5.5.3.92 The uncontaminated sediments from the dredged areas can be backfilled into the other reclamation areas where no dredging would be required. The contaminated sediments can be treated using *ex-situ* treatment method to reduce the contaminant levels. The treated material should be reused as fill material for reclamation as far as possible.

5.5.3.93 A relatively large portion of sediments would remain in the areas where no dredging is required, application of *in-situ* treatment and/or provision of protection measures should be implemented to protect the future developments. *Ex-situ* and *in-situ* treatment methods and protection measures have been presented in the preceding sections. The proposed treatment methods and protection measures are directly applicable to the minimum dredged reclamation option.

5.5.3.94 Although dredging would be limited to a number of dredging zones, spreading of sediment plume, releasing of contaminants and odour emission from the dredging activities should be fully considered when carrying out the minimum dredged reclamation option. The potential impacts and mitigation measures presented in the section on the dredge for *ex-situ* treatment reclamation option are applicable to this case.

5.6 Pilot Tests

5.6.1.1 The feasibility of *in-situ* treatment and *ex-situ* treatment should be demonstrated through pilot tests, which would include bench scale laboratory tests and field trials. The recommended *in-situ* treatment methods or reagents for sediment remediation in the SEKD include:

- Fenton's Reagent;
- Oxygen Release Compound (ORC); and
- Seditreat^{TM}.

5.6.1.2 The recommended *ex-situ* treatment methods are:

- BioGenesis Sediment Washing; and
- DaramendTM Bioremediation.

5.6.1.3 Bench scale laboratory tests will examine the treatability of sediments by the *in-situ* and *ex-situ* treatment methods. The results obtained from the bench scale tests will be used for evaluation of the suitable methods/oxidants and formulation of the subsequent site trials. The proposed field trials for *in-situ* treatment and *ex-situ* treatment are as follows:

Field Trials for *In-situ* Treatment

5.6.1.4 Application of *in-situ* treatment is mostly conducted from a land-based operation. When applying the treatment in a submerged environment, the operation may be more difficult to control. This would affect the treatment performance. To deal with the situation in the SEKD, it is recommended to conduct the *in-situ* treatment in two selected areas. One of the areas can be backfilled prior to the application of *in-situ* treatment and no filling will be applied to the other one to represent the existing conditions.

A. In-situ Treatment after Backfilling

5.6.1.5 Construction of a 40-meter square test cell within the KTAC by enclosure within sheet piling and backfilling with selected material. Injection of the selected oxidants will then be applied through a series of injection points. The changes in contaminant levels will be monitored through short-screen monitoring wells.

B. In-situ Treatment without Backfilling

5.6.1.6 A 40-meter square test area with no backfilling within the KTAC would be selected for the trial. Injection of the selected oxidants will be applied through a fluid injection system to delivery the oxidants into the sediments from a barge-based operation. A number of injection points will be used to cover the test cell.

Field Trials for *Ex-situ* Treatment

5.6.1.7 Field trials of the *ex-situ* approach would involve suction dredging a small quantity of sediment and injecting the selected reagent into the dredge discharge line, with samples collected from the discharge line before and after reagent addition. Parameters of analysis will include organics, sulphides, and heavy metals. A truck-mounted sediment washing unit consisting of sediment processor, liquid/solids separation equipment, screens, water treatment equipment, equipment for biotreatment of the washed sediment and other accessories will be used in the site trials for *ex-situ* treatment. The suitability of reusing the treated material as fill material would be determined in the field trials.

5.7 Recommendations on the Reclamation Options

5.7.1 *Kai Tak Approach Channel (KTAC)*

5.7.1.1 The sediment contaminant levels in the KTAC were found to be exceptionally high and were enriched with heavy metals, organic pollutants and sulphide. The average depth of the contaminated sediments is about 2.9m below the seabed. A total volume of contaminated sediments is approximately $86x10^4$ m^3. The high methane potential in the KTAC sediments supports that sediment treatment would be required to minimize the methane hazards to the future developments at KTAC. The KTAC sediments could be treated by *in-situ* or *ex-situ* treatment. It is likely that either no dredged reclamation option with provision of *in-situ* treatment or dredge for *ex-situ* treatment reclamation option together with *ex-situ* treatment would be adopted for the KTAC reclamation. If temporary sea wall is to be constructed near the boundary between the KTAC and KTTS, it may involve dredging of sediments in the sea wall location. Minimum dredged reclamation would then be adopted. The undredged sediments would require *in-situ* treatment to reduce the methane potential and the dredged sediments would be treated. The treated material should be reused as fill material for reclamation as far as possible.

5.7.1.2 **Figure 5I** is a flowchart to show the approach to deal with the contaminated sediments in areas other than the locations where the major marine structures are to be constructed. Use of *in-situ* treatment avoids the need for sediment dredging and is preferable to remediate the KTAC sediments. However, the high contaminant levels and depth of the contaminant sediments in the channel may limit the treatment efficiency of *in-situ* treatment, if conducted from the water surface. For that reason, the preferred approach is to first carry out reclamation on the Kai Tak Approach Channel to above sea level, prior to the injection of oxidant on a grid basis through the reclamation fill into the sediment to achieve *in-situ* oxidation. Use of *ex-situ* treatment would not be restricted by these factors but removal or dredging of the contaminated sediments would be required. The preferred treatment method of *in-situ* oxidation and dredging for *ex-situ* treatment should be demonstrated through pilot tests.

5.7.1.3 It has been recommended that the pilot tests for *in-situ* treatment of the KTAC sediments should include Fenton's Reagent, ORC and Seditreat™. Each of these oxidants will be tested on a bench-scale basis for final oxidant selection; however, based on past experience it is anticipated that Fenton's Reagent would be used on a pilot-scale basis. Fenton's Reagent has successfully been applied in a number of projects to achieve high organic contaminant reduction rates (~ 99%). It is likely that Fenton's Reagent would be appropriate to treat the