

Section 4

WATER QUALITY

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4.1 Water Quality Parameters

4.1.1 During the WCR construction, operation of the seawater intakes could be directly impacted by Suspended Solids (SS), turbidity and pH values of seawater. SS concentration and turbidity shall, therefore, be monitored to assess the background (ambient levels) and the extent of dredging impact during the construction. The pH value indicates the corrosive impact of seawater. The total hardness of water reflects the extent of the formation of insoluble precipitates that accumulate as adhering deposits on the surface of intake pipes and restrict the intake of seawater. Thus, these parameters are the most sensitive parameters of the seawater intakes that require close monitoring. Dissolved Oxygen (DO) concentration and % saturation will also be closely monitored as it is sensitive to reclamation activities.

4.1.2 Water quality monitoring shall be carried out by the ET to ensure that any deteriorating water quality could be readily detected and timely action taken to rectify the situation. Water quality monitoring parameters shall include:

Dissolved oxygen (DO) (in mg l ⁻¹ and % saturation)	}	<i>In situ</i> measurement
Temperature (°C)		
pH value		
Turbidity (NTU)		
Water depth (m)		
Salinity (ppt)		
Suspended Solids (SS) (mg l ⁻¹)	}	Laboratory measurement

4.1.3 These parameters are selected for monitoring on the following basis:

- (a) To reflect the background marine water quality near and within the working area;
- (b) The impact of the construction activities (dredging, filling and any alternation to flows); and
- (c) With reference to WSD's criteria for salt water intakes.

4.1.4 As described in the EIA Study, the layout and construction phasing of both the TKO Section and Yau Tong reclamations have been designed to optimise tidal flushing of the temporary water body and avoid the formation of embayed water body. However, monitoring shall be carried out by the ET to ensure that, in the event of any deteriorating water quality, impacts are readily detected and action is undertaken in time to rectify the situation.

4.1.5 In association with the water quality parameters, other relevant data shall also be measured, including details of the monitoring location/position, time, water depth, water temperature, salinity, DO % saturation, weather conditions, sea conditions, tidal stage, any external influences and the work being undertaken at the construction site.

4.1.6 A sample monitoring record sheet and data format are shown in *Annex A* for reference.

4.2 Monitoring Equipment

4.2.1 Water quality monitoring equipment with the following specifications shall be supplied by the ET Leader.

Dissolved Oxygen and Temperature Measuring Equipment

4.2.2 Dissolved oxygen and temperature measuring equipment

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

Turbidity Measurement Instrument

4.2.3 The instrument should be a portable, weatherproof turbidity-measuring instrument complete with 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).

4.2.4 The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of SS (in mg l⁻¹). After calibration, turbidity measurements shall be taken as a true representation of levels of SS only before laboratory test results for SS are known.

Suspended Solids

4.2.5 Water samples for suspended solids measurements should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

Water Depth Detector

4.2.6 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 handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

Salinity/pH

4.2.7 A portable salinometer capable of measuring salinity in the range of 0-40ppt shall be provided for measuring salinity of the water at each monitoring location. A pH meter shall also be provided.

Water Sampling Equipment

4.2.8 A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres which can be effectively sealed with cups at both ends, shall be used. The water sampler shall have a positive latching system to keep it open and prevent premature

closure until released by a messenger when the sampler is at the selected water depth (e.g. Kahlsico Water Sampler 13SWB203 or an approved similar instrument).

Location of the Monitoring Stations

- 4.2.9 A hand-held or boat-fixed type Differential Global Positioning System (DGPS) or other equivalent instrument of similar accuracy shall be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.
- 4.2.10 All *in-situ* monitoring instruments shall 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 shall be carried out before measurement at each monitoring location.
- 4.2.11 For the on site calibration of field equipment, the BS 127:1993, "*Guide to Field and On-Site Test Methods for the Analysis of Waters*" shall be observed.
- 4.2.12 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 some equipment is under maintenance, calibration, etc.

4.3 Laboratory Measurement / Analysis

- 4.3.1 Analysis of SS shall be carried out in a HOKLAS or other international accredited laboratory. Water samples shall be collected at the monitoring stations for carrying out the laboratory determination. The detection limit shall be 1 mg l⁻¹ or better for SS. The laboratory analysis shall start within 24 hours after collection of the water samples. The SS determination shall follow *APHA 17ed 2540D* or equivalent methods subject to approval of EPD.
- 4.3.2 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by the EPD. The ET Leader shall provide the ER with one copy of the relevant chapters of the "*Standard Methods for the Examination of Water and Wastewater*" updated edition and any other relevant document for his reference.
- 4.3.3 For the testing methods of other parameters as recommended by EIA or required by EPD, detailed testing methods, pre-treatment procedures, instrument use, QA/QC details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limits and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme. The QA/QC shall be to accordance with the requirement of HOKLAS or international accredited scheme.
- 4.3.4 The QA/QC results shall be reported. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months to case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD.
- 4.3.5 In any circumstance, the sample testing shall have comprehensive QA/QC programmes. The laboratory shall prepare to demonstrate the programmes to EPD or his representatives

when requested. The IC(E) shall undertake regular audits of the testing and calibration results as part of the quality assurance.

4.4 Monitoring Locations

4.4.1 The water quality monitoring locations are shown to *Figure 4.4a-b* (refer to *Table 4.4a-b*). The status and locations of water quality sensitive receivers and the marine activities may change after issuing this manual. If such cases arise, the ET Leader shall propose updated monitoring locations to the IC(E) and seek approval from EPD.

Table 4.4a Water Quality Monitoring Stations - TKO Section

Station Description	HK Metric Grid N	HK Metric Grid E	Code
TKO Section Reclamation	817205	844941	TKO-WM1
TKO Section Reclamation	817013	843863	TKO-WM2
TKO Section Reclamation	817813	843707	TKO-WM3
TKO Section Reclamation	816573	843489	TKO-WM4
TKO Section Reclamation	816351	843274	TKO-WM5
Control Station for TKO Section Reclamation	817653	844499	TKO-C1
Control Station for TKO Section Reclamation	816152	843086	TKO-C2

Table 4.4b Water Quality Monitoring Stations - Yau Tong Section

Station Description	HK Metric Grid N	HK Metric Grid E	Code
Cha Kwo Ling WSD Seawater Pumping Station	817679	842001	YT-WM1
Yau Tong WSD Seawater Pumping Station	817020	842099	YT-WM2
Yau Tong Bay Reclamation	817289	841876	YT-WM3
Yau Tong Bay Reclamation	816693	842384	YT-WM4
Control Station for Yau Tong Bay Reclamation	817348	841437	YT-C1
Control Station for Yau Tong Bay Reclamation	816466	842446	YT-C2

4.4.2 When alternative monitoring locations are proposed, they shall be selected based on the following guidelines:

- (a) Located at the boundary of the mixing zone of the major site activities as indicated to the EIA Study, which are likely to cause water quality impacts;
- (b) Located close to the sensitive receptors which are likely to be affected;
- (c) For monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring;
- (d) Two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations shall be located, as far as is practicable, both upstream and downstream of the works area.

4.4.3 Two 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 body of water as the impact monitoring stations but shall be outside the area of influence of the works. The control station will thus serve as a means to check whether or not the

marine water quality is impacted by other major adjacent development during WCR reclamation construction and to certain circumstances, may be of significant benefit for off-site impact attribution purposes.

4.4.4 Measurements shall be taken at 3 water depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, when the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station will be monitored. The ET Leader shall seek approval from IC(E) and EPD on all the monitoring stations.

4.4.5 Replicate *in-situ* measurements and samples collected from each independent sampling event are required for all parameters to ensure a robust statistically interpretable dataset.

4.5 **Baseline Monitoring**

4.5.1 Baseline conditions for water quality shall be established and agreed with EPD prior to the commencement of works. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall normally be established by measuring the water quality parameters specified to *Section 4.1*. The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood and mid-ebb tides, for four weeks prior to the commencement of marine works.

4.5.2 Prior to the commencement of baseline monitoring the ET Leader shall confirm whether there are, or likely to be, concurrent projects which could generate water quality impacts in the same area as the WCR. The locations of control stations should be examined to determine whether they will be able to detect impacts from any concurrent projects. If this is not the case then alternative control stations should be proposed and agreed with EPD prior to the commencement of baseline monitoring.

4.5.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from the IC(E) and EPD on an appropriate set of data to be used as baseline reference. Baseline monitoring schedule shall be faxed to EPD 1 week prior to the commencement of baseline monitoring.

4.6 **Impact Monitoring**

4.6.1 During the general course of the marine works monitoring shall be undertaken three days per week, *at mid-flood* and *mid-ebb* phase of the tidal cycle with sampling/measurement at the designated monitoring stations. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit Levels, in which case the monitoring frequency will be increased.

4.6.2 During the Yau Tong Reclamation works, water quality monitoring shall be carried out once per day at the Yau Tong WSD Seawater Pumping Station at *mid-flood* and *mid-ebb* of the tidal cycle.

4.6.3 Samples shall be taken at 1 m below the surface, mid-water depth and 1 m above the seabed at both mid-flood and mid-ebb tide. If the water depth is less than 6 m, the mid-depth measurement may be omitted subject to the approval of the Engineer. If the depth is less than 3 m, only the mid-depth measurement need to be taken subject to the approval of the Engineer.

4.6.4 Upon completion of all marine activities, a post project monitoring exercise on water quality shall be carried out for four weeks to the same manner as the impact monitoring.

4.6.5 The proposed water quality monitoring schedule shall be faxed to EPD on or before the first day of the monitoring month. EPD shall also be notified immediately for any changes to schedule by fax. The results of the water quality impact monitoring relating to WSD's seawater intakes at Tseung Kwan O, Yau Tong and Cha Kwo Ling salt water pumping stations shall also be faxed to WSD as soon as they are available.

4.7 **Event and Action Plan for Water Quality**

4.7.1 Monitoring data collected during the period of the construction works shall be assessed for SS and DO with regard to the Action and Limit Levels criteria as shown to *Table 4.7a*. Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions to accordance with the Action Plan in *Table 4.7b* shall be carried out.

4.7.2 The water quality assessment criteria, namely Action and Limit Levels are based on the results of baseline monitoring and WQO of the relevant Water Control Zone (*Table 4.7a*). Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality assessment criteria are exceeded, the actions to accordance with the Action Plan to *Table 4.7b* shall be carried out.

Table 4.7a Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO to mg/l (Surface, Middle & Bottom)	<u>Surface & Middle</u> 5%-ile of baseline data for surface and middle layer. <u>Bottom</u> 5%-ile of baseline data for bottom layer.	<u>Surface & Middle</u> 4 mg/L or 1%-ile of baseline data for surface and middle layer <u>Bottom</u> 2 mg/l or 1%-ile of baseline data for bottom layer
SS to mg/l (depth-averaged)	95%-ile of baseline data or 120% of upstream control station's SS at the same tide of the same day	99%-ile of baseline or 130% of upstream control station's SS at the same tide of the same day or specific sensitive receiver water quality requirements (e.g. 20 mg/L SS level for WSD sea water intakes and 30 mg/L for the Dairy Farm Ice Factory Yau Tong Bay sea water intake)
Turbidity (Tby) to NTU (depth-averaged)	95%-ile of baseline data or 120% of upstream control station's Tby at the same tide of the same day	99%-ile of baseline or 130% of upstream control station's Tby at the same tide of the same day

Notes :

- 1) For DO, non-compliance of the water quality limits occur when the monitoring result is lower than the limits.
- 2) For SS and Turbidity non-compliance of the water quality limits occur when monitoring results are higher than the limits.
- 3) All figures given to the above tables are used for reference only. EPD may amend these figures when considered necessary.

Table 4.7b

Event and Action Plan for Water Quality

Event	ET Leader	IC(E)	ER	Contractor
Action Level exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat to-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IC(E) and ER; 4. Inform WSD if exceedance occurs at any of WSD's seawater intakes; 5. Check monitoring data, all plant, equipment and Contractor's working methods; 6. Discuss mitigation measures with IC(E) and ER; and 8. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Discuss with ET, ER and Contractor on the mitigation measures; 3. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures; and 5. Supervise the implementation of the mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor; 3. Discuss with IC(E) and ET on the proposed mitigation measures; 4. Make agreement on the mitigation measures to be implemented; and 5. Ensure mitigation measures are properly implemented. 	<ol style="list-style-type: none"> 1. Rectify unacceptable practice; 2. Check all plant and equipment; consider changes of working methods; 3. Discuss with ET, IC(E) and ET and propose mitigation measures to IC(E) and ER; and 4. Implement the agreed mitigation measures.
Action Level exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat to-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IC(E) and Contractor; 4. Inform WSD if exceedance occurs at any of WSD's seawater intakes; 5. Check monitoring data, all plant, equipment and Contractor's working methods; 6. Discuss mitigation measures with IC(E) and ER; 8. Ensure mitigation measures are implemented; 9. Prepare to increase the monitoring frequency to daily; and 10. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Discuss with ET, ER and Contractor on the mitigation measures; 3. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures; and 5. Supervise the implementation of the mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor; 3. Discuss with IC(E) and ET on the proposed mitigation measures; 4. Make agreement on the mitigation measures to be implemented; and 5. Ensure mitigation measures are properly implemented. 	<ol style="list-style-type: none"> 1. Rectify unacceptable practice; 2. Check all plant and equipment; consider changes of working methods; 3. Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER within 3 working days; and 4. Implement the agreed mitigation measures.
Limit Level exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat to-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IC(E), contractor and EPD; 4. Inform WSD if exceedance occurs at any of WSD's seawater intakes; 5. Check monitoring data, all plant, equipment and Contractor's working methods; 6. Discuss mitigation measures with IC(E) and ER; 8. Ensure mitigation measures are implemented; and 9. Increase the monitoring frequency to daily until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Discuss with ET, ER and Contractor on the mitigation measures; 3. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures; and 5. Supervise the implementation of the mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor; 3. Discuss with IC(E), ET and Contractor on the proposed mitigation measures; 4. Request Contractor to critically review the working methods; 5. Make agreement on the mitigation measures to be implemented; and 6. Ensure mitigation measures are properly implemented. 	<ol style="list-style-type: none"> 1. Rectify unacceptable practice; 2. Check all plant and equipment; consider changes of working methods; 3. Discuss with ET, IC(E) and ER and propose mitigation measures to IC(E) and ER within 3 working days; and 4. Implement the agreed mitigation measures.

Event	ET Leader	IC(E)	ER	Contractor
Limit Level exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat to-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IC(E), contractor and EPD; 4. Inform WSD if exceedance occurs at any of WSD's seawater intakes; 5. Check monitoring data, all plant, equipment and Contractor's working methods; 6. Discuss mitigation measures with IC(E), ER; 7. Ensure mitigation measures are implemented, and 8. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Discuss with ET, ER and Contractor on the mitigation measures; 3. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures; and 5. Supervise the implementation of the mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor; 3. Discuss with IC(E), ET and Contractor on the proposed mitigation measures; 4. Request Contractor to critically review the working methods; 5. Make agreement on the mitigation measures to be implemented; 6. Ensure mitigation measures are properly implemented; and 7. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Rectify unacceptable practice; 2. Check all plant and equipment; 3. Consider changes of working methods; 4. Discuss with ET, IC(E) and ER and propose mitigation measures to IC(E) and ER within 3 working days; 5. Implement the agreed mitigation measures; and 6. As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.

4.8 Water Quality Mitigation Measures

4.8.1 The EIA Study has recommended water quality control and mitigation measures which shall be incorporated into the contract documents. The Contractor shall be responsible for the design and implementation of the following measures:

Mitigation Measures for Reclamation Activities

Yau Tong and TKO Section Reclamations

1. The maximum rates of working for the TKO Section are as follows:
 - Dredging at the seawall trench is restricted to 1,644 m³ day⁻¹; and
 - Sandfilling at the seawall trench is restricted to 2,177 m³ day⁻¹.
2. The maximum rates of working for the Yau Tong Section are as follows:
 - Dredging at the seawall trench is restricted to 1,892 m³ day⁻¹; and
 - Sandfilling at the seawall trench is restricted to 900 m³ day⁻¹.
3. In addition to the above requirements on seawall construction, sand filling for both the TKO and Yau Tong Section shall be carried out behind completed seawalls. This will ensure that any fines in the sandfill are retained behind the seawalls and therefore minimise impacts to sensitive receivers.
4. Mitigation measures to control impacts resulting from the generation, transport, and disposal of dredged or excavated material during the construction phase for the proposed reclamations at Yau Tong and TKO Section shall include:
 - (a) The use of containment structures such as silt curtains or screens around the construction site;
 - (b) The use of closed clamshell grab dredgers to remove seriously contaminated (Class C) material;
 - (c) The prohibition of stockpiling of any moderately or seriously contaminated (Class B and C) material, and careful control of stockpiling of any uncontaminated (Class A) material to prevent runoff, resuspension and odour nuisances;
 - (d) Dredging/reclamation activities near the intakes of WSD's salt water pumping stations shall be minimised and preferably carried out during non-peak hours when the abstraction rate at the Salt Water Pumping Stations (SWPS) is low in order to maintain water quality at the SWPS.
 - (e) A schedule of dredging/reclamation activities near the intakes shall be provided to WSD prior to commencement of construction works.
5. It shall be noted that currents may reduce the efficacy of silt curtains. Previous research indicates that rates of 0.5 m s⁻¹ would be the upper limit for protection from semi-permanent silt curtains. At times when the tidal currents are too high for effective deployment of silt curtains the works shall be reduced or suspended.
6. Mitigation measures shall also include, but not limited to, construction method and phasing, control over dredging and filling rates, restriction on fine content of fill materials, filling and reclamation to be conducted behind completed seawall, pretreatment of effluent arising from construction activities for compliance with TM standards, provision of proper covering to stockpiles and so on. As regards storage of chemical classifiable as dangerous goods, reference should be made of the *Dangerous Goods Ordinance* and relevant standards.
7. Marine dredging and disposal of contaminated sediments requires special mitigation measures as follows:

- (a) All vessels shall be sized such that adequate clearance 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;
 - (b) All barges and hopper dredgers shall be fitted with tight fitting seals to their bottom openings to prevent leakage of material;
 - (c) Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water, and barges or hoppers shall not be filled to a level which will cause the overflow of materials or polluted water during loading or transportation; and
 - (d) The construction works shall cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site or dumping grounds.
8. Additional provisions will be required where sediments are contaminated. The locations and depths of any areas of contaminated sediments shall be indicated in the construction contract following the completion of the sediment quality survey. The Contractor shall be required to ensure that contaminated sediments are dredged, transported and placed in approved special dumping grounds in accordance with the EPDTC 1-1-92, WBTC 22/92 and WBTC 6/92. Typical mitigation measures to minimise the loss of contaminated material to the water column that shall be incorporated are listed below:
- (a) Use of new specialized water tight grabs to control sediment loss;
 - (b) Transport of contaminated mud to the marine disposal site shall, wherever possible, be by split barge of not less than 750 m³ capacity, well maintained and capable of rapid opening and discharge at the disposal site;
 - (c) The material shall be placed in the pit by bottom dumping, at a location within the pit specified by the FMC;
 - (e) Discharge shall be undertaken rapidly and the hoppers should then immediately be closed, material adhering to the sides of the hopper shall not be washed out of the hopper and the hopper should remain closed until the barge next returns to the disposal site;
 - (f) The dumping vessel shall be stationary throughout the dumping operation;
 - (g) The Contractor must be able to position the dumping vessel to an accuracy of +/-10 m;
 - (h) Monitoring of the barge loading to ensure that loss of material does not take place during transportation;
 - (i) Transport barges or vessels shall be equipped with automatic self-monitoring devices; and
 - (j) On site audit of the equipment and plant is essential to ensure it is used in the correct manner.
9. Final decision making regarding the fate of dredged and excavated material lies with various departments in Government and will depend upon the volume and quality of the material, and other factors.

Further Mitigation Measures for WSD Seawater Intakes at Yau Tong Bay

- 10. Further mitigation measures are required to reduce an acceptable level impacts at the Yau Tong Bay and Cha Kwo Ling seawater intakes to within WSD water quality criteria. The proposed measures will involve the use of a silt curtain around the WSD intakes during dredging and filling activities. The silt curtains are required to be installed and maintained in good condition by the Contractor to the satisfaction of EPD and WSD.
- 11. Other mitigation measures could include reducing the dredging and filling rate during reclamation activities to further reduce the SS levels to within WSD water

quality criteria and restricting dredging to the ebb phase of the tidal cycle, if necessary. However, it should be noted that reducing the dredging and filling rate may impose constraints on the proposed Project programme. This would only be required for Stage 1 prior to the construction of the seawall. It is expected that once the seawall is constructed that filling will occur behind the seawall and the Yau Tong WSD intake will be reprovided to the new proposed waterfront. The need for reducing the dredging rate will be confirmed during The Environmental Monitoring and Audit (EM&A) which will monitor suspended sediment concentrations at the WSD intakes. EM&A results shall be provided to WSD for review.

12. The assessment of impacts to the Yau Tong WSD Saltwater Pumping Station during construction of the WCR reclamation assume that the pumping station had not been reprovioned to the seaward face of the WCR reclamation. According to the construction programme, as described in *Sections 2.3.7 and 2.3.11* of the EIA, the new pumping station will be constructed as part of Phase 2 of the reclamation and the old pumping station will be demolished as part of Phase 3. In order to keep the SS at the intake at, or below, the levels presented above, the existing pumping station should be kept in operation until the completion of the sea wall dredging. Once the outfall is reprovioned there will be no impact from the reclamation filling because the sediment will be retained by the sea walls.

Mitigation Measures for Cooling and Stormwater Discharge

13. Potential water quality impacts may arise from the accumulation of stormwater discharge into the temporary embayment formed during the construction phase. Diversion schemes of all the existing outfalls shall be incorporated into the Preliminary Design to ensure that all stormwater discharges will be diverted prior to Phases 1 and 2 seawall placement. It is therefore expected that these discharges will not have any insurmountable impacts on water quality.

Mitigation Measures for Floating Debris

14. Floating refuse and debris is not only unsightly but may also lead to deterioration of water quality, if left for a long period. Although the accumulation of floating refuse will be prevented through the adoption of a configuration and phasing scheme that maximise flushing, it is recommended that collection and removal of floating refuse is performed at regular intervals, on a twice daily basis, and increased when considerable amount of refuse is observed. The Contractor shall be responsible for the collection of all floating refuse within the site boundary as well as outside the site boundary, if floating refuse is attributed to WCR construction works.

Mitigation Measures for General Construction Activities

15. All site construction runoff shall be controlled and treated to prevent high levels of SS entering surrounding waters. All effluent and waste water arising from construction activities shall comply with the relevant ProPECC Notes (in particular ProPECC PN 1/94) and the WPCO. The following measures, which constitute good site practices, shall be undertaken by the Contractor during construction and shall be included as part of the contract documents:
 - (a) Temporary ditches shall be provided to facilitate runoff discharge into the appropriate watercourses, via a sediment trap/sediment retention basin, prior to discharge;
 - (b) Permanent drainage channels shall also incorporate sediment basins or traps, and baffles to enhance deposition rates;
 - (c) All traps (temporary or permanent) shall incorporate oil and grease removal facilities;

- (d) Sediment traps shall be regularly cleaned and maintained by the Contractor. Daily inspections of such facilities shall be required of the Contractor;
- (e) Concrete batching plants shall be bunded to contain the surface water runoff;
- (f) Water from concrete batching plants shall also pass through sediment traps and settlement tanks prior to runoff into watercourses. These shall be regularly cleaned and maintained by the Contractor;
- (g) Collection of spent bentonite/other grouts in a separate slurry collection system for either cleaning and reuse/disposal to landfill.
- (h) Maintenance and plant areas shall be bunded and constructed on a hard standing with the provision of sediment traps and petrol interceptors;
- (i) All drainage facilities shall be adequate for the controlled release of storm flows;
- (j) Minimising of exposed soil areas to reduce the potential for increased siltation and contamination of runoff;
- (k) All chemical stores shall be contained (bunded) such that spills are not allowed to gain access to water bodies. Chemical waste arising from site shall be properly stored, handled, treated and disposed of complying with the requirements stipulated under the *Waste Disposal (Chemical Waste) (General) Regulation*.
- (l) Chemical toilets shall be required to handle the sewage from the onsite construction workforce.

16. In order to prevent any deterioration in water quality, it will be important that appropriate measures are implemented to control runoff and drainage, and thereby prevent high loadings of SS from entering the nearby rivers or water bodies. Proper site management will be essential to minimise surface water runoff and good housekeeping practices shall be implemented to ensure that debris and rubbish does not enter water bodies.

Construction Runoff

17. The boundaries of critical areas of earthworks should be marked and surrounded by dykes or embankments for flood protection. This shall be implemented prior to the commencement of site preparation works.
18. Construction runoff shall be controlled in the following manner to prevent runoff with high levels of SS.
- (a) Traps (temporary or permanent) shall incorporate oil and grease removal facilities such as oil interceptors at areas where there are high risk of oil/grease pollution;
 - (b) Oil interceptors shall be installed for the maintenance workshop and storage areas in compliance with EPD regulations. These shall be emptied regularly and should have a bypass to prevent flushing during periods of heavy rain;
 - (c) Ditches which tie into the temporary cut off drains or tarpaulin covers shall be provided to reduce sediment runoff;
 - (d) Slope exposure during the wet season shall be minimised through avoiding primary earthworks movements during the wet season and adopting, wherever possible, a construction sequence which reduces the exposed areas through maintaining short work faces;
 - (e) Spent cement mix or other paving materials shall be collected in a separate collection system for either cleaning and reuse or disposal to landfill;
 - (f) Hydroseeding is recommended, wherever practical, to minimise exposed soil areas and reduce the potential for increased siltation and contamination of runoff;
 - (g) Disposal of any solid materials, litter or wastes to the stream shall be prohibited; and
 - (h) Accidental release of soil, debris or solid wastes into adjoining land and

streams shall be prevented by the installation of boarding at the site boundary, particularly along stream banks.

Oils and Solvents

19. To prevent spillages of fuel oils or other polluting fluids to coastal water, all fuel tanks and storage areas shall 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.

Sewage

20. Portable toilets or septic tanks shall be provided for the onsite construction workforce. Appropriate treatment and discharge should be in compliance with the TM.

Stream Culverting and Diversions

21. Stream Culverting is proposed for several of the streams in the Study Area. The stream courses currently discharging into Sam Ka Tsuen Typhoon Shelter will be culverted in 2004. For other stream course discharges, the timing of culverting is unknown. Impacts to the water quality of these streams shall be minimised as far as possible. In addition, temporary diversions of the streams shall be constructed so as to allow the water flow to discharge without overflow, erosion or washout. The areas concerned shall be properly reinstated after diversion to their original conditions so that the drainage pattern would not be affected.

Water Movement

22. Although the modelling has predicted that there will not be significantly reduced flushing of Yau Tong Bay it is still recommended that the proposed culverts through the submerged breakwater be implemented. This will further improve the flushing of Yau Tong Bay following the construction of the Yau Tong section of the WCR.

Phasing

23. It is recommended that if the reclamation at Yau Tong Bay is constructed prior to the WCR, that the stormwater discharges in Yau Tong Bay be reprovided to the new waterfront to further avoid any embayment of polluted discharges. The phasing of the salt water pumping station intake relocation will need to be determined during the detailed design stage. However, it is recommended that the existing pumping station to be relocated is to be maintained operational at its existing location until all seawall dredging has been completed. The Engineering Team shall liaise with WSD on the timing of the relocation.

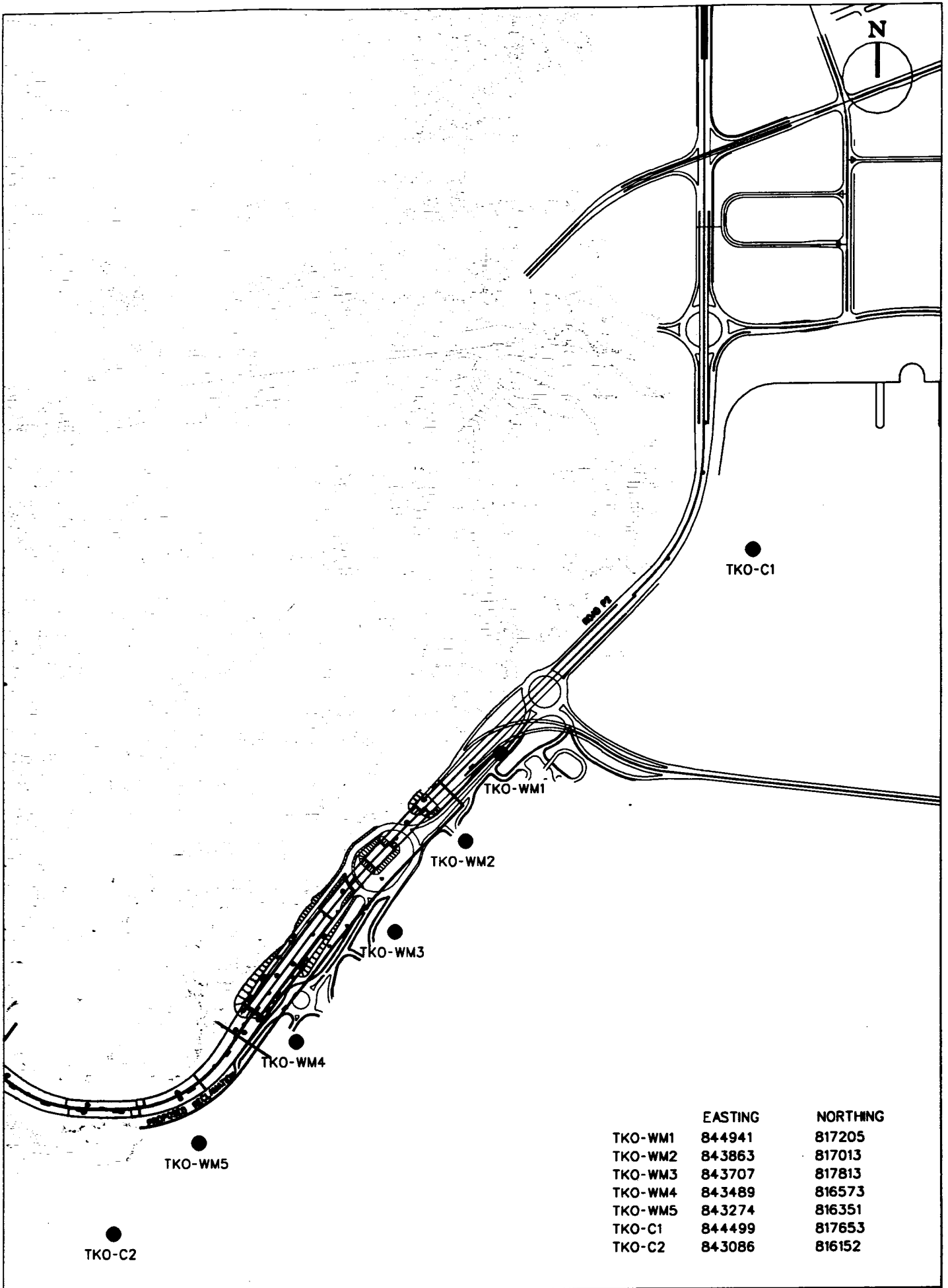
Berthing Facilities

24. Berthing facilities for the Kwun Tong Wholesale Fish Market, Sam Ka Tsuen Ferry Pier and CED Maintenance Depot shall be sited more than 100 m from the Yau Tong Salt Water Pumping Station intake.

Road Runoff During Operation

25. The following mitigation measures for road runoff shall be implemented in order to ensure that impacts during the operational phase are minimised and meet the existing regulatory requirements.
 - (a) Silt traps in gully inlets and oil interceptors shall be installed along the route to minimize pollution to stormwater systems; and
 - (b) Silt traps and oil interceptors shall be cleaned and maintained regularly to

ensure that they function properly.



	EASTING	NORTHING
TKO-WM1	844941	817205
TKO-WM2	843863	817013
TKO-WM3	843707	817813
TKO-WM4	843489	816573
TKO-WM5	843274	816351
TKO-C1	844499	817653
TKO-C2	843086	816152

TKO SECTION RECLAMATION - WATER QUALITY
MONITORING STATIONS

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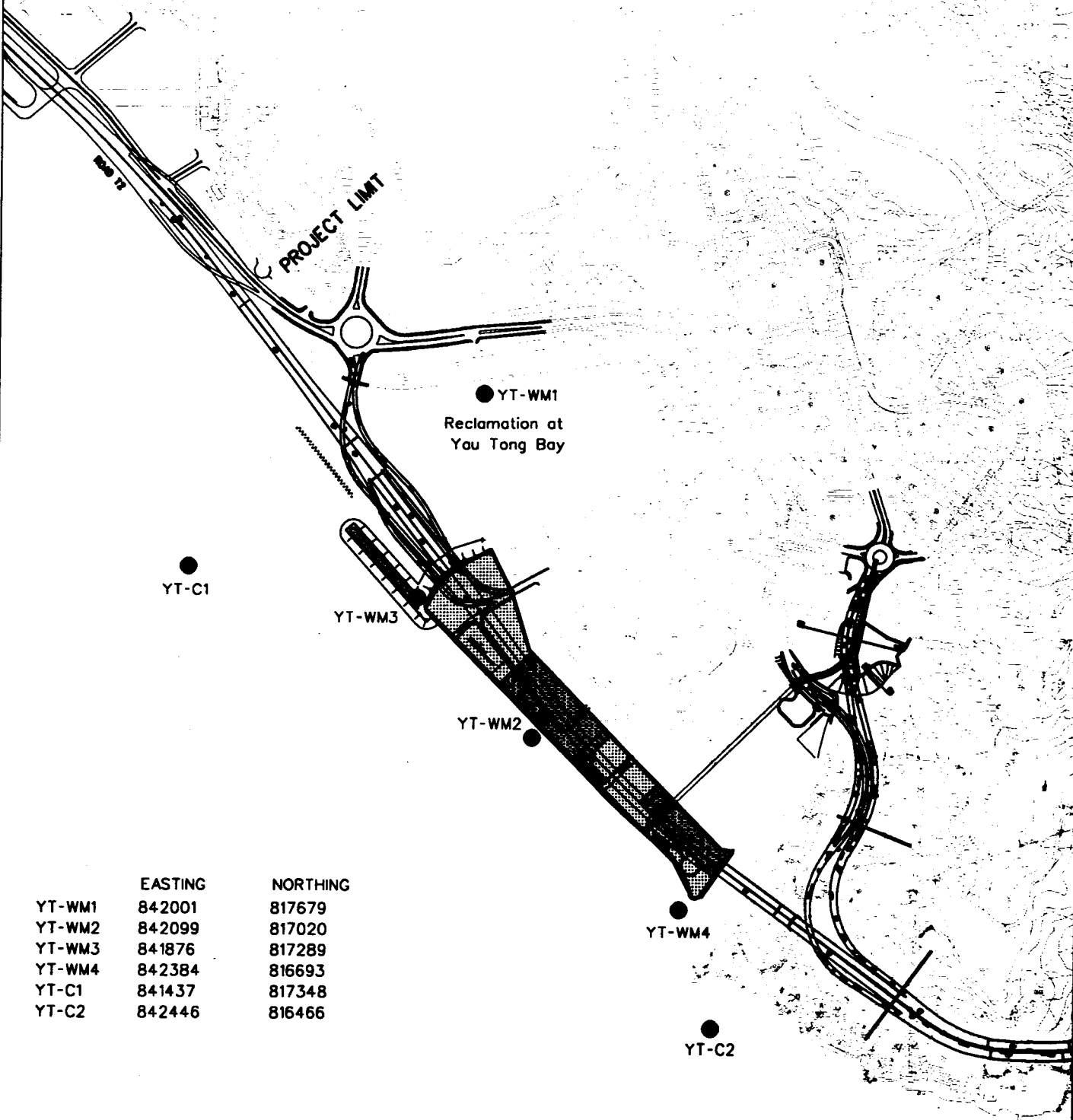
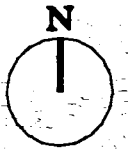
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FIGURE No.

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	EASTING	NORTHING
YT-WM1	842001	817679
YT-WM2	842099	817020
YT-WM3	841876	817289
YT-WM4	842384	816693
YT-C1	841437	817348
YT-C2	842446	816466

YAU TONG COASTAL RECLAMATION -
WATER QUALITY MONITORING STATIONS

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