



Updated Open-air Lagoon Show with Pyrotechnic Effects

Noise Review Study Report

PREPARED FOR



Ocean Park Corporation

DATE

20 June 2024

REFERENCE

0540005



DOCUMENT DETAILS

The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.

DOCUMENT TITLE	Updated Open-air Lagoon Show with Pyrotechnic Effects
DOCUMENT SUBTITLE	Noise Review Study Report
PROJECT NUMBER	0540005
Date	20 June 2024
Version	02
Author	Various
Client name	Ocean Park Corporation

DOCUMENT HISTORY

				ERM APPROVAL TO ISSUE		
VERSION	REVISION	AUTHOR	REVIEWED BY	NAME	DATE	COMMENTS
Version	1.0	Various	MT	TF	05.06.2024	-
	2.0	Various	MT	TF	20.06.2024	

SIGNATURE PAGE

Updated Open-air Lagoon Show with Pyrotechnic Effects

Noise Review Study Report

0540005



Terence Fong

Partner

ERM-Hong Kong, Limited
2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong
T +852 2271 3000

© Copyright 2023 by The ERM International Group Limited and/or its affiliates ('ERM'). All Rights Reserved.
No part of this work may be reproduced or transmitted in any form or by any means, without prior written permission of ERM.



CLIENT: Ocean Park Corporation

PROJECT NO: 0540005

DATE: 20 June 2024

VERSION: 02



Environmental Permit No. EP-249/2006/D
Ocean Park Master Redevelopment Project
Environmental Team Leader Certification


Reference Document/Plan

Document/ Plan to be Certified/ Verified :	Noise Review Study Report
Date of Report:	20 June 2024

Reference EP Condition

Environmental Permit Condition:	2.24
The Permit Holder shall, at least one month before the first open-air lagoon show in the Aqua City, deposit with the Director four hard copies and one electronic copy of a noise review study based on the detailed design of fixed plant and noise impacts from the open-air lagoon show in the Aqua City. The study shall at least include:	
(a) locations and orientations of loud speakers;	
(b) sound power levels of loud speakers;	
(c) predicted noise levels; and	
(d) analysis of predictions against the requirements stipulated in the EIA-TM and Condition 2.23.	
Before submission to the Director, the study shall be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA report and the requirements in Condition 2.23. All measures recommended in the deposited study shall be fully and properly implemented.	

ETL Certification

I hereby certify that the above referenced document/ plan complies with the above referenced condition of EP-249/2006/D.	
	
Ms Mandy To	Date: 20 June 2024
Environmental Team Leader	

Our ref: 0540005_ETL Certification Cert_Noise_20240620.docx

Ocean Park Master Redevelopment Project

Environmental Permit No. EP-249/2006/D - Condition 2.24

**Updated Open-air Lagoon Show with Pyrotechnic Effects
Noise Review Study Report**

Submitted by ERM-Hong Kong, Limited dated 20-06-2024

This is to verify that

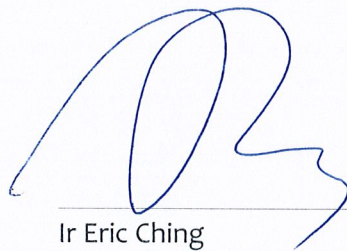
**Updated Open-air Lagoon Show with Pyrotechnic Effects
Noise Review Study Report**

Submitted by ERM-Hong Kong, Limited

dated 20-06-2024

Has been verified by the undersigned.

Signed



Ir Eric Ching
Independent Environmental Checker (IEC)
Retained by Ocean Park Corporation
pursuant to Environmental Permit No. EP-249/2006/D

Date

20 June 2024

CONTENTS

1.	INTRODUCTION	1
1.1	BACKGROUND	1
1.2	PURPOSE OF THE REPORT	1
2.	THE LAGOON NIGHT SHOW	2
2.1	OVERVIEW OF THE SHOW	2
2.2	DESIGN OF THE AUDIO SYSTEM	2
2.3	CHANGES IN DESIGN AS COMPARED WITH THAT OF THE NOISE REVIEW 2020	3
2.3.1	Noise from Audio System	3
2.3.2	Noise from PSEM	3
3.	FIXED PLANT NOISE IMPACT ASSESSMENT	5
3.1	IDENTIFIED NOISE SENSITIVE RECEIVERS	5
3.2	FIXED PLANT NOISE CRITERIA	5
3.3	ASSESSMENT METHODOLOGY	6
3.4	EVALUATION OF IMPACT	7
3.4.1	Fixed Plant Noise	7
3.4.2	Entertainment Noise	7
3.4.3	Cumulative Impacts	7
3.5	RECOMMENDATIONS	8
4.	PSEM NOISE	9
4.1	IDENTIFIED NOISE SENSITIVE RECEIVERS	9
4.2	PSEM NOISE CRITERION	9
4.3	SOURCE NOISE DATA OF PSEM	9
4.4	ASSESSMENT METHODOLOGY	9
4.5	EVALUATION OF IMPACTS	10
4.6	MITIGATION MEASURE	10
5.	CUMULATIVE NOISE IMPACT FROM FIXED PLANT AND PSEM	11
5.1	CUMULATIVE NOISE CRITERIA	11
5.2	EVALUATION OF IMPACTS	11
6.	ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REQUIREMENT	12
7.	CONCLUSION	13

LIST OF APPENDICES

APPENDIX 2.1	SOUND POWER LEVELS OF NOISE SOURCES (FIXED PLANT NOISE ITEMS FROM LAGOON NIGHT SHOW)
APPENDIX 3.1	DETAILS OF SCREENING BY EXISTING STRUCTURES FOR ENTERTAINMENT NOISE
APPENDIX 3.2	CALCULATION FOR ENTERTAINMENT NOISE IMPACT ASSESSMENT (AUDIO SYSTEM FROM LAGOON NIGHT SHOW)
APPENDIX 4.1	PSEM SCHEDULE FOR UPDATED <i>SOTO</i>
APPENDIX 4.2	CALCULATION FOR PSEM NOISE IMPACT ASSESSMENT
APPENDIX 4.3	BARRIER ATTENUATION FOR PSEM NOISE IMPACT ASSESSMENT
APPENDIX 5.1	SUMMARY OF CUMULATIVE NOISE LEVELS (FIXED PLANT NOISE + ENTERTAINMENT NOISE + PSEM NOISE) AT NSRS

LIST OF TABLES

TABLE 2.1	DETAILS OF LAGOON NIGHT SHOW	2
TABLE 2.2	DETAILS OF AUDIO SYSTEM	3
TABLE 2.3	COMPARISON OF THE USE OF PSEM FOR SYMBIO IN NOISE REVIEW 2010 AND THE UPDATED <i>SOTO</i>	4
TABLE 3.1	IDENTIFIED NOISE SENSITIVE RECEIVERS (NSRS)	5
TABLE 3.2	ANLS TO BE USED AS FIXED PLANT NOISE CRITERIA	5
TABLE 3.3	FIXED PLANT NOISE CRITERIA	6
TABLE 3.4	PREDICTED ENTERTAINMENT NOISE LEVELS FROM THE LAGOON NIGHT SHOW	7
TABLE 3.5	CUMULATIVE FIXED PLANT NOISE LEVELS FROM THE LAGOON NIGHT SHOW AND OTHER FIXED PLANT NOISE FROM OCAEAN PARK	7
TABLE 4.1	MAXIMUM SEL FOR EACH TYPE OF PSEM	9
TABLE 5.1	CUMULATIVE NOISE LEVELS FROM THE FIXED PLANT (LAGOON NIGHT SHOW AND OTHER FIXED PLANT NOISE FROM OCEAN PARK) AND PSEM	11

LIST OF FIGURES

FIGURE 2.1	LOCATIONS OF NOISE SENSITIVE RECEIVERS (NSRS) AND NOISE SOURCES OF THE LAGOON SHOW
FIGURE 2.2	LOCATIONS OF PSEM LAUNCHING POINTS

1. INTRODUCTION

1.1 BACKGROUND

An updated open-air lagoon night show with pyrotechnic effects will be hosted in Aqua City in Ocean Park starting from July 2024. Detailed description of the show is presented in *Section 2*.

The potential environmental impacts of the Ocean Park Master Redevelopment Plan (MRP) have been assessed and presented in the Environmental Impact Assessment Report for “*Relocation and Long Term Operation Plan of Ocean Park*” (Register No. AEIAR-101/2006) (the approved EIA Report), and an Environmental Permit (EP-249/2006) for the MRP was granted on 28 July 2006. The EP was varied subsequently with the latest version of EP-249/2006/D issued by EPD on 2 July 2014.

A Noise Review Study Report was deposited to EPD on 19 October 2010 (Noise Review 2010) for the open-air lagoon night show, *Symbio*, under the requirement of Condition 2.24 of the EP, of which impacts from fixed plant noise (i.e. from chillers, split type units and variable refrigerant volumes), entertainment noise (i.e. from audio system of show), Pyrotechnic Special Effect Material (PSEM) noise, and cumulative noise (i.e. fixed plant noise + entertainment noise + PSEM noise) were assessed. In 2014, an Environmental Review Report was approved by EPD on 2 July 2014 (ERR 2014) in support of the application of Variation of EP, of which the fixed plant noise assessment was updated. Subsequently, due to the updates in lagoon night show, i.e. updates in audio system and no PSEM were used, an updated Noise Review Study Report dated 9 January 2020 (Noise Review 2020) was submitted for the shows *Soul of the Ocean (SOTO)* and *Visions of Hong Kong (VHK)*, and was then approved by EPD.

ERM-Hong Kong, Limited (ERM) was appointed by the Ocean Park Corporation, Hong Kong (OPC) to prepare the updated noise review study based on the most up-to-date design layout and other relevant design details provided by the OPC.

1.2 PURPOSE OF THE REPORT

The objective of this Noise Review Study is to update the *Noise Review 2020*, which was deposited to EPD on 9 January 2020, based on the proposed design updates of the show, including those for fixed plant noise, entertainment noise, PSEM noise and cumulative noise impact (if any). It also provides recommendations as to whether any modification and/or refinement of proposed mitigation measures and monitoring and audit requirements are needed.

2. THE LAGOON NIGHT SHOW

2.1 OVERVIEW OF THE SHOW

The lagoon night show is an open-air entertainment event to be hosted at the Aqua City featuring a combination of audio and visual effects. PSEM will be used in the updated show of SOTO, but not for VHK. The general information of the updated lagoon night show is the same as the previous show, with details summarised in **Table 2.1**.

TABLE 2.1 DETAILS OF LAGOON NIGHT SHOW

Show	Frequency every night ^a	Duration	Description
Main show One, "Soul of the Ocean (SOTO)"	1	About 12 minutes	A timeless story told through a shape-shifting sea creature. PSEM will be used.
Main show Two, "Vision of Hong Kong (VHK)"	1	About 5 minutes	An unparallel visual celebration of culture and beauty beneath the night sky of the Southern District of Hong Kong. PSEM will not be used.
	Total	About 17 minutes	

Notes:

^a The shows will start at 19:00 hours and end before 22:00 hours, i.e. before the Park closes daily.

^b The duration of the updated show is about the same as compared with the previous show assessed in the Noise Review 2020, i.e. 10 – 20 minutes.

2.2 DESIGN OF THE AUDIO SYSTEM

Compared to the *Noise Review 2020*, there are no changes to the layout and location of the audio system (see **Figure 2.1**). The speakers will be used for broadcasting music, sound effects, and the narrator's description during the show.

The design of the audio system has incorporated the following features that address the recommendations given in the approved EIA Report:

- The audio system comprises a cluster of low power speakers instead of a few large-power speakers;
- The speakers have been distributed throughout the spectator area rather than being clustered at one end of the venue directly pointing to Noise Sensitive Receivers (NSRs), and have been placed around the lagoon, in front the audience;
- Directional speakers have been used and oriented to point towards the audience and away from the nearby NSRs; and
- The audio system has been estimated to comply with criteria set out in the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*, whilst also providing sufficient direct sound when considering the intelligibility of the audio system.

2.3 CHANGES IN DESIGN AS COMPARED WITH THAT OF THE NOISE REVIEW 2020

2.3.1 NOISE FROM AUDIO SYSTEM

Due to the absence of PSEM, noise from loudspeaker clusters for SOTO and VHK proposed in the *Noise Review 2020* are slightly higher than those for *Symbio* proposed in the *Noise Review 2010*. Since PSEM will be used in the updated lagoon show of *SOTO*, the SWL of each loudspeaker cluster has been reduced. A comparison of assumption employed in the *Noise Review 2020* and this study is given in **Table 2.2**. Details of SWLs for each speaker and speaker cluster, and the total SWL of all speakers are given in **Appendix 2.1**. In this study, the noise assessment was conducted with the assumption that all speakers will be in use at the same time to represent the worst-case scenario.

TABLE 2.2 DETAILS OF AUDIO SYSTEM

Item	Noise Review 2020	This Study ^a
Number of loudspeakers clusters (no change)	<ul style="list-style-type: none"> 17 lighting & audio poles; 10 point source speakers at ground level; 2 point source speakers on exterior wall of Grand Aquarium 12 subwoofer speakers at ground level; and 5 subwoofer speakers on the side edge of Grand Aquarium 	
Sound power level (SWL) of each loudspeaker cluster	<ul style="list-style-type: none"> 88dB(A) for each speaker of the lighting & audio pole and audio support pole; and 91dB(A) for each point source speaker 92dB(A) for each subwoofer speaker 	<ul style="list-style-type: none"> 83dB(A) for each speaker of the lighting & audio pole and audio support pole; and 86dB(A) for each point source speaker 87dB(A) for each subwoofer speaker
Total SWL of all loudspeaker clusters	109dB(A)	104dB(A) ^b
Sound pressure level (SPL) at 9m of each loudspeaker cluster/point source speaker	64 – 69dB(A)	59 – 63dB(A) ^b (see Appendix 2.1)

Notes:

^a Confirmation has been obtained from OPC and their show design contractor that the above SWLs for each lighting & audio pole, audio support pole and point source speaker are practical and adequate for ensuring intelligibility of the broadcast and sound effects.

^b The SWL of all speaker clusters is 104dB(A) and SPL of each speaker cluster/pointer source speaker is in the range of 59 to 63dB(A) at 9m, which are within the respective limits specified under EP condition 2.23, i.e. total SWL of 109dB(A) and SPL of 75dB(A) at 9m.

2.3.2 NOISE FROM PSEM

PSEM will only be used for the updated show of *SOTO*. The locations of the PSEM launching points are shown in **Figure 2.2**. Compared to the assessment conducted in the *Noise Review 2010*, the updated *SOTO* will only use two types of PSEM, namely small comets and small mines. Small gerbs included in the show and assessed in the *Noise Review 2010* will not be used in the updated *SOTO*. A comparison of the use of PSEM for *Symbio* in the *Noise Review 2010* and the updated *SOTO* is given in **Table 2.3**.

TABLE 2.3 COMPARISON OF THE USE OF PSEM FOR SYMBIO IN NOISE REVIEW 2010 AND THE UPDATED SOTO

Item	Symbio in Noise Review 2010	Updated SOTO
Launching points	12	3
Total number of PSEM	90	101
Types of PSEM	<ul style="list-style-type: none"> • Comets (32) • Mines (40) • Gerbs (18) 	<ul style="list-style-type: none"> • Comets (48) • Mines (53)
Duration of the show	10 – 20 minutes per show, 1 show per night (between 6:30pm to 7:30pm)	About 12 minutes 1 show per night (start at 7:00pm)

The same type of comets and mines used in the *Symbio* show will be used for the updated *SOTO*. Hence, the noise data for PSEM adopted in the *Noise Review 2010* are still applicable for the updated *SOTO*.

3. FIXED PLANT NOISE IMPACT ASSESSMENT

3.1 IDENTIFIED NOISE SENSITIVE RECEIVERS

A review of NSRs in the vicinity of the Project has been conducted. No new representative NSRs have been identified as compared to the *Noise Review 2020*. The identified NSRs that may potentially be affected by the show are summarised in **Table 3.1**, while their locations have been indicated in **Figure 2.1**.

TABLE 3.1 IDENTIFIED NOISE SENSITIVE RECEIVERS (NSRS)

NSR	Description	Land Use	Existing/Planned NSR	No. of Storey
PTS1	Old Teaching Block, Police Training School	Government/ Institution/ Community	Existing	4
SW2	Wong Chuk Hang San Wai	Residential	Existing	1
HA	The Hazelton	Residential	Existing	3
CV2	Country Villa, 28 Shouson Hill Road	Residential	Existing	3
XC	Xanadu Couris	Residential	Existing	3
IV1	Island View	Residential	Existing	2
OR	Orchid Valley	Residential	Existing	3
HY	Hau Yuen	Residential	Existing	3
MV	Manly Villa	Residential	Existing	3

3.2 FIXED PLANT NOISE CRITERIA

The *EIAO-TM* and *Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (IND-TM)* specify the applicable Acceptable Noise Levels (ANLs) for the fixed plant noise impact from the show. The ANLs are dependent on the Area Sensitivity Rating (ASR) and the time of day. The ANLs are presented in **Table 3.2**.

TABLE 3.2 ANLS TO BE USED AS FIXED PLANT NOISE CRITERIA

Time Period	Leq (30min), dB(A)		
	ASR "A"	ASR "B"	ASR "C"
Daytime (0700 – 1900)	60	65	70
Evening Time (1900 – 2300)	60	65	70
Nighttime (2300 – 0700 next day)	50	55	60

Fixed plant noise is controlled under Section 13 of the *Noise Control Ordinance (NCO)* and the predictions were made 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 façade of the nearest NSR is at least 5dB(A) lower than the appropriate ANL (as shown in **Table 3.2**) as specified in the *IND-TM*; or
- The prevailing background noise level (for quiet areas with a noise level 5dB(A) below the appropriate ANL).

In accordance with the *Noise Review 2020*, the fixed plant noise criteria for the identified NSRs are presented in **Table 3.3**.

TABLE 3.3 FIXED PLANT NOISE CRITERIA

NSR	Description	Fixed Plant Noise Criteria, dB(A)
PTS1	Old Teaching Block, Police Training School	60
SW2	Wong Chuk Hang San Wai	60
HA	The Hazelton	60
CV2	Country Villa, 28 Shouson Hill Road	60
XC	Xanadu Couris	60
IV1	Island View	60
OR	Orchid Valley	55
HY	Hau Yuen	55
MV	Manly Villa	56

3.3 ASSESSMENT METHODOLOGY

Since there is no change on the fixed plant items from Ocean Park, the predicted noise levels due to other fixed plant noise from Ocean Park were referred to the results presented in ERR 2014. Reference has been made to the fixed plant noise levels for Scenario S1 presented in ERR 2014 to represent the worst-case scenario in this assessment.

The entertainment noise from the lagoon night show was assessed in this study based on the methodology for fixed plant noise assessment specified in the *IND-TM*. Reference was also made to Appendix 3.5 of the approved EIA Report, the *Noise Review 2010*, *ERR 2014* and the *Noise Review 2020*. Directivity was not taken into account in the assessment to represent the worst-case scenario. The screening effect provided by the existing building structures between the lagoon and the concerned NSRs are illustrated in **Appendix 3.1**.

3.4 EVALUATION OF IMPACT

3.4.1 FIXED PLANT NOISE

As demonstrated in the *ERR 2014*, the fixed plant noise from Ocean Park complies with the relevant noise criteria.

3.4.2 ENTERTAINMENT NOISE

With the specified SWLs for the audio system presented in **Table 2.2**, the predicted entertainment noise levels from the show are lower than those predicted in the *Noise Review 2020*. The predicted noise levels alongside a comparison with the results from the *Noise Review 2020* are summarised in **Table 3.4**. Details of the calculation are presented in **Appendix 3.2**.

TABLE 3.4 PREDICTED ENTERTAINMENT NOISE LEVELS FROM THE LAGOON NIGHT SHOW

NSR	Predicted Entertainment Noise Levels from the Lagoon Night Show (Loudspeakers Only), dB(A)	
	Noise Review 2020	This Study
PTS1	50	44
SW2	44	39
HA	55	50
CV2	46	40
XC	43	38
IV1	42	37
OR	44	39
HY	44	39
MV	52	47

3.4.3 CUMULATIVE IMPACTS

The cumulative impacts due to the entertainment noise from the lagoon night show and other fixed plant noise from Ocean Park were predicted and the results are presented in **Table 3.5**.

TABLE 3.5 CUMULATIVE FIXED PLANT NOISE LEVELS FROM THE LAGOON NIGHT SHOW AND OTHER FIXED PLANT NOISE FROM OCAEAN PARK

NSR	ERR 2014	Noise Review 2020		This Study		Noise Criteria, dB(A)
	Fixed Plant Noise Level, dB(A) (1)	Entertainment Noise Level, dB(A) (2)	Cumulative Noise Level, dB(A) (3) = (1) + (2)	Entertainment Noise Level, dB(A) (4)	Cumulative Noise Level, dB(A) (5) = (1) + (4)	
PTS1	57	50	57	44	57	60
SW2	51	44	52	39	52	60
HA	52	55	57	50	54	60

NSR	ERR 2014	Noise Review 2020		This Study		Noise Criteria, dB(A)
	Fixed Plant Noise Level, dB(A) (1)	Entertainment Noise Level, dB(A) (2)	Cumulative Noise Level, dB(A) (3) = (1) + (2)	Entertainment Noise Level, dB(A) (4)	Cumulative Noise Level, dB(A) (5) = (1) + (4)	
CV2	54	46	55	40	54	60
XC	52	43	53	38	52	60
IV1	52	42	52	37	52	60
OR	51	44	52	39	51	55
HY	53	44	53	39	53	55
MV	53	52	55	47	54	56

Notes:

^a Noise levels in (1) were assessed and presented in Annex C9 of *ERR 2014* (Scenario S1).

^b Noise levels in (2) and (3) were assessed and presented in Table 3.5 and 3.6 of *Noise Review 2020*.

^c Noise levels in (5) are the cumulative noise levels calculated by the summation of fixed plant noise levels in (1) from *ERR 2014* and entertainment noise levels in (4) from this study.

The above results indicate that the cumulative noise levels were in the range of 51 to 57 dB(A), and are generally slightly lower than those presented in the *Noise Review 2020*. As the predicted noise levels comply with the relevant noise criteria, no mitigation measures are required.

3.5 RECOMMENDATIONS

Although the predicted results indicate compliance with the relevant noise criteria, it is still recommended that the following mitigation measures proposed in the approved EIA Report be adopted and implemented to ensure noise compliance of the 23 April 2024 show:

- Sound tests to be witnessed by qualified professionals or Independent Environmental Checker (IEC) should be performed to demonstrate that the audio system will satisfy the acoustic design requirements specified in **Table 2.2** and **Appendix 2.1**;
- Good management practices should be in place, including noise monitoring, setting up a complaint hotline, and distributing advance notice to nearby NSRs. It is recommended that good management practices be implemented during both rehearsals and shows.
- As a fallback option, should non-compliance of EIAO-TM noise criteria at the NSRs be identified for the lagoon night show, interim measures (such as turning down/off of music volume) should be implemented before long-term measures such as redesigning show with no music/lower music volume are in place.

4. PSEM NOISE

4.1 IDENTIFIED NOISE SENSITIVE RECEIVERS

The representative NSRs identified in **Section 3.1** have also been adopted to assess the potential noise impacts arising from the use of PSEM.

4.2 PSEM NOISE CRITERION

As per the Noise Review 2010, an evening noise limit of $L_{eq, 15min}$ 55 dB(A) has been adopted for the PSEM noise impact assessment in this Noise Review with reference to the "Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential - Associated Infrastructures - EIA Report" (Register No. AEIAR-032/2000) (approved Theme Park EIA), of which the same noise limit was adopted for residential NSRs.

4.3 SOURCE NOISE DATA OF PSEM

For the updated lagoon show, the same types of PSEM as assessed for the previous *Symbio* show in the *Noise Review 2010* were adopted (except that gerbs are not used). Hence, the same SEL adopted in the PSEM noise assessment in the *Noise Review 2010* are adopted in this assessment.

The maximum measured SEL for each type of PSEM is summarised in **Table 4.1** below.

TABLE 4.1 MAXIMUM SEL FOR EACH TYPE OF PSEM

Type of PSEM	Maximum SEL per PSEM, dB(A)
Small Mines	95 dB(A) at 10m
Small Mines with crackling for final note	93 dB(A) at 31.6m
Small Comets	93 dB(A) at 10m

Note:

Among all the proposed PSEM to be used for the show, only the small mines with crackling will have some crackling sound when it goes up after launching. However, the dominant noise source still comes from the launching point at low level. All PSEM do not have any second burst at high level after launching. As a conservative approach, slant distance is used for the small mines with crackling.

The product mix of PSEM, which accords strictly with the updated show design details, with the corresponding maximum SEL and the launching locations are presented in **Appendix 4.1**.

4.4 ASSESSMENT METHODOLOGY

Reference have been made to the approved Theme Park EIA and the *Noise Review 2010* for the assessment methodology. The maximum individual source noise data obtained were used to compute the resultant noise level of the PSEM display. Distance attenuation, barrier correction and façade effect were taken into account in the noise prediction.

For the updated lagoon show, there may be more than one PSEM being launched at the same time from the same launching location. In these cases, the adopted SEL would be calculated by including appropriate corrections to the measured SEL per PSEM based on the number of PSEM being launched at the same time. Detailed calculation can be referred to **Appendix 4.1**.

4.5 EVALUATION OF IMPACTS

It has been demonstrated that the $L_{eq, 15min}$ 55 dB(A) limit could be met based on the product mix of PSEM (**Appendix 4.2**) from the latest show design.

It is noted that noise impact from the PSEM would be at low level, except for the small mines with crackling for the final note. It is anticipated that noise from the low level PSEM display would be screened off by the proposed building structures surrounding the lagoon at the majority of the identified NSRs. Calculations of the barrier attenuation at the identified NSRs are presented in **Appendix 4.3**.

4.6 MITIGATION MEASURE

No exceedance was predicted from the PSEM noise impact assessment, and therefore, no specific mitigation measures for the PSEM display are required. For the PSEM display, a maximum effect height of 25m for the small mines with crackling during the show is recommended.

5. CUMULATIVE NOISE IMPACT FROM FIXED PLANT AND PSEM

5.1 CUMULATIVE NOISE CRITERIA

As per the Noise Review 2010, the cumulative noise impacts at the NSRs due to the operation of fixed plant (lagoon night show and other fixed plant noise from Ocean Park) and PSEM were reviewed in accordance with the fixed plant noise criteria as presented in the approved EIA Report and **Table 3.2**.

5.2 EVALUATION OF IMPACTS

The cumulative noise levels at the NSRs were assessed based on the results of fixed plant noise impact assessment and PSEM noise impact assessment, which are presented in *Sections 3 and 4* respectively. Results indicate that the cumulative noise levels comply with the fixed plant noise criteria as presented in the approved EIA Report and **Table 3.2** (see **Table 5.1** and **Appendix 5.1**).

TABLE 5.1 CUMULATIVE NOISE LEVELS FROM FIXED PLANT (LAGOON NIGHT SHOW AND OTHER FIXED PLANT NOISE FROM OCEAN PARK) AND PSEM

NSR	Noise Review 2010	ERR 2014	Noise Review 2020 (no PSEM)		This Study (with PSEM)			Noise Criteria, dB(A)
	PSEM Noise Level, dB(A) (1)	Fixed Plant Noise Level, dB(A) (2)	Entertainment Noise Level, dB(A) (3)	Cumulative Noise Level, dB(A) (4) = (2) + (3)	Entertainment Noise Level, dB(A) (5)	PSEM Noise Level, dB(A) (6)	Cumulative Noise Level, dB(A) (7) = (2) + (5) + (6)	
PTS1	48	57	50	57	44	49	57	60
SW	44	51	44	52	39	41	52	60
HA	52	52	55	57	50	51	56	60
CV2	46	54	46	55	40	46	54	60
XC	50	52	43	53	38	50	55	60
IV1	49	52	42	52	37	49	54	60
OR	52	51	44	52	39	53	55	55
HY	50	53	44	53	39	49	54	55
MV	52	53	52	55	47	53	56	56

Notes:

^a Noise levels in (1) were assessed and presented in Table 5.1 of *Noise Review 2010*.

^b Noise levels in (2) were assessed and presented in Annex C9 of *ERR 2014* (Scenario S1).

^c Noise levels in (3) and (4) were assessed and presented in Table 3.5 and 3.6 of *Noise Review 2020*.

^d Noise levels in (7) are the cumulative noise levels calculated by the summation of fixed plant noise levels in (2) from *ERR 2014* (Scenario S1), entertainment noise levels in (5) from this study and PSEM noise levels in (6) from this study.

6. ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REQUIREMENT

Operational phase noise monitoring during the first year of the lagoon night show was completed in accordance with the approved EIA Report and EM&A Manual to ensure compliance with the noise criteria. Nevertheless, noise monitoring for the updated lagoon show is proposed to be carried out on the first day of the updated lagoon show (i.e. 6 July 2024), as well as by the end of July, August and September 2024. The necessity and frequency of further noise monitoring should be further reviewed based on the monitoring results, any adjustment to the loudspeaker system, and any change to the show schedule or rundown.

Reference should be made to Sections 2.20 to 2.23, 2.25 of the approved EM&A Manual for the monitoring methodology and Action and Limit Levels for Entertainment Noise. Noise monitoring shall be carried out at all designated monitoring stations during the performance of the lagoon night show at a logging interval of 30 minutes.

7. CONCLUSION

With the most up-to-date design of the audio system, the cumulative noise levels due to the entertainment noise and fixed plant noise are predicted to comply with the *EIAO-TM* noise criteria. No adverse noise impact is anticipated at the NSRs and no mitigation measures are required.

The noise impacts associated with the use of PSEM were assessed based on the show design and the maximum SEL of the PSEM. The results indicate that the noise levels at all NSRs would comply with the noise criterion of $L_{eq, 15min}$ 55 dB(A), and hence no mitigation is required.

The cumulative noise levels due to fixed plant noise, entertainment noise and PSEM display from the lagoon night show also comply with the *EIAO-TM* noise criteria.

It is recommended that noise monitoring be undertaken on the first day of the updated lagoon show (i.e. 6 July 2024), as well as by the end of July, August and September 2024, in accordance with the monitoring methodology and Action and Limit Levels for Entertainment Noise provided in the EM&A Manual. The necessity and frequency of further noise monitoring should be further reviewed afterwards.



APPENDIX 2.1 SOUND POWER LEVELS OF NOISE
SOURCES (FIXED PLANT NOISE ITEMS
FROM LAGOON NIGHT SHOW)

Sound Power Levels of Noise Sources (Audio System from Lagoon Night Show)

Noise Source	Sound Power Level (SWL) of each speaker, dB(A)	No. of Speakers	Total Sound Power Level (SWL) from each speaker cluster/point source speaker, dB(A)	Sound Pressure Level (SPL) at 9m away from each speaker cluster/point source speaker, dB(A)
LS1	83	5	90.0	63
LS2	83	3	87.8	61
LS3	83	3	87.8	61
LS4	83	3	87.8	61
LS5	83	3	87.8	61
LS6	83	2	86.0	59
LS7	83	4	89.0	62
LS8	83	4	89.0	62
LS9	83	4	89.0	62
LS10	83	3	87.8	61
LS11	83	4	89.0	62
LS12	83	4	89.0	62
LS13	83	3	87.8	61
LS14	83	5	90.0	63
LS15	83	5	90.0	63
LS16	83	5	90.0	63
LS17	83	4	89.0	62
PS1	86	1	86.0	59
PS2	86	1	86.0	59
PS3	86	1	86.0	59
PS4	86	1	86.0	59
PS5	86	1	86.0	59
PS6	86	1	86.0	59
PS7	86	1	86.0	59
PS9	86	1	86.0	59
PS11	86	1	86.0	59
PS13	86	1	86.0	59
PS15	86	2	89.0	62
PS16	86	2	89.0	62
SW1	87	1	87.0	60
SW2	87	1	87.0	60
SW3	87	1	87.0	60
SW4	87	1	87.0	60
SW5	87	1	87.0	60
SW6	87	1	87.0	60
SW7	87	1	87.0	60
SW8	87	1	87.0	60
SW9	87	1	87.0	60
SW10	87	1	87.0	60
SW11	87	1	87.0	60
SW12	87	1	87.0	60
SW13	87	1	87.0	60
SW14	87	1	87.0	60
SW15	87	1	87.0	60
SW16	87	1	87.0	60
SW17	87	1	87.0	60
Total			104.3	







Notes:

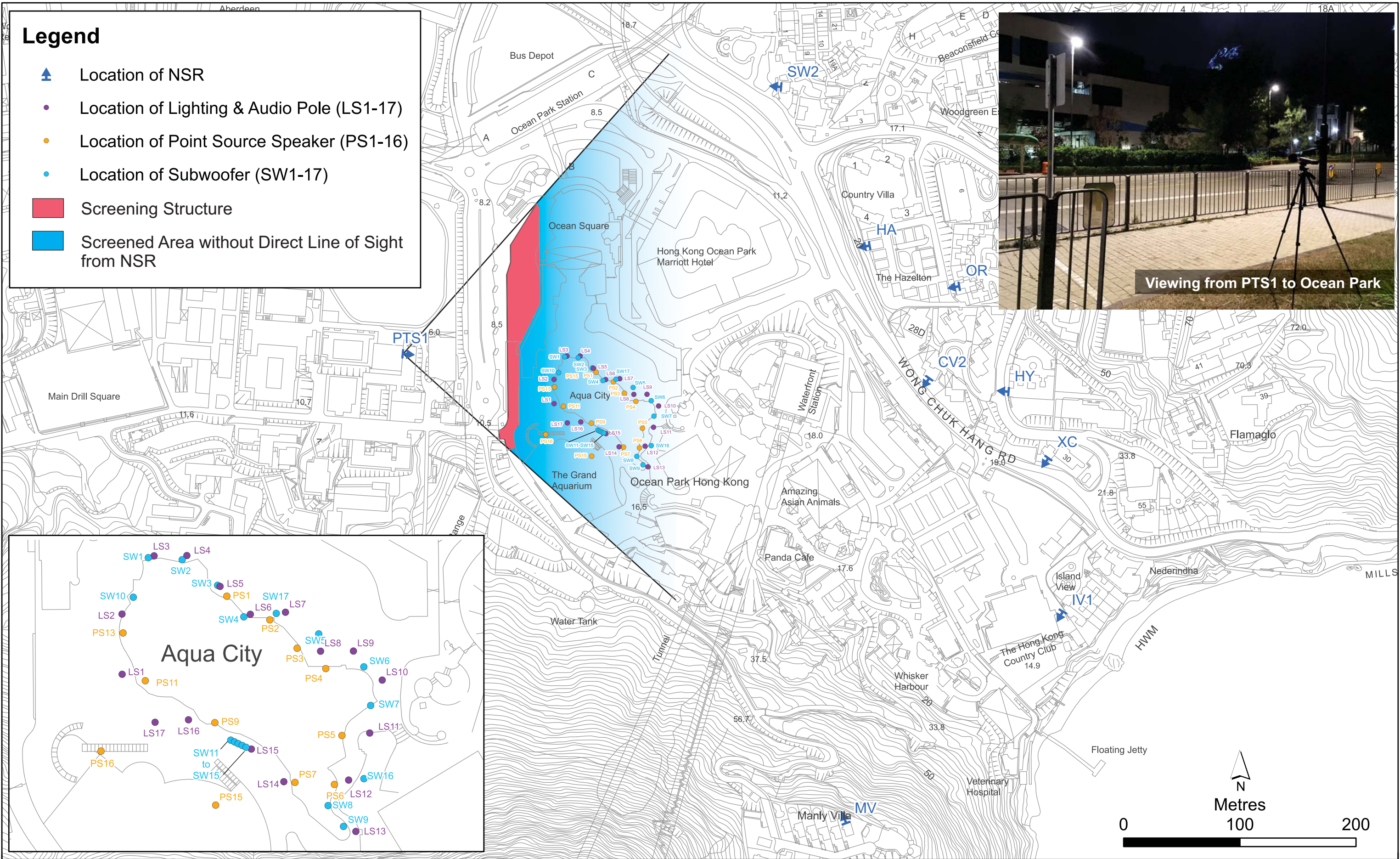
- LS Lighting & audio pole, each will hold 2 to 5 nos. of speakers.
- PS Point source speaker
- SW Subwoofer speaker



APPENDIX 3.1 DETAILS OF SCREENING BY EXISTING
STRUCTURES FOR ENTERTAINMENT
NOISE

Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









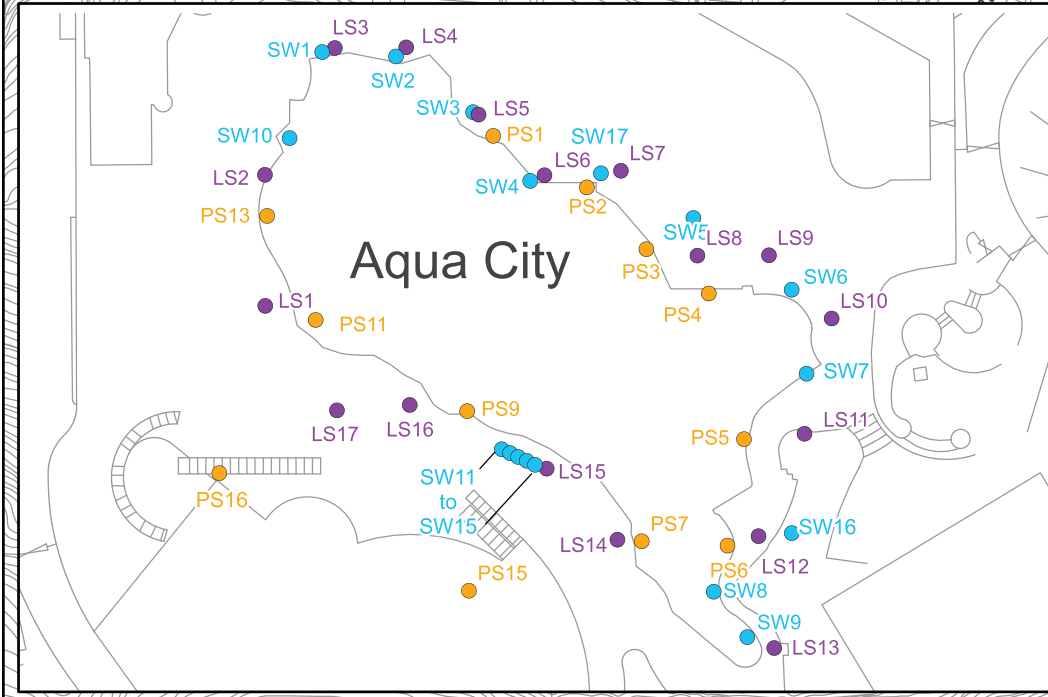
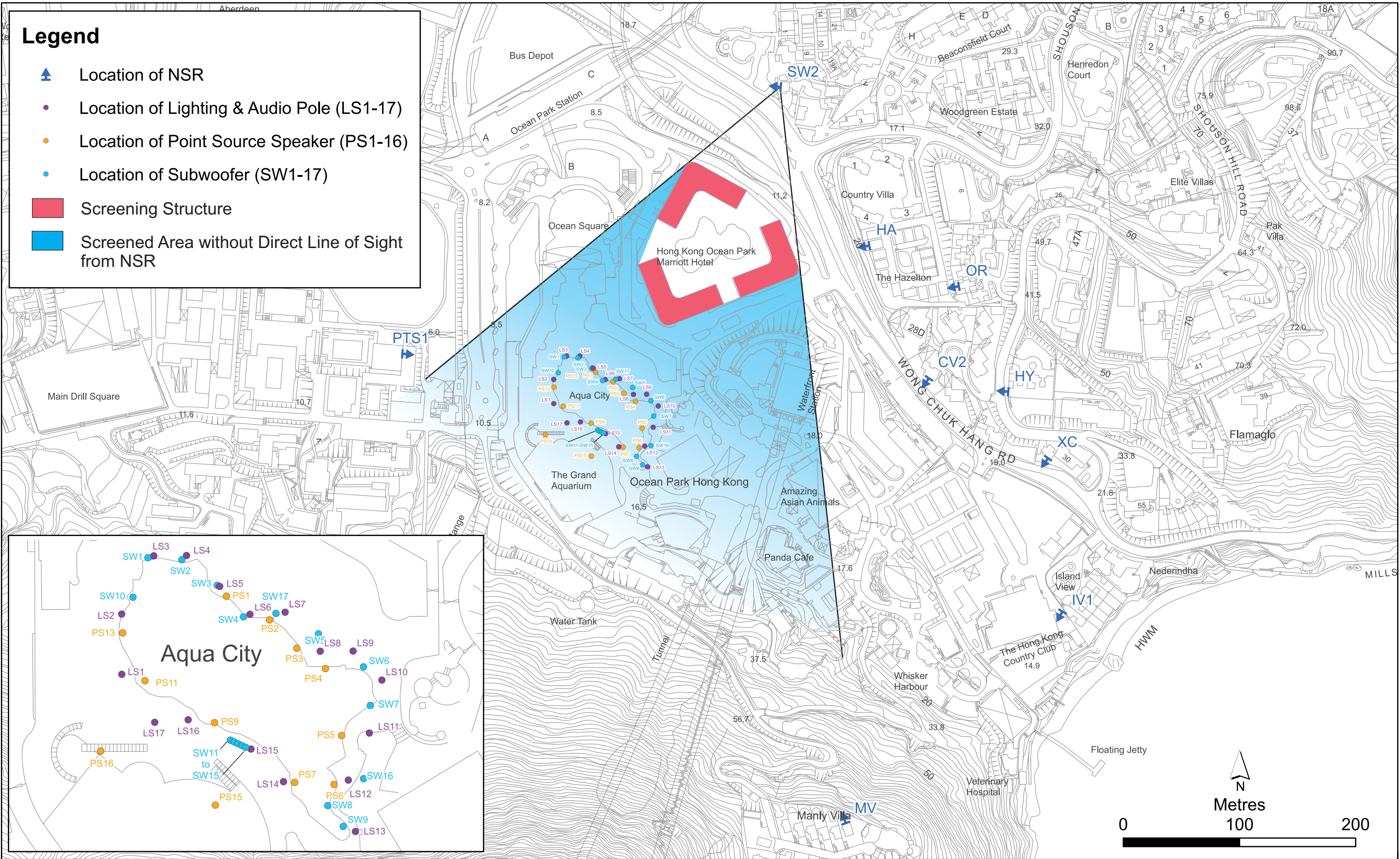
Appendix 3.1

Details of Screening by Existing Structures (For NSR PTS1)









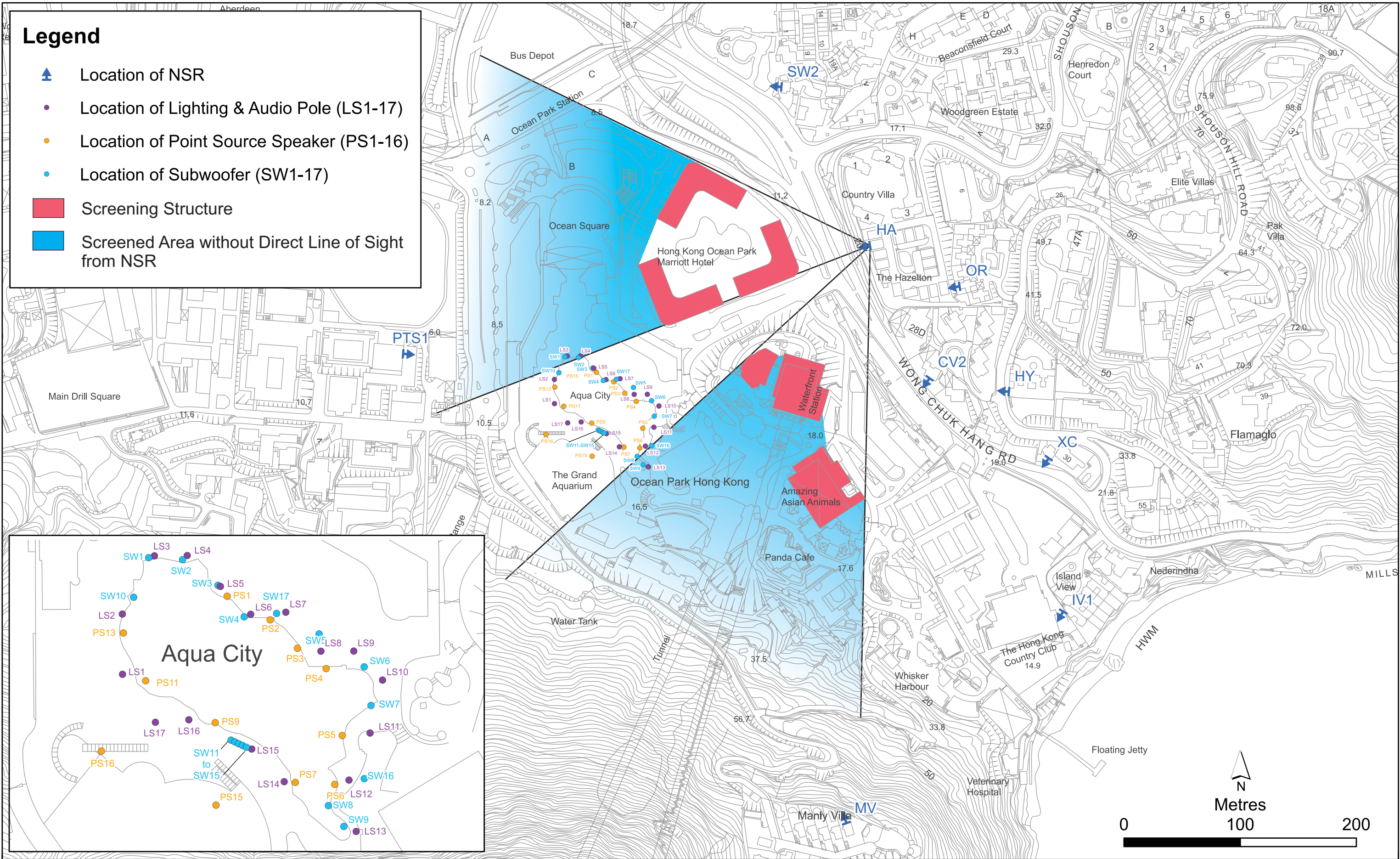
Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









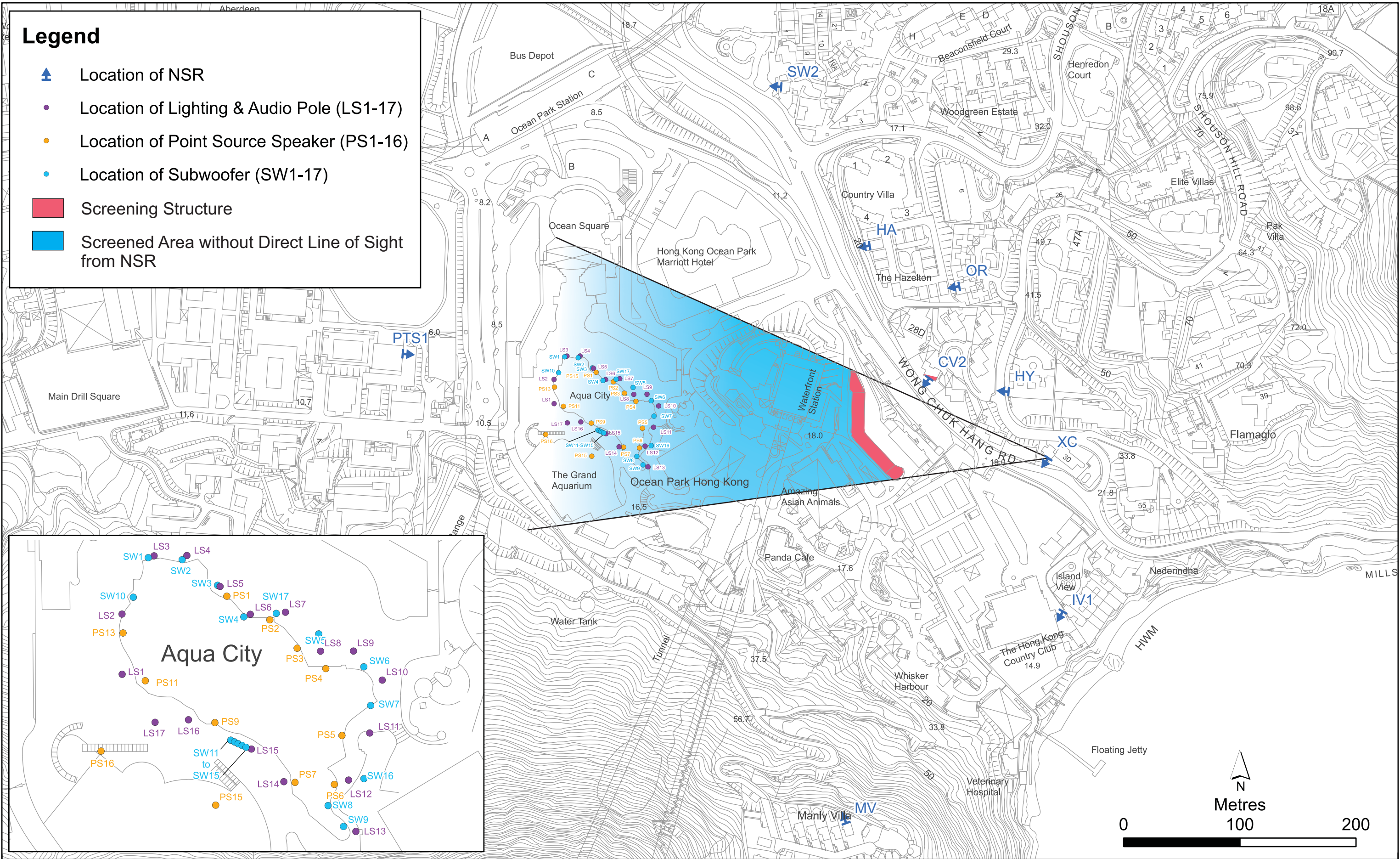
Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









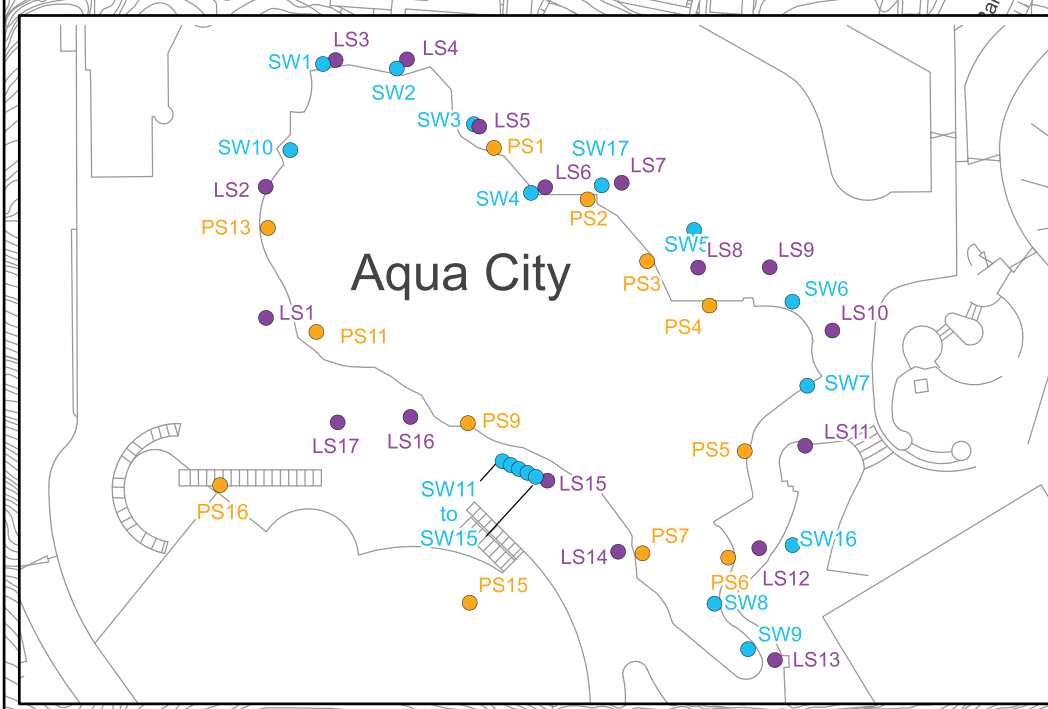
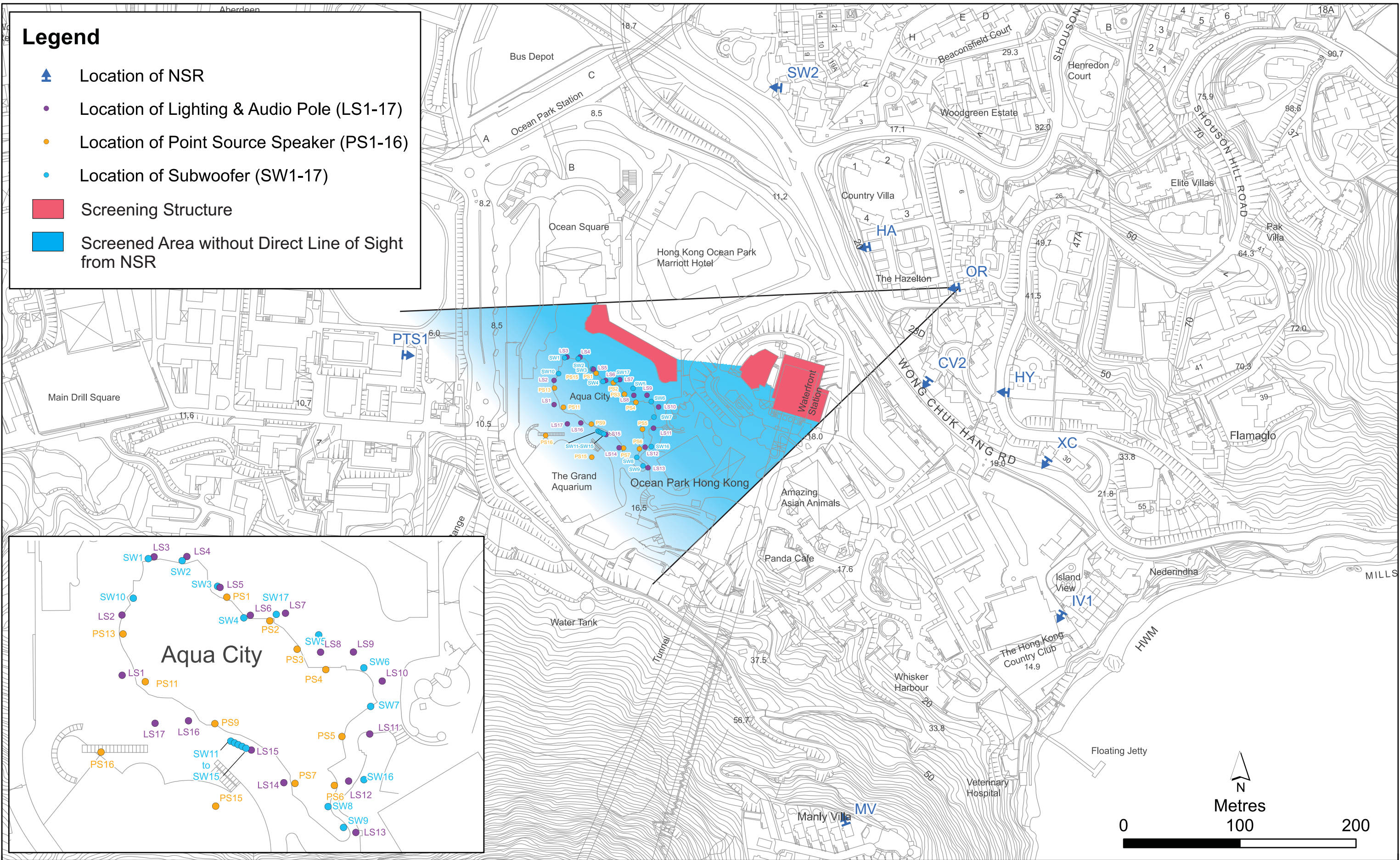
Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR









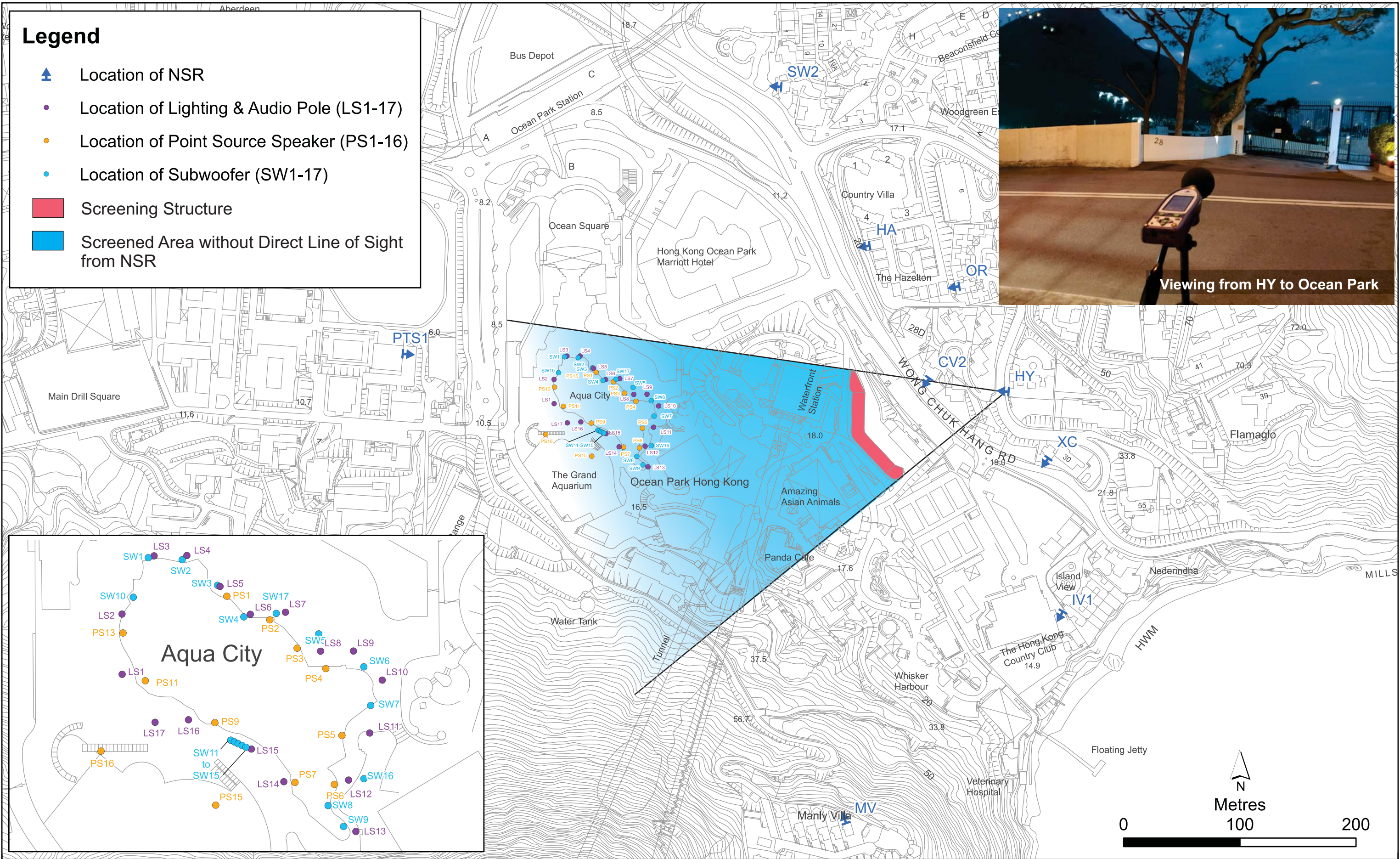
Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR



Legend

-  Location of NSR
-  Location of Lighting & Audio Pole (LS1-17)
-  Location of Point Source Speaker (PS1-16)
-  Location of Subwoofer (SW1-17)
-  Screening Structure
-  Screened Area without Direct Line of Sight from NSR





APPENDIX 3.2 CALCULATION FOR ENTERTAINMENT
NOISE IMPACT ASSESSMENT (AUDIO
SYSTEM FROM LAGOON NIGHT SHOW)

Entertainment Noise Prediction (Audio System from Lagoon Night Show)

NSR		PTS1		NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
Noise Source	Sound Power Level (SWL), dB(A)	X	Y	Z	X	Y	Z	Distance	Barrier		Façade			
LS1	90.0	835886.3	811996.5	16.2	836016.7	811953.6	18.8	137	-51	-10	3	32		
LS2	87.8	835886.3	811996.5	16.2	836016.6	811974.4	18.8	132	-50	-10	3	30		
LS3	87.8	835886.3	811996.5	16.2	836027.7	811994.5	18.8	141	-51	-10	3	30		
LS4	87.8	835886.3	811996.5	16.2	836039.0	811994.6	18.8	153	-52	-10	3	29		
LS5	87.8	835886.3	811996.5	16.2	836050.5	811984.0	18.8	165	-52	-10	3	28		
LS6	86.0	835886.3	811996.5	16.2	836060.9	811974.3	18.8	176	-53	-10	3	26		
LS7	89.0	835886.3	811996.5	16.2	836073.1	811975.1	18.8	188	-53	-10	3	29		
LS8	89.0	835886.3	811996.5	16.2	836085.2	811961.6	18.8	202	-54	-10	3	28		
LS9	89.0	835886.3	811996.5	16.2	836096.6	811961.6	18.8	213	-55	-10	3	27		
LS10	87.8	835886.3	811996.5	16.2	836106.5	811951.6	18.8	225	-55	-10	3	26		
LS11	89.0	835886.3	811996.5	16.2	836102.2	811933.3	18.8	225	-55	-10	3	27		
LS12	89.0	835886.3	811996.5	16.2	836094.9	811917.1	18.8	223	-55	-10	3	27		
LS13	87.8	835886.3	811996.5	16.2	836097.4	811899.3	18.8	232	-55	-10	3	25		
LS14	90.0	835886.3	811996.5	16.2	836072.5	811916.5	18.8	203	-54	-10	3	29		
LS15	90.0	835886.3	811996.5	16.2	836061.3	811927.8	18.8	188	-53	-10	3	30		
LS16	90.0	835886.3	811996.5	16.2	836039.6	811937.9	18.8	164	-52	-10	3	31		
LS17	89.0	835886.3	811996.5	16.2	836028.0	811937.0	18.8	154	-52	-10	3	30		
PS1	86.0	835886.3	811996.5	16.2	836052.8	811980.6	15.3	167	-52	-10	3	27		
PS2	86.0	835886.3	811996.5	16.2	836067.7	811972.4	15.3	183	-53	-10	3	26		
PS3	86.0	835886.3	811996.5	16.2	836077.1	811962.6	15.3	194	-54	-10	3	25		
PS4	86.0	835886.3	811996.5	16.2	836087.0	811955.6	15.3	205	-54	-10	3	25		
PS5	86.0	835886.3	811996.5	16.2	836092.6	811932.5	15.3	216	-55	-10	3	24		
PS6	86.0	835886.3	811996.5	16.2	836090.0	811915.6	15.3	219	-55	-10	3	24		
PS7	86.0	835886.3	811996.5	16.2	836076.4	811916.3	15.3	206	-54	-10	3	25		
PS9	86.0	835886.3	811996.5	16.2	836048.7	811936.9	15.3	173	-53	-10	3	26		
PS11	86.0	835886.3	811996.5	16.2	836024.6	811951.4	15.3	145	-51	-10	3	28		
PS13	86.0	835886.3	811996.5	16.2	836017.0	811967.9	15.3	134	-51	-10	3	28		
PS15	89.0	835886.3	811996.5	16.2	836049.0	811908.4	18.8	185	-53	-10	3	29		
PS16	89.0	835886.3	811996.5	16.2	836009.4	811927.1	18.8	141	-51	-10	3	31		
SW1	87.0	835886.3	811996.5	16.2	836025.7	811993.9	15.3	139	-51	-10	3	29		
SW2	87.0	835886.3	811996.5	16.2	836037.4	811993.2	15.3	151	-52	-10	3	28		
SW3	87.0	835886.3	811996.5	16.2	836049.6	811984.3	15.3	164	-52	-10	3	28		
SW4	87.0	835886.3	811996.5	16.2	836058.7	811973.5	15.3	174	-53	-10	3	27		
SW5	87.0	835886.3	811996.5	16.2	836084.6	811967.6	15.3	200	-54	-10	3	26		
SW6	87.0	835886.3	811996.5	16.2	836100.2	811956.2	15.3	218	-55	-10	3	25		
SW7	87.0	835886.3	811996.5	16.2	836102.5	811942.9	15.3	223	-55	-10	3	25		
SW8	87.0	835886.3	811996.5	16.2	836087.8	811908.3	15.3	220	-55	-10	3	25		
SW9	87.0	835886.3	811996.5	16.2	836093.1	811901.1	15.3	228	-55	-10	3	25		
SW10	87.0	835886.3	811996.5	16.2	836020.5	811980.2	15.3	135	-51	-10	3	29		
SW11	87.0	835886.3	811996.5	16.2	836054.2	811930.9	18.8	180	-53	-10	3	27		
SW12	87.0	835886.3	811996.5	16.2	836055.5	811930.3	18.8	182	-53	-10	3	27		
SW13	87.0	835886.3	811996.5	16.2	836056.8	811929.7	18.8	183	-53	-10	3	27		
SW14	87.0	835886.3	811996.5	16.2	836058.1	811929.0	18.8	185	-53	-10	3	27		
SW15	87.0	835886.3	811996.5	16.2	836059.4	811928.4	18.8	186	-53	-10	3	27		
SW16	87.0	835886.3	811996.5	16.2	836100.2	811917.6	18.8	228	-55	-10	3	25		
SW17	87.0	835886.3	811996.5	16.2	836069.9	811974.6	18.8	185	-53	-10	3	27		
											Total SPL	44		

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR SW2

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836212.0	812226.0	11.2	836016.7	811953.6	18.8	335	-59	-10	3	24
LS2	87.8	836212.0	812226.0	11.2	836016.6	811974.4	18.8	319	-58	-10	3	23
LS3	87.8	836212.0	812226.0	11.2	836027.7	811994.5	18.8	296	-57	-10	3	23
LS4	87.8	836212.0	812226.0	11.2	836039.0	811994.6	18.8	289	-57	-10	3	24
LS5	87.8	836212.0	812226.0	11.2	836050.5	811984.0	18.8	291	-57	-10	3	23
LS6	86.0	836212.0	812226.0	11.2	836060.9	811974.3	18.8	294	-57	-10	3	22
LS7	89.0	836212.0	812226.0	11.2	836073.1	811975.1	18.8	287	-57	-10	3	25
LS8	89.0	836212.0	812226.0	11.2	836085.2	811961.6	18.8	293	-57	-10	3	25
LS9	89.0	836212.0	812226.0	11.2	836096.6	811961.6	18.8	289	-57	-10	3	25
LS10	87.8	836212.0	812226.0	11.2	836106.5	811951.6	18.8	294	-57	-10	3	23
LS11	89.0	836212.0	812226.0	11.2	836102.2	811933.3	18.8	313	-58	-10	3	24
LS12	89.0	836212.0	812226.0	11.2	836094.9	811917.1	18.8	330	-58	-10	3	24
LS13	87.8	836212.0	812226.0	11.2	836097.4	811899.3	18.8	346	-59	-10	3	22
LS14	90.0	836212.0	812226.0	11.2	836072.5	811916.5	18.8	339	-59	-10	3	24
LS15	90.0	836212.0	812226.0	11.2	836061.3	811927.8	18.8	334	-58	-10	3	25
LS16	90.0	836212.0	812226.0	11.2	836039.6	811937.9	18.8	336	-59	-10	3	24
LS17	89.0	836212.0	812226.0	11.2	836028.0	811937.0	18.8	343	-59	-10	3	23
PS1	86.0	836212.0	812226.0	11.2	836052.8	811980.6	15.3	293	-57	-10	3	22
PS2	86.0	836212.0	812226.0	11.2	836067.7	811972.4	15.3	292	-57	-10	3	22
PS3	86.0	836212.0	812226.0	11.2	836077.1	811962.6	15.3	296	-57	-10	3	22
PS4	86.0	836212.0	812226.0	11.2	836087.0	811955.6	15.3	298	-57	-10	3	22
PS5	86.0	836212.0	812226.0	11.2	836092.6	811932.5	15.3	317	-58	-10	3	21
PS6	86.0	836212.0	812226.0	11.2	836090.0	811915.6	15.3	334	-58	-10	3	21
PS7	86.0	836212.0	812226.0	11.2	836076.4	811916.3	15.3	338	-59	-10	3	20
PS9	86.0	836212.0	812226.0	11.2	836048.7	811936.9	15.3	332	-58	-10	3	21
PS11	86.0	836212.0	812226.0	11.2	836024.6	811951.4	15.3	332	-58	-10	3	21
PS13	86.0	836212.0	812226.0	11.2	836017.0	811967.9	15.3	324	-58	-10	3	21
PS15	89.0	836212.0	812226.0	11.2	836049.0	811908.4	18.8	357	-59	-10	3	23
PS16	89.0	836212.0	812226.0	11.2	836009.4	811927.1	18.8	361	-59	-10	3	23
SW1	87.0	836212.0	812226.0	11.2	836025.7	811993.9	15.3	298	-57	-10	3	23
SW2	87.0	836212.0	812226.0	11.2	836037.4	811993.2	15.3	291	-57	-10	3	23
SW3	87.0	836212.0	812226.0	11.2	836049.6	811984.3	15.3	291	-57	-10	3	23
SW4	87.0	836212.0	812226.0	11.2	836058.7	811973.5	15.3	295	-57	-10	3	23
SW5	87.0	836212.0	812226.0	11.2	836084.6	811967.6	15.3	288	-57	-10	3	23
SW6	87.0	836212.0	812226.0	11.2	836100.2	811956.2	15.3	292	-57	-10	3	23
SW7	87.0	836212.0	812226.0	11.2	836102.5	811942.9	15.3	304	-58	-10	3	22
SW8	87.0	836212.0	812226.0	11.2	836087.8	811908.3	15.3	341	-59	-10	3	21
SW9	87.0	836212.0	812226.0	11.2	836093.1	811901.1	15.3	346	-59	-10	3	21
SW10	87.0	836212.0	812226.0	11.2	836020.5	811980.2	15.3	312	-58	-10	3	22
SW11	87.0	836212.0	812226.0	11.2	836054.2	811930.9	18.8	335	-58	-10	3	22
SW12	87.0	836212.0	812226.0	11.2	836055.5	811930.3	18.8	335	-58	-10	3	22
SW13	87.0	836212.0	812226.0	11.2	836056.8	811929.7	18.8	335	-58	-10	3	22
SW14	87.0	836212.0	812226.0	11.2	836058.1	811929.0	18.8	335	-58	-10	3	22
SW15	87.0	836212.0	812226.0	11.2	836059.4	811928.4	18.8	334	-58	-10	3	22
SW16	87.0	836212.0	812226.0	11.2	836100.2	811917.6	18.8	328	-58	-10	3	22
SW17	87.0	836212.0	812226.0	11.2	836069.9	811974.6	18.8	289	-57	-10	3	23
Total SPL											39	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR HA

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836288.2	812089.5	29.2	836016.7	811953.6	18.8	304	-58	0	3	35
LS2	87.8	836288.2	812089.5	29.2	836016.6	811974.4	18.8	295	-57	0	3	33
LS3	87.8	836288.2	812089.5	29.2	836027.7	811994.5	18.8	277	-57	-10	3	24
LS4	87.8	836288.2	812089.5	29.2	836039.0	811994.6	18.8	267	-57	-10	3	24
LS5	87.8	836288.2	812089.5	29.2	836050.5	811984.0	18.8	260	-56	0	3	34
LS6	86.0	836288.2	812089.5	29.2	836060.9	811974.3	18.8	255	-56	0	3	33
LS7	89.0	836288.2	812089.5	29.2	836073.1	811975.1	18.8	244	-56	0	3	36
LS8	89.0	836288.2	812089.5	29.2	836085.2	811961.6	18.8	240	-56	0	3	36
LS9	89.0	836288.2	812089.5	29.2	836096.6	811961.6	18.8	231	-55	0	3	37
LS10	87.8	836288.2	812089.5	29.2	836106.5	811951.6	18.8	228	-55	0	3	36
LS11	89.0	836288.2	812089.5	29.2	836102.2	811933.3	18.8	243	-56	0	3	36
LS12	89.0	836288.2	812089.5	29.2	836094.9	811917.1	18.8	259	-56	0	3	36
LS13	87.8	836288.2	812089.5	29.2	836097.4	811899.3	18.8	270	-57	-10	3	24
LS14	90.0	836288.2	812089.5	29.2	836072.5	811916.5	18.8	277	-57	0	3	36
LS15	90.0	836288.2	812089.5	29.2	836061.3	811927.8	18.8	279	-57	0	3	36
LS16	90.0	836288.2	812089.5	29.2	836039.6	811937.9	18.8	291	-57	0	3	36
LS17	89.0	836288.2	812089.5	29.2	836028.0	811937.0	18.8	302	-58	0	3	34
PS1	86.0	836288.2	812089.5	29.2	836052.8	811980.6	15.3	260	-56	0	3	33
PS2	86.0	836288.2	812089.5	29.2	836067.7	811972.4	15.3	250	-56	0	3	33
PS3	86.0	836288.2	812089.5	29.2	836077.1	811962.6	15.3	247	-56	0	3	33
PS4	86.0	836288.2	812089.5	29.2	836087.0	811955.6	15.3	242	-56	0	3	33
PS5	86.0	836288.2	812089.5	29.2	836092.6	811932.5	15.3	251	-56	0	3	33
PS6	86.0	836288.2	812089.5	29.2	836090.0	811915.6	15.3	264	-56	0	3	33
PS7	86.0	836288.2	812089.5	29.2	836076.4	811916.3	15.3	274	-57	0	3	32
PS9	86.0	836288.2	812089.5	29.2	836048.7	811936.9	15.3	284	-57	0	3	32
PS11	86.0	836288.2	812089.5	29.2	836024.6	811951.4	15.3	298	-57	0	3	32
PS13	86.0	836288.2	812089.5	29.2	836017.0	811967.9	15.3	298	-57	0	3	32
PS15	89.0	836288.2	812089.5	29.2	836049.0	811908.4	18.8	300	-58	0	3	34
PS16	89.0	836288.2	812089.5	29.2	836009.4	811927.1	18.8	323	-58	0	3	34
SW1	87.0	836288.2	812089.5	29.2	836025.7	811993.9	15.3	280	-57	-10	3	23
SW2	87.0	836288.2	812089.5	29.2	836037.4	811993.2	15.3	269	-57	-10	3	23
SW3	87.0	836288.2	812089.5	29.2	836049.6	811984.3	15.3	261	-56	0	3	34
SW4	87.0	836288.2	812089.5	29.2	836058.7	811973.5	15.3	258	-56	0	3	34
SW5	87.0	836288.2	812089.5	29.2	836084.6	811967.6	15.3	238	-56	0	3	34
SW6	87.0	836288.2	812089.5	29.2	836100.2	811956.2	15.3	231	-55	0	3	35
SW7	87.0	836288.2	812089.5	29.2	836102.5	811942.9	15.3	237	-55	0	3	35
SW8	87.0	836288.2	812089.5	29.2	836087.8	811908.3	15.3	271	-57	0	3	33
SW9	87.0	836288.2	812089.5	29.2	836093.1	811901.1	15.3	272	-57	-10	3	23
SW10	87.0	836288.2	812089.5	29.2	836020.5	811980.2	15.3	289	-57	0	3	33
SW11	87.0	836288.2	812089.5	29.2	836054.2	811930.9	18.8	283	-57	0	3	33
SW12	87.0	836288.2	812089.5	29.2	836055.5	811930.3	18.8	282	-57	0	3	33
SW13	87.0	836288.2	812089.5	29.2	836056.8	811929.7	18.8	281	-57	0	3	33
SW14	87.0	836288.2	812089.5	29.2	836058.1	811929.0	18.8	281	-57	0	3	33
SW15	87.0	836288.2	812089.5	29.2	836059.4	811928.4	18.8	280	-57	0	3	33
SW16	87.0	836288.2	812089.5	29.2	836100.2	811917.6	18.8	255	-56	0	3	34
SW17	87.0	836288.2	812089.5	29.2	836069.9	811974.6	18.8	247	-56	0	3	34
											Total SPL	50

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR CV2

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836339.5	811975.5	29.7	836016.7	811953.6	18.8	324	-58	-10	3	25
LS2	87.8	836339.5	811975.5	29.7	836016.6	811974.4	18.8	323	-58	-10	3	23
LS3	87.8	836339.5	811975.5	29.7	836027.7	811994.5	18.8	313	-58	-10	3	23
LS4	87.8	836339.5	811975.5	29.7	836039.0	811994.6	18.8	301	-58	-10	3	23
LS5	87.8	836339.5	811975.5	29.7	836050.5	811984.0	18.8	289	-57	-10	3	24
LS6	86.0	836339.5	811975.5	29.7	836060.9	811974.3	18.8	279	-57	-10	3	22
LS7	89.0	836339.5	811975.5	29.7	836073.1	811975.1	18.8	267	-57	-10	3	26
LS8	89.0	836339.5	811975.5	29.7	836085.2	811961.6	18.8	255	-56	-10	3	26
LS9	89.0	836339.5	811975.5	29.7	836096.6	811961.6	18.8	244	-56	-10	3	26
LS10	87.8	836339.5	811975.5	29.7	836106.5	811951.6	18.8	234	-55	-10	3	25
LS11	89.0	836339.5	811975.5	29.7	836102.2	811933.3	18.8	241	-56	-10	3	26
LS12	89.0	836339.5	811975.5	29.7	836094.9	811917.1	18.8	252	-56	-10	3	26
LS13	87.8	836339.5	811975.5	29.7	836097.4	811899.3	18.8	254	-56	-10	3	25
LS14	90.0	836339.5	811975.5	29.7	836072.5	811916.5	18.8	274	-57	-10	3	26
LS15	90.0	836339.5	811975.5	29.7	836061.3	811927.8	18.8	282	-57	-10	3	26
LS16	90.0	836339.5	811975.5	29.7	836039.6	811937.9	18.8	302	-58	-10	3	25
LS17	89.0	836339.5	811975.5	29.7	836028.0	811937.0	18.8	314	-58	-10	3	24
PS1	86.0	836339.5	811975.5	29.7	836052.8	811980.6	15.3	287	-57	-10	3	22
PS2	86.0	836339.5	811975.5	29.7	836067.7	811972.4	15.3	272	-57	-10	3	22
PS3	86.0	836339.5	811975.5	29.7	836077.1	811962.6	15.3	263	-56	-10	3	23
PS4	86.0	836339.5	811975.5	29.7	836087.0	811955.6	15.3	254	-56	-10	3	23
PS5	86.0	836339.5	811975.5	29.7	836092.6	811932.5	15.3	251	-56	-10	3	23
PS6	86.0	836339.5	811975.5	29.7	836090.0	811915.6	15.3	257	-56	-10	3	23
PS7	86.0	836339.5	811975.5	29.7	836076.4	811916.3	15.3	270	-57	-10	3	22
PS9	86.0	836339.5	811975.5	29.7	836059.5	811933.4	15.3	283	-57	-10	3	22
PS11	86.0	836339.5	811975.5	29.7	836037.3	811944.4	15.3	304	-58	-10	3	21
PS13	86.0	836339.5	811975.5	29.7	836016.8	811967.9	15.3	323	-58	-10	3	21
PS15	89.0	836339.5	811975.5	29.7	836049.0	811908.4	18.8	298	-57	-10	3	25
PS16	89.0	836339.5	811975.5	29.7	836009.4	811927.1	18.8	334	-58	-10	3	24
SW1	87.0	836339.5	811975.5	29.7	836020.5	811980.2	15.3	319	-58	-10	3	22
SW2	87.0	836339.5	811975.5	29.7	836025.7	811993.9	15.3	315	-58	-10	3	22
SW3	87.0	836339.5	811975.5	29.7	836037.4	811993.2	15.3	303	-58	-10	3	22
SW4	87.0	836339.5	811975.5	29.7	836049.6	811984.3	15.3	290	-57	-10	3	23
SW5	87.0	836339.5	811975.5	29.7	836058.7	811973.5	15.3	281	-57	-10	3	23
SW6	87.0	836339.5	811975.5	29.7	836095.9	811957.1	15.3	245	-56	-10	3	24
SW7	87.0	836339.5	811975.5	29.7	836100.2	811956.2	15.3	240	-56	-10	3	24
SW8	87.0	836339.5	811975.5	29.7	836102.6	811932.9	15.3	241	-56	-10	3	24
SW9	87.0	836339.5	811975.5	29.7	836100.1	811917.7	15.3	247	-56	-10	3	24
SW10	87.0	836339.5	811975.5	29.7	836093.1	811901.1	15.3	258	-56	-10	3	24
SW11	87.0	836339.5	811975.5	29.7	836054.2	811930.9	18.8	289	-57	-10	3	23
SW12	87.0	836339.5	811975.5	29.7	836055.5	811930.3	18.8	288	-57	-10	3	23
SW13	87.0	836339.5	811975.5	29.7	836056.8	811929.7	18.8	287	-57	-10	3	23
SW14	87.0	836339.5	811975.5	29.7	836058.1	811929.0	18.8	285	-57	-10	3	23
SW15	87.0	836339.5	811975.5	29.7	836059.4	811928.4	18.8	284	-57	-10	3	23
SW16	87.0	836339.5	811975.5	29.7	836102.6	811932.9	18.8	241	-56	-10	3	24
SW17	87.0	836339.5	811975.5	29.7	836102.6	811932.9	18.8	241	-56	-10	3	24
Total SPL											40	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR **XC**

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836442.1	811906.8	35.0	836016.7	811953.6	18.8	428	-61	-10	3	22
LS2	87.8	836442.1	811906.8	35.0	836016.6	811974.4	18.8	431	-61	-10	3	20
LS3	87.8	836442.1	811906.8	35.0	836027.7	811994.5	18.8	424	-61	-10	3	20
LS4	87.8	836442.1	811906.8	35.0	836039.0	811994.6	18.8	413	-60	-10	3	20
LS5	87.8	836442.1	811906.8	35.0	836050.5	811984.0	18.8	399	-60	-10	3	21
LS6	86.0	836442.1	811906.8	35.0	836060.9	811974.3	18.8	387	-60	-10	3	19
LS7	89.0	836442.1	811906.8	35.0	836073.1	811975.1	18.8	376	-59	-10	3	23
LS8	89.0	836442.1	811906.8	35.0	836085.2	811961.6	18.8	361	-59	-10	3	23
LS9	89.0	836442.1	811906.8	35.0	836096.6	811961.6	18.8	350	-59	-10	3	23
LS10	87.8	836442.1	811906.8	35.0	836106.5	811951.6	18.8	339	-59	-10	3	22
LS11	89.0	836442.1	811906.8	35.0	836102.2	811933.3	18.8	341	-59	-10	3	23
LS12	89.0	836442.1	811906.8	35.0	836094.9	811917.1	18.8	348	-59	-10	3	23
LS13	87.8	836442.1	811906.8	35.0	836097.4	811899.3	18.8	345	-59	-10	3	22
LS14	90.0	836442.1	811906.8	35.0	836072.5	811916.5	18.8	370	-59	-10	3	24
LS15	90.0	836442.1	811906.8	35.0	836061.3	811927.8	18.8	382	-60	-10	3	23
LS16	90.0	836442.1	811906.8	35.0	836039.6	811937.9	18.8	404	-60	-10	3	23
LS17	89.0	836442.1	811906.8	35.0	836028.0	811937.0	18.8	415	-60	-10	3	22
PS1	86.0	836442.1	811906.8	35.0	836052.8	811980.6	15.3	397	-60	-10	3	19
PS2	86.0	836442.1	811906.8	35.0	836067.7	811972.4	15.3	381	-60	-10	3	19
PS3	86.0	836442.1	811906.8	35.0	836077.1	811962.6	15.3	370	-59	-10	3	20
PS4	86.0	836442.1	811906.8	35.0	836087.0	811955.6	15.3	359	-59	-10	3	20
PS5	86.0	836442.1	811906.8	35.0	836092.6	811932.5	15.3	351	-59	-10	3	20
PS6	86.0	836442.1	811906.8	35.0	836090.0	811915.6	15.3	353	-59	-10	3	20
PS7	86.0	836442.1	811906.8	35.0	836076.4	811916.3	15.3	366	-59	-10	3	20
PS9	86.0	836442.1	811906.8	35.0	836059.5	811933.4	15.3	384	-60	-10	3	19
PS11	86.0	836442.1	811906.8	35.0	836037.3	811944.4	15.3	407	-60	-10	3	19
PS13	86.0	836442.1	811906.8	35.0	836016.8	811967.9	15.3	430	-61	-10	3	18
PS15	89.0	836442.1	811906.8	35.0	836049.0	811908.4	18.8	393	-60	-10	3	22
PS16	89.0	836442.1	811906.8	35.0	836009.4	811927.1	18.8	433	-61	-10	3	21
SW1	87.0	836442.1	811906.8	35.0	836020.5	811980.2	15.3	428	-61	-10	3	19
SW2	87.0	836442.1	811906.8	35.0	836025.7	811993.9	15.3	426	-61	-10	3	19
SW3	87.0	836442.1	811906.8	35.0	836037.4	811993.2	15.3	414	-60	-10	3	20
SW4	87.0	836442.1	811906.8	35.0	836049.6	811984.3	15.3	401	-60	-10	3	20
SW5	87.0	836442.1	811906.8	35.0	836058.7	811973.5	15.3	390	-60	-10	3	20
SW6	87.0	836442.1	811906.8	35.0	836095.9	811957.1	15.3	350	-59	-10	3	21
SW7	87.0	836442.1	811906.8	35.0	836100.2	811956.2	15.3	346	-59	-10	3	21
SW8	87.0	836442.1	811906.8	35.0	836102.6	811932.9	15.3	341	-59	-10	3	21
SW9	87.0	836442.1	811906.8	35.0	836100.1	811917.7	15.3	343	-59	-10	3	21
SW10	87.0	836442.1	811906.8	35.0	836093.1	811901.1	15.3	350	-59	-10	3	21
SW11	87.0	836442.1	811906.8	35.0	836054.2	811930.9	18.8	389	-60	-10	3	20
SW12	87.0	836442.1	811906.8	35.0	836055.5	811930.3	18.8	388	-60	-10	3	20
SW13	87.0	836442.1	811906.8	35.0	836056.8	811929.7	18.8	386	-60	-10	3	20
SW14	87.0	836442.1	811906.8	35.0	836058.1	811929.0	18.8	385	-60	-10	3	20
SW15	87.0	836442.1	811906.8	35.0	836059.4	811928.4	18.8	384	-60	-10	3	20
SW16	87.0	836442.1	811906.8	35.0	836102.6	811932.9	18.8	341	-59	-10	3	21
SW17	87.0	836442.1	811906.8	35.0	836102.6	811932.9	18.8	341	-59	-10	3	21
Total SPL											38	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR IV1

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836454.4	811774.9	26.7	836016.7	811953.6	18.8	473	-61	-10	3	21
LS2	87.8	836454.4	811774.9	26.7	836016.6	811974.4	18.8	481	-62	-10	3	19
LS3	87.8	836454.4	811774.9	26.7	836027.7	811994.5	18.8	480	-62	-10	3	19
LS4	87.8	836454.4	811774.9	26.7	836039.0	811994.6	18.8	470	-61	-10	3	19
LS5	87.8	836454.4	811774.9	26.7	836050.5	811984.0	18.8	455	-61	-10	3	20
LS6	86.0	836454.4	811774.9	26.7	836060.9	811974.3	18.8	441	-61	-10	3	18
LS7	89.0	836454.4	811774.9	26.7	836073.1	811975.1	18.8	431	-61	-10	3	21
LS8	89.0	836454.4	811774.9	26.7	836085.2	811961.6	18.8	414	-60	-10	3	22
LS9	89.0	836454.4	811774.9	26.7	836096.6	811961.6	18.8	404	-60	-10	3	22
LS10	87.8	836454.4	811774.9	26.7	836106.5	811951.6	18.8	390	-60	-10	3	21
LS11	89.0	836454.4	811774.9	26.7	836102.2	811933.3	18.8	386	-60	-10	3	22
LS12	89.0	836454.4	811774.9	26.7	836094.9	811917.1	18.8	387	-60	-10	3	22
LS13	87.8	836454.4	811774.9	26.7	836097.4	811899.3	18.8	378	-60	-10	3	21
LS14	90.0	836454.4	811774.9	26.7	836072.5	811916.5	18.8	407	-60	-10	3	23
LS15	90.0	836454.4	811774.9	26.7	836061.3	811927.8	18.8	422	-61	-10	3	22
LS16	90.0	836454.4	811774.9	26.7	836039.6	811937.9	18.8	446	-61	-10	3	22
LS17	89.0	836454.4	811774.9	26.7	836028.0	811937.0	18.8	456	-61	-10	3	21
PS1	86.0	836454.4	811774.9	26.7	836052.8	811980.6	15.3	451	-61	-10	3	18
PS2	86.0	836454.4	811774.9	26.7	836067.7	811972.4	15.3	434	-61	-10	3	18
PS3	86.0	836454.4	811774.9	26.7	836077.1	811962.6	15.3	422	-60	-10	3	19
PS4	86.0	836454.4	811774.9	26.7	836087.0	811955.6	15.3	410	-60	-10	3	19
PS5	86.0	836454.4	811774.9	26.7	836092.6	811932.5	15.3	395	-60	-10	3	19
PS6	86.0	836454.4	811774.9	26.7	836090.0	811915.6	15.3	391	-60	-10	3	19
PS7	86.0	836454.4	811774.9	26.7	836076.4	811916.3	15.3	404	-60	-10	3	19
PS9	86.0	836454.4	811774.9	26.7	836059.5	811933.4	15.3	426	-61	-10	3	18
PS11	86.0	836454.4	811774.9	26.7	836037.3	811944.4	15.3	450	-61	-10	3	18
PS13	86.0	836454.4	811774.9	26.7	836016.8	811967.9	15.3	478	-62	-10	3	17
PS15	89.0	836454.4	811774.9	26.7	836049.0	811908.4	18.8	427	-61	-10	3	21
PS16	89.0	836454.4	811774.9	26.7	836009.4	811927.1	18.8	470	-61	-10	3	21
SW1	87.0	836454.4	811774.9	26.7	836020.5	811980.2	15.3	480	-62	-10	3	18
SW2	87.0	836454.4	811774.9	26.7	836025.7	811993.9	15.3	482	-62	-10	3	18
SW3	87.0	836454.4	811774.9	26.7	836037.4	811993.2	15.3	471	-61	-10	3	19
SW4	87.0	836454.4	811774.9	26.7	836049.6	811984.3	15.3	456	-61	-10	3	19
SW5	87.0	836454.4	811774.9	26.7	836058.7	811973.5	15.3	443	-61	-10	3	19
SW6	87.0	836454.4	811774.9	26.7	836095.9	811957.1	15.3	402	-60	-10	3	20
SW7	87.0	836454.4	811774.9	26.7	836100.2	811956.2	15.3	398	-60	-10	3	20
SW8	87.0	836454.4	811774.9	26.7	836102.6	811932.9	15.3	386	-60	-10	3	20
SW9	87.0	836454.4	811774.9	26.7	836100.1	811917.7	15.3	382	-60	-10	3	20
SW10	87.0	836454.4	811774.9	26.7	836093.1	811901.1	15.3	383	-60	-10	3	20
SW11	87.0	836454.4	811774.9	26.7	836054.2	811930.9	18.8	430	-61	-10	3	19
SW12	87.0	836454.4	811774.9	26.7	836055.5	811930.3	18.8	428	-61	-10	3	19
SW13	87.0	836454.4	811774.9	26.7	836056.8	811929.7	18.8	427	-61	-10	3	19
SW14	87.0	836454.4	811774.9	26.7	836058.1	811929.0	18.8	425	-61	-10	3	19
SW15	87.0	836454.4	811774.9	26.7	836059.4	811928.4	18.8	424	-61	-10	3	19
SW16	87.0	836454.4	811774.9	26.7	836102.6	811932.9	18.8	386	-60	-10	3	20
SW17	87.0	836454.4	811774.9	26.7	836102.6	811932.9	18.8	386	-60	-10	3	20
Total SPL											37	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR OR

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836365.3	812054.5	42.7	836016.7	811953.6	18.8	364	-59	-10	3	24
LS2	87.8	836365.3	812054.5	42.7	836016.6	811974.4	18.8	359	-59	-10	3	22
LS3	87.8	836365.3	812054.5	42.7	836027.7	811994.5	18.8	344	-59	-10	3	22
LS4	87.8	836365.3	812054.5	42.7	836039.0	811994.6	18.8	333	-58	-10	3	22
LS5	87.8	836365.3	812054.5	42.7	836050.5	811984.0	18.8	323	-58	-10	3	23
LS6	86.0	836365.3	812054.5	42.7	836060.9	811974.3	18.8	316	-58	-10	3	21
LS7	89.0	836365.3	812054.5	42.7	836073.1	811975.1	18.8	304	-58	-10	3	24
LS8	89.0	836365.3	812054.5	42.7	836085.2	811961.6	18.8	296	-57	-10	3	25
LS9	89.0	836365.3	812054.5	42.7	836096.6	811961.6	18.8	285	-57	-10	3	25
LS10	87.8	836365.3	812054.5	42.7	836106.5	811951.6	18.8	279	-57	-10	3	24
LS11	89.0	836365.3	812054.5	42.7	836102.2	811933.3	18.8	291	-57	-10	3	25
LS12	89.0	836365.3	812054.5	42.7	836094.9	811917.1	18.8	304	-58	-10	3	24
LS13	87.8	836365.3	812054.5	42.7	836097.4	811899.3	18.8	310	-58	-10	3	23
LS14	90.0	836365.3	812054.5	42.7	836072.5	811916.5	18.8	325	-58	-10	3	25
LS15	90.0	836365.3	812054.5	42.7	836061.3	811927.8	18.8	330	-58	-10	3	25
LS16	90.0	836365.3	812054.5	42.7	836039.6	811937.9	18.8	347	-59	-10	3	24
LS17	89.0	836365.3	812054.5	42.7	836028.0	811937.0	18.8	358	-59	-10	3	23
PS1	86.0	836365.3	812054.5	42.7	836052.8	811980.6	15.3	322	-58	-10	3	21
PS2	86.0	836365.3	812054.5	42.7	836067.7	811972.4	15.3	310	-58	-10	3	21
PS3	86.0	836365.3	812054.5	42.7	836077.1	811962.6	15.3	304	-58	-10	3	21
PS4	86.0	836365.3	812054.5	42.7	836087.0	811955.6	15.3	297	-57	-10	3	22
PS5	86.0	836365.3	812054.5	42.7	836092.6	811932.5	15.3	300	-58	-10	3	21
PS6	86.0	836365.3	812054.5	42.7	836090.0	811915.6	15.3	310	-58	-10	3	21
PS7	86.0	836365.3	812054.5	42.7	836076.4	811916.3	15.3	321	-58	-10	3	21
PS9	86.0	836365.3	812054.5	42.7	836059.5	811933.4	15.3	330	-58	-10	3	21
PS11	86.0	836365.3	812054.5	42.7	836037.3	811944.4	15.3	347	-59	-10	3	20
PS13	86.0	836365.3	812054.5	42.7	836016.8	811967.9	15.3	360	-59	-10	3	20
PS15	89.0	836365.3	812054.5	42.7	836049.0	811908.4	18.8	349	-59	-10	3	23
PS16	89.0	836365.3	812054.5	42.7	836009.4	811927.1	18.8	379	-60	-10	3	22
SW1	87.0	836365.3	812054.5	42.7	836020.5	811980.2	15.3	354	-59	-10	3	21
SW2	87.0	836365.3	812054.5	42.7	836025.7	811993.9	15.3	346	-59	-10	3	21
SW3	87.0	836365.3	812054.5	42.7	836037.4	811993.2	15.3	335	-58	-10	3	22
SW4	87.0	836365.3	812054.5	42.7	836049.6	811984.3	15.3	325	-58	-10	3	22
SW5	87.0	836365.3	812054.5	42.7	836058.7	811973.5	15.3	318	-58	-10	3	22
SW6	87.0	836365.3	812054.5	42.7	836095.9	811957.1	15.3	288	-57	-10	3	23
SW7	87.0	836365.3	812054.5	42.7	836100.2	811956.2	15.3	284	-57	-10	3	23
SW8	87.0	836365.3	812054.5	42.7	836102.6	811932.9	15.3	291	-57	-10	3	23
SW9	87.0	836365.3	812054.5	42.7	836100.1	811917.7	15.3	300	-58	-10	3	22
SW10	87.0	836365.3	812054.5	42.7	836093.1	811901.1	15.3	314	-58	-10	3	22
SW11	87.0	836365.3	812054.5	42.7	836054.2	811930.9	18.8	336	-59	-10	3	21
SW12	87.0	836365.3	812054.5	42.7	836055.5	811930.3	18.8	335	-58	-10	3	22
SW13	87.0	836365.3	812054.5	42.7	836056.8	811929.7	18.8	334	-58	-10	3	22
SW14	87.0	836365.3	812054.5	42.7	836058.1	811929.0	18.8	333	-58	-10	3	22
SW15	87.0	836365.3	812054.5	42.7	836059.4	811928.4	18.8	332	-58	-10	3	22
SW16	87.0	836365.3	812054.5	42.7	836102.6	811932.9	18.8	290	-57	-10	3	23
SW17	87.0	836365.3	812054.5	42.7	836102.6	811932.9	18.8	290	-57	-10	3	23
Total SPL											39	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR HY

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836407.8	811963.9	47.3	836016.7	811953.6	18.8	392	-60	-10	3	23
LS2	87.8	836407.8	811963.9	47.3	836016.6	811974.4	18.8	392	-60	-10	3	21
LS3	87.8	836407.8	811963.9	47.3	836027.7	811994.5	18.8	382	-60	-10	3	21
LS4	87.8	836407.8	811963.9	47.3	836039.0	811994.6	18.8	371	-59	-10	3	21
LS5	87.8	836407.8	811963.9	47.3	836050.5	811984.0	18.8	359	-59	-10	3	22
LS6	86.0	836407.8	811963.9	47.3	836060.9	811974.3	18.8	348	-59	-10	3	20
LS7	89.0	836407.8	811963.9	47.3	836073.1	811975.1	18.8	336	-59	-10	3	23
LS8	89.0	836407.8	811963.9	47.3	836085.2	811961.6	18.8	324	-58	-10	3	24
LS9	89.0	836407.8	811963.9	47.3	836096.6	811961.6	18.8	313	-58	-10	3	24
LS10	87.8	836407.8	811963.9	47.3	836106.5	811951.6	18.8	303	-58	-10	3	23
LS11	89.0	836407.8	811963.9	47.3	836102.2	811933.3	18.8	308	-58	-10	3	24
LS12	89.0	836407.8	811963.9	47.3	836094.9	811917.1	18.8	318	-58	-10	3	24
LS13	87.8	836407.8	811963.9	47.3	836097.4	811899.3	18.8	318	-58	-10	3	23
LS14	90.0	836407.8	811963.9	47.3	836072.5	811916.5	18.8	340	-59	-10	3	24
LS15	90.0	836407.8	811963.9	47.3	836061.3	811927.8	18.8	350	-59	-10	3	24
LS16	90.0	836407.8	811963.9	47.3	836039.6	811937.9	18.8	370	-59	-10	3	24
LS17	89.0	836407.8	811963.9	47.3	836028.0	811937.0	18.8	382	-60	-10	3	22
PS1	86.0	836407.8	811963.9	47.3	836052.8	811980.6	15.3	357	-59	-10	3	20
PS2	86.0	836407.8	811963.9	47.3	836067.7	811972.4	15.3	342	-59	-10	3	20
PS3	86.0	836407.8	811963.9	47.3	836077.1	811962.6	15.3	332	-58	-10	3	21
PS4	86.0	836407.8	811963.9	47.3	836087.0	811955.6	15.3	322	-58	-10	3	21
PS5	86.0	836407.8	811963.9	47.3	836092.6	811932.5	15.3	318	-58	-10	3	21
PS6	86.0	836407.8	811963.9	47.3	836090.0	811915.6	15.3	323	-58	-10	3	21
PS7	86.0	836407.8	811963.9	47.3	836076.4	811916.3	15.3	336	-59	-10	3	20
PS9	86.0	836407.8	811963.9	47.3	836059.5	811933.4	15.3	351	-59	-10	3	20
PS11	86.0	836407.8	811963.9	47.3	836037.3	811944.4	15.3	372	-59	-10	3	20
PS13	86.0	836407.8	811963.9	47.3	836016.8	811967.9	15.3	392	-60	-10	3	19
PS15	89.0	836407.8	811963.9	47.3	836049.0	811908.4	18.8	364	-59	-10	3	23
PS16	89.0	836407.8	811963.9	47.3	836009.4	811927.1	18.8	401	-60	-10	3	22
SW1	87.0	836407.8	811963.9	47.3	836020.5	811980.2	15.3	389	-60	-10	3	20
SW2	87.0	836407.8	811963.9	47.3	836025.7	811993.9	15.3	385	-60	-10	3	20
SW3	87.0	836407.8	811963.9	47.3	836037.4	811993.2	15.3	373	-59	-10	3	21
SW4	87.0	836407.8	811963.9	47.3	836049.6	811984.3	15.3	360	-59	-10	3	21
SW5	87.0	836407.8	811963.9	47.3	836058.7	811973.5	15.3	351	-59	-10	3	21
SW6	87.0	836407.8	811963.9	47.3	836095.9	811957.1	15.3	314	-58	-10	3	22
SW7	87.0	836407.8	811963.9	47.3	836100.2	811956.2	15.3	309	-58	-10	3	22
SW8	87.0	836407.8	811963.9	47.3	836102.6	811932.9	15.3	308	-58	-10	3	22
SW9	87.0	836407.8	811963.9	47.3	836100.1	811917.7	15.3	313	-58	-10	3	22
SW10	87.0	836407.8	811963.9	47.3	836093.1	811901.1	15.3	322	-58	-10	3	22
SW11	87.0	836407.8	811963.9	47.3	836054.2	811930.9	18.8	356	-59	-10	3	21
SW12	87.0	836407.8	811963.9	47.3	836055.5	811930.3	18.8	355	-59	-10	3	21
SW13	87.0	836407.8	811963.9	47.3	836056.8	811929.7	18.8	354	-59	-10	3	21
SW14	87.0	836407.8	811963.9	47.3	836058.1	811929.0	18.8	353	-59	-10	3	21
SW15	87.0	836407.8	811963.9	47.3	836059.4	811928.4	18.8	351	-59	-10	3	21
SW16	87.0	836407.8	811963.9	47.3	836102.6	811932.9	18.8	308	-58	-10	3	22
SW17	87.0	836407.8	811963.9	47.3	836102.6	811932.9	18.8	308	-58	-10	3	22
Total SPL											39	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.

NSR MV

Noise Source	Sound Power Level (SWL), dB(A)	NSR Coordinate			Noise Source Coordinate			Slant Distance (m)	Correction, dB(A)			Corrected Sound Pressure Level, SPL, dB(A)
		X	Y	Z	X	Y	Z		Distance	Barrier	Façade	
LS1	90.0	836268.0	811592.8	107.2	836016.7	811953.6	18.8	449	-61	0	3	32
LS2	87.8	836268.0	811592.8	107.2	836016.6	811974.4	18.8	465	-61	0	3	29
LS3	87.8	836268.0	811592.8	107.2	836027.7	811994.5	18.8	476	-62	0	3	29
LS4	87.8	836268.0	811592.8	107.2	836039.0	811994.6	18.8	471	-61	0	3	29
LS5	87.8	836268.0	811592.8	107.2	836050.5	811984.0	18.8	456	-61	0	3	30
LS6	86.0	836268.0	811592.8	107.2	836060.9	811974.3	18.8	443	-61	0	3	28
LS7	89.0	836268.0	811592.8	107.2	836073.1	811975.1	18.8	438	-61	0	3	31
LS8	89.0	836268.0	811592.8	107.2	836085.2	811961.6	18.8	421	-60	0	3	32
LS9	89.0	836268.0	811592.8	107.2	836096.6	811961.6	18.8	416	-60	0	3	32
LS10	87.8	836268.0	811592.8	107.2	836106.5	811951.6	18.8	403	-60	0	3	31
LS11	89.0	836268.0	811592.8	107.2	836102.2	811933.3	18.8	389	-60	0	3	32
LS12	89.0	836268.0	811592.8	107.2	836094.9	811917.1	18.8	378	-60	0	3	32
LS13	87.8	836268.0	811592.8	107.2	836097.4	811899.3	18.8	362	-59	0	3	32
LS14	90.0	836268.0	811592.8	107.2	836072.5	811916.5	18.8	388	-60	0	3	33
LS15	90.0	836268.0	811592.8	107.2	836061.3	811927.8	18.8	403	-60	0	3	33
LS16	90.0	836268.0	811592.8	107.2	836039.6	811937.9	18.8	423	-61	0	3	32
LS17	89.0	836268.0	811592.8	107.2	836028.0	811937.0	18.8	429	-61	0	3	31
PS1	86.0	836268.0	811592.8	107.2	836052.8	811980.6	15.3	453	-61	0	3	28
PS2	86.0	836268.0	811592.8	107.2	836067.7	811972.4	15.3	439	-61	0	3	28
PS3	86.0	836268.0	811592.8	107.2	836077.1	811962.6	15.3	426	-61	0	3	28
PS4	86.0	836268.0	811592.8	107.2	836087.0	811955.6	15.3	416	-60	0	3	29
PS5	86.0	836268.0	811592.8	107.2	836092.6	811932.5	15.3	393	-60	0	3	29
PS6	86.0	836268.0	811592.8	107.2	836090.0	811915.6	15.3	380	-60	0	3	29
PS7	86.0	836268.0	811592.8	107.2	836076.4	811916.3	15.3	387	-60	0	3	29
PS9	86.0	836268.0	811592.8	107.2	836059.5	811933.4	15.3	410	-60	0	3	29
PS11	86.0	836268.0	811592.8	107.2	836037.3	811944.4	15.3	430	-61	0	3	28
PS13	86.0	836268.0	811592.8	107.2	836016.8	811967.9	15.3	461	-61	0	3	28
PS15	89.0	836268.0	811592.8	107.2	836049.0	811908.4	18.8	394	-60	0	3	32
PS16	89.0	836268.0	811592.8	107.2	836009.4	811927.1	18.8	432	-61	0	3	31
SW1	87.0	836268.0	811592.8	107.2	836020.5	811980.2	15.3	469	-61	0	3	29
SW2	87.0	836268.0	811592.8	107.2	836025.7	811993.9	15.3	478	-62	0	3	28
SW3	87.0	836268.0	811592.8	107.2	836037.4	811993.2	15.3	471	-61	0	3	29
SW4	87.0	836268.0	811592.8	107.2	836049.6	811984.3	15.3	458	-61	0	3	29
SW5	87.0	836268.0	811592.8	107.2	836058.7	811973.5	15.3	444	-61	0	3	29
SW6	87.0	836268.0	811592.8	107.2	836095.9	811957.1	15.3	413	-60	0	3	30
SW7	87.0	836268.0	811592.8	107.2	836100.2	811956.2	15.3	411	-60	0	3	30
SW8	87.0	836268.0	811592.8	107.2	836102.6	811932.9	15.3	389	-60	0	3	30
SW9	87.0	836268.0	811592.8	107.2	836100.1	811917.7	15.3	377	-60	0	3	30
SW10	87.0	836268.0	811592.8	107.2	836093.1	811901.1	15.3	366	-59	0	3	31
SW11	87.0	836268.0	811592.8	107.2	836054.2	811930.9	18.8	410	-60	0	3	30
SW12	87.0	836268.0	811592.8	107.2	836055.5	811930.3	18.8	408	-60	0	3	30
SW13	87.0	836268.0	811592.8	107.2	836056.8	811929.7	18.8	407	-60	0	3	30
SW14	87.0	836268.0	811592.8	107.2	836058.1	811929.0	18.8	406	-60	0	3	30
SW15	87.0	836268.0	811592.8	107.2	836059.4	811928.4	18.8	405	-60	0	3	30
SW16	87.0	836268.0	811592.8	107.2	836102.6	811932.9	18.8	388	-60	0	3	30
SW16	87.0	836268.0	811592.8	107.2	836102.6	811932.9	18.8	388	-60	0	3	30
Total SPL											47	

Remark: With reference to the Noise Review 2020, a barrier correction of -10 dB(A) is added when there is no direct line-of-sight between the NSR and the noise source.



APPENDIX 4.1 PSEM SCHEDULE FOR UPDATED *SOTO*

Measured SEL for PSEM - Based on Noise Review 2010

Type	PSEM	Measured Maximum SEL per PSEM, dB(A)	Measurement Distance, m
1	Mines	95	10
2	Mines, crackle/crackling	93	31.6
3	Comets	93	10

Time	PSEM Item	Type of PSEM	Position	No. of PSEM at launching pad			Adopted SEL, dB(A)			Measurement Distance, m
							Locations of PSEM launching pad			
				P1	P2	P3	P1	P2	P3	
3:18	3 x 1s Mine Gold Glitter	1	1-2-3	1	1	1	95	95	95	10
4:04	3 x 1s Mine Gold Glitter	1	1-2-3	1	1	1	95	95	95	10
4:20	1 x 1s Comet - Red	3	2	--	1	--	--	93	--	10
4:24	2 x 1s Comet - Red	3	1-3	1	--	1	93	--	93	10
4:25	3 x 1s Comet - Red	3	1-2-3	1	1	1	93	93	93	10
4:32	3 x 1s Comet - Red	3	1-2-3	1	1	1	93	93	93	10
5:08	4 x 1s Comet - Blue Tail	3	1-2-3	1	2	1	93	96	93	10
5:42	3 x 1s Comet - Blue Tail	3	1-2-3	1	1	1	93	93	93	10
6:26	4 x 1s Mine - Blue and Green	1	1-2-3	1	2	1	95	98	95	10
7:39	4 x 1s Mine - Red	1	1-2-3	1	2	1	95	98	95	10
7:46	4 x 1s Mine - Red	1	1-3	2	--	2	98	--	98	10
8:23	3 x 1s Comet - Gold Glitter Tail	3	1-2-3	1	1	1	93	93	93	10
10:26	3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	1	1	1	93	93	93	10
11:44	3 x 1s Mine - Gold Glitter	1	1-2-3	1	1	1	95	95	95	10
12:01	1 x 1s shot Mine - Blue	1	2	--	1	--	--	95	--	10
12:04	1 x 1s shot Mine - Blue	1	3	--	--	1	--	--	95	10
12:07	1 x 1s shot Mine - Blue	1	1	1	--	--	95	--	--	10
12:08	1 x 1s shot Mine - Blue	1	3	--	--	1	--	--	95	10
12:12	1 x 1s shot Mine - Blue	1	2	--	1	--	--	95	--	10
12:13	1 x 1s shot Mine - Blue	1	1	1	--	--	95	--	--	10
12:16	1 x 1s Mine - Multicolour	1	2	--	1	--	--	95	--	10
12:19	1 x 1s Mine - Multicolour	1	1	1	--	--	95	--	--	10
12:21	1 x 1s Mine - Multicolour	1	3	--	--	1	--	--	95	10
12:23	1 x 1s Mine - Red	1	1	1	--	--	95	--	--	10
12:25	1 x 1s Mine - Red	1	3	--	--	1	--	--	95	10
12:27	1 x 1s Mine - Red	1	2	--	1	--	--	95	--	10
12:29	2 x 1s Comet - Gold Glitter Tail	3	2	--	2	--	--	96	--	10
12:31	4 x 1s Comet - Blue Tail	3	1-2-3	1	2	1	93	96	93	10
12:46	3 x 1s shot Mine - Blue	1	1-2-3	1	1	1	95	95	95	10
12:55	3 x 1s Mine - Blue and Green	1	1-2-3	1	1	1	95	95	95	10
12:56	2 x 1s Mine - Blue and Green	1	1-2	1	1	--	95	95	--	10
12:57	2 x 1s Mine - Blue and Green	1	2-3	--	1	1	--	95	95	10
12:58	1 x 1s Mine - Blue and Green	1	1	1	--	--	95	--	--	10
12:59	3 x 1s Comet - Blue	3	1-2-3	1	1	1	93	93	93	10
13:00	4 x 1s Comet - Blue	3	1-2-3	1	2	1	93	96	93	10
13:01	6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	2	2	2	96	96	96	10
13:02	6 x 1s Mine - Multicolour	1	1-2-3	2	2	2	98	98	98	10
	3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	1	1	1	93	93	93	31.6
	7 x 1s Comet - Gold Glitter Tail	3	1-2-3	2	3	2	96	98	96	10

Remarks:

When there are more than one PSEM being launched at the same time at the same launching pad, the adopted SEL would be calculated by including appropriate corrections to the measured SEL per PSEM based on the number of PSEM being launched at the same time

For example, two Type 1 mines are being launched at launching pad P1 at 7:46. The adopted SEL at launching pad P1 at 7:46 would be $95 \times 2 = 98$ dB(A)



APPENDIX 4.2 CALCULATION FOR PSEM NOISE IMPACT ASSESSMENT

Calculation of SEL at Noise Sensitive Receiver

NSR:

PTS1

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			202	185	162
Distance Correction^b, dB(A)			-26	-25	-24
Distance Correction^c, dB(A)			-16	-15	-14
Barrier Attenuation (Dz)^d, dB(A)			-12	-16	-19
Barrier Attenuation (Dz)^e, dB(A)			-7	-5	-6
3 x 1s Mine Gold Glitter	1	1-2-3	60	56	55
3 x 1s Mine Gold Glitter	1	1-2-3	60	56	55
1 x 1s Comet - Red	3	2	--	54	--
2 x 1s Comet - Red	3	1-3	58	--	53
3 x 1s Comet - Red	3	1-2-3	58	54	53
3 x 1s Comet - Red	3	1-2-3	58	54	53
4 x 1s Comet - Blue Tail	3	1-2-3	58	57	53
3 x 1s Comet - Blue Tail	3	1-2-3	58	54	53
4 x 1s Mine - Blue and Green	1	1-2-3	60	59	55
4 x 1s Mine - Red	1	1-2-3	60	59	55
4 x 1s Mine - Red	1	1-3	63	--	58
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	58	54	53
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	58	54	53
3 x 1s Mine - Gold Glitter	1	1-2-3	60	56	55
1 x 1s shot Mine - Blue	1	2	--	56	--
1 x 1s shot Mine - Blue	1	3	--	--	55
1 x 1s shot Mine - Blue	1	1	60	--	--
1 x 1s shot Mine - Blue	1	3	--	--	55
1 x 1s shot Mine - Blue	1	2	--	56	--
1 x 1s shot Mine - Blue	1	1	60	--	--
1 x 1s Mine - Multicolour	1	2	--	56	--
1 x 1s Mine - Multicolour	1	1	60	--	--
1 x 1s Mine - Multicolour	1	3	--	--	55
1 x 1s Mine - Red	1	1	60	--	--
1 x 1s Mine - Red	1	3	--	--	55
1 x 1s Mine - Red	1	2	--	56	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	57	--
4 x 1s Comet - Blue Tail	3	1-2-3	58	57	53
3 x 1s shot Mine - Blue	1	1-2-3	60	56	55
3 x 1s Mine - Blue and Green	1	1-2-3	60	56	55
2 x 1s Mine - Blue and Green	1	1-2	60	56	--
2 x 1s Mine - Blue and Green	1	2-3	--	56	55
1 x 1s Mine - Blue and Green	1	1	60	--	--
3 x 1s Comet - Blue	3	1-2-3	58	54	53
4 x 1s Comet - Blue	3	1-2-3	58	57	53
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	61	57	56
6 x 1s Mine - Multicolour	1	1-2-3	63	59	58
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	73	76	75
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	61	59	56
SEL from each launching pad, dB(A)			77	77	76
Total SEL, dB(A)			82		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

SW2

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			308	309	316
Distance Correction^b, dB(A)			-30	-30	-30
Distance Correction^c, dB(A)			-20	-20	-20
Barrier Attenuation (Dz)^d, dB(A)			-19	-19	-19
Barrier Attenuation (Dz)^e, dB(A)			-8	-8	-9
3 x 1s Mine Gold Glitter	1	1-2-3	49	49	49
3 x 1s Mine Gold Glitter	1	1-2-3	49	49	49
1 x 1s Comet - Red	3	2	--	47	--
2 x 1s Comet - Red	3	1-3	47	--	47
3 x 1s Comet - Red	3	1-2-3	47	47	47
3 x 1s Comet - Red	3	1-2-3	47	47	47
4 x 1s Comet - Blue Tail	3	1-2-3	47	50	47
3 x 1s Comet - Blue Tail	3	1-2-3	47	47	47
4 x 1s Mine - Blue and Green	1	1-2-3	49	52	49
4 x 1s Mine - Red	1	1-2-3	49	52	49
4 x 1s Mine - Red	1	1-3	52	--	52
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	47	47	47
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	47	47	47
3 x 1s Mine - Gold Glitter	1	1-2-3	49	49	49
1 x 1s shot Mine - Blue	1	2	--	49	--
1 x 1s shot Mine - Blue	1	3	--	--	49
1 x 1s shot Mine - Blue	1	1	49	--	--
1 x 1s shot Mine - Blue	1	3	--	--	49
1 x 1s shot Mine - Blue	1	2	--	49	--
1 x 1s shot Mine - Blue	1	1	49	--	--
1 x 1s Mine - Multicolour	1	2	--	49	--
1 x 1s Mine - Multicolour	1	1	49	--	--
1 x 1s Mine - Multicolour	1	3	--	--	49
1 x 1s Mine - Red	1	1	49	--	--
1 x 1s Mine - Red	1	3	--	--	49
1 x 1s Mine - Red	1	2	--	49	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	50	--
4 x 1s Comet - Blue Tail	3	1-2-3	47	50	47
3 x 1s shot Mine - Blue	1	1-2-3	49	49	49
3 x 1s Mine - Blue and Green	1	1-2-3	49	49	49
2 x 1s Mine - Blue and Green	1	1-2	49	49	--
2 x 1s Mine - Blue and Green	1	2-3	--	49	49
1 x 1s Mine - Blue and Green	1	1	49	--	--
3 x 1s Comet - Blue	3	1-2-3	47	47	47
4 x 1s Comet - Blue	3	1-2-3	47	50	47
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	50	50	50
6 x 1s Mine - Multicolour	1	1-2-3	52	52	52
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	68	68	67
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	50	52	50
SEL from each launching pad, dB(A)			69	69	68
Total SEL, dB(A)			74		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
 = Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

HA

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			252	262	279
Distance Correction^b, dB(A)			-28	-28	-29
Distance Correction^c, dB(A)			-18	-18	-19
Barrier Attenuation (Dz)^d, dB(A)			-7	-18	-17
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	63	51	52
3 x 1s Mine Gold Glitter	1	1-2-3	63	51	52
1 x 1s Comet - Red	3	2	--	49	--
2 x 1s Comet - Red	3	1-3	61	--	50
3 x 1s Comet - Red	3	1-2-3	61	49	50
3 x 1s Comet - Red	3	1-2-3	61	49	50
4 x 1s Comet - Blue Tail	3	1-2-3	61	52	50
3 x 1s Comet - Blue Tail	3	1-2-3	61	49	50
4 x 1s Mine - Blue and Green	1	1-2-3	63	54	52
4 x 1s Mine - Red	1	1-2-3	63	54	52
4 x 1s Mine - Red	1	1-3	66	--	55
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	61	49	50
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	61	49	50
3 x 1s Mine - Gold Glitter	1	1-2-3	63	51	52
1 x 1s shot Mine - Blue	1	2	--	51	--
1 x 1s shot Mine - Blue	1	3	--	--	52
1 x 1s shot Mine - Blue	1	1	63	--	--
1 x 1s shot Mine - Blue	1	3	--	--	52
1 x 1s shot Mine - Blue	1	2	--	51	--
1 x 1s shot Mine - Blue	1	1	63	--	--
1 x 1s Mine - Multicolour	1	2	--	51	--
1 x 1s Mine - Multicolour	1	1	63	--	--
1 x 1s Mine - Multicolour	1	3	--	--	52
1 x 1s Mine - Red	1	1	63	--	--
1 x 1s Mine - Red	1	3	--	--	52
1 x 1s Mine - Red	1	2	--	51	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	52	--
4 x 1s Comet - Blue Tail	3	1-2-3	61	52	50
3 x 1s shot Mine - Blue	1	1-2-3	63	51	52
3 x 1s Mine - Blue and Green	1	1-2-3	63	51	52
2 x 1s Mine - Blue and Green	1	1-2	63	51	--
2 x 1s Mine - Blue and Green	1	2-3	--	51	52
1 x 1s Mine - Blue and Green	1	1	63	--	--
3 x 1s Comet - Blue	3	1-2-3	61	49	50
4 x 1s Comet - Blue	3	1-2-3	61	52	50
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	64	52	53
6 x 1s Mine - Multicolour	1	1-2-3	66	54	55
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	78	78	77
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	64	54	53
SEL from each launching pad, dB(A)			80	78	77
Total SEL, dB(A)			84		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

CV2

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			260	275	297
Distance Correction^b, dB(A)			-28	-29	-29
Distance Correction^c, dB(A)			-18	-19	-19
Barrier Attenuation (Dz)^d, dB(A)			-16	-16	-14
Barrier Attenuation (Dz)^e, dB(A)			-5	-5	-5
3 x 1s Mine Gold Glitter	1	1-2-3	53	54	55
3 x 1s Mine Gold Glitter	1	1-2-3	53	54	55
1 x 1s Comet - Red	3	2	--	52	--
2 x 1s Comet - Red	3	1-3	51	--	53
3 x 1s Comet - Red	3	1-2-3	51	52	53
3 x 1s Comet - Red	3	1-2-3	51	52	53
4 x 1s Comet - Blue Tail	3	1-2-3	51	55	53
3 x 1s Comet - Blue Tail	3	1-2-3	51	52	53
4 x 1s Mine - Blue and Green	1	1-2-3	53	57	55
4 x 1s Mine - Red	1	1-2-3	53	57	55
4 x 1s Mine - Red	1	1-3	56	--	58
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	51	52	53
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	51	52	53
3 x 1s Mine - Gold Glitter	1	1-2-3	53	54	55
1 x 1s shot Mine - Blue	1	2	--	54	--
1 x 1s shot Mine - Blue	1	3	--	--	55
1 x 1s shot Mine - Blue	1	1	53	--	--
1 x 1s shot Mine - Blue	1	3	--	--	55
1 x 1s shot Mine - Blue	1	2	--	54	--
1 x 1s shot Mine - Blue	1	1	53	--	--
1 x 1s Mine - Multicolour	1	2	--	54	--
1 x 1s Mine - Multicolour	1	1	53	--	--
1 x 1s Mine - Multicolour	1	3	--	--	55
1 x 1s Mine - Red	1	1	53	--	--
1 x 1s Mine - Red	1	3	--	--	55
1 x 1s Mine - Red	1	2	--	54	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	55	--
4 x 1s Comet - Blue Tail	3	1-2-3	51	55	53
3 x 1s shot Mine - Blue	1	1-2-3	53	54	55
3 x 1s Mine - Blue and Green	1	1-2-3	53	54	55
2 x 1s Mine - Blue and Green	1	1-2	53	54	--
2 x 1s Mine - Blue and Green	1	2-3	--	54	55
1 x 1s Mine - Blue and Green	1	1	53	--	--
3 x 1s Comet - Blue	3	1-2-3	51	52	53
4 x 1s Comet - Blue	3	1-2-3	51	55	53
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	54	55	56
6 x 1s Mine - Multicolour	1	1-2-3	56	57	58
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	73	72	72
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	54	56	56
SEL from each launching pad, dB(A)			74	74	73
Total SEL, dB(A)			78		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

XC

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			364	380	403
Distance Correction^b, dB(A)			-31	-32	-32
Distance Correction^c, dB(A)			-21	-22	-22
Barrier Attenuation (Dz)^d, dB(A)			-5	-5	-5
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	62	62	61
3 x 1s Mine Gold Glitter	1	1-2-3	62	62	61
1 x 1s Comet - Red	3	2	--	60	--
2 x 1s Comet - Red	3	1-3	60	--	59
3 x 1s Comet - Red	3	1-2-3	60	60	59
3 x 1s Comet - Red	3	1-2-3	60	60	59
4 x 1s Comet - Blue Tail	3	1-2-3	60	63	59
3 x 1s Comet - Blue Tail	3	1-2-3	60	60	59
4 x 1s Mine - Blue and Green	1	1-2-3	62	65	61
4 x 1s Mine - Red	1	1-2-3	62	65	61
4 x 1s Mine - Red	1	1-3	65	--	64
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	60	60	59
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	60	60	59
3 x 1s Mine - Gold Glitter	1	1-2-3	62	62	61
1 x 1s shot Mine - Blue	1	2	--	62	--
1 x 1s shot Mine - Blue	1	3	--	--	61
1 x 1s shot Mine - Blue	1	1	62	--	--
1 x 1s shot Mine - Blue	1	3	--	--	61
1 x 1s shot Mine - Blue	1	2	--	62	--
1 x 1s shot Mine - Blue	1	1	62	--	--
1 x 1s Mine - Multicolour	1	2	--	62	--
1 x 1s Mine - Multicolour	1	1	62	--	--
1 x 1s Mine - Multicolour	1	3	--	--	61
1 x 1s Mine - Red	1	1	62	--	--
1 x 1s Mine - Red	1	3	--	--	61
1 x 1s Mine - Red	1	2	--	62	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	63	--
4 x 1s Comet - Blue Tail	3	1-2-3	60	63	59
3 x 1s shot Mine - Blue	1	1-2-3	62	62	61
3 x 1s Mine - Blue and Green	1	1-2-3	62	62	61
2 x 1s Mine - Blue and Green	1	1-2	62	62	--
2 x 1s Mine - Blue and Green	1	2-3	--	62	61
1 x 1s Mine - Blue and Green	1	1	62	--	--
3 x 1s Comet - Blue	3	1-2-3	60	60	59
4 x 1s Comet - Blue	3	1-2-3	60	63	59
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	63	63	62
6 x 1s Mine - Multicolour	1	1-2-3	65	65	64
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	75	74	74
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	63	64	62
SEL from each launching pad, dB(A)			79	78	78
Total SEL, dB(A)			83		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

IV1

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			411	428	451
Distance Correction^b, dB(A)			-32	-33	-33
Distance Correction^c, dB(A)			-22	-23	-23
Barrier Attenuation (Dz)^d, dB(A)			-5	-5	-5
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	61	60	60
3 x 1s Mine Gold Glitter	1	1-2-3	61	60	60
1 x 1s Comet - Red	3	2	--	58	--
2 x 1s Comet - Red	3	1-3	59	--	58
3 x 1s Comet - Red	3	1-2-3	59	58	58
3 x 1s Comet - Red	3	1-2-3	59	58	58
4 x 1s Comet - Blue Tail	3	1-2-3	59	61	58
3 x 1s Comet - Blue Tail	3	1-2-3	59	58	58
4 x 1s Mine - Blue and Green	1	1-2-3	61	63	60
4 x 1s Mine - Red	1	1-2-3	61	63	60
4 x 1s Mine - Red	1	1-3	64	--	63
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	59	58	58
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	59	58	58
3 x 1s Mine - Gold Glitter	1	1-2-3	61	60	60
1 x 1s shot Mine - Blue	1	2	--	60	--
1 x 1s shot Mine - Blue	1	3	--	--	60
1 x 1s shot Mine - Blue	1	1	61	--	--
1 x 1s shot Mine - Blue	1	3	--	--	60
1 x 1s shot Mine - Blue	1	2	--	60	--
1 x 1s shot Mine - Blue	1	1	61	--	--
1 x 1s Mine - Multicolour	1	2	--	60	--
1 x 1s Mine - Multicolour	1	1	61	--	--
1 x 1s Mine - Multicolour	1	3	--	--	60
1 x 1s Mine - Red	1	1	61	--	--
1 x 1s Mine - Red	1	3	--	--	60
1 x 1s Mine - Red	1	2	--	60	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	61	--
4 x 1s Comet - Blue Tail	3	1-2-3	59	61	58
3 x 1s shot Mine - Blue	1	1-2-3	61	60	60
3 x 1s Mine - Blue and Green	1	1-2-3	61	60	60
2 x 1s Mine - Blue and Green	1	1-2	61	60	--
2 x 1s Mine - Blue and Green	1	2-3	--	60	60
1 x 1s Mine - Blue and Green	1	1	61	--	--
3 x 1s Comet - Blue	3	1-2-3	59	58	58
4 x 1s Comet - Blue	3	1-2-3	59	61	58
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	62	61	61
6 x 1s Mine - Multicolour	1	1-2-3	64	63	63
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	74	73	73
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	62	63	61
SEL from each launching pad, dB(A)			77	77	76
Total SEL, dB(A)			82		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

OR

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			305	318	338
Distance Correction^b, dB(A)			-30	-30	-31
Distance Correction^c, dB(A)			-20	-20	-21
Barrier Attenuation (Dz)^d, dB(A)			-9	-6	0
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	60	62	67
3 x 1s Mine Gold Glitter	1	1-2-3	60	62	67
1 x 1s Comet - Red	3	2	--	60	--
2 x 1s Comet - Red	3	1-3	58	--	65
3 x 1s Comet - Red	3	1-2-3	58	60	65
3 x 1s Comet - Red	3	1-2-3	58	60	65
4 x 1s Comet - Blue Tail	3	1-2-3	58	63	65
3 x 1s Comet - Blue Tail	3	1-2-3	58	60	65
4 x 1s Mine - Blue and Green	1	1-2-3	60	65	67
4 x 1s Mine - Red	1	1-2-3	60	65	67
4 x 1s Mine - Red	1	1-3	63	--	70
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	58	60	65
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	58	60	65
3 x 1s Mine - Gold Glitter	1	1-2-3	60	62	67
1 x 1s shot Mine - Blue	1	2	--	62	--
1 x 1s shot Mine - Blue	1	3	--	--	67
1 x 1s shot Mine - Blue	1	1	60	--	--
1 x 1s shot Mine - Blue	1	3	--	--	67
1 x 1s shot Mine - Blue	1	2	--	62	--
1 x 1s shot Mine - Blue	1	1	60	--	--
1 x 1s Mine - Multicolour	1	2	--	62	--
1 x 1s Mine - Multicolour	1	1	60	--	--
1 x 1s Mine - Multicolour	1	3	--	--	67
1 x 1s Mine - Red	1	1	60	--	--
1 x 1s Mine - Red	1	3	--	--	67
1 x 1s Mine - Red	1	2	--	62	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	63	--
4 x 1s Comet - Blue Tail	3	1-2-3	58	63	65
3 x 1s shot Mine - Blue	1	1-2-3	60	62	67
3 x 1s Mine - Blue and Green	1	1-2-3	60	62	67
2 x 1s Mine - Blue and Green	1	1-2	60	62	--
2 x 1s Mine - Blue and Green	1	2-3	--	62	67
1 x 1s Mine - Blue and Green	1	1	60	--	--
3 x 1s Comet - Blue	3	1-2-3	58	60	65
4 x 1s Comet - Blue	3	1-2-3	58	63	65
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	61	63	68
6 x 1s Mine - Multicolour	1	1-2-3	63	65	70
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	76	76	75
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	61	65	68
SEL from each launching pad, dB(A)			78	79	82
Total SEL, dB(A)			85		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

HY

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			329	344	367
Distance Correction^b, dB(A)			-30	-31	-31
Distance Correction^c, dB(A)			-20	-21	-21
Barrier Attenuation (Dz)^d, dB(A)			-11	-10	-8
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	56	57	59
3 x 1s Mine Gold Glitter	1	1-2-3	56	57	59
1 x 1s Comet - Red	3	2	--	55	--
2 x 1s Comet - Red	3	1-3	54	--	57
3 x 1s Comet - Red	3	1-2-3	54	55	57
3 x 1s Comet - Red	3	1-2-3	54	55	57
4 x 1s Comet - Blue Tail	3	1-2-3	54	58	57
3 x 1s Comet - Blue Tail	3	1-2-3	54	55	57
4 x 1s Mine - Blue and Green	1	1-2-3	56	60	59
4 x 1s Mine - Red	1	1-2-3	56	60	59
4 x 1s Mine - Red	1	1-3	59	--	62
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	54	55	57
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	54	55	57
3 x 1s Mine - Gold Glitter	1	1-2-3	56	57	59
1 x 1s shot Mine - Blue	1	2	--	57	--
1 x 1s shot Mine - Blue	1	3	--	--	59
1 x 1s shot Mine - Blue	1	1	56	--	--
1 x 1s shot Mine - Blue	1	3	--	--	59
1 x 1s shot Mine - Blue	1	2	--	57	--
1 x 1s shot Mine - Blue	1	1	56	--	--
1 x 1s Mine - Multicolour	1	2	--	57	--
1 x 1s Mine - Multicolour	1	1	56	--	--
1 x 1s Mine - Multicolour	1	3	--	--	59
1 x 1s Mine - Red	1	1	56	--	--
1 x 1s Mine - Red	1	3	--	--	59
1 x 1s Mine - Red	1	2	--	57	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	58	--
4 x 1s Comet - Blue Tail	3	1-2-3	54	58	57
3 x 1s shot Mine - Blue	1	1-2-3	56	57	59
3 x 1s Mine - Blue and Green	1	1-2-3	56	57	59
2 x 1s Mine - Blue and Green	1	1-2	56	57	--
2 x 1s Mine - Blue and Green	1	2-3	--	57	59
1 x 1s Mine - Blue and Green	1	1	56	--	--
3 x 1s Comet - Blue	3	1-2-3	54	55	57
4 x 1s Comet - Blue	3	1-2-3	54	58	57
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	57	58	60
6 x 1s Mine - Multicolour	1	1-2-3	59	60	62
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	75	75	75
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	57	60	60
SEL from each launching pad, dB(A)			77	77	77
Total SEL, dB(A)			82		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Calculation of SEL at Noise Sensitive Receiver

NSR:

MV

PSEM Item	Type of PSEM	Position	Corrected SEL ^a , dB(A)		
			Locations of Launching Pad		
			P1	P2	P3
Slant Distance between NSR and Launching Pad (d2), m			412	426	440
Distance Correction^b, dB(A)			-32	-33	-33
Distance Correction^c, dB(A)			-22	-23	-23
Barrier Attenuation (Dz)^d, dB(A)			0	0	0
Barrier Attenuation (Dz)^e, dB(A)			0	0	0
3 x 1s Mine Gold Glitter	1	1-2-3	66	65	65
3 x 1s Mine Gold Glitter	1	1-2-3	66	65	65
1 x 1s Comet - Red	3	2	--	63	--
2 x 1s Comet - Red	3	1-3	64	--	63
3 x 1s Comet - Red	3	1-2-3	64	63	63
3 x 1s Comet - Red	3	1-2-3	64	63	63
4 x 1s Comet - Blue Tail	3	1-2-3	64	66	63
3 x 1s Comet - Blue Tail	3	1-2-3	64	63	63
4 x 1s Mine - Blue and Green	1	1-2-3	66	68	65
4 x 1s Mine - Red	1	1-2-3	66	68	65
4 x 1s Mine - Red	1	1-3	69	--	68
3 x 1s Comet - Gold Glitter Tail	3	1-2-3	64	63	63
3 x 1s Comet - Twilight Glitter Tail	3	1-2-3	64	63	63
3 x 1s Mine - Gold Glitter	1	1-2-3	66	65	65
1 x 1s shot Mine - Blue	1	2	--	65	--
1 x 1s shot Mine - Blue	1	3	--	--	65
1 x 1s shot Mine - Blue	1	1	66	--	--
1 x 1s shot Mine - Blue	1	3	--	--	65
1 x 1s shot Mine - Blue	1	2	--	65	--
1 x 1s shot Mine - Blue	1	1	66	--	--
1 x 1s Mine - Multicolour	1	2	--	65	--
1 x 1s Mine - Multicolour	1	1	66	--	--
1 x 1s Mine - Multicolour	1	3	--	--	65
1 x 1s Mine - Red	1	1	66	--	--
1 x 1s Mine - Red	1	3	--	--	65
1 x 1s Mine - Red	1	2	--	65	--
2 x 1s Comet - Gold Glitter Tail	3	2	--	66	--
4 x 1s Comet - Blue Tail	3	1-2-3	64	66	63
3 x 1s shot Mine - Blue	1	1-2-3	66	65	65
3 x 1s Mine - Blue and Green	1	1-2-3	66	65	65
2 x 1s Mine - Blue and Green	1	1-2	66	65	--
2 x 1s Mine - Blue and Green	1	2-3	--	65	65
1 x 1s Mine - Blue and Green	1	1	66	--	--
3 x 1s Comet - Blue	3	1-2-3	64	63	63
4 x 1s Comet - Blue	3	1-2-3	64	66	63
6 x 1s Comet - Twilight Glitter Tail	3	1-2-3	67	66	66
6 x 1s Mine - Multicolour	1	1-2-3	69	68	68
3 x 1s Mine - Silver Delayed Crackle	2	1-2-3	74	73	73
7 x 1s Comet - Gold Glitter Tail	3	1-2-3	67	68	66
SEL from each launching pad, dB(A)			81	81	80
Total SEL, dB(A)			85		

Notes:

^a Corrected SEL = Sub-total SEL + distance correction + façade correction + barrier attenuation
= Sub-total SEL + 20log(d1/d2) + 3 + Dz

^b Distance correction for all types of PSEM except Type 2

^c Distance correction for mines with crackle/crackling, i.e. Type 2 PSEM

^d Barrier attenuation for all types of PSEM except Type 2

^e Barrier attenuation for mines with crackle/crackling, i.e. Type 2 PSEM

Summary of Predicted SEL at NSRs

NSR	Predicted SEL at NSRs, dB(A)	Noise Criteria, SEL _{Total} , dB(A) ^a
PTS1	82	85
SW2	74	85
HA	84	85
CV2	78	85
XC	83	85
IV1	82	85
OR	85	85
HY	82	85
MV	85	85

Note:

^a To obtain $L_{eq, 15min}$ 55 dB(A) at the NSR from the PSEM display, the total maximum SEL from all PSEM will be:

$$\begin{aligned} SEL_{Total} &= L_{eq, 15min} 55 \text{ dB(A)} + 10 \log (15 \times 60 \text{ sec} / 1 \text{ sec}) \\ &= 55 + 10 \log (900 \text{ sec} / 1 \text{ sec}) \\ &= 85 \text{ dB(A)} \text{ at the nearest NSR} \end{aligned}$$



APPENDIX 4.3 BARRIER ATTENUATION FOR PSEM
NOISE IMPACT ASSESSMENT

Calculation of Barrier Attenuation for PSEM Types 1 & 3

The noise levels at the identified NSRs were predicted based on equation 1 below:

$$\text{SPL} = \text{SWL} - 20 \log (D) - 8 + 3 + D_z \text{ ----- equation 1}$$

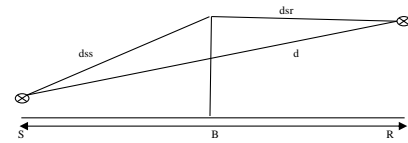
Where

SPL = Sound Pressure Level

SWL = Sound Power Level

D = Distance between the noise sources and identified NSRs

D_z = Barrier Attenuation, in accordance with ISO 9613-2 (see equation 2)



$$D_z = 10 \log [3 + C_2 / l C_3 z K_{met}] \text{ ----- equation 2}$$

Where

$C_2 = 20$, includes effects of ground reflection

l = wavelength, $l_{500\text{Hz}} = 0.69\text{m}$

$C_3 = 1$, for single diffraction

z = path length difference = $d_{ss} + d_{sr} - d$

$K_{met} = \exp [-(1/2000) (d_{ss} d_{sr} d / 2z)^{1/2}]$ for $z > 0$

$K_{met} = 1$ for $z < 0$

NSR PTS1

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	16.2	16.2	16.2
SB =	95	80	50
RB =	107	105	112
SR =	202	185	162
Barrier Ht =	20.8	24.9	24.9
dss =	96	82	53
dsr =	107	105	112
d =	202	185	162
z =	0.791	1.945	2.909
	0.791	1.945	2.909
tan a	0.135	0.211	0.338
tan b	0.041	0.044	0.051
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.56	0.73	0.82
$20/0.69 * z * K_{met}$	12.94	40.97	68.83
Dz	12.02	16.43	18.56
	-12	-16	-19

NSR SW2

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	11.2	11.2	11.2
SB =	40	40	38
RB =	268	269	278
SR =	308	309	316
Barrier Ht =	24.9	24.9	24.9
dss =	43	43	42
dsr =	269	269	279
d =	308	309	316
z =	3.756	3.756	3.909
	3.756	3.756	3.909
tan a	0.423	0.423	0.445
tan b	0.010	0.010	0.010
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.71	0.71	0.71
$20/0.69 * z * K_{met}$	77.02	76.95	80.47
Dz	19.03	19.03	19.22
	-19	-19	-19

NSR HA

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	29.2	29.2	29.2
SB =	60	35	45
RB =	192	227	234
SR =	252	262	279
Barrier Ht =	18.0	24.9	24.9
dss =	61	39	48
dsr =	192	227	234
d =	253	262	279
z =	0.264	3.049	2.303
	0.264	3.049	2.303
tan a	0.167	0.483	0.376
tan b	0.084	0.081	0.076
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.31	0.74	0.66
$20/0.69 * z * K_{met}$	2.34	64.98	44.18
Dz	7.28	18.32	16.74
	-7	-18	-17

NSR CV2

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	29.7	29.7	29.7
SB =	115	130	160
RB =	145	145	137
SR =	260	275	297
Barrier Ht =	35.0	35.0	35.0
dss =	118	133	162
dsr =	145	146	137
d =	261	276	298
z =	2.321	2.017	1.574
	2.321	2.017	1.574
tan a	0.235	0.208	0.169
tan b	0.083	0.079	0.073
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.61	0.56	0.48
20/0.69*z*Kmet	41.14	32.90	22.05
Dz	16.45	15.55	13.99
	-16	-16	-14

NSR XC

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	35.0	35.0	35.0
SB =	160	180	200
RB =	204	200	203
SR =	364	380	403
Barrier Ht =	22.0	22.0	22.0
dss =	161	181	200
dsr =	204	201	203
d =	365	381	404
z =	0.025	0.008	0.002
	0.025	0.008	0.002
tan a	0.088	0.078	0.070
tan b	0.074	0.071	0.067
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.00	0.00	0.00
20/0.69*z*Kmet	0.00	0.00	0.00
Dz	4.77	4.77	4.77
	-5	-5	-5

NSR IV1

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	26.7	26.7	26.7
SB =	200	200	200
RB =	211	228	251
SR =	411	428	451
Barrier Ht =	23.6	23.6	23.6
dss =	201	201	201
dsr =	211	228	251
d =	411	429	451
z =	0.205	0.221	0.239
	0.205	0.221	0.239
tan a	0.078	0.078	0.078
tan b	0.046	0.044	0.042
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.04	0.04	0.03
20/0.69*z*Kmet	0.23	0.23	0.22
Dz	5.09	5.09	5.08
	-5	-5	-5

NSR OR

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	42.7	42.7	42.7
SB =	95	120	140
RB =	210	198	198
SR =	305	318	338
Barrier Ht =	27.0	27.0	18.0
dss =	97	121	140
dsr =	211	199	199
d =	307	320	339
z =	0.502	0.229	0.116
	0.502	0.229	-0.116
tan a	0.200	0.158	0.071
tan b	0.114	0.109	0.103
shadow or illuminated	S	S	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.29	0.13	1.00
20/0.69*z*Kmet	4.16	0.85	-3.35
Dz	8.55	5.85	0.00
	-9	-6	0

NSR HY

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	47.3	47.3	47.3
SB =	120	130	160
RB =	209	214	207
SR =	329	344	367
Barrier Ht =	35.0	35.0	35.0
dss =	123	133	162
dsr =	209	215	207
d =	331	347	369
z =	1.022	0.892	0.527
	1.022	0.892	0.527
tan a	0.225	0.208	0.169
tan b	0.119	0.114	0.107
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.36	0.31	0.18
20/0.69*z*Kmet	10.67	7.97	2.76
Dz	11.36	10.40	7.60
	-11	-10	-8

NSR MV

	P1	P2	P3
Source H =	8.0	8.0	8.0
Rec Ht =	107.2	107.2	107.2
SB =	190	210	250
RB =	222	216	190
SR =	412	426	440
Barrier Ht =	40.5	40.5	40.5
dss =	193	213	252
dsr =	232	226	202
d =	424	437	451
z =	0.792	1.175	2.415
	-0.792	-1.175	-2.415
tan a	0.171	0.155	0.130
tan b	0.241	0.233	0.225
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-22.95	-34.06	-70.00
Dz	0.00	0.00	0.00
	0	0	0

Calculation of Barrier Attenuation for PSEM Type 2

The noise levels at the identified NSRs were predicted based on equation 1 below:

$$\text{SPL} = \text{SWL} - 20 \log (D) - 8 + 3 + D_z \text{ ----- equation 1}$$

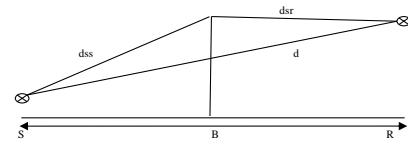
Where

SPL = Sound Pressure Level

SWL = Sound Power Level

D = Distance between the noise sources and identified NSRs

D_z = Barrier Attenuation, in accordance with ISO 9613-2 (see equation 2)



$$D_z = 10 \log [3 + C_2 / I C_3 z K_{met}] \text{ ----- equation 2}$$

Where

$C_2 = 20$, includes effects of ground reflection

I = wavelength, $I_{500\text{Hz}} = 0.69\text{m}$

$C_3 = 1$, for single diffraction

z = path length difference = $d_{ss} + d_{sr} - d$

$K_{met} = \exp [-(1/2000) (d_{ss} d_{sr} d / 2z)^{1/2}]$ for $z > 0$

$K_{met} = 1$ for $z < 0$

NSR PTS1

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	16.2	16.2	16.2
SB =	95	80	50
RB =	107	105	112
SR =	202	185	162
Barrier Ht =	20.8	24.9	24.9
dss =	96	80	51
dsr =	107	105	112
d =	203	185	163
z =	0.181	0.007	0.120
	0.181	0.007	0.120
tan a	-0.128	-0.101	-0.162
tan b	0.083	0.091	0.104
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.30	0.01	0.37
$20/0.69 * z * K_{met}$	1.59	0.00	1.30
Dz	6.62	4.77	6.34
	-7	-5	-6

NSR SW2

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	11.2	11.2	11.2
SB =	40	40	38
RB =	268	269	278
SR =	308	309	316
Barrier Ht =	24.9	24.9	24.9
dss =	41	41	39
dsr =	269	269	279
d =	309	310	317
z =	0.392	0.393	0.440
	0.392	0.393	0.440
tan a	-0.203	-0.203	-0.213
tan b	0.071	0.071	0.069
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.35	0.35	0.37
$20/0.69 * z * K_{met}$	4.01	4.02	4.76
Dz	8.46	8.46	8.90
	-8	-8	-9

NSR HA

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	29.2	29.2	29.2
SB =	60	35	45
RB =	192	227	234
SR =	252	262	279
Barrier Ht =	18.0	24.9	24.9
dss =	62	36	46
dsr =	192	227	234
d =	252	262	279
z =	2.144	0.938	0.737
	-2.144	-0.938	-0.737
tan a	-0.250	-0.231	-0.180
tan b	0.015	0.015	0.014
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
$20/0.69 * z * K_{met}$	-62.15	-27.20	-21.36
Dz	0.00	0.00	0.00
	0	0	0

NSR CV2

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	29.7	29.7	29.7
SB =	115	130	160
RB =	145	145	137
SR =	260	275	297
Barrier Ht =	35.0	35.0	35.0
dss =	115	130	160
dsr =	145	146	137
d =	260	275	297
z =	0.093	0.092	0.096
	0.093	0.092	0.096
tan a	0.017	0.015	0.013
tan b	0.013	0.012	0.011
shadow or illuminated	S	S	S
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	0.09	0.07	0.05
20/0.69*z*Kmet	0.24	0.19	0.15
Dz	5.11	5.03	4.99
	-5	-5	-5

NSR XC

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	35.0	35.0	35.0
SB =	160	180	200
RB =	204	200	203
SR =	364	380	403
Barrier Ht =	22.0	22.0	22.0
dss =	160	180	200
dsr =	204	201	203
d =	364	380	403
z =	0.787	0.752	0.713
	-0.787	-0.752	-0.713
tan a	-0.069	-0.061	-0.055
tan b	0.006	0.005	0.005
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-22.81	-21.80	-20.68
Dz	0.00	0.00	0.00
	0	0	0

NSR IV1

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	26.7	26.7	26.7
SB =	200	200	200
RB =	211	228	251
SR =	411	428	451
Barrier Ht =	23.6	23.6	23.6
dss =	200	200	200
dsr =	211	228	251
d =	411	428	451
z =	0.195	0.195	0.196
	-0.195	-0.195	-0.196
tan a	-0.047	-0.047	-0.047
tan b	0.015	0.015	0.014
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-5.66	-5.67	-5.68
Dz	0.00	0.00	0.00
	0	0	0

NSR OR

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	42.7	42.7	42.7
SB =	95	120	140
RB =	210	198	198
SR =	305	318	338
Barrier Ht =	27.0	27.0	18.0
dss =	95	120	141
dsr =	211	199	199
d =	306	318	338
z =	0.620	0.624	2.199
	-0.620	-0.624	-2.199
tan a	-0.063	-0.050	-0.107
tan b	0.032	0.031	0.029
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-17.97	-18.08	-63.74
Dz	0.00	0.00	0.00
	0	0	0

NSR HY

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	47.3	47.3	47.3
SB =	120	130	160
RB =	209	214	207
SR =	329	344	367
Barrier Ht =	35.0	35.0	35.0
dss =	120	130	160
dsr =	209	215	207
d =	329	345	367
z =	0.068	0.071	0.100
	-0.068	-0.071	-0.100
tan a	0.017	0.015	0.013
tan b	0.043	0.042	0.039
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-1.96	-2.06	-2.89
Dz	0.16	0.00	0.00
	0	0	0

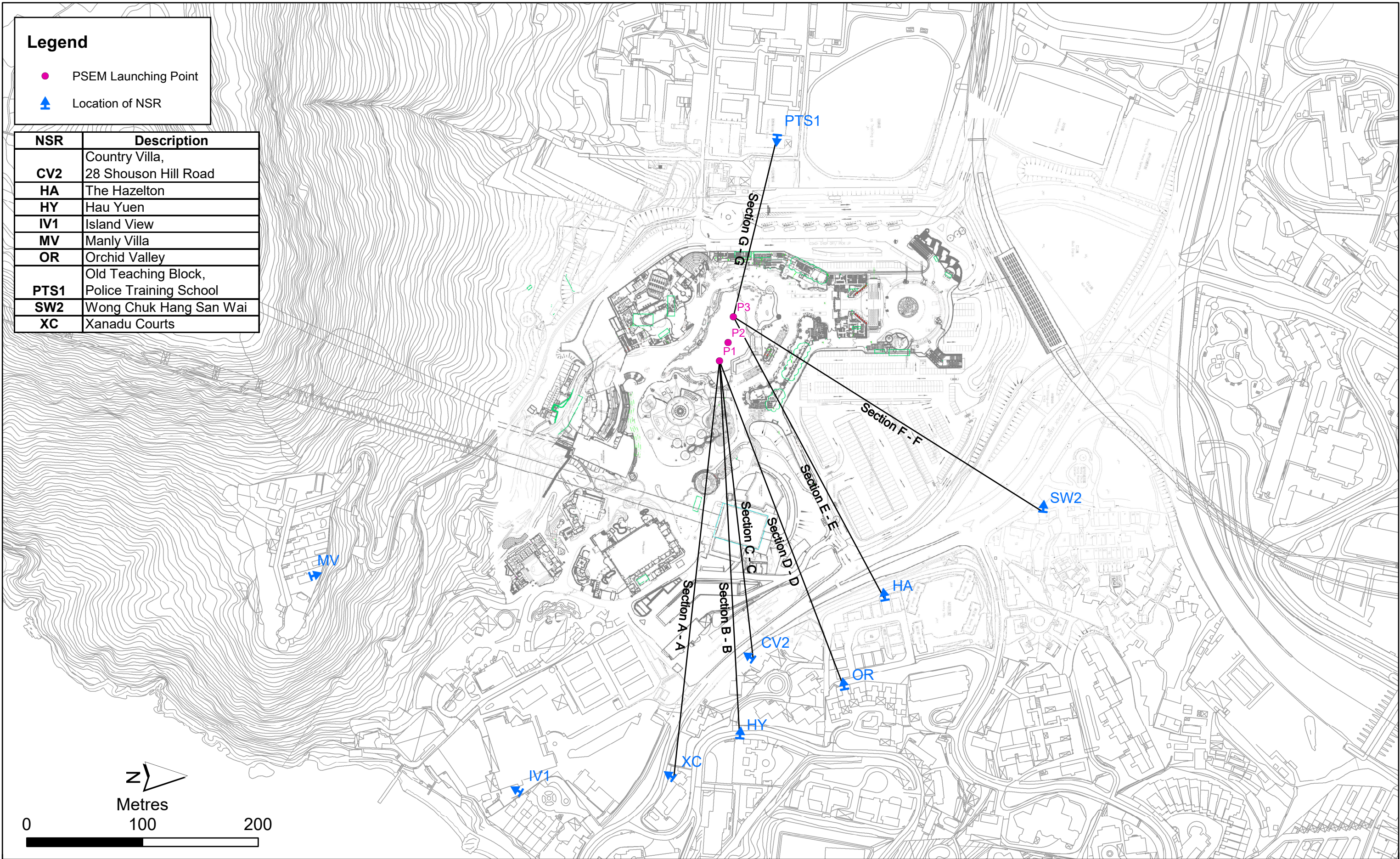
NSR MV

	P1	P2	P3
Source H =	33.0	33.0	33.0
Rec Ht =	107.2	107.2	107.2
SB =	190	210	250
RB =	222	216	190
SR =	412	426	440
Barrier Ht =	40.5	40.5	40.5
dss =	190	210	250
dsr =	232	226	202
d =	418	432	447
z =	3.329	3.798	5.251
	-3.329	-3.798	-5.251
tan a	0.039	0.036	0.030
tan b	0.180	0.174	0.168
shadow or illuminated	I	I	I
Wavelength, 500Hz	0.69	0.69	0.69
Kmet	1.00	1.00	1.00
20/0.69*z*Kmet	-96.49	-110.09	-152.21
Dz	0.00	0.00	0.00
	0	0	0

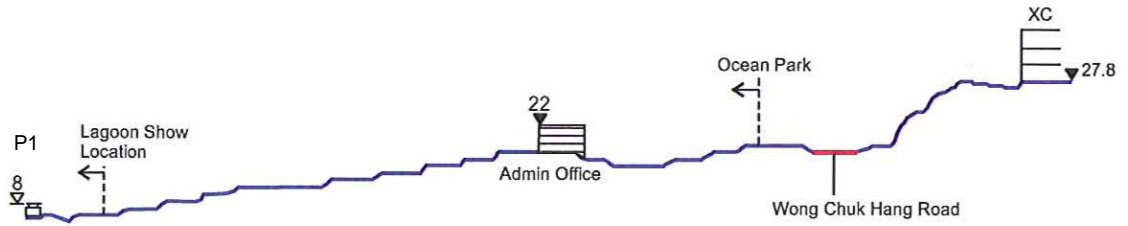
Legend

- PSEM Launching Point
- ▲ Location of NSR

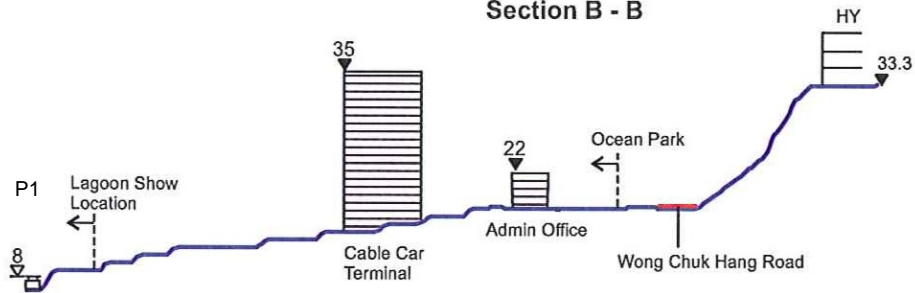
NSR	Description
CV2	Country Villa, 28 Shouson Hill Road
HA	The Hazelton
HY	Hau Yuen
IV1	Island View
MV	Manly Villa
OR	Orchid Valley
PTS1	Old Teaching Block, Police Training School
SW2	Wong Chuk Hang San Wai
XC	Xanadu Courts



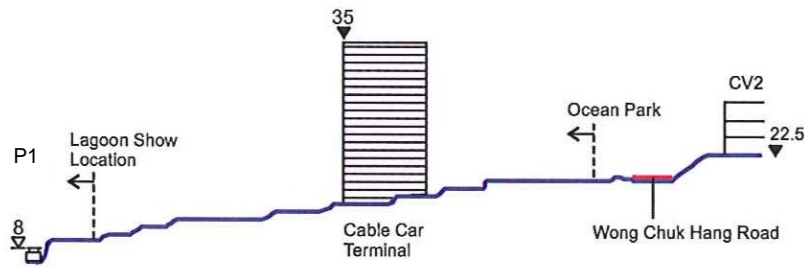
Section A - A



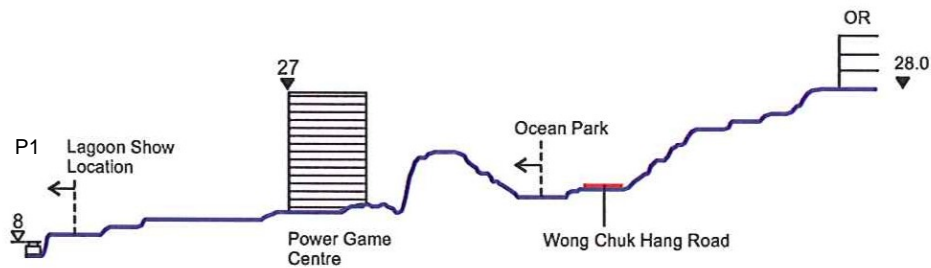
Section B - B



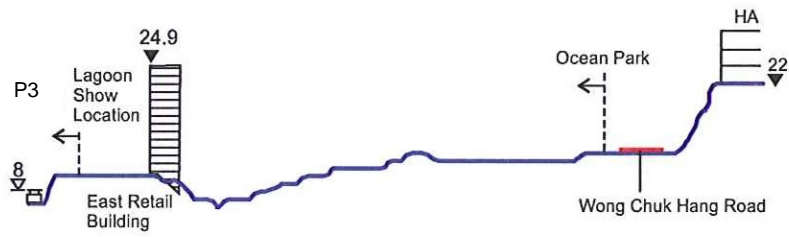
Section C - C



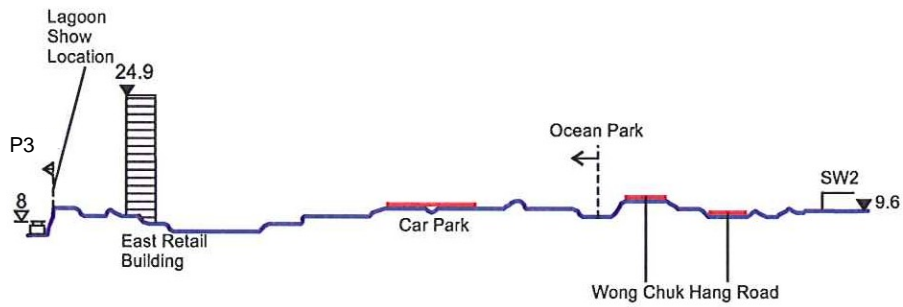
Section D - D



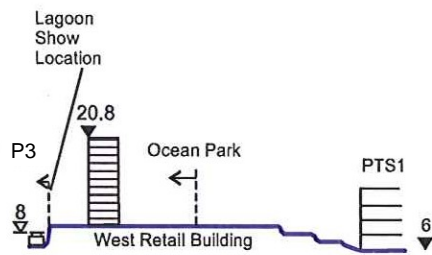
Section E - E

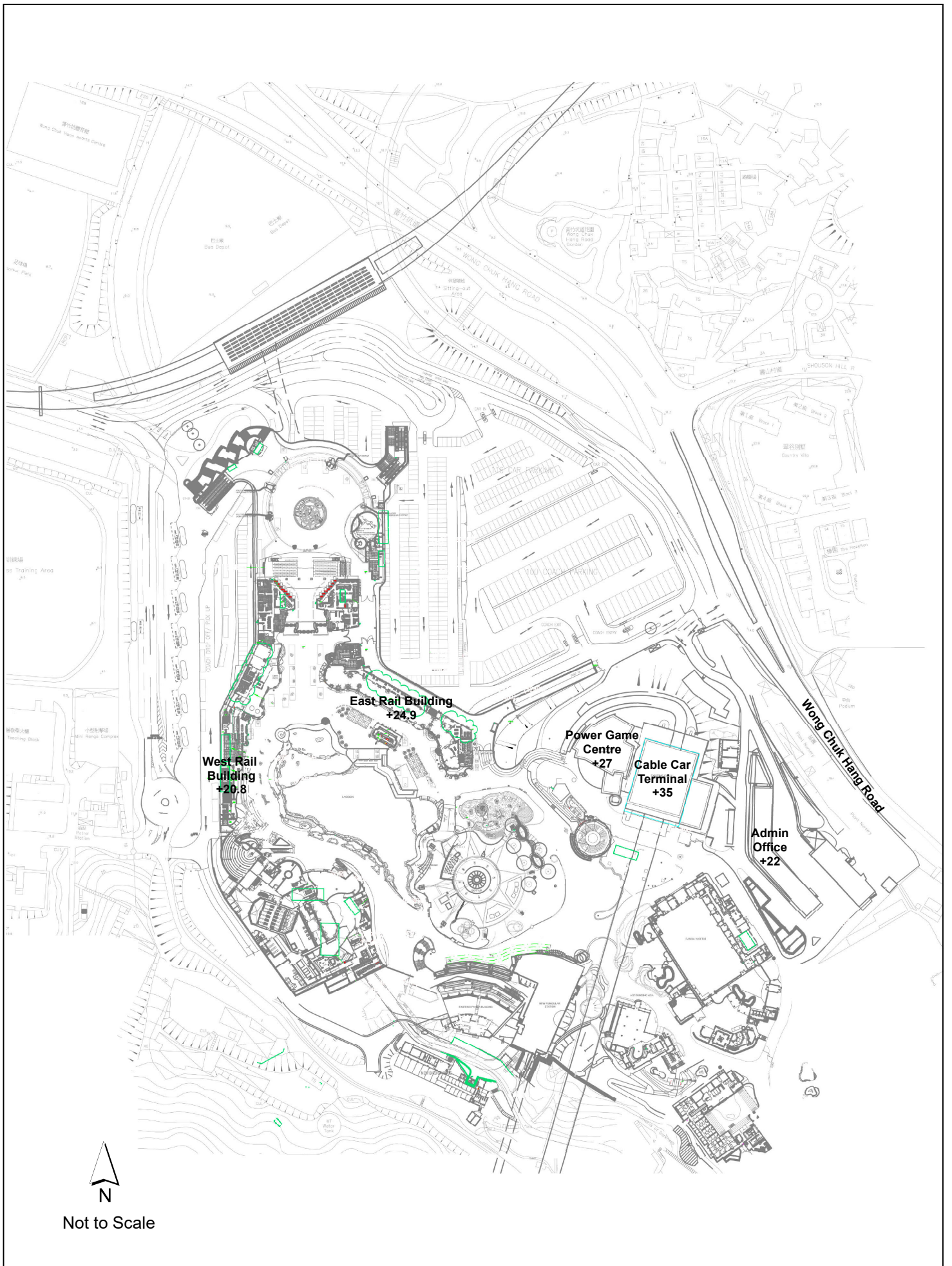


Section F - F



Section G - G





Appendix 4.3

Layout Plan of the Lagoon and the nearby Buildings





APPENDIX 5.1 SUMMARY OF CUMULATIVE NOISE
LEVELS (FIXED PLANT NOISE +
ENTERTAINMENT NOISE + PSEM NOISE)
AT NSRS

Summary of Cumulative Noise Levels at NSRs

Fixed plant noise + Entertainment noise + PSEM noise

NSR	PSEM Noise		Fixed plant + Entertainment noise (loudspeaker noise only)	Fixed plant + Entertainment noise (loudspeaker & PSEM noise)	Noise Criteria, $L_{eq, 30min}$ dB(A)
	Predicted SEL, dB(A)	Calculated $L_{eq, 30min}$ dB(A)			
PTS1	82	49	57	57	60
SW2	74	41	52	52	60
HA	84	51	54	56	60
CV2	78	46	54	54	60
XC	83	50	52	55	60
IV1	82	49	52	54	60
OR	85	53	51	55	55
HY	82	49	53	54	55
MV	85	53	54	56	56



ERM HAS OVER 160 OFFICES ACROSS THE FOLLOWING COUNTRIES AND TERRITORIES WORLDWIDE

Argentina	The Netherlands
Australia	New Zealand
Belgium	Peru
Brazil	Poland
Canada	Portugal
China	Puerto Rico
Colombia	Romania
France	Senegal
Germany	Singapore
Ghana	South Africa
Guyana	South Korea
Hong Kong	Spain
India	Switzerland
Indonesia	Taiwan
Ireland	Tanzania
Italy	Thailand
Japan	UAE
Kazakhstan	UK
Kenya	US
Malaysia	Vietnam
Mexico	
Mozambique	

ERM Hong Kong

2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong

T: +852 2271 3000

F: +852 3015 8052

www.erm.com