For discussion
on 14 February 2001

PWSC(2000-01)91

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
174WC - Replacement and rehabilitation of water mains, stage 1 phase 2

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 1B – detailed design and advance works", to Category A at an estimated cost of $69.8 million in money-of-the-day prices;

(b) the upgrading of part of **174WC**, entitled "Replacement and rehabilitation of water mains, stage 1 phase 2 - investigation", to Category A at an estimated cost of $21.6 million in money-of-the-day prices; and

(c) the retention of the remainders of **90WC** and **174WC** in Category B.

/**PROBLEM** .....

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 approaching the end of their service life to improve the condition of the water supply network and to maintain an acceptable level of service to consumers.

PROPOSAL

2. The Director of Water Supplies (DWS), with the support of the Secretary for Works, proposes –

(a) to upgrade part of **90WC** to Category A at an estimated cost of $69.8 million in money-of-the-day (MOD) prices for the engagement of engineering consultants to carry out detailed design for stage 1 phase 1B of the replacement and rehabilitation works and to carry out advance replacement works along Java Road in North Point; and

(b) to upgrade part of **174WC** to Category A at an estimated cost of $21.6 million in MOD prices for the engagement of engineering consultants to carry out investigations and impact assessments for stage 1 phase 2 of the replacement and rehabilitation works under **174WC**.

PROJECT SCOPE AND NATURE

3. **90WC** and **174WC** cover two separate phases of the stage 1 improvement works for Water Supplies Department's 20-year water mains replacement and rehabilitation programme. The nature of the works is as follows -

(a) works under **90WC** involve the replacement of water mains which are more critical to the supply and distribution network, and which have less potential problems with respect to traffic and land. These constitute **stage 1 phase 1** of the replacement and rehabilitation programme and are intended to bring about early benefits in terms of controlling bursts and leaks; and

/(b) .....

(b) improvement works under **174WC** require further investigation and impact assessments to establish the feasibility of the future works under **stage 1 phase 2** of the same programme.

Stage 1 Phase 1 - PWP item 90WC

4. The present scope of works under **90WC** comprises the replacement and rehabilitation of approximately 234 kilometres of fresh water mains and 99 kilometres of salt water mains. The sites covered under **90WC** are located
----- throughout the territory, as marked on Enclosure 1. We plan to implement the works in two sub-phases, as follows –

(a) **Phase 1A**

DWS will use in-house staff to design and supervise the construction works for this phase, which comprise the replacement and rehabilitation of approximately 16 kilometres of fresh water mains ranging from 150 millimetres to 450 millimetres in diameter with associated service connections.

(b) **Phase 1B**

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

(i) approximately 218 kilometres of fresh water mains ranging from 150 millimetres to 1 400 millimetres in diameter; and

(ii) approximately 99 kilometres of salt water mains ranging from 150 millimetres to 1 000 millimetres in diameter.

Stage 1 Phase 2 - PWP item 174WC

5. As regards **174WC,** the full scope of works comprises the replacement and rehabilitation throughout the territory of approximately 210 kilometres of fresh water mains ranging from 150 millimetres to 600 millimetres in diameter and 40 kilometres of salt water mains ranging from 150 millimetres to 450 millimetres in diameter. The sites covered under **174WC** are also to be found at different locations throughout the territory, as marked on
----- Enclosure 2. Due to insufficient in-house resources, we will use consultants for implementing the works.

/**Assignment** .....

Assignment to be upgraded

6. We now propose to upgrade to Category A the following consultancy services and works –

90WC

(a) consultancy for the detailed design, site investigations and supplementary impact assessment for the phase 1B works described in paragraph 4(b) above.

We plan to start the consultancy study in September 2001 for completion in January 2003.

(b) the replacement of approximately 500 metres of fresh water mains and 700 metres of salt water mains, ranging from 150 millimetres to 400 millimetres in diameter, along Java Road from North Point Road to Tin Chiu Street under the phase 1B works.

The works will be incorporated into the contract for **41WS**[1] "Mainlaying for extension of North Point low level salt water supply system". We plan to start the replacement works in December 2001 for completion by end 2003 to tie in with the waterworks programme for **41WS**. The site plan showing the proposed replacement works is at Enclosure 3.

174WC

(c) the investigation and impact assessment consultancy for the replacement and rehabilitation works described in paragraph 5 above.

We plan to start the consultancy study in September 2001 for completion in September 2002.

JUSTIFICATION

7. Hong Kong's fresh water and salt water supplies are provided through a network of 5 700 kilometres of water mains. Most of these are underground.

/About .....

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[1] Finance Committee approved the upgrading of part of **38WS** as **41WS** to Category A under **Head 709** at an estimated cost of $86.9 million in money-of-the-day prices on 9 February 2001.

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.

8. At present, we carry out piece-meal and small-scale replacement works for older 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 1999, there were about 22 000 pipe failures each year comprising 1 490 bursts and 20 510 leaks. In 2000, the total number of failures increased by about 12% to 24 700, comprising 1 900 bursts and 22 800 leaks.

9. In view of the considerable length of water mains approaching the end of their service life in the foreseeable future, 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 ageing 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 2000 level of 24 700 (1 900 bursts and 22 800 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 220 million to 180 million cubic metres per year. This represents an improvement in the leakage rate of the water mains from the current level of 25% to 15% in 20 years' time. Otherwise, the water supply system would continue to deteriorate. If no action is taken now, 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 the same period.

10. In order to tackle the most problematic areas taking into account the disruption of water supply to consumers and traffic disruption during construction, we plan to carry out the replacement and rehabilitation programme in stages. The stage 1 works, mainly covers about 600 kilometres of water mains which have been identified as prone to bursts and leakage. To bring about early improvement, we will implement the stage 1 works in two phases under **90WC** and **174WC** respectively.

11. We have substantially completed the preliminary investigations and impact assessments for phase 1B works under **90WC**. We now need to start the detailed design to enable the replacement works to proceed. As there are insufficient in-house staff resources, DWS proposes to engage consultants to carry

out the detailed design for the phase 1B works and to draw up proposals to mitigate the disruption to traffic and services.

12. In addition, some sections of the water mains in phase 1B fall within the project boundaries of **41WS** "Mainlaying for extension of North Point low level salt water supply system". To avoid repetitive road opening, traffic disruption and interface problems arising from two contractors working on the same site, we will incorporate the replacement works detailed in paragraph 6(b) above into the works contract under **41WS** as advance works.

13. For the proposed phase 2 works under **174WC**, we need to carry out investigations and impact assessments to enable the detailed design to proceed. Due to insufficient in-house staff resources, DWS proposes to engage consultants to carry out investigations and impact assessments for the phase 2 works and to develop mitigation measures to minimise inconvenience to the public.

FINANCIAL IMPLICATIONS

14. We estimate the capital costs of these parts of **90WC** and **174WC** to be $69.8 million and $21.6 million respectively in MOD prices (see paragraph 15 below), made up as follows –

		$ million	
		90WC	**174WC**
(a) Replacement works under paragraph 6(b)		7.9	-
(i) pipe material	1.0	-	
(ii) water main replacement	5.5	-	
(iii) environmental mitigation measures	0.2	-	
(iv) resident site staff costs	1.2	-	
(b) Site investigations		15.0	11.2

/(c) .....

			$ million			
			90WC		**174WC**	
(c)	Consultants' fees		37.2		7.3	
	(i) detailed design	29.2		-		
	(ii) supervision of site investigations	2.8		1.0		
	(iii) traffic impact assessment	4.2		0.9		
	(iv) drainage impact assessment	-		0.2		
	(v) environmental review	-		0.4		
	(vi) preliminary design	-		4.3		
	(vii) supply interruption assessment	1.0		0.5		
(d)	Contingencies		5.8		1.9	
	Sub-total		65.9		20.4	(in September 2000 prices
(e)	Provision for price adjustment		3.9		1.2	
	Total		69.8		21.6	(in MOD prices)

A breakdown of the estimate for consultants' fees and resident site staff costs by man-months is at Enclosure 4.

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

Year	$ million (Sept 2000)		Price adjustment factor	$ million (MOD)	
	90WC	**174WC**		**90WC**	**174WC**
2001 – 2002	4.8	2.0	1.02550	4.9	2.1
2002 – 2003	51.2	16.5	1.05627	54.1	17.4
2003 – 2004	9.9	1.9	1.08795	10.8	2.1
	65.9	20.4		69.8	21.6

16. We have derived the MOD estimates on the basis of the Government's latest forecast of trend labour and construction prices for the period 2001 to 2004. We will tender the proposed detailed design, investigation, and impact assessment consultancies on a lump sum basis. The consultants will in turn arrange contractors for the site investigations on a re-measurement basis through a competitive tendering process. The consultants will adopt this form of contract as they cannot determine in advance the exact extent of site investigations. We will provide for price adjustment in the consultancy agreements under **90WC** as the consultancy period of each agreement exceeds 12 months, but not for consultancy agreement under **174WC** where the duration of the assignment is less than 12 months. We will incorporate the proposed replacement works in the works contract for **41WS** on a re-measurement basis. We will allow provision for price adjustment as the construction period will exceed 21 months.

17. We estimate the savings in annually recurrent expenditure arising from the proposed advance works under **90WC** to be $202,000.

18. The proposed consultancy assignments and advance works by themselves would lead to an increase in water charges by 0.03% in real terms by 2004[2].

/PUBLIC .....

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[2] The increase in water charges is calculated on the assumption that the demand remains static during the period from 2000 to 2004 and the amount of Government subsidy to the waterworks operations is to be contained at the present level.

PUBLIC CONSULTATION

19. As regards the phase 1B works under **90WC**, we have briefed all District Councils on the findings of the investigation study and will keep them informed of the progress of the works in due course. None objected to the proposal to proceed with the detailed design and impact assessments. A schedule of the public consultation process is at Enclosure 5**.**

20. As regards the proposed advance works under **90WC**, we consulted the Works and Development Committee (WDC) of the Eastern District Council (EDC) on 5 October 2000. The members were briefed on the proposed works and the relevant traffic arrangements during construction. To further monitor the situation during the construction stage, we will establish a Working Group comprising District Council members and representatives from Transport Department, Drainage Services Department and Water Supplies Department to oversee traffic matters and fine-tune the traffic arrangements as necessary. The WDC supported the proposed advance works.

21. As regards the phase 2 works under **174WC,** we will consult the District Councils concerned during the consultancy and will keep them informed of the progress of the works in due course.

22. We consulted the LegCo Panel on Planning, Lands and Works on **90WC** and **174WC** respectively on 13 May 1999 and 8 January 2001. Members had no adverse comments on the projects.

ENVIRONMENTAL IMPLICATIONS

23. DWS completed Preliminary Environmental Reviews (PERs) for **90WC** in December 1997 and for **174WC** in January 2000. The PERs concluded that the works would have no long-term environmental impact. The Director of Environmental Protection vetted the PERs 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[3] in the relevant contracts. The cost of implementing these mitigation measures for the advance works along Java Road is estimated to be $200,000 (in September 2000 prices) and we have included this amount in the project estimate for **90WC**.

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[3] The standard pollution control measures include wheel washing facilities and de-silting traps and other procedures as recommended in Environmental Protection Department's recommended control clauses.

24. We have considered various levels and alignments for the proposed water mains at the planning and preliminary design stages of **90WC** with a view to minimizing the generation of construction and demolition (C&D) materials. We estimate that about 1 800 cubic metres (m^3) of C&D materials will be generated by the proposed works. Of these, about 1 200m^3 (66.7%) will be reused on site, 580m^3 (32.2%) will be reused as fill in public filling areas[4] and 20m^3 (1.1%) will be disposed of at landfills. We shall also require the contractor to implement necessary measures to minimize the generation of C&D materials and to reuse and recycle C&D materials as far as practicable. We shall control the disposal of C&D waste and public fill and shall record the disposal, reuse and recycling of C&D materials for monitoring purposes.

LAND ACQUISITION

25. The proposed consultancies and replacement works do not require land acquisition.

BACKGROUND INFORMATION

26. We upgraded **90WC** for the stage 1 phase 1 works and **174WC** for the stage 1 phase 2 works to Category B in October 1998 and September 2000 respectively.

90WC - Stage 1 phase 1A

27. The estimated value of stage 1 phase 1A is about $155 million in September 2000 prices. In November 2000, Finance Committee approved the upgrading of part of **90WC** to Category A as **175WC** entitled "Replacement and rehabilitation of water mains, stage 1 phase 1 (part 1) works in Sheung Shui, Tai Po, Sha Tin and Mong Kok" at an estimated cost of $115.3 million in MOD prices for the stage 1 phase 1A works.

28. 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 start construction for the remaining works in 2002 for completion in 2006.

/90WC .....

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[4] A public filling area is a designated part of a development project that accepts public fill for reclamation purpose. Disposal of public fill in a public filling area requires a licence issued by the Director of Civil Engineering.

90WC - Stage 1 phase 1B

29. The estimated value of stage 1 phase 1B is about $2.2 billion in September 2000 prices. 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 price for engaging consultants to carry out preliminary investigations and impact assessments for the phase 1B works. The consultants have substantially completed the investigations and impact assessments. We plan to complete the detailed design for this project in January 2003 with a view to commencing the construction works in 2003 for substantial completion in 2006.

30. We will require the consultant to complete the detailed design for the advance replacement works at Java Road by November 2001 to allow the commencement of the proposed replacement works in December 2001 for completion by end 2003 to tie in with the waterworks programme under **41WS**.

174WC - Stage 1 phase 2

31. The estimated value of stage 1 phase 2 is about $1.1 billion in September 2000 prices. We plan to commence the investigations and impact assessments consultancy for the stage 1 phase 2 works under **174WC** in September 2001 for completion in September 2002. We will then proceed with the detailed design by end 2002 with a view to commencing the construction works in early 2005 for completion in 2008.

Other stages

32. We are also continuing to plan other stages of the improvement works for the water supply network with a view to completing the entire replacement and rehabilitation programme in 20 years' time.

Job opportunities

33. We estimate that the proposed site investigation works, advance works and consultancy services will create some 105 new jobs during the consultancy and construction period. These will comprise 70 professional/technical staff and 35 labourers, totalling 1 350 man-months.

Works Bureau
February 2001
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90WC – Replacement and rehabilitation of water mains, stage 1 phase 1
174WC – Replacement and rehabilitation of water mains, stage 1 phase 2

Breakdown of estimates for consultants' fees

Consultants' staff costs		**Estimated man-months**	**Average MPS* salary point**	**Multiplier factor**	**Estimated fee ($ million)**
(a) 90WC - Replacement and rehabilitation of water mains, stage 1 phase 1					
Consultants' staff costs					
(i) detailed design	Professional	143	38	2.4	19.7
	Technical	208	14	2.4	9.5
(ii) supervision of site investigations	Professional	15	38	2.4	2.1
	Technical	16	14	2.4	0.7
(iii) traffic impact assessments for completing detailed design	Professional	11	38	2.4	1.5
	Technical	59	14	2.4	2.7
(iv) supply interruption assessment	Professional	5	38	2.4	0.7
	Technical	6	14	2.4	0.3
(v) site supervision by resident site staff employed by consultants	Professional	3	38	1.7	0.3
	Technical	28	14	1.7	0.9
			Total consultants' staff costs		38.4
(b) 174WC - Replacement and rehabilitation of water mains, stage 1 phase 2					
Consultants' staff costs					

/(i) .....

Consultants' staff costs		**Estimated man-months**	**Average MPS* salary point**	**Multiplier factor**	**Estimated fee ($ million)**
(i) supervision of site investigations	Professional	6	38	2.4	0.8
	Technical	5	14	2.4	0.2
(ii) traffic impact assessment for investigation study	Professional	2	38	2.4	0.3
	Technical	13	14	2.4	0.6
(iii) drainage impact assessment for investigation study	Professional	1	38	2.4	0.1
	Technical	1	14	2.4	0.1
(iv) environmental review for investigation study	Professional	2	38	2.4	0.3
	Technical	2	14	2.4	0.1
(v) preliminary design	Professional	25	38	2.4	3.5
	Technical	18	14	2.4	0.8
(vi) supply interruption assessment	Professional	2	38	2.4	0.3
	Technical	4	14	2.4	0.2
			Total consultants' staff costs		7.3

* 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. A multiplier factor of 1.7 is applied in case of site staff supplied by the consultants. (At 1.4.2000, MPS pt. 38 = $57,525 per month and MPS pt. 14 = $19,055 per month)

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 we have selected the consultants through the usual competitive lump sum fee bid system.

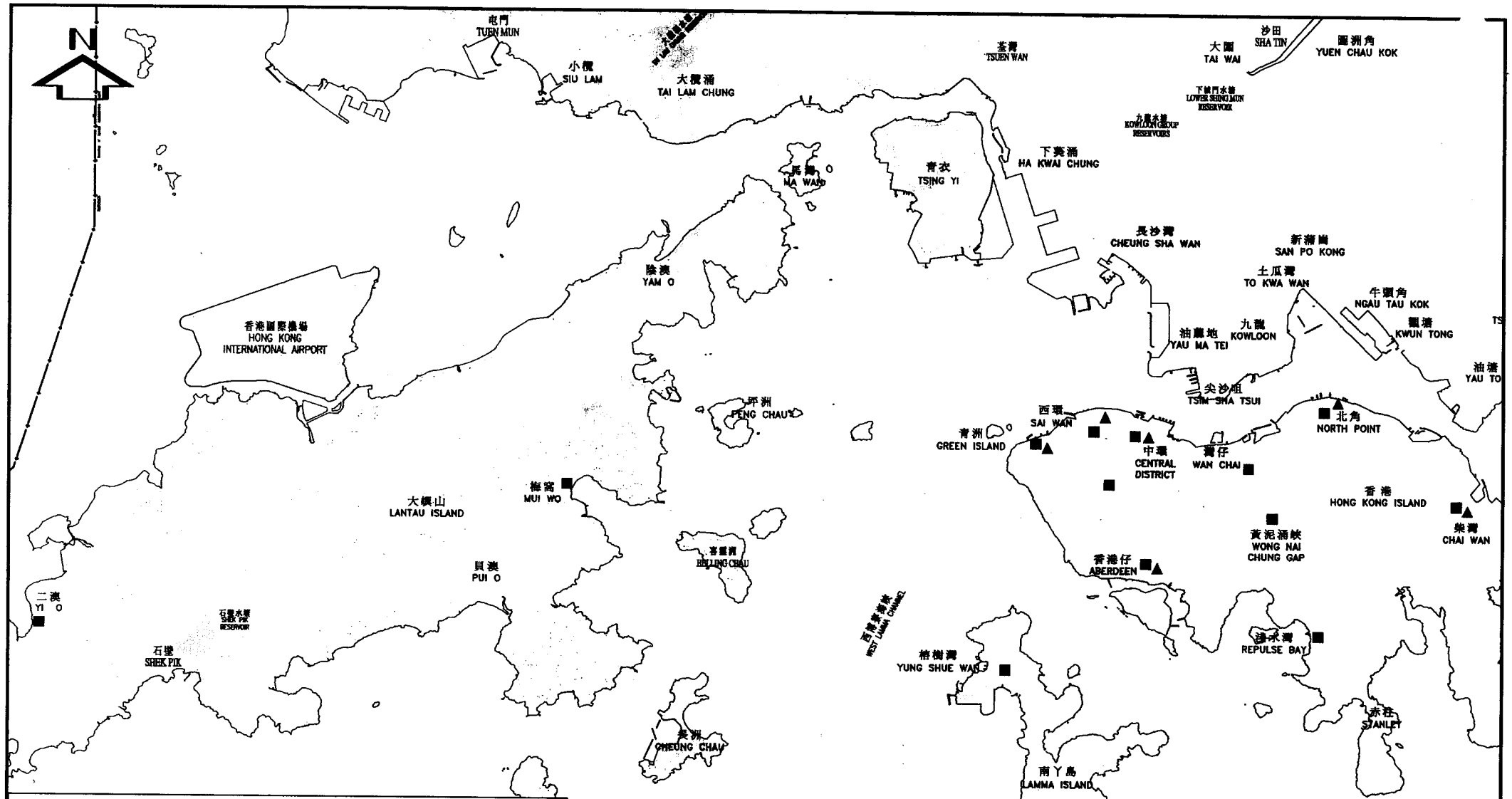
Enclosure 5 to PWSC(2000-01)91

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

Schedule of public consultation

District Council	Date of Meeting	Decision
Central and Western District Council	12 October 2000	Supported
Eastern District Council – Works and Development Committee	05 October 2000	Supported
Islands District Council – Environmental Improvement and Food Hygiene Committee	28 August 2000	Supported
Kowloon City District Council	28 December 2000	Supported
Kwai Tsing District Council	11 January 2001	Supported
Kwun Tong District Council	11 December 2000	Supported
North District Council	09 January 2001	Supported
Sai Kung District Council Traffic and Transport Committee	07 December 2000	Supported
Sha Tin District Council Development and Housing Committee	19 December 2000	Supported
Sham Shui Po District Council	07 December 2000	Supported
Southern District Council – Capital Work Committee	30 October 2000	Supported
Tai Po District Council Environment and Works Committee	12 January 2001	Supported
Tsuen Wan District Council	05 January 2001	Supported
Tuen Mun District Council	19 January 2001	Supported
Wan Chai District Council – Works and Projects Committee	26 September 2000	Supported
Wong Tai Sin District Council	05 December 2000	Supported
Yau Tsim Mong District Council	28 December 2000	Supported
Yuen Long District Council Town Planning and Development Committee	1 February 2001	Supported

(Note : All District Councils supported this project to proceed with the detailed design and impact assessments.)



圖例 LEGEND:

(13 nos.) ■ 食水管更換/修復計劃第1B期
FRESH WATERMAINS REPLACEMENT / REHABILITATION SCHEMES UNDER PHASE 1B

(6 nos.) ▲ 海水管更換/修復計劃第1B期
SALT WATERMAINS REPLACEMENT / REHABILITATION SCHEMES UNDER PHASE 1B

比例尺 SCALE 1 : 150 000

核准 APPROVED

總工程師/工程管理 CE / PM

6 / 2 / 2001

工務計劃項目90WC —— 更換及修復水管工程第1階段第1期
(圖一 - 香港及離島區)
P.W.P. NO. 90WC —— REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 1
(SHEET 1 - HONG KONG & ISLANDS)

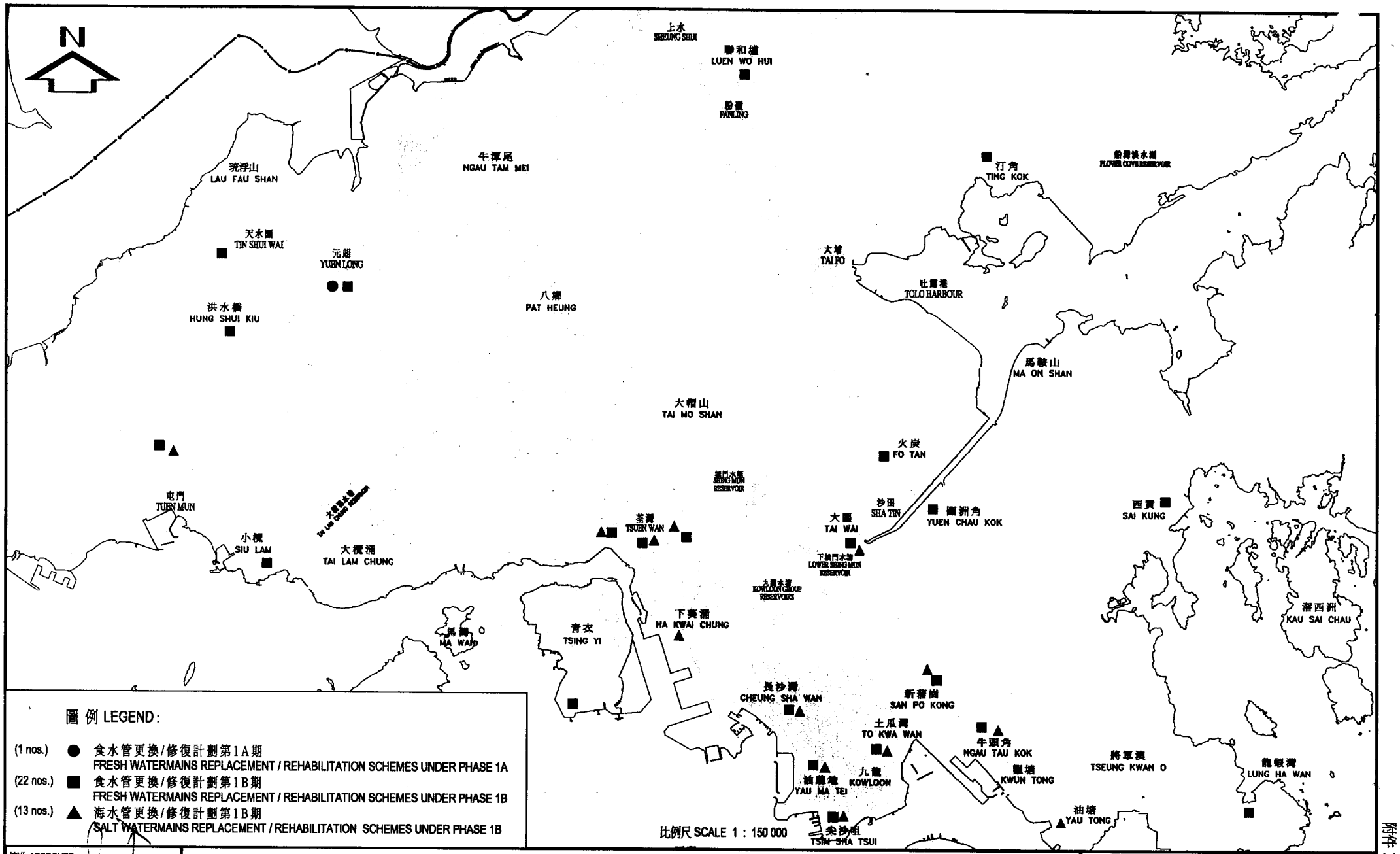
(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

草圖編號 SKETCH NO. 62000 / 149 / 001

REF. R2000040.DWG

附件1 ENCLOSURE 1



核准 APPROVED

總工程師/工程管理 CE/PM

6 / 2 / 2001

工務計劃項目90 WC ---- 更換及修復水管工程第1階段第1期
(圖二-九龍及新界區)
P.W.P. NO. 90WC ---- REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 1
(SHEET 2 - KOWLOON AND NEW TERRITORIES)

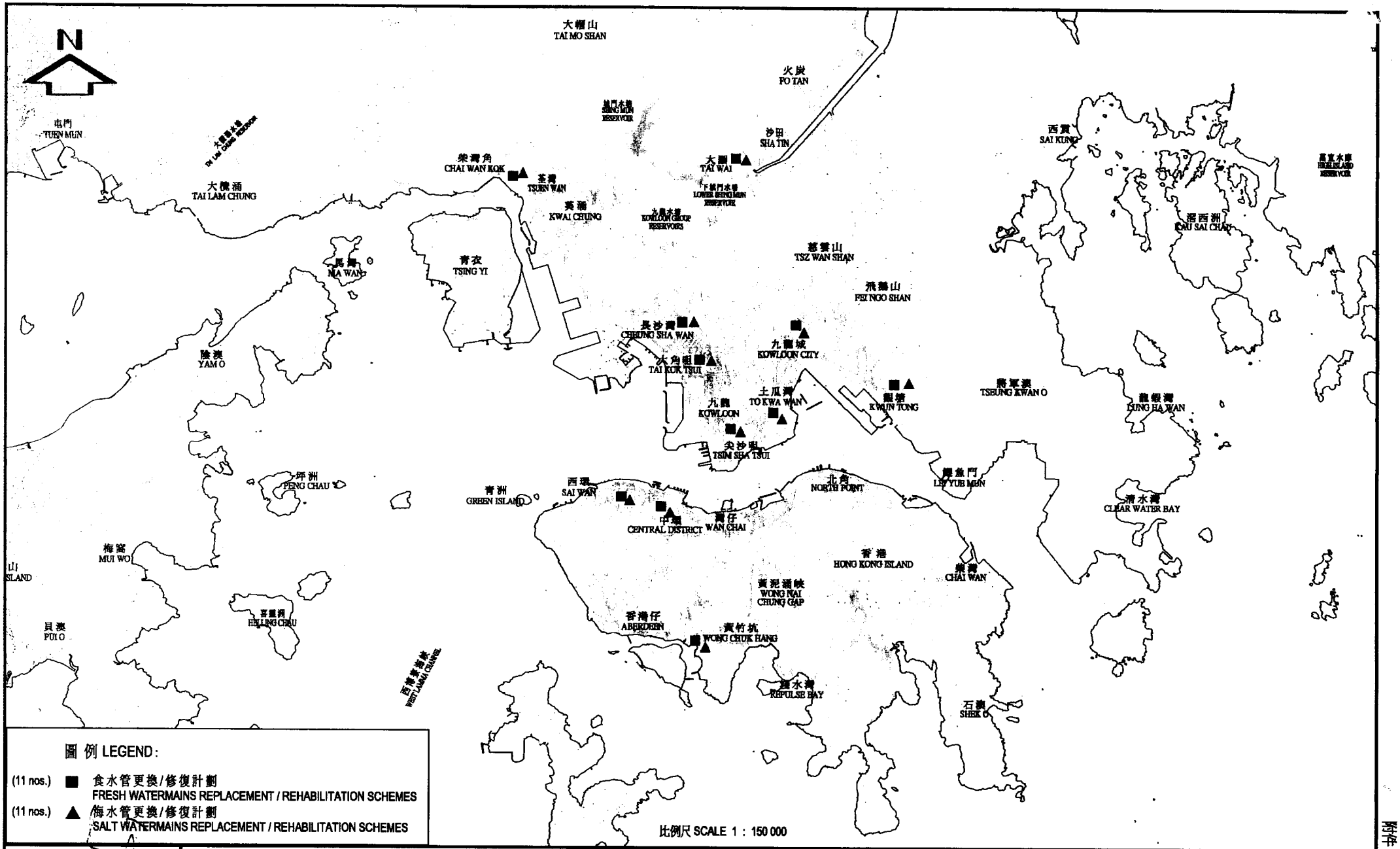
(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

草圖編號 SKETCH NO. 62000 / 149 / 002

附件1 ENCLOSURE 1

REF. B2000040.DWG



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總工程師/工程管理 CE/PM

1/2/2001

工務計劃項目174WC — 更換及修復水管工程第1階段第2期
(圖一)
P.W.P. NO. 174WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 2
(SHEET 1)

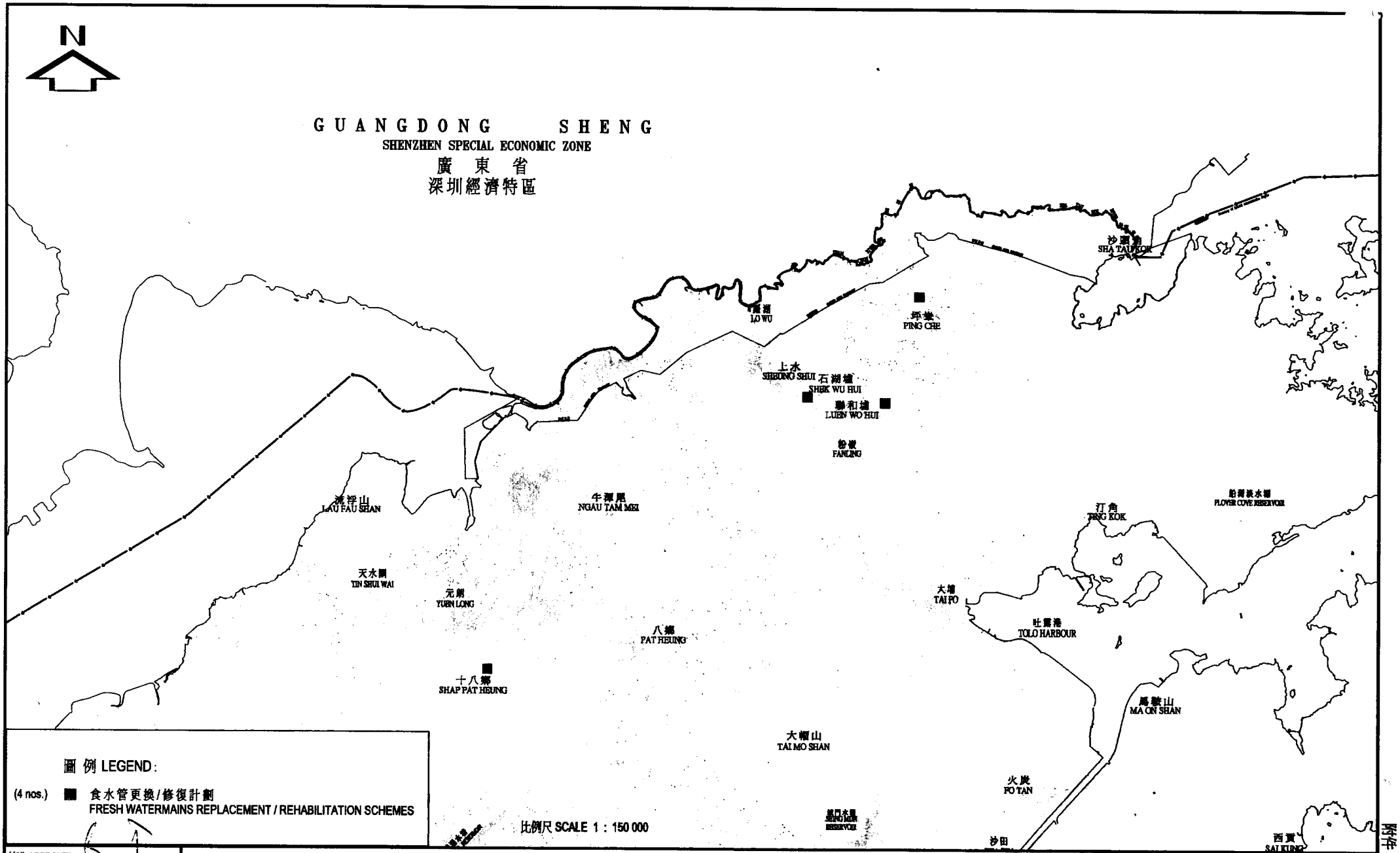
(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

草圖編號 SKETCH NO. 62000 / 150 / 001

REF. R2000041.DWG

附件2 ENCLOSURE 2



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總工程師/工程管理 CE / PM

1 / 2 / 2001

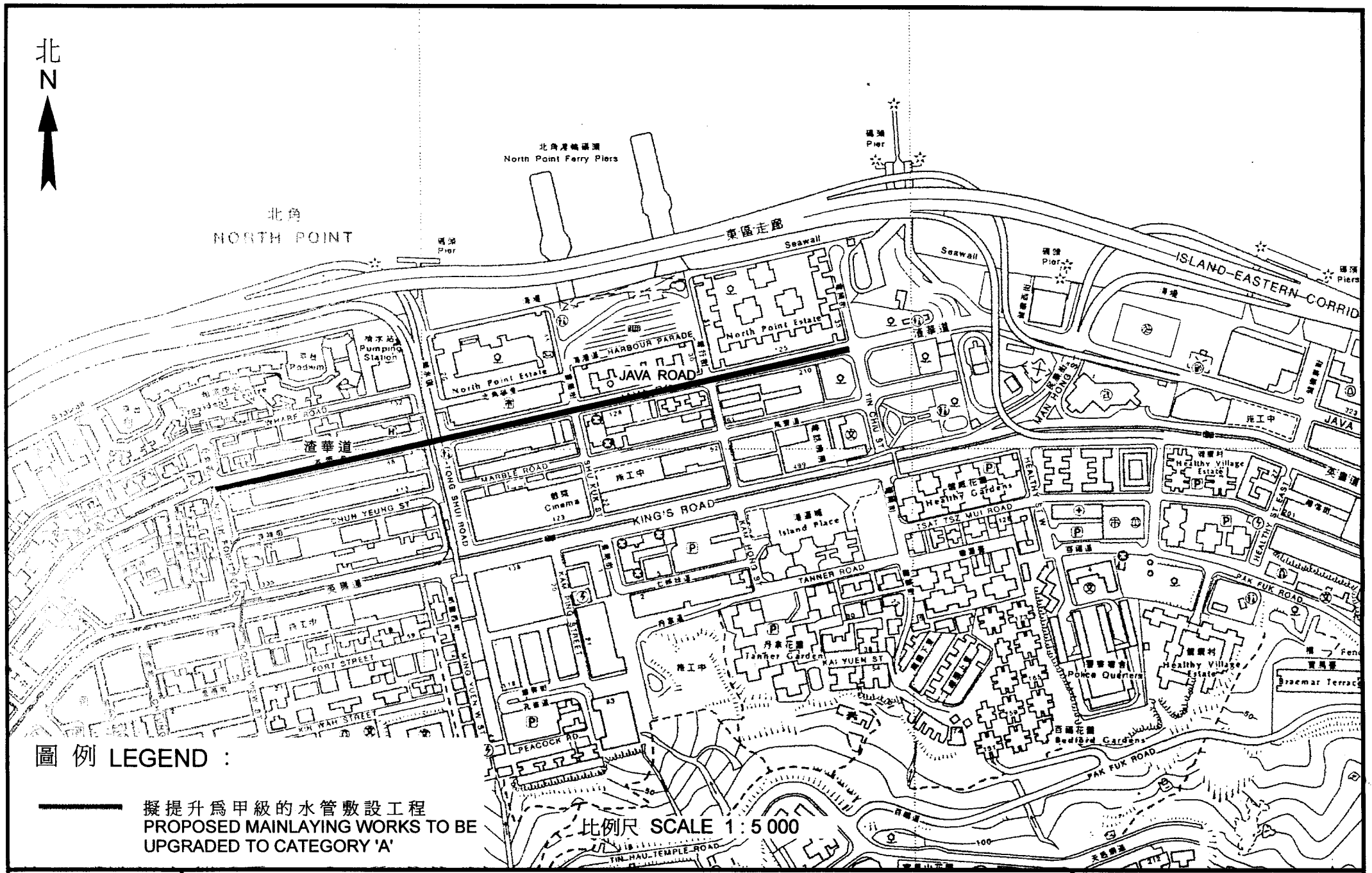
工務計劃項目174WC — 更換及修復水管工程第1階段第2期
(圖二)
P.W.P. NO. 174WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 2
(SHEET 2)

(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

草圖編號 SKETCH NO. 62000 / 150 / 002

附件2 ENCLOSURE 2



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總工程師/顧問工程管理 CE/CM

7 / 1 /2001

工務計劃項目90WC — 更換及修復水管工程第1階段第1B期
- 前期工程

P.W.P. NO. 90WC — REPLACEMENT AND REHABILITATION OF WATER MAINS STAGE 1 PHASE 1.B
- ADVANCE WORKS

(甲級工程)
(CATEGORY 'A')

水務署
WATER SUPPLIES DEPT.

草圖編號
SKETCH NO. SK 62000 / 153

附件 3 Enclosure