

**For information  
on 15 March 2016**

**Legislative Council Panel on Development**

**196WC – Implementation of Water Intelligent Network (WIN)**

**PURPOSE**

This paper briefs Members on the proposal to upgrade part of **196WC** “Implementation of Water Intelligent Network (WIN)” to Category (Cat) A at an estimated cost of \$239.7 million in money-of-the-day (MOD) prices to implement the first stage of WIN.

**PROJECT SCOPE**

2. The part of **196WC** which we propose to upgrade to Cat A comprises -

- (a) construction of chambers, pipeworks and other associated works for the establishment of about 85 District Metering Areas (DMAs) and Pressure Management Areas (PMAs)<sup>1</sup> in Kwun Tong, Sha Tin and Tai Po districts<sup>2</sup> with the installation of monitoring and sensing equipment in the respective part of the water distribution network;
- (b) procurement and establishment of an intelligent network management system and development of associated analytical tools; and
- (c) investigation and detailed design for the remaining about 515 DMAs and PMAs in the territory.

3. Plans showing the locations of the proposed DMAs and PMAs mentioned in paragraphs 2(a) and 2(c) above are at **Enclosure 1** and **Enclosure 2** respectively. A schematic diagram of DMA and PMA and typical details of the

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<sup>1</sup> A DMA is defined as a discrete area of a water distribution network established by the closure of district boundary valve(s) or complete disconnection of water mains, with the quantity of water supplied to the area metered. Some of the DMAs will also serve as PMAs where there is room for pressure management without affecting the minimum supply pressure to sustain normal supply. The monitoring and sensing equipment includes among others flowmeters and pressure loggers to collect water flow and pressure data.

<sup>2</sup> The DMAs and PMA in Tai Po district refer to those within the Shatin major water supply zone.

associated chambers are shown at **Enclosure 3**.

4. Subject to funding approval of the Finance Committee (FC), we plan to commence the proposed works stated in paragraph 2(a) and 2(b) above in end 2016 and early 2017 for completion in end 2019 and end 2018 respectively and to engage consultants to carry out the proposed investigation and detailed design stated in paragraph 2(c) above in late 2016 for completion in end 2017. To meet the programme, the Water Supplies Department will invite tenders for the proposed works and consultancy services in June and April 2016 respectively but the tenders will only be awarded after obtaining FC's funding approval.

5. We will retain the remainder of **196WC** in Cat B, which mainly comprises the establishment of the remaining 515 DMAs and PMAs stated in paragraph 2(c) above and the reprovisioning for water mains which will become aged and susceptible to bursting or leakage before the full implementation of WIN. We will seek funding for the remainder of **196WC** in due course.

## **JUSTIFICATION**

6. In the 1990s, maintenance of a considerable length of water mains approaching the end of their service life became increasingly difficult and costly. Given the poor condition of the water distribution network, replacement and rehabilitation of the aged water mains was the most effective solution to rejuvenate the water distribution network to arrest the rapid rising trend of main bursting and leakage. A programme of Replacement and Rehabilitation of water mains (R&R Programme) was launched in 2000 to replace and rehabilitate around 3 000 kilometres (km) of the aged water mains in Hong Kong. The R&R Programme was now substantially completed. At present, the total length of water mains in Hong Kong is about 8 000 km.

7. Following the substantial completion of the R&R Programme, the condition of the water distribution network has been largely improved. The annual number of water main bursts has been reduced from the peak of about 2 500 in 2000 to 145 in 2015. The leakage rate has also been reduced from exceeding 25% in 2000 to 15% in 2015.

8. Upon completion of the R&R Programme, the water mains previously not covered in the R&R Programme will continue to age and deteriorate. Riding on the technological advancement of sensors, telemetry, network management software and data analysis in recent years, we consider it an opportune time to implement WIN to maintain the healthiness of the water distribution network. With WIN, we would be able to analyse the condition of the water distribution network and determine the most cost-effective means to maintain the healthiness of the network.

9. The essence of WIN is continuous monitoring of network performance in a holistic manner by utilising advanced technologies. Under WIN, the water distribution network will be divided into discrete DMAs and PMAs of manageable size with high-technology monitoring and sensing equipment installed in each DMA and PMA network. Implementation of WIN enables the effective execution of measures under the four pillars of network management in an integrated and coordinated manner. These four pillars include (i) active leakage detection and control through the usage of the monitoring and sensing equipment installed in the network; (ii) pressure management to reduce the pressure in the network of the PMAs; (iii) quality and speedy repairs to water main leaks and bursts; and (iv) asset management by reprovisioning of aged water mains which are beyond economic repair. WIN also enables detection of probable unauthorised consumption from the network.

10. Tremendous amount of time-series flow and pressure data as well as other associated network data will be collected from the monitoring and sensing equipment of the DMAs and PMAs. With WIN, an intelligent network management computer system will be established for analysing the data collected for continuous (and where necessary real-time) monitoring of the condition of the network so as to assess the level of leakage and unauthorised consumption, and to enable timely determination of the priorities and the most effective network management measures for the DMAs and PMAs. In addition, associated analytical tools such as predictive model of water main bursts will also be developed to enhance the function of WIN.

11. In addition to the 600 DMAs and PMAs (i.e. sum of the 85 and 515 DMAs and PMAs as stated in paragraphs 2(a) and 2(c) respectively) to be established under this project, there are also about 1 400<sup>3</sup> DMAs and PMAs which were either established or being established under other projects. The latter DMAs and PMAs were originally planned to be operated and managed on a distinct and individualistic basis. For full implementation of WIN to cover the entire water distribution network in the territory, we will link up these 1 400 DMAs and PMAs to the intelligent network management system. By incorporating all the DMAs and PMAs into the proposed intelligent network management system, WIN will eventually be established and will enable efficient network management to cover the water distribution network in the whole territory.

## **FINANCIAL IMPLICATIONS**

12. We estimate the cost of the proposed works to be \$239.7 million in

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<sup>3</sup> There are 17 major water supply zones in the territory. The 600 DMAs and PMAs to be established under this project belong to 5 major water supply zones, including Kowloon East, Sha Tin, Yuen Long, Sheung Shui & Fanling and Islands major water supply zones. The 1400 DMAs and PMAs which were either established or being established under other projects fully cover the remaining major water supply zones.

MOD prices, made up as follows –

		<b>\$ million</b>	
(a)	Establishment of the 85 DMAs and PMAs	131.8	
	(i) Construction works with installation of monitoring and sensing equipment in the network	108.7	
	(ii) Environmental mitigation measures	1.7	
	(iii) Consultants' fees for contract administration	2.7	
	(iv) Consultants' fees for management of resident site staff (RSS)	1.1	
	(v) Remuneration of RSS	17.6	
(b)	Procurement and establishment of the intelligent network management system and development of associated analytical tools	23.7	
(c)	Investigation and detailed design for the remaining 515 DMAs and PMAs	26.3	
	(i) Site investigation works	15.3	
	(ii) Consultants' fees for investigation and detailed design	8.7	
	(iii) Consultants' fees for supervision of site investigation works	2.3	
(d)	Contingencies	18.2	
	Sub-total	200.0	(in September 2015 prices)

	<b>\$ million</b>
(e) Provision for price adjustment	<u>39.7</u>
Total	239.7 (in MOD <u>prices)</u>

13. Subject to funding approval, we will phase the expenditure as follows—

Year	\$ million (Sept 2015)	Price adjustment factor	\$ million (MOD)
2016 – 17	15.0	1.05775	15.9
2017 – 18	55.0	1.12122	61.7
2018 – 19	57.0	1.18849	67.7
2019 – 20	44.0	1.25980	55.4
2020 – 21	25.0	1.33539	33.4
2021 – 22	4.0	1.40549	5.6
	<u>200.0</u>		<u>239.7</u>

## **PUBLIC CONSULTATION**

14. We consulted the Environment, Housing and Works Committee of the Tai Po District Council, the Traffic and Transport Committee of the Kwun Tong District Council and the Development and Housing Committee of the Sha Tin District Council on 13 January 2016, 26 January 2016 and 3 March 2016 respectively on the proposed construction works for establishment of the 85 DMAs and PMAs in these districts and they all endorsed the project. We will implement suitable traffic and environmental mitigation measures under the works contracts to minimise inconvenience to the public. We will also closely monitor the implementation of these mitigation measures and the interfacing of the proposed works with works in the proximity.

## **ENVIRONMENTAL IMPLICATIONS**

15. The proposed works to be upgraded do not constitute a designated project under the Environmental Impact Assessment Ordinance (Cap

499). The project will not cause any long-term environmental impact. We have included in the project estimate the cost to implement suitable mitigation measures to control short term environmental impacts.

16. During construction of the 85 DMAs and PMAs, we will control noise, dust and site run-off nuisances to meet established standards and guidelines through the implementation of mitigation measures in the relevant works contracts. These include the use of silencers, mufflers, acoustics lining or shields for noisy construction activities, frequent cleaning and watering of the site, and provision of wheel-washing facilities.

17. At planning and design stages for the 85 DMAs and PMAs, we have considered locations of chambers for accommodation of the proposed network monitoring and sensing equipment to reduce construction waste where possible. In addition, we will require the contractors to reuse inert construction waste (e.g. excavated soil) on site or in other suitable construction sites as far as possible, in order to minimise the disposal of inert construction waste at public fill reception facilities<sup>4</sup>. We will require the contractors 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.

18. At construction stage for the 85 DMAs and PMAs, we will require the contractors to submit for approval a plan setting out waste management measures, which will include appropriate mitigation means to avoid, reduce, reuse and recycle inert construction waste. We will ensure that day-to-day operations on site comply with the approved plan. We will require the contractors to separate 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.

19. We estimate that the construction works for establishment of the 85 DMAs and PMAs will generate in total 1 750 tonnes of construction waste. Of these, we will reuse about 260 tonnes (15%) of inert construction waste on site and deliver 1 400 tonnes (80%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 90 tonnes (5%) 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 \$50,000 for this project (based on a unit charge rate of \$27 per tonne for disposal at public fill reception facilities and \$125 per tonne for disposal at landfills as stipulated in the Waste Disposal (Charges for Disposal of Construction Waste) Regulation).

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<sup>4</sup> 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 filling reception facilities requires a licence issued by the Director of Civil Engineering and Development.

20. The proposed site investigation works for establishment of the remaining 515 DMAs and PMAs will only generate a minimal amount of construction waste. We will require the consultant to fully consider measures to minimize the generation of construction waste and to reuse or recycle construction waste as much as possible at the construction stage.

## **HERITAGE IMPLICATIONS**

21. The proposed construction works for establishment of the 85 DMAs and PMAs will be carried out in Tai Po, Kwun Tong and Sha Tin Districts and will not affect any heritage sites, 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.

22. The proposed investigation and detailed design for the remaining 515 DMAs and PMAs in the territory will not affect any heritage sites, 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.

## **TRAFFIC IMPLICATIONS**

23. We have carried out traffic impact assessments (TIAs) for the proposed construction works for the 85 DMAs and PMAs. The cumulative effects of traffic generated by projects at adjacent sites are also covered in the TIAs. The TIAs have concluded that the proposed works would not cause any significant traffic impact on the surrounding road network. In any case, we will implement temporary traffic arrangements to minimise the impact on traffic during construction and will display notice boards on site to explain the reason for the temporary traffic arrangement and the expected completion dates of individual sections of works. In addition, we will set up telephone hotlines for public enquiries or complaints.

24. We will carry out TIAs for the proposed site investigation works for the remaining 515 DMAs and PMAs if necessary.

## **LAND ACQUISITION**

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

## **BACKGROUND**

26. We upgraded **196WC** to Cat B in September 2014.

27. In January 2015, we created a Cat D item entitled “Implementation of Water Intelligent Network (WIN), Advance Package – Investigation and Design” under block allocation Subhead **9100WX** “Waterworks, studies and investigation for items in Category D of the Public Works Programme” and a consultant was engaged in August 2015 to undertake the investigation and detailed design for establishment of the 85 DMAs and PMAs mentioned in paragraph 2(a) above.

28. The establishment of the 85 DMAs and PMAs will not involve any tree removal or planting proposals. We will require the consultant to take into consideration the need for tree preservation during the site investigation and detailed design for the remaining 515 DMAs and PMAs.

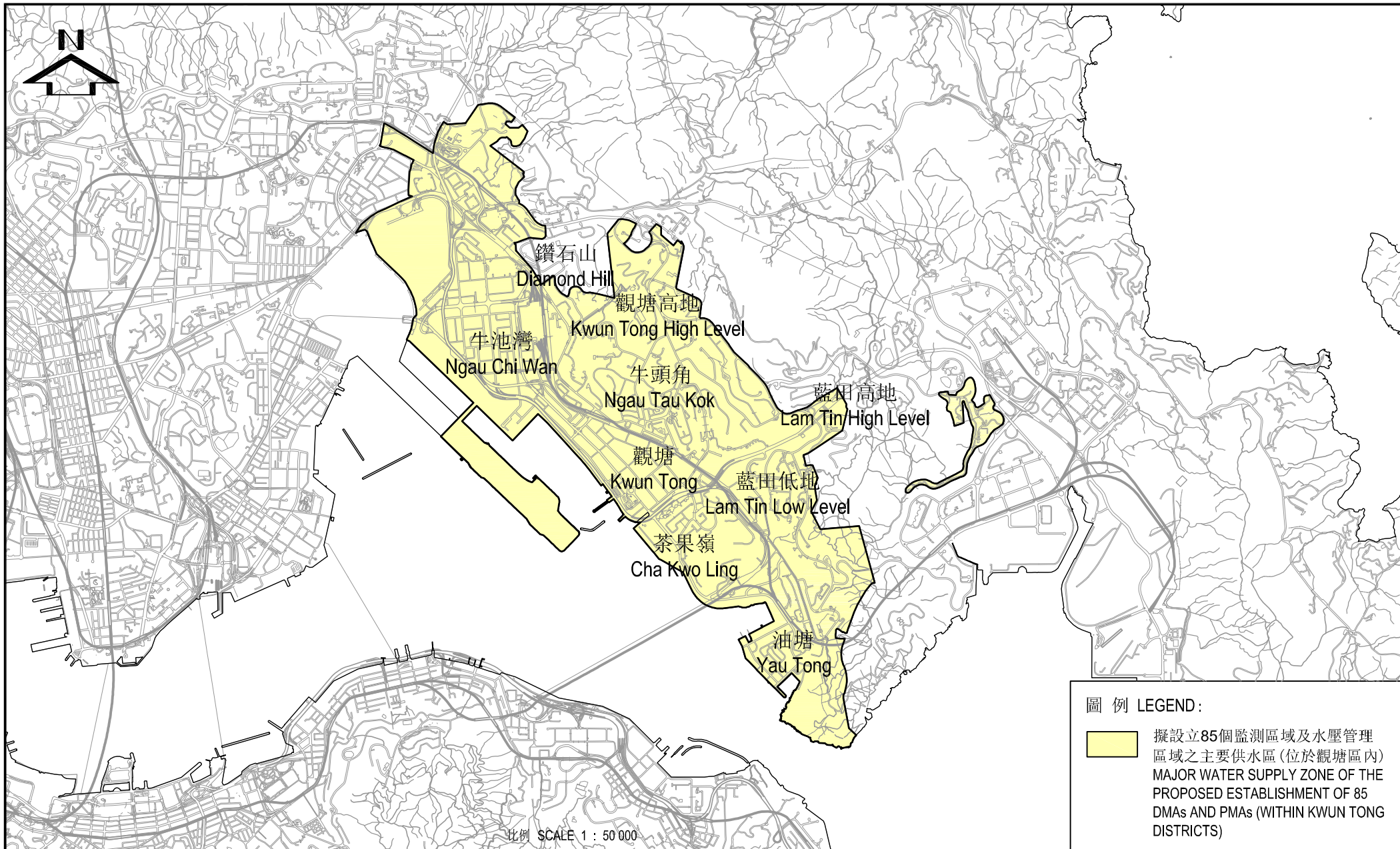
29. We estimate that the proposed works will create 80 jobs (50 for labourer and another 30 for professional or technical staff) providing a total employment of 1 900 man-months.

## **WAY FORWARD**

30. We plan to seek support from the Public Works Sub-committee for upgrading part of **196WC** to Cat A in the second quarter of 2016 before seeking funding approval from the FC.

**Development Bureau**  
**Water Supplies Department**  
**March 2016**





**圖例 LEGEND:**

擬設立85個監測區域及水壓管理區域之主要供水區(位於觀塘區內)  
 MAJOR WATER SUPPLY ZONE OF THE PROPOSED ESTABLISHMENT OF 85 DMAs AND PMAs (WITHIN KWUN TONG DISTRICTS)

工務計劃項目第196WC號 ---- 建設智管網

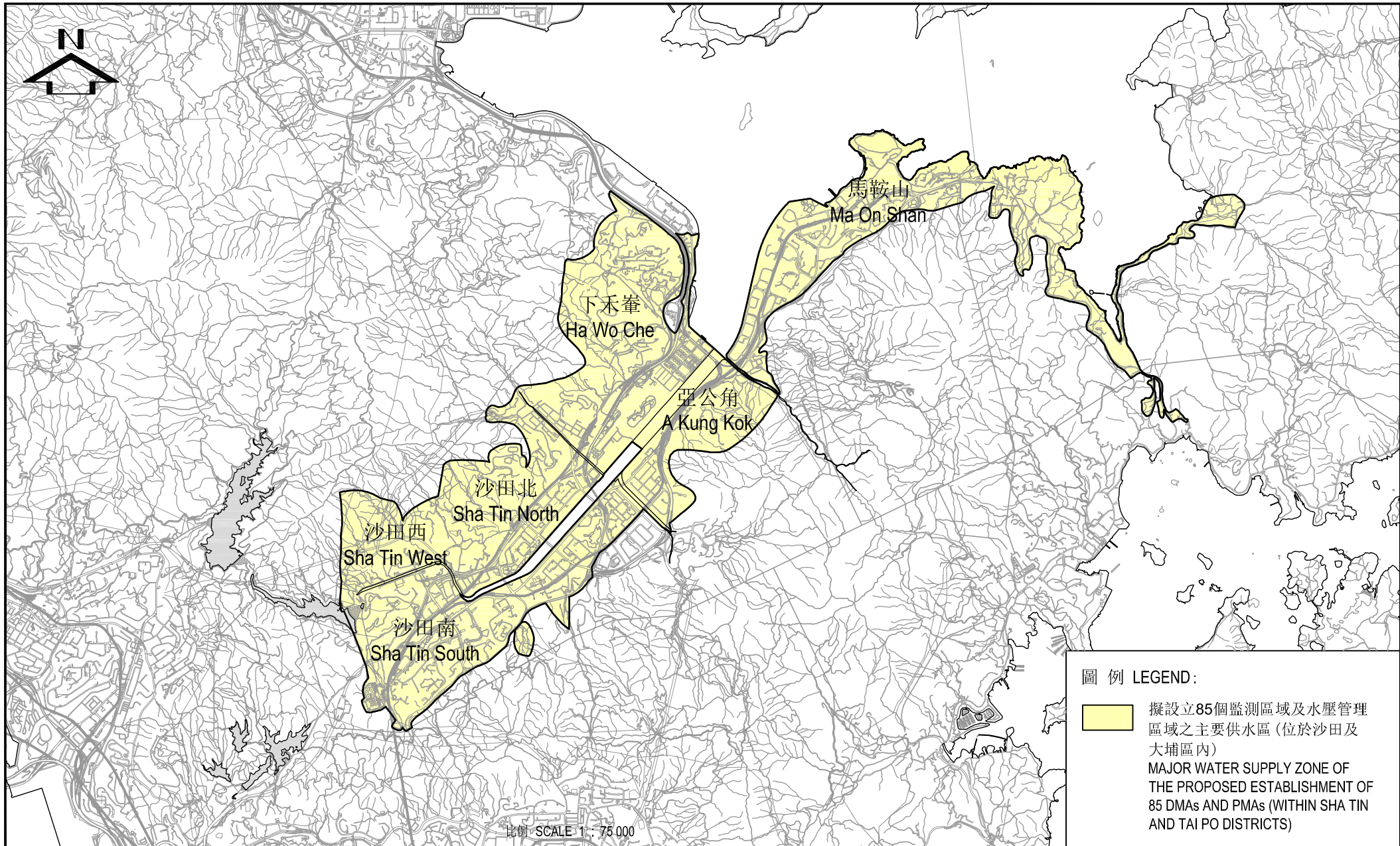
九龍東主要供水範圍

P.W.P. Item No.196WC ---- Implementation of Water Intelligent Network (WIN)

Kowloon East Major Water Supply Zone

水務署  
 WATER SUPPLIES DEPARTMENT

草圖編號 SKETCH NO. SK 62015 / 105



**圖例 LEGEND:**

擬設立85個監測區域及水壓管理區域之主要供水區 (位於沙田及大埔區內)  
 MAJOR WATER SUPPLY ZONE OF THE PROPOSED ESTABLISHMENT OF 85 DMAs AND PMAs (WITHIN SHA TIN AND TAI PO DISTRICTS)

工務計劃項目第196WC號 --- 建設智管網

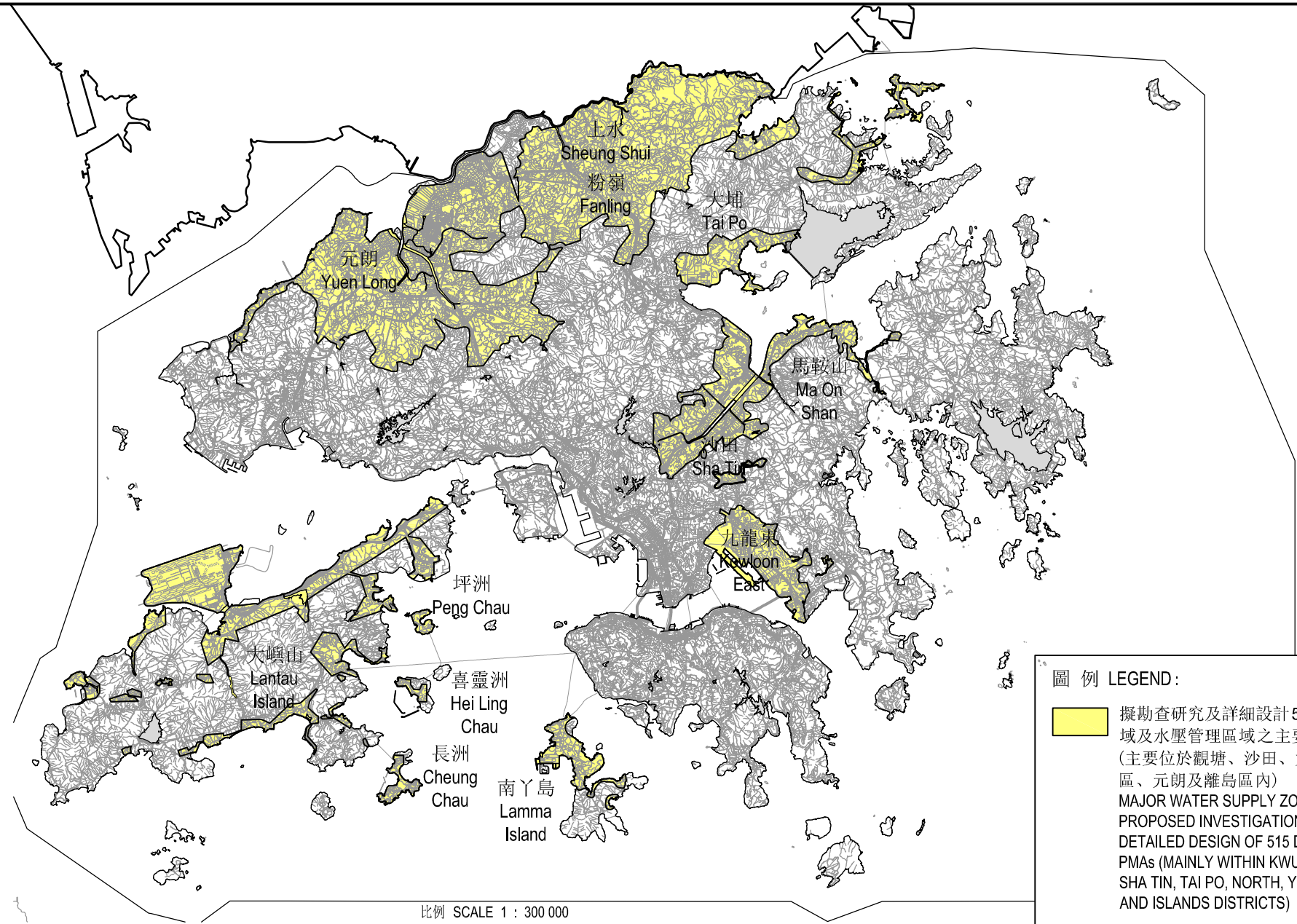
沙田主要供水範圍

P.W.P. Item No. 196WC ---- Implementation of Water Intelligent Network (WIN)


Sha Tin Major Water Supply Zone

水務署  
 WATER SUPPLIES DEPARTMENT

草圖編號 SKETCH NO. SK 62015/106



**圖例 LEGEND:**

 擬勘查研究及詳細設計515個監測區域及水壓管理區域之主要供水區 (主要位於觀塘、沙田、大埔、北區、元朗及離島區內)

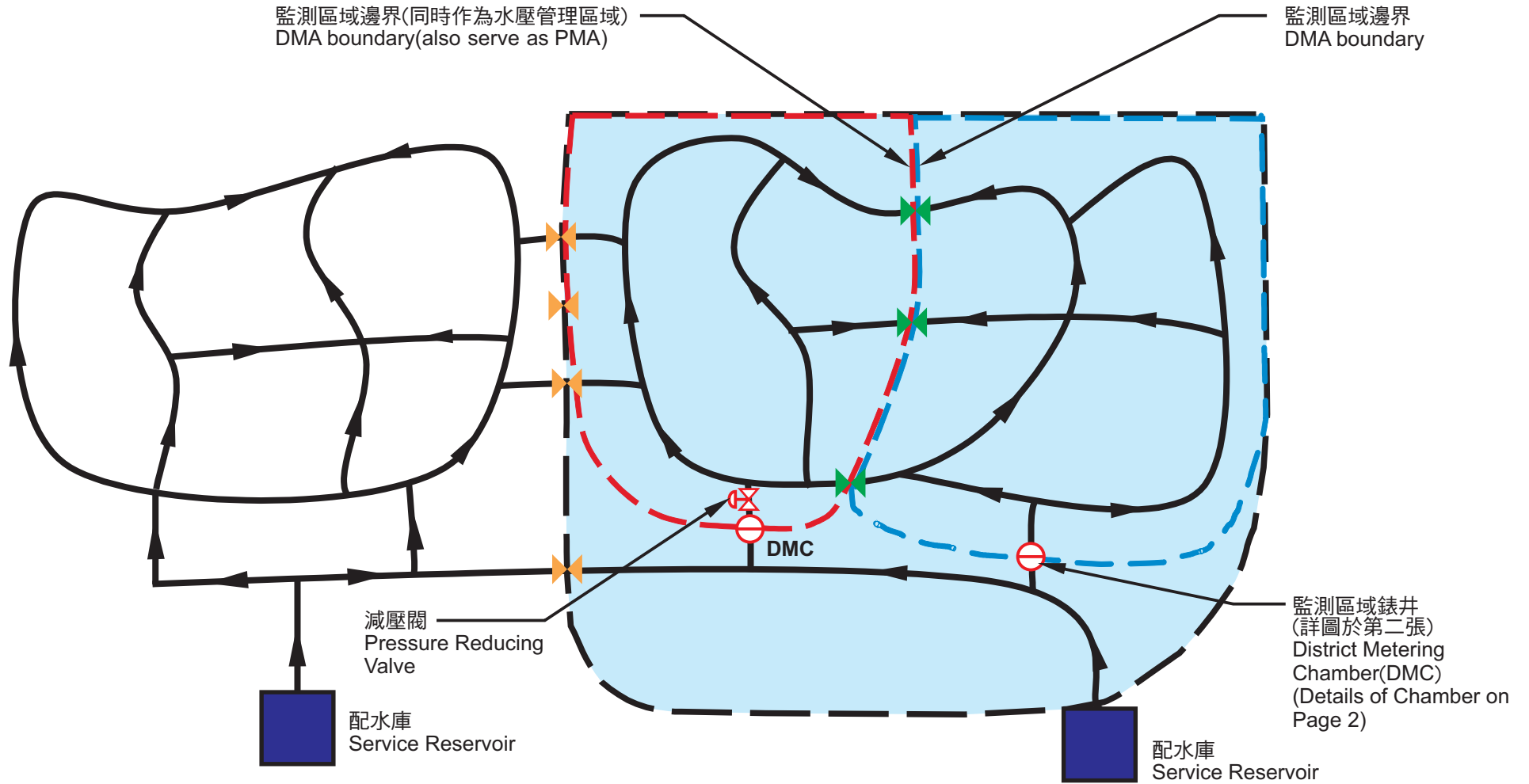
MAJOR WATER SUPPLY ZONE OF THE PROPOSED INVESTIGATION AND DETAILED DESIGN OF 515 DMAs AND PMAs (MAINLY WITHIN KWUN TONG, SHA TIN, TAI PO, NORTH, YUEN LONG AND ISLANDS DISTRICTS)

工務計劃項目第196WC號 ---- 建設智管網  
 P.W.P. Item No. 196WC ---- Implementation of Water Intelligent Network (WIN)

 水務署  
 WATER SUPPLIES DEPARTMENT

草圖編號 SKETCH NO. SK 62015 / 107

圖例 LEGEND:



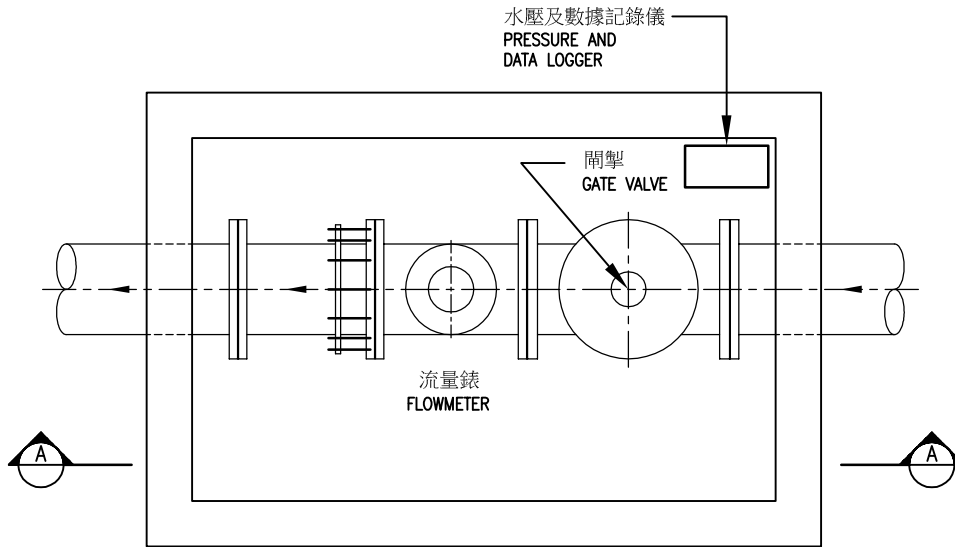
工務計劃項目第196WC號 — 建設智管網  
監測區域及水壓管理區域示意圖

P.W.P. Item No. 196WC — Implementation of Water Intelligent Network (WIN)  
Schematic Diagram of District Metering Area (DMA) and Pressure Management Area (PMA)

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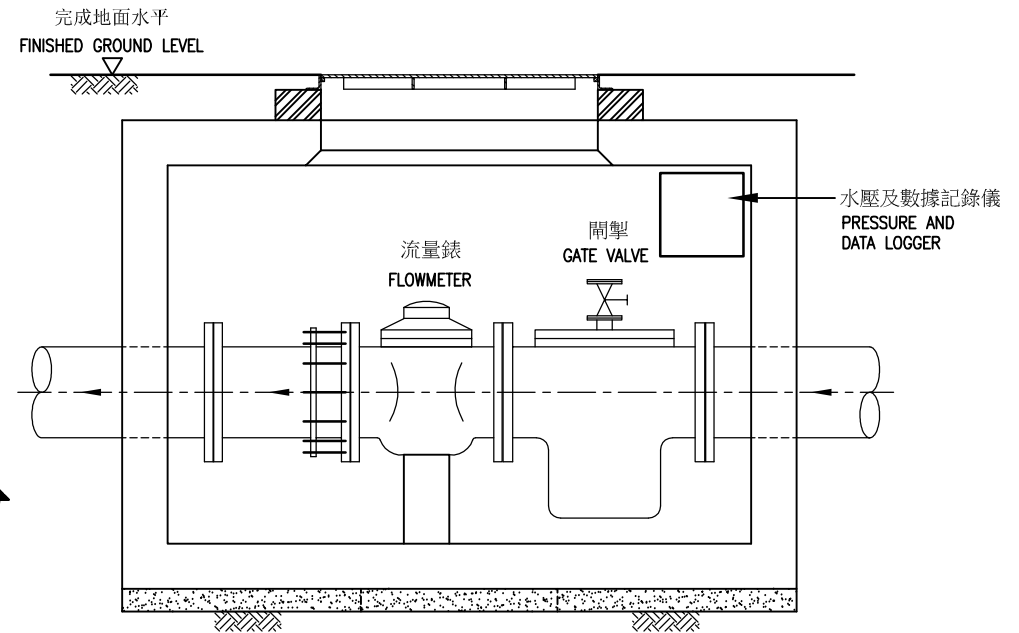
草圖編號 SK 62015 / 108  
SKETCH NO.

註：流量錶用於量度供應到監測區域的水量  
 NOTE : FLOWMETER USED TO METER WATER SUPPLIED TO DMA



平面圖  
SECTIONAL PLAN

比例 SCALE 1 : 25



側面圖 A-A  
SECTION A - A

註 NOTE:  
 1. 所有尺寸以毫米顯示  
 ALL DIMENSIONS ARE IN MILLIMETRES

工務計劃項目第196WC號 --- 建設智管網  
 監測區域錶井示意圖  
 P.W.P. Item No. 196WC ---- Implementation of Water Intelligent Network (WIN)  
 Schematic Layout of District Metering Chamber

水務署  
WATER SUPPLIES DEPARTMENT

草圖編號  
SKETCH NO. SK 62015 / 109