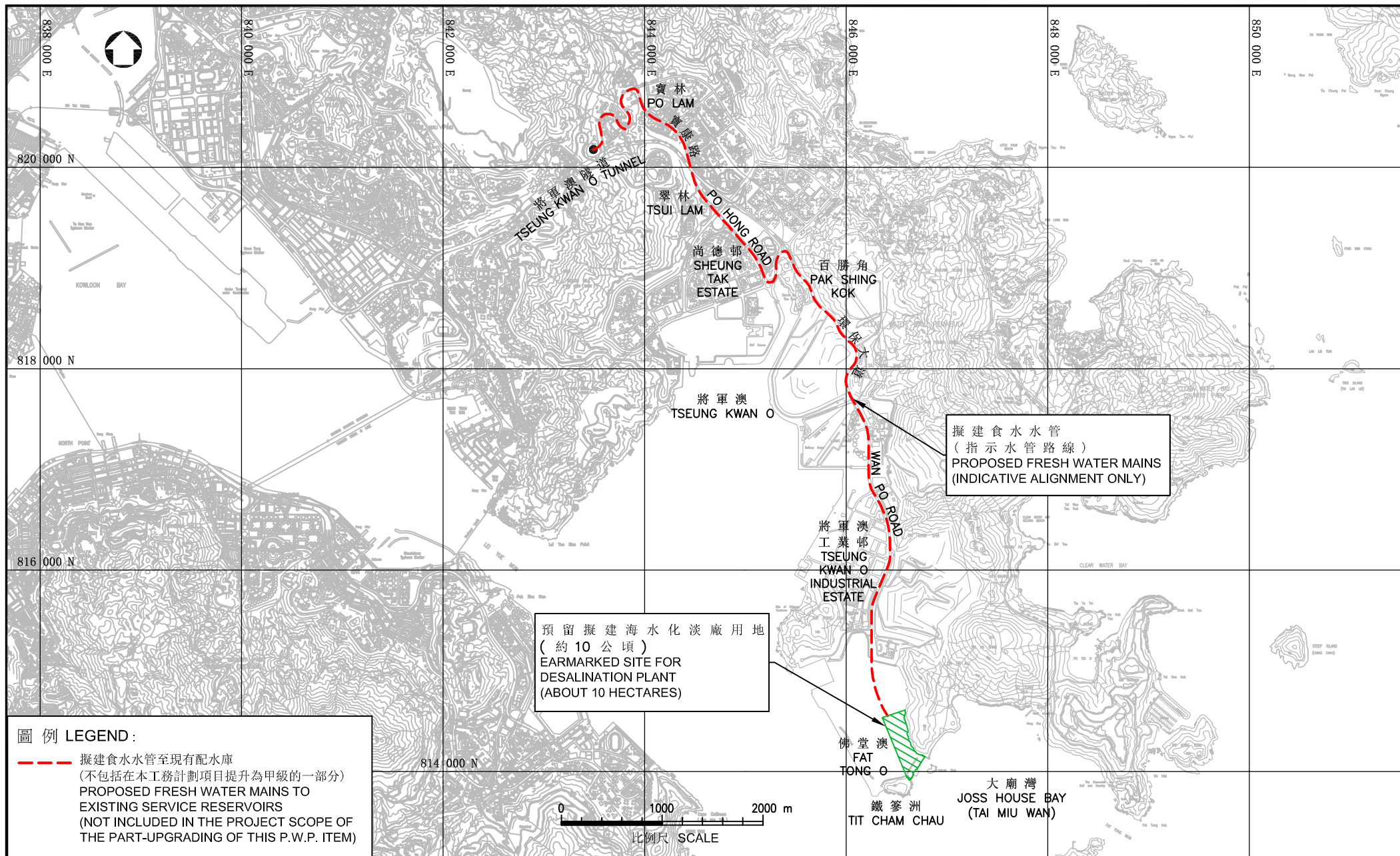
24. On 8 June 2012, FC approved upgrading **345WF** “Planning and Investigation Study of Desalination Plant at TKO” to Category A with an approved project estimate of \$34.3 million in MOD prices. In December 2012, we engaged consultants to commence a P&I study for the proposed desalination plant in 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.

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

26. The proposed review, design and associated site investigation works will not involve any tree removal or planting proposals. We will take into consideration the need for tree preservation during the site investigation works if necessary. We will incorporate tree planting proposal in the construction phase of the Project.

27. We estimate that the proposed review, design and associated site investigation works will create about 50 jobs (6 for labourer and another 44 for professional/technical staff) providing a total employment of 1 040 man-months.

Development Bureau
May 2015



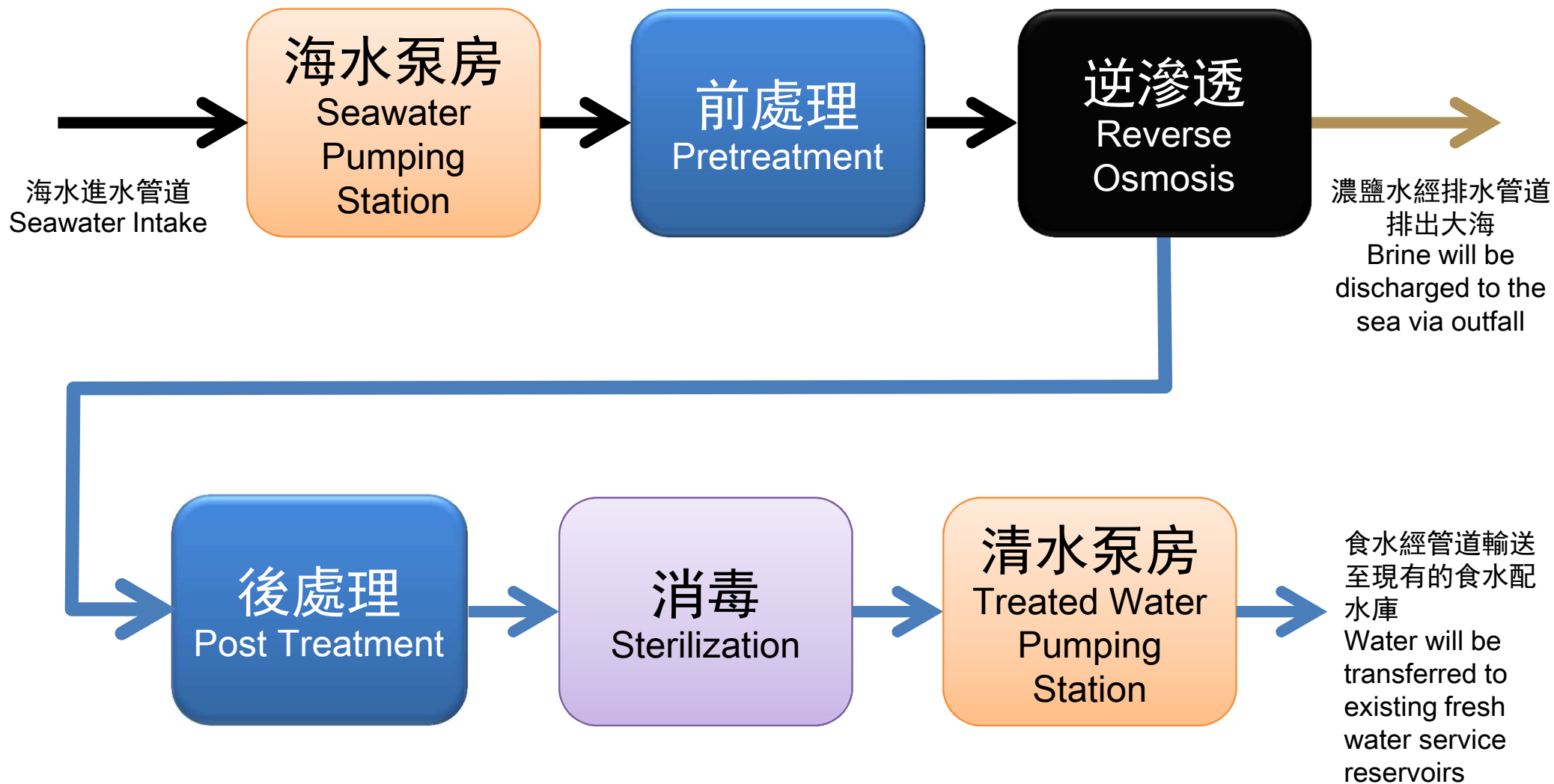
工務計劃項目第 357WF 號 – 將軍澳海水化淡廠第一階段設計及建造 –
 勘察研究檢討、設計及工地勘察
**P.W.P. ITEM NO. 357WF – DESIGN AND CONSTRUCTION FOR FIRST STAGE OF DESALINATION PLANT
 AT TSEUNG KWAN O – INVESTIGATION STUDY REVIEW, DESIGN AND SITE INVESTIGATION**

 **水務署**
 Water Supplies Department

草圖編號 SKETCH NO. SK 52008 / 3

海水化淡廠處理流程

Treatment Processes in Desalination Plant



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 -
 勘察研究檢討、設計及工地勘察

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 AT TSEUNG KWAN O - INVESTIGATION STUDY REVIEW, DESIGN AND SITE INVESTIGATION



水務署
 Water Supplies Department

草圖編號
 SKETCH NO.

SK 52008 / 4

**357WF – Design and construction for first stage of
desalination plant at Tseung Kwan O**

**Breakdown of the estimates for consultants' fees and resident site staff (RSS) costs
(in September 2014 prices)**

			Estimated man- months	Average MPS* salary point	Multiplier (note 1)	Estimated fee (\$ million)
(a) Consultants' staff costs ^(Note 2)						
(i) review on the findings of the P&I study	Professional		18	38	2.0	2.6
	Technical		32	14	2.0	1.6
(ii) further environmental and traffic impact assessments, geotechnical, drainage and hydraulic assessments	Professional		99	38	2.0	14.1
	Technical		58	14	2.0	2.8
(iii) design	Professional		225	38	2.0	32.1
	Technical		468	14	2.0	22.8
(iv) preparation of tender documents and assessment of tenders	Professional		176	38	2.0	25.1
	Technical		170	14	2.0	8.3
					Sub-total	109.4
(b) RSS costs ^(Note 3)						
	Professional		18	38	1.6	2.1
	Technical		36	14	1.6	1.4
					Sub-total	3.5
Comprising –						
(i) Consultants' fees for management of RSS for site investigation works					0.1	
(ii) Remuneration of RSS for site investigation works					3.4	
					Total	112.9

*MPS = Master Pay Scale

Notes

1. A multiplier of 2.0 is applied to the average MPS point to estimate the full staff costs, including the consultants' overheads and profit, as the staff will be employed in the consultants' office. A multiplier of 1.6 is applied to the average MPS salary point to estimate the cost of RSS supplied by the consultants (as at now, MPS point 38 = \$71,385 per month and MPS point 14 = \$24,380 per month.).
2. The actual man-months and fees will only be known when we have selected the consultants through the usual competitive bidding system.
3. The actual man-months and costs will only be known after completion of the site investigation works.