

**MANDAI PARK HOLDINGS**

**SECOND ADDENDUM TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT (26 September 2016)**

**(Last Updated 18 February 2022)**

This addendum shall be read in conjunction with Mandai Park Holdings' (MPH) Environmental Impact Assessment (EIA) of the Mandai Rejuvenation Project ("Mandai EIA Report") dated 26 September 2016 and the first addendum dated 18 March 2019, as part of the Mandai EIA Report.



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## 01. INTRODUCTION

Mandai Park Holdings (MPH) is driving the rejuvenation of Mandai Precinct into an integrated nature and wildlife destination, through its development arm, Mandai Park Development (MPD). From November 2014 to September 2016, MPD had conducted an Environmental Impact Assessment (EIA) for the project. EIAs are studies conducted to evaluate a proposed development's potential environmental impact and recommend measures to mitigate the potential impact of development as much as possible. MPH had engaged stakeholders such as government agencies and the nature community during the EIA process, to understand and address their concerns.

Following the approval of the Mandai EIA Report by the relevant authorities, the report was published in September 2016. As the project progressed into the detailed design development and construction phases, MPD has continued to engage stakeholders, including representatives from the nature community, and provided regular updates and discussions on environmental management. As far as possible, design development and construction methods were aligned with the environmental management requirements stated in the Mandai EIA Report. However, some practical and feasible updates and adjustments to the design and planned works were necessary as the construction phases progressed due to changes in environmental management requirements, new information and learnings acquired, as well as unexpected developments and problems encountered.

This document is the second addendum to the Mandai EIA Report to be published and provides a summary of three design updates and six approved changes to requirements listed in the Mandai EIA Report. It follows the first addendum published in March 2019, which outlined one design update and six approved changes.

For revisions in designs and/or changes in environmental management measures from that in the Mandai EIA Report, MPD had adhered to the approved Change Management process and conducted a series of consultations with its Environmental Advisory Panel (EAP), which comprises subject matter experts from the scientific community, academia, nature groups and the private sector, and representatives from the nature community. Thereafter, MPD had sought approvals from relevant authorities to formalise the changes to the Mandai EIA Report and the environmental management measures required. These approved changes took into consideration the assessed environmental impact of the changes, site constraints and construction methodology, and included improvements to existing environmental management processes, refinements in designs and mitigation measures.

## 02. DESIGN UPDATES TO THE MASTERPLAN


<b>S/N</b>	<b>ITEMS</b>	<b>APPROVED</b>
2-1	Changes to East Node Design	28 December 2018
2-2	Changes to Stormwater Boardwalk Design	16 August 2019
2-3	Mandai Camping Plan	4 November 2020

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-1**

Changes to East Node Design - Relocation of Indoor Attractions and A&A works to existing MSCP	
Original Reference	<ol style="list-style-type: none"> <li>1. EIA Chapter 2.7.2 - Indoor Attractions at demolished Multi-storey Car Park (MSCP) site</li> <li>2. EIA Chapter 2.14 - Existing Back of House Areas</li> <li>3. EIA Chapter 8.1.1.3 - Existing MSCP to be Demolished</li> <li>4. EIA Chapter 2.9.2 - Car Parks within East Node Basement</li> <li>5. EIA Chapter 8.2.1.3 - 15m Setback from Reservoir</li> </ol>
Original Requirements	<ol style="list-style-type: none"> <li>1. Planet Explorer and Sri Seletar Point will be indoor educational areas located on a 1.56ha plot where the existing MSCP is currently sited. This structure will be three storeys high.</li> <li>2. Existing structures within the existing operating wildlife parks such as the MSCP, which are affected by the new developments will need to be demolished.</li> <li>3. There is a breeding facility and nursery to be included as part of back of house.</li> </ol>
Change Proposed	<p><b>Multi-storey Car Park Site (MSCP)</b></p> <ul style="list-style-type: none"> <li>• The MSCP, which is of a smaller footprint than the originally planned Planet Explorer and Sri Seletar Point, is to be retained. Two additional levels will be added with no demolition required. The building height of the revamped MSCP will be kept under 20m, except for the localised lift core areas which constitute a small percentage of the overall building footprint. This is based on the height of the originally planned Planet Explorer and Sri Seletar Point.</li> <li>• The design of the revamped MSCP will take into consideration the surrounding forest and ensure that parts of the built structure would not extend beyond the tree height.</li> <li>• The exterior design of the revamped MSCP will feature greenery such as climbers, and the sheltered space will serve a dual-purpose for (i) visitor arrival and departure, as well as (ii) habitat corridor for arboreal and aerial wildlife. Where possible, tall growing tree species will be planted around the revamped MSCP to enhance the existing adjacent tree height.</li> </ul>

	<ul style="list-style-type: none"> <li>• A permanent road, servicing taxis and cars, and multiple ancillary facilities (including an open-to-sky domestic water tank and four base stations) will be constructed along the perimeter of the revamped MSCP.</li> </ul> <p><b>Indoor Attractions (referred to as Planet Explorer and Sri Seletar Point in the gazetted EIA)</b></p> <ul style="list-style-type: none"> <li>• The Indoor Attractions will comprise of two buildings and will be relocated to the East Node deck. The landscaping concept for the two buildings aims to blend the architecture with the natural setting of the Mandai precinct. Where possible, extensive vertical greenery will be applied on the building façade.</li> <li>• The Planet Explorer building will have up to three storeys, with the height of the building to be kept under 20m. Exceptions are made for lift cores at localised areas which constitute a small percentage of the overall building footprint. This is based on the building height of the originally planned Planet Explorer and Sri Seletar Point in its previous location. Building heights exclude any mechanical and electrical equipment typically located on a building roof.</li> </ul> <p><b>Animal Breeding Facility &amp; Nursery, Animal Hospital, and F&amp;B &amp; Ticketing Area</b></p> <ul style="list-style-type: none"> <li>• The three-storey Breeding Facility &amp; Nursery building will be located next to the Indoor Attractions. The basement and first level will be used for animal holding, and the upper storey will be used as a sky deck for horticulture.</li> <li>• The Animal Hospital with animal treatment facilities will be a two-storey building that is located to the south of Indoor Attractions. This area is occupied by the existing learning centre and toilets, which will be demolished.</li> </ul> <p><b>Construction Schedule and Activities</b></p> <ul style="list-style-type: none"> <li>• With the limited information available during the Conceptual Design stage, the cumulative construction period for the East Node and Indoor Attractions was initially estimated at 42 months in the gazetted EIA. With the commencement of the Detailed Design stage, and due to the design changes, the construction plans of the Indoor Attractions and revamped MSCP have been updated. The duration is extended to approximately 58 months.</li> </ul>
<p>Rationale for Change</p>	<p>The Conceptual Design was changed to achieve greater cost-effectiveness and enhanced visitor experience. The updated design also requires lesser excavation and demolition of existing buildings. This would lower the frequency of construction vehicles along Mandai Lake Road, which reduces the environmental impact and improves traffic flow.</p>

<p>Changes to Impact Assessment (Refer to the Impact Assessment below)</p>	<p>An additional EIA was conducted for the design changes. While the Impact Assessment focused on the East Arrival Node, the evaluation of Impact Significance was not site-specific. For totality, the overall impacts for the entire Project were included. This is to ensure that the comparison with the gazetted EIA is based on the same parameters.</p> <p>The study concluded that the design changes will contribute to a degree of improvement within the impacted area, with the reduction in demolition. However, overall, there are no changes to the Impact Significance from the gazetted EIA.</p>
<p>Proposed Mitigation and Monitoring Measures</p>	<p>Applicable mitigation measures in the existing EIA/Environmental Management and Monitoring Plan (EMMP) will be applied to a contract-specific EMMP.</p> <p>Checks will continue to be conducted by an ecologist prior to and after tree-felling, as detailed in the Wildlife Protection Plan.</p> <p>Additional mitigation measures to be implemented for the design change include:</p> <ul style="list-style-type: none"> <li>Erection of noise barriers along the worksite boundary as illustrated in the figure below. Noise barriers will be designed to achieve a minimum attenuation of 10dB(A).</li> </ul>  <ul style="list-style-type: none"> <li>The latest fencing strategy involves the implementation of fencing barriers with one directional swing gates for small terrestrial animals to access the retained forest, while acting as a barrier to prevent larger animals from entering Mandai Lake Road. The fencing, with one-directional swing gates at 40m intervals along the road, also extends to the driveway around the revamped MSCP to reduce mortality by vehicle strike during operations.</li> </ul>



	<ul style="list-style-type: none"><li>• Supplementary mitigation measures to reduce risk of fauna collision during the construction phase in this area will be carried into the operation phase.</li></ul>
Date of Approval	28 December 2018

**Proposed Change / Activity:**

1. New MSCP design: 2 additional floors, total height of revamped MSCP 18m high
2. Indoor Attractions: Comprising the Planet Explorer and Sri Seletar Point, housed in two separate buildings
3. Breeding Facility & Nursery, Animal Hospital and F&B & Ticketing Area: 3-storey Breeding Facility & Nursery building between Planet Explorer and Sri Seletar Point buildings, 2-storey Animal Hospital building located to the south of the Sri Seletar Point building

**Personnel involved in Impact Assessment:**

MPD Project Management, MPD Sustainable Solutions, ERM Singapore

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE* **	MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff) (Construction)	No Change		Small	Medium	Minor	Small	Medium	Minor
	Air Quality (visitors) (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Noise Emissions Impact (staff and visitors) (Construction)	No Change		Small	Not Applicable#	Minor	Small	Not Applicable	Minor
	Soil and Ground Water Quality (East side) (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Soil and Ground Water Quality (Operations)	No Change		Small	High	Moderate	Small	High	Moderate
Biological	Habitats (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Habitats (Operations)	No Change		Small	High	Moderate	Small	High	Moderate
	Flora & Fauna (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Flora & Fauna (Operations)	No Change		Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

# The definition of noise impact magnitude has taken into account the receptor sensitivity. Refer to Mandai EIA Report Annex 2.0

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-2**

Changes to Stormwater Boardwalk Design	
Original Reference	<ol style="list-style-type: none"> <li>1. EIA Chapter 2.9.3 – Boardwalk</li> <li>2. EIA Chapter 2.9.4 – Drainage Infrastructure</li> </ol>
Original Requirements	<p>In the gazetted EIA, the installation of a 3.6km Boardwalk was proposed to cover over the existing and upgraded drains within the land boundaries of the Singapore Zoo, River Safari and parts of the Night Safari. The Boardwalk would vary between 2m to 3m wide.</p> <p>The gazetted EIA noted that the stormwater system would be further developed and integrated with the existing and new drainage infrastructure, while upgrading of the perimeter drains will be required. Hence, the impact of the stormwater system required had not been covered in the gazetted EIA.</p>
Change Proposed	<p>The refinement of the design of the proposed Boardwalk and the development of the Stormwater Detention System led to three main changes from the gazetted EIA, which are summarised as follows:</p> <ul style="list-style-type: none"> <li>• <b>Reduction in length of Boardwalk:</b> Instead of the original length of approximately 3.6 km, the revised design is proposed to terminate before the southern tip, resulting in the eventual length to be 3.3km, a reduction in length by approximately 0.3 km.</li> <li>• <b>Enhanced Configuration of Boardwalk:</b> Instead of positioning the entire stretch of Boardwalk Over-Drain, different configurations are proposed as follows: <ol style="list-style-type: none"> <li>1. Over-Drain with concretised finishing</li> <li>2. Beside-Drain with concretised finishing</li> <li>3. On-Grade with cemented aggregate Path</li> </ol> </li> <li>• <b>Stormwater Detention System:</b> With further development of the design, the cope of existing drains will be raised with four off-line pumped detention tanks to be constructed. There will also be an underground pipe of diameter 1.5m connecting across the Night Safari.</li> </ul>
Rationale for Change	<p>With the Detailed Design, further opportunities to reduce impact to the environment were identified, specifically:</p> <p><b>Reducing the amount of excavation by adjusting the design to accommodate the terrain:</b> The current terrain includes a narrow shoreline where erosion has already taken place, and there is valuable vegetation on either side of the existing drain. The configuration of the Boardwalk was thus adjusted to accommodate the terrain of the area and ensure a lower environmental impact.</p>

	<p><b>Retaining selected habitats that could continue to serve their ecological functions:</b> The shortened route will avoid impact to a habitat found on the southern tip of the River Safari. The habitat, which consists of extensive coverage of mature Simpoh Air shoreline vegetation (<i>Dillenia suffruticosa</i>), provides the following:</p> <ol style="list-style-type: none"> <li>1. Deep root systems excellent for shoreline stability</li> <li>2. A vital habitat for shoreline dependent fauna             <ol style="list-style-type: none"> <li>a. Stork-billed kingfisher</li> <li>b. Buffy fish owl (Critically Endangered)</li> <li>c. Night heron</li> </ol> </li> <li>3. An important foraging and sheltering habitat for many other species (Bulbuls, pigeons, parakeets, reptiles, amphibians)</li> </ol>
<p>Changes to Impact Assessment (Refer to the Impact Assessment below)</p>	<p>With the Magnitude of the proposed changes assessed and evaluated together with the sensitivity of the receptors per the gazetted EIA, the Residual Impact Significance of the various receptors are evaluated.</p> <p>Overall, there are no changes to the Impact Significance from the gazetted EIA.</p>
<p>Proposed Mitigation and Monitoring Measures</p>	<p>Applicable measures in the EIA/EMMP will be applied into a contract specific EMMP, to mitigate the following:</p> <ul style="list-style-type: none"> <li>• Potential soil destabilisation</li> <li>• Impact of dust generation</li> <li>• Potential leakage of surface runoff from site</li> <li>• Potential impact to groundwater</li> </ul> <p>In addition, where excavation works are being carried out, contractors will propose and implement measures to prevent animals from going into excavated spaces. Any excavations that cannot be covered overnight will be inspected in the morning for wildlife prior to commencing works.</p> <p>Prior to and after tree-felling, wildlife inspections will be carried out. This includes engaging an ecologist to inspect the tree for the presence of fauna, and inhabited tree hollows and nests.</p>
<p>Date of Approval</p>	<p>16 August 2019</p>

**Proposed Change / Activity:**

To institute three main design changes:

1. Reduction in length of Boardwalk – Reduce the length of the Boardwalk by of approximately 0.3km from the original length
2. Enhanced Configuration of Boardwalk – Apply different configurations to position the Boardwalk instead of over-drain position for the entire stretch of the Boardwalk
3. Stormwater Detention System - Raise cope of existing drains with four off-line pumped detention tanks to be constructed, as well as an underground pipe of diameter 1.5m connecting across the Night Safari

**Personnel involved in Impact Assessment:**

MPD Planning & Development, MPD Project Management, MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors) (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Ambient Noise (staff and visitors) (Construction)	No Change		Negligible	Not Applicable#	Negligible	Negligible	Not Applicable	Negligible
	Surface Water Quality (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Surface Water Quality (Operation)	No Change		Small	High	Moderate	Small	High	Moderate
	Soil/Groundwater Quality (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
Biological	Habitats (Construction)	No Change		Small	High	Moderate	Small	High	Moderate
	Flora & Fauna (Construction)	No Change		Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

# The definition of noise impact magnitude has taken into account the receptor sensitivity. Refer to Mandai EIA Report Annex 2.0

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-3**

Mandai Camping Plan					
Original Reference:	<ol style="list-style-type: none"> <li>1. EIA Chapter 2.1.2 – Concept Design of Rainforest Park North</li> <li>2. EIA Chapter 2.2.2 – Bird Park Concept Design</li> <li>3. EIA Chapter 2.6.2 – Eco-Lodge Concept Design</li> </ol>				
Original requirements	<ol style="list-style-type: none"> <li><b>1. Concept Design of Rainforest Park North and Bird Park</b> Occasional night-time activities will comprise overnight camps for small groups (approximately 40 people), similar to overnight education camps currently organised in the existing operating wildlife parks.</li> <li><b>2. Concept Design of Eco-Friendly Resort</b> Areas for camping and similar activities, and related supporting facilities, will be designated in and around the attractions. These areas will cater to conservation, research and education needs and will be operational based on demand.</li> </ol>				
Change Proposed	<p>With further development in the detailed designs of the various features, (i.e. Arrival Nodes, Bird Park, Rainforest Park North, Rainforest Park South, Indoor Attractions and Eco-friendly Resort), details on the camping plan including the optimum location and massing of the camps have since been determined.</p> <p>The refined Mandai Camping Plan consists of two formats of camping – (i) temporary overnight camping (with self-pitched tents); and (ii) designated camp sites with permanent tents for overnight camps. With the refined plan, the following key changes were taken into consideration:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Gazetted EIA</th> <th style="text-align: left;">Refined Mandai Camping Plan</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">Camping in Bird Park and Rainforest Park North</td> <td style="vertical-align: top;"> <p>Camping in Bird Park, Rainforest Park North, Rainforest Park South and East Arrival Node (inclusive of both temporary and permanent campsites)</p> <ul style="list-style-type: none"> <li>- Up to 150 people per campsite (including facilitators)</li> <li>- Fully guided by facilitators</li> <li>- Divided into smaller groups for activities (low-noise and low-light generating activities e.g. nature appreciation walks)</li> <li>- Minimal use of torchlights for guiding purposes</li> </ul> </td> </tr> </tbody> </table>	Gazetted EIA	Refined Mandai Camping Plan	Camping in Bird Park and Rainforest Park North	<p>Camping in Bird Park, Rainforest Park North, Rainforest Park South and East Arrival Node (inclusive of both temporary and permanent campsites)</p> <ul style="list-style-type: none"> <li>- Up to 150 people per campsite (including facilitators)</li> <li>- Fully guided by facilitators</li> <li>- Divided into smaller groups for activities (low-noise and low-light generating activities e.g. nature appreciation walks)</li> <li>- Minimal use of torchlights for guiding purposes</li> </ul>
Gazetted EIA	Refined Mandai Camping Plan				
Camping in Bird Park and Rainforest Park North	<p>Camping in Bird Park, Rainforest Park North, Rainforest Park South and East Arrival Node (inclusive of both temporary and permanent campsites)</p> <ul style="list-style-type: none"> <li>- Up to 150 people per campsite (including facilitators)</li> <li>- Fully guided by facilitators</li> <li>- Divided into smaller groups for activities (low-noise and low-light generating activities e.g. nature appreciation walks)</li> <li>- Minimal use of torchlights for guiding purposes</li> </ul>				

	<p>Areas for camping and similar activities, and related supporting facilities, will be designated in and around the attractions. These areas will cater to conservation, research and education needs and will be operational based on demand.</p>	<p>Design development considerations for permanent campsites designated in East Arrival Node and Rainforest Park South:</p> <ul style="list-style-type: none"> <li>- Areas where environmental impacts are already being felt or planned for i.e. East Arrival Node and Rainforest Park South</li> <li>- Avoid additional clearing of habitats and felling of trees</li> <li>- Integrate campsites with the surrounding through suitable landscaping to attenuate noise and light within the campsites</li> </ul>
<p>Rationale for Change</p>	<p>At the time of writing the gazetted EIA, it was noted that “camping and similar activities, and related supporting facilities will be designated in and around the attractions. These areas will cater to conservation, research and education needs and will be operational based on demand”.</p> <p>Specific details such as the location and massing of the camps were not available as the assessment was then undertaken at the master plan/conceptual design stage. As MPD began the detailed design of the respective Project components, the Mandai Camping Plan was further developed with the goal of driving and supplementing conservation, research and educational needs. Hence, the optimum locations and design for the camps and their related supporting facilities have since been identified and developed respectively. With the impact assessment conducted, necessary environmental measures are being included in the design to ensure no changes to the impacts as assessed in the gazetted EIA.</p>	
<p>Changes to Impact Assessment (Refer to the Impact Assessment below)</p>	<p>The impact to biodiversity from potential light pollution, noise and interactions between visitors and fauna/flora during operation of campsites and related activities can be managed with the implementation of mitigation measures elaborated in the next section.</p> <p>As the location of the campsites and related activities are integrated within design and operation components that were already considered in the gazetted EIA, the potential impacts on biodiversity during the operation of the campsites and related activities were not deemed to be significant enough to increase the Magnitude of impact as assessed in the gazetted EIA.</p> <p>Overall, there are no changes to the Magnitude of the Residual Impacts as assessed in the gazetted EIA. They remain as ‘Small’ and the resulting Impact Significance remained as ‘Moderate’.</p>	

<p>Proposed Mitigation and Monitoring Measures</p>	<p>Mitigation measures include those relevant to the management of habitats within the Project areas as they are designed to sustain habitats/ flora damage from human interaction. The measures can be adopted to mitigate impacts to biodiversity due to interaction of campers with the flora and fauna, including:</p> <ul style="list-style-type: none"> <li>• Signages to be placed at the entrance point, near waste disposal locations and other strategic points to request campers not to feed or interact with fauna and pick/ take flora within the camping sites and the Project areas.</li> <li>• The buffers, setbacks and Retained Forest will be out of bounds for campers. Where feasible, dense vegetative barriers will be used to discourage human incursions to these areas.</li> <li>• Training for campers to raise their awareness of biodiversity protection and management within Singapore and the Mandai area.</li> <li>• CCTV will be installed to monitor visitor interactions with flora and fauna and incursions into areas restricted to visitors.</li> </ul> <p>Similar to what is currently practiced in existing parks, camping activities will be guided by facilitators who have undergone training on biodiversity awareness. These facilitators will guide campers to be sensitive to the surrounding environment.</p> <p>During night walks within the Project areas, only facilitators are allowed to spot wildlife using special torch lights that are not harmful to wildlife. Current practices (e.g. lights-out by 10.30pm and night sentry duties) will also be implemented across future camp programmes. These practices will further reduce the likelihood of undesirable interactions between campers and nocturnal wildlife.</p>
<p>Date of Approval</p>	<p>4 November 2020</p>



**Proposed Activity:**

Refined Mandai Camping Plan

**Personnel involved in Impact Assessment**

MPD Asset Development  
MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY/ VULNERABILITY/ IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ambient Noise (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surface Water Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil / Groundwater Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Biological	Habitats	Insignificant changes in Interaction (not expected to be significant)		Small	High	Moderate	Small	High	Moderate
	Flora & Fauna	Insignificant changes in Interaction (not expected to be significant)		Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

### 03. APPROVED CHANGES TO THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MONITORING AND MANAGEMENT (EMMP) REQUIREMENTS

<b>S/N</b>	<b>ITEMS</b>	<b>APPROVED</b>
2-4	Internal Effluent Discharge Pipe (EDP) Pipe Jacking Works	8 October 2019
2-5	Extension of Working Hours for Mandai West Node Multi-Storey Carpark Repair works (6pm – 12am)	6 August 2020
2-6	On-site Accommodation for Construction Packages due to COVID-19	21 August 2020
2-7	Extension of Working Hours for Indoor Works (Site-wide)	10 March 2021
2-8	Advance Closure of Temporary Ground Crossing	15 October 2021
2-9	Extended Hours of Operations of F&B, Retail, Events and Indoor Attractions	15 October 2021

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-4**

Internal EDP Pipe Jacking Works	
Original Reference	<ol style="list-style-type: none"> <li>1. EIA Chapter 8.5.13.2 – Residual Impacts</li> <li>2. EIA Annex 19 – Tree Protection Guidelines</li> </ol>
Original Requirements	Operation of construction machinery, including activities such as piling and demolition works, will only be undertaken in daylight hours between 0800 and 1800, reducing impact on nocturnal species.
Change Proposed	To allow 24 hours work to be carried out for pipe-jacking of the West Node/Bird Park.
Rationale for Change	<p>The laying of pipes can be done by either Open-cutting or Pipe-jacking method. Between the two methods, pipe-jacking is proposed as its impact to the environment is lower due to less amount of earth removal work and can be done in a shorter time.</p> <p>However, there will be risk of ground settlement which will affect road and walkway users. Continuous operation for pipe jacking (24 hours works) is therefore needed to mitigate the risk of ground collapse on Mandai Lake Road which would cause safety issues to traffic.</p>
Changes to Impact Assessment (Refer to the Impact Assessment below)	<p>Pipe-jacking works for the West Node/Bird Park are localised as they will only be conducted within the work site. The distance to the nearest sensitive receivers is approximately 50m away (from the location of equipment at the jacking shaft to the stream at Mandai Track 15). Lights will only be used within the jacking shafts for underground work as the existing streetlights will be sufficient for aboveground works.</p> <p>As such, there will be no loss of viability of the habitat surrounding the project area. Additionally, the project area will be hoarded up to prevent wildlife from entering. Hence, the magnitude of impact from the night works on wildlife is expected to remain 'Small'.</p> <p>The Impact Significance to wildlife remains 'Moderate' as the residual impacts may affect a small proportion of species population but would not substantially affect other species dependent on it. Hence, there are no changes to the impact assessment in the gazetted EIA Report.</p>
Proposed Mitigation and Monitoring Measures	<p>Applicable mitigation measures in the EIA/EMMP will be applied into a contract-specific EMMP, including:</p> <ul style="list-style-type: none"> <li>• Pipe-jacking works to stop between 6am-8am and 6pm-8pm which coincide with peak crepuscular hours.</li> <li>• High hoarding (STC 20) to be deployed around the shafts (4.8 – 6m) to mitigate noise.</li> </ul>

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	<ul style="list-style-type: none"><li>• Temporary barriers to be used to close the Temporary Ground Crossing (TGC) and prevent animals from entering the work site, whenever the section of Mandai Lake Road is required for night works.</li><li>• Lighting to be downward facing, directed at the work area only and away from the Central Catchment Nature Reserve (CCNR).</li><li>• Lighting levels to be kept to the minimal level required for work safety by the Ministry of Manpower (MOM).</li><li>• Camera traps to be deployed on TGC and buffer/CCNR will continue to be monitored for impact to wildlife.</li></ul>
Date of Approval	8 October 2019

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**Proposed Activity:**

24-hours pipe jacking works for the West Node/Bird Park

**Personnel involved in Impact Assessment:**

MPD Project Management  
MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ambient Noise (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surface Water Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil / Groundwater Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Biological	Habitats	Insignificant changes in Interaction (not expected to be significant)	Affects small area of habitat, such that there is no loss of viability / function of the habitat	Small	High	Moderate	Small	High	Moderate
	Flora & Fauna		Effect does not cause substantial change in population of species, or other species dependent on it	Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-5**

<b>Extension of Working Hours for West Node Multi-Storey Car Park (MSCP) Repair Works</b>	
Original Reference	<ol style="list-style-type: none"> <li>1. EIA Chapter 8.5.13.2 – Residual Impact</li> <li>2. EIA Annex 18.0 – Wildlife Protection Plan Chapter 4</li> <li>3. EIA Addendum 1 – Works that need to be conducted after 6pm and Adjustment of Working Days to allow for Works on Sunday</li> </ol>
Original Requirements	Access to the construction site for works is permitted only from 8am to 6pm, Mondays to Sundays, except under extraordinary circumstances such as for public safety reasons that are subject to MPH and NParks' approval.
Change Proposed	To allow for repair works at West Node MSCP to be conducted till 12 midnight to arrest the cracks from further propagation and prevent the further deterioration of the structure.
Rationale for Change	<p>The construction of the 3-storey West Node MSCP was completed in July 2019. In September 2019, cracks were observed at the soffit of the Level 2 slabs and investigation found that it was caused by inadequate rebar in the slabs. Hence, steel beams and trusses were needed to be installed at the affected slabs to restore the slabs to the required loading.</p> <p>Extension of working hours till 12 midnight is proposed to complete the slab strengthening works in the shortest time possible to arrest the cracks from further propagation and prevent further deterioration of the structure.</p>
Changes to Impact Assessment (Refer to the Impact Assessment below)	<p>Repair works for the West Node MSCP will be localised within the newly constructed car park. The nearest sensitive receptor is the forested area between Track 15 and Mandai Road. Lights will only be used within the Level 1 Car Park and lighting curtain will be installed to shield any light and noise from the repair works. Aligned with the Night Safari's operating hours, the extension of working hours for the repair works will be limited to 12 midnight to minimise any additional impacts.</p> <p>The magnitude of impact from the night works on wildlife is expected to remain 'Small' as there will be no loss of viability of the habitat surrounding the project area and the project area will be hoarded up to prevent wildlife from entering.</p> <p>The Impact Significance to wildlife remains 'Moderate' as the residual impacts may affect a small proportion of species population but will not substantially affect other species dependent on it. Hence, there are no changes to the impact assessment in the gazetted EIA Report.</p>
Proposed Mitigation and Monitoring Measures	Applicable mitigation measures in the existing EIA/ EMMP will be applied to a contract-specific EMMP, including:

	<ul style="list-style-type: none"> <li>• Barriers to be deployed to fully enclose the West Node MSCP to prevent light spillage and minimise noise pollution.</li> <li>• Lighting to be downward facing, directed at the work area only and away from the Central Catchment Nature Reserve (CCNR).</li> <li>• Lighting levels will be kept to the minimal level required for work safety by Ministry of Manpower (MOM).</li> <li>• Noisy activities such as saw cutting will not be carried out at night to reduce noise generated from works.</li> </ul> <p>Workers will leave the site via a designated path and be transported out of Mandai from the site gate before 12 midnight to minimise worker and vehicle movement beyond the work site.</p>
Date of Approval	6 August 2020

**Proposed Activity:**

West Node Multi-storey Car Park steel strengthening repair works at night (6pm – 12 midnight) to arrest the cracks and further deterioration of the structure.

**Personnel involved in Impact Assessment:**

MPD Project Management  
MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	-	No excavation/ demolition required for steel strengthening	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ambient Noise (staff and visitors)	-	No surrounding human receptor	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surface Water Quality	-	No additional chemical / hazardous material required	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil / Groundwater Quality	-	No excavation or earth works required	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Biological	Habitats	Insignificant changes in Interaction (not expected to be significant)	Affects small area of habitat, such that there is no loss of viability / function of the habitat	Small	High	Moderate	Small	High	Moderate
	Flora & Fauna		Effect does not cause substantial change in the population of the species, or other species dependent on it	Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

















\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.



**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-6**

**On-Site Accommodation for Construction Packages due to COVID-19**

Original Reference	EIA Chapter 2.10.4 Manpower  EIA Annex 18 – Wildlife Protection Plan																																										
Original Requirements	The construction workforce will live at an off-site construction worker dormitory and transportation provided daily to bring personnel to and from the site.																																										
Change Proposed	To allow temporary on-site accommodation arising from the COVID-19 situation for a period of up to 6 months.																																										
Rationale for Change	<p>Due to the unforeseen circumstances arising from the COVID-19 situation, on-site accommodation is essential to comply with MOM and BCA’s guidelines to restart construction work.</p> <p>On-site accommodation is required to reduce intermixing and cross infection of construction workers from different projects across different accommodations.</p> <p>Temporary on-site accommodation is proposed for 288 workers, with the workers spread out at the different locations as below:</p>  <table border="1" data-bbox="472 1543 1302 1787"> <thead> <tr> <th>Package</th> <th>Location</th> <th>Type</th> <th>Set up</th> <th>Duration</th> <th>Number of Workers</th> </tr> </thead> <tbody> <tr> <td> External Effluent Discharge Pipe</td> <td>Shaft EDP2</td> <td>Containers</td> <td>2-3 weeks</td> <td>4 months</td> <td>10</td> </tr> <tr> <td> Quarantine Building</td> <td>QB FEA</td> <td>Containers</td> <td>2-3 weeks</td> <td>4 months</td> <td>30</td> </tr> <tr> <td> East Zone Main Contract</td> <td>At current open-air carpark</td> <td>Enclosed Steel Frame Structure</td> <td>1 -2 months</td> <td>6 months</td> <td>120</td> </tr> <tr> <td> West Node Bird Park</td> <td>WN MSCP Level 2</td> <td>Inside Level 2 WN MSCP</td> <td>1 week</td> <td>6 months</td> <td>80</td> </tr> <tr> <td> Rainforest Park North</td> <td>Next to current site office</td> <td>Enclosed Steel Frame Structure /</td> <td>3 months</td> <td>6 months</td> <td>48</td> </tr> <tr> <td colspan="5" style="text-align: right;"><b>TOTAL NUMBER OF WORKERS</b></td> <td><b>288</b></td> </tr> </tbody> </table>	Package	Location	Type	Set up	Duration	Number of Workers	 External Effluent Discharge Pipe	Shaft EDP2	Containers	2-3 weeks	4 months	10	 Quarantine Building	QB FEA	Containers	2-3 weeks	4 months	30	 East Zone Main Contract	At current open-air carpark	Enclosed Steel Frame Structure	1 -2 months	6 months	120	 West Node Bird Park	WN MSCP Level 2	Inside Level 2 WN MSCP	1 week	6 months	80	 Rainforest Park North	Next to current site office	Enclosed Steel Frame Structure /	3 months	6 months	48	<b>TOTAL NUMBER OF WORKERS</b>					<b>288</b>
Package	Location	Type	Set up	Duration	Number of Workers																																						
 External Effluent Discharge Pipe	Shaft EDP2	Containers	2-3 weeks	4 months	10																																						
 Quarantine Building	QB FEA	Containers	2-3 weeks	4 months	30																																						
 East Zone Main Contract	At current open-air carpark	Enclosed Steel Frame Structure	1 -2 months	6 months	120																																						
 West Node Bird Park	WN MSCP Level 2	Inside Level 2 WN MSCP	1 week	6 months	80																																						
 Rainforest Park North	Next to current site office	Enclosed Steel Frame Structure /	3 months	6 months	48																																						
<b>TOTAL NUMBER OF WORKERS</b>					<b>288</b>																																						
Changes to Impact Assessment (Refer to the Impact Assessment below)	There will be no loss of viability of the habitat surrounding the project area as the on-site accommodations are to be located within the designated development site areas and further away from sensitive receptors to minimise any potential environmental impact.																																										

	<p>Additionally, the project area will be hoarded up to prevent wildlife from entering, with additional measures to minimise noise and light spillage. Hence, the magnitude of impact from the night works on wildlife is expected to remain ‘Small’.</p> <p>The Impact Significance to wildlife remains ‘Moderate’ as the residual impacts may affect a small proportion of species population but would not substantially affect other species dependent on it. Hence, there are no changes to the impact assessment in the gazetted EIA Report.</p>
<p>Proposed Mitigation and Monitoring Measures</p>	<p>Applicable mitigation measures in the existing EIA/ EMMP will be applied to a contract-specific EMMP.</p> <ul style="list-style-type: none"> <li>• There will be limited workers and vehicles movement after working hours, except for emergency circumstances, to minimise movement beyond the work site. Worker movement is also strictly restricted to on-site accommodation and its facilities to prevent any trespass into the adjacent CCNR.</li> <li>• Lighting will be directed away from the forested area, and the windows and doors of the on-site accommodation will be adequately sealed to prevent light spillage.</li> <li>• As part of the monitoring efforts to ensure that site noise level complies with the night-time baseline levels, the use of generators will be minimised. Where usage is necessary, the quieter models will be sourced, with acoustic barriers to be deployed around the equipment. Loud music will not be permitted after 6pm and public address systems will not be used, other than for emergency communications.</li> <li>• Sanitary facilities will be adequately manned and inspected daily, as per MOM requirement. Wastewater, washing and cleaning water will be removed daily from site by third-party licensed wastewater collector. Waste bins will also be inspected and emptied at least twice daily.</li> </ul>
<p>Date of Approval</p>	<p>21 August 2020</p>

**Proposed Activity:**

Proposed Temporary on-site accommodation arising from COVID-19 situation  
288 Workers across 5 locations – Effluent Discharge Pipe shaft 2, Quarantine building, Singapore Zoo open air carpark, West Node multi-storey carpark and Rainforest Park North

**Personnel involved in Impact Assessment:**

MPD Project Management  
MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	No Change		Small	High	Moderate	Small	High	Moderate
	Ambient Noise (staff and visitors)	No Change		Negligible	Not Applicable#	Negligible	Negligible	Not Applicable	Negligible
	Surface Water Quality	No Change	Marginal increase in wastewater with 288 workers staying on site but will be managed with proper wastewater management.	Small	High	Moderate	Small	High	Moderate
	Soil / Groundwater Quality	No Change		Small	High	Moderate	Small	High	Moderate
Biological	Habitats	Insignificant changes in Interaction (not expected to be significant)	On-site accommodation will result in increased vehicular/human movement, noise, light and potential increase in human-wildlife interaction, but increase is not large enough to significantly change the magnitude rating.	Small	High	Moderate	Small	High	Moderate
	Flora & Fauna			Small	High	Moderate	Small	High	Moderate

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

# The definition of noise impact magnitude has taken into account the receptor sensitivity. Refer to Mandai EIA Report Annex 2.0

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-7**

<b>Extension of Working Hours for Indoor Works (Site-wide)</b>	
Original Reference	<ol style="list-style-type: none"> <li>1. EIA Chapter 8.5.13.2 – Residual Impact</li> <li>2. EIA Annex 18.0 – Wildlife Protection Plan Chapter 4</li> <li>3. EIA Addendum 1 – Works that need to be conducted after 6pm and Adjustment of Working Days to allow for Works on Sunday</li> </ol>
Original Requirements	Operation of construction machinery, including activities such as piling and demolition works, will only be undertaken in daylight hours between 8am and 6pm, reducing impact on nocturnal species.
Change Proposed	<p>To allow for works to be conducted within enclosed spaces between 6pm to 8am, in selected buildings for specific durations.</p> <p>Works involved will be limited to:</p> <ol style="list-style-type: none"> <li>1. Painting and plastering</li> <li>2. Strutting</li> <li>3. Rebar and formwork installation</li> <li>4. Installation of:               <ol style="list-style-type: none"> <li>a. M&amp;E systems, equipment</li> <li>b. Lighting fixtures</li> </ol> </li> <li>5. Architectural fixtures (non-structural, wall-mounted)</li> <li>6. Testing of:               <ol style="list-style-type: none"> <li>a. M&amp;E systems and equipment and commissioning</li> <li>b. Water tightness</li> </ol> </li> </ol> <p>The works will be carried out in enclosed areas across the following locations:</p> <ol style="list-style-type: none"> <li>1. West Node</li> <li>2. Bird Park</li> <li>3. Designated Animal Water Treatment Plants</li> <li>4. Rainforest Park North</li> <li>5. East Node and Indoor Attractions</li> <li>6. Stormwater Tank 3 at Rainforest Park South</li> </ol>
Rationale for Change	<p>COVID-19 had significantly impacted work progress. Indoor night works are a prudent means of improving productivity on the ground without increasing environmental impact.</p> <p>The following factors were considered when evaluating the nature/types of indoor works to be allowed:</p> <ul style="list-style-type: none"> <li>• The nature of works proposed is limited to those that are relatively minor which can be performed using handheld, battery-operated/manual tools.</li> </ul>

	<ul style="list-style-type: none"> <li>• All night work activities proposed will only commence upon completion of the building shell, with ability to close doors and windows.</li> <li>• Minimal overlap of indoor night works across individual work packages anticipated based on work sequence.</li> <li>• No vehicular movement outdoors and controlled worker movements during indoor night works.</li> </ul>
<p>Changes to Impact Assessment (Refer to the Impact Assessment below)</p>	<p>Several human, physical and ecological sensitive receptors were identified in the vicinity of the project sites. This includes taking into consideration impact to staff and visitors, wild fauna and flora in the neighbouring CCNR (including the Upper Seletar Reservoir), animals and plants under the care of the existing operating wildlife parks, and nearby waterbodies.</p> <p>The Rapid Impact Assessment Matrix (RIAM) methodology was applied to evaluate the impact of the indoor works on these receptors, including: construction-related noise and light pollution, air quality, surface water quality, and soil and ground water quality. The types of works to be conducted within buildings between 6 pm to 8 am, as well as the types of tools and equipment needed and the schedule of the works across the different construction packages were also evaluated.</p> <p>Results from the impact assessment concluded that the introduction of indoor works from 6pm to 8am within the Project Area may potentially have slight negative impacts on wildlife including fauna in the CCNR and animals in the operating wildlife parks, due to added noise and light pressures within this period. This is additional to the impacts already assessed on wildlife from daytime construction works (8am to 6pm).</p> <p>However, it was also assessed that any potential impacts can be properly managed and limited with the implementation of mitigation measures including ongoing monitoring of noise and light in the enclosed areas where works are taking place as well as the surrounding areas. Hence, there are no changes to the impact assessment in the gazetted EIA Report.</p>
<p>Proposed Mitigation and Monitoring Measures</p>	<p>Impacts to all identified sensitive receptors in this EIA are expected to remain limited with the appropriate implementation of management, mitigation and monitoring measures throughout the indoor night works period.</p> <p>Applicable mitigation measures in the EIA/EMMP will be applied into a contract-specific EMMP include key reduction and mitigation measures specific to indoor night works, such as:</p> <ul style="list-style-type: none"> <li>• Not conducting any indoor night works for buildings that are within close proximity to the Upper Seletar Reservoir (e.g. the Mandai Resort) given the difficulty in mitigating noise and light impact on the surrounding areas.</li> </ul>

	<ul style="list-style-type: none"><li>• Limit the number of buildings where indoor night works are carried out, especially those that are in close proximity to sensitive receptors.</li><li>• Limit the overlapping of night works.</li><li>• Ensure doors and windows are closed throughout the night works or kept to the minimum quantity of openings within each Package, without compromising on health and safety.</li><li>• Ensure the usage of tools/equipment are in adherence to the quantity guidelines for each package.</li></ul>
Date of Approval	10 March 2021

**Proposed Activity:**

To allow for works to be done within enclosed spaces between 6pm – 8am, for selected buildings for specific durations

**Personnel involved in Impact Assessment:**

MPD Project Management, MPD Sustainable Solutions, DHI Singapore

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	No Impact		Small	High	Moderate	Small	High	Moderate
	Ambient Noise (staff and visitors)	No Impact		Small	Not Applicable#	Minor	Small	Not Applicable	Minor
	Surface Water Quality	No Impact		Small	High	Moderate	Small	High	Moderate
	Soil / Groundwater Quality (West)	No Impact		Small	Moderate	Small	Small	Moderate	Small
	Soil / Groundwater Quality (East)	No Impact		Small	High	Moderate	Small	High	Moderate
Biological	Flora & Fauna	Slight Negative Impact	Impact is expected to remain limited with appropriate implementation of management, mitigation and monitoring measures	Small	High	Moderate	Small	High	Moderate
	Habitats	No Impact		Small	High	Moderate	Small	High	Moderate

\*Screening - No Impact, Slight Negative or Positive Impact, Minor Negative or Positive Impact, Moderate Negative or Positive Impact, Major Negative or Positive Impact. Based on Rapid Impact Assessment Matrix (RIAM) methodology.

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0.

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

# The definition of noise impact magnitude has taken into account the receptor sensitivity. Refer to Mandai EIA Report Annex 2.0.

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-8**

<b>Advance Closure of Temporary Fauna Crossing for Wildlife</b>	
Original Reference	1. EIA Chapter 8.5.8 – Restrictions to Wildlife Movement / Reductions in Connectivity
Original Requirements	Implement a temporary fauna crossing across Mandai Lake Road that is at least 30m in width during the construction period of the Bird Park and Rainforest Park North, as well as the Mandai Wildlife Bridge (referred to as Eco-link in the gazetted EIA). The location of the temporary fauna crossing is to coincide with existing forest areas on either side of Mandai Lake Road, within approximately 100m of the western boundary of the CCNR. The temporary fauna crossing can only close at least 6 months after the construction completion of the Mandai Wildlife Bridge and when suitable habitat has been established on the bridge.
Change Proposed	To advance the closure of the temporary fauna crossing either by fencing or hoarding up both sides of the road.
Rationale for Change	The temporary fauna crossing was implemented during the construction of the Mandai Wildlife Bridge as an interim measure to facilitate crossings of terrestrial fauna between the forest patches, particularly sambar and wild pigs (target fauna). With changes to development plans and schedules, coupled with data collection on the utilisation of the Mandai Wildlife Bridge by local fauna, it will be prudent to advance the closing of this temporary fauna crossing to minimise risk to wildlife.
Changes to Impact Assessment (Refer to the Impact Assessment below)	Slight positive change to the Impact Assessment is expected. The early closure of the temporary fauna crossing will channel fauna to utilise the Mandai Wildlife Bridge, which is a safer alternative that steers them away from potential road hazards. However, no significant change to overall residual impact. Hence, there are no changes to the impact assessment in the gazetted EIA Report.
Proposed Mitigation and Monitoring Measures	<p>Camera traps and CCTV installed on the Mandai Wildlife Bridge will remain operational to continue the monitoring of fauna activities.</p> <p>Fauna activity along Mandai Lake Road will continue to be monitored. Physical measures and response plan will be implemented to respond to possible cases of animals stranded along the road.</p>
Date of Approval	15 October 2021



**Proposed Activity:**

Closure of Temporary fauna crossing ahead of date stipulated in EIA/EMMP

**Personnel involved in Impact Assessment:**

MPD Sustainable Solutions

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ambient Noise (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surface Water Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil / Groundwater Quality	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Biological	Habitats	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Terrestrial Flora & Fauna	Significant change in interaction	Mandai Wildlife Bridge operational and accessible to local wildlife	Small	High	Moderate	Small	High	Moderate
	Aquatic Flora & Fauna (Stream 15)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

\*Screening - No Change, Insignificant Changes (not expected to be significant), Significant Change in Interaction, Positive Change in Interaction. Based on Mandai EIA Report Chapter 5.1

\*\* Based on EIA proposed methodology. Refer to EIA Annex 2.0

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

**MANDAI PARK HOLDINGS**

**Approved Change from EIA No. 2-9**

Extended Hours of Operations of F&B, Retail, Events and Indoor Attractions																							
Original Reference	1. EIA Chapter 2.11.2 – Operations Schedule																						
Original Requirements	<p>Proposed Project Operational Hours:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #008080; color: white;"> <th style="text-align: left;">Attraction / Activity</th> <th style="text-align: left;">Operational Hours</th> </tr> </thead> <tbody> <tr> <td>Rainforest Park</td> <td>07.00 – 19.00 daily</td> </tr> <tr> <td>Bird Park</td> <td>09.00 – 18.00 daily</td> </tr> <tr> <td>Eco-Lodge</td> <td>24 hours / day</td> </tr> <tr> <td>Planet Explorer and Sri Seletar Point</td> <td>08.00 – 21.00 daily</td> </tr> <tr> <td>East Arrival Node</td> <td>06.00 – 24.00 daily</td> </tr> <tr> <td>West Arrival Node</td> <td>06.00 – 19.00 daily</td> </tr> <tr> <td>Nature trails and boardwalk (public areas)</td> <td>06.00 – 19.00 daily</td> </tr> <tr> <td>Back of House</td> <td>06.00 – 22.00 daily</td> </tr> <tr> <td>Security</td> <td>24 hours / day</td> </tr> <tr> <td>Emergency</td> <td>24 hours / day</td> </tr> </tbody> </table>	Attraction / Activity	Operational Hours	Rainforest Park	07.00 – 19.00 daily	Bird Park	09.00 – 18.00 daily	Eco-Lodge	24 hours / day	Planet Explorer and Sri Seletar Point	08.00 – 21.00 daily	East Arrival Node	06.00 – 24.00 daily	West Arrival Node	06.00 – 19.00 daily	Nature trails and boardwalk (public areas)	06.00 – 19.00 daily	Back of House	06.00 – 22.00 daily	Security	24 hours / day	Emergency	24 hours / day
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Change Proposed	<p>To extend the current allowable operational hours stipulated in the EIA for selected F&amp;B and retail units, and the Indoor Attractions. The new operational hours are:</p> <ul style="list-style-type: none"> <li>• Bird Park restaurant: Up to 9.30pm daily and up to 12 midnight for special events</li> <li>• Rainforest Park North restaurant: Up to 9.30pm daily and up to 12 midnight for special events</li> <li>• West Arrival Node: Up to 9.30pm daily and up to 12 midnight for special events</li> <li>• Indoor Attractions (referred to as Planet Explorer and Sri Seletar Point in the gazetted EIA): Up to 12 midnight daily for special events, MICE business needs and seasonal operating schedule</li> </ul>																						
Rationale for Change	<p>With the development of a more definitive design for all the Features within the Mandai project, the Mandai precinct strives to deliver an immersive cluster of nature and wildlife offerings to our guests that can be experienced up to the night hours. This would span F&amp;B, retail and programmed events that will allow the precinct to provide guests a wider suite of offerings, thus maximising the guest experience.</p> <p>The following parameters are considered when determining the potential locations:</p> <ul style="list-style-type: none"> <li>• Locations are carefully selected to ensure that activities can be contained fully indoors to avoid light and noise spillage</li> <li>• Locations selected are situated close to park entrances or guest arrival points for ease of wayfinding as well as to avoid the need for additional lighting</li> <li>• Locations selected are not near sensitive receptors</li> </ul>																						

<p>Changes to Impact Assessment (Refer to the Impact Assessment below)</p>	<p>The Rapid Impact Assessment Matrix (RIAM) methodology was applied for assessing and summarising the overall significance of impact to the environmental sensitive receptors identified in the original EIA</p> <p>Extension of operating hours was assessed to have minor negative impact on wild fauna. However, it was also assessed that any potential impacts can be properly managed and limited with the implementation of mitigation measures.</p>
<p>Proposed Mitigation and Monitoring Measures</p>	<p>Key mitigation and monitoring measures, such as:</p> <ul style="list-style-type: none"> <li>• Use of noise screening/sound barriers to achieve noise reduction along Mandai Wildlife Bridge</li> <li>• Visitors shall be educated on noise mitigation and reminded to keep their voices down when outdoors</li> <li>• Outdoor landscape lighting will only be kept on for the buildings that have extended operating hours if the lighting is deemed necessary for safety and security reasons</li> <li>• Regular inspection of perimeter fencing to ensure structural integrity and effectiveness to keep wild fauna from entering the premises</li> <li>• Installation of road humps and traffic speed monitoring systems at fauna crossing hotspots</li> </ul>
<p>Date of Approval</p>	<p>15 October 2021</p>

**Proposed Activity:**

Extended Hours of Operations of F&B, Retail, Events and Indoor Attractions

**Personnel involved in Impact Assessment:**

MPD Asset Development, MPD Sustainable Solutions, DHI Singapore

	RECEPTORS	SCREENING* (Changes in Interactions of the Proposed Activity with Receptors with reference to what had been assessed in the EIA)	REMARKS	EIA RESIDUAL IMPACTS (Gazetted EIA)			RESIDUAL IMPACTS (After Approved Change)		
				MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***	MAGNITUDE**	SENSITIVITY /VULNERABILITY /IMPORTANCE**	IMPACT SIGNIFICANCE***
Physical	Air Quality (staff)	Slight Negative Impact		Not Available##	Medium	Not Available	Not Available	Medium	Not Available
	Air Quality (visitors)	Slight Negative Impact		Not Available##	High	Not Available	Not Available	High	Not Available
	Ambient Noise (staff and visitors)	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surface Water Quality	No Change		Small	High	Moderate	Small	High	Moderate
	Soil / Groundwater Quality (West)	No Change		Medium	Low	Minor	Medium	Low	Minor
	Soil / Groundwater Quality (East)	No change		Small	High	Moderate	Small	High	Moderate
Biological	Habitats	-		Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Flora & Fauna	Minor Negative Impact	Impact is expected to remain limited with appropriate implementation of management, mitigation and monitoring measures	Small	High	Moderate	Small	High	Moderate

\*Screening - No Impact, Slight Negative or Positive Impact, Minor Negative or Positive Impact, Moderate Negative or Positive Impact, Major Negative or Positive Impact. Based on Rapid Impact Assessment Matrix (RIAM) methodology.

\*\* Based on EIA proposed methodology. Refer to Mandai EIA Report Annex 2.0.

\*\*\* Impact assessment shall be made based on the Impact Assessment Matrix as per adopted in EIA. Refer to Mandai EIA Report Chapter 4.0.

## The residual impact magnitude of Air Quality on human receptors during the operation phase was not available when the Mandai EIA Report was written as different transport options were being explored at that time. Refer to Mandai EIA Report Chapter 9.1