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## **1 INTRODUCTION**

### **1.1 General**

1.1.1 This Executive Summary summarises the results of the Environmental Impact Assessment (EIA) for Relocation of Diamond Hill Fresh Water and Salt Water Service Reservoirs to Caverns (the Project). The EIA has been prepared in accordance with the requirements of the Environmental Impact Assessment Ordinance (EIAO) and the EIA Study Brief (ESB-317/2019).

### **1.2 Project Background**

1.2.1 The 2011-12 Policy Address announced that the Government would adopt a multi-pronged approach, including Rock Cavern Development (RCD), for expanding land resources. Civil Engineering and Development Department (CEDD) took initiative to commission a study on "Enhancing Land Supply Strategy: Reclamation outside Victoria Harbour and Rock Cavern Development".

1.2.2 The Study has identified three Government facilities (viz. the Diamond Hill Fresh Water and Salt Water Service Reservoirs (DHSRs), Sham Tseng Sewage Treatment Works and Sai Kung Sewage Treatment Works) for relocating to caverns and recommended further detailed feasibility study to identify and address the issues associated with the relocation proposal.

1.2.3 Water Supplies Department (WSD) commenced a detailed feasibility study under Agreement No. CE 33/2014 (WS) "Relocation of Diamond Hill Fresh Water and Salt Water Service Reservoirs to Caverns – Feasibility Study" in December 2014. The result of the Feasibility Study (FS) affirmed that relocating the DHSRs and associated facilities to caverns is technically feasible.

1.2.4 Binnies Hong Kong Limited (formerly Black & Veatch Hong Kong Limited) was commissioned by WSD in December 2018 to undertake the investigation, design and construction supervision on relocating the DHSRs into caverns.

### **1.3 Designated Project**

1.3.1 The Project is a Designated Project under Item Q.2, Part I of Schedule 2 of the Environmental Impact Assessment Ordinance, "Underground Rock Caverns", which requires an environmental permit for its construction and operation.

### **1.4 EIA Study Brief**

1.4.1 In accordance with the requirements of Section 5(1) of the EIA ordinance, a Project Profile (No. PP-582/2019) for the Project was submitted to the Director of Environmental Protection (DEP) for application for an EIA Study Brief on 23 May 2019. Pursuant to Section 5(7)(a) of the EIA Ordinance, the DEP issued a Study Brief (No. ESB-317/2019) on 28 June 2019 for the EIA study.

## **2 PROJECT DESCRIPTION**

### **2.1 General Description of the Project**

2.1.1 The relocated DHSRs will be constructed in a series of caverns linked by access tunnel. The relocated DHFWSR and DHSWSR will be compartmented while the existing DHPS will be split into two pump houses for fresh and salt water supply when relocated.

2.1.2 Ancillary facilities to be constructed near the tunnel portal may include transformer room, switch room, emergency generator room, control room, ventilation building, and pumping station control room, which will be constructed in an above-ground building outside the tunnel.

- 2.1.3 The scope of the Project comprises the following and the general layout plan is shown in [Figure 2.1](#).
- a) Construction of the relocated DHSRs and associated pumping stations and water main laying works;
  - b) Construction of tunnels, adits, ventilation system and caverns for accommodating the relocated DHSRs and the associated facilities;
  - c) Terminating the operation of the existing DHSRs and the associated facilities; and
  - d) All other associated works that are incidental to and necessary for the completion of the Project.
- 2.1.4 The major construction activities of the Project include earthworks, drilling and blasting, construction of concrete structures, handling and transportation of excavated materials, water mainlaying, installation of electrical and mechanical (E&M) equipment and material transportation. The operation of the existing DHSRs and the associated facilities will be terminated after the completion of the testing and commissioning of the relocated DHSRs. Under the Project, the existing DHSRs and associated facilities will be retained after termination of the operation.
- 2.1.5 Demolition of existing facilities, and construction of infrastructures at the released site are not included in the Project and will be carried out by other parties.

## **2.2 Need of the Project**

### **Need for the Development**

- 2.2.1 There is a need to optimise the supply of land by sustainable and innovative approaches to support the social and economic development of Hong Kong, as stated in the 2011-12 Policy Address. Relocation of the service reservoirs and the associated facilities can provide valuable land in urban area for cost-effective residential development or other beneficial uses.

### **Scenarios "With" the Project**

- 1.1.1 The existing DHSRs site of approximately 4 hectares will be released for housing and/or other compatible and beneficial uses after implementation of the Project. In addition, the existing water supply networks will also be optimised in order to ensure the reliability of the water supply system.

### **Scenarios "Without" the Project**

- 2.2.2 If the project is not implemented, the existing DHSRs will be remaining unchanged. The existing DHSRs site cannot be released for the future development to address the territorial housing needs as well as the local needs for community facilities.

## **2.3 Consideration of Alternatives**

### **Relocation Site**

- 2.3.1 A total of four (4) cavern options for the relocation of the DHSRs have been considered. Considerations for the selection of proposed cavern options is summarised in **Table 2-1**.

**Table 2-1 Considerations for Proposed Cavern Options**

Cavern Option	Land Matter	Environmental Considerations	Other Considerations	Preferable Option
Cavern Option 1 - hillsides north of Chuk Yuen North Estate	In government land ("Green Belt" zone)	<ul style="list-style-type: none"> <li>Noise and dust impacts during open excavation but controllable when inside cavern</li> <li>Relatively further away from the Lion Rock Country Park (LRCP) compared to Options 2 and 3</li> </ul>	<ul style="list-style-type: none"> <li>In close proximity to the existing DHSRs allowing the relocated DHSRs to be housed and positioned at similar level as the invert levels of the existing DHFWSR and DHSWSR</li> <li>The geology of the proposed relocation site, belonging to hard granite with no obvious weak zones and faults, is most suitable for construction of large caverns</li> <li>Great public concern on the blasting impact on their private slopes due to its close proximity from the proposed caverns</li> </ul>	No
Cavern Option 2 - hillside north of Ma Chai Hang FWSR	In government land ("Green Belt" zone)	<ul style="list-style-type: none"> <li>Noise and dust impacts during open excavation but controllable when inside cavern</li> <li>Closer to LRCP than Option 1</li> </ul>	<ul style="list-style-type: none"> <li>Relevant Wong Tai Sin District Council members and local public requested to further revise the cavern location in order to maximise the distance between the proposed caverns and nearby housing estates</li> </ul>	No
Cavern Option 3 - hillside northwest of Ma Chai Hang FWSR	In government land ("Green Belt" zone)	<ul style="list-style-type: none"> <li>Noise and dust impacts during open excavation but controllable when inside cavern, and less impact to nearby residents is anticipated compared with Option 2</li> <li>Closer to LRCP than Option 2 but no encroachment</li> </ul>	<ul style="list-style-type: none"> <li>Watermains laying works at Chui Chuk Street will no longer be required</li> </ul>	Yes
Cavern Option 4 - hillside north of Lion Rock Park	In government land ("Green Belt" zone)	<ul style="list-style-type: none"> <li>Greatest distance from nearby residential areas amongst all the four options</li> <li>Closer to LRCP than Option 2 but no encroachment</li> </ul>	<ul style="list-style-type: none"> <li>Potential impact to the structural integrity of MTRC Shatin-Central Link (SCL) Tunnel due to proximity</li> <li>Poor ground condition</li> </ul>	No

2.3.2 Based on the considerations in **Table 2-1**, Cavern Option 3 is the preferred relocation site for the DHSRs.

**Location of Access Tunnel and Tunnel Portal**

2.3.3 A total of nine (9) access tunnel options have been considered. Considerations for the selection of proposed tunnel options is summarised in **Table 2-2**.

**Table 2-2 Considerations for Proposed Tunnel Options**

<b>Tunnel Options</b>	<b>Emergency Vehicular Access (EVA)</b>	<b>Land Matters</b>	<b>Environmental Considerations</b>	<b>Other Considerations</b>	<b>Preferable Option</b>
Tunnel Option 1 – Shatin Pass Road near Fat Jong Temple	Not recommended due to constraint in Shatin Pass Road (i.e. gradient 1:5, greater than 1:10)	Inside Government land	<ul style="list-style-type: none"> <li>• Comparatively lesser air / noise sensitive receivers surrounding the proposed tunnel portal, but will affect woodland and stream habitat</li> <li>• Relatively short tunnel length among other options which will produce lesser excavated material, dust and noise impact.</li> <li>• Low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• Close to existing water main network to Fung Wong Fresh and Salt Water Service Reservoir</li> <li>• Could be used as utility gallery for water mains to Fung Wong Fresh and Salt Water Service Reservoir, also serve as emergency exit</li> </ul>	No
Tunnel Option 2 – Shatin Pass Road near Ying Fuk Court	Not recommended due to inside private slope	Inside private slope	<ul style="list-style-type: none"> <li>• Locating on existing slope and opposite to Wong Tai Sin Hospital mainly which is locating away from residential areas</li> <li>• Potential noise and dust impact, longer tunnel length among Options 1-5, 6a &amp; 6b leading to more excavated materials</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• Close to Chuk Yuen North Estate, CLP's pylons</li> </ul>	No
Tunnel Option 3 – Wing Chuk Street	Not recommended due to inside private slope	Inside private slope	<ul style="list-style-type: none"> <li>• Locating on existing slope and opposite to Chuk Yuen North Estate</li> <li>• Potential noise and dust impacts, generated excavated materials will be similar for Options 3-5, 6a &amp; 6b</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• Close to Chuk Yuen North Estate</li> </ul>	No
Tunnel Option 4 – Junction between Wing Chuk Street & Chui Chuk Street	Not recommended due to inside private slope	Inside private slope	<ul style="list-style-type: none"> <li>• Locating on existing slope and opposite to Pang Ching Court</li> <li>• Potential noise and dust impacts, generated excavated materials will be similar for Options 3-5, 6a &amp; 6b</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• Close to Chuk Yuen North Estate and Pang Ching Court</li> </ul>	No

<b>Tunnel Options</b>	<b>Emergency Vehicular Access (EVA)</b>	<b>Land Matters</b>	<b>Environmental Considerations</b>	<b>Other Considerations</b>	<b>Preferable Option</b>
Tunnel Option 5 – Chui Chuk Street	Feasible, significant traffic impact anticipated during construction stage	Inside Government land	<ul style="list-style-type: none"> <li>• Locating on existing slope and opposite to Pang Ching Court</li> <li>• Potential noise and dust impact, generated excavated materials will be similar for Options 3-5, 6a &amp; 6b</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• Close to Chuk Yuen North Estate and Pang Ching Court</li> <li>• Impact on Chui Chuk Street which is the sole access road for Tsui Chuk Garden</li> <li>• There is constraint on laying water mains in Chui Chuk Street due to existing UUs</li> <li>• Could be considered as EVA / watermains laying to existing network</li> </ul>	No
Tunnel Option 6a & 6b – Ma Chai Hang Fresh Water Service Reservoir	Feasible, further liaison with FSD is required to upgrade the existing access road	Inside Government land	<ul style="list-style-type: none"> <li>• Potential generate larger noise and dust impacts to Tsui Chuk Garden due to close proximity of the work site, direct loss of woodland habitat (Option 6a) for construction of booster pumping station and widening of the existing access road</li> <li>• Relatively short tunnel length which produce lesser excavated material</li> <li>• Visual and landscape impact generated from construction of tunnel portal owing to the close proximity to nearby housing estates</li> </ul>	<ul style="list-style-type: none"> <li>• Far away from existing water main network, not suitable for laying water mains</li> <li>• Booster pump is required</li> <li>• The existing substandard access road will need to be widened for use by emergency vehicles, and the slopes along the access road need to be upgraded.</li> <li>• Larger blasting impact to adjacent areas</li> <li>• WTSDC member and the residents of Tsui Chuk Garden raised their great concern on the tunnel portal location</li> <li>• Local public had great concern about temporarily closure of the access road to Ma Chai Hang FWSR during the construction</li> </ul>	No
Tunnel Option 7 – Near the entrance of Lion Rock Park	Separate EVA not required as passage length not exceeding 750m	Inside Government land	<ul style="list-style-type: none"> <li>• Relatively longer tunnel length which produce larger quantity of excavated material</li> <li>• Potential dust and noise impacts to the nearby sensitive receivers are expected to be longer due to longer construction programme when compare to Tunnel Options 6a &amp; 6b</li> <li>• Direct loss of woodland habitats due to construction</li> <li>• Potential impact on existing flora species of conservation importance</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• No additional pumping station and widening of existing access road to Ma Chai Hang FWSR would be required</li> <li>• Relatively low blasting impact to adjacent areas</li> <li>• Relatively less public concern</li> </ul>	No

Tunnel Options	Emergency Vehicular Access (EVA)	Land Matters	Environmental Considerations	Other Considerations	Preferable Option
Tunnel Option 8 - Adjacent to the Lion Rock Park Transit Nursery Landscape Section	Separate EVA not required as passage length not exceeding 750m	Inside Government land	<ul style="list-style-type: none"> <li>• Direct loss of existing plantation habitats on slope</li> <li>• Relatively longer tunnel length which produce larger quantity of excavated material for disposal</li> <li>• Potential dust and noise impacts to the nearby sensitive receivers are expected longer due to longer construction programme when compare to Tunnel Options 6a &amp; 6b</li> <li>• Relatively low visual and landscape impact generated from construction of tunnel portal</li> </ul>	<ul style="list-style-type: none"> <li>• No additional pumping station and widening of existing access road to Ma Chai Hang FWSR would be required</li> <li>• Relatively low blasting impact to adjacent areas</li> <li>• Potential effect to the hikers to the LRCP</li> </ul>	Yes

2.3.4 Based on the considerations in **Table 2-2**, Tunnel Option 8 is the preferred location of access tunnel and tunnel portal.

**Construction Methods for Tunnel and Cavern**

2.3.5 The considerations and recommendations of construction methods for tunnel and cavern are summarised in **Table 2-3**.

**Table 2-3 Considerations of Construction Methods for Tunnel and Cavern**

Construction Methods Options for Tunnel and Cavern	Engineering Consideration	Environmental Consideration	Construction Duration	Other Considerations	Recommendation
Drill and break (for tunnel)	<ul style="list-style-type: none"> <li>• Commonly adopted in tunneling project</li> </ul>	<ul style="list-style-type: none"> <li>• Noise and dust impacts during open excavation but controllable when inside cavern</li> </ul>	Slower production and longer construction duration	-	Recommended
Drill and blast (for tunnel and cavern construction)	<ul style="list-style-type: none"> <li>• Commonly adopted in tunneling project</li> </ul>	<ul style="list-style-type: none"> <li>• Noise and dust impacts during open excavation but controllable when inside cavern</li> </ul>	Moderate production and construction duration	<ul style="list-style-type: none"> <li>• Potential hazard from the delivery, storage and handling of explosives</li> <li>• Requires permit for use of explosives</li> </ul>	Recommended

<b>Construction Methods Options for Tunnel and Cavern</b>	<b>Engineering Consideration</b>	<b>Environmental Consideration</b>	<b>Construction Duration</b>	<b>Other Considerations</b>	<b>Recommendation</b>
Cut and Cover (initial short section connecting to the portal)	<ul style="list-style-type: none"> <li>• Suitable for the tunnel section where the rock cover is less than half of tunnel span</li> </ul>	<ul style="list-style-type: none"> <li>• Noise and dust impacts but controllable when noise barrier, dust screen and water spraying are implemented</li> </ul>	Shorter construction duration	<ul style="list-style-type: none"> <li>• Temporary traffic arrangement and excavation and lateral support is required</li> </ul>	Recommended
Tunnel Boring Machine (TBM)	<ul style="list-style-type: none"> <li>• Suitable for small to medium size tunnel</li> <li>• Requires larger launching area</li> <li>• Not suitable for abrupt bend</li> </ul>	<ul style="list-style-type: none"> <li>• Less noise and dust impact</li> </ul>	Shorter construction duration	<ul style="list-style-type: none"> <li>• Limited works space in tunnel portal</li> <li>• High capital cost</li> </ul>	Not recommended
Use of chemical expansion agent	<ul style="list-style-type: none"> <li>• Quiet</li> </ul>	<ul style="list-style-type: none"> <li>• No noise and dust impact</li> </ul>	Very slow production and very long construction duration	<ul style="list-style-type: none"> <li>• Drilling is still required</li> <li>• Not suitable for fractured and weak rock mass</li> </ul>	Not recommended

**2.4 Project Programme**

2.4.1 Construction of the Project is tentatively scheduled to commence in mid of 2022 for completion by end of 2027. The tentative programme for proposed fresh water and salt water mains will commence in end of 2022 and complete in Q3 of 2026. The tentative completion date of the construction of relocated DHSRs is in Q3 of 2026. Tentative programme for commissioning of the relocated DHSRs and terminating the operation of the existing DHSRs will be undertaken tentatively in Q4 of 2026. The remaining associated works e.g. landscaping/slope works and reinstatement for access tunnel portal will be undertaken in 2027.

**2.5 Concurrent Projects**

2.5.1 Potential concurrent projects have been identified and summarised in **Table 2-4**. Potential cumulative impacts from these concurrent projects (if any) have been identified and assessed in this EIA Study.



**Table 2-4 Potential Concurrent Projects**

Project Name	Target Work Commencement Date	Target Work Completion Date
CE 28/2017 (HY) - Pedestrian Link near Chuk Yuen North Estate – Design and Construction	Mid 2023	Mid 2029
CE 48/2018 (HY) - Improvement of Lion Rock Tunnel	Mid 2024	[1]
[1] Project details is not available for consideration at time of reporting.		

### 3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The following aspects for potential environmental impacts during the construction and operation phases of the Project has been assessed in this EIA Report in accordance with the Study Brief.

- Air quality impact
- Noise impact
- Water quality impact
- Waste management implications
- Land contamination
- Ecological impact
- Landscape and visual impact
- Hazard to life

#### 3.1 Air Quality Impact

3.1.1 Potential air quality impacts associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.3 and Appendix B of the EIA Study Brief, as well as Annexes 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The study area for air quality impact assessment is defined by a distance of 500m from the boundary of the Project site.

3.1.2 During construction phase, fugitive dust impacts may arise from construction activities including site clearance, rock drilling, blasting operation, breaking works, excavation works, handling and transportation of construction and demolition (C&D) material, stockpiling and wind erosion. Quantitative fugitive dust assessment has been conducted for the assessment area within 500m from the portal area boundary. With implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation, recommended dust suppression measures such as frequent watering, as well as use of blast nets / canvas covers, the predicted concentrations of total suspended particulates (TSP), respirable suspended particulates (RSP) and fine suspended particulates (FSP) at representative air sensitive receivers (ASRs) would comply with the criteria stipulated in the Air Quality Objectives (AQOs) and EIAO-TM. The predicted pollutant concentrations after implementation of mitigation measures are summarised in **Table 3-1**.

**Table 3-1 Summary of Predicted Cumulative Construction Dust Impact (Mitigated Scenario)**

	Pollutant Concentration ( $\mu\text{g}/\text{m}^3$ )					Compliance
	TSP	RSP		FSP		
	1-hr	24-hr (10 <sup>th</sup> Highest)	Annual	24-hr	Annual	
ASRs	197 -361	71 - 77	31 - 36	53 - 55	22 - 24	Yes
AQOs/ EIAO-TM Criteria	500	100	50	75	35	--

Note: Value in blanket () is no. of daily exceedance.

3.1.3 During operation phase, as the DHSRs and DHPS are mainly for the storage and pumping of fresh water and flushing water, no major air pollutant emission source (including odour) is expected.

### 3.2 Noise Impact

3.2.1 Potential noise impacts associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.4 and Appendix C of the EIA Study Brief, as well as Annexes 5 and 13 of the EIAO-TM. The study area for noise impact assessment is defined by a distance of 300m from the boundary of the Project site.

3.2.2 During construction phase, noise will be generated from the powered mechanical equipment (PME) used for these construction activities. Noise impact arising from construction activities of the Project was quantitatively assessed. The predicted maximum unmitigated construction noise levels at the representative noise sensitive receivers (NSRs) would be 70 – 91 dB(A). With implementation of mitigation measures including use of quiet PME, adoption of noise barriers/enclosures and scheduling of PME and construction activities, the predicted maximum construction noise levels at the NSRs would be 58 – 75 dB(A) and comply with the EIAO-TM criteria.

3.2.3 During operation phase, the main fixed noise sources will be ventilation system, transformer room and emergency generator in the ancillary building. As details of the layout and noise specification of the equipment in the ancillary building will be developed by Contractor, the maximum permissible SWL from the ancillary building are determined for future detailed engineering design to ensure compliance with the relevant noise criteria. The maximum permissible SWL of the equipment in the ancillary building would be 91 dB(A). With the fixed plant properly designed to meet the maximum permissible SWLs, no adverse operational noise impact is envisaged. Mitigation measures, such as use of quieter plant, locating fixed plant, louvres or opening away from NSRs, use of silencers, acoustic louvres/doors where necessary, are also recommended to minimise the noise impact during operation of the Project.

### 3.3 Water Quality Impact

3.3.1 Potential water quality impacts associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.5 and Appendix D of the EIA Study Brief, as well as Annexes 6 and 14 of the EIAO-TM. This Project falls within Victoria Harbour (Phase 2) Water Control Zone. The study area for water quality impact assessment is defined by a distance of 500m from the boundary of the Project site.

3.3.2 During construction phase, potential sources of water quality impact associated with the Project include construction site run-off, general construction activities, sewage generated by construction workforce, potential accidental spillage of chemicals, potential groundwater infiltration, construction works in close proximity of inland watercourses and cleansing effluent generated from washing of interior of structures upon completion of

construction and prior to operation. The site practices as outlined in the ProPECC PN 1/94 "Construction Site Drainage" and the ETWB TC(W) No. 5/2005 "Protection of natural streams/ rivers from adverse impacts arising from construction works" are recommended to minimise the potential water quality impacts from the construction activities. With the implementation of the recommended mitigation measures, such as provision of drainage system and sand/silt removal facilities, groundwater control measures, and proper treatment and discharge of cleansing effluent etc., no unacceptable water quality impact is anticipated during construction phase.

- 3.3.3 During operation phase, potential sources of water quality impact include effluents from cleaning of service reservoir, non-point source surface run-off from new impervious area and minimal sewage from the development. With implementation of mitigation measures including proper discharge of sewage and cleansing water, and best management practices to reduce non-point source surface water pollution, adverse water quality impact associated with the operation of the Project is not envisaged.

### **3.4 Waste Management Implications**

- 3.4.1 Waste management implications associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.6 and Appendix E of the EIA Study Brief, as well as Annexes 7 and 15 of the EIAO-TM.

- 3.4.2 During construction phase, wastes generated by the construction activities would include Construction and Demolition (C&D) materials from the construction works, general refuse from the workforce and chemical waste from any maintenance of construction plant and equipment. Approximately 291,212 m<sup>3</sup> of C&D materials, among which 286,333 m<sup>3</sup> is inert and 4,879 m<sup>3</sup> is non-inert, expected to be generated from the Project. It has been estimated that approximately 15% of inert C&D material can be reused on-site, thus reducing the need for off-site disposal. A total of approximately 242,286 m<sup>3</sup> of surplus inert C&D materials has to be disposed of at public fill reception facilities. For the non-inert C&D materials, 3,416 m<sup>3</sup> would be recycled and 1,463 would be disposed of at landfill. It is estimated that about 50 litres of chemical waste would be generated per month and collected by licensed chemical waste collector for disposal at licensed treatment facilities. A 65 kg of general refuse would be generated per day and collected by waste collector for disposal of at waste transfer/disposal facilities and then to landfill. Provided that these identified wastes arisen are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed in terms of the avoidance-minimisation-reuse-recycling-disposal hierarchy, unacceptable environmental impacts are not anticipated during construction of the Project.

- 3.4.3 During operation phase, as the relocated DHSRs are mainly for the storage and pumping of fresh water and flushing water, only small amount of general refuse and chemical waste would be generated and no adverse waste implication is envisaged during operation of the Project.

### **3.5 Land Contamination**

- 3.5.1 Potential land contamination issues associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.7 and Appendix F of the EIA Study Brief, as well as Sections 3.1 and 3.2 of Annex 19 of the EIAO-TM.

- 3.5.2 A review of past and present land uses of the project site was conducted. The land uses in the areas were formerly hilly terrain, slope, agricultural lands, resettlement area, village areas, squatters, roads and vacant lands. The proposed works will be constructed on existing hilly terrain, roads, vacant lands and Lion Rock Park Transit Nursery. No polluting activities / sources were observed within the project site areas during the walkover. Based

on the desk-top review and site walkover, no signs of suspected land contamination due to past and present land uses were identified.

### **3.6 Ecological Impact**

- 3.6.1 Potential ecological impacts associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.8 and Appendix G of the EIA Study Brief, as well as Annexes 8 and 16 of the EIAO-TM. The study area for the terrestrial ecological impact assessment is defined by a distance of 500m from the boundary of the Project and any associated works as well as any other area likely to be impacted by the Project.
- 3.6.2 Ecological surveys were undertaken to establish the ecological profile of the proposed works areas and Study Area. Five (5) types of habitats identified within the Study Area include secondary woodland, shrubland, plantation, developed area and watercourse, of which two (2) types of habitats, including plantation and developed area were located within the Project Area. Temporary loss of plantation and developed area are about 0.760 ha and 3.114 ha respectively. Permanent loss of plantation and developed area are about 0.252 ha and 0.032 ha respectively. The ecological value of the identified habitats within the Project Area is low.
- 3.6.3 The proposed works would not encroach into the boundary of LRCP, hence no direct impact on wildlife and habitats within the country park is anticipated. Direct and indirect ecological impacts that would arise from the Project during the construction and operation phases have been identified and evaluated. Taking into account the small size and low ecological value affected habitats, the magnitude of impact due to permanent and temporary loss of plantation and developed area is anticipated to be relatively small.
- 3.6.4 Construction site runoff and other disturbance impacts resulting from the proposed aboveground works may potentially have indirect impact on wildlife and species of conservation interest. Standard mitigation measures such as good site practice, control of lighting and minimization of groundwater infiltration are proposed.
- 3.6.5 Most impacts are considered to be negligible in nature. Overall, no significant adverse ecological impacts during construction and operation phases were anticipated in this assessment. With effective implementation of recommended mitigation measures, no adverse residual ecological impacts are expected from the Project.

### **3.7 Landscape and Visual Impact**

- 3.7.1 Potential landscape and visual impacts associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.9 and Appendix H of the EIA Study Brief as well as Annexes 10 and 18 of the EIAO-TM. The study area for landscape and impact assessment is defined by a distance of 500m from the boundary of the Project site while the study area for visual impact assessment is defined by visual envelope of the Project.
- 3.7.2 Approximately 260-300 nos. of tree are recommended to be removed. No tree of particular interest was identified within the project site.
- 3.7.3 The most affected landscape baseline are Engineered Slope (Vegetated) (LR1.2), Lion Rock Park Transit Nursery (LR1.5) and Upland Hillside Landscape at Lion Rock (LCA2). Upon full implementation of all proposed mitigation measures, the residual impacts on all landscape baseline are anticipated to be Slight to Moderate to Insubstantial during construction phase and Slightly Adverse to Insubstantial during operation phase.
- 3.7.4 The most affected Visual Sensitive Receivers (VSRs) are Residents in Tin Ma Court (R01), Residents in The Palace (R02), Recreational users in Lion Rock Park (L03), Occupants in

Lion Rock Park Transit Nursery (F07) and Travellers along Lion Rock Road (T02). Upon full implementation of all proposed mitigation measures, the residual impacts on all VSRs are anticipated to be Slight to Moderate to Slight during construction phase and Slightly Adverse to Insubstantial during operation phase.

- 3.7.5 Mitigation measures such as careful site management/design, tree transplanting/compensatory planting and minimization of light impact during construction phases, as well as landscape planting and rooftop/vertical greening during operation phase are recommended. With full implementation of the proposed mitigation measures recommended, all the residual landscape and visual impacts during construction and operation phases arising from the project are considered Acceptable.

### **3.8 Hazard to Life**

- 3.8.1 Potential hazard to life associated with the construction and operation phases of the project have been assessed in accordance with the requirements given in Section 3.4.10 and Appendix I of the EIA Study Brief as well as Section 2 of Annex 4 of the EIAO-TM.
- 3.8.2 No works area will be located within the consultation zone of any Potentially Hazardous Installation (PHI). No manufacturing of dangerous goods during both construction and operation phases of the Project.
- 3.8.3 During construction phase, explosives, classified as Category 1 Dangerous Goods, will be used for the tunnel/caverns construction. Explosives will be delivered daily to the Project site and loaded immediately for blasting. The Project will not involve any overnight storage of explosives. The delivery of explosives from Government Explosives Depots to the blasting site is arranged by the Mines Division and the use of explosives is controlled under the Dangerous Goods Ordinance (Chapter 295). The contractor is required to destroy any unused explosives before nightfall.
- 3.8.4 Diesel oil, classified as Category 5 Dangerous Goods, will be stored inside storage tank within the ancillary building for emergency electricity generation during operation phase. Considering the small amount of diesel oil (~1,500L) storage and proper storage for emergency use, no unacceptable associated off-site impacts are anticipated during operation phase.

## **4 EM&A REQUIREMENT**

- 4.1.1 Baseline monitoring of conditions of potentially disturbed LRs and LCAs within Project Site and Works Area prior to commencement of construction works is recommended. During construction phase of the Project, monitoring of air quality and noise has been recommended at designated sensitive receivers. Environmental site audit should be conducted weekly throughout the construction phase to ensure that the proposed mitigation measures are implemented properly for the aspects of air quality impact, noise impact, water quality impact, waste management implications, ecological impact, and landscape and visual impact.
- 4.1.2 Commissioning test should be conducted prior to operation of the Project to ensure fixed plant noise impact would comply with the relevant noise standards. For landscape and visual impact, site audits should be undertaken during the 12-month establishment period (operation phase) to ensure the proper implementation of the recommended mitigation measures. The conditions and growth performance of the compensatory planting should be regularly checked and monitored.
- 4.1.3 A summary of the EM&A requirements for each environmental aspect is presented in **Table 4-1**.

**Table 4-1 Summary of EM&A Requirements**

Environmental Aspect	Construction Phase	Operation Phase
Air quality impact	√	×
Noise impact	√	√ (commissioning test prior to operation )
Water quality impact	√*	×
Waste management implications	√*	×
Land contamination	×	×
Ecological impact	√*	×
Landscape and visual impact	√*	√*
Hazard to life	×	×
Remarks: √ - Required (monitoring & site audit); √*- (site audit only); × - Not Required		

**5 OVERALL CONCLUSION**

- 5.1.1 The Project mainly comprises construction of the relocated DHSRs and pumping stations, water main laying works, construction of tunnels, adits, ventilation system and caverns, terminating the operation of the existing DHSRs as well as other associated works required for the completion of the Project.
- 5.1.2 The EIA has identified and assessed the potential environmental impacts, including air quality impact, noise impact, water quality impact, waste management implications, land contamination, ecological impact, landscape and visual impact, and hazard to life, during the construction and operation of the Project in accordance with the guidelines of the EIAO-TM and the EIA Study Brief. The EIA has concluded that with the implementation of the recommended mitigation measures, no unacceptable residual environmental impacts are envisaged as a result of the construction and operation of the Project and the Project would be in compliance with the applicable environmental legislation and standards.
- 5.1.3 An EM&A programme has been recommended to monitor the environmental performance of the Project and ensure the mitigation measures recommended would be properly implemented.

**END OF TEXT**

## **FIGURES**