TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

1.1 Project Background

1.1.1 In the Policy Address 2015, the Government set out the intention to adopt the concept of revitalising water bodies in large-scale drainage improvement works and planning drainage networks for the new development areas. The concept of revitalising water bodies is aimed at promoting greening, biodiversity, beautification and water friendliness in addition to achieving efficient drainage, with a view to building sustainable drainage facilities and providing a better living environment.

1.1.2 Fo Tan Nullah (FTN) and Tai Wai Nullah (TWN) were identified as waterbodies of high revitalisation potential and therefore were recommended for detailed investigation and proposing revitalisation schemes for implementation, taken into account its unique features and constraints in the feasibility study on "Study on Revitalisation of Water Bodies" ("the Study") under Agreement No. CE 28/2015 (DS) commissioned by Drainage Services Department (DSD) in December 2015.

1.1.3 In April 2020, AECOM Asia Company Limited was commissioned by DSD to undertake Agreement No. CE54/2019 (DS) – "Revitalisation of Tai Wai Nullah and Fo Tan Nullah – Investigation" (hereafter referred to as "the Assignment") to revitalise the existing TWN and FTN with an aim to enhance their ecological value, provide a greener environment, promote water friendliness and improve the community environment. The Assignment also includes provision of dry weather flow interceptors to improve the water quality. As part of the Assignment, an Environmental Impact Assessment (EIA) study under the Environmental Impact Assessment Ordinance (EIAO) is required for the proposed works to TWN and FTN, respectively.

1.1.4 This EIA Report covers the EIA study for Revitalisation of TWN (hereafter referred to as "the Project").

1.1.5 The proposed revitalisation of TWN is classified as designated project (DP) by virtue of Item I.1(b)(ii), Part I, Schedule 2 of the EIAO – "a drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300 m from the nearest boundary of an existing or planned site of cultural heritage".

1.1.6 Project Profile for Revitalisation of TWN (No. PP-586/2019) was submitted to the Environmental Protection Department (EPD) on 31 July 2019 for application for an EIA study brief under section 5(1)(a) of the EIAO. The EIA Study Brief for the Revitalisation of TWN (No. ESB-320/2019) was issued on 11 September 2019 under the EIAO.

1.2 Purpose of this Executive Summary

1.2.1 This Executive Summary (ES) summarises the key findings, recommendations and conclusions of the EIA Report for the Project. The ES contains the following information:

- Section 2 presents purpose and nature of the Project, consideration of alternative options and construction methods for the Project;
- Section 3 presents the key findings of the environmental impact assessment;
- Section 4 describes the proposed environmental monitoring and audit programme for the Project; and
- Section 5 presents the conclusions.

2 PROJECT DESCRIPTION

2.1 Purpose and Scope of Project

2.1.1 The purposes and objectives of the Project are to revitalise the existing TWN with the aim of enhancing the ecological value of TWN, providing a greener environment, promoting water friendliness and improving the community environment. The Project also includes

provision of dry weather flow interceptors to improve the water quality. Location plan and general layout of the Project are shown in **Figure 2.1** and **Figure 2.2** respectively.

2.1.2 The Project comprises the following key components:

(a) beautification of the existing nullah (approximately 2 km long and 40 m wide) by re-surfacing, greening and modification of channel bed;
(b) provision of approximately 3 km walkways along the nullah and associated stairs and access ramps ;
(c) provision of a Dry Weather Flow Interceptor (DWFI) system;
(d) provision of features for ecological enhancement and sustainable drainage system, and two underground water pumps installed near mid-stream of TWN and underground water pipes for associated water retention and supplement;
(e) construction of viewing decks and revamp of existing foorbridges/ bridges;
(f) revamp/provision of footpaths, railings, pavilions, amenity areas and public open spaces along the nullah and on the nullah bed, as well as the associated UV disinfection system for water play features;
(g) improvement / modification of existing planters; and
(h) associated works including landscaping, utility works, etc.

2.1.3 Subsequent to the issue of the EIA Study Brief (No. ESB-320/2019), underground water pumps installed near mid-stream of TWN (beneath Shing Mun Tunnel Road by the bankside) and underground water pipes (mainly housed within the DWFI system) have been proposed to support the provision of ecological enhancement features in the nullah in view of the insufficient baseflow in TWN. Under the latest revitalisation design, an UV disinfection system has also been proposed for water play features to be provided in riparian amenity areas (fully separated from waterbody of TWN) to promote water friendliness. Furthermore, the Project boundary has been altered to cover modification of channel bed and bank downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court, with an aim to reduce the existing excessive accumulation of silts brought by tidal influence due to unfavourable surface / gradient of the existing channel (i.e. flat and uneven nullah bed in front of the broad-crested weir); the areas near the cul-de-sac of Heung Fan Liu Road due to construction site constrain; and mid-stream near Shing Mun Tunnel Road for overall planning of the mid-stream riparian public open space. In accordance with Clause 6.2 of the EIA Study Brief, confirmation had been sought in writing that the scope of issues could still be covered by EIA Study Brief and hence no fresh EIA Study Brief would be required.

2.1.4 During the operational phase, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD.

2.1.5 The operation of the two proposed underground water pumps near mid-stream of TWN southeast to Pok Ngar Villa (one duty and one standby) will be controlled by a level detector installed at the modified stilling basin (to be deepened and expanded) at upstream of TWN. Water flowing from the low flow channel will be collected in a wet well by gravity through a screened inlet pipe installed at the low flow channel. The water will then be pumped upstream to the modified stilling basin through pressurised underground pipes. The on-duty pump will not operate during night-time (i.e. 2300 – 0700 hours). The stored water in the basin will be naturally discharged for recharging environmental flow in the nullah.

2.2 Need and Benefits of the Project

Water Quality Improvement and Promotion of Water Friendliness

2.2.1 Due to ageing drainage systems and possible expedient connection made in the past, polluted discharges from the existing drainage outlets along TWN are observed at present. Complaints and concerns from the public, including Sha Tin District Council (STDC) and local stakeholders, on the long-standing water quality and odour nuisance of TWN,

particular at the confluence of TWN and Shing Mun River area near Man Lai Court, were received. With the implementation of the proposed DWFI system and treatment wetlands, the existing polluted dry weather flow from the drainage outlets along TWN will either be intercepted by the DWFI system and discharged to the existing sewerage system, via gravity mains (i.e. no DWFI pumping station required), to Shatin Sewage Treatment Works for treatment, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silts brought by tidal influence caused by the uneven surface and flat gradient in front of the broad-crested weir would be greatly reduced. With the abovementioned designs, the water quality and hygiene within the nullah would be improved and odour nuisance to the resident nearby would be alleviated.

2.2.2 After the revitalisation works, similar to the existing condition, the nullah bed of the engineering channel of TWN would be dry most of the time during non-rainy days, except for the low flow channel in the middle. While the main water body of TWN, i.e. the low flow channel, is not suitable to be opened up for public access / physical contact due to safety reasons, the improvement of water quality and riverside environment of the nullah due to the Project would enhance user experience and hence promoting water friendliness culture. In order to allow public to better enjoy the view of the revitalised waterscape and ecological enhancement features (e.g. treatment wetland), construction / modification of footbridges / walkways and public open spaces is proposed along the nullah. The riparian areas (nullah bed of the engineering channel of TWN outside of the low flow channel) of midstream TWN near Pok Ngar Villa would also be opened for public access and be transformed into a public open space with accesses with stepped seats, riparian walkways and other community amenities [including water play features (fully separated from the water body of TWN)] to promote water-friendliness. Associated visitor's facilities, including toilet and management office, would also be provided for the proposed riparian public open space.

2.2.3 Existing freshwater discharge comprising mainly clean river flow from the natural hillside catchment at the upstream of TWN north to Peak One will be partially intercepted and conveyed to the proposed UV disinfection system for treatment prior to be used in the proposed water play features (e.g. water spouts and fountains). The water play features will be closed when the disinfection system is not under normal operation, under maintenance or when the treatment standard as specified in the post-revitalisation water quality monitoring programme established and implemented by DSD is not compiled with.

2.2.4 The riparian walkway and amenity areas would be properly designed to restrict public access / physical contact to the water body, i.e. the low flow channel, and to ensure public safety (e.g. elevated walkway design, fencing, provision of warnings / signage, deployment of specific management personnel etc.). In particular, it should be noted that neither the water from the revitalised nullah with improved water quality or the water play features utilising treated freshwater shall be used for human or animal consumption, bathing or showering, food preparation / washing. Channel management system, as well as rain detection, safety and flood warning system (e.g. water level sensor at the low flow channel) will be adopted and managed by the DSD and access to the riparian walkway and amenity areas [provided with water play features] will be closed in case of foreseeable flooding at the nullah bed or under extreme weather conditions.

Greening Enhancement

2.2.5 The existing concrete nullah of TWN will be resurfaced with layer of vegetation, which will enhance both the aesthetic and ecological values of TWN. Greening of the nullah and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete etc, will be provided. The existing mature trees growing by the bankside along the nullah will be retained, and additional tree planting will be provided along the nullah. The existing planters will also be modified to beautify the footpath along TWN.

Ecological Enhancement

2.2.6 The existing TWN is of low ecological value in view of its concrete-lined channel bed and bank, as well as its limited baseflow, especially in dry season (i.e. from November to March).

With the proposed modification of the existing stilling basin and the installation of the underground water pumps for water retention and supplement, the following proposed ecological features will be viable to improve and create aquatic and terrestrial habitats, hence enhancing its ecological values:

- Reprofiling of the low flow channel and construction of in-stream weirs to create a meandering alignment along the nullah to mimic natural stream pattern where practicable, providing a series of microhabitats for wildlife in surrounding areas;
- Provision of DWFI system to improve water quality and hence support ecological enhancement;
- Provision of treatment wetlands (artificial wetland created to mimic processes in natural wetland ecosystems involving vegetation, soils, and their associated microbes through engineering design) at selected drainage outlets along TWN to remove pollutants and improve stormwater quality (in terms of biochemical oxygen demand, ammonia, total suspended solids, total phosphorus, and pathogens), which can also serve as greening and ecological enhancement measures. General constructed wetland system of smaller scale for aesthetic and ecological enhancement purposes is also proposed;
- Greening of the nullah and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete;
- Incorporation of planting designed to attract wildlife species (e.g. native host plant species for butterflies) during revamp of public open space along TWN;
- Provision of nest boxes / hunting perch for wildlife (e.g. birds) along TWN; and
- Modification of channel bank and existing vehicular access at downstream section of TWN into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roost habitats for waterbirds (e.g. ardeids).

2.3 Consideration of Design and Layout

2.3.1 Environmental implications of various options in regard to the extent of DWFI system, water retention and replenish methods and ecological enhancement designs, and minimisation of siltation at downstream of TWN have been considered with a view to optimising the revitalisation design of TWN in order to enhance the ecological value of the nullah, provide a greener environment, promote water friendliness and improve the community environment whilst avoiding, minimising and mitigating any potential adverse environmental impacts of the Project.

Extent of DWFI System

2.3.2 Drainage outlets with polluted discharges were identified between Sections 1 to 5 of TWN (i.e. the majority of downstream portion of TWN, see **Figure 2.2** for details of the divided sections) through the pollution source identification survey. For the preferred extent of DWFI system, a DWFI system with interception of the highly polluted discharges and provision of treatment wetland for polishing the remaining non-intercepted polluted discharges is considered to be able to fully eliminate or polish the existing polluted discharges to TWN and would improve the water quality and resolve the odour problem of TWN. With the adoption of treatment wetland at selected drainage outlets, it could also minimise the addition of pollutant loads to the existing sewerage system and enhance the ecological values of TWN by providing additional wetland habitats for wildlife, hence it is selected as the preferred option. Section 6 of TWN (i.e. the upstream portion of TWN, see **Figure 2.2** for details) is connected to WSD's facilities that expedient connection/misconnection from industrial area or significant polluted surface runoff due to the nature of the catchment area would be unlikely for this section. Likewise, part of Section 1 (south to Tsuen Nam Road) is also subject to tidal influence with the outlets being submerged mostly in water that the discharges cannot be intercepted by the instream DWFI system. DWFI system is hence not considered necessary for the part of Section 1 (south to Tsuen Nam Road) and Section 6 of the nullah.

Water Retention and Replenish Methods and Ecological Enhancement Designs

2.3.3 In view of the limited baseflow of TWN, water retention and replenish methods have also been considered to retain and supplement water to the nullah in order to provide sufficient water flow to support a healthy aquatic habitat in the channel.

2.3.4 In-stream fixed weirs, which would not be washed away in case of flood discharge, would be incorporated in the nullah bed to retain water depth for aquatic habitats. By impounding floodwater or environmental flows, weirs are particularly useful in the dry channels to retain water for a longer period, which could promote plant growth and aquatic species survival in such an otherwise dry environment.

2.3.5 The existing stilling basin at upstream of TWN, which has served to store water during storm events and to recharge the flow in the nullah on dry days, would be modified and expanded during channel bed modification to increase the water storage capacity while maintaining sufficient water depth for the wetland development in the basin. In view of the limited and inconsistent baseflow, especially in dry season, underground water pumps will be installed beneath the elevated Shing Mun Tunnel Road at mid-stream TWN to pump water to the modified stilling basin for replenishing. The water, i.e. the stormwater and those collection in the mid-stream, in the basin can be used for recharging environmental flow in the nullah, which can help maintain a healthy aquatic habitat and support the proposed emergent wetland planting for in-channel greening and ecological enhancement to mimicking the biodiversity of a natural stream environment and creating an aesthetically pleasing landscape.

Minimisation of Siltation in Downstream Tai Wai Nullah

2.3.6 Apart from the environmental nuisance caused by polluted discharges from drainage outlets along the nullah, excessive accumulation of silts brought by tidal influence due to uneven surface and flat gradient in front of the broad-crested weir at downstream TWN near its confluence with Shing Mun River near Man Lai Court was observed to cause environmental nuisance to nearby residents. In order to tackle this existing issue, modification of channel bed downstream of TWN's broad-crested weir has been incorporated into the revitalisation design to minimise the deposition of excessive silt and resolve the associated environmental nuisance.

2.3.7 Part of the existing concrete vehicular access at the nullah bank would be reconstructed into a mix of stepped terrace and slope with greenings (e.g. planter, grasscrete) at water edge to create foraging / pre-roost habitats for waterbirds (e.g. ardeids) and to enhance greening, whilst maintaining the necessary emergency access function of the existing vehicular track.

2.4 Construction Methods and Sequences of Works

2.4.1 The Project site will be divided into six sections to be constructed in sequence starting from downstream TWN (**Figure 2.2** refers). The construction works along the nullah within each section would last for approximately 1 year and will not be undertaken at the entire section at the same time to avoid multiple construction activities overlapping / concentrating in a certain area over any period.

2.4.2 The proposed revitalisation works would be constructed by traditional open-cut and in-situ concreting method that mainly involve site clearance, soil excavation, sheet-piling, bore piling, formwork, concreting, backfilling, and reinstatement. Desilting works at downstream tidal zone would be carried out at both initial and final stages of construction works to remove silt accumulated at the nullah in addition to the existing routine maintenance desilting works undertaken by the DSD and CEDD along TWN and Shing Mun River respectively.

2.4.3 For each section, the construction works within the nullah, including nullah bed modification with construction of energy dissipation structures, construction of DWFI system and underground water pipes that are associated with the mid-stream pumping facilities along the nullah, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone will only be undertaken during dry season to reduce the potential water quality impacts due to surface run-off. To further reduce the water quality impacts, the excavation in the nullah will be carried out in an enclosed area surrounded by concrete blocks, sandbag barriers or other appropriate physical barriers.

2.4.4 The major parts of the DWFI system are u-channel and pipe system cast-in with the concrete blocks at nullah wall for stabilisation. Taking the inconsistent shapes and sizes of nullah wall / drainage outlets and limited accessibility to the nullah bed into consideration, the more flexible construction method of in-situ construction of DWFI system is considered more suitable and practical than the off-site pre-cast construction. Hence, it is adopted to avoid prolonged construction duration and repeated construction activities from trial installations or on-site adjustment of pre-cast concrete mass to reduce potential disturbance/nuisance to the environment and local residents.

2.5 Construction Programme

2.5.1 The construction works are tentatively scheduled to commence in Q1 2024 for completion in Q4 2029.

2.6 Concurrent Projects

2.6.1 The potential cumulative environmental impacts during construction and/ or operational phase from the below interfacing projects within 500 m from the Project boundary and the designated project "Revitalisation of Fo Tan Nullah" which is under the same Assignment that involves construction works within or near Shing Mun River and its tributaries have been reviewed.

- Revised Trunk Road T4 in Sha Tin;
- Proposed box culverts in Chui Tin Street under Drainage Improvement Works in Sha Tin and Sai Kung; and
- Proposed joint-user complex at Tsuen Nam Road, Tai Wai.

2.6.2 No adverse cumulative environmental impacts from the above potentially interfacing projects were predicted during the construction and operational phases of the Project. Nonetheless, it is recommended that during the detailed design stage, the contractor of this Project should be requested to closely liaise with the contractors of these potential concurrent projects in planning the interfacing works properly to avoid/ minimise repeated and concurrent construction works as far as practicable to further minimise any potential cumulative impacts and to enhance overall environmental performance of the Project.

2.7 Public Consultation

2.7.1 Consultation exercise carried out include:

- Meeting with Sha Tin District Council in June and July 2018, March 2021
- Meeting with Mei Lam Estate in August 2018;
- Meeting with Sha Tin District Council Health and Environmental Committee in March 2019;
- Meeting with Green Groups in July 2020 and July 2022;
- A series of public engagement exercises (e.g. interviews, workshops and surveys) through the use of Design Thinking Approach between December 2020 to August 2021.

2.7.2 During the public inspection period of the Project Profile submitted for the Application of EIA Study Brief (No. PP-586/2019) in 2019, comments received were largely in favour of the Project, in particular, the proposed DWFI system and ecological enhancement are considered to be beneficial to the community. Members of the Sha Tin District Council, general public and green groups are supportive of the Project.

2.7.1 Their following key concerns and comments on the Project have been incorporated into the design of the Project:

- Water quality issues and odour nuisance;
- Promotion of water friendliness, access to nullah and public safety;
- Insufficient baseflow to support proposed ecological enhancement; and
- Avoidance and minimisation of impacts to roosting ardeids.

3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Air Quality Impact

3.1.1 Potential air quality impacts associated with the construction and operational phases of the Project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.4 and Appendix B of the EIA Study Brief, as well as Annexes 4 and 12 of EIAO-TM. The assessment area for air quality impact assessment is defined by a distance of 500m from the Project boundary of the Project.

3.1.2 The potential air quality impacts arising from the construction of the Project would be related to fugitive dust emissions from construction works and gaseous emissions from the use of powered mechanical equipment (PME), and odour nuisance from the desilted/excavated materials generated during desilting works at downstream tidal zone / excavation works in the nullah. Since the construction works of the Project would be divided into sections which are in small scale, the air quality impacts would be localised and minor, and would be well controlled through the implementation of good site practices and dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation as well as the proposed good site practices to minimise the exhaust emissions from non-road mobile machinery (NRMMs) and odour nuisance from handling of desilting/excavated materials. No adverse air quality impact due to the construction of the Project would therefore be anticipated.

3.1.3 With the implementation of DWFI system and treatment wetland under the Project, the existing dry weather flow from drainage outlets would either be intercepted and diverted to the existing sewerage system for conveying to Shatin Sewage Treatment Works for treatment by the DWFI system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silt brought by tidal influence due to the uneven surface and flat gradient of nullah bed in front of the broad-crested weir would be greatly reduced. The odour nuisance of TWN would be alleviated as a result of the operation of the Project. Any odour emission generated from exposed desilted materials during the routine maintenance works would be temporary and confined to the areas of maintenance works that it would be well-controlled through good site practices. No adverse air quality impact due to the operation of the Project would be anticipated.

3.2 Noise Impact

3.2.1 Potential noise impacts associated with the construction and operational phases of the Project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.5 and Appendix C of the EIA Study Brief, as well as Annexes 5 and 13 of the EIAO-TM. The assessment area for noise impact assessment is defined by a distance of 300m from the Project boundary of the Project.

3.2.2 Construction noise is expected from the use of powered mechanical equipment (PME) during various construction activities. No marine transportation of construction materials and waste is required. Noise impact arising from construction activities of the Project has been assessed. With proper implementation of the proposed mitigation measures, including adoption of good site practices, use of quality PME / quieter construction method including use of road ripper for concrete breaking, silent piling by press-in method and use of hydraulic crusher for demolition of footbridge, adoption of movable noise barriers/ noise insulation fabric/ noise enclosure and proper scheduling construction activities during examination period of schools (including TWGHs Tsoi Wing Sing Primary School, Buddhist Wong Wan Tin College and TWGHs Sin Chu Wan Primary School), the mitigated cumulative construction noise levels from the Project and nearby concurrent project at all representative noise sensitive receivers (NSRs) in the vicinity of the Project work site would range from 63 to 75 dB(A), complying with the relevant noise criteria set out in the EIAO-TM. A construction noise management plan (CNMP), which to verify the inventory of noise sources, and to assess the effectiveness and practicality of all identified measures for mitigating the construction noise impact of the Project, would be prepared before

commencement of construction works. Noise monitoring is recommended as part of the environmental monitoring and audit (EM&A) programme for the construction phase of the Project to check compliance with the daytime construction noise criteria. Weekly site audit is also recommended to audit the proper implementation of the recommended mitigation measures for daytime construction activities as part of the EM&A programme.

3.2.3 During operational phase, fixed plant noise from the operation of the proposed underground water pumps and UV disinfection system located beneath the elevated Shing Mun Tunnel Road by the bankside of mid-stream TWN would be the major source of noise impacts based on the current design. The noise impact associated with the operation of the Project has been assessed based on the plant inventory provided by the Project Engineer at the time of the assessment. Maximum allowable sound power levels for the fixed noise sources of the Project have been also determined. The assessment result indicated that the predicted fixed plant noise levels at all representative NSRs would comply with the noise criteria. No adverse noise impact is anticipated during operational phase of the Project. Commissioning tests should be conducted prior to operation of the Project to ensure that the fixed plant noise impact would comply with the relevant noise standards.

3.3 Water Quality Impact

3.3.1 The water quality impact assessment was conducted in accordance with the requirements in Annexes 6 and 14 of the EIAO-TM and the requirements in Section 3.4.6 and Appendix D of the EIA Study Brief. The study area for this water quality impact assessment includes areas within 500 m from the boundary of the Project and covers Shing Mun River, Tolo Harbour and Channel Water Control Zone (WCZ) as designated under the Water Pollution Control Ordinance (WPCO).

3.3.2 The key issues of the land-based construction works include construction works at and in close proximity to TWN / inland water, wastewater generated from general construction activities, construction site runoff, sewage from construction workforce and accidental spillage of chemicals. The potential water quality impacts could be avoided and minimised by implementing the recommended pollution control measures. No adverse water quality impact during construction phase would be anticipated. Regular site audit should be undertaken routinely to inspect the construction activities and works area to ensure the recommended measures are properly implemented.

3.3.3 The potential sources of water quality impacts during operational phase would be related to non-point source surface / irrigation runoff, routine maintenance works (maintenance desilting and minor maintenance to DWFI system), potential changes in hydrodynamics properties and hydrology, and water quality impact from riparian public open space (including operation of UV disinfection system and water play features in amenity area). Adequate drainage system with silt traps and oil interceptors should be incorporated into the proposed works to collect the surface / irrigation runoff or runoff from riparian public open space. With proper design of drainage system and implementation of the recommended pollution control measures, no adverse water quality impact from non-point source surface / irrigation run-off or runoff from riparian public open space would be expected. No adverse water quality impacts would be expected to occur at any identified WSRs due to the small-scale and infrequent routine maintenance works to remove excessive silts, debris and any obstructions for safeguarding the hydraulic capacity of the nullah, which practices and frequencies would be similar to the ones undertaken by DSD along TWN under existing arrangement. Despite the reduced environmental baseflow of the nullah due to the interception of the flow with polluted discharges by the DWFI system, owing to the natural sloping gradient along TWN and the water retention and replenish designs and ecological enhancement features (e.g. wetland habitats created) within the nullah, average flow rate would remain similar to baseline condition and no unacceptable impacts on hydrodynamic properties and hydrology are anticipated. No adverse water quality impact during operational phase would therefore be anticipated.

3.3.4 Upon completion of revitalisation for TWN, water quality of TWN is anticipated to be improved with the implementation of the proposed DWFI system and treatment wetlands. A post-revitalisation water quality monitoring programme, covering the water quality of the revitalised TWN and the disinfected water for the proposed water play features, would be established and implemented by the DSD, with an aim to assess the compliance with the

Water Quality Goals (WQGs) stipulated in DSD PN No. 3/2021 - Guidelines on Design for Revitalisation of River Channel; to monitor long-term water quality trend; to facilitate the emergency response plans for failing to achieve WQGs; and to facilitate the development and implementation of operation and maintenance plan. Maintenance and management requirements for TWN would be adjusted accordingly based on the monitoring results following the operation and maintenance considerations / guidelines stipulated in DSD PN No. 3/2021.

3.4 Waste Management Implications

3.4.1 The waste impact assessment was conducted in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.7 and Appendix E of the EIA Study Brief, as well as Annexes 7 and 15 of the EIAO-TM.

3.4.2 Construction and Demolition (C&D) materials will be generated from channel bed modification, improvement of existing walkways and riparian public open space, landscaping and miscellaneous works, construction of DWFI system and mid-stream underground water pumping facilities for ecological enhancement-associated water retention and supplement. Based on the latest layout, it is estimated that approximately 120,000 m^3 of inert C&D materials and 2,000 m^3 of non-inert C&D materials would be generated.

3.4.3 Inert C&D materials from the above construction works will be sorted and reused as fill material as much as possible. It is estimated that that approximately 116,000 m^3 of inert C&D materials (mainly soil) could be reused on-site as backfill materials whilst approximately 4,000 m^3 of surplus inert C&D materials would be delivered to public fill reception facility (PFRF) for beneficial reuse in other projects. Non-inert C&D materials will be recycled as far as possible before disposed to landfill. Opportunities in minimisation of generation and maximisation of reuse of C&D materials would be continually investigated during the detailed design and construction phases. With the implementation of the recommended good site practices and waste management measures for the handling, transportation and disposal of the identified waste arising, no adverse environmental impacts would be anticipated.

3.4.4 Small quantities of other waste materials, including desilted materials from desilting works at the downstream tidal zone (approximately 1,000 m^3 from each desilting works, i.e. a total of 2,000 m^3), general refuse (approximately 19.5 kg per day) and chemical waste from maintenance and servicing of construction plants and vehicles (highly dependent on the contractor's on-site maintenance activities and the quantity of plant and equipment utilised but in the order of a few cubic meters per month) will also be generated throughout construction. Provided that these identified wastes will be handled, transported and disposed of using the recommended methods and that good site practices would be strictly followed, adverse environmental impacts are not expected.

3.4.5 The main waste types generated from the operation of the Project would be silt, debris, screening and limited amount of chemical waste from the routine maintenance of the DWFI system and nullah as well as desilted materials from maintenance desilting works. With implementation of the relevant legislative requirements and the recommended best waste management practices, adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact would not be anticipated during operational phase. Provided that sufficient number of trash bins and recycling bins would be provided / retained for the collection of general refuse generated by visitors along the revitalised TWN, no unacceptable environmental impact and public transport impact would be anticipated.

3.5 Land Contamination

3.5.1 The land contamination assessment is conducted in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.8 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 Based on the site appraisal, the Project area has been occupied by non-contaminating land uses and no potentially contaminating activities were observed. No adverse land contamination impact arising from the Project is therefore anticipated and mitigation

measures are considered not necessary. No further site investigation works at the Project area is required.

3.6 Sewerage and Sewage Treatment Implications

3.6.1 The assessment on potential sewerage and sewage treatment impacts on the downstream public sewerage, sewage treatment and disposal facilities arising from the Project has been conducted in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.9 and Appendix G of the EIA Study Brief, as well as Section 6.5 of Annex 14 of the EIAO-TM.

3.6.2 A DWFI system is proposed to improve the water quality in the Tai Wai Nullah with intercepted dry weather flow estimated to be at 2,850 m^3/day. The sewerage impact assessment indicated that existing sewerage system has sufficient capacity to take up the additional dry weather flow intercepted by the DWFI system and proposed toilet facility. Thus, no mitigation measures are required. No adverse sewerage impact arising from the Project is anticipated.

3.7 Ecological Impact (Terrestrial and Marine)

3.7.1 The ecological impact assessment is conducted in accordance with the relevant requirements as specified in Section 3.4.10 and Appendix H of the EIA Study Brief, as well as Annexes 8 and 16 of the EIAO-TM. The assessment area for terrestrial ecological impact assessment includes areas within 500m of the Project boundary and any other areas likely to be impacted by the Project while for marine ecology, the assessment area is same as the water quality impact assessment area, covering Shing Mun River, Tolo Harbour and Channel Water Control Zone (WCZ).

3.7.2 A literature review and ecological field surveys covering both dry and wet seasons between May 2020 and January 2021 have been conducted. A total of nine habitat types were recorded within the 500 m assessment area from recent surveys, including woodland, mixed woodland, plantation, grassland, reservoir, village / orchard, developed area / wasteland, natural watercourse and modified watercourse. Dominant habitat types recorded within the Project site included developed area and modified watercourse, which are of low ecological values, except for limited sections of the TWN that supported some wetland vegetation and / or pre-roosting congregation of ardeids and other wetland birds and are hence considered of low to moderate ecological value.

3.7.3 For habitats outside the Project site, woodland and mixed woodland are of moderate or moderate to high ecological value; natural watercourse is of low to moderate ecological value whilst other habitats (plantation, grassland, reservoir, village/ orchard, developed area/ wasteland and modified watercourse) are considered of low ecological value. Species of conservation importance recorded within the assessment area included eight flora, twelve avifauna, eight mammals, four herpetofauna, five butterflies, two odonates and two freshwater species. Among these species, only eight avifauna, two mammal, four butterfly species of conservation importance were recorded within the Project site.

3.7.4 Marine habitats within the assessment area included subtidal hard substrata, soft bottom, and intertidal habitats, which are all of low ecological value. As the Project site is located far from marine habitats (>5.55 km), no direct impacts to marine habitats are anticipated, and indirect impacts are considered negligible.

3.7.5 No direct impacts to natural habitats within the assessment area are anticipated for the Project. Direct impacts arising from the proposed works would be limited to the temporary loss (about 11.1ha) of modified watercourse and developed area. Given the relatively low to moderate ecological value of affected habitats, the small area affected, and the temporary nature of the impact, direct impacts are expected to be *Minor* except for minor-moderate scale impacts to two small stretches of the TWN supporting some wetland vegetation and ardeid pre-roosting site. All affected areas will be reinstated and enhanced in terms of ecological value as part of the Project. Avoidance measures (e.g. restriction of construction hours, protection of mature trees along the nullah and avoidance of encroachment of ardeids night roosting sites) would be implemented to preserve the day roosting and night roosting habitats for bats and ardeids respectively. Floating platforms

would be installed downstream of the Project site in Shing Mun River Channel, during construction phase, to compensate for temporary loss of the pre-roosting site.

3.7.6 Indirect impacts during the construction phase would comprise of human disturbance, construction noise, dust and site run-off. With proper implementation of the recommended mitigation measures and good site practices, no significant adverse ecological impact is anticipated. With ecological enhancement measures incorporated into the revitalisation design of TWN and with restriction of public access in Section 1 (i.e. downstream of TWN), nature of disturbance during operational phase would be minimal compared to existing baseline condition. Net positive ecological outcome would be resulted from the created and enhanced wetland habitats. No unacceptable adverse residual impacts would therefore be expected during both construction and operational phases.

3.7.7 A pre-construction ardeid survey for areas within 100m from the Project site should be conducted to ascertain the status and location of the ardeid night roost before the commencement of construction works. Monthly monitoring of the area within 100m from the Project boundary should be conducted during the construction phase to check the status and location of any active ardeid pre-roosting and night roosting site, as well as the ardeid's usage of the proposed temporary floating pontoons. Remedial actions can then be recommended, where appropriate, based on the impact monitoring results. Monthly site audit should also be carried out throughout the construction phase to ensure recommended measures are properly implemented. No EM&A programme is required during operational phase.

3.7.8 Ecological enhancement designs have been incorporated into the revitalisation plan to promote ecological value of the Project, as well as enhancement measures and good site practices to further minimise any potential environmental impacts. The proposed revitalisation plan for TWN should seek to find a balance between design for local communities' requirements (e.g. aesthetics, recreation/leisure and access) and ecological enhancement. Ecological enhancement could be achieved by incorporating habitat creation within and along the TWN to improve the overall ecological value of the Project site. The design should not result in disturbance impacts on surrounding habitats and fauna utilising the nullah. Upon completion of revitalisation for TWN, ecological value of the Project site is anticipated to be improved by ecological enhancement measures incorporated into the design. A post-enhancement ecological monitoring programme would be developed and implemented by the DSD to review effectiveness of these enhancement measures (e.g. creation of wetland habitats, vegetation planting and specific enhancement measures for identified species). The programme shall aim to record the overall ecological condition of the Project site, including but not limited to the followings: quality of the created habitats and enhancement elements, usage by targeted fauna species and vegetation conditions. Maintenance and management requirements for TWN would be adjusted accordingly based on the monitoring results.

3.8 Fisheries Impact

3.8.1 Potential impacts on fisheries have been assessed in accordance with Section 3.4.11 and Appendix I of the EIA Study Brief as well as Annexes 9 and 17 of the EIAO-TM.

3.8.2 The Project would only involve construction works within the Project area (existing TWN and developed area alongside). No loss of fishing grounds and mariculture areas are anticipated within the assessment area. With the implementation of the recommended water pollution control measures, the Project is not anticipated to cause impacts to fishing grounds and mariculture areas within the assessment area during both construction and operational phases. Thus, no further mitigation measures and environmental monitoring and audit programme specific to fisheries impact are required.

3.9 Cultural Heritage Impact

3.9.1 Cultural heritage impact assessment (CHIA) has been conducted in accordance with the relevant requirements as specified in Section 3.4.13 and Appendix K of the EIA Study Brief, as well as Annexes 10 and 19 of the EIAO-TM. The assessment area for the CHIA of this EIA Study covers the area within 300 m from the Project boundary.

3.9.2 A Declared Monument, Old House, Wong Uk Village, is located within 300m of the discharge area from the revitalised TWN, and located at about 1.8km from the nearest Project boundary. As the proposed works are mostly situated within the TWN and there is substantial separation distance between the Old House and the proposed works, no direct and indirect impacts on the Old House would be anticipated during the construction and operation phases of the Project.

3.9.3 Ten built heritage resources are located within 300 m assessment area from the Project site. Direct impacts from damages through contacting with construction machineries and site negligence might be anticipated for Gatehouse of Pok Ngar Villa (new item pending for grading assessment) within the Project site while indirect impacts of ground-borne vibration would also be anticipated the built heritages located within 100m from the Project site, namely Gatehouse of Pok Ngar Villa (New Item Pending for Grading Assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during construction phase. Appropriate mitigation measures including pre- and post-condition surveys, buffer zone and monitoring of vibration, settlement and tilting incorporated with AAA system for the concerned buildings have been recommended for these built heritages to avoid and minimise any potential direct impacts (e.g. damage through contacting with construction machineries and site negligence) or indirect impacts of ground-borne vibration. With the provision of the proposed measures, no adverse impact would be anticipated for built heritage during the construction phase. Likewise, no significant alteration of the current landscape which might affect the built heritage would be expected. Therefore, no adverse impact would be anticipated for built heritage during the operational phase.

3.9.4 No Site of Archaeological Interest (SAI) were identified within 300 m from the Project boundary and no archaeological potential was identified within the Project area, no archaeological impact for the Project would be anticipated.

3.10 Landscape and Visual Impacts

3.10.1 A landscape and visual impacts assessment has been carried out in accordance with Section 3.4.12 and Appendix J of the EIA Study Brief, Annexes 10 and 18 of the EIAO-TM, and EIAO Guidance Note No.8/2010. The assessment area for the landscape impact assessment include areas within 100m from the boundary of the Project while the assessment area for the visual impact assessment is defined by the visual envelope of the Project.

3.10.2 The construction works for the proposed revitalisation will mainly be carried out within the Tai Wai Nullah. Certain proposed architectural structures constructed at the roadside may impose visual impact to adjacent visual sensitive receivers (VSRs). Amongst the 254 nos. of surveyed trees, 202 nos. are proposed to be retained, including all existing mature trees growing along the nullah. According to the latest tree treatment proposal, 1 no. of tree of common species (i.e. *Sterculia lanceolata*) will be transplanted on-site, and 13 nos. of common species of trees (i.e. *Ficus elastica, Ficus subpisocarpa* and *Sterculia lanceolata*) and 38 nos. of undesirable species (i.e. *Leucaena leucocephala*) are proposed to be removed. As stipulated in DEVB TC(W) No. 4/2020, "…the number of compensatory trees onsite and offsite shall not be lower than that of number of trees removed including dead trees, but excluding trees of undesirable species...", therefore, compensation of the undesirable *Leucaena leucocephala* would not be required and only 13 nos. of trees would need to be compensated. Nonetheless, to compensate the loss of existing trees and to further enhance greening and the amenity value to vicinity of site, approximately 28 nos. of heavy standard compensatory trees are proposed to be planted at available planting area on-site. With the implementation of mitigation measures including preservation of trees, compensatory tree planting, tree transplantation, control of night-time lighting glare, erection of decorative screening hoarding, careful management of construction activities and facilities, as well as reinstatement of temporarily disturbed landscape areas and watercourses, no unacceptable residual landscape and visual impacts from the construction of the Project would be anticipated. The provision of new landscaping works and recreational facilities along the nullah proposed in this Project can have beneficial impact to the VSRs throughout the operational phase.

3.10.3 Tai Wai Nullah will be revitalised with architectural and landscape features aimed at promoting water friendliness and providing an enhanced green and ecological environment. The proposed architectural and landscape features and modified channel bed would be the key sources of visual / landscape changes during operation. With the proposed greening enhancement along channel bed and embankment, provision of recreational opportunity along nullah, sensitive and aesthetically pleasing design, re-provision of affected open space, the overall impacts are considered as acceptable in accordance to Annexes 10 and 18 of the EIAO-TM and the Project would be beneficial to the landscape and visual aspects.

4 ENVIRONMENTAL MONITORING AND AUDIT

4.1.1 Environmental Monitoring and Audit (EM&A) requirements and regular site inspection and audits for air quality, noise, water quality, waste management implication, ecological (terrestrial and marine), cultural heritage, and landscape and visual impacts have been recommended during the construction phase to ensure that the recommended mitigation measures are properly implemented. Commissioning tests for fixed noise sources, i.e. the proposed water pumps and UV disinfection system, have been recommended prior to operation of the Project to ensure to ensure the fixed plant noise impact would comply with the relevant noise standards. The EM&A requirements are specified and detailed in the EM&A Manual.

5 CONCLUSION

5.1.1 With the implementation of the Project, over 70,000 m^2 of concrete-lined channel space of TWN would be transformed into green spaces to promote greening of the local environment and the ecological value of existing TWN would be enhanced with the incorporation of the proposed ecological enhancement features. Furthermore, the introduction of the DWFI system and treatment wetlands to intercept/polish the existing polluted discharges at the drainage outlets along TWN, as well as modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to reduce excessive accumulation of silts brought by tidal influence, would improve long-standing water quality and odour issues associated with the polluted discharges to the nullah. In order to facilitate the public to better enjoy the view of the revitalised waterscape and ecological enhancement features of TWN, as well as to promote water-friendliness, certain locations of the nullah bank of TWN will be transformed into a green open space that can be accessed by the public with provision of riparian walkway and amenity areas for public enjoyment. Cantilevered viewing decks / sheltered walkway are also proposed in the upstream section. No environmental disbenefits would be envisaged from the proposed revitalisation of TWN.

5.1.2 The EIA study provided information on the nature and extent of the environmental impacts likely to arise from the revitalisation of TWN during construction and operational phases. The EIA study has, where appropriate, recommended pollution control measures as well as mitigation measures to ensure compliance with the relevant environmental legislation, standards and guidelines.

5.1.3 Overall, the EIA concluded that the Project would comply with the requirements of the EIA Study Brief and EIAO-TM with the implementation of the proposed measures during the construction and operational phases of revitalisation of Tai Wai Nullah. The schedule of implementation of the proposed measures has been provided in the EIA Report. An EM&A programme has also been recommended to ensure the effectiveness of the proposed measures.