

**For discussion
on 28 March 2017**

Legislative Council Panel on Development

363WF – Upgrading of Disinfection Facilities in Water Treatment Works

PURPOSE

This paper briefs Members on the proposal to upgrade **363WF**, entitled “Upgrading of disinfection facilities in water treatment works” to Category A, at an estimated cost of \$875.6 million in money-of-the-day (MOD) prices, for upgrading disinfection facilities in water treatment works.

PROJECT SCOPE

2. The proposed upgrading of **363WF** to Category A comprises –
- (a) supply and installation of chlorine generation plant in 11 major water treatment works (WTWs)¹ and Tai Lam Chung No. 2 Chlorination Station²; and
 - (b) associated civil, geotechnical and electrical and mechanical (E&M) works³.
3. A plan showing the locations of the WTWs and Tai Lam Chung No. 2 Chlorination Station is at **Enclosure 1**.
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¹ The 11 major WTWs, which are of nominal output capacity not less than 100 000 cubic metres per day, include Au Tau WTW, Ma On Shan WTW, Ngau Tam Mei WTW, Pak Kong WTW, Sha Tin WTW, Sheung Shui WTW, Silver Mine Bay WTW, Siu Ho Wan WTW, Yau Kom Tau WTW, Tsuen Wan WTW and Tuen Mun WTW.

² At the Tai Lam Chung No. 2 Chlorination Station, chlorine is dosed in the raw water supply from Tai Lam Chung Reservoir to effectively control the quality of the raw water before transferring to Tuen Mun WTW and Tsuen Wan WTW, and through a long submarine main to Siu Ho Wan WTW at the North Lantau.

³ The associated E&M works include provision of raw materials preparation systems, products treatment systems, and electricity supply and automatic control systems.

4. Subject to funding approval of the Finance Committee (FC), we plan to commence the proposed works in the third quarter of 2017 for completion by the fourth quarter of 2020.

JUSTIFICATION

5. The use of chlorine gas for disinfection of drinking water has been proven internationally as effective, safe and reliable. Since there are no chlorine gas suppliers in Hong Kong, the Water Supplies Department (WSD) has been importing chlorine gas in liquid form from Guangdong Province, which is transported to WTWs for storage and use in order to sustain daily disinfection operation. The transportation and storage processes of liquid chlorine have been subject to a stringent quantitative risk assessment, and adequate safety measures have been adopted to ensure safety and reliability of the disinfection operation.

6. With advancement of technology, chlorine generation facilities have become more mature and reliable. The ever-improving membrane technology in recent years has rendered a chlorine generation plant to be accommodated in more compact space, and enhanced the cost-effectiveness of such facilities. WSD has carried out a study on generation of chlorine using the technology of membrane electrolysis. It has revealed that the chlorine generation facilities are suitable to be installed in the water treatment works of Hong Kong and Tai Lam Chung No. 2 Chlorination Station to do away with transportation and storage arising from importation of liquid chlorine, and thus eliminating the risk of chlorine gas leakage associated with the transportation and storage of liquid chlorine, resulting in enhancement of the safety of the disinfection operation. The new system shall also be more cost-effective than the current system of using imported liquid chlorine.

7. The chlorine generation process proposed is to produce chlorine gas by electrolyzing brine through electrodes separated by a membrane. The production process is safe and reliable. Chlorine gas will be generated according to the demand and consumed immediately upon production. No chlorine gas will be stored and hence, the risk of storage will be eliminated. WSD has also conducted risk assessment on the operation of the chlorine generation facilities to ensure their reliability and safety. Therefore, WSD plans to upgrade the disinfection facilities by installing chlorine generation

facilities in 11 major WTWs and Tai Lam Chung No. 2 Chlorination Station in stages with construction works commencing in 2017.

8. As the quantity of chlorine gas used at four small WTWs⁴ is low and no chlorine generation facilities with such small production capacity are available in the market at present, WSD will make use of a simple and safe chemical process to convert the chlorine gas generated in the designated major WTWs to sodium hypochlorite solution which will then be transported to these small WTWs to replace chlorine for disinfection operation. The risk of the transportation of sodium hypochlorite solution is much lower than that of liquid chlorine. WSD will strictly follow the international safety standards in devising the transportation arrangement of the sodium hypochlorite solution. The disinfection performance of sodium hypochlorite solution is comparable to that of chlorine, and both disinfectants are widely used in different countries, and are safe and reliable conforming to the international standards.

FINANCIAL IMPLICATIONS

9. We estimate that the cost of the proposed works to be \$875.6 million in MOD prices.

PUBLIC CONSULTATION

10. We consulted the relevant committees of nine concerned District Councils (DCs) as listed in **Enclosure 2** between November 2016 and January 2017. Members generally supported the proposed works.

ENVIRONMENTAL IMPLICATIONS

11. Ten out of the total 11 major WTWs together with Tai Lam Chung No. 2 Chlorination Station are exempted designated projects under the Environmental Impact Assessment Ordinance (Cap. 499) for being in operation before April 1998. As for the remaining major WTW, Sha Tin WTW (South

⁴ The small WTWs include Cheung Sha WTW, Red Hill WTW, Tai O WTW and Tai Po Road WTW.

Works), an Environmental Permit was issued in January 2015. For the proposed works, we have completed the Preliminary Environmental Review (PER) for the project. The PER has concluded and the Director of Environmental Protection agreed that the proposed works, with implementation of appropriate mitigation measures, would not cause adverse environmental impacts. The proposed works when completed will eliminate the need for transportation and storage of liquid chlorine, and hence the associated risk to the vicinity of the waterworks installations.

12. We will incorporate into the works contract the mitigation measures recommended in the PER to control the environmental impacts arising from the construction works to within established standards and guidelines. These measures include frequent watering of the site, covering of materials on trucks and use of silenced construction plant. We have included in the project estimate the cost for the implementation of the environmental mitigation measures.

13. At the planning and design stages, we have designed to minimize the generation of construction waste and will also require the contractor to reuse inert construction waste (e.g. excavated soil) on site or in other suitable construction projects as far as possible, in order to minimize the disposal of inert construction waste to public fill reception facilities⁵. We will encourage the contractor to maximize 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 construction waste and non-inert construction waste at public fill reception facilities and landfills respectively through a trip-ticket system.

⁵ 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.

15. We estimate that the proposed works will generate in total about 16 900 tonnes of construction waste. Of these, we will reuse about 2 120 tonnes (13%) of inert construction waste on site and deliver 13 250 tonnes (78%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 1 530 tonnes (9%) 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 \$1.2 million for the project (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).

HERITAGE IMPLICATIONS

16. The proposed 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 works do not require any land acquisition.

TRAFFIC IMPLICATIONS

18. We have completed the traffic review (TR) for the proposed works. The TR concluded that the traffic impact on the surrounding road network caused by the proposed works would be minimal in the construction and operation stages.

BACKGROUND

19. We upgraded **363WF** to Category B in September 2016.

20. In April 2016, we conducted an in-house review on the feasibility of local generation of chlorine for the use in all WTWs in Hong Kong.

21. We have substantially completed the detailed design for the proposed works using in-house resources.

22. Of the 35 trees within the WTWs and affected by the proposed works, four trees will be preserved, six trees will be transplanted to Ping Che Fresh Water Service Reservoir of WSD and 25 trees will be felled. All trees to be removed are not important trees⁶. We will incorporate planting proposal as part of the project, including an estimated quantity of 25 trees.

23. We estimate that the proposed works will create about 220 jobs (190 for labourers and 30 for professional or technical staff) providing a total employment of 8 200 man-months.

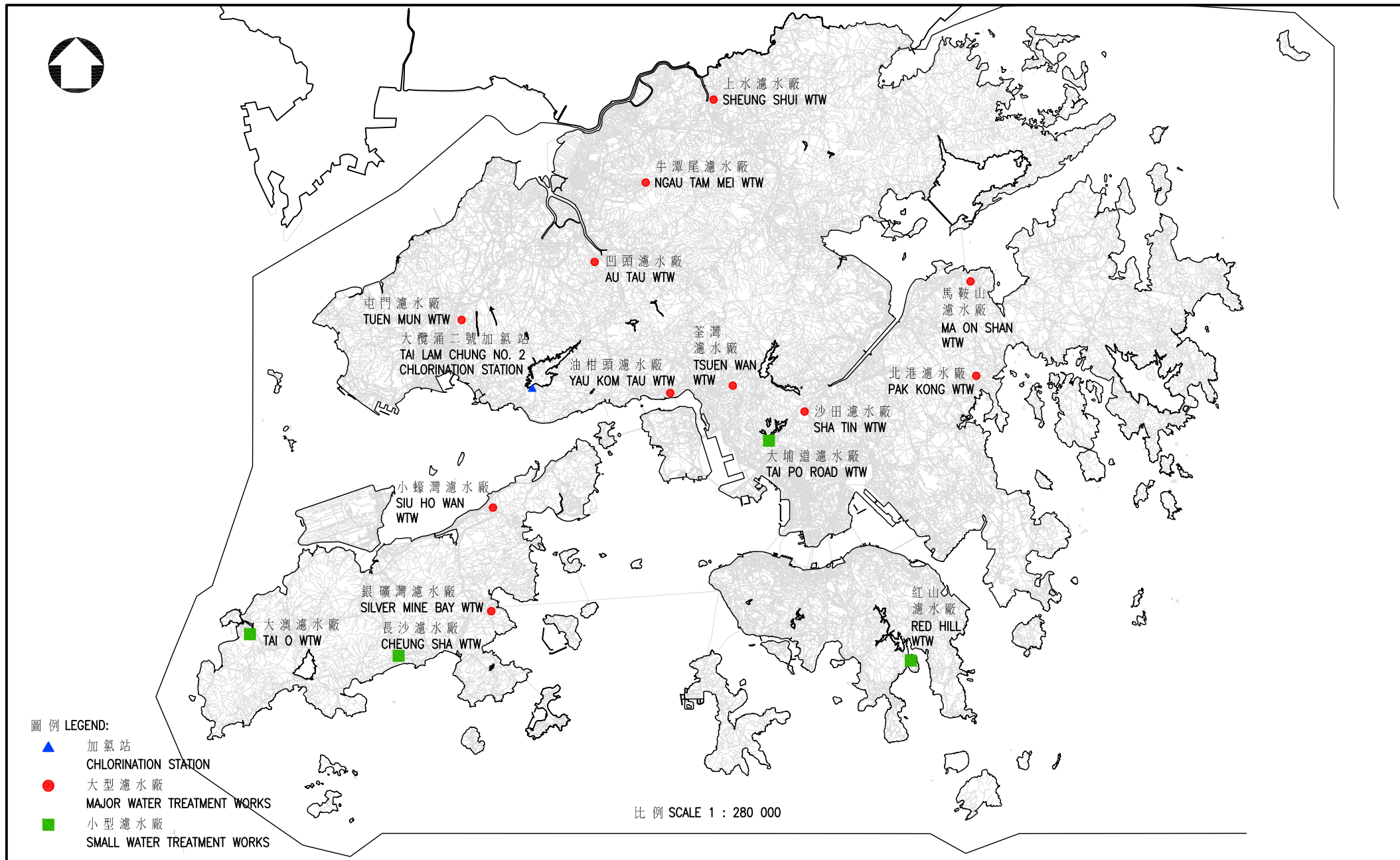
WAY FORWARD

24. We will seek support of the Public Works Subcommittee for the approval from the FC to upgrade **363WF** to Category A and will invite tenders in parallel to enable early commencement of the proposed works. We will only award the contract after obtaining FC's funding approval.

Development Bureau
Water Supplies Department
March 2017

⁶ An "Important tree" refers 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.



工務計劃工程項目第363WF號—改善濾水廠消毒設施

P.W.P. ITEM NO. 363WF — UPGRADING OF DISINFECTION FACILITIES IN WATER TREATMENT WORKS



水務署
Water Supplies Department

草圖編號
SKETCH NO.

SK 52012/1

**363WF – Upgrading of Disinfection Facilities in Water Treatment Works
Consultation with District Councils**

Date of Consultation	District Council	Committee	Waterworks Installations Involved
21 November 2016	North	District Minor Works and Environmental Improvement Committee	Sheung Shui WTW
25 November 2016	Tuen Mun	Environment, Hygiene and District Development Committee	Tuen Mun WTW and Tai Lam Chung No. 2 Chlorination Station
28 November 2016	Islands	Tourism, Agriculture, Fisheries and Environmental Hygiene Committee	Silver Mine Bay WTW, Siu Ho Wan WTW, Cheung Sha WTW and Tai O WTW
3 January 2017	Yuen Long	Culture, Recreation, Community Service and Housing Committee	Au Tau WTW and Ngau Tam Mei WTW
5 January 2017	Tsuen Wan	Environmental and Health Affairs Committee	Tsuen Wan WTW and Yau Kom Tau WTW
11 January 2017	Tai Po	Environment, Housing and Works Committee	Ma On Shan WTW
12 January 2017	Sai Kung	Housing and Environmental Hygiene Committee	Pak Kong WTW
12 January 2017	Sha Tin	Health and Environment Committee	Sha Tin WTW and Tai Po Road WTW
23 January 2017	Southern	District Development and Housing Committee	Red Hill WTW