

## 4 NOISE IMPACT ASSESSMENT

### 4.1 Introduction

4.1.1 This section presents an assessment of potential noise impact from the construction and operation of the Project to the noise sensitive receivers within 300m from the SWHSTW boundary. Appropriate mitigation measures have been recommended, where necessary, to alleviate the potential noise impacts to acceptable levels.

### 4.2 Environmental Legislation, Policies, Plans, Standards and Criteria

4.2.1 Noise impacts were assessed in accordance with the criteria and methodology given in the Technical Memoranda made under the Noise Control Ordinance (NCO), and EIAO-TM.

4.2.2 The *Noise Control Ordinance (NCO)* provides the statutory framework for noise control. The NCO invokes the following four Technical Memoranda, which define the technical means for noise assessment:

- ♦ Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM);
- ♦ Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM);
- ♦ Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM); and
- ♦ Technical Memorandum on Noise from Percussive Piling (PP-TM).

4.2.3 The NCO and the accompanying Technical Memoranda provide a mechanism for assessing noise levels and the statutory power to control noise.

4.2.4 With regard to the assessment of the operational noise impacts, the NCO designates acceptable noise levels for Noise Sensitive Receivers (NSRs) on the basis of an Area Sensitivity Rating (ASR), based on the characteristics of the area within which they are located such as rural, village, low-density residential, or urban. Within these areas, the presence of "influencing factors" (such as the presence of industrial activities or major roads) can further affect the ASR and therefore the acceptable noise level (see **Table 4-1**).

**Table 4-1: Area Sensitivity Ratings**

Type of Area Containing NSR	Degree to which NSR is affected by Influencing Factor		
	Not Affected	Indirectly Affected	Directly Affected
Rural Area	A	B	B
Urban Area	B	C	C
Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
Area other than those above	B	B	C

### Construction Activities

- 4.2.5 Under the GW-TM, noise from construction activity is not restricted during the period 0700 - 1900 hours on weekdays, except Public Holidays. However, the EIAO-TM identifies a daytime general construction noise limit of 75 dB(A)<sub>Leq (30 minutes)</sub> for domestic premises. This standard was used as an assessment criterion in the construction noise assessment.

### Operation Activities

- 4.2.6 Operational noise emitted from the SHWSTW is controlled under the IND-TM. According to the IND-TM, the acceptable Noise Levels (ANLs) for different Area Sensitivity Rating are given in **Table 4-2**. The ANL is a function of the type of area within which the NSR is located, and the degree of the effect on the NSR of influencing factors such as major roads and industrial areas. The ANLs for all ASRs are provided in **Table 4-2**.

**Table 4-2: Acceptable Noise Levels (ANLs) (dB(A))**

Time Period	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)			
Night (2300 to 0700 hours)	50	55	60

- 4.2.7 The assessment area containing NSRs were regarded as low density residential area consisting of low-rise developments. The nearest NSR SR6 is about 140m from an industrial zone (which is adjacent to the SWHSTW) and the NSR SR7 is about 200m from the Sheung Shui Slaughter House (which is considered as having industrial operation of significant scale). The NSRs are therefore considered as being indirectly affected by “influencing factors”. As such, the study area is defined as ASR “B”. According to **Table 4-2**, the ANL for the sensitive receivers would be 65 dB(A) in the daytime/evening and 55 dB(A) at night, which would be used as the criteria for evaluation of the cumulative operational noise impact arising from all items of equipment including new equipment and existing equipment.

### Noise Criteria arising from the New Proposed Equipment

- 4.2.8 The EIAO-TM states that all fixed noise sources should be so located and designed that when assessed in accordance with the IND-TM, the level of the intruding noise at the facade of the nearest sensitive use should be at least 5 dB(A) below the appropriate ANL shown in Table 2 of the IND-TM or, in the case of the background being 5 dB(A) lower than the ANL, the predicted noise level should not exceed the background.
- 4.2.9 Noise surveys were undertaken on 14 January 2005, 15 January 2005 and 15 March 2005 to determine the background noise levels. Results indicated that the measured average daytime and evening time noise level was 60.6 dB(A); and the measured average night-time noise level was 58.0 dB(A) at the selected location (see **Figure No. 4-1**). As mentioned in Section 4.2.7, the assessment area is defined as ASR “B”, therefore the planning criteria of 60 dB(A) would be adopted as daytime & evening time assessment criterion and the planning criteria of 50 dB(A) would be adopted as

the night-time assessment criterion. The assessment criteria for NSR are summarized in **Table 4-3**.

**Table 4-3: Noise Criteria for Operational Noise Levels (dB(A))**

	ANL	Planning Criteria	Measured Background Noise Level	Adopted Noise Criteria
Day (0700 to 1900 hours)	65	60	60.6	60
Evening (1900 to 2300 hours)				
Night (2300 to 0700 hours)	55	50	58.0	50

- 4.2.10 In any event, the ASR assumed in this assessment is for indicative assessment only. It should be noted that fixed noise sources are controlled under section 13 of the NCO. Nothing in this assessment shall bind the Noise Control Authority in assessing noise from these sources upon the receipt of complaints. The Authority shall assess the noise impacts based on the contemporary conditions / situations.

### 4.3 *Description of the Environment*

- 4.3.1 The Project site is located at Chuk Wan Street of Shek Wu Hui adjacent to the Sheung Shui Slaughter House and an industrial area.
- 4.3.2 Baseline noise survey was carried out at one selected location within the assessment area (see **Figure No. 4-1**) on 14 January 2005, 15 January 2005 and 15 March 2005. The selected monitoring station is located near SR6 which is representative to reflect the prevailing background noise level. All the noise measurements were conducted in accordance with IND-TM. The detailed methodology and results were presented in **Annex 4-1**. The measured noise levels at the selected location range from 57.0 to 64.1  $L_{eq(30-min)}$  dB(A).

### 4.4 *Assessment Methodology*

#### Construction Phase

- 4.4.1 The assessment followed the procedures given in the GW-TM. For the assessment of noise from PME, the distance attenuation was estimated using the standard formula:
- $$\text{Distance Attenuation in dB(A)} = 20 \log D + 8 \text{ [where D is the distance in metres]}$$
- 4.4.2 Sound Power Levels of the equipment were taken from Table 3 of the GW-TM. Where no SPL is supplied in the TM, reference was made to BS 5228, previous similar studies or information from the contractors. Groups of equipment likely to be employed for each construction task (i.e. site clearance and set up site office, piling work, excavation, demolition, concreting work and pipe work or miscellaneous) are shown in **Annex 4-2A**. The equipment lists are considered realistic and practicable.

- 4.4.3 The construction noise assessment provided results for each month through the construction period. In order to assess the noise impacts, a construction programme as shown in **Annex 4-2B**, which assumes all works to be carried out continuously from August 2005 to July 2009, is adopted for assessment.
- 4.4.4 Generally, all works would be carried out in the non-restricted hours (0700-1900 hours). In the event that the construction activities are undertaken during restricted hours, it would be the responsibility of the contractor to ensure compliance with the NCO and the relevant TMs. In such cases, the contractor will be required to submit CNP application to the Noise Control Authority and abide by any conditions stated in the CNP, should one be issued. Therefore, the potential noise impacts of construction works within restricted hours are not formally assessed in this assessment report. In order to avoid any potentially adverse noise impact, indicative assessment for representative NSRs have been undertaken and are presented in Section 4.6.
- 4.4.5 As the E&M works are mainly installation work, limited number of PME would be used. Also most of the E&M works would be carried out indoors. Thus it is considered that the E&M works would not contribute to the cumulative impact at the NSRs.
- 4.4.6 Based on the construction programme and the assigned PME groups, the construction noise levels from both individual and all concurrent construction activities of civil works which are considered to be significant at the NSR has been assessed.
- 4.4.7 Noise impact was assessed on the basis of the following three conservative assumptions:
- All PME items required for a particular construction activity would be located at the notional source position, which was at a position mid-way between the appropriate geographical centre of the construction site and its boundary nearest to the NSR;
  - A +3 dB(A) facade correction was added to the predicted noise levels to account for the facade effect at each NSR; and
  - Noise impacts at the nearest sensitive facades of the residential buildings to the source positions were assessed.
- 4.4.8 Within 300 m from the SWHSTW boundary, there were no other construction activities undertaken concurrently with this Project during construction period. Therefore, no cumulative construction noise impact was anticipated.

#### Operation Phase

- 4.4.9 The assessment followed the procedures given in the GW-TM. For the assessment of noise from equipment, the distance attenuation was estimated using the standard formula as mentioned in Section 4.4.1.

- 4.4.10 To provide more accurate and realistic prediction, on-site noise measurement was carried out for some equipment (e.g. mechanically raked fine screen and air compressors). However, on-site noise measurement for other equipment (e.g. exhaust fans, pumps, etc) could not be carried out due to site constraints. The Sound Power Levels of the pump and ventilation fans were taken from the *Good Practices on Pumping System Noise Control* (GP-PS) and *Good Practices on Ventilation System Noise Control* (GP-VS). The estimated SWL of other equipment were taken with reference to the specifications of similar items of equipment provided by contractor/plant supplier and other similar projects.
- 4.4.11 Noise impact was assessed on the basis of the following three conservative assumptions:
- All items (including both duty and standby items) are in operation together;
  - A +3 dB(A) facade correction was added to the predicted noise levels to account for the facade effect at each NSR; and
  - Noise impacts at the nearest sensitive facades of the residential buildings to the source positions were assessed.

#### 4.5 *Identification of Environmental Impacts*

- 4.5.1 Major potential noise impacts arising from the Project would be:
- Construction; and
  - Operation noise.

##### Noise Sensitive Receivers (NSRs)

- 4.5.2 Potential noise sensitive receivers (NSRs) have been identified in accordance with the criteria set out in the EIAO TM and through site inspection. The representative existing sensitive receivers which are within 300m from the boundary of the SWHSTW are listed in **Table 4-5**. Locations of the NSRs are shown in **Figure No. 2** and **Figure No. 4-1**. A section across sludge dewatering house extension and SR6 (the nearest NSR) is shown in **Figure No. 4-2**. There are no planned noise sensitive receivers in the vicinity of the SWHSTW which will be affected by the Project.

**Table 4-5: Existing NSR within 300m from Boundary of SWHSTW**

NSR	Description	Type of Use	Distance from STW Boundary
SR6	Wai Loi Tsuen	Residential	104
SR7	Temporary Domestic Structure	Residential	170

## 4.6 *Prediction and Evaluation of Environmental Impacts*

### Construction Phase

- 4.6.1 As illustrated in the construction programme shown in **Annex 4-2B**, various construction activities would be carried out concurrently during certain periods. Cumulative noise impacts arising from different construction activities have been predicted and are shown in **Annex 4-2C**. As indicated in **Annex 4-2A**, the major noisy construction tasks would be site clearance and excavation with total SWL of 124 dB(A).
- 4.6.2 The predicted noise levels at SR6 were in the range of 55.7 to 75.8 dB(A). The cumulative noise level at the SR6 would exceed the noise criteria of 75 dB(A) during certain periods. As a result noise mitigation measures would be required.

### Operation Phase

- 4.6.3 The plant inventory and the SWL of the SWHSTW are summarized in **Annex 4-3A**. The plant inventory used for the prediction of operation noise impact is practical and realistic. To represent the worst-case scenario, all items of equipment were assumed to operate continuously 24 hours a day and the directivity was not included in the calculation.
- 4.6.4 Facilities that would be housed / enclosed in concrete structure were assumed to have a 20 dB(A) reduction of noise emitted from the sources due to transmission loss of the wall. Some items of equipment would be screened from the line-of-sight of NSRs by buildings, structures within the site or solid boundary wall. This allowed a reduction in the SPL of 10 dB(A) in accordance with the relevant Technical Memorandum. Due to the facade effect, a positive 3 dB(A) has been added to predicted noise levels at the NSRs. For determining the distance correction factors, the distances between the probable source positions and the NSRs were considered.

### Noise Criteria arising from the New Proposed Equipment

- 4.6.5 According to the plant inventory of the new proposed equipment as shown in **Annex 4-3A**, the predicted noise level at SR6 is 42 dB(A), which would meet both the daytime and night-time criteria of 60 dB(A) and 50 dB(A) respectively. Thus no mitigation measures would be required for the new equipment. Details of the calculation are presented in **Annex 4-3B**.

### Cumulative Impact

- 4.6.6 Assessment was also carried out based on the SWL of existing plants as well as the proposed plants. **Annex 4-3C** presents the results of the cumulative operational noise impacts of the SWHSTW.
- 4.6.7 According to **Table 4-3**, the ANL for the sensitive receivers would be 65 dB(A) in the daytime/evening and 55 dB(A) at night. As shown in **Annex 4-3C**, the predicted cumulative operation noise levels at the SR6 would be 48 dB(A), which would meet both the daytime and night-time criteria.

#### **4.7 Mitigation of Potential Adverse Environmental Impacts**

##### **Construction Phase**

###### Use of Quiet PME

- 4.7.1 To reduce construction noise impacts on the affected NSRs, silenced types of PME, which are in accordance with BS5228:Part 1, 1997, are recommended. The total SWL of PME for each construction activities were calculated and are summarized in **Annex 4-4A**. The equipment lists are considered realistic and practicable.
- 4.7.2 A detailed calculation of construction noise impact for the mitigated scenario is presented in **Annex A4-4B**. The results indicate that the cumulative construction noise levels predicted at SR6 would comply with the daytime noise criteria of 75 dB(A).

###### Good Site Practice

- 4.7.3 In addition to quiet PME, good site practices listed below should be adopted to further abate any residual impacts during the construction phase of the Project and should be included in the contract:
- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction phase;
  - Silencers or mufflers on construction equipment should be utilised, if found necessary, to further reduce noise, and should be properly maintained during the construction phase;
  - Mobile plant should be sited as far away from NSRs as possible;
  - Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
  - Plant known to emit noise strongly in one direction, should, where possible, be orientated so that the noise is directed away from nearby NSRs; and
  - Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

##### **Operation Phase**

- 4.7.4 The assessment results indicated that during operation phase of the Project, the predicted levels at the NSRs would satisfy the requirement of the IND-TM and hence mitigation measures would not be required.

#### **4.8 Evaluation of Residual Impacts**

- 4.8.1 No adverse construction noise impact for the project is expected with the use of silenced PME and implementation of good site practices.

- 4.8.2 As indicated in **Annex 4-3B**, the predicted noise level at NSRs due to the new equipment are 40 dB(A) to 42dB(A). As the background noise level is in the range of 57.0 dB(A) to 64.1 dB(A), which is much higher than the noise from new equipment. The noise contribution from the operation of the proposed new equipment would not increase the background level by more than 1 dB(A).

#### **4.9 *Environmental Monitoring and Audit***

- 4.9.1 An Environmental Monitoring and Audit (EM&A) programme for control of construction noise would be established. The recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction period. Details of the specific requirements are provided in a stand-alone EM&A Manual prepared according to the findings and recommendations of this noise impact assessment. Operation noise monitoring is not required.

#### **4.10 *Conclusions***

##### Construction Phase

- 4.10.1 With the adoption of quiet PME and good site practices, the predicted construction noise levels at representative NSRs would no exceed the relevant noise criteria.

##### Operation Phase

- 4.10.2 The noise impacts associated with the operation of the Project were also assessed. The assessment result indicated that the unmitigated operation noise levels predicated at representative NSRs would comply with both the daytime and nighttime criteria. Thus no adverse noise impact arising from the Project would be expected.

\*\*\* END \*\*\*



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Figure No. 4 - 1

Figure No. 4 - 2

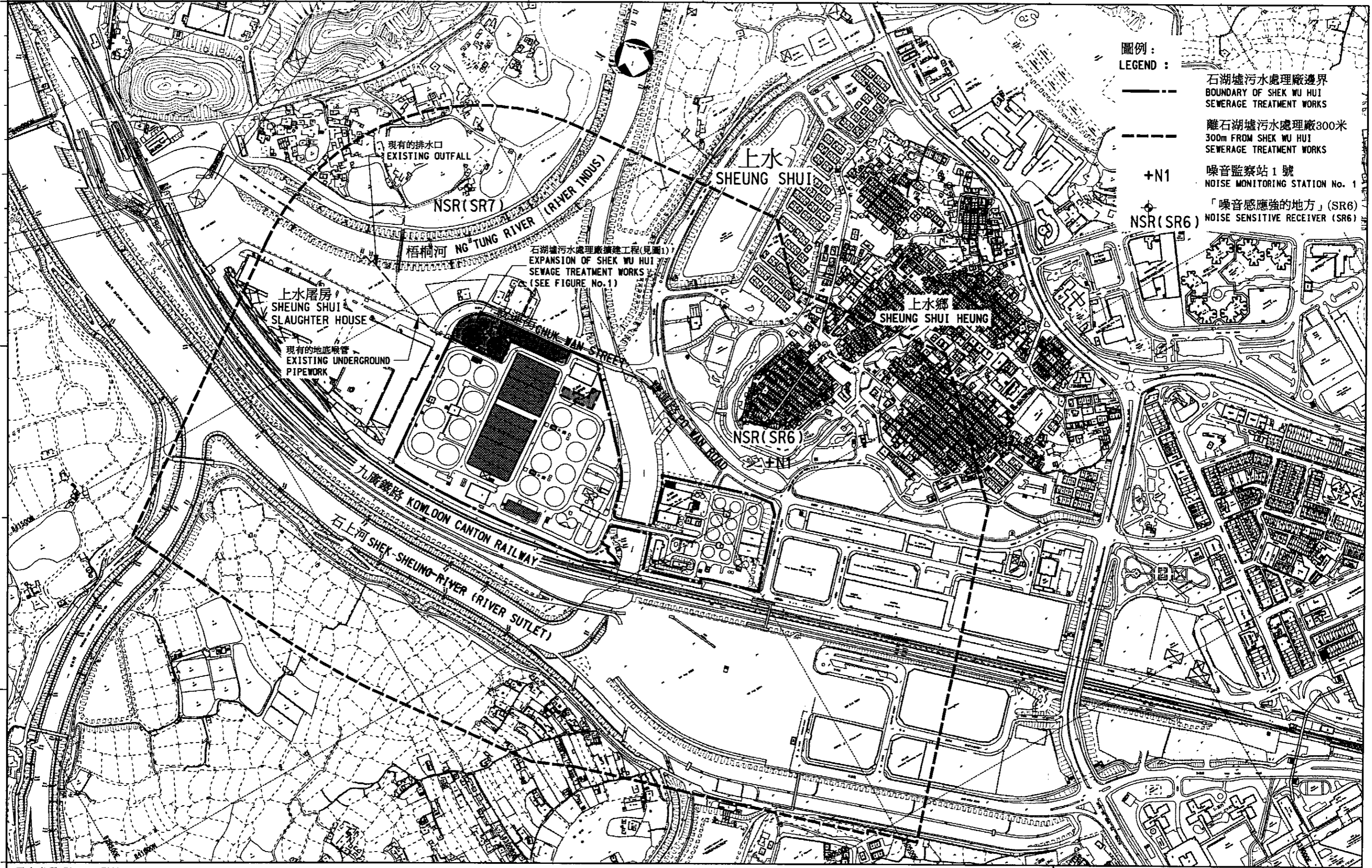
Annex 4 - 1

Annex 4 - 2A to 2C

Annex 4 - 3A to 3C

Annex 4 - 4A to 4B

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- 圖例 :  
LEGEND :
- 石湖墟污水處理廠邊界  
BOUNDARY OF SHEK WU HUI SEWERAGE TREATMENT WORKS
  - 離石湖墟污水處理廠300米  
300m FROM SHEK WU HUI SEWERAGE TREATMENT WORKS
  - +N1 噪音監察站 1 號  
NOISE MONITORING STATION No. 1
  - NSR(SR6) 「噪音感應強的地方」(SR6)  
NOISE SENSITIVE RECEIVER (SR6)

圖表名稱 Figure Title

石湖墟污水處理廠擴建工程  
離石湖墟污水處理廠300米的噪音監察站和「噪音感應強的地方」位置圖  
EXPANSION OF SHEK WU HUI SEWERAGE TREATMENT WORKS  
LOCATION PLAN OF NOISE MONITORING STATION AND NOISE SENSITIVE RECEIVERS WITHIN 300m FROM THE SWHSTW

圖表編號 Figure No.

4 - 1

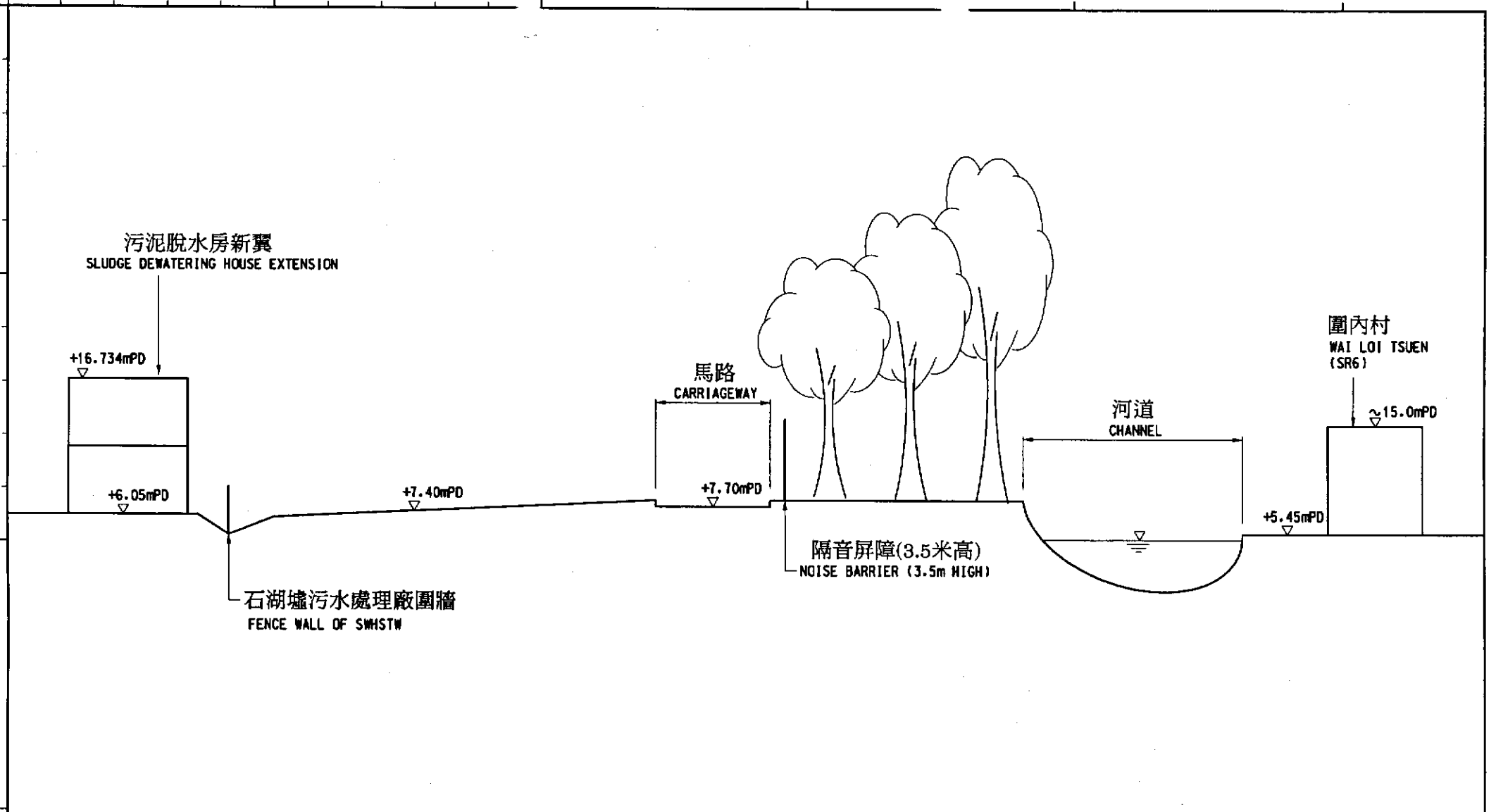
比例 Scale

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香港特別行政區政府渠務署  
DRAINAGE SERVICES DEPARTMENT  
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION



圖表名稱 Figure Title

石湖墟污水處理廠擴建工程

污泥脫水房新翼至圍內村(SR6)橫切面

EXPANSION OF SHEK WU HUI SEWAGE TREATMENT WORKS

SECTION ACROSS SLUDGE DEWATERING HOUSE EXTENSION AND WAI LOI TSUEN (SR6)

圖表編號 Figure No.

4 - 2

比例 Scale

不依比例  
NOT TO SCALE

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## Annex 4-1 : Baseline Noise Survey Data

### (1) Monitoring Location

Baseline noise monitoring was undertaken at one location as shown in **Figure No. 4-1**.

### (2) Monitoring Parameters and Frequency

The qualified staff undertook noise measurement at the location in three different time periods as shown in the following table. Noise monitoring was carried out using sound level meters with respect to  $L_{\text{eq}} (30 \text{ min})$ ,  $L_{\text{max}}$ ,  $L_{\text{min}}$ ,  $L_{10}$  and  $L_{90}$ .

**Table 1 Baseline Noise Monitoring**

Time Period	Type	Duration / min
Daytime (07:00-19:00)	A	30
Evening time (19:00-23:00)	B	30
Night-time (23:00-07:00)	C	30

All noise measurements were conducted in accordance with the *Technical Memorandum for Assessment on Noise from Places Other than Domestic Premises, Public Places or Construction Sites*.

### (3) Monitoring Equipment

As referred to the Technical Memorandum issued under the Noise Control Ordinance, sound level meters in compliance with the International Electromechanical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specification were used for carrying out the noise monitoring.

### (4) Field Monitoring Methodology and QA/QC Procedure

The sound level meter was set on a tripod at a height of 1.2m above ground level. The meter was posited away from any nearby reflective surfaces. The battery condition was checked to ensure good functioning of the meter. Parameters such as frequency weighting, the time weighting and the measurement time would be set as follows:

- frequency weighting: A
- time weighting: Fast
- time measurement: 30 minutes

Prior to and after each noise measurement, the meter was calibrated using the Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.

No noise monitoring was conducted in the presence of fog, rain, and wind with gusts exceeding 5m/s.

Noise measurement was paused during periods of high intrusive noise if possible and observation was recorded when intrusive noise could be avoided.

**(5) Monitoring Results**

Date	Time Period	Monitoring Station	Time	Noise Parameter, dB(A)					Remarks
				L <sub>eq</sub> (30 min)	L <sub>10</sub>	L <sub>90</sub>	L <sub>max</sub>	L <sub>min</sub>	
14/01/05	A	N1	1730 – 1800	57.0	59.7	50.5	81.7	46.7	Traffic Noise
14/01/05	B	N1	1900 – 1930	64.1	66.1	58.4	84.7	53.2	Traffic Noise
15/01/05	C	N1	0630 – 0700	58.1	60.0	51.9	88.4	49.3	Traffic Noise
15/03/05	C	N1	2300 – 23:30	57.8	60.1	46.7	78.3	43	-

## Annex 4-2A

**Powered Mechanical Equipment (PME) for Different  
Construction Tasks during Normal Daytime Working Hours  
(Un-Mitigated Scenario)**

**Site Clearance and Set Up Site Office**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Breaker, excavator mounted	CNP028	1	122	100%	0	122
Excavator	CNP081	1	112	100%	0	112
Dump Truck	CNP067	1	117	100%	0	117
Air compressor	CNP002	1	102	100%	0	102
Bulldozer	CNP030	1	115	100%	0	115
Generator	CNP102	1	100	100%	0	100
Total =						124

**Piling Work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Bored Piling, grab & chisel	CNP 164	1	115	100%	0	115
Mobile Crane	CNP048	1	112	100%	0	112
Dump truck	CNP067	1	117	100%	0	117
Air compressor	CNP002	1	102	100%	0	102
Generator	CNP102	1	100	100%	0	100
Piling, oscillator	CNP165	1	115	100%	0	115
Total =						121

**Excavation Work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Dump truck	CNP067	1	117	100%	0	117
Excavator	CNP081	1	112	100%	0	112
Generator	CNP102	1	100	100%	0	100
Air compressor	CNP002	1	102	100%	0	102
Breaker, excavator mounted	CNP028	1	122	100%	0	122
Total =						124

**Concreting Work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Mobile Crane	CNP048	1	112	100%	0	112
Concrete Lorry Mixer	CNP044	1	109	100%	0	109
Bar Bender and cutter	CNP021	1	90	100%	0	90
Concrete pump	CNP047	1	109	100%	0	109
Poker	CNP170	3	113	100%	0	117.8
Chipper, hand held	CNP043	1	112	100%	0	112.0
Saw, circular, wood	CNP201	1	108	100%	0	108.0
Generator	CNP102	1	100	100%	0	100
Air Compressor	CNP002	1	102	100%	0	102
Total =						121

**Pipework or miscellaneous work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Backhoe	CNP081	1	112	100%	0	112
Mobile Crane	CNP048	1	112	100%	0	112
Lorry	CNP141	1	112	100%	0	112
Compactor	CNP050	1	105	100%	0	105
Generator	CNP102	1	100	100%	0	100
Air Compressor	CNP002	1	102	100%	0	102
Roller	CNP185	1	108	100%	0	108
Total =						118

**Demolition of Existing Structure**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Breaker, excavator mounted	CNP028	1	122	100%	0	122
Breaker, hand-held	CNP024	1	108	100%	0	108
Air Compressor	CNP002	1	102	100%	0	102
Lorry	CNP141	1	112	100%	0	112
Loader	CNP081	1	112	100%	0	112
Generator	CNP102	1	100	100%	0	100
Total =						123

**Annex 4-2B : Construction Programme of Expansion of Shek Wu Hui Sewage Treatment Works**

Activities	Duration month	2005		2006				2007				2008				2009		
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
<b>Expansion of Shek Wu Hui Sewage Treatment Works</b>																		
<b>Section 1 of the Works</b>																		
Site Clearance and Set Up Site Office	3																	
Piling Construction of Bioreactor	3																	
Excavation Works of Bioreactor	3																	
Piling Construction of Air Blower House	3																	
Excavation Works of Air Blower House	3																	
Superstructure Construction of Bioreactor (Concreting works)	16																	
Superstructure Construction of Air Blower House (Concreting works)	16																	
Pipework and miscellaneous work for Section 1	16																	
Installation of E&M Equipment for Air Blower House and Bioreactor	16																	
Commissioning of Air Blower House and Bioreactor	4																	
<b>Section 2 of the Works</b>																		
Piling Construction of FST and RAS/SAS Pumping Station	3																	
Excavation Works of FST and RAS/SAS Pumping Station	3																	
Superstructure Construction of FST and RAS/SAS Pumping Station (Concreting works)	19																	
Pipework and miscellaneous work for Section 2	19																	
Installation of E&M Equipment for FST and RAS/SAS Pumping Station	3																	
Commissioning of FST and RAS/SAS Pumping Station	4																	
<b>Section 3 of the Works</b>																		
Piling Construction of Press House Extension	2																	
Excavation Works of Press House Extension	1																	
Piling Construction of Sludge Conditioning Tank	2																	
Excavation Works of Sludge Conditioning Tank	2																	
Superstructure Construction of Press House Extension (Concreting works)	23																	
Construction of Sludge Conditioning Tanks (Concreting works)	23																	
Pipework and miscellaneous work for Section 3	23																	
Installation of E&M Equipment for Sludge Conditioning Tanks and Press House Extension	4																	
<b>Modification of the Existing Bioreactors of Shek Wu Hui Sewage Treatment Works</b>																		
Modification of the existing Bioreactor No. 1 (1 mth Demolition works + 2mth E&M Works)	3																	
Modification of the existing Bioreactor No. 2 (1 mth Demolition works + 2mth E&M Works)	3																	
Modification of the existing Bioreactor No. 3 (1 mth Demolition works + 2mth E&M Works)	3																	
Modification of the existing Bioreactor No. 4 (1 mth Demolition works + 2mth E&M Works)	3																	





Annex 4-2C: Calculation of Construction Noise Levels at Noise Sensitive Receivers During Normal Daytime Working Hours - Unmitigated Scenario

(2) For SR7

Activities	Duration month	SWL dB(A)	Distance (m)	DA dB(A)	SR dB(A)	FC dB(A)	SPL dB(A)	2005		2006				2007				2008				2009												
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3										
<b>Expansion of Shek Wu Hui Sewage Treatment Works</b>																																		
<b>Section 1 of the Works</b>																																		
Site Clearance and Set Up Site Office	3	124	175	-53	0	3	74	74	74																									
Piling Construction of Bioreactor	3	121	240	-56	0	3	69	69	69																									
Excavation Works of Bioreactor	3	124	240	-56	0	3	71	71	71																									
Piling Construction of Air Blower House	3	121	340	-59	0	3	66	66	66																									
Excavation Works of Air Blower House	3	124	340	-59	0	3	68	68	68																									
Superstructure Construction of Bioreactor (Concreting works)	16	121	240	-56	0	3	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69											
Superstructure Construction of Air Blower House (Concreting works)	16	121	330	-58	0	3	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66											
Pipework and miscellaneous work for Section 1	16	118	330	-58	0	3	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62											
Installation of E&M Equipment for Air Blower House and Bioreactor	6																																	
Commissioning of Air Blower House and Bioreactor	4																																	
<b>Section 2 of the Works</b>																																		
Piling Construction of FST and RAS/SAS Pumping Station	3	121	220	-55	0	3	69	69	69																									
Excavation Works of FST and RAS/SAS Pumping Station	3	124	220	-55	0	3	72	72	72																									
Superstructure Construction of FST and RAS/SAS Pumping Station (Concreting works)	19	121	220	-55	0	3	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69											
Pipework and miscellaneous work for Section 2	19	118	220	-55	0	3	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66											
Installation of E&M Equipment for FST and RAS/SAS Pumping Station	3																																	
Commissioning of FST and RAS/SAS Pumping Station	4																																	
<b>Section 3 of the Works</b>																																		
Piling Construction of Press House Extension	2	121	515	-62	-10	3	52	52																										
Excavation Works of Press House Extension	1	124	515	-62	-10	3	54	54																										
Piling Construction of Sludge Conditioning Tank	2	121	560	-63	-10	3	51	51																										
Excavation Works of Sludge Conditioning Tank	2	124	560	-63	-10	3	54	54																										
Superstructure Construction of Press House Extension (Concreting works)	23	121	515	-62	0	3	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62											
Construction of Sludge Conditioning Tanks (Concreting works)	23	121	560	-63	-10	3	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51											
Pipework and miscellaneous work for Section 3	23	118	515	-62	-10	3	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49											
Installation of E&M Equipment for Sludge Conditioning Tanks and Press House Extension	4																																	
<b>Modification of the Existing Bioreactors of Shek Wu Hui Sewage Treatment Works</b>																																		
Modification of the existing Bioreactor No. 1 (1 mth Demolition works + 2mth E&M Works)	3	123	390	-59	0	3	67																											
Modification of the existing Bioreactor No. 2 (1 mth Demolition works + 2mth E&M Works)	3	123	345	-59	0	3	67																											
Modification of the existing Bioreactor No. 3 (1 mth Demolition works + 2mth E&M Works)	3	123	305	-59	0	3	67																											
Modification of the existing Bioreactor No. 4 (1 mth Demolition works + 2mth E&M Works)	3	123	275	-59	0	3	67																											
<b>Overall Noise Level, dB(A)</b>								74.3	74.3	74.3	72.9	72.9	73.0	75.3	75.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	71.6	71.6	71.6	62.5	62.5	62.5	62.5	67.1	67.1	67.1	67.1

**Abbreviations:**  
 DA = Distance Attenuation  
 SR = Reduction due to screening from the line-of-sight of NSRs by building, noise barrier, structures within the site or solid boundary wall. This allowed a reduction in the SPL of 10 dB(A) in accordance with the relevant Technical Memorandum.  
 FC = A +3 dB(A) facade correction was added to the predicted noise levels to account for the facade effect at each NSR.  
 SPL at NSR = Sound Power Level at NSR = SWL + DA + SR + FC

**Annex 4-3A : The Plant Inventory of Shek Wu Hui Sewage Treatment Works**

**(1) New Equipment**

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Horsepower & rpm of pump		Air Flow Rate (m <sup>3</sup> /hr)
							kW	rpm	
<b>Proposed Flow Division Pump Pits</b>									
Pumps in Pump Pit No. 1	3	2 duty + 1 standby	Ref 3	94	99	in tanks	22	970	
Pumps in Pump Pit No. 2	3	2 duty + 1 standby	Ref 3	94	99	in tanks	22	970	
<b>Proposed Bioreactor</b>									
Internal recycle pump	3	2 duty + 1 standby	Ref 3	92	97	in tanks	15	365	
<b>Proposed Air Blower House</b>									
Air Blower	2	1 duty + 1 standby	Ref 1	104	107	Enclosed	250	3000	
Exhaust Fan	4		Ref 4	89	95		1	700	
<b>Proposed RAS/SAS Pumping Station</b>									
RAS pump	3	2 duty + 1 standby	Ref 3	92	97	Enclosed	9	955	
SAS pump	2	1 duty + 1 standby	Ref 3	92	95	Enclosed	1	925	
Exhaust Fan	1		Ref 4	89	89		1	700	
<b>Proposed Centrifuges for sludge thickening</b>									
Centrifuge	2	1 duty + 1 standby	Ref 4	81	84	enclosed	60	2900	
dosing pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	5	1000	
Feed pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	15	1400	
<b>Proposed Sludge Dewatering House Extension</b>									
Plate filter press	1		Ref 1	100	100	enclosed	11	3000	
Feed pump	2	1 duty + 1 standby	Ref 3	94	97	enclosed	22	1470	
Dosing pump	2	1 duty + 1 standby	Ref 3	92	95	enclosed	9	1400	
Exhaust Fan	1		Ref 4	89	89		1	700	
<b>Proposed Deodorizing Unit</b>									
Exhaust Fan of De-odorizer for Inlet Works	2	1 duty + 1 standby	Ref 3	83	86		4	2255	2088
Exhaust Fan of De-odorizer for SHTs	2	1 duty + 1 standby	Ref 3	85	88		15	1993	12096

**(2) Existing Equipment**

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Horsepower & rpm of pump		Air Flow Rate (m <sup>3</sup> /hr)
							kW	rpm	
<b>Existing Inlet Works</b>									
Inlet pump	3		Ref 1	104	109	enclosed	250	1470	
Exhaust Fan of Inlet Pumping Station	3		Ref 4	89	94		2	750	
Mechanically raked fine screen	3		Ref 2	87	92	enclosed			
Air compressor for aerated grit channels	3		Ref 2	87	92	enclosed	15	1450	
<b>Existing Bioreactors</b>									
Pump in Bioreactor No. 1 & No. 2	6		Ref 3	97	105	in tanks	26	960	
Pump in Bioreactor No. 3 & No. 4	6		Ref 3	97	105	in tanks	26	960	
<b>Existing Air Blower House</b>									
Air Blower	4	3 duty + 1 standby	Ref 1	104	110	Enclosed	590	9850	
Exhaust Fan	3		Ref 4	89	94		2	750	
<b>Existing RAS Pumping Station</b>									
RAS pump	3		Ref 1	100	105	Enclosed	200	885	
<b>Existing Primary Sludge Thickener</b>									
Thickened sludge pump	2		Ref 3	92	95	Enclosed	15	1450	
<b>Existing Sludge Consolidation House</b>									
Air compressor for DAF unit	4		Ref 2	87	93	Enclosed	6	1450	
<b>Existing Sludge Dewatering House</b>									
Plate filter press	8		Ref 1	100	109	enclosed	4	1450	
Feed pump	10		Ref 3	94	104	enclosed	22	1450	
Transfer pump	2		Ref 3	92	95	enclosed	8	1450	

Ref:

Ref 1: The estimated SWLs were made with reference to the approved "Tai Po Sewage Treatment - Stage V Final EIA Report".

Ref 2: The estimated SWLs were determined by on-site measurement.

Ref 3: Good Practice on Pumping System Noise Control / Good Practices on Ventilation Noise Control.

Ref 4: The estimated SWLs were made with reference to the specification of similar items of equipment provided by suppliers.

Remarks:

(#) : Only those noisy equipment are included in the table. Other equipment (e.g. those for final clarifiers, pH control system, sludge conditioning tanks, etc..) which does not have significant noise impact are not included.

## Annex 4-3B : Calculation of Operational Noise Levels at NSR - Unmitigated

### (1) Predicted Noise Levels at SR6 due to the new proposed equipment

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Enclosure Reduction <sup>(*)</sup> dB(A)	Screening Reduction <sup>(*)</sup> dB(A)	Distance (m)	Distance Attenuation d B(A)	facade correction d B(A)	SPL at NSR	Horsepower & rpm of pump kW rpm	Air Flow Rate (m <sup>3</sup> /hr)
<b>Proposed Flow Division Pump Pits</b>														
Pumps in Pump Pit No. 1	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	320	-58	3	<b>34</b>	22	970
Pumps in Pump Pit No. 2	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	280	-57	3	<b>35</b>	22	970
<b>Proposed Bioreactor</b>														
Internal recycle pump	3	2 duty + 1 standby	Ref 3	92	97	in tanks	0	-10	340	-59	3	<b>31</b>	15	365
<b>Proposed Air Blower House</b>														
Air Blower	2	1 duty + 1 standby	Ref 1	104	107	Enclosed	-20	0	245	-56	3	<b>34</b>	250	3000
Exhaust Fan	4		Ref 4	89	95			-10	245	-56	3	<b>32</b>	1	700
<b>Proposed RAS/SAS Pumping Station</b>														
RAS pump	3	2 duty + 1 standby	Ref 3	92	97	Enclosed	-20	0	395	-60	3	<b>20</b>	9	955
SAS pump	2	1 duty + 1 standby	Ref 3	92	95	Enclosed	-20	0	395	-60	3	<b>18</b>	1	925
Exhaust Fan	1		Ref 4	89	89			-10	395	-60	3	<b>22</b>	1	700
<b>Proposed Centrifuges for sludge thickening</b>														
Centrifuge	2	1 duty + 1 standby	Ref 4	81	84	enclosed	-20	0	190	-54	3	<b>13</b>	60	2900
dosing pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	190	-54	3	<b>16</b>	5	1000
Feed pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	190	-54	3	<b>16</b>	15	1400
<b>Proposed Sludge Dewatering House Extension</b>														
Plate filter press	1		Ref 1	100	100	enclosed	-20	0	150	-52	3	<b>31</b>	11	3000
Feed pump	2	1 duty + 1 standby	Ref 3	94	97	enclosed	-20	-10	150	-52	3	<b>18</b>	22	1470
Dosing pump	2	1 duty + 1 standby	Ref 3	92	95	enclosed	-20	-10	150	-52	3	<b>16</b>	9	1400
Exhaust Fan	1		Ref 4	89	89			-10	150	-52	3	<b>30</b>	1	700
<b>Proposed Deodourizing Unit</b>														
Exhaust Fan of De-odourizer for Inlet Works	2	1 duty + 1 standby	Ref 3	83	86			-10	280	-57	3	<b>22</b>	4	2255
Exhaust Fan of De-odourizer for SHTs	2	1 duty + 1 standby	Ref 3	85	88			-10	150	-52	3	<b>29</b>	15	1993
<b>Total SPL =</b>												<b>42</b>		

Ref:

Ref 1: The estimated SWLs were made with reference to the approved "Tai Po Sewage Treatment - Stage V Final EIA Report".

Ref 2: The estimated SWLs were determined by on-site measurement.

Ref 3: Good Practice on Pumping System Noise Control / Good Practices on Ventilation Noise Control.

Ref 4: The estimated SWLs were made with reference to the specification of similar items of equipment provided by suppliers.

Remarks:

<sup>(\*)</sup>: Enclosure Reduction is the reduction of SWL due to the enclosure for the equipment. Screening Reduction is the reduction of SWL due to the screening of line of sight by building or structures between the noise sources and noise sensitive receivers.

<sup>(#)</sup>: Only those noisy equipment are included in the table. Other equipment (e.g. those for final clarifiers, pH control system, sludge conditioning tanks, etc..) which does not have significant noise impact are not included.

## Annex 4-3B : Calculation of Operational Noise Levels at NSR - Unmitigated

### (2) Predicted Noise Levels at SR7 due to the new proposed equipment

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Enclosure Reduction <sup>(*)</sup> dB(A)	Screening Reduction <sup>(*)</sup> dB(A)	Distance (m)	Distance Attenuation d B(A)	facade correction d B(A)	SPL at NSR	Horsepower & rpm of pump kW	rpm	Air Flow Rate (m3/hr)	
<b>Proposed Flow Division Pump Pits</b>																
Pumps in Pump Pit No. 1	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	410	-60	3	32	22	970		
Pumps in Pump Pit No. 2	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	360	-59	3	33	22	970		
<b>Proposed Bioreactor</b>																
Internal recycle pump	3	2 duty + 1 standby	Ref 3	92	97	in tanks		-10	220	-55	3	35	15	365		
<b>Proposed Air Blower House</b>																
Air Blower	2	1 duty + 1 standby	Ref 1	104	107	Enclosed	-20	0	315	-58	3	32	250	3000		
Exhaust Fan	4		Ref 4	89	95			-10	315	-58	3	30	1	700		
<b>Proposed RAS/SAS Pumping Station</b>																
RAS pump	3	2 duty + 1 standby	Ref 3	92	97	Enclosed	-20	0	240	-56	3	24	9	955		
SAS pump	2	1 duty + 1 standby	Ref 3	92	95	Enclosed	-20	0	240	-56	3	22	1	925		
Exhaust Fan	1		Ref 4	89	89			-10	240	-56	3	26	1	700		
<b>Proposed Centrifuges for sludge thickening</b>																
Centrifuge	2	1 duty + 1 standby	Ref 4	81	84	enclosed	-20	0	480	-62	3	5	60	2900		
dosing pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	480	-62	3	8	5	1000		
Feed pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	480	-62	3	8	15	1400		
<b>Proposed Sludge Dewatering House Extension</b>																
Plate filter press	1		Ref 1	100	100	enclosed	-20	0	540	-63	3	20	11	3000		
Feed pump	2	1 duty + 1 standby	Ref 3	94	97	enclosed	-20	-10	540	-63	3	7	22	1470		
Dosing pump	2	1 duty + 1 standby	Ref 3	92	95	enclosed	-20	-10	540	-63	3	5	9	1400		
Exhaust Fan	1		Ref 4	89	89			-10	540	-63	3	19	1	700		
<b>Proposed Deodourizing Unit</b>																
Exhaust Fan of De-odourizer for Inlet Works	2	1 duty + 1 standby	Ref 3	83	86			-10	520	-62	3	17	4	2255	2088	
Exhaust Fan of De-odourizer for SHTs	2	1 duty + 1 standby	Ref 3	85	88			-10	630	-64	3	17	15	1993	12096	
<b>Total SPL =</b>												<b>40</b>				

Ref:

Ref 1: The estimated SWLs were made with reference to the approved "Tai Po Sewage Treatment - Stage V Final EIA Report".

Ref 2: The estimated SWLs were determined by on-site measurement.

Ref 3: Good Practice on Pumping System Noise Control / Good Practices on Ventilation Noise Control.

Ref 4: The estimated SWLs were made with reference to the specification of similar items of equipment provided by suppliers.

Remarks:

<sup>(\*)</sup>: Enclosure Reduction is the reduction of SWL due to the enclosure for the equipment. Screening Reduction is the reduction of SWL due to the screening of line of sight by building or structures between the noise sources and noise sensitive receivers.

<sup>(#)</sup>: Only those noisy equipment are included in the table. Other equipment (e.g. those for final clarifiers, pH control system, sludge conditioning tanks, etc.) which does not have significant noise impact are not included.

Annex 4-3C : Calculation of Operational Noise Levels at NSR - Unmitigated

(1) Predicted Cumulative Noise Levels at SR6

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Enclosure Reduction <sup>(*)</sup> dB(A)	Screening Reduction <sup>(*)</sup> dB(A)	Distance (m)	Distance Attenuation d B(A)	facade correction d B(A)	SPL at NSR	Horsepower & rpm of pump kW	rpm	Air Flow Rate (m3/hr)	
<b>New Equipment</b>																
<b>Proposed Flow Division Pump Pits</b>																
Pumps in Pump Pit No. 1	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	320	-58	3	34	22	970		
Pumps in Pump Pit No. 2	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	280	-57	3	35	22	970		
<b>Proposed Bioreactor</b>																
Internal recycle pump	3	2 duty + 1 standby	Ref 3	92	97	in tanks	0	-10	340	-59	3	31	15	365		
<b>Proposed Air Blower House</b>																
Air Blower	2	1 duty + 1 standby	Ref 1	104	107	Enclosed	-20	0	245	-56	3	34	250	3000		
Exhaust Fan	4		Ref 4	89	95			-10	245	-56	3	32	1	700		
<b>Proposed RAS/SAS Pumping Station</b>																
RAS pump	3	2 duty + 1 standby	Ref 3	92	97	Enclosed	-20	0	395	-60	3	20	9	955		
SAS pump	2	1 duty + 1 standby	Ref 3	92	95	Enclosed	-20	0	395	-60	3	18	1	925		
Exhaust Fan	1		Ref 4	89	89			-10	395	-60	3	22	1	700		
<b>Proposed Centrifuges for sludge thickening</b>																
Centrifuge	2	1 duty + 1 standby	Ref 4	81	84	enclosed	-20	0	190	-54	3	13	60	2900		
dosing pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	190	-54	3	16	5	1000		
Feed pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	190	-54	3	16	15	1400		
<b>Proposed Sludge Dewatering House Extension</b>																
Plate filter press	1		Ref 1	100	100	enclosed	-20	0	150	-52	3	31	11	3000		
Feed pump	2	1 duty + 1 standby	Ref 3	94	97	enclosed	-20	-10	150	-52	3	18	22	1470		
Dosing pump	2	1 duty + 1 standby	Ref 3	92	95	enclosed	-20	-10	150	-52	3	16	9	1400		
Exhaust Fan	1		Ref 4	89	89			-10	150	-52	3	30	1	700		
<b>Proposed Deodorizing Unit</b>																
Exhaust Fan of De-odorizer for Inlet Works	2	1 duty + 1 standby	Ref 3	83	86			-10	280	-57	3	22	4	2255	2088	
Exhaust Fan of De-odorizer for SHTs	2	1 duty + 1 standby	Ref 3	85	88			-10	150	-52	3	29	15	1993	12096	
<b>Existing Equipment</b>																
<b>Existing Inlet Works</b>																
Inlet pump	3		Ref 1	104	109	enclosed	-20	0	515	-62	3	30	250	1470		
Exhaust Fan of Inlet Pumping Station	3		Ref 4	89	94			-10	515	-62	3	25	2	750		
Mechanically raked fine screen	3		Ref 2	87	92	enclosed	-20		220	-55	3	20				
Air compressor for aerated grit channels	3		Ref 2	87	92	enclosed	-20		220	-55	3	20	15	1450		
<b>Existing Bioreactors</b>																
Pump in Bioreactor No. 1 & No. 2	6		Ref 3	97	105	in tanks	0	-10	375	-59	3	38	26	960		
Pump in Bioreactor No. 3 & No. 4	6		Ref 3	97	105	in tanks	0	-10	340	-59	3	39	26	960		
<b>Existing Air Blower House</b>																
Air Blower	4	3 duty + 1 standby	Ref 1	104	110	Enclosed	-20	0	245	-56	3	37	590	9850		
Exhaust Fan	3		Ref 4	89	94			-10	245	-56	3	31	2	750		
<b>Existing RAS Pumping Station</b>																
RAS pump	3		Ref 1	100	105	Enclosed	-20	0	420	-60	3	27	200	885		
<b>Existing Primary Sludge Thickener</b>																
Thickened sludge pump	2		Ref 3	92	95	Enclosed		0	280	-57	3	41	15	1450		
<b>Existing Sludge Consolidation House</b>																
Air compressor for DAF unit	4		Ref 2	87	93	Enclosed	-20	0	190	-54	3	22	6	1450		
<b>Existing Sludge Dewatering House</b>																
Plate filter press	8		Ref 1	100	109	enclosed	-20	0	150	-52	3	41	4	1450		
Feed pump	10		Ref 3	94	104	enclosed	-20	-10	150	-52	3	25	22	1450		
Transfer pump	2		Ref 3	92	95	enclosed	-20	-10	150	-52	3	16	8	1450		
<b>Total SPL =</b>												<b>48</b>				

Ref:

Ref 1: The estimated SWLs were made with reference to the approved "Tai Po Sewage Treatment - Stage V Final EIA Report".

Ref 2: The estimated SWLs were determined by on-site measurement.

Ref 3: Good Practice on Pumping System Noise Control / Good Practices on Ventilation Noise Control.

Ref 4: The estimated SWLs were made with reference to the specification of similar items of equipment provided by suppliers.

Remarks:

(\*) Enclosure Reduction is the reduction of SWL due to the enclosure for the equipment. Screening Reduction is the reduction of SWL due to the screening of line of sight by building or structures between the noise sources and noise sensitive receivers.

(#) : Only those noisy equipment are included in the table. Other equipment (e.g. those for final clarifiers, pH control system, sludge conditioning tanks, etc..) which does not have significant noise impact are not included.

Annex 4-3C : Calculation of Operational Noise Levels at NSR - Unmitigated

(2) Predicted Cumulative Noise Levels at SR7

Items <sup>(#)</sup>	No. of Items	Remark	Ref.	SWL /Item	Total SWL dB(A)	Enclosed	Enclosure Reduction <sup>(*)</sup> dB(A)	Screening Reduction <sup>(*)</sup> dB(A)	Distance (m)	Distance Attenuation d B(A)	facade correction d B(A)	SPL at NSR	Horsepower & rpm of pump kW rpm	Air Flow Rate (m3/hr)
<b>New Equipment</b>														
<b>Proposed Flow Division Pump Pits</b>														
Pumps in Pump Pit No. 1	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	410	-60	3	32	10	475
Pumps in Pump Pit No. 2	3	2 duty + 1 standby	Ref 3	94	99	in tanks		-10	360	-59	3	33	10	475
<b>Proposed Bioreactor</b>														
Internal recycle pump	3	2 duty + 1 standby	Ref 3	92	97	in tanks		-10	220	-55	3	35	10	475
<b>Proposed Air Blower House</b>														
Air Blower	2	1 duty + 1 standby	Ref 1	104	107	Enclosed	-20	0	315	-58	3	32		
Exhaust Fan	4		Ref 4	89	95			-10	315	-58	3	30		
<b>Proposed RAS/SAS Pumping Station</b>														
RAS pump	3	2 duty + 1 standby	Ref 3	92	97	Enclosed	-20	0	240	-56	3	24	8	885
SAS pump	2	1 duty + 1 standby	Ref 3	92	95	Enclosed	-20	0	240	-56	3	22	2	1350
Exhaust Fan	1		Ref 4	89	89			-10	240	-56	3	26		
<b>Proposed Centrifuges for sludge thickening</b>														
Centrifuge	2	1 duty + 1 standby	Ref 4	81	84	enclosed	-20	0	480	-62	3	5	60	2900
dosing pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	480	-62	3	8	5	1000
Feed pump	3	2 duty + 1 standby	Ref 3	92	97	enclosed	-20	-10	480	-62	3	8	15	1400
<b>Proposed Sludge Dewatering House Extension</b>														
Plate filter press	1		Ref 1	100	100	enclosed	-20	0	540	-63	3	20		
Feed pump	2	1 duty + 1 standby	Ref 3	94	97	enclosed	-20	-10	540	-63	3	7	11	1470
Dosing pump	2	1 duty + 1 standby	Ref 3	92	95	enclosed	-20	-10	540	-63	3	5	8	1400
Exhaust Fan	1		Ref 4	89	89			-10	540	-63	3	19		
<b>Proposed Deodorizing Unit</b>														
Exhaust Fan of De-odorizer for Inlet Works	2	1 duty + 1 standby	Ref 3	83	86			-10	520	-62	3	17		2088
Exhaust Fan of De-odorizer for SHTs	2	1 duty + 1 standby	Ref 3	85	88			-10	630	-64	3	17		12096
<b>Existing Equipment</b>														
<b>Existing Inlet Works</b>														
Inlet pump	3		Ref 1	104	109	enclosed	-20	0	515	-62	3	30	250	1470
Exhaust Fan of Inlet Pumping Station	3		Ref 4	89	94			-10	515	-62	3	25	2	750
Mechanically raked fine screen	3		Ref 2	87	92	enclosed	-20		220	-55	3	20		
Air compressor for aerated grit channels	3		Ref 2	87	92	enclosed	-20		480	-62	3	13	15	1450
<b>Existing Bioreactors</b>														
Pump in Bioreactor No. 1 & No. 2	6		Ref 3	97	105	in tanks	0	-10	365	-59	3	39	26	960
Pump in Bioreactor No. 3 & No. 4	6		Ref 3	97	105	in tanks	0	-10	285	-57	3	41	26	960
<b>Existing Air Blower House</b>														
Air Blower	4	3 duty + 1 standby	Ref 1	104	110	Enclosed	-20	0	340	-59	3	34	590	9850
Exhaust Fan	3		Ref 4	89	94			-10	340	-59	3	28	2	750
<b>Existing RAS Pumping Station</b>														
RAS pump	3		Ref 1	100	105	Enclosed	-20	0	240	-56	3	32	200	885
<b>Existing Primary Sludge Thickener</b>														
Thickened sludge pump	2		Ref 3	92	95	Enclosed		0	500	-62	3	36	15	1450
<b>Existing Sludge Consolidation House</b>														
Air compressor for DAF unit	4		Ref 2	87	93	Enclosed	-20	0	480	-62	3	14	6	1450
<b>Existing Sludge Dewatering House</b>														
Plate filter press	8		Ref 1	100	109	enclosed	-20	0	540	-63	3	29	4	1450
Feed pump	10		Ref 3	94	104	enclosed	-20	-10	540	-63	3	14	22	1450
Transfer pump	2		Ref 3	92	95	enclosed	-20	-10	540	-63	3	5	8	1450
<b>Total SPL =</b>												<b>46</b>		

Ref:

Ref 1: The estimated SWLs were made with reference to the approved "Tai Po Sewage Treatment - Stage V Final EIA Report".

Ref 2: The estimated SWLs were determined by on-site measurement.

Ref 3: Good Practice on Pumping System Noise Control / Good Practices on Ventilation Noise Control.

Ref 4: The estimated SWLs were made with reference to the specification of similar items of equipment provided by suppliers.

Remarks:

<sup>(\*)</sup>: Enclosure Reduction is the reduction of SWL due to the enclosure for the equipment. Screening Reduction is the reduction of SWL due to the screening of line of sight by building or structures between the noise sources and noise sensitive receivers.

<sup>(#)</sup>: Only those noisy equipment are included in the table. Other equipment (e.g. those for final clarifiers, pH control system, sludge conditioning tanks, etc.) which does not have significant noise impact are not included.

**Annex 4-4A**

**Powered Mechanical Equipment (PME) for Different  
Construction Tasks during Normal Daytime Working Hours  
(with the Use of Silenced PME)**

**Site Clearance and Set Up Site Office**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Breaker, excavator mounted *	C2/4 #	1	119	100%	0	119
Excavator *	C3/97 #	1	105	100%	0	105
Dump Truck *	C9/20 #	1	103	100%	0	103
Air compressor	CNP 002	1	102	100%	0	102
Bulldozer *	C9/2 #	1	104	100%	0	104
Generator *	CNP 103	1	95	100%	0	95
Total =						119

**Piling Works**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Bored Piling, grab & chisel	CNP 164	1	115	100%	0	115
Mobile Crane *	C7/114 #	1	101	100%	0	101
Dump truck *	C9/20 #	1	102	100%	0	102
Air compressor	CNP 002	1	103	100%	0	103
Generator *	CNP 103	1	95	100%	0	95
Piling, oscillator *	CNP 165	1	115	100%	0	115
Total =						118

**Excavation Works**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Dump truck *	C9/20 #	1	102	100%	0	102
Excavator *	C3/97 #	1	105	100%	0	105
Generator *	CNP 103	1	95	100%	0	95
Air compressor	CNP 002	1	102	100%	0	102
Breaker, excavator mounted *	C2/4 #	1	119	100%	0	119
Total =						119

**Concreting Work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Mobile Crane *	C7/114 #	1	101	100%	0	101
Concrete Lorry Mixer*	C6/23#	1	100	100%	0	100
Bar Bender and cutter	CNP 021	1	90	100%	0	90
Concrete pump *	C6/36#	1	106	100%	0	106
Poker *	C6/32#	3	100	100%	0	105
Chipper, hand held	CNP 043	1	112	100%	0	112
Saw, circular, wood	CNP 201	1	108	100%	0	108
Generator *	CNP 103	1	95	100%	0	95
Air Compressor	CNP 002	1	102	100%	0	102
Total =						117

**Pipework or miscellaneous work**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Backhoe *	C8/33#	1	102	100%	0	102
Mobile Crane *	C7/114 #	1	101	100%	0	101
Lorry *	C9/40 #	1	105	100%	0	105
Compactor	CNP 050	1	105	100%	0	105
Generator *	CNP 103	1	95	100%	0	95
Air Compressor	CNP 002	1	102	100%	0	102
Roller *	C8/25 #	1	96	100%	0	96
Total						111

**Demolition of Existing Structures**

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Barrier dB(A)	Total SWL dB(A)
Breaker, excavator mounted *	C2/4 #	1	119	100%	0	119
Breaker, hand-held	CNP 024	1	108	100%	0	108
Air Compressor *	CNP 002	1	102	100%	0	102
Loader *	C3/97 #	1	105	100%	0	105
Lorry *	C3/59 #	1	105	100%	0	105
Generator *	CNP 103	1	95	100%	0	95
Total =						120

Note:

# - BS 5228 Part 1 :1997

\* - Quiet Plant

Annex 4-4B: Calculation of Construction Noise Levels at Noise Sensitive Receivers During Normal Daytime Working Hours - Mitigated Scenario

Activities	Duration month	SWL dB(A)	Distance (m)	DA dB(A)	SR dB(A)	FC dB(A)	SPL dB(A)	2005		2006				2007				2008				2009		
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
<b>Expansion of Shek Wu Hui Sewage Treatment Works</b>																								
<b>Section 1 of the Works</b>																								
Site Clearance and Set Up Site Office	3	119	350	-59	-10	3	54	54	54															
Piling Construction of Bioreactor	3	118	390	-60	-10	3	52	52	52															
Excavation Works of Bioreactor	3	119	390	-60	-10	3	53	53	53															
Piling Construction of Air Blower House	3	118	235	-55	-10	3	56	56	56															
Excavation Works of Air Blower House	3	119	235	-55	-10	3	57	57	57															
Superstructure Construction of Bioreactor (Concreting works)	16	117	390	-60	0	3	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
Superstructure Construction of Air Blower House (Concreting works)	16	117	235	-55	0	3	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	
Pipework and miscellaneous work for Section 1	16	111	390	-60	-10	3	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	
Installation of E&M Equipment for Air Blower House and Bioreactor	6																							
Commissioning of Air Blower House and Bioreactor	4																							
<b>Section 2 of the Works</b>																								
Piling Construction of FST and RAS/SAS Pumping Station	3	118	390	-60	-10	3	52	52	52															
Excavation Works of FST and RAS/SAS Pumping Station	3	119	390	-60	-10	3	53	53	53															
Superstructure Construction of FST and RAS/SAS Pumping Station (Concreting works)	19	117	390	-60	0	3	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
Pipework and miscellaneous work for Section 2	19	111	390	-60	-10	3	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	
Installation of E&M Equipment for FST and RAS/SAS Pumping Station	3																							
Commissioning of FST and RAS/SAS Pumping Station	4																							
<b>Section 3 of the Works</b>																								
Piling Construction of Press House Extension	2	118	140	-51	-10	3	60	60																
Excavation Works of Press House Extension	1	119	140	-51	-10	3	61	61																
Piling Construction of Sludge Conditioning Tank	2	118	140	-51	-10	3	60	60																
Excavation Works of Sludge Conditioning Tank	2	119	140	-51	-10	3	61	61	61	61														
Superstructure Construction of Press House Extension (Concreting works)	23	117	140	-51	0	3	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	
Construction of Sludge Conditioning Tanks (Concreting works)	23	117	140	-51	-10	3	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	
Pipework and miscellaneous work for Section 3	23	111	140	-51	-10	3	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	
Installation of E&M Equipment for Sludge Conditioning Tanks and Press House Extension	4																							
<b>Modification of the Existing Bioreactors of Shek Wu Hui Sewage Treatment Works</b>																								
Modification of the existing Bioreactor No. 1 (1 mth Demolition works + 2mth E&M Works)	3	120	300	-59	0	3	64															64		
Modification of the existing Bioreactor No. 2 (1 mth Demolition works + 2mth E&M Works)	3	120	351	-59	0	3	64															64		
Modification of the existing Bioreactor No. 3 (1 mth Demolition works + 2mth E&M Works)	3	120	335	-59	0	3	64															64		
Modification of the existing Bioreactor No. 4 (1 mth Demolition works + 2mth E&M Works)	3	120	365	-59	0	3	64															64		

Abbreviations:  
 DA = Distance Attenuation  
 SR = Reduction due to screening from the line-of-sight of NSRs by building, noise barrier, structures within the site or solid boundary wall. This allowed a reduction in the SPL of 10 dB(A) in accordance with the relevant Technical Memorandum.  
 FC = A +3 dB(A) facade correction was added to the predicted noise levels to account for the facade effect at each NSR.  
 SPL at NSR = Sound Power Level at NSR + SWL + DA + SR + FC



Annex A4-4B: Calculation of Construction Noise Levels at Noise Sensitive Receivers During Normal Daytime Working Hours - Mitigated Scenario

(2) For SR7

Activities	Duration month	SWL dB(A)	Distance (m)	DA dB(A)	SR dB(A)	FC dB(A)	SPL dB(A)	2005			2006				2007				2008				2009										
								Q3		Q4		Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4		Q1		Q2		Q3	
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	
<b>Expansion of Shek Wu Hui Sewage Treatment Works</b>																																	
Section 1 of the Works																																	
Site Clearance and Set Up Site Office	3	119	175	-53	-5	3	65	65	65																								
Piling Construction of Bioreactor	3	118	240	-56	-5	3	61	61	61																								
Excavation Works of Bioreactor	3	119	240	-56	-5	3	62	62	62																								
Piling Construction of Air Blower House	3	118	340	-59	-5	3	58	58	58																								
Excavation Works of Air Blower House	3	119	340	-59	-5	3	59	59	59																								
Superstructure Construction of Bioreactor (Concreting works)	16	117	240	-56	0	3	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64			
Superstructure Construction of Air Blower House (Concreting works)	16	117	330	-58	0	3	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62			
Pipework and miscellaneous work for Section 1	16	111	330	-58	-5	3	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50			
Installation of E&M Equipment for Air Blower House and Bioreactor	6																																
Commissioning of Air Blower House and Bioreactor	4																																
Section 2 of the Works																																	
Piling Construction of FST and RAS/SAS Pumping Station	3	118	220	-55	-5	3	62	62	62																								
Excavation Works of FST and RAS/SAS Pumping Station	3	119	220	-55	-5	3	63	63	63																								
Superstructure Construction of FST and RAS/SAS Pumping Station (Concreting works)	19	117	220	-55	0	3	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65			
Pipework and miscellaneous work for Section 2	19	111	220	-55	-5	3	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54			
Installation of E&M Equipment for FST and RAS/SAS Pumping Station	3																																
Commissioning of FST and RAS/SAS Pumping Station	4																																
Section 3 of the Works																																	
Piling Construction of Press House Extension	2	118	515	-62	-10	3	49	49																									
Excavation Works of Press House Extension	1	119	515	-62	-10	3	50																										
Piling Construction of Sludge Conditioning Tank	2	118	560	-63	-10	3	48	48																									
Excavation Works of Sludge Conditioning Tank	2	119	560	-63	-10	3	49	49																									
Superstructure Construction of Press House Extension (Concreting works)	23	117	515	-62	0	3	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58			
Construction of Sludge Conditioning Tanks (Concreting works)	23	117	560	-63	-10	3	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47			
Pipework and miscellaneous work for Section 3	23	111	515	-62	-10	3	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41			
Installation of E&M Equipment for Sludge Conditioning Tanks and Press House Extension	4																																
<b>Modification of the Existing Bioreactors of Shek Wu Hui Sewage Treatment Works</b>																																	
Modification of the existing Bioreactor No. 1 (1 mth Demolition works + 2mth E&M Works)	3	120	390	-59	0	3	64																										
Modification of the existing Bioreactor No. 2 (1 mth Demolition works + 2mth E&M Works)	3	120	345	-59	0	3	64																										
Modification of the existing Bioreactor No. 3 (1 mth Demolition works + 2mth E&M Works)	3	120	305	-59	0	3	64																										
Modification of the existing Bioreactor No. 4 (1 mth Demolition works + 2mth E&M Works)	3	120	275	-59	0	3	64																										

Abbreviations:

DA = Distance Attenuation  
 SR = Reduction due to screening from the line-of-sight of NSRs by building, noise barrier, structures within the site or solid boundary wall. This allowed a reduction in the SPL of 10 dB(A) in accordance with the relevant Technical Memorandum.  
 FC = A +3 dB(A) facade correction was added to the predicted noise levels to account for the facade effect at each NSR.  
 SPL at NSR = Sound Power Level at NSR = SWL + DA + SR + FC