5 NOISE

5.1 Introduction

This *Section* assesses the potential noise impacts associated with the construction and operation of the proposed desalination plant at Tseung Kwan O Area 137 (the Project).

5.2 Relevant Legislation and Guidelines

5.2.1 Construction Noise

The principal legislation relating to the control of construction noise is the *Environmental Impact Assessment Ordinance* (*EIAO*) *(Cap. 499)*. The *Technical Memorandum on Environmental Impact Assessment Process* (*EIAO-TM*), issued under the *EIAO*, provides guidelines and noise criteria for evaluating noise impacts.

The *Noise Control Ordinance (Cap. 400)* (*NCO*) also provides means to assess construction noise impacts. Various Technical Memoranda (TMs), which stipulate control approaches and criteria, have been issued under the *NCO*. The following TMs are applicable to the control of noise impacts from 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*).

General Construction Works

Under the *EIAO*, potential noise impact arising from general construction works during normal working hours (ie 07:00 to 19:00 hrs on any day not being a Sunday or public holiday) at the openable windows of buildings, which rely on opened windows for ventilation, is to be assessed in accordance with the noise criteria specified in the *EIAO-TM*. The *EIAO-TM* noise standards are presented in ***Table 5.2a***.

Table 5.2a EIAO-TM Day-time Construction Noise Standards ($L_{eq,\ 30\ min}$ dB(A))

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

Notes:
(1) The above standards apply to uses which reply on opened windows for ventilation.
(2) The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external façade.

When assessing a Construction Noise Permit (CNP) application for the use of Powered Mechanical Equipment (PME) during the restricted hours, the Noise Control Authority

will compare the Acceptable Noise Levels (ANLs), as promulgated in *GW-TM*, and the Corrected Noise Levels (CNLs) (ie after accounting for factors such as barrier effects and reflections) associated with the proposed PME operations. The ANLs are related to the noise sensitivity of the area in question and different Area Sensitivity Ratings (ASR) have been established to reflect the background characteristics of different areas. The appropriate ASR for the Noise Sensitive Receiver (NSR) is determined with reference to ***Table 5.2b***.

Table 5.2b 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:
(a) "Country Park" means an area that is designated as a country park pursuant to section 14 of the *Country Parks Ordinance*;
(b) "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;
(c) "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;
(d) "not affected" means that the NSR is at such a location that noise generated by the IF is not noticeable at the NSR; and
(e) "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.

The relevant ANLs for each area sensitivity rating are shown in ***Table 5.2c***.

Table 5.2c Acceptable Noise Levels for General Construction Works (ANL, $L_{eq,\ 5\ min}$ dB(A))

Time period	**Area Sensitivity Rating (dB(A))**		
	A	B	C
All days during the evening (ie 19:00-23:00 hrs) and general holidays (including Sundays) during the day and evening (ie 07:00-23:00 hrs)	60	65	70
All days during the night-time (ie 23:00-07:00 hrs)	45	50	55

The Noise Control Authority will consider a well-justified CNP application for construction works within restricted hours as guided by the relevant Technical Memorandum 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*.

Ground-borne Noise

Noise arising from general construction works during normal working hours is governed by the *EIAO-TM* under the *EIAO* as shown in *Table 5.2a*. The *Technical Memorandum on Noise From Places Other than Domestic Premises, Public Places or Construction Sites* (*IND-TM*) under the *NCO* stipulates that noise transmitted primarily through the structural elements of building, or buildings, shall be 10 dB(A) less than the relevant ANLs.

Based on the principle for ground-borne noise criteria (i.e. taking account of the minus 10dB(A) requirement under the *IND-TM*), ground-borne construction noise levels inside domestic premises and schools will be limited to 65dB(A) and 60dB(A) (55dB(A) during examination) respectively, with reference to the daytime airborne noise criterion of 75dB(A) and 70dB(A)(65dB(A) during examination) in accordance with *EIAO-TM*.

In the evening (19:00 – 23:00hrs) and during nighttime (23:00 – 07:00hrs), ground-borne noise level will be limited to 10dB(A) below the respective ANLs for the Area Sensitivity Rating category of "A, B and C" at the NSRs along the proposed project. A summary of these criteria is given in ***Table 5.2d*** below.

Table 5.2d Ground-borne Noise Criteria (ANL, $L_{eq, 5min}$ dB(A))

Time period	Area Sensitivity Rating (dB(A))		
	A	B	C
All days during the evening (ie 19:00-23:00 hrs) andgeneral holidays (including Sundays) during the day and evening (ie 07:00-23:00 hrs)	50	55	60
All days during the night-time (ie 23:00-07:00 hrs)	35	40	45

5.2.2 Operational Noise

The *EIAO-TM* and *IND-TM* specify the applicable ANLs for the operation of Project. The ANLs are dependent on the ASR and the time of the day and are presented in ***Table 5.2e***.

Table 5.2e ANLs to be used as Fixed Plant Noise Criteria

Time Period	$L_{eq\ 30min}$ (dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Day-time (ie 07:00-19:00 hrs)	60	65	70
Evening (ie 19:00-23:00 hrs)	60	65	70
Night-time (ie 23:00-07:00 hrs)	50	55	60

Fixed plant noise is controlled under Section 13 of the *NCO* and the predictions will be undertaken in accordance with the *IND-TM*. The noise criteria for planning and design of Designated Projects are set out in the *EIAO-TM* as follows:

- the noise level at the facade of the nearest NSR is at least 5 dB(A) lower than the appropriate ANL (as shown in *Table 5.2d*) as specified in the *IND-TM*; or
- the prevailing background noise level (for quiet areas with a noise level 5 dB(A) below the appropriate ANL).

Road Traffic Noise

The traffic noise standards for planning purposes specified in Table 1 under Annex 5 of the *EIAO-TM* was employed as the noise limits for the road traffic noise impact assessment. The applicable road traffic noise standards are 70dB(A) $L_{10,\ 1hr}$ for domestic premises and 65dB(A) $L_{10,\ 1hr}$ for education institutions and church, respectively. These noise limits were applied for the peak hour traffic flows and for uses that rely on opened windows for ventilation.

5.3 Description of the Noise Environment

5.3.1 Baseline Environmental Conditions

The Project Site consists of mainlaying located along Tsui Lam Road, Po Hong Road, Wan Po Road and a desalination plant site near the southern end of Wan Po Road south of the Southeast New Territories (SENT) Landfill and the Tseung Kwan O Industrial Estate. High-rise residential developments and educational institutions exist along the mainlaying sections. Background noise levels vary from a typical of a general rural environment to a low density residential area, and there are limited numbers of vehicles or noisy plant items operating during evening and night-time periods. The major existing noise sources were identified as the general noise from the existing SENT Landfill, Tseung Kwan O Industrial Estate and the traffic noise in the vicinity.

5.3.2 Noise Sensitive Receivers

In accordance with the requirements given in Section 3.4.3.2 of the *EIA Study Brief*, the Study Area for the noise impact assessment covered a distance of 300m from the boundary of the Project Site. Only the first layer of the NSRs located along Wan Po Road, Po Hong Road and Tsui Lam Road were included in the assessment as the NSRs behind were located further away from the road and were screened. The area considered in the assessment is shown in ***Figure 5.3a***.

Existing NSRs that would potentially be affected by the Project are identified as residential developments, chapels and schools along Wan Po Road, Po Hong Road and Tsui Lam Road, as well as the village house at Nam Tong on Tung Lung Chau which is located at more than 1.3 km to the south-east of the Project Site boundary. The locations of the identified representative NSRs are presented in ***Figures 5.3b*** to ***5.3e***.

The locations of the identified representative planned NSRs for assessment are presented in ***Figure 5.3f***. Photos showing the existing NSRs are presented in *Annex 5A*.

The representative air-borne NSRs within the study area and their separation distances to the Project Site are listed in *Table 5.3a*. Potential construction and operational noise impact at the representative existing NSRs were assessed according to the matrix in ***Table 5.3a***. The two identified representative planned NSRs were not assessed for noise impacts during construction phase as no implementation program could be found for these developments.

Table 5.3a Representative Air-borne Noise Sensitive Receivers Selected for Construction Noise Impact Assessment

NSR	Location	Use [a]	Approx. Horizontal Distance to Notional Source Position[b] (m)	Floors
TLC1	Village House at Tung Lung Chau	Residential	1340	1
LP1	Lohas Park – Phase 2 Tower 1	Residential	17/2600[d]	49
TB1	The Beaumont	Residential	185	38
CSS1	Creative Secondary School	Educational	26	7
OS1	Oscar by the Sea	Residential	84	32
TKOP1	Tseung Kwan O Plaza	Residential	24	45
BG1	Beverly Garden	Residential	43	40
STE1	Sheung Tak Estate	Residential	29	38
KNH1	Kwong Ming Court - Kwong Ning House	Residential	38	38
LSTPS1	Leung Sing Tak Primary School	Educational	268	7
NFP1	Nan Fung Plaza	Residential	297	43
SACK1	St. Andrew's Catholic Kindergarten	Educational	271	4
CKWPS1	POH Chan Kwok Wai Primary School	Educational	144	6
HHCSC1	Haven of Hope Christian Service Chapel	G/IC	54	2
DHMC1	Ma Chan Duen Hey Memorial College	Educational	100	7
MC1	Metro City	Residential	67	43
VH1	Verbena Heights	Residential	44	33
HSG1	Hong Sing Garden	Residential	201	30
KLC1	King Ling College	Educational	272	8
SP1	Serenity Place	Residential	16	41
RT1	Radiant Towers	Residential	41	44
FP1	Finery Park	Residential	49	43
WOG1	Well On Garden	Residential	46	40
PLKLFC1	PLK Laws Foundation College	Educational	7	8
KTPS1	TKO Kei Tak Primary School	Educational	14	8
CJCLS1	The Church of Jesus Christ of Latter-days Saints	G/IC	30	5
PYH1	Po Lam Estate - Po Yan House	Residential	132	35
TKOV1	TKO Village No. 271	Residential	32	3
KMC1	King Ming Court	Residential	21	35
TLE1	Tsui Lam Estate	Residential	21	22
SCPS1	School of Continuing and Professional Education - CUHK	Educational	16	8
YC1	Youth College (Tseung Kwan O)	Educational	34	7
HCMS1	Hong Chi Morninghill School Tsui Lam	Educational	66	5
LP2	Lohas Park – Phase 2 Tower 9	Residential	66	56
A78R1[c]	TKO Area 78 Residential Development	Residential	192	-

NSR	Location	Use [a]	Approx. Horizontal Distance to Notional Source Position[b] (m)	Floors
A86S1[c]	Planned School in Area 86	Educational	59	-

Notes:
(a)G/IC denotes Government, Institution or Community.
(b) According to the GW-TM, notional source position refers to the position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR.
(c) Representative Planned NSR
(d) 17m is the separation between the LP1 and the notional source position of the nearest workfront of mainlaying works and 2600m is the separation between the LP1 and the notional source position of the construction site of the desalination plant.

The representative ground-borne NSRs within the study area and their separation distances to the ground-borne noise sources of Project Site are presented in ***Table 5.3b***.

Table 5.3b Representative Ground-borne Noise Sensitive Receivers

NSR	Location	Use	Approx. Horizontal Distance to Notional Source Position[a] (m)	Floors
LP1	Lohas Park – Phase 2 Tower 1	Residential	72	49
LP2	Lohas Park – Phase 2 Tower 9	Residential	40	56
KMC1	King Ming Court	Residential	23	35

Note:
(a) According to the GW-TM, notional source position refers to the position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR.

5.3.3 Potential Concurrent Projects

The potential concurrent projects in the vicinity of the Project include the Cross Bay Link (CBL), TKO Area 86 Development Stages 1-3 at Lohas Park, Tseung Kwan O – Lam Tin Tunnel (TKO-LTT) and Trunk Road T2. The distance from the site boundary of the Project to TKO-LTT and Trunk Road T2 is greater than 3km. Cumulative impact is not anticipated due to large separation distances and hence not taken into account. The construction phase and study areas of the CBL (2016 - 2020), TKO Area 86 Development (ongoing – 2020) and the proposed desalination plant (2017 – 2020) overlap, hence, the cumulative impacts are assessed in this report.

5.4 Potential Sources of Impact

5.4.1 Construction Phase

The major activities associated with the construction phase will involve the use of PME and they are summarised as follows:

- *Mainlaying* – concrete breaking, excavation, pipe laying, pipe jacking, backfilling, concrete reinstatement, asphalt reinstatement, painting of road

marking; pipe jacking would be employed as trenchless method for some sections of mainlaying works (See ***Figure 5.4a***);

- *Desalination Plant Construction & Slope Mitigation Works* - site clearance and ground investigation, foundation and piling, building works, architectural and landscaping work, submarine intake and outfall, slope mitigation and E&M installation, testing and commissioning.

Potential sources of noise impacts during the construction phase of the Project will mainly arise from powered mechanical equipment (PME) operating at the construction work sites. The construction noise assessment was undertaken based on the proposed construction works programme (see *Annex 5B*), and plant inventory (see *Annex 5C)*. The plant inventory was reviewed by the Design Engineer and was confirmed to be suitable for completing the Assignment within the scheduled timeframe.

The normal working hours of the Contractor will be between 07:00 and 19:00 hrs from Monday to Saturday (except public holidays). Construction activities during restricted hours are not expected. Should evening and night works between 19:00 and 07:00 hrs or on public holidays (including Sundays) be required, the Contractor will submit a CNP application which will be assessed by the Noise Control Authority.

Mainlaying

Mainlaying is expected to be constructed under three works packages for the alignments between the desalination plant to Shek Kok Road, Shek Kok Road to Po Shun Road and Po Shun Road to Tseung Kwan O Fresh Water Primary Service Reservoir. It is anticipated that the mains will be constructed in segments of up to 40m in length (i.e. workfront, see ***Figures 5.8a*** and ***5.8b***). Construction works will be carried out at most three workfronts concurrently in Section A (Desalination Plant to Shek Kok Road) and Section C (Po Shun Road to Tseung Kwan O Fresh Water Primary Service Reservoir) and at most four workfronts concurrently in Section B (Shek Kok Road to Po Shun Road). The construction activities at one workfront will last for about one to two months only. There are five proposed works areas (See ***Figure 5.4a***) where pipe jacking (trenchless tunneling) method will be adopted. Tunneling works using the pipe jacking method will be mainly carried out underground during the day-time period only.

Interfacing of Construction Activities

As mentioned above, a workfront for the mains using trenching is up to 40m and mainlaying works for Sections A, B & C will be carried out simultaneously. The work programme of the construction for the sections will be properly managed such that concurrent workfronts will be scattered away from other sections and the NSRs will not be affected by the construction activities from two sections at any one time. For tunneling and excavation using the pipe jacking method, the construction activities will be scheduled such that only one works area (See ***Figure 5.4a***) will be in operation at any one time.

Mainlaying and desalination plant construction may be carried out at the same time. Only one identified NSR, Lohas Park – Phase 2 Tower 1 (LP1), will be affected by both activities. Based on this, cumulative noise impact from mainlaying and the construction of the desalination plant were assessed.

5.4.2 Operational Phase

During operation, noise will be generated from fixed plant sources, i.e. two pumping stations proposed to be situated in the desalination plant. All equipment will be accommodated inside plant rooms and hence fully enclosed. Operational noise from the pumping station is assumed to be emitted through louvres. As the nearest NSR is located at over 1.3 km away from the desalination plant, there are considered to be no unacceptable noise impacts during the operation of the desalination plant.

Traffic generated from the site is insignificant as only 5 to 10 round trips per day are expected for the transportation of chemicals to the desalination plant. This comprises less than 0.05% of the Annual Average Daily Traffic (AADT) on Wan Po Road and Tseung Kwan O Tunnel Road. With consideration of the low traffic arising from the Project, no traffic noise impact is anticipated.

5.5 **Assessment Methodology**

5.5.1 Construction Phase

General Construction Activities

The construction noise impact assessment was undertaken in accordance with the procedures outlined in the *GW-TM,* which is issued under the *NCO* and the *EIAO-TM*. The assessment methodology is summarised as follows:

- Locate representative NSRs that may be affected by the Project;
- Determine the plant teams for corresponding activities, based on the agreed plant inventory;
- Assign sound power levels (SWLs) to the PME proposed based on the *GW-TM*, *British Standard BS 5228*[(1)] and list of SWLs of other commonly used PME[(2)];
- Calculate the correction factors based on the distance between the NSRs and the notional noise source position of the work sites;
- Apply corrections in the calculations, such as potential screening effects and acoustic reflection, if any; and
- Predict the construction noise levels at NSRs in the absence of any mitigation

(1) British Standard "Noise and Vibration Control on Construction and Open Sites – Part I", BS 5228: Part I

(2) "Sound power levels of other commonly used PME" prepared by the Noise Control Authority (http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

measures.

The construction noise assessment was undertaken based on the proposed construction works programme and plant inventory, and appropriate utilisation rates of the items of PME (see *Annex 5C*). The Project Proponent has reviewed the programme and plant inventory, and has confirmed that they are reasonable and practicable for completing the Project within the scheduled timeframe.

The total SWL associated with each construction activity was established based on an assumed plant inventory. The notional source positions were established in accordance with the procedures stated in the *GW-TM*. The potential noise impacts at NSRs for a maximum of 3 or 4 workfronts (worse-case scenario considering the cumulative impacts of the noisiest PME) were subsequently 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 5.2.1*.

Ground-borne Noise

The method used to predict construction ground-borne noise is based on the U.S. Department of Transportation "High-Speed Ground Transportation Noise and Vibration Impact Assessment" [(1)]. The predicted ground-borne noise level (L_p) inside the noise sensitive rooms is given by the following equation:

$$L_p = L_{v,rms} + C_{dist} + C_{damping} + C_{building} + C_{floor} + C_{noise}$$

where

$L_{v,rms}$ is the vibration level at a distance R from the source related to the vibration source level at a reference distance R_0;

C_{dist} is the distance attenuation;

$C_{damping}$ is the soil damping loss across the geological media;

C_{floor} is the coupling loss per floor;

C_{noise} is the conversion factor from floor vibration levels to noise levels.

Reference Vibration Sources

The vibration velocities were determined by measurements in Peak Particle Velocity. In such cases, a crest factor of four was applied to establish the rms level in accordance with the *Federal Transit Administration's Guidance Manual* [(2)].

Reference has been made to the Tunnel Boring Machine (TBM) employed for Kwai Tsing Tunnel of West Rail project from the EIA for Drainage Improvement in Tsuen Wan, Kwai Chung & Tsing Yi - Tsuen Wan Drainage Tunnel (Register No.: AEIAR-

(1) U.S. Department of Transportation "High-Speed Ground Transportation Noise and Vibration Impact Assessment", 1998

(2) U.S. Department of Transportation, "Transit Noise and Vibration Impact Assessment", 1995

088/2005). The geology is consisting of mainly granite. The measurements are considered the most appropriate available information for assessing TBM ground-borne noise.

Soil damping loss

No soil damping loss is assumed for conservative purpose.

Coupling loss into Building Structures

Coupling loss into building structures is the change in the incident ground-surface vibration due to the presence of the piled building foundation. The empirical values based on the guidance set out in the *Transport Noise Reference Noise Book* are given in the following ***Table 5.5a***.

Table 5.5a Loss Factor for Coupling into Building Foundations

Loss factor for coupling into building foundation (dB)	**Octave Band Frequencies (Hz)**					
	16	31.5	63	125	250	500
Large building on Piles	-7	-10	-12	-15	-17	-14
Single residences	-5	-6	-6	-5	-4	-3

Coupling Loss Per Floor

Coupling loss per floor is the floor-to-floor vibration transmission attenuation. In multi-storey buildings, the attenuation of vibration from floor to floor is approximately -1dB in the upper floor regions at low frequencies and greater than -3dB at lower floors at high frequencies. Coupling loss of -1dB pre floor is assumed for a conservative assessment.

Conversion from Floor Vibration to Noise Levels

Conversion from floor vibration levels to indoor reverberant noise levels is based on the standard acoustic principles. The conversion factor is depended on the surface area of the room, the radiation efficiency, the volume of the room and the room reverberation time. Results for residential units, school and temple are summarised in ***Table 5.5b***.

Table 5.5b Conversion Factor from Floor Vibration levels to indoor reverberant noise levels

NSR Description	**Conversion** C_{noise} (dB re 1 x 10^{-6} mm/s)
Residential Unit	-27
Temple	-27
School	-24

Pipe jacking would be employed as a trenchless method at five proposed sections along the rising mains (See ***Figure 5.4a***). The sections are located at road junctions such that the trenchless method can reduce interruption caused to road traffic. A micro-tunnel

boring machine (micro-TBM) with a shield diameter of not more than 1.5m would be used to construct the trenchless tunnel sections.

5.5.2 Operational Phase

No noise sensitive receivers were identified within 300m of the operational site area of the proposed desalination plant at Tseung Kwan O. In view of the above and that all equipment will be accommodated inside plant rooms, quantitative assessment is considered not necessary for the operation phase of the proposed desalination plant. In addition, traffic generated from the site is insignificant as only 5 to 10 round trips per day are expected for the transportation of chemicals along Wan Po Road via Tseung Kwan O Tunnel Road. The Annual Average Daily Traffic Flow on Wan Po Road was above 30,000 in 2013. It is anticipated the increase in daily traffic flow will be less than 0.05% on Wan Po Road and the increase in road traffic noise due to the Project will be less than 0.01dB(A). With consideration of the low traffic arising from the Project, no traffic noise impact is anticipated.

5.6 Evaluation of Impacts

5.6.1 General Construction

Desalination Plant

As the representative NSRs are located at more than 1.3 km away from the Notional Source Position, the predicted noise levels at the representative NSRs would comply with the stipulated construction noise criteria. A summary of the predicted construction noise levels is presented in ***Table 5.6a***. Details of the noise calculations are presented in *Annex 5D*.

Table 5.6a Predicted Construction Noise Levels at Representative NSRs for Construction of Desalination Plant

NSR	Description	Approx. Horizontal Distance to Notional Source Position[a] (km)	Predicted Construction Noise Levels[b], $L_{eq,\ 30\ min}$ dB(A)
LP1	Lohas Park – Phase 2 Tower 1	2.6	34 - 50
TLC1	Village House at Tung Lung Chau	1.3	39 - 56

Notes:
(a) According to the GW-TM, notional source position refers to the position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR. If the construction site is large such that the notional source position would be greater than 50m from the point on the site boundary nearest to the NSR, the position was taken to be a point 50m from that point on the site boundary measured along the line between the approximate geographical centre of the site and the point on the site boundary nearest to the NSR.
(b) All predicted noise levels were corrected with 3dB(A) for façade reflection.
(c) Assessment criterion for construction noise impact is 75 dB(A) for domestic premises.

The predicted construction noise levels at the representative NSRs are well below the noise criteria, hence the NSRs will not be adversely affected by the construction of the desalination plant.

Mainlaying Works

The predicted façade noise levels during daytime period due to the mainlaying construction works are calculated in accordance with the methodology described in GW-TM. The results are summarised in ***Table 5.6b*** with details of the noise calculations given in *Annex 5D*.

Cumulative Impact

The maximum predicted noise levels and cumulative noise impact from interfacing mainlaying and construction of the desalination plant as well as the construction activities of the Cross Bay Link and TKO Area 86 Developments are presented for LP1, the NSR most proximal to the mainlaying works and the concurrent projects. Results indicate that the noise impact from the desalination plant and the concurrent projects are insignificant and low, respectively. The maximum predicted cumulative CNL at LP1 remains at 85 dB(A). Details of the noise calculations are presented in *Annex 5D*.

Table 5.6b Predicted Construction Noise Levels at Representative NSRs for Mainlaying Works

NSR	Description	Approx. Horizontal Distance to Notional Source Position[a] (m)	Predicted Construction Noise Levels[b], $L_{eq,\ 30\ min}$ dB(A)
LP1[d][e]	Lohas Park – Phase 2 Tower 1	17 - 116	68 - 85
TB1	The Beaumont	185 - 201	42 - 70
CSS1	Creative Secondary School	26 – 76	56 - 84
OS1	Oscar by the Sea	84 – 113	48 - 76
TKOP1	Tseung Kwan O Plaza	24 – 80	56 - 84
BG1	Beverly Garden	43 – 90	52 - 80
STE1	Sheung Tak Estate	29 – 82	55 - 83
KNH1	Kwong Ming Court - Kwong Ning House	38 – 88	53 - 81
LSTPS1	Leung Sing Tak Primary School	268 – 315	38 - 66
NFP1	Nan Fung Plaza	298 – 305	38 - 66
SACK1	St. Andrew's Catholic Kindergarten	278 – 288	38 - 66
CKWPS 1	POH Chan Kwok Wai Primary School	144 – 165	44 - 72
HHCSC1	Haven of Hope Christian Service Chapel	54 – 70	50 - 78
DHMC1	Ma Chan Duen Hey Memorial College	100 – 110	46 - 74
MC1	Metro City	67 – 80	49 - 77
VH1	Verbena Heights	44 – 63	52 - 80
HSG1	Hong Sing Garden	201 – 205	40 - 68
KLC1	King Ling College	272 – 275	37 - 65
SP1	Senerity Place	16 – 45	58 - 86
RT1	Radiant Towers	41 – 63	52 - 80
FP1	Finery Park	49 – 65	51 - 79
WOG1	Well On Garden	46 – 60	51 - 79

NSR	Description	Approx. Horizontal Distance to Notional Source Position[a] (m)	Predicted Construction Noise Levels[b], $L_{eq,\ 30\ min}$ dB(A)
PLKLFC1	PLK Laws Foundation College	7 – 40	65 - 93
KTPS1	TKO Kei Tak Primary School	14 – 43	59 - 87
CJCLS1	The Church of Jesus Christ of Latter-days Saints	30 – 50	54 - 82
PYH1	Po Lam Estate - Po Yan House	132 – 143	43 - 71
TKOV1	TKO Village No. 271	32 – 65	53 - 81
KMC1[e]	King Ming Court	21 – 35	58 - 86
TLE1	Tsui Lam Estate	21 – 48	56 - 84
SCPS1	School of Continuing and Professional Studies - CUHK (Tseung Kwan O Learning Centre)	16 – 40	59 - 87
YC1	Youth College (Tseung Kwan O)	34 – 55	53 - 81
HCMS1	Hong Chi Morninghill School Tsui Lam	66 – 90	48 - 76
LP2 [e]	Lohas Park – Phase 2 Tower 9	48 - 119	49 - 78

Notes:
(a) According to the GW-TM, notional source position refers to the position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR.
(b) All predicted noise levels were corrected with 3dB(A) for façade reflection.
(c) Assessment criterion for construction noise impact is 75 dB(A) for domestic premises and 70dB(A) for education institutions (65dB(A) during examinations).
(d) The calculation for cumulative CNL (Desalination plant + mainlaying + Cross Bay Link + TKO Area 86) for LP1 under unmitigated scenario is shown in Annex 5D-3.
(e) Calculation includes pipe jacking for trenchless mainlaying method.

Results indicate that the construction noise levels at the majority of the representative NSRs are predicted to exceed the *EIAO-TM* noise criteria during day-time period due to the mainlaying construction works. Therefore, mitigation measures will be required.

Ground-borne Noise

King Ming Court is identified as the critical ground-borne NSR as it is the receiver with the least horizontal separation (ie. 23m) to the proposed tunnel section to be conducted by trenchless method. The ground-borne noise level is predicted to be 42dB(A) at King Ming Court which comply with criterion for ground-borne noise. The ground-borne noise calculation is shown in *Annex 5D-4a*.

In fact, the size of the cutter head (diameter <1.5m) of the micro-TBM is small (ie. fewer cutter discs and less driving power) compared with the reference source of TBM (8.7m diameter for the TBM from the *EIA for Drainage Improvement in Tsuen Wan, Kwai Chung & Tsing Yi - Tsuen Wan Drainage Tunnel* (Register No.: AEIAR-088/2005)). In addition, although the soil damping loss is assumed zero in the assessment for conservative purpose, the geological condition along the rising mains is mainly soft in nature as the rising mains will be laid at approximately 1.5m below the ground level. The soft geology will provide significant damping of vibrations and hence considerably reduce the transmission of ground-borne vibrations.

In addition to the five proposed sections (See ***Figure 5.4a***) that will be constructed by micro-TBM, trenchless method may be carried out at other sections to avoid interruption caused to road traffic where necessary. Based on the assessment methodology in *Section 5.5.1*, there are minimum horizontal separations between the NSR and the micro-TBM that shall be maintained in order to comply with the criteria. The calculations of the minimum separations are presented in *Annex 5D-4b*. Safety factor of 10dB(A) is applied in the calculation for conservatism. The minimum separations for different types of NSR are summarized in ***Table 5.6c***.

Table 5.6c Minimum separation between the micro-TBM and NSR

NSR	Daytime Ground-borne Noise Criteria, dB(A)	Minimum Horizontal Separation, m
Domestic Premises and Temples	65	5
Educational Institutions (normal period)	60	12
Educational Institutions (during examination period)	50	23

Provided that the minimum separations shown in the *Table 5.6c* can be maintained, it is anticipated that the ground-borne noise generated by the micro-TBM for this Project would be insignificant and unlikely to cause adverse impact on the nearby NSRs.

5.7 Mitigation Measures

5.7.1 Construction Phase

In view of the predicted noise exceedances during the construction of the Project, the following mitigation measures have been considered:

- Good construction site practice;
- Use of quite PME;
- Adoption of movable noise barriers and noise enclosures;
- Use of noise insulation sheet; and
- Scheduling of PME / construction activities.

Good Construction Site Practice

Good construction site practice and noise management can considerably reduce the potential noise impact of the 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 utilised 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;
- Plants 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.

Use of Quiet PME

The use of quiet PME is considered to be a practicable means to mitigate the construction noise impact. Quiet plant 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. Quiet PME that have been adopted in the assessment are summarised in ***Table 5.7a***.

Table 5.7a Sound Power Level of Quiet PME

PME	EPD QPME[a] / BS5228 [b] Reference	Sound Power Level (dB(A))
Wheeled excavator fitted with hydraulic rock breaker	BS D8 12	106
Excavator/loader, wheeled/tracked	BS D3 97	105
Dump truck (50 t)	BS D9 39	103
Piling, vibrating hammer	EPD/PME/18	115
Lorry, with crane/grab, 5.5tonne < gross vehicle weight ≦ 38 tonne	EPD/PME/36	112
Concrete truck mixer	BS D6 35	100
Poker, vibratory, hand-held	BS D6 40	98
Asphalt paver	BS D8 24	101
Paint line marker (low pressure)	EPD/PME/22	87
Road roller	BS D8 27	104
Drill rig, rotary type (diesel)	EPD/PME/12	110
Grout pump	EPD/PME/15	105
Bull dozer	BS D3 27	109
Mobile crane	BS D7 114	101
Concrete pump, stationary/lorry mounted	BS D6 36	106
Poker, vibratory, hand-held (electric)	EPD/PME/19	102

PME	EPD QPME[(a)] / BS5228 [(b)] Reference	Sound Power Level (dB(A))

Notes:
(a) *British Standard BS 5228:2009, Part 1 - Noise and Vibration Control on Construction and Open Sites*
(b) "Sound power *levels* of other commonly used PME" prepared by the Noise Control Authority (http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

Adoption of Movable Noise Barriers

The use of noise barriers will be an effective means to mitigate the noise impact arising from the construction works, particularly for low-rise NSRs. The use of movable barriers could generally provide a 5 dB(A) reduction for movable PME and 10 dB(A) for stationary PME. Movable noise barriers of 3m in 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. With reference to *A Practical Guide for the Reduction of Noise from Construction Works* by EPD, the noise barrier material should have a superficial surface density of at least 7 kg m^{-2} and have no openings or gaps.

In view of the close proximity between NSRs and the works areas, movable noise barriers will be deployed along the mainlaying sections as far as practicable. Reference has been made to *EIAO Guidance Note No. 9/2010 Preparation of Construction Noise Assessment Under the Environmental Impact Assessment Ordinance*; it is anticipated that the major noise source of movable PMEs, such as saw/groover, wheeled excavator fitted with hydraulic rock breaker, lorry with crane/grab, concrete truck mixer, vibratory poker and excavator/loader, will be located behind the movable barriers, and therefore these barriers could produce at least a 5 dB(A) noise reduction.

Use of Noise Insulating Sheet

Noise insulating sheet would be adopted for PME such as piling machines (*Annex 5E*). The noise insulating sheet should be deployed such that there would be no opening or gaps on the joints. With reference to the approved EIA Report for *West Island Line (WIL) (Register No.: AEIAR-126/2008 approved on 23 Dec 2008)* and *MTRC Contract C4420 Tsim Sha Tsui Modification Noise Assessment Report for Variation of Environmental Permit (July 2003)* and the technical data from the manufacturer of the noise insulating sheet, a reduction of over 10 dB(A) could be achieved with the use of the noise insulating sheet. For a conservative assessment, a noise reduction of 10 dB(A) for the PME with noise insulating sheet deployed was assumed in this assessment.

Sequencing and Scheduling of PME / Construction Activities

To further alleviate the construction noise impacts, some construction activities (e.g. excavation/shoring, reinstatement (asphalt), and pipe jacking) will be planned and carried out in sequence, such that items of PME proposed for these activities will not be operated simultaneously. Grouping of PME is considered for these activities.

Moreover, PMEs will not be used at the works areas near educational institutions with residual impact (ie the "influence area" within a radius of 40m) during school hours in order to reduce impact to the educational institutions. The locations of the influence areas are presented in ***Figure 5.7a*** and ***Figure 5.7b***.

Use of Noise Enclosure/ Acoustic Shed

Noise enclosures or acoustic sheds would be used to cover stationary PME such as generators. With the adoption of noise enclosures, PMEs could be completely screened, and noise reduction of 15 dB(A) can be achieved according to the *EIAO Guidance Note No.9/2010*.

The use of noise enclosures is considered to mitigate the residual impact arising from sawcutting pavement at some workfronts instead of use of movable noise barrier. Portable/Movable noise enclosure made of material with superficial surface density of at least 7 kg m^{-2} may be used for screening the noise from operation of the saw/groover, concrete. The locations where the portable noise enclosure will be required for sawcutting pavement are presented in ***Figure 5.7c***, ***Figure 5.7d*** *and* ***Figure 5.7e***.

The above mitigation measures have been vetted and confirmed by the Project Proponent and its Engineering Consultant as being practicable in completing the works within the scheduled timeframe. It is considered practical to specify the quiet PME and noise mitigation measures described in *Section 5.7.1* in the contract document to mitigate the construction noise impact. With the implementation of quiet PME, movable noise barriers and noise enclosure for various construction activities and grouping of PME (See *Annex 5E)*, the mitigated noise levels at the representative NSRs were calculated and the results summarised in ***Table 5.7b*** with details of the calculations given in *Annex 5F-1a*. The results indicate that the predicted façade noise levels are in the range of 38 to 75 dB(A) and 37 to 82 dB(A) at residential NSRs and educational NSRs, respectively.

Table 5.7b Predicted Construction Noise Levels at Representative NSRs for Mainlaying Works (With Mitigation Measures)

NSR	Description	Approx. Horizontal Distance to Notional Source Position[a] (m)	Predicted Construction Noise Levels[b], $L_{eq,\ 30\ min}$ dB(A)	Noise Criteria [c]
LP1[d], [e]	Lohas Park – Phase 2 Tower 1	17 - 116	68 - 75	75
TB1	The Beaumont	185 - 201	42 - 64	75
CSS1	Creative Secondary School	26 – 76	56 - 78	70/65
OS1	Oscar by the Sea	84 – 113	48 - 71	75
TKOP1	Tseung Kwan O Plaza	24 – 80	56 - 73	75
BG1	Beverly Garden	43 – 90	52 - 75	75
STE1	Sheung Tak Estate	29 – 82	55 - 72	75
KNH1	Kwong Ming Court - Kwong Ning House	38 – 88	53 - 70	75
LSTPS1	Leung Sing Tak Primary School	268 – 315	38 - 61	70/65
NFP1	Nan Fung Plaza	298 – 305	38 - 60	75
SACK1	St. Andrew's Catholic Kindergarten	278 – 288	38 - 61	70/65
CKWPS1	POH Chan Kwok Wai Primary School	144 – 165	44 - 66	70/65

NSR	Description	Approx. Horizontal Distance to Notional Source Position[a] (m)	Predicted Construction Noise Levels[b], $L_{eq,\ 30\ min}$ dB(A)	Noise Criteria [c]
HHCSC1	Haven of Hope Christian Service Chapel	54 – 70	50 - 73	75
DHMC1	Ma Chan Duen Hey Memorial College	100 – 110	46 - 68	70/65
MC1	Metro City	67 – 80	49 - 71	75
VH1	Verbena Heights	44 – 63	52 - 74	75
HSG1	Hong Sing Garden	201 – 205	40 - 63	75
KLC1	King Ling College	272 – 275	37 - 60	70/65
SP1	Senerity Place	16 – 45	58 - 75	75
RT1	Radiant Towers	41 – 63	52 - 69	75
FP1	Finery Park	49 – 65	51 - 68	75
WOG1	Well On Garden	46 – 60	51 - 74	75
PLKLFC1	PLK Laws Foundation College	7 – 40	65 - 87	70/65
KTPS1	TKO Kei Tak Primary School	14 – 43	59 - 82	70/65
CJCLS1	The Church of Jesus Christ of Latter-days Saints	30 – 50	54 - 71	75
PYH1	Po Lam Estate - Po Yan House	132 – 143	43 - 66	75
TKOV1	TKO Village No. 271	32 – 65	53 - 70	75
KMC1 [e]	King Ming Court	21 – 35	58 - 75	75
TLE1	Tsui Lam Estate	21 – 48	56 - 73	75
SCPS1	School of Continuing and Professional Studies - CUHK (Tseung Kwan O Learning Centre)	16 – 40	59 - 82	70/65
YC1	Youth College (Tseung Kwan O)	34 – 55	53 - 70	70/65
HCMS1	Hong Chi Morninghill School Tsui Lam	66 – 90	48 - 65	70/65
LP2 [e]	Lohas Park – Phase 2 Tower 9	48 - 119	49 - 67	75

Notes:
(a) According to the GW-TM, notional source position refers to the position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR.
(b) All predicted noise levels were corrected with 3dB(A) for façade reflection.
(c) Assessment criterion for construction noise impact is 75 dB(A) for domestic premises and 70dB(A) for education institutions (65dB(A) during examinations)..
(d) The calculation for cumulative CNL (Desalination plant + mainlaying + Cross Bay Link + TKO Area 86) for LP1 under mitigated scenario is shown in *Annex 5F-2*.
(e) Calculation includes pipe jacking for trenchless mainlaying method as shown in *Annex 5F-1b*.

With the adoption of the recommended mitigation measures, exceedance of the *EIAO-TM* noise criteria at some of the NSRs during the daytime period is still anticipated due to close proximity to the works sites.

5.8 Cumulative Impact

5.8.1 Construction Phase

The major concurrent projects to be assessed for construction noise cumulative impacts include the Cross Bay Link (CBL) and the Area 86 Development Stages 1-3 at Lohas Park. The assessment results show that the cumulative noise impacts of the Project with these concurrent projects will comply with EIAO requirements.

5.8.2 Operation Phase

No cumulative impact is anticipated during the operational phase.

5.9 Residual Impact

5.9.1 Construction Phase

With the use of practical noise mitigation measures, including the use of quiet PME, movable noise barriers, noise insulation sheet and scheduling of construction activities, exceedances of the construction noise criteria during normal school hours are still predicted at some of the NSRs arising from the construction of the mains due to the close proximity to the NSRs. Due to the nature of the construction work, it is envisaged that the exceedances will mainly occur at four education institution NSRs.

The predicted residual impacts and the durations are summarised in ***Table 5.9a*** and ***Table 5.9b***.

Table 5.9a Predicted Residual Construction Noise Impacts from Construction of Mains

NSR	Description	Predicted Residual Noise Impact from Individual Activity, dB (A)								
		a) Sawcutting pavement	**b) Breaking up of pavement**	**c) Excavation /shoring**	**d) Pipe laying**	**e) Backfiling**	**f) Reinstatement (concrete)**	**g) Reinstatement (asphalt)**	**h) Painting of road marking**	**i) Pipe jacking**
		Duration (The duration of each construction work activity for each segment, ie 40m)								
		1 day Exceedance due to the use of concrete saw only.	**2 days** Exceedance due to the use of hydraulic breaker only.	**3 weeks** Exceedance due to excavator, dump truck and sheet piling.	**2 weeks** Exceedance due to the use of lorry for 30min only.	**1 week** Exceedance due to the use of lorry to grab the soil and vibrator compactor.	**1 – 2 days** Exceedance due to the use of concrete lorry mixer and vibratory poker.	**1 – 2 days** Exceedance due to the use of asphalt paver, dump truck and road roller.	**Half day** Exceedance due to the use of paint line marker only.	**2 weeks** Exceedance due to excavator, dump truck and sheet piling.
CSS1[(a)]	Creative Secondary School	8 dB(A)	-	2dB(A)	-	2dB(A)	-	3dB(A)	-	-
PLKLFC1[(a)]	PLK Laws Foundation College	17dB(A)	9dB(A)	11dB(A)	8dB(A)	11dB(A)	5dB(A)	12dB(A)	-	-
KTPS1[(a)]	TKO Kei Tak Primary School	12dB(A)	3dB(A)	6dB(A)	2dB(A)	5dB(A)	-	6dB(A)	-	-
SCPS1[(a)]	School of Continuing and Professional Studies - CUHK	12dB(A)	3dB(A)	5dB(A)	2dB(A)	5dB(A)	-	6dB(A)	-	-

Notes:
(a) Use of PME at the influence areas as identified in Figure 5.7a and Figure 5.7b will be scheduled outside the school hours in order to reduce impact at the NSRs with residual impact.

Table 5.9b Summary of Residual Impact

NSR	Land Use	Range of exceedance, dB(A)	Duration of residual impact, weeks		No. of floors exceeded noise criteria	No. of dwellings/classrooms per floor	No. Of dwellings affected
			1 to 4 dB(A)	≥5 dB(A)			
CSS1[a]	Educational	2-8	4	1	7	5	-
PLKLFC1[a]	Educational	5-17	0	8	8	4	-
KTPS1[a]	Educational	2-12	3	5	8	6	-
SCPS1[a]	Educational	2-12	3	5	8	4	-

The School of Continuing and Professional Studies – CUHK (Tseung Kwan O Learning Centre) (SCPS1) and the TKO Kei Tak Primary School (KTPS1) are predicted to be subject to residual impacts of 2dB(A) to 12dB(A) during normal school hours due to sawcutting, breaking up of pavement, excavation/shoring, pipe laying, backfilling, and reinstatement (asphalt). Quiet PME, temporary noise barriers and insulating fabric have been recommended as mitigation measures to alleviate the noise emissions from PME. The feasibility of installing substantial noise barrier/enclosure has been reviewed. However, installation of large and substantial noise barriers/enclosure at the sources of the exceedance would be impractical due to the lack of space between the works sites as well as potential secondary impacts as a consequence of building a substantial noise barrier with a large footing. However, SCPS1 and KTPS1 have been observed to have been installed with either split-type or window-type air conditioners, which will further alleviate the residual impacts. Furthermore, noisy construction works will be avoided in the influence areas near SCPS1 and KTPS1 during normal school hours as presented in ***Figure 5.7b***.

Creative Secondary School (CSS1), which is predicted to be subject to residual impacts of 2dB(A) to 8dB(A)during normal school hours. Residual impacts are predicted during sawcutting, excavation/shoring, backfilling, and reinstatement (asphalt) works. While quiet PME, noise barriers and insulating fabric have been recommended as mitigation measures to alleviate the noise emissions from the PME, given the location of the NSR in very close proximity of the works site, installation of large and substantial noise barriers/enclosure would be impractical due to limited space available as well as potential secondary impacts as a consequence of building a substantial noise barrier with a large footing. CSS1 is observed to have been installed with split-type air conditioners, which will further alleviate the residual impacts. Noisy construction works will also be avoided in the influence area near CSS1 during school hours as presented in ***Figure 5.7a***.

Exceedance during normal school hours of 5dB(A) to 17dB(A) is also predicted at the PLK Laws Foundation College (PLKLFC1), due to sawcutting, breaking up of pavement, excavation/shoring, pipe laying, backfilling, and reinstatement (asphalt) and reinstatement (concrete) works. While quiet PME, noise barriers and insulating fabric have been recommended as mitigation measures to alleviate the noise emissions from the PME, given the location of the NSR in very close proximity of the works site, installation of large and substantial noise barriers/enclosure would be impractical due to limited space available as well as potential secondary impacts as a consequence of building a substantial noise barrier with a large footing. PLKLFC1 is observed to have been installed with either split-type or window-type air conditioners, which will further alleviate the residual impacts. In addition noisy construction works will be avoided in the influence area near PLKLFC1 during school hours as presented in ***Figure 5.7b***.

In view the duration of noise exceedance at the four schools is limited to 8 weeks, the construction work in the influence areas near the four schools shall be scheduled during long school holidays (eg summer holiday, Easter holiday or Christmas holiday, etc) as far as practicable. Scheduling the construction work for the four schools and

other recommended mitigation measures will be specified in the contract document for proper implementation.

As such, no residual impacts are anticipated and predicted noise levels at all NSRs are predicted to comply with the EIAO requirements.

5.9.2 Operation Phase

No residual impact is anticipated during the operational phase.

5.10 Environmental Monitoring and Audit

5.10.1 Construction Phase

The recommended mitigation measures, monitoring procedures and locations are presented in detail in the Environmental Monitoring and Audit (EM&A) Manual. This will facilitate the contractor to have early warning and undertake the necessary actions to reduce noise emissions at specific areas. The effectiveness of on-site control measures could also be evaluated through the regular site audits. All the recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction.

5.10.2 Operation Phase

Noise monitoring for the operation of the two pumping stations in the desalination plant are considered unnecessary during the operation phase.

5.11 Conclusions

5.11.1 Construction Phase

A construction noise assessment has been undertaken to predict the noise levels at the representative NSRs due to the construction of the Project. Practicable mitigation measures, including use of quiet construction plant, movable noise barriers, noise insulation sheets, scheduling of construction activities and noise enclosures, have been recommended. No adverse noise impacts are anticipated with the implementation of the practical mitigation measures and noise levels at all NSRs are predicted comply with the EIAO requirements.

5.11.2 Operation Phase

All equipment will be accommodated inside the plant rooms and hence fully enclosed. Operational noise from the pumping station is assumed to be emitted through louvres. No adverse noise impacts are anticipated at the representative NSRs during the operational phase due to the Project because of the large horizontal separation.