For discussion
on 14 June 2013

LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS

Controlling the Impact of Dumping and Dredging Activities on the Marine Environment

PURPOSE

This paper informs Members on the regulatory and management controls currently put in place to minimize the impact on the marine environment arising from dredging and sediment dumping activities in the Hong Kong waters.

BACKGROUND

2. Dredging activities are mostly associated with the construction of large scale infrastructure and works projects at or near the coast, the harbour areas and in reclamation areas. For maritime safety and flood control considerations, it is also necessary to conduct maintenance dredging of the harbour fairways, berths, anchorages, navigation channels or approaches, as well as in drainage channels and watercourses. All these dredging activities generate marine sediments, commonly referred to as marine mud, requiring proper disposal. At present, uncontaminated sediments are disposed into the open sea disposal grounds at South of Cheung Chau, East of Ninepin, and East of Tung Lung Chau. The contaminated sediments are required to be buried at the confined marine disposal facility (CMDF) in the east of Sha Chau (ESC). The locations of sediment disposal areas are shown in **Annex A**.

3. To make the best use of the limited capacity of the disposal areas, the Marine Fill Committee (MFC) set up under the Civil Engineering and Development Department (CEDD) is tasked to manage the allocation of sediment disposal space for individual projects on a need basis. As a general policy, project proponents are required to avoid and/or reduce dredging where practicable, and to explore the feasibility of reusing the dredged/excavated sediment as fill material as far as possible. The MFC will only consider granting allocation when the need for removal of sediment has been satisfactorily demonstrated.

4. The list of current major projects, including cross-boundary construction projects such as the Hong Kong-Zhuhai-Macao Bridge, which involves dredging of sediment is shown in **Annex B**. To safeguard the marine environment, environmental assessments are undertaken for dredging works and sediment disposal operations prior to commencement of such activities.

ENVIRONMENTAL IMPACT ASSESSMENT ON DREDGING WORKS

5. Under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), a dredging operation exceeding the volume of 500,000 m^3 or close to certain sensitive areas (**Annex C**) is a designated project and must go through the statutory environmental impact assessment (EIA) process in order to obtain an environmental permit (EP) for the construction and operation of the project.

6. The objectives of the EIA process are to-

(a) predict the nature and extent of impacts from dredging works;

(b) assess the acceptability of the impacts;

(c) identify suitable mitigation measures, where necessary, for incorporation into the design of works so as to avoid, minimize and mitigate impacts to acceptable levels; and

(d) design a comprehensive programme of environmental monitoring and audit (EM&A) and an action plan to ensure that the impacts are indeed kept within acceptable levels.

7. EPs issued by the Environmental Protection Department (EPD) in respect of dredging works would set out all mitigation measures that can effectively prevent and minimize impacts on the marine environment. Examples of mitigation measures include restricting the size of dredging area, limiting the overall dredging rate, restricting the type and number of dredgers, and using silt curtain to confine any impact within the dredging area. Contravention of EP conditions is an offence[1] under EIAO liable to prosecution action by EPD.

[1] Maximum penalty of $2 million and imprisonment for 6 months for the first offence upon conviction.

ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

8. Environmental monitoring during the implementation of the dredging works is an essential element of the EIA process to measure and to minimize the actual impacts of the works. In addition, the monitoring conducted on site enables the project proponent and EPD to verify the predictions made in the EIAs, to assess the effectiveness of the mitigation measures, and to trigger additional measures should any unacceptable and/or unexpected impact be observed.

9. Prior to the commencement of the dredging works, marine water monitoring will be conducted to establish the background (or baseline) levels, thereby enabling any impacts due to dredging to be more easily identified. The actual impacts of dredging will be measured once the works have started.

10. Through the implementation of extensive mitigation measures and the comprehensive EM&A programme, dredging operations carried out in Hong Kong are properly conducted and closely monitored to minimize their environmental impacts on the marine environment.

MANAGEMENT OF SEDIMENT DISPOSAL AREAS

11. CEDD is responsible for the management of all designated sediment disposal areas in Hong Kong. A Centralized Management and Monitoring System has been set up by CEDD to provide overall control of the operations and environmental monitoring at all the uncontaminated sediment disposal areas in Hong Kong. For the confined marine disposal facility in the east of Sha Chau (ESC CMDF), compliance environmental monitoring is drawn up in light of the findings and recommendations of the approved EIA. The monitoring work has been conducted since operation of the mud pits and will continue until 2 years after closure of all the pits to ensure that there is no unacceptable impact on the environment. The monitoring programme (**Annex D**) covers water and sediment quality (both sediment chemistry and whole-sediment toxicity testing), contaminant concentrations in fisheries resources (together with ecological and human health risk assessment) and assessment of benthic recolonization. The results of the monitoring programme are regularly reviewed by CEDD and other relevant government departments including the Agriculture, Fisheries and Conservation Department (AFCD) and EPD in order to ensure that the ESC CMDF is properly designed and operated. According to the past EM&A results (**Annex E**), there has not been any exceedance of environmental

quality standards. There is no evidence of unacceptable environmental impacts on water quality as a result of the disposal operations at ESC CMDF.

12. Other than CEDD's surveillance programme, EPD separately conducts a comprehensive monitoring programme on Hong Kong waters since 1986. The programme currently covers a total of 76 open-water stations. The monitoring programme provides a scientific basis to appraise the environmental condition of Hong Kong's marine waters, and to monitor the long-term changes in water quality. Based on the latest monitoring results[2], the marine water quality of the North Western Water Control Zone (which covers the area of ESC CMDF) has met an overall compliance rate on the key water quality objectives of 72% or above since 2009. In addition, there is no sign of deterioration in terms of turbidity and total suspended solids observed in the marine waters at or near ESC CMDF.

REGULATORY CONTROL ON MARINE DUMPING ACTIVITIES

13. For projects involving disposal of sediments at sea, dumping operations have to be conducted at the designated sediment disposal areas and are subject to the statutory controls of the Dumping at Sea Ordinance (Cap. 466) (DASO). Project proponents have to seek the approval of the Director of Environmental Protection (DEP) on the classification of the sediments to be disposed of, in accordance with the technical circular "Environment, Transport and Works Bureau Technical Circular (Works) No. 34/2002" or, where applicable, the "Buildings Department Practice Note for Authorized Persons and Registered Structural Engineers No. 252" (re-issued as ADV-21). The project proponents would then have to apply for a marine dumping permit granted by EPD under DASO before dumping operation could commence at the sediment disposal area designated by the MFC. In 2012, EPD issued 150 marine dumping permits, which are of a similar order to the 143 and 162 permits issued in 2010 and 2011 respectively.

14. To ensure dumping operations are properly carried out at sea, all dumping vessels listed in a marine dumping permit issued under the DASO must be installed with automatic recording equipment with Global Positioning System (GPS). The equipment transmits real time self-monitoring data, including the barge position, draught level, etc. direct from the barge at sea to the Control Centre at EPD through mobile communication networks. Any irregularities in dumping operations would be detected through this monitoring system such that remedial action could be taken as

[2] EPD's annual report "Marine Water Quality in Hong Kong in 2011".

soon as practicable. In addition, EPD conducts surprise inspections at construction sites, and at the marine vessels to deter non-compliance and illegal disposal activities. About 700 inspections are conducted, including those conducted on land, in marine waters and by helicopter flights every year.

OTHER CONTROLS ON MARINE LITTERING

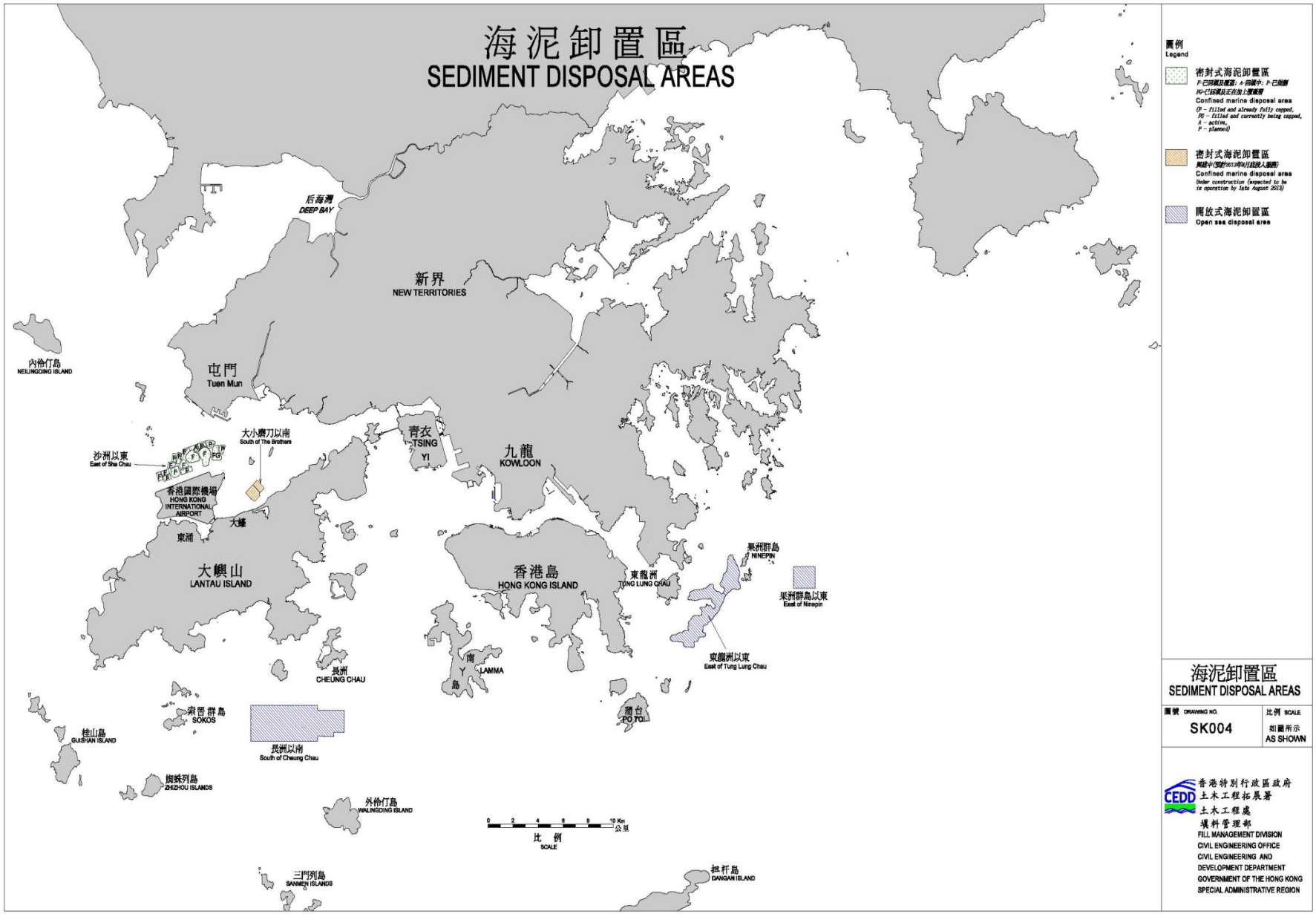
15. Regulatory control and management measures are also in place to tackle marine littering and floating refuse affecting the marine environment. For instance, the Marine Department (MD) takes enforcement action against any person who deposits any litter into the waters of Hong Kong, which is an offence[3] under the Summary Offence Ordinance (Cap. 228). Apart from enforcement control, the MD operates a fleet of specialized refuse collection vessels to clean up floating refuse to maintain the cleanliness in Hong Kong waters. MD also regularly conducts joint operations with the Food and Environmental Hygiene Department (FEHD) to clear refuse accumulated at foreshores other than gazetted beaches. Floating refuse washed ashore in gazetted beaches and marine parks is separately collected by the Leisure and Cultural Services Department (LCSD) and AFCD respectively.

ADVICE SOUGHT

16. Members are invited to note the various regulatory and management control measures in place to mitigate the environmental impact of dredging and waste dumping activities in the Hong Kong waters.

Environmental Protection Department
June 2013

[3] Maximum penalty is $10,000 and imprisonment of 6 months upon conviction.


海泥卸置區
SEDIMENT DISPOSAL AREAS
后海灣
DEEP BAY
新界
NEW TERRITORIES
內伶仃島
NEILINGDING ISLAND
屯門
Tuen Mun
大小磨刀以南
South of The Brothers
青衣
TSING YI
九龍
KOWLOON
沙洲以東
East of Sha Chau
香港國際機場
HONG KONG INTERNATIONAL AIRPORT
大嶼
東涌
大嶼山
LANTAU ISLAND
香港島
HONG KONG ISLAND
東龍洲
TUNG LUNG CHAU
果洲群島
NINEPIN
果洲群島以東
East of Ninepin
東龍洲以東
East of Tung Lung Chau
南丫島
LAMMA
長洲
CHEUNG CHAU
索罟群島
SOKOS
桂山島
GUISHAN ISLAND
長洲以南
South of Cheung Chau
橫瑣列島
ZHIZHOU ISLANDS
外伶仃島
WAILINGDING ISLAND
三門列島
SANMEN ISLANDS
擔杆島
DANGAN ISLAND
0 2 4 6 8 10 Km
公里
比 例
SCALE
圖例
Legend
密封式海泥卸置區
P-已回填及覆蓋; A-回填中; F-已完成
FC-已回填及正在加上覆蓋層
Confined marine disposal area
(P - filled and already fully capped,
FC - filled and currently being capped,
A - active,
F - planned)
密封式海泥卸置區
興建中(預計2013年8月前投入運作)
Confined marine disposal area
Under construction (expected to be in operation by late August 2013)
開放式海泥卸置區
Open sea disposal area
海泥卸置區
SEDIMENT DISPOSAL AREAS
圖號 DRAWING NO.
SK004
比例 SCALE
如圖所示
AS SHOWN
CEDD
香港特別行政區政府
土木工程拓展署
土木工程處
填料管理部
FILL MANAGEMENT DIVISION
CIVIL ENGINEERING OFFICE
CIVIL ENGINEERING AND
DEVELOPMENT DEPARTMENT
GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION

Annex B

Major Projects involving Dredging/Excavation of Sediment and Dumping Operations

Project Titles	Schedule of Disposal Activity	Estimated Dumping Volume (bulked quantity in million cubic metres)
Kai Tak Development*	2013 to 2016	1.02
Wanchai Development Phase 2	2013 to 2016	0.42
Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel	2013 to 2016	5.16
Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers	2013 to 2014	10.05
Central-Wanchai Bypass	2013 to 2014	0.33
Central Kowloon Route	2015 to 2019	0.28
Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL)*	2013 to 2015	0.16
Shatin to Central Link*	2013 to 2019	1.62
Hong Kong-Zhuhai-Macao Bridge (HZMB) – Hong Kong Link Road (HKLR)*	2013 to 2015	0.37
Tuen Mun-Chek Lap Kok Link (TMCLKL)*	2013 to 2016	1.09
Regulation of Shenzhen River Stage 4	2013 to 2016	0.12

*denotes major infrastructure projects under CE's Policy Address 2007-08

Annex C

ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE (CAP. 499)

SCHEDULE 2

DESIGNATED PROJECTS REQUIRING ENVIRONMENTAL PERMITS

PART I

C –RECLAMATION, HYDRAULIC AND MARINE FACILITIES, DREDGING AND DUMPING

C.12 A dredging operation exceeding 500 000 m^3 or a dredging operation which-

(a) is less than 500 m from the nearest boundary of an existing or planned-

(i) site of special scientific interest;

(ii) site of cultural heritage;

(iii) bathing beach;

(iv) marine park or marine reserve;

(v) fish culture zone;

(vi) wild animal protection area;

(vii) coastal protection area; or

(viii) conservation area; or

(b) is less than 100 m from a seawater intake point.

Annex D

Summary table of the East Sha Chau Contaminated Mud Pit V Environmental Monitoring Programme

Parameters	**Method of collection**	**Sampling frequency**
Water Quality Temperature, DO, pH, Salinity, Current Velocity & Direction, SS, Ammonia, Nutrients (NOx & TIN), BOD5, Turbidity, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc, Arsenic	*In-situ* measurement and water sample collection	8 times/year
Sediment Quality Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc, Arsenic, PAHs, PCBs, DDE & DDT, TBT, TOC, Particle Size Distribution	Sediment collection with sea bed grab samplers	12 times/year
Sediment Toxicity Test	Sediment collection with sea bed grab samplers	2 times/year
Tissue/Whole Body Contaminant Testing Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc, Arsenic, PAHs, PCBs DDE &DDT, TBT	Trawl Sampling	2 times/year
Fisheries Resources	Trawl Sampling	4 times/year
Benthic Ecology Benthic Communities, Benthic Colonization	Sediment collection with sea bed grab samplers	2 times/year

Annex E

Review of Environmental Monitoring & Audit (EM&A) Data of the Confined Marine Disposal Facility in the East of Sha Chau

According to the Environmental Monitoring and Audit (EM&A) programme for the confined marine disposal facility in the East of Sha Chau (the ESC facility), monitoring data are collected on a regular basis at the following two types of stations:

A. Impact stations are set up in areas that have the potential to be affected by the operation of the disposal facility at ESC; and

B. Reference stations are set up in areas that are remote from the influence of the operation of the disposal facility.

2. Monitoring results of key EM&A data including suspended solids levels, dissolved oxygen levels and fisheries trawling analysis for the period between early 2007 and early 2012 are described in the following paragraphs.

Suspended Solids[4]

3. If there is any impact due to the operation of the ESC facility, higher suspended solids (SS) levels should be recorded at the Impact stations than at the Reference stations. **Chart 1** shows the recorded SS levels at the Impact and Reference stations between February 2007 and February 2012. It can be seen that the mid-depth SS levels at the Impact stations vary with time following a similar pattern as the data collected at the Reference stations. Furthermore, SS levels at the Impact stations are generally lower than those at the Reference stations except for August 2010. In August 2010, the SS levels of Impact stations were 15.5 mg/L, which was 5.3 mg/L higher than 10.2 mg/L as recorded at the Reference stations. As this recorded value was well below the action level of 37.88 mg/L, it indicates that the actual impact of the ESC facility on SS levels is not significant.

[4] Suspended solids (SS) refer to small solid particles which remain in suspension in water as colloid or due to the motion of the water. It is an indicator of water quality and is determined as the weight of the residue after removing the liquid portion of a litre of the water sample.

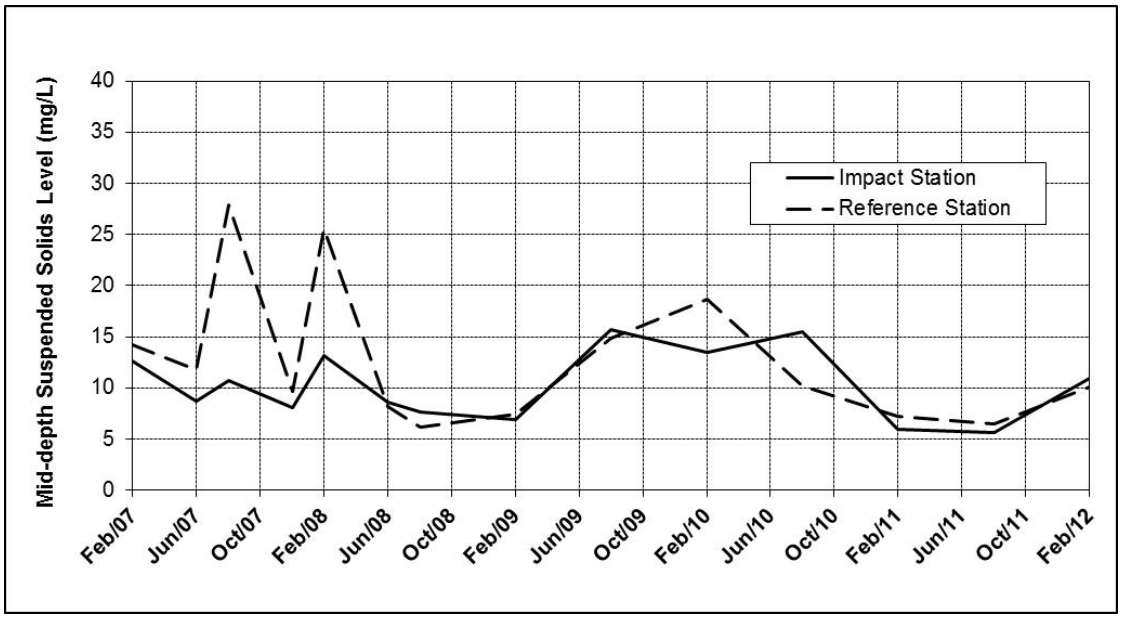


Chart 1 – Suspended solids level measured at Impact and Reference stations

(Remarks – The recorded SS levels at the Impact station are generally lower than and follow a similar trend of Reference station.)

Dissolved Oxygen

4. If there is any impact due to the operation of the ESC facility, lower dissolved oxygen (DO) levels should be recorded at the Impact stations than at the Reference stations. **Chart 2** below shows the recorded DO levels at the Impact station between February 2007 and February 2012. The DO levels at the Impact stations follow generally the trend of the Reference stations and are of similar values. There was no evidence of any trend of a decrease in DO levels due to operation of the ESC facility and the DO levels were maintained above the Water Quality Objective (WQO) of 4 mg/L throughout the reporting period.

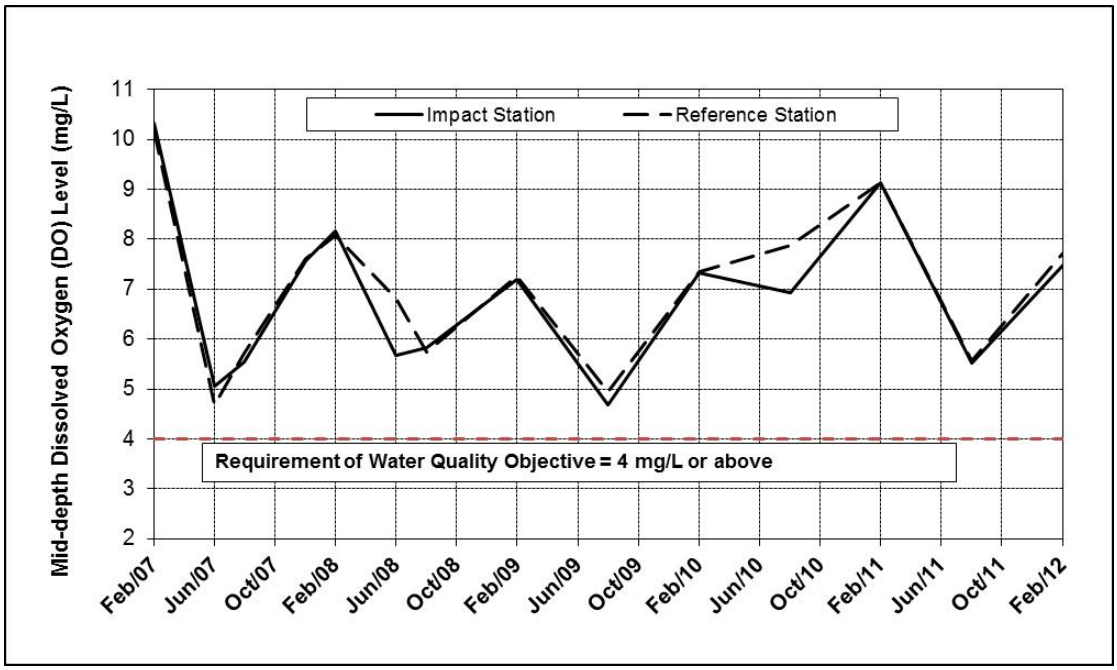


Chart 2 – Dissolved Oxygen level measured at Impact and Reference stations

(Remarks – The recorded DO levels at the Impact station generally follow a similar trend of the Reference station and they are all above the WQO requirement.)

Fisheries Trawling Analysis

5. If there is any impact on fisheries resources due to the operation of the ESC facility, lower fish catch and number of fish species should be recorded at the Impact stations than at the Reference stations in the trawling surveys under the EM&A programme. **Chart 3** to **Chart 5** below show the respective fish catch (number and mass) and number of fish species collected at the Impact and Reference stations between February 2007 and February 2012. Except for some local variances, the recorded fisheries resources at both stations are comparable and generally follow similar trends. The results do not suggest any trend of adverse impact on fisheries resources due to the operation of the ESC facility.

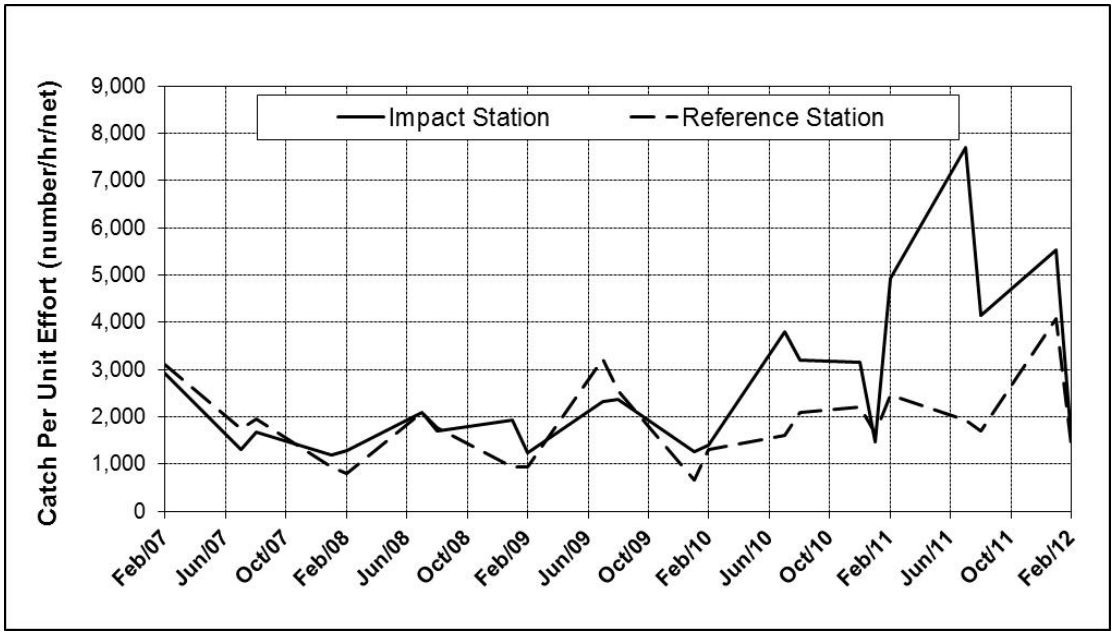


Chart 3 – Number of fish catch measured at Impact and Reference stations

(Remarks – The recorded number of fish catch at the Impact station is generally more than and follows a similar trend of the Reference station, though with local variations.)

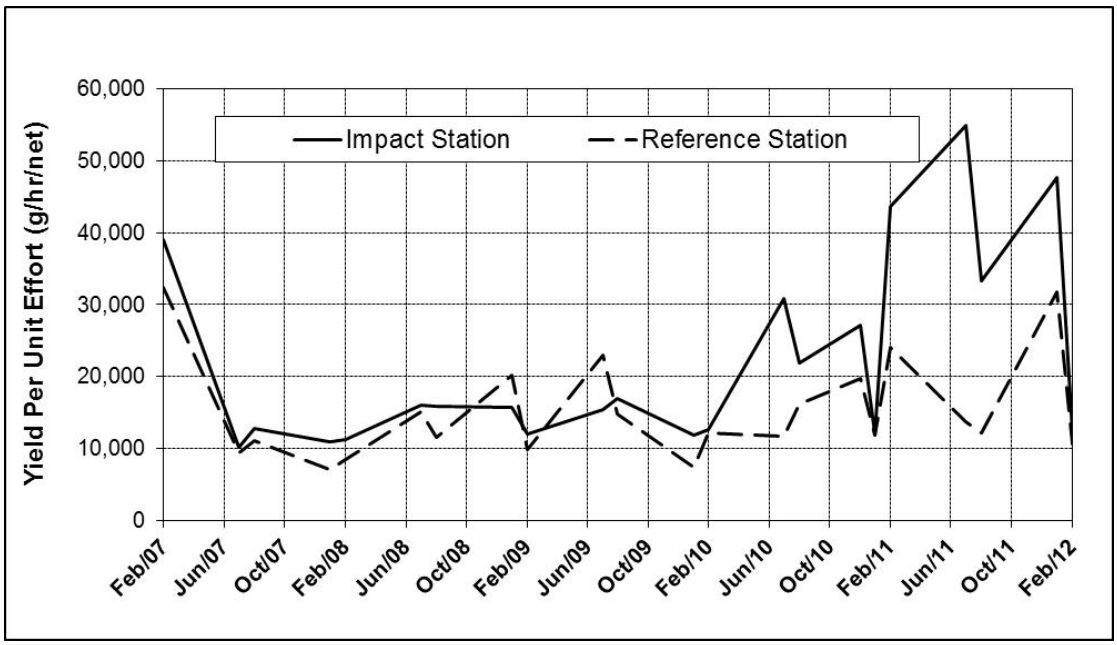


Chart 4 – Mass of fish catch measured at Impact and Reference stations

(Remarks – The recorded mass of fish catch at the Impact station is generally more than and follows a similar trend of the Reference station, though with local variations.)

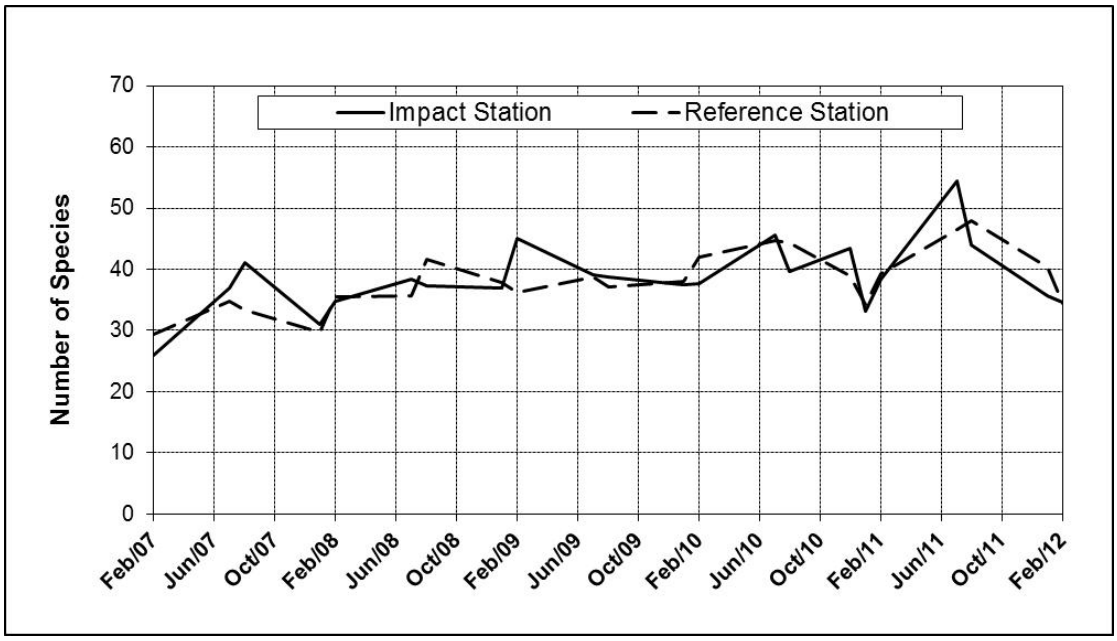


Chart 5 – Number of fish species measured at Impact and Reference stations

(Remarks – The recorded number of fish species at the Impact station generally follows a similar trend of the Reference station, though with local variations.)

6. According to the EM&A data collected between February 2007 and February 2012, it is observed that disposal activities of the ESC facility have not resulted in unacceptable impacts on SS levels, DO levels and fisheries resources. The measurements indicated that impacts due to the ESC facility have been controlled within the requirements of relevant standards and requirements as predicted in the EIA.