Appendix 3.2 Modelling Assumptions for Concurrent Projects

General

As identified in **Chapter 3**, the following projects will be assessed for cumulative impacts:

- Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel
- Development of a 100MW Offshore Wind Farm in Hong Kong
- Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau
- Planning and Engineering Study on Future Land Use at Ex-Lamma Quarry Area at Sok Kwu Wan, Lamma Island - Feasibility Study

Details of these concurrent projects and the assumptions of their contributions to cumulative impacts due to suspended solids (SS) release are presented in the following sections.

Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel

This project involves dredging of the existing Kwai Tsing Container Basin as well as parts of the northern and western fairways to a depth of -17.5 mCD, to accommodate the 'ultra large container ships' at the Kwai Tsing Container Terminal. According to published information, this project is currently under construction and is anticipated to commence operation before 2017. Thereafter, periodic maintenance dredging would be carried out to maintain the required depth. Given the current construction programme, this project is likely to be completed before commencement of the improvement dredging works at the Lamma Power Station Navigation Channel (the 'Channel'). As such, only operation phase maintenance dredging at Kwai Tsing will be considered for cumulative impact assessment.

According to the approved EIA report (AEIAR-156/2010), only one grab dredger will be required for operation phase maintenance dredging. Based on information from the approved EIA report, the assumptions and modelling parameters for the sediment loss due to operation phase maintenance dredging is summarised in **Table 1**.

Table 1: Summary of Operation Phase Maintenance Dredging

	Model Parameters	Model Assumption (from AEIAR-156/2010)
A	Activity to be modelled	Operation of one closed grab dredger during operation phase maintenance dredging
B	Maximum dredging rate	4,000 m^3/day
C	Total working time required	Continuously for 24 hours a day
D	Fluidized sediment entering into suspension	20 kg/m^3
E	Calculated sediment loss rate (unmitigated) *E = (B*D)/C*	0.93 kg/s
F	Point of suspended sediment release	Throughout the water column

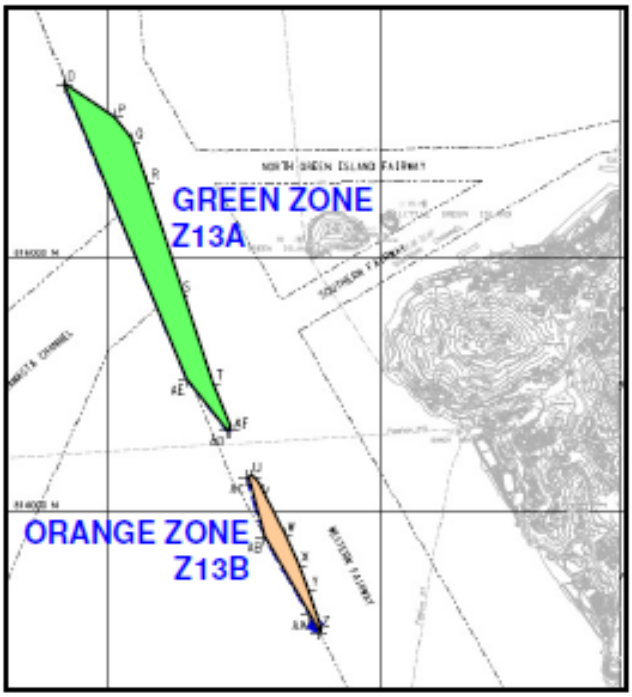
Source: Information based on the approved EIA report (AEIAR-156/2010)

Assuming only those areas that originally required deepening under the Kwai Tsing project will require future maintenance dredging to maintain the channel depth, the SS will be modelled from a representative

worst case fixed location nearest to the improvement dredging works at the Channel, at the southern tip of the western fairway zone Z13B as shown in **Figure 1**.

It should be noted that the approved EIA report applied a higher sediment loss rate (1.44 kg/s), to account for the effects of large boulders / debris in Rambler Channel that could hinder the closing of the grab. However, this assumption is considered to be less applicable to operation phase maintenance dredging which primarily involves removal of silt accumulated over a relatively short period (e.g. 1 to 2 years), and the likelihood of encountering large debris in areas nearer to Lamma Island (which is under open sea conditions) is low. Separately, it may be noted that the application of silt curtains surrounding the grab dredger would further reduce the sediment loss, and this mitigation measure has been recommended in the approved EIA report. Nevertheless, the potential reductions due to mitigation using silt curtains has not been applied to the model in the approved EIA report for Kwai Tsing project, and similarly will not be applied in the model for cumulative impact assessment associated with this project.

Figure 1: Location of Zone Z13B



Source: Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel (AEIAR-156/2010)

Development of a 100MW Offshore Wind Farm in Hong Kong

An offshore wind farm facility comprising approx. 35 nos. of wind turbine units to generate a total capacity of 100MW with associated submarine cables, offshore substation and wind monitoring mast is proposed to be located at a site approx. 2km southwest of Lamma Island. Based on the approved EIA report for the project (AEIAR-152/2010), the key source of potential water quality impact due to the project is from the following construction activities:

- Dredging works for construction of the nearshore cable landing area
- Submarine jetting for installation of the submarine cables
- Scour apron construction as part of the turbine foundations

While the construction programme and sequence for this concurrent project is undetermined at this stage, for the purpose of cumulative impact assessment, it is assumed that the aforementioned construction activities will occur at the same time, and coincide with the improvement dredging works at the Channel. The assumptions and modelling parameters for the sediment loss due to this concurrent project is summarised in **Table 2**.

Table 2: Summary of Key Marine Construction Activities

	Model Parameters	Model Assumption (from AEIAR-152/2010)		
		Dredging Works	Jetting Works	Scour Apron Works
A	Activity to be modelled	Operation of one closed grab dredger at the nearshore cable landing area	Operation of one jetting machine moving along the cable route	Disturbance of the seabed due to scour protection works at the base of each turbine
B	Maximum working rate	2,500 m^3/day	0.075 m^3/s	900 m^3
C	Total working time required	Continuously for 12 hours a day, for a total of 2 days only	Continuously for 12 hours a day, for a total of 3 days	Continuously for 24 hours a day, 7 days a week
D	Dry density of sediment	n/a	600 kg/m^3	600 kg/m^3
E	Fluidized sediment entering into suspension	17 kg/m^3	20%	20%
F	Calculated sediment loss rate (unmitigated)	$F = (B*E)/C$ = 0.98 kg/s	$F = B*D*E$ = 9 kg/s	$F = (B*D*E)/C$ = 1.25 kg/s
G	Point of suspended sediment release	Throughout the water column	Near seabed	Near seabed

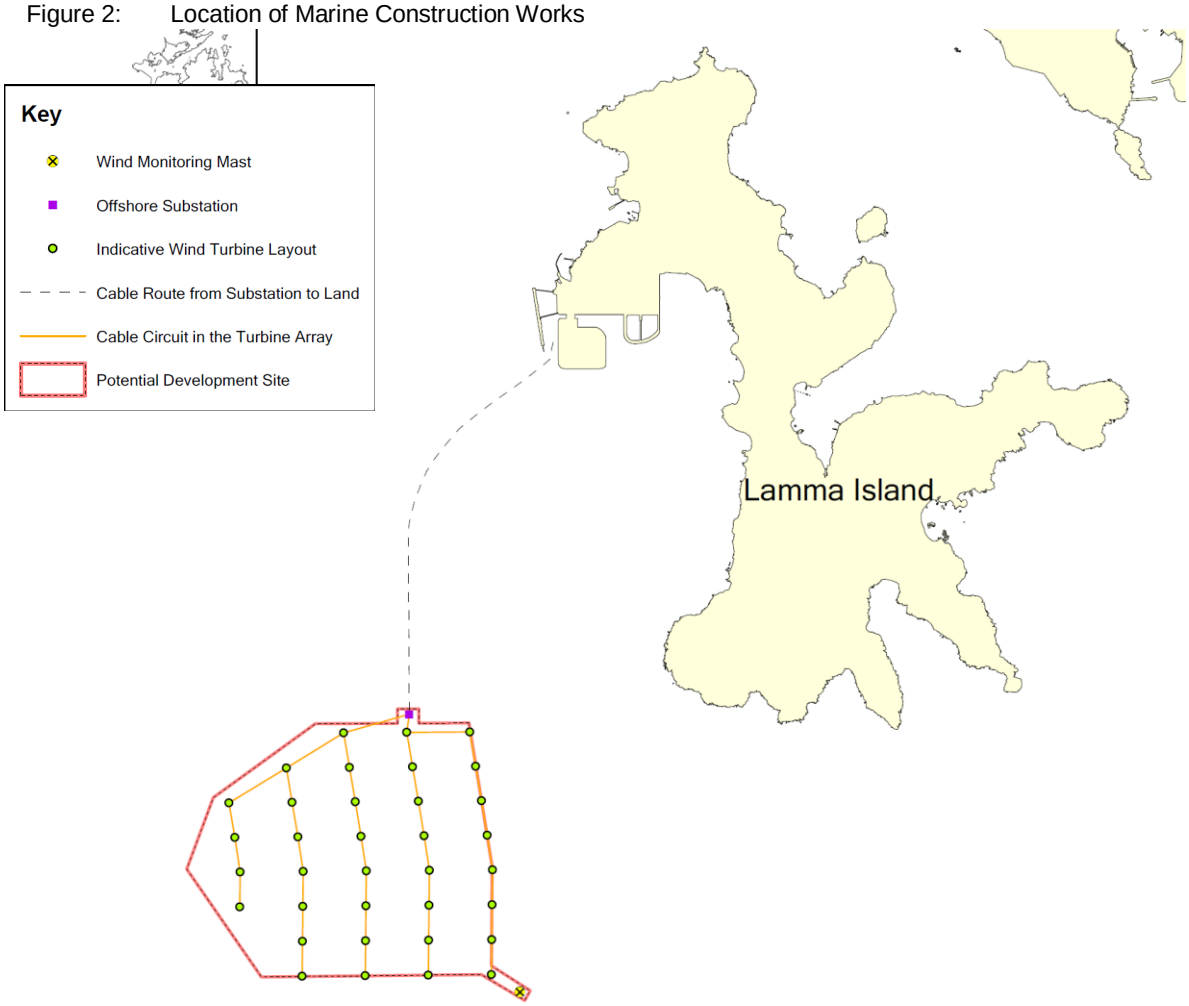
Source: Information based on the approved EIA report (AEIAR-152/2010)

Figure 2 shows the location of the marine construction activities. Dredging works at the cable landing point will be modelled at a fixed location next to the existing seawall where the cable route from the substation lands. Scour apron works will be assumed to be located at the indicative wind turbine locations, and a different release point (wind turbine location) will be assumed each day, using the nearest points to the improvement dredging works at the Channel which represents the worst case.

For the submarine jetting works, part of the submarine cable will need to cross the existing Channel to connect the nearshore cable landing area with the offshore substation. During improvement dredging works at the Channel, the Channel will be occupied by various marine vessels, which may potentially conflict with any concurrent construction activities from the offshore wind farm that needs to cross the Channel, and create safety concerns. To avoid unnecessary conflicting activities within the Channel, it is anticipated that the submarine jetting works for the section of cable between the nearshore cable landing area and the offshore substation will not be conducted concurrently with the improvement dredging works at the Channel. However, the jetting works for laying the cable circuit in the turbine array within the wind farm development site (as shown in **Figure 2**) are assumed to be conducted concurrently with the improvement dredging works at the Channel (as the two works areas will not intersect and conflict).

The sediment release due to jetting works will be entered into the model within a series of grid cells to represent the jetting machine moving along the cable circuit route. Noting that the approved EIA specified that one pass of the jetting machine will be adequate to reach the required burial depth, and assumed a jetting speed of 360 m/hr, the jetting machine will cover a length of over 4 km within each working day, hence the entire circuit would be completed in three days.

Figure 2: Location of Marine Construction Works



Source: Development of a 100MW Offshore Wind Farm in Hong Kong (AEIAR-152/2010)

Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau

This project involves construction and operation of an advanced thermal incineration plant on a proposed artificial island to be created adjacent to the southwest coast of Shek Kwu Chau. The primary marine works for this project includes reclamation of approx. 11.8 ha of land and construction of a breakwater. According to the approved EIA report (AEIAR-163/2012), the primary sources of SS release due to the project would be due to filling activities for the reclamation area, and dredging activities for installation of the anti-scouring layer for the breakwaters.

Filling activities would be carried out after the seawall surrounding the reclamation area is formed, with a single marine access opening to allow construction vessels to enter the reclamation area, and a four layer silt curtain system deployed at the marine access to control the dispersion of fines from the filling activities. With the proposed filling activities to be conducted behind the seawall and silt curtains covering the marine access, the approved EIA report estimated the sediment loss rate for public fill and sand fill to be no more than 0.11 kg/s and 0.07 kg/s respectively.

For the dredging activities for installation of the anti-scouring layer for the breakwaters, a single closed grab dredger with frame-type silt curtains is specified, and the resultant sediment loss rate calculated in the approved EIA report is 0.46 kg/s.

According to the approved EIA report, installation of the anti-scouring layer for the breakwaters is programmed to commence after completion of the site filling for reclamation, hence the two activities would not occur concurrently. There is also no difference in the working period for either activity (i.e. both will be conducted 12 hours per day, 6 days per week). Given the above, the worst case cumulative impact would be based on the activity with the largest sediment loss rate, namely the dredging activities for installation of the anti-scouring layer for the breakwaters. The assumptions and modelling parameters for the sediment loss due to this concurrent project activity is summarised in **Table 3**.

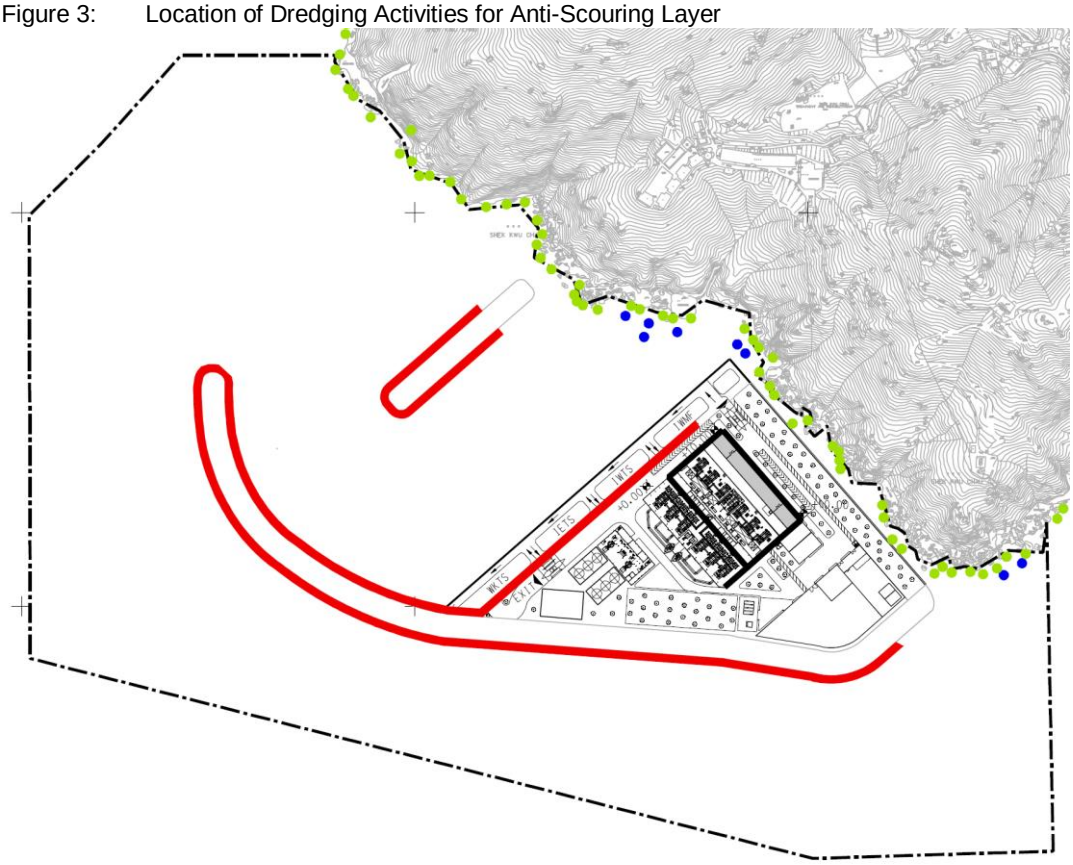
Table 3: Summary of Dredging Activities for Installation of Anti-Scouring Layer

	Model Parameters	Model Assumption (from AEIAR-163/2012)
A	Activity to be modelled	Operation of one closed grab dredger with frame-type silt curtain for dredging for the anti-scouring layer
B	Maximum dredging rate	4,000 m^3/day
C	Total working time required	Continuously for 12 hours a day, 6 days a week
D	Fluidized sediment entering into suspension	20 kg/m^3
E	Calculated sediment loss rate (unmitigated) *E = (B*D)/C*	1.85 kg/s
F	Calculated sediment loss rate (mitigated with 75% reduction due to silt curtain) *F = E*0.25*	0.46 kg/s
G	Point of suspended sediment release	Throughout the water column

Source: Information based on the approved EIA report (AEIAR-163/2012)

Sediment loss from this concurrent project activity will be modelled as a fixed source at the point nearest to the improvement dredging works at the Channel, which is the easternmost part of the dredging area. The area where dredging for anti-scouring layer is required is shown in **Figure 3**.

Figure 3: Location of Dredging Activities for Anti-Scouring Layer



Source: Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau (AEIAR-163/2012)

Planning and Engineering Study on Future Land Use at Ex-Lamma Quarry Area at Sok Kwu Wan, Lamma Island - Feasibility Study

This project involves construction and operation of various tourist and recreational facilities accompanied by housing developments. The primary marine works for this project includes construction of an emergency submarine sewage outfall, ferry / refuse transfer piers, landing steps, vertical seawall and drainage outfalls. According to information provided by the project proponent in April and May 2016, the primary sources of SS release due to the project would be due to grab dredging activities for construction of the sewage outfall diffusers, while the outfall pipeline alignment would comprise construction using the trenchless horizontal directional drilling method, hence there would be no SS release associated with the pipeline construction. Other works involve deposition and removal of rock materials only and hence are not associated with significant SS release.

According to information provided by the project proponent, dredging works for the sewage outfall diffusers will be conducted by a closed grab dredger, at a production rate is 55 m3/hr. The total dredged volume is 1,800 m3, and would be completed in 3 working days, based on 12 working hours per day. The assumptions and modelling parameters for the sediment loss due to this concurrent project activity is summarised in **Table 4**.

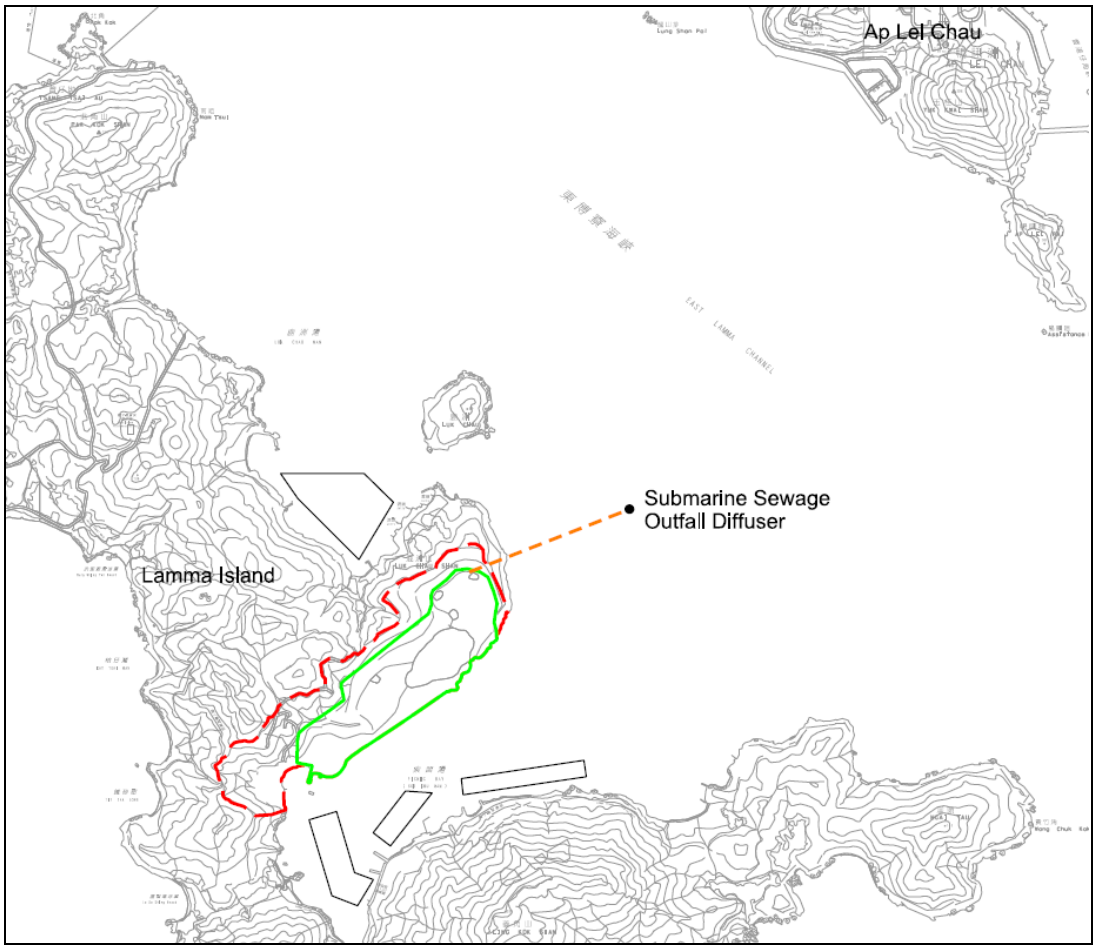
Table 4: Summary of Dredging Activities for Construction of Submarine Sewage Outfall Diffusers

	Model Parameters	Model Assumptions (from project proponent)
A	Activity to be modelled	Operation of one closed grab dredger for construction of submarine sewage outfalls
B	Maximum dredging rate	55 m^3/hr (equivalent to 660 m^3/day)
C	Total working time required	12 hours a day for 3 days
D	Fluidized sediment entering into suspension	20 kg/m^3
E	Calculated sediment loss rate (unmitigated) *E = (B*D)/C*	0.31 kg/s
F	Point of suspended sediment release	Throughout the water column

Source: Information provided by project proponent in April and May 2016

Sediment loss from this concurrent project activity will be modelled as a fixed source at the location of the sewage outfall. The area where dredging for anti-scouring layer is required is shown in **Figure 4**.

Figure 4: Location of Submarine Sewage Outfall Diffuser



Source: Information provided by project proponent in April 2016