

MTR Corporation Limited

HONG KONG SECTION OF GUANGZHOU -
SHENZHEN - HONG KONG EXPRESS RAIL LINK
(No. EP-349/2009/E)

Groundwater Monitoring and Contingency Plan
(Revision 01)

(Contract 810A – West Kowloon Terminus Station North)

Verified by : 
Position : Independent Environmental Checker
Date : 27 April 2012

MTR Corporation Limited

HONG KONG SECTION OF GUANGZHOU -
SHENZHEN - HONG KONG EXPRESS RAIL LINK

(No. EP-349/2009/E)

Groundwater Monitoring and Contingency Plan

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(Contract 810A – West Kowloon Terminus Station North)

Certified by : 
Position : Environmental Team Leader
Date : 27 APR 2012

**Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link
(Environmental Permit No. EP-349/2009/E)
Condition 2.11 – Groundwater Monitoring and Contingency Action Plan
(Contract No. 810A – West Kowloon Terminus Station North)**

Responses to Comments

<u>No.</u>	<u>Comments</u>	<u>Responses</u>
	I refer to the subject plan submitted in your letter dated 1 March 2012. Please find comments on the plan as below:	
	- The term “utilities” mentioned in the plan should include water mains.	Noted and included in Section 3.1 of the revised plan.
	- The standard monitoring frequency for observation well (“well”?) mentioned in para 3.2(3) should be clarified.	Text has been amended.
	- Utilities Monitoring Points (UMPs) should be installed to monitor the settlement due to the proposed works.	Layout Plans showing the existing instrumentation and monitoring for utilities have been included in Appendix A, please refer to Drawing Nos. 810A/W/WKT/AAT/C06/022, 023 & 024.
	In view of your tight programme of the project, you are reminded to carefully review the comments and the plan to ensure compliance with the relevant Environmental Permit conditions.	

EXPRESS RAIL LINK
CONTRACT 810A – West Kowloon Terminus Station (North)

**Groundwater Monitoring and
Contingency Plan**

Revision 02 - April 2012



MTR/XRL810A West Kowloon Terminus Station (North)

About this document

This document is available for all project employees via the project network. We regularly revise this document and the latest version is always available electronically. Once printed, the document should no longer be considered to be the latest version. It may be distributed to the MTR Corporation (MTR) and/or the Engineer's Representative on the understanding that any such document may not be the latest version or it may be distributed to the MTR and/or the Engineer's Representative as a controlled document in which case the front cover is to be stamped "Controlled Copy" in red and a copy number added.

The Geotechnical Manager (GM) Leader is responsible for updating and maintaining the plan, including the original hard copy, which should be signed by the person in charge of the project to indicate approval.

The status of this plan is identified by a revision number and date on each page. Changes to the document are identified by a vertical single line in the right-hand margin. On revision, the plan will be uploaded as a whole to the project server. Technical Documents Module. The GM maintains a record of the revision status of the plan, which is available on request.

If you have any enquiry relating to this plan, please contact the GM.

Revision History and Plan Approval

Revision	Date	Prepared by:	Checked by	Approved by:	Section/Description
00	6 Jan 12	Judy Chau	E Marley	John McLeod	Initial Issue
01	14 Feb 12	Judy Chau	E Marley	John McLeod	1 st Amendment
02	18 Apr 12	Judy Chau	E Marley	John McLeod	2 nd Amendment

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Appendices

- Appendix A – Instrumentation & Monitoring Drawings (810AW/WKT/AAT/C06/021, 041, 042 and 043)
- Appendix B – Event / Action Plan for Excessive / Insufficient Groundwater Levels.
- Appendix C – Standpipe Monitoring Record Sheet Sample
- Appendix D – Organizational Chart for Groundwater Monitoring

1 Scope of Monitoring of Groundwater and Contingency Plan

Excavation activities invariably result in affect the ground water level. To closely monitor the ground water level throughout the excavation of cofferdam of XRL810A, LGJV is proposing to implement an intensive monitoring regime to control dewatering activities. The plan is also prepared to fulfill the groundwater monitoring requirements stated in PS clause P30.12 – 30.19. Pursuant to Condition 2.11 of Environmental Permit No. EP-349/2009/E, the plan would be deposited to the Environment Protection Department of HKSAR by the Permit Holder.

Ground water level is monitored in accordance with clause G2.7.1 of General Specification and clause 2.12 of the M&W specification (Civil), and controlled by means of recharge wells and pumps as per Clause P13 “Special precautions and Requirements”.

Ground water table monitoring shall be conducted on a weekly basis on site as a precautionary measure against possible impact to the structures, building and features due to the potential groundwater drawdown induced by excavation or dewatering.

2 Trigger and Action Level Definitions

The trigger level is that the groundwater levels shall be maintained with respect to the existing building within a range of +1.0m of an established upper baseline and –1.0m from an established lower baseline. In line with the recommendation made in the EIA Report where its Appendix 11.8 “Hydrogeological Impact Assessment” refers, the level shall be set at -1.5m (action level) and -2.0m (alarm level) from the established lower baseline.

The AAA value for groundwater table (lowest groundwater level) shall be set at +1.3mPD (Alert Level), +0.8mPD (Action Level) and +0.3mPD (Alarm Level).

Please refer to Appendix B for AAA response values and event action plan for excessive/insufficient groundwater level.

3 Monitoring Control of Construction Activities

3.1 General

To ensure that construction activities are controlled and therefore the potential risk of damage to existing buildings and structures is mitigated, it is essential that all monitoring data is reviewed and any instruments that have reached a trigger/ action level or are developing a potentially adverse trend are reported to the Construction Team, Geotechnical Manager, Environmental Team (ET) Leader and MTR. Intense monitoring of the structures and utilities (include gas, water mains, storm drain and sewer, as shown in the drawings 810A/W/WKT/AAT/C06/022, 023, 024) within the zone of influence of excavation / dewatering works, and review of the monitoring data will be used to control excavation activities.

3.2 Monitoring of Observation Wells

The Contractor shall monitor the observation well (PZ5(SP), PZ5(PZ), PX6(SP), PZ6(PZ), P27(SP), P27(PZ), PZ8, PZ9(SP), PZ9(PZ), PZ10, ASP16, SP4 to SP6, SP7A, SP8, SP9, SP11A, SP12 to SP14) as shown in the drawings 810A/W/WKT/AAT/C06/021 (Appendix A). Details are shown on 041,042 and 043 with due regard to the excavation and dewatering process, groundwater level and any other construction constraints.

The monitoring phases are defined as follows:

(1) Baseline Monitoring - monitoring carried out over an initial phase to establish the existing groundwater level prior to commencement. It also allows the natural variations caused by considerable groundwater fluctuation due to seasonal change and specific rainfall events, and repeatability of the monitoring to be established.

(2) Active Monitoring - monitoring during active construction works within 50m of the observation well. Active excavation works that require active monitoring are those that could potentially lead to significant changes in the conditions of the groundwater level, these include dewatering and excavation.

(3) Standard monitoring frequency for observation well shall be carried out by weekly.

4. Groundwater Management and Mitigation Measures

- 4.1 Baseline reference shall be taken from the standpipes located outside and inside the Diaphragm Wall before any excavation of cofferdam.
- 4.2 When groundwater levels fall below or rise above the permitted tolerance range (i.e. 1m above the upper baseline and 1m below the lower baseline), for any of the selected wells, for a period of more than 48 hours (without significant rainfall), then the contractor will, in accordance with the Event / Action Plan (Appendix B), formulate a proposal for, and implement, a course of action to rectify the situation and bring groundwater levels back within range.
- 4.3 In general terms, where groundwater levels are observed to be too low within the selected well(s), additional water can be added through the recharge wells. Where the level is too high, excess groundwater can be pumped out of the ground and discharged into the mains drains.
- 4.4 Groundwater levels will continue to be monitored on a weekly basis for the selected wells during the 'action period' until the levels are within permitted range and then again on a weekly cycle.
- 4.5 Abnormally high or abnormally lower groundwater levels may have an adverse effect on the adjacent existing structure and water mains by inducing either over dewatering or water-logged soil conditions, respectively.
- 4.6 It is expected that the dewatering for the construction of the WKT station may lower water levels locally, and in the short-term only. It is not anticipated that the construction of the WKT station would have a long term effect on groundwater levels as the hydro static pressures within the ground would allow the groundwater to equalise around the new structures.
- 4.7 In general terms, where groundwater levels are observed to be low within the selected wells, additional water can be added through the recharge wells. Where the level is too

high, excess groundwater can be pumped out of the ground and discharge into the mains drains.

- 4.8 Active monitoring frequency for groundwater shall be carried out by daily.
- 4.9 The groundwater monitoring record shall be submitted to Engineer by weekly.

5. Monitoring and Reporting Team

The organization chart and details information please refer to Appendix D.

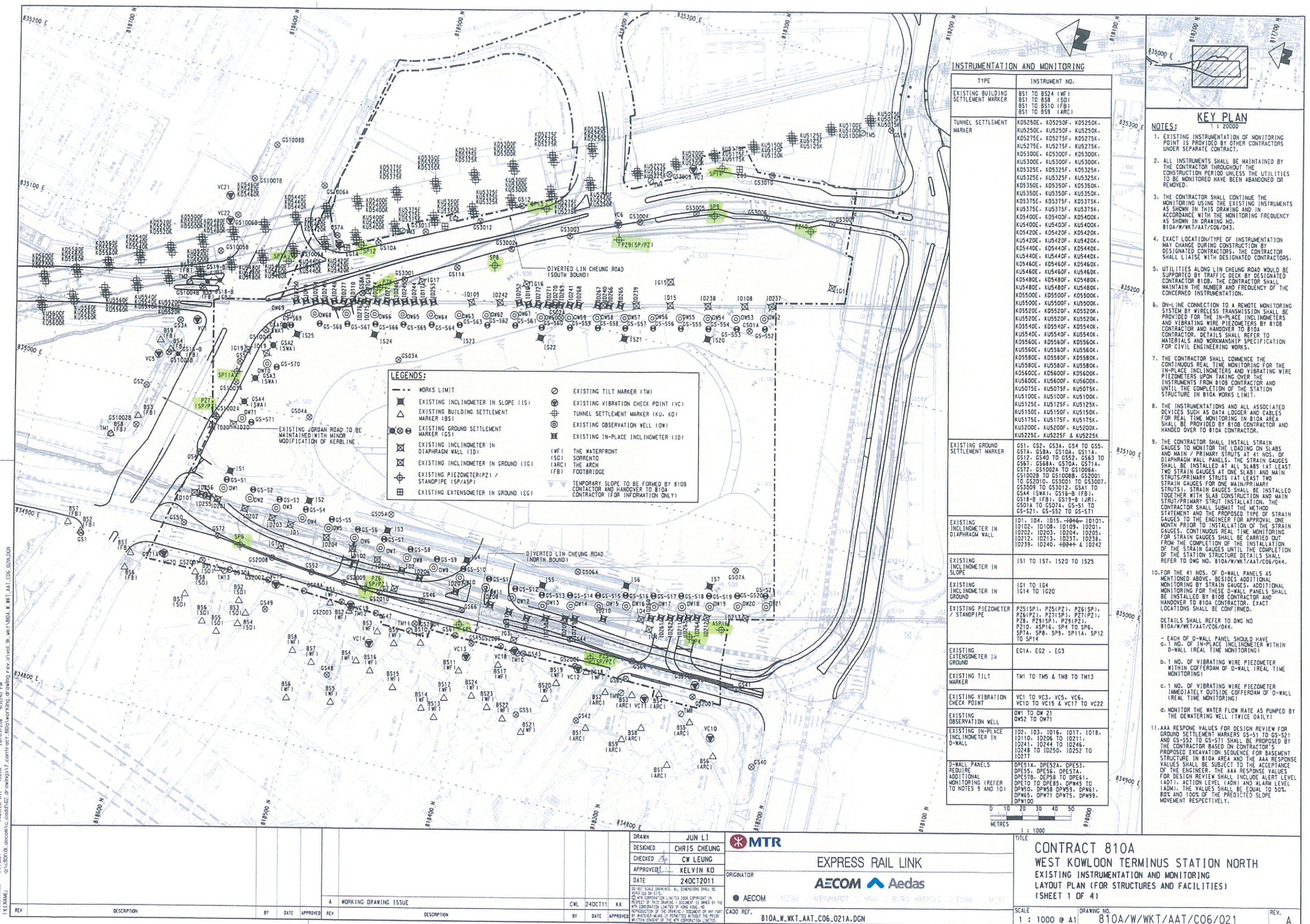


MTR/XRL810A

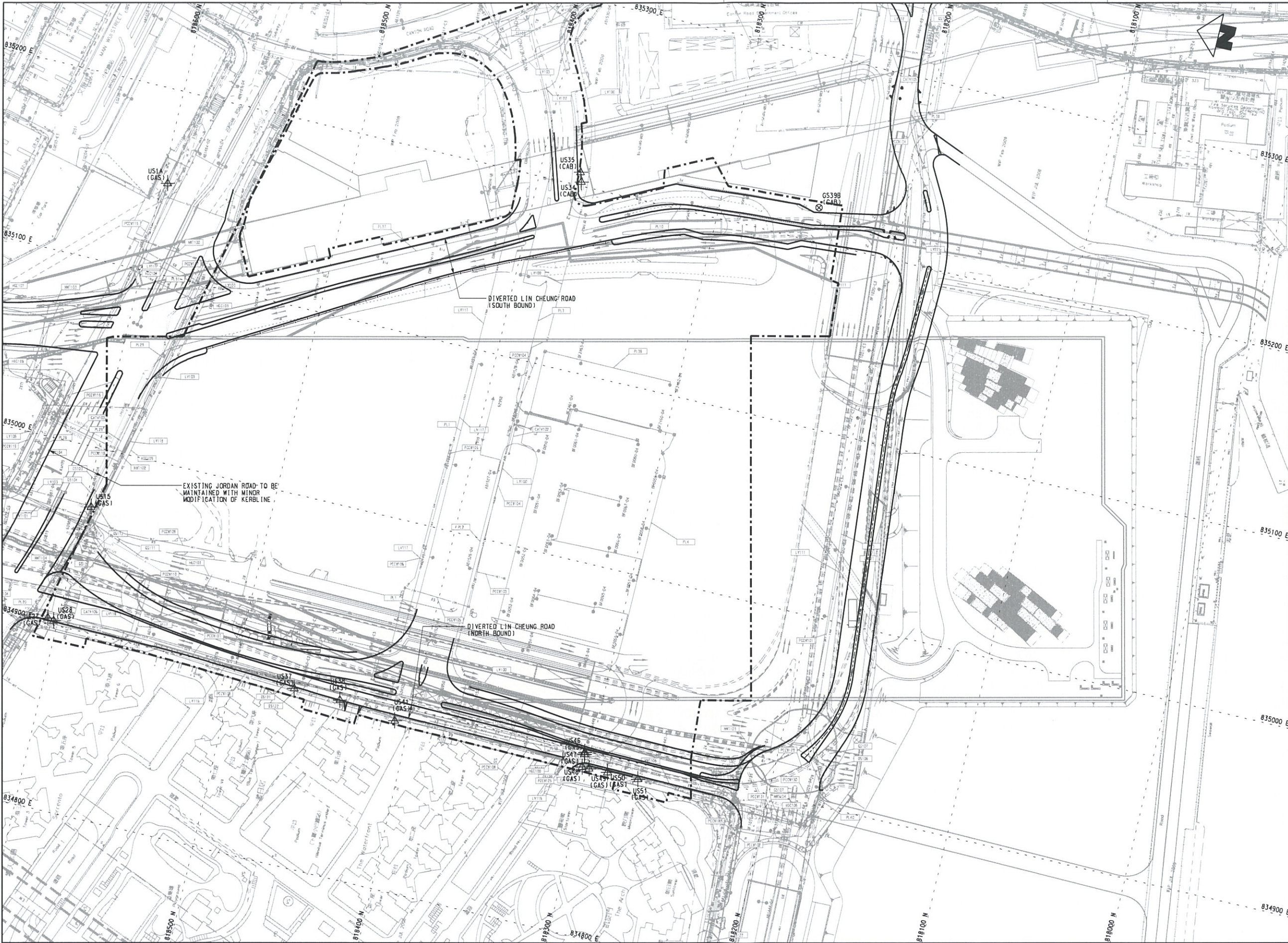
West Kowloon Terminus Station (North)

Appendix A

Instrumentation and Monitoring Drawings
(810A/W/WKT/AAT/C06/021, 022, 023, 024, 041, 042 and 043)



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KEY PLAN

1 : 20000

NOTES:

- EXISTING INSTRUMENTATION OF MONITORING POINT IS PROVIDED BY OTHER CONTRACTORS UNDER SEPARATE CONTRACT.
- ALL INSTRUMENTS SHALL BE MAINTAINED BY THE CONTRACTOR THROUGHOUT THE CONSTRUCTION PERIOD UNLESS THE UTILITIES TO BE MONITORED HAVE BEEN ABANDONED OR REMOVED.
- THE CONTRACTOR SHALL CONTINUE THE MONITORING USING THE EXISTING INSTRUMENTS AS SHOWN IN THIS DRAWING AND IN ACCORDANCE WITH THE MONITORING FREQUENCY AS SHOWN IN DRAWING NO. 810A/W/KT/AAT/C06/043. SHOULD THERE BE DIVERSION OF EXISTING UTILITIES, THE SAME NO. OF MONITORING FREQUENCY SHALL BE PROVIDED.
- EXACT LOCATION/TYPE OF INSTRUMENTATION MAY CHANGE DURING CONSTRUCTION BY DESIGNATED CONTRACTORS. THE CONTRACTOR SHALL LIAISE WITH DESIGNATED CONTRACTORS.
- UTILITIES ALONG L'IN CHEUNG ROAD WOULD BE SUPPORTED BY TRAFFIC DECK BY DESIGNATED CONTRACTOR. THE NUMBER AND FREQUENCY OF THE CONCERNED INSTRUMENTATION SHALL BE MAINTAINED.

LEGENDS:

- WORKS LIMIT
- EXISTING UTILITY SETTLEMENT MARKER (US)
- EXISTING GROUND SETTLEMENT MARKER (GS)
- (GAS) GAS MAIN
- (CAB) ELECTRIC/TELEPHONE CABLE

TYPE	INSTRUMENT NO.
EXISTING UTILITY SETTLEMENT MARKER	US1A, US15, US27 TO US28, US37, US38, US41 & US46 TO US51 (GAS) US34 & US35 (CAB)
EXISTING SETTLEMENT MARKER (GS)	GS39B (CAB)

0 10 20 30 40 50
METRES
1 : 1000

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED
A	WORKING DRAWING ISSUE	CWL	24OCT11	KK					

DRAWN JUN LI

DESIGNED CHRIS CHEUNG

CHECKED CW LEUNG

APPROVED KELVIN KO

DATE 24OCT2011

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

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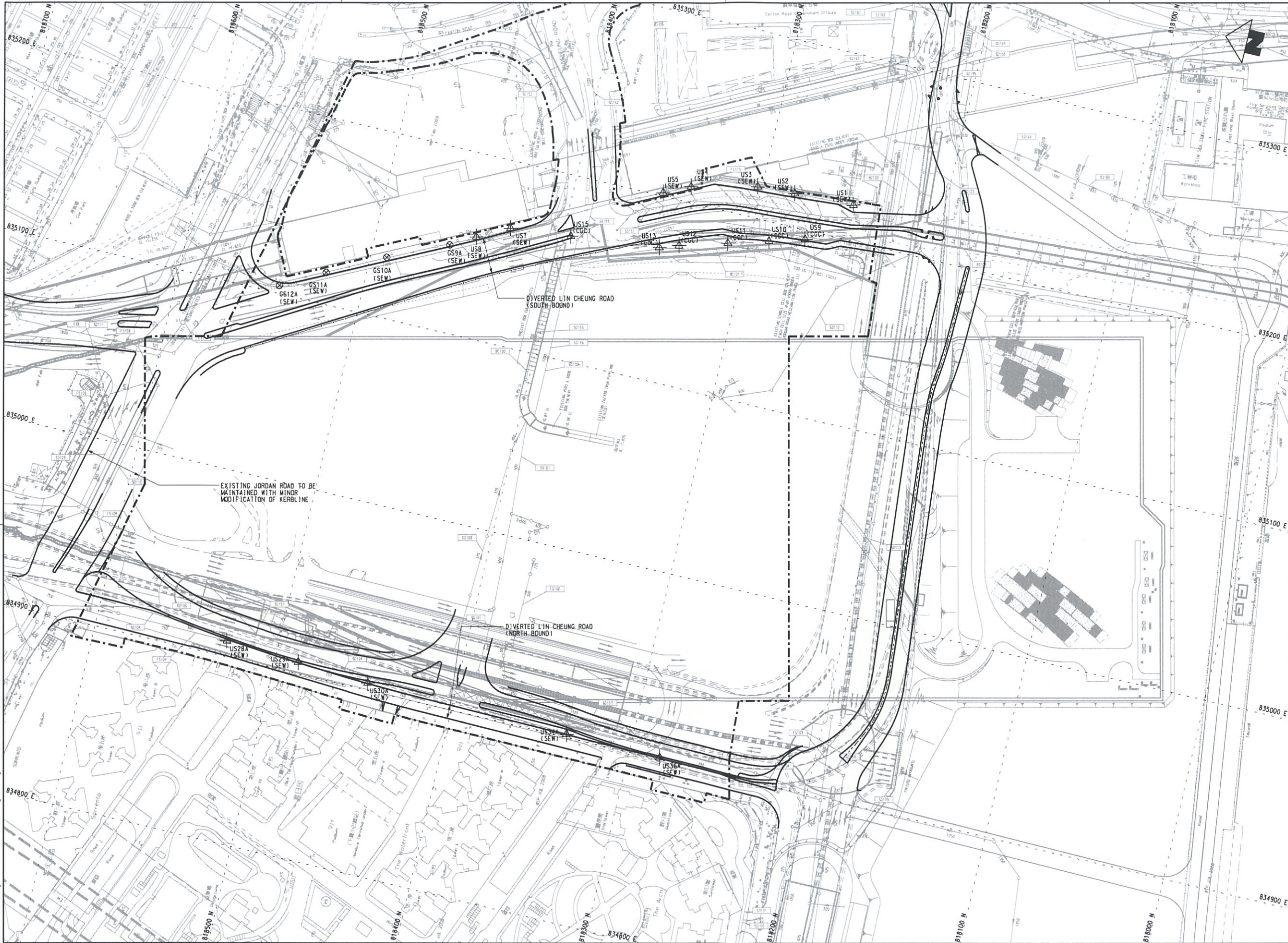
EXPRESS RAIL LINK

ORIGINATOR

CADD REF. 810A_W_KT_AAT_C06_022A.DGN

TITLE	CONTRACT 810A WEST KOWLOON TERMINUS STATION NORTH EXISTING INSTRUMENTATION AND MONITORING LAYOUT PLAN (FOR ELECTRIC/TEL. CABLE AND GAS MAIN) (SHEET 2 OF 4)
SCALE	1 : 1000 @ A1
DRAWING NO.	810A/W/KT/AAT/C06/022
REV.	A

PLOT DRW: G:\C06\00\COMMON\B_SHARED\CADD_ADMIN\02_UTILITY\PILOT_DRAWING\A3.BW_COL_SYSTEM\PLT
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KEY PLAN
1 : 20000

NOTES:

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- ALL INSTRUMENTS SHALL BE MAINTAINED BY THE CONTRACTOR THROUGHOUT THE CONSTRUCTION PERIOD UNLESS THE UTILITIES TO BE MONITORED HAVE BEEN ABANDONED OR REMOVED.
- THE CONTRACTOR SHALL CONTINUE THE MONITORING USING THE EXISTING INSTRUMENTS AS SHOWN IN THIS DRAWING AND IN ACCORDANCE WITH THE MONITORING FREQUENCY AS SHOWN IN DRAWING NO. 810A/W/KT/AAT/C06/043. SHOULD THERE BE DIVERSION OF EXISTING UTILITIES, THE SAME NO. OF MONITORING FREQUENCY SHALL BE PROVIDED.
- EXACT LOCATION/TYPE OF INSTRUMENTATION MAY CHANGE DURING CONSTRUCTION BY DESIGNATED CONTRACTORS. THE CONTRACTOR SHALL LIAISE WITH DESIGNATED CONTRACTORS.
- UTILITIES ALONG LIN CHEUNG ROAD WOULD BE SUPPORTED BY TRAFFIC DECK BY DESIGNATED CONTRACTOR. THE NUMBER AND FREQUENCY OF THE CONCERNED INSTRUMENTATION SHALL BE MAINTAINED.

LEGEND:

--- WORKS LIMIT

⊕ EXISTING UTILITY SETTLEMENT MARKER (US)

⊗ EXISTING GROUND SETTLEMENT MARKER (GS)

(SEW) SEWER
(SWM) STORM DRAIN
(CGC) CULVERT GC

TYPE	INSTRUMENT NO.
EXISTING UTILITY SETTLEMENT MARKER	US1 TO US5, US7 TO US8, US28A TO US30A, US34A, US36A (SEW) US9 TO US13, US15 (CGC)
EXISTING GROUND SETTLEMENT MARKER	GS9A TO GS12A & GS9B TO GS12B (SEW)

0 10 20 30 40 50
METRES
1 : 1000

DRAWN JUN LI		DESIGNED CHRIS CHEUNG		CHECKED CW LEUNG		APPROVED KELVIN KO		DATE 24OCT2011		DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.	
A WORKING DRAWING ISSUE		CWL 24OCT11		KK		BY DATE APPROVED		CADD REF. 810A_W_KT_AAT_C06_024A.DGN		TITLE CONTRACT 810A WEST KOWLOON TERMINUS STATION NORTH EXISTING INSTRUMENTATION AND MONITORING LAYOUT PLAN (FOR STORM DRAIN & SEWER) (SHEET 4 OF 4)	
REV		DESCRIPTION		BY		DATE		APPROVED		SCALE 1 : 1000 @ A1	
REV		DESCRIPTION		BY		DATE		APPROVED		DRAWING NO. 810A/W/KT/AAT/C06/024	

ORIGINATOR EXPRESS RAIL LINK

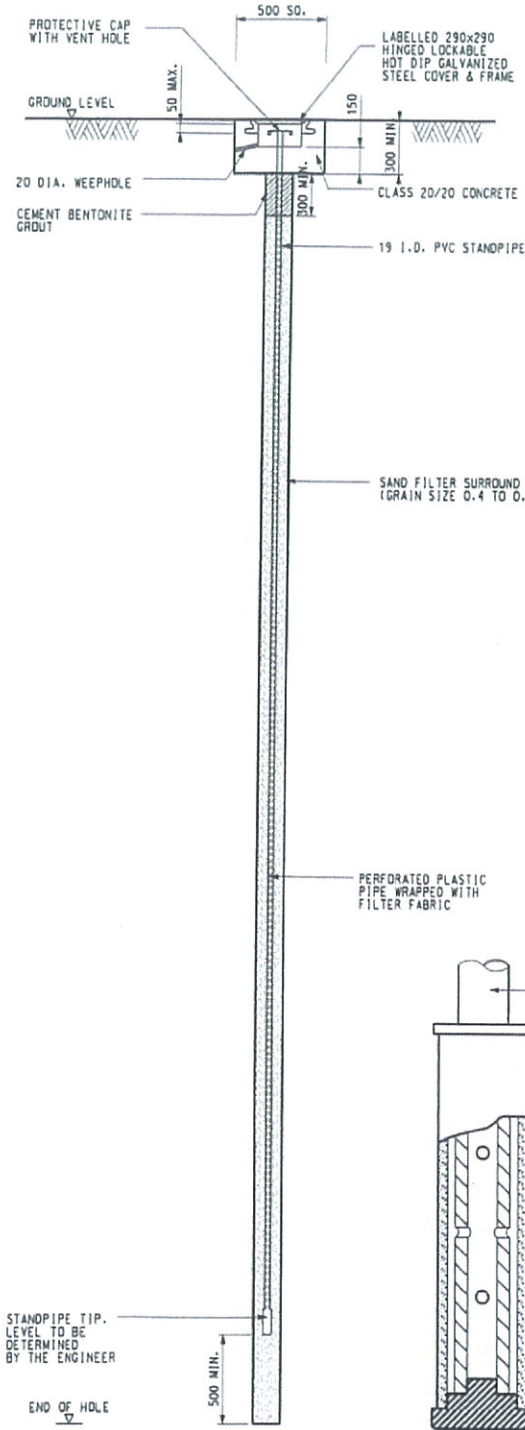
AECOM Aedas

● AECOM ○ AEDAS ○ MEINHARDT ○ MVA ○ BÜRO HAPPOLD ○ EDWARDS ○ MOTT

SCALE 1 : 1000 @ A1

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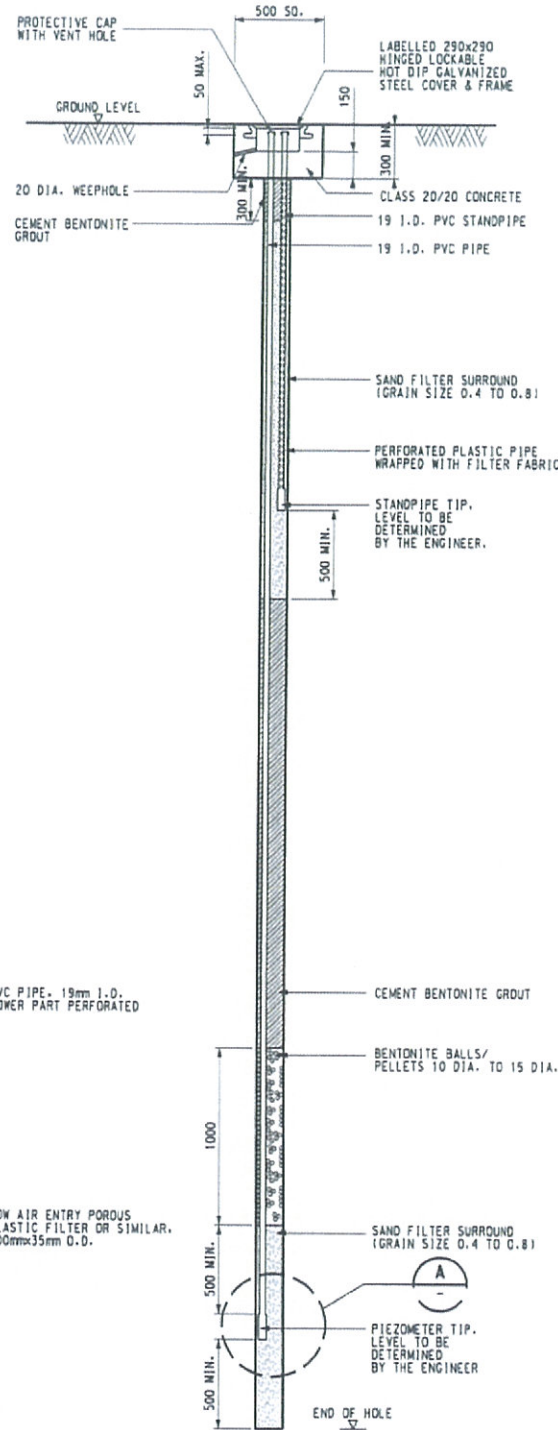
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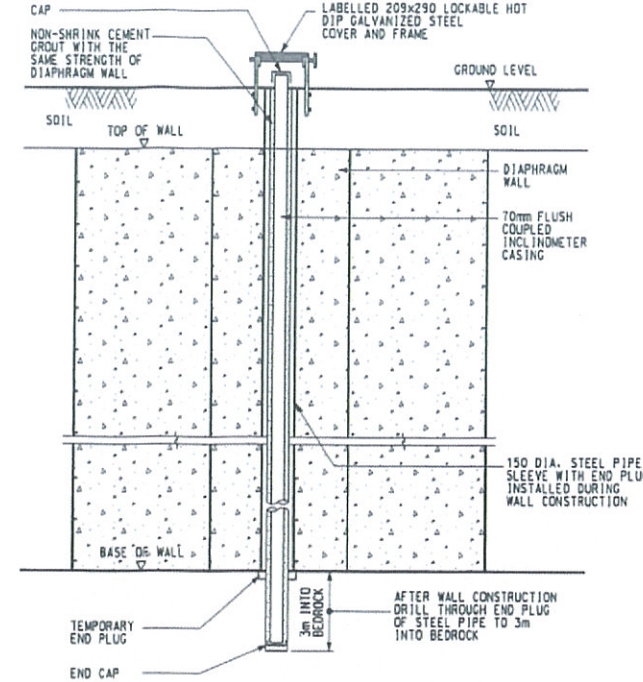
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OPEN-HYDRAULIC PIEZOMETER

DETAIL
SCALE N.T.S.

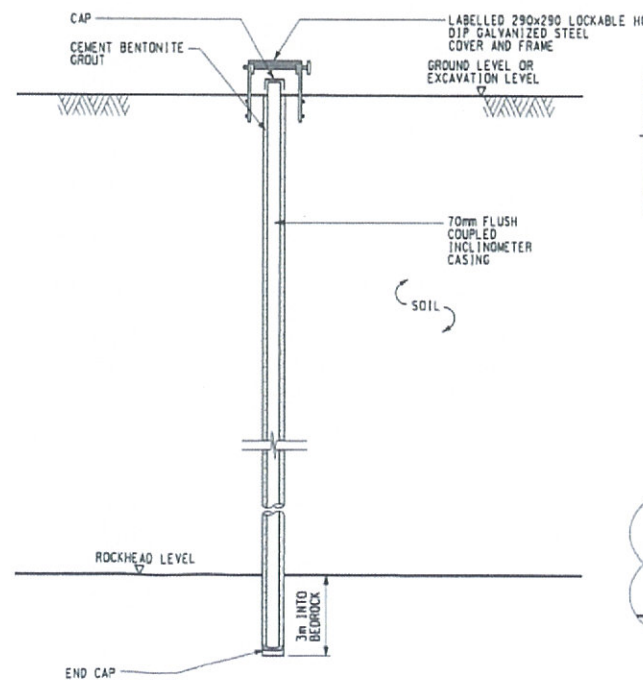
STANDPIPE
N.T.S.



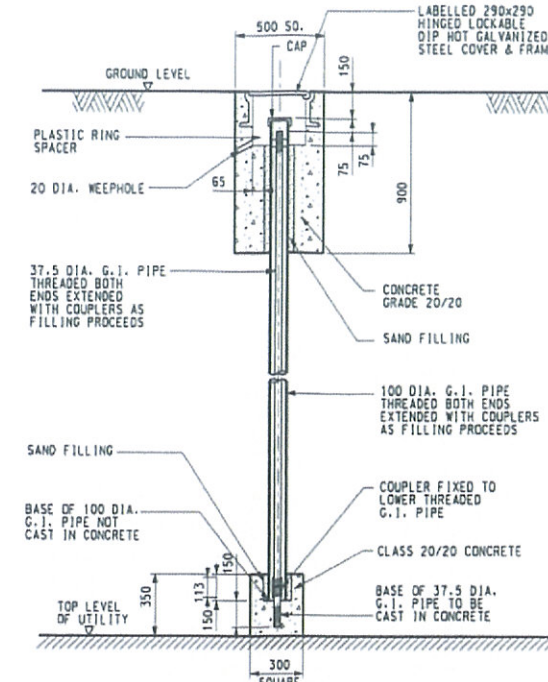
STANDPIPE
AND PIEZOMETER
N.T.S.



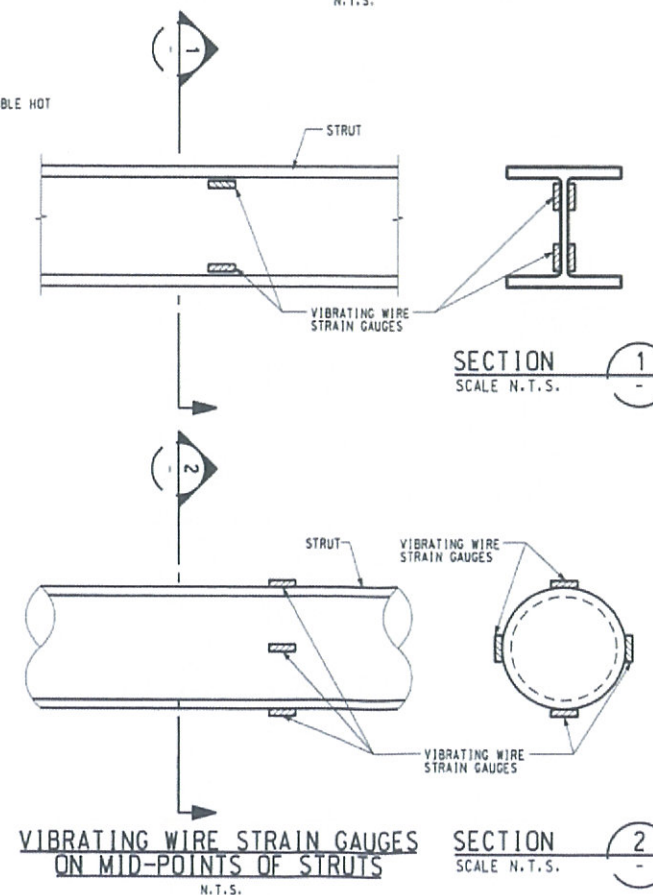
INCLINOMETER IN DIAPHRAGM WALL
(FOR INFORMATION ONLY)
N.T.S.



INCLINOMETER IN GROUND AND SLOPE
N.T.S.



UTILITY SETTLEMENT MARKER
N.T.S.



VIBRATING WIRE STRAIN GAUGES
ON MID-POINTS OF STRUTS
N.T.S.

SECTION 1
SCALE N.T.S.

SECTION 2
SCALE N.T.S.

- NOTES:
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. 810A/W/WKT/AAT/C06/021 TO 024, 032 TO 033.
 - STRAIN GAUGES SHALL BE INSTALLED AT ALL LEVEL OF STRUTS AT EVERY 30m INTERVAL (HORIZONTALLY). STRAIN GAUGES SHALL BE INSTALLED AT THE MID-POINT OF STRUTS.

Q:\380\00 COMMON\03 SHARED\03 ADMIN\02 STATION\01 DRAWINGS\01 COL SYSTEM\01
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APPROVED BY: elvis
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DRAWN JUN 11
DESIGNED CHRIS CHEUNG
CHECKED CW LEUNG
APPROVED KELVIN KO
DATE 24OCT2011



EXPRESS RAIL LINK

AECOM Aedas

ORIGINATOR

● AECOM

CADD REF. 810A_W_WKT_AAT_C06_042A.DGN

TITLE
CONTRACT 810A
WEST KOWLOON TERMINUS STATION NORTH
INSTRUMENTATION AND MONITORING
TYPICAL DETAILS
(SHEET 2 OF 3)

SCALE N.T.S. DRAWING NO. 810A/W/WKT/AAT/C06/042

REV. A

TABLE 1: MONITORING FREQUENCY

INSTRUMENT TYPE	BACKGROUND / STANDARD / ACTIVE MONITORING FREQUENCY		
	BACKGROUND	STANDARD	ACTIVE
GROUND SETTLEMENT MARKER	BI-WEEKLY	WEEKLY	DAILY
BUILDING SETTLEMENT MARKER	BI-WEEKLY	WEEKLY	DAILY
UTILITY SETTLEMENT MARKER	BI-WEEKLY	WEEKLY	DAILY
INCLINOMETER IN DIAPHRAGE WALL	BI-WEEKLY	WEEKLY	TWICE DAILY
INCLINOMETER IN GROUND / INCLINOMETER IN SLOPE	BI-WEEKLY	WEEKLY	TWICE DAILY
EXTENSOMTER IN GROUND	BI-WEEKLY	WEEKLY	DAILY
TILT MARKER	BI-WEEKLY	WEEKLY	DAILY
PIEZOMETER / STANDPIPE	BI-WEEKLY	WEEKLY	DAILY
VIBRATION CHECK POINT	BI-WEEKLY	WEEKLY	DAILY
STRAIN GAUGE	BI-WEEKLY	WEEKLY	DAILY
OBSERVATION WELL	BI-WEEKLY	WEEKLY	TWICE DAILY
TUNNEL SETTLEMENT MARKER (KU, KD)	BI-WEEKLY	BI-WEEKLY	BI-WEEKLY

TABLE 2: AAA RESPONSE VALUES FOR SETTLEMENT , ANGULAR DISTORTION AND VIBRATION

NAME OF BUILDING, STRUCTURE OR UTILITY	AAA RESPONSE VALUES													
	SETTLEMENT			ANGULAR DISTORTION			VIBRATION							
							TRANSIENT VIBRATION				PROLONGED VIBRATION			
			PPVC (mm/s)			AMPLITUDE (mm)	PPVC (mm/s)			AMPLITUDE (mm)				
ALERT (mm)	ACTION (mm)	ALARM (mm)	ALERT	ACTION	ALARM		ALERT	ACTION	ALARM					
AUSTIN STATION & TUNNELS	10	15	20	1:2000	1:1500	1:1000	12	18	25	0.2	8	12	15	0.2
BOX CULVERT GC / JR	10	15	20	1:1500	1:1000	1:500	12	18	25	0.2	12	18	25	0.2
UTILITIES (GAS, ELECTRICITY, DRAINS & SEWER, TELEPHONE)	10	20	25	1:1500	1:1000	1:500	12	18	25	0.2	12	18	25	0.2
UTILITIES (WATER MAIN)	8	12	15	1:2000	1:1500	1:1000	12	18	25	0.2	12	18	25	0.2
GROUND	12	18	25	-	-	-	-	-	-	-	-	-	-	-
KOWLOON STATION DEVELOPMENT - SORRENTO	8	12	15	1:2000	1:1500	1:1000	12	18	25	0.2	8	12	15	0.2
KOWLOON STATION DEVELOPMENT - THE WATERFRONT	8	12	15	1:2000	1:1500	1:1000	12	18	25	0.2	8	12	15	0.2
KOWLOON STATION DEVELOPMENT - THE ARCH	8	12	15	1:2000	1:1500	1:1000	12	18	25	0.2	8	12	15	0.2
FOOTBRIDGE FB14	8	12	15	1:2000	1:1500	1:1000	12	18	25	0.2	8	12	15	0.2
UTILITIES (GAS MAIN GOVERNOR, HIGH VOLTAGE CABLE JOINT)	10	20	25	1:1500	1:1000	1:500	12	18	25	0.2	6	10	13	0.2

TABLE 3: AAA RESPONSE VALUES FOR GROUNDWATER TABLE (LOWEST GROUNDWATER LEVEL)

PIEZOMETER / STANDPIPE NO.	ALERT (mPD)	ACTION (mPD)	ALARM (mPD)
ALL PIEZOMETERS / STANDPIPES	+1.3	+0.8	+0.3

REMARKS : THESE AAA VALUES ON GWT WILL BE FURTHER REVIEWED UPON THE LATEST GWT MONITORING RECORDS.

TABLE 4: INSTRUMENTATION PROVISIONAL INSTALLATION LEVEL

INSTRUMENT NO.	PROVISIONAL INSTALLATION LEVEL (mPD)
PZ5(PZ)	-30
PZ5(SP)	-30
PZ6(PZ)	-22
PZ6(SP)	-22
PZ7(PZ)	-17
PZ7(SP)	-17
PZ8	-12
PZ9(PZ)	-26.5
PZ9(SP)	-26.5
PZ10	-10
SP4	-20
SP5	-4
SP6	-4
SP7A	-5
SP8	-4
SP9	-20
SP11A	-10
SP12	-10
SP13	-10
SP14	-10
ASP16	-10
EG1A	-30
EG2	-17
EG3	-23
ID1	-24.0
ID4	-39.8
ID15	-47.9
~~ID16~~	~~-24.0~~
ID19	-27.0
ID20	-29.0
ID101	-26.5
ID102	-26.0
ID108	-48.1
ID109	-19.7
ID201	-25.8
ID202	-25.2
ID203	-24.5
ID204	-25.5
ID205	-24.8
ID212	-48.7
ID213	-52.5
ID237	-43.2
ID238	-45.4
ID239	-48.8
ID240	-45.8
~~ID241~~	~~-38.6~~
ID242	-21.6
IG1	-25.5
IG2	-28
IG3	-27.5
IG4	-40
IG14	-21
IG15	-33
IG16	-35.5
IG17	-15
IG18	-21
IG19	-28
IG20	-23

INSTRUMENT NO.	PROVISIONAL INSTALLATION LEVEL (mPD)
IS1, IS2	-23
IS3	-18
IS4	-28
IS5 & IS6	-33
IS7	-48
IS20	-43
IS21	-38
IS22	-28
IS23	-21
IS24 & IS25	-28

TABLE 5: PROVISIONAL INSTALLATION LEVEL FOR IN-PLACE INCLINOMETER

INSTRUMENT TYPE & NO	PROVISIONAL INSTALLATION LEVEL (mPD)	INSTRUMENT TYPE & NO	PROVISIONAL INSTALLATION LEVEL (mPD)
ID2	-25.9	ID260	-38.12
ID3	-29.0	ID261	-39.38
ID16	-27.52	ID262	-40.24
ID17	-23.04	ID263	-47.9
ID18	-24.29	ID264	-47.8
ID110	-23.18	ID265	-44.84
ID206	-27.24	ID266	-44.67
ID207	-27.82	ID267	-44.67
ID208	-27.3	ID268	-42.17
ID209	-38.01	ID269	-40.69
ID210	-36.39	ID270	-37.56
ID211	-44.1	ID271	-38.05
~~ID243~~	~~-21.65~~	ID272	-37.29
ID241	-39.41	ID273	-21.58
ID244	-22.65	ID274	-20
ID245	-23.38	ID275	-17.2
ID246	-22.96	ID276	-17.69
~~ID247~~	~~-25.5~~	ID277	-23.97
ID248	-23.96		
ID249	-24.49		
ID250	-25.79		
~~ID251~~	~~-25.5~~		
ID252	-23.76		
ID253	-24.45		
ID254	-25.54		
ID255	-23.44		
ID256	-22.82		
ID257	-31.14		
ID258	-36.57		
ID259	-38.05		

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. 810A/W/WKT/AAT/C06/021 TO 024, 032 TO 033.
2. LEVELS SHOWN IN THIS TABLE ARE DESIGNED LEVELS. EXISTING INSTALLATION LEVELS MAY BE VARIED SUBJECTED TO ACTUAL INSTALLATION WORKS CARRIED OUT BY OTHERS.
3. INSTALLATION LEVEL OF OBSERVATION WELLS AND VIBRATING WIRE PIEZOMETERS SHALL BE -28.0mPD.

PLOT DRG: G:\CROINVO\COMMON\B_SHARED\CAUD_DOWN\02_USTATION\PILOT_DIVER\A3.BW.COL_SYSTEM\PILOT
MODEL NAME: PRINTED BY: ebel 26/09/2018 4:56:01PM
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REVISION	DESCRIPTION	BY	DATE	APPROVED	REVISION	DESCRIPTION	BY	DATE	APPROVED
A	WORKING DRAWING ISSUE								

DRAWN	JUN LI		EXPRESS RAIL LINK	TITLE	CONTRACT 810A WEST KOWLOON TERMINUS STATION NORTH INSTRUMENTATION AND MONITORING TYPICAL DETAILS (SHEET 3 OF 3)	
DESIGNED	CHRIS CHEUNG					
CHECKED	CW LEUNG					
APPROVED	KELVIN KO					
DATE	24OCT2011	ORIGINATOR	AECOM Aedas	SCALE	DRAWING NO.	
DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE. © MTR CORPORATION LIMITED 2008. COPYRIGHT IN RESPECT OF THIS DRAWING / DOCUMENT IS OWNED BY THE MTR CORPORATION LIMITED OF HONG KONG. NO REPRODUCTION OF THE DRAWING / DOCUMENT OR ANY PART BY WHATEVER MEANS IS PERMITTED WITHOUT THE PRIOR WRITTEN CONSENT OF THE MTR CORPORATION LIMITED.		● AECOM ● AEDAS ● MEIN-HARDT ● MVA ● BUREAU HAPPOLD ● EDWARDS ● MOTT		810A.W.WKT.AAT.C06.043A.DGN	N.T.S.	810A/W/WKT/AAT/C06/043

Appendix B – Event / Action Plan for Excessive / Insufficient Groundwater Levels

	Event	Geotechnical Engineer	MTR	Geotechnical Manager (GM)	Contractor
	Groundwater level at the selected monitoring wells is observed to be outside the permitted range.	- Notify the MTR. - Carry out investigation and repeat monitoring of the well to clarify the result. - Report results of the investigation to the MTR and direct contractor to formulate remedial action. - Increase monitoring frequency to check mitigation measures	- Review and analyse results informed by GM. - Review the proposed remedial actions by the contractor. - Supervise the implementation of the remedial actions		- Reduce and recharge - Suspend the recharge until groundwater falls back within the permitted tolerance range
Trigger Level	(a) Alert level more than 1.0m above upper baseline level	Check against recorded rainfall i. if no significant rainfall (>10mm) has been recorded in previous 48 hours, then (a1) ii. if significant rainfall (>10mm) has been recorded in previous 48 hours then continue to monitor until levels fall or rainfall stops then (a2)			(a1) Excess groundwater to be pumped out of the ground and discharged into the mains drains. Daily monitoring until groundwater levels return to within tolerances (a2) No Action
	(b) Action level more than 1.5m below lower baseline level	Continue to monitor, if i. groundwater level rises again to within tolerance range within 48 hours, then (b1) ii. groundwater level does not rise again to within tolerance range within 48 hours, then (b2)			(b1) No Action (b2) Additional water to be added through the recharge wells. Daily monitoring until groundwater levels return to within tolerances

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	(c) Alarm level more than 2.0m below lower baseline level	Continue to monitor, if i. groundwater level rises again to within tolerance range within 48 hours, then (b1) ii. groundwater level does not rise again to within tolerance range within 48 hours, then (b2)			(c1) No Action (c2) Increase groundwater recharge rate. Increase the monitoring frequency of ground, water mains and building settlement markers in the adjacent areas. Daily monitoring until groundwater levels return to within tolerances. Implement the remedial proposals the works until the groundwater level rises to within tolerance range.
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	Event	Environmental Manager	MTR	MTR's ET leader	Contractor
EIA Action Level	(c) more than 2.0m below lower baseline level	Notify the MTR's ET Leader.		- Carry out investigation and repeat monitoring of the well to clarify the result. - Record the investigation results and satisfactory remedial action implementation on the contemporaneous log-book.	- Action per (a1), (a2), (b1), (b2), (c1) and (c2) as above. - Submit the respective remedial mitigation proposal to MTR's ET Leader.

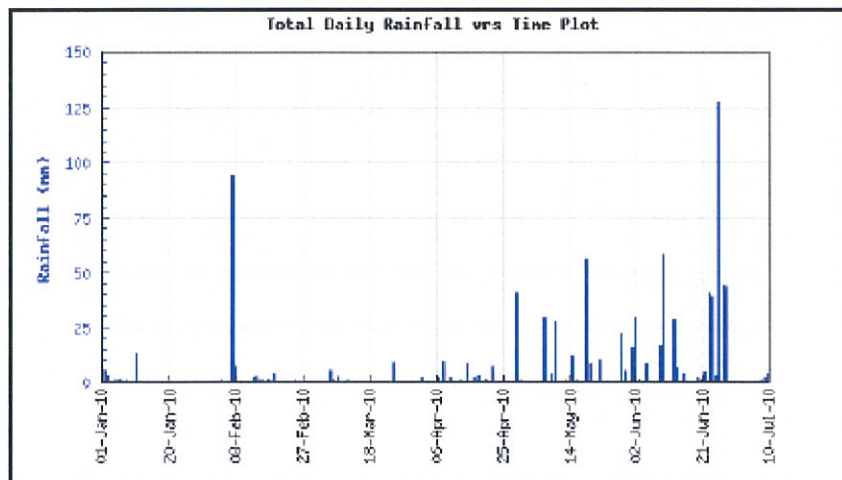
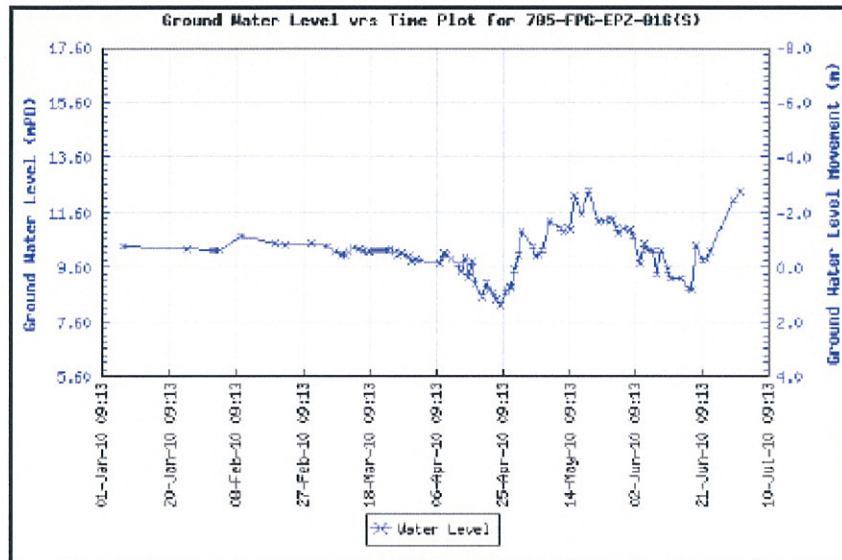
Appendix C – Standpipe Monitoring Record Sheet Sample



MTR Corporation
C705 (GCL J3295)
KET Station and Overrun Tunnel

STANDPIPE MONITORING RECORD SHEET

Instrument ID : 705-FPG-EPZ-016(S) Type : Stand Pipe
Easting : 831167.090 Northing : 815784.850 Initial Level : 12.660 mPD
Location : Forbes Street Playground
Remark : GI reference 1024/WILD/0297(S)



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West Kowloon Terminus Station (North)



MTR Corporation
C705 (GCL J3295)
KET Station and Overrun Tunnel

STANDPIPE MONITORING RECORD SHEET

Instrument ID : 705-FPG-EPZ-016(S) Type : Stand Pipe
Easting : 831167.090 Northing : 815784.850 Initial Level : 12.660 mPD
Location : Forbes Street Playground
Remark : GI reference 1024/WILD297(S)

Reading Date	Reading (m)	Offset (m)	Water Level (mPD)	Drawdown From Last (m)	Drawdown From Base (m)	Remarks
2009-05-22	3.06	-	9.60	-	0.00	Base reading
2010-01-07	2.30	0.00	10.36	-0.76	-0.76	
2010-01-25	2.41	0.00	10.25	0.11	-0.65	
2010-02-01	2.44	0.00	10.22	0.03	-0.62	
2010-02-02	2.45	0.00	10.21	0.01	-0.61	
2010-02-03	2.45	0.00	10.21	0.00	-0.61	
2010-02-09	1.96	0.00	10.70	-0.49	-1.10	
2010-02-19	2.22	0.00	10.44	0.26	-0.84	
2010-02-22	2.24	0.00	10.42	0.02	-0.82	
2010-03-01	2.23	0.00	10.43	-0.01	-0.83	
2010-03-08	2.31	0.00	10.35	0.08	-0.75	
2010-03-08	2.49	0.00	10.17	0.18	-0.57	
2010-03-10	2.63	0.00	10.03	0.14	-0.43	
2010-03-11	2.60	0.00	10.06	-0.03	-0.46	
2010-03-12	2.51	0.00	10.15	-0.09	-0.55	
2010-03-13	2.35	0.00	10.31	-0.16	-0.71	
2010-03-15	2.42	0.00	10.24	0.07	-0.64	
2010-03-16	2.47	0.00	10.19	0.05	-0.59	
2010-03-17	2.51	0.00	10.15	0.04	-0.55	
2010-03-18	2.49	0.00	10.17	-0.02	-0.57	
2010-03-19	2.47	0.00	10.19	-0.02	-0.59	
2010-03-20	2.45	0.00	10.21	-0.02	-0.61	
2010-03-22	2.47	0.00	10.19	0.02	-0.59	
2010-03-23	2.48	0.00	10.18	0.01	-0.58	
2010-03-24	2.43	0.00	10.23	-0.05	-0.63	
2010-03-25	2.49	0.00	10.17	0.06	-0.57	
2010-03-26	2.62	0.00	10.04	0.13	-0.44	
2010-03-27	2.59	0.00	10.07	-0.03	-0.47	
2010-03-29	2.68	0.00	9.98	0.09	-0.38	
2010-03-30	2.86	0.00	9.80	0.18	-0.20	
2010-03-31	2.78	0.00	9.88	-0.08	-0.28	
2010-04-01	2.81	0.00	9.85	0.03	-0.25	
2010-04-07	2.94	0.00	9.72	0.13	-0.12	
2010-04-08	2.57	0.00	10.09	-0.37	-0.49	
2010-04-09	2.64	0.00	10.02	0.07	-0.42	
2010-04-10	2.76	0.00	9.90	0.12	-0.30	
2010-04-12	2.98	0.00	9.68	0.22	-0.08	
2010-04-13	3.24	0.00	9.42	0.26	0.18	
2010-04-14	2.71	0.00	9.95	-0.53	-0.35	
2010-04-15	3.43	0.00	9.23	0.72	0.37	
2010-04-16	2.85	0.00	9.81	-0.58	-0.21	
2010-04-17	3.68	0.00	8.98	0.83	0.62	
2010-04-19	4.15	0.00	8.51	0.47	1.09	HB Alert(1.00m)
2010-04-20	3.63	0.00	9.03	-0.52	0.57	
2010-04-21	3.89	0.00	8.77	0.26	0.83	

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West Kowloon Terminus Station (North)



MTR Corporation
C705 (GCL J3295)
KET Station and Overrun Tunnel

STANDPIPE MONITORING RECORD SHEET

Instrument ID : 705-FPG-EPZ-016(S) Type : Stand Pipe
Easting : 831167.090 Northing : 815784.850 Initial Level : 12.660 mPD
Location : Forbes Street Playground
Remark : GI reference 1024/WIL/D297(S)

Reading Date	Reading (m)	Offset (m)	Water Level (mPD)	Drawdown From Last (m)	Drawdown From Base (m)	Remarks
2010-04-22	4.02	0.00	8.84	0.13	0.98	
2010-04-23	4.26	0.00	8.40	0.24	1.20	HB Alert(1.00m)
2010-04-24	4.48	0.00	8.18	0.22	1.42	HB Alert(1.00m)
2010-04-26	4.01	0.00	8.85	-0.47	0.95	
2010-04-26	3.89	0.00	8.77	-0.12	0.83	
2010-04-27	3.77	0.00	8.89	-0.12	0.71	
2010-04-27	3.78	0.00	8.88	0.01	0.72	
2010-04-28	3.18	0.00	9.48	-0.60	0.12	
2010-04-29	2.64	0.00	10.02	-0.54	-0.42	
2010-04-30	1.77	0.00	10.89	-0.87	-1.29	
2010-05-03	2.32	0.00	10.34	0.55	-0.74	
2010-05-04	2.67	0.00	9.99	0.35	-0.39	
2010-05-05	2.61	0.00	10.05	-0.06	-0.45	
2010-05-06	2.47	0.00	10.19	-0.14	-0.59	
2010-05-08	1.37	0.00	11.29	-1.10	-1.69	
2010-05-11	1.65	0.00	11.01	0.28	-1.41	
2010-05-12	1.81	0.00	10.85	0.16	-1.25	
2010-05-13	1.59	0.00	11.07	-0.22	-1.47	
2010-05-14	1.71	0.00	10.95	0.12	-1.35	
2010-05-15	0.48	0.00	12.18	-1.23	-2.68	LB Action(-2.40m)
2010-05-17	1.13	0.00	11.53	0.65	-1.93	LB Alert(-1.90m)
2010-05-19	0.28	0.00	12.38	-0.85	-2.78	LB Action(-2.40m)
2010-05-22	1.40	0.00	11.26	1.12	-1.66	
2010-05-24	1.37	0.00	11.29	-0.03	-1.69	
2010-05-25	1.29	0.00	11.37	-0.08	-1.77	
2010-05-26	1.35	0.00	11.31	0.06	-1.71	
2010-05-27	1.65	0.00	11.01	0.30	-1.41	
2010-05-28	1.86	0.00	10.80	0.21	-1.20	
2010-05-29	1.67	0.00	10.99	-0.19	-1.39	
2010-05-31	1.72	0.00	10.94	0.05	-1.34	
2010-06-01	1.96	0.00	10.70	0.24	-1.10	
2010-06-03	2.94	0.00	9.72	0.98	-0.12	
2010-06-04	2.23	0.00	10.43	-0.71	-0.83	
2010-06-05	2.44	0.00	10.22	0.21	-0.62	
2010-06-07	2.46	0.00	10.20	0.02	-0.60	
2010-06-08	3.34	0.00	9.32	0.88	0.28	
2010-06-09	2.47	0.00	10.19	-0.87	-0.59	
2010-06-11	3.16	0.00	9.50	0.69	0.10	
2010-06-12	3.46	0.00	9.20	0.30	0.40	
2010-06-15	3.51	0.00	9.15	0.05	0.45	
2010-06-17	3.84	0.00	8.82	0.33	0.78	
2010-06-18	3.90	0.00	8.76	0.06	0.84	
2010-06-19	2.25	0.00	10.41	-1.65	-0.81	
2010-06-21	2.83	0.00	9.83	0.58	-0.23	
2010-06-22	2.76	0.00	9.90	-0.07	-0.30	

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West Kowloon Terminus Station (North)



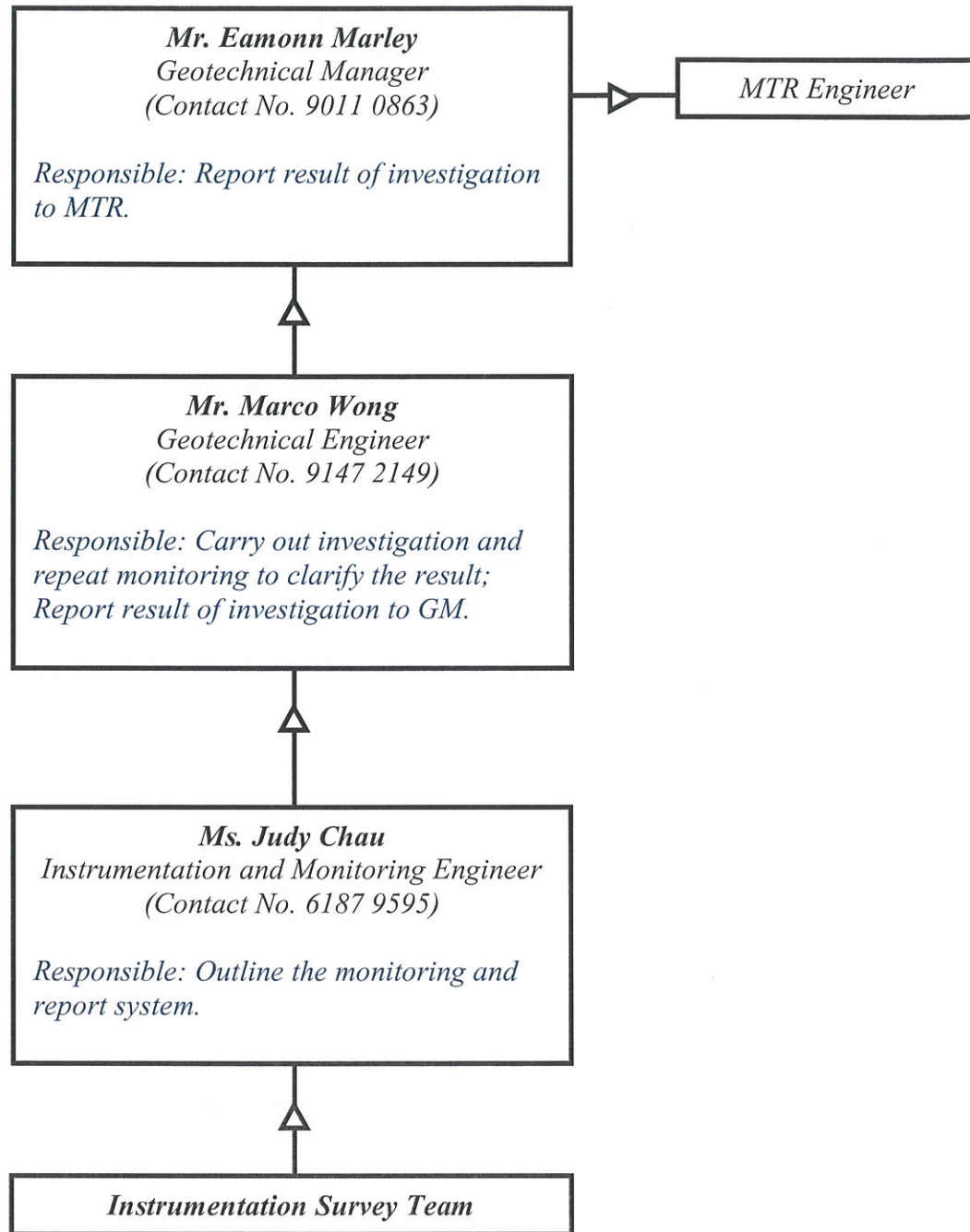
MTR Corporation
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Easting : 831167.090 Northing : 815784.850 Initial Level : 12.660 mPD
Location : Forbes Street Playground
Remark : G1 reference 1024/WIL/D297(S)

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Appendix D – Organizational Chart for the Groundwater Monitoring



Remark:  Communication link for co-ordination during the level exceedance and unforeseeable incidents.