KOWLOON SOUTHERN LINK
Contractor's Submission Form

Contract: KDB200 - West Kowloon Station and Tunnels, Jordan Road to East Tsim Sha Tsui Station

To: Engineer's Representative-Mr. Tom Keenan

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Title of Submission: Environmental Monitoring and Audit Groundwater Monitoring Working Plan

Submission Ref. No. KDB200/CSF/ENV/000152/H

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Please find attached the revised Environmental Monitoring and Audit Groundwater Monitoring Working Plan and response to EPD's comment for your review and onward submission to EPD.

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[X] **For Review** [ ] **For Information** [ ] **For Record Purposes**

From: Contractor's Representative
Name: Mr. Greg Jacques Signature:
Title: Project Director
Date: 23-May-2007

Link 200 Joint Venture
Balfour Beatty Kumagai John Holland

Remarks:

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KCRC KOWLOON SOUTHERN LINK

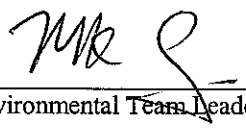
CONTRACT KDB200

ENVIRONMENTAL MONITORING AND AUDIT

GROUNDWATER MONITORING

WORKING PLAN

MAY 2007

Certified By :	M.K. Cheung
Signed :	
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Contract KDB200 – Kowloon Southern Link

Environmental Monitoring and Audit

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1 INTRODUCTION

Based on the Environmental Impact Assessment (EIA) report for the Kowloon Southern Link, the following findings were reported with regard to the groundwater tested (for the sampling points under the KDB200 Contract):

(i) Exceedances in cadmium and mercury over the TM-Water limits for locations KSD100/DHEPZ052 (Fire Station in Canton Road) and KSD100/DHE053 (West Kowloon Reclamation);

(ii) Occasional exceedances in copper, lead and mercury over the Dutch C Levels for locations KSD100/DHEPZ052, KSD100/DHE053 and KSD100/DHE063 (industrial activities west Canton Road).

(iii) No exceedance in Risk Based Screening Levels (to assess impact on health of construction workers) for all samples tested; remedial action of groundwater not considered necessary.

According to the requirements of the EIA Report and its subsequent Environmental Permit and Link 200 JV's Further Environmental Permit, and its pursuant Environmental Monitoring and Audit (EM&A) Manual under the KDB200 Contract, a Working Plan for the monitoring and treatment of groundwater (if groundwater quality levels are found to be above the ambient levels as defined by the Limit Levels during the dewatering process) from the dewatering processes shall be submitted to EPD for agreement.

The purpose of this Working Plan is to update groundwater quality information in the related works areas that have not been sampled before. As such, the proposed groundwater sampling points have been selected to be more focused at areas with potential groundwater intrusion during construction and close to the contaminated sites previously identified in section 8.4.1.6 of the EIA report (refer to **Appendix D**). Additionally, discussions were also provided for the proposed monitoring parameters, collection methods, and proposed mitigation measures (including number of treatment facilities, use of individual treatment facilities and their capacities).

This Working Plan sets forth the proposed procedures for baseline and impact monitoring of the groundwater for KDB200 Contract, as well as the respective well locations, and contains the following sections:

Section 2: Background Information - relating to groundwater, with selected relevant sections extracted from the EIA report;

Section 3: Baseline Monitoring – including monitoring parameters, collection methods, proposed monitoring locations and baseline results

Section 4: Impact Monitoring – including monitoring parameters, procedures, proposed well locations and proposed mitigation measures (including number of treatment facilities, use of individual treatment facilities and their capacities).

Section 5: Conclusion

The groundwater monitoring of KDB300&400 would be detailed in a separate Working Plan (to be submitted by others and not under this Contract).

2 BACKGROUND INFORMATION

The following sections are extracted from the EIA report with reference to information specific to groundwater pollution and monitoring.

"8.4 Construction Water Quality Impact

The site will be maintained by good site practices and there will be no direct discharge of wastewater into the Victoria Harbour during the construction phase. Hence, quantitative water quality dispersion modelling is considered not necessary. Other water quality issues relevant to the construction phase are described in the following sections.

8.4.1.5 Groundwater Seepage

The WKN and the tunnels from WKN to NAC will be constructed by cut and cover using D-wall technique (see Chapter 4). This construction methodology can minimise the intrusion of groundwater during excavation. D-wall technique involves excavation of a narrow trench that is kept full of slurry, which exerts hydraulic pressure against the trench walls and acts as a shoring to prevent collapse. Slurry trench excavations can be performed in all types of soil, even below the ground water table.

The construction usually begins with the excavation of discontinuous primary panels of typically up to 6m long and down to the rockhead. In order to provide an effective cut-off to ground water flow, the walls will need to be toe grouted. Once the excavation of a panel is completed, a steel reinforcement cage will be placed in the centre of the panel. Concrete is then poured in one continuous operation. Once the primary panels are set, secondary panels will be constructed between the primary panels and the process then repeats to create a continuous wall. It should be noted that this slurry trench method will reduce the gap between the panels to the practicable minimum. After this, soil excavation will be commenced. The intrusion of groundwater through D-wall panels during soil excavation is therefore considered insignificant.

For the tunnels to the south of WKN, bored tunnelling will be adopted along Canton Road, except for some locations (e.g. TBM launching / construction access shaft, CRPB, tunnel section along Salisbury Road, etc as described in Chapter 4) which will be constructed by cut-&-cover. Ground treatment (e.g. grouting) will be carried out along Canton Road prior to bored tunnelling. The intrusion of groundwater during bored tunnelling would therefore be insignificant.

***8.4.1.6** Groundwater from Contaminated Area*

Potential land contamination areas are identified in the vicinity of the study area including the TST Fire Station, the former shipyard sites within the West Kowloon Reclamation, Canton Road Government Office, Tai Kok Tsui petrol filling station at Skyway House and the factory building at Shum Mong Road.

Site investigations were conducted between Oct 2002 and Feb 2003. Ground water table was found at about 1-2m below the ground level. The locations of the collected groundwater samples are shown in Figure 8-2. Some of the water samples show certain degree of contamination as described in the following sections.

(a) Groundwater Analytical Results

Table 8-3 shows the measurement results for the groundwater samples taken from 5 drillholes. Heavy metals (including Cd, Cr, Cu, Ni, Pb, Zn, Hg, As, Ba, Co, Mo and Sn), BTEX, cyanide, PAH, Total Petroleum Hydrocarbon (TPH) and dioxin were tested.

Estimation indicates that the amount of groundwater generated during dewatering will be around 580m^3 per day, which is corresponding to the flow band of 400 – 600m^3 / day listed in the TM-Water.

Table 8-3 : *Comparison between contaminants and TM-Water effluent discharge criteria*

Parameters	Maximum Concentration[1] (mg/L) (unless specified)					TM-Water Effluent limit for inshore waters of VHWCZ (mg/L)	Reporting Limit (μg/L)[5]
	KSD100/DHE063	KSD100/DHEPZ052	KSD100/DHEPZ113	KSD100/DHE053	KSD100/DHE120[3]	400 – 600 m³ / day	
pH	7.89	8	7.4	7.2	7.7	6-9	
Temperature ℃	22.4	20.4	19.1	19.8	26.9	< 40℃	20 –25
TPH C6 – C9	<0.020	<0.020	<0.020	<0.020	<0.020	---	
TPH C10–C14	<0.050	<0.050	<0.050	<0.050	<0.050	---	
TPH C15 – C28	0.115	<0.1	0.13	<0.1	0.11	---	
TPH C29 – C36	<0.050	<0.050	<0.050	<0.050	0.321	---	
Dioxin (pg/L)	0.04	---	---	---	0.019	---	10 pgL
Cd	< 0.0002	**0.0013**	0.0005	<0.0002	0.0005	0.001	
Cr	0.006	0.043	0.051	0.0071	0.0043	0.7	
Cu	0.4	0.230	0.330	0.340	0.055	0.7	
Ni	0.0035	0.023	0.027	0.0057	0.0081	0.7	
Pb	0.013	0.210	0.210	0.0051	0.061	0.7	
Zn	0.130	0.270	0.29	0.053	0.037	0.7	
Hg	< 0.0005	0.0016	**0.0029**	**0.0025**	<0.0005	0.001	
As	<0.010	0.021	0.015	<0.010	<0.010	0.7	
Ba	0.130	0.35	0.35	0.110	0.120	2.7	
Co	0.0045	0.016	0.017	0.0048	<0.001	---	
Mo	0.015	0.019	0.017	0.026	0.0079	---	
Sn	0.0053	0.124	0.074	0.0074	0.011	---	
Total Cyanide (μg/L)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---	
PAH[8] (μg/L)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	0.1 – 1 (Low molecular weight) 0.02 – 0.1 (High molecular weight)

Parameters	Maximum Concentration[1] (mg/L) (unless specified)					TM-Water Effluent limit for inshore waters of VHWCZ (mg/L)	Reporting Limit (μg/L)[5]
	KSD100/DHE063	KSD100/DHEPZ052	KSD100/DHEPZ113	KSD100/DHE053	KSD100/DHE120[3]	400 – 600 m³ / day	
Benzene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	1
Ethylbenzene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	
Toluene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	
Meta- & Para Xylene (μg/L)	< 4	< 4	< 4	< 4	< 4	---	
Ortho Xylene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	

Note *[1]: Bolded letters indicate exceedance in discharge limits at flow band of 400 –600m³ /day.*

[2]: KSD100/DHEPZ052: Fire Station in Canton Road;
KSD100/DHE053: West Kowloon Reclamation (replaced adjacent drillhole KSD100/DHE056); KSD100/DHEPZ113: Petrol station in Skyway House;
KSD100/DHE120: Former shipyard site in West Kowloon Reclamation Area; KSD100/DHE063: industrial activities west Canton Road

[3]:There will be no groundwater discharge from DHE120 as there will only be at-grade rail works

[4]: ProPECC Note 3/94: Contaminated Land Assessment and Remediation

[5]: According to TM-Water, the chemicals concentration for TPH, dioxin, BTEX and PAH should be below the Reporting limit. Discharges of PCB, PAHs, petroleum oil, pesticide and toxicant into foul sewers, inland waters and coastal waters are prohibited. As the presence of these chemicals is not known at this stage, the groundwater cannot be discharged to the stormwater or foul sewer directly.

It can be seen from the above table that the maximum temperature of the samples are less than 40℃ and the pH of the samples are in the range of 6-9, which comply with the standards stipulated in TM-Water. In addition, the concentration of Cr, Ni, As, Cu, Pb, Zn, and Ba are well below the TM-Water limits. However, exceedances in heavy metals (Cd and Hg) contents are observed at locations KSD100 / DHEPZ052 (Fire Station in Canton Road), KSD100 / DHE053 (West Kowloon Reclamation), and KSD100/DHEPZ113 (Petrol station in Skyhouse).

(b) Impact on health of construction workers

The Dutch ABC Values for groundwater are based on the use of groundwater for potable supply. As this is rarely the case in Hong Kong, the Dutch B Values are not necessarily appropriate for assessing the requirement of groundwater remediation, particularly within urban areas where there may be numerous diffuse sources of historical contamination within the vicinity. Hence, the Dutch C values are used for assessment.

When comparing the groundwater with the Dutch levels, 4 groundwater samples exceed the Dutch C Levels. The analytical results exceeding the Dutch C Levels are given in Table 8-4.

Table 8-4 : *Summary of groundwater samples exceeding Dutch C Level*

Drillhole reference	Depth (mbgl)	Contaminant	Concentration (µg/L)	Dutch C Limit (µg/L)
KSD100/DHEPZ052	8.0m	Copper Lead	230 210	200 200
KSD100/DHE053[1]	6.5m	Copper Mercury	340 2.5	200 2
KSD100/DHE063	3.0m	Copper	400	200
KSD100/DHEPZ113	6.5m	Copper Lead Mercury	330 210 2.9	200 200 2

Notes:

[1] According to the record for Drillhole KSD100/DHE056 (see Figure 2 of Appendix 10-2), there is distributed marine deposit starting from approximately 5.8m deep. The on-site Contamination Specialist decided to take soil samples at 0.5, 1 and 3m deep. This drillhole was backfilled after sampling. However, the amount of groundwater collected before backfilling of the borehole was found to be insufficient for the required analytical testing. As such, groundwater was collected at an adjacent Drillhole KSD100/DHE053 (835327m easting and 818111m northing) as determined by the on-site Contamination Specialist.

The groundwater analytical results indicate occasionally elevated concentrations over the Dutch C level of metals including copper, lead and mercury. Such results are not considered unusual for groundwater in urban areas, where there are numerous potential diffuse sources of contamination. Free product was not observed in any of the samples or drillholes.

The impact of groundwater on the health of construction workers is based on the Dutch C Value as a screening tool, followed by a risk assessment approach where elevated concentrations of contaminants are present. The assessment methodology is given in the Contamination Assessment Report in Appendix 10-2. Table 8-5 below summarizes the Risk Based Screening Levels (RBSL) for each contaminant. Specific values for the sources of reference for individual factors are given in Appendix 10-2.

Table 8-5 : Risk Based Screening Levels for selected contaminants in groundwater

Contaminants	THQ	Risk	RfD_o	SF_o	BW	AT_n	AT_c	IR	ED	EF	RBSL ($\mu g/L$)
Copper	1	--	0.005	--	60	5	--	0.02	5	312	17500
Lead	--	0.0004	--	0.28	60	--	70	0.02	5	312	70200
Mercury	1	--	0.0001	--	60	5	--	0.02	5	312	351

Note [1]: THQ-Taget Hazard Quotient for chemical
Risk- Taget excess individual lifetime cancer risk
RfD_o-Chronic Oral Reference dose
SF_o- Carcinogenic slope factor
BW-Body Weight
AT_n-Averaging time for non-carcinogens
AT_c-Averaging time for carcinogens
IR-Water Ingestion Rate
ED-Exposure Duration
EF-Exposure Frequency
RBSL-Risk-Based Screening Level for Groundwater

Although the contamination of groundwater exceeds Dutch C level, none of the samples exceed the calculated RBSL for construction workers. Hence, remedial action of groundwater is not considered necessary.

8.4.2.4 Groundwater from Contaminated Areas

Direct discharge of groundwater is not adopted. Contaminated groundwater from dewatering process should be recharged back into the ground at the discharged wells in the stockpile areas or temporary work areas as shown in Figure 8-3. The groundwater recharging wells will be selected at places where the groundwater quality will not be affected by the recharge operation as indicated in Section 2.3 of the TM-Water.

The Contractor shall perform ambient measurements on the groundwater quality at the WKN and the cut-&-cover tunnel to the north of WKN with reference to ProPECC PN3/94 "Contaminated Land Assessment and Remediation", prior to the selection of the recharge wells; and submit a working plan to EPD for agreement. The measurement data of the groundwater will serve as the baseline and the pollutant levels of the groundwater to be recharged shall be measured and not be higher than the baseline measurement at the recharge well.

Apart from the mitigation measures mentioned in S8.4.2.1 and S8.4.2.2, the following additional mitigation measures are proposed to minimize the release of contaminants:

- *Free products shall be removed by installing the petrol interceptor prior to recharge;*
- *Groundwater monitoring wells will be installed to monitor the effectiveness of the recharge wells. The locations of the monitoring wells will be near to the recharge points. During the recharge period, the groundwater level at the monitoring well shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary. Details of groundwater monitoring are given in the EM&A Manual.*

In addition, before excavation, the Contractor shall update the extent of potential groundwater contamination by collecting more groundwater samples along the alignment. The effluent limits and reporting limits are shown in Table 8-3. The Contractor should apply for a discharge licence under the WPCO through the Local Control Office of EPD for groundwater recharge operation.

3 BASELINE MONITORING

3.1 General

The requirements set forth in the EM&A Manual stated that:

- "Prior to construction, ambient ground water quality measurements will be conducted for the WKN and the cut-&-cover tunnel to the north of WKN. The parameters and the associated reporting limits/TM-Water limits as shown in **Table 3-1** should be adopted. Groundwater sampling will be undertaken daily for 7 days. Where the concentrations of parameters exceed the relevant limits, the groundwater should be recharged within the site (during the dewatering process).

- The locations of the recharge wells shall be determined on the basis that the pollutant levels of the groundwater to be recharged shall not be higher than the baseline at the recharge well. Monitoring wells shall be selected near to the recharge points and at site boundaries. A control well shall also be selected within the site.

- A working plan shall be submitted to EPD for agreement prior to selection of the recharge wells.

- A limit level shall be developed based on the ambient water quality measurements."

3.2 Monitoring Parameters

Per the EIA requirements, the chemical testing of groundwater should be carried out to update the groundwater quality. Following the principle adopted for land contamination of the EIA study, confirmatory testing for groundwater should only include chemical parameters that have previously been identified in the approved EIA Report. It has been noted that there was no land usage of the site area since the EIA study. Potential contamination activities at the site area have not been observed or reported.

The characteristics of groundwater identified in the EIA Report are summarized below:

- EIA sampling points KSD100/DHE052 and KSD100/DHE053
Cadmium (Cd) and mercury (Hg) levels exceeded the TM-Water Effluent discharge limits, whilst TPH results were not conclusive.

- EIA sampling points KSD100/DHE063
Cadmium (Cd) and mercury (Hg) levels exceeded the TM-Water Effluent discharge limits, whilst TPH results were not conclusive (It should be noted that the TM-Water does not provide effluent discharge limits for TPH).

Types of contamination recorded at all three sampling points confirmed that the characteristics of groundwater along the alignment was consistent. This justified the proposed testing for identified parameters to update the groundwater quality within the site areas.

The testing parameters and reporting limits are shown in **Table 3-1** (with reference to the Table 8-3 of the approved EIA report). Testing will be undertaken by a HOKLAS

accredited laboratory with individual HOKLAS accredited methods. The reference methods are shown in **Appendix A**. The groundwater levels shall also be recorded.

Table 3.1 Groundwater Testing Parameters and Reporting Limits

Parameters	Reporting Limit (µg/L)
TPH C10 – C14	25
TPH C15 – C28	25
TPH C29 – C36	25
Cd	1
Cu	1
Hg	0.5

Note:
[1]: The effluent limits for inshore waters apply to the discharge of uncontaminated groundwater to storm drain only.

3.3 Collection of Samples

Groundwater samples at each monitoring location have been collected using either a Telfon bailer (disposable) or a PVC bailer (which will be decontaminated using non-phosphate detergent). The groundwater samples were transferred to clearly labelled and pre-cleaned sample containers with necessary preservatives immediately after collection. Sufficient quantity of samples has been collected for all laboratory analyses. After collection, the groundwater samples were stored at 0-4°C and delivered to the laboratory within 24 hours under proper chain-of-custody system. There was zero headspace when sampling for volatile chemicals.

3.4 Baseline Monitoring Locations

As required in the Environmental Mitigation Implementation Schedule (Appendix to the EIA and the EM&A Manual) and in EIA Reference S.8.4.2.4, the groundwater samples should be taken at the West Kowloon Station, and to the north of the station in the cut and cover section. Furthermore, the groundwater quality will be defined along the alignment, along with a control station.

As stated in the EIA Report Section 8.4.1.5, diaphragm walls would be constructed either side of excavation along the alignment and would prevent migration of groundwater. Therefore, sampling locations would concentrate within the alignment. No excavation would be carried out outside either side of the diaphragm walls.

As shown in the Figure in **Appendix B**, previous groundwater results are currently available for three locations within the KDB200 project, namely KSD100/DHE052, KSD100/DHE053 and KSD100/DHE063, in which KSD100/DHE052 and KSD100/DHE053 were located around the launching shaft. To supplement the groundwater condition at TBM launching shaft, an additional sampling point (S1) in launching shaft which relates to DHE052 and DHE053 has been proposed. The testing parameters focused on cadmium, mercury and copper which were found to exceed or be close to the discharge limit in the EIA, as well as TPH (C10-C14, C15-C28 and C29-C36) which were not conclusive in the EIA report.

Similarly, for sampling points S2 and S3 (close to DHE063), cadmium, mercury, copper and TPH C10-C14, C15-C28 and C29-C36 were tested.

Moreover, to address the purpose of the Working Plan as mentioned in Section 1, more sampling points have been proposed to update the groundwater quality

information in the related works areas that have not been sampled before. On this basis the following locations were considered for groundwater sampling, testing and defining the baseline (see **Appendix B**):

- 1 no. control point near the site boundary to determine the current site conditions and to act as a control if and when any recharging commences – Point C. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36).

- 2 locations within the launching shaft area, adjacent to the previous locations of DHE52 and DHE53 in the EIA Report – Point S1 and S1a. Monitoring parameters included Cd, Hg and Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of this sampling point was to determine the groundwater quality within the area (Area 1) as shown in Appendix B.

- 2 locations in WKN (inside station), on either side of the previous location DHE063 in the EIA Report – Points S2 & S3. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of these sampling points was to determine the groundwater quality within Area 2 as shown in Appendix B.

- 1 location in the cut and cover section North of WKN (inside station) – Point S4. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of this sampling point was to determine the groundwater quality within Area 3 as shown in Appendix B.

- Baseline data was also undertaken at the recharge wells, Point R, R1, R2a, R2b and R3, as shown in **Appendix B**. These recharge wells have been chosen on the basis that contaminated soil was previously found at point KSD100/DHE063, and therefore, deemed appropriate to locate the recharging well as close as possible to this location. In addition, three monitoring wells M1, M2 & M3 were also proposed as shown in **Appendix B**. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36).

It has been considered that the purpose of the Groundwater Monitoring Plan has been fulfilled by taking cognisance of the previous EIA results in combination with the additional sampling points provided above.

3.5 Baseline Monitoring Programme

Sampling at well points S1 – 4, S1a, M1 – 3, C, R, R1, R2a, R2b and R3 was carried out for seven consecutive days.

3.6 Reporting

3.6.1 Collection of Samples

Ambient monitoring has been conducted at Point S1, S1a, S2, S3, S4, C, R, R1, R2a, R2b, R3, M1, M2 and M3 for seven consecutive days (between February and May 2006, and August 2006).

Groundwater samples at these monitoring locations were collected using a PVC bailer. The groundwater samples were transferred to clearly labelled and pre-cleaned

sample containers for immediate delivery to the laboratory within 24 hours under proper chain-of-custody system.

Table 3-2 summarises the range of ambient results for each monitoring point and the detailed results are shown in **Appendix E.**

Table 3.2 Ambient Results for Groundwater Monitoring

Monitoring Point	Coordinates	Water Level (range in mbgl)	Cd (range in µg/L)	Cu (range in µg/L)	Hg (range in µg/L)	TPH C10-14 (range in µg/L)	TPH C15-28 (range in µg/L)	TPH C29-36 (range in µg/L)
S1	835317, 818134	3 – 3.2	<1	1-2	<0.5	<25	<25 - 50	<25
S1a	835316, 818168	3.1 – 3.2	<1	1-2	<0.5	<25	<25 - 92	<25 - 34
S2	835273, 818236	2 – 2.4	<1	<1 -25	<0.5	<25	78 - 433	<25 - 277
S3	835243, 818296	1.1 – 1.7	<1	2 - 27	<0.5	<25 - 62	75 - 403	<25 - 316
S4	835140, 818513	1.2 – 1.7	<1	<1 - 3	<0.5	26 - 60	129 – 461	<25 – 857
C	835201, 818009	1.4 – 2.7	<1	<1 - 10	<0.5	<25	75 - 201	44 – 227
R	835240, 818240	1.2 – 2.7	<1	<1 - 2	<0.5	<25 - 60	86 - 237	25 – 120
R1	835289, 818180	2.4 – 2.8	<1	1-2	<0.5	<25 - 45	26 - 927	<25 - 423
R2a	835219, 818316	2.7 – 2.9	<1	<1-2	<0.5	<25 - 32	56 - 304	<25 - 201
R2b	835215, 818321	3.1 – 3.2	<1	1-2	<0.5	38 - 1440	237 - 8840	42 - 304
R3	835158, 818434	3.1 – 3.2	<1	<1-2	<0.5	25 - 1970	204 - 13200	40 - 706
M1	835194, 818192	2.4 – 2.5	<1	1 - 2	<0.5	<25	81 - 129	48 - 94
M2	835118, 818282	2.4 – 2.9	<1	<1 -1	<0.5	<25	107 - 252	28 – 115
M3	835139, 818422	3.3 – 3.6	<1	<1-2	<0.5	<25 - 50	44 - 504	<25 - 194

Note:
*mbgl denotes for meter below ground level
The above ambient results show the range between the minimum and maximum values obtained in the seven consecutive days monitoring periods.

3.6.2 *Groundwater Quality for Area 1*

As discussed, previous groundwater results (EIA) are currently available for three locations within the KDB200 project, namely KSD100/DHE052, KSD100/DHE053 and KSD100/DHE063, in which KSD100/DHE052 and KSD100/DHE053 were located around the launching shaft. To supplement the information on groundwater conditions at the TBM launching shaft, additional sampling points (S1 & S1a) in the launching shaft which relates to DHE052 and DHE053 was proposed to update groundwater quality for Area 1 (see **Appendix B**). The testing parameters focused on cadmium, mercury and copper as well as TPH which either exceeded or were close to the discharge limit or were inconclusive in the EIA.

The results for the testing of the samples collected at Point S1 & S1a (presented in **Appendix E**) show that all the monitoring parameters including Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36) are below or equal to the detection limits, and also comply with the TM-water effluent discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were also compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 μg/L}, Hg {2 μg/L}, Cu {200 μg/L}).

3.6.3 Groundwater Quality for Area 2

The results for the testing of the samples collected at Point S2 (presented in **Appendix E**) show no exceedances in TM-Water discharge limits. Similarly, for Point S3, there are no exceedances in TM-Water discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 μg/L}, Hg {2 μg/L}, Cu {200 μg/L}).

3.6.4 Groundwater Quality for Area 3

The results for the testing of the samples collected at Point S4 (presented in **Appendix E**) show no exceedances in TM-Water discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were also compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 μg/L}, Hg {2 μg/L}, Cu {200 μg/L}).

4 IMPACT MONITORING

4.1 Monitoring Parameters

The following parameters should be monitored during the re-charging of groundwater:

- water level at the monitoring wells and recharge wells;
- water quality (parameters would follow those for baseline monitoring) at the monitoring wells and control well, and
- water quality (parameters would include TPH (C10-C14, C15-C28 and C29-C36)) of the recharging groundwater.

4.2 Monitoring Procedure

The groundwater samples shall be collected following the procedure mentioned in *Section 3.3*. During the re-charging of groundwater, water level should be monitored on a daily basis, while water quality should be measured on a weekly basis to ensure that the water levels at the site boundary and the pollution levels will not increase significantly, and to ensure that there is no transfer of pollutants beyond the site boundary.

4.3 Suggestion for Well Locations

Control Well Locations

As stated in the EM&A Manual Reference S.5.6.3, a control well is required within the site. No guidance is given on the location. However, using the principle that the control station should not be directly influenced by the works, it is reasonable to suggest this well be located near the site boundary of KDB200 as shown in **Appendix B.**

As shown in **Appendix E**, the maximum values reported for TPH (C10-C14, C15-C28 and C29-C36) are <25 μg/L, 201 μg/L and 227 μg/L, respectively.

Recharge Well Locations

Contaminated groundwater from the dewatering processes will be recharged back into the ground via a series of recharge wells. The recharge wells are required to be located at places where the groundwater quality will not be affected by the recharge operation. In order to fulfill the requirements of the EIA and the EM&A Manual, a series of measurements will be taken at various key locations to determine groundwater quality, prior to the selection of the recharge wells. The data collected will serve as the baseline of the groundwater to be recharged. As mentioned previously in S3.4, the prevailing site conditions and work programme will also prevail in determining the locations.

Based on the existing results from the previous EIA report, recharge wells, Point R, R1, R2a and R2b been proposed as shown in **Appendix B**. The recharge wells at Point R, R2a and R2b have been chosen on the basis that contaminated soil was previously found near point KSD100/DHE063, and therefore it is deemed appropriate to locate the recharge wells as close as possible to this location. The other recharge well R1 chosen to facilitate localised recharge operation near Area 1. Based on the baseline monitoring results in **Appendix E**, the maximum values reported for TPH (C10-C14, C15-C28 and C29-C36) are 1970 μg/L, 13,200 μg/L and 706 μg/L, respectively.

After the conducting of baseline monitoring at R3, it was discovered the option of utilizing this recharge well was not viable. The baseline data for R3 is presented in this working plan nevertheless.

Monitoring Well Locations

Groundwater monitoring wells will be installed to monitor the effectiveness of the recharge wells. The EIA Report and EM&A Manual state these should be located close to the recharge wells and at the site boundary. Works would dictate the practicability of the final locations. During the recharge period, the groundwater and the quality of groundwater at the monitoring wells shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary.

For the proposed recharge well, two monitoring wells, (Point M1 and M2) has been proposed and shown in **Appendix B**, with their respective baseline parameters reported in **Appendix E**.

4.4 Mitigation Measures

The associated limit levels – baseline levels are tabulated in **Table 4-1**. The amount of groundwater generated from the station area during dewatering will be up to 617m^3/day. The EIA has previously established that if groundwater is found to be uncontaminated, it could be subject to pretreatment via a sediment tank to remove excess silt and subsequently be discharged to the public drainage system. If disposed in this manner, the effluent limits shall be made reference to the limits for inshore waters of Victoria Harbour WCZ.

However, for the purposes of this Working Plan and based on the results obtained for the baseline samples in **Appendix E**, groundwater abstracted as part of the dewatering works will be required to be recharged within the site. For the groundwater from the KDB200 site, a comparison of the water quality results in **Appendix E** indicates that there are significant variances in the TPH readings (over the 7 sampling days), while no exceedances of the Dutch C and TM-Water discharge limits for heavy metals have been observed.

Baseline results have shown that trace levels of TPH have been observed, with variances in the daily readings as mentioned above and are not restricted or focussed in specific areas. It is suspected that these low levels of TPH, which are entirely consistent with expected background urban groundwater quality, may be caused by the presence of potential diffusing source(s) within the Tsim Sha Tsui/Jordan areas. Background information indicates a similar profile in variability of TPH in other parts of the site.

In line with the requirement of the EIA, the basis of employing treatment facilities will depend on the values of the baseline at the extraction wells and recharge wells. If any baseline values at the extraction wells exceed the proposed limit levels at the recharge well, it is conceded that the extracted groundwater will be subject to the appropriate treatment prior to recharging. Using the same principal, if the baseline values at the extraction wells do not exceed the proposed limit levels at the recharge well, then no treatment facilities will be provided. Based on the results of the baseline samples reported in **Appendix E**, groundwater from S1 and S1a will not require any treatment when recharged into R1. Groundwater from S2, S3 and S4 will be subjected to treatment, i.e., silt removal and carbon filters, prior to being recharged into recharge wells, Point R, R2a or R2b. A carbon filter will be placed in line with the recharge wells, Points R, R2a and R2b, so all recharge water will be subjected to treatment even though it may not be required based on the aforesaid principal. In accordance with the EIA report, the groundwater recharging wells will be selected at places where the groundwater quality will not be affected by the recharge operation. Therefore points R, R1, R2a and R2b are selected. As no "free products" were observed in the test results of the collected samples, no petrol interceptor is proposed. For the dewatering rate from the station area as mentioned above, one (1) unit of the activated carbon filter treatment system shall be provided, with a capacity of 40 cubic metre per hour. Specifications for this treatment unit are provided in **Appendix C**. A summary of the recharge wells, monitoring wells and control wells in each excavation area are shown in **Table 4-2**.

The Contractor's handling of groundwater during the dewatering and subsequent recharge will not introduce any additional chemical contamination into the groundwater. In case the water levels and the pollutant levels of groundwater increase significantly, the Event and Action Plan shown in **Table 4-3** should be implemented.

Table 4.1 Limit Levels for Recharging Groundwater

Parameters	Limit Levels (μg/L) for Groundwater Recharging to Recharge Well*			
	R	R1	R2a	R2b
TPH C10 -C14	56	25	32	92
TPH C15 - C28	224	305	264	779
TPH C29 - C36	110	110	176	171
Cd#	1			
Cu#	500			
Hg#	1			

* The limit levels for recharging groundwater would be the 95th percentile of the recorded baseline levels at recharge well.
In order to address EPD's concern on some exceedingly high level, the following baseline data is omitted from the calculation of Limit Levels.
- R1 3 Aug. 06
- R2a – None (all data are comparable with each other and data obtained at nearby S3 and R2b
- R2b – 10 Aug. 06

\# The baseline levels of Cd, Cu & Hg at recharge well are below the TM-Water Effluent Limits, so the TM-Water Effluent limits are taken as limit levels.

Table 4.2 Summary of Wells

Wells	Excavation Area		
	Area 1	Area 2	Area 3
Baseline Monitoring Well	S1, S1a	S2, S3	S4
Recharge Well	R1	R, R2a, R2b	R, R2a, R2b
Monitoring Well	M1, M2		
Control Well	C		

Table 4.3 Event and Action Plan for Groundwater Recharging

Event	Action			
	ET Leader	IEC	ER	Contractor
Ground water level at recharge point exceeds 1m from baseline	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring of the well to clarify the result. 3. Report the results of investigation to IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation measures.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER accordingly. 3. Supervise the implement of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	1. Reduce the recharge rate AND / OR 2. Suspend the recharge until the groundwater level at recharge points falls back to less than 1m difference with the baseline
Pollution level of recharging groundwater exceed the baseline levels[1] / the pollution levels at the monitoring well	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring for 3 consecutive days to clarify the result.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to	If samples for 3 consecutive days indicate exceedance of baseline levels, then: 1. Suspend the recharge OR 2. Carry out maintenance on

Event	Action			
	ET Leader	IEC	ER	Contractor
	3. Review results of 3 consecutive days. 4. Report the results of investigation to IEC and the Contractor. 5. Discuss with the Contractor and formulate remedial measures. 6. Increase monitoring frequency to check mitigation measures.	accordingly. 3. 3. Supervise the implement of remedial measures.	propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	sedimentation tank and carbon filter.

Note:
[1]: The baseline levels (Limit Levels) for recharging water are presented in **Table 4-1**.

4.5 Contingency Measures

In this Working Plan, the recharging operation has been proposed to be undertaken at Recharge Point R, R1, R2a and R2b. Due to the limited working space within the site, more recharging wells may be necessary to supplement and/or replace the currently proposed Recharge Point R, R1, R2a and R2b as the work progresses. Should such circumstances occur, new baseline values will be obtained for the newly proposed recharge wells after suitable locations have been determined. Using the basis as discussed in Section 4.4, the use of treatment facilities will depend on the values of the baseline at the extraction wells and recharge wells. Accordingly, an updated Working Plan will be submitted per the EP requirements to EPD.

5 CONCLUSION

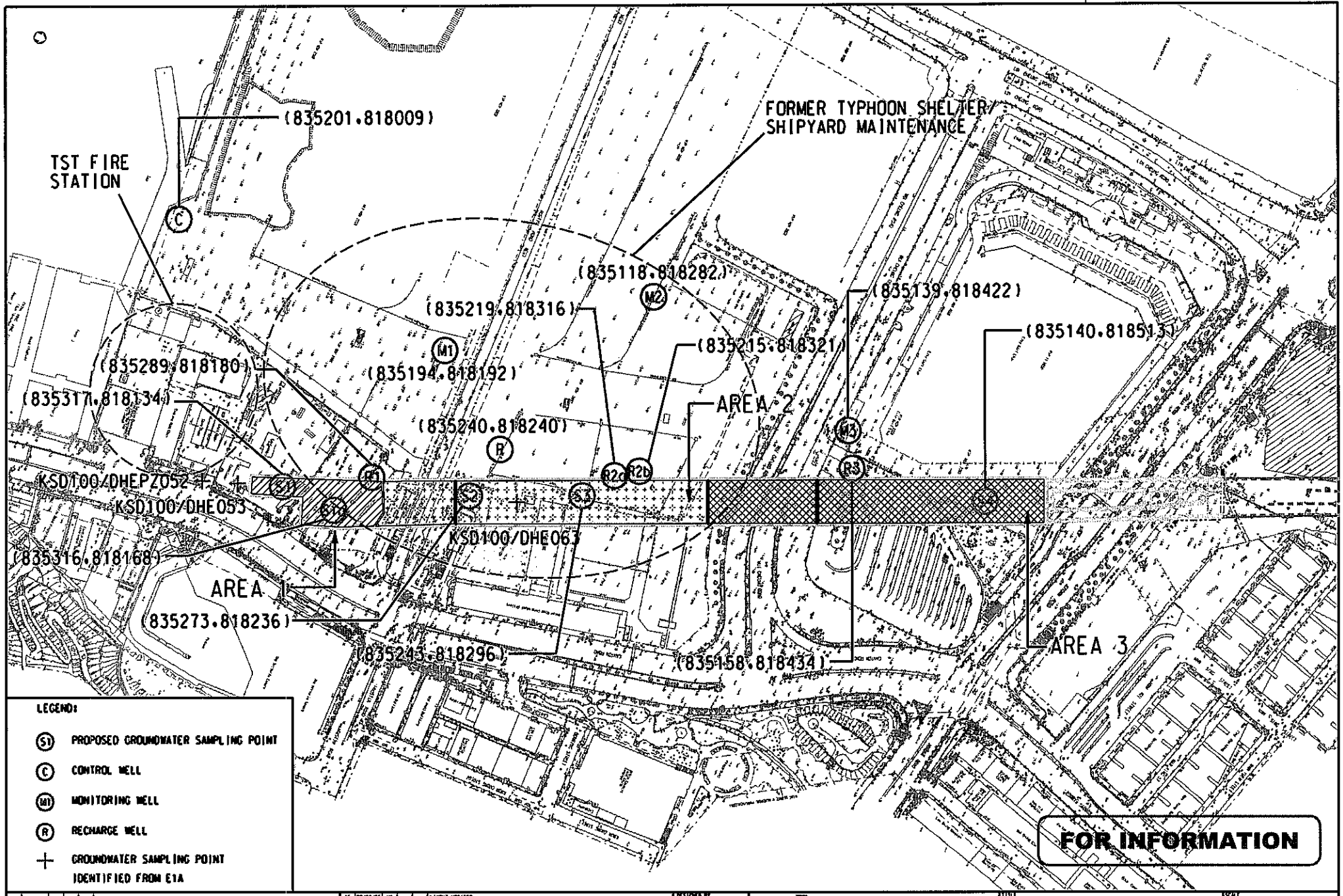
This Working Plan sets forth the procedures for baseline and impact monitoring of the groundwater resulting from the dewatering processes for the KDB200 Contract. Sampling and testing requirements as recommended in the EIA have been adopted for the Plan. For the purposes of this Working Plan, extracted groundwater from Points S1 and S1a, will be recharged into the Recharge Point R1 within the site without any treatment. Extracted groundwater from Points S2, S3 and S4 will be recharged into Recharge Point R, R2a and R2b within the site, subject to pretreatment via a sediment tank and an activated carbon filter system prior to recharge. Treatment of the groundwater will be subject to compliance with the Limit Levels and Event and Action Plan detailed in **Tables 4-1** and **4-2** respectively.

APPENDIX A

ANALYTICAL METHODS AND REPORTING LIMITS FOR GROUNDWATER SAMPLES

Analyse Description	Reference Method	Reporting Limit (μg/L)
Cadmium	USEPA 6020	1
Copper		1
Mercury	APHA 3112B	0.5
C10 – C14	USEPA 8015/ GCFID	25
C15 – C28	USEPA 8260/Purge & Trap GCMS	
C29 – C36		

APPENDIX B GROUNDWATER MONITORING LAYOUT PLAN



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A7	08/03/06	MK			LAYOUT UPDATED
A6	22/02/06	MK			LAYOUT UPDATED
A5	09/02/06	MK			LAYOUT UPDATED
A4	06/02/06	MK			LAYOUT UPDATED
A3	06/01/06	MK			LAYOUT UPDATED
A2	28/10/05	MK			LEGEND REVISED
A1	17/09/05	MK			P0043 DELETED, P0044 ADDED
A0	19/08/05	MK			

DESIGNED BY KC
DRAWN BY PC
CHECKED BY MC
IN CHARGE PW
DATE 28JUN2006

KCR 九龍南線 Kowloon Southern Link
Link 200 Joint Venture
Mott Connell in association with Aedas

TITLE
CONTRACT KDB200
GROUNDWATER MONITORING PLAN

SCALE 1 : 1000 @ A1
ORIGINATOR LOKLAM
ORIGINATOR REFERENCE
REF NO
DRAWING NUMBER KDB200 /SK/A3040
REV A9
RAILWAY KSL
LOCATION WKN
STAGE W
SHEET NO 1OF1

FULL SIZE A1

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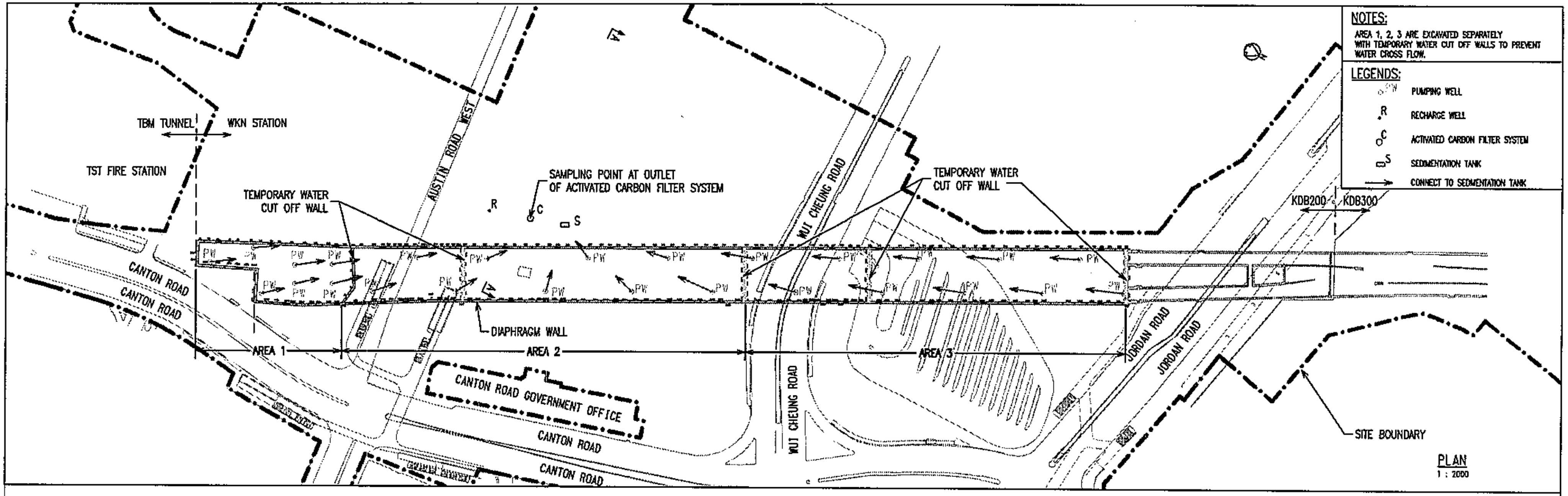

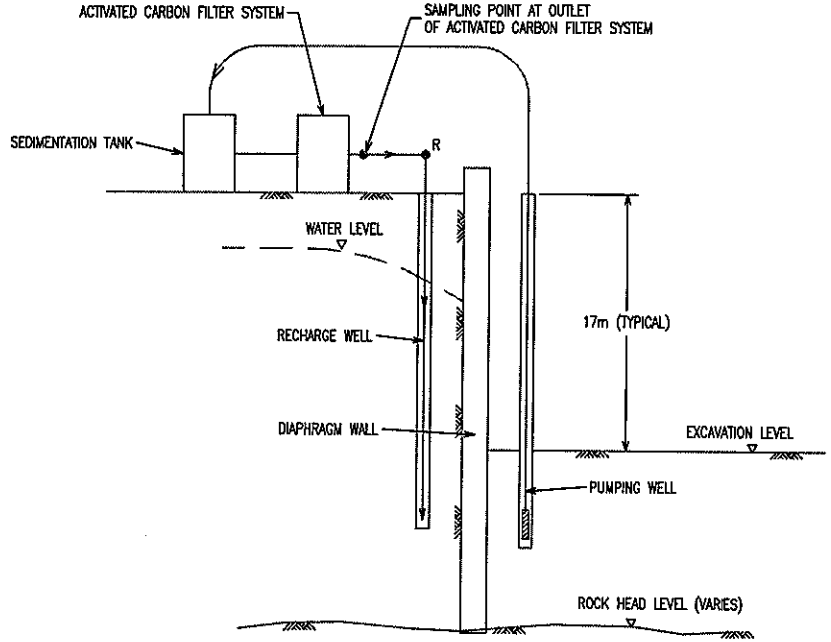

TYPICAL DETAIL
N.T.S.

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D	11JUL06				FOURTH DRAFT FOR COMMENT
C	09JUN06				THIRD DRAFT FOR COMMENT
B	29MAY06				SECOND DRAFT FOR COMMENT
A	10MAY06				FIRST DRAFT FOR COMMENT

DESIGNED BY J.W.
DRAWN BY K.K.MAK
CHECKED BY W.W.FUNG
IN CHARGE J.W.
DATE 10MAY06

KCR 九廣鐵路 九龍南線 Kowloon Southern Link
Link 200 Joint Venture
Mott Connell
MEINHARDT Aedas

TITLE
CONTRACT KDB200
PROPOSED RECHARGING OPERATION FOR GROUND WATER

SCALE AS SHOWN
ORIGINATOR LBSXJH
ORIGINATOR REFERENCE
DRAWING NUMBER KDB200/SK/ 047
REV E
RAILWAY KSL
LOCATION WKN
STAGE Z
SHEET NO 1 OF 1

APPENDIX C Specifications of Activated Carbon Filter System

HYDREX

Waste & Water Treatment

TECHNICAL SPECIFICATION

NO. 1387

TO : Link 200 JV
HONG KONG

FOR : ACTIVATED CARBON FILTER SYSTEM

Hydrex offers to furnish, subject to terms and conditions contained herein, the equipment and materials described in this proposal which is based upon the specifications and information supplied by the Purchaser.

This proposal shall not become a contract or binding until its acceptance by the Purchaser and approval of an officer of Hydrex.

The information contained in this proposal is confidential and proprietary in nature and is transmitted to the Purchaser for its sole use. By accepting this proposal the Purchaser agrees not to disclose the contents to any unauthorized person without an approval from Hydrex.

HYDREX ASIA LTD.

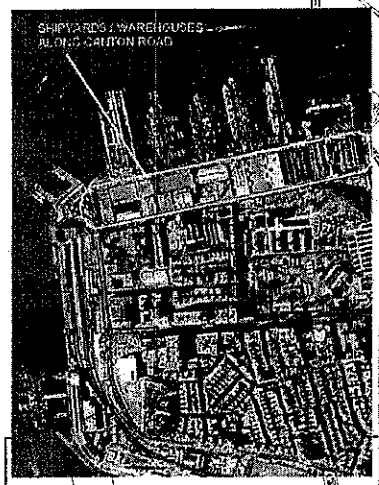
701 BEVERLEY COMMERCIAL CENTRE,
87-105 CHATHAM ROAD, KLN., HONG KONG
Phone: 2527-9544 & 2527-8291/Fax: (852) 2865-1533
E-Mail Address: hydrxasia@hknet.com

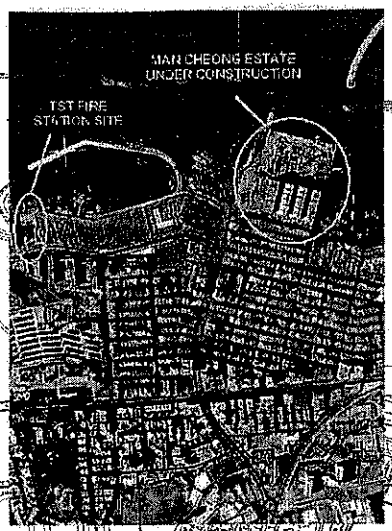
1. ACTIVATED CARBON FILTER

One activated carbon filters shall be provided for the removal of organics from the treated water. Each filter shall consist of a steel tank, internals (underdrain with strainers), rate of flow indicator, pressure gages, manhole, supporting legs, manual operating valves and granular activated carbon. All internal surfaces of the tanks will be lined with epoxy.

Number of Units	One (1)
Manufacturer	Hydrex design (locally fabricated)
Type	Vertical pressure type
Capacity per Unit	40 m^3/hr
Size, Dia x Str. Height	Ø 2400 x Str. Height 1,220 mm
Filtration Rate	8.84 $m^3/m^2/hr$
Backwash Flow	140 m^3/hr
Shell Thickness	6 mm, Q235A
Tank Head Thickness	8 mm, Q235A
Design/Test Pressure	5.0/ 7.5 bar
Valve & Main Pipe Sizes	
Service:	100 mm
Backwash	150 mm
Rinse	75 mm
Control Valve Type	Butterfly valves, manual operation
Underdrain	Header/ laterals with coarse sand subfill.
Interior Finishing	Sand blasted, coal tar epoxy painted
Exterior Finishing	Sand blasted, coal tar epoxy painted
Coarse Sand Volume	1.4 m3
Carbon Volume	3.15 m3
Strainer Material	PP

APPENDIX D Site History – The Potential Contaminated Sites





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DATE	

KCR 九廣鐵路

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新鐵路策劃

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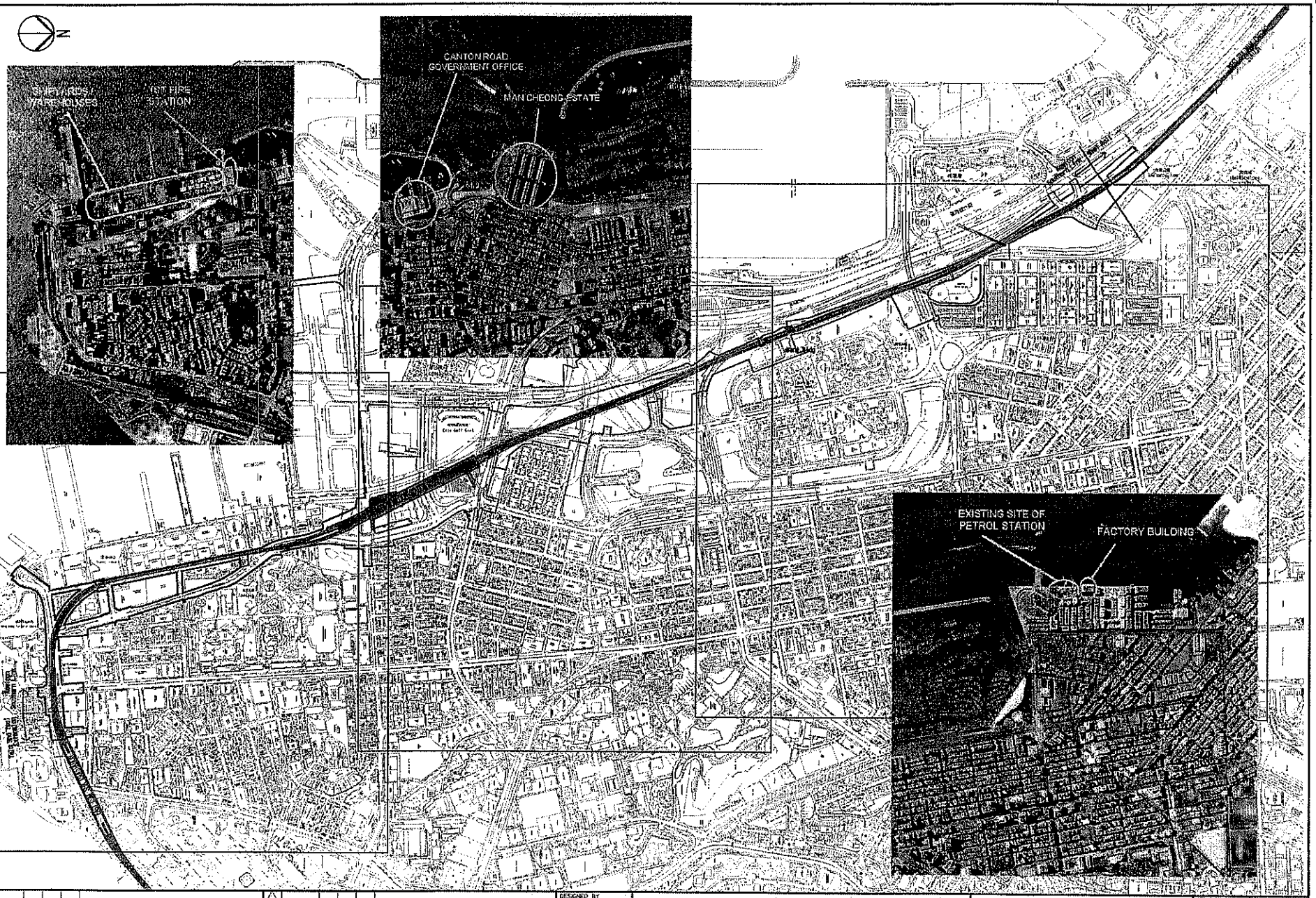

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KCR

New Railway Projects
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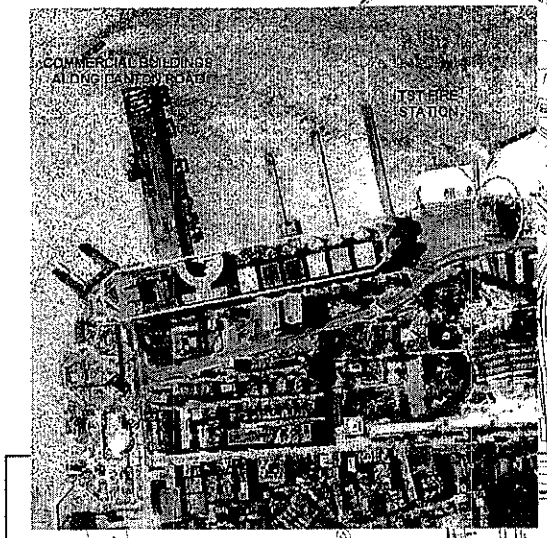

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KCR 九廣鐵路

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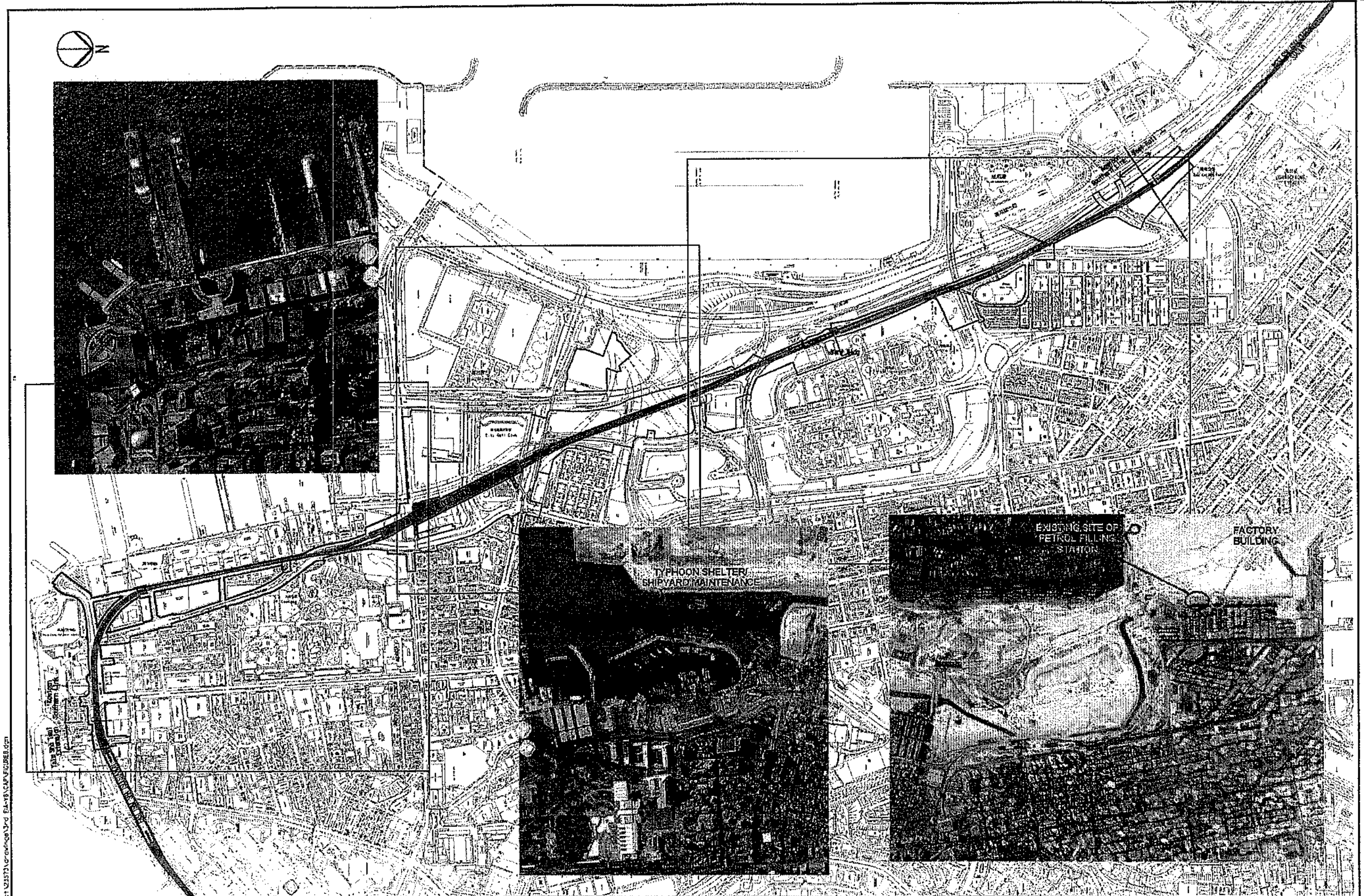

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IN CHARGE
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KCR

New Railway Projects
新鐵路策劃

AERIAL PHOTOGRAPHY FOR 1995

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FULL SIZE A1

APPENDIX E

AMBIENT BASELINE MONITORING RESULTS

Point S1 (25 February 2006 - 3 March 2006)

Monitoring Parameters	*Cadmium*	*Copper*	*Mercury*
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	0.001	0.5	0.001
Reporting Limit (μg/L)	1	1	0.5
Date	*Baseline Monitoring Results, (μg/L)*		
25/02/2006 (Sat)	<1	1	<0.5
26/02/2006 (Sun)	<1	<1	<0.5
27/02/2006 (Mon)	<1	1	<0.5
28/02/2006 (Tue)	<1	<1	<0.5
01/03/2006 (Wed)	<1	<1	<0.5
02/03/2006 (Thu)	<1	<1	<0.5
03/03/2006 (Fri)	<1	<1	<0.5

Point S1 (25 May 2006 - 31 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10-C14	*C15-C28*	*C29-C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (μg/L)*					
25/05/2006 (Thu)	<25	50	<25	<1	1	<0.5
26/05/2006 (Fri)	<25	26	<25	<1	1	<0.5
27/05/2006 (Sat)	<25	<25	<25	<1	1	<0.5
28/05/2006 (Sun)	<25	27	<25	<1	2	<0.5
29/05/2006 (Sun)	<25	<25	<25	<1	2	<0.5
30/05/2006 (Mon)	<25	<25	<25	<1	1	<0.5
31/05/2006 (Tue)	<25	<25	<25	<1	1	<0.5

Point S1a (4 Aug 2006 - 10 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10-C14	*C15-C28*	*C29-C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (μg/L)*					
04/08/2006 (Fri)	<25	92	34	<1	<1	<0.5
05/08/2006 (Sat)	<25	71	29	<1	2	<0.5
06/08/2006 (Sun)	<25	82	31	<1	2	<0.5
07/08/2006 (Mon)	<25	66	<25	<1	2	<0.5
08/08/2006 (Tue)	<25	<25	<25	<1	1	<0.5
09/08/2006 (Wed)	<25	32	<25	<1	2	<0.5
10/08/2006 (Thu)	<25	52	<25	<1	2	<0.5

Point S2 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (μg/L)*					
27/04/2006 (Thu)	<25	95	43	<1	1	<0.5
28/04/2006 (Fri)	<25	93	52	<1	<1	<0.5
29/04/2006 (Sat)	<25	433	277	<1	8	<0.5
30/04/2006 (Sun)	<25	87	<25	<1	25	<0.5
01/05/2006 (Mon)	<25	78	26	<1	<1	<0.5
02/05/2006 (Tue)	<25	219	143	<1	1	<0.5
04/05/2006 (Thu)	<25	128	42	<1	1	<0.5

Point S3 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (µg/L)*					
27/04/2006 (Thu)	<25	125	63	<1	2	<0.5
28/04/2006 (Fri)	36	247	200	<1	3	<0.5
29/04/2006 (Sat)	<25	246	172	<1	2	<0.5
30/04/2006 (Sun)	<25	83	<25	<1	10	<0.5
01/05/2006 (Mon)	<25	75	<25	<1	27	<0.5
02/05/2006 (Tue)	27	88	<25	<1	5	<0.5
04/05/2006 (Thu)	62	403	316	<1	2	<0.5

Point S4 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (µg/L)*					
27/04/2006 (Thu)	29	454	857	<1	2	<0.5
28/04/2006 (Fri)	45	435	279	<1	2	<0.5
29/04/2006 (Sat)	26	146	47	<1	2	<0.5
30/04/2006 (Sun)	60	461	240	<1	<1	<0.5
01/05/2006 (Mon)	31	129	<25	<1	3	<0.5
02/05/2006 (Tue)	34	131	<25	<1	<1	<0.5
04/05/2006 (Thu)	28	153	36	<1	2	<0.5

Point C (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
08/05/2006 (Mon)	<25	201	227	<1	6	<0.5
09/05/2006 (Tue)	<25	75	50	<1	10	<0.5
10/05/2006 (Wed)	<25	94	44	<1	6	<0.5
11/05/2006 (Thu)	<25	87	69	<1	9	<0.5
12/05/2006 (Fri)	<25	87	62	<1	9	<0.5
13/05/2006 (Sat)	<25	89	57	<1	5	<0.5
14/05/2006 (Sun)	<25	137	176	<1	<1	<0.5

Point R (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
08/05/2006 (Mon)	60	237	85	<1	<1	<0.5
09/05/2006 (Tue)	32	173	63	<1	2	<0.5
10/05/2006 (Wed)	<25	118	34	<1	2	<0.5
11/05/2006 (Thu)	<25	86	25	<1	2	<0.5
12/05/2006 (Fri)	<25	90	32	<1	2	<0.5
13/05/2006 (Sat)	25	110	42	<1	2	<0.5
14/05/2006 (Sun)	28	192	120	<1	2	<0.5

Point R1 (3 Aug 2006 - 9 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
03/08/2006 (Wed)	45	927	423	<1	1	<0.5
04/08/2006 (Fri)	<25	336	111	<1	2	<0.5
05/08/2006 (Sat)	<25	213	43	<1	1	<0.5
06/08/2006 (Sun)	<25	172	35	<1	2	<0.5
07/08/2006 (Mon)	<25	114	36	<1	1	<0.5
08/08/2006 (Tue)	<25	208	104	<1	1	<0.5
09/08/2006 (Wed)	<25	26	<25	<1	2	<0.5

Point R2a (3 Aug 2006 - 9 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (µg/L)*					
03/08/2006 (Wed)	32	304	201	<1	2	<0.5
04/08/2006 (Fri)	<25	169	99	<1	<1	<0.5
05/08/2006 (Sat)	<25	110	47	<1	2	<0.5
06/08/2006 (Sun)	<25	119	71	<1	<1	<0.5
07/08/2006 (Mon)	<25	147	96	<1	1	<0.5
08/08/2006 (Tue)	<25	59	26	<1	1	<0.5
09/08/2006 (Wed)	<25	56	<25	<1	2	<0.5

Point R2b (7 Aug 2006 - 13 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	*Baseline Monitoring Results, (µg/L)*					
07/08/2006 (Mon)	44	779	192	<1	2	<0.5
08/08/2006 (Tue)	61	778	108	<1	1	<0.5
09/08/2006 (Wed)	38	237	42	<1	2	<0.5
10/08/2006 (Thu)	1440	8840	304	<1	2	<0.5
11/08/2006 (Fri)	98	748	92	<1	1	<0.5
12/08/2006 (Sat)	61	411	72	<1	1	<0.5
13/08/2006 (Sun)	73	594	109	<1	1	<0.5

Point R3 (6 Aug 2006 - 12 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
06/08/2006 (Sun)	25	264	75	<1	1	<0.5
07/08/2006 (Mon)	32	363	109	<1	1	<0.5
08/08/2006 (Tue)	54	576	205	<1	<1	<0.5
09/08/2006 (Wed)	27	204	40	<1	2	<0.5
10/08/2006 (Thu)	1970	13200	706	<1	2	<0.5
11/08/2006 (Fri)	519	6540	530	<1	<1	<0.5
12/08/2006 (Sat)	82	899	192	<1	<1	<0.5

Point M1 (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
08/05/2006 (Mon)	<25	120	79	<1	2	<0.5
09/05/2006 (Tue)	<25	129	94	<1	2	<0.5
10/05/2006 (Wed)	<25	104	77	<1	1	<0.5
11/05/2006 (Thu)	<25	97	71	<1	1	<0.5
12/05/2006 (Fri)	<25	81	48	<1	1	<0.5
13/05/2006 (Sat)	<25	104	83	<1	2	<0.5
14/05/2006 (Sun)	<25	96	62	<1	2	<0.5

Point M2 (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
08/05/2006 (Mon)	<25	218	115	<1	1	<0.5
09/05/2006 (Tue)	<25	252	73	<1	<1	<0.5
10/05/2006 (Wed)	<25	158	50	<1	1	<0.5
11/05/2006 (Thu)	<25	173	59	<1	1	<0.5
12/05/2006 (Fri)	<25	107	28	<1	1	<0.5
13/05/2006 (Sat)	<25	107	52	<1	1	<0.5
14/05/2006 (Sun)	<25	167	51	<1	<1	<0.5

Point M3 (3 Aug 2006 - 9 Aug 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (µg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (µg/L)***					
03/08/2006 (Wed)	50	345	137	<1	2	<0.5
04/08/2006 (Fri)	27	304	93	<1	<1	<0.5
05/08/2006 (Sat)	28	227	67	<1	2	<0.5
06/08/2006 (Sun)	34	324	122	<1	2	<0.5
07/08/2006 (Mon)	<25	44	<25	<1	2	<0.5
08/08/2006 (Tue)	41	504	194	<1	1	<0.5
09/08/2006 (Wed)	28	196	48	<1	2	<0.5

KDB200 – Responses to Comments on Groundwater Monitoring Working Plan (Oct 2006)

Comments from
Environment Protection Officer for Director of Environmental Protection
Environmental Protection Department
Ref: Ax(1) to EP2/G/A/121 Pt.5
Dated 29 November 2006

Item	Comments	Responses
ii.	The purpose of point R3 is unclear.	"R3" is originally proposed to be one of the recharge well, similar to other recharge locations R, R1, R2a and R2b. However, after the conducting of baseline monitoring at R3, it was discovered the option of utilizing this recharge well was not viable. R3 will no longer be used for recharging groundwater. The baseline data for R3 is presented in this working plan nevertheless. The relevant text will be revised to reflect the intension of R3.
iii.	The baseline monitoring results of R1, R2a R2b and R3 are dubious. In the results of R2b and R3, there was an extraordinary surge of TPH level in the groundwater of the well on the date of 10.8.06 and there was an aftereffect on 11.8.06. In results of R1 and R2a, the TPH levels in the groundwater was in an odd decreasing trend, as if some contaminants has got into the well right before the baseline monitoring. This odd increase of the range of baseline data will give an unreasonable high action level (which would be set at the 95 percentile of baseline data). KCRC should provide an explanation to these data.	The methodology of the groundwater sampling, as stated in Section 3.3 of the Groundwater Monitoring Working Plan, was properly followed by LJV during the baseline monitoring. Analyses were undertaken by a HOKLAS accredited laboratory. Consideration had been given to the natural fluctuation of the groundwater system. Thus, the baseline data were reliable.
iii.	The IEC should be well aware of these dubious data obtained in Aug 2006 and the implication of these data and carry out proper audit.	Noted.
iv.	Last sentence, para. 4.5 – The subject WP is a submission requirement. To better tally with wordings of the EP Condition, please revise the last sentence to *".... will be submitted per the EP requirements to EPD."*	Noted. The text will be revised accordingly.

Item	Comments	Responses
2.	KCRC/contractor have acknowledged that the July 2006 version of the WP is prepared based on the best available information. However, it is noted from the subject Oct 2006 version that baseline monitoring was conducted for the additional proposed wells only within a month time after the July 2006 submission. While the current Oct 2006 version regards any supplement/replacement of recharging well(s) as a "*Contingency Measures*" only, for the avoidance of omission of information at this point of time. For this purpose, we recap the ET Leader's and IEC's roles on EP submission as per Condition 1.9 of the EP (No. EP-215/2005/B and EP-01/215/2005/B).	LJV has engaged EPD on the subject of a groundwater working plan since September 2005. The working plan that was approved in July 2006 was prepared inline with the on-going dialogue between all involved parties and based on the best available information. Yet, like any construction site, site conditions and other constraints will change and be updated as the programme progresses. And the site conditions have indeed evolved and hence the updating of the working plan is deemed necessary. The endorsements from ET and IEC reaffirmed the submissions – both the July 2006 and the current versions - were prepared in accordance with the requirements stipulated in the EP.

KDB200 – Responses to Comments on Groundwater Monitoring Working Plan (December 2006)

Comments from
Environment Protection Officer for Director of Environmental Protection
Environmental Protection Department
Ref: Ax(1) to EP2/G/A/121 Pt.12
Dated 23 January 2007

Item	Comments	Responses
i	The baseline monitoring results of R1, R2a R2b and R3 are dubious. In the results of R2b and R3, there was an extraordinary surge of TPH level in the groundwater of the well on the date of 10.8.06 and there was an aftereffect on 11.8.06. In results of R1 and R2a, the TPH levels in the groundwater was in an odd decreasing trend, as if some contaminants has got into the well right before the baseline monitoring. This odd increase of the range of baseline data will give an unreasonable high action level (which would be set at the 95 percentile of baseline data). KCRC should provide an explanation to these data.	We would like to reiterate that the methodology of the groundwater sampling, as stated in Section 3.3 of the Groundwater Monitoring Working Plan, was properly followed during the baseline monitoring. Analyses were undertaken by a HOKLAS accredited laboratory. Site observation during baseline monitoring did not identify any contaminants getting into the well, hence influencing the baseline monitoring results. There are no record to support EPD's suggestion. The fluctuation among baseline data is believed to be of natural cause and the data obtained reflects the nature of the background TPH levels.
ii.	The IEC should be well aware of these dubious data obtained in Aug 2006 and the implication of these data and carry out proper audit.	To be addressed by KCRC / IEC.

KDB200 – Responses to Comments on Groundwater Monitoring Working Plan (December 2006)

Comments from
Environment Protection Officer for Director of Environmental Protection
Environmental Protection Department
Ref: Ax(1) to EP2/G/A/121 Pt.13
Dated 28 February 2007

<table>
<tr><th>Item</th><th>Comments</th><th>Responses</th></tr>
<tr><td>i</td><td>The R-to-C responded that the fluctuation among baseline data is believed to be of natural cause. However, since the range of the baseline data, showing a fluctuation up to more than 60 times difference, has a direct implication on the control standard and action & limit levels, please provide substantial demonstration to confirm that was not sampling error, but a natural cycle.</td><td>In order to address EPD's concern on the control standard and action & limit levels and to make progress in this monitoring plan and the subsequent licence application, the following baseline data is omitted from the calculation of Limit Levels.
• R1 – 3 Aug. 06
• R2a – None (all data are comparable with each other and data obtained at nearby S3 and R2b)
• R2b – 10 Aug. 06

The re-derived Limit Levels for recharging groundwater would be:
<table>
<tr><th>Parameters</th><th>R1</th><th>R2a</th><th>R2b</th></tr>
<tr><td>TPH C10 – C14, μg/L</td><td>25</td><td>32</td><td>92</td></tr>
<tr><td>TPH C15 – C28, μg/L</td><td>305</td><td>264</td><td>779</td></tr>
<tr><td>TPH C29 – C36, μg/L</td><td>110</td><td>176</td><td>171</td></tr>
<tr><td>Cd, μg/L</td><td colspan="3">1</td></tr>
<tr><td>Cu, μg/L</td><td colspan="3">500</td></tr>
<tr><td>Hg, μg/L</td><td colspan="3">1</td></tr>
</table>

The groundwater plan will be revised accordingly upon agreement on this approach.</td></tr>
</table>

Item	Comments	Responses
ii.	If the baseline data of the recharging wells revealed such a large fluctuation of TPH level in groundwater, there may be a need to review whether the 7 days monitoring period is adequate to reveal a complete natural cycle in all the sampling points.	We would like to clarify that in all our responses to previous comments, we suggested that the fluctuation was of "background variation" (i.e. not due to the KSL construction works) but never suggested any "cyclic" phenomenon. The approved KSL EM&A Manual stipulated a 7-day baseline monitoring period. This approach was adopted by the Environmental Team in the Groundwater Working Plan back in January 2006 which was subsequently approved by all parties. The Environmental Team has followed the working plan consistently since.