12.3.13 The Contractor shall include all works required in order to carry out the pumping tests such as piezometers, observation wells, dewatering wells, submersible pumps, level switch, monitoring, etc. The cost for such works shall be deemed to have been included in the Contract Price. Method statement and drawings showing the proposed pumping tests shall be included.

12.3.14 A detailed report on the pumping test shall be submitted upon completion of the pumping tests. Excavation can only commence when the results from the pumping tests are deemed acceptable to the QP(S) and the Engineer.

12.3.15 Notwithstanding the above proposed groundwater control measures, the Contractor shall limit the piezometric water pressure drawdown at building/structures/utilities during the excavation/mining to not more than 1m below the existing levels.

12.4 Construction of Earth Retaining or Stabilising Structure (ERSS) Walls

12.4.1 The Contractor shall produce method statements and shop drawings for the ERSS walls to suit his construction methods. The information provided should include the method and machinery to construct the ERSS wall, lifting and handling of the rebar cage, the use of stabilizing fluids, the interface with transversing sewers and utilities etc. The shop drawings shall include the rebar arrangement, and the termination level corresponding to soil condition. The Contractor shall be responsible for sealing off the ingress of water through the ERSS walls and/or gaps in ERSS prior to further excavation.

12.4.2 Where there is presence of rock Grade IV or better above the FEL, the ERSS shall toe in at least 2m below FEL.

12.4.3 The Contractor shall note that the ERSS shall be designed to minimize the construction period and to protect the surrounding structures and services. Should fluvial sand be envisaged where the ERSS is located, the Contractor shall propose measures to maintain stability and to reduce the risk of water drawdown during construction of the ERSS. The Contractor shall be fully responsible for ERSS stability and take all necessary measures to ensure ERSS stability.

12.4.4 The use of diesel piling hammers shall not be permitted. Only silent piler or equivalent equipment shall be used and the Contractor shall submit details of this equipment to the Engineer for acceptance.

12.5.13 Where a waterstop is used between diaphragm wall panels, the Contractor shall install the waterstop to a minimum requirement of at least 5m below formation level or at least 1m into stratum with permeability less than 1E-7 m/s, whichever is deeper. Where waterstop installation fails to meet the above criteria, the Contractor shall propose alternative groundwater control measures to the acceptance of the Engineer. Notwithstanding this minimum requirement, the Contractor is responsible to design and install the waterstop and relevant groundwater control measures to requirements from other authorities in order to safeguard adjacent buildings and infrastructures.

If waterstop bars are used, vertical grouting shall be carried out behind all diaphragm wall joints where the ground is permeable, to a minimum of 1m above and 2m below ground with permeability less than 1x10-7m/s (e.g. F1 sand, other permeable soil). This is irrespective of whether it is above or below the Final Excavation Level (FEL). The Contractor shall propose actual vertical length of grout required based on soil investigation and excavation records from the diaphragm wall and submit for the Engineer's acceptance. When the diaphragm wall is exposed, the Contractor shall repair any joints or part of wall body that have jetting, spraying or leakage of water.

The Contractor may propose alternative joint design such as those formed using over-cutting method, which would be subjected to the Engineer's acceptance.

12.5.14 The Contractor shall ensure his proposed diaphragm wall machine has features that enable strict control of the verticality and twisting during the excavation process. In this respect, the diaphragm wall machine shall be equipped with real-time monitoring of excavated trench profile via the cutters and grabs, including monitoring of deflections on the XX and YY axes, rotation about the ZZ axis and deviation from the vertical. Such reports shall be submitted to the Engineer following the completion of excavation for each diaphragm wall panel.

12.5.15 The Contractor shall sequence his works such that the diaphragm wall panels are not excavated so close to other recently cast panels which contain workable concrete or unset concrete, such that a flow of concrete or instability could be induced or damage caused to any panel. This sequence of works shall be submitted to the Engineer for acceptance prior to commencement of the diaphragm wall excavation works.

12.5.16 Before commencing concreting of a diaphragm wall panel, the Contractor shall satisfy himself that the concrete supplier has sufficient quantity of concrete to construct the panel in one continuous operation. The Contractor shall ensure that the concreting rate is sufficient to prevent poor quality diaphragm wall panels. Where the density of the reinforcement cage is high, the Contractor shall employ a very workable cohesive concrete.

12.26.5.4 In addition to the requirements in Clause 33 of the General Specification, tree felling shall be controlled tightly. Trees shall not be felled at one go. Tree felling shall be planned to be carried out in stages and in tandem with the Works being carried out at the localised zones. Such staged felling of trees shall be subject to the approval of NParks and the acceptance of the Engineer and shall be included in the programme for the construction of the Works.

12.26.5.5 Upon approval for tree felling by Nparks, the Contractor shall initiate a consultation with NParks and arrange for a joint site inspection with NParks and LTA to survey the affected locations with potential loss of greenery. The Contractor shall obtain NParks' advice and recommendation on the type and extent of temporary greening required in accordance to **Appendix AY** of the Particular Specification.

12.26.5.6 The Contractor shall submit a temporary greening proposal to NParks and LTA based on the recommendation from joint site inspection. The temporary greening proposal shall include detailed temporary greening plan and greening specifications. The Contractor shall comply with Appendix AY of the Particular Specification, to propose planting strips with shrubs / hedges / trees to reduce the loss of greens during construction phase where space is available; Where space is constrained, the Contractor shall propose vertical greening or full-size stickers/graphics on the hoardings and noise barriers to achieve greenery impression, to the Engineer's acceptance.

12.26.5.7 Upon approval from NParks and the Engineer's final acceptance on the proposal, the Contractor shall proceed with the implementation of temporary greening. The cost of implementing the temporary greening plan and all associated works shall be deemed included in the Contract Price.

12.26.5.8 All debris and partially cut portions of trees shall be completely removed from the site. The Contractor shall provide debris skips of appropriate sizes for temporary storage of all fell trees, disposed shrubs and turfing and cut portions while awaiting removal from the site.

12.26.5.9 The Contractor shall bear the full cost of all trees (including shrubs) felling, protection, transplanting, retaining and conservation and any other works associated to and for compliance with NParks, HDB and Town Council's requirements.

12.26.5.10 <u>The Contractor shall engage arborist and conduct monthly inspection of the condition of trees at the new Clementi Forest edge as specified in Clause 23 of the Particular Specification. The Contractor shall fell trees that are deemed unsafe at the new Clementi Forest edge when required by the Contractor's Arborist and subject to the relevant agencies' approval.</u>

12.26.6 Tree Transplanting

12.26.6.1 The tree transplanting works are to be carried out by a contractor that is listed on the Landscape Company Register, and supervised by an ISA certified arborist with minimum 5 years' experience.

12.26.6.2 The Contractor shall:

(a) submit transplanting method statements, based on ISA best practices or equivalent, for NParks' approval before proceeding with the works.

(b) maintain the transplanted trees for a period of 8 weeks or until they are established to the satisfaction of NParks.

(c) replace dead/damaged/dying transplanted trees at their own cost if the transplanted trees do not establish within 8 weeks, or within a timeframe / meeting conditions deemed satisfactory by NParks.

(d) coordinate with NParks on the transplanting timeline.

12.27 OG Boxes

12.27.1 The Contractor shall provide temporary and permanent OG boxes as required to facilitate the construction and completion of the Works, including all necedessary associated incoming and outgoing cables at his own cost.

12.27.2 The OG box shall be suitable for outdoor environment. All components of the OG box shall be accommodated in a weatherproof housing to IP 55 and of robust construction.

12.27.3 The OG box shall be provided with a watershed top. The housing shall be made of galvanized steel sheet with thickness not less than 2.5mm in accordance with the LTA Materials & Workmanship Specification . The OG box shall be sprayed with 1 coat of anti-rust primer and 2 finishing coats of paint colour subject to the approval of the relevant Authorities and the Engineer's acceptance.

12.27.4 Adequate ventilation shall be provided to permit natural circulation of air. The ventilation apertures shall be suitably screened to prevent the entry of vermin and other foreign bodies.

12.27.5 The OG box shall be provided with suitable mounting on a concrete/brick footing. A concrete plinth of minimum height of 400mm shall also be provided for mounting of the OG box.

12.27.6 The OG box shall be provided in the exterior outdoor area for the accommodation of power distribution boards, communication and signalling equipment and other remote/local control and monitoring equipment as required by the SWC. The Contractor shall coordinate with the SWCs for the provision of cast in pipes for all cabling in and out from the OG box, including those for local earthing of power and control systems.

12.50 Completion of Works

12.50.1 Upon Completion of the whole of the Works or such other period that the Engineer shall instruct, the Contractor shall remove from the site his site offices, workshops, storage sheds and other temporary structures including temporary piles and temporary foundations and turf the areas where required.

12.50.2 The Contractor shall also reinstate, to the acceptance of the Engineer, any defect caused by him during the course of the Works. All costs incurred shall be borne by the Contractor.

12.51 Construction Quality Assessment

12.51.1 The Contractor shall note that the Authority would be assessing the construction quality at various stages of the project.

12.51.2 The Contractor shall provide necessary support and documentation for the assessment to be carried out successfully.

12.52 Use of Granite Fines in Structural Concrete

12.52.1 The Contractor shall refer to Appendix BM of the Particular Specification for the specification and requirements on the use of granite fines in structural concrete.