For discussion **PWSC(2011-12)42**
on 14 December 2011

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 709 – WATERWORKS
Water Supplies – Combined fresh/salt water supplies
189WC – Replacement and rehabilitation of water mains, stage 4 phase 2

Members are invited to recommend to Finance Committee the upgrading of **189WC** to Category A at an estimated cost of $4,510.3 million in money-of-the-day prices for the replacement and rehabilitation of water mains under stage 4 phase 2.

PROBLEM

Ageing fresh and salt water mains throughout the territory are prone to frequent bursts and leakages, disrupting water supplies and traffic flow, and causing inconvenience to the public. We need to replace and rehabilitate water mains approaching the end of their serviceable life to improve the condition of the water supply network and to maintain an acceptable level of service.

PROPOSAL

2. The Director of Water Supplies, with the support of the Secretary for Development, proposes to upgrade the remaining part of **189WC** to Category A at an estimated cost of $4,510.3 million in money-of-the-day (MOD) prices to implement the works in the second phase of stage 4 of the territory-wide water mains replacement and rehabilitation programme (R & R programme).

/PROJECT …..

PROJECT SCOPE AND NATURE

3. The remaining part of **189WC** (which represents the final stage of works under the R & R programme) comprises the replacement and rehabilitation of water mains in various districts as shown in Enclosure 1, involving –

(a) about 302 kilometres (km) of fresh water mains ranging from 20 to 2 300 millimetres (mm) in diameter, including the associated service pipes and connections; and

(b) about 48 km of salt water mains ranging from 25 to 1 200 mm in diameter, including the associated service pipes and connections.

4. Subject to the approval of the Finance Committee (FC), we plan to commence the proposed works in January 2012 for completion in December 2015.

JUSTIFICATION

5. The local fresh water and salt water supplies are provided through a network of about 7 800 km of water mains. Most of these water mains are underground, and a substantial portion of them were laid more than 30 years ago. They are approaching the end of their serviceable life and have become increasingly difficult and costly to maintain. As a result of their ageing, there had been an increasing number of main bursts and leakages causing inconvenience to the public and loss of precious water resources. To prevent deterioration of the water supply network, we started implementing a territory-wide programme in 2000 for replacement and rehabilitation of some 3 000 km of aged water mains in four stages.

6. After eleven years of implementation, the R & R programme has achieved steady progress and is approaching the final stage. With the replacement and rehabilitation works completed so far, coupled with the proactive leakage control and pressure management measures, the annual number of main bursts has decreased from the peak of about 2 500 in 2000-01 to 609 in 2010-11 as shown in Enclosure 2. In the first six months of 2011-12, there were 212 incidents of main bursts. The water main leakage rate has also reduced from 25% in 2001 to 20% in 2010. We anticipate that the leakage rate will further decrease to 15% upon completion of the entire R & R programme in 2015.

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FINANCIAL IMPLICATIONS

7. We estimate the cost of the proposed works to be $4,510.3 million in MOD prices (please see paragraph 9 below), broken down as follows –

			$ million	
(a)	Water main replacement by		2,245.0	
	(i) conventional method[1]	1,470.0		
	(ii) trenchless methods[2]	775.0		
(b)	Water main rehabilitation[3] by trenchless methods		790.0	
(c)	Environmental mitigation measures		30.0	
(d)	Consultants' fees for		39.0	
	(i) contract administration	5.0		
	(ii) management of resident site staff	34.0		
(e)	Remuneration of resident site staff		301.0	
(f)	Contingencies		340.0	
	Sub-total		3,745.0	(in September 2011 prices)

/(g) …..

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1 Water main replacement by conventional method refers to laying of new water mains in trench. It involves opening up road surface for the whole lengths of the pipelines being replaced. For budgetary purpose, based on site investigation results, we have assumed that around 83% of water mains under stage 4 phase 2 will be replaced by conventional method. The actual percentage will depend on site conditions.

2 Water main replacement by trenchless methods (sometimes referred to as 'minimum dig' or 'reduced dig' methods) refers to the use of pipe jacking, micro-tunnelling or boring techniques to construct underground pipelines without opening up road surface for the whole lengths of the pipelines being replaced. For budgetary purpose, based on site investigation results, we have assumed that around 4% of water mains under stage 4 phase 2 will be replaced by trenchless methods. The actual percentage will depend on site conditions.

3 Water main rehabilitation refers to the launch of a new pipe from a 'launching pit' and pulling it inside the existing pipe route to a 'receiving pit'. Trenchless methods are adopted without opening up the road surface except at the pits. For budgetary purpose, based on site investigation results, we have assumed that around 13% of water mains under stage 4 phase 2 will be rehabilitated by trenchless methods. The actual percentage will depend on site conditions.

		$ million	
(g)	Provision for price adjustment	765.3	
	Total	4,510.3	(in MOD prices)

8. We engaged consultants to carry out detailed design of the proposed works. Owing to insufficient in-house resources, we propose to continue to engage consultants to undertake contract administration and site supervision of the proposed works. A breakdown of the estimates for consultants' fees and resident site staff costs by man-months is at Enclosure 3.

9. Subject to FC's approval, we will phase the expenditure as follows –

Year	**$ million (Sept 2011)**	**Price adjustment factor**	**$ million (MOD)**
2012–13	150.0	1.05375	158.1
2013–14	888.6	1.11171	987.9
2014–15	990.8	1.17285	1,162.1
2015–16	871.7	1.23736	1,078.6
2016–17	536.8	1.30541	700.7
2017–18	307.1	1.37721	422.9
	3,745.0		4,510.3

10. 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 2012 to 2018. We will deliver the works under re-measurement contracts because the quantities of works are subject to variation during construction to suit the actual underground conditions. The contracts will provide for price adjustments.

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11. The proposed works will not give rise to additional recurrent expenditure. The project by itself would lead to an increase in production cost of water by 1.17% in real terms by 2018[4].

PUBLIC CONSULTATION

12. We consulted the concerned District Councils (DCs) in mid 2010 and July 2011 on the proposed works and all DCs supported the project. A table showing the consultation results is at Enclosure 4. We will implement suitable traffic and environmental mitigation measures under the works contracts to minimise the inconvenience to the public. We will also closely monitor the implementation of these mitigation measures and the interfacing of the proposed works with other works in the proximity, and will consult the relevant DCs as necessary.

13. We consulted the Legislative Council Panel on Development on the proposed works on 22 November 2011. Members raised no objection to the proposal.

ENVIRONMENTAL IMPLICATIONS

14. This is not a designated project under the Environmental Impact Assessment Ordinance (Cap 499). The project does not have any long-term environmental impact. Short-term construction impact will be mitigated through the implementation of standard pollution control measures, and also the measures recommended in the Preliminary Environmental Review report for this project. We have included in paragraph 7(c) above a sum of $30.0 million (in September 2011 prices) in the project estimates for implementation of these mitigation measures and will incorporate these requirements into the works contracts for implementation.

15. At the planning and design stages, we have considered the alignments of the proposed water mains to reduce the generation of 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

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[4] 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 2011 to 2018.

waste at public fill reception facilities[5]. We will require the contractors to maximise the use of recycled / recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste.

16. At the construction stage, we will require the contractors 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 contractors 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.

17. We estimate that the project will generate in total about 481 000 tonnes of construction waste. Of these, we will reuse about 267 000 tonnes (55.5%) of inert construction waste on site and deliver 207 000 tonnes (43.0%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 7 000 tonnes (1.5%) 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 $6.5 million for this project (based on a unit cost of $27 per tonne for disposal at public fill reception facilities and $125 per tonne[6] at landfills).

HERITAGE IMPLICATIONS

18. The proposed works will be carried out at various locations in Kowloon, New Territories and Outlying Islands. The proposed works in Kowloon will not affect any heritage sites, i.e. all declared monuments, proposed monuments, graded historic sites/buildings, sites of archaeological interest and Government historic sites identified by the Antiquities and Monuments Office (AMO). For the proposed works in the New Territories and Outlying Islands, some of the proposed alignments fall within sites of archaeological interest. A Heritage Impact Assessment (HIA) and an Environmental Review (ER) have been

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[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 filling reception facilities requires a licence issued by the Director of Civil Engineering and Development.

[6] This estimate has taken into account the cost for developing, operating and restoring the landfills after they are filled and the aftercare required. It does not include the land opportunity cost for existing landfill sites (which is estimated at $90 per m^3), nor the cost to provide new landfills (which is likely to be more expensive) when the existing ones are filled.

conducted for works in the New Territories and Outlying Islands respectively during the investigation phase. The HIA and ER concluded that the proposed works will not cause adverse impact on sites of archaeological interest. We will conduct archaeological watching brief during excavation as a precautionary measure according to the recommendation of the HIA report and ER report approved by AMO.

TRAFFIC IMPLICATIONS

19. We have carried out Traffic Impact Assessments (TIA) for the proposed works. The cumulative effects of traffic generated by projects at adjacent sites are also covered in the TIA. The TIA have concluded that the proposed works would not cause any significant traffic impact to the surrounding road network. Nonetheless, 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 of temporary traffic arrangements and the expected completion dates of the individual sections of works. In addition, we will set up telephone hotlines for public enquiries or complaints. Furthermore, trenchless methods will be adopted as needed for works along busy roads.

LAND ACQUISITION

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

BACKGROUND

21. The R & R programme was originally planned for implementation in stages from 2000 to 2020. In response to the public aspiration for early completion of the project, we compressed the works programme in 2005 and advanced the target completion date of the entire project to 2015.

22. The R & R programme is implemented in four stages. Stage 1 and stage 2 involve water mains of 600 km and 750 km respectively and were substantially completed in early 2010 and mid 2011 respectively. Stage 3 involves water mains of 800 km, and 43% of the works were completed as at September 2011. We expect to complete stage 3 by December 2013.

23. As regards stage 4 which involves replacement and rehabilitation of 850 km of water mains in two phases, we upgraded part of **189WC** to Category A

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in July 2008 as **190WC** "Replacement and rehabilitation of water mains, stage 4 – investigation and detailed design" for engagement of consultants to carry out investigation and detailed design of the proposed works. In February 2011, we upgraded another part of **189WC** to Category A as **191WC** "Replacement and rehabilitation of water mains, stage 4 phase 1" for the replacement and rehabilitation of 500 km of water mains. Construction of stage 4 phase 1 works commenced in March 2011 for completion in December 2015. The remainder of **189WC** was retained in Category B.

24. The proposed works will not involve any tree removal or planting proposals.

25. We estimate that the proposed works will create about 1 200 jobs (970 for labourers and another 230 for professional/technical staff) providing total employment of 50 670 man-months.

Development Bureau
December 2011

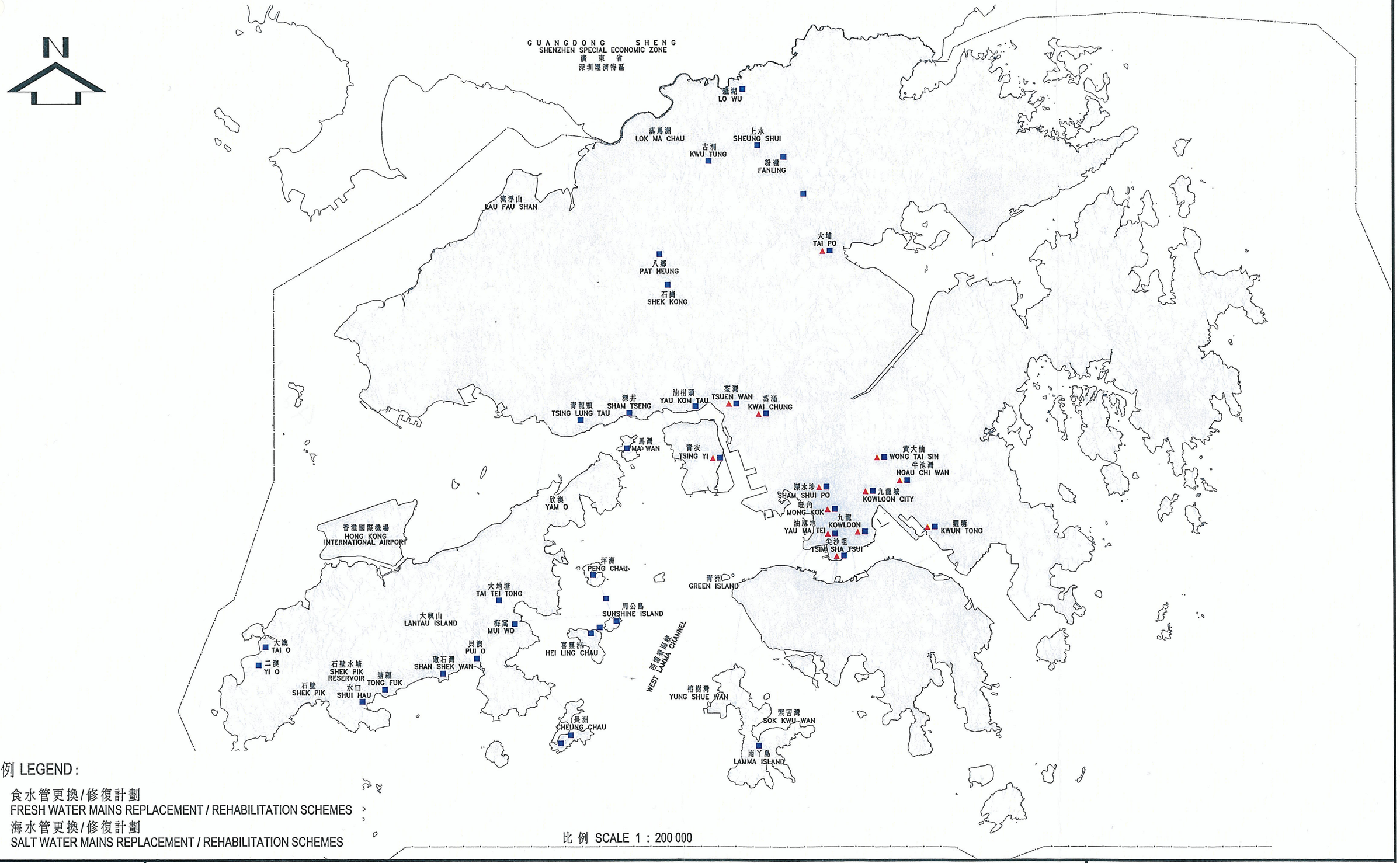


圖 例 LEGEND :

- ■ 食水管更換/修復計劃
  FRESH WATER MAINS REPLACEMENT / REHABILITATION SCHEMES
- ▲ 海水管更換/修復計劃
  SALT WATER MAINS REPLACEMENT / REHABILITATION SCHEMES

比 例 SCALE 1 : 200 000

核准 APPROVED

總工程師/工程管理 CE / PM

3 / 10 / 2011

工務計劃工程項目第 189WC 號 ------ 更換及修復水管工程第 4 階段第 2 期

P.W.P. Item no. 189WC ----- Replacement and rehabilitation of water mains, stage 4 phase 2

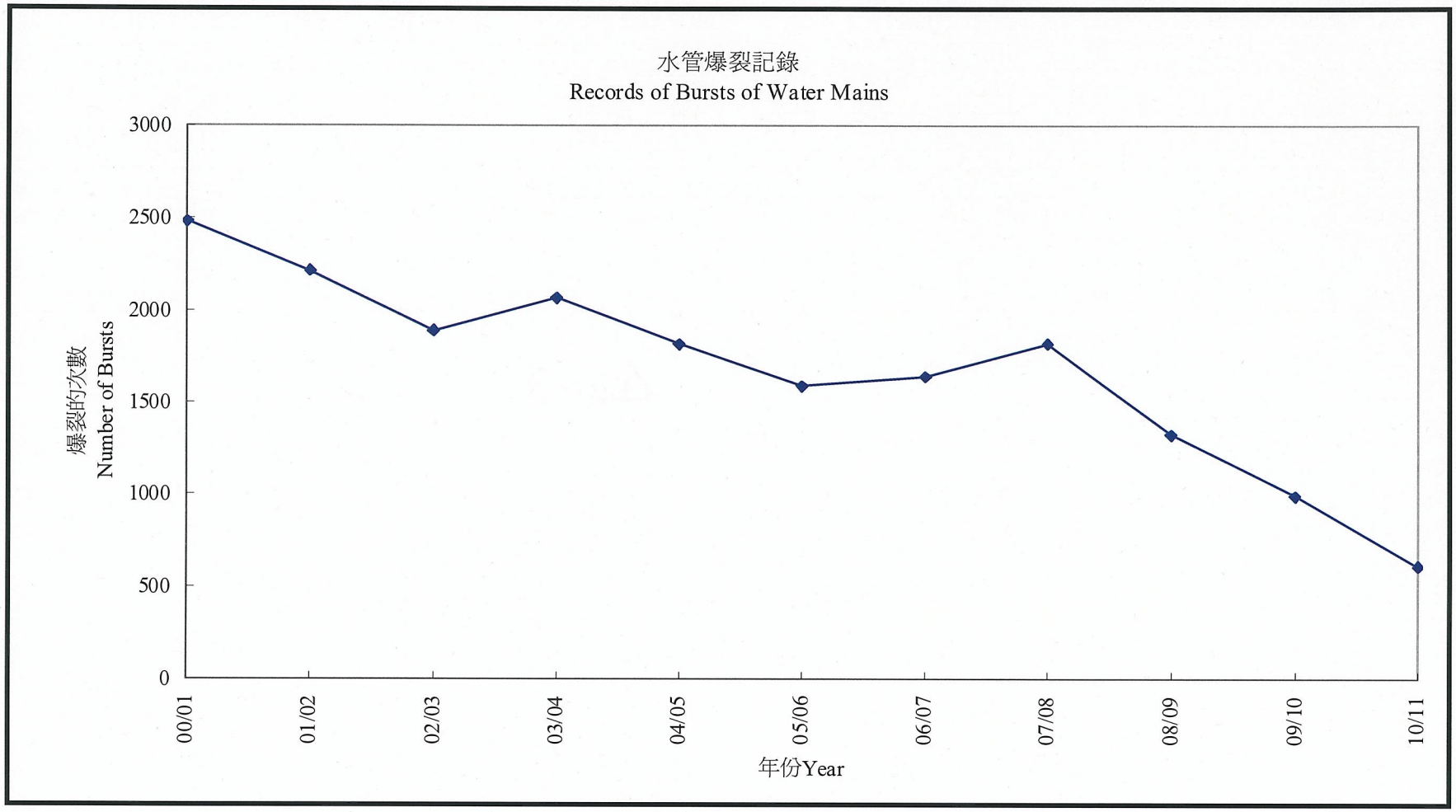
（甲級工程）
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPARTMENT

草圖編號 SKETCH NO. SK 62011 / 034

REF. 62011-034.DWG

附件 1 ENCLOSURE 1


水管爆裂記錄
Records of Bursts of Water Mains
爆裂的次數
Number of Bursts
3000
2500
2000
1500
1000
500
0
00/01
01/02
02/03
03/04
04/05
05/06
06/07
07/08
08/09
09/10
10/11
年份Year

189WC – Replacement and rehabilitation of water mains, stage 4 phase 2

Breakdown of the estimates for consultants' fees and resident site staff costs (in September 2011 prices)

			Estimated man-months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee ($million)
(a)	Consultants' fees for contract administration (Note 2)		–	–	–	5.0
					Sub-total	5.0
(b)	Resident site staff costs (Note 3)	Professional	1 500	38	1.6	149.8
		Technical	5 466	14	1.6	185.2
					Sub-total	335.0
	Comprising –					
	(i) Consultants' fee for management of resident site staff					34.0
	(ii) Remuneration of resident site staff					301.0
					Total	340.0

* MPS = Master Pay Scale

Notes

1. A multiplier of 1.6 is applied to the average MPS salary point to estimate the cost of resident site staff supplied by the consultants. (As at now, MPS salary point 38 = $62,410 per month and MPS salary point 14 = $21,175 per month.)

2. The consultants' staff cost for contract administration is calculated in accordance with the existing consultancy agreement for the design and construction of the project. The construction phase of the assignment will only be executed subject to Finance Committee's approval to upgrade the proposed works to Category A.

3. The actual man-months and actual costs will only be known after completion of the construction works.

Enclosure 4 to PWSC(2011-12)42

189WC – Replacement and rehabilitation of water mains, stage 4 phase 2

Consultation with District Councils

District Council	Date of Meeting	Decision
Tai Po District Council Environment, Housing and Works Committee	14 July 2010	Supported
Yuen Long District Council Town Planning and Development Committee	14 July 2010	Supported
North District Council District Minor Works and Environmental Improvement Committee	19 July 2010	Supported
Wong Tai Sin District Council Traffic and Transport Committee	27 July 2010	Supported
Sham Shui Po District Council Transport and Housing Affairs Committee	29 July 2010	Supported
Kwai Tsing District Council Traffic and Transport Committee	12 August 2010	Supported
Tsuen Wan District Council Environmental and Health Affairs Committee, and Traffic and Transport Committee	2 September 2010 and 6 September 2010	Supported
Yau Tsim Mong District Council Traffic and Transport Committee	9 September 2010	Supported
Kowloon City District Council Housing and Infrastructure Committee	16 September 2010	Supported
Kwun Tong District Council Traffic & Transport Committee	7 October 2010	Supported
Islands District Council Agriculture, Fisheries and Environmental Hygiene Committee	18 July 2011	Supported