Nighttime Spectacular in Hong Kong Disneyland

Environmental Review Report

15 July 2021

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15 July 2021

Nighttime Spectacular in Hong Kong Disneyland

Environmental Review Report

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1. INTRODUCTION

1.1 Background

A night-time spectacular with revised fireworks displays (the revised Show) will be hosted by the Hong Kong Disneyland Management Limited (HKDML) in the Theme Park at Lantau Island upon the completion of the new castle under its multi-year expansion plan. The layout of the Theme Park and updated launching area for the revised Show are presented in *Figure 1.1*.

The potential environmental impacts of the fireworks have been assessed and presented in the approved Environmental Impact Assessment (EIA) Report for *Construction of an International Theme Park in Penny's Bay of North Lantau and it's Essential Associated Infrastructures* (Register No.: AEIAR-032/2000) (the approved EIA Report), and a Further Environmental Permit (FEP-01/059/2000) was granted on 21 July 2000. FEP-01/059/2000 was replaced by EP-01/059/2000/C on 25 October 2012. Under the requirement of Condition 3.6, "…… *Any changes to the details or design of the fireworks displays shall be reviewed by the ET Leader and deposited with the Director*."

ERM-Hong Kong, Limited (ERM) was appointed by HKDML to undertake an environmental review to demonstrate that no adverse environmental impacts will arise from the revised Show based on the proposed changes in the design and other relevant details provided by HKDML.

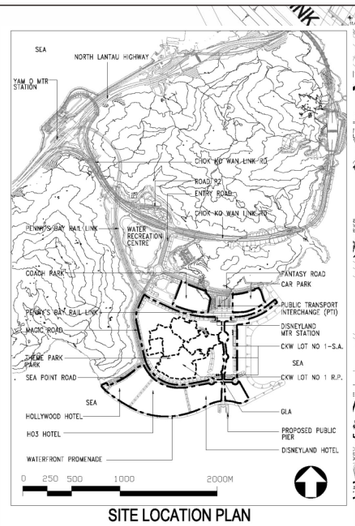
1.2 Purpose of this Report

The objective of this Environmental Review Report (ERR) is to review the likely environmental impacts assessed in the approved EIA Report and the *Revised EIA Review Report* approved in June 2005 (ERR 2005) based on the proposed changes in the design of the revised Show. It also provides recommendations as to whether any modification and/or refinement of proposed mitigation measures and monitoring and audits requirements are needed.

1.3 Structure of this Report

The remainder of this Report is set out as follows:

- *Section 2* describes the proposed variations;
- *Section 3* provides details of air quality impact assessment;
- *Section 4* provides details of noise impact assessment;
- *Section 5* summarises updated environmental monitoring and audit (EM&A) requirements, if any; and
- *Section 6* provides the conclusion of the environmental review.



SITE LOCATION PLAN

Figure 1.1

Fireworks Launching Area

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2. PROPOSED VARIATIONS AND ASSOCIATED ENVIRONMENTAL ISSUES

2.1 Proposed Variations

A comparison between the revised Show and the fireworks displays assessed in the ERR 2005 are summarised in *Table 2.1*.

Table 2.1: Comparison between the Revised Show and the Fireworks Displays assessed in the ERR 2005

	Key Item	Previous fireworks displays (ERR 2005)	Revised Show
1.	Show time	Around 20 minutes	No change
2.	Shell products	Shell products were used	Shell products will not be used
3.	Launching area	Fireworks products and pyro were launched from a launching area at the back of house, from the castle and the rooftop of adjacent buildings.	The existing launching area at the back of house was demolished. All pyro will only be launched from the original castle and adjacent rooftop launching sites, as well as several new launching sites on the new portion of the castle (at the rear side).
4.	Number of products	Maximum nos. of 670 and 456 in the air quality and noise impact assessments, respectively.	Maximum nos. of 550 with quieter pyro products have been selected.
5.	Maximum height	Maximum +140 mPD	Maximum +120 mPD, ie lowered by about 20m.
6.	Total Net Explosive Quantity (NEQ) and black powder	■ About 165kg ■ 41% as black powder	■ 62.5kg, ie about 102kg less ■ No black powder

2.2 Key Environmental Issues Associated with the Proposed Changes

2.2.1 Air Quality

With regards to the proposed changes to the firework displays as presented in *Table 2.1*, the air quality impact due to the revised Show may be different from that of the previous fireworks displays as assessed in the ERR 2005. The air quality impact assessment presented in the ERR 2005 has been reviewed, taking into account the proposed changes. Details of the air quality impact assessment are given in *Section 3*.

2.2.2 Noise

A quantitative noise impact assessment has been prepared based on the product inventory and noise data provided by the Design Team from the US for the revised Show. Details are given in *Section 4*.

2.2.3 Hazard

As per Sections 10.6.4 and 10.6.5 of the approved EIA Report, the minor blast or project effects associated with fireworks and pyrotechnics referred to the blast and debris inherent in the functioning of the device. Also, Hazard Division 1.4 fireworks and pyrotechnics articles included the smaller calibre and non projectile types (including small diameter shells). Substances and articles of Division 1.4 presented only a small hazard in the event of initiation or ignition. The effects would largely be confined to the package and no projection of fragments of appreciable range or size is to be

expected. Even an external fire would not cause virtually instantaneous explosion of almost the entire contents of the package.

As such, the hazard assessment of dangerous goods (fireworks, sodium hypochlorite) has assessed the risks associated with the following facilities and activities associated with fireworks:

- Transport accidents leading to fire/ explosion of fireworks cargo on vehicle;
- Fire/ explosion in fireworks storage; and
- Fireworks shell landing/ bursting near spectators within the Theme Park or public road (assessment for the risk associated with landing/ bursting near spectators was limited to shell products only in the approved EIA Report, ie excluding impact from pyros as potential risk from pyros was considered to be insignificant)

As confirmed by HKDML and by the Design Team from the US, there is no change in the requirements given in the *Hazard Management Plan* prepared under Condition 3.12 of the EP, and also no change in the assumptions made in the approved EIA Report and ERR 2005 in terms of the locations of firework stores, storage inventory, transport route, transport quantity and frequency and procedures for removal of aerial products.

Similarly, there is no change in the assumptions made in the approved EIA Report in terms of location of sodium hypochlorite stores, storage inventory, transport route, transport quantity and frequency.

Also, shell products will not be used for the revised Show and only same type of (1.4G) products as in the previous show will be used for the revised Show. The risks levels due to the storage, use, transport, handling and processing of dangerous goods (fireworks and sodium hypochlorite) evaluated in the approved EIA Report remain valid, and the hazard to life in terms of individual risk and societal risk are expected to be lower than those predicted in the approved EIA Report and in compliance with the risk criteria stipulated in Section 2 of Annex 4 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM).

As mentioned in Table 2.1, all pyro will only be launched from the original castle and adjacent rooftop launching sites, as well as several new launching sites on the new portion of the castle, ie at the rear side. As the new launching locations are located at the rear side at the back of the castle, they are located further away from the audiences and hence will not pose an increased risk to the audiences.

The requirements given in the Hazards Management Plan that are applicable to pyros will continue to be implemented for the revised Show. Major requirements include full compliance with the *Dangerous Goods Ordinance* and Home Affair Bureau's Fireworks Permits, safety measures at the launch locations, quality control of fireworks vendor, locations and requirements of discharge and storage sites, capacity of the storage, emergency and contingency plans, and transportation requirements.

With the implementation of the requirements given in the Hazards Management Plan, no adverse risk impact is anticipated from the revised Show.

2.2.4 Water Quality

The spent fireworks will be collected immediately after the completion of the firework displays and disposed of in accordance with the *Waste Management Plan* (WMP) for the operational stage approved under Condition 3.21 of the EP to prevent adverse impacts to water quality from the discharge of fireworks residue. No adverse water quality impact is therefore expected.

2.2.5 Waste Management

The remains of fireworks may contain heavy metals in low concentration and mid-level fireworks remains may contain dioxins furans which is anticipated to be similar to the assumption made in the approved EIA Report and ERR 2005. All fireworks remains will be treated as chemical waste and stabilised, if necessary, with cement to avoid the hazards and potential environmental impacts

associated with the disposal of waste. The stabilised fireworks remains should be safe for disposal at landfills. With implementation of the WMP, no adverse impact is anticipated.

2.2.6 Terrestrial Ecology

A review of the potential impacts to White-bellied Sea Eagle (WBSE) as a result of the proposed changes have been undertaken by comparing the assumptions made in the approved EIA Report and ERR 2005.

The location of launching site at the back of house was demolished and the location of current Phase 1 launching site at the castle and the adjoining buildings will remain the same as presented in both the approved EIA Report and ERR 2005, which is located at about 2km from the WBSE nesting site reported in the approved EIA Report. In view of the large separation distance, the lower maximum bursting height of the revised Show, and that there are no additional noise impacts from the proposed changes (refer to *Section 4* of this Report), potential impacts of the revised Show is expected to be less than those predicted in the approved EIA Report and ERR 2005.

In addition, the power range of lasers will not be greater than 30 Watt and the use of laser effects will be terminated against fixed and non-reflective objects within the Theme Park such that no laser beam will be directly pointing toward the Pa Tau Kwu area. The scale of the revised Show is expected to be similar to the assumptions made in the approved EIA Report and ERR 2005, and potential impacts to the WBSE are therefore also expected to be similar.

2.2.7 Landscape and Visual

The landscape and visual impact assessment (LVIA) prepared in the approved EIA Report concluded that the operation phase of the Theme Park would create some visual intrusion of unscreened elements into the backdrop of the natural scenery and would also create a new landscape character with positive visual qualities. The proposed changes in the revised Show with lower maximum height will not have any impact on the results of the LVIA presented in the approved EIA Report.

3. AIR QUALITY IMPACT ASSESSMENT

3.1 Introduction

As a result of the proposed changes as described in *Section 2.1*, the potential air quality impacts associated with the revised Show are reviewed. This *Section* reviews and assesses the potential air quality impacts associated with the proposed changes.

3.2 Air Emissions from the Revised Show

Air emissions from the fireworks of the revised Show may have the potential to cause air quality impacts to the Air Sensitive Receivers (ASRs) in the vicinity of the Theme Park. Bursting of fireworks during the revised Show may cause emissions of Particulate Matter (PM). The fireworks contain a number of metal species including aluminium (Al), antimony (Sb), barium (Ba), strontium (Sr), copper (Cu) and titanium (Ti), which may also be emitted to the atmosphere during the revised Show. Therefore, the key air pollutants of concern from the revised Show are PM (including respirable suspended particulates (RSP) and fine suspended particulates (FSP)) and the aforementioned metal species which were assessed in the ERR 2005. Odour was also assessed in the ERR 2005 as the previous fireworks displays contain black powder which, when detonated, may emit hydrogen sulphide (H_2S) and thus has the potential to cause odour impact. As the fireworks of the revised Show will no longer contain black powder, there will be no associated H_2S emissions and thus odour impact is not a concern for the revised Show.

As provided by HKDML and the Design Team from the US, the total Net Explosive Quantity (NEQ) of the revised Show is reduced to 62.5kg, whereas the total NEQ of the previous fireworks displays is 165kg as assumed in the ERR 2005. As advised by MP Associates, Inc. (MPA), the supplier of the pyrotechnic articles for the revised Show engaged by HKDML, the amount of metal emissions in the fireworks (i.e. Al, Sb, Ba, Sr, Cu and Ti) is 8.3% of the NEQ of the fireworks and the breakdown of the metal emissions is presented in *Table 3.1*. The breakdown of the metal emissions assumed in the ERR 2005 are also provided in *Table 3.1* for comparison. It can be seen that the emissions of individual metal species from the revised Show are lower compared with those from the previous fireworks displays except for Cu and Ti.

Table 3.1 Breakdown of Metal Emissions from the Revised Show and the Previous Fireworks Displays

Metal Species	Revised Show	Previous Show
	Emission Quantity [a]	Emission Quantity [b]
Al	1.875kg	2.03kg
Sb	0.125kg	0.89kg
Ba	1.125kg	2.12kg
Sr	0.500kg	1.14kg
Cu	0.875kg	0.63kg
Ti	0.688kg	0.28kg

Notes:
a) The emission quantities were calculated based on the metal breakdown in terms of % of NEQ provided by MPA (see *Appendix A*).
b) The emission quantities were made reference to ERR 2005.

Also, as confirmed by MPA, about 11% of the total NEQ will be used as lift charge, where oxygen, nitrogen and water vapour will be produced as byproducts of the lift charge (see *Appendix A*). As a conservative and worst case assumption, apart from 8.3% of metals and 11% of lift charge, the remaining 80.7% of the total NEQ are assumed to contribute to RSP emissions arising from the revised Show. The amount of RSP emissions was assumed to be 42% of the NEQ of the fireworks in the ERR 2005. Considering the total NEQ and its proportion of RSP, the total amount of RSP

emissions from the revised Show (50.4kg) is about 27% less compared with that from the previous fireworks displays (69.4kg).

3.3 Identification of Air Sensitive Receivers

The representative ASRs identified in the ERR 2005 have been reviewed. The identified representative ASRs in the vicinity of the Theme Park are listed in *Table 3.2* and their locations are shown in *Figure 3.1*.

Table 3.2 Details of the Identified Representative ASRs

ASR No.	Description	Type of Use	Approx. Base Elevation (m)	Approx. Maximum Height (m above ground)	Separation Distance from the Nearest Project Site Boundary (m)
A1	Administration Building of Penny's Bay Gas Turbine Power Station	Industrial	4	10	330
A2	Penny's Bay Fire Station	GIC	4	5	45
A3	Penny's Bay Police Post	GIC	4	5	20
A4	Inspiration lake Recreation Centre	Recreational	4	5	250
A5	Luk Keng Tsuen	Residential	3	5	2,200
A6	Cherish Court Discovery Bay	Residential	5	60	1,660
A7	Peng Chau	Residential	26	5	1,745
A8	Siena Two Block 30 in Discovery Bay	Residential	28	25	2,400
A9	Resort in Theme Park	Hotel	3	25	- (b)
A10	Potential Resort in Phase II of Theme Park	Hotel	3	25	- (b)
A11	Potential Hotel on Northern Land	Hotel	4	25	- (b)
A12	Potential Sunny Bay Development (c)	Recreational	0	25	2,250
A13	Potential Sunny Bay Development (c)	Recreational	0	25	2,220
A14	Potential Sunny Bay Development (c)	Recreational	0	25	2,440
A15	Amalfi Discovery Bay	Residential	0	50	2,010
A16	Greenvale Village	Residential	35	85	2,530

Note:
(a) GIC = Government, institution or community uses.
(b) Located within the Project site.
(c) With reference to the Approved North-east Lantau Outline Zoning Plan (No. S/I-NEL/12), the potential Sunny Bay Development will be planned for tourism and recreation related developments, including public open space, potential tourism uses such as retail, entertainment and hotel uses and other compatible uses. Maximum building height is assumed to be 25m as a reasonable assumption.

3.4 Evaluation of Impacts

3.4.1 RSP and FSP Emissions

As mentioned in *Section 3.2*, the total RSP emissions from the revised Show are considerably less than those from the previous fireworks displays (about 27% less). To evaluate the potential RSP impact at the identified ASRs due to the revised Show as compared with that due to the previous fireworks displays, the RSP emissions from the revised Show and the previous fireworks displays are broadly broken down into 3 different bursting heights for comparison as shown in *Table 3.3*.

ASR ID	ASR Description
A1	Penny's Bay Gas Turbine Power Station
A2	Penny's Bay Fire Station
A3	Penny's Bay Police Post
A4	Inspiration Lake Recreation Centre
A5	Luk Keng Tsuen
A6	Cherish Court Discovery Bay
A7	Peng Chau
A8	Siena Two Block 30 in Discovery Bay
A9	Resorts in Theme Park
A10	Potential Resorts in Phase II of Theme Park
A11	Potential Hotels on Northern Land
A12	Potential Sunny Bay Development
A13	Potential Sunny Bay Development
A14	Potential Sunny Bay Development
A15	Amalfi Discovery Bay
A16	Greenvale Village

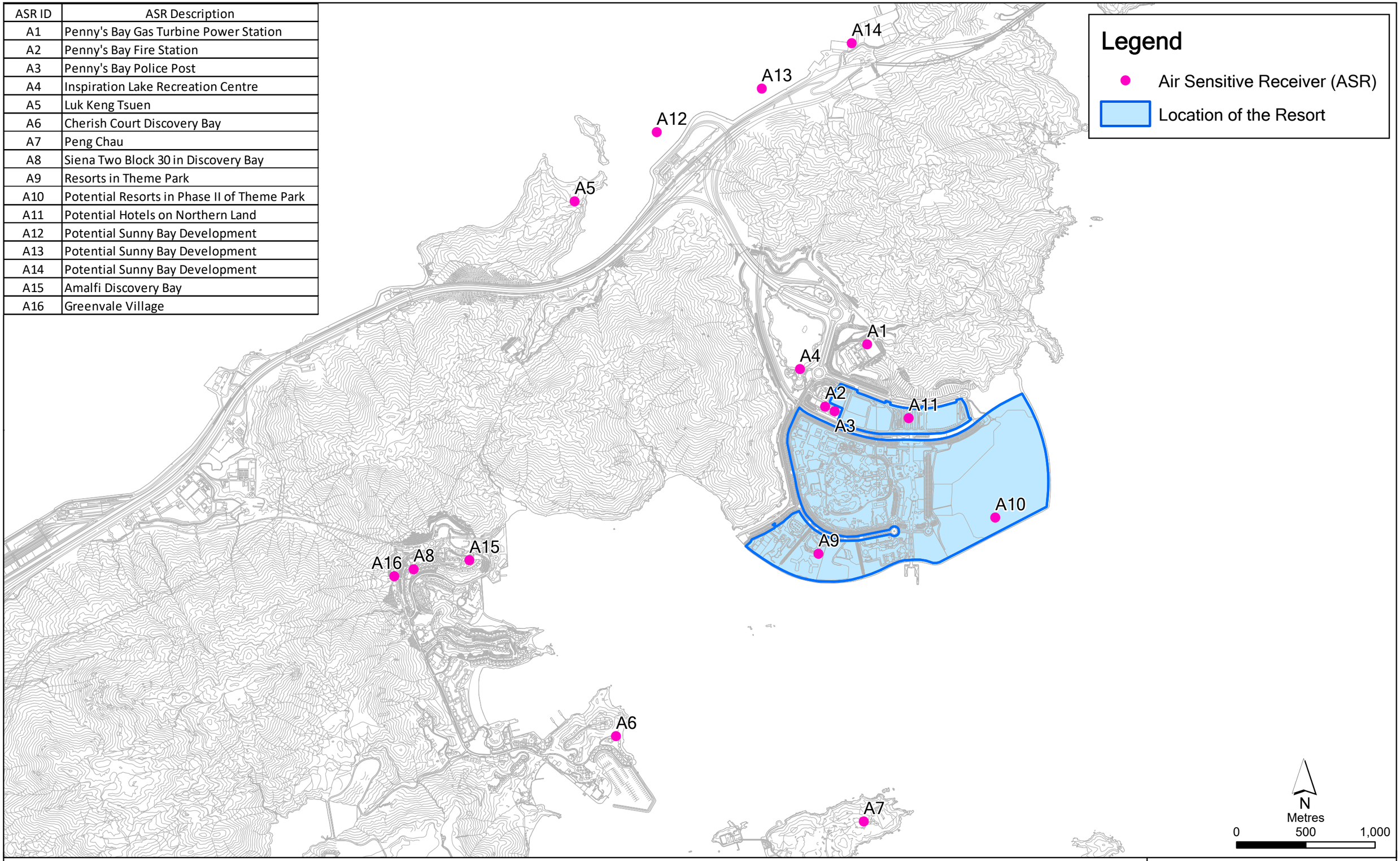

Figure 3.1

Location of Air Sensitive Receivers

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Table 3.3 RSP Emissions from the Revised Show and the Previous Fireworks Displays at Different Bursting Heights

Previous Fireworks Displays [(a)]			Revised Show [(b)]		
Emission Height	Total NEQ (g)	Total RSP Emissions (g)	Emission Height	Total NEQ (g)	Total RSP Emissions (g)
140mPD	24,298	10,205	120mPD	2,121	1,712
100mPD	9,764	4,101	100mPD	4,845	3,910
70mPD	131,210	55,108	70mPD	55,507	44,794
Total:	**165,272**	**69,414**		**62,473**	**50,416**

Notes:
(a) The NEQ and RSP emissions at different bursting heights were made reference to ERR 2005.
(b) The NEQ and RSP emissions at different bursting heights were confirmed by HKDML.

As shown in *Table 3.3*, RSP emissions from the revised Show have reduced at all of the 3 emission heights. Majority of the RSP is emitted at the lower emission level (i.e. 70mPD) for both the previous fireworks displays and the revised Show, with about 19% reduction of RSP emissions at this level from the revised Show. The highest emission level for the revised Show is about 20m lower than that for the previous fireworks displays, but the RSP emissions from the revised Show at this level only account for 5% of the total and are considerably less than that from the previous fireworks displays. The identified near-field ASRs (i.e. A1 to A4, A9 to A11) in this ERR were also identified in the ERR 2005 and they are all low-rise buildings (i.e. less than 30mPD, see *Table 3.2*). Given the large vertical separation between the near-field ASRs and the highest emission level of the revised Show (i.e. 120mPD) and that the impact at low level ASRs is dominated by the lowest emission level (70mPD) where the emission will be reduced, the RSP impact at these near-field ASRs due to the revised Show is expected to be lower than that due to the previous fireworks displays.

A number of far-field ASRs (i.e. A5 to A8, A12 to A16) were also identified in this ERR. As these far-field ASRs are all at least more than 1.6km away from the Project site boundary, the influence due to the change of emission height by 20m at the highest emission level (i.e. 140mPD reduced to 120mPD) from such great distance is likely to be minimal. Considering that the lowest and middle emission levels which account for the majority of the RSP emissions remain unchanged at 70mPD and 100mPD with a RSP emission reduction of about 18%, the RSP impact at these far-field ASRs due to the revised Show is expected to be lower than that due to the previous fireworks displays.

FSP was not assessed in ERR 2005. As FSP is part of RSP, FSP impact at both near-field and far-field ASRs due to the revised Show is also expected to be lower than that due to the previous fireworks displays.

Air quality impact arising from RSP and FSP emissions from the revised Show is lower than that due to the previous fireworks displays.

3.4.2 Metal Emissions

With reference to the assessment results in ERR 2005, the predicted contributions from the previous fireworks displays for the concerned metal species are minimal with respect to the relevant assessment criteria. The assessment criteria for the metal species as adopted in ERR 2005 have been reviewed with reference to the following recognised international air quality standard reference documents and databases:

- World Health Organisation (WHO);
- United States Environmental Protection Agency – Integrated Risk Information System (USEPA IRIS);
- Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (OEHHA); and
- EH40/2005 Workplace Exposure Limit (2018 Version), Health & Safety Executive, UK.

The current air quality standards for the metal species from the abovementioned documents and database, if available, are presented in *Table 3.4*. The adopted assessment criteria as shown in *Table 3.4* was selected in the order of preference as presented above.

Table 3.4 Air Quality Standards for Metal Species

Metal Species	Air Quality Standards (Chronic) (μg/m³)				Assessment Criteria (μg/m³)	
	WHO [b]	USEPA IRIS [c]	OEHHA [d]	UK OEL [e]	Updated Criteria	Criteria in ERR 2005
Al	-	-	-	100	100	100
Sb	-	-	-	5	5	5
Ba	-	-	-	5	5	5
Sr	-	-	-	-	-	-
Cu	-	-	-	10	10	2.4
Ti	-	-	-	100	100	100

Notes:

(a) "-" means standard is not available.

(b) WHO Air Quality Guidelines for Europe, Second Edition: http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf

(c) USEPA IRIS: https://cfpub.epa.gov/ncea/iris_drafts/AtoZ.cfm

(d) OEHHA: https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary

(e) EH40/2005 Workplace Exposure Limit 2nd Edition (2011), Health & Safety Executive, UK http://www.hse.gov.uk/pubns/priced/eh40.pdf
A safety factor of 100 has been applied for conversion of time-weight-average value to long-term exposure limit, with reference to the approach adopted in the approved EIA report and 2005 ERR.

As shown in *Table 3.1*, the emissions of individual metal species from the revised Show have reduced compared with those from the previous fireworks displays except for Cu and Ti. Adopting the same analysis as presented in *Section 3.4.1*, the air quality impact due to emissions of Al, Sb, Ba and Sr from the revised Show at the identified ASRs is expected to be minor and lower than that from the previous fireworks displays.

According to the assessment results in the ERR 2005, the maximum Cu and Ti contributions among the identified ASRs due to the previous fireworks displays are predicted to be only 0.0347μg/m³ (i.e. 0.35% of the Cu assessment criterion) and 0.0151μg/m³ (i.e. 0.015% of the Ti assessment criterion), respectively.

Given that the Cu emissions from the revised Show are about 1.4 times of those from the previous fireworks displays (see *Table 3.1*), the maximum Cu contributions at the identified ASRs due to the revised Show would be about 0.05μg/m³ (i.e. 0.5% of the Cu assessment criterion). Taking into account the background Cu concentration of 0.174μg/m³ [1], the cumulative Cu concentration at the identified ASRs is about 0.23μg/m³, which is well within the relevant Cu assessment criterion of 10μg/m³.

Given that the Ti emissions from the revised Show are about 2.5 times of those from the previous fireworks displays (see *Table 3.1*), the maximum Ti contributions at the identified ASRs due to the revised Show would be about 0.04μg/m³, which is well within the relevant Ti assessment criterion of 100μg/m³ [2].

Therefore, unacceptable air quality impact arising from emissions of the identified metal species during the revised Show is not anticipated.

(1) Maximum measured Cu annual average concentration among all stations in 2015-2019 with reference to EPD's Air Quality Reports in 2015-2019 – Summary of Airborne Species Concentration Derived from RSP.

(2) Ti concentration is not available with reference to EPD's Air Quality Reports in 2019 – Summary of Airborne Species Concentration Derived from RSP.

3.5 Mitigation Measures

As unacceptable air quality impact is not anticipated as a result of the proposed changes to the revised Show, additional mitigation measures are not required.

4. NOISE IMPACT ASSESSMENT

4.1 Introduction

This Section reviews and assesses the potential noise impact associated with the proposed changes in the firework displays.

4.2 Statutory Requirements and Evaluation Criterion

In accordance with the approved EIA Report and ERR 2005, an evening noise limit of $L_{eq(15\ min)}$ 55dB(A) at residential premises was adopted for the noise impact assessment for firework displays at the Theme Park. This noise limit has been adopted for the noise impact assessment in this ERR.

4.3 Identification of Noise Sensitive Receivers

The representative Noise Sensitive Receivers (NSRs) that may be affected by the revised Show have been reviewed and identified. The locations of the identified NSR are listed in *Table 4.1* and presented in *Figure 4.1*.

Table 4.1 Identified Noise Sensitive Receivers (NSRs)

NSR	Description	Ground Level mPD	Number of Storey	Minimum Separation Distance from the Launching Site (m)	Sensitive Use
N1	Peng Chau (Block D of Sea Crest Villa)	6	3	2,670	Residential
N2	Discovery Bay (Block 48 of Crestmont Villa)	40	5	2,420	Residential
N3	Discovery Bay (95 Headland Village)	40	3	2,550	Residential

4.4 Assessment Methodology

As discussed in *Section 2.1*, revisions have been made to the design of the firework display including the number of products and quieter pyros. It should be noted that the duration of the revised Show is similar to the assumptions made in the approved EIA Report and ERR 2005.

Although ultimately there will be potentially two fireworks shows (one for the Phase I Park and one for Phase II Park) which may be updated from time to time, the shows at these two sites will be staged separately and will not coincide within any 15 minute period interval as mentioned in ERR 2005 and *Section 4.4.29* of the approved EIA Report. For the purpose of this assessment, the noise impact from one firework show is therefore assessed and compared against the assessment criteria.

Reference has been made to the assessment methodology adopted in approved EIA Report and ERR 2005 for this assessment. The noise output of the revised Show has been calculated based on the Sound Exposure Levels (SEL) for the individual firework items selected and established by the Design Team from the US from the product inventory presented in ERR 2005. Details of the product inventory are shown in *Appendix B1*.

4.5 Identification of Potential Environmental Noise Impacts

The firework noise levels at the representative NSRs have been predicted and are summarised in *Table 4.2*. Details of the calculation are presented in *Appendix B2*. The predicted firework noise levels for the revised Show are in the range of 44 to 48 dB(A) at the representative NSRs, ie lower than the predicted noise levels of 52 and 55 dB(A) in the ERR 2005 and comply with the noise criteria of 55dB(A).

NSR ID	NSR Description
N1	Peng Chau (Block D of Sea Crest Villa)
N2	Discovery Bay (Block 48 of Crestmont Villa)
N3	Discovery Bay (95 Headland Village)

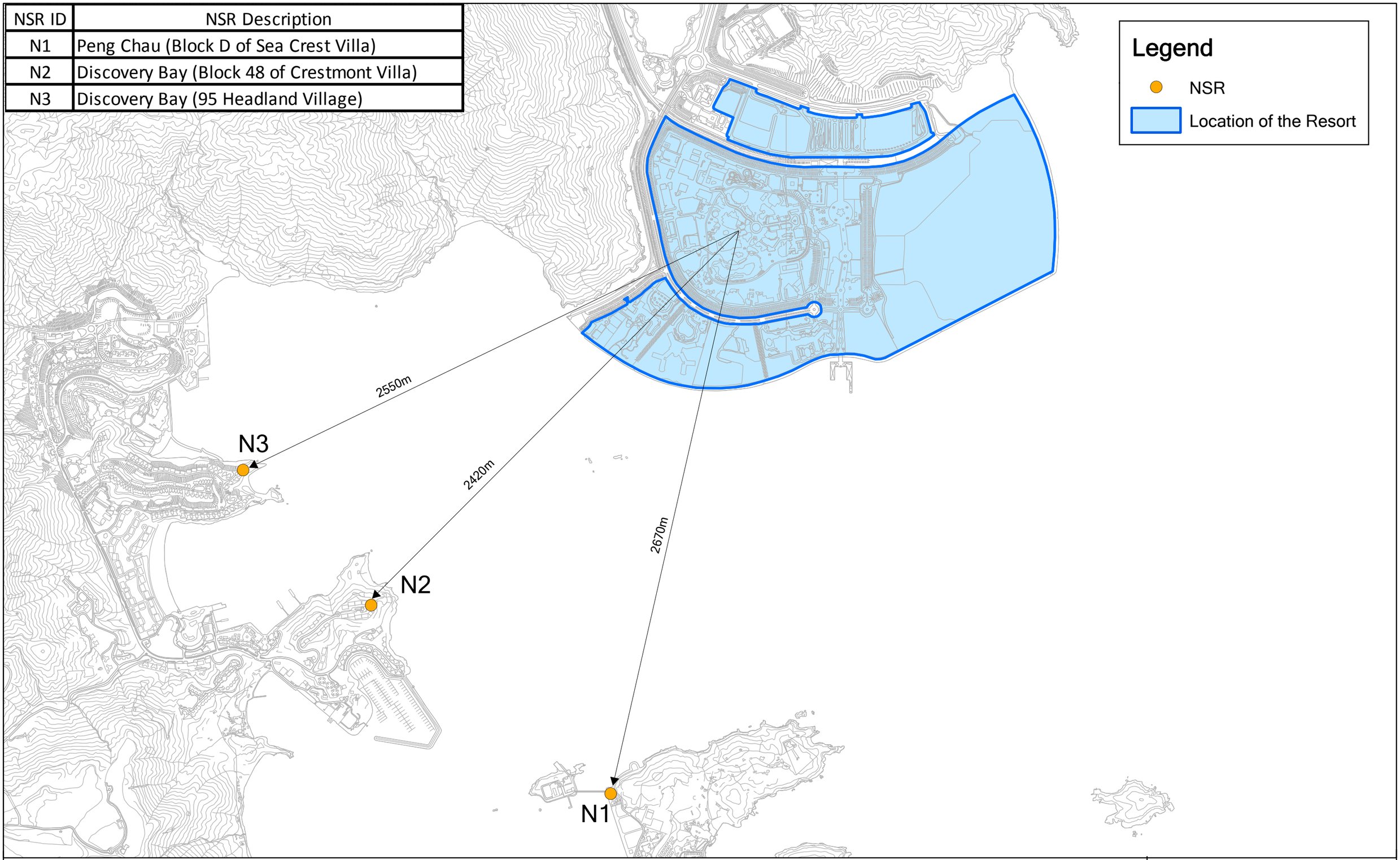

Figure 4.1

Location of Noise Sensitive Receivers

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Date: 1/11/2019

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Table 4.2 Predicted Firework Noise Levels, $L_{eq\ (15min)}$ dB(A)

NSR	Description	Predicted Firework Noise Levels, $L_{eq\ (15min)}$ dB(A)	Noise Criterion, dB(A)
N1	Peng Chau (Block D of Sea Crest Villa)	44	55
N2	Discovery Bay (Block 48 of Crestmont Villa)	48	55
N3	Discovery Bay (95 Headland Village)	48	55

It should be noted that the maximum SELs of the firework items were adopted in the assessment for worst-case scenario. As the revised Show will continue to be refined, *Appendix B1* is only an indication of the quantities of devices expected to be used for the revised Show. It should be noted that the final quantities of devices to be used is expected to be lower than this worst case scenario. Noise monitoring during testing and commissioning will be carried out to confirm any modifications to the expected show design are required to ensure noise compliance.

4.6 Mitigation Measures

As no exceedance of the noise criterion due to the revised Show is predicted, no specific mitigation measures are necessary. Noise monitoring for the revised Show will be carried out during testing and commissioning and regular noise monitoring will be resumed upon commissioning. The results of the revised Show during testing and commissioning will be used to verify the noise assessment and if required, the monitoring results will be used for improving the fireworks show design to ensure compliance with the noise criterion.

5. REVIEW OF ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REQUIREMENTS

The ongoing environmental monitoring and audit (EM&A) programme will be continued in accordance with the requirements given in the *Operational EM&A Plan* (Revision H).

The air quality and noise monitoring for fireworks have been suspended since 2 January 2018 as the fireworks show at the Castle has been temporarily suspended since then. The noise monitoring for fireworks will be carried out during testing and commissioning, and regular air quality and noise monitoring will be resumed upon commissioning. Monitoring will be carried out in accordance with the requirements given in the *Operational EM&A Plan*, including monitoring locations, frequency, equipment, parameters and Action and Limit Levels.

6. CONCLUSIONS

The assessment indicates that the air quality impact arising from RSP and FSP emissions from the revised Show is lower than that due to the previous fireworks displays. The assessment further confirms that the identified metal species assessment criteria will not be exceeded. No unacceptable air quality impact is anticipated.

The Project Proponent has reviewed the entire Project as a whole, the proposed changes will not constitute a material change to the environmental impact of the Project and the Project fully complies with the EIAO-TM requirements.

APPENDIX A SUPPORTING DOCUMENTS FOR AIR QUALITY IMPACT ASSESSMENT

APPENDIX A1 CONFIRMATION LETTER FROM MPA

MP ASSOCIATES, INC.

P.O. BOX 546 • IONE, CA 95640-0546
(209) 274-4715 • FAX (209) 274-4843

September 22, 2020

Environmental Protection Department
Environmental Assessment Division
Regional Assessment Group

27th Floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

To Whom It May Concern:

Disney has requested that MP Associates, Inc. (MPA) provide certain confidential information regarding the custom-made pyrotechnic articles manufactured by MPA for use at Hong Kong Disneyland (HKDL). The information below only applies to the pyrotechnic articles currently being considered for use at HKDL:

1. The lift charge contained in the pyrotechnic articles is an average of approximately 11% of the total Net Explosive Quantity (NEQ) of the articles planned for use. The current lift charge propellent used in the show incorporates a high-energy inorganic oxidizer. Upon combustion, the oxidizer primarily produces the gaseous byproducts of oxygen, nitrogen and water vapor.

2. The formulae for the pyrotechnic compositions of the new articles do not include chromium, lead, mercury, arsenic, manganese, nickel or zinc.

3. The approximate average percentage of metals in the articles' current pyrotechnic compositions is 8.3% (see attached table for details).

Thank you for the opportunity to provide this information.

Sincerely,

David Pier
Executive Vice President
MP ASSOCIATES, INC.

Attachment

DP:gp
cc: File

Hong Kong Disneyland Resort

"HKNC PET"

Metals Breakdown

as of 08/23/2019

-CONFIDENTIAL-

Total Aluminum per show:	**3.0%**
Total Antimony per show:	**0.2%**
Total Barium per show:	**1.8%**
Total Copper per show:	**1.4%**
Total Strontium per show:	**0.8%**
Total Titanium per show:	**1.1%**

APPENDIX B SUPPORTING DOCUMENTS FOR NOISE IMPACT ASSESSMENT

APPENDIX B1 PRODUCT INVENTORY FOR THE REVISED SHOW

Appendix B1 - Product Inventory for the Revised Show

Item no.	Type	Description	Number of Devices
38mm Crossette			
3	Crossette 38mm	PF SS	4
44mm Starburst			
6	Starburst 44mm, Plastic Case	Pink/Fusia Strobe LSPF ULSL	8
6	Starburst 44mm, Plastic Case	Red & Lemon Octopus LSPF ULSL	6
6	Starburst 44mm, Plastic Case	White Strobe LSPF ULSL	6
6	Starburst 44mm, Plastic Case	Firefly & Crackle PF ULSL	10
6	Starburst 44mm, Plastic Case	Gold Glitter Waterfall 4sec BT PF ULSL	8
6	Starburst 44mm, Plastic Case	Green & Lemon Octopus LSPF ULSL	6
75mm			
39	Type 3AB Mine	Blue Bottom & SS Top mine w/Blue Starburst Appears@2sec LSPF ULSL	24
39	Type 3AB Mine	Blue w/Tail LSPF ULSL	2
39	Type 3AB Mine	Pink w/Tail LSPF ULSL	2
39	Type 3AB Mine	Pink/Fushia w/Tail w/Pink/Fushia Strobe Base LSPF ULSL	4
39	Type 3AB Mine	SS Bottom &Blue Top mine w/SS Starburst Appears@2sec LSPF ULSL	4
39	Type 3AB Mine	SS Bottom & Varigated Top mine w/SS Starburst Appears@2sec LSPF ULSL	6
39	Type 3AB Mine	Stinger Mine w/White Strobe Base PF ULSL	6
39	Type 3AB Mine	Varigated Bottom & SS Top mine w/Varigated Starburst Appears@2sec LSPF ULSL	12
39	Type 3AB Mine	Varigated Flyers LSPF ULSL	18
39	Type 3AB Mine	Varigated Crossette w/Varigated Base & SS Middle LSPF ULSL	18
39	Type 3AB Mine	Violet w/Firefly Base LSPF ULSL	4
39	Type 3AB Mine	White Strobe Base, Violet Middle, Green Top mine LSPF ULSL	3
39	Type 3AB Mine	White Strobe Base, Green Middle, Violet Top mine LSPF ULSL	3
38mm Comet			
4	Comet 38mm	L/S P/F Green with Tail	11
4	Comet 38mm	L/S P/F Lemon with Tail	9
4	Comet 38mm	L/S P/F Red with Tail	19
4	Comet 38mm	L/S P/F Voilet with Tail	9
44mm Comet/Mine			
4	Comet 44mm	PF Firefly	8
4	Comet 44mm - Crossing	FireFly Long Throw PF ULSL	14
4	Comet 44mm	Green w/Tail ULSL	3
4	Comet 44mm	Lemon w/Tail ULSL	3
4	Comet 44mm	Blue w/Tail LSPF ULSL	1
4	Mine 44mm	Blue w/White Strobe Base LSPF ULSL	6
4	Mine 44mm	Firefly PF ULSL	28
4	Mine 44mm	Firefly PF w/Small LSPF Varigated Strobe ULSL	6
4	Mine 44mm	Green LSPF w/Gold Glitter PF Base ULSL	2
4	Mine 44mm	Pink w/Tail LSPF ULSL	1
4	Mine 44mm	Seafoam LSPF w/Gold Glitter PF Base ULSL	2
5	Comet Mine 44mm	Lemon w/Tail & Green Mine LSPF ULSL	3
5	Comet Mine 44mm	Lemon w/Tail & Red Mine LSPF ULSL	3
5	Comet Mine 44mm	Lemon w/White Strobe Mine LSPF ULSL	2
5	Comet Mine 44mm	Red w/White Strobe Mine LSPF ULSL	2
5	Comet Mine 44mm	Orange w/Purple Mine LSPF ULSL	9
5	Mine 44mm	PF Gold Glitter & L/S P/F Seafoam	18
5	Mine 44mm	PF Gold Glitter & L/S P/F White Strobe	18
5	Comet Mine 44mm	SS Comet w/Blue Mine LSPF ULSL	17
5	Comet /Mine44mm	SS PF Comet w/Green LSPF Mine ULSL	17
5	Comet /Mine44mm	SS PF Comet w/Lemon LSPF Mine ULSL	7
5	Comet /Mine44mm	SS PF Comet w/Red LSPF Mine ULSL	7
5	Comet /Mine44mm	SS PF Comet w/White Strobe Mine ULSL	9
5	Comet /Mine44mm	SS PF Comet w/Varigated LSPF Mine ULSL	18
5	Stinger Symulator 44mm	Stinger Symulator PF ULSL	34
100mm			
38	Type 4AB Mine	Blue LSPF w/Gold Glitter PF Base ULSL	4
38	Type 4AB Mine	Green w/Lemon Base LSPF ULSL	1
38	Type 4AB Mine	Red LSPF & Crackle PF ULSL	8
38	Type 4AB Mine	Violet LSPF w/Firefly PF Base ULSL	12
39	Type 4AB Mine	Blue LSPF w/White Stobe Base ULSL	2
39	Type 4AB Mine	Kamuro Look w/30%White Strobe & 70% Pink Strobe Base LSPF ULSL	8
39	Type 4AB Mine	Kamuro Look w/White Strobe Base LSPF ULSL	8
39	Type 4AB Mine	Lemon w/Green Base LSPF ULSL	1
39	Type 4AB Mine	Lemon w/Red Base LSPF ULSL	1
39	Type 4AB Mine	Orange & Fast Crackle Base PF ULSL	20
39	Type 4AB Mine	Red w/Lemon Base LSPF ULSL	1
39	Type 4AB Mine	Stinger Mine w/White Strobe Base PF ULSL	8
39	Type 4AB Mine	Varigated w/Tail LSPF w/SS PF Base ULSL	36
		Total	**550**

Note:

(a) The items are selected and established by the Design Team from US with reference to the product list presented in Annex C7a of ERR 2005. Similar or quieter items have been selected for the revised Show.

APPENDIX B2 FIREWORK NOISE PREDICTION

Appendix B2 - Firework Noise Prediction

		N1		N2		N3	
Item no.	Number of Devices	Individual Corrected Measured Max. SEL [(a)]	Total SEL for each item	Individual Corrected Measured Max. SEL [(a)]	Total SEL for each item	Individual Corrected Measured Max. SEL [(b)]	Total SEL for each item
3	4	51	57	53	59	53	59
4	122	34	55	36	57	36	57
5	164	40	62	42	64	42	64
6	44	49	65	56	72	56	72
38	25	57	71	60	74	60	74
39	191	44	67	46	69	46	69
	550	**Total SEL =**	74		77		77
		Time Correction =	-29.5		-29.5		-29.5
Predicted Fireworks Noise Levels (Facade) - $L_{eq\ (15min)}$, dB(A) =			44		48		48

Notes:

(a) The SELs are with reference to the SELs presented in Annex C7a of ERR 2005 for conservatism. Similar or quieter products have been selected for the revised Show such that predicted noise levels should be lower than the predicted noise levels assessed in ERR 2005.

(b) N3 is located at 2,550m from the firework launching area which is ~130m farther than N2. SELs for each item at N2 have been adopted for N3 for worst case scenario.

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