



## 2. PROJECT DESCRIPTION

### 2.1 Location and Description of the Project

2.1.1 The works for this project in Tai O mainly comprises the following items and as shown in **Figure 2.1**:

- (a) Expansion and upgrading of Tai O Sewage Treatment Works (STW) which includes 0.26ha site formation by reclamation, construction of a seawall and berthing area and a 130m long submarine outfall, upgrading of the existing level of sewage treatment to provide secondary treatment with a design capacity of 2,750m<sup>3</sup>/day, and construction of effluent reuse facilities. Proposed general layout of the Tai O STW is shown in **Figure 2.2**;
- (b) Provision of new sewers to unsewered areas/villages where practicable, Hang Mei including Wang Hang Tsuen; Leung Uk Tsuen, Nam Chung Tsuen and Fan Kwai Tong; the unsewered area of Tai O Town and Shek Tsai Po; and
- (c) Construction of two new sewage pumping stations (SPS), one at Hang Mei at the east of the catchment area to convey flows to the existing sewers near Lung Tin Estate, and one at Fan Kwai Tong to convey flows from the villages at the south of the catchment area. Proposed general layout of the Hang Mei SPS and Fan Kwai Tong SPS are shown in **Figure 2.4** and **Figure 2.5**, respectively.

#### Sewage Treatment Works

2.1.2 The existing Tai O STW is located at the north coast of Tai O near Kau San Tei. It is currently a primary sewage treatment works with design capacity of 1,220m<sup>3</sup>/day. Upon completion of the Project, it will be expanded to a capacity of 2,750m<sup>3</sup>/day with secondary treatment level. A Membrane-bioreactor (MBR) type of sewage treatment process will be adopted.

2.1.3 Conventional secondary sewage treatment process generally involves the biological degradation of organic content in the influent followed by secondary sedimentation to settle out the sludge from the aqueous activated sludge solution. Rather than employing sedimentation, an MBR system passes the aqueous activated sludge solution through membrane filtration to separate water from the sludge. The MBR system can operate at a considerably higher mixed liquor suspended solids concentration and provide an effective and reliable barrier, therefore MBR system has smaller footprint, superior effluent quality and less sludge production over the conventional process. All the MBR modules will be placed in MBR tanks, which are covered and installed indoor.

2.1.4 The STW upgrading works will include construction of new treatment facilities and effluent reuse facilities for non-potable use of portion of the treated effluent within STW. All the expansion and upgrading works will be constructed on a site which comprised a new reclaimed land as well as the existing site of Tai O STW, giving a total area of 0.34ha. Proposed general layout of the Tai O STW and the Schematic Flow Diagram are shown in **Figure 2.2** and **Figure 2.3**, respectively.

#### Sewage Pumping Station

2.1.5 Two new sewage pumping stations, namely Fan Kwai Tong SPS and Hang Mei SPS, would be constructed under the Project to convey the sewage from the proposed new sewers to the existing sewers. The designed average dry weather flow (ADWF) for the Fan Kwai Tong SPS and Hang Mei SPS would be 540m<sup>3</sup>/day and 350m<sup>3</sup>/day respectively.



## **Sewers Works**

- 2.1.6 The proposed sewers works in Tai O include:
- (a) Construction of approximately 5,000m in length of new gravity sewers / twin sewer rising mains with size ranging from 100mm to 300mm diameter in village areas by open cut method; and
  - (b) Construction of approximately 100m in length of twin sewer rising mains with size 100mm diameter along Tai O Road underneath two sections of Tai O Creek by trenchless method.
- 2.1.7 Under Part I, Schedule 2 of the EIAO, the project consists of the following designated projects:
- (a) Construction of submarine sewage outfall (Item F.6);
  - (b) Effluent reuse facilities within the Tai O STW (Item F.4);
  - (c) Sewers works at Nam Chung Tsuen (Item Q.1).

## **2.2 Need of the Project**

### **Existing Conditions**

- 2.2.1 The existing Tai O STW is a primary sewage treatment facility which only provides a basic form of treatment for sewage collected. It is an Imhoff Tank for solids separation from the influent sewage and stabilization of the separated solids. Effluent without any biological treatment is discharged to the sea through a twin 225mm diameter, 260m long submarine outfall. The existing facilities were built in the 1980's and the conditions are deteriorating, particularly for the submarine outfall where leakages at the joints were identified. The effluent qualities (without nutrient removal) are able to meet the effluent discharge standard for primary sewage treatment level. It is currently operated near its design capacity but would be inadequate to cope with the future demand within the catchments.

### **Purpose and Objectives of the Project**

- 2.2.2 The Project is to improve the hygiene conditions in Tai O and to improve the coastal water quality to the northwest of Tai O, by providing new sewers where practicable to unsewered areas in Tai O, upgrading the sewage treatment level of the existing Tai O STW from primary to secondary, expanding the STW by increasing its design capacity to cope with the population growth and future developments at Tai O, and replacing the existing deteriorated submarine outfall by constructing a new submarine outfall with improved conditions and capacity.

## **2.3 Scenarios With and Without the Projects**

### **Without Project**

- 2.3.1 Most of the village houses (i.e. approximately 45% of village houses in Tai O) will remain unsewered. Sewage will be disposed of at septic tanks and required to be cleared manually from time to time. Hygiene problems will continue to arise such as odour impacts. Improper maintenance of septic tanks will also cause problems such as overflow from septic tanks or soakaway pit, which would cause pollution to nearby areas and/or streams. For those stilted houses close to the shoreline, the sewage will continue to discharge into the nearby water body which also contributes to adverse environmental impacts.
- 2.3.2 Moreover, the sewage treatment plant will remain as primary treatment level and suffer from insufficient capacity to cope with increased sewage flows and loads in



the future and consequently deteriorate the coastal water quality. While regular maintenance works to the existing submarine outfall would be carried out, its deteriorating and aged condition would inevitably pose a potential risk of structural failure which would cause detrimental effect to the surrounding water quality and nearby marine ecology and resources.

### **With Project**

- 2.3.3 Public sewers will be provided to unsewered village houses as far as practicable. Only approximately 5% of village houses in Tai O will remain unsewered. Hygiene problems arising from the use of septic tanks alongside the watercourses will be largely relieved. Public sewers will also be provided to the stilted houses areas as far as practicable, and about 50% of the stilted houses in Tai O will be provided with public sewers under this project. The direct discharge of sewage into the nearby water body will be relieved.
- 2.3.4 Moreover, the sewage treatment level will be upgraded from primary to secondary and the capacity of the STW will be expanded to cope with the population growth and future developments in Tai O. The STW will also have sufficient capacity to cater for the sewage flows from the remaining stilted houses when they are connected to public sewers in the future. Discharge of low quality effluent to the receiving water body will be reduced and hence the coastal water quality of Tai O will be improved. By replacing the aged submarine outfall with a new one, the potential risk of unexpected sewage pollution to the receiving water body due to structural failure of the existing outfall can be avoided.

## **2.4 Consideration of Alternative Design and Layout of Proposed Tai O STW**

- 2.4.1 The existing level of sewage treatment of Tai O STW will be expanded and upgraded to provide secondary treatment with a design capacity of 2,750m<sup>3</sup>/day. Additional land is required because the existing footprint of 0.08ha is insufficient for the required upgrading works. Options including alternative locations; possibility to split preliminary treatment units from the main treatment facilities; and alternative site formation methods have been reviewed and evaluated under the Project.

### **Consideration of Alternative Site Locations**

- 2.4.2 A review of possible sites for the construction of a new STW has been conducted with reference to the planned developments on the approved Tai O Fringe Outline Zoning Plan (OZP) No. S/I-TOF/2 as presented in **Appendix 2.1**. These potential sites must have sufficient usable land (about 0.34ha), would preferably be remote from residents and main tourist areas, be able to accommodate an outfall as short as possible, suitable for effective plume dispersion of effluent, and be compatible with existing sewer network. Cost-effectiveness and environmental considerations have also been taken into account during the review process. As a result, the area to the north of Tai O at and near the existing Tai O STW is identified as most suitable for the expansion and upgrading of Tai O STW. Three alternative site locations within this area were then critically reviewed.
- 2.4.3 The option to expand and upgrade the existing Tai O STW at its original location has been studied. However it is constrained by existing site conditions such as insufficient usable land and surrounded by existing slopes and vegetation. Since it is considered desirable to avoid extensive slope modification works both on environmental and technical point of view, a small extent of reclamation would be required to form additional land for the upgraded STW. In order to reduce the extent of reclamation, a compact arrangement of STW is adopted by introducing a two-



storey superstructure buildings arrangement. The objective is to provide required facilities and enough maintenance access for the functioning of STW, at the same time occupy the least extent of land. The layout and footprint of the proposed upgraded STW is shown in **Figure 2.2** as **Option 1 - Modified Original Location** (total site area is 0.34ha which involves existing land of 0.08ha and reclaimed area of 0.26ha).

- 2.4.4 Two potential locations for the expansion and upgrading of Tai O STW have also been identified as described below.
- 2.4.5 **Option 2 - Alternative Location at St. Stephen's Tai O Family (Figure 2.6)** - use of the St. Stephen's Tai O Family site for the construction of a new STW, which is located at the north of Tai O just next to the existing Tai O Sewage Pumping Station No. 2 (Tai O SPS2) at Kau San Tei and just upstream of the existing Tai O STW. Under this option, the whole of the St. Stephen's Tai O Family site will need to be cleared and vacated, re-provisioned and re-housed for the construction of the new STW which is highly undesirable from land issue consideration.
- 2.4.6 **Option 3 - Alternative Location at North of St. Stephen's Tai O Family (Figure 2.7)** - reclamation, with an extent of approximately 0.34ha, is required over the rocky shore to form new land on the coast to the north of the St. Stephen's Tai O Family for the new STW. It is located at the east of the existing STW, north of the St. Stephen's Tai O Family and immediately upstream of the existing Tai O STW. This site is located adjacent to a path leading to a pagoda for dolphin-watching and is relatively more visually intrusive to the nearby residents and tourists as compared with Option 1. As there is substantial level difference between the adjacent access road and the coastline, extensive retaining structures would likely be required under this option which may cause potential impact to landscape due to necessary removal of trees/vegetation.
- 2.4.7 **Table 2.1** summarizes the evaluation results of the three options for site locations: Option 1 - Modified Original Location; Option 2 - Alternative Location at St. Stephen's Tai O Family; and Option 3 - Alternative Location at North of St. Stephen's Tai O Family.
- 2.4.8 Through comparisons of the alternative locations for the upgrading and expansion of the Tai O STW against the various consideration factors, including environmental considerations, public concern, land issues, planning issues, engineering and geotechnical considerations, operation & maintenance difficulties, project programme, and capital cost for site formation, it is considered to expand and upgrade the Tai O STW under Option 1 - Modified Original Location as the preferred option to develop further under this Project.

**Table 2.1 : Comparisons of the Alternative Options for Site Locations - Option 1, 2 & 3**

	<b>Option 1 - Modified Original Location (Figure 2.2)</b>	<b>Option 2 - St. Stephen's Tai O Family (Figure 2.6)</b>	<b>Option 3 - North of St. Stephen's Tai O Family (Figure 2.7)</b>
STW Plan Area (hectare)	0.34*	0.39	0.37*
Reclamation Extent (hectare)	0.26*	None	0.34*



	<b>Option 1 - Modified Original Location (Figure 2.2)</b>	<b>Option 2 - St. Stephen's Tai O Family (Figure 2.6)</b>	<b>Option 3 - North of St. Stephen's Tai O Family (Figure 2.7)</b>
Environmental Considerations	<ul style="list-style-type: none"> <li>No adjacent noise and air quality sensitive receivers located in the immediate vicinity</li> <li>Some visual impacts on the coastline</li> <li>Lesser landscape impact on marsh / reedbed</li> <li>Impact on water quality and marine ecology during construction (outfall, seawall, reclamation)</li> <li>Beneficial use of Construction and Demolition Material</li> </ul>	<ul style="list-style-type: none"> <li>Closer to noise and air quality sensitive receivers (e.g. Yeung Hau Temple)</li> <li>Some visual impacts on natural valley setting and surroundings</li> <li>More landscape impact on marsh / reedbed</li> <li>Impact on water quality and marine ecology during construction (outfall)</li> </ul>	<ul style="list-style-type: none"> <li>Closer to noise and air quality sensitive receivers (e.g. Yeung Hau Temple)</li> <li>Some visual impacts on the coastline; highly visible to users of the coastal footpath</li> <li>More landscape impact on marsh / reedbed</li> <li>Impact on water quality and marine ecology during construction (outfall, seawall, reclamation)</li> <li>Potential impact to landscape and removal of trees/vegetation may be required</li> <li>Beneficial use of Construction and Demolition Material</li> </ul>
Public Concern	<ul style="list-style-type: none"> <li>Public may have concern on reclamation</li> </ul>	<ul style="list-style-type: none"> <li>Potential objection on land resumption and relocation and reprovisioning of CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers**</li> </ul>	<ul style="list-style-type: none"> <li>Public may have concern on reclamation</li> </ul>
Land Issues	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Will require relocation and reprovisioning of the existing CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers**; will cause public nuisance and potential objection is expected</li> <li>Will require private building land resumption and clearance of residential structures; potential objection is expected</li> <li>Associated land costs for relocation, reprovisioning, resumption and clearance will be significant</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>



	<b>Option 1 - Modified Original Location (Figure 2.2)</b>	<b>Option 2 - St. Stephen's Tai O Family (Figure 2.6)</b>	<b>Option 3 - North of St. Stephen's Tai O Family (Figure 2.7)</b>
Planning Issues (OZP Status)	<ul style="list-style-type: none"> <li>• "Other Specified Uses (Sewage Treatment Works)" - STW is always permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul>	<ul style="list-style-type: none"> <li>• mainly within "Government, Institution or Community" ("G/IC") zone and partly not covered by any zoning – STW within an area zoned "G/IC" may be permitted with or without conditions on planning application under Section 16 of Town Planning Ordinance which requires about 2 months to process, and subject to detailed design of the exact layout and site configuration, re-zoning application under Section 12A of Town Planning Ordinance may be needed which requires about 14 to 20 months to process</li> </ul>	<ul style="list-style-type: none"> <li>• "Coastal Protection Area" and partly not covered by any zoning – re-zoning application under Section 12A of Town Planning Ordinance may be needed which requires about 14 to 20 months to process</li> </ul>
Engineering and Geotechnical Considerations	<ul style="list-style-type: none"> <li>• No existing man-made slope nearby</li> <li>• Natural Terrain Hazard Study and further ground investigation works required</li> </ul>	<ul style="list-style-type: none"> <li>• Slope feature 9SW-D/CR167 adjacent to the site but is unlikely to be affected</li> <li>• Natural Terrain Hazard Study and further ground investigation works required</li> </ul>	<ul style="list-style-type: none"> <li>• New retaining structures required</li> <li>• Slope feature 9SW-C/C4 adjacent to the site but is unlikely to be affected</li> <li>• Natural Terrain Hazard Study and further ground investigations works required</li> </ul>
Operation and Maintenance Considerations	<ul style="list-style-type: none"> <li>• No particular difficulties in marine access</li> </ul>	<ul style="list-style-type: none"> <li>• Access by small vehicles only unless a long jetty is constructed over the shallow water for marine access, which is highly undesirable from environmental, technical and cost considerations</li> </ul>	<ul style="list-style-type: none"> <li>• No particular difficulties in marine access</li> </ul>



	Option 1 - Modified Original Location (Figure 2.2)	Option 2 - St. Stephen's Tai O Family (Figure 2.6)	Option 3 - North of St. Stephen's Tai O Family (Figure 2.7)
Project Programme	<ul style="list-style-type: none"> <li>No extra lead time required to resolve land issue</li> <li>No programme implication due to change of planning status, except where minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which takes about 2 months to process</li> <li>Construction for site formation about 1.5 year</li> </ul>	<ul style="list-style-type: none"> <li>Long lead time required to resolve complicated land issues, such as reprovisioning and relocation of the CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers**, resumption of private building land, and clearance of residential structures</li> <li>Long lead time required to carry out re-zoning application and approval</li> <li>Construction of site formation about 1 year</li> </ul>	<ul style="list-style-type: none"> <li>No extra lead time required to resolve land issue</li> <li>Long lead time required to carry out re-zoning application and approval</li> <li>Construction for site formation more than 1.5 year</li> </ul>
Capital Cost for Site Formation	<ul style="list-style-type: none"> <li>Lower cost for site formation works than Option 3</li> </ul>	<ul style="list-style-type: none"> <li>Lowest cost for site formation works</li> </ul>	<ul style="list-style-type: none"> <li>Highest cost for site formation works</li> </ul>
<b>Conclusion</b>	<b>Preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>

Remarks:



Option which is more preferable or has less impact in respect of different consideration factors.

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Reclamation area excludes seawall sloping area.

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The site is also known as "St. Stephen's Tai O Family".

### Consideration of Alternative STW Arrangements

- 2.4.9 In order to reduce the extent of additional land required at the existing STW site for the construction of the new treatment units as presented under the Modified Original Location, the potential to construct preliminary treatment units at a separate location from Tai O STW has been studied and evaluated.
- 2.4.10 Two split options have been examined for the alternative STW arrangement and potential use of the unallocated government land zoned as "Government, Institution or Community" (G/IC) in the OZP, located just next to the Tai O SPS2.
- 2.4.11 **Option 4 - Split Option A (Figure 2.8)** - comprises a layout for the preliminary treatment units within the strip of land at the south end of the G/IC site and uses the Tai O SPS2 site area.
- 2.4.12 **Option 5 - Split Option B (Figure 2.9)** - the provision of preliminary treatment units within the Tai O SPS2 site area, which would involve substantial civil works to modify the Tai O SPS2 substructure and superstructure.
- 2.4.13 Reduction in new land required at the proposed Tai O STW site (Option 1 - Modified Original Location (No Split Option)) can be achieved with Options 4 and 5 by 23% and 8% respectively. However, there are corresponding increases in both the capital cost and recurrent cost for these options. They will involve heavy construction works carried out adjacent to and at the existing Tai O SPS2, which would pose safety issues within the very constrained space. The split options will also require the construction of a new twin 300mm diameter rising mains along the existing



narrow and winding footpath between the preliminary treatment units and the new main treatment units at the Tai O STW site, in order to meet the current standard of design. This will require substantial temporary and permanent slope stabilisation works along the existing footpath.

- 2.4.14 Although arguably the spilt options will have a minor reduction of impact on water quality, fisheries and marine ecology due to slightly lesser scale of reclamation and seawall extent, they will create or increase environmental impacts that will not be present under the No Split Option, including increasing visual, noise and air impacts to adjacent sensitive receivers, tree felling/transplantation and potential impact to adjacent mangrove areas etc.
- 2.4.15 **Table 2.2** summarizes the evaluation results of the three options for site arrangements: Option 1 - Modified Original Location (No Split Option); Option 4 - Split Option A; and Option 5 - Split Option B.
- 2.4.16 Through the comparisons of the alternative STW arrangement options against the various consideration factors, it is preferred to expand and upgrade the Tai O STW at the Modified Original Location (No-Split).

**Table 2.2 : Comparisons of the Alternative Options for Site Arrangements - Option 1, 4 & 5**

Design Criteria	Option 1 - Modified Original Location (No Split Option) (Figure 2.2)	Option 4 - Split Option A (Figure 2.8)	Option 5 - Split Option B (Figure 2.9)
STW Plan Area (hectare)	0.34*	0.34*	0.34*
Additional Land Required at the Existing Tai O STW Site (hectares)	0.26*	0.20*	0.24*





Design Criteria	Option 1 - Modified Original Location (No Split Option) (Figure 2.2)	Option 4 - Split Option A (Figure 2.8)	Option 5 - Split Option B (Figure 2.9)
Environmental Considerations	<ul style="list-style-type: none"> <li>Possibly slightly higher impact on water quality, fisheries and marine ecology during construction (outfall, seawall, reclamation) than other two options</li> <li>Avoidance of environmental impacts at G/IC site under the other two options</li> </ul>	<ul style="list-style-type: none"> <li>Possibly slightly lesser impact on water quality, fisheries and marine ecology during construction (outfall, seawall, reclamation) than Option 1</li> <li>Noise and air quality impacts to environmental sensitive receivers in close vicinity (e.g. CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers** and nearby houses)</li> <li>Tree felling / transplantation required</li> <li>Impact on adjacent mangrove areas</li> <li>Environmental impacts associated with construction of the new twin rising mains along the existing footpath leading to Tai O STW</li> </ul>	<ul style="list-style-type: none"> <li>Possibly slightly lesser impact on water quality, fisheries and marine ecology during construction (outfall, seawall, reclamation) than Option 1</li> <li>Noise and air quality impacts to environmental sensitive receivers in close vicinity (e.g., CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers** and nearby houses)</li> <li>Environmental impacts associated with construction of the new twin rising mains along the existing footpath leading to Tai O STW</li> </ul>
Public Concerns	<ul style="list-style-type: none"> <li>Public may have concern on reclamation but would be restricted to one location only</li> </ul>	<ul style="list-style-type: none"> <li>Reduced reclamation extent may be seen favourably by public</li> <li>Nearby residents may have concern on environmental impacts and inconvenience caused during both permanent and temporary stages</li> <li>Public may have concern on tree felling / transplantation and impact on adjacent mangrove areas</li> </ul>	<ul style="list-style-type: none"> <li>Reduced reclamation extent may be seen favourably by public</li> <li>Nearby residents may have concern on environmental impacts and inconvenience caused during both permanent and temporary stages</li> </ul>
Land Issues	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Potential land use conflict with a proposed wilderness campsite for part of the G/IC site</li> <li>Part or all of the existing footpath adjacent to the Tai O SPS2 will need to be occupied for the proposed preliminary treatment facilities at the G/IC site</li> </ul>	<ul style="list-style-type: none"> <li>Part or all of the existing footpath adjacent to the Tai O SPS2 will need to be occupied for its reconstruction to accommodate the preliminary treatment facilities</li> </ul>



Design Criteria	Option 1 - Modified Original Location (No Split Option) (Figure 2.2)	Option 4 - Split Option A (Figure 2.8)	Option 5 - Split Option B (Figure 2.9)
Planning Issues (OZP Status)	<p><b>Existing Tai O STW Site</b></p> <ul style="list-style-type: none"> <li>“Other Specified Uses (Sewage Treatment Works)” – STW is always permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul>	<p><b>Existing Tai O Imhoff Tank Site</b></p> <ul style="list-style-type: none"> <li>“Other Specified Uses (Sewage Treatment Works)” – STW and minor relaxation of the building height restriction may be permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul> <p><b>Existing Tai O SPS2 and adjacent G/IC Site</b></p> <ul style="list-style-type: none"> <li>“Government institution and Community” – STW may be permitted with or without conditions on planning application under Section 16 of Town Planning Ordinance which requires about 2 months to process</li> </ul>	<p><b>Existing Tai O Imhoff Tank Site</b></p> <ul style="list-style-type: none"> <li>“Other Specified Uses (Sewage Treatment Works)” – STW is always permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul> <p><b>Existing Tai O SPS2</b></p> <ul style="list-style-type: none"> <li>“Government institution and Community” – STW and minor relaxation of the building height restriction may be permitted with or without conditions on planning application under Section 16 of Town Planning Ordinance which requires about 2 months to process</li> </ul>
Engineering and Geotechnical Considerations	<ul style="list-style-type: none"> <li>No major difficulties</li> </ul>	<ul style="list-style-type: none"> <li>Deep substructures and limited space at G/IC Site will involve engineering difficulties</li> <li>More slopes affected due to construction of new twin rising mains along existing footpath</li> </ul>	<ul style="list-style-type: none"> <li>Deep substructures and limited space at Tai O SPS2 will involve engineering difficulties</li> <li>More slopes affected due to construction of new twin rising mains along existing footpath</li> <li>Temporary re-provisioning of Tai O SPS2 required</li> </ul>



Design Criteria	Option 1 - Modified Original Location (No Split Option) (Figure 2.2)	Option 4 - Split Option A (Figure 2.8)	Option 5 - Split Option B (Figure 2.9)
Operation and Maintenance Considerations	<ul style="list-style-type: none"> <li>No major difficulties</li> </ul>	<ul style="list-style-type: none"> <li>More operation and maintenance difficulties at two separate locations compared with one single site</li> <li>More recurrent cost required and higher life-cycle cost</li> </ul>	<ul style="list-style-type: none"> <li>More operation and maintenance difficulties at two separate locations compared with one single site</li> <li>More recurrent cost required and higher life-cycle cost</li> </ul>
Construction Programme	<ul style="list-style-type: none"> <li>Construction of the seawall and reclamation about 1.5 year</li> </ul>	<ul style="list-style-type: none"> <li>Construction of the seawall and reclamation about 1.2 year</li> <li>Shortest overall construction programme due to the independent construction of preliminary treatment units from seawall and reclamation works</li> </ul>	<ul style="list-style-type: none"> <li>Construction of the seawall and reclamation about 1.3 year</li> <li>Shorter overall construction programme than Option 1 due to the independent construction of preliminary treatment units from seawall and reclamation works, but slightly longer overall construction programme than Option 4.</li> </ul>
Capital Cost	<ul style="list-style-type: none"> <li>Lowest capital cost with least number of structures and installations and due to construction within one site only</li> </ul>	<ul style="list-style-type: none"> <li>Highest capital cost with the largest number of structures and installations and due to construction at two sites</li> </ul>	<ul style="list-style-type: none"> <li>Slightly lower capital cost than Option 4, but still much higher capital cost than Option 1 with more number of structures and installations and due to construction at two sites</li> </ul>
Conclusion	<b>Preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>

Remarks:



Option which is more preferable or has less impact in respect of different consideration factors. To enable comparison between the Modified Original Location Option and the alternative Split Options A and B, it is assumed that the new land extent to be formed at the existing Tai O STW site will be by seawall / reclamation works.

\* Reclamation area excludes seawall sloping area.

\*\* The site is also known as "St. Stephen's Tai O Family".

### Alternative Site Formation Methods

2.4.17 Based on the principle to form the additional land at the existing Tai O STW site, alternative construction methods, namely by reclamation with seawall, by constructing a cavern, or by forming a platform deck over the existing coastline have been evaluated. It should be noted that the method of site formation by cutting into the existing slope has also been studied. Since the evaluation based on various



consideration factors on slope cutting option is similar to that for the cavern option in most aspects, it is not included in the alternative site formation methods for clarity.

2.4.18 The conceptual layouts for the three options are as follow:

- **Reclamation** (Option 1) - comprising a seawall and stone fill reclamation, adjacent to, and at the west of the existing STW site (**Figure 2.2**);
- **Cavern** (Option 6) - comprising an excavation within the hill at the south side of the existing STW site, formation of portal and access/ventilation adits (**Figure 2.10**); and
- **Platform Deck** (Option 7) - comprising a concrete platform on bored piles foundation (**Figure 2.11**).

2.4.19 Under reclamation option, the proposed Tai O STW could be confined within the area zoned "OU (Sewage Treatment Works)" on the approved OZP under which the proposed STW is permitted. Vertical seawall would be proposed at north-western face for marine berthing area in order to reduce the further reclamation for marine berthing area. Major environmental concerns associated with reclamation works and seawall construction under the Reclamation Option are loss of fishing grounds and resources, and water quality deterioration due to marine dredging activities. Alternative construction method to avoid marine dredging had been considered as presented in **Section 2.5**.

2.4.20 The Cavern Option has a lined internal height of 19.5 metres and a span of 27.5 metres, with a total length of 120 metres. Two tunnels will form the entrance to the cavern from the portals at the hill side to provide safe ingress/egress and to facilitate the ventilation of the cavern. The cavern will be formed within "fair to good" rock mass conditions and drill and blast method will be adopted since the transport of large tunnel boring machine to this remote location is impracticable.

2.4.21 Giving the land access to the proposed STW site is limited, the Cavern Option would have water quality, fisheries and marine ecological impacts due to the needs of jetty area for delivery of construction plants and materials. It would also potentially create other environmental impacts including the impact on terrestrial ecology and natural landscape setting due to significant amount of tree/vegetation removal required, visual impact due to formation of tunnel portals and slope stabilization works, and generation of substantial amount of Construction and Demolition Material. Furthermore, the energy consumption during operation and maintenance would be higher due to the needs of substantial ventilation and lightening required for Cavern Option.

2.4.22 Under the Cavern Option, there would be high engineering risk and safety hazard associated with the extensive slope stabilization works and blasting activities required. It may affect the existing slope up to a height of 30 metres and would disturb the unstable rock mass across the face of the slope. Potential safety hazard and risk for explosive delivery to this remote location would also be one of the drawbacks of this option.

2.4.23 The Platform Deck Option is essentially an alternative to reclamation. However, since the existing seabed of the proposed site is shallow, a large temporary working platform is required for mobilizing the piling plants for under-water piling. Beside the larger extent of environmental impacts under Platform Deck Option due to the needs of temporary working platform, the associated disruption caused to the marine environment due to the extensive piling works under Platform Deck Option would not be too dissimilar to that due to reclamation works and seawall construction. Moreover, this option requires a large concrete platform deck sitting on extensive piled foundation which would have more visual impact than the other two options.



- 2.4.24 Another major issue with this option is that the treatment units would be situated at a higher elevation than the Reclamation Option, which would then require a higher pump head and more stages of pumping with additional pumping facilities and pipelines/channels. This would increase the operation and maintenance cost and difficulties, including the needs of more power consumption, more mechanical and electrical parts.
- 2.4.25 The surface level of platform deck, with approximately 2.5 metres thick, would be at around +7.5mPD. It would be supported by in-situ concrete piles of 1.5 metres diameter spaced at 5.5 metres centre to centre. Due to shallow sea bed levels along the coastline where barge mooring is not possible, it is necessary to construct a heavy duty temporary working platform which is both technically and environmentally undesirable.
- 2.4.26 **Table 2.3** discussed the comparisons of the three alternative options for site formation methods: Option 1 – Reclamation; Option 6 – Cavern; and Option 7 – Platform Deck.
- 2.4.27 Through the comparisons of the alternative site formation options against the various consideration factors, it is preferred to form the required land at the Tai O STW by means of reclamation and seawall.

**Table 2.3 : Comparisons of the Alternative Options for Site Formation Methods - Option 1, 6 & 7**

Design Criteria	Option 1 - Reclamation (Figure 2.2)	Option 6 - Cavern (Figure 2.10)	Option 7 - Platform Deck (Figure 2.11)
STW Plan Area (hectares)	0.34*	0.42	0.34
Reclamation Extent (hectares)	0.26*	0	0
Environmental Considerations	<ul style="list-style-type: none"> <li>Water quality impact due to outfall dredging and reclamation</li> <li>Impact on marine ecology, fisheries and marine fauna during construction (outfall and reclamation)</li> <li>Slightly lesser landscape and visual impact due to STW structures</li> <li>Natural coastline will be affected</li> <li>Beneficial use of Construction and Demolition Material from other sites for seawall and reclamation works</li> </ul>	<ul style="list-style-type: none"> <li>Water quality impact due to outfall dredging and jetty construction</li> <li>Impact on marine ecology, fisheries and marine fauna during construction (outfall and jetty construction, blasting activities)</li> <li>Impact on terrestrial ecology</li> <li>Impact on natural landscape setting and substantial tree and vegetation removal is required</li> <li>Higher landscape and visual impact due to portal formation and slope stabilisation works</li> <li>Substantial amount of Construction and Demolition Material will be generated</li> </ul>	<ul style="list-style-type: none"> <li>Higher water quality impact due to outfall dredging, piling works and platform deck construction</li> <li>Impact on marine ecology, fisheries and marine fauna during construction (outfall, piling works, platform deck and temporary platform construction)</li> <li>Higher landscape and visual impact due to STW structures located at higher level on platform deck</li> <li>Natural coastline will be affected</li> <li>Extensive use of concrete and reinforcement for piling works and platform deck construction</li> <li>Moderate amount of Construction and Demolition Material will be generated</li> </ul>



Design Criteria	Option 1 - Reclamation (Figure 2.2)	Option 6 - Cavern (Figure 2.10)	Option 7 - Platform Deck (Figure 2.11)
Public Concern	<ul style="list-style-type: none"> <li>Public may have concern on reclamation</li> </ul>	<ul style="list-style-type: none"> <li>May be seen favourably by public as no reclamation is involved</li> </ul>	<ul style="list-style-type: none"> <li>Public may have lesser concern than Option 1</li> </ul>
Planning Issues (OZP Status)	<ul style="list-style-type: none"> <li>“Other Specified Uses (Sewage Treatment Works)” – STW is always permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul>	<ul style="list-style-type: none"> <li>Cavern will be situated across zones “Other Specified Uses (Sewage Treatment Works)”, “Coastal Protection Area” and “Green Belt”, where re-zoning application for areas zoned “Coastal Protection Area” and “Conservation Area” under Section 12A of Town Planning Ordinance is needed which requires about 14 to 20 months to process</li> </ul>	<ul style="list-style-type: none"> <li>“Other Specified Uses (Sewage Treatment Works)” – STW is always permitted; however planning application under Section 16 of the Town Planning Ordinance for minor relaxation of the building height restriction is required if the proposed building height is more than two storeys, which requires about 2 months to process</li> </ul>
Engineering and Geotechnical Considerations	<ul style="list-style-type: none"> <li>No major difficulty</li> </ul>	<ul style="list-style-type: none"> <li>High engineering risk and safety hazard in respect of slope stability due to extensive blasting activities, portal formation and slope stabilisation works</li> <li>Potential safety hazard and risk for explosive delivery to this remote location</li> <li>Large jetty or berthing area may be required for delivery of construction plants and materials</li> <li>Difficult logistic arrangement to handle and dispose substantial amount of Construction and Demolition Material</li> </ul>	<ul style="list-style-type: none"> <li>Substantial temporary works will be required for piling works and platform deck construction</li> <li>Difficulties for working in remote location for potential extensive rock excavation on the rocky coastline</li> </ul>



Design Criteria	Option 1 - Reclamation (Figure 2.2)	Option 6 - Cavern (Figure 2.10)	Option 7 - Platform Deck (Figure 2.11)
Operation and Maintenance Considerations	<ul style="list-style-type: none"> <li>No major difficulty</li> <li>Lowest recurrent cost and life-cycle cost</li> </ul>	<ul style="list-style-type: none"> <li>Special arrangements will be required to operate the STW within confined space, e.g. enhanced ventilation and lighting installations, stringent fire services requirements etc.</li> <li>Since no berthing area is available, there will be more access difficulties for maintenance activities as compared with Option 1 and 7</li> <li>Higher recurrent cost and life-cycle cost than Option 1</li> </ul>	<ul style="list-style-type: none"> <li>Additional pump installations and pump stages will be required for the more elevated arrangement of STW units</li> <li>Highest recurrent cost and life-cycle cost</li> </ul>
Construction Programme	<ul style="list-style-type: none"> <li>Site formation works about 1.5 years</li> </ul>	<ul style="list-style-type: none"> <li>Site formation works about 3 years</li> </ul>	<ul style="list-style-type: none"> <li>Site formation works about 1.5 years</li> </ul>
Capital Cost	<ul style="list-style-type: none"> <li>Lowest capital cost</li> </ul>	<ul style="list-style-type: none"> <li>Highest capital cost</li> </ul>	<ul style="list-style-type: none"> <li>Higher capital cost than Option 1</li> </ul>
Conclusion	<b>Preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>

Remarks:



Option which is more preferable or has less impact in respect of different consideration factors.  
\* Reclamation area excludes seawall sloping area.

## 2.5 Consideration of Alternative Construction Methods and Sequences of Work for Tai O STW

2.5.1 As discussed in **Section 2.4**, reclamation is preferred for the proposed expansion and upgrading of the Tai O STW. A vertical seawall is proposed at the marine berthing area and sloping seawall is proposed at the other portion of the Tai O STW. Sloping and vertical seawalls formed of traditional mass concrete blocks are proposed to retain the reclamation fill for the construction of collection, treatment and disposal facilities. The proposed seawall shall comprise pre-casted seawall blocks and suitable backfilling material at the boundary of reclamation area.

2.5.2 Prior to the construction, dredging work could be deployed to remove the soft marine deposit underneath the foundation of seawall and reclamation area. Fully-dredge construction method can eliminate settlement problems and achieving stability of seawalls and outfall. However, the method may incur possible environmental impacts such as release of suspended solids.

2.5.3 Marine ground investigation and laboratory testing along the proposed submarine outfall had been conducted under this Project. However, due to the shallow water levels at the proposed site of Tai O STW, the marine ground investigation works could not be performed at the proposed site of Tai O STW. Based on the marine ground investigation conducted along the proposed submarine outfall and the existing site condition of strong waves and high rock head level observed at the west side of the existing Tai O STW, it is expected that the marine sediment layers



could probably be around 1 m. No-dredge reclamation method by displacing marine deposit with the self weight of mass concrete blocks is considered feasible for the construction of Tai O STW.

2.5.4 The works sequences of this no-dredge reclamation of Tai O STW are presented in **Appendix 2.2** and as described below:

- (i) Construct the core of seawall and foundation stone first to form a temporary seawall which acts as a barrier between the proposed Tai O STW site and the sea;
- (ii) Fill the enclosed area of the proposed Tai O STW site to temporary level of 3mPD to form a land platform;
- (iii) Undertake excavation and construction within the land platform, fill up to the final design level; and
- (iv) Erect the permanent seawall at the latest stage.

2.5.5 It is considered that the no-dredge reclamation of Tai O STW by displacing marine deposit is more environmental friendly when compared with the fully dredge reclamation as it eliminates the dredging of marine deposits, avoids the need of marine dumping and reduces release of suspended particles. Hence, no-dredge reclamation would be proposed for the Tai O STW construction.

## 2.6 Design of Submarine Sewage Outfall

2.6.1 Treated effluent is presently discharged to the sea through the existing submarine outfall comprising twin 225mm diameter pipes of approximately 260m long. The existing submarine outfall was built in the 1980's and the conditions are deteriorating and leakages at the joints of the outfall occur. While regular maintenance works to the existing submarine outfall would continue to be carried out, its deteriorating and aged condition would inevitably pose a potential risk of structural failure which would cause detrimental effect to the surrounding water quality and nearby marine ecology and resources. Therefore, it is both environmentally and technically more sensible to construct a new submarine outfall under the Project than to maintain using the existing submarine outfall even with refurbishment and proper maintenance. Moreover, the outfall is currently operated near its design capacity but would be inadequate to cope with the future demand within the catchments. A new submarine outfall comprising twin 300mm diameter pipes with design capacity of 2,750m<sup>3</sup>/day is therefore proposed. With the replacement of the deteriorating and aged submarine outfall by a new one, the potential risk of unexpected sewage pollution to the receiving water body due to structural failure of the existing submarine outfall can be avoided. It would be able to meet the future demand within the catchments. The new outfall will be aligned at the west side of the existing submarine outfall to convey and discharge the treated effluent from the new Header Tank at Tai O STW. The existing outfall will be decommissioned and left abandoned after the new outfall is in operation.

2.6.2 Since effluent discharge through existing outfall has to be maintained during the construction of the Tai O STW, it is considered that the construction of the new outfall close to the alignment of the existing submarine outfall is not preferred. The new submarine outfall is designed to align in parallel to the alignment of the existing submarine outfall in a distance of 45 meters away. Based on the existing seabed conditions and the hydraulic calculations to satisfy flow conditions through the outfall pipes and the risers, preliminary design of the submarine outfall sizes, lengths, riser positions has been carried out, which is confirmed based on the results of simulations in the water quality model as presented in **Section 5 – Water Quality**





**Impact Assessment** of this EIA to predict the water quality impacts of the effluent discharged at the proposed flow rates and locations. The length of new submarine outfall pipes, as evaluated, has been designed to the shortest length in order to minimize the associated environmental impacts during both the construction and operation stage, while fulfilling the requirements on water quality of the receiving water body. It is believed that the scheme is having the best environmental performance.

## **2.7 Consideration of Alternative Construction Methods and Sequences of Work for Tai O submarine outfall**

- 2.7.1 Two possible construction methods for laying of submarine outfall have been studied, including pipe laying by fully-dredge and pipe laying by Horizontal Directional Drilling (HDD).
- 2.7.2 Fully-dredge is a traditional way to construct submarine outfall. The seabed is dredged to the required depth for placing the outfall pipes and the pipes protection materials. Under this option, the outfall could be designed to its shortest length of 130m in order to minimize the associated environmental impacts during both the construction and operation stage. Proper protections on outfall pipes with armoured rock could be provided to enhance the durability of pipelines. Measures such as silt curtains could be provided around the seabed excavation for the outfall construction so as to contain marine sediment and minimise water quality impact.
- 2.7.3 HDD method is a new construction method for laying submarine outfall by trenchless technology. Under the HDD method, a pilot hole is firstly drilled and will be enlarged using reamers until the required diameter is achieved. Finally, the pipeline will be pulled through the pre-reamed hole.
- 2.7.4 The HDD method is constrained by the turning radius of the equipments, and the minimum length of Tai O STW submarine outfall will be approximately 200m based on the available ground investigation results. Dredging is still required under the HDD method for laying of diffusers. Since the length of submarine outfall is longer under the HDD method where thicker layer of marine deposit is observed, the HDD method would not have the benefits of less dredging when compared with fully-dredge method. Installation of pipe piles foundation at the diffusers could reduce the amount of dredging required, however, the operation would involve piling works at the diffusers locations that would affect the marine ecology. The longer construction period for HDD method would also pro-long the nuisance arising on the adjacent environment from the construction activities.
- 2.7.5 Since dredging could not be avoided and the length of submarine outfall would be substantially increased under the HDD method, it is considered that fully-dredge method is preferred for the construction of submarine outfall of Tai O STW.

## **2.8 Alternative Sewage Treatment Process**

- 2.8.1 The existing Tai O STW comprises an Imhoff Tank for solids separation from the influent sewage and stabilisation of the separated solids with a design Average Dry Weather Flow (ADWF) of 1,220m<sup>3</sup>/day. The Imhoff Tank performs only a primary sewage treatment level.
- 2.8.2 Given the objective of improving the coastal water quality at the northwest of Tai O, the existing Tai O STW needs to be upgraded to provide a secondary sewage treatment level. In addition, the capacity of Tai O STW needs to be expanded to a design ADWF of 2,750m<sup>3</sup>/day so as to be able to treat future increased sewage flows at Tai O.



- 2.8.3 Review of the latest secondary treatment technologies with nitrogen removal has been conducted in the selection of the most appropriate treatment technology for Tai O STW upgrade. These included Sequencing Batch Reactor (SBR), Hybrid Process, Biological Aerated Filters (BAF) and Membrane Bioreactors (MBR).
- 2.8.4 SBR treatment has been adopted in other STWs in Hong Kong, including Peng Chau STW and Ngong Ping STW. It is a fill-and-draw activated sludge treatment system, in which aeration, sedimentation and decant occur in the same tank. For continuous flow application, at least two SBR tanks would be required. With SBR, there is no separate clarification stage and the equipment and control is complex. The SBR tanks require large footprints, which at Tai O would result with substantial land reclamation for the new STW. SBR treatment process at Tai O is therefore not preferred.
- 2.8.5 The Hybrid Treatment Process is a variety of synthetic packing materials developed with the activated sludge process. The Hybrid Treatment Process requires a smaller footprint in comparison with the SBR but it is a treatment process that is not widely adopted internationally or in Hong Kong and therefore there is limited operational experience and knowledge with this treatment process. It is therefore not recommended treatment process for Tai O.
- 2.8.6 The BAF treatment process comprises a fixed-film system in which a biofilm-support filter medium is submerged in wastewater to provide biological treatment. BAF requires a smaller footprint than SBR treatment process, however the high capital and operational costs of BAF in conjunction with the limited Hong Kong operational experience of BAF treatment process, it is not a preferred treatment process for Tai O.
- 2.8.7 The MBR treatment process is a combination of activated sludge treatment process with solids separation by microfiltration. A major advantage associated with MBR is that compared to all other treatment processes, MBR installations require the smallest footprint. It generates the least sludge volume compared to other treatment processes and produces a high effluent quality that is similar to the combination of secondary clarification and effluent microfiltration. MBR technology is widely used worldwide and has been adopted in Hong Kong. MBR has relatively high capital and operational costs compared with other treatment processes, however, due to the small footprint and high effluent quality, it is the most appropriate treatment process suitable to upgrade the Tai O STW to both minimise land reclamation extent and to protect Tai O coastal water quality. MBR is therefore preferred and selected as the secondary treatment process for Tai O STW.
- 2.8.8 The upgraded Tai O STW will also be equipped with sludge treatment units which can produce sludge with at least 30% dry solid content for disposal. Deodorising facilities will also be provided to limit the odour emissions.

## **2.9 Selection of Preferred Scheme**

- 2.9.1 Based on the evaluation described in **Section 2.4**, Option 1 - Modified Original Location (No Split, Reclamation Option) is preferred for the expansion and upgrading of Tai O STW. It is situated at a remote location from residents or main tourist areas and is not within "Conservation Area", "Coastal Protection Area", "Green Belt" or "Village Type Development" zones where rezoning and land resumption is not required. This site would enable the construction of a shortest outfall so as to minimise environmental impact due to dredging activities. The overall environmental impacts associated with this option is considered to be similar to, if not lesser than, the other site locations and site formation options, such as the Cavern Option. From a technical point of view, it would involve the lowest



engineering risk and safety hazard with the shortest overall implementation programme. Finally, on a cost aspect, this is the most cost-effective option in terms of capital, recurrent and life-cycle costs.

- 2.9.2 Since the marine sediment layers at the site of Tai O STW would probably be around 1 m, no-dredge reclamation method by displacing marine deposit with the self weight of mass concrete blocks is considered feasible and is more environmentally preferred when compared with fully dredge construction method. The traditional non-dredged construction method for sea-wall construction will be used in conjunction with ground improvement method such as the construction of stone columns to control settlement.
- 2.9.3 The Tai O STW would adopt MBR treatment process owing to the advantage of small footprint and good effluent quality.
- 2.9.4 In order to further reduce the footprint of the new STW and hence the extent of reclamation required, below ground structures and two-storey buildings are proposed to accommodate the required facilities, namely:
- Administration Building is situated above the Odour Control Room and the Storm Tank;
  - Air Blower Room is situated above the Sludge Pump Room;
  - Fire Pump Room is situated above the Workshop; and
  - Standby Generator Room is situated above the Transformer Room and Switch Room.
- 2.9.5 Further refinement of the layout to optimise the land intake would be continued during the ongoing process of detailed design, with an aim to reduce the footprint required as far as practicable.
- 2.9.6 As discussed in **Section 2.7**, the new submarine outfall would be constructed by fully dredge method. Measures such as silt curtains could be provided around the seabed excavation for the outfall construction so as to contain marine sediment and minimise water quality impact.

## **2.10 Effluent Reuse**

- 2.10.1 The following non-potable effluent reuse elements are proposed for MBR treated effluent:
- (a) Process cleaning water for: screens, grit classifier, membrane filter press, storm tanks, channels and tanks, floor wash down, etc.; and
  - (b) On-site toilet flushing.
- 2.10.2 200m<sup>3</sup>/day of the treated effluent would be undergoing chlorination in the disinfection tank before being conveyed to the treated water storage tank for further distribution to the effluent reuse units within the STW. The quality of chlorinated effluent for effluent reuse in this Project is summarized in **Table 2.4**. This is the effluent reuse standards recommended in the proposed expansion of Shek Wu Hui STW for off-site toilet flushing and other non-potable uses. The recommended standards are more stringent when compared with the treated effluent standard recommended for Ngong Ping STW, where the effluent is reused for off-site toilet flushing and other potential non-potable reuses (such as irrigation, water features, cooling towers, etc.). The recommended standards under United States Environmental Protection Agency (USEPA) 2012 “Guidelines for Water Reuse” are also provided for reference.



Table 2.4 : Effluent Reuse Standards

Water Quality Parameter	Unit	Ngong Ping STW Effluent Reuse Quality	Shek Wu Hui STW Effluent Reuse Quality	USEPA 2012 Recommended Value	Recommended Effluent Reuse Quality for Tai O STW
pH	-	Not specified	6-9	6-9	6-9
Residual Chlorine	mg/L	≥ 0.5	≥ 1	≥ 1	≥ 1
<i>E.Coli</i>	counts/100 ml	< 100	Not detectable	Not detectable	Not detectable
Turbidity	NTU	≤ 10	≤ 5	≤ 2	≤ 2
Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L	≤ 10	≤ 10	≤ 30	≤ 10
Dissolved Oxygen	mg/L	≥ 2	≥ 2	Not specified	≥ 2
Total Suspended Solid (TSS)	mg/L	≤ 10	≤ 5	≤ 30	≤ 5
Ammonia Nitrogen (NH <sub>3</sub> N)	mg/L	≤ 1	≤ 1	Not specified	≤ 1
Colour	Hazen Unit	≤ 20	≤ 20	Not specified	≤ 20
Synthetic Detergents	mg/L	≤ 5	≤ 5	Not specified	≤ 5
Threshold Odour Number (TON)	-	Not specified	≤ 100	Not specified	≤ 100

- 2.10.3 The schematic diagram of effluent reuse is presented in **Figure 2.3**. A chlorine dosing system in the form of sodium hypochlorite with contact time of about 30 minutes will be installed. The remaining portion of treated effluent without chlorination will be discharged via outfall. The chlorination process will cease when its quantity is monitored to reach a pre-set level to avoid over generation of chlorinated treated effluent. The pre-set level of residual chlorine for effluent reuse is 1.5+/- 0.5mg/L, with periodic monitoring at point of use that 0.2 mg/L is maintained, with the target set point adjusted as necessary. In-house monitoring would be performed by STW Operators at the discharge point to ensure the residual chlorine level in discharged effluent is less than 1mg/L as stated in the Technical Memorandum on Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Water (TM) for the North Western Water Control Zone and North Western Supplementary.
- 2.10.4 Apart from the online monitoring and control system for the wastewater quality as mentioned, regular sampling programme will be devised to further safeguard and ensure that the quality of the treated effluent is suitable for reuse. Should the treated effluent not meet the required standards for process cleaning and toilet flushing or in case of breakdown of the wastewater system, a contingency plan would be triggered. The wastewater reuse system will be shut down.
- 2.10.5 Small amount of sodium hypochlorite solution (<250L) will be stored on-site. Such amount could be exempted from licensing requirements under the Dangerous



Goods Ordinance (Cap 295) and is far less than that planned to be stored in the Stonecutters Island STW (1.8 million L of sodium hypochlorite) for the operation of the disinfection facilities in the Harbour Area Treatment Scheme (HATS), storage of which has been concluded to present an “acceptable” risk in the quantitative risk assessment of the approved EIA study for HATS.

- 2.10.6 Sodium hypochlorite is classified as a Category 4 poisonous substance under the Dangerous Goods Ordinance (Cap 295). They are not acutely toxic, flammable, or explosive substances, but hazardous gas would be generated if they were accidentally mixed with incompatible chemicals. Also, the use of these chemicals in the treated effluent reuse system would not constitute a potentially hazardous installation in accordance with EPD’s ProPECC PN 2/94 Potentially Hazardous Installation.

## **2.11 Measures for Effluent Reuse to avoid Potential Health Impacts**

- 2.11.1 The effluent reuse is expected to reduce the amount of potable water demand required for the on-site STW operation, thereby providing an environmental benefit. Since there is no off-site effluent reuse, no potential health impacts to general public on effluent reuse is anticipated.
- 2.11.2 The treated effluent is to undergo a chlorination treatment process before being conveyed to the point of storage and usage. Chlorination is to minimize bacterial growth and contamination during the water transmission. The recommended residual chlorine level in Tai O STW is 1 mg/L for reducing odour and bacterial growth.
- 2.11.3 The process for the generation of chlorinated treated effluent will cease when its quantity is monitored to reach a pre-set level. The pre-set level of residual chlorine for effluent reuse is 1.5+/- 0.5mg/L, with periodic monitoring at point of use that 0.2 mg/L is maintained, with the target set point adjusted as necessary. In-house monitoring would be performed by STW Operators at the discharge point to ensure the residual chlorine level in discharged effluent is in compliance with the discharge requirements. No adverse water quality impacts are therefore anticipated from the normal operation of the effluent reuse system.
- 2.11.4 To avoid possible incorrect pipe connections, pipes for the treated effluent would be specially arranged to differentiate them from potable water pipes. For example, pipes for the treated effluent are colour-coded, clearly labelled with warning signs and notices, and/or sized differently, so that physical connection of the treated effluent pipes with potable water fittings would be unlikely. The effluent reuse system will also be provided with safe guard system to avoid arbitrarily contact from human. Appropriate provisions would also be incorporated into the operation and maintenance manual to prevent possible incorrect pipe connections. With proper preventative measures in place, potential health and hygiene impacts are not anticipated to occur during the normal operation of the effluent reuse system.

## **2.12 Consideration of Alternative Site Location of Proposed Hang Mei SPS**

- 2.12.1 Hang Mei Village at the east of the catchment area is remote and a sewage pumping station is proposed to convey flows to connect with the existing sewers system near Lung Tin Estate.
- 2.12.2 On reviewing the available site and the topography of adjacent village area, four potential sites have been considered for the location of Hang Mei SPS (as shown in **Figure 2.12**). Brief comparison between the characteristics of the four sites in terms



of land use, land status, potential environmental impacts, engineering requirements, construction constraints and O&M issues is presented in **Table 2.5**.

- Option 1 - The tree area to the south of No.18 Wang Hang Tsuen;
- Option 2 - The area to the north of No.5 Wang Hang Tsuen;
- Option 3 - The tree area to the south-west of No.14 Wang Hang Tsuen; and
- Option 4 - The planter area to the east of Lung Tin Estate.

2.12.3 It is considered that Option 1 is preferred since it has the advantage of no land resumption required, relatively less environmental impacts and the availability of vehicular access which reduces the nuisance to the public during the operation and maintenance of the SPS.



**Table 2.5 : Comparisons of the Alternative Sites for Hang Mei SPS**

		Option 1	Option 2	Option 3	Option 4
<b>Location</b>		The tree area to the south of No.18 Wang Hang Tsuen	The area to the north of No.5 Wang Hang Tsuen	The tree area to the south-west of No.14 Wang Hang Tsuen	The planter area to the east of Lung Tin Estate
<b>Current Land Use</b>		No special use with some trees	Agricultural land	No special use with some trees	Planter
<b>Land Status</b>		Unallocated Government Land	Private Lot	Unallocated Government Land	Unallocated Government Land
<b>Land Resumption</b>		Not required	Required	Not required	Not required
<b>Planning Issues (OZP Status)</b>		"Green Belt (GB)" – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation), which requires about 2 months to process	"Village Type Development (V)" – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation), which requires about 2 months to process	"Village Type Development (V)" – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation), which requires about 2 months to process	"Government, Institution or Community" ("G/IC") – SPS (public utility installation) is always permitted.
<b>Potential Environmental Impacts</b>	Water Quality	No works in watercourse. Low water quality impact.	Dredging will be required for the associated pipe bridge foundation works. High water quality impact.	No works in watercourse. Low water quality impact.	No works in watercourse. Low water quality impact.
	Noise	With some distance away from nearby residential area. Moderate impact during construction.	Close to nearby village houses. High impact during construction.	With some distance away from nearby residential area. Moderate impact during construction.	With some distance away from nearby residential area. Moderate impact during construction.
	Ecology	No significant ecological habitat will be affected.	Potential indirect impact on the nearby mangrove plants and waterbirds due to the associated pipe bridge foundation works.	No significant ecological habitat will be affected.	No significant ecological habitat will be affected.
	Landscape	Removal of existing trees will be required.	Loss of agricultural land.	Removal of existing trees will be required.	Partial loss of the planter and amenity area.



		Option 1	Option 2	Option 3	Option 4
	Visual	Located adjacent to Tai O Road. Visual impact is reduced due to the level difference (approximately 2m) between the Tai O Road and the proposed site. Moderate visual impact.	Located near the entrance of Wang Hang Tsuen, and is conspicuous to the public. High visual impact.  The associated pipe bridge will also have significant visual impact to the surroundings.	Located at the centre of Wang Hang Tsuen with local residential buildings adjacent. Moderate visual impact.	Located at a scenic area along major pedestrian route, high visual impact.
	Cultural Heritage	Archaeological potential is not anticipated.  No impact to built heritage is anticipated.	Archaeological potential is not anticipated.  Mitigation in the form of condition survey and vibration monitoring may be required for built heritage resources	Archaeological potential is not anticipated.  Mitigation in the form of condition survey and vibration monitoring may be required for built heritage resources	Archaeological potential is not anticipated.  No impact to built heritage is anticipated.
	Odour	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.





	Option 1	Option 2	Option 3	Option 4
<b>Engineering and O&amp;M Issues</b>	<ul style="list-style-type: none"> <li>• Plenty of site area will be available.</li> <li>• Vehicular access is available.</li> <li>• Less nuisance to the public during the operation and maintenance of the SPS, since the skips could be transported away along Tai O Road.</li> <li>• Two short sections of rising main across Tai O Creek will be required.</li> <li>• Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>	<ul style="list-style-type: none"> <li>• Plenty of site area will be available.</li> <li>• Vehicular access is not available.</li> <li>• Construction of a pipe bridge (~90m) associated with several piers will be required for supporting a section of rising main across Tai O Creek.</li> <li>• Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>	<ul style="list-style-type: none"> <li>• Plenty of site area will be available.</li> <li>• Vehicular access is not available.</li> <li>• Two short sections of rising main across Tai O Creek will be required.</li> <li>• Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> <li>• Longer rising main will be required.</li> </ul>	<ul style="list-style-type: none"> <li>• Site will be in conflict with CEDD/DO's proposed works. Limited space is available.</li> <li>• Vehicular access is available.</li> <li>• Less nuisance to the public during the operation and maintenance of the SPS, since the skips could be transported away along Tai O Road.</li> <li>• Construction of a long gravity sewer by pipe jacking (~180m) underneath Tai O Creek will be required.</li> <li>• Deeper wet well will be required.</li> <li>• Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>
<b>Recommendation</b>	<b>Preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>



## **2.13 Consideration of Alternative Site Location of Proposed Fan Kwai Tong SPS**

- 2.13.1 The villages at the south of the catchment area including Leung Uk Tsuen, Nam Chung Tsuen and Fan Kwai Tong are located nearly 1km from the existing sewers rendered that connecting these villages to the existing sewers solely by gravity is infeasible. A pumping station at Fan Kwai Tong is therefore proposed.
- 2.13.2 On reviewing the available site and the topography of adjacent village area, three potential sites have been considered for the location of Fan Kwai Tong SPS (as shown in **Figure 2.13**). Brief comparison between the characteristics of the three sites in terms of land use, land status, potential environmental impacts, engineering requirements, construction constraints and O&M issues is presented in **Table 2.6**.
- Option 1 - The area to the north-east of No.10 Nam Chung Tsuen;
  - Option 2 - The area next to the public toilet near No. 12 Nam Chung Tsuen; and
  - Option 3 - The area next to a pond to the south-west of No. 71 Nam Chung Tsuen.
- 2.13.3 It is considered that Option 1 is preferred since it has the advantage of no land resumption required and relatively less environmental impacts.



**Table 2.6 : Comparisons of the Alternative Sites for Fan Kwai Tong SPS**

		Option 1	Option 2	Option 3
<b>Location</b>		The area to the north-east of No.10 Nam Chung Tsuen	The area next to the public toilet near No. 12 Nam Chung Tsuen	The area next to a pond to the south-west of No. 71 Nam Chung Tsuen
<b>Current Land Use</b>		No special usage.	No special usage.	No special usage. Hedgerow area.
<b>Land Status</b>		Unallocated Government Land	Partly at Unallocated Government Land & partly below High Water Mark	Partly at Unallocated Government Land & partly at Private Lot
<b>Land Resumption</b>		Not required	Not required	Required
<b>Planning Issues (OZP Status)</b>		“Village Type Development (V)” – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation), which requires about 2 months to process	“Village Type Development (V)” – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation), which requires about 2 months to process	“Village Type Development (V)” – planning application under Section 16 of the Town Planning Ordinance is required for the SPS (public utility installation) and pond filling, which requires about 2 months to process
<b>Potential Environmental Impacts</b>	Water Quality	No works in watercourse, low water quality impact.	Temporary/permanent reclamation may be required. High impact to marine water quality.	Filling up part of the pond may be required. Moderate impact of water quality.
	Noise	Located with some distance away from nearby village houses, moderate impact during construction.	Very close to nearby village houses. High noise impact during construction.	Located with some distance away from nearby village houses, moderate impact during construction.
	Ecology	No significant ecological habitat will be affected.	Potential adverse impact to marine habitat due to possible reclamation works.	No significant ecological habitat will be affected.
	Landscape	Removal of some existing trees may be required.	No significant impact.	Loss of some green area.
	Visual	Located with some distance away from the major pedestrian route, moderate visual impact.	Located close to the major pedestrian route, conspicuous to the public. High visual impact.	Located close to the major pedestrian route, conspicuous to the public. High visual impact.



		Option 1	Option 2	Option 3
	Cultural Heritage	Archaeological potential is not anticipated. Mitigation in the form of condition survey and vibration monitoring may be required for built heritage resources.	Archaeological potential is not anticipated. Mitigation in the form of condition survey and vibration monitoring may be required for built heritage resources.	Archaeological potential is not anticipated. Mitigation in the form of condition survey and vibration monitoring may be required for built heritage resources.
	Odour	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.	Deodorization facilities will be incorporated in the design to mitigate potential odour impacts during operation.
<b>Engineering and O&amp;M Issues</b>		<ul style="list-style-type: none"> <li>Plenty of site area will be available.</li> <li>Vehicular access is not available.</li> <li>Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>	<ul style="list-style-type: none"> <li>Limited site area. Temporary/permanent reclamation may be required to obtain more footprint for the proposed works. Foreshore and seabed issue.</li> <li>Vehicular access is not available.</li> <li>Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>	<ul style="list-style-type: none"> <li>Plenty of site area will be available.</li> <li>Vehicular access is not available.</li> <li>Filling up part of the pond may be required to obtain more footprint for the proposed works. High drainage impact anticipated.</li> <li>Emergency storage for retention of sewage flows for at least 4 hours will be provided at the SPS (as agreed with operation personnel including transportation to the remote site), an emergency discharge of sewage overflows from the SPS is unlikely to occur.</li> </ul>
<b>Recommendation</b>		<b>Preferred</b>	<b>Not preferred</b>	<b>Not preferred</b>



## 2.14 Project Tentative Implementation Programme

2.14.1 The tentative implementation schedule for different works packages is presented in **Table 2.7**.

**Table 2.7 : Tentative Implementation Schedule for Different Works Packages**

	Tai O STW	SPS and Sewers Works
EIA Endorsed	February 2017	
Scheme Gazette under Foreshore and Seabed (Reclamation) Ordinance	March 2017	--
Scheme Gazette under Water Pollution Control (Sewerage) Regulation	--	March 2017
Contract Commencement	April 2018	June 2018
Contract Completion	March 2022	December 2022

## 2.15 Public Consultations

2.15.1 Project Profile was prepared in December 2009 for application of Environmental Impact Assessment Study Brief under EIAO. No adverse comments had been received from the public.

2.15.2 Consultations had been conducted with regarding the proposed works under this Project. While public consultation would continue to be conducted throughout the implementation of the Project, the list of major public consultations on the proposed sewerage works that have been conducted so far is presented in **Table 2.8**. General support to the objective of the Tai O Sewerage Works was gained from the forum.

**Table 2.8 : List of Major Public Consultations on the Sewerage Works**

Tai O SPS and Sewers Works	Title	Initial Public Consultation Meetings on Village Sewerage in Tai O
	Attendees	Tai O Rural Committee (RC), Islands District Councillor
	Date	June 2011 (2 meetings)
	Title	Initial Public Consultation Meetings on Village Sewerage in Tai O
	Attendees	Association for Tai O Environment and Development, Tai O Community Resources Centre and HK Young Women's Christian Association
	Date	June 2011, August 2012 (3 meetings)
	Title	Consultation Meetings on Sewerage System to Shek Tsai Po Stilted Houses
	Attendees	Shek Tsai Po (East) Villager's Representative (VR), HK Young Women's Christian Association
	Date	July 2011
	Title	Consultation Meeting on Hang Mei SPS and Fan Kwai Tong SPS in Tai O
	Attendees	Nam Tong Sun Tsuen VR (Fan Kwai Tong SPS), Tai O Country Side VR (Hang Mei SPS)
	Date	November 2012 (2 meetings)
Title	Consultation Meeting on Sun Ki Village Sewerage in Tai O	
Attendees	Tai O Country Side VR	
Date	November 2012	



Tai O STW	Title	Consultation with green groups on Tai O STW
	Attendees	World Wide Fund for Nature Hong Kong (WWF), Kadoorie Farm & Botanic Garden Corporation (KFBG) and Green Power
	Date	September 2012

2.15.3 Key findings and concerns obtained from the public consultation meetings as well as the follow-up action taken are listed below.

- Key findings and concerns: General supports on the proposed sewerage works and SPSs.  
Follow-up action: Detailed design of the proposed sewerage works and SPSs on-going.
- Key findings and concerns: Technical constraints in provision of sewerage to stilted houses and concern on land resumption for the proposed SPSs in Sun Ki.  
Follow-up action: Provision of proposed sewerage to stilted houses has been reviewed with focus on technical feasibility. The technical feasibility has been demonstrated with pilot run in Shek Tsai Po. Sewerage cannot be provided to silted houses in Sun Ki in the current stage of the project as SPSs construction in the proposed areas is impracticable at the current stage. Nevertheless, the proposed STW will be designed with sufficient capacity to cater for the sewage of these stilted houses in case sewerage connection can be made in the future.
- Key findings and concerns: General supports on the objective of the project and had no strong view on the proposed reclamation works. Reminded that the reclamation extent should be minimised as far as practicable.  
Follow-up action: Extent of reclamation has been reviewed and it has been designed with minimum proposed reclaimed area to suit the purpose of the project.

## 2.16 Project Interface / Concurrent Projects

2.16.1 Based on our review, the following interface projects in Tai O have been identified:

- “Improvement Works at Tai O - Design and Construction” undertaken by CEDD/HK&I;
- Natural Terrain Hazard Mitigation Works;
- “Water Supply from Tung Chung to Tai O” undertaken by WSD Development Division;
- “Replacement and Rehabilitation of Water Mains Stage 4, Mains On Hong Kong and Islands - Investigation, Design and Construction” undertaken by WSD CM Division; and
- “Hong Kong – Zhuhai - Macao Bridge (HZMB) and related projects, including Hong Kong Link Road (HKLR), Hong Kong Boundary Crossing Facilities HKBCF) and Tuen Mun – Chek Lap Kok Link (TM-CLKL)” undertaken by HyD.

2.16.2 The following discusses the potential interface issues between this project and the above-mentioned projects.



### **Improvement Works at Tai O - Design and Construction**

- 2.16.3 Based on the information provided by CEDD, there are 3 contracts under this Agreement. The first contract: Contract No. IS/2010/01 Construction of Riverwall at Yat Chung, Tai O and Ancillary Improvement Works, which commenced in August 2010 for completion in mid 2014, will not have conflicts with this project concerning construction programme.
- 2.16.4 The works under Contract No. IS/2010/01 include construction of sewerage network with terminal manholes along the back of houses at Tai O Wing On Street (beside the riverbank), which are also included in DSD's sewerage catchment area. This sewerage network will collect sewage flow from houses at the north side of Tai O Wing On Street, from House No. 38 to House No. 140 (even numbers only), which are currently discharged into the Tai O Creek. It will then connect to existing sewers and transfer to Tai O No. 1 Sewage Pumping Station. The works will not have conflicts with this project.
- 2.16.5 The construction works of Phase 2 Stage 1 of "Improvement Works at Tai O" include improvement to existing streetscapes in Tai O Yim Tin and will tentatively commence in 2016 for completion in late 2018 / early 2019. The remaining works undertaken by CEDD, including the improvement to existing streetscapes in Tai O such as re-paving of Market Street, Wing On Street and Tai Ping Street, which might have interface with DSD's future sewer laying works, is currently under Review Stage.

### **Natural Terrain Hazard Mitigation Works**

- 2.16.6 Based on the information provided by CEDD/GEO, there are 3 contracts under this Agreement. The catchment area of the 1st contract (CEDD Contract No. GE/2013/16) is at Tai O East; the 2nd contract at Nam Chung (CEDD Contract No. GE2013/14); the 3<sup>rd</sup> contract at Wang Hang. The 1<sup>st</sup> contract, which was scheduled tentatively to commence in April 2014 for completion in late 2016, will not have conflicts with this project concerning construction programme. The 2<sup>nd</sup> contract, which was scheduled tentatively to commence in June 2015 for completion in December 2017, will not have conflicts with this project either concerning construction programme.

### **Water Supply from Tung Chung to Tai O**

- 2.16.7 Based on the information provided by WSD, the in-house design work of this project is suspended currently. There is no implementation programme of design and construction of this project at the time of preparation of this report. Therefore, no conflicts with this project concerning construction programme is anticipated.

### **Replacement and Rehabilitation of Water Mains Stage 4, Mains On Hong Kong and Islands - Investigation, Design and Construction**

- 2.16.8 The construction of Stage 4 works in Tai O under Contract No. 15/WSD/11 commenced in mid 2012 and is anticipated for completion in mid 2016. No interfacing issue will be expected.

### **HZMB and related projects, including HKLR, HKBCF and TM-CLKL**

- 2.16.9 Based on the information from HyD, the construction works of HKLR and related projects commenced in late 2011 and are anticipated to be completed by end 2016 to tally with the commissioning of the HZMB. The northern section of the TM-CLKL for further connection to the Tuen Mun Western Bypass will be completed by 2018 to meet the forecast traffic demand.



2.16.10 As the proposed works under HKBCF would be sufficiently far away from the Tai O STW, no physical interface between the projects would be expected. The EIA report on HZMB stated that the dredging and filling construction activities would have no water quality impacts to Tai O Mangrove and Horseshoe Crab Habitat. No cumulative impact would then be anticipated.

**Summary - Potential Interfacing Projects During Construction**

2.16.11 The potential interfacing projects are summarized in **Table 2.9**.





**Table 2.9 : Interfacing Projects**

Interfacing Project	Scheduled Construction Period		Overlapping Months	Potential Cumulative Construction Impacts
	Start	Complete		
Improvement Works at Tai O	Early 2016	End 2018 / Early 2019	0 <sup>Note 1</sup>	No <sup>Note 1</sup>
Natural Terrain Hazard Mitigation Works	June 2015	December 2017	0	No
Water Supply from Tung Chung to Tai O	No implementation programme	No implementation programme	-	No
Replacement and Rehabilitation of Water Mains Stage 4, Mains On Hong Kong and Islands – Investigation, Design and Construction	Mid 2012	Mid 2016	0	No
HZMB and related projects	End 2011	2018	0	No
<b>Note 1:</b> Most of the construction works of this project in Tai O do not overlap with the project area of Phase 2 Stage 1 of “Improvement Works at Tai O” apart from a small area for the improvement to existing streetscapes in Tai O Yim Tin. The contractor would be requested to coordinate with the contractor of CEDD and arrange the construction works schedule in order to avoid concurrent works to be carried out under two projects.				

2.16.12 Notwithstandingly, continuous liaison will be conducted with all works department and utilities companies to ensure adequate phasing with each concurrent project is taken into consideration, if interfacing does eventually occurs. Cumulative environmental impact will therefore be eliminated by proper scheduling of works to avoid concurrent works.