

11. LAMMA BREAKWATER ISLAND LANDFILL

11.1 Basic Information

Project Title

11.1.1 Lamma Breakwater Island Landfill, (LBIL) marine site M.6.

Nature of Project

11.1.2 The Project would form a new marine based waste disposal site to the south west of Lamma Island (*Figure 11.1*).

11.1.3 The LBIL would require construction of an artificial island of approximately 585ha. The site would be designated as a public filling area for the receipt of inert C&D material; once the reclamation is completed, the site would be developed as a landfill for subsequent operation for the disposal of waste.

11.1.4 Construction works would be as described in Part A, Section 3.2. In addition works for the LBIL would include:

- Dredging of about 10Mcum of underlying muds for construction of an outer seawall.

Location and Scale of Project

11.1.5 The LBIL is situated 2.5km to the west of Lamma Island and about 5km south east of Cheung Chau. Seabed levels in this area vary from 15 to 20m below Chart Datum.

11.1.6 The LBIL would cover an area of 585ha to an elevation of +6mPD. The artificial island would accommodate a landfill with a capacity of 130Mcum to an elevation of +56mPD. The site would accommodate approximately 225Mcum of fill material.

History of Site

11.1.7 The site falls within the Hong Kong Island South & Lamma Island Planning and Development Study, and is on the boundary of the South West New Territories Development Strategy Review area. The site coincides with that previously considered for developed as a possible breakwater to facilitate port operations. The coastal marine waters around south Lamma have been proposed for protection as a Marine Reserve / Park.

Number and Types of Designated Projects Covered

11.1.8 The LBIL would qualify as a Designated Project under the five categories listed in Part A; Section 2.1.

11.2 Outline of Planning and Implementation Programme

11.2.1 An outline for the planning and implementation of this site is summarised in Part A; Section 3.3 and an outline programme is shown in *Figure 11.2*. Assuming landfill operations start in 2019, LBIL would be full during the period 2035 to 2045, depending upon the rate of waste arisings and the number of other landfills operating concurrently.

11.2.2 The site is currently not covered by any statutory town plans, as described in Section 3.3, Town Planning Ordinance procedures to cover the site would be required and the reclamation would need to be gazetted under the Foreshore & Sea-bed (Reclamations) Ordinance.

11.2.3 The Recommended Development Strategy formulated under the South West New Territories Development Strategy Review identified the potential of Cheung Chau and Lamma as tourist and recreation developments; this recognised their mountain scenery, appealing coastal areas and the large number of archaeological and historical sites.

- 11.2.4 Lamma Island lies to the east of this site and is covered by the Lamma Island OZP Plan no. S/I – LI/3 issued in October 2001. The general planning intentions of the Lamma Island OZP are to conserve the natural landscape, the cultural heritage, the rural character and the car-free environment of Lamma Island; and to enhance the role of Lamma Island as a leisure destination. The Island has been subject to further investigation under the Planning and Development Study on Hong Kong Island South and Lamma Island.
- 11.2.5 The LBIL coincides partly with one of the sites proposed for development under the C&D Materials Study.
- 11.2.6 The LBIL also coincides partly with a site proposed for development of a breakwater under the PADS Studies. The PADS breakwater was proposed to provide protection to the Lantau Port and create an additional area of sheltered anchorage within the Western Harbour. The landward side of the breakwater was proposed to provide about 400ha of reclaimed land for port backup, although no specific usage was identified in the Lantau Port & Western Harbour Development Studies. Subsequently this site was identified in the Recommended Strategy under the South West New Territories Development Strategy Review as a “Possible Breakwater” and an area for “Possible Special/Port Related Industries”. The Port and Maritime Board have advised that the status of the “Lamma Breakwater” in the Port Development Programme is linked to the identification of a new container terminal site; a number of sites for which were considered under the *Port Development Strategy Review*. A new study on *Hong Kong Port – Master Plan 2020* started in the second half of 2002 and will formulate a master plan for port development for the next 20 years.

11.3 Possible Impacts on the Environment

- 11.3.1 Possible impacts on the environment during the construction, operation and aftercare phases of the LBIL are outlined below. *Figure 11.1* provides details of identified sensitive receivers. The individual assessments are summarised in *Tables 11.1 and 11.2*.

Air Quality

- 11.3.2 The reclamation and landfill development has the potential to cause the following air quality impacts:
- Dust (TSP / RSP) and exhaust emissions from on-site plant during construction and operation (following reclamation).
 - Gaseous emissions during landfill operation and aftercare arising from non-point source emissions and gas flaring / utilisation (including emissions of methane, carbon dioxide, carbon monoxide, sulphur dioxide, nitrous oxides, etc.).
 - Odours arising during the operation of the landfill from waste decomposition and leachate treatment.
- 11.3.3 There are no air sensitive receivers within 500m of the site. The nearest ASRs are isolated village houses on South Lamma at a distance of approximately 5km. As the site lies in an open marine area (i.e., no airshed) there would not be any accumulation of air pollutants. The HEC Lamma Power Station is located at some distance from the site - some 4km to the north. Significant air quality impacts are not anticipated.
- 11.3.4 This is a marine site and waste will be delivered to the site by marine vessel. The amount of air pollutants resulting from the territory-wide waste delivery (per kg of waste deposited at the site) is anticipated to be less compared to a land based site that relies on road transport. The estimated cumulative distance to be travelled from the existing and planned (South East Kowloon RTS to be commissioned in 2012) marine RTSs to the site is 250km. As such, no regional impacts are expected to arise from waste delivery.

Noise

- 11.3.5 The reclamation and landfill development has the potential to cause the following noise impacts:
- construction – from dredging, tipping, piling works and general construction activities;
 - operation – from the use of fixed plant, marine vessels, waste reception area, pumping plant, possible helicopter noise etc.
- 11.3.6 No noise sensitive receivers have been identified within 300m of the site; The nearest NSRs are on South Lamma, at a distance of approximately 5km to the east. Significant noise impacts are not anticipated. However, potential operational phase noise impacts would need to be considered in subsequent studies in the event that the island reclamation is used for other landuses (in addition to landfill) or a separate afteruse is developed on top of the landfill following completion of the landfilling operations.
- 11.3.7 Whilst it is not anticipated at this stage, it is possible that activities could continue beyond normal working hours during the construction and operation phases. This would depend upon working arrangements for fill delivery, day-to-day landfill operations and the overall construction programme. However, as this is an off-shore reclamation site with no noise sensitive receivers in the vicinity, the more stringent requirements for noise emissions during the evening and night time periods are not expected to be an issue for this site.
- 11.3.8 The site can only be accessed by marine traffic during both operation and construction phase. Noise from land based waste delivery vehicle is not a concern for this site.

Water Quality

Baseline Conditions at the Site

- 11.3.9 The site is located within the Southern Water Control Zone (WCZ). This area has converging / diverging currents. Flood and ebb currents split into two branches, one flowing north/south to Ma Wan, and the other flowing east / west toward the Soko Islands. Currents are generally low, with the velocity of flood flows reduced by the presence of Lamma island, (ERM 1997b¹).
- 11.3.10 Background water quality conditions have been established from EPD routine monitoring stations, the latest available data being that collected in 2000, (EPD 2001²). The site is situated in the western waters of Hong Kong which are generally characterised by elevated levels of suspended solids, (compared to Eastern Waters) as a result of the influence of the Pearl River Estuary. Locations of the nearest routine EPD water quality monitoring stations (SM5, SM6, SM7 and SM18) are presented in *Figure 11.1*.
- 11.3.11 Water quality data for 2000 at the monitored stations indicates full compliance with the Southern WCZ Water Quality Objectives (WQOs) for key parameters such as dissolved oxygen, (DO), *E. Coli*, and un-ionised ammonia. However, consistent with long-term trends (data measured annually since 1991) levels of total inorganic nitrogen (TIN) exceeded WQOs at all stations.
- 11.3.12 The nearest regular EPD sediment monitoring station in this area is SS3, which lies approximately 240m to the north. Sediments at SS3 are considered to be uncontaminated according to EPD data. The potential for impacts associated with contaminated marine muds is considered limited.

¹ ERM-Hong Kong Ltd (1997b) Site Search for a New Power Station: Preliminary Site Search (Revised Final Technical Report No. 2), Hongkong Electric Company, Ltd.

² EPD (2001) Marine Water Quality in Hong Kong (in 2000). Environmental Protection Department, Hong Kong Government.

Key Issues and Sensitive Receivers

11.3.13 The project has the potential to cause the following water quality impacts:

- Sediment loss to the water column during dredging / reclamation;
- Runoff with elevated levels of suspended solids from the site during landfill construction (post-reclamation); and
- Change in the hydrodynamic regime (i.e., change in flushing capacity and sediment deposition / erosion patterns).

11.3.14 Identified Water Sensitive Receivers (WSRs) present in the vicinity of the site are:

- Cooling water intake for HEC Lamma Power Station (5km);
- Gazetted beach near the Power Station at Hung Shing Ye (5.2km);
- Gazetted beaches at Lo So Shing, SW Lamma (4.2km), and Cheung Chau (6km); and
- Secondary contact recreation sub-zone around the west and south Lamma coastlines.

11.3.15 In addition, there are a number of ecological resources around the project area that may be sensitive to any decline or change in water quality or sediment deposition / erosion patterns. Potential impacts upon these are discussed in the "Ecology" subsection. These receivers include:

- Green Turtle nesting habitat at Lamma Island Sham Wan beach;
- Core habitat area for the Finless Porpoise at Ha Mei Tsui; and
- General Marine and coastal waters around the proposed South Lamma Marine Park / Reserve.

11.3.16 The locations and uses of the WSRs are shown in *Figure 11.1*

Reclamation and Site Formation

11.3.17 Due to the exposed location of the site, localised dredging is likely to be necessary for the seawalls prior to construction of the reclamation. The dredged material can be placed within the footprint of the reclamation, reducing transport and spillage losses.

11.3.18 The placement of fill for island construction is also likely to lead to localised increases in suspended solid levels. The hydrodynamic and water quality modelling indicated that although no WQO exceedences were predicted, the suspended solids levels would increase at FP2 (13.95%), SC20 (12.00%), NS2 (19.15%), NS1 (15.23%) and FP8 (20.90%) in the dry season during the Phase 1 construction. Increases were also predicted at FP1 (16.10%), MP6 (16.37%) and NS4 (18.61%) during the wet season. During Phase 2 construction increases were predicted at SC20 (16.24%), NS2 (19.15%) and FP8 (28.03%) in the dry season and at FP1 (17.41%), MP6 (19.20%) and NS4 (21.05%) in the wet season. During Phase 3 construction increases were predicted at NS2 (16.67%) and FP8 (28.27%) in the dry season and FP1 (17.13%), MP6 (18.44%) and NS4 (20.11%) in the wet season.

Hydrodynamic and Water Quality Impacts Following Island Formation

- 11.3.19 The presence of the artificial island is predicted to significantly increase the accumulated flow through the East Lamma Channel (45.02%) and to reduce the flow in the West Lamma Channel (32.03%) during the dry season. In the wet season, a reduction in accumulated flow is predicted in all three major channels of between 4.26% (East Lamma Channel) and 7.91% (Tathong Channel). The presence of the artificial island is predicted to significantly increase the velocity between the island and Lamma Island during the neap ebb tide and to cause some significant changes in flow pattern between Peng Chau and Lamma Island during the neap flood tide in the wet season. In the dry season, the velocity was predicted to increase between the island and Lamma Island and around the western part of the island during the spring ebb tide. Significant increases in flow velocity were also predicted around the island during neap ebb tide. The overall average current magnitude was predicted to increase by up to 23.59% to the north-east of the island.
- 11.3.20 In the hydrodynamic and water quality modelling, the relative differences in tidal flux between major channels, including Victoria Harbour, East and West Lamma Channels and Adamasta Channel, were investigated. It is predicted that the presence of the island would cause a small increase in the accumulated fluxes in Victoria Harbour (ranged from 0.96% to 2.74%) for all tide phases except during the wet season neap flood period when there would be a small reduction in the calculated fluxes (-3.02%).
- 11.3.21 It also predicted that the island would increase the accumulated fluxes in East Lamma Channel for all tidal phases (ranged from 1.08% to 7.25%), however, decrease in the fluxes would occur in West Lamma Channel for all tidal phases (ranged from -4.87% to -9.66%).
- 11.3.22 However, the effect on Adamasta Channel would be quite large. The model predicted that there would be increases in the tidal fluxes through the channel at all tide phases (that ranged from +6.05% to +89.66%).
- 11.3.23 Overall, the presence of the island would, in general, reduce the fluxes through West Lamma Channel and redistribute flow to the remaining three channels. East Lamma Channel would receive the largest proportion of the West Lamma Channel flow. The effect of the overall changes in the flow discharges through the four channels would however be small based on the finding that the net reductions were within 1%, and therefore, the pollutant dispersion capability of harbour west area would only be marginally reduced.
- 11.3.24 In the hydrodynamic and water quality modelling, 17 sensitive receivers that are close to the site were selected for presentation. Of the 17 chosen indicator points, 15 of them (FP8, GB4, FC2, GB11, FP2, CW4, FP1 and MP6) are located in the Southern WCZ. While the remaining 2 (MF8-9) are located in Mainland waters and classified as Category 2 in the Mainland Sea Water Standard.
- 11.3.25 According to the dry season water quality modelling results, the predicted 90%ile DO for depth average and bottom layer ranged from 6.38 to 7.43mg/L which complied with the WQOs of ≥ 4 mg/L for depth averaged DO and ≥ 2 mg/L for bottom layer DO as well as the Mainland standard of 5mg/L. Comparing to the baseline water quality results, the percentage differences are minimal (ranged from 0.15 to 1.82%).
- 11.3.26 The predicted average dry season salinity ranged from 33.86 to 34.00ppt. The differences in salinity levels caused by the presence of the island were also minimal (less than 1%) at all the selected indicator points as compared to the WQO requirement that change due to any waste discharge should not exceed 10% of natural ambient level.
- 11.3.27 The predicted dry season SS levels at the indicator points were in the range of 3.82 to 5.63mg/L. The largest difference of 3.98% and 3.81% were predicted at NS2 (Fishery Nursery/Spawning Ground South of Nam Tam Wan, Cheung Chau) and NS1 (Fishery Nursery/Spawning Ground South of Pak Tso Wan, Cheung Chau) respectively. Compared to the WQO requirement that any waste discharge should not raise the natural ambient level by 30% as well as the Mainland standard that man-made increment should not exceed 100mg/L, these differences are considered very small.

- 11.3.28 The change in average dry season *E.coli* levels caused by the presence of the island is significant at Stations GB4 (Gazetted Beach at Silvermine Bay) and FC2 (Fish Culture Zone at Cheung Sha Wan). For FC2, there would be a 140% increase of *E.coli* levels. However, the predicted *E.coli* levels at this station with value of 24count/100mL would be quite small when compared with the WQO of 610cfu/100mL. The predicted average *E.coli* levels for the remaining indicator points were low (1 – 18count/100mL).
- 11.3.29 The predicted average dry season UIA levels (0.000778 – 0.00350mg/L) at all indicator points were very small as compared to the WQO of 0.021mg/L and the Mainland standard of 0.020mg/L.
- 11.3.30 The predicted dry season TIN levels (0.0906 – 0.0913mg/L) at the 2 indicator points were very small and well below the Mainland standard of 0.3mg/L. Since the Hong Kong WQO of TIN is an annual mean value, the predicted mean TIN levels at the indicator points in Hong Kong waters for the dry and wet seasons were averaged to represent the annual mean values. All 15 indicator points in Hong Kong waters breached the WQO of 0.1mg/L with calculated annual mean values ranging from 0.1013 to 0.1984mg/L. However, the calculated averaged baseline concentrations at these stations also exceeded the WQO.
- 11.3.31 According to the wet season water quality modelling results, the predicted 90%ile DO for depth average and for bottom DO ranges from 4.73 to 6.97mg/L. The values complied with the WQOs of ≥ 4 mg/L for depth-average and ≥ 2 mg/L for bottom DO as well as the Mainland standard of 5mg/L. Four indicator points, namely GB11 (Gazetted Beach in Cheung Chau), CW4 (Cooling Water Intake at Lamma Island), FP2 (Finless Porpoise Area near Cheung Chau) and NS2 (Fishery Nursery/Spawning Ground South of Nam Tam Wan, Cheung Chau), showed reductions in DO levels in comparison with the baseline values. The percentage reduction ranged from 0.18 to 2.24%.
- 11.3.32 The predicted average salinity in the wet season ranged from 19.20 to 25.10ppt. Comparing to the baseline water quality results, the differences in salinity caused by the presence of the island were small ranging from 0.72 to 4.04%. The differences were below the WQO requirement of 10%.
- 11.3.33 The predicted SS levels in the wet season at the indicator points were in the range of 4.50 to 8.40mg/L. The percentage differences ranged from 0.37 to 10.83% with the largest difference at GB4 (Gazetted Beach at Silvermine Bay). Compared to the WQO requirement that any waste discharge should not raise the natural ambient level by 30% as well as the Mainland standard that man-made increment should not exceed 100mg/L, the differences are considered small.
- 11.3.34 The predicted wet season *E.coli* levels ranged from 1 to 32count/100mL which is well below the WQO of 610cfu/100mL and the Mainland standard of 200count/100mL.
- 11.3.35 The predicted average wet season UIA levels (0.00374 – 0.00558mg/L) at all indicator points were low and well below the WQOs of 0.021mg/L for annual mean and the Mainland standard of 0.020mg/L. The largest increase compared with the baseline scenario was at NS3 (Fishery Nursery/Spawning Ground Southwest of Cheung Chau) with a percentage difference of 5.42%.
- 11.3.36 The predicted wet season TIN levels (0.2241 – 0.2779mg/L) at the indicator points in Mainland were below the Mainland standard of 0.3mg/L. However, the predicted TIN levels (0.2682 – 0.3153mg/L) at the indicator points in Hong Kong waters were relatively higher as compared to the dry season data. All stations in Hong Kong waters breached the WQO of 0.1mg/L as discussed in Section 11.3.30 above.

Cumulative Impacts

- 11.3.37 Currently, there are ongoing extensions including dredging and reclamation at the southern side of the Lamma Power Station. However, these works are scheduled for completion by mid 2003 and no cumulative water quality impacts are envisaged.

11.3.38 The Lamma Power Station extension was investigated (along with others), as a potential site for construction of a Waste-to-Incinerator Energy Facility (WEIF). Whilst the final decision on this project, (i.e. preferred site and implementation programme) has not been made, the siting of a WEIF at Lamma was not recommended on environmental grounds (CDM 1998.³). For the purposes of this assessment it is assumed that any future facility would not be located at Lamma Island.

11.3.39 The site coincides with that for the potential Lamma Breakwater, which includes for port related back-up facilities. The potential for cumulative impacts lies in the future need for the Lamma Breakwater, the effects of which may be facilitated to some extent by the LBIL if this option is pursued. This issue will require further investigation and confirmation.

Waste Management / Disposal Impacts

11.3.40 For construction of the “island” on which the landfill would be located, inert C&D material would be brought in exclusively by marine vessel, from a network of barging points across the SAR. The location of barging points would vary during the filling process, according to the source of materials at any given time.

11.3.41 Whilst various options for construction that avoid dredging have been investigated, it is anticipated that muds would need to be excavated to facilitate construction of the outer seawall, prior to public filling. Excavated muds would then be disposed of within the area to be reclaimed with public fill. Following this, the “island” would act as a major recipient of municipal solid waste and other landfilled waste streams.

11.3.42 Anticipated volumes of materials are as follows:

- Volume of public fill that could be accepted for island construction: 225Mcum
- Volume of muds to be dredged for the outer sea wall: 10Mcum

11.3.43 Various potentially polluting materials may be stored, handled and transported to / from the site. Examples may include chemicals for waste water/leachate treatment, waste oils, fuel for plant working on the site, etc. These would be managed as described in Section 5.5.

11.3.44 Regarding GHG emissions, waste delivery to the site will be by marine vessel which has a lower GHG emission rate (per kg waste handled) compared to road transport. Based on the information given in the Preliminary Marine Review (March 2002), it is noted that the cumulative distance between marine RTSs and the site is around 250km. According to the ranking scale (see Section 5), the GHG impacts are considered to be neutral.

Ecology

Baseline Conditions

11.3.45 There are a number of ecological resources of conservation interest and significance in the general area of the LBIL, principally those located at South Lamma. The LBIL would be near to the Sham Wan SSSI and approximately 2km from the eastern edge of the proposed South Lamma Marine Reserve / Park. The potential LBIL would also be just over 2.3km from the Ha Mei Tsui headland at the southeast Lamma coastline.

11.3.46 *Figure 11.1* shows the locations of ecologically sensitive areas in the vicinity of the site.

³ CDM (1998). Feasibility Study of Waste-to-Energy Incineration Facilities: Site Assessment Report – Lamma Island. Submitted to EPD, July 1998.

- 11.3.47 The Green Turtle *Chelonia mydas* is the only turtle species known to breed locally, with nesting only reported thus far at the sandy beach at Sham Wan, south Lamma.⁴ The Green Turtle is protected under the Wild Animals Protection Ordinance, Cap.170 and is listed under Appendix I of CITES. The beach at Sham Wan and the nearby shallow waters were designated a SSSI in June 1999, whilst (since 1999) approximately 0.5ha of the nesting area including the beach is a "Restricted Area" between June and November.
- 11.3.48 The Black Finless Porpoise frequents the waters around the LBIL area and generally around south Lamma throughout the year. Seasonal distribution data collated by the AFCD shows that the waters around Ha Mei Tsui are a very important part of the species' core habitat between September and May, with the peak season for the Finless Porpoise being between March and May ("Spring"). The Chinese White Dolphin prefers waters further to the west, although there have been occasional sightings in the site area.⁵
- 11.3.49 The area with the greatest concentration of Finless Porpoise sightings is immediately off the Ha Mei Tsui headland, South Lamma. The AFCD distribution map for the "Spring" period shows most sightings within a 1km radius from this headland: a total of 29 sightings, with most of these in waters 0.5-1km offshore. The exact reasons for the apparent concentration in activity at this location are not known, although it has been hypothesized that the unusual bathymetry in the few hundred metres closest to the headland provides a good habitat for the primary prey species of the Finless Porpoise.
- 11.3.50 Inter-tidal resources at southwest Lamma were investigated under the HEC Power Station Extension study. The macroinvertebrate and macroalgae community around Ha Mei Tsui was relatively diverse amongst the six west coast survey locations. The most abundant species were the Chiton *Acanthopleura japonica*, the Limpet *Patelloida saccharina*, and the macroalgae *Neogoniolithon misakiense*. None of the intertidal community species are of particular conservation significance.
- 11.3.51 The Power Station Extension study described the shallow sub-tidal waters at southwest Lamma, as being characterised by steep rocky substrate comprised of boulders. This substrate character (combined with the peninsula status of the location and the water current) appears to be conducive to coral establishment as the greatest coral diversity on the west Lamma coast is to be found in this area. Hard coral of the genus *Tubastrea* was reported as abundant on the southwest-facing coast, whilst three species of soft coral, three of sea whip, one sea pen and one sea fan were also observed in the 1998 survey. Other abundant coral reef associates reported in large numbers were the sea cucumber *Colochirus crassus* and the long-spined sea urchin *Diadema setosum* (ERM, 1999). It was concluded that the coastal sub-tidal habitat around Ha Mei Wan, southwest Lamma, is of "high ecological value".

Direct Habitat Loss

- 11.3.52 No specific surveys of the benthos at the site area have been carried out, however given the depth of water at this site approximately 20m, it is reasonably anticipated that hard corals would be absent due to the low light levels, although the presence of soft corals and gorgonians cannot be discounted, (ERM 1997c⁶). It is expected that benthic communities will be representative of similar communities in southern waters as surveyed by Shin and Thompson, (1982), dominated by polychaetes, molluscs and crustaceans. It is anticipated that the benthic community will generally be of low ecological significance.

⁴ AFCD (2001). AFCD Website. Conservation: Protection of Green Turtles. [www.afcd.gov.hk/con_new/turtle.htm].

⁵ AFCD (2001). AFCD Website. Conservation: Chinese White Dolphin. www.afcd.gov.hk/con_new/cdp_distri4.htm].

⁶ ERM-Hong Kong Ltd (1997c) Stage 1 EIA for a New Power Station: Stage 1 EIA Report Volume I, Hongkong Electric Company, Ltd.

- 11.3.53 The site footprint covers a surface area of 585ha and the site is entirely sub-tidal. It is anticipated that there will be no benthic species of particular ecological significance in the area.
- 11.3.54 Using AFCD data, the total number of sightings of Finless Porpoise at set distances from the Ha Mei Tsui headland has been identified. The number of sightings in consecutive 500m “bands” from the headland is as follows:

Distance	# Finless Porpoise Sightings	Cumulative Total within 3km (%)
0.0 – 0.5km	8	13
0.5 – 1.0km	21	46
1.0 – 1.5km	12	65
1.5 – 2.0km	10	81
2.0 – 2.5km	5	89
2.4 – 3.0km	7	100
0.0 – 3.0km	63	100

- 11.3.55 The data confirms that the highest number of sightings (33%) occurs between 0.5km and 1km from the headland, with over 80% of sightings within 2km of the Ha Mei Tsui headland. The distance between the headland and the potential LBIL is approximately 2.3km. There has also been a further amendment in the LBIL footprint to move the site some 500m further west of the location indicated in the Draft SEA, thereby further increasing the distance from the apparent core area for the Finless Porpoise.
- 11.3.56 The above table has been generated from AFCD data to provide an indication of the distribution of Finless Porpoise sightings in the waters in between the Ha Mei Tsui headland and the potential location of the LBIL. For the purpose of this SEA the AFCD data has been simply presented to try and define more accurately the “core” area for the Finless Porpoise. The results of this exercise are that the core area does not overlap with the potential LBIL site, although given the inherent secrecy of the Finless Porpoise it would be prudent that this issue is further investigated at the detailed EIA stage.
- 11.3.57 The final configuration of the LBIL would also be subject to more detailed investigation at the detailed design stage and would be affected by the findings of further investigation into the distribution and behaviour of the Finless Porpoise off southwest Lamma Island.
- 11.3.58 The Finless Porpoise may also be prone to adverse impact from general disturbance associated with landfill development and operation, including vessel noise / vibration. Whilst it is known that vessel collision is a significant source of mortality for the Finless Porpoise, the mammal would be able to avoid impacts to a certain extent and it is also recommended that marine vessel access to any future LBIL be routed to avoid the coastal waters of South Lamma and the Ha Mei Tsui headland as far as practicable.
- 11.3.59 The modelling results show that a slight increment (around 1mg/L) in suspended solids levels would occur and rise to a level < 6.5mg/L at FP1, MP6 and NS4 during Phase 2 construction in the wet season. This sediment concentration (1mg/L) rise to a level less than 6.5mg/L may also apply to NS4 during Phase 3 construction in the wet season. The resulting reduction in water quality may adversely affect the above sensitive areas. These areas include the Finless Porpoise Area, Potential Marine Park and Fishery Nursery/Spawning Ground, south to the southwest of Lamma Island. There are no operational changes in water quality.

Water Quality / Hydrodynamics

11.3.60 The SSSI designated turtle breeding beach at Sham Wan (South Lamma) is protected from the effects of LBIL due to the coastal morphology. The Finless Porpoise, for which the area forms part of the core habitat, could be driven out by dredging and reclamation activities. Any deterioration in water quality would drive fish from the area due to their sensitivity to increased suspended sediment levels, resulting in reduced feeding opportunities for the Green Turtle and Finless Porpoise in these waters. Further discussion of potential impacts on the Green Turtle is discussed in Chapter 17, (Lamma South Island Landfill).

Marine Vessel Disturbance

11.3.61 From a study conducted on behalf of the AFCD, it is known from data on strandings of Black Finless Porpoise specimens that vessel collision is a significant cause of death (Jefferson, 2001). As the South Lamma area is part of the core habitat for Finless Porpoise, any increase in marine traffic required for site formation / reclamation activities and facility operation could lead to an increase in incidences of vessel collision.

11.3.62 The marine waters in the area to the south of Lamma area are important for the Green Turtle. Given the location of the potential LBIL relative to the turtle's nesting ground at Sham Wan, there is the potential for disturbance of the turtles during their breeding season.

Fisheries

11.3.63 There are two fishing zones in the vicinity of the LBIL: Ha Mei (zone 98) and Tai Kok (zone 99). Available data indicates that both of these zones are similarly popular in terms of the number of fishing vessels utilizing the zone compared against other fishing zones to the north ("North Lamma" report refers). Likewise, the productivity of these two zones is similar on a unit area basis. In terms of value ranking for adult fish, Tai Kok ranks 50 / 210 zones compared with 66 / 210 for Ha Mei. Ha Mei has slightly better ranking for fry fish 45 / 89 compared with 49 / 89 for Tai Kok. The overall value of both Tai Kok and Ha Mei were high for the HKSAR, ranking 84th and 70th respectively out of 210 fishing zones (ERM, 1999).

11.3.64 The numerical model predicts that the small increase in suspended solids levels during construction phases 2 and 3 in the wet season may temporarily impose adverse impacts on the Fishing Nursery/Spawning Ground located South of Lamma Island (NS4).

11.3.65 The most commonly caught species in these two zones were the same, including the scad *Caranx* spp., the sardine *Sardinella jussieui*, and the croaker *Argyrosomus* spp. The catch of Mantis shrimp *Oratosquilla* spp. – a commercially valuable species – was the 5th most important in terms of species weight in both zones (*ibid.*). Other commercially important species for which the South Lamma area is a known spawning ground include the coastal mud shrimp *Solenocera crassicornis*, and the Jinga shrimp *Metapenaeus affinis*. The marine waters are also an important nursery area for the shrimp *Metapenaeopsis barbata* and *M.palmensis*, and croaker and grouper fry, amongst others (ERM, 1998). Due to their importance as a nursery area for commercial fish species it has been proposed that the waters around South Lamma be designated a Fisheries Protection Area (*ibid.*).

11.3.66 Overall, the construction of the LBIL has potential to create a significant adverse impact on fisheries resources in the area. Marine dredging works will have considerable potential to affect fisheries in the area; particularly on the ebb tide when the ebb tide current from the West Lamma Channel may transport sediment south from the works area and deeper into the productive fisheries grounds. General reclamation and site formation activities may also lead to adverse impacts from sediment dispersal away from the works location.

11.3.67 There are no fish culture zones in the area of the proposed LBIL. The nearest FCZ is located a considerable distance away on the eastern side of Lamma Island at Sok Kwu Wan.

Cultural Heritage

- 11.3.68 There is no immediate evidence of archaeological remains in this area. However there are a significant number of archaeological sites on both Lamma and Cheung Chau. The presence of sites on land strongly suggests that seafarers would have used the natural harbours of the islands and the waters around the LBIL for several thousand years.
- 11.3.69 Recognising the likelihood of archaeological remains in this area and the lack of archaeological data currently available for this site a detailed marine archaeological investigation should be carried out in any future studies.

Landscape and Visual

- 11.3.70 *Landscape Planning Designations* – This area of landscape is not covered by any planning designations reflecting landscape/landscape values and so there will be no impact on these values.
- 11.3.71 *Landscape Resources* - The site lies in a marine area, so that the only landscape resource affected will be an area of offshore water. Given the low sensitivity of this resource, there will be no significant impacts on landscape resources.
- 11.3.72 *Landscape Character* – The island landfill site falls within the Southern Coastal Waters LCA (*Figure 11.4*). The landscape of this part of Hong Kong is exposed offshore water with little sense of containment other than distant islands in PRC waters and the distant islands of Lantau, Lamma and Cheung Chau (*Figure 11.3*). The area is given some landscape context by the proximity of Lamma Island. Shipping introduces movement and artificial elements into what is otherwise a predominantly natural setting.
- 11.3.73 There exists potential for substantial impacts on landscape character resulting from construction/operation works, which will introduce new elements which are incompatible with the existing open landscape. During the afteruse phase of the island landfill, these impacts are likely to be reduced, as the completed island is restored. The character of the island will be generally inconsistent with the open, natural character of the surrounding landscape. As a consequence of this, the long-term impact on landscape character will be moderate to substantial.
- 11.3.74 *VSRs* - *VSRs* affected by the island landfill are identified in *Tables 11.3 and 11.4*. The extent of the project visual envelopes is shown in *Figure 11.5* and the key views to the island landfill are shown in *Figure 11.6*.
- 11.3.75 Because of the location of the island there are no large areas of population close to the site. *VSRs* that will be the most affected are residential *VSRs* in Nam Tam, Cheung Chau and recreational *VSRs* in Lamma Island Trail and visitors using these areas for boating, fishing and other water sport activities. Other recreational *VSRs* that will be less affected are the visitors to the Hung Shing Ye Beach, Fa Peng Beach and Lo So Shing Beach as their locations are further away from the island and at sea/ground level. Occupational *VSRs* are affected at Lamma Island Power Station. Other *VSRs*, such as travellers on vessels using the Shipping Lanes, are often transient.
- 11.3.76 The *VSRs* will experience works on the landfill (shipping, marine vessels and partially constructed island) as relatively close artificial elements contrasting with the coherent natural qualities of the existing landscape. Resulting visual impacts will generally be substantial to moderate. After the restoration of the landfill island, the visual impact of the island will be reduced. The somewhat artificial profile of the island will however still contrast with the existing character of views (*Figure 11.7*). Therefore, the residual visual impact on major *VSRs* during the afteruse phase will be reduced to moderate to slight.
- 11.3.77 *Mitigation Measures* – Landscape and visual mitigation measures are outlined in Part A of the Report and are illustrated in *Figure 11.8*.

Landfill Gas

- 11.3.78 There are no sensitive receivers (targets) or pathways within 500m of the site. Therefore, there are no potential off-site landfill gas hazards. Landfill gas would have safety implications for those working on the site. In the event that the reclamation on which the landfill would be constructed is also developed for other afteruses, the potential operational phase landfill gas hazards would need to be considered for those developments.
- 11.3.79 Given the remote location of the site and the lack of any sizeable population nearby, the direct off-site use of LFG as an energy source in surrounding communities, is not considered practical. However, it would be used as an on-site energy source.

11.4 Environmental Protection Measures to be Incorporated into Design and Further Environmental Implications

- 11.4.1 Environmental design measures have been identified in Part A (Section 3.8) and generic approaches to mitigating impacts on different environmental parameters are outlined in Part A (Section 5). Whilst the specific requirement for environmental mitigation would be dependent upon the findings of an EIA, the following environmental protection measures are those which are site-specific.

Air Quality

- 11.4.2 No specific air quality mitigation measures are recommended at this stage, other than good site practice.

Noise

- 11.4.3 No specific noise mitigation measures are recommended at this stage, other than good site practice.

Water Quality

- 11.4.4 Although no WQO exceedances were found during either the operation or the construction phase, there were WQO exceedances in TIN in all baseline, construction and operation phases. In addition, mitigation could still be required to prevent impacts during dredging and filling for the artificial island reclamation subjected to the confirmation of the filling and dredging rate. Construction procedures, defining the rates and method of dredging and filling taking in to account the hydrodynamics of the surrounding waters and tidal effects (ebb and flood) should be defined in any EIA. If significant impacts are predicted, a silt curtain may be installed around the immediate works area to prevent dispersion of sediments. In addition, specific protection may be required to protect the cooling water intake at the Lamma Power Station.

Solid Waste

- 11.4.5 No specific waste management mitigation measures are recommended at this stage, other than good site practice as described in Part A (Section 5).

Ecology

- 11.4.6 Specific controls on vessel movements to minimise impacts on the Finless Porpoise are recommended if this site is investigated further. Tentatively, routing of marine vessels through waters away from the coastline of South Lamma and sufficiently far from the Ha Mei Tsui headland to avoid the "core" habitat (once more suitably defined by field investigation) is recommended.
- 11.4.7 The application of measures to prevent unacceptable impacts on water quality will also apply to ecological resources, and are likely to be necessary.

11.4.8 Through the course of this SEA, the location of the LBIL within the site search envelope has been modified to increase the distance of the site from the core area for the Finless Porpoise. If the LBIL is selected for more detailed investigation, it is recommended that opportunities to maximise the distance of the site from the core area be investigated further.

Fisheries

11.4.9 Mitigation applied for the protection of ecological resources would apply equally to the protection of fisheries resources.

Cultural Heritage

11.4.10 No specific measures for the protection of cultural heritage are deemed necessary at this stage. This should be re-evaluated in the event that a marine archaeological assessment is carried out as part of an EIA if this site is investigated further.

Landscape & Visual

11.4.11 *Mitigation Measures* – Landscape and visual mitigation measures are outlined in Part A of the Report and are illustrated in *Figure 11.8*.

11.5 Summary

11.5.1 A summary of the SEA for the LBIL is provided in *Tables 11.1 and 11.2*:

Table 11.1: Lamma Breakwater Island Landfill SEA

	Impacts	Score	Commentary
Air Quality Assessment			
1	Distance to areas of air sensitive land use	○	There are no ASRs within 500m of the site.
2	Presence of topographic features which could decrease or exacerbate impacts	○	There are no features which would affect air dispersal. In addition as there are no ASRs within 3km, this criterion is not applicable.
3	Occurrence of meteorological conditions which could exacerbate impacts	○	The predominant wind direction is towards ASRs. However the remoteness of ASRs is such that this criterion is not applicable.
4	Cumulative Impacts of relevant emissions (TSP (construction), NO _x , CO, SO ₂ – LFG Flare) taking into account ambient conditions	-	Review of all known planning information (OZPs and the SWNT Development Strategy Review) indicate there are no other confirmed or planned developments within 5km of this marine site, which could contribute to cumulative air quality impacts. The HEC Lamma Power Station is located approximately 4.2km to the north of the site. There are no ASRs located within 500m of the island site and hence no cumulative air quality impacts are anticipated.
5	Total Emissions of Air Pollutants from the territory-wide waste transportation between the RTSs and the site	○	Waste will be delivered to the site by marine vessel and the cumulative distance to be travelled is estimated to be 250km.
6	Overall Impact	○	Overall air quality impacts is considered to be ' Neutral ' because local impacts are not anticipated due to the absence of ASRs within 500m.
Noise Assessment			
1	Distance to areas of noise sensitive land use	○	There are no NSRs within 300m of the site.
2	Topographic Features (only applicable if there are NSRs within 300m)	○	The area between the proposed landfill site and the nearest land mass Soko Islands is marine (flat). Notwithstanding, as there are no NSRs within 3km this criterion is not directly applicable.
3	Cumulative Impacts of developments within 300m	○	No developments that could cause cumulative impacts.
4	Overall Impact	○	' Neutral '. Negligible noise impacts on surrounding NSRs due to its remote siting.

	Impacts	Score	Commentary
Water Quality Assessment			
1	Water Course Diversion	○	Artificial Island. Not Relevant.
2	Potential for sediment contaminant release	○	None. EPD routine sediment quality monitoring data collected near to the site indicates uncontaminated marine sediments.
3	Potential impacts on WSRs	-	Water quality modelling indicates that the construction of the island may cause some increase in SS but that this remains below the WQO. It is predicted that TIN standard in the operational phase would be breached, however, it was also breached in the baseline scenario and the elevation due to the presence of island was not significant, therefore, the island would not be the cause of the exceedance. The impact is assessed to be at the upper end of 'Negative – Low' category. In addition, the island will slightly reduce the flushing capability of Western Harbour.
4	Potential Impacts on Groundwater	○	Artificial Island. Not Relevant.
5	Potential Cumulative Impacts (Potential for concurrent projects to exacerbate preceding impacts)	○	There are no major marine developments currently planned around the site that could result in cumulative impacts. The site coincides with that for the potential Lamma Breakwater. The potential for cumulative impacts lies in the future status of the Lamma Breakwater which will require confirmation.
6	Overall Impact	-	Potential water quality impacts are considered to be ' Negative – Low '. The works will result in increases in suspended solid levels during dredging / reclamation and potential reduction in flushing capacity of Ha Mei Wan during operation. Although LBIL was categorised as 'Negative – Low', the water quality impact, in fact, can either be in the upper end of 'Negative – Low' or lower end of 'Neutral / Negative – Low' category. It was finally categorized as 'Negative – Low' so that the relative differences in water quality impacts with respect to SCCIL can be illustrated.
Waste Management Assessment			
1	Balance of Materials (surplus/deficit of public fill needed for landfill development)	+	The site could accommodate a major volume of public fill (225Mcum) negating the need to import filling material for site formation. Dredged muds will be incorporated with the fill materials within the island footprint.
2	GHG emissions from mode of transport for delivery of waste to the site from RTSS	○	Waste will be delivered to the site via marine vessel. The distance travelled from marine RTS(s) to the site has been estimated to be 250km.
3	Overall Impact	+	Overall the site is considered to have a ' Positive ' impact due to the ability to accommodate surplus C&D material and the avoidance of land based secondary environmental impacts.

	Impacts	Score	Commentary
Ecological Assessment			
1	Potential for secondary environmental impacts on "Areas of Absolute Exclusion"	○	The proposed S Lamma Marine Park is located some 2km to the east. Hydrodynamic modelling indicates marginally significant construction phase impacts in the wet season and insignificant operational phase impacts to the water quality or hydrodynamics which may affect this area.
2	Affects an important habitat	- / - -	The site is in the vicinity of the core habitat for the Finless Porpoise. There are also coral communities of high conservation value located at Ha Mei Tsui (southwest Lamma), these areas are situated at some distance from the site and therefore the impacts associated with water quality reduction are anticipated to be marginally significantly only.
3	Affects species of conservation importance	- -	This site is located in the vicinity of the core area for the Finless Porpoise. This Cetacean is listed under Appendix I of CITES and is protected under the Wild Animals Protection Ordinance (Cap. 170) and may suffer significant direct impacts, particularly during operation.
5	Potential for Cumulative Ecological Impacts on sites of recognised value	○	There are no known concurrent works in the vicinity of the artificial island location that have potential to create cumulative ecological impacts, however this would require verification on the basis of the final decision for the proposals for the Lamma Breakwater (and back-up facilities).
6	Overall Impact	- / - -	Ecological impacts are considered to ' Negative – Low / High ' due to the close proximity to the proposed South Lamma Marine Park, and the core habitat for the Finless Porpoise.
Fisheries Assessment			
1	Potential for secondary environmental impacts on "Areas of Absolute Exclusion"	○	There are no existing "Areas of Absolute Exclusion" (eg. Fish Culture Zones) that may be affected by the works.
2	Affects important mariculture/ fisheries resources (including spawning / nursery ground)	- -	The two fishing zones in the vicinity of the potential artificial island are ranked highly in terms of fisheries productivity in the HKSAR. The waters around the potential site are an important spawning and nursery ground for a range of commercially important fish and crustaceans. It has been proposed that the waters around South Lamma are designated a "Fisheries Protection Area".
3	Potential for Cumulative Fisheries Impacts on sites of recognised value	○	There are no anticipated cumulative impacts.
4	Overall Impact	-	The potential fisheries impacts are considered to be ' Negative – Low ' due to minor sediment input to the fisheries and spawning grounds, south of Lamma Island (NS4) during the construction phase in the wet season.

	Impacts	Score	Commentary
Cultural Heritage Assessment			
1	Important cultural (Declared, Deemed or Graded sites) / archaeological sites	0	There are no known sites of cultural heritage significance.
2	Potential for archaeological value	-	No marine based deposits of archaeological interest have been found in the site area, although there is evidence of land based archaeological finds nearby on Lamma Island. This suggests that the coastal area of Lamma Island has been used by seafaring people for several thousands of years. Recognising the lack of archaeological data currently available, it is considered that the likelihood of archaeological remains in this area is reasonable. A detailed marine archaeological investigation should be carried out in any future studies.
3	Potential for Cumulative Heritage Impacts on sites of recognised value	0	The nearest sites of cultural heritage value are land based, (on Lamma Island. Therefore they would not be affected by this development.
4	Overall Impact	-	The potential impacts on cultural heritage are considered to be 'Negative – Low' . Whilst there is not direct evidence of cultural heritage remains in the site area, the occurrence of remains on nearby Lamma Island increases the potential for marine archaeological finds.

	Impacts	Score	Commentary
Landscape and Visual Impact Assessment			
1	Implications for Landscape Planning and Designations	○	This area of seascape is not covered by any planning designations reflecting landscape/seascape values and so there will be no impact on these values. Overall impacts on landscape planning designations will therefore be Neutral.
2	Impacts on Landscape Resources	○	As the site lies in a marine area, there will be no significant impacts on landscape resources. Overall impacts on landscape resources will therefore be Neutral.
3	Impacts on Landscape Character	--	The island landfill will contrast with the open and natural character of the Southern Coastal Waters Landscape Character Area. The impact on this character area will be substantial reducing to moderate/substantial with the restoration of the island. Overall impacts on landscape character will be Negative – High.
4	Visual Impact	- / --	The most affected VSRs will be residents in Nam Tam, Cheung Chau and a few recreational receivers who use that part of the sea area for active and passive recreation. The impact on these VSRs will be substantial to moderate. After the restoration of the landfill island with mitigation measures fully implemented, the visual impact of the island will be reduced to moderate. Overall visual impacts will be Negative – Low/High.
5	Overall Impact	- / --	Overall, landscape and visual impacts will be ' Negative – Low / High ' for the following reasons: <ul style="list-style-type: none"> • There are no landscape designations covering the disposal site. • Because it is a marine site, no significant landscape resources will be affected. • The island landfill will significantly affect the open and natural landscape character of the coastline to the south-west of Lamma. • There are reasonably low numbers of residential visual receivers within the visual envelope.
Landfill Gas Assessment			
1	Distance between the new / extended landfill and SRs	○	This is a marine site located over 4km west of Lamma Island. The nearest sensitive receivers are >250m away
2	Number of Receivers within 250m (i.e. Consultation Zone)	○	There are no SRs within 500m
3	Man-made / Natural Pathways for LFG Migration	○	None
4	Additional Utilisation of LFG to Reduce GHG Emissions	○	LFG would be utilised on-site. There are no potential off-site users of LFG.
5	Overall Impact	○	'Neutral'

Table 11.2: Summary for Lamma Breakwater Island Landfill SEA

Overall Impacts	Score	Commentary
Overall Air Quality Impact	O	Neutral
Overall Noise Impact	O	Neutral
Overall Water Quality Impact	-	Negative – Low
Overall Waste Management Impact	+	Positive
Overall Ecological Impact	- / - -	Negative – Low / High
Overall Fisheries Impact	-	Negative – Low
Overall Cultural Heritage Impact	-	Negative – Low
Overall Landscape & Visual Impact	- / - -	Negative – Low / High
Overall Landfill Gas Impact	O	Neutral

Table 11.3 Assessment of Significance of Visual Impacts for Lamma Breakwater Island Landfill During Construction / Operation Phase for Lamma Breakwater (Note: All impacts adverse unless otherwise noted)

Identity No. of VSR	Key Visually Sensitive Receiver (VSR)	Approx Minimum Distance Between VSR and Source(s)	Nos. of VSRs (order of magnitude only)	Magnitude of Impact During Construction (Negligible, Small, Intermediate, Large)	VSR Sensitivity (Low, Medium, High)	Impact Significance before Mitigation Measures (Insubstantial, Slight, Moderate, Substantial)	Significance of Residual Impacts (Insubstantial, Slight, Moderate, Substantial)
<i>Residential VSRs</i>							
VR50	Cheung Chau	5km	Few	Large	High	Substantial	Moderate
<i>Occupational VSRs</i>							
VR54	Lamma Island Power Station	5km	Few	Intermediate	Low	Moderate	Slight
<i>Recreational VSRs</i>							
VR60	Hung Shing Ye Beach, Lamma Island	5km	Few	Large	Medium	Substantial	Moderate
VR55	Fa Peng Beach, Cheung Chau	5.5km	Few	Large	Medium	Substantial	Moderate
VR60a	Lo So Shing Beach, Lamma Island	5km	Few	Large	Medium	Substantial	Moderate
VR57	Lamma Island Trail, Lookout Point pavilion at headland on trail between Hing Shing Yeh Beach and Soh Kwu Wan	5km	Few	Large	Medium	Substantial	Moderate
VR11	Area for Boating, Fishing, Diving and other water sports activities	0km - 15km (varies)	Few	Large	Medium	Substantial	Moderate
<i>Travelling VSRs</i>							
VR49	Maritime Vessels	2km	Moderate	Moderate	Medium	Moderate	Slight

Table 11.4 Assessment of Significance of Visual Impacts for Lamma Breakwater Island Landfill During Afteruse Phase
(Note: All impacts adverse unless otherwise noted)

Identity No. of VSR	Key Visually Sensitive Receiver (VSR)	Approx Minimum Distance Between VSR and Source(s)	No.s of VSRs (order of magnitude only)	Magnitude of Impact During Afteruse (Negligible, Small, Intermediate, Large)	VSR Sensitivity (Low, Medium, High)	Impact Significance before Mitigation Measures (Insubstantial, Slight, Moderate, Substantial)	Significance of Residual Impacts (Insubstantial, Slight, Moderate, Substantial)
<i>Residential VSRs</i>							
VR50	Cheung Chau	5km	Few	Large	High	Substantial	Moderate
<i>Occupational VSRs</i>							
VR54	Lamma Island Power Station	5km	Few	Intermediate	Low	Moderate	Slight
<i>Recreational VSRs</i>							
VR60	Hung Shing Ye Beach, Lamma Island	5km	Few	Intermediate	Medium	Moderate	Slight
VR55	Fa Peng Beach, Cheung Chau	5.5km	Few	Intermediate	Medium	Moderate	Slight
VR60a	Lo So Shing Beach, Lamma Island	5km	Few	Intermediate	Medium	Moderate	Slight
VR57	Lamma Island Trail	5km	Few	Large	Medium	Substantial	Moderate
VR11	Area for Boating, Fishing, Diving and other water sports activities	0km - 15km (varies)	Few	Intermediate	Medium	Moderate	Slight
<i>Travelling VSRs</i>							
VR49	Maritime Vessels	2km	Moderate	Small	Medium	Moderate	Slight