For discussion **CB(1) 1523/01-02(09)**
19 April 2002

Legislative Council Panel on Environmental Affairs

Effect of Dioxins and Removal of Dioxin-contaminated Soil at Penny's Bay

This paper provides supplementary information to address the concerns raised by Members at a special meeting of the Panel on 10 April 2002 regarding the effect of dioxins and the removal of dioxin-contaminated soil as related to the Environmental Impact Assessment (EIA) study for the decommissioning of Cheoy Lee Shipyard (CLS) at Penny's Bay.

Thermal desorption vs treatment method proposed by Green Island Cement for dioxin-contaminated soil

2. The treatment method proposed by Green Island is an incineration method by nature. We have carried out a detailed evaluation of direct incineration and thermal desorption followed by incineration of treatment residue as methods for treating the dioxin-contaminated soil in Sections 4.187 - 4.210 of the EIA report, the key findings of which are summarized in Tables 4.51 and 4.54 of the report.

3. As explained in our paper No. CB(1) 1434/01-02(02) for the last meeting on 10 April, direct incineration is an effective method to remove organic pollutants including dioxins. However, unlike thermal desorption which will be carried out using indirect heat in an inert environment (nitrogen), the oxygen-rich atmosphere inside an incinerator during the direct incineration process could lead to secondary dioxin formation if the operating conditions are not consistently well-controlled and monitored. If all 30,000 m^3 of dioxin-contaminated soil is to be treated by direct incineration instead of thermal desorption followed by incineration of about 600 m^3 of oily residue at the Chemical Waste Treatment Centre (CWTC) in Tsing Yi ("the recommended method"), the incineration time will be longer and there will be more emissions overall (although all emissions will have to comply with the relevant standards).

A much more comprehensive Environmental Monitoring & Audit programme will be required to ensure acceptable levels of emissions.

4. In addition, subject to the cohesiveness and plasticity of the dioxin-contaminated soil, the soil after direct incineration may turn into a slag-like product which is more difficult to treat before proper disposal.

5. Due to the intense energy required (1200ºC for incineration vs 540ºC for thermal desorption), the cost of direct incineration will be about 30% higher than that of the recommended method. In this connection we have looked at Green Island's estimate of $261M which covers only the capital and operating costs of their proposed purpose-built incinerator and incineration process. This is higher than our estimate of about $203M for the capital and operating costs of the recommended method. If we are to include the costs of excavation, transportation and storage, precautionary measures, cement solidification (due to the presence of heavy metals) and decommissioning which constitute the entire decontamination process but are not currently reflected in Green Island's estimate, the total operating costs of the Green Island proposal will likely be higher.

Flexibility in the tendering exercise to accommodate other treatment technologies apart from thermal desorption

6. In the EIA report, we have recommended treating the dioxin-contaminated soil by thermal desorption followed by incineration of the treatment residue at CWTC. Although the recommended method has been endorsed by the Advisory Council on the Environment, we are prepared to consider other proven alternatives for treatment of dioxin-contaminated soil as may be proposed by the tenderers. However, these alternatives must be proven to be more cost-effective and conform to the technical and programming requirements of the project. They also need to comply with the statutory requirements specified under the EIA Ordinance.

Decommissioning of the thermal desorption plant

7. Details of the decommissioning of the thermal desorption plant at To Kau Wan (TKW) are set out in Chapters 5.69, 6.74 and 7.94 of the EIA report and include (a) plant decontamination; (b) plant dissembling; (c) waste management, and (d) shipment of plant equipment back to the vendor. The general procedures for decommissioning include:

- Cleansing the desorption plant by feeding clean soil to the desorption plant after all impacted soil has been treated;

- Purging the plant system with an inert gas;

- Dissembling of the plant;

- Decontamination of the plant equipment by steam cleaning, wire brushing and, if necessary, chemical solvent cleaning;

- Treatment of all wastewater on site by the wastewater treatment system;

- Dioxin testing and confirmation by wipe samples of the surface of the equipment to ensure that the plant equipment is clean;

- Disposal of all chemical waste in accordance with the Waste Disposal Ordinance;

- Clear labeling of all components of the plant equipment for shipment to their destination; and

- Proper decontamination and wipe-sample testing of all other housing structure materials to ensure that they are dioxin-free.

8. There will be two end-products at the end of the thermal desorption process, namely, the decontaminated soil and oily residue. The former is clean inert material and is suitable for use as public fill. The latter still contains dioxin and will be transported to CWTC for incineration.

Cases of accidents in the US arising from transportation of residue from thermal desorption plants

9. We have approached the United States Environmental Protection Agency (USEPA) for accidents arising from transportation of residue from thermal desorption plants. However, they do not have record on these. We have conducted further research using the US Department of Transportation Hazardous Material Incident Database from 1993 to 2001. No record of incidents associated with dioxins was found.

10. As explained at the meeting on 10 April, transportation of the 600 m^3 of oily residue generated from the thermal desorption process from TKW to CWTC will have extremely low inherent risks given the non-volatile, insoluble and low inflammability nature of the contaminants and the adoption of appropriate safety measures such as speed limit and escort. The safety measures proposed in the EIA report for the transportation of the residue are over and above those adopted in the US. For example, it is not required in the US to provide vehicle escort for the transportation of residue in much bigger quantities using public roads over long distances. The 600 m^3 of oily residue will be collected and transported to CWTC by batches in sealed drums at around 2 to 3 trips per week during hours of light traffic. Each trip will carry 10 drums of residue with a total volume of about 2 m^3. The health risk in relation to inhalation of dioxin in case of transportation accident is estimated to be about 4 x 10^{-14}, which is well below the USEPA standard of $1x10^{-4}$ – $1x10^{-6}$.

Testing of dioxins by local laboratories

11. Members have also asked if there are local laboratories for the testing of dioxins.

12. At the moment, no local commercial laboratory is capable of carrying out the testing of dioxins. However, we will require the Contractor to engage a laboratory to establish a dioxin testing facility locally and this facility will be tested and calibrated in accordance with the relevant standards. We will also specify parallel tests to be undertaken overseas to ensure that the highest testing standards will be achieved at the local testing facility. Before commissioning of this local testing facility, the dioxin samples will be sent to overseas laboratory for testing.

Medical examination for former workers of CLS

13. Members have also suggested recalling former workers of CLS for medical examination in view of the discovery of dioxins at the shipyard site.

14. As we have explained during previous meetings, the overall average dioxin concentration in all soil samples collected at the shipyard site is 1.6 part per billion toxicity equivalent (ppb TEQ). Compared to the acceptable standard of 1 ppb TEQ, the average level of dioxin contamination at the shipyard site is low. Based on the dioxin-contaminated data, we believe that the former workers

of CLS are unlikely to have been exposed to high airborne concentrations of dioxins in a continuous manner. The long-term health risk to these former workers should be low. We therefore do not consider it necessary to conduct medical examination for these ex-workers.

Progress of consultation with Antiquities Advisory Board on archaeological rescue works

15. AMO has consulted members of the Antiquities Advisory Board on the archaeological rescue works at CLS. They have indicated no objection to the rescue works.

Civil Engineering Department
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