For discussion **PWSC(2000-01)51**
on 25 October 2000

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 709 - WATERWORKS
Water Supplies - Combined fresh/salt water supply
90WC - Replacement and rehabilitation of water mains, stage 1 phase 1

Members are invited to recommend to Finance Committee –

(a) the upgrading of part of **90WC**, entitled "Replacement and rehabilitation of water mains, stage 1 phase 1 (part 1) works in Sheung Shui, Tai Po, Sha Tin and Mong Kok", to Category A at an estimated cost of $115.3 million in money-of-the-day prices; and

(b) the retention of the remainder of **90WC** in Category B.

PROBLEM

Ageing fresh and salt water mains throughout the territory are prone to frequent bursts and leaks. We need to replace and rehabilitate water mains reaching the end of their service life to improve the condition of the water supply network and to maintain a reasonable level of service to consumers.

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PROPOSAL

2. The Director of Water Supplies (DWS), with the support of the Secretary for Works, proposes to upgrade part of **90WC** to Category A at an estimated cost of $115.3 million in money-of-the-day (MOD) prices for the replacement and rehabilitation of aged water mains, stage 1 phase 1 (part 1) works in Sheung Shui, Tai Po, Sha Tin and Mong Kok.

PROJECT SCOPE AND NATURE

3. The full scope of works under **90WC** comprises the replacement and rehabilitation of approximately 250 kilometres of fresh water mains and 100 kilometres of salt water mains throughout the territory. We plan to implement the works in two phases as follows –

(a) **Phase 1A**

DWS will use in-house staff to design and supervise the construction of this phase of works, which comprises the replacement and rehabilitation of –

(i) approximately 28.4 kilometres of fresh water mains ranging from 150 millimetres to 450 millimetres in diameter and associated service connections in Yuen Long, Sheung Shui, Fanling, Tai Po and Sha Tin; and

(ii) approximately 3.4 kilometres of salt water mains ranging from 150 millimetres to 400 millimetres in diameter and associated service connections in Sha Tin.

(b) **Phase 1B**

DWS will engage consultants to design and supervise the construction of this phase of works, which comprises the replacement and rehabilitation of –

(i) approximately 220 kilometres of fresh water mains ranging from 150 millimetres to 1 400 millimetres in diameter throughout the territory; and

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(ii) approximately 100 kilometres of salt water mains ranging from 150 millimetres to 1 000 millimetres in diameter throughout the territory.

4. The part of **90WC** we now propose to upgrade to Category A comprises the replacement and rehabilitation of –

(a) approximately 12.5 kilometres of fresh water mains and 3.4 kilometres of salt water mains and associated service connections in Sheung Shui, Tai Po and Sha Tin under the phase 1A works.

We have substantially completed the detailed design for these works using in-house staff. We plan to commence the works in stages starting in late 2000 for completion by the end of 2005.

(b) approximately 1.6 kilometres of fresh water mains and 0.9 kilometre of salt water mains and associated service connections in Mong Kok under the phase 1B works.

These works will be incorporated into the works contract under Drainage Services Department's (DSD's) project **106CD**[1] "West Kowloon drainage improvement, stage 2 phase 2 and stage 3 phase 1 works". We plan to start the works in February 2001 for completion in 2006 to tie in with the programme under **106CD**.

JUSTIFICATION

5. Hong Kong's fresh water and salt water supplies are provided through a network of 5 700 kilometres of water mains. Most of these water mains are underground. About 45% of the water mains were laid some 30 years ago as part of the development of urban areas and new towns. They are approaching the end of their service life and have become increasingly difficult and costly to maintain.

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[1] Finance Committee approved the upgrading of part of **59CD** as**106CD**, entitled "West Kowloon drainage improvement, stage 2 phase 2 and stage 3 phase 1 works" under **Head 704** to Category A at an estimated cost of $1,767.2 million in money-of-the-day prices on 9 June 2000.

6. At present, we carry out piece-meal and small-scale replacement works for some aged water mains on an ad-hoc basis. However, we are experiencing an increasing number of main bursts due to the deteriorating condition of the mains. From 1994 to 1998, there were about 21 000 pipe failures per year, comprising 1 400 bursts and 19 600 leaks. The number of failures has increased by about 30% to 27 200 in 1999, comprising 1 850 bursts and 25 350 leaks.

7. In view of the considerable length of water mains approaching the end of their service life in the years to come, we engaged consultants in February 1996 to carry out an Underground Asset Management Study (the Study) to develop a comprehensive and cost-effective management plan for the water supplies network. We completed the Study at the end of 1997. Taking into account the capital cost of the replacement and rehabilitation works, savings in maintenance costs, the loss of water and the social implications of leakage and main bursts, the Study recommended the replacement and rehabilitation of some 3 000 kilometres of aged water mains in stages over 20 years to prevent further deterioration of the water supply network. We estimate that the number of pipe failures per year will be reduced from the 1999 level of 27 200 (1 850 bursts and 25 350 leaks) to 15 000 (1 000 bursts and 14 000 leaks) upon the completion of the recommended 20-year programme. Over the same period, the loss of fresh water will be reduced from 240 million to 180 million cubic metres per year. Otherwise, the water supply system will continue to deteriorate and we believe the number of pipe failures per year would increase to 40 000 with annual loss of 630 million cubic metres of fresh water in 20 years' time.

8. In order to tackle the most problematic areas and to minimise disruption of water supply to consumers and traffic congestion during construction, we plan to carry out the replacement and rehabilitation programme in stages. The stage 1 phase 1 works mainly covers those water mains which have been identified as having major burst and leakage problems. While all the mains in phase 1 are prone to failure, we intend to bring about early improvement by according priority to those water mains laid in areas where there are no major problems with land clearance, traffic or underground utilities. We have substantially completed the detailed design of the part of phase 1A works detailed in paragraph 4(a) above. We therefore propose to upgrade this part of **90WC** to Category A for implementation.

9. In addition, some sections of the water mains in phase 1B fall within the site boundary of DSD's project **106CD** "West Kowloon drainage improvement, stage 2 phase 2 and stage 3 phase 1 works". In order to minimise road opening, traffic disruption and inconvenience to the general public, we propose to incorporate the replacement works detailed in paragraph 4(b) above into the works contract under **106CD**.

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FINANCIAL IMPLICATIONS

10. We estimate the capital cost of the proposed works to be $115.3 million in MOD prices (see paragraph 11 below). This is made up as follows –

		$ million	
(a)	**Phase 1A (part)**		
	(i) Pipe materials	12.9	
	(ii) Water main replacement	71.1	
	(iii) Environmental mitigation measures	0.5	
	Sub-total for (a)	84.5	
(b)	**Phase 1B (part)**		
	(i) Pipe materials	1.6	
	(ii) Water main replacement	8.7	
	(iii) Environmental mitigation measures	0.1	
	(iv) Consultants' fees	0.4	
	(v) Resident site staff cost	1.2	
	Sub-total for (b)	12.0	
(c)	Contingencies	9.6	
	Sub-total	106.1	(in September 2000 prices)
(d)	Provision for price adjustment	9.2	
	Total	115.3	(in MOD prices)

A breakdown of the estimate for consultants' fees and resident site staff cost by man-months is at the **Enclosure**.

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

Year	$ million (Sept 2000)	Price adjustment factor	$ million (MOD)
2000 – 2001	0.1	1.00000	0.1
2001 – 2002	17.3	1.02550	17.7
2002 – 2003	22.8	1.05627	24.1
2003 – 2004	27.7	1.08795	30.1
2004 – 2005	23.1	1.12059	25.9
2005 – 2006	15.1	1.15421	17.4
	106.1		115.3

12. We have derived the MOD estimates on the basis of the Government's latest forecast of trend labour and construction prices for the period 2000 to 2006. We will implement the mainlaying works under four re-measurement contracts because the quantities involved may vary with the actual ground conditions. To obtain more information about underground utilities in particular, we have carried out a comprehensive review of utility record drawings. In addition, we have conducted extensive utility surveys comprising investigation pits/trenches to identify possible conflict with existing utilities so as to determine the most practical alignment of the replacement water mains during the planning and design stage. We will also require contractors to carry out trial pits/trenches to confirm the actual alignment of existing utilities prior to commencement of the works. We will provide for price adjustments in the works contracts because the contract periods will exceed 21 months.

13. We estimate the savings in annually recurrent expenditure arising from this project to be $2.33 million.

14. The notional increase in water charges brought about by this project is negligible.

PUBLIC CONSULTATION

15. On 13 May 1999, we consulted the LegCo panel on Planning, Lands and Works on **90WC**. Members had no adverse comments on the project.

16. In March 2000, we consulted the Development and Housing Committee of the Sha Tin District Council, the District Development and Environmental Improvement Committee of the North District Council and the Environment and Works Committee of the Tai Po District Council on the works in Sha Tin, North District and Tai Po respectively. The three Committees supported the proposed works.

17. As regards the part of phase 1B works proposed to be carried out in conjunction with **106CD**, the Director of Drainage Services consulted the Traffic and Transport Committee of the then Yau Tsim Mong Provisional District Board and that of the Yau Tsim Mong District Council on 26 November 1998 and 25 May 2000 respectively, and the Recreation Select Committee of the ex-Provisional Urban Council on 12 May 1999. All of them supported the implementation of the works.

ENVIRONMENTAL IMPLICATIONS

18. DWS completed a Preliminary Environmental Review (PER) for **90WC** in December 1997 and concluded that the works would have no long-term environmental impact. The Director of Environmental Protection vetted the PER and agreed that an Environmental Impact Assessment would not be necessary. We will control noise, dust and site run-off during construction through the implementation of mitigation measures[2] in the relevant contracts. For this works package, the cost of implementing these mitigation measures is estimated to be $600,000 in September 2000 prices and we have included this amount in the project estimate.

19. We have considered the alignment of the proposed water mains in the planning and design stages with a view to minimizing the generation of construction and demolition material (C&DM). As the C&DM will be mostly excavated materials suitable for filling purposes, we will reuse them on site for backfilling. Eventually there may be about 500 cubic metres (m^3) of C&DM to be disposed of at designated landfills and 5 300 m^3 at designated public filling areas. We will require the contractors to implement necessary measures to minimize the generation of

/C&DM .....

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[2] The standard pollution control measures include wheel washing facilities, de-silting traps, the use of silenced plant and other procedures as recommended in the Environment Protection Department's Recommended Pollution Control Clauses.

C&DM and to reuse and recycle C&DM. We will control the disposal of C&DM by requiring the contractors to follow a trip-ticket system and to prepare and implement a waste management plan. We will record the disposal, reuse and recycling of C&DM for monitoring purposes.

LAND ACQUISITION

20. The proposed works do not require land acquisition.

BACKGROUND INFORMATION

21. We upgraded **90WC** to Category B in October 1998.

Stage 1 phase 1A

22. The estimated value of stage 1 phase 1A is about $155 million in September 2000 prices, including $93.0 million in September 2000 prices for works we propose to upgrade in this paper.

23. Amongst the fresh water mains and salt water mains for replacement and rehabilitation under the phase 1A works of **90WC**, about 0.4 kilometre of fresh water mains and 0.6 kilometre of salt water mains in Sha Tin fall within the boundary of roadworks project **695TH** "Widening of Fo Tan Road and related improvement measures in Fo Tan" of the Director of Highways (DHy). Moreover, about 1.2 kilometres of the fresh water mains in Yuen Long fall within the boundary of Long Ping Station being constructed as part of the West Rail project of the Kowloon-Canton Railway Corporation (KCRC).

24. To avoid interface problems which would arise from two contractors working on the same site, DWS has entrusted the replacement works mentioned in paragraph 23 above to DHy and KCRC respectively under their works contracts. We commenced the mainlaying works in Sha Tin in December 1999 for completion in December 2001. The cost of $4.46 million is chargeable to the block allocation under **Subhead 9100WX** "Waterworks studies and investigations for items in Category D of the Public Works Programme", as approved by DWS under delegated authority. We also commenced the mainlaying works in Yuen Long in December 1999 for completion in February 2002. The cost of $4.65 million is chargeable to the same block allocation, as approved by DWS under delegated authority.

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25. We are continuing with the detailed design of the remaining works under stage 1 phase 1A of **90WC** using in-house staff. We aim to commence the construction works in 2002 for completion in 2006.

Stage 1 phase 1B

26. The estimated value of stage 1 phase 1B is about $2.2 billion in September 2000 prices, including $13.1 million in September 2000 prices for works we propose to upgrade in this paper.

27. We have substantially completed the detailed design for the proposed works mentioned in paragraph 4(b) above using the services of DSD's consultants. The design fees of $0.56 million is chargeable to the block allocation under **Subhead 9100WX** "Waterworks studies and investigations for items in Category D of the Public Works Programme".

28. In November 1999, Finance Committee approved the upgrading of part of **90WC** to Category A as **95WC** "Replacement and rehabilitation of water mains, stage 1 phase 1B – investigation" at an estimated cost of $66.3 million in MOD prices for engaging consultants to carry out investigations and impact assessments for the phase 1B works. We commenced the investigations and impact assessments in December 1999 for completion in February 2001.

29. Based on the findings of the investigation study, we will seek to partially upgrade **90WC** to Category A in early 2001 for engaging consultants to carry out the detailed design with a view to commencing the construction works in 2003 for substantial completion in 2006.

Other stages

30. We are also continuing with the planning of other stages and phases of the improvement works on the water supply network with a view to completing the whole replacement and rehabilitation programme in 20 years' time. These other stages and phases are estimated to cost about $9 billion in September 2000 prices.

/**Job** .....

Job opportunities

31. We estimate that the proposed works at paragraph 4 above will create some 40 new jobs during the construction stage. These will comprise five professional/technical staff and 35 labourers, totalling 1 500 man-months.

Works Bureau
October 2000
(PWSC0299/WIN12)

Enclosure to PWSC(2000-01)51

90WC - Replacement and rehabilitation of water mains, stage 1 phase 1

Breakdown of estimates for consultants' fees

Consultants' staff costs			Estimated man-months	Average MPS* salary point	Multiplier factor	Estimated fee ($ million)
(i)	Consultants' fees for construction stage	Professional	2.5	40	2.4	0.38
		Technical	0.5	16	2.4	0.03
(ii)	Site supervision by resident site staff employed by the consultants	Professional	10.5	40	1.7	1.12
		Technical	3.0	16	1.7	0.10
					Total consultants' staff costs	1.63

*MPS = Master Pay Scale

Notes :

1. A multiplier factor of 2.4 is applied to the average MPS point to arrive at the full staff costs including the consultants' overheads and profit, as the staff will be employed in the consultants' offices. (At 1.4.2000, MPS pt. 40 = $62,780 per month and MPS pt. 16 = $21,010 per month). A multiplier factor of 1.7 is applied in case of site staff supplied by the consultants.

2. The figures given above are based on estimates prepared by the Director of Water Supplies. We will only know the actual man-months and actual fees when construction works are completed.