# Environmental Impact Assessment Ordinance (CAP 499) S.5(1)(b)

Operation of Shenzhen Section of Shenzhen Bay Bridge

Project Profile

August 2007

Major Works Project Management Office Highways Department

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# **CONTENT**

		<b>PAGE</b>
1. BASIC IN	FORMATION	1
1.1 Project Title		1
1.2 Purpose and Nature of the Project		2
1.3 Name of Project Proponent		2
1.4 Location and Scale of Project		2
1.5 Number and Types of Designated Projects to be covered by the Project Profile		2
1.6 Contact P	Person	3
2. OUTLINI	E OF PLANNING AND IMPLEMENTATION PROGRAMME	3
2.1 Project Planning and Implementation		3
2.2 Project Timetable		3
2.3 Interfacin	g with Other Projects	3
3. POSSIBL	E IMPACT ON THE ENVIRONMENT	4
3.1 Project Process		4
3.2 Operation	nal Environmental Impact	4
4. MAJOR I	ELEMENTS OF THE SURROUNDING ENVIRONMENT	8
5. ENVIRO	NMENTAL MITIGATION MEASURES	8
6. USE OF P	PREVIOUSLY APPROVED EIA REPORTS	11
Appendix 1	Location and General View of Shenzhen Section of Shenzhen Bay Bridge	
Appendix 2	General Layout of the Shenzhen Section of Shenzhen Bay Bridge and HKPA boundary	
Appendix 3	Typical Cross Section of the Shenzhen Section of Shenzhen Bay Bridge	

# 1. Basic Information

# 1.1 Project Title

Operation of Shenzhen Section of Shenzhen Bay Bridge (SSBB)

# 1.2 Purpose and Nature of the Project

The Shenzhen Bay Bridge (SBB) (previously known as Hong Kong-Shenzhen Western Corridor) project is a dual-3 lane elevated highway across Deep Bay that links up Hong Kong with Shekou, Shenzhen. The total length of the SBB is approximately 5.5 km with 3.5 km in Hong Kong and 2 km in Shenzhen.

The environmental impacts of the Hong Kong section of the SBB have been assessed under Agreement No. CE 39/2001 (Shenzhen Western Corridor Investigation and Planning EIA Report No. EIA-082/2002) (SBB EIA Report) and was approved by the Director of Environmental Protection (DEP) on 4 November 2002, (letter ref. () in EP2/G/A/119Pt II) under the EIA Ordinance (EIAO). The associated Environmental Permit (EP) (No. EP-162/2003) for the construction and operation of the Hong Kong section of SBB was issued by DEP on 2 April 2003.

SSBB was constructed by the Shenzhen side under the Mainland regulatory regime, which included an environmental assessment. The Co-operation Agreement for the Operation and Maintenance of the SSBB signed between the Hong Kong and Shenzhen governments agreed that Hong Kong would maintain and operate the SSBB.

The Shenzhen Bay Port Hong Kong Port Area Ordinance (Cap. 591) enacted in April 2007 extends the Hong Kong Port Area (HKPA) to cover, amongst others, the SSBB. Under this Ordinance, all laws of Hong Kong became applicable to the HKPA including the SSBB on the date of its opening on 1 July 2007. The operation of the SSBB thus requires an EP issued under the EIAO. The statutory process to apply the requisite EP under the EIAO could not be duly exercised before the laws of Hong Kong became applicable to the SSBB.

At present, the SSBB is temporarily exempted from the EP requirement in respect of operation by an Order from the Chief Executive in Council pursuant to Section 30 of the EIAO for a period of 12 months, or till the issue of an EP by the DEP under the EIAO whichever is the earlier. To ensure that the environment would not be adversely affected during the exempted period, the Order requires the operator of the SSBB, i.e. the Director of Highways to implement in the SSBB, where applicable, the same environmental mitigation and monitoring measures set out in the EP for the operation of the Hong Kong section.

# 1.3 Name of Project Proponent

Highways Department

# 1.4 Location and Scale of Project

The location and general view of the SSBB is shown in <u>Appendix 1</u>. The northern end of the SSBB is connected to the landing point located at Dongjiaotou in Shenzhen. The southern end of the SSBB is connected with the Hong Kong section of the SBB. The overall length of the SSBB is about 2 km. The general layout of the SSBB and the HKPA boundary as extracted from the Shenzhen Bay Port Hong Kong Port Area Ordinance (Cap 591) is shown in <u>Appendix 2</u> and the typical cross section of the SSBB within the boundary of the HKPA is shown in <u>Appendix 3</u>. As shown in the drawings, the laws of Hong Kong including relevant environmental legislation will be applicable to the envelope encompassing the bridge deck up to the top of the bridge tower of the SSBB.

# 1.5 Number and Types of Designated Projects to be covered by the Project Profile

This Project Profile covers the SSBB within the boundary of the HKPA as defined under Shenzhen Bay Port Hong Kong Port Area Ordinance (Cap 591). The project is classified as a designated project under Categories A.1 and A.8 in Schedule 2 of the EIAO.

#### 1.6 Contact Person

Chief Engineer/Major Works 1-1
Major Works Project Management Office,
Highways Department,
6/F., Homantin Government Offices,
88 Chung Hau Street,
Homantin, Kowloon,
Hong Kong.

# 2 Outline of Planning and Implementation Programme

# 2.1 Project Planning and Implementation

The planning and construction of the SSBB was under the management of the Shenzhen Western Corridor Project Office which was appointed by the Shenzhen Municipal People's Government. The SSBB is operated by Highways Department of Hong Kong SAR Government since its opening on 1 July 2007.

# 2.2 Project Timetable

The construction works for the SSBB commenced in December 2003 and was completed in March 2007. The SBB was opened for public use on 1 July 2007.

#### 2.3 Interfacing with Other Projects

The SSBB lies within Mainland boundary and is connected with the Hong Kong section of the SBB at the southern end. At the northern end, the Project is connected to the Hong Kong Port Area (HKPA) located at Dongjiaotou. The reclamation works for the construction of the HKPA and the northern landing of the bridge began in early 2002 and was completed in January 2006. The construction of the Hong Kong section of the SBB commenced in August 2003 and was substantially completed in December 2005. The Project has interaction with the boundary crossing facilities located on the north and the Hong Kong section of the SBB on the south.

# 3 Possible Impact on the Environment

# 3.1 Project Process

As mentioned in Section 1.2 above, the SSBB was constructed by the Shenzhen Municipal People's Government under their regime with EIA carried out to protect the sensitive receivers located within Mainland boundary. The related EIA Reports prepared by Mainland had been reviewed under the Appendices 3A and 3B of the SBB EIA Report conducted by the Hong Kong side and the cumulative impacts have been assessed in the relevant chapters for air, noise, hydrodynamics, water quality, waste, landscape and visual, ecological, fishery and hazards. The SBB EIA Report is held in the register kept by Environmental Protection Department (EPD) and the information and findings of the Report in the register are still valid and relevant. The following sections discuss the various environmental impacts of the SSBB.

# 3.2 Operational Environmental Impact

# Hydrodynamic Impact

Similar to the Hong Kong section of the SBB, the presence of bridge piers may potentially affect the water flow of Deep Bay leading to increased sedimentation. However, the design of the bridge has minimized the reduction in flushing capacity and the effects on water quality as indicated in para. 7.7.120 of the SBB EIA Report. According to para. 7.7.122 of the SBB EIA Report, the predicted reductions in accumulated flux is -3.31% and salinity flux is -3.49% due to the presence of the whole bridge. The changes in sedimentation rates in Deep Bay were predicated to be insignificant as indicated in para 7.8.36 - 7.8.37 of the SBB EIA Report. This has in fact been verified by the Final Sedimentation Rate Monitoring Report submitted in August 2007 to the EIA Subcommittee of the Advisory Council on the Environment in accordance with Section 4.7 of the EP No. EP-162/2003. The results show that the changes in seabed level were found to be less than those predicted in the SBB EIA Report. The observed values at the indicator points were up to about 28 mm / yr lower than the predicted values.

# Water Quality Impact

Major sources of impact are:

- road runoff from the bridge;
- local discharges; and
- changes in sedimentation and erosion patterns in Deep Bay.

Water quality modeling undertaken in the SBB EIA study also indicated that the variations in water quality conditions between the baseline scenario, i.e. without SBB (scenario 1) and with the SBB in place scenario (scenario 3) at most of the indicator points in the dry and wet seasons were generally very small as shown in para. 7.7.150 of the SBB EIA Report. The average changes in water quality parameters, viz Total Inorganic Nitrogen (TIN), Suspended Solids (SS), Unionized Ammonia (UIA), E. coli, Dissolved Oxygen (DO), and 5 days Biochemical Oxygen Demand (BOD<sub>5)</sub> within the inner region of Deep Bay were about 2.49, 2.33, 1.82, 1.25, -0.41, and 1.38% respectively. The small changes in water quality parameters are considered to have insignificant effect on water quality (See Table 7.36 of SBB EIA Report).

#### **Noise and Air Impact**

Vehicle emissions and road traffic noise will be the main sources of impact. The cumulative air quality impacts have been adequately assessed in the SBB EIA Report Table 5.17 whereas the cumulative traffic noise impacts have been adequately assessed in Table 6.9. It was concluded in para. 5.11.3 and 6.11.4 of the SBB EIA Report that impacts were insignificant. As the SSBB is farther away from Hong Kong and there no sensitive receivers in the vicinity, it can be concluded that there will be no significant impact arising from the operation of the SSBB.

#### **Waste Impact**

As the SSBB is a highway for use by road traffic only, waste impact arising from the operation stage of the project will be minimal.

# Landscape and Visual Impact

Potential sources of visual impact during operation stage include elevated road, piers, columns, the cable-stayed bridge and the night lighting (e.g. street lights and architectural lighting). It is considered that the effect of the impact will be less intrusive than the Hong Kong section of the SBB in view of its location which is farther away from the visual sensitive receivers within Hong Kong boundary as shown in Figure 13.15b of the SBB EIA Report.

# **Ecological Impact**

There may be concern that noise and disturbance during operation stage may affect wildlife distribution and activity near shore of Ngau Hom Shek since the coastal areas of Deep Bay at Ngau Hom Shek has a diverse and complex eco system, which include mud flats, some marine habitats such as horseshoe crabs, water birds and mangroves. According to para. 9.7.70 of the SBB EIA Report, wildlife could be accustomed to regular sources of noise; hence traffic noise from the operation stage of the SBB would not be expected to adversely affect wildlife. The study also concluded that no noise barriers would be required.

Other source of impact on the marine ecology include road runoff posed on the nearby habitats. However, as noted above, the hydrodynamic and water exchange capacity of Deep Bay during operation stage would be very similar to the pre-bridge condition and therefore no significant impact to marine ecology is expected. With proper control of carriageway cleaning and water monitoring, it is anticipated that the effect of road runoff would be minimal.

There might be permanent loss of seabed due to the presence of dolphins (a ship protection device) and bridge piers. However, this is considered insignificant as shown in para. 9.7.55 - 9.7.56 of the SBB EIA Report. The loss represents less than 0.001 % of the Deep Bay Area.

Para. 9.7.63 of the SBB EIA Report has concluded that the presence of

the bridge has no barrier effect to birds in Deep Bay.

Based on experiences from other countries and extensive literature review and researches carried out during the Investigation and Planning stage for the SBB project, the SBB EIA Report also concluded that there is no direct evidence of effect of light or presence of cable-stayed bridge structures on migrating birds. However, in view of lack of local records involving bird collision with cable-stayed bridge, it was recommended that monitoring for bird mortality due to collision with the SBB will be recorded and monitored to provide reference for operating the bridge lighting scheme (See para. 9.7.74 – 9.7.76 of SBB EIA Report). This monitoring work will cover the SSBB.

Table 9.7.4 in the SBB EIA Report gives a brief account of the potential cumulative effects with other projects during the operation stage of SBB. As evident, this covers the operation of the SSBB.

# **Fishery Impact**

According to para. 10.5.31 of the SBB EIA Report, the impact is considered minor.

#### Hazards

There are no potentially hazardous installations, nor dangerous goods storage incorporated in the design for the operation of the SBB and therefore no hazards are foreseen. The operation of SBB also does not involve use or storage of explosives and therefore no potential hazards were identified as shown in para. 11.3 of the SBB EIA Report. However, an Emergency Response Plan for Chemical Spillage, which has been verified by an Independent Environmental Checker, has been prepared and submitted to EIA Subcommittee of the Advisory Council of Environment in accordance with Section 5.1 of the EP No. EP-162/2003. Measures incorporated in the design to minimize the impact include provision of gully sumps along the bridge to avoid direct discharge of chemicals into Deep Bay.

# **Cultural Heritage Impact**

According to the SBB EIA study, there are no items of cultural heritage value that will be directly or indirectly affected.

# 4. Major Elements of the Surrounding Environment

On the north, the SSBB is connected to the boundary crossing facilities which include passenger processing area, public transport interchange, vehicle holding area and cargo processing areas built on reclaimed land. The areas to the east and west of the reclaimed land are mostly industrial type developments including ports and industrial buildings. There are no existing sensitive receivers in the vicinity of the bridge alignment. On the southern end, it connects with the Hong Kong section of the SBB. There is no mudflat in the immediate vicinity of SSBB.

# 5. Environmental Mitigation Measures

Environmental Mitigation Measures as outlined below have been enforced since the opening of the SSBB to public on 1 July 2007:

#### **Hydrodynamic and Water Quality**

- Similar to the Hong Kong section, the SSBB carriageway will be cleaned twice a week by means of vacuum air sweeper (s) or suction truck (s) to remove grit and pollutants. The interval between 2 cleaning operations shall not exceed 4 days.
- The removed grits and pollutants shall be transported away for off-site disposal.
- Gullies have been installed along the bridge and rain-water runoff will be monitored and audited to check whether the cleansing frequency of the carriageway of the SSBB should be reviewed.
- An Emergency Response Plan for Chemical Spillage as required in Section 5.1 of the EP will be enforced.

# <u>Air</u>

No mitigation measures have been proposed on SSBB as no direct impact nor air sensitive receivers have been identified according to the SBB EIA Report.

# **Noise**

No mitigation measures have been proposed on SSBB as no direct impact nor noise sensitive receivers in the vicinity have been identified.

#### Waste

No mitigation is required as no impact is identified.

# Landscape and Visual

To minimize the effect, mitigation measures have been adopted in the design. These include:

- Lighting has been designed such that it will cause minimum glare to the nearby receivers.
- A controlled lighting schedule for the architectural lighting has been incorporated into the operation and maintenance manual. In general, the architectural lighting will only be turned on between 19:30 – 22:00.
- Choices of colour scheme for the bridge, lighting fittings and other street furniture have been carefully chosen to ensure they blend with the surrounding. ACABAS approval has also been sought in November 2004 in relation to the overall appearance of the elevated structure including the lighting effect.

#### **Ecology**

No significant impact would be expected during the operation stage. The following mitigation measures have been implemented:

- An Emergency Response Plan for Chemical Spillage as required in Section 5.1 of the EP No. EP-162/2003 will be enforced to tackle chemical spillage incidents.
- A controlled lighting schedule for the tower and cable lighting has been recommended. In addition, monitoring of bridge lighting scheme and bird collision monitoring will be undertaken as part of the environmental management and auditing process for 3 years

during the operation stage to provide reference for operating the bridge lighting scheme in the future.

# **Fishery**

Permanent impact on fishery is considered insignificant and no mitigation is required.

# Hazard

No mitigation is required as no impact is identified. However, an Emergency Response Plan for Chemical Spillage as required in Section 5.1 of the EP No. EP-162/2003 will be enforced to tackle any hazards arising from chemical spillage incidents.

# **Cultural Heritage Impact**

No mitigation is required as no impact is identified.

As discussed above, environmental impacts arising from the operation of the SBB have been fully addressed during the planning stage. It is envisaged that the impacts arising from the operation of the SSBB will have even less effect on the sensitive receivers within Hong Kong SAR boundary compared with that caused by the Hong Kong section of the SBB.

The overall cumulative impacts of the SSBB have also been taken into account in the environmental assessment of the entire SBB as recorded in the SBB EIA Report.

#### **Environmental Monitoring & Auditing**

An Environmental Monitoring & Auditing (EM&A) programme and manual have been developed for the Hong Kong section of the SBB for the operation stage. In view of the same nature of the works involved, it is considered that the relevant requirements as stipulated in the EP No. EP-162/2003 for the operation of the Hong Kong section of the SBB and the EM&A Manual (September 2002) as referred to in the EP will also

be applicable to the SSBB. These include monitoring of surface runoff from the carriageway and monitoring of bridge lighting scheme and bird mortality due to collision with bridge structure.

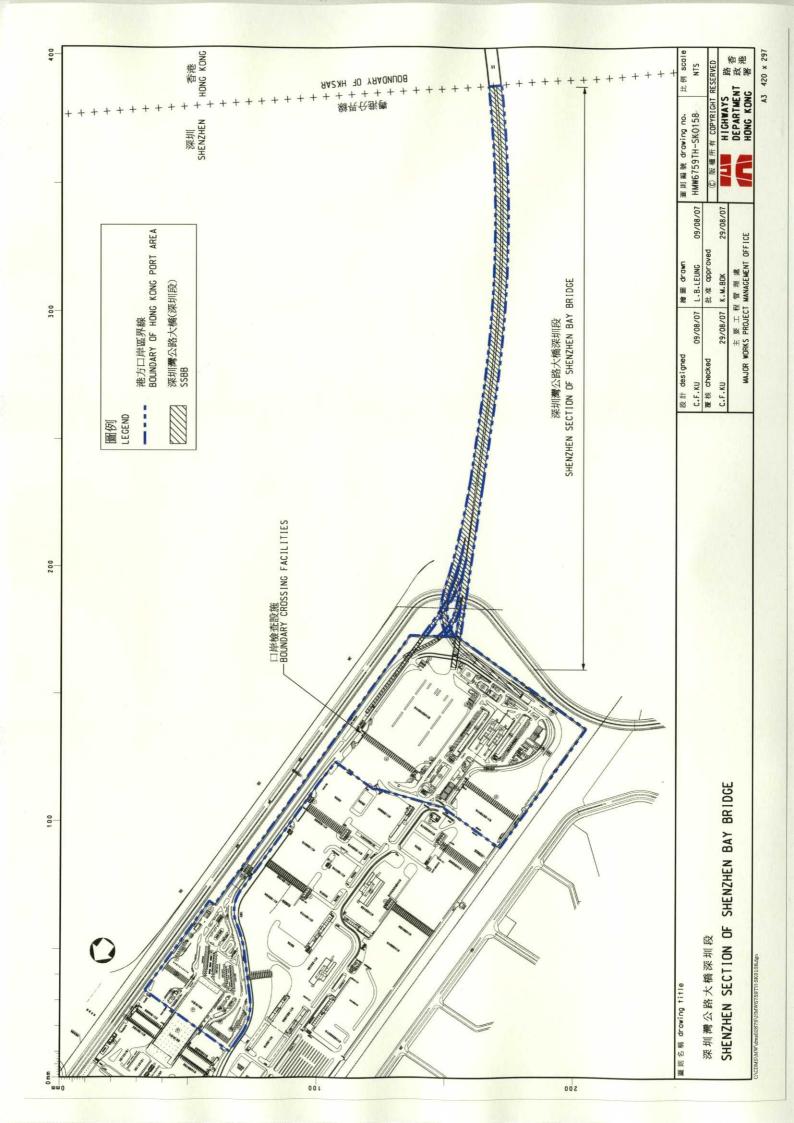
In the discharge of the above obligations, the project proponent shall adopt the requirements and procedures provided for in the above EM&A Manual. This includes employment of an environmental team to implement the necessary environmental monitoring and auditing programme and an Independent Environmental Checker to audit the result of the discharge of the these obligations, to validate and verify the accuracy of the monitoring results and report, and inspect the SSBB to detect any irregularity in the discharge of the obligations by the project proponent.

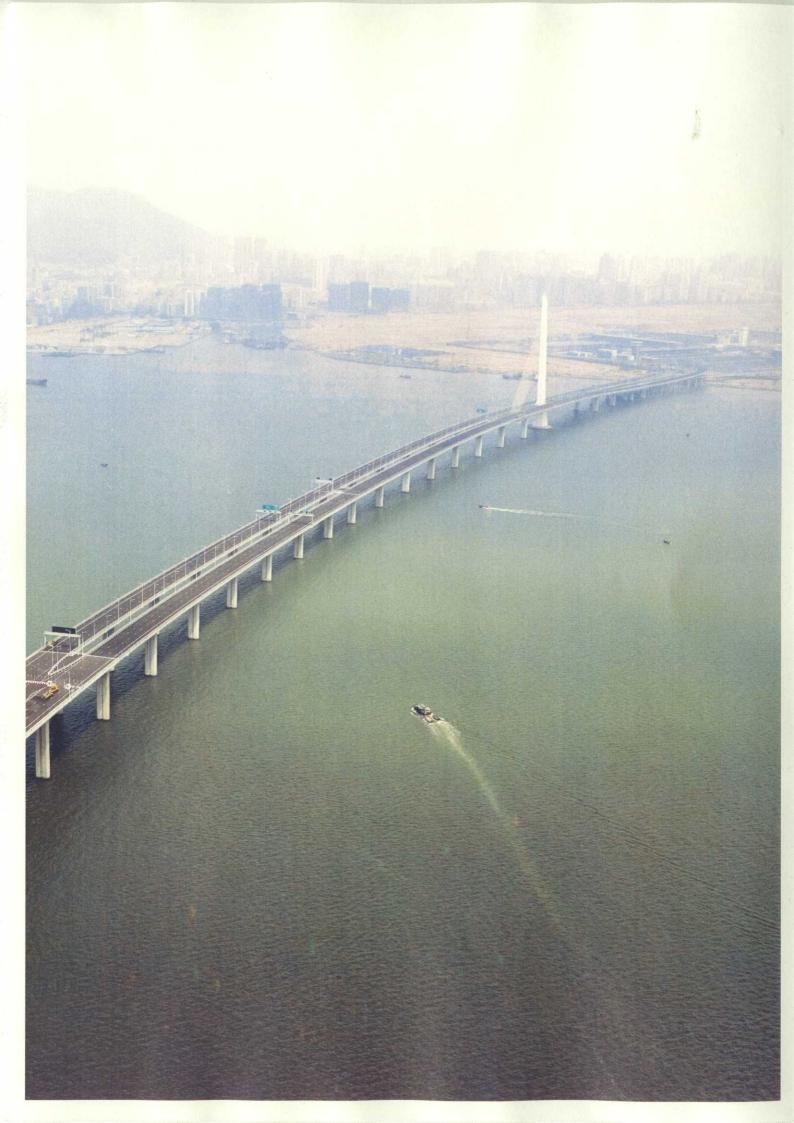
The above Environmental Monitoring and Auditing works including monitoring bridge surface run-off, bird mortality due to collision with the bridge structure have continued for the SSBB since the opening of the bridge on 1 July 2007.

#### 6. Use of Previously Approved EIA Reports

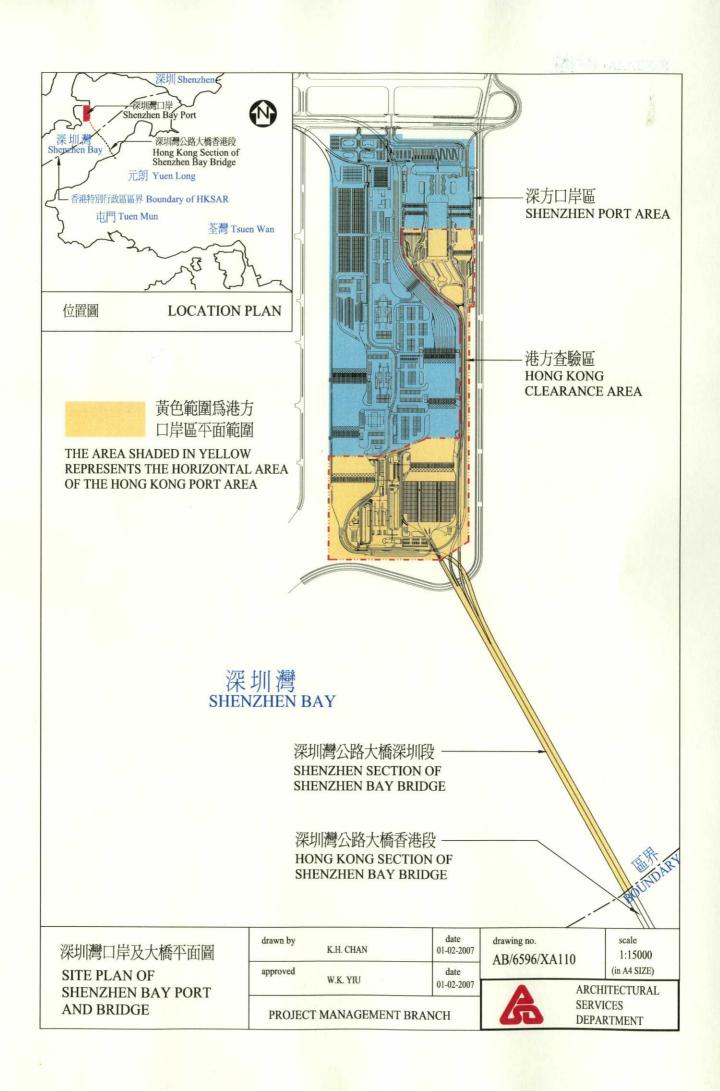
The Highways Department – Agreement No. CE 39/2001 Shenzhen Western Corridor – Investigation and Planning Environmental Impact Assessment Report September 2002 (SBB EIA Report No. EIA-082/2002) has been made reference to in preparing this Project Profile. This SBB EIA Report has addressed air quality, noise, hydrodynamics, water quality and sediment quality, waste management, ecology, fisheries, hazard to life, cultural heritage, landscape and visual impacts for the operation stage of the entire SBB. The SBB EIA Report was approved with conditions on 4 November 2002 and is held in the EPD of HKSAR registry. As stated in the SBB EIA Report, the environmental impacts of the SSBB have been reviewed and the cumulative impacts have been assessed.

Appendix 1





Appendix 2



Appendix 3

