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4 NOISE IMPACT

4.1 Introduction

4.1.1.1 This section presents an assessment of potential noise impacts associated with the construction and operation of the Project. The noise impact assessment has been conducted in accordance with the requirements of Annex 5 and Annex 13 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) as well as the requirements set out under Clause 3.4.2 of the Environmental Impact Assessment (EIA) Study Brief (No. ESB-309/2018) (hereinafter "the Study Brief").

4.2 Environmental Legislation, Standards and Criteria

4.2.1 General

- 4.2.1.1 Noise impacts have been assessed in accordance with the criteria and methodology given in the EIAO-TM and the Technical Memoranda made under the Noise Control Ordinance (NCO).
- 4.2.1.2 The NCO provides the statutory framework for noise control. This defines statutory limits applicable to equipment used during the construction and operation phases of the Project. The NCO invokes four Technical Memoranda, which define the technical means for noise assessment:
 - (i) Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM);
 - (ii) Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM);
 - (iii) Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM); and
 - (iv) Technical Memorandum on Noise from Percussive Piling (PP-TM).
- 4.2.1.3 With regard to the assessments of the construction noise impact during restricted hours and operational fixed plant noise impact, 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 (see **Table 4.1**). Within these areas, the presence of "influencing factors" (such as the presence of industrial area or major roads) can further affect the ASR and hence the acceptable noise levels.

Turne of Area Containing NCD	Degree to which NSR is affected by Influencing Factor				
Type of Area Containing NSK	Not Affected	Indirectly Affected	Directly Affected		
Rural area, including country parks or village type developments	А	В	В		
Low density residential area consisting of low-rise or isolated high-rise developments	A	В	С		
Urban area	В	С	С		
Area other than those above	В	В	С		
Note:					

Table 4.1Area Sensitivity Ratings (ASRs)

"country park" means an area that is designated as a country park pursuant to section 14 of the Country Parks Ordinance;

- "directly affected" means that the NSR is at such a location that noise generated by the IF is readily
 noticeable at the NSR and is a dominant feature of the noise climate of the NSR;
 - "indirectly affected" means that the NSR is at such a location that noise generated by the IF, whilst noticeable at the NSR, is not a dominant feature of the noise climate of the NSR;
- "not affected" means that the NSR is at such a location that noise generated by the IF is not noticeable at the NSR; and
- "urban area" means an area of high density, diverse development including a mixture of such elements as industrial activities, major trade or commercial activities and residential premises.

4.2.2 Construction Noise

General Construction Works

4.2.2.1 The NCO provides the statutory framework for noise control of construction works, other than percussive piling, using powered mechanical equipment (PME) between the hours of 1900 and 0700 hours or at any time on Sundays and general holiday (that is, restricted hours). Noise control on construction activities taking place at other times is subject to the Noise Standards for Daytime Construction Activities stated in Table 1B of Annex 5 in the EIAO-TM. The noise limit is Leq(30 minutes) 75 dB(A) at the façades of domestic premises and Leq(30 minutes) 70 dB(A) at the façade of educational institutions (Leq(30 minutes) 65 dB(A) during examinations).

Construction Works during Restricted Hours

4.2.2.2 Between 1900 and 0700 hours and all day on Sundays and general holidays, activities involving the use of PME for the purpose of carrying out construction works is prohibited unless a Construction Noise Permit (CNP) has been obtained. A CNP may be granted provided that the Acceptable Noise Level (ANL) for the NSRs can be complied with. ANLs are assigned depending upon the ASR. The corresponding basic noise levels (BNLs) for evening and night time periods are given in **Table 4.2**.

Table 4.2	Construction	Noise	Criteria	for	Activities	Other	Than	Percussive
	Piling							

Time Boried	Basic Noise Level (BNLs), dB(A)				
	ASR A	ASR B	ASR C		
All days during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day-time and evening (0700 to 2300 hours)	60	65	70		
All days during the night-time (2300 to 0700 hours)	45	50	55		

- 4.2.2.3 The Noise Control Authority will consider a well-justified CNP application, for construction works within restricted hours as guided by the relevant Technical Memoranda issued under the Noise Control Ordinance. The Noise Control Authority will take into account of contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in this EIA shall bind the Noise Control Authority in making his decision. If a CNP is to be issued, the Noise Control Authority shall include in it any condition he thinks fit. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.
- 4.2.2.4 Under the DA-TM, the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW) within a designated area during restricted hours would require a valid CNP. The SPME includes hand-held breaker, bulldozer, concrete lorry mixer, dump truck and hand-held vibratory poker. The PCW are:
 - Erecting or dismantling of formwork or scaffolding.

- Loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material.
- Hammering.
- 4.2.2.5 In general, it should not be presumed that a CNP would be granted for carrying out PCW within a designated area during restricted hours. The CNP may be granted for the execution of construction works during restricted hours involving the use of PME and/ or SPME if the relevant Acceptable Noise Levels and criteria stipulated in the GW-TM and DA-TM can be met. These noise level requirements are more stringent (i.e. 15 dB(A) less than those listed in the GW-TM) to offer additional protection to the population.
- 4.2.2.6 Percussive piling is prohibited between 1900 and 0700 hours on any weekday not being a general holiday and at any time on Sunday or general holiday. A CNP is required for the carrying out of percussive piling between 0700 and 1900 hours on any day not being a general holiday. PP-TM sets out the requirements for working and determination of the permitted hours of operations for the CNP applications. The permitted hours of operations would be 3, 6 or 12 hours per day depending on the types of percussive piling and the predicted noise impact at NSRs.

4.2.3 Operational Phase Fixed Plant Noise

4.2.3.1 Fixed plant noise sources are controlled by the NCO and IND-TM. The ANLs for the NSRs are determined based on the ASR as stated in **Section 4.2.1.3** and **Table 4.1**. The ANLs for different ASRs during different periods are summarised in **Table 4.3** below.

Time Period	ANL L _{eq 30-min} , dB(A)			
	ASR A	ASR B	ASR C	
Day (0700 to 1900 hours)	60	65	70	
Evening (1900 to 2300 hours)	60	65	70	
Night (2300 to 0700 hours)	50	55	60	

Table 4.3 Acceptable Noise Level for Fixed Plant Noise

- 4.2.3.2 According to IND-TM, the Project site is located in vicinity of Yuen Long Industrial Estate. Any NSR shall, irrespective of **Table 4.1**, be assigned an ASR of "C" if it is within 100 m of a zone designated as "Industrial" or "Industrial Estate" on a statutory Outline Zoning Plan, or an ASR of "B" if it is between 100 m and 250 m from such a zone, except in cases where **Table 4.1** indicates an ASR of "C".
- 4.2.3.3 There were three residential NSRs identified within the 300m assessment area. The identified NSRs are located to the north, west and east of the proposed Yuen Long Effluent Polishing Plant (YLEPP). These NSRs are 1-storey to 2-storey high village houses. The NSR to the north of the YLEPP is located in rural area and is not affected by any influence factor, an ASR of "A" has been assigned. Located within 100m from Yuen Long Industrial Estate, the NSR to the west of the YLEPP has been assigned with an ASR of "C". Whereas, the NSR to the east of YLEPP is located between 100m and 250m from Yuen Long Industrial Estate, hence an ASR of "B" has been assigned.
- 4.2.3.4 As stipulated in Annex 5 of the EIAO-TM, the noise standard for planning purposes for fixed noise source are (a) 5 dB(A) below the appropriate ANL, or (b) the prevailing background noise levels (for quiet areas with level 5 dB(A) below the ANL). In this regard, noise measurement was undertaken in the vicinity of the representative NSRs to study the background noise level. The noise measurement results are presented in in **Appendix 4.1** and the lowest background noise levels recorded at each NSR are summarized in below **Table 4.4**. Should the background noise level be lower than the ANL by more than 5 dB(A), the background noise level would be adopted as the assessment criteria.

Measurement Location		Mea Backgr L _{eq}	asured Low ound Noise _{30-min} , dB(A	Measurement Method	
ID	Description	Day ⁽²⁾	Evening (3)	Night ⁽⁴⁾	Method
N1	Squatter house at the north of Yuen Long STW	53	47	46	Free-field
N2	Squatter house at the west of Yuen Long STW	49	47	43	Free-field
N3	Squatter house at the east of Yuen Long STW	55	57	53	Free-field

 Table 4.4
 Summary of Background Noise Measurement Results

Note:

 Façade correction of +3 dB(A) has been added to the measurement results for free-field measurement.

- (2) Daytime means 07:00 19:00.
- (3) Evening time means 19:00 23:00.
- (4) Night time means 23:00 07:00 of the next day.
- 4.2.3.5 In any event, the ASR assumed in the EIA Report is for indicative assessment only. It should be noted that the fixed noise sources are controlled under Section 13 of the NCO. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force and taking account of contemporary conditions/situations of adjoining land uses. Nothing in the EIA Report shall bind the Noise Control Authority in the context of law enforcement against all the fixed noise sources being assessed.

4.3 Description of Environment

4.3.1.1 The existing Yuen Long Sewage Treatment Works (YLSTW) is located to the west of Shan Pui River as shown in **Figure 1.1**. Surrounding area is a mixture of rural village type developments, fish ponds and industrial buildings. The prevailing noise climate of the assessment area is dominated by the industrial fixed plant noise from Yuen Long Industrial Estate.

4.4 Noise Sensitive Receivers

- 4.4.1.1 The assessment area for noise impact assessment is defined by a distance of 300m from the Project boundary as specified in the Study Brief. The representative NSRs within the assessment area for the construction and operation noise impact assessments have been identified based on the finding of the site visits and review of latest information from Planning Department, and Lands Department as well as the statutory Outline Zoning Plan (OZP) gazetted under Town Planning Ordinance including OZP Plan No. S/YL/23 – Yuen Long, Plan No. S/YL-NSW/8 - Nam Sang Wai, Plan No. S/YL-PS/18 - Ping Shan, and Plan No. S/YL-LFS/9 - Lau Fau Shan & Tsim Bei Tsui. No planned NSR is identified within the 300m assessment area.
- 4.4.1.2 Representative NSRs located close to the subject noise sources (i.e. the first layer of NSRs) are considered as the most affected location. The first layer of NSRs would provide acoustic shielding to those receivers at further distance behind. The first layer of NSRs represent the worst case scenario, and are selected as representative NSRs for the noise assessment. The representative NSRs identified within 300m from the Project boundary is presented in Table 4.5 below. Locations of the representative NSRs are shown in Figure 4.1. Photographs of the existing NSRs are provided in Appendix 4.2.

NSR	Description	No. of Storeys	Type of Use	Distance from the nearest Site Boundary of the Project (m)	Consideration in Construction [C] or Operation [O] Phase Assessment
NSR1	Squatter house to the north of YLSTW	1	Residential	280	C&O
NSR2	Squatter house to the west of YLSTW	2	Residential	70	C&O
NSR3	Squatter house to the east of YLSTW	2	Residential	180	C&O

Table 4.5 Details of Representative Noise Sensitive Receivers

4.4.1.3 Based on the ANLs presented in **Table 4.3** and the background noise measurement results as summarized in **Table 4.4**, the fixed plant noise criteria of the representative NSRs have been determined and are presented in **Table 4.6**.

			Background			
NSR	Time Period	ANL – 5 L _{eq 30-min} , dB(A)	Location ID	Measured Lowest Noise Level ⁽⁴⁾ , L _{eq 30-min} , dB(A)	Noise Criteria, L _{eq 30-min} , dB(A)	
	Day ⁽¹⁾	55		53	53	
NSR1	Evening ⁽²⁾	55	N1	47	47	
	Night ⁽³⁾	45		46	45	
	Day ⁽¹⁾	65		49	49	
NSR2	Evening ⁽²⁾	65	N2	47	47	
	Night ⁽³⁾	55		43	43	
NSR3	Day ⁽¹⁾	60	N3	55	55	
	Evening ⁽²⁾	60		57	57	
	Night ⁽³⁾	50		53	50	

 Table 4.6
 Noise Criteria for Fixed Plant Noise Impact Assessment

Note:

(1) Daytime means 07:00 – 19:00.

(2) Evening time means 19:00 – 23:00.

(3) Night time means 23:00 - 07:00 of the next day.

(4) Façade correction of +3 dB(A) has been added to the measurement results for free-field measurement.

4.5 Identification of Environmental Impacts

4.5.1 Construction Phase

4.5.1.1 Potential source of noise impact during construction phase of the Project would be the use of PME for various construction activities. Major construction works of the Project would include demolition of existing facilities of YLSTW, foundation and superstructure works for the proposed YLEPP. Details of the proposed construction methods and sequence of works are described in **Section 2** of this EIA Report.

- 4.5.1.2 As described in **Section 2** of this EIA Report, the foundation schemes for respective structures are subject to vetting and approval by relevant authority. Yet, it is realised that percussive piling would be carried out for some of the proposed facilities of YLEPP, except in the period from November to March in view of the concerns of impacts to waterbirds. Use of percussive piling would be subject to detail design in the future. Alternative piling method will be considered as far as practicable to avoid using percussive piling. Should the percussive piling construction method to be used for the Project, a CNP, as mentioned in **Section 4.2.2.6**, will be applied during construction phase of the Project.
- 4.5.1.3 The construction programme at the time of assessment does not require any construction activities using PME undertaken during restricted hours (i.e. hours from 1900 to 0700 or at any time on a general holiday). Therefore, only noise impact from general construction activities during the non-restricted hours have been assessed in this EIA Report.
- 4.5.1.4 Based on current available information, no concurrent project has been identified within the assessment area. As such, cumulative construction noise impact would not be expected.

4.5.2 Operation Phase

4.5.2.1 Potential fixed plants noise impact during operation of the proposed YLEPP would be generated from the operation of the pumps, air blowers, motors, ventilation fans and extraction fans of deodourisation units, etc. at the proposed treatment facilities. The details of fixed noise plant inventory for proposed YLEPP are presented in **Appendix 4.6**. The pumps, air blowers and motors would be located within reinforced concrete buildings, while ventilation fans would be provided at the ventilation vents of these buildings. The Project proponent advised the proposed YLEPP will be operated 24 hours per day, 7 days per week throughout the year. Thus, the day time, evening time and night time operational fixed plant noise impact have been assessed.

4.6 Assessment Methodology

4.6.1 Construction Phase

- 4.6.1.1 The construction noise impact assessment was undertaken based on standard acoustic principles and followed the procedures given in the GW-TM. The sound pressure level of each construction task has been calculated, depending on the number of plant items and the distance from NSR. The general approach is summarized below:
 - Locate the NSRs which would most likely be affected by noise from the construction work;
 - Determine the items of PME for each discrete construction activity, based on available information or agreed plant inventories;
 - Assign sound power levels (SWLs) to the proposed PME according to the GW-TMs;
 - Calculate distance attenuation and screening effects to NSRs from notional noise source; and
 - Predict construction noise levels at NSRs in the absence of any mitigation measures.
- 4.6.1.2 The construction programme and the plant inventory (including type and quantity of the PME used as well as percentage on time utilization) respectively presented in **Appendices 4.3 and 4.4** are confirmed by the Project Engineer to be practical and suitable for the proposed works. Based on the construction programme, the plant inventory and the sound power level (SWL) of equipment in Table 3 of GW-TM, the SWL of each construction activities has been calculated, based on the type and quantity of the PME used as well as percentage on time utilization.
- 4.6.1.3 To calculate the sound pressure level of each construction activities, distance attenuation correction has been applied. The distance attenuation was determined by using the following formula:

Distance Attenuation in $dB(A) = 20 \log D + 8$

where D is distance between PME and NSR in metres

- 4.6.1.4 The following assumptions have been applied as well:
 - (i) A +3 dB(A) façade correction was added to the predicted noise levels to account for the facade effect at each identified representative NSR;
 - (ii) All PME items required for a particular construction activity was assumed to be located at the notional source position of the workfront where such activity is to be performed in accordance with the GW-TM;
 - (iii) As a worst-case assumption, noise impact at the nearest sensitive facades of the residential buildings to the source positions was assessed; and
 - (iv) As a worst-case assumption, noise assessment points of all NSRs were assumed at the same height as the Project Site, i.e. G/F of all NSRs.
- 4.6.1.5 In accordance with the construction programme (**Appendix 4.3**) at the time of the assessment, no construction activities with PME operation would be undertaken in the restricted hours. The predicted construction noise impact would be compared with the noise standards mentioned in **Section 4.2.2.1**.
- 4.6.1.6 If exceedance of relevant noise standards is predicted, practicable direct noise mitigation measures including the use of quieter equipment, movable noise barriers, noise barriers, enclosures and quieter alternative methods would be considered. Appropriate correction factors for barrier effect would be adopted in accordance with Section 2.10 of the GW-TM. In cases where the mitigated noise levels still exceed the relevant criteria, the duration of noise exceedance would be estimated.

4.6.2 Operation Phase

The fixed plant noise impact assessment was undertaken based on standard acoustic principles and followed the procedures given in the IND-TM. The following standard acoustic formula was used for calculating the sound pressure levels at the representative NSR.

SPL = SWL - DC + FC - BC

Where:	
SPL	Sound Pressure Level at NSR, in dB(A)
SWL	Sound Power Level of the PME, in dB(A)
DC	Distance Attenuation, in dB(A) (i.e. 20logD + 8 [where D is the distance in metres])
FC	Façade Correction, in dB(A) (i.e. 3 dB(A))
BC	Barrier Correction, in dB(A)

- 4.6.2.1 The SWL of the fixed plants were referenced to EPD's Good Practices on Ventilation System Noise Control, approved EIA reports, namely EIA report of Expansion of Sha Tau Kok Sewage Treatment Works (EIA-245/2016), EIA report of Harbour Area Treatment Scheme (HATS) Stage 2A (EIA-148/2008), EIA report of Upgrading and expansion of San Wai Sewage Treatment Works and expansion of Ha Tsuen Pumping Station (EIA-086/2002), product catalogue and engineering design information.
- 4.6.2.2 The fixed noise plant inventory (**Appendix 4.6**) for the assessment have been confirmed by Project proponent.
- 4.6.2.3 It was assumed that all the fixed plant within the same location would be operated simultaneously at any time of the day for the worst-case scenario. Screening correction offered by buildings or other structures such as office and residential buildings has been taken into account in the noise prediction. According to the GW-TM, effective barriers can result in noise reduction of 5 to 10 dB(A) for the fixed plant depending on the line of sight of the representative NSR. With reference to EPD's Good Practices on Pumping System

Noise Control, a noise reduction of more than 20 dB(A) could be provided by complete enclosures constructed by compressed strawboard (56mm thick) or plastered brick wall (125mm thick). As a conservative assumption in the assessment, noise reduction of 20 dB(A) was applied for fixed plants fully enclosed by plastered brick wall (125mm thick and surface density of 240 kg/m²). A positive 3 dB(A) was added to the predicted noise levels at the NSR due to the façade effect.

- 4.6.2.4 With reference to EPD's Good Practices on Pumping System Noise Control and Good Practices on Ventilation System Noise Control, a positive 3 dB(A) for correction of tonality has been considered in the assessment.
- 4.6.2.5 The predicted noise levels at the representative NSRs were compared with criteria set out in **Table 4.6**. Mitigation measures have been recommended in cases where an exceedance is predicted.

4.7 Prediction and Evaluation of Environmental Impacts

4.7.1 Construction Noise

4.7.1.1 Potential noise impacts from construction of the proposed YLEPP and demolition of the existing YLSTW during the normal daytime working hours have been assessed at the representative NSRs based on the construction programme as shown in **Appendix 4.3** and the construction plant inventory presented in **Appendix 4.4**. The unmitigated noise assessment results are summarized in **Table 4.7**. Details of the construction unmitigated noise assessment are presented in **Appendix 4.5**.

NSR	Daytime Noise Criteria,	Predicted Unmitigated Construction Noise L L _{eq 30-min} , dB(A)		
		Phase 1	Phase 2	
NSR1	75	55 – 76	58 – 67	
NSR2	75	64 – 79	60 – 71	
NSR3	75	59 - 80	56 – 69	

 Table 4.7
 Predicted Construction Noise Levels at Representative Noise

 Sensitive Receivers under Unmitigated Scenario

Note:

Boldfaced values indicate exceedance of noise criteria.

4.7.1.2 Referring to **Table 4.7**, in the absence of noise mitigation measures, non-compliance of the construction noise criterion would be predicted at the representative NSRs during Phase 1 construction of the proposed YLEPP and demolition of the existing YLSTW, while compliance is predicted during Phase 2 construction. Hence, direct mitigation measures would be required to alleviate the potential construction noise impact on the affected NSRs during Phase 1 construction.

4.7.2 Operational Fixed Plant Noise

4.7.2.1 Under the existing scenario, the treatment capacity of existing YLSTW is 70,000 m³/day. During Phase 1 construction of the Project, part of the existing YLSTW would be demolished for construction of the YLEPP Phase 1, while part of the YLSTW would still be in operation to handle the daily sewage. The treatment capacity of YLSTW would be reduced to 35,000 m³/day. After completion of Phase 1 construction of YLEPP, the remaining part of existing YLSTW would be ceased in operation. The treatment capacity of the YLEPP Phase 1 would be 100,000 m³/day. After completion of Phase 2 construction of YLEPP (i.e. the remaining part of existing YLSTW is also demolished), the treatment capacity of YLEPP would be 180,000 m³/day. Considering the existing YLSTW and the proposed Phase 1 YLEPP and Phase 2 YLEPP, similar types of fixed plants would be used. In view of similar plants, higher noise emission would be expected from more fixed plants in operation. It is therefore expected that the fixed noise emission levels would be highest in Phase 2 operation, which requires the highest number of fixed plants to be operated to cater the highest treatment capacity. Thus, the worst-case scenario for fixed plant noise assessment would be the operation phase of YLEPP Phase 2 as confirmed by the Project Engineer.

4.7.2.2 Referring to the preliminary engineering design, the sound power levels of the fixed plants under the worst-case scenario in the fixed noise impact assessment are presented in **Appendix 4.6**. Details of the noise calculation are also presented in **Appendix 4.6**. A summary of the fixed noise impact assessment results at the representative NSRs during the operation phase of the Project is shown in **Table 4.8**.

Table 4.8	Predicted Fixed Plant Noise Levels at Representative Noise Sensitive
	Receivers under Unmitigated Scenario

NSR	Noise Criteria (Day/Evening / Night), L _{eq 30-min} , dB(A)	Predicted Fixed Plant Noise Level, L _{eq 30-min} , dB(A)
NSR1	53 / 47 / 45	44
NSR2	49 / 47 / 43	51
NSR3	55 / 57 / 50	45

Note:

Boldfaced values indicate exceedance to the noise criteria.

4.7.2.3 The assessment results show that exceedance of the fixed plant noise criteria would be expected at the NSR2 during operation of YLEPP Phase 2 at daytime, evening time and night time. Mitigation measures are therefore required to alleviate the associated impact on the affected NSR.

4.8 Mitigation of Adverse Environmental Impacts

4.8.1 Construction Noise

Exceedance of the construction noise criteria would be predicted during Phase 1 4.8.1.1 construction under unmitigated scenario. The use of temporary movable noise barriers is recommended for hydraulic breakers mounted on excavators during construction to alleviate the adverse construction noise impact. The temporary movable noise barriers should be made of materials with density of at least 10 kg/m² to provide sufficient noise reduction. No sound leaks should be allowed through the barriers due to holes, slits, cracks, openings or gaps. Noise barriers will become more effective when located immediately adjacent to the work area, and can reduce the noise level by up to 5dB(A) and 10dB(A) for mobile and stationary plant respectively. With reference to GW-TM, noise attenuation of 5 dB(A) is applied when this type of PME would be screened from NSR's view. The construction plant inventory for the assessment of mitigated scenario is presented in Appendix 4.7. The details of construction noise impact assessment under mitigated scenario are presented in Appendix 4.8 and the mitigated noise levels at representative NSRs are summarized in below **Table 4.9**. With the implementation of the above proposed mitigation measure, the predicted mitigated construction noise levels at the representative NSRs would comply with relevant noise criteria. No adverse construction noise impact would be anticipated. No further noise mitigation measures would be required.

Table 4.9	Predicted	Construction	Noise	Levels	at	Representative	Noise
	Sensitive F	Receivers unde	r Mitiga	ted Scen	ario)	

NSR	Noise Criteria, L _{eq 30-min} , dB(A)	Predicted Mitigated Construction Noise Level, L _{eq 30-min} , dB(A) Phase 1
NSR1	75	55 – 72
NSR2	75	64 – 74
NSR3	75	59 – 75

- 4.8.1.2 In addition to the above construction noise mitigation measures, good site practices listed below and the noise control requirements stated in EPD's *"Recommended Pollution Control Clauses for Construction Contracts"* should be included in the Contract Specification for the Contractors to follow and implement the relevant measures to further minimize the potential noise impacts during the construction phase of the Project.
 - Quiet PME, such that those listed in EPD's Quality Powered Mechanical Equipment, should be considered for construction works to further minimize the potential construction noise impact.
 - Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme.
 - Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction programme.
 - Mobile plant, if any, 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, wherever possible, be orientated so that the noise is directed away from the nearby NSRs
 - Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

4.8.2 Operational Fixed Plant Noise

4.8.2.1 In view of the non-compliance of fixed plant noise criteria in the prediction as presented in **S.4.7.2**, mitigation measures should be implemented to alleviate the potential operation phase fixed plant noise impact. With reference to EPD's Good Practices on Pumping System Noise Control, locating plants inside a plantroom with silencers at air inlet and outlet and a sound proof door could provide noise reduction of 30dB(A). A 10 dB(A) noise reduction could be provided for ventilation fans by installing silencers. With the above mitigation measures in place, the predicted fixed plant noise levels at the representative NSRs would comply with the relevant criteria. The operation phase fixed plant inventory with mitigation measures in place and detailed fixed plant noise level predictions are presented in **Appendix 4.9**. A summary of the predicted fixed noise levels at representative NSRs is presented in **Table 4.10**.

	Noise Criteria	Predicted Fixed Plant Noise
NSR	(Day & Evening / Night),	Level,
	L _{eq 30-min} , dB(A)	L _{eq 30-min} , dB(A)
NSR1	53 / 47 / 45	35
NSR2	49 / 47 / 43	42
NSR3	55 / 57 / 50	37

Table 4.10	Predicted Fixed Plant Noise Levels at Representative Noise Sensitive
	Receivers under Mitigated Scenario

4.8.2.2 The assessment results show that no exceedance of the fixed plant noise criteria would be expected at the representative NSRs with the implementation of noise mitigation measures including locating PME inside a plantroom with silencers at air inlet and outlet and a sound proof door and installing silencers for ventilation fans. No adverse fixed plant noise impact would be anticipated during operation of the Project. The above mentioned mitigation measures would apply to both Phases 1 and 2 of the Project.

4.9 Evaluation of Residual Impacts

4.9.1 Construction Noise

4.9.1.1 No residual noise impact due to the construction of the Project is anticipated.

4.9.2 Operational Fixed Plant Noise

4.9.2.1 No residual fixed plant noise impact due to the operation of the Project is anticipated.

4.10 Environmental Monitoring and Audit

- 4.10.1.1 An EM&A programme during construction phase is recommended to be established. With reference to **Appendix 4.5**, construction noise exceedances at all 3 NSRs are predicted during Phase 1 construction of the Project under unmitigated scenario. No construction noise exceedance would be predicted at the NSRs during Phase 2 construction. Thus, construction noise monitoring is recommended during Phase 1 construction. Regular site environmental audit during both Phase 1 and Phase 2 construction is recommended to ensure proper implementation of mitigation measures and good site practices. Details of the EM&A programme are provided in a stand-alone EM&A Manual.
- 4.10.1.2 No adverse fixed plant noise impact is anticipated during the operation of the YLEPP Phase 1 or Phase 2 with mitigation measures in place. Commissioning test should be conducted prior to operation of the Project to ensure fixed plant noise impact would comply with the relevant noise standards. No operational noise monitoring is therefore deemed necessary.

4.11 Conclusion

- 4.11.1.1 The assessment for the potential construction noise impact from construction of proposed YLEPP and demolition of existing YLSTW has been conducted. The assessment results indicate that the predicted construction noise levels during Phase 1 construction of the Project at the representative NSRs would exceed the noise criteria without mitigation measures, while the predicted construction noise levels during Phase 2 construction of the Project would comply with the noise criteria. With mitigation measures in terms of temporary movable noise barriers for hydraulic breakers mounted on excavators, the predicted construction noise levels at the representative NSRs during Phases 1 construction of the Project would all comply with the noise criteria. Thus, no adverse construction noise impact arising from the Project would be anticipated.
- 4.11.1.2 The noise impact associated with the operation of the YLEPP has been assessed based on the plant design information provided by the Project Engineer at the time of the assessment. The assessment results indicate that the predicted fixed plant noise levels at the representative NSR would exceed the noise criteria under unmitigated scenario. With proper implementation of mitigation measures, the predicted fixed plant noise levels at representative NSRs would comply with relevant criteria, no adverse fixed plant noise impact due to the operation of the YLEPP would be anticipated. Commissioning test should be conducted prior to operation of the Project to ensure that the fixed plant noise impact would comply with the relevant noise standards.