

CONTENTS

5	NOISE ASSESSMENT	1
5.1	INTRODUCTION	1
5.2	LEGISLATION REQUIREMENT AND EVALUATION CRITERIA	1
5.3	BASELINE ENVIRONMENTAL CONDITIONS AND NOISE SENSITIVE RECEIVERS	4
5.4	POTENTIAL SOURCES OF IMPACTS	5
5.5	ASSESSMENT METHODOLOGY	7
5.6	EVALUATION OF IMPACTS	9
5.7	MITIGATION MEASURES	11
5.8	ENVIRONMENTAL MONITORING AND AUDIT	11
5.9	CONCLUSIONS	11

ANNEXES

<i>Annex 5</i>	<i>Noise Assessment Supporting Information</i>
<i>Annex 5-A</i>	<i>Mitigation Measures for the Village House (N1)</i>
<i>Annex 5-B</i>	<i>Terrain Profile</i>
<i>Annex 5-C</i>	<i>Construction Programme for Noise Assessment</i>
<i>Annex 5-D</i>	<i>Construction Plant Inventory</i>
<i>Annex 5-E</i>	<i>Equipment Inventory during Operational Phase</i>
<i>Annex 5-F</i>	<i>Construction Noise Assessment</i>
<i>Annex 5-G</i>	<i>Operational Noise Assessment</i>

5 NOISE ASSESSMENT

5.1 INTRODUCTION

This section provides an evaluation of the noise impacts arising from the construction and operation of the LNG terminal proposed on Black Point. Activities during the construction phase, including reclamation, site formation and building construction and fixed plant noise sources during operational phase, have the potential to cause noise impacts to the surrounding area. Appropriate mitigation measures will be recommended, where necessary, in order to mitigate any adverse impacts.

5.2 LEGISLATION REQUIREMENT AND EVALUATION CRITERIA

5.2.1 Construction Phase

General

The noise impacts associated with the LNG terminal construction will be assessed according to the *Environmental Impact Assessment Ordinance (Cap.499)* and its *Technical Memorandum, EIAO-TM*. The assessment criteria are defined in *Annex 5* of the *EIAO-TM* and the principal legislation for controlling construction noise is the *Noise Control Ordinance, Cap. 400 (NCO)*. A number of technical memoranda (TMs) have been issued under the NCO to stipulate control approaches and criteria and those which may be relevant to the construction of the terminal include the following:

- *Technical Memorandum on Noise from Construction Work Other than Percussive Piling (GW-TM)* which provides the guidelines for controlling the construction noise from power mechanical equipment (PME) in general construction works.
- *Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM)* which deals with control of noise generated by specified powered mechanical equipment (SPME) and prescribed construction work (PCW) within designated areas.
- *Technical Memorandum on Noise from Percussive Piling (PP-TM)* which addresses the control of noise from percussive piling in addition to issuance of Construction Noise Permit (CNP).

Percussive Piling

Under the *PP-TM*, percussive piling is prohibited at any time on Sundays and public holidays and during evening and night-time hours (1900 - 0700 hours), Monday through Saturday. A CNP is required in order to carry out such work during daytime hours (0700 - 1900 hours) Monday through Saturday.

In addition, percussive piling is prohibited at any time on Sundays and public holidays and during evening and night-time hours (1900 - 0700 hours), Monday through Saturday.

As the issuance of a CNP by the *Noise Control Authority* would depend on the submission of an application by the contractor, and therefore on the contractor's compliance with the percussive piling noise limits set out within the *PP-TM*, the assessment of this type of noise has not been included in this EIA.

General Construction Works During Restricted Hours

The *NCO* provides statutory controls on general construction works during restricted hours (i.e., 1900 - 0700 hours Monday to Saturday and at any time on Sundays and public holidays). The use of *PME* for carrying out construction works during these restricted hours would require a CNP. The *Noise Control Authority* will assess all CNP applications on a case-by-case basis and, in doing so the authority advises that they will be guided by the *GW-TM*.

When assessing an application for the use of *PME*, the *Noise Control Authority* will compare the Acceptable Noise Levels (ANLs) specified in the *GW-TM* with the CNLs (adjusted for any barrier and reflection effects) associated with the proposed *PME* operations. The *NCO* requires that noise levels from construction at affected NSR be less than the specified ANL. The ANLs are related to the inherent noise sensitivity of the noise receiver areas in question, which in turn relate to the background noise characteristics of these areas. Each noise receiver area is then assigned an Area Sensitivity Rating (ASR) based on its predominant land use and the presence, if any, of Influencing Factors (IFs) such as nearby industrial areas, major roads or airports. The relevant ANLs are shown in *Table 5.1*. Factors influencing the outcome of a CNP application, such as the assigning of ANLs, would be determined by the *Noise Control Authority* at the time of the application review based on the prevailing site conditions which may change from time to time. It should be noted that nothing in this report shall bind the *Noise Control Authority* in making their decision. If a permit is to be issued, the Authority shall include any condition it thinks fit, and such conditions shall be followed while the works covered by the permit are being carried out. Failure to comply with any conditions could result in the cancellation of the permit and prosecution action under the *NCO*.

Table 5.1 *Acceptable Noise Levels (ANLs) for General Construction Works to be carried out during Restricted Hours* ^(a)

Time Period	Area Sensitivity Rating		
	L _{Aeq, 5 min} (dB(A))		
	A	B	C
All days during the evening (1900 - 2300 hours) and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours)	60	65	70
All days during the night-time (2300 - 0700 hours)	45	50	55

Note:
(a) The above standard applies to uses which rely on opened windows for ventilation.

General Construction Works During Normal Working Hours

Although the NCO does not provide for the control of noise from construction activities during normal working hours (0700 - 1900, Monday to Saturday), Annex 5 of the EIAO-TM specifies a limit of L_{eq, 30 min} 75 dB(A) for residential NSRs. Annex 5 also provides construction noise limits of L_{eq, 30 min} 70 dB(A) and 65 dB(A) for schools during normal teaching periods and examination periods respectively.

5.2.2 *Operational Phase*

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

- The total fixed source noise level at the facade of the nearest NSR is at least 5 dB(A) lower than the appropriate ANL (as shown in Table 5.2) as specified in the *Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM)*; or
- Where the prevailing noise level in the area is 5 dB(A) or more below the appropriate ANL, the total fixed source noise level must not exceed this noise level.

The criteria noise limits stipulated in the IND-TM apply for all days and general holidays and are dependent on the Area Sensitivity Rating (ASR) of the NSRs, as shown in Table 5.2.

Table 5.2 *ANLs to be used as Operational Noise Criteria*

Time Period	L _{Aeq 30min} (dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Daytime (0700 - 1900)	60 (55)	65 (60)	70 (65)
Evening (1900 - 2300)	60 (55)	65 (60)	70 (65)
Night-time (2300 - 0700)	50 (45)	55 (50)	60 (55)

L_{Aeq 30min} (dB(A))

Note:

The number in brackets indicates the noise limit (ANL -5) for operational noise impact assessment.

As the site is located in a rural area and no influencing factors affect the NSRs which are located at more than 1.6 km away from the site in addition to a hill (the Black Point Headland) from the site. An ASR "A" has been assumed for the NSR located in the vicinity of the proposed site. Baseline noise measurement has been conducted to investigate the prevailing noise levels at Black Point and to establish the noise limit for the assessment of the operational noise impact. Detail of the noise measurement will be further discussed in *Section 5.3.3*.

The Area Sensitive Rating assumed in this Report is for an indicative operational noise assessment only. It should be noted that fixed noise sources are controlled under *Section 13* of the NCO. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions / situations of adjoining land uses.

5.3 *BASELINE ENVIRONMENTAL CONDITIONS AND NOISE SENSITIVE RECEIVERS*

5.3.1 *Baseline Environmental Conditions*

The site is surrounded by the Black Point Headland (southeast to the site) and the existing Black Point Power Station is located to the northeast of the site. The north and west of the proposed site is open sea. The background noise environment is dominated by the fixed plant noise from the operation of the Black Point Power Station and the operation of the concrete batching plant, fabrication yard and barging point located behind the headland for the Shenzhen Western Corridor Project ; and road traffic noise from Lung Kwu Tan Road (*Figure 5.3a*). The concrete batching plant, fabrication yard and barging point is scheduled to be decommissioned by the end of 2006, prior to the initiation of construction of the Project.

5.3.2 *Noise Sensitive Receivers*

The nearest NSR is identified as the village house at Lung Kwu Sheung Tan (N1) which is located at approximately 1.6 km away from the site. However, this village house (N1) is used as an office for the outdoor karting track, according to the approved EIA Report for Proposed Karting Track in D.D.134, Lung Kwu Sheung Tan, Tuen Mun (AEIAR-096/2006) (*Annex 5-A*). To present a worse case scenario, the noise impact at this village house has been assessed. In addition, the Black Point Headland located between the proposed site and the NSR N1 will act as a substantial barrier to reduce the potential construction and operational noise impact to N1. Terrain profile between N1 and the LNG terminal is given in *Annex 5-B*. The location of the

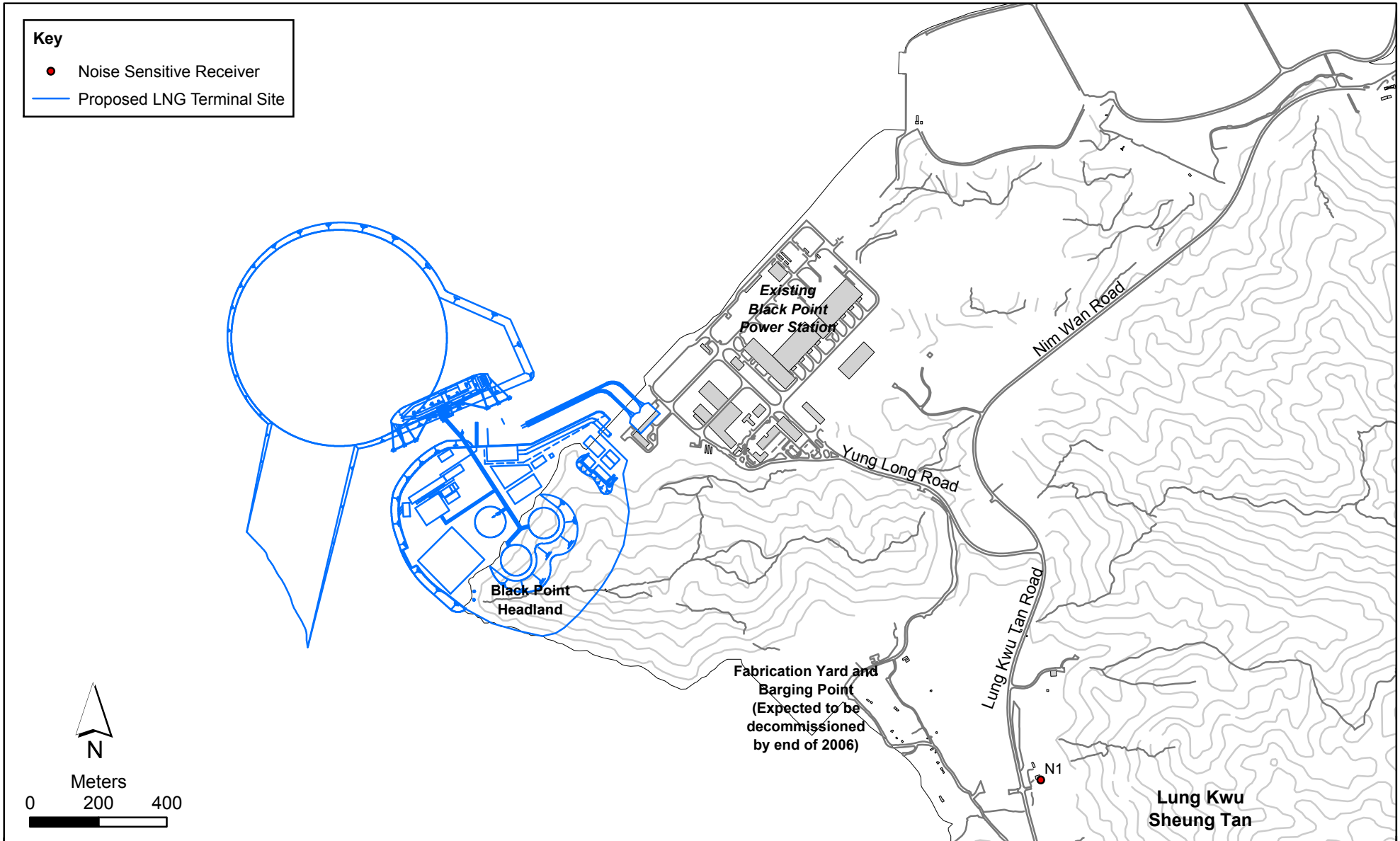


Figure 5.3a

Location of Noise Sensitive Receiver at Black Point

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Date: 03/10/2006

Environmental
Resources
Management



NSR is shown in *Figure 5.3a*. No planned NSR is identified within 2 km from the site.

5.3.3 *Baseline Noise Measurement*

To investigate the prevailing noise levels at the NSR, a continuous 24-hour noise measurement was made from 24 to 25 January 2006 at the 1st floor level of village house (N1) (*Figure 5.3b*). The noise measurement was conducted using SVAN 949 Sound Level Meter (Type 1) and was calibrated using B&K Sound Level Calibrator Type 4231 with a calibration signal of 94.0 dB(A) at 1kHz. The measurement was conducted with reference to the calibration and measurement procedures as stated in the *IND-TM*.

The measurement results are summarised in *Table 5.3* and a timeline chart showing the prevailing noise levels is presented in *Figure 5.3c*.

Table 5.3 *Measured Prevailing Facade Noise Level*

Period	L _{Aeq, 30min} dB(A)		
	Minimum	Average	Maximum
0700 – 2300 hours	50	63	68
2300 – 0700 hours	39	46	51

As the most conservative case, the minimum measured prevailing noise level of 39 dB(A) during night-time period, which is lower than the (ANL-5) criterion, will be adopted as the stipulated noise limit for the assessment of operational noise impacts.

5.4 *POTENTIAL SOURCES OF IMPACTS*

5.4.1 *Construction Phase*

Potential impacts to the NSR during the construction phase of the LNG terminal will mainly arise from PME operating at construction work sites. The major construction work will include the following key activities:

- Land based works:
 - *Site clearance;*
 - *Soil compaction; and*
 - *Blasting and excavation.*
- Reclamation:
 - *Dredging;*
 - *Seawall Construction;*
 - *Placing fill; and*
 - *Drainage Works.*
- Main Jetty works:

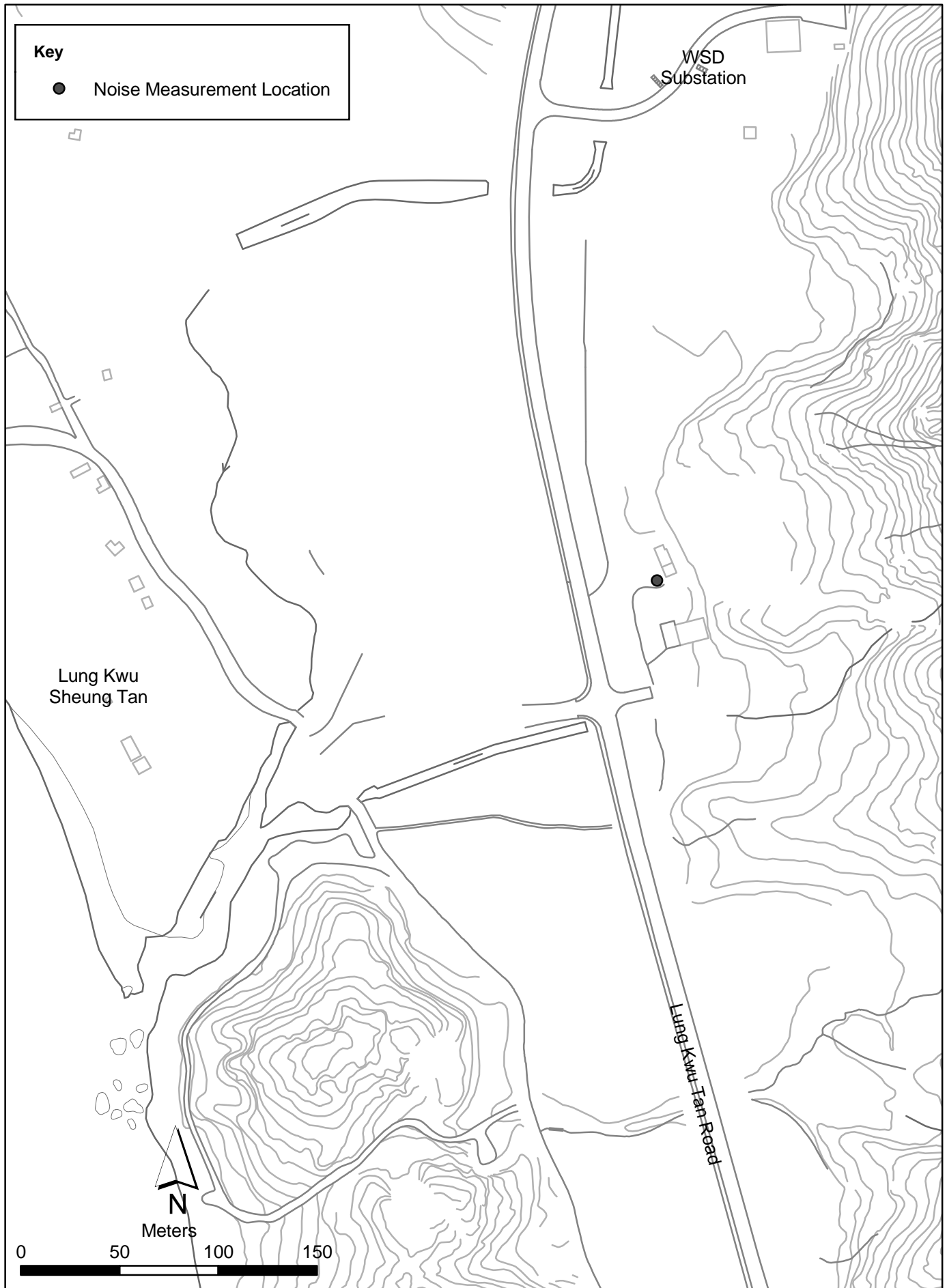


FIGURE 5.3b

Location of Prevailing Noise Measurement
in Black Point

**Measured Prevailing Noise Levels at N1 (Village House at Lung Kwu Tan)
(24 - 25 January 2006)**

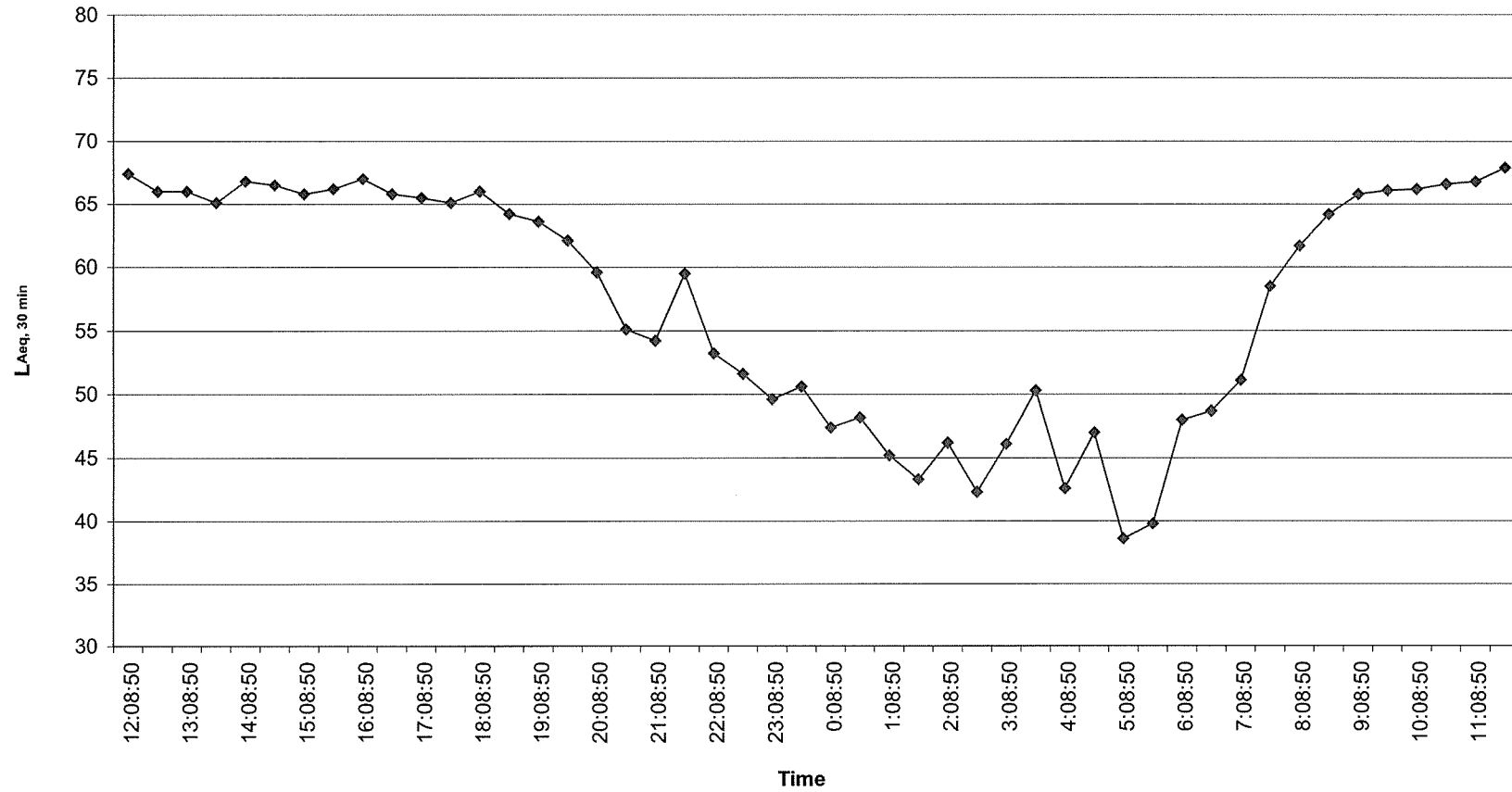


Figure 5.3c

Measured Prevailing Noise Levels at NSR

- Ground Investigation;
 - Construction of jetties and access bridge;
 - Dredging of approach channel and turning basin; and
 - Intake and Outfall construction.
- Civil works at terminal:
 - Civil and structural construction works for the terminal facilities.

The construction noise assessment will be undertaken based on the construction programme and plant inventories summarised in *Annexes 5-C* and *5-D* respectively.

The plant inventory has been checked by Project Proponent and is confirmed to be practical and feasible to complete the Project within the scheduled timeframe and the PMEs are available in the market. Liaisons on the blasting works are being conducted with the Mines Division of GEO and CEDD in the preparation of the report.

The standard working hours will be from 0800 to 1800 hours, however, the following works may be carried out during the evening period:

- Blasting and excavation works;
- Dredging by the larger Trailing Suction Hopper Dredger (TSHD);
- Clearing and crushing of the blasted rocks and their transportation off site during the evening;
- Occasional large concrete pours on the jetty head or outfall, if daytime temperatures are high; and
- Facility construction works for the terminal facility including tank construction.

It should be noted that the construction activities associated with site formation will not be carried out during the restricted hours (1900 – 0700 hours). For a worse case assessment, we have examined noise elevations assuming 24-hour working.

5.4.2

Operational Phase

Noise associated with the operational phase of the LNG Terminal would mainly arise from the plant at the terminal site. The dominant noise sources are mainly from the machinery including the following equipment:

- Heat exchangers, including LNG submerged combustion vaporizers;
- Compressors and diesel emergency generators;
- Various kind of pumps; and

- Special equipment such as unloading arms and nitrogen generator.

The noise data for the equipment have made reference to manufacturers' data and the results of field measurement conducted at overseas LNG terminal. To minimise the noise impact to the environment, most of the noise sources will be housed within individual enclosures or claddings. As a conservative approach, it is assumed that all equipment will be operated on a 24-hour basis. With reference to the overseas LNG terminals, the equipment inventory are developed by the Engineers and their respective sound power levels (SWLs) in one-one octave band provided by the Project Proponent are presented in *Annex 5-E*.

The suppliers of equipment should guarantee the specified SWL and the equipment should be free of the characteristics of tonality, impulsiveness and intermittency, by providing certificate of measurement and verify the SWL during testing and commissioning in accordance with international standard procedures. With such guarantee included in LNG Procurement Contract, the noise emission from the equipment should comply with the tender specification. If necessary, the suppliers should apply attenuation measures to achieve the guaranteed noise levels determined during the detailed design stage. The proposed equipment is also confirmed to be available in the market.

5.5 ASSESSMENT METHODOLOGY

5.5.1 Construction Phase

Construction Works Carried out During Normal Working Hours

The methodology for the noise impact assessment is in accordance with the procedures outlined in the *GW-TM*, which is issued under the *NCO* and the *EIAO-TM*, and is summarized as follows:

- Identifying the likely type, sequence and duration of principal noisy construction activities required for the implementation of the project;
- Identifying a list of construction plant likely to be required for each construction activity;
- Calculating the maximum total SWL for each construction activity using the plant list and SWL data given for each plant in the technical memorandum. When the PME is not listed in the TMs, SWLs provided in the document prepared by the *Noise Control Authority* (http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf) and *British Standard 5228, Noise and Vibration*

Control on Construction and Open Sites - Part 1 (BS5228: Part 1: 1997) ⁽¹⁾ are referred;

- Identifying representative NSRs as defined by the *EIAO-TM* based on existing and committed land uses in the Study Area that may be affected by the worksite;
- As a conservative approach, calculating the distance attenuation to NSR from nearest worksite; and
- Predicting construction noise levels at NSRs in the absence of any mitigation measures.

Using a conservative approach, each work activity has been assumed to operate simultaneously and the time schedule of each activity has been provided in *Annex 5-C*. Based on the construction programme, cumulative noise impact throughout the construction phase has been assessed.

Due to the large separation distance plus a hill located between the construction site and the NSR (approximately 1.6 km), the noise will be reduced due to energy lost through atmospheric absorption during transmission, therefore the correction factor for the atmospheric absorption has been calculated based on ISO 9613⁽²⁾ procedure. Additionally, a facade correction of +3 dB(A) is applied. Predictions are made of the most conservative case construction noise levels at the identified representative NSR.

Construction Works Carried out during Restricted Hours

Considering the construction programme of the Project, night-time construction works will need to be carried out. The site is located outside designated area as defined in *DA-TM* and the construction noise assessment for night-time works has been carried out in accordance with the requirements of the *GW-TM* in the context of programming only.

5.5.2 *Operational Phase*

The methodology for the noise impact assessment is in accordance with the procedures outlined in the *ISO 9613-1*⁽¹⁾ and *IND-TM*, which is issued under the *NCO* and the *EIAO-TM*. The methodology for the fixed plant noise assessment is presented below:

- Identifying types of equipment and the number of equipment;
- Calculating the maximum total SWL for each type of equipment;

(1) British Standard 5228, Noise and Vibration Control on Construction and Open Sites - Part 1. Code of Practice for Basic Information and Procedures for Noise and Vibration Control

(2) ISO9613-1 Acoustics - Attenuation of Sound during Propagation Outdoors - Part 1 : Calculation of the Absorption of Sound by the Atmosphere

- Identifying representative NSRs as defined by the *EIAO-TM* based on existing and committed landuses in the Study Area that may be affected by the worksite;
- Calculating the distance attenuation to the NSRs from noise sources; and
- Presenting the results in terms of $L_{Aeq(30min)}$ dB, as specified in the *TM*.

With the considerable separation between the site and the noise sensitive receivers, the atmospheric absorption during sound transmission is considered as one of the major factors that will have a significant impact on the noise prediction. Assessment results have been predicted in a conservative approach without other attenuations due to foliage of trees and shrubs, ground effects and buildings/claddings in which the equipment are placed.

The predicted noise levels at the NSR are compared with the criteria set out in *Section 5.3.3*. Mitigation measures will be proposed should any exceedance be predicted.

5.6 EVALUATION OF IMPACTS

5.6.1 Construction Phase

Construction Works Carried out During Normal Working Hours

The unmitigated construction noise levels at the NSR N1 (Village house at Lung Kwu Sheung Tan) have been predicted and are presented in *Annex 5-F*. The predicted construction noise levels at N1 are in the range of 35 - 44 dB(A), which are below the daytime construction noise criterion of 75 dB(A) throughout the construction period and utilized the conservative set of assumptions in the analysis.

Percussive Piling

Percussive piling will be utilised for the construction of the trestle and LNG jetty. As the issuance of a CNP for percussive piling by the *Noise Control Authority* would depend on the submission of an application by the contractor, and therefore on the contractor's compliance with the percussive piling noise limits set out within the *PP-TM*, the assessment of this type of noise has not been included in this assessment. However, the contractors will follow the procedure set out in the *PP-TM*, as described in *Section 5.2.1* to assess the noise impact in the application of the CNP.

Construction Works carried out during Restricted Hours

The predicted noise levels as shown in the *Annex 5-E* are within the ANLs stipulated in *GW-TM* throughout the restricted hours. As described in *Section 5.2.1*, a CNP is required for the construction works being carried out

during the evening and night-time period (1900 - 0700 hours) Monday through Saturday.

As mentioned in *Section 5.4.1*, some of the construction works may be carried out during restricted hours based on the preliminary implementation programme. Without evening and night-time works, the project will be delayed by 5 – 8 months. Assessment on the construction works to be carried out during restricted hours (1900 – 0700 hours) is included to preliminarily appraise the feasibility in the context of programming. However, it should be noted that the assessment provided here is for indicative purpose only and serves as a reference for the future design and construction stage. Whether a CNP could be issued would be subject to the discretion of the Authority taking into account of the details and information provided and the circumstance when the CNP application is filed. The actual amount of construction work and the resultant noise levels would be compiled with the requirement of CNP.

Cumulative Impact

The construction of karting track (as mentioned in *Section 5.3.2*) has been completed and it is operational in August 2006. In addition, the village house (NSR N1) within the karting track site is used as an office.

As mentioned in *Section 3.7*, there will be no concurrent major projects to be constructed in the vicinity of the NSR, and therefore no cumulative impact from the construction of the LNG terminal and other designated projects is anticipated.

5.6.2

Operational Phase

The most conservative case noise levels at the NSR N1 (Village house at Lung Kwu Sheung Tan) during the operational phase of the LNG terminal have been predicted. The detailed calculation of the predicted noise level is presented in *Annex 5-G*. The predicted noise level is 33 dB(A) and is below the stipulated noise criterion during daytime and night-time period.

Cumulative Impact

The approved EIA Report for Proposed Karting Track in D.D.134, Lung Kwu Sheung Tan, Tuen Mun (AEIAR-096/2006) (*Annex 5-A*) has been reviewed to evaluate the cumulative operational noise impact. According to the approved EIA report, a 7.5 m high barrier will be provided for the NSR N1 (village house) if it is used for noise sensitive purpose. The predicted noise level at the village house is up to 50 dB(A) due to the operation of karting track, and therefore the operation of LNG terminal will have insignificant contribution to the cumulative noise level at the NSR N1.

The EIA Report for the Emission Control Project at Castle Peak Power Station “B” Unit (EIA-123/2006), which is under public inspection, has also been reviewed. Given that the Emission Control Project is located at more than 3

km from the NSR N1, its operation will have insignificant contribution to the cumulative noise level at the NSR N1.

The noise associated with the operation of LNG terminal and other projects is therefore not expected to give rise unacceptable environmental impacts.

5.7 *MITIGATION MEASURES*

5.7.1 *Construction Phase*

The predicted noise levels are low and below the daytime and night time criteria as a result of the considerable separation distance and a hill located between the NSR and the Project. Therefore, mitigation measures are not required.

5.7.2 *Operational Phase*

The predicted noise levels are below the daytime and night time criteria as a result of the considerable separation distance between the NSR and the Project. Therefore, mitigation measures are not required.

5.8 *ENVIRONMENTAL MONITORING AND AUDIT*

5.8.1 *Construction Phase*

Given the compliance with the stipulated noise criterion, noise monitoring is not anticipated to be required during the construction phase.

5.8.2 *Operational Phase*

Given the compliance with the stipulated noise criterion, noise monitoring is not anticipated to be required during the operational phase.

5.9 *CONCLUSIONS*

No noise sensitive receivers will be affected by the construction activities. Predicted construction noise levels at the NSR, range from 35 – 44 dB(A), which are within the stipulated noise criterion of 75 dB(A). In view of the insignificant construction noise impact, mitigation measures are not anticipated during the construction phase.

Based on the most conservative case, the noise levels generated from the equipment at the LNG Terminal have been predicted. Due to the large separation distance and a hill located between the NSR and the noise source, the predicted operational noise level is 33 dB(A), which is within daytime and night-time noise criteria. Therefore mitigation measures are not anticipated during the operational phase.

In view of the anticipated insignificant noise impact in both construction and operational phases, noise monitoring work is considered to be not necessary.

Annex 5

Noise Assessment Supporting Information

Annex 5-A

Mitigation Measures for the Village House (N1)

Annex 5-B

Terrain Profile

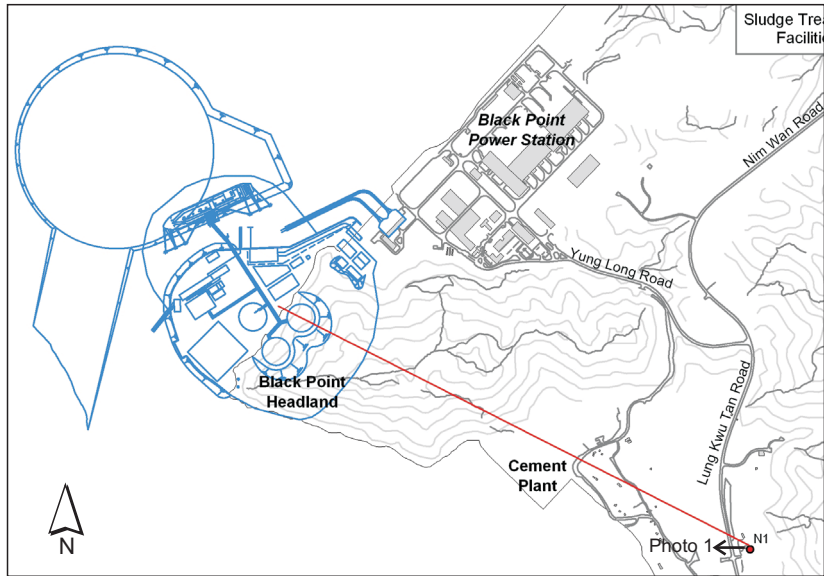
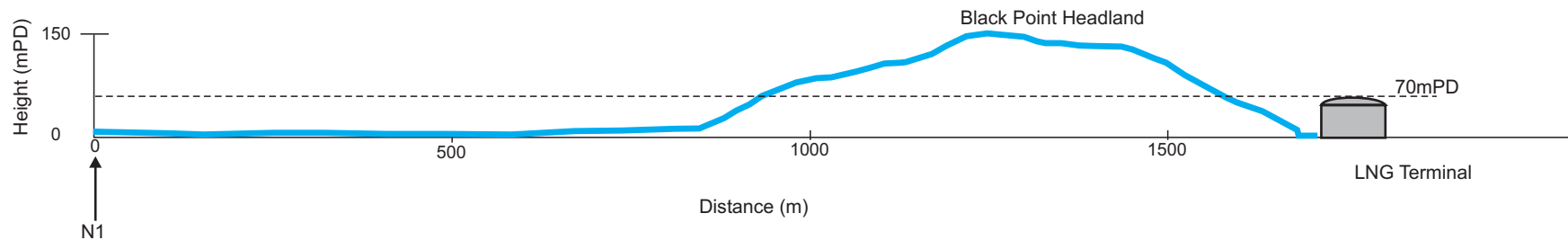


Photo 1 - Photograph taken at the highest floor of village house to the west showing the village house is screened by the patch of Acacia plantation of about 3m high adjacent Lung Kwu Tan Road as well as containers.



Photo 2 - The village house is used as an office.



Remark :
Shape of tank is indicative only

Figure 5-B1

Terrain Profile Between N1 and LNG Terminal

Annex 5-C

Construction Programme for Noise Assessment

Annex 5-D

Construction Plant Inventory

Annex 5-D - Preliminary Construction Plant Inventory

BLACK POINT OPTION

LAND BASED WORKS

Activity	Plant Required	No. of PME	CNP / BS5228 Ref.	SWL	Overall SWL
Earthwork					
- Site Clearance	Bulldozer / Excavator	2	CNP 030	115	118
	Backactor mounted with Breaker	3	CNP 027	122	127
	Truck	1	CNP 067	117	117
	Mobile Crane	4	CNP 048	112	118
	<i>Sub-total SWL =</i>				128
- Soil Compaction	Pneumatic Roller	1	CNP 185	108	108
	Mobile Crane	4	CNP 048	112	118
	<i>Sub-total SWL =</i>				118
- Blasting and Excavation	Bulldozer / Excavator	5	CNP 030	115	122
	Backactor mounted Drilling Rig	10	CNP 027	122	132
	Backactor mounted with Breaker	4	CNP 027	122	128
	Truck	12	CNP 067	117	128
	Electric Generator	4	CNP 101	108	114
	Concrete crushers, excavator mounted	2	.. ⁽¹⁾	103	106
	Mobile Crane	1	CNP 048	112	112
	Air Compressor	2	CNP 003	104	107
<i>Sub-total SWL =</i>				135	
- Slope Stabilization and Drainage Works	Backactor mounted Drilling Rig	3	CNP 027	122	127
	Water Pump	2	CNP 282	103	106
	Backactor mounted with Breaker	3	CNP 027	122	127
	Concrete Pumps	2	CNP 047	109	112
	Grout Pump w/Mixer	2	.. ⁽¹⁾	105	108
	<i>Sub-total SWL =</i>				130

RECLAMATION

Activity	Plant Required	No. of PME	CNP / BS5228 Ref.	SWL	Overall SWL
Dredging					
	Dredger - Grab	2	CNP 063	112	115
	Tug Boat / Motor Boat	2	CNP 221	110	113
	Split Bottom Barge	2	CNP 061	104	107
<i>Sub-total SWL =</i>				118	
Seawall Construction					
Placing Seawall Core	Tug Boat / Motor Boat	1	CNP 221	110	110
	Derrick Lighter	2	CNP 061	104	107
	Split Bottom Barge	2	CNP 061	104	107
<i>Sub-total SWL =</i>				113	
Placing Seawall Rock Armour	Derrick Lighter	2	CNP 061	104	107
	Backactor	2	CNP 027	122	125
	<i>Sub-total SWL =</i>				125
Placing Fill					
	Derrick Lighter	2	CNP 061	104	107
	Sand Barge + Generator	3	CNP 061+CNP 101	109	114
	Vibro-compactor	2	CNP 050	105	108
	Backactor	4	CNP 027	122	128
	Bulldozer / Excavator	8	CNP 030	115	124
	Pneumatic Roller	4	CNP 185	108	114
	Truck	12	CNP 141	112	123
	<i>Sub-total SWL =</i>				131
Drainage Works					
Install of Temporary Work	Backactor mounted with Vibrator	2	CNP 027	122	125
	Cutter, circular, steel (electric)	2	.. ⁽¹⁾	112	115
	Grinding Machine	2	CNP 065	98	101
<i>Sub-total SWL =</i>				125	
Laying of Drainage Pipes	Backactor	2	CNP 081	112	115
	Truck	1	CNP 067	117	117
	<i>Sub-total SWL =</i>				119
Backfilling	Pneumatic Roller	1	CNP 185	108	108
	Backactor	2	CNP 081	112	115
	<i>Sub-total SWL =</i>				116

Annex 5-D - Preliminary Construction Plant Inventory

MAIN JETTY

Activity	Plant Required	No. of PME	CNP / BS5228 Ref.	SWL	Overall SWL	
Ground Investigation	SI Barge + Generator	2	CNP 061+CNP 101	109	112	
	Split Bottom Barge	2	CNP 061	104	107	
			<i>Sub-total SWL =</i>	113		
Jetties and Access Bridge						
- Steel Piles Construction	Crawler Crane	2	CNP 048	112	115	
	900 CFM Air Compressor	1	CNP 002	102	102	
	Mobile Crane	1	CNP 048	112	112	
	350 CFM Air Compressor	1	CNP 001	100	100	
	Tugboat	4	CNP 221	110	116	
	Truck	1	CNP 067	117	117	
	Generator	1	CNP 101	108	108	
	SI Barge + Generator	3	CNP 061+CNP 101	109	114	
	Piling, earth auger	3	CNP 167	114	119	
	Derrick Lighter	7	CNP 061	104	112	
	Automatic Grinder Machine	2	CNP 065	98	101	
	Poker, vibratory	2	CNP 170	113	116	
			<i>Sub-total SWL =</i>	125		
	- Concrete Caps, Slabs and Foundations	Crawler Crane	2	CNP 048	112	115
		900 CFM Air Compressor	2	CNP 002	102	105
25 Ton Mobile Crane		1	CNP 048	112	112	
350 CFM Air Compressor		2	CNP 001	100	103	
Tugboat		7	CNP 221	110	118	
Truck		1	CNP 067	117	117	
Generator		1	CNP 101	108	108	
Derrick Lighter		7	CNP 061	104	112	
Poker, vibratory		4	CNP 170	113	119	
Concrete Pump		2	CNP 047	109	112	
Bar bender and cutter		4	CNP 021	90	96	
Water Pump		4	CNP 282	103	109	
			<i>Sub-total SWL =</i>	125		
Dredging of Approach Channel and Turning Basin		Trailing Suction Hopper Dredger	1	Penny Bay EIA ⁽²⁾	109	109
		Mobile Crane	1	CNP 048	112	112
	Tugboat	2	CNP 221	110	113	
	Generator	1	CNP 101	108	108	
	Derrick Lighter	2	CNP 061	104	107	
	Dredger - Grab	3	CNP 063	112	117	
			<i>Sub-total SWL =</i>	120		
Intake and Outfall Construction	Tug Boat / Motor Boat	1	CNP 221	110	110	
	Derrick Lighter	1	CNP 061	104	104	
	Dredger - Grab	1	CNP 063	112	112	
			<i>Sub-total SWL =</i>	115		

LNG TERMINAL CIVIL, M&E WORK

Activity	Plant Required	No. of PME	CNP / BS5228 Ref.	SWL	Overall SWL
Terminal Civil Work	Truck	3	CNP 067	117	122
	Derrick Barge	9	CNP 061	104	114
	Tugboat	5	CNP 221	110	117
	Crawler Crane	15	CNP 048	112	124
	Drill Rig	3	Table C.10 Ref No. 2 ⁽³⁾	112	117
	Backhoe - Track	2	CNP 081	112	115
	Forklift	11	Penny Bay EIA ⁽²⁾	113	123
	Dump truck, with grab	1	.. ⁽¹⁾	105	105
	Track Drill	1	Table C.3 Ref No. 123 ⁽³⁾	128	128
	Generator	9	CNP 101	108	118
	Air Compressor 375 cfm, Portable	13	CNP 001	100	111
	Air Compressor 900 cfm, Portable	1	CNP 002	100	100
	Air Compressor 1200 cfm, Portable	1	CNP 003	104	104
	Air Compressor 2000 cfm, Portable	1	CNP 003	104	104
	Winch - Hoist 2 Drum	1	CNP 263	102	102
	Pump - Submersible	2	CNP 283	85	88
	Water jetting unit	1	.. ⁽¹⁾	107	107
	Pump - Concrete	4	CNP 047	109	115
	Grout Pump w/Mixer	1	.. ⁽¹⁾	105	105
	Tractor with Trailer	2	CNP 222	118	121
	Tower Crane	2	CNP 049	95	98
	Automatic Grinder Machine	8	CNP 065	98	107
	Air blower	3	.. ⁽¹⁾	95	100
	Winch (Power & Pneumatic/3 ton)	8	CNP 261	110	119
	Discharging Pump	4	CNP 282	103	109
	Batching Plant 60 CM/HR	2	CNP 022	108	111
	Concrete Mixer	10	CNP 046	96	106
	Poker, vibratory	8	CNP 170	113	122
	Bar bender and cutter	8	CNP 021	90	99
			<i>Sub-total SWL =</i>	133	

Remark:

(1) SWL refer to the document prepared by the Noise Control Authority (http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

(2) SWL refer to the approved EIA Report for the Construction of an International Theme Park in Penny's Bay of North Lantau and its Essential Associated Infrastructures

(3) SWL refer to the BS 5228 : Part 1: 1997

Annex 5-E

Equipment Inventory during Operational Phase

Annex 5-E - Equipment Inventory during Operational Phase												
BLACK POINT OPTION												
A-Weighted Correction												
			26.2	16.1	8.6	3.2	0.0	-1.2	-1.0	1.1		
Octave and Center Frequency Hz												
SWL												
Data Source ⁽¹⁾												
			63	125	250	500	1000	2000	4000	8000	dB(A)	No. of plant
Heat Exchangers												
E-301A-D	LNG Seawater Vaporizers (& Spare)	F	105	103	97	88	85	85	82	74	94	4
E-302 A-C	LNG Submerged Combustion Vaporizer	M	97	107	113	121	116	113	108	100	121	3
Blowers, Compressors and Generator (Note 9)												
K-301 A/B	Boil-off Gas Compressors (450 kW)	E	101	101	101	101	103	99	95	92	106	2
K-302	Ship Unloading Compressor (900 kW)	E	107	107	107	107	109	105	101	98	112	1
K-303	Pipeline Compressor (800 kW)	E	101	101	101	101	103	99	95	92	106	1
K-401 A/B	Instrument/ Plant Air Compressor & spare	M	59	73	83	88	89	86	81	74	93	2
G-402	Emergency Generator-Diesel Driven	M	80	84	86	87	86	92	94	85	98	1
Pumps												
P-201 A-D	LNG Send-out Pumps - in LNG Tank (two per tank)	M	94	96	97	96	95	94	91	88	101	4
P-301 A-D	HP LNG Booster Pumps (& Spare)	F	90	92	93	93	93	98	88	81	101	4
P-401 A-C	Seawater Pumps (& Spare)	M	80	84	86	87	86	92	94	85	98	3
P-402 A-D	Firewater Pumps - 2 Electric & 2 Diesel	M	80	84	86	87	86	92	94	85	98	4
P-403 A/B	Firewater Jockey Pump (& Spare)	M	51	62	72	80	82	81	77	70	86	2
P-404 A/B	Service Water Pump (& Spare)	M	51	62	72	80	82	81	77	70	86	2
P-405 A/B	Drinking Water Pump (& spare)	M	51	62	72	80	82	81	77	70	86	2
P-406	Submerged Combustion Vaporizer Water Overflow Pump	M	87	89	90	89	88	87	84	81	94	1
P-407	CPI Oily Water Sump Pump	M	87	89	90	89	88	87	84	81	94	1
P-408 A/B	Process Area Sump Pumps, 2 x 100%	M	87	89	90	89	88	87	84	81	94	2
Special Equipment												
N-101 A-D	LNG Unloading Arms (& Spare)	M	65	68	69	69	71	66	60	52	74	4
N-102	LNG Vapor Return Arm	M	65	68	69	69	71	66	60	52	74	1
N-401	Nitrogen Package for Terminal	M	70	76	82	88	94	98	94	88	102	1
N-402	Instrument Air Drier and Package	M	79	83	85	77	75	74	74	71	83	1
Expansion Case - 1000 MSCFD												
E-301 E/F	LNG Seawater Vaporizer	F	105	103	97	88	85	85	82	74	94	2
E-302 D/E	LNG Submerged Combustion Vaporizer	M	97	107	113	121	116	113	108	100	121	2
P-201 E/F	LNG Send-out Pumps - in T-201 C	M	94	96	97	96	95	94	91	88	101	2
P-301 H-J	HP LNG Booster Pumps	F	90	92	93	93	93	98	88	81	101	2
P-401 D	Seawater Pump	M	80	84	86	87	86	92	94	85	98	1
Note:												
(1) F indicates noise data obtained from the field measurement conducted at other LNG Terminal, and M indicates the noise data provided by Manufacturers												

Annex 5-F

Construction Noise Assessment

Annex 5-G

Operational Noise Assessment

