

**CONTENTS**

<b>4. NOISE IMPACT ASSESSMENT .....</b>	<b>4-1</b>
4.1 Introduction.....	4-1
4.2 Relevant Legislation and Guidelines .....	4-1
4.3 Description of the Noise Environment.....	4-5
4.4 Noise Sensitive Receivers.....	4-6
4.5 Prevailing Background Noise Monitoring.....	4-7
4.6 Identification for Potential Impacts .....	4-8
4.7 Assessment Methodology.....	4-11
4.8 Evaluation of Impacts .....	4-13
4.9 Mitigation Measures .....	4-15
4.10 Cumulative Impacts .....	4-20
4.11 Residual Impacts.....	4-21
4.12 Monitoring and Audit Requirements .....	4-21
4.13 Conclusion .....	4-21

**Figure**

Figure 4.1                      Representative Noise Sensitive Receivers (NSRs) within Assessment Area

**Appendices**

Appendix 4.1                      Photos of Existing Representative Noise Sensitive Receivers

Appendix 4.2                      Prevailing Noise Monitoring Report

Appendix 4.3                      Works Section Plan

Appendix 4.4                      Schematic Diagram of Operational Noise Sources

Appendix 4.5                      Construction Plant Inventory (Without Mitigation)

Appendix 4.6a                      Summary of Predicted Noise Levels during Daytime Period (Without Mitigation)

Appendix 4.6b                      Construction Noise Assessment (Without Mitigation)

Appendix 4.7                      Construction Plant Inventory (With Mitigation)

Appendix 4.8a                      Summary of Predicted Noise Levels during Daytime Period (With mitigation)

Appendix 4.8b                      Construction Noise Assessment (With Mitigation)

Appendix 4.9                      Operational Plant Inventory

Appendix 4.10                      Document for the Noise Data of the Operational Noise Sources

Appendix 4.11                      Operational Noise Assessment (Unmitigated)

Appendix 4.12                      Operational Noise Assessment (Mitigated)

Appendix 4.13                      Schematic Configuration of Noise Barrier

## **Tables**

- Table 4.1 - *EIAO-TM* Day-time Construction Noise Standards (Leq, 30 min dB(A))
- Table 4.2 - Area Sensitivity Ratings
- Table 4.3 - Basic Noise Levels (BNLs)
- Table 4.4 - ANLs
- Table 4.5 - Representative Noise Sensitive Receivers (NSRs)
- Table 4.6 - Noise Criteria of Planned Operational Noise Sources
- Table 4.7 - Equipment Inventory of the Proposed Stormwater Pumping Station
- Table 4.8 - Predicted Construction Noise Levels (Without Mitigation Measure)
- Table 4.9 - Predicted Noise Level at the Representative NSRs (Unmitigated)
- Table 4.10 - SWL of QPME adopted for Construction Noise Mitigation
- Table 4.11 - Predicted Construction Noise Levels (With Mitigation Measures)
- Table 4.12 - Predicted Noise Level at the Representative NSRs (Mitigated)

## **4. NOISE IMPACT ASSESSMENT**

### **4.1 Introduction**

- 4.1.1 This Chapter assesses the potential noise impacts associated with the construction and operation of the Project 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 stated in Clause 3.4.5 and *Appendix C* of the *EIA Study Brief (ESB-334/2020)*.
- 4.1.2 Potential construction noise impacts may be generated as a result of the use of powered mechanical equipment (PME) for various construction activities including site clearance, construction for pumping station, construction of associated drains and outlet and construction of tidal gate. Further details of the construction activities, programme and equipment requirements are discussed in this Chapter.
- 4.1.3 Operational noise associated with the operation of the proposed stormwater pumping station is the major potential noise source during operation phase of the Project. The proposed tidal gate at River Silver will be opened or closed within 5 mins during heavy rainfall (i.e. emergency use only). It is estimated to be used approximately 10 days per year only according to Drainage Services Department's tide gauge record in vicinity of Mui Wo coastal area for past years. No significant noise impact is anticipated.

### **4.2 Relevant Legislation and Guidelines**

#### Construction phase

- 4.2.1 The principal legislation relating to the control of construction noise is *Noise Control Ordinance (NCO) (Cap. 400)* and the *Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)*. The *NCO* provides controls on general construction works during restricted hours (i.e. between 1900 and 0700 hours or at any time on a general holiday (including Sunday)). The *EIAO-TM*, issued under the *EIAO*, provides guidelines and noise criteria for evaluating the daytime construction noise impact. The assessment criteria are defined in *Annex 5* of the *EIAO-TM* with reference made to *Annex 13* of the *EIAO-TM* for the guidelines of noise assessment. No percussive piling will be involved in this Project, so *Technical Memorandum on Noise from Percussive Piling (TM-PP)* is not applicable for this Project.
- 4.2.2 A number of Technical Memoranda have been issued under the *NCO* to stipulate control approaches and criteria with respect to construction activities:
- *Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM)*; and
  - *Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM)*.
- 4.2.3 The *GW-TM*, which provides the guidelines for controlling the construction noise from the use of PME at the construction work sites, details the procedures that should be

adopted for the assessment of noise from construction work other than percussive piling, the issuing of Construction Noise Permits (CNP), and for determining whether or not any such CNP is being complied with.

4.2.4 In addition to the general controls on the use of PME during restricted hours, the use of Specified Powered Mechanical Equipment (SPME) and/or undertaking of Prescribed Construction Work (PCW) within designated areas are controlled under *DA-TM*. The *DA-TM* details the procedures for the assessment of the use of SPME and/or undertaking of PCW during restricted hours for issuing of CNP adopted by the Noise Control Authority. As the Site is located at Designated Area, the *DA-TM* is applicable for this project. The *DA-TM* regulates the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW):

SPME:

- Hand-held breaker
- Bulldozer
- Concrete lorry mixer
- Dump truck
- Hand-held vibratory poker

PCW:

- Erection or dismantling of formwork or scaffolding
- Loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material
- Hammering

4.2.5 Under the *EIAO*, potential noise impact arising from general construction works during non-restricted hours (i.e. 07:00 to 19:00 hrs on any day not being a Sunday or general holiday) at 1 m from the external façade of the Noise Sensitive Receiver (NSR), which rely on opened windows for ventilation, is to be assessed in accordance with the noise criteria specified in *Annex 5* of the *EIAO-TM*. The *EIAO-TM* noise standards are presented in **Table 4.1**.

**Table 4.1 - *EIAO-TM* Day-time Construction Noise Standards (Leq, 30 min dB(A))**

Use	Noise Standard (dB(A))
Domestic Premises, Hotels and Hostels	75
Educational Institutions (normal periods)	70
Educational Institutions (during examination periods)	65

Notes:

- a) The above standards apply to uses which rely on opened windows for ventilation.
- b) The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external façade.

4.2.6 If construction work is conducted during restricted works (i.e. 1900 and 0700 hours from Monday to Saturday and at any time on Sundays or general holidays) using Powered Mechanical Equipment (PME), a Construction Noise Permit (CNP) should be obtained. The Noise Control Authority may issue a CNP if the Corrected Noise Level is equal to or less than the Acceptable Noise Level. The Acceptable Noise Level (ANL) is related to the noise sensitivity of the area in question and the time period that the CNP is applied for. The Area Sensitivity Rating depends on the type of area and the degree of impact that Influencing Factors (IFs) have on the NSRs. Industrial area, major road or the area within the boundary of Hong Kong International Airport shall be considered to be an IF. The classification of Area Sensitivity Ratings and the corresponding basic noise levels (BNLs) are shown in **Table 4.2** and **Table 4.3**.

**Table 4.2 - Area Sensitivity Ratings**

Types of Area Containing NSR	Degree to which NSR is affected by Influencing Factor (IF)		
	Not Affected	Indirectly Affected	Directly Affected
Rural area, including Country Parks or village type developments	A	B	B
Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
Urban area	B	C	C
Area other than those above	B	B	C

Notes:

The following definitions apply:

- "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.

**Table 4.3 - Basic Noise Levels (BNLs)**

Time period	BNL for each Area Sensitivity Rating, $L_{eq}$ , 5 min (dB(A))		
	A	B	C
All days during the evening (i.e. 19:00-23:00 hrs) and general holidays (including Sundays) during the day and evening (i.e. 07:00-23:00 hrs)	60	65	70
All days during the night-time (i.e. 23:00-07:00 hrs)	45	50	55

4.2.7 Based on the current design, construction works using PME/PCW will be carried out during non-restricted hours. No construction works will be required to be carried out during restricted hours. In case construction works are required to be carried out during restricted hours, the Noise Control Authority will consider a well-justified CNP application, for construction works within restricted hours as guided by the relevant TMs issued under the *NCO*. The Noise Control Authority will take into account adjoining land uses and any previous complaints against construction activities at the site before making a decision. Nothing in this EIA Report shall bind the Noise Control Authority in making its decision. The Noise Control Authority may include any conditions in a CNP that it considers appropriate. Failure to comply with any such conditions may lead to cancellation of the CNP and prosecution action under the *NCO*.

Operation Phase

4.2.8 The *Technical Memorandum for the Assessment of Noise From Places Other than Domestic Premises, Public Places or Construction Sites (IND-TM)* issued under the *NCO* specifies the applicable ANLs for assessing potential operational noise impacts. The ANLs are dependent on the ASR and the time of the day and are presented in **Table 4.4**.

**Table 4.4 - ANLs**

Time period	Leq 30min (dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Day-time (i.e. 0700 to 1900 hours)	60	65	70
Evening (i.e. 1900-2300 hours)	60	65	70
Night-time (i.e. 2300-0700 hours of the next day)	50	55	60

4.2.9 The noise criteria for planned operational noise sources are set out in Table 1A of *Annex 5* of the *EIAO-TM* as follows:

- 5 dB(A) below the appropriate ANL (as shown in **Table 4.4**) as specified in the *IND-TM*; or
- The prevailing background noise levels (for quiet areas with a noise level 5 dB(A) below the appropriate ANL).

4.2.10 Since the NSRs are situated in rural areas and no influencing factors affect the NSRs, an ASR of "A" is assigned. Baseline noise measurements have been conducted to investigate the prevailing noise levels and to establish the noise limits for the assessment of the operational noise impacts. Details of the noise measurements are discussed further in **Section 4.5**.

4.2.11 The ASR assumed in this EIA Report is for an indicative operational noise assessment only. It should be noted that operational 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 operational 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 this EIA Report shall bind the Noise Control Authority in the context of law enforcement against any operational noise source being assessed.

### **4.3 Description of the Noise Environment**

#### Assessment Area

- 4.3.1 In accordance with the requirements given in Clause 3.4.5.2 and *Appendix C* of the *EIA Study Brief*, the Assessment Area for the noise impact assessment covers a distance of 300m from the boundary of the Project. The Assessment Area considered in the assessment is shown in **Figure 4.1**.

#### Baseline Conditions

- 4.3.2 The Project is located in a rural area in Mui Wo, Lantau Island, with some villages scattered within the Assessment Area (i.e. within 300m from the Project Site). Site inspection was conducted to confirm its existing condition. Background noise levels are typical of a general rural environment in the vicinity of village environment and agricultural use with some small-scale industrial establishments, such as storage yards and workshops scattered in and around the villages. The major existing noise sources were identified as traffic noise from local roads and occasional marine vessel traffic.
- 4.3.3 In accordance with the Outline Zoning Plan (OZP) for Mui Wo North and (No. S/I-MWN/2) and Mui Wo Fringe (No. S/I-MWF/10), the land uses of the surrounding areas were zoned as “Agriculture” (AGR), “Green Belt” (GB), “Government/Institution/Community” (GIC), “Recreation” (REC), “Open Space” (O), “Commercial” (C), “Residential (Group A)” (“R(A)”), “Residential (Group C)” (“R(C)”), “Residential (Group D)” (“R(D)”), “Village Type Development” (V), “Coastal Protection Area” (“CPA”) and “Other Specified Uses” (“OU”).
- 4.3.4 Four alignment options including Conforming Scheme and Design Options 1 to 3 were formulated and investigated to determine the optimal scheme of improvement, taking due consideration of the land requirement, feasibility, practicability, environmental impacts, construction programme, effectiveness, environmental benefits and environmental disbenefits. Details and comparison of the different alignment options are provided in **Chapter 2**. In view of the environmental benefits and disbenefits of the different design schemes discussed in **Chapter 2**, Design Option 1 is recommended and adopted for the noise impact assessment.



#### 4.4 Noise Sensitive Receivers

- 4.4.1 The Assessment Area for the noise impact assessment is determined as an area of 300 m from the boundary of the Project. The Noise Sensitive Receivers (NSRs) within 300m from the Project site boundary (Assessment Area) have been identified and the representative NSRs are listed in **Table 4.5**. Representative assessment points located at the first layer, which provides acoustic shielding to those NSRs at distances further away from the Project site, are selected for noise assessment. The area considered in the assessment is shown in **Figure 4.1**.
- 4.4.2 The 300m assessment area is within the No. S/I-MWN/2 (Mui Wo North) and No. S/I-MWF/10(Mui Wo Fringe) of the Outline Zoning Plan (OZP). The relevant OZP, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board have been reviewed.
- 4.4.3 The locations of the identified representative NSRs are presented in **Figure 4.1**. Photographs showing the representative NSRs are also presented in **Appendix 4.1**. No planned or committed NSRs have been identified within the Assessment Area.
- 4.4.4 Descriptions of the representative NSRs and noise assessment points selected are listed in **Table 4.5**.

**Table 4.5 - Representative Noise Sensitive Receivers (NSRs)**

NSR	Description	Type of Use	No. of Storeys	Noise Assessment Point	Approx. Separation Distance from the Project Site Boundary (m)
N1	Tai Tei Tong	Residential	3	70 Tai Tei Tong	17
N2	Nam Bin Wai	Residential	3	9 Nam Bin Wai	≤5
N3	Ma Po Tsuen	Residential	3	5 Ma Po Tsuen	≤5
N4	Ling Tsui Tau	Residential	3	20 Ling Tsui Tau	17
N5	Tsoi Yuen Tsuen	Residential	2	21 Tsoi Yuen Tsuen	23
N6	Tsoi Yuen Tsuen	Residential	2	42 Tsoi Yuen Tsuen	≤5
N7	Mui Wo Chung Hau St	Residential	3	39K Mui Wo Chung Hau St	≤5
N8	Ngan Ho Court	Residential	14	Ngan Long House	72
N9	Silver View Centre	Residential	3	13-16 Silver View Centre	≤5
N10	Luk Tei Tong	Residential	3	145 Luk Tei Tong	16
N11	Mui Wo School	Educational Institution	1	Mui Wo School	≤5
N12	Church of Christ in China - Mui Wo Church	Place of Worship	2	Church of Christ in China - Mui Wo Church	58
N13	Tin Hau Temple	Place of Worship	1	Tin Hau Temple	82
N14	Hung Shing Temple	Place of Worship	1	Hung Shing Temple	21

NSR	Description	Type of Use	No. of Storeys	Noise Assessment Point	Approx. Separation Distance from the Project Site Boundary (m)
N15	Ma Po Tsuen	Residential	3	32 Ma Po Tsuen	6
N16	Ma Po Tsuen	Residential	3	9 Ma Po Tsuen	≤5
N17	Ma Po Tsuen	Residential	2	13 Ma Po Tsuen	≤5
N18	Luk Tei Tong	Residential	3	183 Luk Tei Tong	58
N19	Luk Tei Tong	Residential	3	46 Luk Tei Tong	16

Notes:

- 1) The noise criteria will be reduced to 65dB(A) during school examination periods.
- 2) Construction noise criteria for place of public worship is not specified in the *EIAO-TM*. The more stringent criteria of 70 dB(A) is adopted as a conservative approach.

## 4.5 Prevailing Background Noise Monitoring

4.5.1 To investigate the prevailing noise levels at the nearby existing NSRs in the vicinity of the proposed stormwater pumping station, noise measurements were taken at two locations on three weekdays and three weekends in October 2022. The noise measurement was conducted using Sound Level Meter (Type 1), which had been calibrated with a calibration signal of 94.0 dB(A) at 1kHz. The microphone was set at 1.2m above ground level in free-field. The measurements were conducted in accordance with the calibration and measurement procedures stated in the *IND-TM*. The measured prevailing background noise levels are summarised in **Table 4.6**. Prevailing Noise Monitoring Report is given in **Appendix 4.2** with the noise monitoring stations (NA1 and NA2) shown in Appendix A of the Prevailing Noise Monitoring Report.

**Table 4.6 - Noise Criteria of Planned Operational Noise Sources**

Noise Monitoring Stations	Time Periods	Measured Noise Levels, L <sub>90</sub> (1 hour) dB(A) <sup>(1)</sup>	Measured Noise Levels with +3 façade correction, L <sub>90</sub> (1 hour) dB(A)	ANL-5 for ASR "A", dB(A) <sup>(3)</sup>	Operational Noise Criteria, dB(A) <sup>(4)</sup>
NA1 (near NSR N2)	Daytime & Evening <sup>(2)</sup>	45	48	55	<u>48</u>
	Night-time <sup>(2)</sup>	43	46	45	<u>45</u>
NA2 (near NSR N4)	Daytime & Evening <sup>(2)</sup>	50	53	55	<u>53</u>
	Night-time <sup>(2)</sup>	44	47	45	<u>45</u>

Notes:

- 1) The noise measurement descriptor is A-weighted sound pressure level exceeded for 90% of the time (L<sub>90</sub>) measured using Type 1 sound level meter. Measurements were taken free-field. The averaged noise levels (L<sub>90</sub>) during the daytime/evening period and night-time period were taken to represent the prevailing noise levels.
- 2) Day and Evening: 0700 to 2300 hours; Night: 2300 to 0700 hours
- 3) *IND-TM* specifies the applicable Acceptable Noise Levels (ANLs) for assessing potential operational noise impact. The noise criteria for planned operational noise sources are set out in the *EIAO-TM* as follows
  - 5 dB(A) below the appropriate ANL (as shown in **Table 4.4**) as specified in the *IND-TM*; or,
  - the prevailing background noise levels (for quiet areas with a noise level 5 dB(A) below the appropriate ANL).
- 4) Operational Noise Criteria at noise monitoring station NA1 have been adopted for operational noise assessment as it is the nearest NSR towards the proposed stormwater pumping station, with lowest measured noise levels.

## **4.6 Identification for Potential Impacts**

### Construction Phase

4.6.1 Potential impacts to the NSRs during the construction phase of the Project will mainly arise from the use of PME. The major construction activities will include:

#### ***Construction of Access across Pak Ngan Heung River***

- Site clearance and Mobilisation
- Construction of Crossings bridge

#### ***Construction of Stormwater Pumping Station***

- Site clearance and Mobilisation
- Excavation for Stormwater Pumping Station
- Piling Works for Wet Well and Pumping Station
- Concreting Works for Wet Well
- Superstructure for Pumping Station
- E&M Installations and Testing for Pumping Station
- Reinstatement

#### ***Construction of Associated Drainage Works (Outlet Channel to River Silver)***

- Site Clearance & Mobilisation
- Excavation & Temporary Works
- Formwork Erection, Reinforcement Fixing and Concreting
- Formwork Dismantling and backfilling

#### ***Construction of Associated Drains Works (Ling Tsui Tau, Nam Bin Wai and Ma Po Tsuen)***

- Pipe-laying Works
- Backfilling and Reinstatement

***Construction of Associated Drains Works (River Crossing)***

- Construction of Launching Pit
- Equipment setup
- Trenchless Operation
- Construction of Manhole
- Reinstatement & Ancillary Works

***Construction Diversion Box Culvert (From Tai Tei Tong River to Luk Tei Tong Bypass Channel)***

- Site Clearance & Mobilisation
- Excavation & Temporary Works
- Formwork Erection, Reinforcement Fixing and Concreting
- Formwork Dismantling and Backfilling

***Improvement Works Along Tai Tei Tong River***

- Construction of Flood Walls and Reconstruction of Gabion Walls
- River Reprofilng
- Modification of Agricultural Weir & Fish Ladders
- Construction of Low Flow Device

***Improvement Works Along Luk Tei Tong Bypass Channel and Luk Tei Tong River***

- Construction of Gabion Walls
- Construction of Box Culvert
- Construction of Mechanical Penstocks

***Construction of Tidal Gate and Other Associated Works***

- Construction of Temporary Barrier across River Silver & Isolation from upstream flows
- Concreting Works for Tidal Gate
- Delivery and E&M Installations for Tidal Gate

**River Revitalisation Works and Associated Works**

- Construction of Footpath along Luk Tei Tong Bypass Channel
- Softscape and Hardscape Works

4.6.2 During trenchless operation, the tunnelling machine would be operated at the bottom of the pit which is at least 3m below ground level. The cutter head would be varied from 1,800mm to 2,250mm in diameter subject to the size of the proposed drain, which is relatively small in size. Based on preliminary geological investigation, the tunnelling works would be mainly in soil nature. In view of the relatively small size of tunnelling works and the works would be in soil layer, noise of the tunnelling machine would be effectively shielded from the NSRs. Based on this, potential airborne and ground-borne noise impact during the construction phase is not anticipated.

4.6.3 All the works types will be conducted in stages and implemented concurrently. The construction works are expected to last for around 51 months. The construction works is anticipated to commence in 3<sup>rd</sup> quarter of 2025 and completed in 4<sup>th</sup> quarter of 2029. Estimated durations of the construction work are provided in **Appendix 2.4**. The proposed works will be conducted during non-restricted hours only, i.e. between 07:00 and 19:00 hours on any day except Sunday and general holiday. There is no schedule for the proposed construction works to be conducted during restricted hours.

4.6.4 Should evening and night works between 19:00 and 07:00 hrs or on general holidays (including Sundays) be required, the Contractor will submit a CNP application which will be assessed by the Noise Control Authority.

Operation Phase

4.6.5 Operational noise associated with the operation of the proposed stormwater pumping station at Nam Bin Wai is the major potential noise source during operation phase of the Project. The proposed tidal gate at River Silver will be opened or closed within 5 mins during heavy rainfall (i.e. emergency use only) and no significant noise impact is anticipated. Location of the proposed stormwater pumping station is shown in **Figure 4.1**. Schematic layout showing the noise sources at the proposed stormwater pumping station is illustrated in **Appendix 4.4**. The equipment inventory of the proposed stormwater pumping station is listed in **Table 4.7** and **Appendix 4.9**.

**Table 4.7 - Equipment Inventory of the Proposed Stormwater Pumping Station**

Equipment	Location	No. of Equipment		Maximum Sound Power Level for Each Equipment, dB(A)
		Option 1	Option 2	
Flood pumps	Pump room	4	4	86
Ventilation fan (A) facing to the corridor	Deodorization Room	1	1	71
Ventilation fan (B) facing to the corridor	Deodorization Room	1	1	71
Ventilation fan (H) facing to the corridor	Plumbing Pumps and Tanks Room & Store Room	1	1	71

Equipment	Location	No. of Equipment		Maximum Sound Power Level for Each Equipment, dB(A)
		Option 1	Option 2	
Ventilation fan (F) facing to the corridor	Motor Room	3	3	89
Ventilation fan (D) facing to the southeast	Fuel tank room	-	1	71
Ventilation fan (E) facing to the southeast	Generator Room	-	1	71
Ventilation fan (G) facing to the southeast	CLP Transformer Room	1	-	71
Ventilation fan (C) facing to the southwest	Equipment Hall	9	9	71

Notes:

- 1) Only 4 sets out of total 5 sets of pumps will be operated at any one time.
- 2) Two operation modes:  
Option 1 (General Condition):  
 4 pumps + All fans except the fans for Fuel Tank Room (D) and Generator Room (E).  
Option 2 (Emergency Condition, if CLP power supply fail):  
 4 pumps + All fans except the fans for CLP transformer Room (G).

## 4.7 Assessment Methodology

### Construction Phase

4.7.1 The construction noise impact assessment was undertaken in accordance with the procedures outlined in the *GW-TM*, which is issued under the *NCO*, the *EIAO-TM* and the *EIAO GN No. 9/2010*. The assessment methodology is summarised as follows:

- Identify the representative NSRs that may be affected by the construction of the Project;
- Determine the plant items for corresponding construction activities, based on the agreed plant inventory;
- Assign sound power levels (SWLs) to the PME proposed based on the *GW-TM* and list of SWLs of other commonly used PME;
- Calculate the correction factors based on the distance between the NSRs and the notional noise source positions of different works areas;
- Apply corrections in the calculations, such as potential screening effects and acoustic reflection, if any;
- Predict the construction noise levels at NSRs in the absence of any mitigation measures; and
- Add a positive 3 dB(A) façade correction to the predicted noise levels in order to account for the facade effect at each NSR.

4.7.2 In reality, not all PME items within a works area will be operating at all times. The construction noise assessment was undertaken based on the proposed construction

works programme and plant inventory, and appropriate utilization rates of the PME items (see **Appendix 2.4** and **Appendix 4.5**). The Engineer and Project Proponent have reviewed the programme and plant inventory with appropriate utilization rates, and have confirmed that they are reasonable and practicable for completing the Project within the scheduled timeframe. The proposed methods for the construction of the Project are common in Hong Kong and the PMEs proposed are available in the Hong Kong market.

- 4.7.3 The works section plan of the Project is shown in **Appendix 4.3**. The total SWL associated with each construction activity for corresponding sections was established. The potential noise impacts at NSRs were evaluated by comparing the predicted noise levels with the *EIAO-TM* day-time construction noise limits ( $L_{eq, 30min}$  dB(A)), as outlined in **Section 4.2**.

#### Cumulative Noise Impact

- 4.7.4 Potential concurrent projects are discussed in Section 4.10.

#### Operation Phase

- 4.7.5 A quantitative noise assessment has been carried out for the operation of the proposed stormwater pumping station at the representative NSRs N2, N4 and N16, which are the nearest NSRs with direct line of sight towards the proposed stormwater pumping station. Two operation modes during general condition and emergency condition when CLP power supply fail have been assessed respectively.
- 4.7.6 The methodology used for the quantitative operational noise assessment is in accordance with the procedures outlined in the *IND-TM* and the *EIAO-TM* and is presented below:
- Identify the types of equipment and their number;
  - Assign sound power levels (SWLs) to the proposed equipment with reference to noise data from specification for similar capacity of equipment;
  - Identify representative NSR as defined by the *EIAO-TM* based on existing and committed land uses in the Assessment Area that may be affected by the works areas of the Project;
  - Calculate the distance correction factors, using a conservative approach, based on the horizontal distance between the NSR and the noise sources;
  - Calculate the corrected noise levels after taking into account other corrections such as potential screening effects, if any, by adopting standard acoustics principles;

- A 6dB(A) correction for tonality has been applied to all equipment as a conservative approach; and
- Present the results in terms of  $L_{eq}$ , 30min dB(A), as specified in the *IND-TM*.

4.7.7 The predicted noise levels at the NSRs N2, N4 and N16 were compared with the criteria set out in **Section 4.5**. No potential cumulative operational noise sources are identified.

4.7.8 It is assumed that the stormwater pumping station will be operated anytime within 24-hour due to its emergency use nature. The equipment inventory of the proposed stormwater pumping station together with their respective sound power levels (SWLs) are presented in **Appendix 4.9**. Document showing the noise data of similar capacity of equipment are given in **Appendix 4.10**.

## **4.8 Evaluation of Impacts**

### Construction Phase

4.8.1 The predicted construction noise levels during day-time period for the construction of the Project without mitigation measures are presented in **Table 4.8**. Summaries of the predicted noise levels and details of the noise calculations are presented in **Appendix 4.6**.



**Table 4.8 - Predicted Construction Noise Levels (Without Mitigation Measure)**

NSR	Noise Assessment Points	Predicted Maximum Noise Level <sup>(2), (3)</sup> , dB(A)	Noise Criteria, Leq, 30min, dB(A)	Compliance (Y/N)
N1	70 Tai Tei Tong	<b><u>82</u></b>	75	N
N2	9 Nam Bin Wai	<b><u>89</u></b>	75	N
N3	5 Ma Po Tsuen	<b><u>97</u></b>	75	N
N4	20 Ling Tsui Tau	<b><u>85</u></b>	75	N
N5	21 Tsoi Yuen Tsuen	<b><u>77</u></b>	75	N
N6	42 Tsoi Yuen Tsuen	<b><u>92</u></b>	75	N
N7	39K Mui Wo Chung Hau St	<b><u>100</u></b>	75	N
N8	Ngan Long House	74	75	Y
N9	13-16 Silver View Centre	<b><u>84</u></b>	75	N
N10	145 Luk Tei Tong	<b><u>83</u></b>	75	N
N11	Mui Wo School	<b><u>92</u></b>	65/70 <sup>(1)</sup>	N
N12	Church of Christ in China - Mui Wo Church	<b><u>74</u></b>	70 <sup>(4)</sup>	N
N13	Tin Hau Temple	<b><u>71</u></b>	70 <sup>(4)</sup>	N
N14	Hung Shing Temple	<b><u>82</u></b>	70 <sup>(4)</sup>	N
N15	32 Ma Po Tsuen	<b><u>87</u></b>	75	N
N16	9 Ma Po Tsuen	<b><u>95</u></b>	75	N
N17	13 Ma Po Tsuen	<b><u>90</u></b>	75	N
N18	183 Luk Tei Tong	74	75	Y
N19	46 Luk Tei Tong	<b><u>84</u></b>	75	N

Notes:

- 1) The noise criteria will be reduced to 65dB(A) during school examination periods.
- 2) All predicted noise levels dB(A) were corrected with 3dB(A) for façade reflection.
- 3) Predicted noise levels which exceeded the corresponding criteria are shown as bold and underlined.
- 4) Construction noise criteria for place of public worship is not specified in the *EIAO-TM*. The more stringent criteria of 70 dB(A) is adopted as a conservative approach.

4.8.2 The results indicate the construction noise levels at some of the representative NSRs exceeded the *EIAO-TM* noise criteria in daytime during the course of the construction period. Mitigation measures are therefore be required to mitigate the construction noise impact.

#### Operation Phase

4.8.3 Flood pumps of the proposed pumping station will be fully enclosed within the building which has no openings (the door should be closed during operation of the PME) and its building material are 150mm reinforced concrete and 225m brick walls. 30 dB(A) of noise attenuation has been assumed in the assessment. Based on the plant inventory presented in **Appendix 4.9**, the predicted façade noise levels at the identified NSRs N2, N4 and N16 due to operation of the proposed stormwater pumping station are summarised in **Table 4.9**. Detailed calculation of predicted noise levels in unmitigated scenario is presented in **Appendix 4.11**.

**Table 4.9 - Predicted Noise Level at the Representative NSRs (Unmitigated)**

Location	Predicted Noise Level, dB(A)	Predicted Maximum Noise Level, dB(A)	Operational Noise Criteria, dB(A) <sup>(2)</sup>	Compliance (Yes/No)
N2	Daytime & Evening <sup>(1)</sup>	56	48	No
	Night-time <sup>(1)</sup>	56	45	No
N4	Daytime & Evening <sup>(1)</sup>	52	48	No
	Night-time <sup>(1)</sup>	52	45	No
N16	Daytime & Evening <sup>(1)</sup>	60	48	No
	Night-time <sup>(1)</sup>	61	45	No

Notes:

1) Daytime and Evening, 0700-2300 hours, Night-time, 2300-0700 hours.

2) Please refer to **Section 4.5**.

4.8.4 Results of the quantitative noise assessment due to operation of the proposed stormwater pumping station indicate that the predicted noise levels at 1m from the facade of all NSRs N2, N4 and N16 do not comply with noise criteria during both daytime and night-time periods.

## **4.9 Mitigation Measures**

### Construction Phase

4.9.1 In view of the predicted noise exceedances during the construction of the Project, the following mitigation measures have been considered. The “Recommended Pollution Control Clauses for Construction Contracts” promulgated by EPD will also be added to the Contract for future contractors to follow:

- Good site practice;
- Quieter construction method/ PME; and
- Adoption of temporary noise barrier or noise enclosure
- Scheduling of Noisy Activities to Avoid Noise Impact on N11

### Good Site Practices

4.9.2 Good site practices and noise management can considerably reduce the potential noise impact of construction activities on nearby NSRs. The noise benefits of these practices can vary according to specific site conditions and operations. Since the effect of the good construction site practices could not be quantified, the mitigated noise levels calculated in the subsequent sections have not taken account of this effect. The following site practices should be followed during the construction of the Project:

- Only well-maintained plant will be operated on-site and plant will be serviced regularly during the construction phase;
- Silencers or mufflers on construction equipment will be utilized where required and will be properly maintained during the construction phase;

- Mobile plant, if any, will be sited as far away from NSRs as possible;
- Machines and plant (such as trucks) that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum;
- Plant known to emit noise strongly in one direction will, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and
- Material stockpiles and other structures will be effectively utilised, wherever practicable, in screening noise from on-site construction activities.
- The Project Proponent/ the Contractor will keep close communication with the nearby sensitive receivers on the schedule of the construction works to minimise disturbance to the nearby sensitive receivers.

#### Quieter Construction Method / PME

- 4.9.3 The use of quiet PME is considered to be a practicable means to mitigate the construction noise impact. Quiet PME is defined as a PME having actual SWL lower than the value specified in the *GW-TM*. The total SWL of all plant items to be used on-site at each works area will be specified so that flexibility is allowed for the Contractor to select plant items to suit the construction needs. The Contractor shall select plant items with total SWL equal to or lower than the total SWL specified in the plant inventory in **Appendix 4.7** in order to meet the relevant noise criteria. The Engineer and Project Proponent have reviewed the programme and plant inventory with appropriate utilization rates, and have confirmed that they are reasonable and practicable for completing the Project within the scheduled timeframe.
- 4.9.4 The Contractor shall consider quieter construction methods or technologies to reduce the noise at its source if they are technically feasible and applicable for the proposed construction works. These include using mini-excavator and electric poker, sharing the use of noisy PME from other works areas located further away from NSRs, etc.
- Mini-excavator has been adopted as a mitigation measure to replace traditional excavator in all construction works.
  - Electric poker has also been adopted to replace traditional type poker in construction of crossing bridge, concreting works for wet wall, superstructure for pumping station, concreting works at outlet channel to River Silver, construction of Manhole, construction of box culvert, modification of agricultural weir and fish ladders, construction of low flow device and concreting works for tidal gate (Items 1.1.2, 1.2.4, 1.2.5, 1.3.3, 1.5.4, 2.3, 3.1.3, 3.1.4 and 4.2).
  - For construction of flood walls and reconstruction of gabion wall along Tai Tei Tong River (item 3.1.1) pipe-laying works and backfilling & reinstatement at Ling Tsui Tau, Nam Bin Wai and Ma Po Tsuen (item 1.4.1 and 1.4.2); dump truck and/or concrete lorry mixer from other works areas located further away from NSRs will be used, i.e., dump truck will not be used for item 3.1.1 and item 1.4.2; dump truck and concrete lorry mixer will not be used for item 1.4.1. Material required to

delivery or disposal as well as concrete required for casting will be transported manually to / from other works areas located further away from NSRs.

- 4.9.5 Sound power levels of quieter equipment are listed in **Table 4.10**. Other quieter equipment / construction methods not adopted in the assessment shall be considered during the design, tendering and implementation stage of the construction works as appropriate.

**Table 4.10 - SWL of QPME adopted for Construction Noise Mitigation**

QPME / Quiet PME	QPME Reference Number	Brand	Model Number	SWL, dB(A)
Generator, silenced	EPD-12580	DENYO	DCA-25LSKE	88
Air Compressor	EPD-07503	AIRMAN	PDS55S-5C1	92
Roller, vibratory	EPD-06779	SAKAI	HV620	94
Asphalt Paver	EPD-12854	JOSEPH VOEGELE AG / VOEGELE	SUPER 1603-3	104
Crane, mobile	EPD-07646	Maeda	CC1485S-1	92

Adoption of Temporary Noise Barriers or Noise Enclosure

- 4.9.6 The use of noise barriers will be an effective means to mitigate the noise impact arising from the construction works in the works area, particularly for low-rise NSRs. Temporary Noise Barriers of appropriate height with skid footing should be used and located within a few metres of stationary plant and mobile plant such that the line of sight to the NSR is blocked by the barriers. The length of the barrier should be at least five times greater than its height. It is anticipated that the major noise source of all PMEs, including movable and large PMEs, will be located at a level lower than the top of the proposed movable barriers. All movable barriers are expected to provide noise reductions of at least 5 dB(A) for mobile plant such as excavator and roller and 10 dB(A) for stationary plants such as winch. With reference to *A Practical Guide for the Reduction of Noise from Construction Works*, the noise barrier material should have a superficial surface density of at least 14 kg/m<sup>2</sup>, without openings or gap.
- 4.9.7 The use of noise enclosure is to cover stationary PMEs, such as generator which will be completely screened. The construction material of the noise enclosure should have a minimum surface density of 14 kg/m<sup>2</sup> and without openings or gaps. This can achieve at least a 15 dB(A) noise reduction according to the *EIAO Guidance Note No.9/2010*.
- 4.9.8 The use of quieter PME is presented in **Appendix 4.7** and the schematic configuration of the noise barrier is presented in **Appendix 4.13**.

Scheduling of Noisy Activities to Avoid Noise Impact on N11

- 4.9.9 To minimise the construction noise impact on N11, the use of concrete lorry mixer for modification of agricultural weir & fish ladder (item 3.1.3) should be avoided during examination period of N11. The contractor should keep close communication with the operator of Mui Wo School to obtain the updated schedule of examination at the time of conducting the relevant construction works.

4.9.10 With the implementation of the good construction site practices, use of quieter construction method/ PME, temporary noise barriers and enclosures, and rescheduling of PME / construction activities to avoid work during sensitive (e.g., school examination period) and reduce the concurrent operation of PMEs (as shown in **Appendix 4.7**), the mitigated noise levels at the representative NSRs were calculated and the results are summarized in **Table 4.11**. Summaries of predicted mitigated noise levels and detailed calculations are presented in **Appendix 4.8a**.

**Table 4.11 - Predicted Construction Noise Levels (With Mitigation Measures)**

NSR	Description	Predicted Maximum Noise Level <sup>(2), (3)</sup> , dB(A)	Noise Criteria, $L_{eq}$ , 30min, dB(A)	Compliance (Y/N)
N1	70 Tai Tei Tong	65	75	Y
N2	9 Nam Bin Wai	75	75	Y
N3	5 Ma Po Tsuen	72	75	Y
N4	20 Ling Tsui Tau	73	75	Y
N5	21 Tsoi Yuen Tsuen	62	75	Y
N6	42 Tsoi Yuen Tsuen	65	75	Y
N7	39K Mui Wo Chung Hau St	75	75	Y
N8	Ngan Long House	61	75	Y
N9	13-16 Silver View Centre	72	75	Y
N10	145 Luk Tei Tong	66	75	Y
N11	Mui Wo School	67 (65 during Examination Period)	65/70 <sup>(1)</sup>	Y
N12	Church of Christ in China - Mui Wo Church	57	70 <sup>(4)</sup>	Y
N13	Tin Hau Temple	59	70 <sup>(4)</sup>	Y
N14	Hung Shing Temple	62	70 <sup>(4)</sup>	Y
N15	32 Ma Po Tsuen	75	75	Y
N16	9 Ma Po Tsuen	74	75	Y
N17	13 Ma Po Tsuen	70	75	Y
N18	183 Luk Tei Tong	62	75	Y
N19	46 Luk Tei Tong	72	75	Y

Notes:

- 1) The noise criteria will be reduced to 65dB(A) during school examination periods.
- 2) All predicted noise levels dB(A) were corrected with 3dB(A) for façade reflection.
- 3) Predicted noise levels which exceeded the corresponding criteria are shown as bold and underlined.
- 4) Construction noise criteria for place of public worship is not specified in the *EIAO-TM*. The more stringent criteria of 70 dB(A) is adopted as a conservative approach.

4.9.11 With the implementation of the proposed mitigation measures, it is anticipated that adverse construction noise impact is not expected at the representative NSRs.

4.9.12 A Construction Noise Management Plan would be prepared and submitted before commencement of construction works, so that both the verification of the inventory of

noise sources, and the assessment of the effectiveness and practicality of all identified measures for mitigating the construction noise impact of the Project would be performed during the design, tendering and implementation stage of the construction works.

4.9.13 Telephone number of the 24-hour hotline will be displayed at all vehicular site entrances/ exits or at a convenient location for public enquiry and information at all times during the construction period.

Operation Phase

4.9.14 In order to mitigate the noise exceedances at all NSRs during the operation of the proposed stormwater pumping station, acoustic louvers are proposed to be adopted at all ventilation fans. The design sound attenuation performance of the proposed acoustic louvers should be at least -10 dB(A) at all ventilation fans, except for ventilation fans D, E, F1, F2 and F3, of which the design sound attenuation performance should be at least -20 dB(A). The predicted façade noise levels at the representative NSRs after adopting the proposed acoustic louvers are summarised in **Table 4.12**. Detailed calculation of predicted noise levels in mitigated scenario is presented in **Appendix 4.12**.

**Table 4.12 - Predicted Noise Level at the Representative NSRs (Mitigated)**

Location	Predicted Noise Level, dB(A)	Predicted Noise Level, dB(A)	Operational Noise Criteria, dB(A) <sup>(2)</sup>	Compliance (Yes/No)
N2	Daytime & Evening	42	48	Yes
	Night-time	42	45	Yes
N4	Daytime & Evening	34	48	Yes
	Night-time	34	45	Yes
N16	Daytime & Evening	44	48	Yes
	Night-time	44	45	Yes

4.9.15 With the implementation of the proposed mitigation measures, predicted operational noise levels at all representative NSRs will comply with the relevant noise criteria and no adverse operational noise impact is anticipated.

4.9.16 In the assessment, noise mitigation measures, including provision of acoustic louvers and proper design of the proposed stormwater pumping station have been taken into account. These noise reduction design measures should be incorporated into the Design and Contract Specifications to minimise the noise nuisance due to the operation of the proposed stormwater pumping station, and ensure that the maximum sound power levels of the operational equipment are met. The following measures should also be included in the detailed design and specifications of the relevant contracts:

- the ventilation fan exhaust should be orientated to face away from the NSRs as far as practical, acoustic louvers are proposed to be adopted at all ventilation fans;
- quieter equipment should be selected during procurement; and

- specifications on noise level for all equipment and silencers should be included when ordering equipment.

#### **4.10 Cumulative Impacts**

4.10.1 The potential cumulative construction noise impact during the construction phase has been checked against the following known committed/existing projects at the time the EIA is prepared. A review of the potential cumulative construction noise impact is given below:

##### ***Desilting Works at River Silver Mui Wo***

- It is a designated project and governed by Environmental Permit No. EP-589/2021. In accordance with the Environmental Permit Conditions 2.2 and 2.5, the desilting works shall only be carried out either manually or by non-diesel operated PME and shall only be carried out during non-bathing season from December to February or other dates of Silvermine Bay Beach closure. As per Section 4.3.1 of the Project Profile, the noise impact would be from the use of generator, crane and dump truck for which desilted material will be transported away from the loading area. The proposed desilting area is surrounded by seawalls which forms a natural noise barrier. The Project Profile concludes that adverse noise impact from the desilting Works at River Silver Mui Wo to be minimal. As such, no cumulative environmental impact during construction phase is anticipated. Close liaison with the Contractor of this interfacing project will also be taken place, if possible, to minimize the simultaneous construction activities with this interfacing project.

##### ***PWP No. 4353DS - Outlying Islands Sewerage Stage 2 - Extension of Sewerage System to Other Unsewered Villages in Mui Wo Village Sewerage Works at Luk Tei Tong and Ma Po Tsuen***

- Relevant works has started in November 2021 and expected to complete in June 2025. No significant environmental impact is expected from the operation sewerage system. In view of the above, no cumulative environmental impact during construction and operation phase are anticipated.

##### ***7414 RO "Improvement Works at Mui Wo - Remaining Phase"***

- Works area at Mui Wo Ferry Pier is outside the 300m Assessment Area of this Project. No potential cumulative impact is anticipated.

4.10.2 No potential noise source is identified that may have cumulative noise impact during operation phase of the Project. No adverse cumulative environmental impact is envisaged during both construction and operation phase of the Project.

#### **4.11 Residual Impacts**

##### Construction Phase

- 4.11.1 With the implementation of the recommended noise mitigation measures, including good construction site practices, use of quiet construction method/PME, temporary noise barriers/ noise enclosures, scheduling of PME / construction activities to avoid work during sensitive time (e.g., school examination period) and reduce the concurrent operation of PMEs, the construction noise levels from the Project would comply with the *EIAO-TM* day-time noise criteria and no residual impact is anticipated.

##### Operational Phase

- 4.11.2 With proper implementation of the recommended noise mitigation measures, including acoustic louvers, no residual operational noise impact is anticipated.

#### **4.12 Monitoring and Audit Requirements**

- 4.12.1 Weekly noise monitoring is proposed to be undertaken at the representative NSRs (N3, N7, N11 and N16). Regular site inspections and audits should be conducted to ensure that the recommended mitigation measures are properly implemented during the construction stage.
- 4.12.2 Noise monitoring is not required during the operation phase as the design of the proposed stormwater pumping station would ensure compliance with the noise criteria. A commissioning test should be conducted prior to the operation of the Project to ensure operational noise levels would comply with the relevant noise standards.

#### **4.13 Conclusion**

- 4.13.1 Owing to the close proximity of some of the NSRs to the works area of the Project, mitigation measures are required to be implemented to mitigate the construction noise impacts. Practicable mitigation measures, including good construction site practices, use of quiet construction method/PME, temporary noise barriers/ noise enclosures, scheduling of PME / construction activities to avoid work during sensitive time (e.g., school examination period) and reduce the concurrent operation of PMEs are recommended. With the implementation of the recommended mitigation measures, the mitigated construction noise levels at all representative NSRs will comply with the daytime construction noise criteria throughout the construction period. Noise monitoring during the construction stage is recommended to ensure compliance with the relevant noise criteria. A Construction Noise Management Plan would be prepared and submitted before commencement of construction works, so that both the verification of the inventory of noise sources, and the assessment of the effectiveness and practicality of all identified measures for mitigating the construction noise impact of the Project would be performed during the design, tendering and implementation stage of the construction works.
- 4.13.2 No adverse operational noise impact is anticipated after implementing the proposed noise mitigation measures (e.g. acoustic louvers). A commissioning test should be



conducted prior to the operation of the Project to ensure operational noise levels would comply with the relevant noise standards.