

10. Noise Impact Assessment

10.1 Introduction

This section has evaluated and assessed the potential noise impact likely to arise from the proposed Project during both the construction and operation phases, in accordance with Condition 3.4.5 of the EIA Study Brief No. ESB-198/2008.

This section presents the findings of the assessment of potential noise impacts of the proposed Project in the vicinity of sensitive receivers, and is structured as follows:

Section 10.2: Provides discussions on existing environmental legislation, standards, guidelines and criteria;

Section 10.3: Provides a description on the existing environmental conditions;

Section 10.4: Provides discussions on the potential noise sources of this Project;

Section 10.5: Identifies the noise sensitive receivers (NSR) for this Project;

Section 10.6: Describes the assessment methodology adopted for this EIA;

Section 10.7: Describes the prediction and evaluation of environmental impacts due to the Project;

Section 10.8: Proposes potential mitigation measures to address the identified impacts;

Section 10.9: Proposes appropriate environmental monitoring and auditing programme; and

Section 3.10: Summarises the key findings of this section.

Based on the latest information, the construction of the Project is expected to be undertaken 24 hours a day, 7 days a week. The Project is tentatively scheduled to be undertaken between mid 2011 to mid 2013. The noise impact assessment has been based on the criteria and guidelines as stated in Annexes 5 and 13 of the EIAO-TM and NCO, and covers the scope outlined in the EIA Study Brief. The assessment concluded that under noise level at the representative NSRs will comply with the construction noise standard during daytime working hours, and therefore no adverse noise impact is expected, details of which are further elaborated in the following subsections.

10.2 Relevant Legislation, Standards & Guidelines

10.2.1 Construction Phase

10.2.1.1 General Construction Activities during Non-Restricted Hours

Noise impacts arising from general construction activities other than percussive piling during the daytime period (07:00-19:00 hours of any day not being a Sunday or general holiday) shall be assessed against the noise standards tabulated in **Table 10.1** below.

Table 10.1: Noise Standards for Daytime Construction Activities

Noise Sensitive Uses	0700 to 1900 hours on any day not being a Sunday or general holiday, Leq (30 min), dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and hostel	
Educational institutions including kindergarten, nurseries and all others where unaided voice communication is required	70 65 during examination

Source: EIAO-TM, Annex 5, Table 1B - Noise Standards for Daytime construction Activities

Note: The above noise standards apply to uses, which rely on opened windows for ventilation
 The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external facade
 The above standards shall be met as far as possible. All practicable mitigation measures shall be exhausted and the residual impacts are minimised

10.2.1.2 General Construction Activities during Restricted Hours

Noise impacts arising from general construction activities (excluding percussive piling) conducted during the restricted hours (19:00-07:00 hours on any day and anytime on Sunday or general holiday) are governed by the Noise Control Ordinance (NCO).

For carrying out general construction activities involving the use of any Powered Mechanical Equipment (PME) within restricted hours, a Construction Noise Permit (CNP) is required from the Authority under the NCO. The noise criteria and the assessment procedures for issuing a CNP are specified in Technical Memorandum on Noise from Construction Work Other Than Percussive Piling (GW-TM) under the NCO.

The acceptable noise levels (ANLs) for the noise sensitive receivers (NSRs) are determined based on area sensitive rating (ASR). ASR is defined in the GW-TM. The ASR depends on the type of area and the degree of impact that Influencing Factors (IFs) have on the NSRs and is determined from **Table 10.2** below. Industrial area, major road or the area within the boundary of Hong Kong International Airport shall be considered to be an IF.

Table 10.2: Area Sensitivity Rating

Type of Area Containing NSR	Degree to which NSR is affected by IF		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

For a given ASR, the ANL is given by **Table 10.3** below:

Table 10.3: Acceptable Noise Level for Construction Noise

Time Period	ANL, Leq (30 min), dB(A)		
	ASR A	ASR B	ASR C
All days during the evening (1900 to 2300 hours), and general holidays including Sundays during the daytime and evening (0700 to 2300 hours)	60	65	70
All days during the night-time (2300 to 0700 hours)	45	50	55

The use of Specified PME (SPME) and/or the carrying out of Prescribed Construction Work (PCW) within a Designated Area (DA) under the NCO during the restricted hours are also prohibited without a CNP. The relevant technical details in Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM) under NCO can be referred. According to the Designated Area defined under the NCO (effective from 1 January 2009), the construction locations of this project do not fall within these areas.

According to the construction programme, the proposed construction works will be carried out 24 hours per day. For any construction activities to be undertaken during restricted hours, it will be the future Contractor's responsibility to ensure compliance with the NCO and the relevant TMs. The Contractor will be required to submit the necessary CNP application to the Noise Control Authority.

Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process the CNP application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations.

10.2.2 Operation Phase

Some maintenance dredging and trimming work to remove high spots at local locations will be required to maintain operations within the container terminal areas. Similarly, some maintenance dredging associated with this Project will also be undertaken. Maintenance dredging for this Project will involve only one dredger with one barge at any given time. The impacts associated with this activity will thus be reduced compared to the capital works dredging scenario. No other fixed plant noise source is anticipated. The noise criteria for the construction phase are also applicable to the operational phase of this Project.

10.3 Description of the Environment

The major works area is located in the Rambler Channel between the container terminals in Kwai Chung and Tsing Yi. The existing land uses in the adjoining areas are industrial, commercial, hotel and residential uses. Road traffic along Kwai Tsing Road (Kwai Tsing Bridge), Tsing Yi Road and other distributor networks together with the operation of the container terminals constitute the dominant noise sources in the area.

Another works area of the Project is within the approach channel, located more than 1.3km to the west of the Hong Kong Island.

10.4 Potential Noise Sources

The major construction activity involved in this Project is the dredging of marine mud. All dredged mud will be placed on barges for offsite disposal. Based on the latest available information, there are no land based works within the Study Area (shown in **Figure 10.1**) for this Project.

For this construction noise assessment the Project area is divided into five works areas, namely Works Areas A to E as shown in **Figure 10.2**. A maximum of three dredgers will be used within the works areas each day during the construction (capital dredging works) phase. No more than one dredger will be operating at any given time in each Works Area.

An inventory of project-specific PME has been assumed and is presented in **Appendix 10.2a**. A letter from the Project Proponent confirming that the plant inventory (Condition 3.4.5.2 (iv) of the EIA Study Brief) is practical and suitable for completion of the Project works is attached in **Appendix 10.3**.

10.5 Study Area and Noise Sensitive Receivers

In accordance with Condition 3.4.5.2(i) of the EIA Study Brief, the Assessment Area is defined as within 300m of the dredging site boundary of the Project for the noise impact assessment. This assessment area is identified and shown in **Figure 10.1**.

Identification of Noise Sensitive Receivers (NSRs) as defined in Annex 13 of the EIAO-TM has been undertaken, covering existing and planned noise sensitive uses according to the requirement as set out in Condition 3.4.5.2 (iii) of the EIA Study Brief.

Rambler Crest is on the east of Tsing Yi Island and is located within 300m of the proposed construction site boundary. This development is currently used as serviced apartments which are provided with central air-conditioning. According to the EIAO-TM, Rambler Crest is therefore not considered an NSR. No other NSR has been identified within 300 m from the boundary of the proposed dredging areas.

No planned or committed NSRs including those earmarked on the relevant Outline Zoning Plans, Outline Development Plans and Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development application approved by the Town Planning Board, have been identified within the assessment area.

As no NSR has been identified within the 300m Study Area, the NSR located closest to the Project site boundary was adopted for assessment. This NSR has been identified to be the Ching Tao House (CTH) of Cheung Ching Estate in Tsing Yi, which is located more than 310m from the site boundary. Other NSRs within 500m from the site boundaries have also been identified. Details of the identified NSRs are shown in the following **Table 10.4** and shown in **Figure 10.2**. Photos of the identified NSRs are shown in **Appendix 10.1**.

Table 10.4: Identified Noise Sensitive Receivers

NSR ID	Description	Use	Number of Floors	Horizontal distance to the nearest site boundary, m
CTH	Cheung Ching Estate - Ching Tao House	Residential	13	312
CKH	Cheung Ching Estate - Ching Kwai House	Residential	13	317
CPH	Cheung Ching Estate - Ching Pak House	Residential	22-24	426
CWH	Cheung Ching Estate - Ching Wai House	Residential	22-24	443
CYH	Cheung Ching Estate - Ching Yung House	Residential	22-24	447
CCH	Cheung Ching Estate - Ching Chung House	Residential	22-24	480

10.6 Assessment Approach & Methodology

Assessment approach to the noise impact is in line with the Guidance Note titled “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance” (GN 9/2004). In **Section 3.5.2.3**, six possible working scenarios of this Project were adopted for the water quality modelling to assess the impact on Water Sensitive Receivers (WSRs). Those six scenarios are summarised in **Table 10.5** again and the working locations of the grab dredger (GD) and cutter suction dredger (CSD) are shown in **Figures 3.5b** to **3.5g**.

Table 10.5: Water Quality Modelling Scenarios for Dredging Operation

Scenario	Rambler Channel (A)*	Stonecutter Island (B)*	Northern Fairway (C)*	Western Fairway (D)*	Western Fairway (E)*
1	One GD		One GD	One GD	
2	One GD		One GD		One GD
3			One GD	One GD	One GD
4	One GD	One GD		One GD	
5	One GD	One GD	One GD		
6	One CSD		One GD		One GD

* denote reference dredging locations shown in **Figure 3.5b** to **3.5g**.

As mentioned in **Section 10.4**, the construction of the Project is mainly carried out in five works areas, namely Works Areas A to E. A maximum of three dredgers will be used within the works areas per day. Some harder material has been identified in Works Area D may need to be removed by a CSD. As no more than one dredger would be in operation at any time in each Works Area, no GD will be in operation when the CSD is working (at the same location).

For the purpose of noise impact analysis, three construction scenarios have been derived according to the construction schedule to assess the effect to the identified Noise Sensitive Receivers (NSRs) on Tsing Yi Island (**Table 10.4**). The active Works Areas of different scenarios are listed as below (a detailed construction plant inventory is presented in **Appendix 10.2a**) :

Scenario N1

- One GD works in Works Area A
- One GD works in Works Area B
- One GD works in Works Area C
- No dredging work in other Works Areas

Scenario N2

- One GD works in Works Area B
- One GD or CSD works in Works Area D.
- One GD works in Works Area E
- No dredging work in other Works Areas

Scenario N3

- One GD works in Works Area A
- One GD works in Works Area B
- One GD works in Works Area E
- No dredging work in other Works Areas

The sound power levels (SWLs) of the PME have been referenced to GW-TM. Where no suitable sound power level can be found in the relevant TM, reference would be made to BS 5228 Part 1 or noise emission levels measured for PME used in previous projects in Hong Kong.

In order to predict the worst case scenario, on-time percentages for all PME of each construction activity have been assumed to be 100% (as only half number of barges will be in operation at any one time, the on-time percentage for barges is assumed to be 50%).

Based on standard acoustic principles, the noise impact is estimated with the following standard formula:

$$SPL = SWL - DC + FC$$

where

SPL is the predicted sound pressure level in dB(A)

SWL is the sound power level of the PME in dB(A)

DC is the distance Attenuation in dB(A) = $20\log(D)+8$ (where D is the distance between the assessment point and the notional noise source position in meters)

FC is the façade correction in dB(A) = $+3\text{dB(A)}$

NSR CTH, which is the closest NSR to the construction site boundary, has been selected as the assessment point for the assessment in the first place. If the impact at CTH is predicted to be non-compliant with the daytime noise criteria, then NSRs located further from the site boundary would be adopted for the assessment. Conversely, if the impact prediction is found to be compliant at CTH, then no assessment of the further NSR will be required. As the selected NSR is located in the urban area and facing the Tsing Yi Duplicate South Bridge with an annual average daily traffic flow in excess of 30,000 vehicles i.e., it is directly affected by an influencing factor, an ASR "C" was assumed for this assessment.

10.7 Prediction and Evaluation of Environmental Impacts

10.7.1 Construction Phase

This section covers the requirements stated in Condition 3.4.5.2 (v) of the EIA Study Brief. The predicted unmitigated construction noise levels at the representative NSR within the construction period of the Project are listed in **Table 10.6**. Details of the construction noise calculations and results are presented in **Appendix 10.2b**.

Table 10.6: Predicted Construction Noise Levels at the Representative NSR

Representative NSR	Predicted Noise Levels, dB(A)	Daytime (0700 to 1900) Noise Criteria, dB(A)
CTH	54 - 55	75

During the whole works period, no exceedance of the construction noise criteria for residential uses was predicted at the representative NSR in the absence of mitigation measures during daytime hours.

10.7.2 Cumulative Impact

As noted in **Section 2.8**, it is likely there will be an overlap of this Project with some other concurrent projects. As the detailed plant inventories and works programmes are not available for all concurrent

projects, an analytical approach has been adopted to assess the potential cumulative impacts for the daytime period.

It has been assumed that the overall construction noise impact level during daytime at NSR CTH (which is the most affected NSR of this Project) should not exceed the daytime noise standard 75 dB(A). If the contribution from this Project is added to the allowable standard of 75 dB(A) then the cumulative impact of the construction noise from this Project would still be 75 dB(A) ($75 \text{ dB(A)} + 55 \text{ dB(A)} = 75 \text{ dB(A)}$). Therefore the potential contribution to the concurrent construction impacts is considered to be negligible.

If the overall construction noise impact level from the concurrent projects is already higher than 75 dB(A), the contribution from this Project is further reduced.

On the other hand, if the overall construction noise impact level from the concurrent projects is lower than 75 dB(A), then the cumulative construction noise impact level with this Project in place shall be no greater than 75 dB(A).

As discussed above, the potential contribution from this Project to any concurrent construction impacts is considered to be negligible.

10.7.3 Operation Phase

As stated in **Section 2.7**, the need for maintenance dredging cannot be ruled out. The assumption that only one dredger and barge would be involved in maintenance dredging for this Project suggests that the noise levels will easily comply with the daytime standard. Maintenance dredging will not be undertaken over a 24hr period and thus full compliance is anticipated with the daytime noise standard.

Only one barge will operate on a daily basis in the works areas during maintenance dredging, which means a reduced maximum dredging volume of $4000\text{m}^3/\text{day}$ (in-situ volumes), compared to $12,000\text{m}^3/\text{day}$ for the capital works. The number of barge movements will also be reduced. Considering the fact the identified NSRs are over 300m from the works areas and after taking into account the background noise levels associated with the Container Terminals and current marine traffic, the potential noise impact at the NSRs due to the Project's marine traffic generated from the dredging activity is considered to be negligible. Even if the Container Terminal Operators were to undertake maintenance dredging concurrently with maintenance dredging for this Project, it may be surmised that the noise levels would comply at the NSR. It should be noted that the Container Terminal Operators have historically scheduled their maintenance dredging works to minimise disturbance to their operations.

10.8 Mitigation Measures

No mitigation measures are required during daytime construction as exceedance of the daytime noise criteria is not anticipated.

In order to evaluate whether carrying out the dredging works in restricted hours 1900 to 0700 is feasible, a comparison of the predicted construction noise impact levels against the restricted hours criteria has been carried out and the results are presented in **Table 10.7**.

Table 10.7: Construction Noise Levels at the Representative NSR

Representative NSR	Predicted Noise Levels, dB(A)	Noise Criteria, dB(A)	
		Evening 1900 to 2300, and Sundays / general holidays during 0700 to 2300	Night time 2300 to 0700
CTH	54 - 55	70	55

The construction noise level at the representative NSR is predicted to comply with the noise standards stipulated in the GW-TM. As no residual impact is anticipated, it is considered that it is feasible for the dredging works to be carried out during restricted hours. However, as mentioned in **Section 10.2**, the Authority will consider all the factors affecting their decision taking contemporary situations/conditions into account such as concurrent projects in any CNP application.

The plant inventory to be used during the operation phase i.e. maintenance dredging, will be reduced to one dredger and one barge; hence, the noise level at the representative NSRs predicted during maintenance dredging will be further reduced compared to the construction period. It is therefore expected to comply with the construction noise criteria.

In order to further ameliorate the construction noise impacts, good site practices listed below are proposed. Although the noise mitigating effects are not easily quantifiable and the benefits may vary with the site conditions and operating conditions, good site practices are easy to implement.

- Only well-maintained plant shall be operated on-site and plant should be serviced regularly during the construction programme;
- Machines and plant that may be in intermittent use shall be shut down between works periods or should be throttled down to a minimum;
- Plant known to emit noise strongly in one direction shall, wherever possible, be orientated so that the noise is directed away from nearby NSRs; and
- If dredging is to be carried out during restricted hours, work locations close to NSRs shall be avoided.

10.9 Environmental Monitoring and Audit (EM&A) Requirements

No existing or planned NSR has been identified within 300 m from the works areas. The predicted construction noise level at the NSR located nearest to the works areas is well below the daytime noise criteria. Thus construction noise monitoring is not required. If there are any planned noise sensitive uses within 300m from the works area occupied during the dredging period, a noise monitoring programme shall be implemented during the period(s) with predicted occurrence of noisy activities.

10.10 Summary

This assessment has predicted the construction noise impacts of the Project at a representative NSR located closest to the Project site, which is more than 310m from the site boundary. Based on the latest available information, there are no existing and planned NSRs identified within 300m from Project boundary.

Under the unmitigated scenario, the noise level at the representative NSR will comply with the construction noise standard during daytime working hours, and therefore no adverse noise impact is expected.

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The proposed construction will be carried out 24 hours per day. As the construction noise impact level at the representative NSR is predicted to comply with the noise standards during restricted hours, it is considered that it is feasible for the construction works being carried out in the restricted hours. In case of any construction activities during restricted hours, it will be the Contractor's responsibility to ensure compliance with the NCO and the relevant TMs. The Contractor will be required to submit a CNP application to the Noise Control Authority.

As a reduced plant inventory has been assumed for the maintenance dredging compared to the capital works programme, the noise levels at the representative NSR during maintenance dredging are expected to be no worse than during the construction phase and will comply with the construction noise criteria.