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ACE-EIA Paper 6/2016
For advice on 17 October 2016

Environmental Impact Assessment Ordinance (Cap. 499)
Environmental Impact Assessment Report

Sha Tin Cavern Sewage Treatment Works

PURPOSE

This paper presents the key findings and recommendations of the Environmental Impact Assessment (EIA) report for the proposed Sha Tin Cavern Sewage Treatment Works (hereafter known as “the Project”) submitted under Section 6(2) of the Environmental Impact Assessment Ordinance (EIAO) (Application No. EIA-240/2016). The Drainage Services Department (DSD) (the Applicant) and their consultants will present the EIA report at the meeting of the EIA Subcommittee.

ADVICE SOUGHT

2. Members’ views are sought on the findings and recommendations of the EIA report. The Director of Environmental Protection (DEP) will take into account comments from the public and the Advisory Council on the Environment (ACE) in deciding whether or not to approve the EIA report under Section 8(3) of the EIAO.

BACKGROUND

3. The existing Sha Tin Sewage Treatment Works (STSTW) is located at the estuary of the Shing Mun River occupying a large footprint of about 28 hectares in prime waterfront. The relocation of existing STSTW can release its existing site for

housing and other beneficial uses. The DSD has completed a feasibility study for the Project in 2013 with recommendation that Nui Po Shan at A Kung Kok is a suitable location for the Project.

4. The Applicant submitted the EIA report for the Project for approval. The DEP, in conjunction with the relevant authorities, considered that the EIA report met the requirements of the EIA Study Brief and the Technical Memorandum on EIA Process (TM), for the purpose of exhibiting the report for public inspection, under Section 7(4) of the EIAO.

NEED FOR THE PROJECT

5. The Chief Executive in his 2011-2012 Policy Address has identified the relocation of the existing STSTW into caverns as one of the developments to release valuable land resources to meet the needs of the society. Furthermore, the STSTW has been in operation for over 30 years, many of its facilities will soon approach their normal design life in the next decade or so. Without the Project, the sewage treatment facilities would continue to age and this will soon result in increased maintenance needs, necessitating a substantial rehabilitation or modernization of the existing STSTW.

ENVIRONMENTAL BENEFITS

6. According to the EIA report, the Project will bring about the following benefits upon its completion and during its construction stage:

- (i) The released site will provide opportunities for developing a green and vibrant waterfront living environment for the community while the adjacent surrounding areas will be enhanced.
- (ii) The visually less pleasing STSTW facilities will be replaced.
- (iii) The potential odour problem from the existing STSTW site will be removed and better managed inside the caverns.
- (iv) Advanced technologies can be adopted for the new sewage treatment facilities to enhance operation efficiency, resilience and reliability, thus better safe-guarding the treated quality of the effluents.

- (v) Rocks generated from the Project will provide valuable source of construction materials to support the local construction industry.

DESCRIPTION OF THE PROJECT

7. The Project is to construct caverns for housing the Sha Tin Cavern Sewage Treatment Works (CSTW) and its related ancillary facilities; and to demolish the existing STSTW after the commencement of CSTW. The location and general layout of the Project is shown in **Figure 1**. The key components of the Project are as follows:

- (i) Construction of caverns at Nui Po Shan and its associated tunnels and portals for access to the CSTW as shown in **Figure 2**.
- (ii) Construction of a secondary sewage treatment works with ancillary facilities including sludge treatment facilities inside the caverns, with a design capacity of 340,000 m³/day at average dry weather flow.
- (iii) Site formation and construction of ancillary facilities such as an administration building, ventilation buildings, electrical substations and an internal access road at the main and secondary portals.
- (iv) Construction of pipelines from the cavern sewage treatment works for connection to the existing emergency submarine outfall of the existing STSTW by using trenchless method as shown in **Figure 3**.
- (v) Construction of new effluent tunnels and pipelines for the discharge of treated effluent from the CSTW to the existing Tolo Harbour Effluent Export Scheme (THEES) tunnel.
- (vi) Construction of a ventilation adit connecting the CSTW to a ventilation shaft located in Nui Po Shan, together with a surface access of around 500m length leading from the end of A Kung Kok Shan Road.
- (vii) Construction of a temporary magazine at Nui Po Shan, with access from A Kung Kok Shan Road, for storage of explosives for up to a few days'

use during construction of caverns, and its decommissioning after the completion of blasting works.

(viii) Decommissioning and demolition of the existing STSTW.

8. The Project covers the following elements that are Designated Project (DP) under Schedule 2 of the EIAO:

- (i) Item F.1 in Part I: *Sewage treatment works within an installed capacity of more than 15,000 m³ per day.*
- (ii) Item F.2 in Part I: *Sewage treatment works*
 - *with an installed capacity of more than 5,000 m³ per day; and*
 - *a boundary of which is less than 200m from the nearest boundary of an existing or planned residential area, educational institution and health care institution.*
- (iii) Item F.4 in Part I: *An activity for the reuse of treated sewage effluent from a treatment plant.*
- (iv) Item K.10 in Part I: *An explosives depot in a stand-alone, purpose built building.*
- (v) Item Q.2 in Part I: *Underground rock caverns.*
- (vi) Item 11 in Part II: *Decommissioning of an explosives depot.*

CONSIDERATION OF ALTERNATIVE OPTIONS

9. The EIA report has considered alternative options for the development of the Project, including site locations, plant designs, construction methodologies and programme, in order to avoid and minimize environmental impacts. The environmental benefits and dis-benefits of the options have been evaluated. The recommended options of various project items have taken into account environmental considerations, site constraints, other factors such as operational requirements, and engineering considerations and comments received during the public engagement exercises. Some of the key approaches that have been adopted by the Applicant to avoid or minimize environmental impacts are summarized as below:

Avoidance of Impacts

- (i) Optimizing the position and orientation of the CSTW to avoid encroachment on Ma On Shan Country Park as well as on Mui Tsz Lam and Mau Ping Priority Sites for Enhanced Conservation.
- (ii) Avoiding the need to construct a new emergency submarine outfall by continuing utilization of the existing one so as to prevent the potential water quality impacts arising from necessary dredging works.
- (iii) Constructing the connection pipes to the existing emergency submarine outfall by trenchless method such that potential marine ecological and water quality impacts during construction would be avoided.
- (iv) Avoiding additional suspension of the Tolo Harbour Effluent Export Scheme (THEES) for the connection works from CSTW to THEES tunnel by modifying the existing inlet facilities under the normal THEES maintenance period instead of breaking into the THEES tunnel through T-junction with longer suspension period.

Minimization of Impacts

- (i) Selection of the preferred site at Nui Po Shan with suitable geology to provide a natural barrier with low permeability for preventing groundwater drawdown; and its suitable location in close proximity to existing high-speed road to shorten the construction period and haul route, and thereby reduce indirect environmental impacts.
- (ii) Actively responded to public views received during public engagement exercises by situating the outlet of the ventilation shaft uphill and remote from all major residential developments and villages to minimize potential odour impact during operation of the CSTW.
- (iii) Adopting compact technologies that require less space, instead of conventional activated sludge process, for biological treatment to enable considerable reduction in excavation volume and shortening of construction period, and in turn to help minimize potential environmental impacts.

- (iv) Providing sufficient standby facilities and standby equipment parts/accessories for all major treatment units and electrical & mechanical equipment to minimize the risk of inadequately treated effluent or emergency discharge during operation, and thereby safeguarding the water quality of receiving water-bodies.

SPECIFIC ENVIRONMENTAL ASPECTS TO HIGHLIGHT

Water Quality Impact

10. According to the EIA report, the treatment processes in the CSTW will be newly installed and of advanced technologies. The design treatment capacity and effluent standards for CSTW will be the same as the existing STSTW. Therefore, there will be no addition to flow and loading of the treated effluent from CSTW to be discharged to the Victoria Harbour via the THEES tunnel under normal operation. Hence, despite the same treatment level, treatment performance and reliability will be enhanced in comparison with the aging STSTW, thereby benefiting the water environment.

11. Groundwater drawdown is a common concern related to underground excavation works. Apart from the very competent rock stratum at Nui Po Shan providing a natural barrier with low permeability to prevent groundwater drawdown, precautionary measures such as continuous groundwater monitoring, pre-grouting and post-grouting would be implemented to provide additional safeguards against major changes in groundwater levels.

12. The water quality impacts arising from construction of works have been immensely avoided by key design considerations, including the avoidance of constructing a new submarine outfall by using the existing outfall; connection to the existing outfall by trenchless method instead of marine dredging; as well as synchronizing the connection works from the CSTW to THEES with the THEES maintenance period to avoid the need for additional suspension of the THEES. In addition, no above-ground structures would be constructed within the water gathering grounds.

13. No cumulative or residual water quality impacts are expected during the construction and operation phases of the Project with the recommended mitigation measures properly implemented.

Ecological Impact

14. Majority of the Project works will be constructed underground with minimum disturbance or damage to the terrestrial ecology. Only a relatively small portion of the Project that involves above-ground work at the main portal, secondary portal, ventilation shaft and access road might potentially impact upon existing flora and fauna at Nui Po Shan. Ecological field surveys have been conducted over the entire Project site covering both dry and wet seasons. The survey findings show that no site of conservation importance will be directly affected by the Project. Given the relatively low to moderate ecological values of the terrestrial and marine habitats identified during the field survey and the small area directly affected by the Project, ecological impacts are anticipated to be generally minor in nature.

15. Since the excavation and blasting works will be carried out at a significant depth of 80m to 300m below ground surface at Nui Po Shan, no adverse disturbance to the terrestrial habitats and fauna above is anticipated. In addition, the adoption of trenchless method for constructing a pipeline below river-bed connecting the CSTW to the existing submarine outfall would not disturb any marine habitat. On land-based works, the provision of an elevated section for the proposed access road at the stream crossing at Nui Po Shan will preserve the natural stream habitat, including an identified crab species of conservation importance (*Cryptopotamon anacoluthon*).

16. The construction works will unavoidably result in permanent loss of some woodland of approximately 0.65 ha which will be mitigated by compensatory planting of about 0.92 ha with native species. In addition, direct impact to some common or very common plant species but with conservation importance (including *Cibotium barometz*, *Canthium dicoccum* and *Peristylus tentaculatus*) located near the works limits will be avoided by excluding them from the works areas during site clearance or preparation works. A confirmatory vegetation survey would be conducted prior to the commencement of site clearance works so that they would be clearly labelled and fenced off for on-site preservation before commencement of construction. All temporarily affected works areas will be reinstated.

17. Penfold Park Egretty (the Egretty) is located approximately 750m southwest of the existing STSTW. The EIA report has assessed the potential impacts on the Egretty during demolition and decommissioning of the existing

STSTW. Given its long distance from the STSTW, with the implementation of noise control measures, potential adverse disturbance to breeding sites at the Penfold Park Egrettry is not anticipated.

18. Flight line survey indicated that ardeids would mostly depart the Egrettry for their foraging ground around sunrise and return to their roosting sites at the Egrettry around sunset along the direction of Shing Mun River. Flight paths both directly across and circumventing the STSTW site were recorded. Most birds flew at heights below 20m, but some might reach as high as 30m-40m. With the prohibition of construction activities involving powered mechanical equipment during the restricted hours (i.e. 7pm to 7am), noise impact on the ardeids flying over the existing STSTW during these hours is not anticipated.

19. As the daytime demolition works using quieter Quality Powered Mechanical Equipment are scheduled to span over nine months, the soundscape in the vicinity of the STSTW site, which is being nominated by traffic noise at Tolo Highway and Tate's Cairn Highway, would not be significantly altered. Nevertheless, the ardeids might still be potentially caused to take a higher flight path directly above the STSTW site or displaced to other flight paths around the site as identified during the flight line survey mentioned above. The EIA report considered that the increase in energy exertion in taking these flight paths around the site would be minor as the increase in distance would not be longer than 500m.

Air Quality Impact

20. As cavern is an effective enclosure for the CSTW and the exhausted air from all treatment units will be conveyed to the deodourizers of 80%-97% odour removal efficiency before discharging to the environment via the ventilation shaft, the predicted odour concentration at all air sensitive receivers (ASRs) located in the vicinity of CSTW would comply with the odour criterion (5 odour units based on an averaging time of 5 seconds) stipulated in the TM. The Project will provide considerable improvement in the air quality of the Project area when compared with the existing STSTW.

21. During construction phase, with the implementation of dust control measures including watering for active construction areas and using dust collector with dust removal efficiency of 99% for rock crushing activities, the predicted dust impact at ASRs would comply with criteria stipulated in TM respectively.

Hazard to Life

22. A Quantitative Risk Assessment has been carried out to assess the potential hazard to life issues arising from the storage, transport and use of explosive during construction of the Project.

23. The assessment results show that the societal risk for the storage and use of explosives lies within the “Acceptable” region when compared to the criteria stipulated in the TM, and the transport of explosives lies within the lower region of “As Low As is Reasonably Practicable (ALARP)”. An ALARP assessment has been undertaken considering a range of mitigation measures and the results show compliance with the ALARP principles by implementing the recommendations, such as to avoid the return of unused explosive to the magazine and to maintain a minimum of 10 minutes headway between two consecutive explosives carrying vehicles.

Noise Impact

24. With the recommended mitigation measures in place during the cavern construction and STSTW demolition works, such as adoption of quiet Powered Mechanical Equipment (PME), deployment of movable noise barrier/acoustic mat, and limitation on PME operations, the noise levels at representative noise sensitive receivers (NSRs) due to the construction activities would comply with the TM criteria except occasional exceedance of noise criterion during examination period by 1dB(A) at S.K.H. Ma On Shan Holy Spirit Primary School. To further reduce the noise impact, the Contractor will liaise closely with the schools to avoid scheduling noisy construction works during examination periods as far as practicable.

25. The predicted fixed plant noise levels at the representative NSRs would comply with the criteria. Prior to the operation of the Project, a commissioning test for a number of installations would be conducted to ensure compliance with the relevant allowable maximum sound power levels.

Other Environmental Impacts

26. Other environmental impacts including landscape and visual, fisheries, health, waste management, land contamination and cultural heritage are relatively minor and have also been addressed in the EIA report. With the implementation of

recommended mitigation measures, the Project will comply with the relevant requirements under the TM.

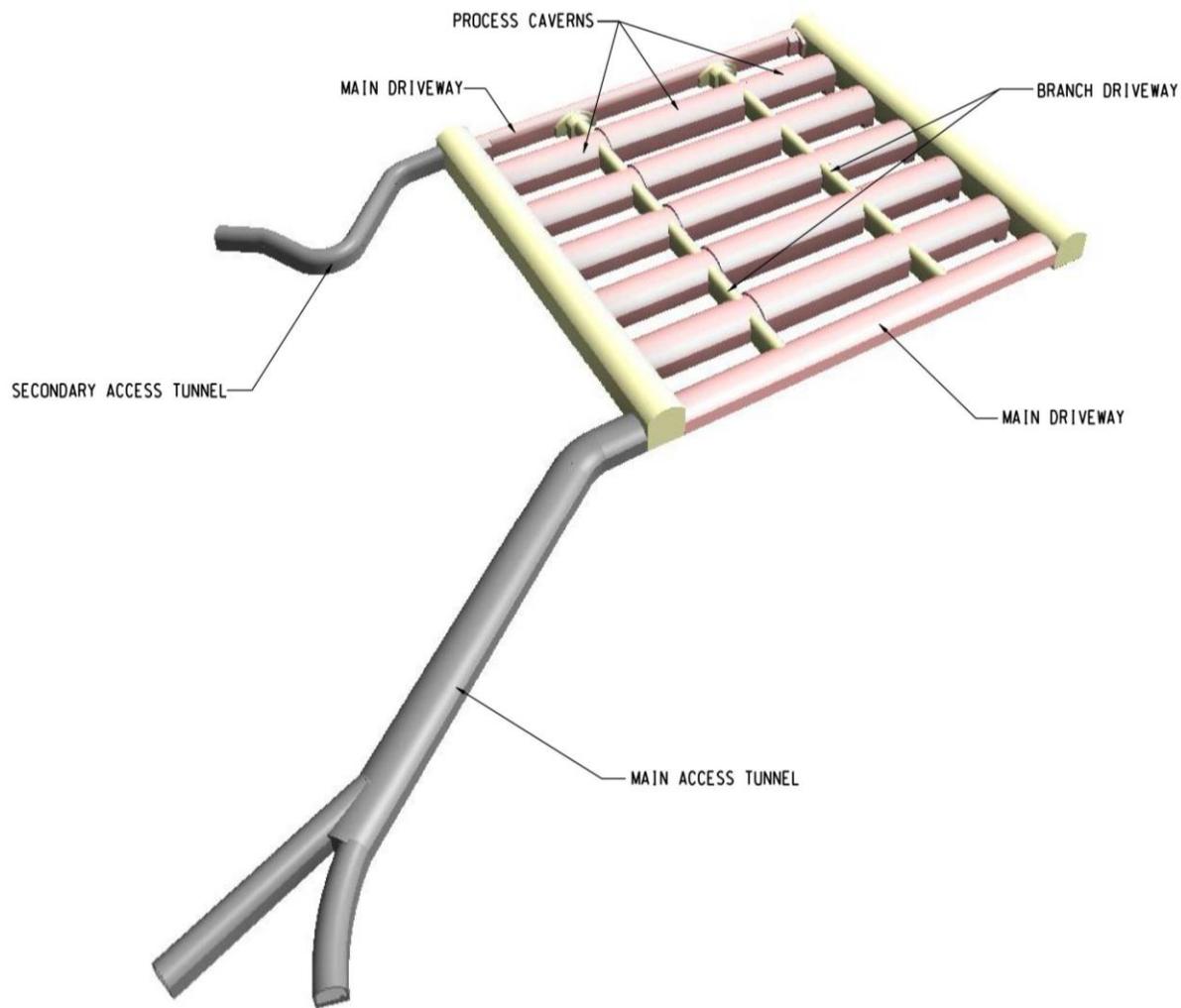
ENVIRONMENTAL MONITORING AND AUDIT

27. The EIA report includes an Environmental Monitoring and Audit (EM&A) Manual which recommends the EM&A programme for the construction and operation phases of the Project. Key recommended EM&A requirements cover air quality, noise, water quality, hazard to life, ecology and waste management.

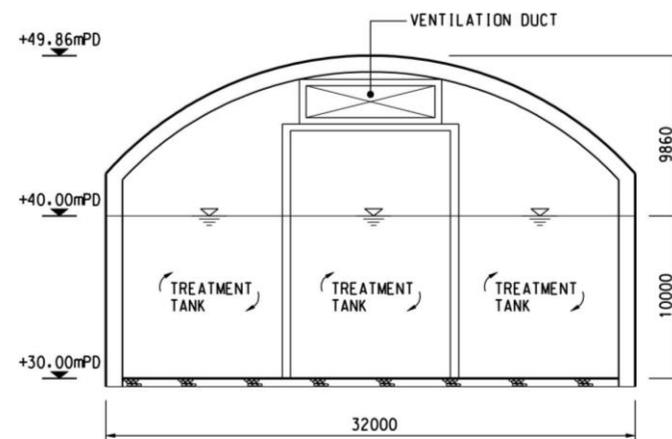
PUBLIC CONSULTATION

28. The Applicant has made the EIA report, EM&A Manual and Executive Summary available for public inspection under the EIAO from 5 August 2016 to 3 September 2016. During this inspection period, two sets of public comments were received by the Environmental Protection Department. The main concerns raised by the public are on ecology, water quality, noise, air quality and hazard to life. The public comments will be summarized in a gist to be provided separately.

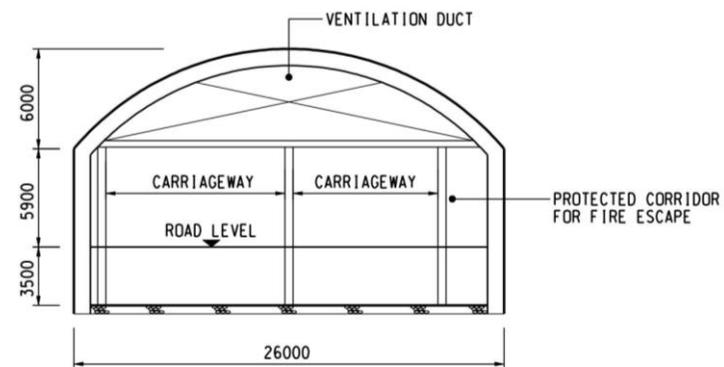
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Environmental Assessment Division
Environmental Protection Department



3-D VIEW OF CSTW FOR ILLUSTRATION
NOT TO SCALE



TYPICAL SECTION AT
PROCESS CAVERN
(DIMENSION IN MILLIMETERS)



TYPICAL SECTION AT TUNNEL
(DIMENSION IN MILLIMETERS)

NOTE:

1. ELEVATIONS AND DIMENSIONS VARIES AT DIFFERENT LOCATION OF CAVERNS AND ARE SUBJECT TO DETAILED DESIGN.

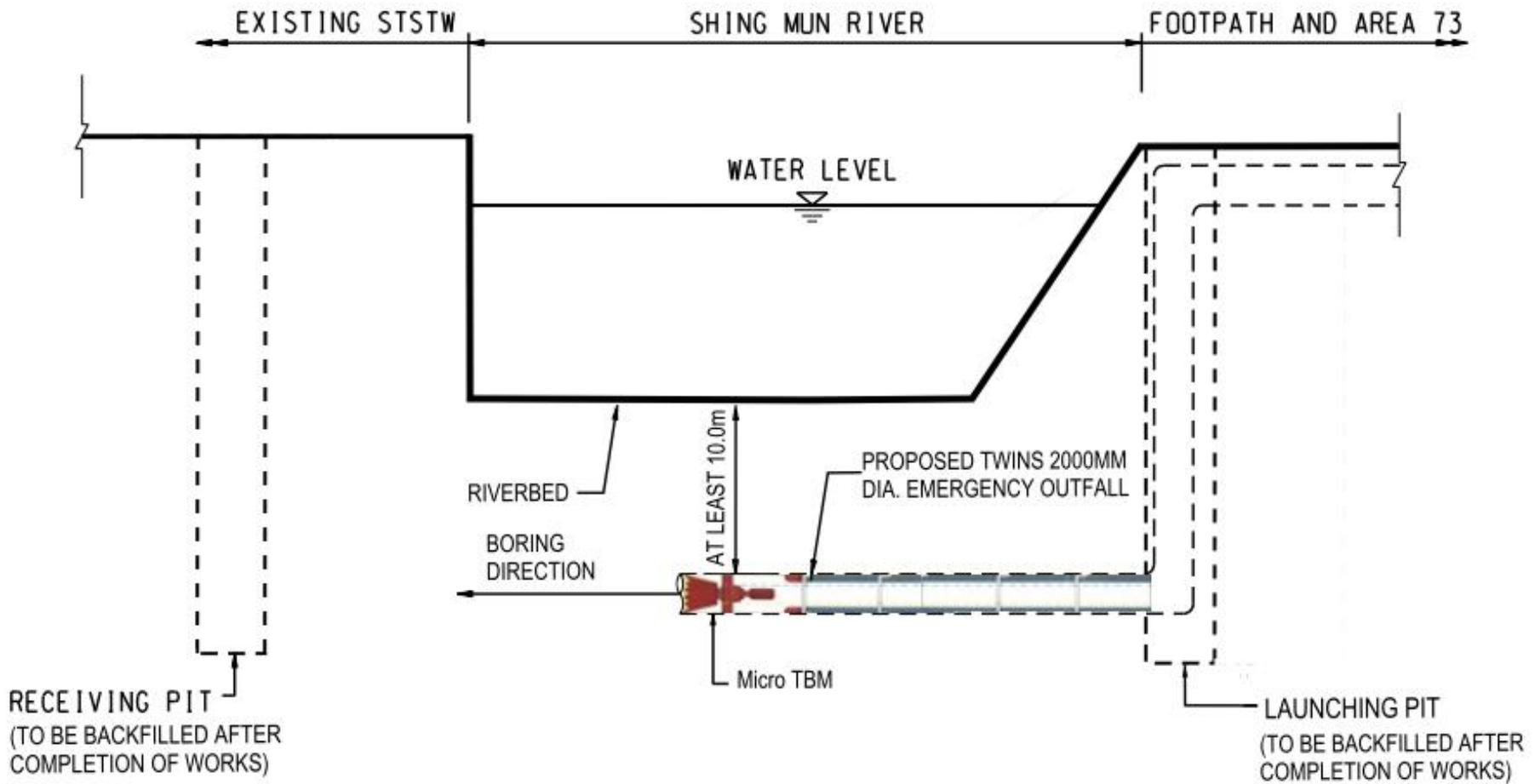
Project Title: Sha Tin Cavern Sewage Treatment Works

Figure 2: Caverns at Nui Po Shan and its associated tunnels

(Based on Figure 2.04 of the EIA Report)

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Figure 3: Trenchless pipe-laying method for connection to existing emergency outfall
 (Based on Diagram 2.01 of the EIA Report)

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