



**Water Supplies Department  
The Government of the Hong Kong Special Administrative Region**

**Agreement No. CE 23/2008 (WS)  
Pressure Management of the Fresh Water Distribution Systems  
of the Tsuen Wan West, Tuen Mun, Sai Kung, Aberdeen and Red Hill  
Major Supply Zones - Investigation**

**BRIEF**

14 August 2008

**DRAFT**

## Agreement No. CE 23/2008 (WS)

# Pressure Management of the Fresh Water Distribution Systems of the Tsuen Wan West, Tuen Mun, Sai Kung, Aberdeen and Red Hill Major Supply Zones - Investigation

## BRIEF

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## BRIEF

### 1. Introduction

- 1.1 This Brief is to be read in conjunction with the Memorandum of Agreement, the General Conditions of Employment of Engineering and Associated Consultants for an Investigation Assignment (1997 Edition) (hereinafter referred to as the General Conditions of Employment (GCE)), the Special Conditions of Employment and the Schedule of Fees.

### 2. Description of the Project

- 2.1 Based on the recommendations of the previous consultancy studies, the Water Supplies Department (WSD) has progressively implemented pressure management (PM) and continuous monitoring (CM) schemes in various areas to control and reduce leakage in the fresh water distribution systems since 1997. WSD has so far established eighteen small-scale PM and CM schemes. Recently, WSD has completed the studies on the large-scale PM and CM schemes for the North Point and Shau Kei Wan, Tsuen Wan East, Tai Po, Western, and Kowloon Central Major Supply Zones (MSZs). Arrangement is being made to implement the PM and CM schemes in these MSZs. In addition, WSD is currently conducting PM studies at the Central, Eastern, Sai Wan and Kowloon West MSZs. As a long-term strategy to combat high water leakage problems in the territory, WSD intends to further extend the implementation of PM and CM schemes to more districts to cover the Tsuen Wan West, Tuen Mun, Sai Kung, Aberdeen and Red Hill areas.
- 2.2 This Assignment is to design the PM and CM schemes for the Tsuen Wan West, Tuen Mun, Sai Kung, Aberdeen and Red Hill MSZs, which comprise the supply zones of the following fresh water service reservoirs :-

#### Tsuen Wan West Major Supply Zone

- (a) Choi Yuen Tsuen Fresh Water Tank (FWT);
- (b) Chuen Lung FWT;
- (c) Chuen Lung No. 2 FWT;
- (d) Ha Fa Shan Fresh Water Break Pressure Tank (FWBPT);
- (e) Hon Man Tsuen FWT;
- (f) Ma Wan No. 2 Fresh Water Service Reservoir (FWSR);

- (g) Sham Tseng FWT;
- (h) Sham Tseng West FWSR;
- (i) Shek Lei Hang FWT;
- (j) Tai Wo Tsuen FWBPT;
- (k) Tsing Yi East FWSR;
- (l) Tsing Yi East No. 2 FWSR;
- (m) Tsing Yi North High Level FWSR;
- (n) Tsing Yi North Low Level FWSR;
- (o) Tsing Yi South FWSR;
- (p) Tsuen Wan West High Level FWSR;
- (q) Tsuen Wan West Low Level FWSR;
- (r) Tsuen Wan West Ultra High Level FWSR; and
- (s) Yau Kom Tau Fresh Water Primary Service Reservoir.

#### Tuen Mun Major Supply Zone

- (a) Fu Tei Sheung Tsuen FWT;
- (b) Lung Kwu Sheung Tan FWT;
- (c) San Shek Wan FWT;
- (d) Siu Lam FWSR;
- (e) Siu Lam No. 2 FWSR;
- (f) Tuen Mun East FWSR;
- (g) Tuen Mun East No. 2 FWSR;
- (h) Tuen Mun North FWSR;
- (i) Tuen Mun West FWSR; and
- (j) Tuen Mun West No. 2 FWSR.

#### Sai Kung Major Supply Zone

- (a) Fei Ngo Shan FWSR;
- (b) Hoi Ha FWBPT;
- (c) Kau Sai Chau FWBPT;
- (d) Kei Pik Shan FWT;
- (e) Muk Min Shan FWT;
- (f) Ngau Wu Tun FWT;
- (g) Pak A FWBPT;
- (h) Pak Kong Au FWSR;
- (i) Pik Uk FWBPT;
- (j) Sai Kung FWBPT;
- (k) Sai Kung FWSR;
- (l) Tai Long FWBPT;
- (m) Tai Po Tsai FWSR;
- (n) Tai Shui Tseng FWT;
- (o) Tan Ka Wan FWBPT;
- (p) Tiu Keng Leng FWSR;
- (q) Tui Min Hoi FWSR;
- (r) Tseung Kwan O East Low Level FWSR;
- (s) Tseung Kwan O West High Level FWSR;
- (t) Tseung Kwan O West Low Level FWSR;

- (u) Uk Tau FWBPT;
- (v) Wong Mo Ying FWT; and
- (w) Yim Tin Tsai FWBPT.

#### Aberdeen Major Supply Zone

- (a) Ap Lei Chau FWSR;
- (b) Ap Lei Chau No. 2 FWSR; and
- (c) Wong Chuk Hang FWSR.

#### Red Hill Major Supply Zone

- (a) Chung Hom Kok FWSR;
- (b) Chung Hom Kok No. 2 FWSR;
- (c) Headland Road FWBPT; and
- (d) Red Hill FWSR.

The Tsuen Wan West, Tuen Mun, Sai Kung, Aberdeen and Red Hill MSZs are hereafter referred to as the Project Study Area. Their locations are shown in the attached sketches Nos. SK 51038/1-6 in Appendix I. The boundaries of the FWSR supply zones shown on the sketches are indicative only and subject to verification.

### **3. Objectives of the Assignment**

- 3.1 The objectives of this Assignment are to develop network models and, by making use of the network models, to design the most appropriate PM and CM schemes for the fresh water distribution systems within the Project Study Area in order to reduce water leakage.

### **4. Description of the Assignment**

- 4.1 The Assignment shall cover, but not be limited to, the following major tasks:-
  - (a) to develop network models for the fresh water distribution systems within the Project Study Area;
  - (b) to design and carry out field works required for the calibration and validation of the network models for the fresh water distribution systems within the Project Study Area;
  - (c) to design the most appropriate PM and CM schemes for the fresh water distribution systems within the Project Study Area by making use of the network models;
  - (d) to organise and give a 2-day presentation and/or demonstration to WSD's staff on:-

- i) the planning, construction, calibration and validation of the network models for the fresh water distribution systems; and
- ii) the design, establishment, use, operation and management of the PM and CM schemes so formulated.

## **5. Deliverables**

5.1 The Deliverables to be produced by the Consultants under this Assignment are as set out below:-

(a) Implementation Programme

The Consultants shall submit to the Director's Representative for approval five (5) copies of the detailed and itemised programme of the Assignment (using SureTrak or other compatible software approved by the Director's Representative) in accordance with Clause 8 of this Brief.

(b) Progress Reports

The Consultants shall submit to the Director's Representative five (5) copies of the progress reports in accordance with Clause 9 of this Brief within the first five (5) working days of each month.

(c) Field Works Proposal for the Calibration and Validation of the Network Models

The Consultants shall submit to the Director's Representative for approval the draft Field Works Proposal in several packages including detailed planning, design, calculations and programme for the field works. The Consultants shall submit five (5) copies of the draft Field Works Proposal for each package. The first package shall be submitted within three (3) months from the date for commencement of the Assignment, whereas the last package shall be submitted within six (6) months from the date for commencement of the Assignment. The details of the field works are stipulated in Clause 6.3(t) of this Brief. Upon receipt of the comments of the Director's Representative, the Consultants shall take into consideration these comments, make revisions to the draft proposal and submit to the Director's Representative within two (2) weeks five (5) copies of the revised proposal and the responses to the comments received.

(d) Field Data Reports

The Consultants shall submit to the Director's Representative two (2)

copies of the field data report in accordance with Clause 6.3(t) of this Brief within three (3) weeks from the completion of taking the measurements and records of the field data for each of the proposed monitoring points within the Project Study Area. The Consultants shall also submit to the Director's Representative two (2) copies of the summary report for all the monitoring points with completed field data reports within one week upon submission of the field data reports when the percentage of monitoring points with completed field data reports has reached or exceeded 20%, 40%, 60%, 80% and 100% respectively.

(e) Preliminary Design of PM and CM Schemes for the Tsuen Wan West Low Level FWSR Supply Zone

The Consultants shall submit to the Director's Representative within seven (7) months from the date for commencement of the Assignment five (5) copies of the preliminary design of PM and CM schemes for the fresh water distribution systems within the Tsuen Wan West Low Level FWSR supply zone. The preliminary design shall include drawings, data and other information as may be required by the Director's Representative. The Consultants shall consult staff of New Territories West Region on the preliminary design of PM and CM schemes. Upon receipt of the comments of the Director's Representative and Regional staff, the Consultants shall take into consideration these comments, make revisions to the preliminary design and submit to the Director's Representative within two (2) weeks five (5) copies of the revised preliminary design and the responses to the comments received.

(f) Preliminary Design of PM and CM Schemes (Excluding Tsuen Wan West Low Level FWSR Supply Zone)

The Consultants shall submit to the Director's Representative the preliminary design of PM and CM schemes for the fresh water distribution systems within the Project Study Area (excluding the Tsuen Wan West Low Level FWSR supply zone) in six (6) batches. For Batch 1 to Batch 5 submissions, each batch shall consist of the preliminary design of PM and CM schemes for the fresh water distribution systems of ten (10) FWSR supply zones. Batch 6 shall consist of the preliminary design of PM and CM schemes for the fresh water distribution systems of the remaining eight (8) FWSR supply zones. The Consultants shall submit the preliminary design of PM and CM schemes in accordance with the following schedule:-

Batch	Due Date (from the date for commencement of the Agreement)
1	10 months
2	11 months
3	12 months
4	13 months
5	14 months
6	15 months

Each batch of submission shall contain five (5) copies of the preliminary design of PM and CM schemes. The preliminary design shall include drawings, data and other information as may be required by the Director's Representative. The Consultants shall consult staff of relevant Regions on the preliminary design of PM and CM schemes. Upon receipt of the comments of the Director's Representative and Regional staff, the Consultants shall take into consideration these comments, make revisions to the preliminary design and submit to the Director's Representative within two (2) weeks five (5) copies of the revised preliminary design and the responses to the comments received.

(g) Technical Reports

The Consultants shall submit to the Director's Representative for consideration the following reports in accordance with Clauses 6.4 and 6.5 of this Brief:-

i) Technical Report No. 1

The Consultants shall submit to the Director's Representative within fifteen (15) months from the date for commencement of the Assignment five (5) copies of the draft Technical Report No. 1 on network model construction, calibration and validation in accordance with Clause 6.4 of this Brief. Upon receipt of the comments of the Director's Representative, the Consultants shall take into consideration these comments, make revisions to the report and submit to the Director's Representative within one (1) month five (5) copies of the revised report and the responses to the comments received.

ii) Technical Report No. 2

The Consultants shall submit to the Director's Representative within seventeen (17) months from the date for commencement of the Assignment five (5) copies of the draft Technical Report No. 2 on the design of PM and CM schemes for the fresh water

distribution systems within the Project Study Area. The Consultants shall again consult staff of relevant Regions on the PM and CM schemes recommended in the report. Upon receipt of the comments of the Director's Representative and Regional staff, the Consultants shall take into consideration these comments, make revisions to the report and submit to the Director's Representative within one (1) month five (5) copies of the revised report and the responses to the comments received.

(h) Final Report

- i) The Consultants shall submit to the Director's Representative for approval within twenty (20) months from the date for commencement of the Assignment five (5) copies of the draft Final Report for the Assignment in accordance with Clause 6.6 of this Brief.
- ii) The report shall include all such plans, data and other documents as may be necessary or required by the Director's Representative for the examination and consideration of the study. Upon receipt of the comments of the Director's Representative, the Consultants shall take into consideration these comments, make revisions to the report and submit to the Director's Representative within one (1) month five (5) copies of the revised draft Final Report and the responses to the comments received.
- iii) Upon agreement on the revised draft Final Report by the Director's Representative, the Consultants shall submit to the Director's Representative within one (1) month five (5) bound copies and one unbound copy of the Final Report.

(i) Paperless Final Report (in HTML format)

The Consultants shall submit to the Director's representative two (2) copies of the paperless Final Report together with the Final Report in accordance with Clause 6.7 of this Brief. The Consultants shall prepare the paperless report on interactive compact discs (CDs) approved by the Director's Representative and shall assist to upload the paperless report on to the WSD's Intranet System.

(j) Executive Summary

The Consultants shall submit to the Director's Representative for approval within twenty (20) months from the date for commencement of the Assignment five (5) copies of the draft Executive Summary (both English and Chinese versions) in accordance with Clause 6.8 of this Brief. Upon receipt of the comments of the Director's Representative,

the Consultants shall take into consideration these comments, make revisions to the draft Executive Summary and submit within one (1) month to the Director's Representative ten (10) copies of the revised Executive Summary. Upon agreement on the revised Executive Summary by the Director's Representative, the Consultants shall submit to the Director's Representative within one (1) month ten (10) copies of the Executive Summary.

(k) Records of Meetings and Correspondence

The Consultants shall prepare and submit to the Director's Representative for retention one (1) copy of the minutes of the meetings attended by the Consultants and the correspondence with others in connection with the services provided under Clause 6 of this Brief.

5.2 The Consultants shall submit soft copies in duplicate on CDs approved by the Director's Representative the endorsed, approved or final versions of the documents, reports, programs, databases, drawings, records, etc., submitted in any Deliverables listed in, but not be limited to, Clause 5.1 of this Brief. The Consultants shall clearly label on the surface of the CDs a description of the files stored and provide the source computer programs used on the CDs. The submissions shall include, but not be limited to, the following:-

- (a) all network models built (using InfoWater, H<sub>2</sub>OMAP or other compatible softwares approved by the Director's Representative) under this Assignment;
- (b) all drawings (using AUTOCAD or other compatible softwares approved by the Director's Representative) produced under this Assignment;
- (c) all photographs (in JPEG or other compatible format approved by the Director's Representative) taken under this Assignment;
- (d) all reports and documents (using Microsoft Office or other compatible softwares approved by the Director's Representative) produced under this Assignment; and
- (e) all Implementation Programmes (using SureTrak or other compatible softwares approved by the Director's Representative) produced under this Assignment.

5.3 The Consultants shall provide any other reports, papers, submissions, programmes, estimates, calculations, certificates, plans, drawings and any other documents in connection with the Assignment and as required by the Director's Representative.

- 5.4 The Consultants shall keep one set of all correspondence in relation to the Assignment. Upon request of the Director's Representative, the Consultants shall submit to the Director's Representative a copy of the correspondence, which should be properly filed, classified and indexed to enable easy reference, search and retrieval of information.
- 5.5 The Consultants shall draw the Director's Representative's attention to any Deliverables that are under licence and any pre-existing copyright or patent on any Deliverables and any other restriction whatsoever affecting the Employer's use of the same and, if required by the Director's Representative, verify the existence of any licence, copyright, patent or restriction.

## **6. Services to be Provided by the Consultants**

- 6.1 The duties of the Consultants shall be as defined in the GCE and the Special Conditions of Employment and as amplified, extended and set out in this Brief.
- 6.2 The services to be rendered by the Consultants comprise all necessary review, investigation, studies, design work, field works, co-ordination, consultation, contract administration, site inspections, site supervision and provision of advice to achieve the objectives of the Assignment as set out in Clause 3 of this Brief.
- 6.3 To meet the objectives of the Assignment, the Consultants shall provide the following services:-
- (a) to draw the attention of the Director's Representative to any legal implications and consequences arising from or in relation to the Assignment;
  - (b) to make their own arrangements to obtain information necessary for the completion of the Assignment;
  - (c) to make suitable arrangements to gain access to any public and/or private estates for carrying out all the works under the Assignment including the provision of any necessary lighting, signing, and guarding for the works under the Assignment;
  - (d) to consult, liaise and coordinate with the following authorities/departments and any others that have an interest in or an effect on or which are affected by the Assignment, pursuant to the requirements of Clause 19 of the GCE:-
    - i) Agriculture, Fisheries and Conservation Department;

- ii) Architectural Services Department;
- iii) Buildings Department;
- iv) Civil Engineering and Development Department (CEDD), including Geotechnical Engineering Office (GEO);
- v) Drainage Services Department (DSD);
- vi) Environmental Protection Department;
- vii) Fire Services Department;
- viii) Food and Environmental Hygiene Department;
- ix) Government Property Agency;
- x) Government Laboratory;
- xi) Government Logistics Department;
- xii) Government Secretariat: Transport and Housing Bureau;
- xiii) Government Secretariat: Food and Health Bureau;
- xiv) Government Secretariat: Development Bureau (DEVB);
- xv) Highways Department (HyD);
- xvi) Home Affairs Department: District Offices and District Councils;
- xvii) Hong Kong Housing Authority;
- xviii) Housing Department;
- xix) Hong Kong Police Force;
- xx) Hong Kong Observatory;
- xxi) Lands Department;
- xxii) Leisure and Cultural Services Department;
- xxiii) Planning Department (PlanD);
- xxiv) Transport Department (TD);
- xxv) Water Supplies Department (WSD);
- xxvi) China Light and Power Hong Kong Ltd;
- xxvii) Hong Kong and China Gas Co. Ltd;
- xxviii) Hong Kong Electric Co. Ltd;
- xxix) PCCW-HKT Ltd;
- xxx) Hong Kong Cable Television Ltd;
- xxxi) Mass Transit Railway Corporation Ltd;

- xxxii) Hong Kong Tramways Ltd;
- xxxiii) other relevant utility companies; and
- xxxiv) other relevant government departments/offices.
- (e) to identify, communicate, liaise and correspond direct with the bodies, departments, organizations and persons from whom useful information could be obtained in connection with and for the implementation of the Assignment, copy such correspondence and refer any problems in communication or liaison to the Director's Representative;
- (f) to circulate and collect plans, papers and reports necessary for the completion of the Assignment and submit the circulation list to the Director's Representative for agreement;
- (g) to comply with all reasonable instructions of the Director's Representative and with all relevant circulars, WSD's departmental instructions and technical memoranda as directed by the Director's Representative;
- (h) to take cognizance of the current version of all relevant procedures, manuals, circulars, handbooks, standards, guidelines and document in use by the Employer including, but not be limited to, the following in their provision of the services:-

<b>Item</b>	<b>Title</b>	<b>Issuing Authority</b>
i)	Project Administration Handbook for Civil Engineering Works	CEDD
ii)	Standard Methods of Measurement for Civil Engineering Works	CEDD
iii)	Technical Circulars	CEDD
iv)	Sewerage Manual	DSD
v)	Stormwater Drainage Manual	DSD
vi)	Technical Circulars	DSD
vii)	EACSB Circulars	EACSB
viii)	Handbook on Selection, Appointment and Administration of Engineering and Associated Consultants and Amendments by Engineering and Associated Consultants Selection Board	EACSB
ix)	Code of Practice on Monitoring and Maintenance of Water-carrying Services Affecting Slopes (2006 Edition)	ETWB
x)	Construction Site Safety Handbook	DEVB
xi)	Construction Site Safety Manual	DEVB
xii)	Public Works Department, Lands and Works Branch, Works Bureau, Environmental, Transport and Works Bureau and Development Bureau Technical Circulars	DEVB

<b>Item</b>	<b>Title</b>	<b>Issuing Authority</b>
xiii)	Relevant Technical Circulars and Guidance Notes	GEO
xiv)	General Specification for Civil Engineering Works	HKSARG
xv)	Stores and Procurement Regulations	HKSARG
xvi)	Code of Practice for the Lighting, Signing and Guarding of Road Works (Fourth Issue 2006)	HyD
xvii)	Guidelines on Traffic Impact Assessment and Day-time Ban Requirements for Road Works on Traffic Sensitive Routes	HyD
xviii)	Technical Circulars	HyD
xix)	Professional Persons Environmental Consultative Committee (ProPECC) Practice Notes	PlanD
xx)	Planning, Environmental and Lands Branch/Bureau Technical Circulars and Housing, Planning and Lands Bureau Technical Circulars	DEVB
xxi)	Transport Planning and Design Manual	TD
xxii)	Civil Engineering Design Manual	WSD
xxiii)	Departmental Instructions	WSD
xxiv)	Project Administration Manual for Engineering Works	WSD
xxv)	Manual of Mainlaying Practice	WSD
xxvi)	Safety Manual	WSD
xxvii)	Standard Drawings for Civil Engineering Works	WSD

(i) to comply with the requirements of all relevant ordinances and regulations including, but not be limited to, the following in their provision of the services:-

- i) Air Pollution Control Ordinance;
- ii) Animals and Plants (Protection of Endangered Species) Ordinance;
- iii) Buildings Ordinance;
- iv) Copyright Ordinance;
- v) Country Park Ordinance;
- vi) Dangerous Goods Ordinance;
- vii) Electricity Ordinance;
- viii) Environmental Impact Assessment Ordinance;
- ix) Factories and Industrial Undertakings Ordinance;
- x) Gas Safety Ordinance;
- xi) Lands (Resumption) Ordinance;

- xii) Noise Control Ordinance;
  - xiii) Roads (Works, Use and Compensation) Ordinance;
  - xiv) Road Traffic Ordinance;
  - xv) Town Planning Ordinance;
  - xvi) Waste Disposal Ordinance;
  - xvii) Waterworks Ordinance; and
  - xviii) Water Pollution Control Ordinance.
- (j) to take cognizance of reports, working papers and other documents produced under, but not be limited to, the following WSD studies in their provision of the services:-
- i) Agreement No. CE 21/93 “A Study on Effective Leakage Reduction and Control for the Supply and Distribution System Operated by the Water Supplies Department”;
  - ii) Agreement No. CE 91/2001 (WS) “Study on Pressure Management and Remote Monitoring & Supervisory Control of the Fresh Water Distribution Systems of the North Point and Shau Kei Wan Service Reservoir Supply Zones – Investigation”;
  - iii) Service Order No. D886805 “Pressure Management Study for Fung Wong and Kennedy Town Fresh Water Service Reservoir Supply Zones”;
  - iv) Service Order No. E788365 “Study on Pressure Management of the Fresh Water Distribution Systems of the Tsuen Wan East Major Supply Zone”;
  - v) Service Order No. E788385 “Study on Pressure Management of the Fresh Water Distribution Systems of the Western Major Supply Zone”;
  - vi) Service Order No. E976121 “Study on Pressure Management of the Fresh Water Distribution Systems of the Kowloon Central Major Supply Zone”;
  - vii) Agreement No. CE 83/95 “Digitization of Watermains Record Plan”; and
  - viii) Service Order No. F009369 “Provision of Services to Water Supplies Department for Digital Mapping System Migration”.
- (k) to take cognizance of, but not be limited to, the following international

publication in their provision of the services:-

- i) Network Analysis - Code of Practice issued by Water Research Centre.
- (l) to identify the boundary valves of the FWSR supply zones and verify the boundaries of the FWSR supply zones on site, taking account of possible changes to the boundary valves and cross-connections between the FWSR supply zones. No additional consultancy fee will be incurred in case of any difference between the verified boundaries of the FWSR supply zones and the boundaries as shown on sketches Nos. SK 51038/1-6;
- (m) to verify the water mains details including quantities, sizes, alignments, etc. on site, taking account of possible changes to the water mains details. There may be additional or missing water mains identified in the FWSR supply zones. No additional consultancy fee will be incurred in case of any difference between the verified water mains details and that as indicated in the Mains Record Plans;
- (n) to collect and review all existing relevant drawings, plans, information from the Supervisory Control and Data Acquisition system of WSD, water supplies and customer data, etc. for building up the network models for the fresh water distribution systems within the Project Study Area. The Consultants shall carry out detailed screening and verification of the data collected and take the necessary action to rectify the anomalies found in the data;
- (o) to consult staff from relevant Regions and Divisions of WSD and carry out site investigation to gather information on customers and buildings requiring exceptionally high water supply pressure and on areas with problems of poor water supply pressure and take into account of such information in building up the network models and establishing the District Metering Areas (DMAs) and Pressure Management Areas (PMAs) for the fresh water distribution systems within the Project Study Area;
- (p) to conduct site surveys and inspections to buildings with direct water supply and gather information of the water pressure required by the buildings and take into account of such information in building up the network models and establishing the DMAs and PMAs for the fresh water distribution systems within the Project Study Area;
- (q) to collect the information and take into account of the existing DMAs, PMAs and Waste Detection Areas (WDAs) for building up the network models for the fresh water distribution systems within the Project Study Area;

- (r) to conduct site visits and take measurements to obtain any missing water supply and consumer data and verify any ambiguous or incorrect data necessary for building up the network models for the fresh water distribution systems within the Project Study Area;
- (s) to develop network models including, but not be limited to, extended period simulation, using InfoWater, H<sub>2</sub>OMAP or other compatible softwares approved by the Director's Representative for the fresh water distribution systems within the Project Study Area;
- (t) to plan, design and carry out the field works for calibration and validation of the network models for the fresh water distribution systems in the Project Study Area, including, but not be limited to, the following:-
  - i) to design and identify the numbers and locations of the field monitoring points (with the minimum numbers of monitoring points specified in the table below for various MSZs) within the Project Study Area for taking sufficient measurements and records of the field data to enable the calibration and validation of the network models. If the field works are conducted with the numbers of field monitoring points less than the specified minimum numbers of monitoring points for each MSZ, payment for the field works will be deducted on a pro-rata basis from the relevant item under the Schedule of Fees. No additional payment will be made if the monitoring points exceed the minimum numbers;

<b>Tsuen Wan West Major Supply Zone</b>		
Service reservoir water level monitoring points	Flow monitoring points	Pressure monitoring points
19	21	418
<b>Tuen Mun Major Supply Zone</b>		
Service reservoir water level monitoring points	Flow monitoring points	Pressure monitoring points
10	12	386
<b>Sai Kung Major Supply Zone</b>		
Service reservoir water level monitoring points	Flow monitoring points	Pressure monitoring points
23	60	366
<b>Aberdeen Major Supply Zone</b>		
Service reservoir water level monitoring points	Flow monitoring points	Pressure monitoring points
3	4	47
<b>Red Hill Major Supply Zone</b>		
Service reservoir water level monitoring points	Flow monitoring points	Pressure monitoring points
4	8	51

- ii) to design and identify the types, specifications and quantities of the field equipment (which shall itself be calibrated and tested at frequent intervals and shall include, but not be limited to, data loggers, flowmeters, pressure transducers and level transmitters) required for monitoring the service reservoir water levels, flows and pressures at the proposed monitoring points of the fresh water distribution systems;
- iii) to carry out site inspections prior to installation of the field equipment to confirm the suitability of the proposed monitoring points and types of field equipment to be used;
- iv) to identify all the existing facilities, installations and rights that may be affected by the field works;
- v) to liaise with the concerned government departments and parties and obtain permission for carrying out the field works at the proposed monitoring points, and to incorporate any specific requirements in the field works;

- vi) to provide and install the field equipment and take measurements and records of the field data (which shall include, but not be limited to, water level in a service reservoir, flows and pressures) at the proposed monitoring points of the fresh water distribution systems within each of the service reservoir supply zones in the Project Study Area over a minimum monitoring period of seven (7) continuous days in order to calibrate and validate the network models, using, but not be limited to, extended period simulation;
- vii) to remove the field equipment and reinstate to the original conditions upon completion of taking measurements and records of the field data;
- viii) to monitor, check and analyse the field data recorded by the field equipment on a daily basis throughout the monitoring period in order to ensure that the data is suitable for use in calibration and validation of the network models;
- ix) to extend the monitoring period and carry out further field works at their own costs in order to rectify any discrepancies or errors in the field data or to comply with the requirements for the calibration and validation of the network models. Extended monitoring or repeated monitoring at the same monitoring point shall not be considered as an extra monitoring point in the calculation of the minimum numbers of monitoring points;
- x) to prepare and submit to the Director's Representative a field works proposal including detailed planning, design, calculations and programme for the field works required for the calibration and validation of the network models;
- xi) to make arrangements for gaining access to any private lots, public housing estates, waterworks installations, etc;
- xii) to carry out all necessary surveys, leveling and sounding, including, but limited to, surveys of the levels at the proposed monitoring points;
- xiii) to carry out all necessary site investigations, sounding and pressure measurements to verify whether the boundary valves for the FWSR supply zones are fully closed and to liaise with staff from relevant Regions of WSD to ensure that the boundary valves are fully closed during the monitoring period;
- xiv) to prepare and submit to the Director's Representative field data reports on the details of the field data obtained at each monitoring point within three (3) weeks after completion of

taking the measurements and records of the field data at the monitoring point;

- xv) to prepare and submit to the Director's Representative a summary report listing all the monitoring points with completed field data reports when the percentage of monitoring points with completed field data reports has reached or exceeded 20%, 40%, 60%, 80% and 100% respectively;
  - xvi) to handle and verify the field data for the calibration and validation of the network models; and
  - xvii) to identify hydraulic anomalies such as local large headlosses by field investigations and remove such anomalies before proceeding further with the design.
- (u) to calibrate and validate the network models using the data obtained from the field works;
- (v) to prepare and submit to the Director's Representative the report on the calibration and validation of the network models, which shall include, but not be limited to, the method used, results, findings and conclusions of the field works;
- (w) to advise on the criteria and procedures to be adopted for the design of PM and CM schemes and to demonstrate using the calibrated and validated network models the suitability and cost-effectiveness of the PM and CM schemes for the fresh water distribution systems within the Project Study Area including, but not be limited to, the following:-
- i) to review the present zoning of the Project Study Area using the network models if necessary and to advise any necessary modifications to optimise the operational efficiency;
  - ii) to design the appropriate PM and CM schemes fulfilling the following requirements:
    - 1) take into account the operation of the existing DMAs, PMAs and WDAs;
    - 2) minimise the number of permanent flowmeters, district boundary valves and permanent pressure reducing valves (PRVs) while keeping the maximum size of flowmeters and pressure reducing valves to 300 mm as far as possible;
    - 3) minimise the number of compartments to be formed within the fresh water distribution networks;

- 4) minimise disturbance of existing flow patterns within the fresh water distribution networks; and
  - 5) take into account the operational requirements especially when dealing with emergency situations.
- iii) to recommend the optimal locations, sizes and types of monitoring and control equipment and data logging devices for the flowmeter and PRV sites and critical pressure points to be used in the PM and CM schemes;
  - iv) to provide data for individual PMAs and DMAs, including, but not be limited to, boundaries of the areas, locations of boundary valves, total number of domestic and commercial connections, total number of properties, total length of water mains, large consumers identified, total water consumption, quantity in water saving, and flow and pressure data at essential locations;
  - v) to recommend details of the field investigations, tests and operation procedures required for establishing the PMAs and DMAs;
  - vi) to submit the preliminary design of PM and CM schemes in batches in accordance with Clauses 5.1(e) and (f) and submit the revised preliminary design of PM and CM schemes after consultation with the Director's Representative and Regional staff; and
  - vii) to submit the design of PM and CM schemes in Technical Report No. 2 and consult staff of relevant Regions again on the design of PM and CM schemes.
- (x) to establish a programme for subsequent monitoring of the leakage, flow and pressure in the fresh water distribution systems by WSD within the Project Study Area;
  - (y) to collect relevant operational and financial data from WSD for detailed analysis to demonstrate the suitability and cost-effectiveness of the recommended PM and CM schemes;
  - (z) to provide methodologies for the review of the performance of the recommended PM and CM schemes;
  - (za) to prepare an Operational Manual for the operation and management of the PM and CM schemes within the Project Study Area;

- (zb) to identify any interface between the construction works of the recommended PM and CM schemes and the programmed Replacement and Rehabilitation of Water Mains or other WSD New Works projects within the Project Study Area;
- (zc) to organise and give a 2-day presentation and/or demonstration to WSD's staff on:-
  - i) the planning, construction, calibration and validation of the network models for operating and monitoring the performance of the fresh water distribution systems within the Project Study Area; and
  - ii) the design, establishment, use, operation and management of the PM and CM schemes formulated within the Project Study Area.

The presentation and/or demonstration aim at the transfer of knowledge and technology. The presentation and/or demonstration shall cover network model construction, demand analysis and allocation, calibration, validation, and performance of the distribution systems before and after the implementation of the recommended PM and CM schemes. The Consultants shall submit the presentation and/or demonstration materials and handouts to the Director's Representative for agreement at least two (2) weeks before the presentation and/or demonstration.

- (zd) to prepare and submit the Deliverables in accordance with the timing and the quantities as stipulated in Clause 5 of this Brief;
- (ze) to prepare and submit the Implementation Programme in accordance with Clause 8 of this Brief;
- (zf) to prepare and submit the progress reports and expenditure forecasts in accordance with Clause 9 of this Brief;
- (zg) to advise the Director's Representative in writing immediately upon the identification of any potential slippage in progress or potentially significant cost deviation and propose necessary measures to restore progress and to control the expenditure;
- (zh) to attend the progress meetings at monthly intervals or at such other intervals as required by the Director's Representative;
- (zi) to attend working group meetings, liaison meetings and other meetings as required for the completion of the Assignment or as instructed by the Director's Representative;
- (zj) to provide any information related to the Assignment as may from time

to time be required by the Director's Representative; and

- (zk) to provide Chinese translation of the Executive Summary referred to in Clause 5.1(j) of this Brief. The translation shall be carried out by competent translators or translation firms. The translation should be of reasonable quality in rhetoric and phraseology to convey precisely the original meaning of the English version.

6.4 The Technical Report No. 1 on network model construction, calibration and validation for the fresh water distribution systems within the Project Study Area shall include, but not be limited to, the following:-

- (a) the softwares used in constructing the network models;
- (b) the methodologies considered suitable for network model construction and the methodologies recommended for use in this Assignment;
- (c) the network model construction;
- (d) the data needed for running, calibrating and validating the network models;
- (e) the details of the field works including, but not be limited to, the results, findings and conclusions of the field works;
- (f) the details of the calibration and validation of the network models, which shall include, but not be limited to, the accuracy standards and methodologies adopted, the methods used, results and findings;
- (g) the constraints of the calibrated and validated network models;
- (h) the user manuals on how to use, maintain and update the calibrated and validated network models; and
- (i) other aspects as required by the Director's Representative.

6.5 The Technical Report No. 2 on the design of PM and CM schemes for the fresh water distribution systems within the Project Study Area shall include, but not be limited to, the following:-

- (a) the recommendations on the most appropriate and cost-effective PM and CM schemes based on the findings in the Technical Report No. 1;
- (b) the review of the monitoring and control equipment and facilities to be used and the recommendations of the best locations for installation of PRVs and flowmeters, and the suitable locations for construction of the PRV and flowmeter chambers for the PM and CM schemes. The

recommendations for the chamber locations should have taken into consideration of various factors such as the presence of utilities and impact to the traffic;

- (c) the cost-effectiveness analysis for the recommended PM and CM schemes;
- (d) the recommendations on the implementation details, such as strategy, costs and programme, of the recommended PM and CM schemes;
- (e) the methodologies for the review of the performance of the recommended PM and CM schemes;
- (f) the recommendations on additional staff resources and recurrent costs required in the future operation of the PM and CM schemes;
- (g) the Operational Manual for the operation and management of the recommended PM and CM schemes including contingency plans for every PM and CM scheme for maintaining water supply in all possible cases of mainburst within or outside the PM and CM areas. In addition to the independent DMAs/PMAs, the contingency plans shall describe in details the operational procedures/guidelines for the efficient operation of the district boundary valves between adjacent DMAs/PMAs, and zone boundary valves between adjacent supply zones during emergency situation or when the need arises so as to minimise the timing and extent of supply interruption due to main bursts or other emergencies;
- (h) the detailed DMA and PMA schematic diagrams for each service reservoir supply zone with indication of cut line valves at boundaries of the supply zone. The schematic diagrams shall show the operations of the DMAs and PMAs under normal circumstances and contingency situation; and
- (i) other aspects as required by the Director's Representative.

6.6 The Final Report shall include, but not be limited to, the following:-

- (a) the background of the Assignment;
- (b) the works carried out by the Consultants and the findings under the Assignment;
- (c) the summary of the recommendations on the most suitable PM and CM schemes developed for the Project Study Area;
- (d) the detailed summaries of the interface between the construction works

of the recommended PM and CM schemes and the programmed Replacement and Rehabilitation of Water Mains or other WSD New Works projects within the Project Study Area. The summaries shall give details on the amount of works of the recommended PM and CM schemes to be handed over to the Replacement and Rehabilitation of Water Mains or other WSD New Works projects for site construction;

- (e) the conclusions and the way forward of the Assignment; and
- (f) other aspects as required by the Director's Representative.

6.7 The paperless Final Report (in HTML format) shall include, but not be limited to, the following:-

- (a) the program installed for easy uploading or installation of the paperless Final Report onto the WSD's Intranet System;
- (b) a hyperlinked series of documents that will guide the users to access documents via an internet browser; and
- (c) other aspects as required by the Director's Representative.

6.8 The Executive Summary shall be in both English and Chinese and include, but not be limited to, the following:-

- (a) the background of the Assignment;
- (b) the general description of the Assignment carried out by the Consultants;
- (c) the major findings in the Assignment;
- (d) the conclusions and the way forward; and
- (e) other aspects as required by the Director's Representative.

## **7. Response to Queries**

7.1 The Consultants shall respond to queries raised under Clause 20 of the GCE up to a date three (3) months after the final submission of the Deliverables required under the Agreement. Such date shall be confirmed in writing to the Consultants by the Director's Representative.

## 8. Programme of Implementation

8.1 The due date for commencement of the Assignment is 01 February 2009 or the date written in the letter of acceptance, whichever is the later. The Assignment period is twenty-two (22) months, which may be extended subject to the agreement between the Consultants and the Director's Representative.

8.2 Pursuant to Clause 26(B) of the GCE, the Consultants shall submit and the Director's Representative shall agree, or instruct, the draft Implementation Programme and the revised draft Implementation Programme within the following periods:-

Submission of the draft Implementation Programme : Within 2 weeks of the date for commencement of the Assignment.

Agreement of the draft Implementation Programme : Within 2 weeks from receipt of the draft programme or instruction for submission of the revised draft programme.

Submission of the revised draft Implementation Programme : Within 2 weeks from the instruction of the Director's Representative.

8.3 The Consultants shall discuss with the Director's Representative to agree on the activities, the major tasks and the timing of submissions of reports for inclusion in the programme. The programme shall detail the tasks to be carried out, the target dates for the submissions of reports, the completion dates for major tasks and any decision dates that may be required for the uninterrupted progress of the Assignment. The critical path(s) should be included and highlighted clearly in the programme. The programme shall include, but not be limited to, the following major tasks:-

- (a) the commencement and completion of the network model construction;
- (b) the submission of the Field Works Proposal;
- (c) the commencement and completion of the field works and surveys;
- (d) the submission of the field data reports;
- (e) the commencement and completion of the calibration and validation of the network model constructed;
- (f) the commencement and completion of the design and establishment of

- the PM and CM schemes;
- (g) the submission of preliminary design of PM and CM schemes for the Tsuen Wan West Low Level FWSR;
  - (h) the submission of Batch 1 to Batch 6 preliminary design of PM and CM schemes;
  - (i) the submission of draft Technical Report No. 1 and Technical Report No. 1;
  - (j) the submission of draft Technical Report No. 2 and Technical Report No. 2;
  - (k) the submission of the draft Final Report and the Final Report;
  - (l) the submission of the draft and final Executive Summary;
  - (m) the submission of the Paperless Report on the Project in HTML format; and
  - (n) other tasks necessary for the satisfactory completion of the Assignment.

8.4 The due dates of the major tasks referred to in Clause 8.3 of this Brief shall include but not be limited to:-

<b>Deliverable / Milestone</b>	<b>Due Date (from date for commencement of the Agreement)</b>
Submission of the first package of draft Field Works Proposal for the calibration and validation of the network models	3 months
Submission of the last package of draft Field Works Proposal for the calibration and validation of the network models	6 months
Submission of preliminary design of PM and CM schemes for the Tsuen Wan West Low Level FWSR	7 months
Submission of Batch 1 preliminary design of PM and CM schemes	10 months
Submission of Batch 2 preliminary design of PM and CM schemes	11 months

<b>Deliverable / Milestone</b>	<b>Due Date (from date for commencement of the Agreement)</b>
Submission of Batch 3 preliminary design of PM and CM schemes	12 months
Submission of Batch 4 preliminary design of PM and CM schemes	13 months
Submission of Batch 5 preliminary design of PM and CM schemes	14 months
Submission of Batch 6 preliminary design of PM and CM schemes	15 months
Submission of draft Technical Report No. 1	15 months
Submission of draft Technical Report No. 2	17 months
Submission of draft Final Report	20 months
Submission of draft Executive Summary	20 months

8.5 The Implementation Programme shall include a statement detailing the method of approach and the proposed allotment of resources for the timely and satisfactory completion of the major tasks and reports. The Consultants shall endeavour to ensure that the statement is followed throughout the Assignment.

8.6 In case an agreement cannot be arrived at between the Director's Representative and the Consultants regarding the completion date for any task, such completion date shall be reasonably fixed by the Director's Representative.

8.7 All works shall be completed within the Assignment period unless otherwise agreed by the Director's Representative. The Consultants shall use their best endeavours to achieve completion within the Assignment period, taking into account the need in co-ordinating with other works contingent on this project and vice versa.

## **9. Progress Reports**

9.1 The Consultants shall submit to the Director's Representative progress reports within the first five (5) working days of each month on all aspects of the Assignment covered in the Implementation Programme. The reports shall include a list of those items of the Assignment that are behind the Implementation Programme together with proposals for expediting the

progress so as to complete the Assignment on time. The reports shall also include a financial statement of current and forecast expenditure in accordance with Clause 10 of this Brief. The content and form of such reports shall be to the satisfaction of the Director's Representative.

## **10. Financial Management**

- 10.1 At monthly intervals or at such other intervals as the Director's Representative may require, the Consultants shall submit reports on the current and forecast expenditure on the Assignment and the fees due to the Consultants, in a form to be agreed by the Director's Representative.
- 10.2 The Consultants shall prepare and update the cost estimates and expenditure forecasts for the purpose of or in connection with the Assignment in accordance with the Project Administration Handbook for Civil Engineering Projects.

## **11. Standards and Specifications**

- 11.1 The Consultants shall adopt such technical and design standards and specifications as are in current use by WSD or, if non-existent, the British Codes of Practice and Specifications. The Consultants shall submit recommendations on appropriate alternatives to the Director's Representative for agreement in the following cases:-
- (a) if suitable standards or specifications do not exist;
  - (b) if the current standards or specifications appear to require modification; and
  - (c) if, by the adoption of the current standards or specifications, the Consultants would incur additional expenses not within reasonable contemplation.

## **12. Variations and Other Commitments**

Not used.

## **13. Director's Representative**

- 13.1 The Director's Representative as defined in the GCE shall be the Assistant Director/Development of WSD or such other person as may be authorised by the Director of Water Supplies in writing and notified to the Consultants.

The Director's Representative may delegate any of the powers and functions vested in him to other officers. If the Consultants are dissatisfied with a decision or instruction of any such officer, the matter shall be referred to the Director's Representative for a ruling.

- 13.2 During the course of the Assignment, the Consultants shall report direct to the Director's Representative.

#### **14. Control of the Project and Assignment**

- 14.1 Pursuant to Clause 13 of the General Conditions of Employment, the Consultants shall attend meetings of relevant committees, public consultation bodies and District Councils as necessary. The number of such meetings is estimated to be twenty (20) over which the Employer shall pay the extra cost on a time charge basis.

- 14.2 The Consultants when necessary shall communicate and correspond directly with other Government departments/parties, utility undertakers and various divisions of WSD to obtain information in connection with the Project, copying such correspondence to the Director's Representative.

#### **15. Information and Facilities to be Provided by the Employer**

- 15.1 All available information relevant to the Assignment will be provided to the Consultants. All information relevant to the Assignment, where available, can be inspected at the office of the Development (1) Division of WSD by prior arrangement with the Director's Representative. The Consultants shall advise the Director's Representative those documents which they currently hold and those of which a copy may be needed. A copy of each of the documents indicated as needed will be supplied free of charge by the Director's Representative on request from the Consultants, except those currently available from the Sales Section of the Information Services Department. In the case of plans and drawings, two prints of each plan or drawing shall be provided free of charge if requested by the Consultants.

#### **16. Consultants' Office and Staffing**

- 16.1 The Consultants shall maintain for the duration of this Assignment an office in Hong Kong under the control of the Project Director of the Consultants, who shall be responsible for the Assignment. The Consultants shall have adequate professional, technical and administrative support staff in all relevant disciplines and shall provide all specialist/sub-consultant services if necessary to ensure that progress is to the satisfaction of the Director's

Representative and to ensure completion of the Assignment according to the programme as stated in Clause 8 of this Brief.

- 16.2 At the commencement of the Assignment, the Consultants shall submit for the approval of the Director's Representative a list of professional and technical staff to be engaged in the Assignment. In the event that the Consultants are unable to provide or maintain any key staff quoted in the Technical Proposal for reasons beyond their control, they shall report to the Director's Representative as soon as practicable for approval a substitute staff having qualification and experience comparable with the staff who is leaving the project team.
- 16.3 In accordance with the technical proposal made at the tender stage, the Consultants shall provide the staff and manpower input to the Director's Representative. The Director's Representative shall have the right to check the time-log record of the Consultants' staff and specialists/sub-consultants deployed for the Assignment. The proposed key staff shall include a project engineer who shall be a professionally qualified engineer with a minimum of 5 years waterworks and network modelling experience and shall be the contact person with WSD on all technical matters relating to the Assignment. The name and curriculum vitae of the project engineer shall be submitted to WSD for agreement.

## **17. Specialist and Sub-consultant Services**

- 17.1 The Consultants shall provide all specialist and sub-consultant services required for the satisfactory completion of the Assignment. No additional fees or expenses for the provision of such services rendered locally or overseas shall be payable by the Employer except as otherwise provided for in the Schedule of Fees.

## **18. Surveys**

- 18.1 One velograph, or computer soft copy, and two prints of topographical mapping at 1:20,000, 1:5,000 and 1:1,000 scales prepared by the Survey and Mapping Office of the Lands Department, where available, for the Project Study Area, can be obtained free of charge on application to the Director's Representative. The Consultants shall be responsible for any necessary updating and verification of the information shown on these maps.
- 18.2 All field survey work required for the proper execution of the Assignment shall be the duty of the Consultants unless otherwise provided for in the Agreement. A copy of field notes, field data and resultant plans arising from these surveys shall be handed over to the Director's Representative upon completion of the Assignment. The accuracy as well as the presentation of

these surveys should be of a standard agreed by the Director's Representative.

- 18.3 Appendix II specifies the division of responsibility for surveying among the Consultants, WSD, the Lands Administration Office, and the Survey and Mapping Office as well as the relevant sub-offices at district level of the Lands Department.

**19. Insurance**

- 19.1 The amount of insurance cover to be maintained in accordance with Sub-clause (A) of Clause 47 of the GCE shall be twice the Lump Sum value of the fee, subject to a maximum of HK\$75 million and a minimum of HK\$5 million.