

## 1 Introduction

The Planning and Engineering Study on Future Land Use at Ex-Lamma Quarry Area at Sok Kwu Wan, Lamma Island – Feasibility Study (the Study) was jointly commissioned by Planning Department and Civil Engineering and Development Department on 30 January 2012. The Study will examine the development potential of the Ex-Lamma Quarry site (the Study Site), and to formulate the future land use options and detailed development proposals and examine the supporting infrastructure.

A two-stage Community Engagement programme will be conducted in the Study. Stage 1 Community Engagement, launched in December 2012, aims to solicit public views towards the initial land use options of the Study. Public views collected will serve as important inputs in formulating the preferred land use option and Preliminary Outline Development Plan at the next stage of the study.

The findings and recommendations of the Study will serve as a reference for the preparation and revision of the relevant town plan to guide the future development of the Study Site, and provide the basis for further engineering investigation and detailed design works.

The Study Site has an area of approximately 34.3 hectares. It is currently covered by the approved Lamma Island Outline Zoning Plan (OZP) No. S/I-LI/9 and is zoned “Undetermined”, pending on detailed consideration of appropriate uses. The Study Area includes the Study Site, the adjacent “Comprehensive Development Area” (“CDA”) site (former cement plant), and natural slopes and shorelines, accounting for a total area of approx. 59.9 hectares.

### 1.1 Development of Initial Land Use Options

Initial land use options were formulated based on the following basic planning and design concepts:

- a) Provide future developments on the existing platforms;
- b) Preserve existing natural vegetation as far as possible;
- c) Protect visual connection to the natural backdrop of the Study Site from major vantage points;
- d) The Lakeside Park and Woodland Park will provide visual relief to the building cluster and extend the existing greenery to the waterfront;
- e) Enhance both external and internal connectivity of the Study Site;
- f) A continuous waterfront promenade creates a pleasant area for public enjoyment;
- g) Adopt stepped height profile for buildings descending towards the waterfront to be in harmony with its waterfront setting;
- h) Provide subsidised and private housing for a variety of housing on the island; and
- i) Provide supporting government, institution or community facilities to serve the future development.

As a result, Initial Options 1a, 1b and 2 were developed as detailed in the Digest ([Download](#)). Preliminary feasibility assessments were undertaken including the provision of basic infrastructures required to serve the proposed development. The following sections provide a

brief summary of the work undertaken to-date.

## **2 Preliminary Feasibility Assessments**

### **2.1 Traffic and Transport (incl. Marine Traffic)**

Ferry surveys were conducted during the peak hours on typical weekday and weekend and supplemented by the results of Monitoring Survey on Ferry Services in 2011 and 2012 undertaken by the Transport Department (TD) to ascertain current ferry passenger volumes.

The survey results revealed that the ferries did not carry passengers to the vessels capacities for the regular and kaito ferry routes to/from Lamma Island. In view of the available spare capacity for the two routes (i.e. Sok Kwu Wan – Central and Sok Kwu Wan – Aberdeen), it is broadly feasible to extend the existing licensed ferry service to serve the proposed developments at the Study Site, as a cost effective solution to serve both the residents at the Study Site and Sok Kwu Wan.

In addition, a preliminary transport strategy has been proposed for the internal circulation as well as the external connectivity of the future development at the Study Site, including pedestrian connection along the coast from the Study Site to Lo So Shing through the “Comprehensive Development Area” (“CDA”) site. If this connection is to be pursued, there will be issues to be resolved including land resumption issues of the CDA site and other areas along the route, site formation, and/ or disturbance to existing trees and shoreline in respect of the proposed coastal pathway.

With a coastline that spans 1.2 km, the proposed ferry pier for the Study Site will be centrally located to minimize the walking distance between the pier and the various parts of the Study Site. Considering the short distance between various developments and the proximity to the proposed ferry pier, walking and cycling would be the two main modes of transport within the Study Site. The footpaths and cycle tracks proposed will comply with the Transport Planning & Design Manual (TPDM) requirements. More detailed proposals will be examined during the Traffic and Transport Impact Assessment in the next stage of the Study.

### **2.2 Drainage**

It has been assessed that the proposed land use types will slightly increase the total surface runoff generated from the Study Site. The peak runoff generated from the Study Site is estimated and three outfalls are proposed to serve the future development. The future development will also require existing drainage diversion and provision of new drainage works. Detailed proposals will be examined and identified during the Drainage Impact Assessment in the next stage of the Study.

### **2.3 Sewerage**

There is no existing sewerage system within the Study Site. The Sok Kwu Wan Sewage Treatment Works (SKWSTW), located on the opposite coast to the Study Site is currently under construction. It is scheduled for completion by 2014. However, the design capacity of SKWSTW did not fully cater for the proposed development within the Study Site.

An assessment was carried out to determine the need and extent of sewerage infrastructure required to support the proposed development. Two options are considered, either to expand the SKWSTW to increase the treatment capacity or to construct an on-site sewage treatment works (STW) within the Study Site. Expansion of the SKWSTW would require laying new rising mains and pumping station, extensive slope cutting, as well as providing a

new submarine outfall. An on-site STW including associated sewerage network and submarine outfall is considered to be more cost effective. In addition, locating the STW within a cavern development has also been considered and preliminarily assessed. However, taking into account the limited land that can be released for housing or other land uses and the higher development costs along with long-term operation and maintenance costs required, a non-cavern STW is proposed for the sake of cost effectiveness.

More detailed assessments and design will be investigated as part of the Sewerage Impact Assessment to be conducted in the next stage of the Study.

## **2.4 Water Supply and Utilities**

### Water Supply

A broad assessment has been conducted to examine the capacity of the existing water supply network, and projected water demands at Lamma Island, based on the population and employment data from the Planning Department's 2009-based Territorial Population and Employment Data Matrices (TPEDM). It was found that if some upgrading works were to be carried out, the existing water supply system is capable to serve an additional population of about 5,000. Further increase in water demands would require the provision of a new fresh water system (a new submarine water pipe and associated facilities).

### Utilities

The provision of utilities to the Study Site is being discussed with various agents including Hong Kong Electric Co. Ltd. for electricity supply, Hong Kong China Gas Company Ltd. for gas supply, and PCCW Limited for telecommunication. The initial feedbacks from these utilities providers are positive and feasible. Detailed assessments and infrastructure proposals will be investigated in light of the proposed population during the preparation of the Utilities Impact Assessment for the next stage of the Study.

## **2.5 Geotechnical**

The preliminary feasibility assessments of the initial land use options in terms of geotechnical aspects include Site Formation, Slopes and Natural Terrain Hazard Mitigation requirements.

### Site Formation

It is preferable to keep the proposed site formation levels close to the existing levels as far as possible in order to minimize the volume of cut and fill materials. This would reduce the environmental impacts of site formation works and minimize disturbance to the existing vegetation. However, the existing ground level is found to be low in some areas that are difficult to drain and are prone to flooding. The minimum level for site formation is dependent on the future land use of the site and will be examined in details in the next stage of the Study.

### Slopes

The proposed site layout is designed to minimize the extent of modification of the existing slopes. However, there will be some excavation on existing slopes in order to form the platforms for the main development, access roads and the hillside resort hotel. Slope improvement works may include slope regrading, construction of minor retaining structures and installation of soil/rock slope stabilization measures. Specific requirements and the condition of existing man-made slopes will be reviewed in further detail as part of the Geotechnical Assessment in the next stage of the Study.

## Natural Terrain Hazards

Steep natural terrain with evidence of erosion, rock outcrop and boulders has been observed adjacent to the site. These slopes have potential for landslides, boulder and rock falls which pose a risk to the development. It is anticipated that mitigation works will be required. The design of mitigation measures is subject to the findings of the Natural Terrain Hazard Assessment which will be undertaken in the next stage of the Study.

## **2.6 Marine-related Facilities**

Existing marine-related facilities of the Study Site include the sloping rock armour seawall, natural rocky coastline and a concrete pier at the southern end of the site. The proposed marine works may include modifications to the existing seawall and coastline, construction of a new ferry pier and seawall landing, construction of a refuse transfer station and a marina in front of part of the Study Site. These proposals have been broadly assessed in light of the various technical constraints and standards and are preliminarily found to be feasible. Nevertheless, more detailed assessments and designs upon the proposed features will be carried out in the next stage of the Study, subject to the outcome of the preferred land use option.

## **2.7 Environment**

Developments proposed under the Study (the Project) falls into the category of a Designated Project under Item 1 of Schedule 3 of the Environmental Impact Assessment Ordinance (EIAO), i.e. “Engineering feasibility study of urban development projects with a study area covering more than 20ha or involving a total population of more than 100,000”.

This Project also includes individual proposals that fall under Schedule 2 of the EIAO including Items C.12(a) – Dredging operation which is less than 500m from the nearest boundary of an existing fish culture zone and I.1(b) – A drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300m from the nearest boundary of an existing fish culture zone. An Environmental Impact Assessment will be carried out under the EIA Study Brief No. ESB-232/2011.

In the preliminary assessment, the following environmental issues were examined and the environmental impacts of the Project will be assessed and minimized with appropriate mitigation measures to meet the requirements of the statutory EIAO procedures. These issues will be addressed in details in the EIA in the next stage of the Study:

- a) Air Quality
- b) Water Quality
- c) Ecology and Fisheries
- d) Noise
- e) Waste
- f) Land Contamination
- g) Cultural Heritage
- h) Health Impact due to Potential Radon

### Air Quality

“Zero emission” vehicles are proposed for use inside the Study Site to minimize air quality impacts from vehicular emissions. Marine vessels would contribute to an increase in emission of SO<sub>2</sub>, NO<sub>2</sub>, RSP and FSP. Near-field air quality impact from the adjacent cement plant is also anticipated, as well as odour issues due to the development of the STW for the Study Site. These issues can be addressed through design and mitigation measures and cumulative air quality impact from the development will be addressed in the Environmental Impact Assessment (EIA) in the next stage of the Study.

### Water Quality

During the construction phase, site surface runoff, sewage from workforce and accidental spillage of chemical may arise from the construction activities. Dredging for the submarine outfall may be required, which would disturb seabed sediments. These issues can be ameliorated by mitigation measures through construction methods that will be addressed in the Environmental Impact Assessment (EIA) in the next stage of the Study.

During the operational phase, sewage discharge associated with the new development will require adequate sewage treatment before discharging into nearby water bodies. Effluent from submarine outfall may have impacts on marine water quality. Potential water quality impacts from residential and tourism developments will depend on sewage treatment level and disposal strategy. To reduce the impacts, the proposed submarine outfall should be outside the Sok Kwu Wan bay. The impacts on marine water quality and inland water quality from effluent of sewage discharge, the proposed residential and tourism developments as well as future recreational activities will be further assessed and mitigation measures will be proposed, if necessary, in the detailed EIA study to meet the water quality/discharge standards/ requirements.

### Ecology and Fisheries

Ecological surveys have been conducted. Based on the baseline review and ecological survey, no habitats of high ecological value have been recorded within the Project Site. Egrets, herons and black kites have been recorded loafing and foraging along the coastal edge. Potential loss of loafing and foraging areas along coast areas and disturbance to breeding birds during the operational phase will be assessed.

A small island area is located at the south-western part of the 5ha man-made lake in the Study Site. This island appears to be in occasional use by low numbers of ardeids as a day-time roost. No works are being proposed at this location to minimize the possible ecological impacts. Consideration may need to be given to adopt appropriate mitigation measures such as phasing the construction to minimize possible disturbance to egrets, herons and kites during the design and construction phases. Avoidance of nesting sites where possible would also be the priority as mitigation.

Just outside of the Project Site, along the access path that leads to the former cement plant, small streams running from seepages in the rock face provides habitats for Romer's Tree Frogs *Liuxalus romeri* (calling adults and tadpoles) which have been recorded from this area. This species is endemic to Hong Kong and is considered to be Endangered by IUCN. Whilst no direct habitat loss is predicted as a result of the Project, consideration should be given to minimize disturbance to habitat from an increased human population in the operational phase.

There are occasional records of Green Turtles *Chelonia mydas* entering Sok Kwu Wan. This species has not been recorded breeding at Sok Kwu Wan. Breeding records are only from Sham Wan and Shek Pai Wan of Tung O on Lamma Island well outside of the Study Area .

In terms of ecological impacts due to water quality, they would be from increased non-point source pollution such as the proposed public pier and increased marine traffic, and increased point source pollution from the proposed submarine outfall, and increased disturbance impacts on fishing activities from marine traffic (construction and operation phases). Possible mitigation measures to minimize induced water quality impacts include good site practices to control construction site runoff and wastewater from construction activities, avoidance/control of marine traffic close to the Fish Culture Zones through careful design of marine traffic routes, control of capacities/operation of proposed piers, and locating the submarine outfall outside the bay.

Additional sources of fisheries impacts may be from the proposed marina and water activities within the inland lake. These impacts could be assessed and mitigated through restriction on boating activities and recreational uses. Mitigation of any ecological impacts of the project will be required. The environmental acceptability of the options will be subject to findings and assessments of the ecological surveys under the EIA.

### Noise

Potential noise impacts on the noise sensitive receivers nearby and within the Study Site, such as noise from road traffic, if any, or from the public pier and marine traffic will be assessed. With suitable mitigation measures and planning, these noise impacts could be minimized.

### Waste

During the operational phase of the STW, grit from inlet screening works and dewatered sludge is expected. Sludge could be delivered by a purpose-built sealed container to minimize the odour impact. The handling of the dewatered sludge will be further studied in the EIA study while any grit will be disposed of at a landfill.

### Land Contamination

If any land contamination is found within the Study Site, it will be remediated prior to the construction phase and will not be a major issue during the construction and operational phases.

### Cultural Heritage

The proposed sewage treatment and water supply networks as well as the coastal walk connection may have direct impacts on the built heritage within the Study Area, while there may be indirect impacts on built heritage due to the increased population and visitation. No specific sites have been documented in literature for marine archaeology and potential impacts are subject to the findings of the marine geophysics survey. Detailed assessments will be conducted during the EIA study.

### Health Impact due to Potential Radon

Development at the Study Site may have potential health risks associated with the accumulation of indoor radon concentrations arising from the ex-quarry. Improved ventilation design and providing airtight seals around service pipes and entries in the basement or ground level should be considered to reduce the potential for elevated indoor radon concentrations.

Overall, with appropriate mitigation measures, the environmental impacts could be mitigated to meet the statutory EIAO requirements.

## **2.8 Sustainability**

Sustainability implications of the Initial Land Use Options were evaluated using the Computer-Aided Sustainability Evaluation Tool (CASET) as a framework. This process seeks to identify and assess at the planning stage the implications of the Project in various economic, social and environmental aspects. It also provides the overall implication of the Project to the local community as well as to Hong Kong as a whole.

The Sustainable Development System (SDS) is the approach taken for the Sustainability Assessment (SA). In terms of the environment, carbon emissions, energy consumption and waste would increase due to a rise in on-site population. However, adverse impacts are minimal to Hong Kong as a whole as the development is a comparatively small-scale project. Avoidance and mitigation measures would be explored in later stages of the Project to ensure any adverse impacts on the local environment are minimized. In relation to the economy, the project impacts are all beneficial as the development would generate investment and job opportunities. As for social implications, due to the provision of more open space, both initial land use options are expected to bring about an improvement in recreational and social activities and facilities. On the other hand, the provision of quality open space and enhancement works of the site may raise private rent, creating burden on the local rural lifestyle. Comparatively speaking, Option 1 shows less adverse environmental impacts as residential buildings consume less energy and water and generate less sewage than hotels. Option 1 also provides more open space for the public, but Option 2 brings more economic benefits due to its increased emphasis on tourism and commercial activities.

## **3 Way Forward**

The broad assessments undertaken have established that the proposed Initial Land Use Options are feasible in broad terms. More detailed technical assessments will be followed in accordance with the requirements under the Study Brief as well as the statutory EIA requirements based on the preferred option in the next stage of the Study.