Appendix 4.5 Sediment Handling Options

Existing methods for management of sediment include in-situ treatment, ex-situ treatment and disposal. In-situ treatment avoids the need for sediment dredging, however, the objective of the Project is to provide sufficient depth of Kwai Tsing Container Basin, and approach channel at the portions of Northern Fairway and Western Fairway to Kwai Tsing Container Terminal (KTCT) for the safe navigation of the Ultra Large Container Ships (ULCS). As such, in-situ treatment of contaminated sediment was not considered as depth of the sea bed is required to be increased to provide sufficient depth for ULCS.

Currently, the common method for management of the dredged sediment is open sea disposal or disposal at designated locations as allocated by MFC depending on the level of contamination. Options for disposal at other locations for other beneficial uses and ex-situ treatment were reviewed as follows:

Disposal or Beneficial Uses

Sediment from this project can be reused as public fill, landfill cover, etc. However, pre-treatment and dewatering of sediment may be required if the sediment is used as public fill or landfill cover. For the creation of artificial mudflats, it provides opportunity for habit restoration, but it may involve habitat tradeoff, it also has risk of impact to water quality and marine habitat. It is considered that these disposal methods are not appropriate for use in this project.

Ex-situ Treatment Options

Ex-situ treatment of sediments can be carried out by means of physical, chemical, biological or thermal methods, a Study on the Options for Management of Contaminated Sediment in Hong Kong [1] commissioned by CEDD, was reviewed in order to identify any feasible alternatives for marine disposal which could be applied on this Project. A brief account of various treatment methods are provided as follows:

- **Mechanical Dewatering**

Mechanical dewatering is to separate water from the sediments by mechanical means such as belt filter presses and centrifuge. Dewatering process is effective but the process is slow and a processing plant has to set up to facilitate off-loading of sediments. However, the water generated from dewatering process contains with contaminants which may also require further treatment, the treated sediment also may contain contaminant which is also required to be treated before disposal. Therefore, if this process is adopted for handling Cat M_f, Cat H_p and Cat H_f materials, it has to be supplemented with other treatment processes. It is therefore considered this option may not be appropriate for use in this project.

- **Physical Separation / Sediment Washing**

Sediment washing is an extraction process which use solvent such as water for separating out the contaminated sediments and concentrated with smaller volume, this process is an effective process for treating contaminated sandy material. Since the dredged sediment from this project mainly comprises soft material clay with very low fraction of sand, this method is considered not appropriate for use in this project.

- **Brick Making**

[1] Ove Arup & Partners Hong Kong Ltd (2008). *Agreement No. FM 01/2007 – Review of Options for Management of Contaminated Sediment in Hong Kong. Final Report (Rev A)*. August 2008.

The contaminated sediments could be used as raw material for construction products like building bricks as the contaminant However, this process may not be appropriate as high temperature is required for brick making and treatment of by-product such flue gas from the process is required.

- **Bioremediation**

Bioremediation is to degrade the contaminants in sediment by bacteria into harmless substances; this method needs to acquire space to construct the process plant. However, if this method is adopted, it requires extensive investigation to study the condition of bacteria so as to increase the efficiency of contaminant degrades. Moreover, biological process is applicable and effective to organic contaminant and it is not suitable in the presence of heavy metals which inhibit the microbial metabolism. As such, this treatment method is considered not appropriate for use in this project.

- **Chemical Treatment**

Available technology for chemical treatment can be by oxidation, reduction, hydrolysis or neutralization. However, this treatment is more useful on organic contaminants and is contaminant-specific, tailor-made processes for treating individual contaminants are required. As such, this method will not be appropriate in this project if wide ranges of contaminant are identified.

- **Stabilization Treatment**

Stabilization treatment is to add substances to the contaminated sediment to increase the bound of contaminant with the soil particles and its stability such that the contaminant will not be released upon disposal. However, if treated sediment could not be used for construction material, besides no reduction in sediment quantity, extra efforts in searching for disposal locations shall be made. This treatment method is considered not appropriate for use in this project.

- **Thermal Treatment/Incineration**

Thermal treatment/Incineration is to destroy contaminant by thermal process. However, this treatment will cause air pollution and problems on dioxin formation.

In all, off-site treatment requires considerable land to set up treatment plant. The treatment plant may involve combination of several treatment processes so as to ensure dredged sediment is properly treated prior to disposal or reuse. Moreover, pilot tests will be required to review the efficiency on different combinations of treatment processes before mass scale implementation. In addition, setting up of treatment plant is a designated project and environmental impact assessment will be required before adoption.

Conclusion

It was concluded after these detailed study that these options are not appropriate given the volume of material to be treated and appropriate time frame.