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## **1 INTRODUCTION**

### **1.1 Project Background**

- 1.1.1 In 2002, the Environmental Protection Department (EPD) carried out the Sewerage Master Plan Stage 2 Review (SMP Stage 2 Review), and completed the Preliminary Project Feasibility Study for Islands Sewerage Stage (hereinafter referred to as “PPFS” ).
- 1.1.2 In February 2008, Drainage Services Department (DSD) commenced the Investigation Stage of “Upgrading of Cheung Chau and Tai O Sewage Collection, Treatment and Disposal Facilities” under Agreement No. CE 31/2007 (DS) by commissioning a consultant to carry out review on the conclusions and recommendations of the PPFS report, surveys, investigations, impact assessments, preliminary environmental review and preliminary design of the recommended works (hereinafter referred to as “Investigation Consultancy” ).
- 1.1.3 During the implementation of Investigation Consultancy, DSD conducted various consultations activities, including attending the Islands District Council, meetings with Legislative Council member, Green Lantau Association and the Association for Tai O Environment and Development. DSD committed that extensive and in-depth consultation would be conducted during the design and construction stage of this Project.
- 1.1.4 In December 2010, Drainage Services Department (DSD) commissioned Atkins China Limited (ACL) to undertake Design and Construction of Upgrading of Cheung Chau and Tai O Sewage Collection, Treatment and Disposal Facilities under Agreement No. CE 15/2010 (DS).
- 1.1.5 The works for the Project as recommended in the Investigation Consultancy mainly comprises the upgrading for the sewage collection, treatment and disposal facilities in two outlying islands, Cheung Chau and Tai O in Lantau. In December 2009, DSD applied for two separate Environmental Impact Assessment (EIA) Study Briefs under Section 5(1) the Environmental Impact Assessment Ordinance (EIAO) for the works in Cheung Chau and Tai O, respectively.
- 1.1.6 An Environmental Impact Assessment (EIA) Study Brief No. ESB-212/2009 was issued to cover the upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities (hereinafter referred as the “Project” ).



## 1.2 Project Description

1.2.1 The works for this Project in Tai O mainly comprises the following items and as shown in Location Plan in **Figure 1.1**:

- a) Expansion and upgrading of Tai O Sewage Treatment Works (STW) which includes 0.26 ha site formation by reclamation, construction of a seawall and a 130 m long submarine outfall, upgrading of the existing level of sewage treatment to provide secondary treatment with a design capacity of 2,750 m<sup>3</sup>/day, and construction of effluent reuse facilities. Proposed general layout of the Tai O STW is shown in **Figure 1.2**;
- b) Improvement of the existing sewers at Tai O and provision of new sewers to unsewered areas/villages where practicable, 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) and Hang Mei and Fan Kwai Tong, respectively. The designed averaged dry weather flows (ADWF) of the Hang Mei SPS and Fan Kwai Tong SPS are 350 m<sup>3</sup>/day and 540 m<sup>3</sup>/day, respectively. Proposed general layout of the Hang Mei SPS and Fan Kwai Tong SPS are shown in **Figure 1.3** and **Figure 1.4** respectively.

1.2.2 Under Part I, Schedule 2 of the EIAO, the Project consists of the following designated projects (DP):

- a) Construction of submarine outfall of Tai O STW (Item F.6);
- b) Effluent reuse facilities within the Tai O STW (Item F.4); and
- c) Sewers works (near Nam Chung Tsuen) which would fall partly within any of the sensitive areas (i.e. a conservation area) (Item Q.1).

1.2.3 Expansion and upgrading of Tai O STW, construction of Hang Mei SPS, construction of Fan Kwai Tong SPS and sewers works are not classification as DP under the EIAO of this project.

## 1.3 Project Programme

1.3.1 The tentative implementation schedule of the Project is presented in **Table 1.1**.



**Table 1.1 : Tentative Implementation Schedule of the Project**

	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

#### **1.4 Purpose of this Environmental Monitoring and Audit (EM&A) Manual**

- 1.4.1 The purpose of this EM&A Manual (hereinafter refer to as the “Manual” ) is to guide the set up of an EM&A programme to ensure compliance with the recommendations in the EIA study covering the upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for both the construction and operational phase of both the DP component (Construction of submarine outfall of Tai O STW, construction of effluent reuse facilities within Tai O STW and Sewers works (near Nam Chung Tsuen) which would fall partly within any of the sensitive areas) and non-DP component (expansion and upgrading of Tai O STW, construction of Hang Mei SPS, construction of Fan Kwai Tong SPS and other sewers works) of the Project. It aims to provide systematic procedures for monitoring, auditing and minimising environmental impacts associated with the construction and operational phases.
- 1.4.2 This Manual provides specific information, guidance and instruction to personnel in charged with environmental responsibilities and undertaking environmental monitoring and auditing works for the Project. It also provides systematic procedures for monitoring, auditing, and minimising environmental impacts associated with the construction activities.
- 1.4.3 The EM&A programme contain the following information:
- project organization for the Project;
  - responsibilities of the Contractor, the Engineer or Engineer’s Representative (ER) and Environmental Team (ET) with respect to the environmental monitoring and audit requirements during the course of the Project;



- the basis for, and description of the broad approach underlying the EM&A programme;
- requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
- definition of Action and Limit levels;
- establishment of Event and Action plans;
- requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- requirements for review of EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme.

## **1.5 Project Organisation**

- 1.5.1 Involvement of relevant parties in a collaborative and interactive manner is essential for the implementation of the recommended EM&A programme. The following sections outline the primary responsibilities and duties of the key EM&A programme participants. The lines of communication with respect to EM&A works are shown in **Appendix A**.
- 1.5.2 Drainage Services Department (DSD) is the project proponent and works department and hence will assume overall responsibility for the project.
- 1.5.3 Environmental Protection Department (EPD) is the statutory enforcement body for environmental protection matters in Hong Kong.
- 1.5.4 The Engineer's Representative (ER) shall appoint an appropriate member of the resident site staff, who shall:
- (i) Monitor the Contractor's compliance with the contract specifications, including the EM&A programme, and the effective implementation and operation of environmental mitigation measures in a timely manner;
  - (ii) Ensure that impact monitoring is conducted at the correct locations at the correct frequency as identified in the EM&A programme;





- (iii) Instruct the Contractor to follow the agreed protocols or those In the Contract Specifications in the event of exceedances or complaints;
- (iv) Review the programme of works with a view to identifying any potential environmental impacts before they arise;
- (v) Check that mitigation measures that have been recommended in the EIA Report, this document and contract documents, or as required, are correctly implemented in a timely manner, when necessary;
- (vi) Report the findings of site audits and other environmental performance reviews to DSD;
- (vii) Verify the environmental acceptability of permanent and temporary works, relevant design plans and submissions; and
- (viii) Comply with the agreed Event Contingency Plan in the event of any exceedance.

1.5.5 The Independent Environmental Checker (IEC) shall advise the ER on environmental issues related to the project. The IEC shall not be in any way an associated body of the ER, the Contractor or the ET for the project. The IEC shall be empowered to audit from an independent viewpoint the environmental performance during the construction of the Project. The IEC shall be a person who has relevant professional qualifications in environmental control and at least 7 years experience in EM&A and environmental management.

1.5.6 The IEC shall be responsible for the duties defined in this Manual, and shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this Manual, as well as any other relevant submissions required under the Environmental Permit. The IEC shall be responsible for verifying the environmental acceptability of permanent and temporary works, relevant design plans and submissions under the EP. The IEC shall verify the logbook prepared and kept by the ET Leader. The IEC shall notify EPD by fax, within 24 hours of receipt of notification from the ET Leader of any such instance or circumstance or change of circumstances or non-compliance with the EIA Report or the Environmental Permit, which might affect the monitoring or control of adverse environmental impact.



- 1.5.7 The main duties of the IEC are to carry out independent environmental audit of the project. This shall include, inter alias, the following:
- (i) Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;
  - (ii) Validate and confirm the accuracy of monitoring results, appropriateness of monitoring equipment, monitoring locations with reference to the locations of the nearby sensitive receivers, and monitoring procedures;
  - (iii) Carry out random sample check and audit on monitoring data and sampling procedures, etc.;
  - (iv) Conduct random site inspection (at least once a month);
  - (v) Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;
  - (vi) Review the effectiveness of environmental mitigation measures and Project environmental performance; and
  - (vii) On an as needed basis, verify and certify the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions under the environmental permit. Where necessary, the IEC shall agree in consultation with the ET Leader and the Contractor the least impact alternative;
  - (viii) Verify investigation results of complaint cases and the effectiveness of corrective measures;
  - (ix) Verify EM&A reports submitted and certified by the ET Leader; and
  - (x) Feedback audit results to ER/ ET by signing according to the Event/ Action Plans specified in this Manual.
- 1.5.8 An Environmental Team (ET) headed by an ET Leader shall be an independent party from the Contractor and has relevant professional qualifications in environmental control and possess at least 7 years experience in EM&A and/or environmental management subject to the approval of the ER. The ET Leader shall plan, organise and manage the implementation of the EM&A programme, and ensure that the EM&A works are undertaken to the required standards.
- 1.5.9 The ET Leader shall be responsible for the implementation of the EM&A programme



in accordance with the EM&A requirements specified in this Manual and the EP. The ET Leader shall keep a contemporaneous logbook for recording each and every instance or circumstance or change of circumstances that may affect the compliance with the recommendations of the EIA report. This logbook shall be kept readily available for inspection by the IEC, and Director of Environmental Protection (DEP) or his authorised officers.

1.5.10 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project.

1.5.11 The broad categories of works of the ET comprise the following:

- (i) To monitor the various environmental parameters as required by the EM&A programme;
- (ii) To follow up and close out of the non-compliance actions;
- (iii) To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;
- (iv) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- (v) To review the EM&A programme after the collection and analysis of the baseline data;
- (vi) To modify the EM&A programme in terms of parameters, sites, sample sizes, frequency etc. if appropriate in consultation with the ER and EPD; and
- (vii) To report the environmental monitoring and audit results to the IEC, Contractor and the ER.

1.5.12 The Contractor shall assign an on-site environmental coordinator to oversee Contractor's environmental performance and the implementation of the EM&A duties. The coordinator shall be a person who has relevant professional qualifications in environmental control and is subject to approval by the ER.

1.5.13 The broad categories of works of the Contractor comprise the following:

- (i) Work within the scope of the construction contract and other tender conditions with respect to environmental requirements;
- (ii) Operate and strictly adhere to the guidelines and requirements in this EM&A programme and contract specifications;



- (iii) Provide assistance to ET in carrying out monitoring;
  - (iv) Participate in the site inspections undertaken by the ET as required, and undertake correction actions;
  - (v) Provide information / advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
  - (vi) Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event / Action Plans;
  - (vii) Implement measures to reduce impact where Action and Limit levels are exceeded; and
  - (viii) Adhere to the procedures for carrying out complaint investigation.
- 1.5.14 The Contractor should also participate in the environmental performance review undertaken by the ER and undertake any corrective actions as instructed by the ER.



## **2 AIR QUALITY**

### **2.1 Introduction**

2.1.1 In this section, the requirements, methodology, equipment, monitoring location, criteria and protocols for the monitoring and audit of air quality impacts during the construction and operation of the Project are presented.

2.1.2 With the implementation of dust suppression and control measures stipulated in the Air Pollution Control (Construction Dust) Regulation, no potential dust impact would be anticipated. Therefore, no construction dust monitoring is required for the construction phase. Regular site audits are required to ensure the dust control measures are properly implemented.

2.1.3 With the installation of deodourizing unit for the temporary sewage treatment facilities (odour removal efficiency of 97%), no potential odour impact would be anticipated. Regular site audits are required to ensure the odour control measures are properly implemented.

2.1.4 During the operational phase of the Project, all the odorous gas arising from the sewage would be collected and properly treated by deodorization units with an odour removal efficiency of 97% for Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS. During sludge transportation, the sludge should be carried by enclosed container to avoid unacceptable odour nuisance. With the above mitigation measures incorporated into the design, no unacceptable odour impacts are anticipated. Odour monitoring and audit is proposed during the operation phase to ensure the continuing effectiveness of the odour control measures.

### **2.2 Air Quality Parameters**

2.2.1 The air quality parameters to be monitored include:

- odour units or equivalent Hydrogen Sulphide (H<sub>2</sub>S) concentration.

### **2.3 Monitoring Requirements and Equipment**

#### **Operation Phase**

##### General

2.3.1 For baseline and commissioning monitoring, H<sub>2</sub>S measurements and odour sampling shall be carried out at the odour emission points and at sensitive receivers. The purpose is to determine the correlation between H<sub>2</sub>S concentrations and odour units obtained from the odour samplings. Once such correlation is established, H<sub>2</sub>S



monitoring will be continued and it serves as a surrogate indicator for the odour for operation monitoring. H<sub>2</sub>S concentrations measured will be converted to equivalent odour units.

2.3.2 The following items should be recorded during odour sampling and H<sub>2</sub>S concentration measurement:

- the prevailing weather condition;
- wind direction;
- any odour detected during sampling and the flavours of odour with detailed description of characteristics (e.g. sewage or rotten-egg smell, decayed vegetables, ammonical, dischargeable odour, putrefaction, sharp, pungent, fish, irritating, fruit, vinegar, etc);
- downwind or upwind direction from the odour source;
- duration of odour (intermittent or continuous) during sampling; and
- photo showing the sampling locations relative to existing land features. The relevant meteorological data (e.g. ambient temperature, wind speed and direction, relative humidity, etc.) from the nearest Hong Kong Observatory station during the sampling period should also be recorded for reference.
- Measurement at each location shall be carried out at least three (3) times for each sampling event.

#### Odour Sampling

2.3.3 Odour concentration sampling at designated sampling locations will be carried out. Each sampling at each location shall be carried out at least three (3) times in order to see if there would be any major fluctuation in the measured data.

2.3.4 During each odour sampling day, one blank sample is to be collected for quality control. The sample will be taken by purging pure nitrogen gas into odour sampling bag directly as a blank sample.

2.3.5 The odour concentration of the collected air samples should be determined by a forced-choice dynamic olfactometer with a panel of human assessors being the sensor in accordance with the European Standard Method: Air Quality - Determination of Odour Concentration by Dynamic Olfactometry (EN13725) within 24 hours after collection.



### H<sub>2</sub>S Measurement

2.3.6 H<sub>2</sub>S concentrations shall be measured by portable H<sub>2</sub>S analyser, type Jerome 631-X H<sub>2</sub>S, or equivalent which utilises a gold film sensor for the detection of hydrogen sulphide. The instrument is controlled by microprocessor, ensuring rapid accurate analyses, and should be fitted with the following accessories:

- Data logger (to allow the instrument to operate unattended);
- Interface cable and interface software; and
- Data download and graphics services.

2.3.7 The instrument is capable of measuring H<sub>2</sub>S concentration in the range 1ppb to 50ppm, to an accuracy of  $\pm 6\%$ .

### Odour Complaint Registration

2.3.8 A complaint registration system should be in place to handle the odour complaint case. The operator of the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS (i.e. DSD) in future can have their complaint registration system and would not be limited to the below proposed complaint registration system.

2.3.9 In the event when an odour complaint is received, the operator shall liaise with the complainant and a Complaint Registration Form shall be completed. The Complaint Registration Form is to record detailed information regarding the odour complaint and hence, facilitates efficient investigation work. The registration form shall contain, but not be limited to the following information:

- (i) Location of where the odour nuisance occurred, including whether the odour was experienced indoors or outdoors;
- (ii) Date and time of the complaint and the nuisance event;
- (iii) Description of the complaint, i.e. the type and characteristics of the odour; and an indication of the odour strength (highly offensive / offensive / slightly offensive / just continuously detectable /intermittently detectable); and
- (iv) Name and contact information of the complainant.

2.3.10 This information shall be obtained by the plant engineer or his representative(s) of the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS when the complaint is received. The Odour Complaint Register is recommended to be kept at the Tai O STW. The Complaint Registration Form is shown in **Appendix B** for reference.

2.3.11 In addition, it is recommended to obtain the following information:



- (i) Meteorological conditions from the Hong Kong Observatory's Hong Kong International Airport Weather Station (including temperature, wind speed, relative humidity) at the time of the complaint; and
- (ii) Whether any abnormal operations are being carried out at the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS at the time the nuisance occurred.

## 2.4 Air Quality Monitoring Locations

### Odour

- 2.4.1 Seven existing Air Sensitive Receivers (ASRs) have been identified for odour monitoring as shown in **Table 2.1** and illustrated in **Figure 2.1 to Figure 2.3**. Monitoring shall be conducted at 1.5 m above the ground surface.

**Table 2.1 Proposed Odour Monitoring Locations**

ID No.	Location	Nature of Use
A1	CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers	Rehab Centre
A2	Resting Area at Kau San Tei	Recreational activity areas
A3	No. 71 Nam Chung Tsuen	Residential
A4	No. 9 Nam Chung Tsuen	Residential
A5	No.10 Nam Chung Tsuen	Residential
A6	No.18 Wang Hang Village	Residential

## 2.5 Baseline Air Quality Monitoring

### Odour

- 2.5.1 Prior to the demolition of the existing major odour emission sources in Tai O STW or commissioning of the upgraded treatment facility of Tai O STW, and construction of Fan Kwai Tong SPS and Hang Mei SPS, a programme to odour sampling with olfactometry analysis and H<sub>2</sub>S concentration measurement at the selected ASRs as shown in **Table 2.1**, A1 to A7, shall be undertaken by the ET to establish the prevailing odour condition for one year at a three months interval. The ET shall submit the baseline monitoring programme to the IEC for agreement prior to conducting the monitoring works. In case insufficient baseline monitoring results are obtained, the ET shall liaise with the ER and IEC to agree on an appropriate set of data to be used as a baseline reference and submit to ER and IEC for agreement.
- 2.5.2 Baseline odour monitoring should consist of both odour sampling and H<sub>2</sub>S concentration measurements. Sampling at the selected ASRs using olfactometry and





H<sub>2</sub>S analyser should be carried out simultaneously. The results will be used for establishing the correlations between odour units and H<sub>2</sub>S concentration at ASRs. Since H<sub>2</sub>S is one of the key components of odour emissions from STW and SPS, it serves as a surrogate indicator for odours.

## 2.6 Impact Air Quality Monitoring

### Construction Phase

- 2.6.1 The ET shall carry out weekly site audits to ensure the dust and odour control measures are properly implemented.

### Operation Phase

#### Odour Monitoring during Commissioning Stage

- 2.6.2 The odour removal efficiency of deodorization units shall be audited at a monthly interval during the first year of commissioning stage. Odour sampling with olfactometry analysis and H<sub>2</sub>S measurements shall be conducted at the exhaust vent and inlet of the each deodorization unit. Correlation between odour level (in odour units) and H<sub>2</sub>S concentration will be established. Once such correlation is established, only H<sub>2</sub>S monitoring shall be carried out after the commissioning period, which serves as a surrogate indicator for odour. The H<sub>2</sub>S concentrations measured can be converted to equivalent odour units. Air flow rate at the exhaust vent shall also be recorded.
- 2.6.3 In addition, odour sampling with olfactometry analysis and H<sub>2</sub>S measurements are to be conducted at a monthly interval during the first year of commissioning stage at the selected ASRs as shown in **Table 2.1**.
- 2.6.4 Upon completion of the first commissioning year monitoring, the ET shall summarise all the monitored results including analysis of the results to establish the correlation between H<sub>2</sub>S concentration and the odour units due to the operation of the upgraded Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS, and the trend of odour removal efficiency of the deodorization units, for the IEC agreement. The trend of the odour removal efficiency of the deodorization units will be used for reviewing their maintenance frequency.

#### Subsequent Monitoring

- 2.6.5 Based on the monitoring results obtained from the first year commissioning period the ET shall propose detailed monitoring requirements and programme for the Operation and Maintenance (O&M) period thereafter the first commissioning year for



agreement by the IEC. As a basic approach, odour monitoring shall be conducted in the first five years of the Operation and Maintenance (O&M) period after the first commissioning year. The odour removal efficiency of deodorization units shall be monitored. H<sub>2</sub>S measurement shall be conducted at the exhaust vent and inlet of the each deodorization unit at a three month interval for the upgraded Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS. The measured H<sub>2</sub>S concentration shall be converted to the equivalent odour units based on the correlation established during the first year commissioning period. The odour removal efficiency of the deodorization units shall be calculated and reported. With reference to the monitoring results, the frequency of monitoring could be revised to fit the situation, subject to EPD's approval.

## 2.7 Environmental Quality Performance Limits

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. **Table 2.2** shows the air quality criteria, namely Action and Limit Levels to be used.

**Table 2.2 Action / Limit Levels for Air Quality**

Parameters	Action Level	Limit Level
Odour Nuisance	Averaged baseline H <sub>2</sub> S concentration measured at ASRs (commissioning period only); or any incidence of odour complaint received through the Odour Complaint Register	Averaged baseline H <sub>2</sub> S concentration or the 5 OU equivalent, whichever is greater at ASRs (commissioning period only); or two or more complaints through the Odour Complaint Register within a three month period; or odour removal efficiency of deodorization units drops below 97%.

## 2.8 Event and Action Plan

- 2.8.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Event and Action Plan in **Table 2.3** shall be carried out.

**Table 2.3 Event and Action Plan for Air Quality (Operational Phase)**

EVENT	ACTION PLAN FOR ODOUR	
	PERSON IN CHARGE OF ODOUR MONITORING	DSD
<b>ACTION LEVEL</b>		
Exceedance of Action level (odour measurement)	<ol style="list-style-type: none"> <li>1. Identify source/ reason of exceedance;</li> <li>2. Repeat measurement to confirm findings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks;</li> <li>2. Implement more mitigation measures if necessary;</li> <li>3. Inform EPD if the cause of exceedance is considered to be caused by the STW / SPS;</li> <li>4. Undertake maintenance of the deodourization facility if necessary.</li> </ol>
Exceedance of Action level (odour complaint)	<ol style="list-style-type: none"> <li>1. Identify source/ reason of complaint;</li> <li>2. Carry out measurement to determine odour emissions from STW / SPS.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation and verify the complaint whether it is related to potential odour emissions from the STW / SPS. Investigation should be completed within 2 weeks;</li> <li>2. Implement more mitigation measures if necessary;</li> <li>3. Inform EPD if the complaint is considered to be related to the STW / SPS;</li> <li>4. Undertake maintenance of the deodourization facility if necessary.</li> </ol>
<b>LIMIT LEVEL</b>		
Exceedance of Limit level	<ol style="list-style-type: none"> <li>1. Identify source/ reason of exceedance / complaint;</li> <li>2. Carry out measurement to determine odour emissions from STW / SPS;</li> <li>3. Carry out analysis of the operation and implementation of odour mitigation measures to determine if possible mitigation to be implemented;</li> <li>4. Carry out measurement to determine odour emissions from STW / SPS after implementation of abatement measures to confirm their effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks;</li> <li>2. Inform EPD if the cause of exceedance / complaint is considered to be caused by the STW / SPS;</li> <li>3. Formulate abatement measures;</li> <li>4. Ensure abatement measures are properly implemented;</li> <li>5. If exceedance continues, consider what more / enhanced mitigation measures should be implemented, until the exceedance is abated;</li> <li>6. Undertake maintenance of the deodourization facility if necessary.</li> </ol>



## **2.9 Mitigation Measures**

- 2.9.1 The Contractor shall be responsible for the design and implementation of the measures recommended in **Appendix C, Table C1**.



### **3 NOISE**

#### **3.1 Introduction**

3.1.1 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction of the Project are presented.

3.1.2 No adverse operational noise impacts are expected if appropriate design and noise mitigation are adopted. Therefore, no EM&A programme is recommended for the operational phase of the Project.

#### **3.2 Monitoring Requirements and Equipment**

##### **Noise Parameters**

3.2.1 The construction noise level shall be measured in terms of equivalent A-weighted sound pressure level ( $L_{eq}$ ).  $L_{eq(30min)}$  shall be used as the monitoring parameter for the time period between 07:00-19:00 hours on normal weekdays. For all other time period,  $L_{eq(5min)}$  shall be employed for comparison with the Noise Control Ordinance criteria.

3.2.2 The two statistical sound levels  $L_{10}$  and  $L_{90}$ , the level exceeded for 10% and 90% of the time respectively, shall also be recorded during monitoring. The  $L_{90}$  may be considered as the ambient level into which the  $L_{10}$  as an average peak level intrudes. A sample data record sheet is shown in **Appendix B**.

##### **Noise Monitoring Equipment / Calibration**

3.2.3 Sound level meters and calibrators shall comply with the International Electrotechnical Commission (IEC) Publication 651:1979 (Type 1) and 804:1985 (Type 1) specification as referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance. The sound level meters shall be supplied and used with the manufacturer recommended weather shield as appropriate.

3.2.4 Sound level meters shall be calibrated using a portable calibrator prior to and following each noise measurement. The calibration levels shall be noted with the measurement results and where the difference between the calibration levels is greater than 1.0 dB(A), the measurement shall be repeated. Calibrated hand-held anemometers shall also be supplied for the measurement of wind speeds during noise monitoring periods.

3.2.5 The equipment shall be kept in a good state of repair in accordance with the manufacturer's recommendations and maintained in proper working order with



sufficient spare equipment available in the event of breakdown to maintain the planned monitoring programme.

- 3.2.6 Noise measurements shall not be made in the presence of fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with the hand-held anemometers capable of measuring the wind speed in m/s.
- 3.2.7 The ET is responsible for provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

### 3.3 Noise Monitoring Locations

- 3.3.1 Seven monitoring locations as presented in **Table 3.1** have been identified for noise monitoring within the Study Area. Their locations are shown in **Figure 3.1 to 3.9**. The status and locations of noise sensitive receivers may change after the approval of the EIA Report. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from the IEC.

**Table 3.1 Noise Monitoring Locations**

ID No.	Location	Nature of Uses	Construction Works <sup>(1)</sup>
N1	CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers	Rehab Centre	DP
N2	No. 6 Shek Tsai Po Street	Residential	Non-DP
N3	No. 21 Shek Tsai Po Street	Residential	Non-DP
N4	No. 150 Tai O Tai Ping Street	Residential	Non-DP
N5	No. 52 Tai O Wing On Street	Residential	Non-DP
N6	Temple (Wang Hang Village)	Residential	Non-DP
N7	No.10 Nam Chung Tsuen	Residential	Non-DP

Note: (1) DP :Submarine sewage outfall and reuse of sewage effluent

Non-DP refers to upgrading of Tai O STW, Hang Mei SPS, Fan Kwai Tong SPS and the works of sewers works

- 3.3.2 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:
- The locations shall be close to the site activities which are likely to have significant noise impacts;
  - The locations shall be close to the noise sensitive receivers (NSRs) (NB. For the purpose of this section, any domestic premises, hotel, hostel, temporary housing



accommodation, hospital, medical clinic, , place of public worship, library, court of law, performing art educational institution centre shall be considered as NSR); and

- Care shall be taken to cause minimal disturbance to the occupants of sensitive receivers.

3.3.3 The monitoring location shall normally be at a position from the exterior of the sensitive receivers building façade and 1.2 m above the ground. If there is a problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurement made. For reference, a correction of +3dB(A) shall be made to free field measurements. The ET Leader shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline and impact monitoring shall be carried out at the same position.

### **3.4 Baseline Noise Monitoring**

3.4.1 To obtain fully satisfactory baseline results, weather proof logging sound level meter shall be used. Continuous baseline noise for the A-weighted levels  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  shall be measured over a period of two consecutive weeks and sampling period of 5 minutes will be used throughout the monitoring. Average, by sound power, of six consecutive  $L_{eq (5 \text{ min})}$  reading is used to provide  $L_{eq (30 \text{ min})}$  for the non-restricted period and three consecutive  $L_{eq (5 \text{ min})}$  reading is used to provide  $L_{eq (15 \text{ min})}$  for the restricted period. The monitoring period shall be selected prior to the commencement of any construction activities and so as to avoid other typical noise sources. Measurements shall be recorded to the nearest 0.1 dB. Major noise sources observed, both on-site and off-site, at each location will be recorded. A schedule on the baseline monitoring shall be submitted to the IEC for approval before the monitoring.

3.4.2 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader and Contractor shall liaise with the IEC to agree on an appropriate set of data to be used as a baseline reference and submit to the IEC for approval.

### **3.5 Impact Noise Monitoring**

3.5.1 Noise monitoring shall be undertaken at all designated monitoring stations when there are construction works nearby. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when construction activities are undertaken:



- (i) one set of  $L_{eq}$  (30 min) noise level as six consecutive  $L_{eq}$  (5 min) between 07:00-19:00 hours on normal weekdays; and
- (ii) one set of  $L_{eq}$  (15 min) noise level as three consecutive  $L_{eq}$  (5 min) for the restricted hours.

3.5.2 Major noise sources observed, both on-site and off-site, at each location shall be recorded.

3.5.3 In the case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in **Table 3.3** shall be carried out. This additional monitoring shall be continued until the exceedance is rectified or proved to be from a source other than the construction activities.

### 3.6 Event and Action Plan

3.6.1 The Action and Limit levels for construction noise are shown in **Table 3.2**. All NSRs identified in the Project are classified with an Area Sensitivity Rating (ASR) A in accordance with the Technical Memorandum on Noise from Construction Work Other Than Percussive Piling. Should non-compliance of the noise criteria occurs, action in accordance with the Event and Action Plans in **Table 3.3** shall be carried out.

**Table 3.2 : Action and Limit Levels for Construction Noise**

Time Period	Action	Limit
07:00-19:00 hours on normal weekdays;	When one or more documented complaints are received	75dB(A)*
07:00-23:00 hours on holidays; and 19:00-23:00 hours on all other days		45 <sup>(1)</sup> dB(A) 60 <sup>(2)</sup> dB(A)
23:00-07:00 hours of the next day		30 <sup>(1)</sup> dB(A) 45 <sup>(2)</sup> dB(A)

Note: • Between 07:00-19:00 hours, construction noise limit for school during normal time is 70dB(A) and 65dB(A) during examination period.

ASR = "A" which is a rural area that are not affected by the IF.

(1) - As stipulated In the Technical Memorandum on Noise from Construction Work in Designated Areas.

(2) - As stipulated in the Technical Memorandum on Noise from Construction Work other than Percussive Piling



**Table 3.3 : Event and Action Plan for Construction Noise**

Event	ET	IEC	ER	CONTRACTOR
Action Level	<ol style="list-style-type: none"> <li>1. Notify ER, IEC and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the IEC and contractor and formulate remedial measures; and</li> <li>5. Increase monitoring frequency to check the effectiveness of mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the investigation results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; and</li> <li>4. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC and ER; and</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, EPD &amp; Contractor;</li> <li>2. Identify source and investigate the cause of exceedance;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Discuss with the IEC, Contractor and ER on remedial measures required;</li> <li>7. Assess the effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ER and Contractor on the potential remedial actions; and</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Supervise the implementation of remedial measures; and</li> <li>5. If exceedance continues, consider stopping the Contractor to continue working on that portion of work which causes the exceedance until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Submit further proposal if problem still not under control; and</li> <li>5. Stop the relevant portion of works as determined by ER, until the exceedance is abated.</li> </ol>



### **3.7 Mitigation Measures**

- 3.7.1 The Contractor shall be responsible for the design and implementation of the measures recommended in **Appendix C, Table C2**.



## **4 WATER QUALITY**

### **4.1 Introduction**

4.1.1 This section presents the requirements, methodology, equipment, monitoring location, criteria and protocol for the monitoring and audit of water quality impacts during the construction and operation of the Project.

4.1.2 Water quality impacts arising from construction and operational activities would be minimized by implementation of suitable mitigation measures and through good management practices. Contractual documents for the Tai O STW and other related projects should incorporate the mitigation measures for water pollution control as recommended in the EIA report.

### **4.2 Water Quality Monitoring Equipment and Parameters**

#### **Water Quality Parameters**

4.2.1 Marine water quality monitoring during both the construction and operational phase of the Project is to quantify the variability of pollutant concentrations in the marine waters. Measured pollutant concentrations are to be compared to the relevant Water Quality Objectives and to the baseline data to identify any significant impact on water quality from both the construction and operation of upgraded Tai O STW.

4.2.2 Dissolved Oxygen (DO), turbidity, suspended solids (SS), E.coli, and nitrogen levels shall be monitored at designated marine water quality stations. DO and turbidity shall be measured in-situ whereas SS, E.coli and nitrogen concentrations shall be determined by laboratory. In addition, other relevant parameters including temperature, pH and salinity shall also be measured.

4.2.3 The ambient level of total inorganic nitrogen (TIN) near the Project area is generally high. Monitoring of TIN concentration is therefore considered necessary.

4.2.4 A sample of data record sheet for marine water quality monitoring is shown in **Appendix B** for reference.

#### **Water Sampling Equipment**

4.2.5 A transparent PVC or glass cylinder, which has a volume of not less than 2 litres and can be sealed at both ends with cups, should be used for collection of water samples at various depths. The water sampler should be equipped with a positive latching system. During water sampling, a messenger is released to trigger the closure of the water sampler at suitable water depths.

4.2.6 All in-situ monitoring instruments should be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter should be carried out before measurement at each monitoring location.

4.2.7 For the on-site calibration of field equipment, the BS 127:1993, Guide to Field and On-Site Test Methods for the Analysis of Water should be observed.

4.2.8 Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.



### **Water Depth Detector**

- 4.2.9 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

### **Monitoring Position Equipment**

- 4.2.10 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication or other equipment instrument of similar accuracy, shall be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### **Dissolved Oxygen (DO) and Temperature Measuring Equipment**

- 4.2.11 The instrument should be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and use a DC power source. It should be capable of measuring:
- (i) a DO level in the range of 0 – 20 mg /L and 0 – 200% saturation; and
  - (ii) a temperature of 0 – 45 degree Celsius.
- 4.2.12 A membrane electrode with automatic temperature compensation shall be equipped with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. (For example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).
- 4.2.13 The salinity compensation should not be built-in to the DO equipment. In-situ salinity should be measured to calibrate the DO equipment prior to each DO measurement.

### **Turbidity Measurement Instrument**

- 4.2.14 The instrument should be a portable, weatherproof turbidity-measuring instrument complete with a comprehensive operation manual. The equipment should use a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU and be complete with a cable (e.g. Hach model 2100P or an approved similar instrument).

### **Salinity**

- 4.2.15 A portable salinometer capable of measuring salinity in the range of 0 – 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

### **pH**

- 4.2.16 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to pH 0.1 in a range of 0 to 14. Standard buffer solutions of at least pH 7 to pH 10 shall be used for calibration of the instrument before and after use. Details of the method shall comply with APHA, 19th ed. 4500-HTB.

### **Laboratory Analysis**

- 4.2.17 Analysis of marine water and the STW effluent quality parameters as listed in **Table 4.1** shall be carried out in a HOKLAS or other internationally accredited laboratory. The analysis shall commence within 24 hours after the collection of water samples.



Details on the testing method, pre-treatment procedure, instrument to use, Quality Assurance/Quality Control (QA/QC) protocol (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limit and accuracy shall be submitted to DSD and the IEC for agreement, prior to the commencement of monitoring programmes.

- 4.2.18 If in-house or non-standard methods are proposed, details on the method verification shall be required to submit to EPD. Under any circumstances, testing of water sample shall have comprehensive quality assurance and quality control protocols. The laboratory shall prepare to demonstrate the quality assurance protocols to EPD when requested.

**Table 4.1 : Analytical Methods and Detection Limits for Marine Water Samples**

Parameters	Standard Method	Detection Limit
Suspended Solid (SS)	APHA 20ed.2540 D	0.5 mg /L
5-day Biochemical Oxygen Demand (BOD <sub>5</sub> )	APHA 18ed. 5210B	0.1 mg /L
Ammonia Nitrogen (NH <sub>3</sub> -N)	ASTM D3590-89 B (FIA)	0.005 mg /L
Unionised Ammonia (NH <sub>4</sub> -N)	By Calculation	0.001 mg/L
Total Kjeldahl Nitrogen (TKN)	ASTM D3590-89 B (FIA) and APHA 20ed 4500-N A&D (FIA)	0.05 mg/L
Total Inorganic Nitrogen (TIN)	By Calculation	0.01 mg/L
Nitrite-nitrogen (NO <sub>2</sub> )	APHA 20ed. 4500-NO2- B (FIA)	0.002 mg/L
Nitrate-nitrogen (NO <sub>3</sub> )	APHA 20ed. 4500-NO3- F & I (FIA)	0.002 mg/L
Orthophosphorus (PO <sub>4</sub> )	ASTM D515-88 A (FIA)	0.002 mg/L
Total Phosphorus (TP)	ASTM D515-88 B (FIA) and APHA 20ed 4500-P G (FIA)	0.02 mg/L
<i>E.coli</i>	membrane filtration with CHROMagar Liquid <i>E. coli</i> –coliform culture <sup>(1)</sup>	1 cfu/100mL

Note:

- (1) (a) DoE, DHSS & PHLS (1983); The Bacteriological Examination of Drinking Water Supplies 1982, Sec.7.8 & 7.9; and (b) B.S.W. Ho and T.Y. Tam (1997), Enumeration of *E. coli* in environmental waters and wastewater using a chromogenic medium. Wat. Sci. Tech.Vol.35, No.11-12, pp.409-413; method adopted in 1997.

### 4.3 Construction Phase Water Quality Monitoring

#### Monitoring Locations

- 4.3.1 The marine water quality monitoring stations during the marinebased construction works were chosen based on the following criteria:
- (i) At locations close to and preferably at the boundary of the major site activities as indicated in the EIA report, which are likely to have water quality impacts;
  - (ii) Close to the sensitive receivers which are directly or likely to be affected;
  - (iii) For monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring;



- (iv) At two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations should be located, as far as is practicable, both upstream and down stream of the works area.

4.3.2 Control stations are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same waterbodies as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works. The marine water monitoring locations are shown in **Figure 4.1**. It is recommended to set up four monitoring stations as presented in **Table 4.2**.

**Table 4.2 : Marine Water Monitoring Locations**

Station	Description	Easting (m)	Northing (m)
W1	Predicted Dredging Non-impact Zone	803622	813812
W2	Predicted Dredging Non-impact Zone	803304	813568
C1	Control Station	803050	814059
C2	Control Station	804236	814357

- 4.3.3 Water sampling should be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above seabed if water depth is 6m or above. If water depth is 3m to 5m, the mid-depth station may be skipped. If the water depth be less than 3m, only the mid-depth station should be monitored.
- 4.3.4 Control stations (C1, C2) as shown in **Figure 4.1 and Table 4.2** are indicative and subject to further review before the construction phase. The revised stations sitting should be submitted 4 weeks before commencement of baseline monitoring for IEC and EPD approval.
- 4.3.5 Two proposed monitoring stations (W1 and W2) are located within or at the boundary of the secondary contact recreation subzone. These locations are proposed to monitor the impacts from the construction of the submarine outfall as well as the effluent discharge from the proposed STW on water quality.
- 4.3.6 The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such cases exist, the ET Leader should propose with justification for changes to monitoring locations or other requirements of the EM&A programme, and seek approval from the IEC, EPD and AFCD.

**Baseline Water Quality Monitoring**

- 4.3.7 Baseline conditions of water quality should be established and agreed with EPD prior to the commencement of works. The purposes of the baseline monitoring are to establish baseline ambient conditions prior to the commencement of the Project and to demonstrate the suitability of the proposed monitoring stations. The baseline conditions shall be established by measuring the concentration of selected water quality parameters specified at the proposed marine water quality stations are shown in **Figure 4.1**.
- 4.3.8 The measurements shall be taken at all designated monitoring stations including control stations, at least once per month, both at mid-flood and mid-ebb tides during each survey, for at least 3 months prior to the commencement of marine works.
- 4.3.9 The ET shall inform the IEC and EPD the baseline monitoring schedules at least one week prior to the commencement of baseline monitoring. **Table 4.3** illustrates the baseline monitoring programme for each water quality parameter.



**Table 4.3 : Marine Water Monitoring Programme**

Parameter	Stations	Frequency	Duration
Temperature (°C)	All	Once per month, at mid-ebb and mid-flood	Three months
Turbidity (NTU)			
pH			
Salinity (ppt)			
DO (mg/L)			
SS (mg/L)			
Ammonia Nitrogen (mg/L)			
TIN (mg/L)			
E.coli (cfu/100mL)			

Note: Unionised Ammonia will be derived by calculation.

- 4.3.10 Other relevant data shall also be recorded, such as: monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena underway near the monitoring station. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring.
- 4.3.11 Duplicate in-situ measurements and samples shall be collected for each independent sampling event to ensure a robust statistically interpretable database.
- 4.3.12 In the exceptional case when insufficient baseline monitoring data or questionable results are obtained, the ET should seek approval from EPD for an appropriate set of data to be used as baseline reference.

**Impact Monitoring**

- 4.3.13 During the course of marine works such as dredging of submarine outfall and filling, monitoring shall be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/ measurement at the designated monitoring stations. Duplicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The interval between two sets of monitoring shall not be less than thirty-six hours except where there are exceedances of Action and / or Limit levels, in which case the monitoring frequency will be increased. To ensure the recommended dredging rate (i.e. 62.5m<sup>3</sup>/hr; 500m<sup>3</sup>/day) is not exceeded during construction, the amount of dredged materials shall be controlled on-site on a daily basis. Given that the estimated volume of dredged materials is approximately 26,700m<sup>3</sup>, the estimated minimum period of dredging works is therefore approximately 55 days. Moreover, on-site monitoring spot check by independent EM&A checkers shall be required and included in the future contract document.
- 4.3.14 Two consecutive measures of DO concentration, DO saturation and turbidity will be taken in situ at 1 m below the surface, mid-depth and 1 m above the seabed at each location. If the water depth is less than 6 m, the mid-depth measurement may be omitted. If the depth is less than 3 m, only the mid-depth measurements need to be taken. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second readings of DO or turbidity



parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken. Duplicate water samples for SS and TIN shall be collected at the same three depths.

- 4.3.15 The water quality parameters during impact monitoring will be the same as baseline monitoring. Upon the completion of all marine based construction activities, a post-construction monitoring exercise on water quality shall be carried out for four weeks in the same manner as the impact monitoring. Duplicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database.

#### **Construction Site Audit**

- 4.3.16 Regular site audit should be carried out to ensure that the recommended mitigation measures are properly implemented during the construction phase of upgrading of Tai O STW project. It can also provide an effective control of any improper malpractices and therefore achieve continual improvement in environmental performance on site. Site audit shall include site inspections and compliance audits.

#### **Site Inspection**

- 4.3.17 Site inspection shall be carried out by the ET and attentions shall be paid to the mitigation measures recommended for water pollution control. In the event that the recommended mitigation measures are not fully or properly implemented, deficiencies shall be recorded and reported to the site management and suitable actions shall be taken, which may include:
- (i) Record the problems and investigate the cause;
  - (ii) Issue action notes to the Contractor who is responsible for the works;
  - (iii) Implement remedial and corrective actions immediately;
  - (iv) Re-inspect the site condition upon completion of the remedial and corrective actions; and
  - (v) Record the event and discuss with the Contractor for preventive actions.

#### **Compliance Audit**

- 4.3.18 Compliance audits are to be undertaken to ensure that a valid discharge license issued by EPD is in place prior to any effluent discharge from construction activities of the Project site. If monitoring of the treated effluent quality from the Works Areas is required during the construction phase of the Project, the monitoring shall be carried out in accordance with the Water Pollution Control Ordinance license that is under the ambit of a regional EPD office.
- 4.3.19 The auditing results reflect whether the effluent quality is in compliance with the discharge license requirements. In case of non-compliance, suitable actions by the ET shall be undertaken to:
- (i) Notify the Contractor, IEC and ER on the non-compliance;
  - (ii) Identify the sources of pollution;
  - (iii) Check the implementation status of recommended mitigation measures;
  - (iv) Investigate the operating conditions of on-site treatment systems;
  - (v) Implement corrective and remedial actions to improve the effluent quality;
  - (vi) Increase the monitoring frequency until the effluent quality is in compliance with the discharge licence requirements; and
  - (vii) Record the non-compliance events and propose preventive measures.





#### **4.4 Operational Phase Monitoring**

- 4.4.1 A Post-Project Monitoring (PPM) programme is recommended to confirm the water quality predictions presented in the EIA report. It is suggested to start the marine water quality monitoring for the operational phase three months after the commissioning of the upgraded Tai O STW.
- 4.4.2 During the operation phase (post commissioning of the STW), monitoring locations (W1 and W2) and control stations (C1 and C2) should be monitored for the parameters as listed in **Table 4.1**, following the same analytical methods.
- 4.4.3 Marine water samples and in-situ measurements shall be taken at a frequency of twice per month at mid-flood and mid-ebb tides, respectively to determine the water quality compared to the baseline monitoring.
- 4.4.4 The monitoring programme can be discontinued after one year (12 months) of monitoring if there is no obvious deterioration in water quality.

#### **Operational Phase STW Effluent Quality Monitoring**

- 4.4.5 To ensure the effectiveness of the proposed wastewater treatment process, monitoring of the STW effluent quality is recommended for water quality parameters including pH, BOD5, SS, TIN, NH3-N and E. coli. Monitoring of residual chlorine, cadmium, copper, nickel, lead, mercury, chromium, zinc, PCBs and PAHs shall also be included.
- 4.4.6 A valid discharge licence shall be obtained from EPD prior to the effluent discharge from the upgraded STW. The monitoring frequency and parameters specified in the discharge licence shall be fully complied during the monitoring. The ET shall seek approval from EPD on all the monitoring requirements. The effluent results reflect whether the effluent quality is in compliance with the discharge licence requirements. In case of non-compliance, suitable actions shall be undertaken to notify the plant operator for the non-compliance and identify the cause for the non-compliance. Corrective and remedial actions shall be implemented to improve the effluent quality. The monitoring frequency should also be increased until the effluent quality is in compliance with the discharge licence requirements. The non-compliance events and preventive measures shall be documented.
- 4.4.7 In case of an emergency discharge, daily marine water monitoring should be conducted throughout the discharge period until the normal STW operation is resumed and the quality of receiving marine water resumes to its normal level.
- 4.4.8 Apart from the online monitoring and control system for the wastewater quality, 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.

#### **4.5 Event and Action Plan**

- 4.5.1 Marine water quality thresholds for actions are shown in **Table 4.4**. These thresholds should be applied to ensure that any water quality deterioration can be readily detected.
- 4.5.2 When the monitoring results of water quality parameters at any designated monitoring stations exceed the water quality thresholds, appropriate actions in accordance with the Event and Action Plan in **Table 4.5** shall be carried out.



**Table 4.4 : Thresholds for Marine Water Quality Parameters**

Parameters	Action Water Quality Level	Limit Water Quality Level
DO in mg/ L (Surface, Middle & Bottom)	<u>Surface &amp; Middle</u> : 5 percentile of baseline data for surface and middle layer. <u>Bottom</u> : 5 percentile of baseline data for bottom layer.	<u>Surface &amp; Middle</u> : 4 mg/L or 1 percentile of baseline data for surface and middle layer. <u>Bottom</u> : 2 mg/L or 1 percentile of baseline data for bottom layer.
SS in mg/ L (depth average)	95 percentile of baseline data or 120% of upstream control station's SS at the same tide of the same day.	99 percentile of baseline data or 130% of upstream control station's SS at the same tide of the same day.
Unionised Ammonia in mg /L (depth average)	95 percentile of baseline data or 0.021 mg/L.	99 percentile of baseline data or 0.021 mg /L.
<i>E.coli</i> (depth average)	95 percentile of baseline data.	99 percentile of baseline or 610 cfu/100mL as geometric mean for secondary contact, recreation subzones and fish culture zones.
Turbidity in NTU (depth - average)	95 percentile of baseline data or 120% of upstream control station's turbidity at the same tide of the same day.	99 percentile of baseline or 130% of upstream control station's turbidity at the same tide of the same day.
TIN in mg/ L (depth average)	95 percentile of baseline data.	99 percentile of baseline data.

Parameters	Action Water Quality Level	Limit Water Quality Level
DO in mg/L (Surface, Middle & Bottom)	<u>Surface &amp; Middle</u> : 5 percentile of baseline data for surface and middle layer. <u>Bottom</u> : 5 percentile of baseline data for bottom layer.	<u>Surface &amp; Middle</u> : 4 mg/L or 1 percentile of baseline data for surface and middle layer. <u>Bottom</u> : 2 mg/L or 1 percentile of baseline data for bottom layer.
SS in mg/L (depth average)	95 percentile of baseline data or 120% of upstream control station's SS at the same tide of the same day.	99 percentile of baseline data or 130% of upstream control station's SS at the same tide of the same day.
Unionised Ammonia in mg /L (depth average)	95 percentile of baseline data or 0.021 mg/L.	99 percentile of baseline data or 0.021 mg /L.
<i>E.coli</i> (depth average)	95 percentile of baseline data.	99 percentile of baseline or 610 cfu/100mL as geometric mean for secondary contact, recreation subzones and fish culture zones.
Turbidity in NTU (depth - average)	95 percentile of baseline data or 120% of upstream control station's turbidity at the same tide of the same day.	99 percentile of baseline or 130% of upstream control station's turbidity at the same tide of the same day.
TIN in mg/L (depth average)	95 percentile of baseline data.	99 percentile of baseline data.

Notes: 1. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

2. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

3. For turbidity, SS and TIN, non-compliance of the water quality limits occurs when monitoring result is higher than the limit.

4. All the figures given in the table are used for reference only and could be amended by EPD.



**Table 4.5 : Event and Action Plan for Protection of Marine Water Quality**

Event	Actions to be Taken			
	ET Leader	IEC	ER	Contractor
Action water quality level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor and ER; and</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working methods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of noncompliance in writing; and</li> <li>2. Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the noncompliance in writing;</li> <li>2. Rectify unacceptable practice; and</li> <li>3. Amend working methods if appropriate.</li> </ol>
Action water quality level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor, ER, EPD, and AFCD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented; and</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Action level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; and</li> <li>4. Supervise the implementation of mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC on the proposed mitigation measures;</li> <li>2. Ensure mitigation measures are properly implemented; and</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the noncompliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Submit proposal of additional mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; and</li> <li>5. Implement the agreed mitigation measures.</li> </ol>
Limit water quality level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor, ER, EPD, and AFCD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods; and</li> <li>5. Discuss mitigation</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; and</li> <li>3. Request Contractor to review the working methods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the noncompliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods; and</li> <li>4. Submit proposal of mitigation measures</li> </ol>



Event	Actions to be Taken			
	ET Leader	IEC	ER	Contractor
	measures with IEC, ER and Contractor.	actions; and 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly.		to ER within 3 working days of notification and discuss with ET, IEC and ER.
Limit water quality level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor, ER, EPD, AFCD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented; and</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly; and</li> <li>4. Supervise the implementation of mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>2. Request Contractor to critically review the working methods;</li> <li>3. Make agreement on the mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented; and</li> <li>5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>3. Implement the agreed mitigation measures;</li> <li>4. Resubmit proposals of mitigation measures if problem still not under control; and</li> <li>5. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>

4.5.3 It is recommended that additional mitigation measures be taken if the monitoring results indicate that the marine works have caused adverse impacts on water quality to the identified sensitive receivers to rectify the non-compliance to water quality criteria. When necessary, construction programme should be carefully reviewed to reduce the impact of dredging to ensure that water quality at locations of the identified sensitive receivers is in compliance with criteria. Working schedule and mitigation measures should be reviewed by the Contractor, IEC, ET Leader and ER. Under certain circumstances, the schedule for construction works may need to be revised until the adverse impacts to water quality are reduced to an acceptable level.

4.5.4 The ET Leader should assess the effectiveness and efficiency of the proposed mitigation measures and/or remedial actions for on-going construction activities. Due to the relatively short dredging period, the performance of the environmental management system (that is, the overall EM&A programme) should be reviewed by



the ET Leader on a weekly basis. The findings of this review should be included in the relevant monthly EM&A reports and quarterly summary reports, together with any recommendations to improve the performance of the EM&A programme.

#### **4.6 Water Quality Mitigation Measures**

- 4.6.1 The Contractor shall be responsible for the design and implementation of the measures recommended in **Appendix C, Table C2**.



## **5 WASTE MANAGEMENT**

### **5.1 Introduction**

5.1.1 Based on the waste management implication assessed in the EIA Report, it has been identified that some construction wastes (including inert and non-inert wastes), dredged marine sediment, chemical waste and general refuse will be generated from the construction activities. Construction and demolition (C&D) waste will be fully reused on site as far as practicable. EM&A requirements are recommended during the construction phase of proposed SPSs, sewers works and the upgrading of Tai O STW under the Project.

5.1.2 Through proper on-site handling and storage (covered containers), reuse (of inert construction wastes) and off-site disposal (via approved waste collectors to approved waste facilities and/or disposal grounds), the generation, handling and disposal of these wastes are not expected to give rise to any adverse environmental impacts. The ET shall check the Contractor's implementation of waste management practices during the regular site environmental audits to ensure wastes are being managed properly.

### **5.2 Construction Phase EM&A Requirements**

#### **Site Audit / Inspection**

5.2.1 Site inspections and supervisions of waste management procedures and auditing of the effectiveness of implemented mitigation measures shall be undertaken by the ET on a regular basis (e.g. weekly as a minimum). These tasks shall be scheduled in the Waste Management Plan (WMP) to be prepared by the Contractor, and the site audits summary shall be presented in the EM&A reports.

#### **Waste Management Practices**

5.2.2 An on-site environmental co-ordinator shall be employed by the Contractor. Prior to commencement of Project works, the co-ordinator shall prepare a WMP in accordance with the requirements set out in the ETWB TC(W) No. 19/2005, Waste Management on Construction Sites, for the ER's approval. The WMP shall include monthly and yearly Waste Flow Tables (WFT) that indicate the amounts of waste generated, recycled and disposed of (including final disposal site), and which shall be regularly updated.

5.2.3 The overall principles of construction waste management are to reduce waste generation and to reuse and recycle construction waste. The arrangement for



avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities and the recommended mitigation measures are to be described in a WMP.

- 5.2.4 The WMP will indicate the disposal location(s) of all surplus excavated materials and wastes. A trip ticket system in accordance with Development Bureau Technical Circular (Works) (TC(W)) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials shall be included in the WMP. Surplus excavated materials and wastes shall only be disposed of at designated disposal locations unless otherwise approved by the Director. All measures recommended in the WMP shall be fully and properly implemented by the Contractor throughout the construction period.

#### **Mitigation Measures**

- 5.2.5 The implementation status of the following mitigation measures shall be monitored through the site audit programme by the ET:
- To minimize the production of construction waste through careful design, planning, good site management, and control of ordering procedures, segregation and reuse of materials; To arrange for private contractors to collect used formwork materials for reuse;
  - To dispose of any chemical wastes such as lubricating oil or solvent in strict accordance with the Waste Disposal (Chemical Waste) (General) Regulation. Only licensed chemical waste collectors shall be employed to collect any chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme both published by EPD;
  - All chemical toilets, if any, shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal;
  - To assign a reliable waste collector to collect general refuse generated from the construction site on a daily basis to minimize the potential odour, pest and litter impacts;
  - To identify requirements on proper waste management for implementation during the operation of the project; and



- Toolbox talks shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling.

5.2.6 **Appendix C, Table C4** shows the implementation schedule of the mitigation measures for waste management.

#### **Good Site Practices**

5.2.7 In order to check that the waste control and mitigation measures have been implemented by the Contractor as good site practices, the following shall be included as part of the site inspections and audits:

- The reuse/recycling of all materials on site shall be investigated prior to treatment/disposal off site;
- Good site practices shall be adopted from the commencement of works to avoid the generation of waste, reduce cross contamination of waste and to promote waste minimisation practices;
- All waste materials shall preferably be sorted on-site into inert and non-inert construction wastes, and where the materials will be recycled or reused these shall be further segregated. Inert material, or public fill will comprise stone, rock, masonry, brick, concrete and soil which is suitable for land reclamation and site formation whilst non-inert materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance);
- The Contractor shall be responsible for identifying what materials can be recycled/reused, whether on-site or off-site. In the event of the latter, the Contractor shall make arrangements for the collection of the recyclable materials. Any remaining non-inert waste shall be collected and disposed of to the Public Filling Areas whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if no use of the inert material can be found on-site, the materials can be delivered to a Public Fill Area or Public Fill Bank after obtaining the appropriate licence;
- In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be implemented by the Contractor, in accordance with the contract and the requirements of Development Bureau Technical Circular (Works) (TC(W)) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials;





- Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall register with EPD as a Chemical Waste Producer if there is any use of chemicals on site including lubricants, paints, diesel fuel, etc. Only licensed chemical waste collectors shall be employed to collect any chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme both published by EPD;
- A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive surroundings. These bins shall be cleared daily and the collected waste disposed of to the refuse transfer station. Further to the issue of ETWB TC(W) No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness, the Contractor is required to maintain a clean and hygienic site throughout the project works;
- All chemical toilets, if any, shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal;
- For allocation of sediment disposal sites and application of marine dumping permit, another proposal for sampling and chemical testing of the sediment will be prepared and submitted to the EPD for approval following the procedures in ETWB TC(W) No. 34/2002. The approved detailed sampling and chemical testing will be carried out prior to the commencement of the dredging activities to confirm the sediment disposal methods. The contamination levels of the sediment to be dredged will be analysed and recorded. After carrying out the sampling and testing, a Sediment Quality Report (SQR) will be prepared for EPD approval as required under the DASO to agree and confirm the quantities and extent of the contamination of the sediments prior to the dredging works. The SQR will include the sampling details, the chemical testing results, quality control records, proposed classification and delineation of sediment according to the requirements of ETWB TC(W) No. 34/2002; and
- The Contractor shall comply with all relevant statutory requirements and guidelines and their updated versions that may be issued during the course of project construction.

### **5.3 Operational Phase EM&A Requirements**

5.3.1 Given the nature of use of the Project, there is no EM&A requirement considered



necessary during the operational phase. However, the Operator shall ensure the general refuse to be disposed of at landfill site regularly by a reputable waste collector to reduce pest, odour and litter impacts.



## **6 LAND CONTAMINATION**

### **6.1 Introduction**

6.1.1 The land contamination assessment has been carried out which included a review of historical / current land uses, desktop review and the site inspection. Other relevant information was also collected from related Government Departments during the course of the assessment. No potential land contamination sites are located within the construction areas of the proposed SPSs, sewers works and the upgraded Tai O STW. No unacceptable residual impact is anticipated during the construction and operation of the Project.

### **6.2 Monitoring and Audit Requirements**

6.2.1 There are no EM&A requirements for land contamination.



## **7 ECOLOGY**

### **7.1 Introduction**

7.1.1 The ecological assessment carried out in the EIA study has addressed the ecological consequences of the project. The potential ecological impacts during construction and operation are all ranked as minor or insignificant.

### **7.2 Construction Phase EM&A Requirements**

7.2.1 Weekly site inspection should be carried out by the environmental team to ensure the implementation of mitigation measures and proper site practice proposed to safeguard air and water quality as well as noise impacts.

7.2.2 Implementation of “Dolphin exclusion zone and Dolphin watching plan” . Procedures are described in the following sections.

7.2.3 Dolphin Exclusion Zone - Marine reclamation / dredging involves the installation of perimeter silt curtain and removal of silt curtain. Dolphin exclusion zone of 250m radius should be implemented in reclamation / dredging sites of the Project during the installation of reclamation / dredging works. Works will be suspended when any Chinese White Dolphin (CWD) is found within the exclusion zone. After the silt curtain is installed, all the subsequent works will be conducted inside the casing (a small and completely confined area), and a dolphin exclusion zone is not required.

7.2.4 Dolphin Watching Plan - A dolphin watching plan for works areas will also be included in the EM&A programme. For reclamation site, once the perimeter silt curtains are installed or re-deployed, the filling works would be conducted inside the silt curtains and a dolphin exclusion zone is not needed. Instead a dolphin watching plan will be performed. The plan would include regular inspection of the silt curtains, scanning of the waters surrounded by the curtains, and an action plan should be devised to cope with any unpredicted incidents such as in case dolphins are found within the waters surrounded by the silt curtains.

### **7.3 Operational Phase EM&A Requirements**

7.3.1 During the operation phase, adverse impacts are not expected to occur. Therefore, no mitigation measure is required. No specific ecological EM&A is recommended.

### **7.4 Mitigation Measures**

7.4.1 Recommended mitigation measures during construction phase included the following:



- erection of Hoardings – Hoardings of 3m tall will be erected along the works area of Hang Mei SPS during construction phase. Given this measure, the potential impact to woodland and associated wildlife would be minimised;
- uses of quiet machinery/construction method during the construction phase – Construction method / machinery producing less noise will be employed in order to minimise the potential impact of construction noise.
- decoupling of noisy equipment on vessels;
- speed limits and regular routes of work-related vessel - The potential impacts of marine traffic disturbance or collision risk due to the work-related vessel traffic will be minimised by application of speed limits (e.g. 10 knots) and regular routes (to be determined during the construction stage by the environmental team);
- establishment of dolphin exclusion zone and implementation of Dolphin Watching Plan in the reclamation and dredging site during the installation of the perimeter silt curtains and any re-deployment of the perimeter silt curtains;
- implementation of good site practice – the integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the relevant effluent discharge guidelines;
- strict enforcement on no-dumping – to avoid degrading the Chinese White Dolphin habitat, restrictions prohibiting dumping of rubbish, food, oil, or chemicals will be strictly enforced; and
- spill response plan – in the event of vessels operating in the works areas transporting oil or other hazardous chemicals, an oil-spill response plan, with specific provisions for protecting marine ecology and dolphins, will be formulated.

7.4.2 No mitigation measure during operation phase was considered necessary.



## **8 FISHERIES**

### **8.1 Introduction**

8.1.1 No significant impact was anticipated during both construction and operation phase.

### **8.2 Construction Phase EM&A Requirements**

8.2.1 There will be monitoring and auditing for marine water quality during construction of the Project. A monitoring and audit programme aims to ensure that the released SS concentrations from the dredging activities would not adversely affect the sensitive receivers. This monitoring programme would be used to assess the effectiveness of mitigation measures during construction. No specific fisheries EM&A programme would thus be required during the construction phase of the project.

### **8.3 Operational Phase EM&A Requirements**

8.3.1 During the operation phase, adverse impacts are not expected to occur. Therefore, no specific fisheries EM&A programme would thus be required during the operation phase of the project.

### **8.4 Mitigation Measures**

8.4.1 Recommended mitigation measures during construction phase included the following:

- minimising dredging works – the amount to be dredged has been minimized as far as practicable;
- filling after completion of seawall;
- limit the works fronts - the number of concurrent dredging/filling work fronts will be limited;
- using closed grab;
- employing cage type silt curtains;
- implementation of good site practice – the integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the relevant effluent discharge guidelines;
- strict enforcement on no-dumping – to avoid degrading the Chinese White Dolphin habitat, restrictions prohibiting dumping of rubbish, food, oil, or chemicals will be strictly enforced; and

8.4.2 spill response plan – in the event of vessels operating in the works areas transporting



oil or other hazardous chemicals, an oil-spill response plan, with specific provisions for protecting marine ecology and dolphins, will be formulated.



## 9 CULTURAL HERITAGE

### 9.1 Introduction

- 9.1.1 Mitigation measures have been recommended in the EIA Report for the preservation and conservation of the potentially affected archaeological and built heritage sites from the proposed sewers works (non-DP component) under the Project.
- 9.1.2 Desk based research highlighted the potential for archaeology within the study areas in Tai O. A number of the proposed works areas are located within the Tai O SAI however, these areas have known some disturbance from previous utilities works. A programme of archaeological watching brief was recommended to be implemented during the construction phase with a frequency of monitoring based on the level of existing impact and previous archaeological findings. A methodology and scope have been recommended but will have to be confirmed with AMO prior to implementation.
- 9.1.3 In addition, the Contractor shall report to the ER, the Project Proponent and the AMO immediately if any discoveries of the antiquities or supposed antiquities occur during the course of the construction works.
- 9.1.4 The Built Heritage Impact Assessment has also identified a number of built heritage resources, including a shrine near Fan Kwai Tong SPS which require mitigation measures during the construction stage. The aim of these measures is to ensure that the built heritage resource are not damaged by the construction works. The measures will also ensure that the public will have safe access to built heritage resource, such as shrines, temples and graves during the construction phase.
- 9.1.5 No EM&A requirement is considered necessary during the construction and operational phase of upgrading of Hang Mei SPS.

### 9.2 Construction Phase Mitigation Measures

#### Archaeology

- 9.2.1 An Archaeological Watching Brief is required as part of the EM&A requirement to be implemented during the construction phase. During the Archaeological Watching Brief, archaeological deposits and/or features, if appropriate, will be identified and recorded within the areas of archaeological interest highlighted in the EIA. **Table 9.1** includes the areas and the type of mitigation works required:





**Table 9.1 : Proposed Further Archaeological Works during Construction Phase**

Areas of Impact	Archaeological Potential	Type of Archaeological Investigation/ Protection	Scope
Proposed Sewers Works			
Kat Hing Street (Figure 9.1)	Moderate archaeological potential potentially disturbed by utilities	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest)	Archaeological Watching Brief area is marked on <b>Figure 9.1</b> .  Due to the moderate archaeological potential which is based on previous findings and level of existing impacts, one visit per four sections monitoring frequency is proposed.
Kat Hing Back Street (Figure 9.1)	Moderate archaeological potential potentially disturbed by utilities	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest)	Archaeological Watching Brief area is marked on <b>Figures 9.1</b> .  Due to the moderate archaeological potential which is based on previous findings and level of existing impacts, one visit per four sections monitoring frequency is proposed.
Tai O Market Street (Figure 9.2)	Moderate archaeological potential potentially disturbed by utilities.	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest)	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest) marked on <b>Figure 9.2</b> .  Due to the nature of the findings and the limited works (three sections only) full time monitoring of the works is recommended.
Wing On Street (Figures 9.2 and 9.3)	Moderate archaeological potential potentially disturbed by utilities	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest)	Archaeological Watching Brief area is marked on <b>Figures 9.2 and 9.3</b> .  Due to the moderate archaeological potential which is based on previous findings and level of existing impacts, one visit per four sections monitoring frequency is proposed.
Tai Ping Street (Figures 9.3)	Moderate archaeological potential potentially disturbed by utilities	Archaeological Watching Brief (area located within the boundary of Tai O Site of Archaeological Interest)	Archaeological Watching Brief area is marked on <b>Figures 9.3</b> .  Due to the moderate archaeological potential which is based on previous findings and level of existing impacts, one visit per four sections monitoring frequency is proposed.

9.2.2 Each monitoring visit should nominally be of a day's duration and would typically involve observation, finds collection and recording as specified in **Appendix D**.

9.2.3 The archaeological watching brief must be undertaken by a qualified archaeologist who shall apply for and obtain a licence to conduct the watching brief for the project (as required under section 12 of the Antiquities and Monuments Ordinance Cap.53).



It should be noted that processing of the licence application may take up to 8 weeks after acceptance by AMO of Application. Final details of the scope and methodology including monitoring frequency will be submitted to the AMO for review and approval prior to the submission of the licence application.

### **Built Heritage**

- 9.2.4 The mitigation recommendations as listed in **Table 9.2 and 9.3** will be presented for Built Heritage Resources as shown in **Figures 9.4 to 9.17**. The description below will provide the detailed requirements for each of the mitigation actions and will be abbreviated in the tables by the letters shown in brackets.

#### Condition Survey

- 9.2.5 A condition survey must be carried out by qualified building surveyor or engineer in advance of works for Graded Historic Buildings and structures and Nil Grade heritage structures that may be affected by ground borne vibration. The Condition Survey Report should contain descriptions of the structure, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended.
- 9.2.6 The condition survey report for Graded Historic Buildings must be submitted to AMO for comment before construction activities commence. The contractor must implement the approved monitoring and precautionary measures.

#### Vibration and Settlement Monitoring

- 9.2.7 Vibration and settlement monitoring should be undertaken during the construction works to ensure that safe levels of vibration and settlement are not exceeded. A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Grade heritage structures should be adopted. The Alert/Alarm/Action limits for settlement shall be 6mm, 8mm and 10mm respectively. It should be noted that the condition survey report should highlight if the limit should be lowered after the detailed study of the condition of the building. A monitoring schedule should be included in the condition survey report. The location of proposed monitoring point on the building should avoid damaging the historic fabric and approved by the owner.

#### Provision of Buffer Zones (BZ)

- 9.2.8 A buffer zone should be provided to separate the building from the construction works. The buffer zone should be clearly marked out by temporary fencing. The buffer zone



should be at least 1 metre unless site restrictions make this unfeasible. In this case the buffer zone should be made as large as the site restrictions allow.

Provision of Protective Covering (PC)

9.2.9 Protective covering in the form of plastic sheeting placed on a movable fence should be provided for external walls and surfaces of historical buildings and structures in close proximity to works areas, i.e. areas where a buffer zone alone cannot provide protection from equipment and works activities.

Safe Public Access (SPA)

9.2.10 Any proposed works in close proximity to buildings or structures used by the public for religious, ritual or funerary purposes, such as shrines, ancestral halls, temples and graves have the potential to create an unsafe environment for members of the public. The contractor must ensure that safe public access is maintained, through provision of clearly marked paths separated from the construction works areas is provided for any such affected cultural heritage structure.

**Table 9.2 : Mitigation Recommendations for Graded Historic Buildings in Tai O**

Recorded Resource	Grade	Cat Ref	Mitigation <sup>(1)</sup>
Kwan Tai Temple	Grade 2	T-44	No mitigation required
No. 1 Tai O Market Street, Tai O	Grade 2	T-39	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  Any damage to exterior walls will be repaired with finishes which match with the existing finish. If matching material is not readily available, the closest possible substitute will be sourced by the contractor and AMO will be contacted for comment on the material.  CS/ VM, BZ, PC
Nos. 7, 9, 11 & 13 Tai O Market Street, Tai O	Grade 2	T-40	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  CS/ VM



Recorded Resource	Grade	Cat Ref	Mitigation <sup>(1)</sup>
No. 14 Tai O market Street	Grade 2	T-43	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  CS/VM
No. 17 Tai O Market Street, Tai O	Grade 2	T-41	No mitigation required
No. 60 Kat Hing Street	Grade 2	T-49	No mitigation required
Tin Hau Temple	Grade 3	T-45	No mitigation required
Nos. 46 Kat Hing Street	Grade 3	T-48A	No mitigation required
Nos. 48 Kat Hing Street	Grade 3	T-48B	No mitigation required
Shek Lun Kok	Grade 3	T-50	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  CS, VM
Wing Hing Petrol Station	Grade 3	T-59	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  CS, VM
Shrine with stone dog at Kat Hing Back Street	Grade 3	T-54	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  CS/ VM BZ, PC, SPA
Nos. 2 & 4 Tai O Market Street, Tai O	Proposed Grade 2	T-38	A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted.  The Alert, Alarm and Action (AAA) vibration limit will be set at 6/8/10 mm/s respectively.  Any damage to exterior walls will be repaired with finishes which match with the existing finish. If matching material is not readily available, the closest possible substitute will be sourced by the contractor and AMO will be contacted for comment on the material.  CS/ VM, BZ, PC



Recorded Resource	Grade	Cat Ref	Mitigation <sup>(1)</sup>
Stilt Houses of Tai O	Proposed to be Graded	T-66 & T-67	The Alert, Alarm and Action (AAA) vibration limit to be agreed with AMO. CS/VM, BZ, PC

Note: (1)

CS – Condition Survey  
VM – Vibration and Settlement Monitoring  
BZ – Buffer Zone  
PC – Provision of Protective Covering  
SPA – Safe Public Access



**Table 9.3 : Mitigation Recommendations for Nil-Grade Historic Structures in Tai O**

Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
Shrine in front of No.23 Tai O Wing On Street	Earth Shrine	T-01	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Shrine between No.24 & 26 Tai O Wing On Street	Earth Shrine	T-02	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
No.30 Tai O Wing On Street	Village House	T-03	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Nos.44 & 46 Tai O Wing On Street	Village House	T-04	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No.48 Tai O Wing On Street	Yik Cheung Salt Fish Store	T-05	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine across from No. 103 Shek Tsai Po Street	Shrine	T-06	The vibration limit will be set at 15 mm/s. CS/ VM
No. 54 Tai O Wing On Street	Tai O Culture Shop	T-07	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 64 Tai O Wing On Street	Village House	T-08	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 72 Tai O Wing On Street	Fat Kee Hardware Shop	T-09	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 92 Tai O Wing On Street	Village House	T-10	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 96 Tai O Wing On Street	Village House	T-11	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 104 Tai O Wing On Street	Dou Fok Tong	T-12	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 101 Tai O Wing On Street	Village House	T-13	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 107 Tai O Wing On Street	Village House	T-14	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 105 Tai O Wing On Street	Village House	T-15	The vibration limit will be set at 15 mm/s. CS/ VM BZ, PC,
No. 112 Tai O Tai Ping Street	Wing Chor School and Tai O Catholic Church	T-16	The vibration limit will be set at 15 mm/s. CS/ VM



Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
No. 121 Tai O Tai Ping Street	Village House	T-17	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine next to No. 120 Tai O Tai Ping Street	Shrine	T-18	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC/ SPA
No. 124 Tai O Tai Ping Street	Civil Aid Association of Tai O	T-19	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 145 Tai O Tai Ping Street	Village House	T-20	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 147 Tai O Tai Ping Street	Village House	T-21	The vibration limit will be set at 15 mm/s. CS/ VM
No. 140 Tai O Tai Ping Street	Village House	T-22	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 144 Tai O Tai Ping Street	Village House	T-23	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 155 Tai O Tai Ping Street	Village House	T-24	The vibration limit will be set at 15 mm/s. CS/ VM
No. 152 Tai O Tai Ping Street	Village House	T-25	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 156 Tai O Tai Ping Street	Shop/ factory	T-26	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 158 and No. 160 Tai O Tai Ping Street	Shop house	T-27	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 168 Tai O Tai Ping Street	Village House	T-28	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 170 Tai O Tai Ping Street	Shop/ factory Village House	T-29	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 172 Tai O Tai Ping Street	Tong Yi Zan	T-30	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Ruin beside No. 181 Tai O Tai Ping Street	Village House	T-31	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No 181 Tai O Tai Ping Street	Village House	T-32	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC



Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
No. 182 Tai O Tai Ping Street	Shop house	T-33	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 184 Tai O Tai Ping Street	Village House	T-34	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 200 Tai O Tai Ping Street	Village House	T-35	The vibration limit will be set at 15 mm/s. CS/ VM
Nos. 205 & 207 Tai O Tai Ping Street	Village House	T-36	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine east of No. 207 Tai O Tai Ping Street	Fuk Tak Gong	T-37	The vibration limit will be set at 15 mm/s. CS/ VM
Behind No. 20 Tai O Market Street, Tai o	Shop/ factory	T-42	No mitigation required
Earth Shrine on east of Rural committee Building (Kat Hing Back Street)	Shrine	T-46	No mitigation required
No. 42 Kat Hing Street	Restaurant	T-47	No mitigation required
Ruin beside No. 39 Kat Hing Back Street	Village House	T-51	The vibration limit will be set at 15 mm/s. CS/VM
No. 43 Kat Hing Back Street	Village House	T-52	The vibration limit will be set at 15 mm/s. CS/ VM
Shrine behind No. 56 Kat Hing Street	Earth Shrine	T-53	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Shrine between Nos. 77 & 79 Kat Hing Back Street	Chong Long She	T-55	The vibration limit will be set at 15 mm/s. CS/ VM
No. 77 Kat Hing Back Street	Village House	T-56	The vibration limit will be set at 15 mm/s. CS/ VM
Building between nos. 81 & 86 Kat Hing Back Street	Fuel Storage Building	T-57	The vibration limit will be set at 15 mm/s. CS/ VM
Gate near Nos. 86 & 87 Kat Hing Back Street	Entrance gate to former garden	T-58	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine near BBQ Area on path to Yeung Hau Temple	Earth Shrine	T-60	The vibration limit will be set at 15 mm/s. CS/ VM
No. 95 Kat Hing Back Street	Village House	T-61	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC





Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
Shrine to the north of No. 95 Kat Hing Back Street	Earth Shrine	T-62	The vibration limit will be set at 15 mm/s. CS/VM
No. 98 Kat Hing Back Street	Village House	T-63	The vibration limit will be set at 15 mm/s. CS/VM, BZ, PC
Gate foundation next to the gate of Tai O No.4 Flood Pumping Station	Gate Foundation	T-64	No mitigation required
No. 83 Kat Hing Back Street	Shop/ village house	T-65	The vibration limit will be set at 15 mm/s. CS/ VM
Shrine to the east of No. 111 Shek Tsai Po Street	Earth Shrine	T-68	The vibration limit will be set at 15 mm/s. CS/VM, BZ, PC, SPA
Nos. 109, 110 & 111 Shek Tsai Po Street	Shop/ Residential	T-69	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 97A Shek Tsai Po Street	Village House	T-70	No mitigation required
Shrine in front of No. 91A Shek Tsai Po Street	Earth Shrine	T-71	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Shrine in front of No. 52 Shek Tsai Po Street	Earth Shrine	T-72	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Well behind No. 6 Shek Tsai Po	Well	T-73	The vibration limit will be set at 15 mm/s. CS/ VM
Well behind No. 19 Shek Tsai Po	Well	T-74	The vibration limit will be set at 15 mm/s. CS/ VM
Shrine next to No. 34 Shek Tsai Po	Earth Shrine	T-75	The vibration limit will be set at 15 mm/s. CS/ VM
No. 44 Shek Tsai Po	Village House	T-76	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine next to No. 21 Shek Tsai Po	Earth Shrine	T-77	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Well and shrine next to No. 72 Shek Tsai Po	Well and shrine	T-78	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
No. 21 Shek Tsai Po	Village House	T-79	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shop at No. 19 Shek Tsai Po	Cheng Cheung Hing's Shrimp Store	T-80	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC



Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
Nos. 15, 16 & 17 Shek Tsai Po	Village House	T-81	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Nos. 66, 67 & 68 Shek Tsai Po	Village House	T-82	The vibration limit will be set at 15 mm/s. CS/ VM
No. 62 Shek Tsai Po	Village House	T-83	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Well south of No. 59 Shek Tsai Po	Well	T-84	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine in front of No. 8 Shek Tsai Po	Earth Shrine	T-85	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine to the northwest of 21B Leung Uk Tsuen	Earth Shrine	T-86	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Nos. 16 17 Leung Uk Tsuen	Village House	T-87	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 15 Leung Uk Tsuen	Village House	T-88	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 14 Leung Uk Tsuen	Village House	T-89	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 13 Leung Uk Tsuen	Village House	T-90	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Nos. 9 - 11 Leung Uk Tsuen	Village House	T-91	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 12 Leung Uk Tsuen	Village House	T-92	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 8 Leung Uk Tsuen	Village House	T-93	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 4 - 6 Leung Uk Tsuen (and unit beside No. 6)	Village House	T-94	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Leung Ancestral Hall in Leung Uk Tsuen	Ancestral Hall	T-95	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
No. 2 Leung Uk Tsuen	Village House	T-96	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC



Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
No. 1 Leung Uk Tsuen	Village House	T-97	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Well east of No. 1 Leung Uk Tsuen	Well	T-98	The vibration limit will be set at 15 mm/s. CS/ VM
Hung Shing Temple and shrine on Shek Tsai Po Street	Temple	T-99A	No mitigation required
	Shrine	T-99B	The vibration limit will be set at 15 mm/s. CS/VM
Ruin behind Leung Uk Playground	Village House	T-100	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine behind No 1B Nam Chung Tsuen	Earth Shrine	T-101	The vibration limit will be set at 15 mm/s. CS/ VM
Building beside No. 6 Nam Chung Tsuen	Village House	T-102	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine next to gate of No. 8 Nam Chung Tsuen	Earth Shrine	T-103	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Well next to gate of No. 8 Nam Chung Tsuen	Well	T-104	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Shrine north of No. 10 Nam Chung Tsuen	Earth Shrine	T-105	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Grave south of No. 11 Nam Chung Tsuen	Grave	T-106	The vibration limit will be set at 15 mm/s. CS/ VM
Seawall north of Nam Chung Tsuen	Seawall	T-107	The vibration limit will be set at 15 mm/s. CS/ VM
No. 8 Fan Kwai Tsuen	Village House	T-108	No mitigation required
Nos. 6 - 7 Fan Kwai Tsuen	Village House	T-109	No mitigation required
Building north of No. 6 Fan Kwai Tsuen	Village House	T-110	No mitigation required
Salt Pan north of Wang Hang Village	Salt Pan	T-111	No mitigation required
Shrine east of the bridge north of Wang Hang Village	Earth Shrine	T-112	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Well and Shrine near 21B Leung Uk Tsuen	Well and Shrine	T-113	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA



Recorded Resource	Type/ Title	Cat Ref	Mitigation Recommendations
Nos. 2 & 4 Wang Hang Village and nearby ruins	Village House	T-114	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC,
Nos. 8 – 10 Wang Hang Village	Village House	T-115	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Temple south of Nos. 11 – 13 Wang Hang Village	Wah Kwong Temple	T-116	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC, SPA
Building to the north of Nos. 19 & 20 Wang Hang Village	Village House	T-117	The vibration limit will be set at 15 mm/s. CS/ VM, BZ, PC
Salt Pan north of Nam Chung Tsuen	Salt Pan	T-118	No mitigation required

Note: (1)  
CS – Condition Survey  
VM – Vibration and Settlement Monitoring  
BZ – Buffer Zone  
PC – Provision of Protective Covering  
SPA – Safe Public Access

### 9.3 Operational Phase Mitigation Measures

#### Archaeology/Built Heritage

9.3.1 No mitigation measures will be required during the operational phase.

### 9.4 Construction Phase EM&A Requirements

9.4.1 **Appendix C, Table C7** shows the implementation schedule of the mitigation measures. Also, relevant construction phase measures recommended in the EIA Report are shown in **Section 9.2** above. All these measures shall be covered by the EM&A programme.

#### Archaeology

9.4.2 Periodic monitoring is required for the Archaeological Watching Brief to ensure compliance with agreed methodology and scope.

#### Built Heritage

9.4.3 The condition survey report shall finalise the EM&A requirements for vibration and settlement monitoring for the heritage structures requiring condition survey. This should include the type of monitoring equipment required, the location of monitoring equipment, the frequency of monitoring and reporting requirements and action plan. Protective covering, provision of buffer zone and safe public access are also EM&A



requirements.

## **9.5 Operational Phase EM&A Requirements**

### **Archaeology/ Built Heritage**

9.5.1 There are no requirements for EM&A during the operational phase.



## **10 LANDSCAPE AND VISUAL**

### **10.1 Introduction**

10.1.1 The EIA Report has recommended landscape and visual mitigation measures to be undertaken during construction and operational phases of the expansion and upgrading of Tai O STW, proposed Hang Mei SPS and proposed Fan Kwai Tong SPS (DP components) under this Project. The implementation and maintenance of landscape mitigation measures shall be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures.

### **10.2 Baseline Monitoring**

10.2.1 Baseline monitoring report shall be prepared to check, record and re-confirm the status of the LRs and LCAs within works area prior to commencement of construction works, and to review proposed mitigation measures to identify any potential conflicts among the mitigation measures, the Project works, and operational requirements, and to resolve such conflicts at early stage. Any changes to the mitigation measures should be incorporated in the detailed design.

### **10.3 Construction Phase EM&A Requirements**

10.3.1 Regular audits shall be carried out to ensure all the recommended landscape and visual mitigation measures would be effectively implemented.

10.3.2 A certified Arborist, Landscape Architect or related professional shall be employed for the implementation of landscape construction works particularly during site clearance operations when the proposed tree felling and transplanting will take place and subsequent maintenance operations.

10.3.3 All measures undertaken during the construction stage shall be audited by competent person, as a member of the Environmental Team. This shall be completed on a regular basis to ensure compliance with the intended aims of the EIA. Site inspections shall be undertaken at two times a month throughout the construction period.

### **10.4 Operational Phase EM&A Requirements**

10.4.1 During the operational phase, it is recommended that the landscape mitigation measures shall be monitored during the 12 month establishment period by a competent person to ensure the intended mitigation effects are sustained.



Compensatory tree planting required to offset the loss of existing trees if transplanting of trees is not feasible or not preferable. Additional planting works for screening and amenity purposes shall be checked regularly to ensure their health conditions are well managed. Planting must be established and sustainable to provide long term landscape mitigation.

- 10.4.2 All measures undertaken during the first year of the operational stage shall be audited by the competent person. This shall be completed on a regular basis to ensure compliance with the intended aims of the EIA. Site inspections shall be undertaken once every quarter during the first year of the operational stage.

## **10.5 Mitigation Measures**

- 10.5.1 The EIA Study has recommended mitigation measures for landscape and visual impacts during both construction and operational phase of the Project. A summary of the recommended mitigation measures is provided in **Table 10.1 and Table 10.2**. The implementation schedule of the recommended mitigation measures is provided in **Appendix C, Table C6**.



**Table 10.1 : Proposed Mitigation Measures during Construction Phase**

Landscape and Visual Impact Mitigation Measures		Implementation Agent	Management/ Maintenance Agent
CM-1	<p>Visual Screen/Hoarding</p> <p>Decorative hoarding or boundary fence for construction sites shall be considered, and designed to be compatible to the surroundings.</p>	Contractors	DSD
CM-2	<p>Protection to Existing Trees within Works Areas</p> <p>All existing trees which are not in direct conflict with the proposed works will be retained. The existing trees proposed to be retained shall be properly maintained and protected by means of fencing to prevent vehicular or pedestrian intrusion that may potentially damage tree canopies, trunks and root zones. Detailed tree protection specifications shall be allowed and included in the Contract Specification, which specifying the tree protection requirement, submission and approval system, and tree monitoring system. For trees with high preservation value, individual tree assessments and continuous tree monitoring reports shall be provided by a certified Arborist, Landscape Architect or related professional during construction. All retained trees shall be recorded photographically at the commencement of contract.</p> <p>Root pruning to the retained trees should be prohibited. Retained trees should be well-preserved by setting up a tree protection zone throughout the construction period for protecting the retained trees from damages.</p> <p>To maximize protection to existing trees and ground vegetation, construction contracts may designate "No-intrusion Zone" to various areas within the site boundary with rigid and durable fencing for each individual no-intrusion zone. The contractor should close monitor and restrict the site working staff not to enter the "no-intrusion zone", even for non-direct construction activities and storage of equipment.</p>	DSD and Contractors	DSD





Landscape and Visual Impact Mitigation Measures		Implementation Agent	Management/ Maintenance Agent
CM-3	<p><b>Tree Transplanting</b></p> <p>Existing trees to be affected shall be directly transplanted to the proposed tree receiving sites. The construction programme should also allow sufficient time for root pruning and root ball preparation prior to transplanting, if necessary, and transplanting operations to be carried out in planting season.</p> <p>Tree pruning such as topping, lion tailing would be prohibited as far as possible. Also, frequent keep watering would be necessary for transplanting trees. The proposed tree preservation measures during construction would be carried out and approved by the competent persons.</p> <p>Compensatory planting would be implemented to fully compensate for the tree and vegetation loss if transplanting of trees is considered not feasible or not preferable.</p> <p>Early preparation of trees to be transplanted shall be undertaken to increase their likely survival rate following transplanting.</p>	Contractors	DSD
CM-4	<p><b>Construction Light</b></p> <p>Security floodlight for construction areas shall be controlled, such as equipped with adjustable shield, frosted diffusers and reflective covers, at night to avoid excessive glare to the nearby areas and residents. Other security measures shall also be considered to minimize the visual impacts by construction light.</p>	Contractors	DSD
CM-5	<p><b>Dust and Erosion Control for Exposed Soil</b></p> <p>Excavation works and demolition of existing building blocks shall be well planned with precautions to suppress dust. Exposed soil shall be covered or watered often. Areas that are expected to be left with bare soil for a long period of time after excavation shall be properly covered with suitable protective fabric. Suitable drainage shall be provided around construction sites to avoid discharge of contaminants and sediments into sensitive water-based habitats.</p>	Contractors	DSD
CM-6	<p><b>Reinstatement of Works Areas</b></p> <p>The affected works areas including affected landscape shall be properly reinstated to the satisfaction of relevant government departments.</p>	Contractors	DSD



**Table 10.2 : Proposed Mitigation Measures during Operational Phase**

Landscape and Visual Impact Mitigation Measures		Implementation Agent	Management / Maintenance Agent
OM-1	<p>Architectural and Landscape Design</p> <p>The appearance of the proposed structures shall be properly designed, including a careful selection of material, colour and texture, so as to fit into the existing suburban, natural to semi-natural surroundings. The aesthetic design of the proposed structures will follow the requirements in the Guidelines on Aesthetic Design of Pumping Station Buildings and submitted to Vetting Committee on Aesthetic Design of Pumping Station Buildings (VCAB) for approval in accordance with DSD TC No. 9/2006, and circulated to ASD for comment in accordance with ETWB TCW No. 8/2005. Sufficient planting will be provided around the boundary fence of the proposed buildings for screening. Buffer planting will also be provided. All mitigation measures should also be properly annotated on the photomontages.</p>	DSD	DSD
OM-2	<p>Establishment Period</p> <p>A 12-month establishment period for the soft landscape works shall be allowed in the main contract for contractor to carry out routine horticultural operations, including watering, pruning, weeding, pest control, replacement of dead plants etc. to ensure healthy establishment of new planting during a 12 month establishment period. This period can also serves as a kind of warranty/guarantee on the quality of the plants supplied and installed by the contractor. Monthly monitoring during the first year of establishment period is recommended.</p>	DSD and Contractors	DSD
OM-3	<p>Seawall Design</p> <p>The design of the seawall for Tai O STW shall be in keeping with the adjacent landscape character.</p>	DSD	DSD



## **11 SITE INSPECTION / AUDIT**

### **11.1 Site Inspection Requirements**

- 11.1.1 Site inspections/audits provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely, at least once per week, to inspect/audit the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With reference to the Project's contractual environmental requirements, pollution control and mitigation specifications and a well established site inspection/audit, deficiency and action reporting system in accordance with the event contingency plan of the EM&A programme, the site inspection/audit would be one of the most effective tools used to enforce the environmental protection requirements on the construction site. A site inspection/audit checklist, to be used for undertaking site inspection/audit, will be prepared by the ET and submitted to the ER for approval.
- 11.1.2 The ET is responsible for formulation of the environmental site inspection/audit, deficiency and action reporting system, and for carrying out the site inspection/audit works.
- 11.1.3 Regular site inspections/audits shall be carried out at least once per week. All observations and results will be recorded in the data record sheets, which will pass to the Contractor. If non-compliance is found on site, the Event / Action Plan will be implemented.
- 11.1.4 The areas of inspection/audit shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it will also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The ET shall make reference to the following information in conducting the inspection/audit:
- (i) The EIA recommendations on environmental protection and pollution control mitigation measures;
  - (ii) Works progress and programme;
  - (iii) Individual works methodology proposals (which shall include proposal on associated pollution control measures);
  - (iv) The contract specifications on environmental protection;
  - (v) The relevant environmental protection and pollution control laws; and
  - (vi) Previous site inspection/audit results.
- 11.1.5 The Contractor shall update the ET Leader with all relevant information of the



construction contract for him to carry out the site inspections/audits. The inspection/audit results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection/audit, deficiency and action reporting system formulated by the ET to report on any remedial measures subsequent to the site inspections/audits.

- 11.1.6 Ad-hoc site inspections/audits shall also be carried out if significant environmental problems are identified. Inspections/audits may also be required subsequent to receipt of an environmental complaint, or as part of the investigation/audit work, as specified in Action Plan EM&A.

## **11.2 Compliance with Legal and Contractual Requirements**

- 11.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong, which the construction activities shall comply with.
- 11.2.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to ET Leader of vetting to see whether sufficient environmental protection and pollution control measures have been included.
- 11.2.3 The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated and that the any foreseeable potential for violating the laws can be prevented.
- 11.2.4 The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET Leader's inspection upon his request.
- 11.2.5 The ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and



pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

- 11.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

### **11.3 Environmental Complaints**

- 11.3.1 Complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall undertake the following procedures upon receipt of the complaints:

- (i) log complaint and date of receipt and inform the ER immediately;
- (ii) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- (iii) if a complaint is valid and due to works, identify mitigation measures;
- (iv) if mitigation measures are required, advise the Contractor accordingly;
- (v) review the Contractor's response on the identified mitigation measures, and the updated situation;
- (vi) if the complaint is transferred from EPD, submit interim report to EPD after endorsement by ER on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (vii) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur,
- (viii) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is FM), the results should be reported within the time frame assigned by EPD); and
- (ix) record the complaint, Investigation, the subsequent actions and the results in the monthly EM&A reports.

- 11.3.2 During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.



## **12 REPORTING**

### **12.1 Baseline Monitoring Report**

12.1.1 The baseline monitoring results, their interpretation and proposals for the Action / Limit level parameters will be presented in the form of a report which will be submitted to the ER for agreement. The report will be supported by the baseline monitoring data in electronic format prepared in HTML or PDF format, along with information from the covering monitoring locations, equipment and protocols. The agreed baseline report will then be reissued as a standalone report.

12.1.2 The baseline monitoring report shall include (but not limited to) the following elements:

- (i) Executive Summary;
- (ii) Project background information;
- (iii) Drawings showing the locations of the baseline monitoring stations;
- (iv) Monitoring methodology, equipment used and calibration details, parameters monitored, locations, dates and times, etc.;
- (v) Monitoring results (in both hard and diskette copies) including graphical plots;
- (vi) Interpretation of the significance of monitoring results and explanation of influencing factors;
- (vii) Determination of the Action and Limit levels for each monitoring parameter and statistical analysis of the baseline data;
- (viii) Revisions for inclusion in the EM&A programme; and
- (ix) Comments and conclusions.

### **12.2 Monthly EM&A Reports**

12.2.1 The results and finding of all EM&A work required in the EM&A programme shall be recorded in the monthly EM&A reports prepared by the ET Leader. Monthly EM&A Reports shall be submitted to the ER within 10 working days of the end of each reporting month, the first report will be submitted in the month after construction works commence. Copies of each monthly EM&A report shall be submitted to each of the three parties: the Contractor, the ER and DSD), and the electronic copy shall be prepared in HTML or PDF format.

12.2.2 The first monthly EM&A Report shall be included at least the following:

- (i) 1-2 pages executive summary;
- (ii) Basic project information including a synopsis of the project organisation programme and management structure, and the work undertaken during the month;
- (iii) Brief summary of EM&A requirement;
- (iv) All monitoring parameters;



- (v) Environmental quality performance limits (Action and Limit Levels);
- (vi) Event/Action Plan;
- (vii) Environmental mitigation measures;
- (viii) Environmental requirements in contract documents;
- (ix) Advice on the implementation status of environmental protection and pollution control/mitigation measures;
- (x) Drawing showing the project area, any environmental sensitive receivers and the monitoring location;
- (xi) Monitoring results together the following information:
- (xii) Monitoring Methodology;
- (xiii) Equipment used and calibration details;
- (xiv) Parameter monitored;
- (xv) Monitoring location (and depth);
- (xvi) Monitoring date, time, frequency and duration;
- (xvii) Graphical plots of monitored trends over the past four reporting periods and the following information:
  - Major activities being carried out on site during the period;
  - Weather condition during the period; and
  - Other factor which might affect the monitoring results.
- (xviii) Summary of non-compliance (exceedance) of the environmental quality performance limits (Action and Limit Levels);
- (xix) Review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (xx) Description of recommendations and/or actions taken, or outstanding, in the event of non-compliances or deficiencies, including site inspections and audits;
- (xxi) A summary record of all complaints received and follow-up actions;
- (xxii) Summary record of notification of summons, successful prosecutions for breaches of environmental protection/pollution control legislation, and actions taken to rectify such breaches; and
- (xxiii) Future key issues as reviewed from the work programme and work method statements.

12.2.3 The subsequent EM&A Reports shall include the following:

- (i) Title page;
  - 1-2 pages executive summary
  - Breaches of Action / Limit Levels;
  - Complaint Log;
  - Reporting Changes; and
  - Future key issues.
- (ii) Content Page;



- (iii) Environmental Status;
  - Drawing showing the project area, any environmental sensitive receivers and monitoring locations;
  - Monitoring results;
  - Summary of non-compliance with the AL Levels; and
  - Summary of complaints.
- (iv) Environmental Issues and Actions;
  - Review issues carried forward and/or follow-up procedures related to earlier non-compliance (complaints and deficiencies);
  - Description of the action taken in the event of non-compliance and deficiency reporting;
  - Recommendations and advice on the implementation status of the environmental mitigation measures and the corresponding effectiveness of the measurement; and
  - Summary of the updated implementation schedules.
- (v) Future Key Issues; and
- (vi) Appendix.
  - Action / Limit Levels;
  - Graphical plot of monitored parameters over the past four reporting period and the following information:
    - a) major activities being carried out on site during the period;
    - b) Weather condition during the period; and
    - c) Other factor which might affect the monitoring results.
  - Monitoring schedule for the next reporting month;
  - Cumulative complaints statistics; and
  - Details of complaints, outstanding issues and deficiencies.

## 12.3 Final Summary EM&A Report

12.3.1 The Final Summary EM&A Report shall contain at least the following information:

- (i) Executive Summary (1-2 pages);
- (ii) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) basic project information including a synopsis of the project organization contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) A brief summary of EM&A requirements including:





- environmental mitigation measures, as recommended in the EIA Report;
  - environmental impact hypotheses tested;
  - Action / Limit Levels;
  - all monitoring parameters; and
  - Event Action Plans.
- (v) A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the EIA report summarized in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post project monitoring (for the past twelve months for annual report) for all monitoring stations against;
- the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results.
- (vii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action / Limit Levels);
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) A description of the actions taken in the event of non-compliance;
- (x) A summary record of all complaints received (written or verbal) for each media liaison and consultation undertaken, action and follow-up procedures taken;
- (xi) A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations including locations and nature of the breaches, investigation, follow-up actions taken and results;
- (xii) A review of the validity of EIA Report predictions and identification of shortcomings in EIA Report recommendations;
- (xiii) A review of the effectiveness and efficiency of the mitigation measures; and
- (xiv) A review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigation action when necessary.

## **12.4 Data Keeping**

- 12.4.1 The site document such as the monitoring field records, laboratory analysis records, site inspection forms etc. are not required to be included in the monthly EM&A reports for submission. However, all documents and records shall be well kept by the ET and be ready for inspection upon request. All documents and data shall be kept for at least one year after completion of the construction contract.



## **12.5 Interim Notifications of Environmental Quality Limit Exceedances**

- 12.5.1 Interim notifications of exceedances of Limit Levels will be issued to the ER within 24 hours of the identification of an exceedance. The notification shall be followed with advice to ER on the results of investigation, proposed action and any necessary follow-up proposals in case of exceedance.



## ***Appendix A***

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### ***Line of Communication***





## ***Appendix B***

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# ***Sample of Monitoring Data Record Sheet***



### Air Quality (H<sub>2</sub>S) Monitoring Data Record Sheet

General Information					
Monitoring Location					
Date					
Weather					
Monitoring Results					
Sample No.	Time	Wind Speed	Wind Direction	Temperature	Level (ppb)
Sample 1	Start:				
	Stop:				
Sample 2	Start:				
	Stop:				
Sample 3	Start:				
	Stop:				
Sample 4	Start:				
	Stop:				
Sample 5	Start:				
	Stop:				
Sample 6	Start:				
	Stop:				
Sample 7	Start:				
	Stop:				
Sample 8	Start:				
	Stop:				
Other Observations					

	Name & Designation	Signature	Date
Recorded by:			
Checked by:			



### Sample of Odour Complaint Registration Form

Subject	Description
Name of Complainant:	
Complainant's Contact Information:	Tel:
	Fax:
	Address:
Location of Odour Nuisance:	
Date of Odour Nuisance:	
Time of Odour Nuisance:	
Type of Odour Nuisance:	
Extent of Odour Strength: (delete as appropriate)	Highly Offensive/ Offensive/ Slightly Offensive/ Continuously Detectable/ Intermittently Detectable/
Meteorological Conditions:	
Temperature	
Wind Speed	
Relative Humidity	
Wind Direction	
SPS Operation Conditions:	Normal / Abnormal
Details of Operation Conditions:	



### Noise Monitoring Data Record Sheet

Monitoring Location	
Description of Location	
Date of Monitoring	
Weather Condition	
Wind Strength (m/s)	

Equipment	Equipment No.
Sound Level Meter	
Sound Pressure Calibrator	

Calibration before measurement (dB(A))	
Calibration after measurement (dB(A))	

Measurement Start Time	
Measurement Time Length (min)	
Measurement Results (dB(A))	
$L_{eq}$	
$L_{10}$	
$L_{90}$	
Major Noise Source(s) During Measurement	
Surrounding Activities During Measurement	
Remarks	Free Field / Façade Measurement

	Name & Designation	Signature	Date
Recorded by:			
Checked by:			





### Water Quality Monitoring Data Record Sheet

Location			
Date			
Start Time (hh:mm)			
Weather			
Sea Conditions			
Tide Mode			
Water Depth (m)			
Monitoring Depth	Surface	Middle	Bottom
pH			
Salinity (ppt)			
Temperature (°C)			
DO Saturation (%)			
DO (mg/L)			
BOD <sub>5</sub> (mg/L)			
Turbidity (NTU)			
SS (mg/L)			
NH <sub>3</sub> -N (mg/L)			
TIN (mg/L)			
<i>E.coli</i> (cfu/100ml)			
Observed Construction Activities	<100m from location		
	>100m from location		
Other Observation			

Name & Designation

Signature

Date

Recorded By: \_\_\_\_\_

Checked By: \_\_\_\_\_

Note: The SS results are to be filled up once they are available from the laboratory.



## ***Appendix C***

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# ***Implementation Schedule of Mitigation Measures***

**Table C1 Implementation Schedule of Recommended Mitigation Measures – Air Quality**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.3.5.5	<p>Appropriate dust control measures should be implemented during the construction stage in accordance with the requirements in the Air Pollution Control (Construction Dust) Regulation. Dust control techniques should be considered to control dust to a level not exceeding the AQOs as well as the 1-hour TSP guideline level of 500 µg/m<sup>3</sup>. These measures include, but are not limited to, the following:</p> <ul style="list-style-type: none"> <li>• Adoption of good site practices;</li> <li>• Avoid practices likely to raise dust level;</li> <li>• Frequent cleaning and damping down of stockpiles and dusty areas of the site;</li> <li>• Covering the exposed areas with tarpaulin;</li> <li>• Reducing drop height during material handling;</li> <li>• Regular plant maintenance to minimize exhaust emission; and</li> <li>• Sweep up dust and debris at the end of each shift.</li> </ul>	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation

S.3.5.7 ~ S.3.5.8	Given each section of the works would be small scale, localised, and short-term, it would not be useful to perform dust dispersion modelling for this type of transient dust generation activities. Dust suppression and control measures stipulated in the Air Pollution Control (Construction Dust) Regulation would be applied. These measures include, but are not limited to, the following: Adoption of good site practices; Avoid practices likely to raise dust level; Frequent cleaning and damping down of stockpiles and dusty areas of the site; Covering the exposed areas with tarpaulin; Reducing drop height during material handling; Regular plant maintenance to minimize exhaust emission; and Sweep up dust and debris at the end of each shift.	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		EIA, Air Pollution Control (Construction Dust) Regulation
S.3.9.4	Based on the current design, the odour emissions from the temporary sewage treatment facilities would be ventilated to a deodorizing unit. The deodorizing unit is designed to be able to achieve an odour removal efficiency of 97%.	Odour control during operation phase	DSD and Operators		√		EIA
S.3.10.1	For the construction activities under the Project, the suitable requirements stipulated in the Air Pollution Control (Construction Dust) Regulation shall be implemented during the construction activities to minimize the dust impact. It is recommended that typical dust control methods including the following good site practices should also be incorporated during construction phase:	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Watering every hour on unpaved areas and stockpiles of dusty materials (if no tarpaulin is provided) to reduce dust emissions by 90% (e.g. watering intensity at 1.5 litre/m <sup>2</sup> during the first hour, subsequent application at 0.1 litre/m <sup>2</sup> . Actual application shall depend on the site condition and weather conditions)	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		EIA, Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Use of frequent watering for particularly dusty construction areas and areas close to ASRs	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Vehicle washing facilities should be provided at every vehicle exit point	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation

S.3.10.1	Where a site boundary adjoins a road, streets or other areas accessible to the public, hoarding of not less than 2.4 m high from ground level should be provided along the entire length except for a site entrance or exit	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Stockpiles of imported material kept on site shall be contained within hoarding, dampened and/or covered during dry and windy weather	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Material stockpiled alongside trenches should be covered with tarpaulins	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet during the non-working hours	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to keep the dusty materials wet	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Water sprays shall be used during the delivery and handling of sands aggregates and the like	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	All demolished items that may emit dust particles should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides within a day of demolition	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation

Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)							
S.3.5.7 ~ S.3.5.8	Given each section of the works would be small scale, localised, and short-term, it would not be useful to perform dust dispersion modelling for this type of transient dust generation activities. Dust suppression and control measures stipulated in the Air Pollution Control (Construction Dust) Regulation would be applied. These measures include, but are not limited to, the following: Adoption of good site practices; Avoid practices likely to raise dust level; Frequent cleaning and damping down of stockpiles and dusty areas of the site; Covering the exposed areas with tarpaulin; Reducing drop height during material handling; Regular plant maintenance to minimize exhaust emission; and Sweep up dust and debris at the end of each shift.	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		EIA, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	For the construction activities under the Project, the suitable requirements stipulated in the Air Pollution Control (Construction Dust) Regulation shall be implemented during the construction activities to minimize the dust impact. It is recommended that typical dust control methods including the following good site practices should also be incorporated during construction phase:	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1*	Watering every hour on unpaved areas and stockpiles of dusty materials (if no tarpaulin is provided) to reduce dust emissions by 90% (e.g. watering intensity at 1.5 litre/m <sup>2</sup> during the first hour, subsequent application at 0.1 litre/m <sup>2</sup> . Actual application shall depend on the site condition and weather conditions)	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		EIA, Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Use of frequent watering for particularly dusty construction areas and areas close to ASRs	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Vehicle washing facilities should be provided at every vehicle exit point	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation

S.3.10.1	Where a site boundary adjoins a road, streets or other areas accessible to the public, hoarding of not less than 2.4 m high from ground level should be provided along the entire length except for a site entrance or exit	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Stockpiles of imported material kept on site shall be contained within hoarding, dampened and/or covered during dry and windy weather	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Material stockpiled alongside trenches should be covered with tarpaulins	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet during the non-working hours	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to keep the dusty materials wet	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	Water sprays shall be used during the delivery and handling of sands aggregates and the like	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.10.1	All demolished items that may emit dust particles should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides within a day of demolition	Air Quality (fugitive dust) Control during Construction Phase	Contractors		√		Annex 4 and Annex 12 of EIAO -TM, Air Pollution Control (Construction Dust) Regulation

Operational Phase (Non Designated Project Element)							
S.3.10.2	The enclosure provided for the odour sources of the upgraded Tai O STW and new Hang Mei SPS and Fan Kwai Tong SPS and the installation of deodorization units with 97% odour removal efficiency will reduce the potential odour impacts. Odour impacts after the upgrading works will be significantly reduced. The current design information of deodorizing units is summarized in Table 3.9 of EIA.	Odour control during operation phase	DSD and Operators	√	√	√	EIA
S.3.10.3	In addition, good housekeeping practices listed below should be followed to control odour emissions from the plant and these standard practices should be included in the plant operator manual: Screens should be cleaned regularly to remove accumulated organic debris; Grit and screening transfer systems should be flushed regularly with water to remove organic debris and grit; Grit and screened materials should be transferred to closed containers to minimize odour escape; Sludge should be frequently withdrawn from tanks to prevent the production of gases; Sludge should be transferred to closed containers; and Sludge containers should be flushed with water regularly.	Odour Control during Operation Phase	DSD and Operators	√	√	√	EIA

Legend:

D – Design, C – Construction, O - Operation

BD – Building Ordinance

ETWB TCW – Environmental and Transport Works Bureau Technical Circular

HKPSG – Hong Kong Planning Standards and Guidelines

EIAO-TM – Technical Memorandum on Environmental Impact Assessment Process

TPO – Town Planning Ordinance

WBTC – Works Bureau Technical Circulars

**Remark: \* means the specified measures for the DP component**



**Table C2 Implementation Schedule of Recommended Mitigation Measures – Noise**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.4.4.9	Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following mitigation measures should be followed during the construction phase: only well-maintained plants should be operated on-site and plants should be serviced regularly during the construction works; machines and plants that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; plants known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from the NSRs; mobile plant should be sited as far away from NSRs as possible; and material stockpiles and other structures should be effectively.	Noise control during construction	Contractors, ER		√		EIA, Contractual requirements

S.4.4.12	Use of quiet plant (PME): Generator Poker, vibratory, hand-held Vibratory Compactor Breaker, excavator mounted Excavator Crane, mobile mounted	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.13 - S.4.4.14	Noise barrier in the form of site hoarding shall be used for the following PMEs where practicable: -Backhoe (mini) -Breaker, hand-held, mass>10Kg and <20Kg -Generator -Poker, vibratory hand-held -Bar Bender and cutter (electric) -Vibratory compactor -Breaker, excavator mounted -Hydraulic Vibratory Driver for driving Sheet Piling -Pilling, earth auger, auger -Hoist (electric) -Excavator -Dumper -Submersible Pump -Rock Drill, hand-held (pneumatic) -Air Compressor -Bentonite Filtering Plant -Ventilation Fan -Welding Machine -Concrete Pump -Saw, circular, wood -Winch (electric) -Drill/grinder, hand-held -Grout Mixer -Grout Pump	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.14	The barrier / enclosure material's surface mass shall be in excess of 7 kg/m <sup>2</sup> .	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.18	Avoidance of undertaking different works types at the same time near the NSRs.	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.20	Alternative construction method (Drill with chemical agent) shall be adopted for the breaking up of road surface of Works Type 1 (Construction of sewer (open cut method)) and Works Type 3 (Upgrading of existing sewer).	Noise control during construction	Contractors	√	√		EIA, Contractual requirements

Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)							
S.4.4.9*	The following mitigation measures should be followed during the construction phase: only well-maintained plants should be operated on-site and plants should be serviced regularly during the construction works; machines and plants that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; plants known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from the NSRs; mobile plant should be sited as far away from NSRs as possible; and material stockpiles and other structures should be effectively	Noise control during construction	Contractors, ER		√		EIA, Contractual requirements
S.4.4.12*	Use of quiet plant (PME): Generator Poker, vibratory, hand-held Vibratory Compactor Breaker, excavator mounted Excavator Crane, mobile mounted	Noise control during construction	Contractors		√		EIA, Contractual requirements

S.4.4.13 - S.4.4.14*	Noise barrier in the form of site hoarding shall be used for the following PME's where practicable: -Backhoe (mini) -Breaker, hand-held, mass>10Kg and <20Kg -Generator -Poker, vibratory hand-held -Bar Bender and cutter (electric) -Vibratory compactor -Breaker, excavator mounted -Hydraulic Vibratory Driver for driving Sheet Piling -Pilling, earth auger, auger -Hoist (electric) -Excavator -Dumper -Submersible Pump -Rock Drill, hand-held (pneumatic) -Air Compressor -Bentonite Filtering Plant -Ventilation Fan -Welding Machine -Concrete Pump -Saw, circular, wood -Winch (electric) -Drill/grinder, hand-held -Grout Mixer -Grout Pump	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.14*	The barrier / enclosure material's surface mass shall be in excess of 7 kg/m <sup>2</sup> .	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.18*	Avoidance of undertaking different works types at the same time near the NSRs.	Noise control during construction	Contractors		√		EIA, Contractual requirements
S.4.4.20*	Alternative construction method (Drill with chemical agent) shall be adopted for the breaking up of road surface of Works Type 1 (Construction of sewer (open cut method)) and Works Type 3 (Upgrading of existing sewer).	Noise control during construction	Contractors	√	√		EIA, Contractual requirements

Operational Phase (Non Designated Project Element)							
S.4.5.7 – S.4.5.8	<p>The equipments are designed to be installed inside the respective building structures and a reduction of 20 dB(A) can be achieved if the building enclosure is built using suitable material such as concrete with surface density of 25 kg/m<sup>2</sup>.</p> <p>The provision of acoustic louver at ventilation fans can provide significant reduction in noise levels. It is recommended that acoustic louvers be provided at the discharge point of ventilation fans with a minimum noise reduction of 10 dB(A). A 10 dB(A) reduction has also been applied to noise sources which are blocked and do not have a direct line of sight to the NSR.</p>	Noise Control	Operator of STW/SPS			√	Annex 5 of TMEIAP NCO; Good Practices on Ventilation Systems Noise Control; Good Practices on Pumping Systems Noise Control

Legend:

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**Remark: \* means the specified measures for the DP component**

**Table C3 Implementation Schedule of Recommended Mitigation Measures – Water Quality**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S 5.7.9	<p>The practices outlined in ProPECC PN 1/94 Construction Site Drainage are recommended to be adopted to minimize potential water quality impacts from construction site runoff and other construction activities. Design of mitigation measures should be submitted by the Contractor to the Engineer for approval. The mitigation measures should cover, but not limited to the following practices:</p> <ul style="list-style-type: none"> <li>-Perimeter channels are provided in the works areas to intercept runoff at site boundary prior to the commencement of any earthwork.</li> <li>-Surface runoff should be discharged into storm drains via adequately designed sand/ silt removal facilities;</li> <li>-Work programmes should be designed to minimize the size of work areas to minimize the soil exposure soil and reduce the potential for increased siltation and runoff;</li> <li>-Silt removal facilities, channels and manholes should be maintained and cleaned regularly to ensure the proper function;</li> <li>- Careful programming of the works to minimize soil excavation during the rainy season;</li> <li>- Earthwork surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed;</li> <li>- Trench excavation should be avoided in the wet season, and if necessary, it should be carried out and backfilled in short sections;</li> <li>- Open stockpiles of construction materials on site should be covered with tarpaulin or similar fabric during rainstorms.</li> </ul>	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water

S 5.7.10	Good site practices should be adopted to clean the rubbish and litter on construction sites to avoid the rubbish, debris and litter from entering to nearby water bodies. It is recommended to clean the construction sites on a regular basis.	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
S 5.7.11	The domestic sewage generated by the workforce on construction sites should be collected and discharged to the STW for proper treatment. Portable toilets should be provided by the Contractor, where necessary, to handle sewage from the workforce. The Contractor should also be responsible for the waste disposal and maintenance practices.	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
S 5.7.12 – S 5.7.13	Illegal disposal of chemicals should be strictly prohibited. Registration to EPD as a CWP (Chemical Waste Producers) is required if chemical wastes are generated and need to be disposed of. Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance (WDO). The Code of Practice on Packaging, Labelling and Storage of Chemical Wastes published under the WDO should be used as a guideline for handling chemical wastes. Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drains, fall tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water

Construction Phase (Designated Project Element - Construction of submarine sewage outfall, Item F.6)							
S 5.7.7*	<p>Construction of submarine outfall:</p> <ul style="list-style-type: none"> <li>- Dredging is to be undertaken using closed grab dredgers with a total production rate of 62.5 m<sup>3</sup>/hr;</li> <li>- Silt curtains must be deployed with an efficiency of 75% or higher for reduction of sediment release from the dredging location while dredging works is in progress;</li> <li>- All vessels be sized such that adequate clearance (i.e. minimum clearance of 0.6 m) is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;</li> <li>- Excess materials be cleaned from the decks and exposed fittings of barges before the vessel is moved;</li> <li>- Adequate freeboard (i.e. minimum of 200 m) be maintained on barges to ensure that decks are not washed by wave action;</li> <li>- All barges be fitted with tight fitting seals to their bottom openings to prevent leakage of material;</li> <li>- Construction activities not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site or dumping ground;</li> <li>- Loading of barges and hoppers be controlled to prevent splashing of dredged material to the surrounding water, and barges and hoppers not be filled to a level which would cause the overflow of materials or sediment laden water during loading or transportation;</li> <li>and</li> <li>- Decks of all vessels be kept tidy and free of oil or other substances that might be accidentally or otherwise washed overboard.</li> </ul>	Water Quality Control	Contractors, ER		√		EIA, Contractual requirements



Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)							
S 5.7.9	<p>The practices outlined in ProPECC PN 1/94 Construction Site Drainage are recommended to be adopted to minimize potential water quality impacts from construction site runoff and other construction activities. Design of mitigation measures should be submitted by the Contractor to the Engineer for approval. The mitigation measures should cover, but not limited to the following practices:</p> <ul style="list-style-type: none"> <li>-Perimeter channels are provided in the works areas to intercept runoff at site boundary prior to the commencement of any earthwork.</li> <li>-Surface runoff should be discharged into storm drains via adequately designed sand/ silt removal facilities;</li> <li>-Work programmes should be designed to minimize the size of work areas to minimize the soil exposure soil and reduce the potential for increased siltation and runoff;</li> <li>-Silt removal facilities, channels and manholes should be maintained and cleaned regularly to ensure the proper function;</li> <li>- Careful programming of the works to minimize soil excavation during the rainy season;</li> <li>- Earthwork surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed;</li> <li>- Trench excavation should be avoided in the wet season, and if necessary, it should be carried out and backfilled in short sections;</li> <li>- Open stockpiles of construction materials on site should be covered with tarpaulin or similar fabric during rainstorms.</li> </ul>	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
S 5.7.10	<p>Good site practices should be adopted to clean the rubbish and litter on construction sites to avoid the rubbish, debris and litter from entering to nearby water bodies. It is recommended to clean the construction sites on a regular basis.</p>	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
S 5.7.11	<p>The domestic sewage generated by the workforce on construction sites should be collected and discharged to the STW for proper treatment. Portable toilets should be provided by the Contractor, where necessary, to handle sewage from the workforce. The Contractor should also be responsible for the waste disposal and maintenance practices.</p>	Water Quality Control	Contractors		√		WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water

S 5.7.12 – S 5.7.13	<p>Illegal disposal of chemicals should be strictly prohibited. Registration to EPD as a CWP (Chemical Waste Producers) is required if chemical wastes are generated and need to be disposed of. Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance (WDO). The Code of Practice on Packaging, Labelling and Storage of Chemical Wastes published under the WDO should be used as a guideline for handling chemical wastes.</p> <p>Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drains, fall tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.</p>	Water Quality Control	Contractors		√	WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
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Operational Phase (Non Designated Project Element)							
S 5.7.14 – S 5.7.16	<p>Emergency discharge of raw sewage from the Tai O STW would be caused by the failure of electrical power supply or treatment units. The mitigation measures should cover, but not limited to the following practices:</p> <ul style="list-style-type: none"> <li>- Relevant governmental departments, likely EPD, LCSD and DSD should be noticed by the STW operator immediately under possibility of any emergency raw sewage discharge;</li> <li>- The STW operators should maintain good communications with various relevant parties;</li> <li>- Standby facilities for the main treatment units and standby pumps, accessories/ equipment parts should be installed to avoid the occurrence of an emergency discharge. Storm Tanks would also be incorporated to provide temporary storage of flow under extremely high flow conditions and hence reduce the chance of emergency bypass. Dual power supply or standby power sources should also be implemented to minimize the possibility of power failure;</li> <li>- The proposed STW should be designed, managed and operated properly to minimize the chance of emergency discharge of raw sewage from the STW;</li> <li>- In case of damages to the submarine outfall, the treated effluent will be diverted to the emergency outfall. Off-line tanks will be implemented to provide a buffer zone for influent or effluent storage. The treated effluent from the emergency outfall will likely meet the effluent standard for this project. Thus, the emergency outfall serves as a standby unit to the submarine outfall.</li> <li>- Contingency plan should be developed to deal with emergency discharge during the operation of the STW, which include the following: <ul style="list-style-type: none"> <li>- Locations of the sensitive receivers in vicinity of the emergency discharge;</li> <li>- A list of relevant governmental bodies to inform of and to ask for assistance in the event of an emergency discharge, including key contact persons and telephone numbers;</li> <li>- Reporting procedures required in the event of an emergency discharge;</li> <li>- Responsibility and procedure for clean-up of the affected water body/sensitive receivers after the emergency discharge; and</li> <li>- Procedures listing the most effective means in rectifying the breakdown of the pumping station to minimize the discharge duration.</li> </ul> </li> </ul>	Water Quality Control	DSD, ER and Contractors	√	√	√	WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water



S 5.7.18 – S 5.7.19	<p>Nonetheless, mitigation measures are recommended below in order to reduce the possibility of emergency bypass of sewage:</p> <ul style="list-style-type: none"><li>- A standby pump should be provided to cater for breakdown and maintenance of the duty pumps in order to avoid sewage bypass;</li><li>- An alarm should be installed to signal high water levels in the wet well to the control station of the nearest manned station or plant where the operator can take immediate rectification action;</li><li>- Standby power supply will be provided at the two SPSs;</li><li>- Twin sewer rising mains should be provided wherever technically feasible to minimize the shutdown of SPS for pipeline repairing; and</li><li>- Regular maintenance and checking of plant equipment be practiced to prevent equipment failure.</li></ul> <p>An emergency overflow bypass should be provided for each of the pumping stations to channel any overflows directly, or via the storm water drainage systems, into the local receiving water, to prevent any sewage spilled into the surrounding areas, including village streets.</p>	Water Quality Control	DSD, ER and Contractors	√	√	√	WPCO; TM –Effluent Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water
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Operational Phase (Designated Project Element - Effluent reuse facilities within the Tai O STW, Item F.4)							
S 2.10.4*	<p>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.</p> <p>Apart from the online monitoring and control system for the wastewater quality, 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.</p>	Effluent Reuse Quality Control	Operator of Tai O STW			√	WPCO; USEPA 2012 "Guidelines for Water Reuse" EIA

Legend:

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**Remark: \* means the specified measures for the DP component**



**Table C4 Implementation Schedule of Recommended Mitigation Measures – Waste Management Implication**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.6.5.1	During the planning stage, waste management measures will be implemented that will aim to recover, avoid and minimise the constructed waste generated on site by utilising the following general approach: - Reduce wastage; - Reuse materials, where possible; - Recycle materials, where possible; and - Dispose of materials after all other options have been considered.	Waste management during construction	Contractors		√		-

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
6.5.2	<p>Adverse impacts from waste management are not expected, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:</p> <ul style="list-style-type: none"> <li>- The Contractor shall prepare a WMP in accordance with the requirements set out in the ETWB TCW No. 19/2005, Waste Management on Construction Site, for the ER's approval. The WMP shall include monthly and yearly Waste Flow Tables that indicate the amounts of waste generated, recycled and disposed of (including final disposal site);</li> <li>- The Contractor's waste management practices and effectiveness shall be audited by the ER on regular basis;</li> <li>- The Contractor shall provide training for site staff for the concept of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;</li> <li>- Sufficient waste disposal points and regular collection of waste shall be provided;</li> <li>- Trucks with covering for the open-box bed and enclosed container shall be used to minimise windblown litter and dust during transportation of waste;</li> <li>- Regular cleaning and maintenance programme for drainage systems, pumps and oil interceptors;</li> <li>- Separation of chemical wastes for special handling and appropriate treatment at a Chemical Waste Treatment Facility;</li> <li>- Encourage collection of aluminium cans, paper and plastic bottles by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the workforce;</li> <li>- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;</li> <li>- A recording system for the amount of wastes generated, recycled and disposed (including disposal sites) should be proposed; and</li> <li>- Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.</li> </ul>	Waste management during construction	ER and Contractors		√		ETWB TCW No. 19/2005, Waste Management on Construction Sites; Waste Disposal Ordinance; and Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.3 to S.6.5.6	<p>C&amp;D Materials</p> <p>With good site management it can reduce the over-ordering of C&amp;D materials such as concrete and mortars. Alternatives such as steel frameworks and plastic fencing can be considered to increase the chances for reuse.</p> <p>In order to minimise the potential environmental impacts resulting from collection and transportation of C&amp;D materials for off-site disposal, the excavated materials comprising fill materials should be reused on-site as backfilling materials as far as practicable. C&amp;D waste, such as wood, plastic, steel and other metals should be reused or recycled and, as a last resort, disposed of to landfill sites. A suitable area should be designated within the site for temporary stockpiling of C&amp;D materials and to facilitate the sorting process. In order to monitor the disposal of C&amp;D materials at the designated public fill reception facility and landfill and to control fly-tipping, a trip ticket system should be included. Reference can be made to Development Bureau TC(W) No. 6/2010 "Trip Ticket System for Disposal of Construction and Demolition Materials" for details.</p> <p>The C&amp;D materials to be disposed of at public filling reception facilities shall be materials only consist of brick, concrete, cement plaster, soil and inert building debris. The materials shall be free from plastics, chemical waste, industrial metals and other materials that are considered unsuitable at the facility.</p>	Waste management during construction	Contractors		√		ETWB TCW No 6/2010, Waste Disposal Ordinance
S.6.5.7	<p>General Refuse</p> <p>General refuse should be stored in enclosed bins or compaction units separate from C&amp;D materials. A reputable waste collector should be employed by the Contractor to remove general refuse from the site regularly, separately from C&amp;D materials. An enclosed and covered area is preferred to reduce the occurrence of wind-blown light materials. In addition, a sufficient number of enclosed bins shall be provided on site for containment of general refuse to prevent visual impacts and nuisance to the sensitive surrounding.</p>	Waste management during construction	Contractors		√		Waste Disposal Ordinance



EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.8 and S.6.5.9	Chemical Waste For the disposal of chemical wastes produced at the construction site, the Contractor is required to register with the EPD as a CWP and to follow the requirements stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used. Appropriate labels should be securely attached on each chemical waste container indicating the chemical characteristics of the chemical waste, such as explosives, flammable, oxidising, irritant, toxic, harmful, corrosive, etc. The Contractor shall also use a licensed waste collector engaged to transport and dispose of the chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation	Waste management during construction	Contractors		√	√	Waste Disposal (Chemical Waste) (General) Regulation
S.6.5.10	Sewage Chemical toilets to be provided on-site shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal	Waste management during construction	Contractors		√		Waste Disposal Ordinance

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.11 and S.6.5.12	<p>Dredged Marine Sediment</p> <p>Dredged marine sediments to be disposed of at different marine disposal sites should be stored separately to avoid cross contaminated. To minimise potential odour nuisance, covers should be provided for the storage tank or barges. Different category of marine sediments should be disposed of at the designated marine designated sites.</p> <p>The testing results and sediment quantities for each category presented in this report are for EIA purposes only. For allocation of sediment disposal sites and application of marine dumping permit, another proposal for sampling and chemical testing of the sediment will be prepared and submitted to the EPD for approval following the procedures in ETWB TC(W) No. 34/2002. The approved detailed sampling and chemical testing will be carried out prior to the commencement of the dredging activities to confirm the sediment disposal methods. The contamination levels of the sediment to be dredged will be analysed and recorded. After carrying out the sampling and testing, a SQR will be prepared for EPD approval as required under the DASO to agree and confirm the quantities and extent of the contamination of the sediments prior to the dredging works. The SQR will include the sampling details, the chemical testing results, quality control records, proposed classification and delineation of sediment according to the requirements of ETWB TC(W) No. 34/2002.</p>	Waste management during construction	Contractors		√		ETWB TC(W) No. 34/2002, Dumping at Sea Ordinance

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Designated Project Element - Construction of submarine sewage outfall, Item F.6)</b>							
S.6.5.7	General Refuse General refuse should be stored in enclosed bins or compaction units separate from C&D materials. A reputable waste collector should be employed by the Contractor to remove general refuse from the site regularly, separately from C&D materials. An enclosed and covered area is preferred to reduce the occurrence of wind-blown light materials. In addition, a sufficient number of enclosed bins shall be provided on site for containment of general refuse to prevent visual impacts and nuisance to the sensitive surrounding.	Waste management during construction	Contractors		√		Waste Disposal Ordinance
S.6.5.8 and S.6.5.9	Chemical Waste For the disposal of chemical wastes produced at the construction site, the Contractor is required to register with the EPD as a CWP and to follow the requirements stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used. Appropriate labels should be securely attached on each chemical waste container indicating the chemical characteristics of the chemical waste, such as explosives, flammable, oxidising, irritant, toxic, harmful, corrosive, etc. The Contractor shall also use a licensed waste collector engaged to transport and dispose of the chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation	Waste management during construction	Contractors		√	√	Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.11 and S.6.5.12	<p>Dredged Marine Sediment</p> <p>Dredged marine sediments to be disposed of at different marine disposal sites should be stored separately to avoid cross contaminated. To minimise potential odour nuisance, covers should be provided for the storage tank or barges. Different category of marine sediments should be disposed of at the designated marine designated sites.</p> <p>The testing results and sediment quantities for each category presented in this report are for EIA purposes only. For allocation of sediment disposal sites and application of marine dumping permit, another proposal for sampling and chemical testing of the sediment will be prepared and submitted to the EPD for approval following the procedures in ETWB TC(W) No. 34/2002. The approved detailed sampling and chemical testing will be carried out prior to the commencement of the dredging activities to confirm the sediment disposal methods. The contamination levels of the sediment to be dredged will be analysed and recorded. After carrying out the sampling and testing, a SQR will be prepared for EPD approval as required under the DASO to agree and confirm the quantities and extent of the contamination of the sediments prior to the dredging works. The SQR will include the sampling details, the chemical testing results, quality control records, proposed classification and delineation of sediment according to the requirements of ETWB TC(W) No. 34/2002.</p>	Waste management during construction	Contractors		√		ETWB TC(W) No. 34/2002, Dumping at Sea Ordinance
<b>Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)</b>							
S.6.5.1	<p>During the planning stage, waste management measures will be implemented that will aim to recover, avoid and minimise the constructed waste generated on site by utilising the following general approach:</p> <ul style="list-style-type: none"> <li>- Reduce wastage;</li> <li>- Reuse materials, where possible;</li> <li>- Recycle materials, where possible; and</li> <li>- Dispose of materials after all other options have been considered.</li> </ul>	Waste management during construction	Contractors		√		-

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
6.5.2	<p>Adverse impacts from waste management are not expected, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:</p> <ul style="list-style-type: none"> <li>- The Contractor shall prepare a WMP in accordance with the requirements set out in the ETWB TCW No. 19/2005, Waste Management on Construction Site, for the ER's approval. The WMP shall include monthly and yearly Waste Flow Tables that indicate the amounts of waste generated, recycled and disposed of (including final disposal site);</li> <li>- The Contractor's waste management practices and effectiveness shall be audited by the ER on regular basis;</li> <li>- The Contractor shall provide training for site staff for the concept of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;</li> <li>- Sufficient waste disposal points and regular collection of waste shall be provided;</li> <li>- Trucks with covering for the open-box bed and enclosed container shall be used to minimise windblown litter and dust during transportation of waste;</li> <li>- Regular cleaning and maintenance programme for drainage systems, pumps and oil interceptors;</li> <li>- Separation of chemical wastes for special handling and appropriate treatment at a Chemical Waste Treatment Facility;</li> <li>- Encourage collection of aluminium cans, paper and plastic bottles by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the workforce;</li> <li>- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;</li> <li>- A recording system for the amount of wastes generated, recycled and disposed (including disposal sites) should be proposed; and</li> <li>- Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.</li> </ul>	Waste management during construction	ER and Contractors		√		ETWB TCW No. 19/2005, Waste Management on Construction Sites; Waste Disposal Ordinance; and Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.3 to S.6.5.6	<p>C&amp;D Materials</p> <p>With good site management it can reduce the over-ordering of C&amp;D materials such as concrete and mortars. Alternatives such as steel frameworks and plastic fencing can be considered to increase the chances for reuse.</p> <p>In order to minimise the potential environmental impacts resulting from collection and transportation of C&amp;D materials for off-site disposal, the excavated materials comprising fill materials should be reused on-site as backfilling materials as far as practicable. C&amp;D waste, such as wood, plastic, steel and other metals should be reused or recycled and, as a last resort, disposed of to landfill sites. A suitable area should be designated within the site for temporary stockpiling of C&amp;D materials and to facilitate the sorting process. In order to monitor the disposal of C&amp;D materials at the designated public fill reception facility and landfill and to control fly-tipping, a trip ticket system should be included. Reference can be made to Development Bureau TC(W) No. 6/2010 "Trip Ticket System for Disposal of Construction and Demolition Materials" for details.</p> <p>The C&amp;D materials to be disposed of at public filling reception facilities shall be materials only consist of brick, concrete, cement plaster, soil and inert building debris. The materials shall be free from plastics, chemical waste, industrial metals and other materials that are considered unsuitable at the facility.</p>	Waste management during construction	Contractors		√		ETWB TCW No 6/2010, Waste Disposal Ordinance
S.6.5.7	<p>General Refuse</p> <p>General refuse should be stored in enclosed bins or compaction units separate from C&amp;D materials. A reputable waste collector should be employed by the Contractor to remove general refuse from the site regularly, separately from C&amp;D materials. An enclosed and covered area is preferred to reduce the occurrence of wind-blown light materials. In addition, a sufficient number of enclosed bins shall be provided on site for containment of general refuse to prevent visual impacts and nuisance to the sensitive surrounding.</p>	Waste management during construction	Contractors		√		Waste Disposal Ordinance

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.6.5.8 and S.6.5.9	Chemical Waste For the disposal of chemical wastes produced at the construction site, the Contractor is required to register with the EPD as a CWP and to follow the requirements stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used. Appropriate labels should be securely attached on each chemical waste container indicating the chemical characteristics of the chemical waste, such as explosives, flammable, oxidising, irritant, toxic, harmful, corrosive, etc. The Contractor shall also use a licensed waste collector engaged to transport and dispose of the chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation	Waste management during construction	Contractors		√	√	Waste Disposal (Chemical Waste) (General) Regulation
S.6.5.10	Sewage Chemical toilets to be provided on-site shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal	Waste management during construction	Contractors		√		Waste Disposal Ordinance
<b>Operational Phase (Non Designated Project Element)</b>							
S.6.5.13	The major waste generated during the operational phase will be screenings, silt and debris, grits and dewatered sludge. The screenings, silt and debris and grits are considered similar in nature to general refuse and will be disposed of at landfill sites regularly by a reputable waste collector to reduce pest, odour and litter impacts. The dewatered sludge will be disposal of at Sludge Treatment Facilities.	Waste management	DSD			√	Waste Disposal Ordinance
S.6.5.14	For chemical waste generated during the operational phase, the handling procedures and disposal method are the same as those presented in Section 6.5.8 of EIA.	Waste management	DSD			√	Waste Disposal (Chemical Waste) (General) Regulation

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WBTC – Works Bureau Technical Circulars  
Remark: \* means the specified measures for the DP component

**Table C5 Implementation Schedule of Recommended Mitigation Measures – Ecology**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.8.8.1	Tree loss in affected plantation will be minimized. The two trees affected by the construction works of Hang Mei SPS will be transplanted. Impact to watercourse habitats will be avoided by using trenchless method. Works area in affected terrestrial habitats will be reinstated after completion of construction works	To minimize environmental impacts on terrestrial habitats	Contractor		√		-
S.8.8.6	Good Site Practices – The integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. Good site practice and precautionary measures will also be implemented to avoid the potential impact due to site runoff. The potential impact to terrestrial habitats surrounding the works areas due to noise and dust can also be minimised by implementation of good site practice.	To minimize environmental impacts on marine life	Contractor		√		-
S.8.8.7	Strict enforcement on no-dumping – Restrictions prohibiting dumping of rubbish, food, oil, or chemicals should be strictly enforced. This should also be covered in the contractor briefings.	To minimize environmental impacts on marine life	Contractor		√		-
S.8.8.9	Erection of Hoardings – Hoardings of 3m tall will be erected along the works area of Hang Mei SPS during construction phase. Given this measure, the potential impact to woodland and associated wildlife would be minimized.	To minimize the environmental impact to woodland and associated wildlife	Contractor		√		-
S.8.8.10	Uses of quiet machinery/construction method during the construction phase – Construction method / machinery producing less noise will be employed in order to minimise the potential impact of construction noise	To minimize the environmental impact to woodland and associated wildlife	Contractor		√		-
S.5.7	Water quality mitigation measures as required in the Water Quality section	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		EIAO-TM, WPCO and its regulations.



EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.3, 4, 5 & 6	Good site practices	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Construction Phase (Designated Project Element - Construction of submarine sewage outfall, Item F.6)</b>							
S.8.8.3	Mitigation measures for marine noise impact, i.e. decoupling of noisy equipment on vessels should be applied in present project, and the noise impact would be controlled to acceptable level. Establishment of dolphin exclusion zone and implementation of Dolphin Watching Plan should also be applied. Dolphin exclusion zone of 250m radius should be implemented in the reclamation and dredging sites during the installation of the perimeter silt curtains and any re-deployment of the perimeter silt curtains. The perimeter silt curtain installation or re-deployment works should not be commenced until a 30 minute of no dolphin sighting is made within the exclusion zone and will be suspended when any Chinese White Dolphin (CWD) is found within the exclusion zone. Once the perimeter silt curtains are installed or re-deployed, the dredging and filling works would be conducted inside the silt curtains and a dolphin exclusion zone is no longer required. Subsequently, a dolphin watching plan will then be performed. The plan would include regular inspection of the silt curtains, visual inspection of the waters surrounded by the curtains, and an action plan should be devised to cope with any unpredicted incidents such as the case that a dolphin is found within the waters surrounded by the silt curtains. The details of the dolphin exclusion zone and dolphin watching plan for works areas should be included in the EM&A programme.	To protect the acoustically sensitive Chinese White Dolphin	Contractor		√		-

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.8.8.4	The potential impacts of marine traffic disturbance or collision risk due to the work-related vessel traffic flow during construction phase are also considered. It is recommended that similar measures which are adopted in other Projects in the western Hong Kong waters to mitigate marine traffic disturbance on CWD, such as speed limits (e.g. 10 knots) and regular routes (to be determined during the construction stage by the environmental team), should be applied. The magnitude of any marine traffic disturbance impact could be controlled to acceptable level	To prevent collision of Dolphin	Contractor		√		-
S.8.8.5	Reduce re-suspension of sediments – Any significant changes in water quality or turbidity should be avoided. This could be mitigated through construction methods. This includes measures such as using closed-grab dredging, and using silt curtains around the work areas. To conclude, the number of concurrent dredging/filling work fronts should be limited, closed-grab dredging and silt curtains should be used, and the seawall should be constructed prior to the filling works.	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-
S.8.8.6	Good Site Practices – The integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. Good site practice and precautionary measures will also be implemented to avoid the potential impact due to site runoff. The potential impact to terrestrial habitats surrounding the works areas due to noise and dust can also be minimised by implementation of good site practice.	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-
S.8.8.7	Strict enforcement on no-dumping – Restrictions prohibiting dumping of rubbish, food, oil, or chemicals should be strictly enforced. This should also be covered in the contractor briefings.	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.8.8.8	Spill response plan - There will also be a spill response plan if vessels operating in the works areas will be transporting oil or other hazardous chemicals. The oil spill response plan will have specific provisions for protecting marine ecological resources. Given these measures, the marine ecosystem in the area would be protected	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-
S.5.7	Water quality mitigation measures as required in the Water Quality section	To minimize environmental impacts on marine and coastal fauna in the nearby waters.	Contractor		√		EIAO-TM, WPCO and its regulations.
S.3, 4, 5 & 6	Good site practices	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)</b>							
S.8.8.1	Tree loss in affected plantation will be minimized. The two trees affected by the construction works of Hang Mei SPS will be transplanted. Impact to watercourse habitats will be avoided by using trenchless method. Works area in affected terrestrial habitats will be reinstated after completion of construction works	To minimize environmental impacts on terrestrial habitats	Contractor		√		-
S.8.8.6	Good Site Practices – The integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. Good site practice and precautionary measures will also be implemented to avoid the potential impact due to site runoff. The potential impact to terrestrial habitats surrounding the works areas due to noise and dust can also be minimised by implementation of good site practice.	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.8.8.7	Strict enforcement on no-dumping – Restrictions prohibiting dumping of rubbish, food, oil, or chemicals should be strictly enforced. This should also be covered in the contractor briefings.	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		-
S.8.8.10	Uses of quiet machinery/construction method during the construction phase – Construction method / machinery producing less noise will be employed in order to minimise the potential impact of construction noise	To minimize the environmental impact to woodland and associated wildlife	Contractor		√		-
S.3, 4, 5 & 6	Good site practices	To minimize environmental impacts and potential ecological impacts within and near the construction site	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Operational Phase</b>							
N/A	None specific	N/A	N/A	N/A	N/A	None specific	N/A

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WBTC – Works Bureau Technical Circulars

DP-1– Construction of submarine sewage outfall (Item F.6)

DP-2 – Effluent reuse facilities within the Tai O STW (Item F.4)

DP-3 – Sewers works at Nam Chung Tsuen (Item Q.1)

**Remark: \* means the specified measures for the DP component**

**Table C6 Implementation Schedule of Recommended Mitigation Measures – Fisheries**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.5.7	Marine water quality mitigation measures as required in the Water Quality section	To protect fisheries resources	Contractor		√		EIAO-TM, WPCO and its regulations
S. 5 & 6	Good site practices	To protect fisheries resources	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Construction Phase (Designated Project Element - Construction of submarine sewage outfall, Item F.6)</b>							
S.5.7	Marine water quality mitigation measures as required in the Water Quality section	To protect fisheries resources	Contractor		√		EIAO-TM, WPCO and its regulations
S., 5 & 6	Good site practices	To protect fisheries resources	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)</b>							
S. 5 & 6	Good site practicesss	To protect fisheries resources	Contractor		√		EIAO-TM, APCO, NCO, WPCO and its regulations
<b>Operational Phase</b>							
N/A	None specific	N/A	N/A	N/A	N/A	None specific	N/A

Legend:

D – Design, C – Construction, O - Operation

BD – Building Ordinance

ETWB TCW – Environmental and Transport Works Bureau Technical Circular

HKPSG – Hong Kong Planning Standards and Guidelines

EIAO-TM – Technical Memorandum on Environmental Impact Assessment Process

TPO – Town Planning Ordinance

WBTC – Works Bureau Technical Circulars

Remark: \* means the specified measures for the DP component

**Table C7 Implementation Schedule of Recommended Mitigation Measures - Cultural Heritage**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
S.10.5.1 to S.10.5.4	An Archaeological Watching Brief during construction phase was recommended for areas with archaeological potential within the villages. In order to create a specification tailored to this Project, it was necessary to devise a means of calculating the numbers of Archaeological Watching Brief visits per section of alignment, where 'section' can nominally be taken to mean a length of sewer alignment between two manholes. Past experience has shown that engineering work of this kind tends to be conducted on the basis of short sections of alignment between two manholes. Although the lengths of alignment between manholes vary somewhat, this is nevertheless a meaningful basis upon which to decide the monitoring schedule. With this in mind, four levels of Archaeological Watching Brief frequency were matched to four different levels of archaeological potential associated with undisturbed areas of archaeological potential and areas of high to low archaeological potential but disturbed by utilities. The suggested visit frequencies for the four categories are provided in Table 10-2 of EIA. Each monitoring visit should nominally be of a day's duration and would typically involve observation, finds collection and recording as specified in Appendix 10.4 of EIA. Should significant findings be made, additional archaeological resources will be provided in the form of additional/extended visits to ensure that appropriate recording and retrieval is accomplished prior to the continuation of engineering groundworks	Identification, retrieval and recording of potential archaeological material and deposits	DSD and Contractors		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.5	Archaeological Watching Brief Scope The methodology for conducting an Archaeological Watching Brief programme is appended in Appendix 10.4 of EIA	Identification, retrieval and recording of potential archaeological material and deposits	DSD and Contractors		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.10.5.11 – S.10.5.12	<p>Condition Survey (CS)</p> <p>A condition survey must be carried out by qualified building surveyor or engineer in advance of works for Graded Historic Buildings and structures and Nil Graded heritage structures that may be affected by ground borne vibration. The Condition Survey Report should contain descriptions of the structure, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended.</p> <p>The condition survey report for Graded Historic Buildings must be submitted to AMO for comment before construction activities commence. The location of proposed monitoring point in the building should avoid damaging the historic fabric and approved by the owner. The contractor must implement the approved monitoring and precautionary measures.</p>	Identification of heritage buildings and structures that may be damaged by ground borne vibration.	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.13 – S.10.5.14	<p>Vibration and Settlement Monitoring (VM)</p> <p>Indirect impacts from construction related activities, such as concrete breaking and excavation works may occur if conducted in the vicinity of built heritage structures. This distance that required attention will be defined as 20 m from the proposed works area.</p> <p>Vibration and settlement monitoring should be undertaken during the construction works to ensure that safe levels of vibration and settlement are not exceeded. A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted. The Alert/Alarm/Action limits for settlement shall be 6mm, 8mm and 10mm respectively. It should be noted that the condition survey report should highlight if the limit should be lowered after the detailed study of the condition of the building. A monitoring schedule should be included in the condition survey report. The location of any monitoring equipment in the building must be approved by the owner before installation and should avoid damaging the historic fabric.</p>	Prevention of damage from ground borne vibration during the construction phase	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.15	<p>Provision of Buffer Zones (BZ)</p> <p>A buffer zone should be provided to separate the building from the construction works. The buffer zone should be clearly marked out by temporary fencing. The buffer zone should be made at least 1 m from the proposed works or if this is not possible as large as the site restrictions allow.</p>	Prevention of damage to heritage structures from contact with equipment and machinery during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.10.5.16	Provision of Protective Covering (PC) Protective covering in the form of plastic sheeting on a movable fence should be provided for external walls and surfaces of historical buildings and structures in close proximity to works areas, i.e. areas where a buffer zone alone cannot provide protection from equipment and works activities.	Prevention of damage to heritage structures from contact with equipment and machinery during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.17	Safe Public Access (SPA) Any proposed works in close proximity to buildings or structures used by the public for religious, ritual or funerary purposes, such as shrines, ancestral halls, temples and graves have the potential to create an unsafe environment for members of the public. The contractor must ensure that safe public access is maintained, through provision of clearly marked paths separated from the construction works	To ensure the safety of members of the public when using heritage structures during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment



EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)</b>							
S.10.5.1 to S.10.5.4	An Archaeological Watching Brief during construction phase was recommended for areas with archaeological potential within the villages. In order to create a specification tailored to this Project, it was necessary to devise a means of calculating the numbers of Archaeological Watching Brief visits per section of alignment, where 'section' can nominally be taken to mean a length of sewer alignment between two manholes. Past experience has shown that engineering work of this kind tends to be conducted on the basis of short sections of alignment between two manholes. Although the lengths of alignment between manholes vary somewhat, this is nevertheless a meaningful basis upon which to decide the monitoring schedule. With this in mind, four levels of Archaeological Watching Brief frequency were matched to four different levels of archaeological potential associated with undisturbed areas of archaeological potential and areas of high to low archaeological potential but disturbed by utilities. The suggested visit frequencies for the four categories are provided in Table 10-2 of EIA. Each monitoring visit should nominally be of a day's duration and would typically involve observation, finds collection and recording as specified in Appendix 10.4 of EIA. Should significant findings be made, additional archaeological resources will be provided in the form of additional/extended visits to ensure that appropriate recording and retrieval is accomplished prior to the continuation of engineering groundworks	Identification, retrieval and recording of potential archaeological material and deposits	DSD and Contractors		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.5	Archaeological Watching Brief Scope The methodology for conducting an Archaeological Watching Brief programme is appended in Appendix 10.4 of EIA	Identification, retrieval and recording of potential archaeological material and deposits	DSD and Contractors		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.10.5.11 – S.10.5.12	<p>Condition Survey (CS)</p> <p>A condition survey must be carried out by qualified building surveyor or engineer in advance of works for Graded Historic Buildings and structures and Nil Graded heritage structures that may be affected by ground borne vibration. The Condition Survey Report should contain descriptions of the structure, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended.</p> <p>The condition survey report for Graded Historic Buildings must be submitted to AMO for comment before construction activities commence. The location of proposed monitoring point in the building should avoid damaging the historic fabric and approved by the owner. The contractor must implement the approved monitoring and precautionary measures.</p>	Identification of heritage buildings and structures that may be damaged by ground borne vibration.	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.13 – S.10.5.14	<p>Vibration and Settlement Monitoring (VM)</p> <p>Indirect impacts from construction related activities, such as concrete breaking and excavation works may occur if conducted in the vicinity of built heritage structures. This distance that required attention will be defined as 20 m from the proposed works area.</p> <p>Vibration and settlement monitoring should be undertaken during the construction works to ensure that safe levels of vibration and settlement are not exceeded. A maximum level of 5 mm/s for Grade 1, 7.5 mm/s for Grades 2 and 3 Historic Buildings and 15 mm/s for Nil Graded heritage structures should be adopted. The Alert/Alarm/Action limits for settlement shall be 6mm, 8mm and 10mm respectively. It should be noted that the condition survey report should highlight if the limit should be lowered after the detailed study of the condition of the building. A monitoring schedule should be included in the condition survey report. The location of any monitoring equipment in the building must be approved by the owner before installation and should avoid damaging the historic fabric.</p>	Prevention of damage from ground borne vibration during the construction phase	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.15	<p>Provision of Buffer Zones (BZ)</p> <p>A buffer zone should be provided to separate the building from the construction works. The buffer zone should be clearly marked out by temporary fencing. The buffer zone should be made at least 1 m from the proposed works or if this is not possible as large as the site restrictions allow.</p>	Prevention of damage to heritage structures from contact with equipment and machinery during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
S.10.5.16	Provision of Protective Covering (PC) Protective covering in the form of plastic sheeting on a movable fence should be provided for external walls and surfaces of historical buildings and structures in close proximity to works areas, i.e. areas where a buffer zone alone cannot provide protection from equipment and works activities.	Prevention of damage to heritage structures from contact with equipment and machinery during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
S.10.5.17	Safe Public Access (SPA) Any proposed works in close proximity to buildings or structures used by the public for religious, ritual or funerary purposes, such as shrines, ancestral halls, temples and graves have the potential to create an unsafe environment for members of the public. The contractor must ensure that safe public access is maintained, through provision of clearly marked paths separated from the construction works	To ensure the safety of members of the public when using heritage structures during the construction works	Contractor		√		EIAO-TM/ AMO/ Guidelines for Cultural Heritage Impact Assessment
<b>Operational Phase</b>							
N/A	None specific	N/A	N/A	N/A	N/A	None specific	N/A

Legend:

D – Design, C – Construction, O - Operation

BD – Building Ordinance

ETWB TCW – Environmental and Transport Works Bureau Technical Circular

HKPSG – Hong Kong Planning Standards and Guidelines

EIAO-TM – Technical Memorandum on Environmental Impact Assessment Process

TPO – Town Planning Ordinance

WBTC – Works Bureau Technical Circulars

**Remark: \* means the specified measures for the DP component**

**Table C8 Implementation Schedule of Recommended Mitigation Measures - Landscape & Visual**

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Non Designated Project Element)</b>							
Table 11.17	CM-1 Visual Screen/Hoarding Decorative hoarding or boundary fence for construction sites shall be considered, and designed to be compatible to the surroundings.	To minimize the potential visual impacts	Contractors	√	√		N/A
Table 11.17	CM-2 Protection to Existing Trees within Works Areas All existing trees which are not in direct conflict with the proposed works will be retained. The existing trees proposed to be retained shall be properly maintained and protected by means of fencing to prevent vehicular or pedestrian intrusion that may potentially damage tree canopies, trunks and root zones. Detailed tree protection specifications shall be allowed and included in the Contract Specification, which specifying the tree protection requirement, submission and approval system, and tree monitoring system. For trees with high preservation value, individual tree assessments and continuous tree monitoring reports shall be provided by a certified Arborist, Landscape Architect or related professional during construction. All retained trees shall be recorded photographically at the commencement of contract. Root pruning to the retained trees should be prohibited. Retained trees should be well-preserved by setting up a tree protection zone throughout the construction period for protecting the retained trees from damages. To maximize protection to existing trees and ground vegetation, construction contracts may designate "No-intrusion Zone" to various areas within the site boundary with rigid and durable fencing for each individual no-intrusion zone. The contractor should close monitor and restrict the site working staff not to enter the "no-intrusion zone", even for non-direct construction activities and storage of equipment.	Landscape mitigation measures	Contractors	√	√		EIA, DEVB TCW No. 7/2015, 'Guidelines on Tree Preservation during Development' issued by GLTM Section, DEVB

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
Table 11.17	<p>CM-3 Tree Transplanting</p> <p>Existing trees to be affected shall be directly transplanted to the proposed tree receiving sites. The construction programme should also allow sufficient time for root pruning and root ball preparation prior to transplanting, if necessary, and transplanting operations to be carried out in planting season.</p> <p>Tree pruning such as topping, lion tailing would be prohibited as far as possible. Also, frequent keep watering would be necessary for transplanting trees. The proposed tree preservation measures during construction would be carried out and approved by the competent persons.</p> <p>Compensatory planting would be implemented to fully compensate for the tree and vegetation loss if transplanting of trees is considered not feasible or not preferable.</p> <p>Early preparation of trees to be transplanted shall be undertaken to increase their likely survival rate following transplanting.</p>	Landscape mitigation measures	Contractors	√	√	√	EIA, DEVB TCW No. 7/2015, 'Guidelines on Tree Transplanting' issued by GLTM Section, DEVB
Table 11.17	<p>CM-4 Construction Light</p> <p>Security floodlight for construction areas shall be controlled, such as equipped with adjustable shield, frosted diffusers and reflective covers, at night to avoid excessive glare to the nearby areas and residents. Other security measures shall also be considered to minimize the visual impacts by construction light.</p>	To reduce the night-time glare effect to the surrounding environs.	Contractors		√		EIA
Table 11.17	<p>CM-5 Dust and Erosion Control for Exposed Soil</p> <p>Excavation works and demolition of existing building blocks shall be well planned with precautions to suppress dust. Exposed soil shall be covered or watered often. Areas that are expected to be left with bare soil for a long period of time after excavation shall be properly covered with suitable protective fabric. Suitable drainage shall be provided around construction sites to avoid discharge of contaminants and sediments into sensitive water-based habitats.</p>	To minimize the disturbance to existing landscape resources and minimize the impacts on the visual amenity of the area	Contractors		√		EIA
Table 11.17	<p>CM-6 Reinstatement of Works Areas</p> <p>The affected works areas including affected landscape shall be properly reinstated to the satisfaction of relevant government departments.</p>	Landscape mitigation measures	Contractors		√		EIA

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
<b>Construction Phase (Designated Project Element - Sewers works at Nam Chung Tsuen, Item Q.1)</b>							
Table 11.17	CM-1 Visual Screen/Hoarding Decorative hoarding or boundary fence for construction sites shall be considered, and designed to be compatible to the surroundings.	To minimize the potential visual impacts	Contractors		√		N/A
Table 11.17	CM-2 Protection to Existing Trees within Works Areas All existing trees which are not in direct conflict with the proposed works will be retained. The existing trees proposed to be retained shall be properly maintained and protected by means of fencing to prevent vehicular or pedestrian intrusion that may potentially damage tree canopies, trunks and root zones. Detailed tree protection specifications shall be allowed and included in the Contract Specification, which specifying the tree protection requirement, submission and approval system, and tree monitoring system. For trees with high preservation value, individual tree assessments and continuous tree monitoring reports shall be provided by a certified Arborist, Landscape Architect or related professional during construction. All retained trees shall be recorded photographically at the commencement of contract. Root pruning to the retained trees should be prohibited. Retained trees should be well-preserved by setting up a tree protection zone throughout the construction period for protecting the retained trees from damages. To maximize protection to existing trees and ground vegetation, construction contracts may designate "No-intrusion Zone" to various areas within the site boundary with rigid and durable fencing for each individual no-intrusion zone. The contractor should close monitor and restrict the site working staff not to enter the "no-intrusion zone", even for non-direct construction activities and storage of equipment.	Landscape mitigation measures	Contractors	√	√		EIA, DEVB TCW No. 7/2015, 'Guidelines on Tree Preservation during Development' issued by GLTM Section, DEVB
Table 11.17	CM-4 Construction Light Security floodlight for construction areas shall be controlled, such as equipped with adjustable shield, frosted diffusers and reflective covers, at night to avoid excessive glare to the nearby areas and residents. Other security measures shall also be considered to minimize the visual impacts by construction light.	To reduce the night-time glare effect to the surrounding environs.	Contractors		√		EIA

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
Table 11.17	CM-5 Dust and Erosion Control for Exposed Soil Excavation works and demolition of existing building blocks shall be well planned with precautions to suppress dust. Exposed soil shall be covered or watered often. Areas that are expected to be left with bare soil for a long period of time after excavation shall be properly covered with suitable protective fabric. Suitable drainage shall be provided around construction sites to avoid discharge of contaminants and sediments into sensitive water-based habitats.	To minimize the disturbance to existing landscape resources and minimize the impacts on the visual amenity of the area	Contractors		√		EIA
Table 11.17	CM-6 Reinstatement of Works Areas The affected works areas including affected landscape shall be properly reinstated to the satisfaction of relevant government departments.	Landscape mitigation measures	Contractors		√		EIA
<b>Operational Phase (Non Designated Project Element)</b>							
Table 11.18	OM-1 Architectural and Landscape Design The appearance of the proposed structures shall be properly designed, including a careful selection of material, colour and texture, so as to fit into the existing suburban, natural to semi-natural surroundings. The aesthetic design of the proposed structures will follow the requirements in the Guidelines on Aesthetic Design of Pumping Station Buildings and submitted to Vetting Committee on Aesthetic Design of Pumping Station Buildings (VCAB) for approval in accordance with DSD TC No. 9/2006, and circulated to ASD for comment in accordance with ETWB TCW No. 8/2005. Sufficient planting will be provided around the boundary fence of the proposed buildings for screening. Buffer planting will also be provided. All mitigation measures should also be properly annotated on the photomontages.	To ensure the proposals are integrated with the existing landscape and visual content, and avoid cluster effect.	Project Engineer and Landscape Architect	√		√	EIA, DSD TC No. 9/2006, ETWB TCW No. 8/2005

EIA Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures			What requirements or standards for the measures to achieve?
				D	C	O	
Table 11.18	OM-2 Establishment Period A 12-month establishment period for the soft landscape works shall be allowed in the main contract for contractor to carry out routine horticultural operations, including watering, pruning, weeding, pest control, replacement of dead plants etc. to ensure healthy establishment of new planting during a 12 month establishment period. This period can also serve as a kind of warranty/guarantee on the quality of the plants supplied and installed by the contractor. Monthly monitoring during the first year of establishment period is recommended.	The planting proposal seeks to compensate for the predicted tree loss resulting from the construction of the proposed works, visually integrate the proposals within its existing landscape framework and provide an improved visual amenity for future users.	Project Proponent			√	EIA, Section 3 of General Specification for Civil Engineering Works Volume 1, 2006 Edition
Table 11.18	OM-3 Seawall Design The design of the seawall for Tai O STW shall be in keeping with the adjacent landscape character.	To ensure the proposals are integrated with the existing landscape character of Tai O STW.	Project Proponent	√		√	EIA

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**Remark: \* means the specified measures for the DP component**





## *Appendix D*

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# *Methodology for Archaeological Watching Brief (AWB)*



## **Methodology for Archaeological Watching Brief (AWB)**

### **1. Introduction**

Archaeological Watching Brief (AWB) is a form of mitigation which is required when engineering works impact on areas that have been assessed as having some degree of archaeological potential and where conventional testing methods are deemed insufficient. The range of archaeological resources that require monitoring include both historical and prehistoric material and features.

An AWB should be undertaken by a qualified and licensed archaeologist during engineering groundworks works during the construction stage. A qualified archaeologist should inspect the site at an interval that will depend upon the archaeological potential of the area in question and the nature and duration of the construction programme. Details of the frequency of inspection will be provided to AMO for review and comment once the detailed construction programme has been finalised. A construction programme should be provided to the archaeologist carrying out such Watching Brief prior to the commencement of site works in order to arrange the inspection schedule. The archaeologist should be notified no less than 3 working days prior to any changes to the construction programme so that arrangements can be made to monitor the works. The Engineer should facilitate arrangements and liaise between the archaeologist and construction contractor.

The Watching Brief process entails the observation of the engineering works by qualified archaeologists in order to identify any archaeological material or features revealed during engineering groundworks. Site staff within the project area should inform the archaeologist in case of discovery of antiquities in the course of excavation works. Upon identification of such material or features the archaeologists will require immediate access to the excavation area for recording of the material/features *in situ*, artefact/ecofacts retrieval and sample collection. The archaeologist should recommend and agree with AMO appropriate mitigation measures/follow up action(s) including arranging more time and resources to conduct necessary archaeological works.

These guidelines serve two basic purposes: firstly, to ensure that the archaeological resources are adequately recorded and recovered and secondly, that appropriate measures are taken on site to create a minimum of delays to the engineering schedule.

### **2. Detailed Methodology of the Archaeological Watching Brief (AWB)**

#### **2.1 Watching Brief Personnel & Licence Requirements**

Watching Brief should be undertaken by a qualified archaeologist, who must apply for a licence under the Antiquities and Monuments Ordinance (Cap. 53) from the Antiquity Authority before the commencement of archaeological fieldwork. Such licences are valid for a period of 12 months, and for projects lasting longer than one year it will therefore be necessary to renew the licence. In order to facilitate such licence renewal, the archaeologist must provide with the application an interim report summarising the works conducted and findings made during the existing licence period. All staff employed by the archaeologist must be suitably qualified and experienced for their



roles.

## **2.2 Areas to be monitored**

The areas which require AWB must be defined and submitted by the qualified archaeologist under the project and agreed with AMO prior to commencement of works.

## **2.3 Site access**

Archaeologists should be allowed reasonable access to relevant areas of engineering groundworks, so that deposits can be examined and recorded. Trenches may require temporary shoring and engineering groundworks might need to be temporarily rescheduled, to provide a safe environment for such works. Provision should be made, at the earliest stage of construction programming, for specific blocks of time to be available for unrestricted archaeological access to areas of groundworks in the identified area of archaeological potential.

## **2.4 Monitoring and retrieval methodology**

The table below shows the various categories of archaeological material and features that are most likely to occur in local contexts. Also listed are the recommended type and degree of recording and retrieval required for each category.



<b>Categories of Archaeological Materials</b>	<b>Retrieval &amp; Recording Procedures</b>
<p><b>Human Burial</b> Skeletal remains Items associated with human burial, i.e. grave goods</p>	<p><b>Full Recording &amp; Recovery of Human Remains &amp; Associated Artefacts &amp; Ecofacts</b></p> <ul style="list-style-type: none"> <li>▪ Complete recording by photography, drawing, written description</li> <li>▪ Full measurement of burial and surrounding matrix</li> <li>▪ Retrieval of human remains and associated artefacts &amp; ecofacts</li> <li>▪ Retrieval of surrounding soil for further analysis</li> </ul>
<p><b>Intact Features</b> Structural/architectural remains Undisturbed contexts, e.g. hearth, midden, habitation area, assemblages of artefacts and/or environmental material</p>	<p><b>Full Recording of Archaeological Features &amp; Recovery of Artefacts/Ecofacts</b></p> <ul style="list-style-type: none"> <li>▪ Recording and measurement of salient features by photography, drawing and written description</li> <li>▪ Retrieval of artefacts &amp; ecofacts</li> <li>▪ Retrieval of samples from the surrounding matrix</li> </ul>
<p><b>Intact Artefacts</b> Complete objects, e.g. pottery, metal objects, stone and bone tools. The objects are complete but isolated and are not part of assemblage of feature</p>	<p><b>Recovery of Artefacts &amp; Record of Matrix</b></p> <ul style="list-style-type: none"> <li>▪ Retrieval of objects</li> <li>▪ Recording by written description and photography</li> <li>▪ Sampling of surrounding matrix</li> </ul>
<p><b>Isolated &amp; Fragmentary Material</b> Pottery sherds, non-human bone, other artefact fragments (e.g. metal, tile, glass). There are no complete objects, the material is isolated and fragmentary in nature</p>	<p><b>Recovery of Archaeological Material &amp; Recording as Appropriate</b></p> <ul style="list-style-type: none"> <li>▪ Retrieval of fragmentary artefacts &amp; ecofacts</li> <li>▪ Recording by written description and photography, as appropriate</li> <li>▪ Sampling of surrounding matrix</li> </ul>
<p><b>Deposits with Archaeological Potential</b></p> <ul style="list-style-type: none"> <li>▪ Soil deposits which exhibit characteristics associated with archaeological remains in Hong Kong</li> </ul>	<p><b>Sampling of Deposit</b></p> <ul style="list-style-type: none"> <li>▪ Recording of soils by photography and written description</li> <li>▪ Collection of soil samples from deposits displaying archaeological potential</li> </ul>

Any archaeological materials recovered during the programme should be properly recorded and submitted to the AMO. Upon the discovery of significant archaeological remains, the qualified archaeologist will contact both the AMO informing them of the discovery and the Site Engineer to ensure a temporary suspension of works. Any follow-up works, if required, should be conducted following consultation and agreement with the AMO.

## 2.5 Recording forms for Archaeological Watching Brief (AWB)

Full and proper records (written, graphic, electronic and photographic as appropriate) should be made for all work undertaken. Standardised forms are used for the recording of any archaeological material identified during the AWB and these would typically include the following:



- Registers to record the finds, special finds, contexts, photographs, drawings, levels and samples;
- Context description forms; and
- A daily record form designed specifically for AWB. This form must locate clearly the area of works monitored, the nature and extent of the works, and summaries of the day's findings all cross-referenced to register numbers used that day.

## 2.6 Safety requirements

Archaeologists and staff employed in monitoring must follow the safety procedures enforced by the contractors on site.

## 2.7 Archaeological Watching Brief Report

The procedures and result of the AWB should be presented in report form, following standards set by the AMO for reports on other types of archaeological field work. This includes details of the overall programme, methodology, sampling strategy, implementation, findings and interpretation. The report should be submitted to the AMO for approval in draft and, following resolution of any comments, in final form. All data, material and records forming the site archive must be submitted to the AMO upon completion of the project. The Watching Brief report should contain, as a minimum, the following elements:

- Non-technical summary
- Site location (including maps and relevant drawings) and descriptions
- Context of the project
- Geological and topographical background
- Archaeological and historical background
- General and specific aims of field works monitoring
- Reference to relevant legislation
- Field methodology
- Results
- Conclusion
- Recommendations
- Appendices and supporting illustrations including maps, drawings, photos of site and finds
- References

In addition to the draft and final Watching Brief Report, periodic progress reports will be compiled for the separate works areas and submitted to AMO. The duration which each progress report should cover is to be decided in agreement with AMO, bi-monthly progress reports are proposed.



## **2.8 Mitigation Measures**

The Contractor should be sufficiently flexible to allow any necessary contingency arrangements to be implemented. Should significant archaeological materials be discovered, appropriate mitigation measures will be designed and implemented with the prior approval of the AMO.



## *Figures*






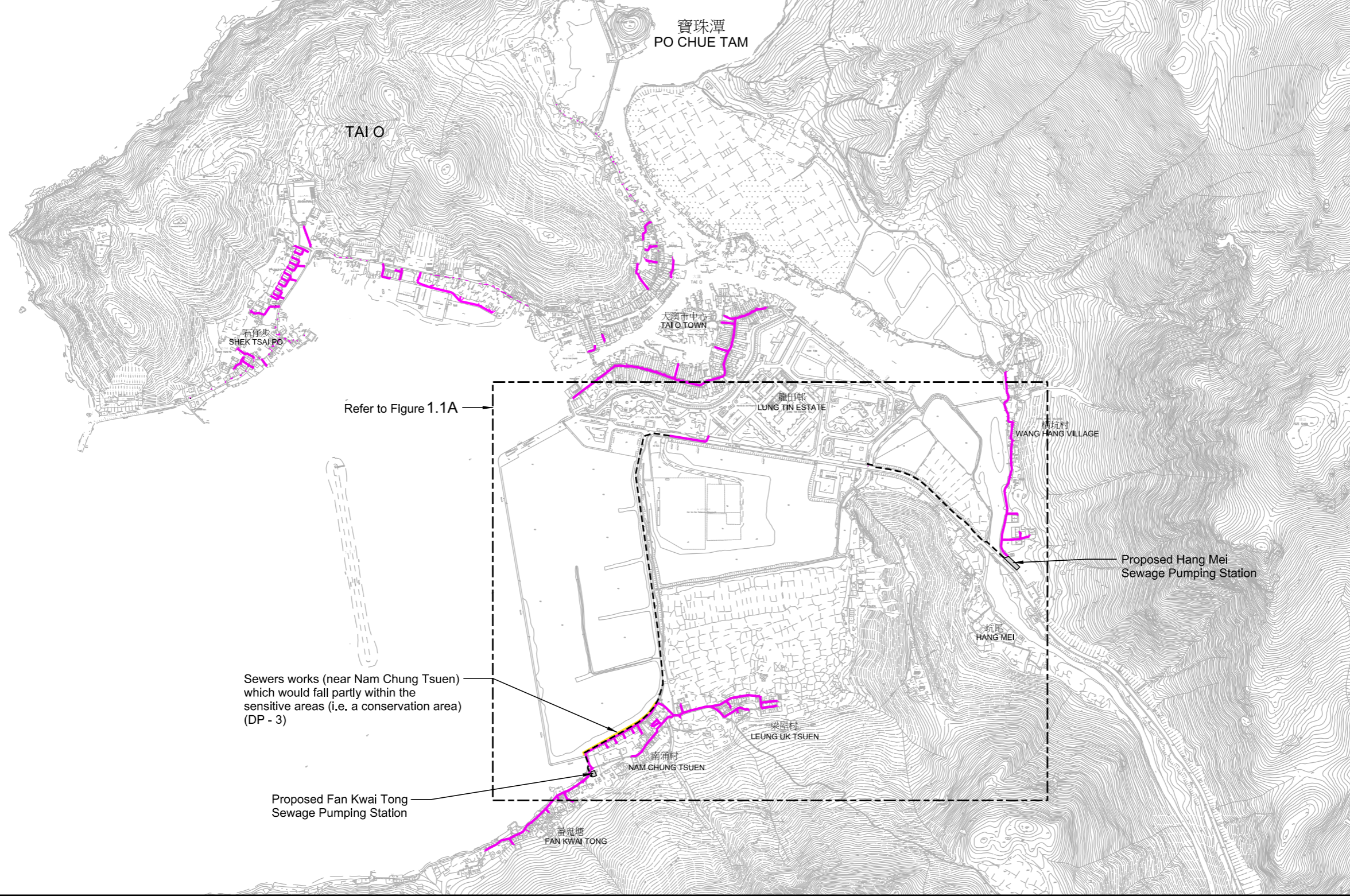


Proposed Submarine Outfall (DP - 1)

Proposed Expansion and Upgrading of the Tai O Sewage Treatment Works

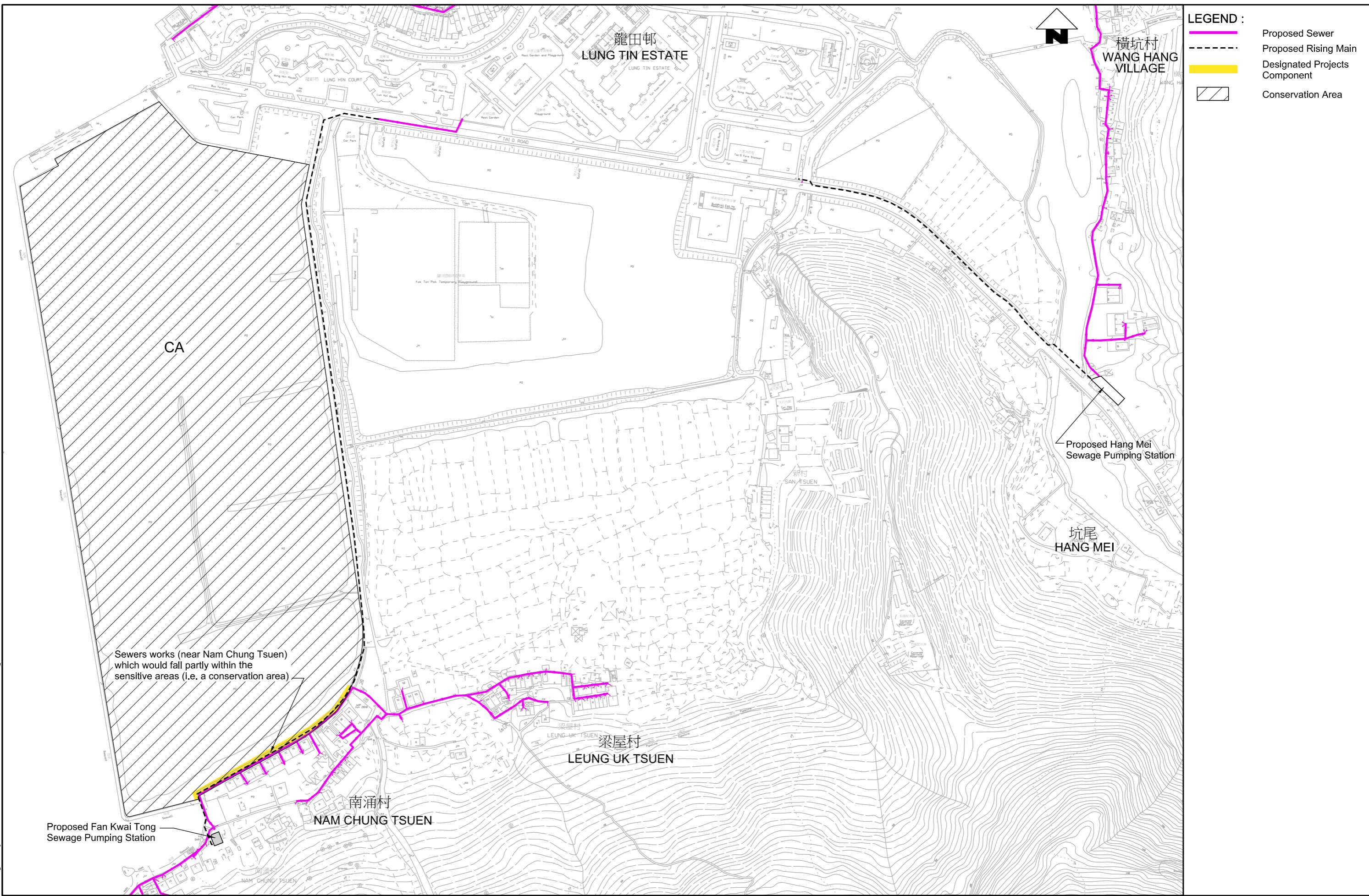
Proposed Treated Effluent Reuse in Tai O STW (DP - 2)

- LEGEND :**
-  Proposed Sewer
  -  Proposed Rising Main
  -  Designated Projects Components
  - DP - 1: Proposed submarine outfall;
  - DP - 2: Proposed Treated Effluent Reuse in Tai O STW;
  - DP - 3: Proposed sewers works near Nam Chung Tsuen



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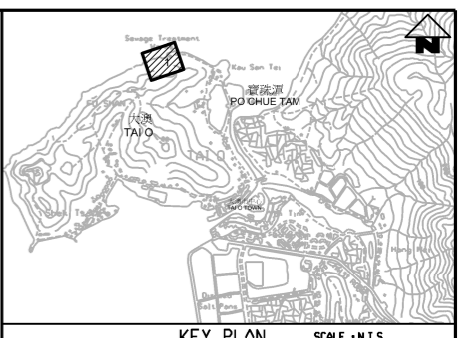
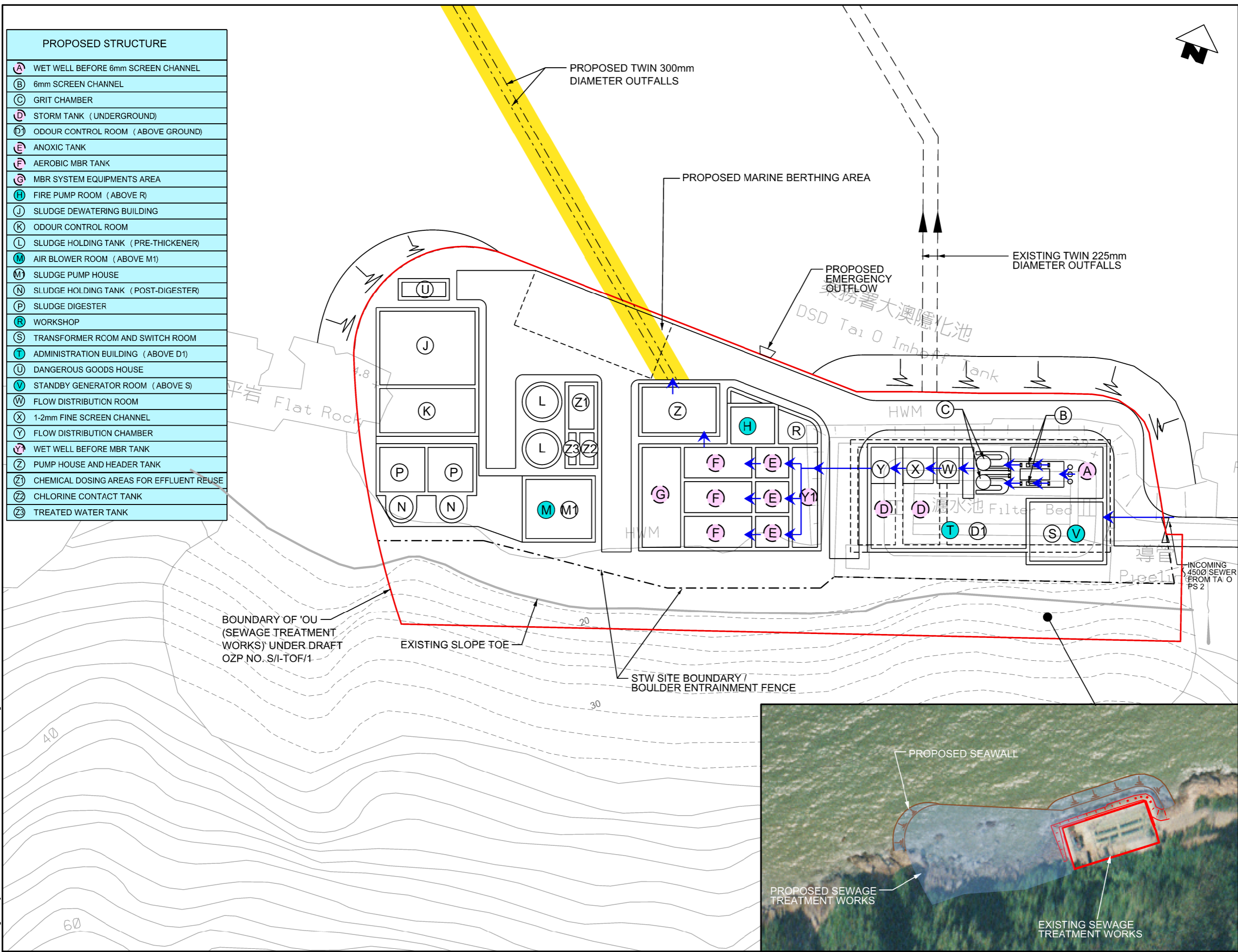
- LEGEND :**
- Proposed Sewer
  - - - Proposed Rising Main
  - Designated Projects Component
  - Conservation Area

Sewers works (near Nam Chung Tsuen) which would fall partly within the sensitive areas (i.e. a conservation area)

Proposed Fan Kwai Tong Sewage Pumping Station

Proposed Hang Mei Sewage Pumping Station

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KEY PLAN SCALE: 1:N.T.S.

PROPOSED STRUCTURE	
(A)	WET WELL BEFORE 6mm SCREEN CHANNEL
(B)	6mm SCREEN CHANNEL
(C)	GRIT CHAMBER
(D)	STORM TANK (UNDERGROUND)
(E)	ODOUR CONTROL ROOM (ABOVE GROUND)
(F)	ANOXIC TANK
(G)	AEROBIC MBR TANK
(H)	MBR SYSTEM EQUIPMENTS AREA
(I)	FIRE PUMP ROOM (ABOVE R)
(J)	SLUDGE DEWATERING BUILDING
(K)	ODOUR CONTROL ROOM
(L)	SLUDGE HOLDING TANK (PRE-THICKENER)
(M)	AIR BLOWER ROOM (ABOVE M1)
(M1)	SLUDGE PUMP HOUSE
(N)	SLUDGE HOLDING TANK (POST-DIGESTER)
(P)	SLUDGE DIGESTER
(R)	WORKSHOP
(S)	TRANSFORMER ROOM AND SWITCH ROOM
(T)	ADMINISTRATION BUILDING (ABOVE D1)
(U)	DANGEROUS GOODS HOUSE
(V)	STANDBY GENERATOR ROOM (ABOVE S)
(W)	FLOW DISTRIBUTION ROOM
(X)	1-2mm FINE SCREEN CHANNEL
(Y)	FLOW DISTRIBUTION CHAMBER
(Z)	WET WELL BEFORE MBR TANK
(Z1)	PUMP HOUSE AND HEADER TANK
(Z2)	CHEMICAL DOSING AREAS FOR EFFLUENT REUSE
(Z3)	CHLORINE CONTACT TANK
(Z4)	TREATED WATER TANK

LEGEND:

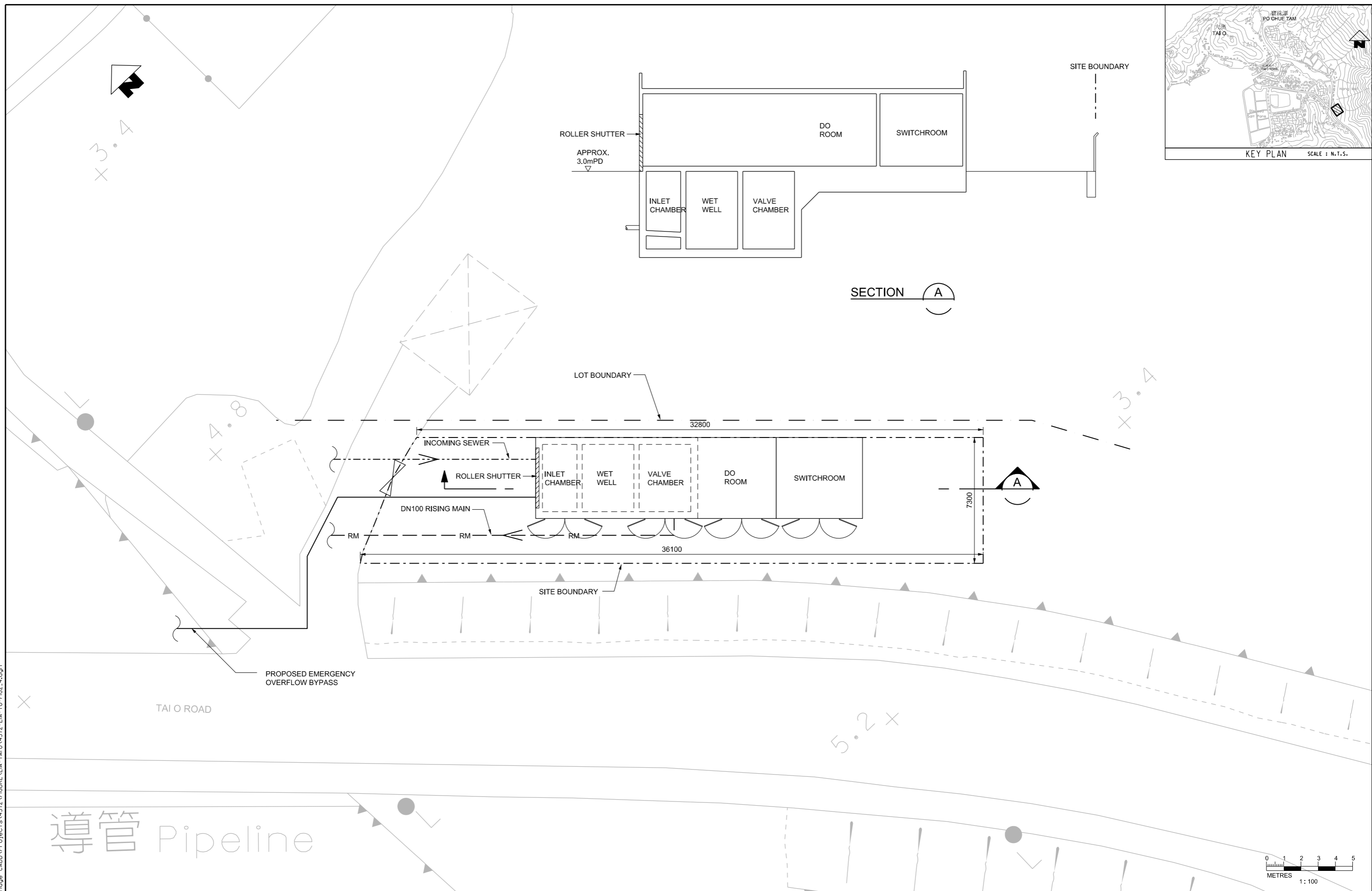
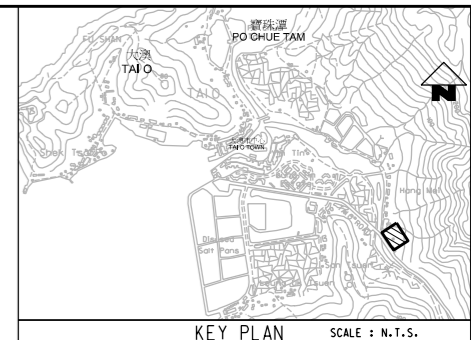
(A)	STRUCTURE LOCATED AT GROUND LEVEL
(A)	STRUCTURE LOCATED UNDERGROUND
(A)	STRUCTURE LOCATED AT UPPER GROUND LEVEL
←	FLOW DIRECTION

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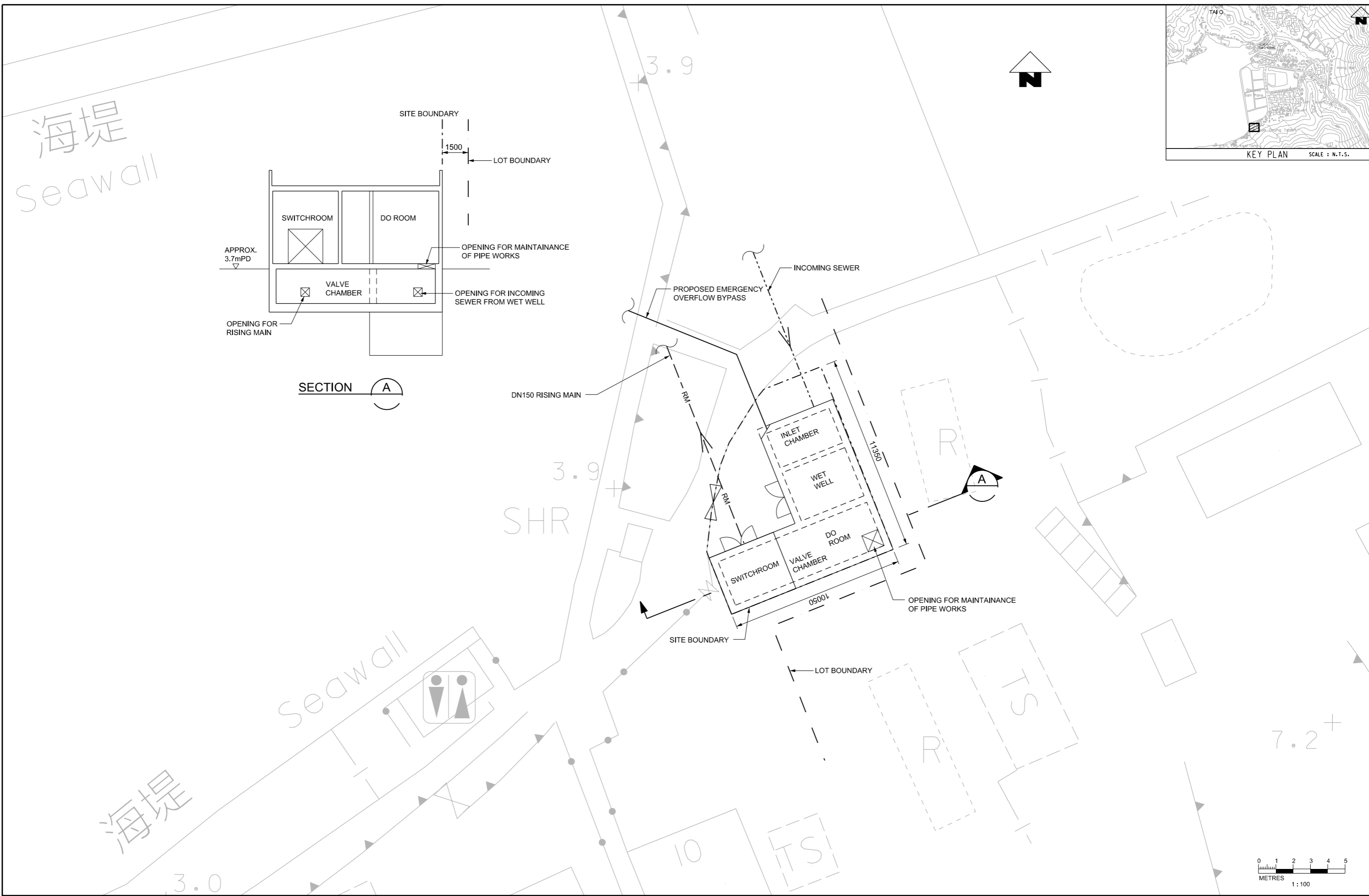


Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

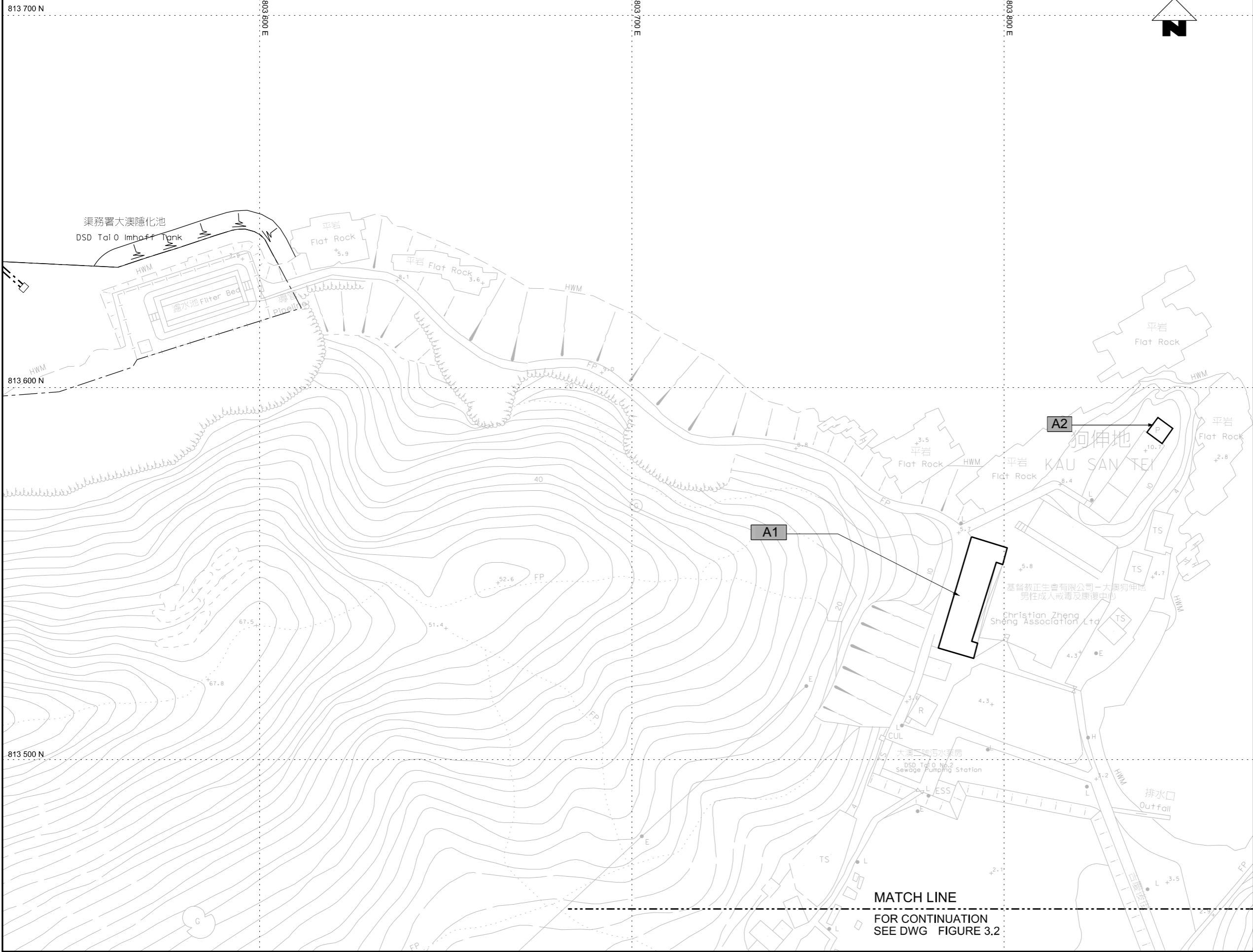
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Date :	Mar 2016	Figure :	1.2



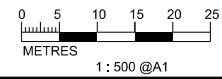
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- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Odour Monitoring Locations
  - 500m Study Boundary

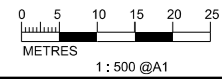
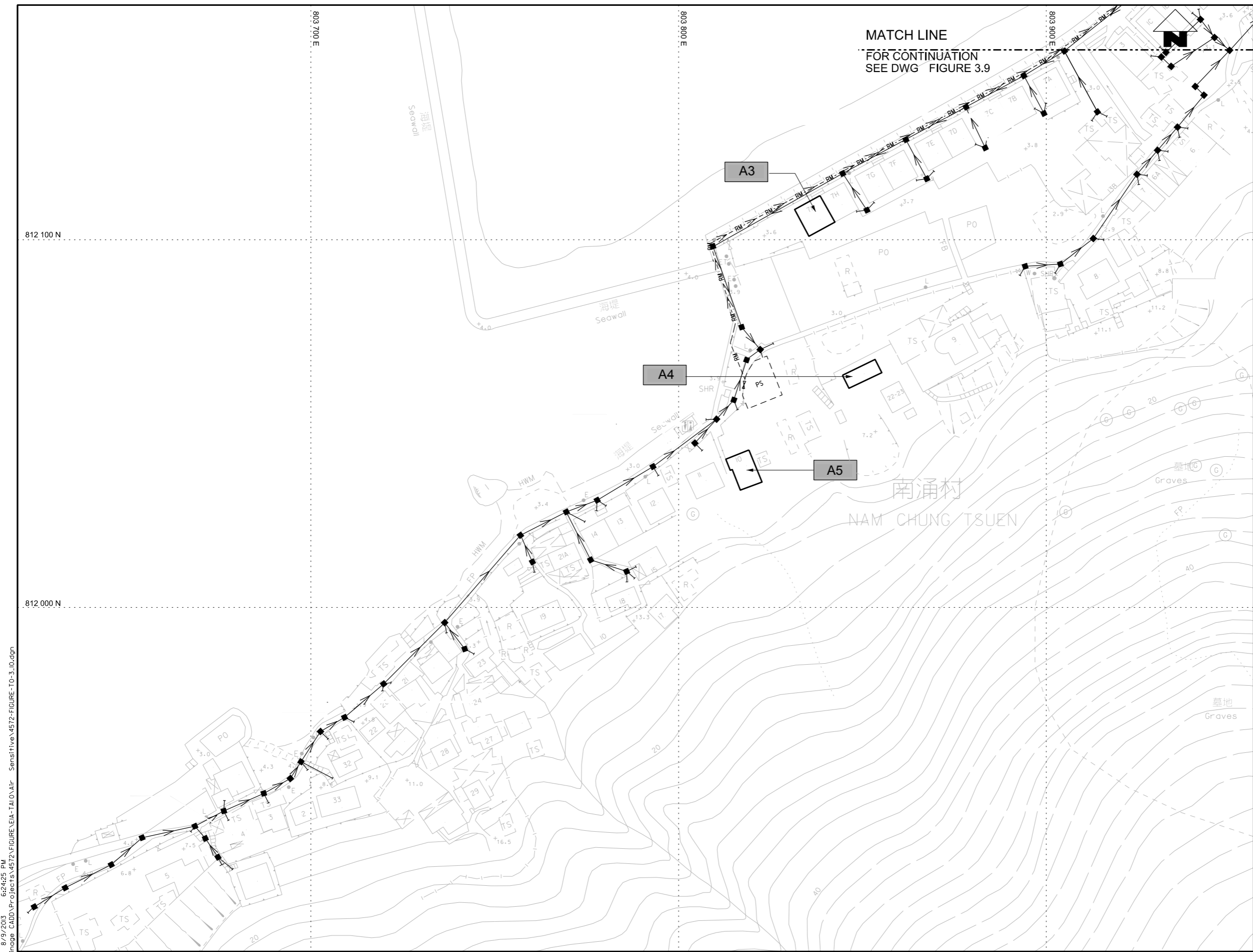


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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	<b>Odour Monitoring Locations (Sheet 1 of 3)</b>		
Date :	<b>MAY 2015</b>	Figure :	<b>2.1</b>

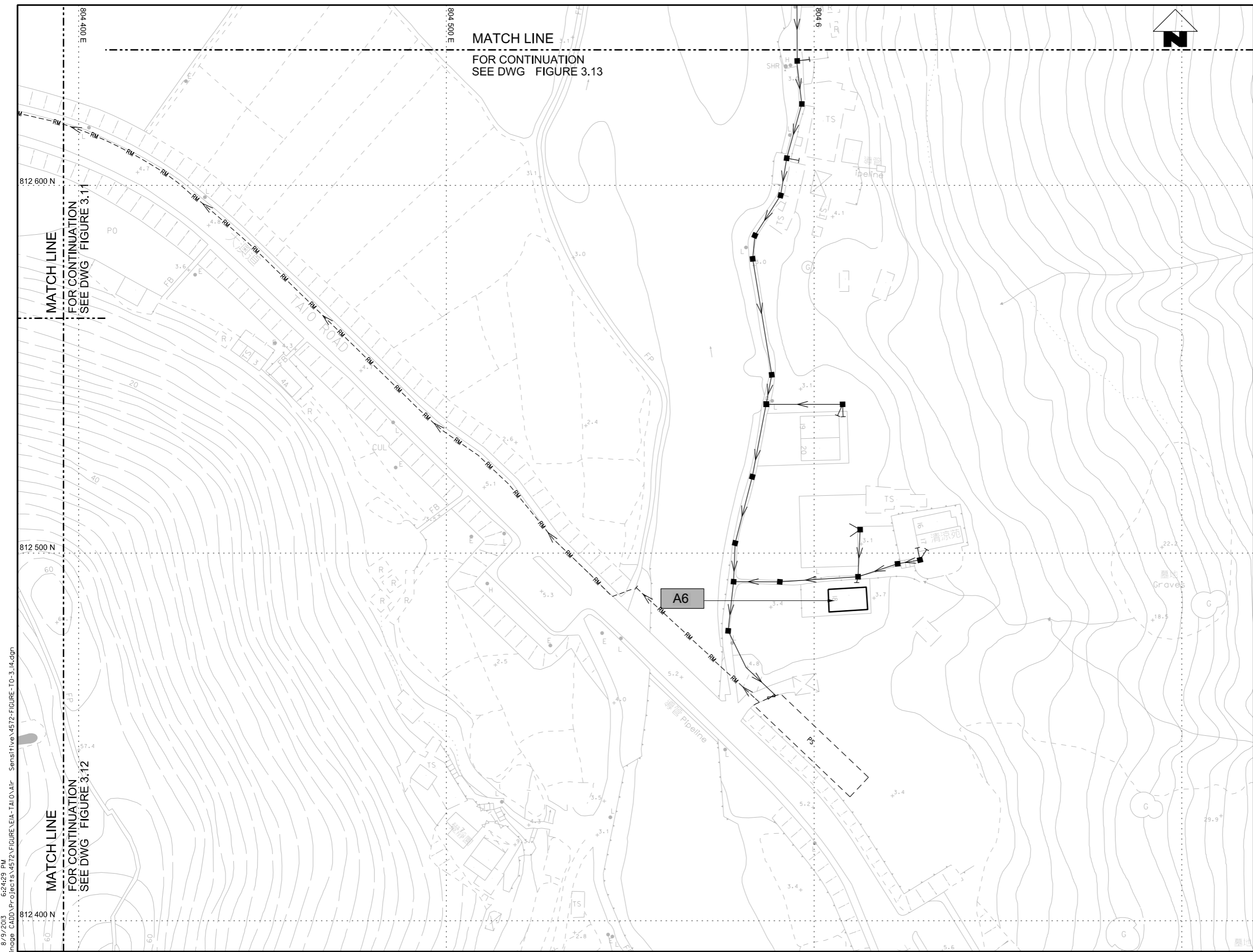


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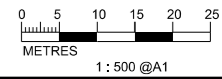


Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	<b>Odour Monitoring Locations (Sheet 2 of 3)</b>		
Date :	MAY 2015	Figure :	2.2



- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Odour Monitoring Locations
  - 500m Study Boundary

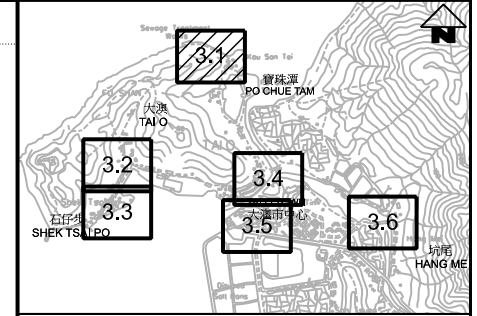
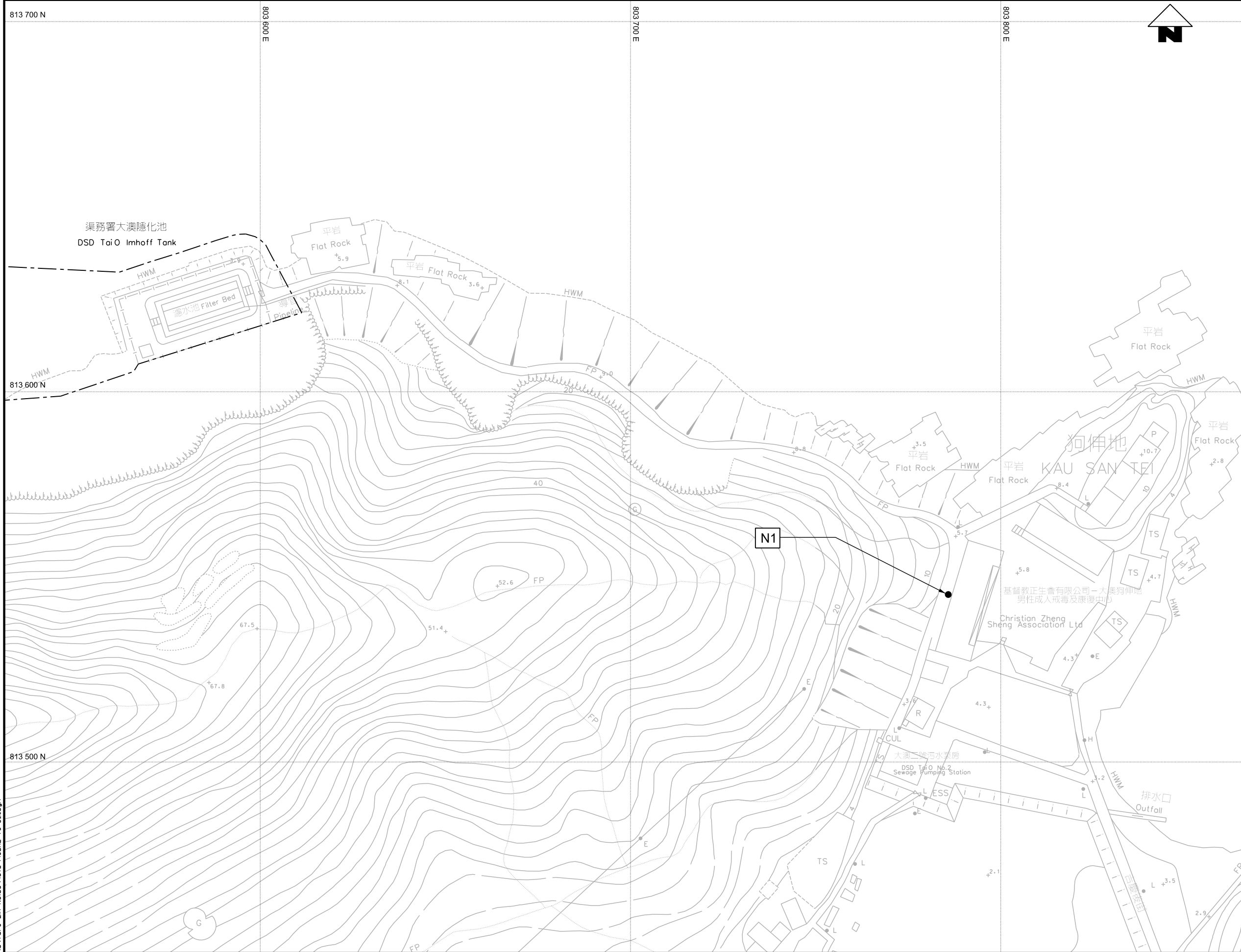


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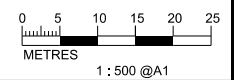
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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	<b>Odour Monitoring Locations (Sheet 3 of 3)</b>		
Date :	MAY 2015	Figure :	2.3



KEY PLAN SCALE : N.T.S.

- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION



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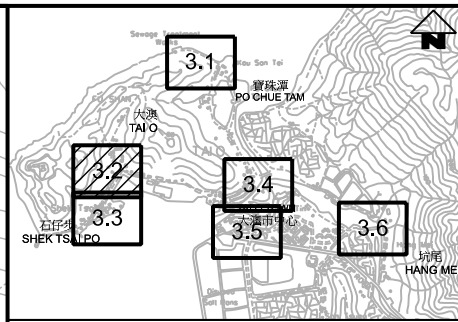
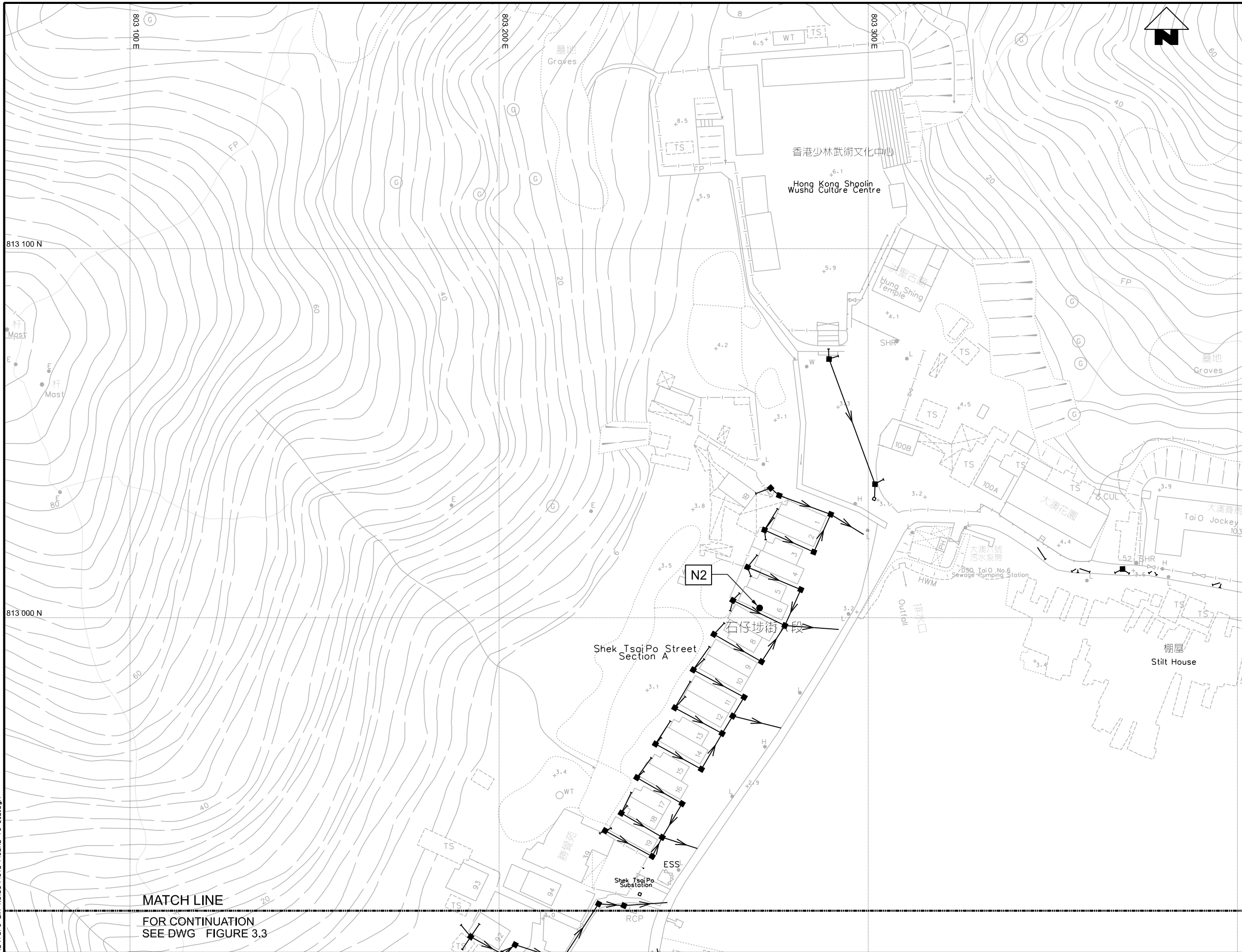
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Agreement No. CE 15/2010 (DS)  
Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
Outlying Islands Sewerage Stage 2 -  
Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :  
Date :

NOISE MONITORING LOCATIONS  
(Sheet 1 of 7)  
Figure :  
May 2015  
3.1



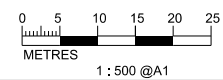


KEY PLAN SCALE : N.T.S.

LEGEND AND ABBREVIATION:

- Proposed Sewer
- Proposed Manhole
- Proposed Rising Main
- Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
- Proposed Sewage Pumping Station
- Label for Noise Sensitive Receiver
- 300m Study Boundary
- NOISE MONITORING LOCATION

MATCH LINE  
FOR CONTINUATION  
SEE DWG FIGURE 3.3

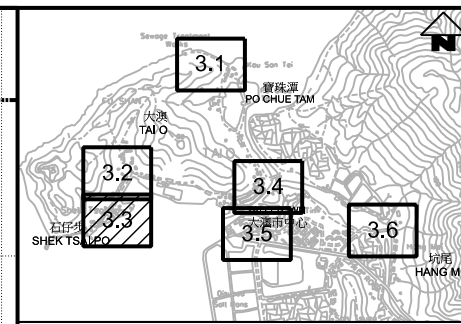
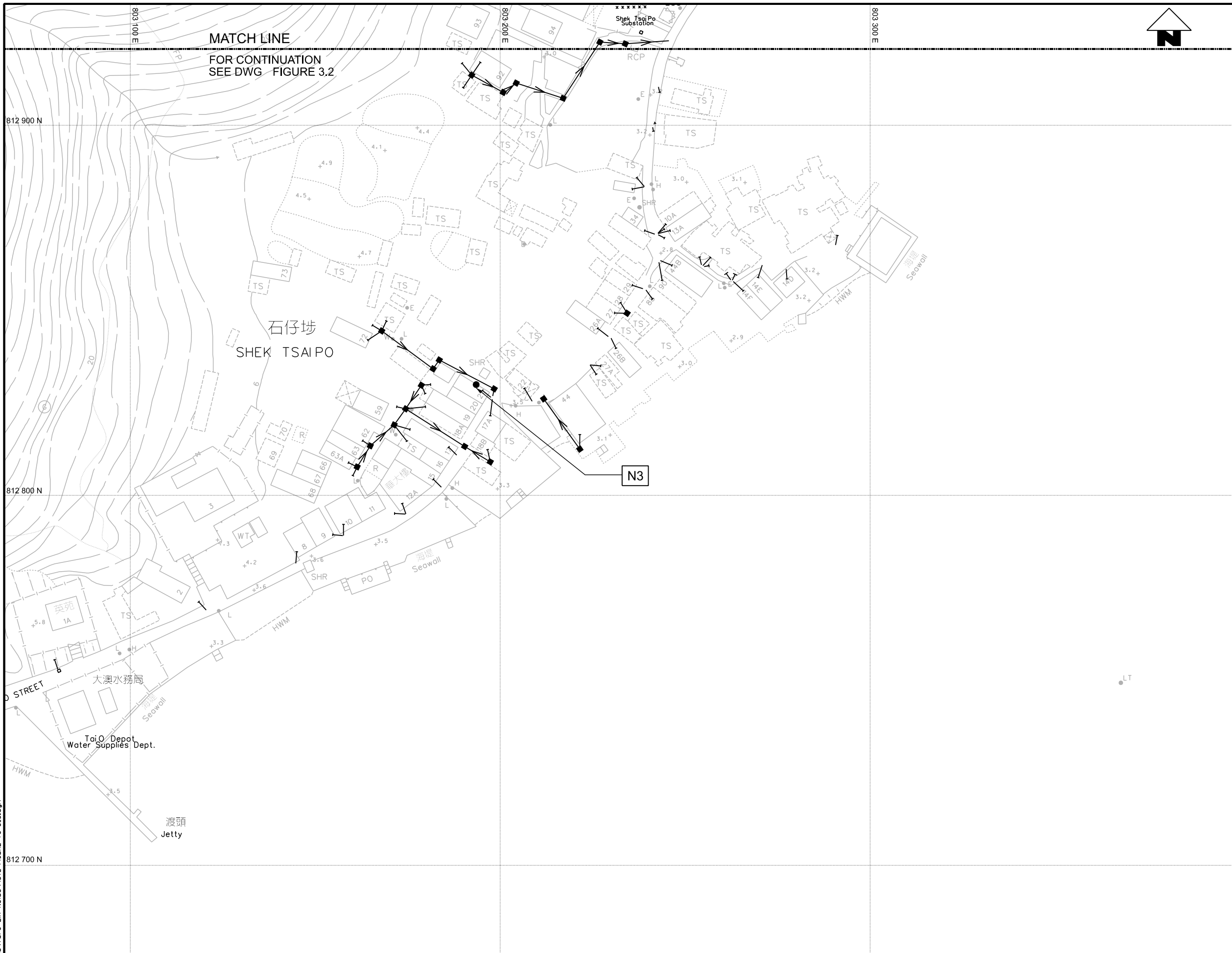


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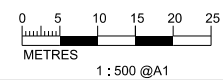
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Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
Outlying Islands Sewerage Stage 2 -  
Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	NOISE MONITORING LOCATIONS (Sheet 2 of 7)		
Date :	May 2015	Figure :	3.2



KEY PLAN SCALE : N.T.S.

- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION

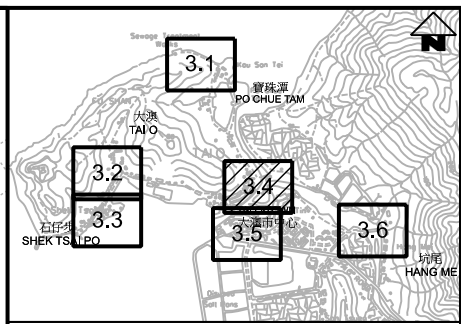
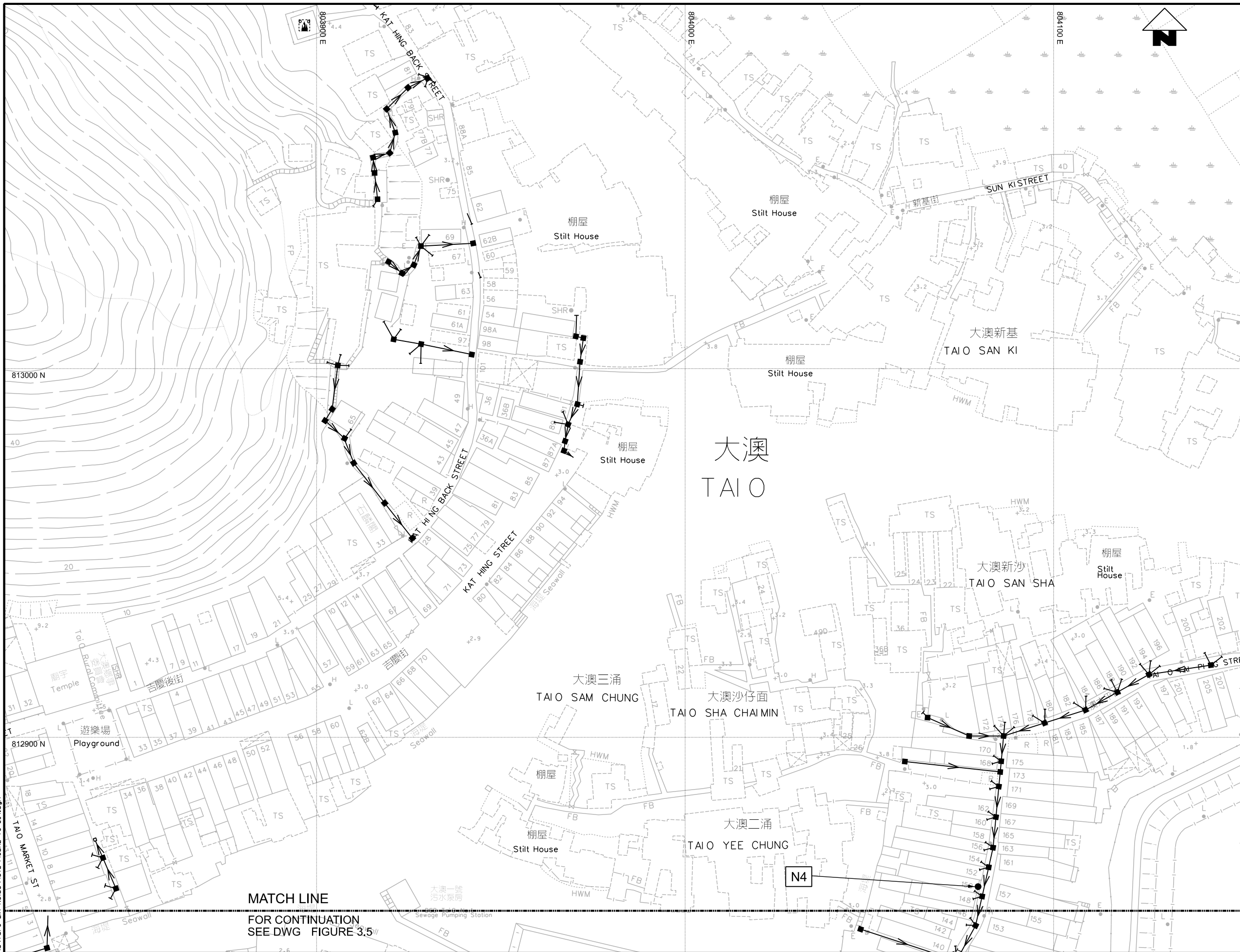


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities**

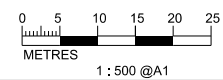
Title :	<b>NOISE MONITORING LOCATIONS (Sheet 3 of 7)</b>		
Date :	May 2015	Figure :	3.3



- KEY PLAN SCALE : 1:500
- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION

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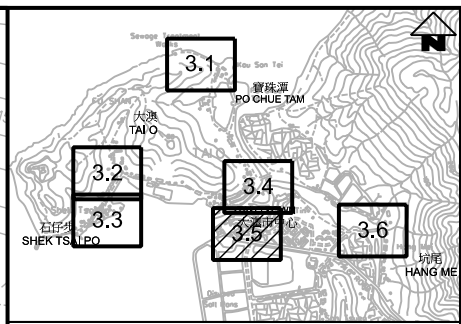
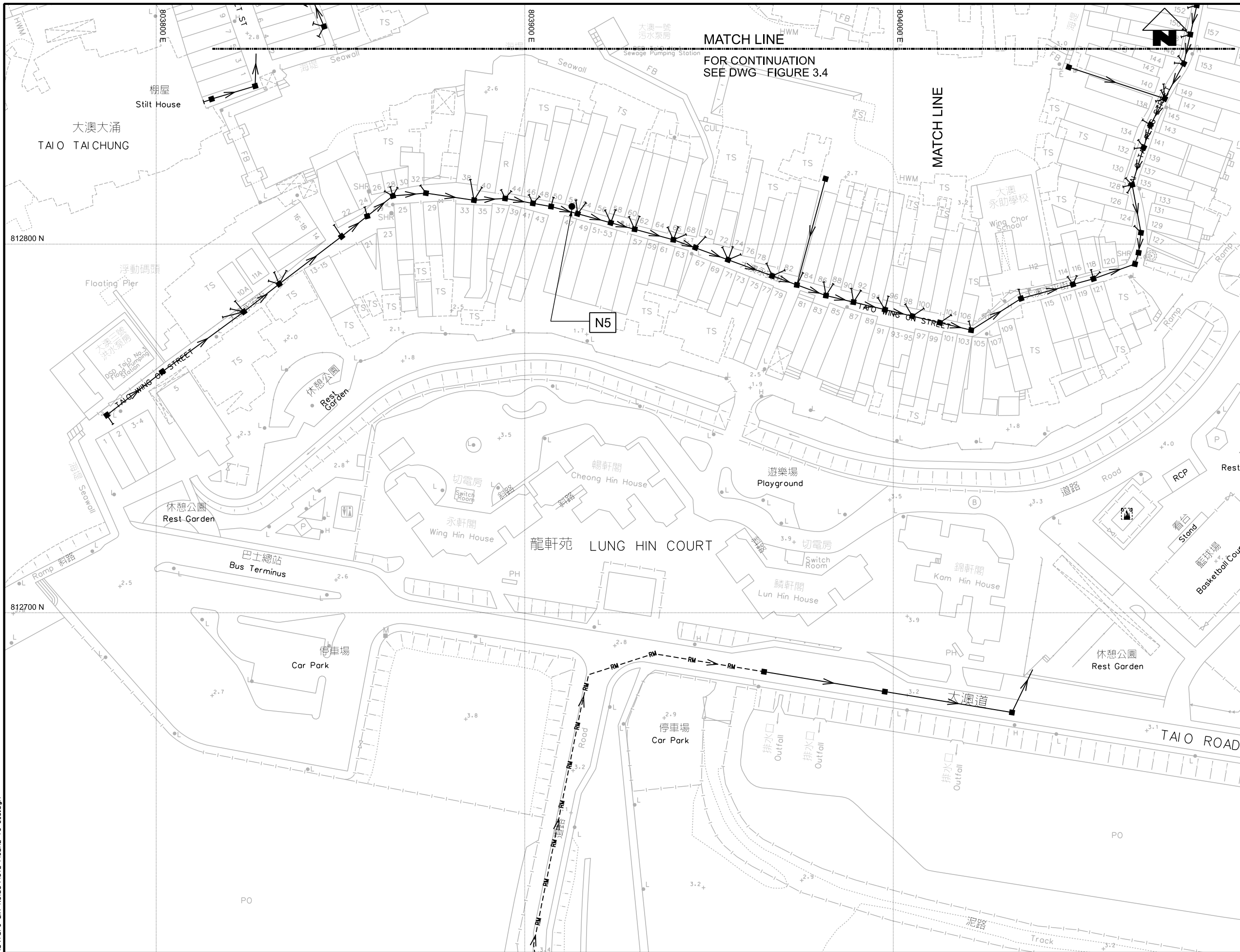
MATCH LINE  
 FOR CONTINUATION  
 SEE DWG FIGURE 3.5



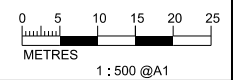
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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	NOISE MONITORING LOCATIONS (Sheet 4 of 7)		
Date :	May 2015	Figure :	3.4



- KEY PLAN** SCALE : N.T.S.
- LEGEND AND ABBREVIATION:**
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION



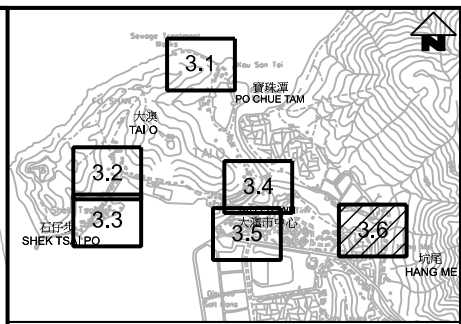
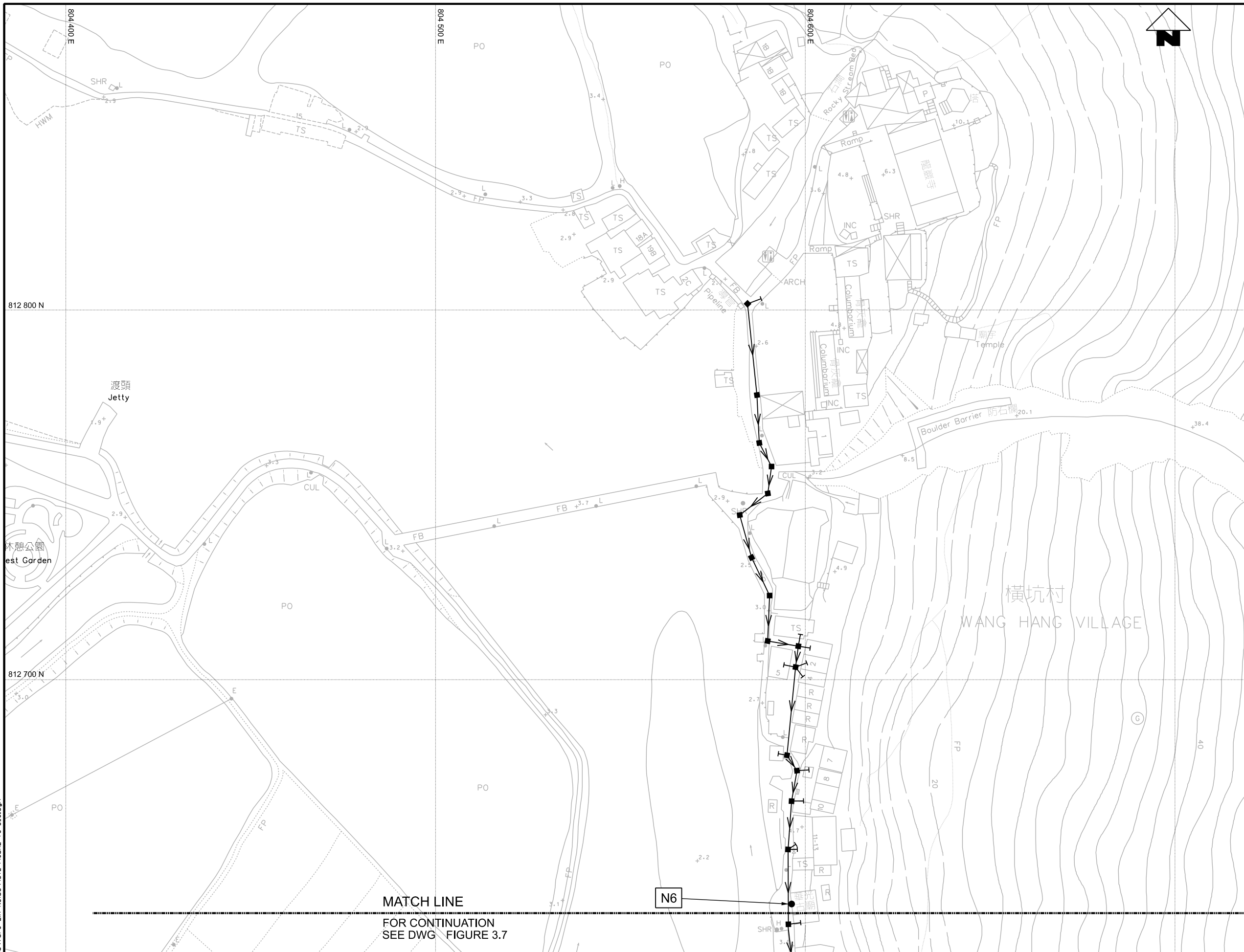
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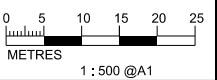
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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

<b>Title :</b>	<b>NOISE MONITORING LOCATIONS</b> (Sheet 5 of 7)		
<b>Date :</b>	May 2015	<b>Figure :</b>	3.5



KEY PLAN SCALE : N.T.S.

- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION



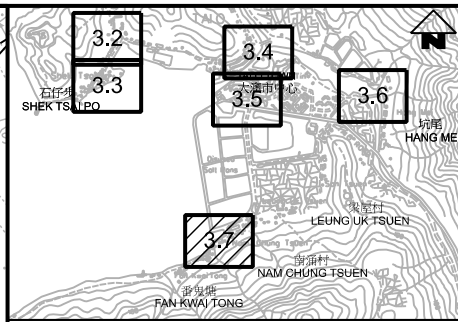
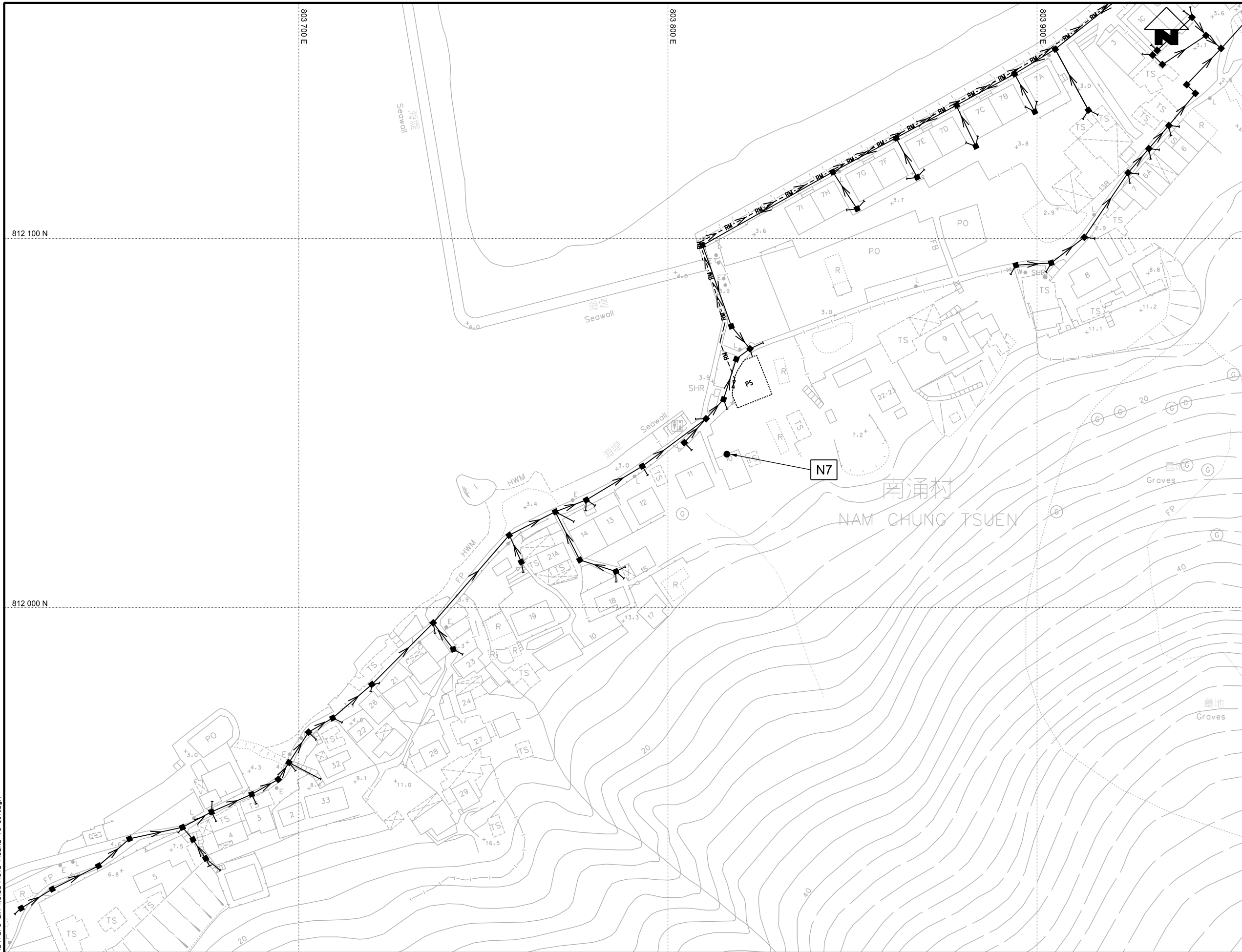
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SEE DWG. FIGURE 3.7

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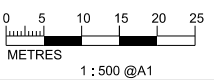
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Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
Outlying Islands Sewerage Stage 2 -  
Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	NOISE MONITORING LOCATIONS (Sheet 6 of 7)		
Date :	May 2015	Figure :	3.6



KEY PLAN SCALE : 1:500

- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary
  - NOISE MONITORING LOCATION

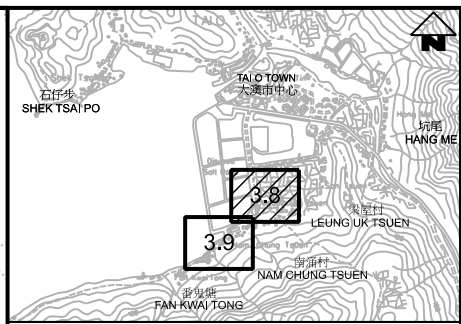


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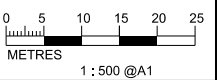
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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	NOISE MONITORING LOCATIONS (Sheet 7 of 7)		
Date :	May 2015	Figure :	3.7



- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe  
(subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary

MATCH LINE  
FOR CONTINUATION  
SEE DWG FIGURE 3.9

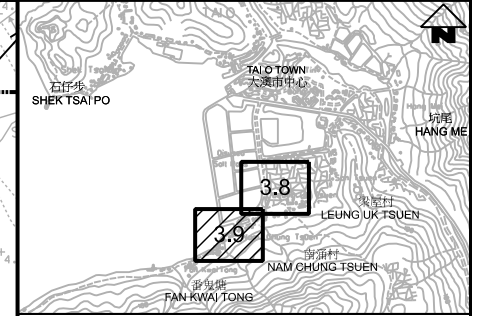
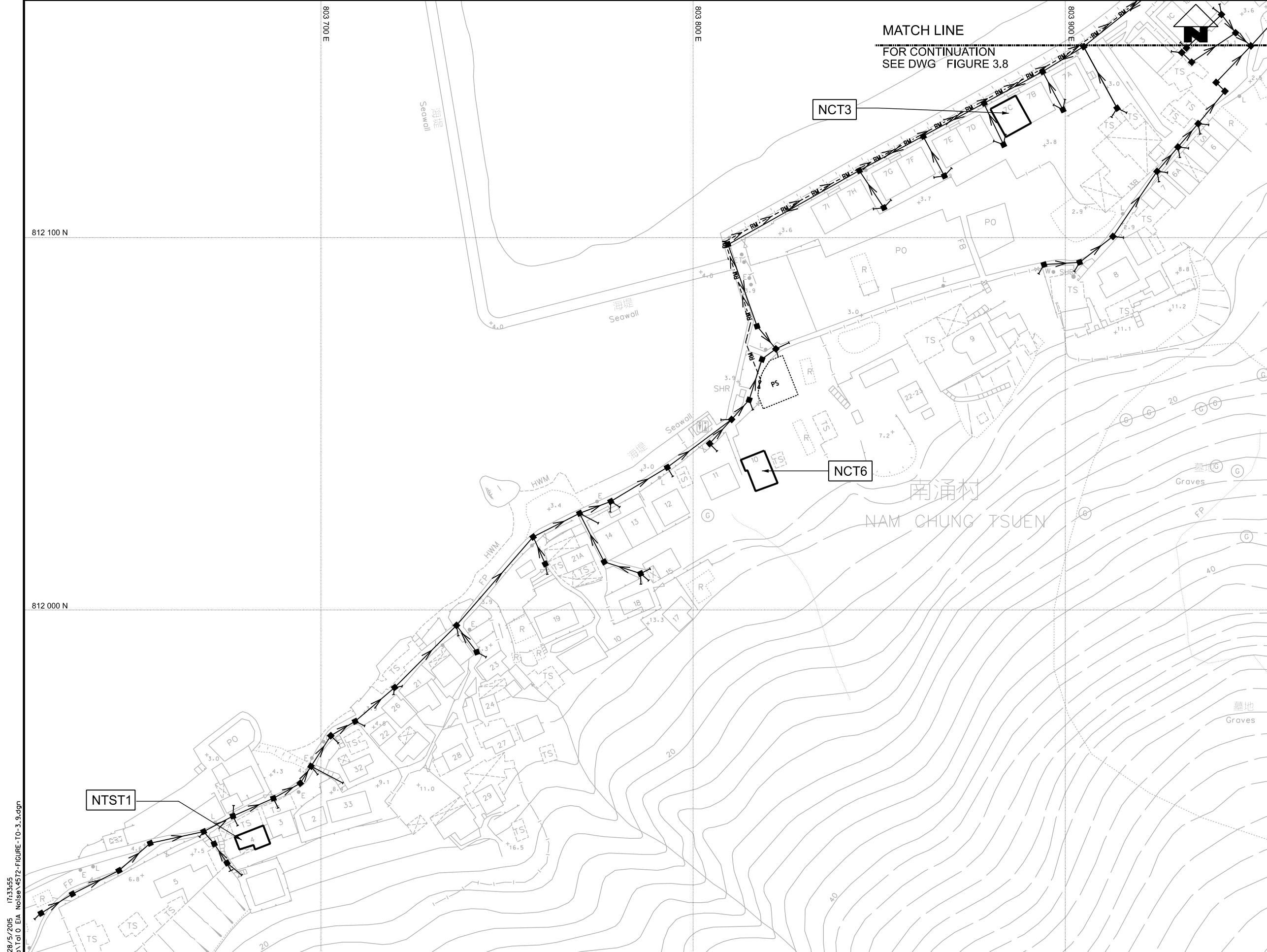


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Agreement No. CE 15/2010 (DS)  
Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
Outlying Islands Sewerage Stage 2 -  
Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	NOISE SENSITIVE RECEIVERS (Sheet 1 of 2)		
Date :	May 2015	Figure :	3.8



- LEGEND AND ABBREVIATION:
- Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Label for Noise Sensitive Receiver
  - 300m Study Boundary

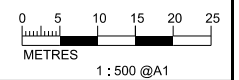
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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

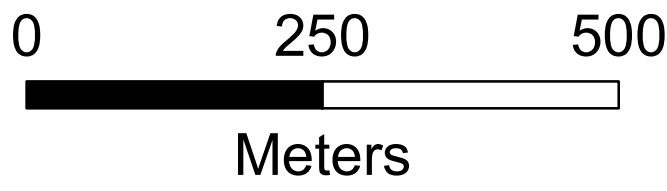
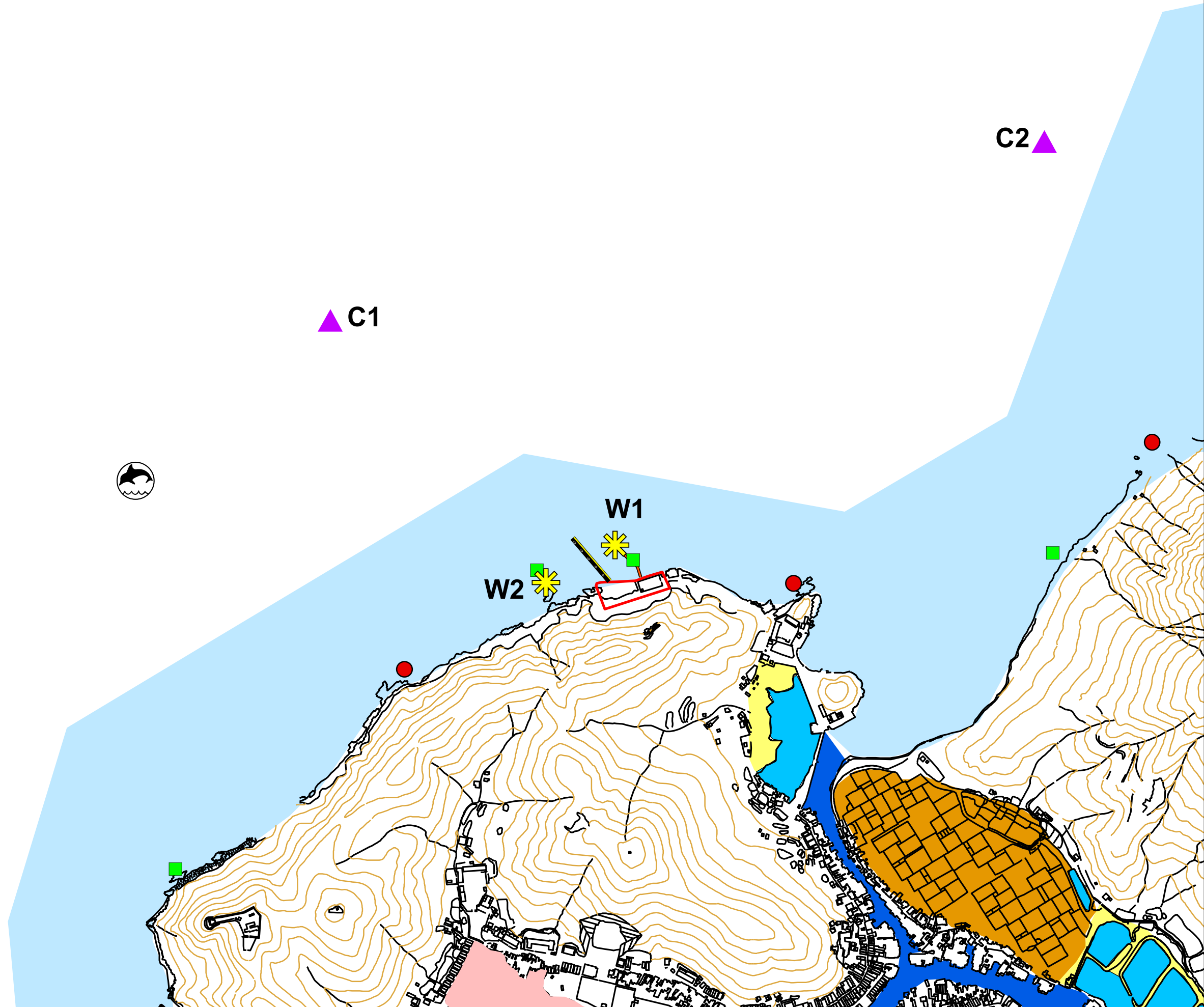
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Date :	May 2015	Figure :	3.9

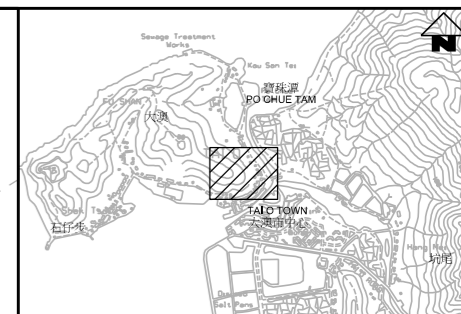
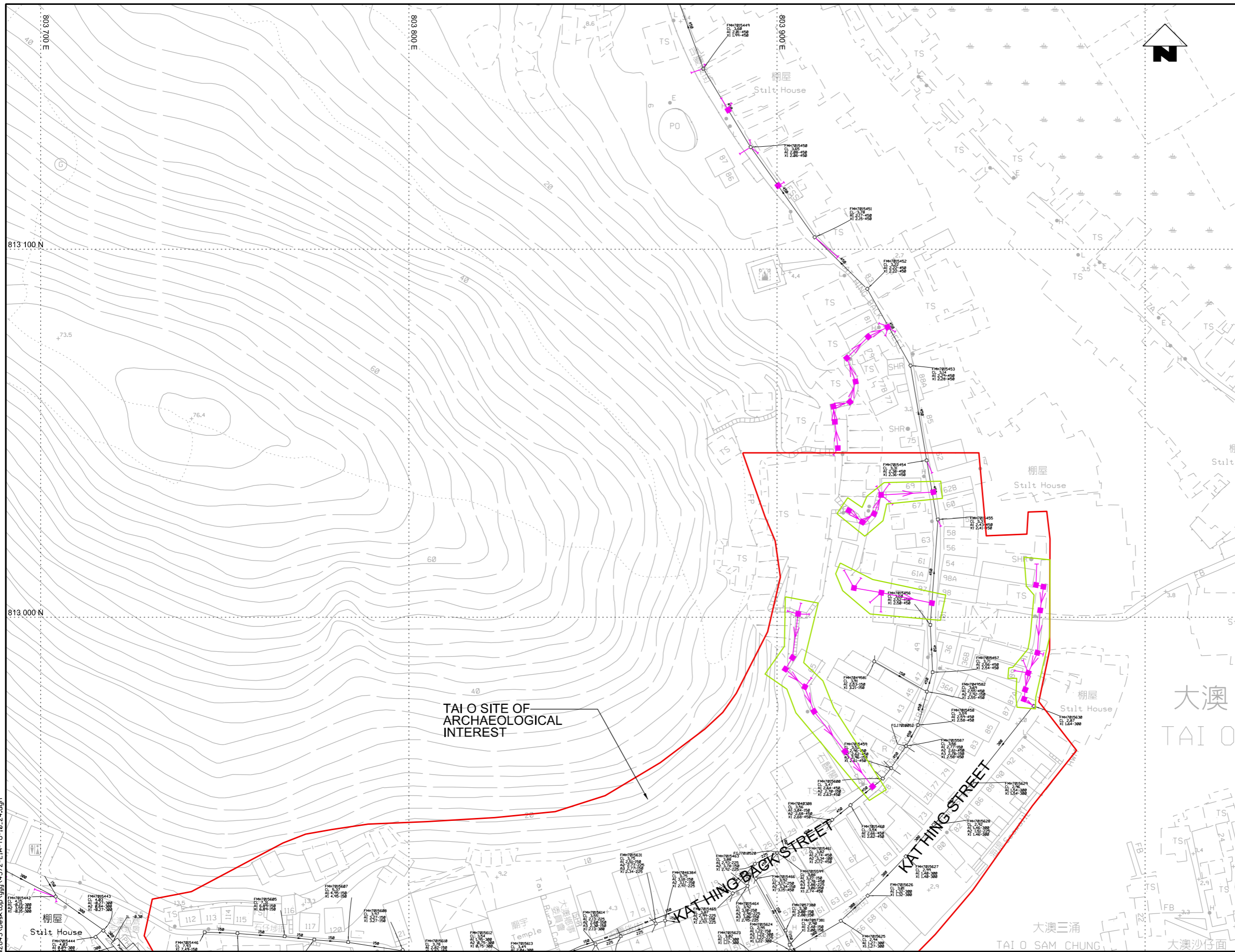




# Legend

-  Control Monitoring Point
-  Impact Monitoring Point
-  Proposed Submarine Outfall
-  Existing Submarine Outfall
-  Expansion of Tai O STW
-  Echinomuricea and Balanophyllia
-  Echinomuricea
-  Chinese White Dolphins
-  Mudflat
-  Pond
-  Marsh Land
-  Mangrove
-  Watercourse
-  Secondary Contact Zone





KEY PLAN SCALE : N.T.S.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - RM Proposed Rising Main
  - └ Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - PS Proposed Sewage Pumping Station
  - Archaeological Watching Brief (frequency 1 in 4 sections)
  - Site of Archaeological Interest

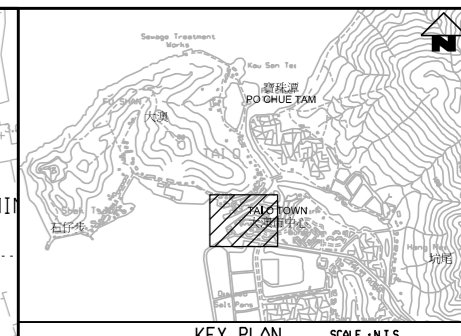
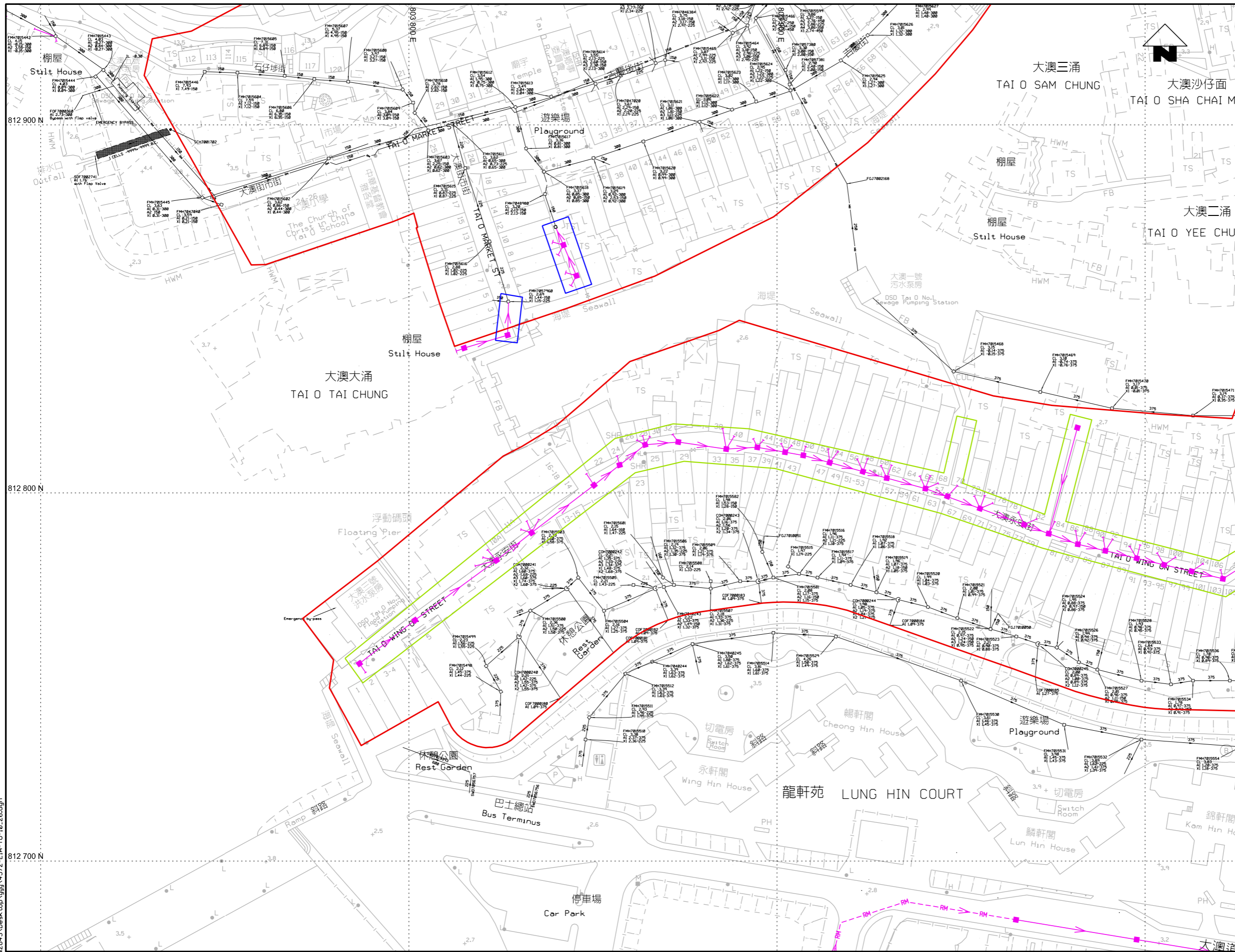


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 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Assessment of Terrestrial Archaeological Potential within Project in Tai O (Sheet 1 of 3)		
Date :	MAY 2015	Figure :	9.1



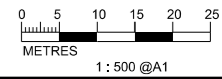
- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - RM Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - PS Proposed Sewage Pumping Station
  - Archaeological Watching Brief (frequency 1 in 4 sections)
  - Site of Archaeological Interest
  - 100% Archaeological Watching Brief Monitoring

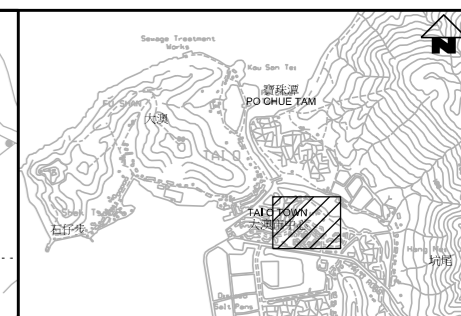
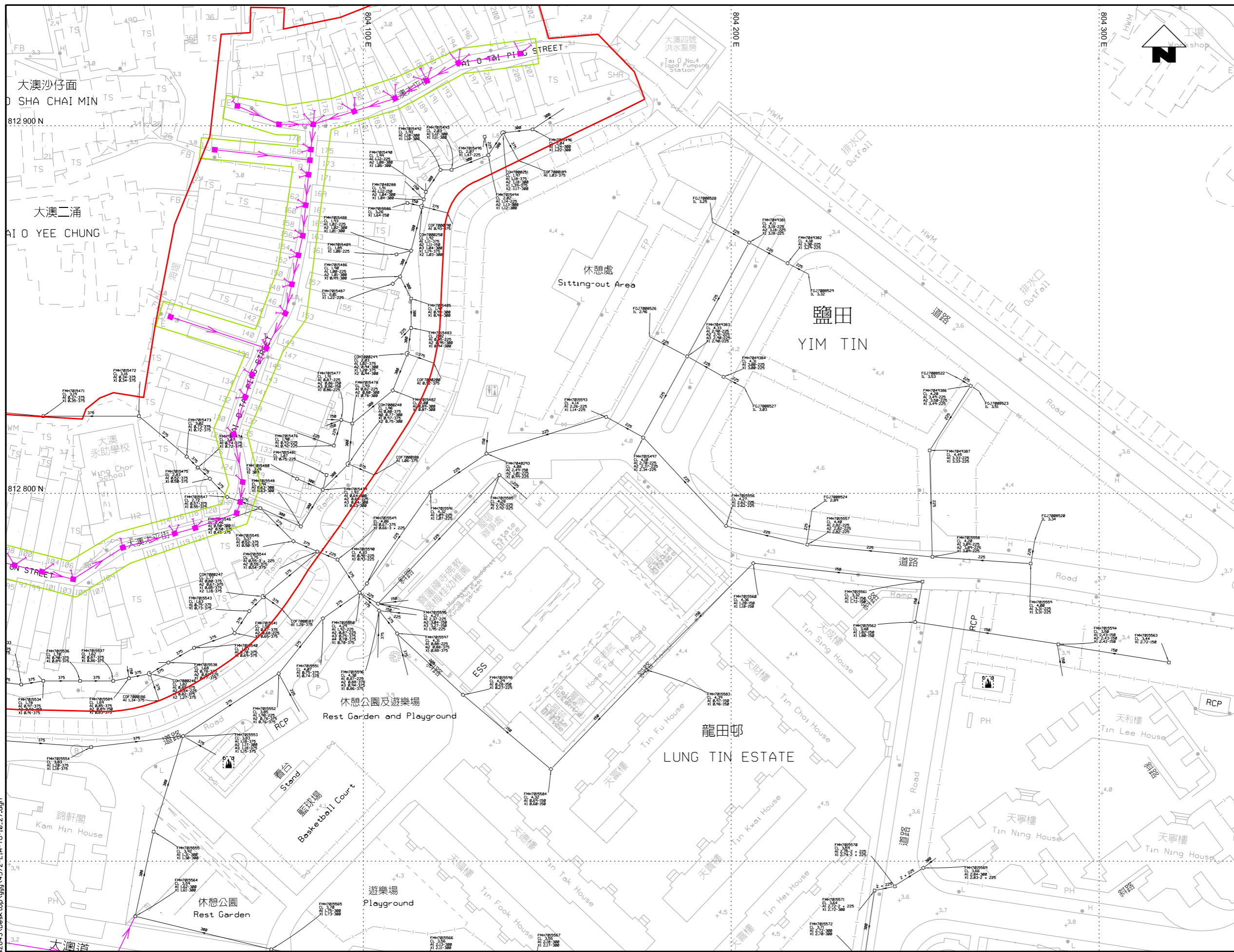
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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

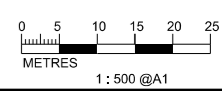
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Date :	MAY 2015	Figure :	9.2





KEY PLAN SCALE :N.T.S.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - RM Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - PS Proposed Sewage Pumping Station
  - Archaeological Watching Brief (frequency 1 in 4 sections)
  - Site of Archaeological Interest

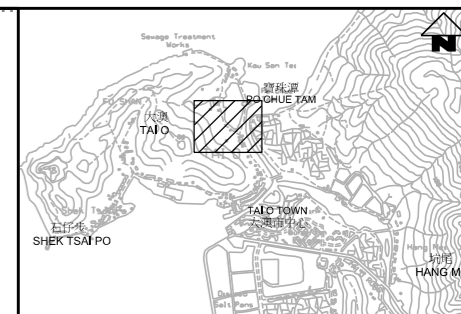
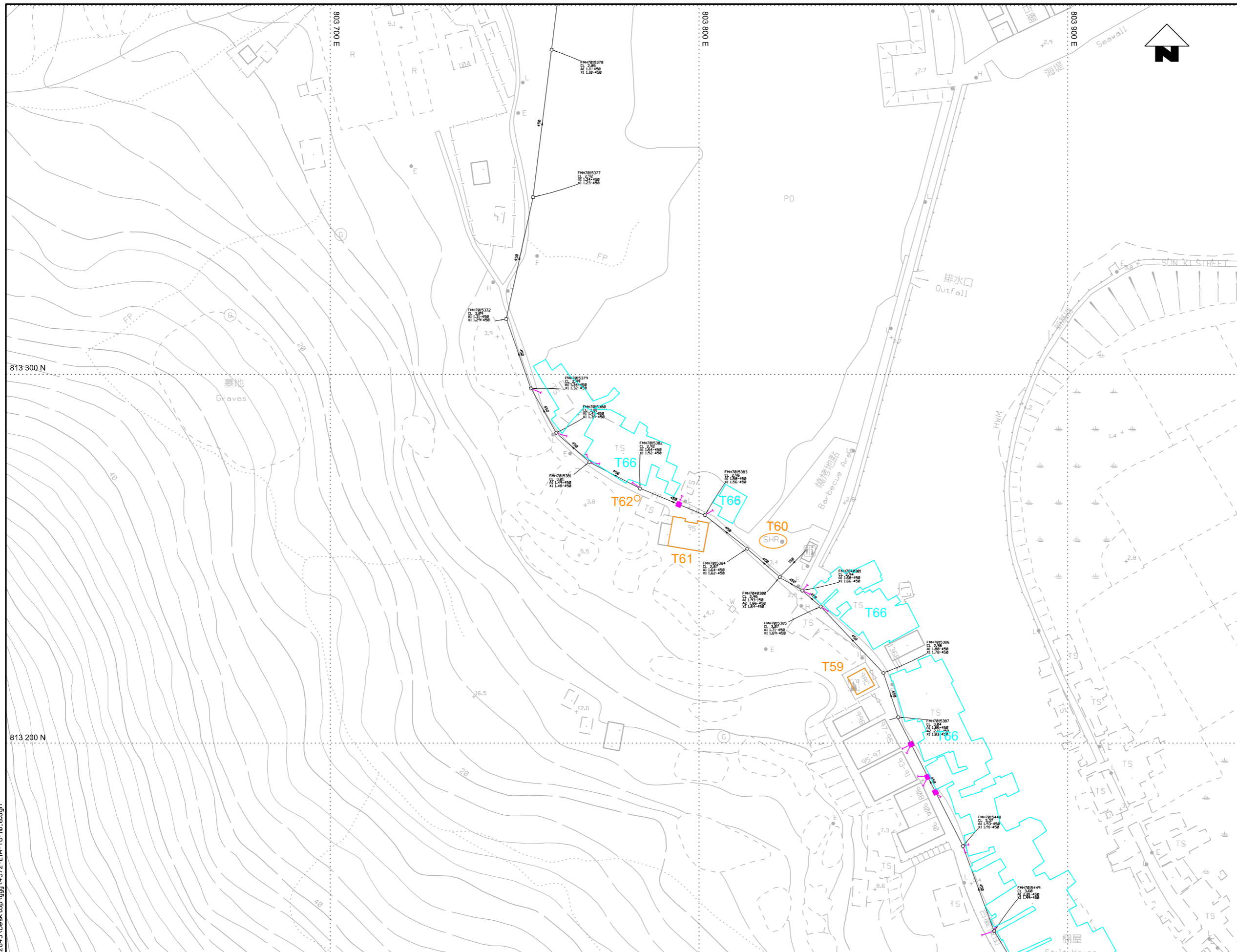


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

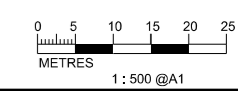
Title :	Assessment of Terrestrial Archaeological Potential within Project in Tai O (Sheet 3 of 3)		
Date :	MAY 2015	Figure :	9.3



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House

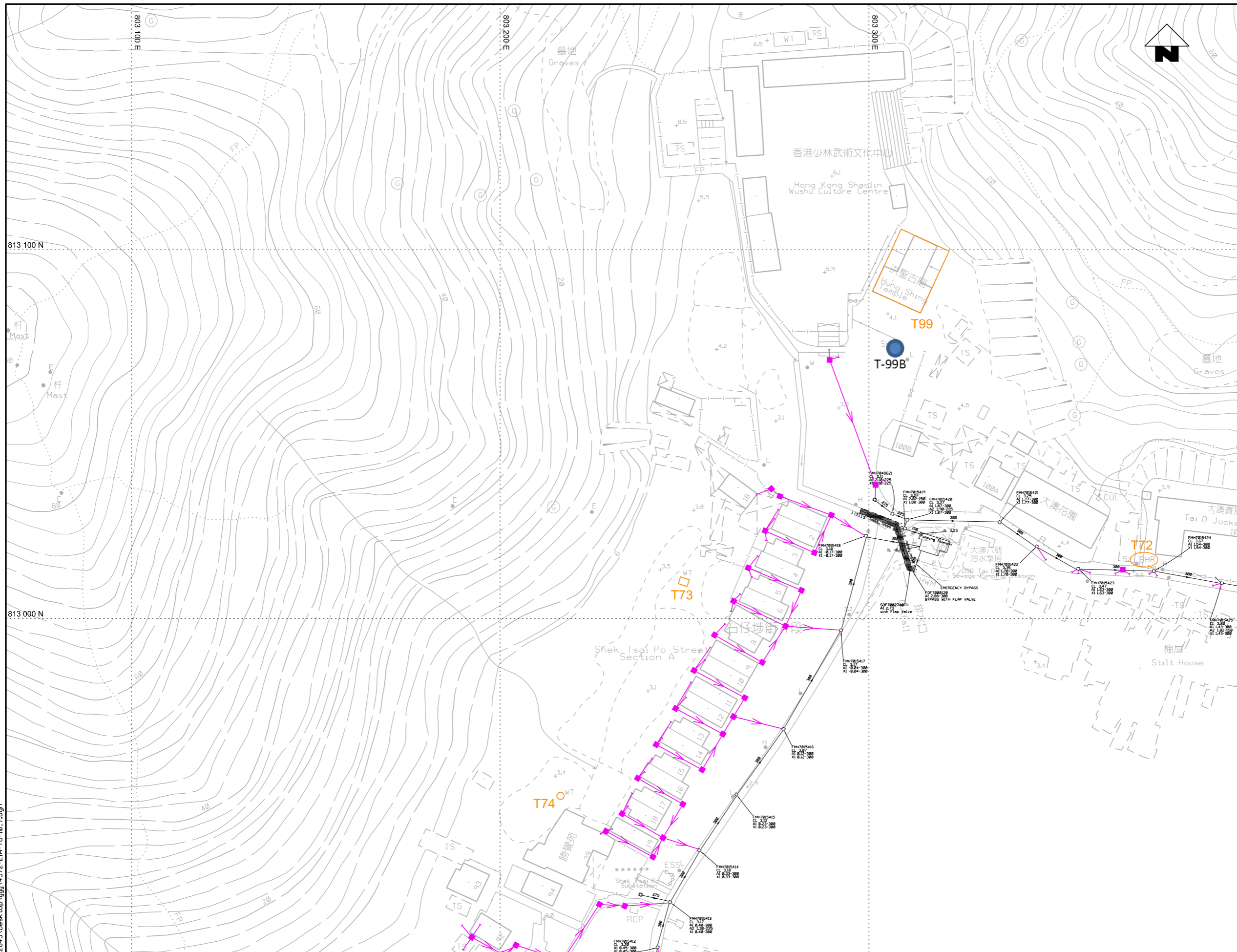


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

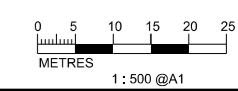
Title :	Location of Built Heritage Resources (Sheet 1 of 14)		
Date :	MAY 2015	Figure :	9.4



KEY PLAN SCALE :N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of site works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House

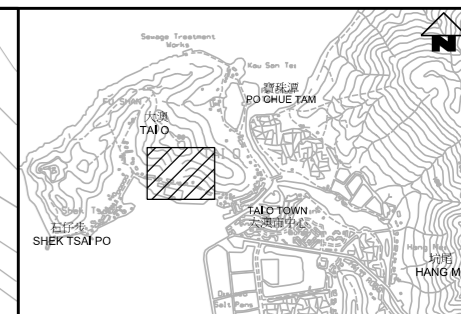
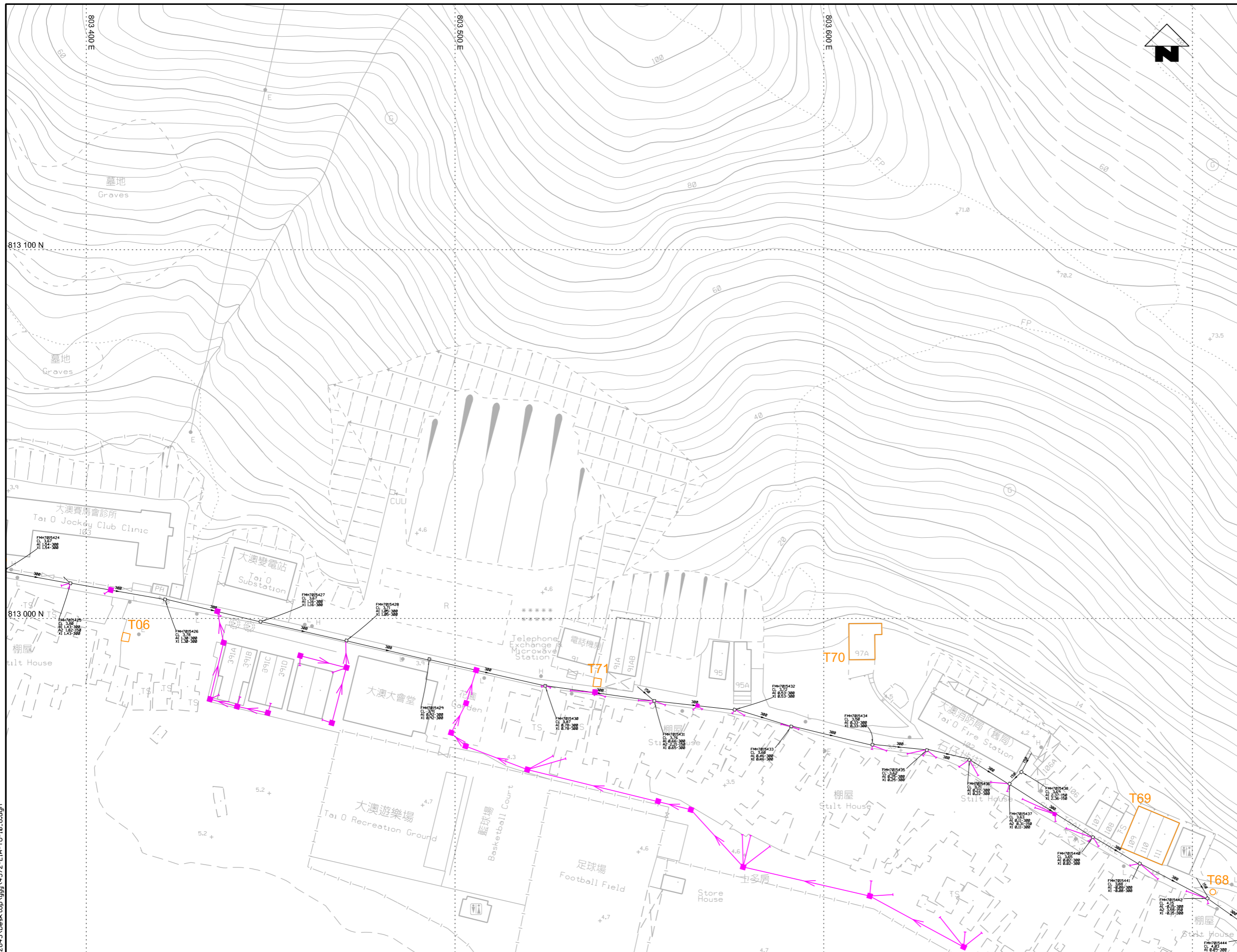


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

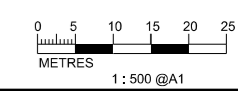
Title :	Location of Built Heritage Resources (Sheet 2 of 14)		
Date :	MAY 2015	Figure :	9.5



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House

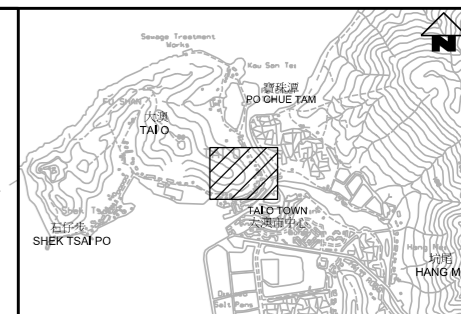
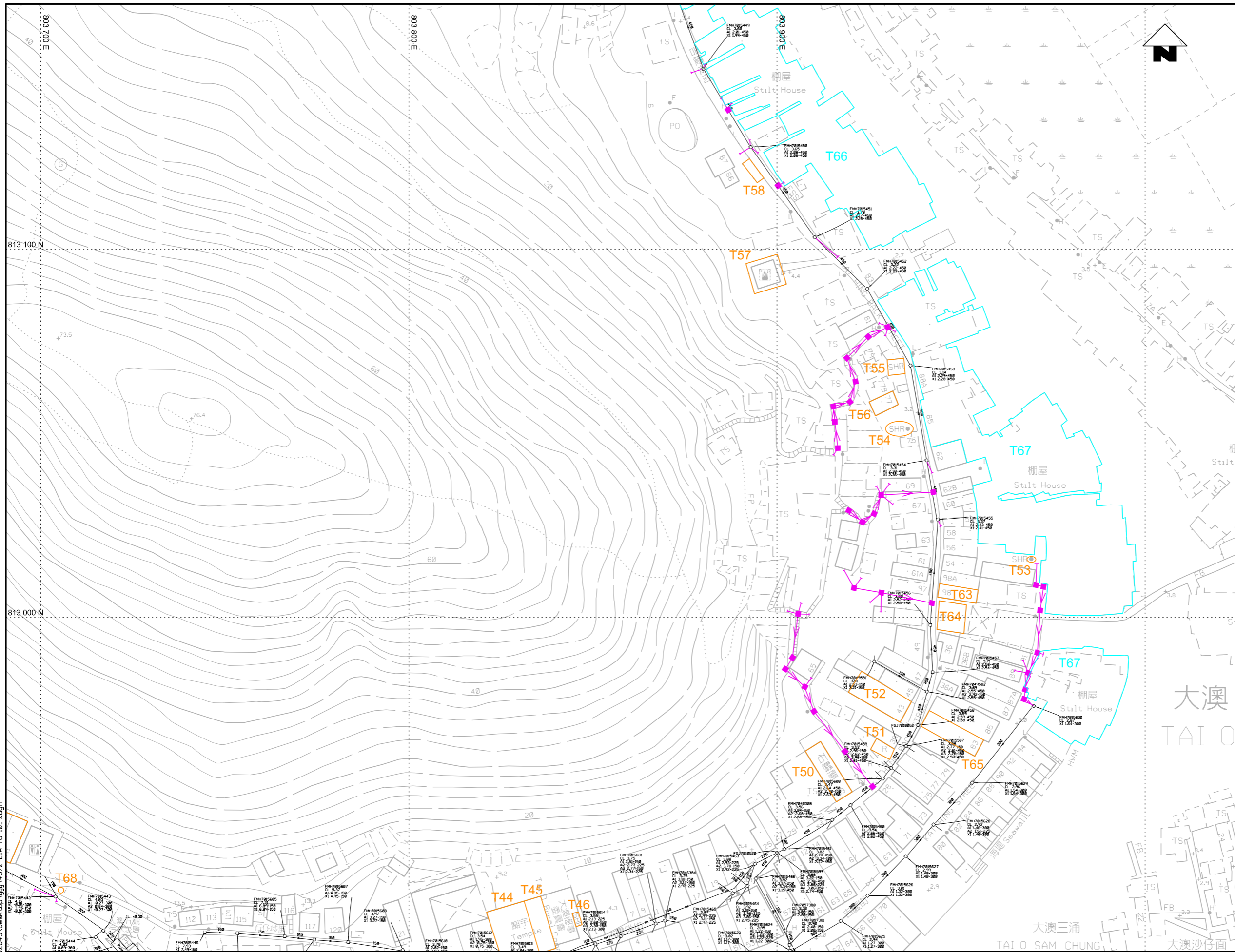


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 3 of 14)		
Date :	MAY 2015	Figure :	9.6



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of site works.

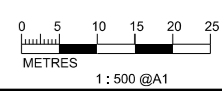
- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House

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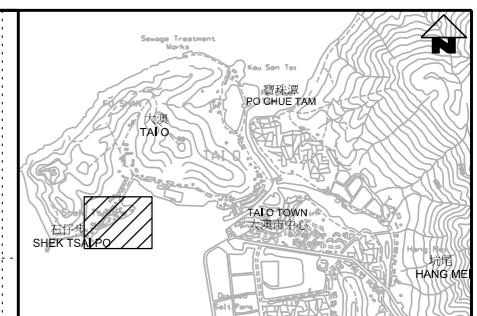
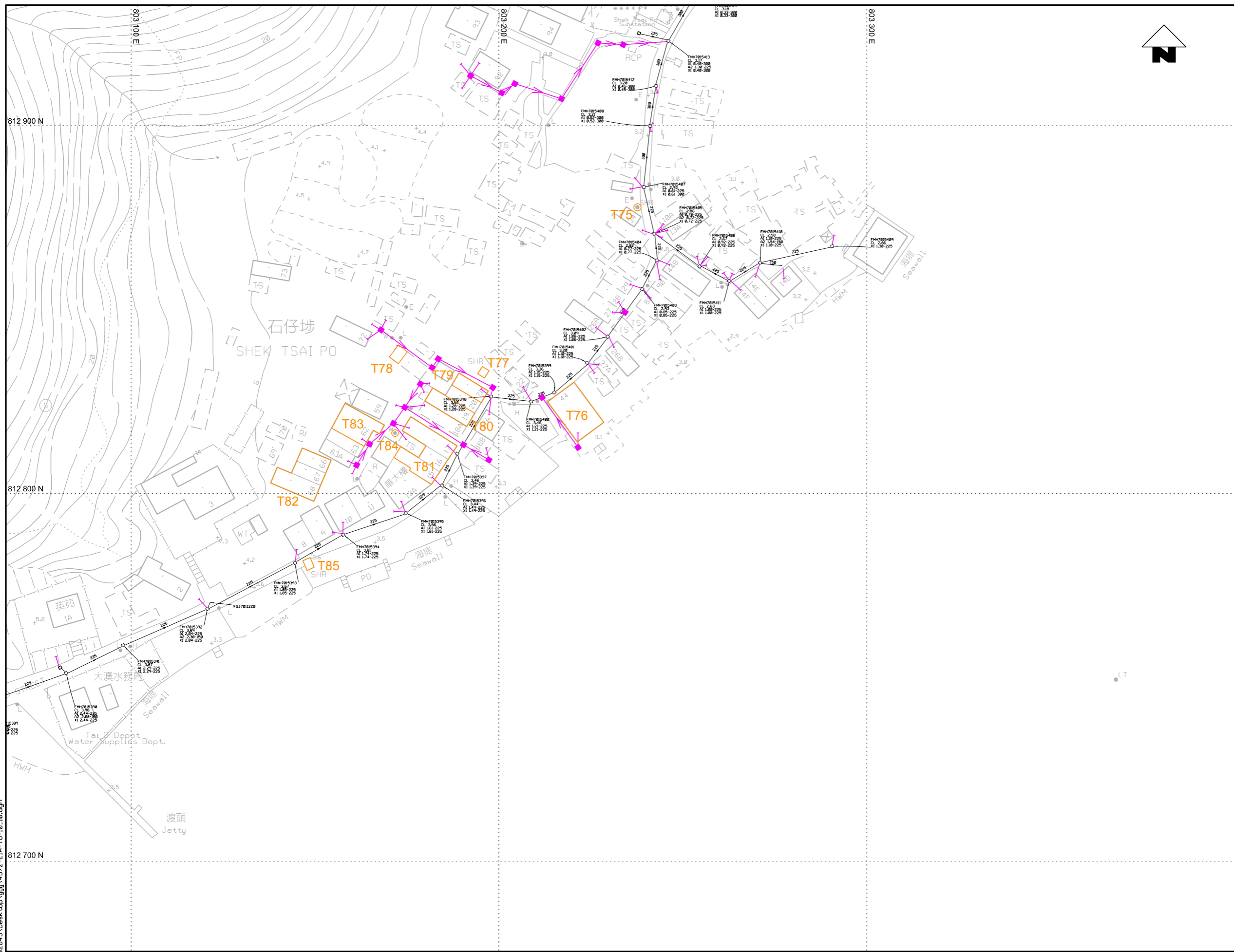


Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 4 of 14)		
Date :	MAY 2015	Figure :	9.7







KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House

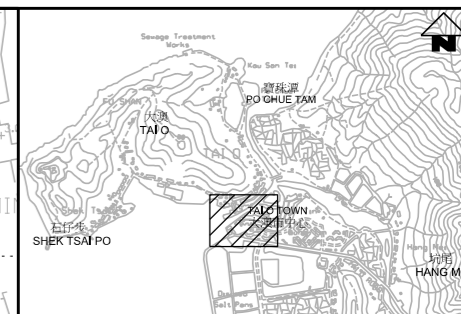
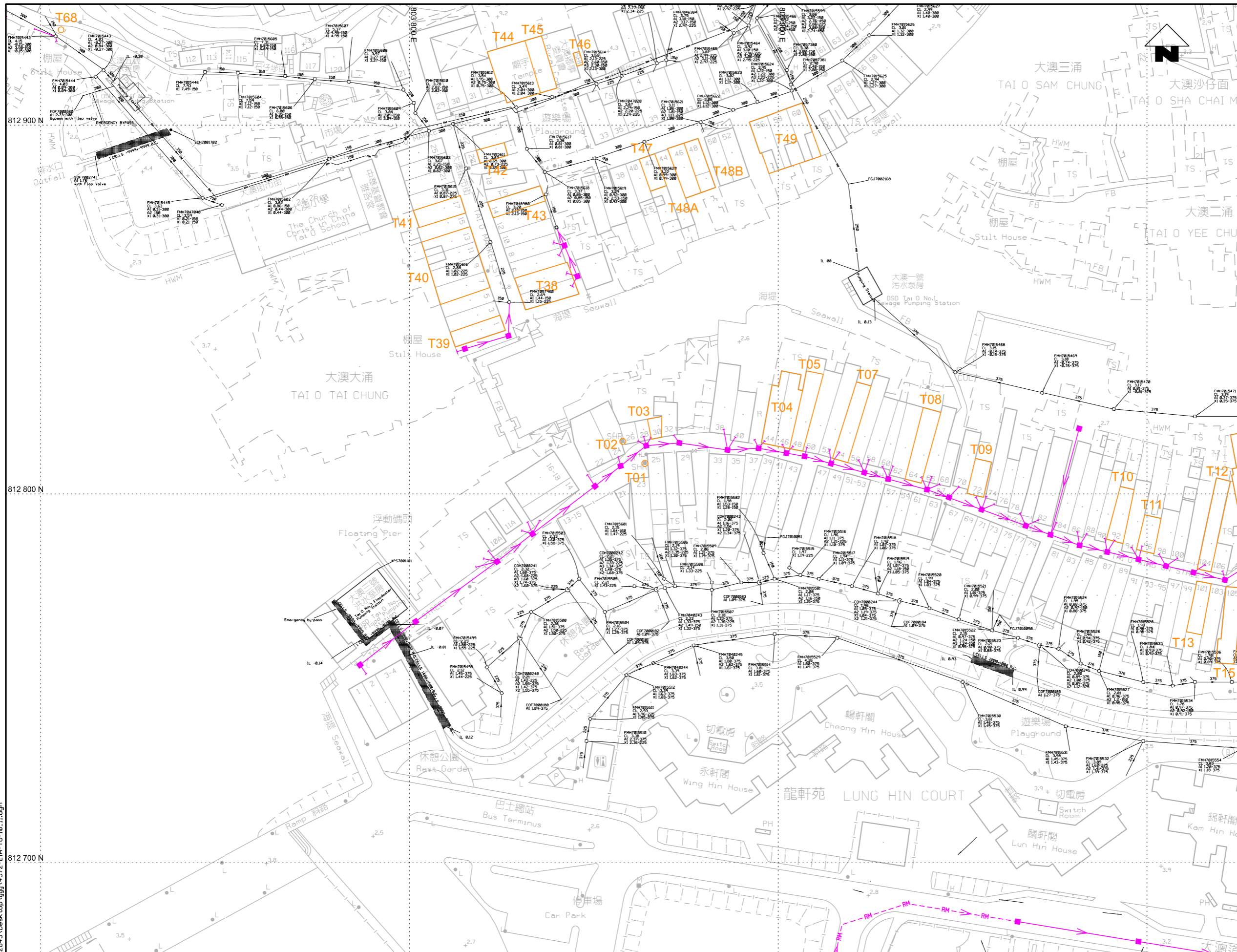


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

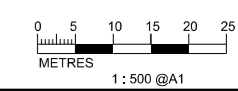
Title :	Location of Built Heritage Resources (Sheet 5 of 14)		
Date :	MAY 2015	Figure :	9.8



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House Existing Rising Main

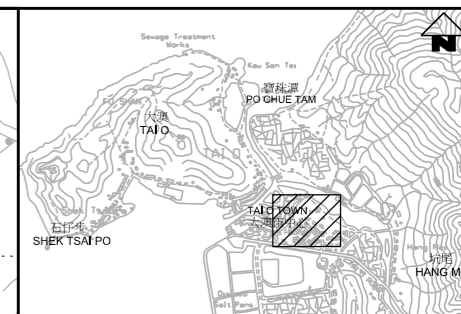
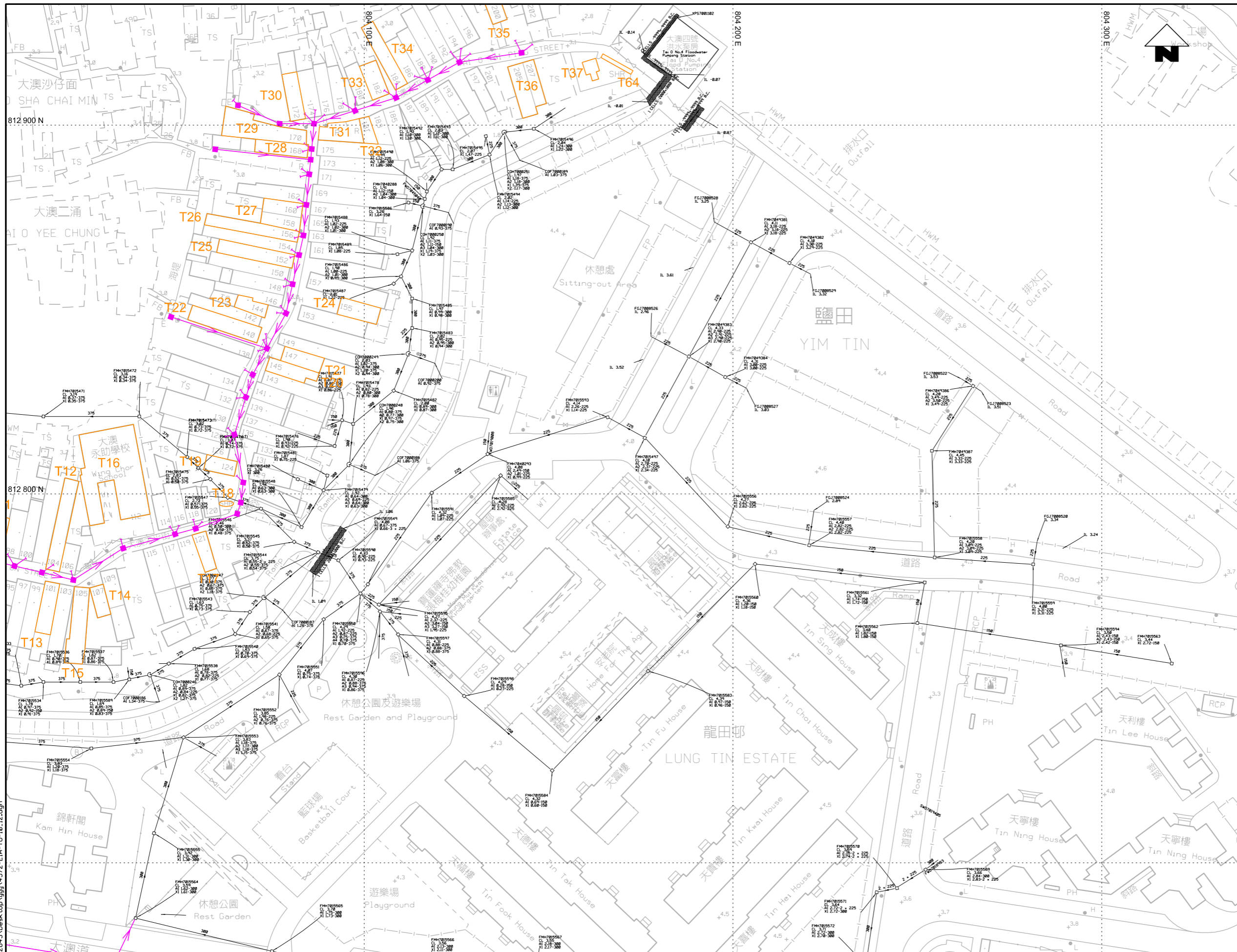


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

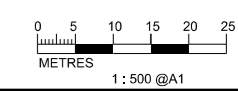
Title :	Location of Built Heritage Resources (Sheet 6 of 14)		
Date :	MAY 2015	Figure :	9.9



KEY PLAN SCALE :N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House

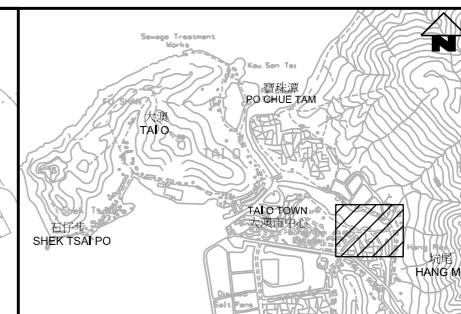
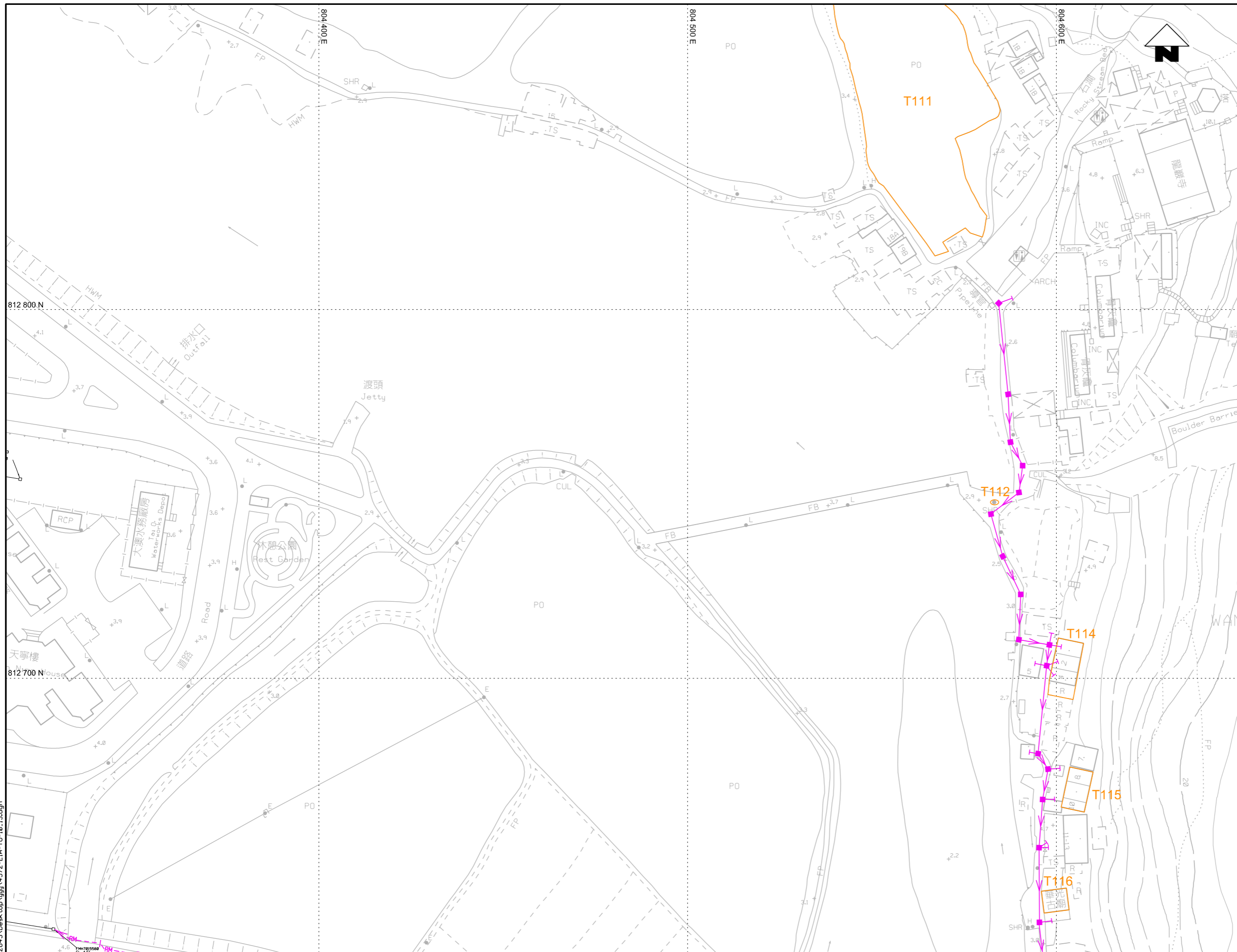


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Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

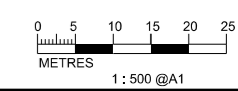
Title :	Location of Built Heritage Resources (Sheet 7 of 14)		
Date :	MAY 2015	Figure :	9.10



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House

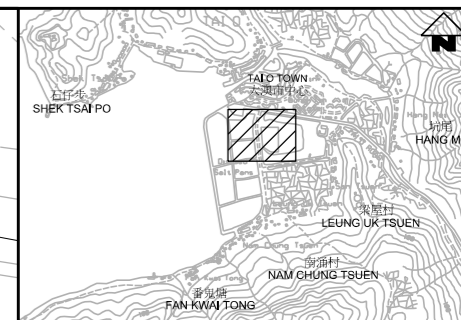
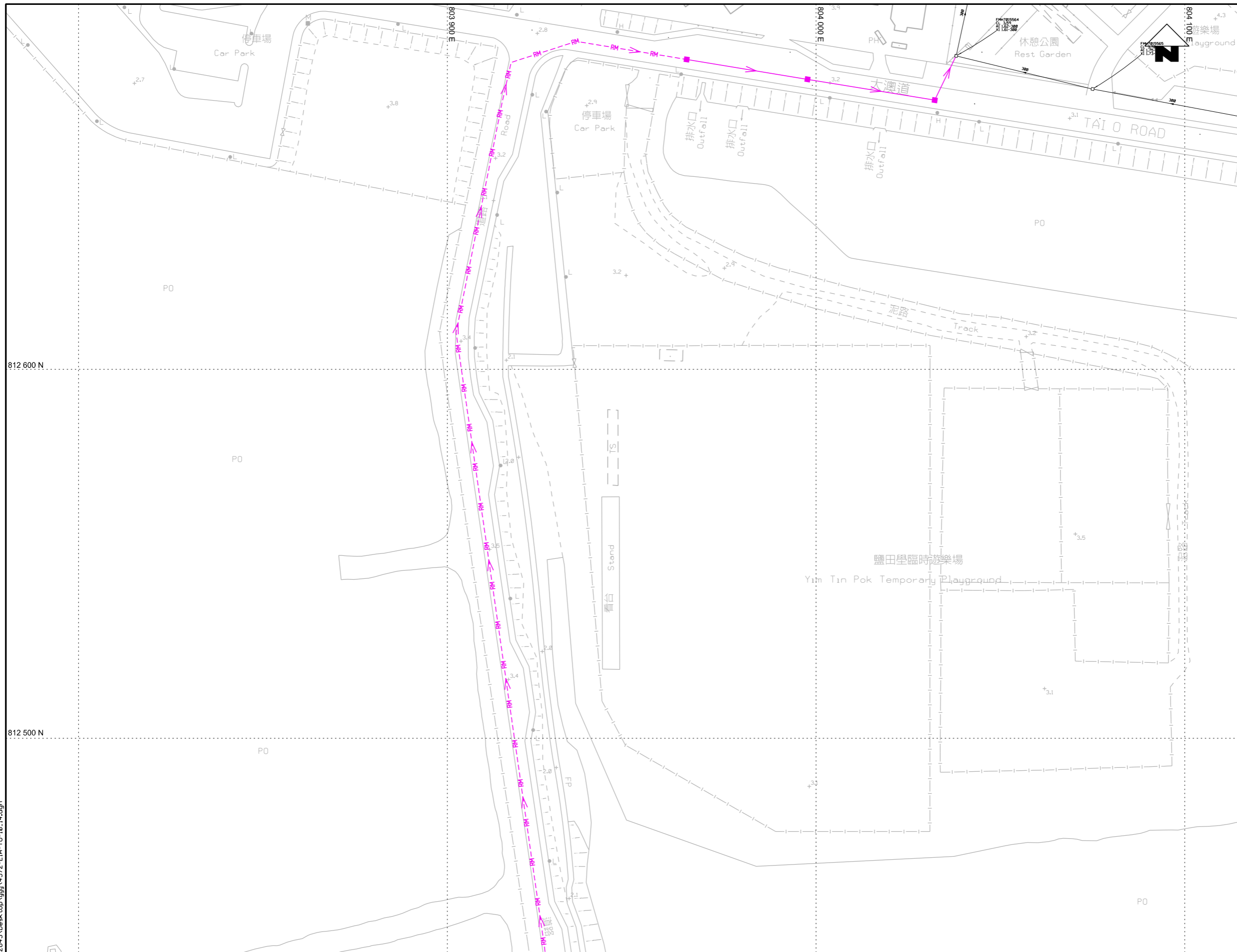


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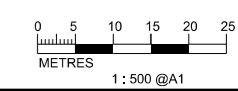
Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 8 of 14)		
Date :	MAY 2015	Figure :	9.11



- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

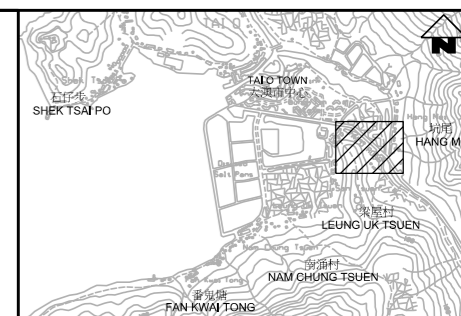
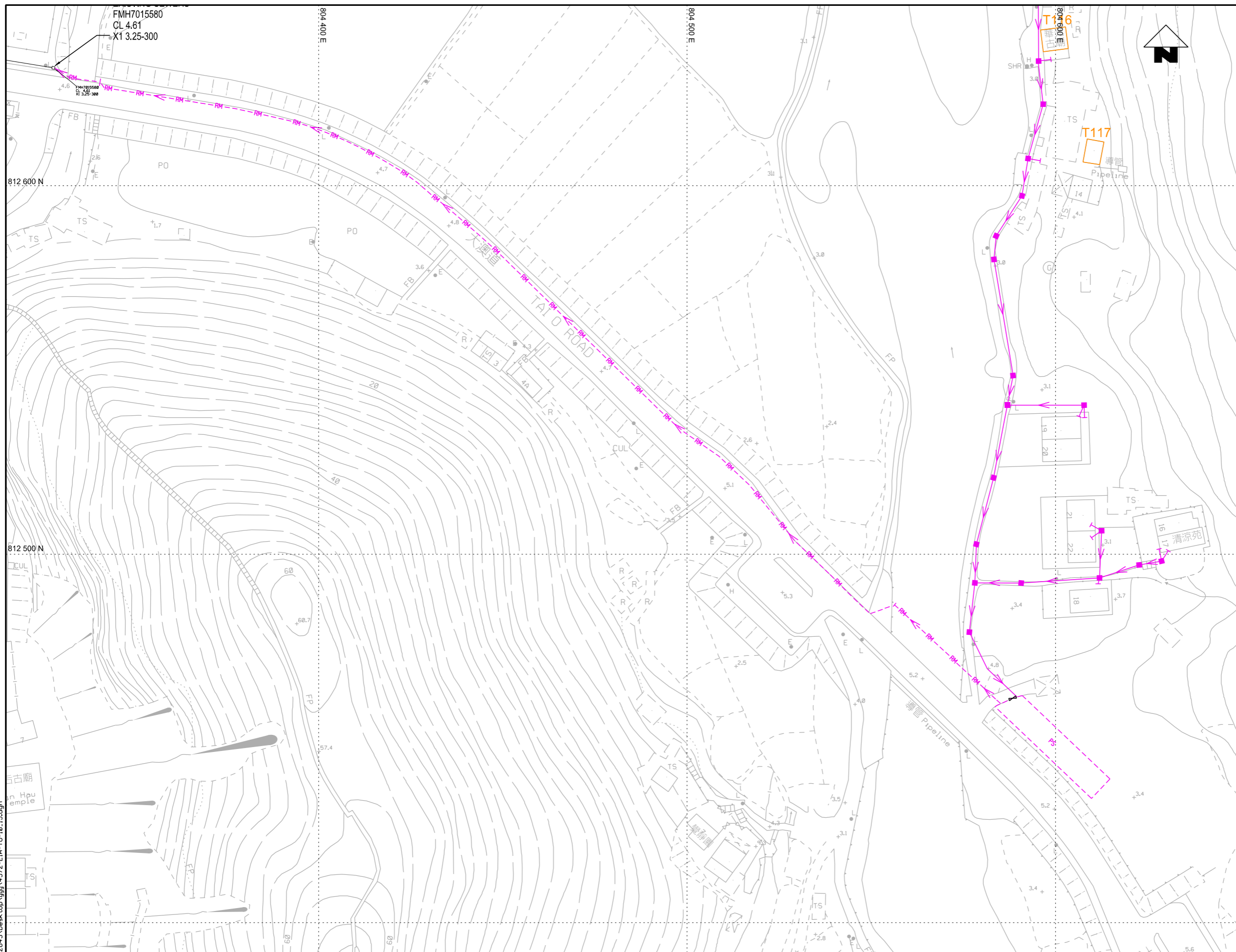
- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - RM Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - PS Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House



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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

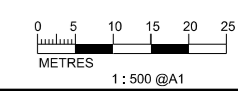
Title :		Location of Built Heritage Resources (Sheet 9 of 14)	
Date :	MAY 2015	Figure :	9.12



KEY PLAN SCALE : 1:10,000

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House

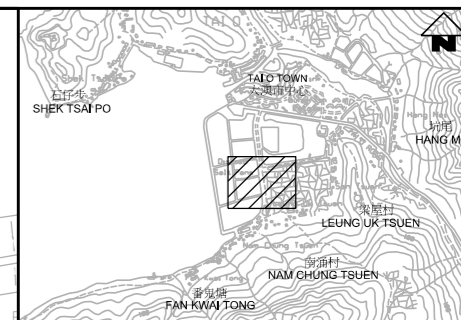


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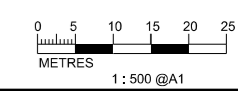
Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 10 of 14)		
Date :	MAY 2015	Figure :	9.13



- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House

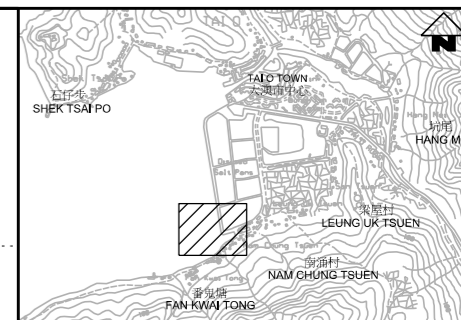
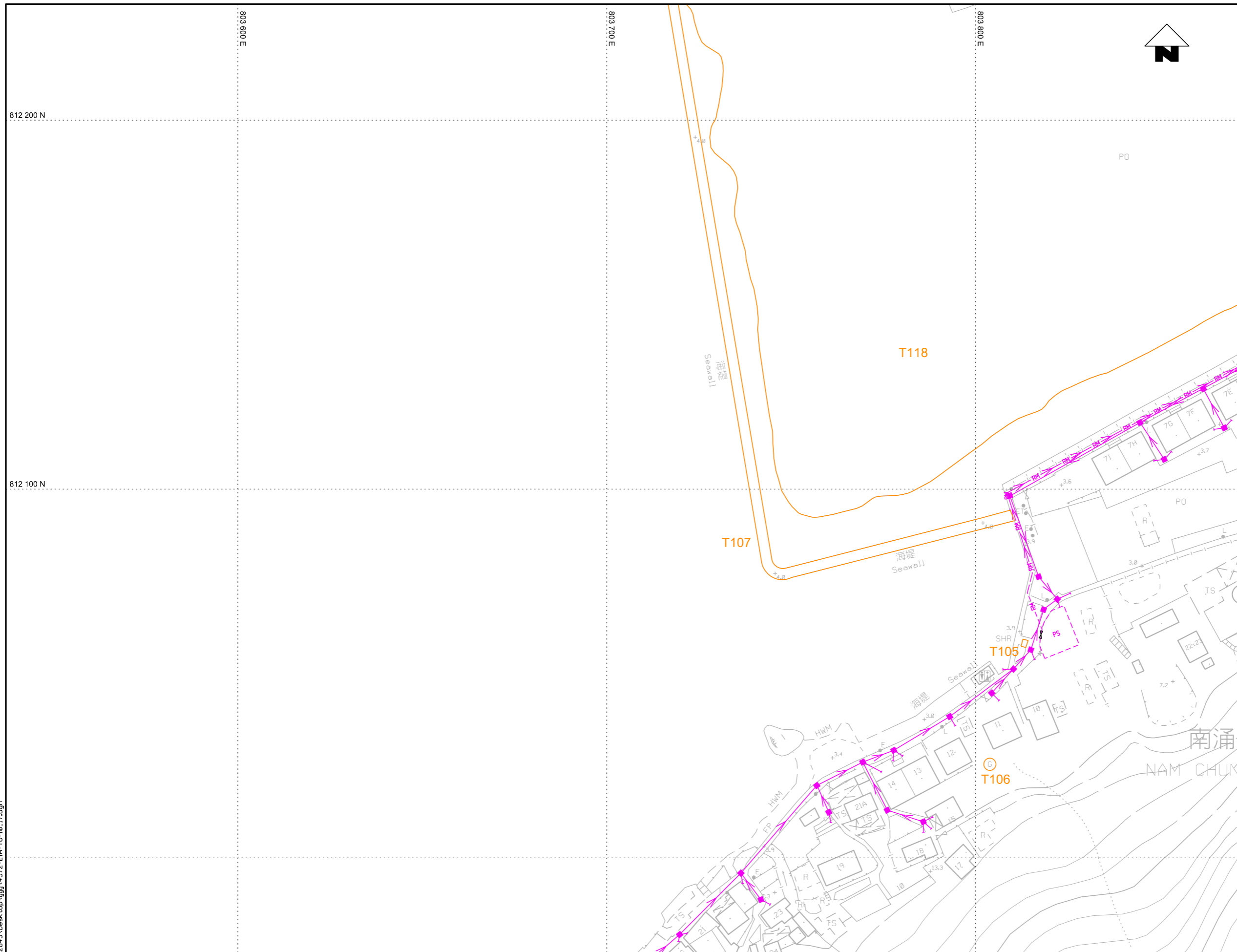


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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

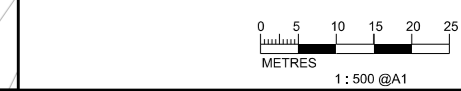
Title :	Location of Built Heritage Resources (Sheet 11 of 14)		
Date :	MAY 2015	Figure :	9.14



KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Stilt House



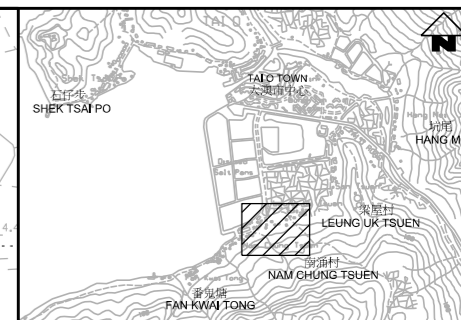
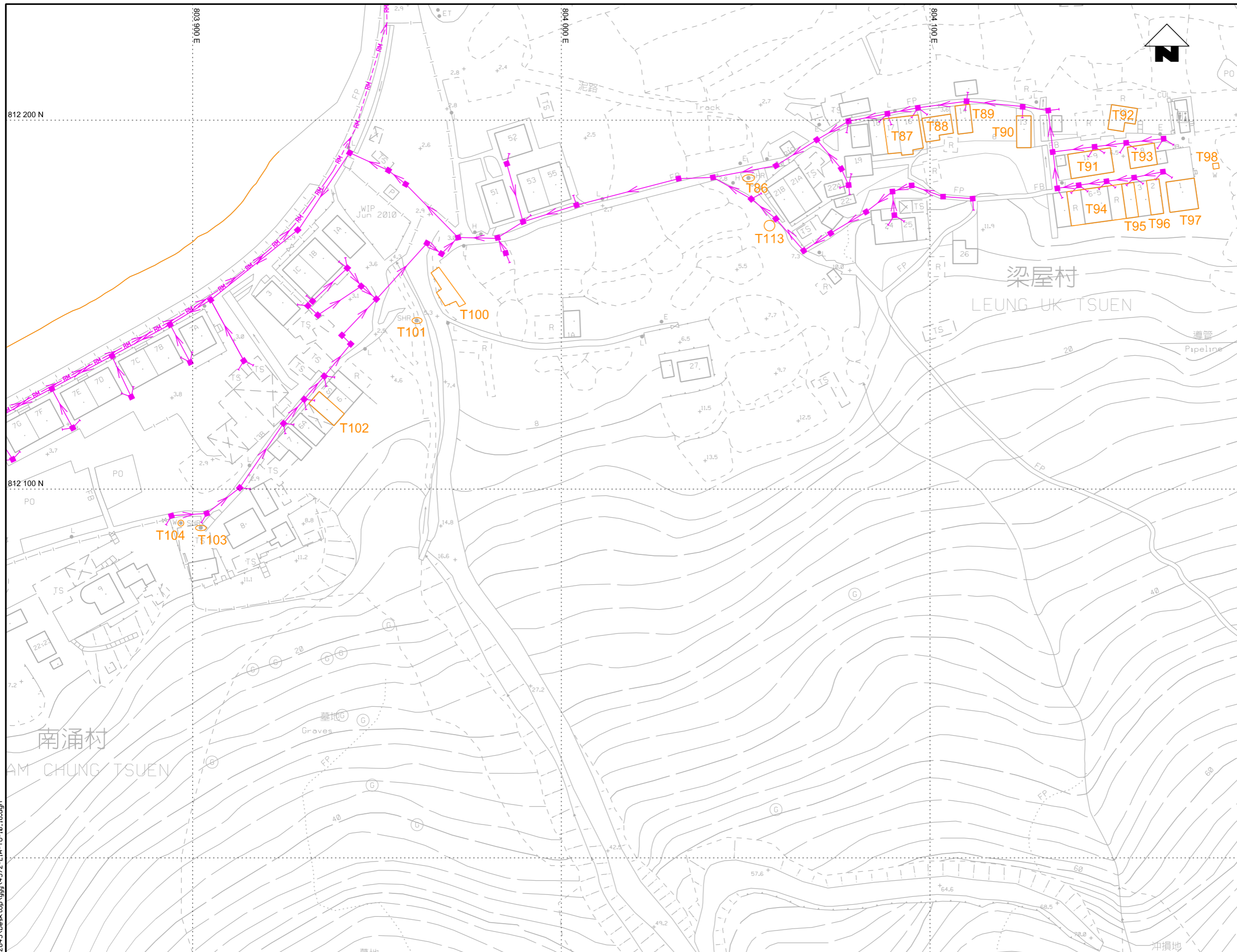
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 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
**Outlying Islands Sewerage Stage 2 -**  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 12 of 14)		
Date :	MAY 2015	Figure :	9.15

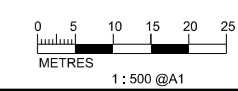




KEY PLAN SCALE : N.T.S.

- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of site works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House

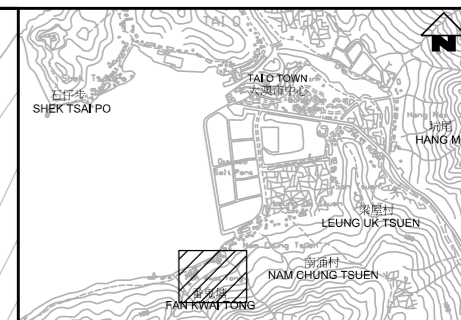
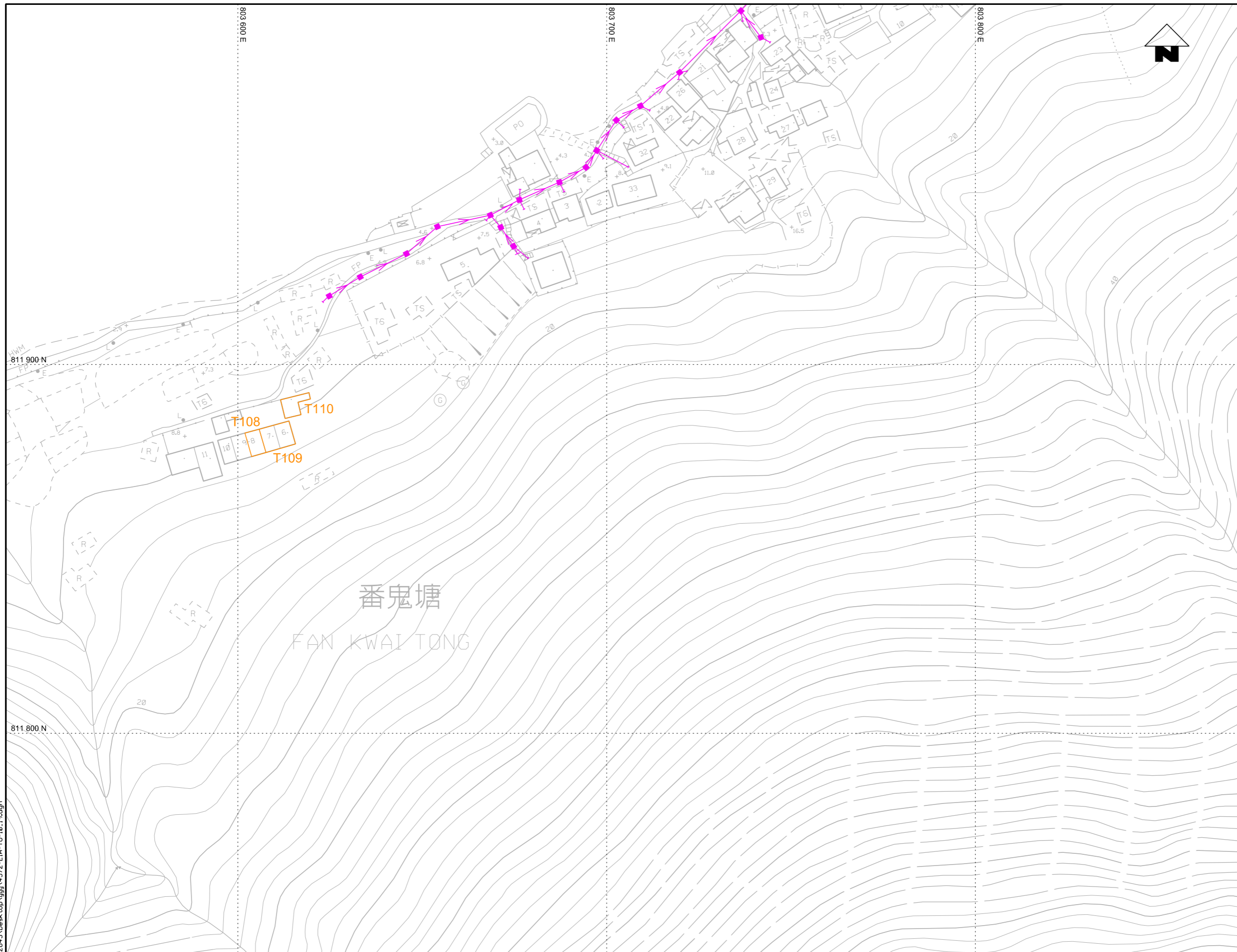


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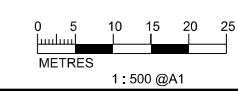
Agreement No. CE 15/2010 (DS)  
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction  
 Outlying Islands Sewerage Stage 2 -  
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	Location of Built Heritage Resources (Sheet 13 of 14)		
Date :	MAY 2015	Figure :	9.16



- NOTES :
1. Exact location of manholes to be determined on site by the Engineer.
  2. Tapping pipes and timber box for the proposed manhole for future house connection are not shown for clarity. Exact location of tapping pipes and timber boxes shall be determined on site by the Engineer.
  3. Details of existing sewers / drains shown are for information only and shall be confirmed on site by the contractor when necessary for the execution of site works.

- LEGEND AND ABBREVIATION:
- Existing Manhole
  - Existing Sewer
  - Existing Rising Main
  - Proposed Sewer
  - Proposed Manhole
  - Proposed Rising Main
  - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
  - Proposed Sewage Pumping Station
  - Location of Built Heritage Resources
  - Estimated Edge of Still House



番鬼塘  
FAN KWAI TONG

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Title :	Location of Built Heritage Resources (Sheet 14 of 14)		
Date :	MAY 2015	Figure :	9.17