Annex 6F

Flushing Capacity Assessment

6F1 DEEP BAY FLUSHING CAPACITY ASSESSMENT

6F1.1 INTRODUCTION

One of the objectives of the modelling exercise is to assess "any residual impacts, which include any change in hydrodynamic regime", due to construction and operation of the Project. In this respect, the construction of the Gas Receiving Station (GRS) on a reclaimed land may affect the circulation of water in the Deep Bay due to changes in coastline morphology, bathymetry and existing BPPS discharges. This, in turn, may induce a change in the flushing change and subsequent the water quality of Deep Bay.

The purpose of this assessment is to evaluate, by modelling, the impact of this Project on the flushing efficiency of the Deep Bay. A tracer has been included in Shenzhen River discharge to calculate the concentration of this tracer without the reclamation (Baseline Scenario) and with the reclamation (Operational Scenario). The simulations for both cases were performed under neap-spring cycles in the dry and wet seasons to assess the flushing in Deep Bay. The same approach was adopted in the HKLNG EIA (1).

6F1.2 MODELLING METHODOLOGY

6F1.2.1 *Model Selection*

This study is based on the already existing hydrodynamic simulations using the Delft3D hydrodynamic model (FLOW). The Delft3D water quality model (WAQ) has been applied to the tracer simulations which are driven by the output from the FLOW simulations.

6F1.2.2 *Model Inputs*

The study assesses the flushing capacity of Deep Bay by monitoring the tracer concentrations inside Deep Bay as a result of a constant tracer release in Shenzen River. When a (dynamic) equilibrium is reached, the amount of tracer entering Deep Bay should be the same as the amount of tracer leaving Deep Bay. The rate of flushing however determines the tracer concentrations inside Deep Bay. If the flushing is effective, the tracer concentrations will be low. In contrast, the tracer concentrations will be high when the flushing is ineffective. The changes to the flushing capacity can be determined by comparing the concentrations before and after the implementation of the

(1) ERM - Hong Kong, Ltd (2006) Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities. For CAPCO. Final EIA Report. December 2006.

Project. Note that a concentration increase indicates a reduction in the flushing whereas a concentration decrease indicates an increased flushing.

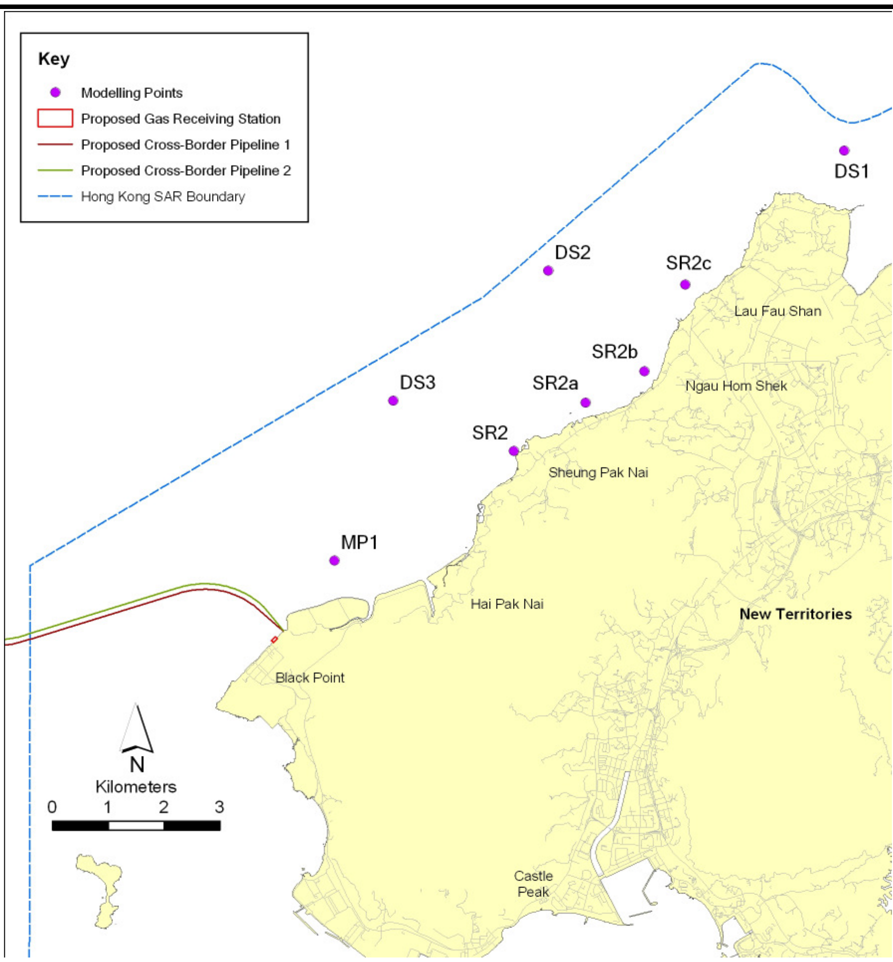
The situation prior to the Project implementation is represented by the Baseline flow calculation, while the situation after the Project implementation is represented by the Operational flow calculation (Seasonal Varied Flow).

Simulations have been carried out for typical wet season and typical dry season conditions. The duration of the run is one neap-spring cycle. The time series output data have been acquired with a time step of 30 minutes. The output stations are chosen as the locations of the selected modelling points in Deep Bay (see *Figure 6F.1)*.

In this exercise, the boundary conditions are set to zero with respect to the tracer concentration. The Shenzhen River constitutes the only source of tracer. The flow of the Shenzhen River has been attributed a constant tracer concentration of 1 g m^{-3}.

The simulations are given sufficient spin-up to reach a dynamic equilibrium in the system.

Figure 6F.1 ***Locations of the Selected Modelling Points in Deep Bay***



6F1.3 *MODELLING RESULTS*

The results of the simulations are presented as a time-averaged over a spring-neap cycle (after the dynamic equilibrium has been obtained), before and after the implementation of the project, in the dry and wet seasons (*Table 6F.1*).

Table 6F.1 Tracer concentrations at Selected Modelling Points in Deep Bay

Output Stations	Baseline		Ope/Bas	
	Dry	Wet	Dry	Wet
	Concentration (mg L^{-1})		Relative Change	
DS 1	0.0207	0.1374	100.0%	100.0%
DS 2	0.0059	0.0444	100.0%	100.2%
DS 3	0.0027	0.0181	99.8%	100.5%
MP1	0.0016	0.0081	100.0%	100.4%
SR2	0.0056	0.0179	99.9%	100.4%
SR2a	0.0073	0.0293	100.0%	100.3%
SR2b	0.0091	0.0439	100.0%	100.2%
SR2c	0.0118	0.0706	100.0%	100.1%

Notes:

1. Ope = Operational Flow Calculation
2. Bas = Baseline Flow Calculation

The simulation results show that there are only marginal changes to the tracer concentrations at the selected modelling points in Deep Bay. In the dry season, the tracer concentrations at the modelling points generally remain unchanged which implies the effect of reclamation on the flushing capacity is negligible. In the wet season, the increased tracer concentrations (ie maximum 0.5%) indicate that there is a slight reduction in flushing. The changes in flushing characteristics of the areas due to the inclusion of the reclamation at Black Pont are thus considered minimal. This conclusion is also supported by the water quality modelling results which showed negligible impact of the GRS on the water quality.