

**For Discussion
On 17 April 2009**

**Islands District Council
Paper IDC 47/2009**

**Hong Kong-Zhuhai-Macao Bridge -
Hong Kong Link Road & Hong Kong Boundary Crossing Facilities
and
Tuen Mun-Chek Lap Kok Link**

PURPOSE

The purpose of this paper is to present the latest development of the following infrastructure projects and the options recommended:

- Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities (HKBCF) and Hong Kong Link Road (HKLR)¹; and
- Tuen Mun-Chek Lap Kok Link (TM-CLKL).

BACKGROUND

2. The HZMB and the TM-CLKL are amongst the ten major infrastructure projects announced by the Chief Executive in the Policy Address in October 2007. The HZMB will be of strategic importance to the future economic development of Hong Kong, Macao and the Western the Pearl River Delta (PRD). The TM-CLKL together with the Tuen Mun Western Bypass (TMWB) will provide direct connections between Shenzhen Bay Port, Northwest New Territories (NWNT) and the Hong Kong International Airport (HKIA). The local logistics industry will be benefited from the direct connection, which will also facilitate the connection with the NWNT, HKIA and Tung Chung, thereby alleviating the busy traffic along the North Lantau Highway (NLH) in the future.

3. The Governments of Guangdong, Hong Kong Special Administrative Region (HKSAR) and Macau Special Administrative Region, have agreed to adopt the mode of “separate locations of Boundary Crossing Facilities (BCF)” for the HZMB. Therefore, Hong Kong needs to set up its own BCF. Preliminary investigation shows revealed that 130 hectares of land (excluding the 20 hectares for the landfall of the TM-CLKL Link) will be needed for the HKBCF.

¹ The Hong Kong Link Road (HKLR) is the section between Hong Kong-Zhuhai-Macao Bridge (HZMB) Main Bridge at the HKSAR boundary and the Hong Kong Boundary Crossing Facilities (HKBCF).

4. On 19 September 2007, Highways Department (HyD) presented the result of the site selection study for the HKBCF to the Islands District Council (IDC) via IDC Paper 84/2007). Thereafter, HyD proceeded with further investigation on the various options, taking into consideration views from IDC members and residents, while at the same time proceeding with various topical studies and financing arrangements for the HZMB Main Bridge. In June 2008, the Finance Committee of the Legislative Council approved the funding applications of \$86.9 million for the preliminary design and site investigation of the HKBCF, and \$46.6 million for the preconstruction works for the HZMB. The preliminary design of the HZMB Main Bridge also started in March 2009.

5. A series of public consultation events have been conducted since September 2008 in which we have consulted different groups and residents of Lantau, and collected their views on the overall layout of the HKBCF, HKLR and TM-CLKL, including the HKBCF site selection and the alignments of the HKLR and TM-CLKL.

Site Selection for the HKBCF

6. Regarding the HKBCF, discussions mainly focused on the following site options (see [Figure 1](#)):

- (a) Option WCLK (West of the HKIA);
- (b) Option SSW (near San Shek Wan); and
- (c) Option NECKL (Northeast of the HKIA).

7. Analysis on the aforementioned options is presented in the following sections.

HKBCF site selection

Option WCLK

8. Option WCLK (See [Figure 2](#)) – This option involves reclamation at the west of the Airport Island for the HKBCF. The exact location of this option may vary between the HKSAR boundary and the Airport Island. We consider this option is not feasible mainly because of the following:

- (a) Main water flow of PRD Region – The HZMB is locating at the major water flow path of the PRD. As such, extreme

caution must be exercised when designing for the HZMB so as not to impede the flow and flood discharge capacity of PRD and upstream, jeopardizing the discharge capacity of the Pearl River Estuary. Assessments were carried out during the HZMB feasibility study² and the Ministry of Water Resources and other related experts unanimously agreed that the blockage ratio of the HZMB should be controlled within 10% in order to alleviate the impacts on the flood discharging function of the Pearl River Estuary to an acceptable level. If the HKBCF is located at the water west of the Airport Island, the flow blockage area will be increased, affecting the water flow and flood discharge ability at the upstream of the Pearl River Estuary.

- (b) Conservation of Marine Ecology – The waters in the western side of the Airport has long been recognized as an active area and nursing ground of Chinese White Dolphins. Dolphins are densely populated at Sha Chau/ Lung Kwu Chau and at the west of Lantau Island, is an important dolphin movement corridor in-between the two locations. An artificial island constructed in the way of this movement corridor will seriously affect the marine ecology.
- (c) This option and the SSW option will preclude the opportunity of combining reclamation of the TM-CLKL with the HKBCF. This option will require reclamation not only on the western side, but also on the eastern side to provide a landfall for the TM-CLKL, which is not conducive to sustainability development objectives that reclamation should be minimized.
- (d) In comparison with option NECLK, this option will cause a 2km detouring, resulting in an additional social cost (including time and fuel consumption) and traffic emission (NO_x emission increased by 60 tonnes per annum).
- (e) Nevertheless, if the BCF artificial island is located near the HKSAR boundary, the navigation channel thereat will have to

² The HZMB feasibility study was commissioned jointly by the Governments of : Guangdong, HKSAR and Macao SAR to investigate the feasibility of the Hong Kong-Zhuhai-Macao Bridge project.
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be distorted so as to bypass the artificial island. That may have impact to the marine navigation safety.

Option SSW

9. Option SSW (See **Figure 3**) – HKBCF is constructed in the form of partial reclamation and partial cutting of slope at San Shek Wan. This option is not feasible mainly due to the following reasons:

- (a) The BCF will be extremely close to the nearby villages, with the shortest distance being 20m. It is envisaged that it would result in non-compliance with air-quality and noise requirement as stipulated under the Environmental Impact Assessment Ordinance (EIAO).
- (b) Option SSW involves large scale of hillside cutting (about 15 million cubic meters), as well as substantial excavation to natural woodland (about 35 hectares), over about 20,000 trees and 2 kilometers of natural shoreline, resulting in significant damage to the natural environment in San Shek Wan.
- (c) This option will involve reclamation not only at San Shek Wan for the BCF, but also on the eastern side of the Airport Island to serve as the landfall for the TM-CLKL, which is not conducive to sustainability development objectives that reclamation should be minimized.

Option NECLK

10. Option NECLK: (see **Figure 4**) – HKBCF is located at the northeast waters off the Airport Island, 2km away from the Tung Chung New Town. We acknowledge the concerns shown by some Tung Chung residents over the environmental, visual and security aspects of this option. After a thorough study, we present the below supplements:

- (a) Environmental impact – Environmental Impact Assessment (EIA) in accordance with the EIAO has been substantially completed. The latest assessments, taking account into the cumulative impact arising from the HKBCF, HKLR, TM-CLKL and other major sources, showed that option NECLK will meet the requirements under the EIAO,

including the criteria on air-quality and noise-levels.

The finalised EIA study report will be submitted to the Director of Environmental Protection for statutory procedures under the EIAO in June 2009, and will be ready for public inspection upon the agreement of the Director of Environmental Protection.

- (b) Visual impact – With the BCF locating 2km away from Tung Chung (equivalent to the distance between Central and Jordan), and that the buildings on the BCF are generally low-rise ones (Passenger Clearance Building being the largest building at HKBCF, has similar height as the existing airport terminal buildings), visual impact on views from Tung Chung should be minimal. In response to public views, we have altered the scheme of a section of viaduct of the HKLR near Tung Chung to a combination of tunnel and at-grade road so as to minimize the visual and noise impact (see photomontages in [Figures 5 to 9](#)).
- (c) Security consideration – concern has been raised whether the long stretch of bonded road from HKSAR boundary to the HKBCF will be prone to illegal activities. After discussing with the relevant law enforcement agencies, it was concluded that with the road being closely monitored by closed circuit televisions (CCTVs), and that there is no branching-out along the entire stretch of road which is a condition not conducive to criminal activities, the HKLR should not be prone to illegal activities.

11. Amongst the various HKBCF site options, Option NECLK stands out with the following major merits:

- (a) At a regional level, locating the HKBCF at the north-east waters off the Airport Island will facilitate integration with the TM-CLKL and TMWB, forming a more convenient and comprehensive strategic road network that links up Hong Kong, Shenzhen, Zhuhai and Macao. Also, with a variety of transport modes availability in proximity, HKBCF will become a multi-modal transportation-hub (including the Airport, the SkyPier, the Airport Express Line and Tung Chung Line) in the area.

(b) Locally, with the HKBCF located at the north-east waters off

the Airport Island and connected to the TM-CLKL, the passage linking the HKIA, NWNT and Lantau area is formed. The connectivity of Tung Chung and the Lantau area to the urban area of HK is enhanced, and transport network between the above areas are improved. With close proximity and ties to the Tung Chung Town, there is potential for the further economic development of the local area. For example, a localized economic zone comprising of the HKBCF, HKIA and Tung Chung can be formed, bringing economic benefits and creating business and job opportunities to the local area.

- (c) The stations of the Hong Kong-Shenzhen Airport Rail Link³, if implemented, can be located inside the HKBCF. This will further strengthen the synergy effect between the various projects.
- (d) Locating the HKBCF at the north-east waters of the Airport Island will enhance the connectivity of various trunk roads, thus forming a more convenient and comprehensive strategic road network.
- (e) With the proximity of commercial, exhibition and business facilities such as the Asia World-Expo, hotels, shopping malls and outlets, effect of bridge head economy in the area can be formed.
- (f) Reclamation of the HKBCF can merge with the TM-CLKL landfall. The dredging of seabed can be reduced by approximately 5 million cubic meters and the seawall construction be reduced by approximately 1.8 kilometers.

12. To conclude, locating the HKBCF at the north-east waters off the Airport Island will bring in benefits at the strategic and macro angle. It will result in better overall transport network layout for the region, as well as overall benefits. In addition, HKBCF's proximity to other airport facilities will bring forth synergy effect, fostering closer ties with Tung Chung, thus contributing to the formation of a local economic zone.

³ The Hong Kong-Shenzhen Airport Rail Link was mentioned in the Chief Executive in the policy address in October 2007 that it is necessary to study the feasibility and economic benefits of establishing a rail connection between Hong Kong and Shenzhen Airports.

After balancing various aspects of considerations, we propose that the NECLK option be adopted. Upon balancing all factors, we conclude that the NECLK shall be the preferred site location for the HKBCF.

Hong Kong Link Road (HKLR)

13. The HKLR will be about 12km long, dual 3-lane carriageway, linking the HZMB Main Bridge at the HKSAR Boundary and the HKBCF located at the north-east waters of the Airport Island.
14. The alignment of the HKLR from HKSAR boundary to Scenic Hill is in the form of sea viaduct running through the Airport Channel. It is the same as the recommended alignment presented in IDC Paper ref. No. IDC 108/2005. In view of residents' concerns over the sea viaduct from Scenic Hill to the HKBCF, the viaduct option has been changed to the tunnel-cum-at grade road scheme as described in Paragraph 10 above. The entire alignment of the HKLR is shown in **Figure 10**. The key merits of this alignment are:
 - (a) Major facilities in the HKIA will not be affected; and
 - (b) The Lantau hillside and associated ecological features (including the Lantau Country Park and the Tung O Ancient Trail) are kept intact.

In response to the concerns expressed by Sha Lo Wan residents on the visual impact caused by the HKLR, HyD has decided to modify the viaduct portion near Sha Lo Wan by increasing the span length from 60m to 180m. The appearance of the viaduct will also be optimized.

15. Some residents suggested other alignment options including an alignment involving a tunnel along the northern side of the Airport Island (see **Figure 11**). However, this option is not adopted in view of the following major problems which are in conflict with the concept of sustainable development:
 - (a) The tunnel will pose an undesirable constraint to the future developments of the HKIA; the area at the north of the Airport Island is reserved for Airport expansion.

Constructing a tunnel underneath the expansion will increase the risk caused by fire or explosion inside the tunnel, thus affecting the operation and safety of the airport.

- (b) When compared to the Airport-Channel alignment, this option will cause a 3km detour, hence increasing social cost (e.g. time and fuel consumption) and exhausted gas emission (additional of about 90 tonnes of NO_x emission).
- (c) It is much more costly than the Airport-Channel alignment described above (estimated increase in construction cost of HK\$13 billion).
- (d) It is estimated an extra 15 million cubic meters contaminated mud will be created when compared to the proposed alignment.
- (e) Lighting and ventilation facilities will require to be operating 24-hours daily inside the proposed 7km long tunnel. An increase in energy consumption of 30 million kilowatt hour annually is envisaged.

Another alignment option considered for HKLR is an alignment involving a tunnel through the Lantau hillside (see [Figure 12](#)). However, the eastern tunnel portal will be located inside the Country Park, whereas the western tunnel portal will destroy the natural shoreline and hillside of the Lantau Island. This option is therefore not considered.

Tuen Mun-Chek Lap Kok Link

16. In September 2007, HyD reported the findings of the NWNT Traffic and Infrastructure Review to IDC and sought their comments (IDC paper ref. IDC 83/2007). The members generally supported the proposals for the TM-CLKL and TMWB and supported the proposed projects to proceed to the investigation and preliminary design stage. In January 2008, Finance Committee of the Legislative Council approved the funding of HK\$ 88.6 million to for conducting the site investigation and preliminary design of the TM-CLKL and TMWB. The proposed TM-CLKL together with TMWB will form a strategic passage linking NWNT, the HKIA and North Lantau. The proposed TM-CLKL will also provide a direct linkage between the

proposed HKBCF, NLH and the road network in Tuen Mun. This new connection will connect the NLH and HKBCF in the south and Pillar Point in Tuen Mun and the Shenzhen Western Corridor in the north. Upon completion of the proposed passage, the travelling distance between NWNT, HKIA and Tung Chung will significantly be reduced by 22 kilometers.

17. An artificial island was initially proposed to be constructed near Tai Mo To to provide the southern landfall for the subsea tunnel crossing the Urmston Road. Subsequent to further study, it is now decided to integrate it with the artificial island HKBCF to reduce the extent of seabed dredging and seawall construction. The southern landing point of the subsea tunnel will be located at the integrated artificial island (**Figure 13**).
18. A marine viaduct is proposed to be constructed at the southeast of the abovementioned artificial island to provide direct connection between the HKBCF and North Lantau. This connection will alleviate the traffic flow in the local road network of Tung Chung town centre and thus reduce the traffic and environmental impacts to the area. The proposed marine viaduct is far from the Tung Chung town centre, thus the environmental impact will be relatively minor. In addition, adoption of marine viaduct scheme does not require reclamation for the subsea tunnel landing point which may affect the operation of the existing Tung Chung navigation channel, environmental and ecological impact to Tai Ho Bay area during construction of the project can also be minimized.

Overall Scheme

19. After balancing various factors and considering views from different stakeholders, our overall scheme is to locate the HKBCF at the north-east waters off the Airport Island, the Airport-Channel alignment for HKLR, and the TM-CLKL. The overall scheme is shown in **Figure 14**.

Way Forward

20. Based on the above overall scheme, we shall kick off the statutory procedures for the Environmental Impact Assessment and apply for funding for the detailed design of the HKBCF. In mid 2009, we shall gazette the Works of the HKLR and TM-CLKL under the “Roads (Works, Use and Compensation)

Ordinance” and gazette the works of the HKBCF under the “Roads (Works, Use and Compensation) Ordinance”, “Railways Ordinance”, “Foreshore and Sea-bed (Reclamations) Ordinance” and “Town Planning Ordinance”. The scopes of the aforementioned projects are appended in Appendix I.

Appendix

Appendix I	HKBCF Project Scope
	HKLR Project Scope
	TM-CLKL Project Scope
Figure 1	Site Options for HKBCF
Figure 2	Option WCLK
Figure 3	Option SSW
Figure 4	Option NECLK – Recommended Option
Figure 5	Tunnel cum at-grade road Scheme
Figure 6	Viaduct scheme and Tunnel cum at-grade road Scheme (Photomontage)
Figure 7	Option NECLK – Views from Seaview Crescent
Figure 8	Option NECLK – Views from Coastal Skyline
Figure 9	Option NECLK – Views from Caribbean Coast
Figure 10	Recommended Alignment of HKLR
Figure 11	HKLR alignment option – Tunnel option along northern side of the Airport Island
Figure 12	HKLR alignment option – Tunnel option through Lantau Island
Figure 13	Tuen Mun – Chek Lap Kok Link Layout
Figure 14	Overall Scheme

Highways Department
April 2009

Hong Kong Boundary Crossing Facilities (HKBCF)
Project Scope

The HKBCF will be located at the north-east waters of the Hong Kong International Airport (HKIA), and about 130 hectares of land will be reclaimed for it. HKBCF will provide passenger and cargo processing facilities for the passengers using the HZMB. Apart from reclamation works, the project includes:

1. Passenger related facilities including processing kiosks and examination facilities for private cars and coaches, passenger clearance building and halls, etc;
2. Cargo processing facilities including kiosks for clearance of goods vehicles, customs inspection platforms, X-ray buildings, etc;
3. Accommodation for and facilities of the Government departments providing services in connection with the HKBCF;
4. Provision of transport and miscellaneous facilities inside the HKBCF including public transport interchange, transport drop-off and pick-up areas, vehicle holding areas, passenger queuing areas, road networks, footbridges, fencing, sewage and drainage systems, water supply system, utilities, electronic system, traffic control and information system, etc;
5. Provision of road access for the connection of the HKBCF to HKLR, the TM-CLKL and the HKIA;
6. Reprovisioning of the affected Airport's facilities; and
7. Provision of other facilities for connection with the Airport such as the extension of the existing Automated People Mover to connect the Airport Terminal with the HKBCF.

Hong Kong Link Road (HKLR)

Project Scope

- 1 The Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) will be an approximately 12 kilometers long, dual 3-lane carriageway, linking the HZMB Main Bridge and the HKBCF. The design speed of it is 100km/hr. The alignment starts from HKSAR boundary at the west, via the North Lantau and the Airport Channel and connects to the HKBCF at the northeast of the Airport Island.
- 2 The HKLR will be in form of sea viaduct connecting the HZMB Main Bridge from the HKSAR boundary to the north-west of Sha Lo Wan. To avoid causing any impact on the natural shoreline of North Lantau, the HKLR will continue to be in the form of sea viaduct passing over the North Lantau shoreline and Airport Channel to connect to the Scenic Hill on Airport Island. The total length of the viaduct is about 9.3 kilometers.
- 3 The HKLR will be in the form of a tunnel passing through the Scenic Hill, and pass underneath the existing Airport Road and Airport Express Line with a total length of 1.1km. The tunnel will daylight at the reclamation at the east of the Airport Island and connect to the HKBCF by a 1.6 km long at-grade road. This design will minimise the visual impact to the Tung Chung residents.

In addition to the aforementioned works, the project will also include associated civil, structural, geotechnical, marine, environmental protection, landscaping and drainage works, street lighting, traffic aids (including sign gantries), traffic control and surveillance system and electrical and mechanical works.

Tuen Mun – Chek Lap Kok Link (TM-CLKL)

Project Scope

1. TM-CLKL (with total length of about 9 kilometers) connects the proposed HZMB HKBCF, HKIA and Lantau Island, relieving the traffic demand of Tuen Mun Road, Ting Kau Bridge, Lantau Link and NLH and providing an alternative route linking the HKIA and the urban area. Upon completion of the TM-CLKL, the travelling distance between NWNT and HKIA/Tung Chung will be reduced by about 22 kilometers. The TM-CLKL will also connect the HKBCF with NLH and Tuen Mun.

Subsea Tunnel

2. The northern portion of TM-CLKL is proposed to be a subsea tunnel crossing Urmston Road to connect Tuen Mun and the HKBCF. The tunnel will be a 5 km long dual 2-lane carriageway.

Northern Connection

3. The aforementioned subsea tunnel will have its northern landfall at Tuen Mun Area 40 adjacent to the River Trade Terminal, and requires reclamation works at that area. The proposed northern landfall is far away from the Butterfly Beach in Tuen Mun and will minimize impacts to the existing navigation channel. The proposed northern connection will be in the form of at-grade road and viaduct connecting to the proposed Tuen Mun Western Bypass (TMWB).
4. The project also consists of a toll plaza situated at Tuen Mun Area 46 and an interchange at Lung Mun Road. The interchange facilitates vehicular access between Tuen Mun South and Lantau Island/HKIA via TM-CLKL, and access to/from NWNT via TMWB.

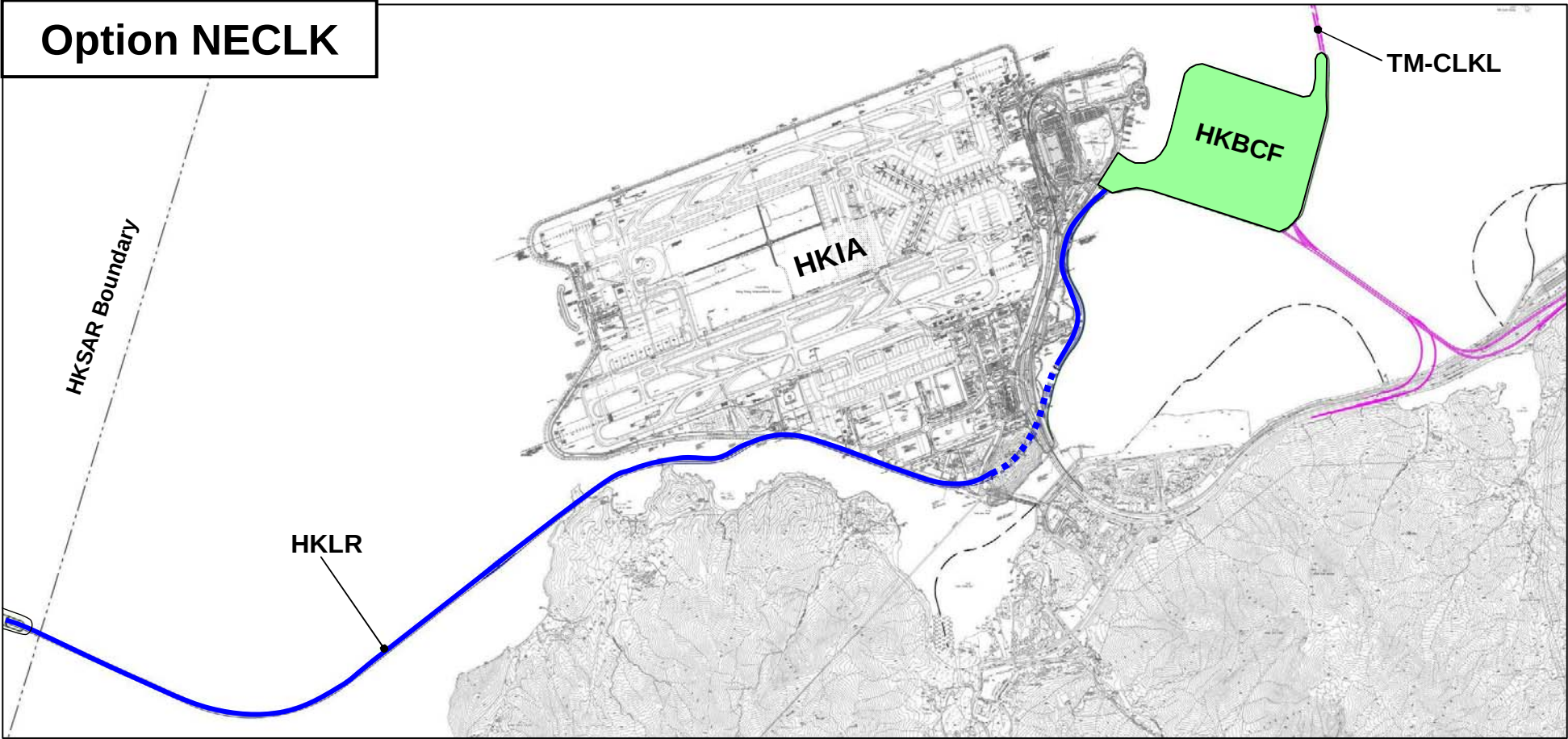
Southern Connection

5. The aforementioned subsea tunnel would have its southern landfall on the artificial island at the north-east waters of the Airport Island, and be connected to the HKIA via the proposed road network within the HKBCF. A dual 2-lane marine viaduct will be constructed at the southeast of the artificial island and span across the existing Tung Chung Navigation Channel to provide direct connection between the

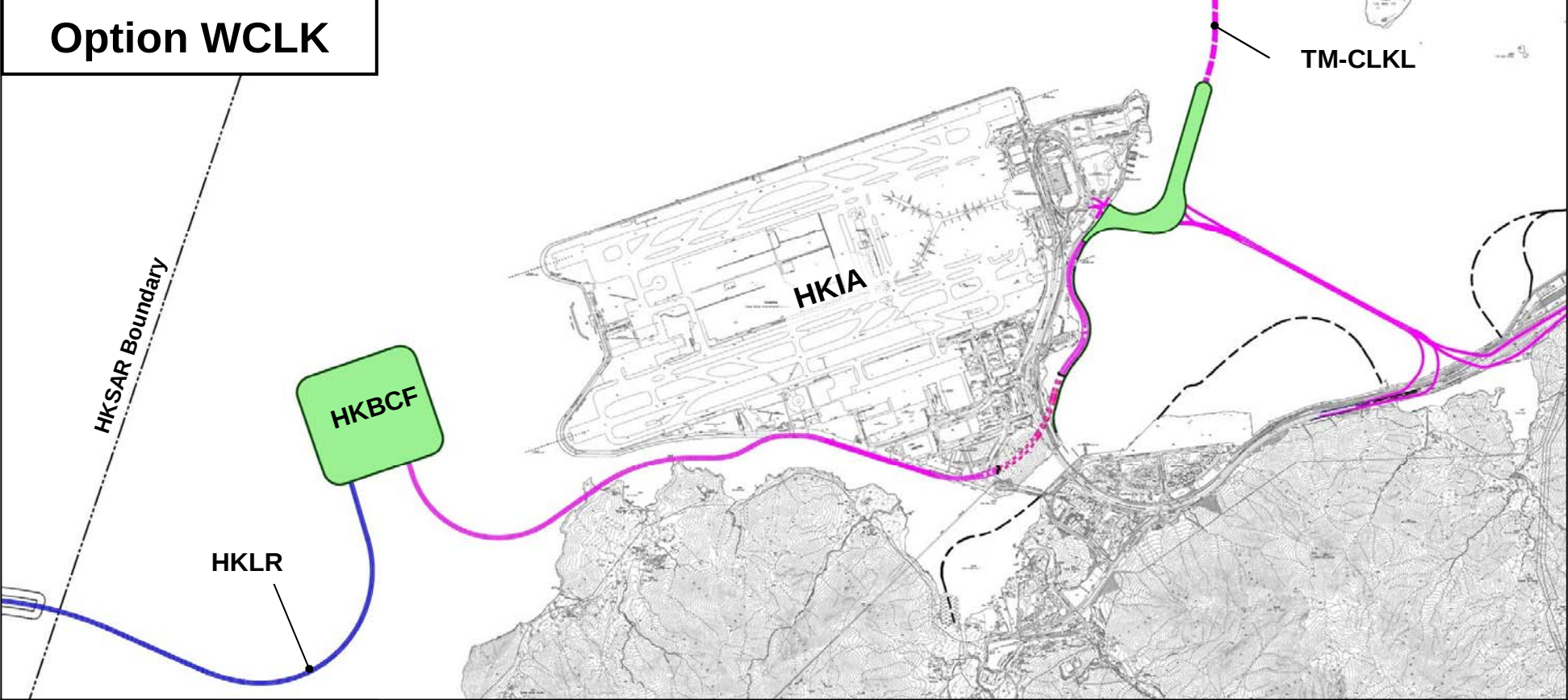
HKBCF and the NLH. Such a connection could reduce the need for traffic to route through the local road network of Tung Chung Town Centre and minimizes the consequential traffic and environmental impacts in the area.

Figure 1 Site Options for HKBCF

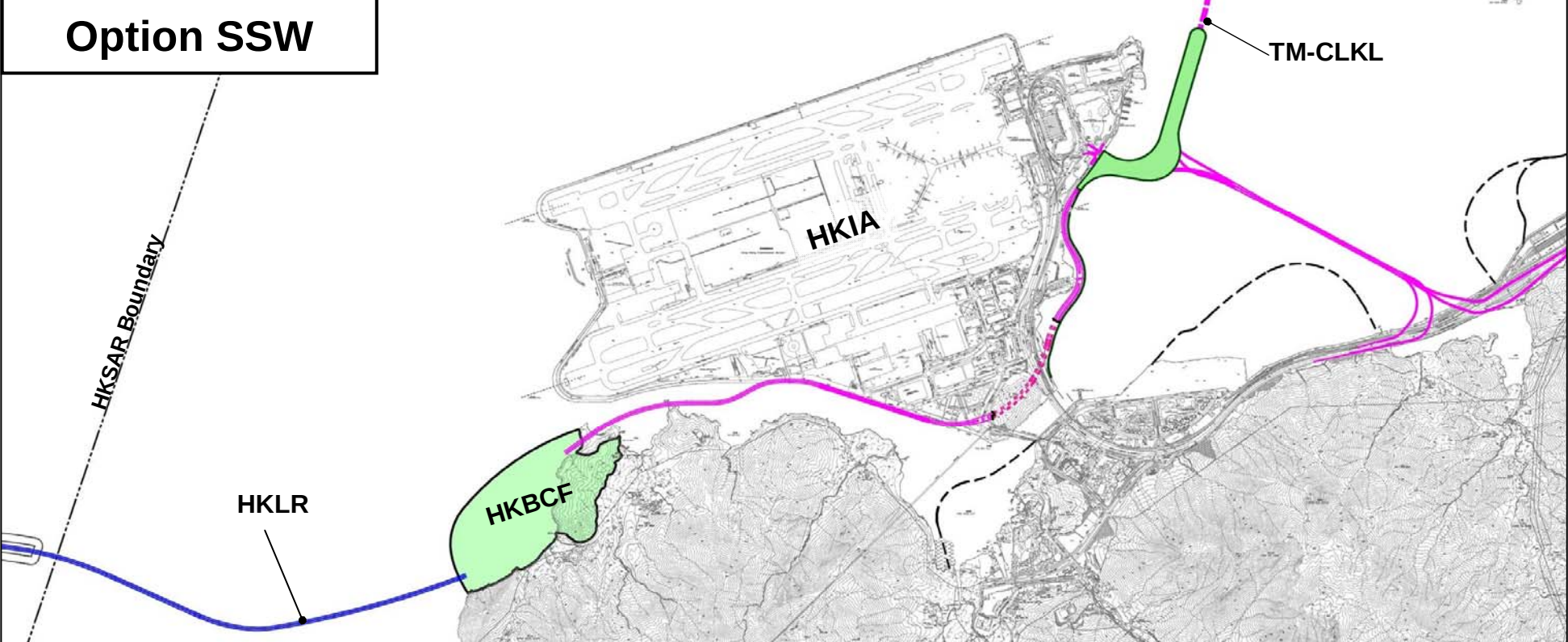
Option NECLK



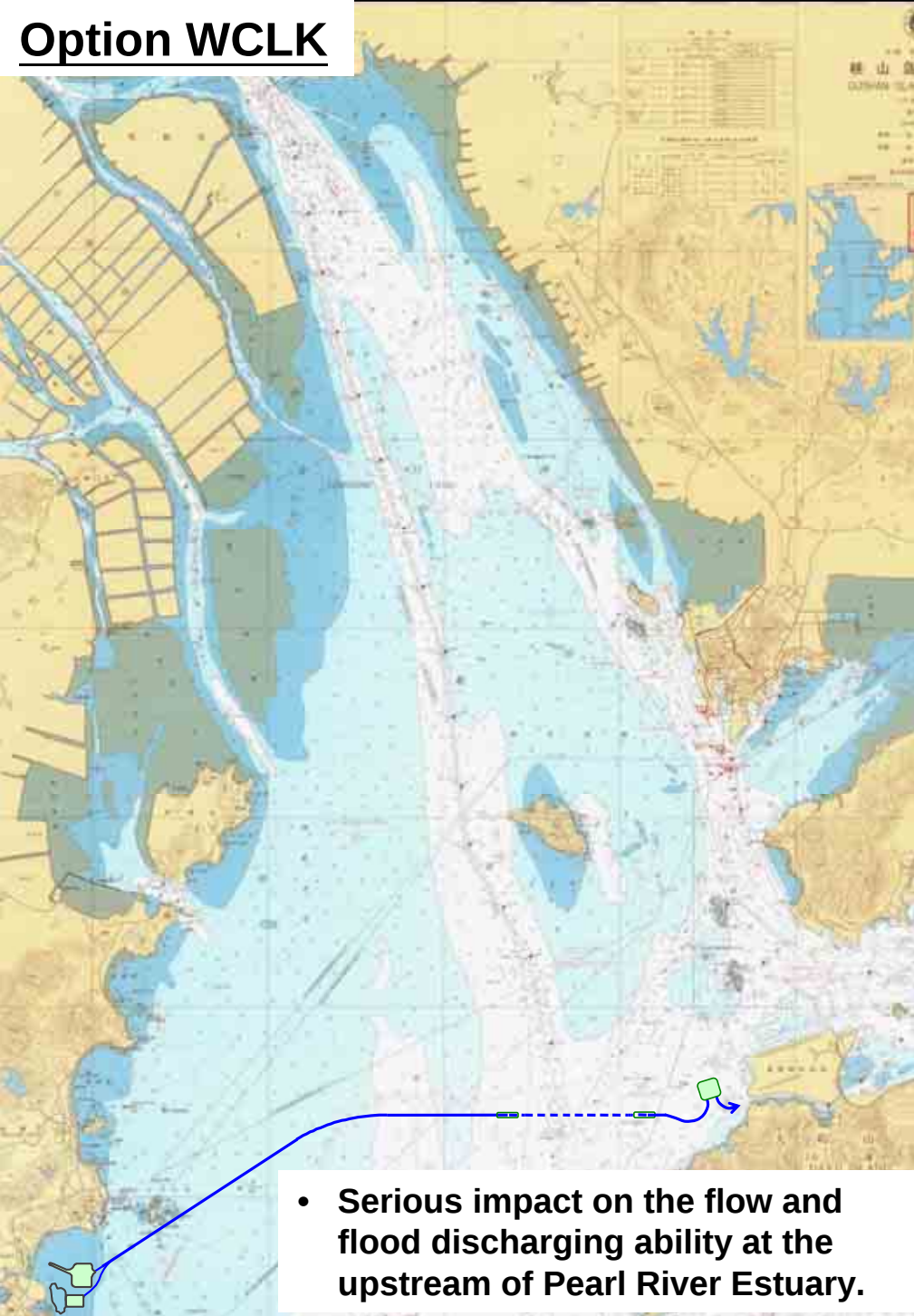
Option WCLK



Option SSW

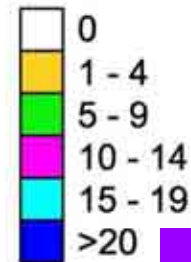


Option WCLK



Legend

No. of dolphin sightings per 100 surveys



Dolphin Active Zone

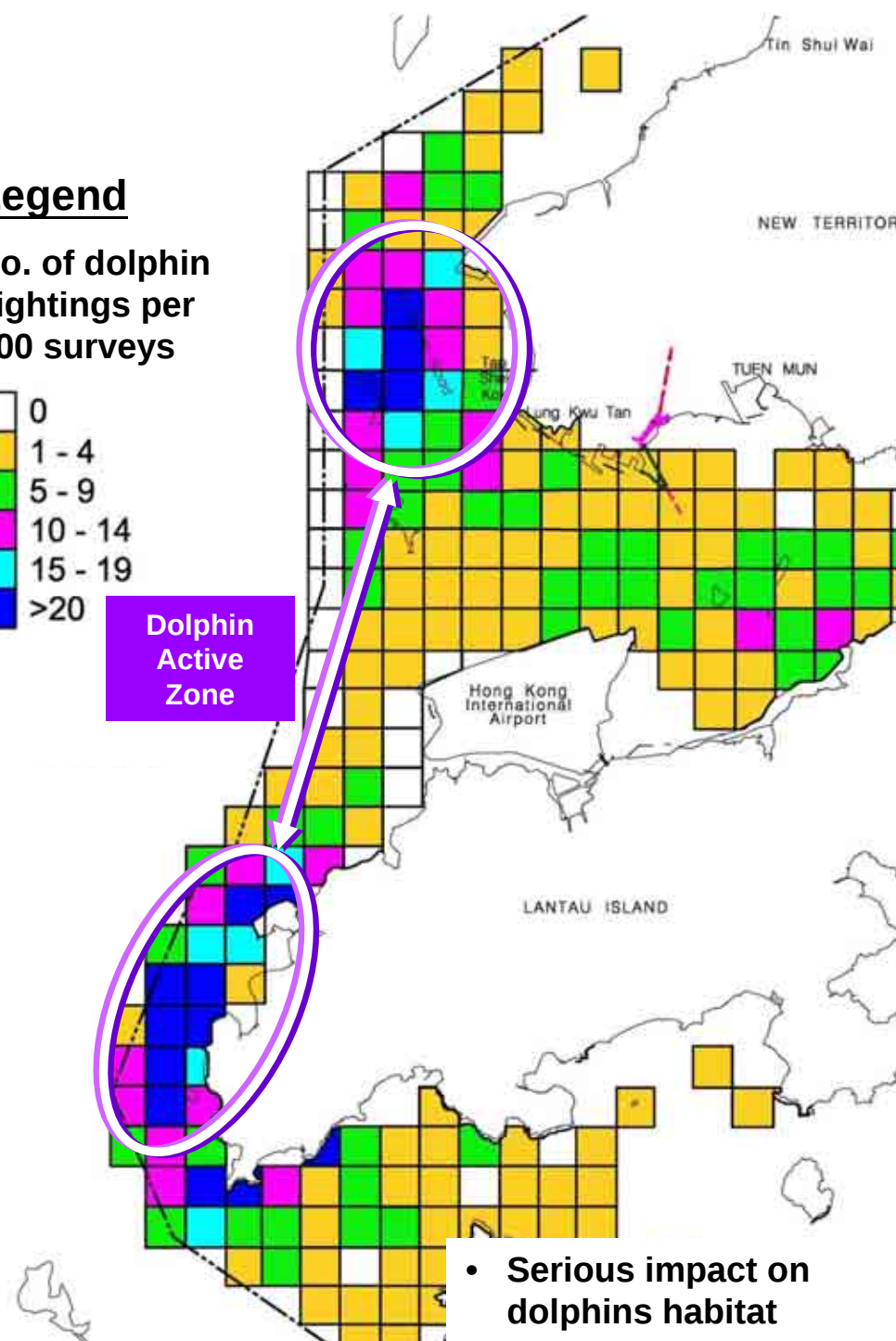
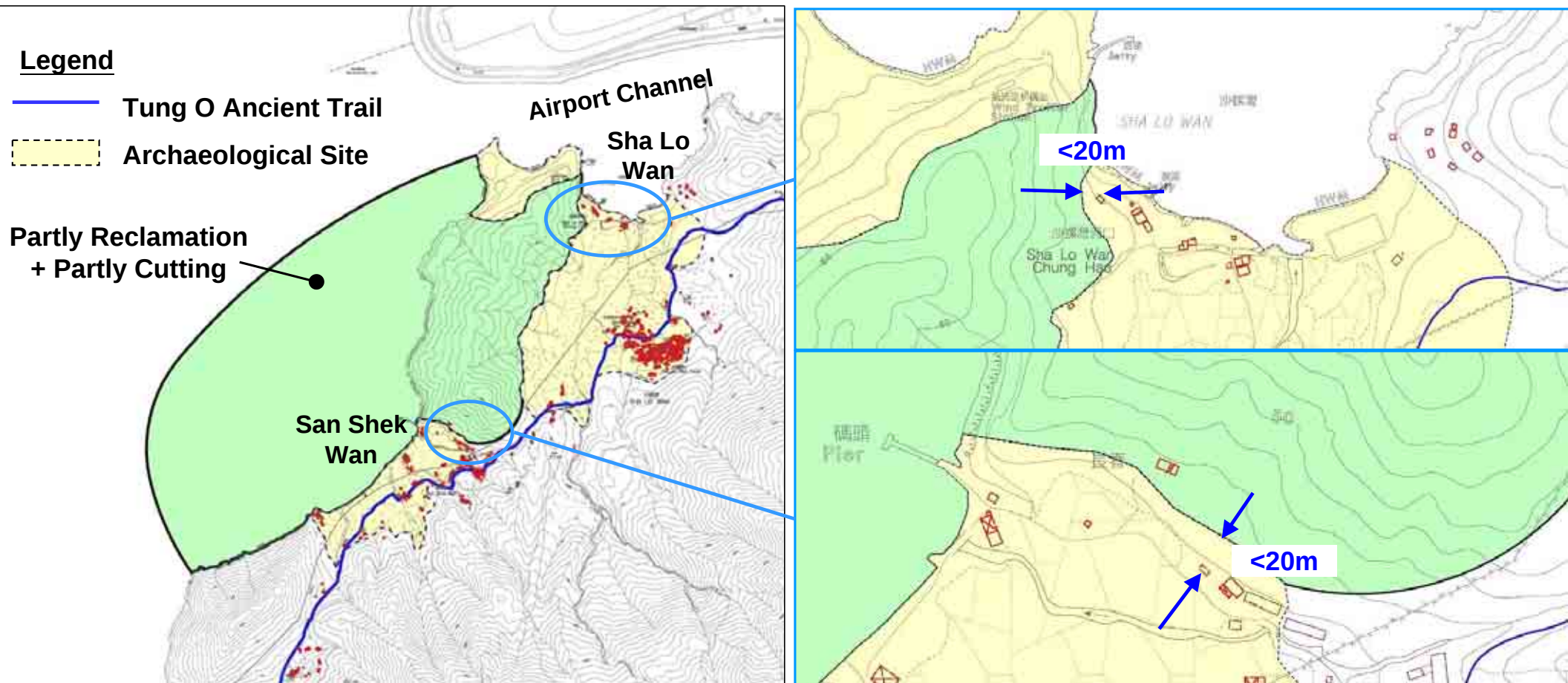


Figure 2 Option WCLK

Option SSW



- Extremely close to village houses at San Shek Wan and Sha Lo Wan
→ non-compliance with air-quality and noise criteria
- Substantial hillside cutting (~15 Million m³), and damage to natural woodland (~35 hectares) → Serious impact on the natural setting of North Lantau
- Loss of natural shoreline (~2km)



Figure 3 Option SSW

Option NECLK

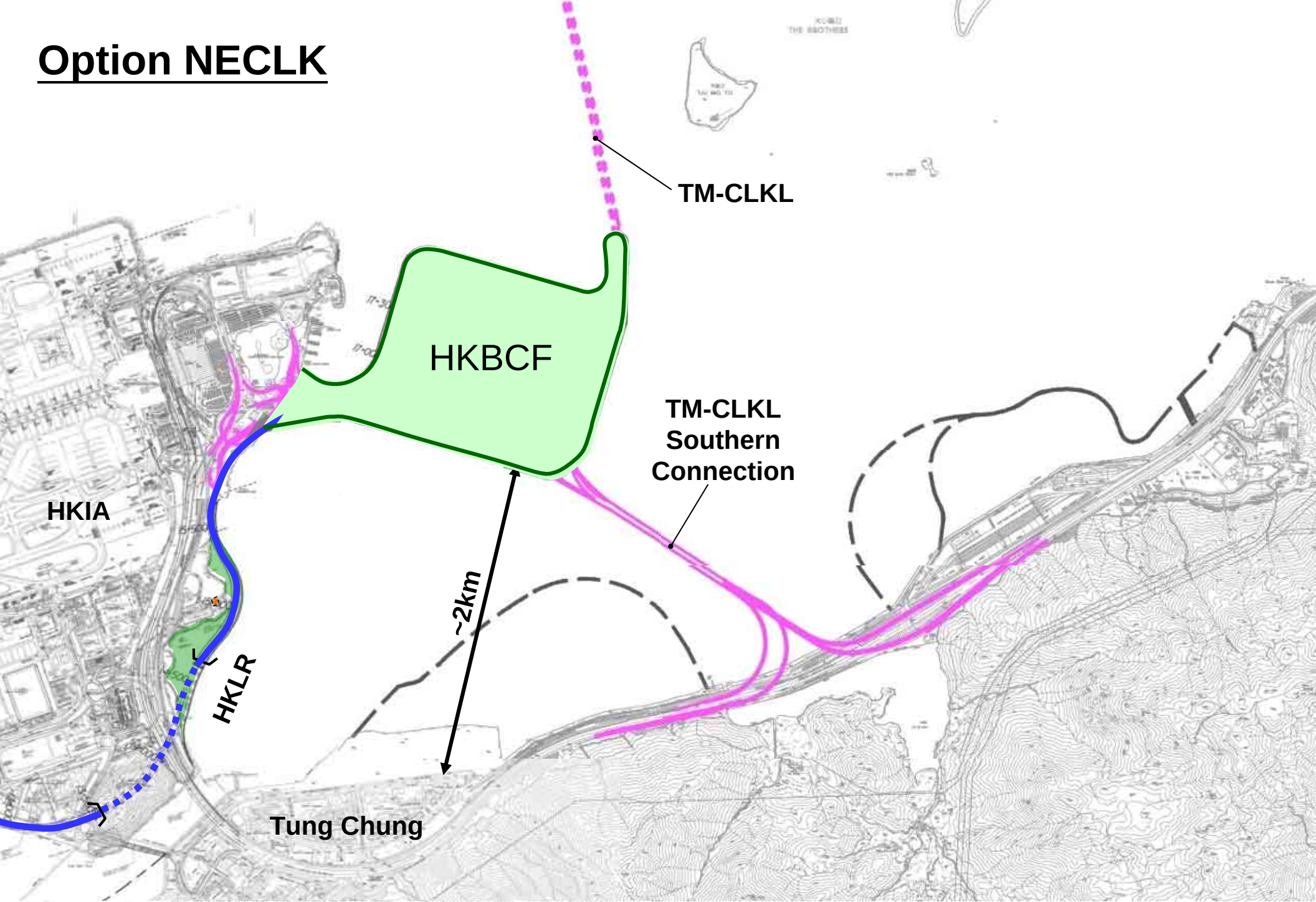


Figure 4 Option NECLK – Recommended Option

Option NECLK

- A section of viaduct of the HKLR near Tung Chung has been changed to a combination of tunnel and at-grade road.

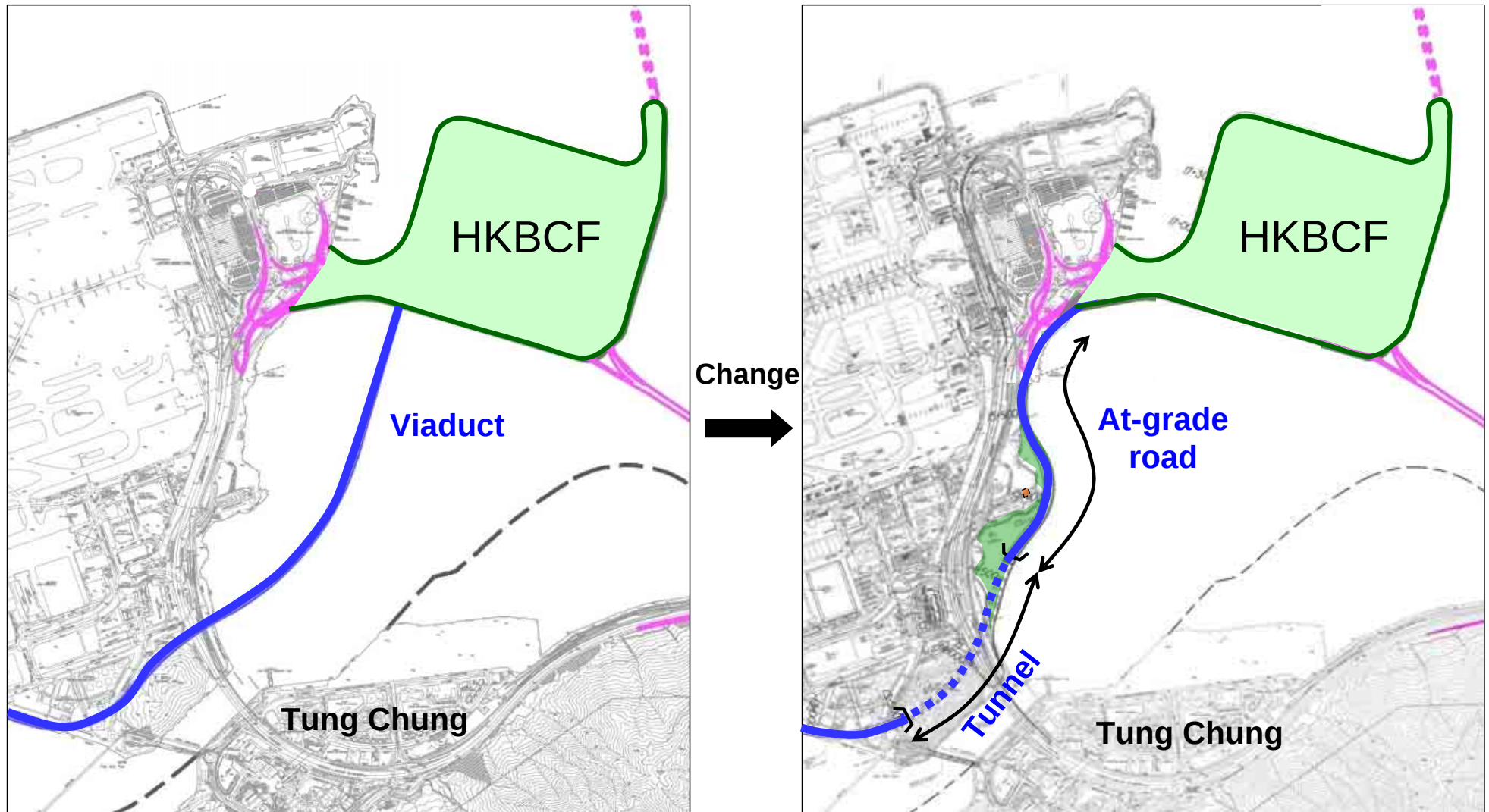


Figure 5 Tunnel cum at-grade road Scheme

Views from Tung Chung

**Viaduct Scheme
(photomontage)**



**Tunnel cum at-grade road Scheme
(photomontage)**

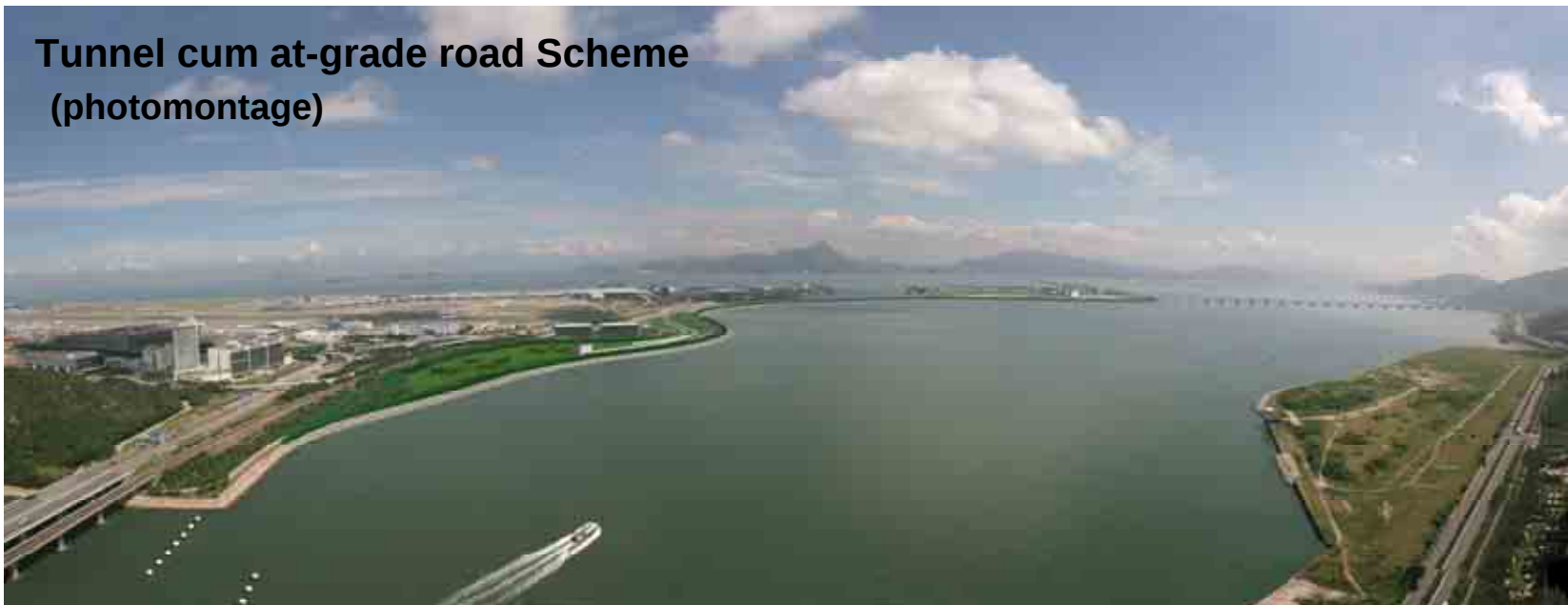


Figure 6 Viaduct Scheme and Tunnel cum at-grade road Scheme (Photomontage)

Views from Seaview Crescent

**View from high-level
(photomontage)**



**View from mid-level
(photomontage)**

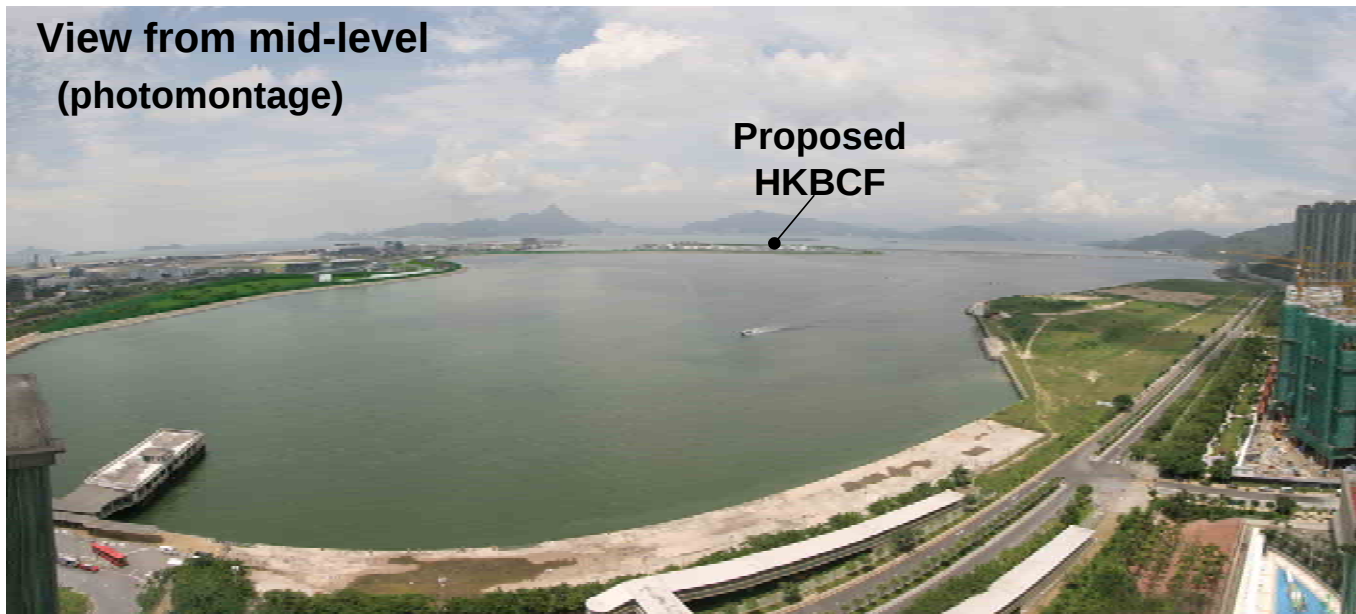


Figure 7 Option NECLK – Views from Seaview Crescent

Views from Coastal Skyline

View from high-level
(photomontage)



View from mid-level
(photomontage)



Figure 8 Option NECLK – Views from Coastal Skyline

Views from Caribbean Coast

View from high-level
(photomontage)



View from mid-level (photomontage)



View from low-level
(photomontage)

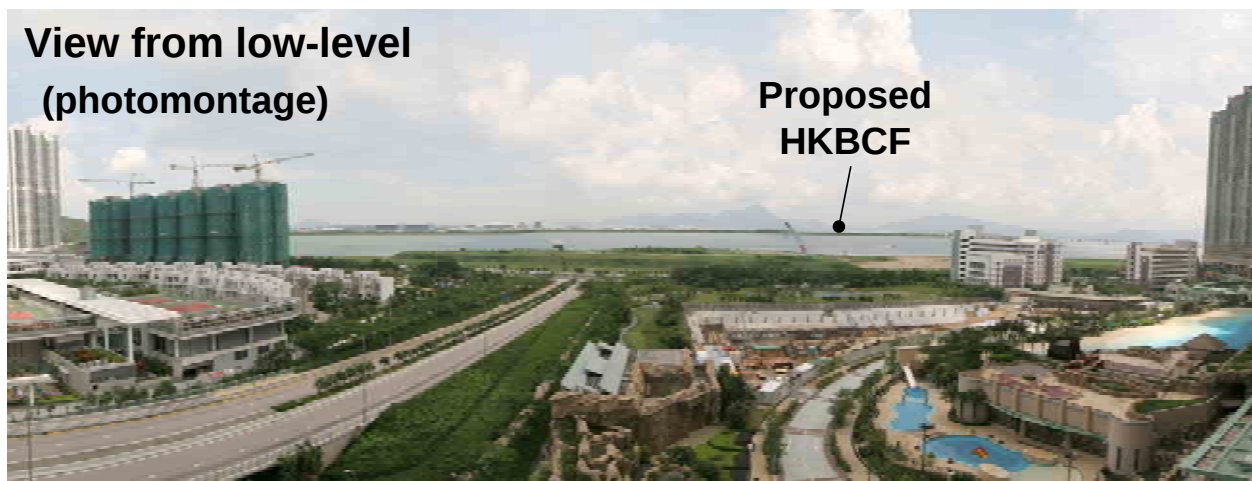


Figure 9 Option NECLK – Views from Caribbean Coast

Hong Kong Link Road

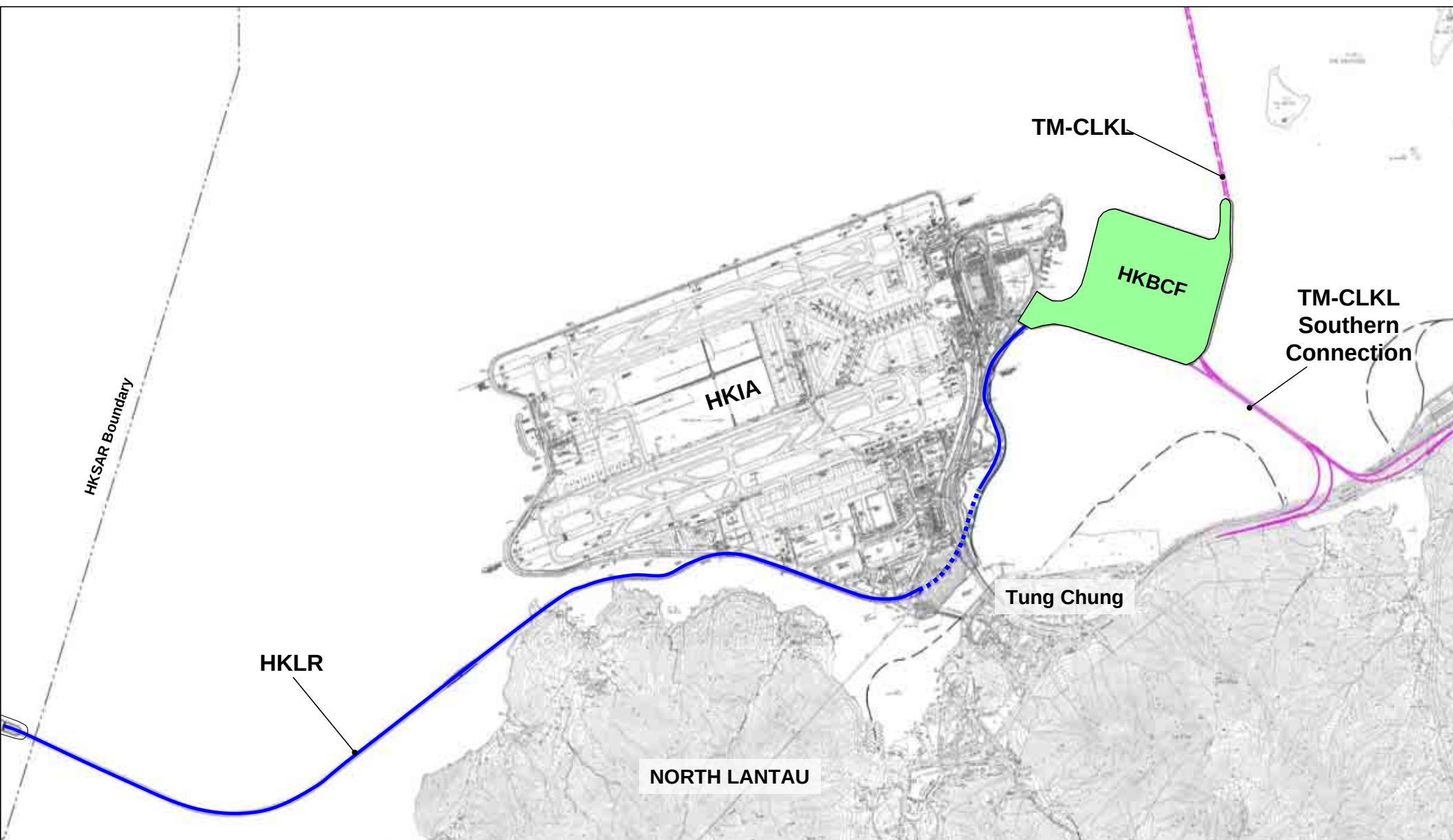


Figure 10 – Recommended alignment of HKLR



ARUP

- Tunnel ~7km + Viaduct ~8km → Much costly (~\$13 Billion more than the proposed Airport-Channel alignment)
- Constraint to the future development of the Hong Kong International Airport
- Longer than Airport-Channel alignment by ~3 km → increase social cost (eg time and fuel consumption) and the traffic emission (annual NO_x emission will be 90 tonnes more).
- Create an extra 15 Million m³ contaminated mud.

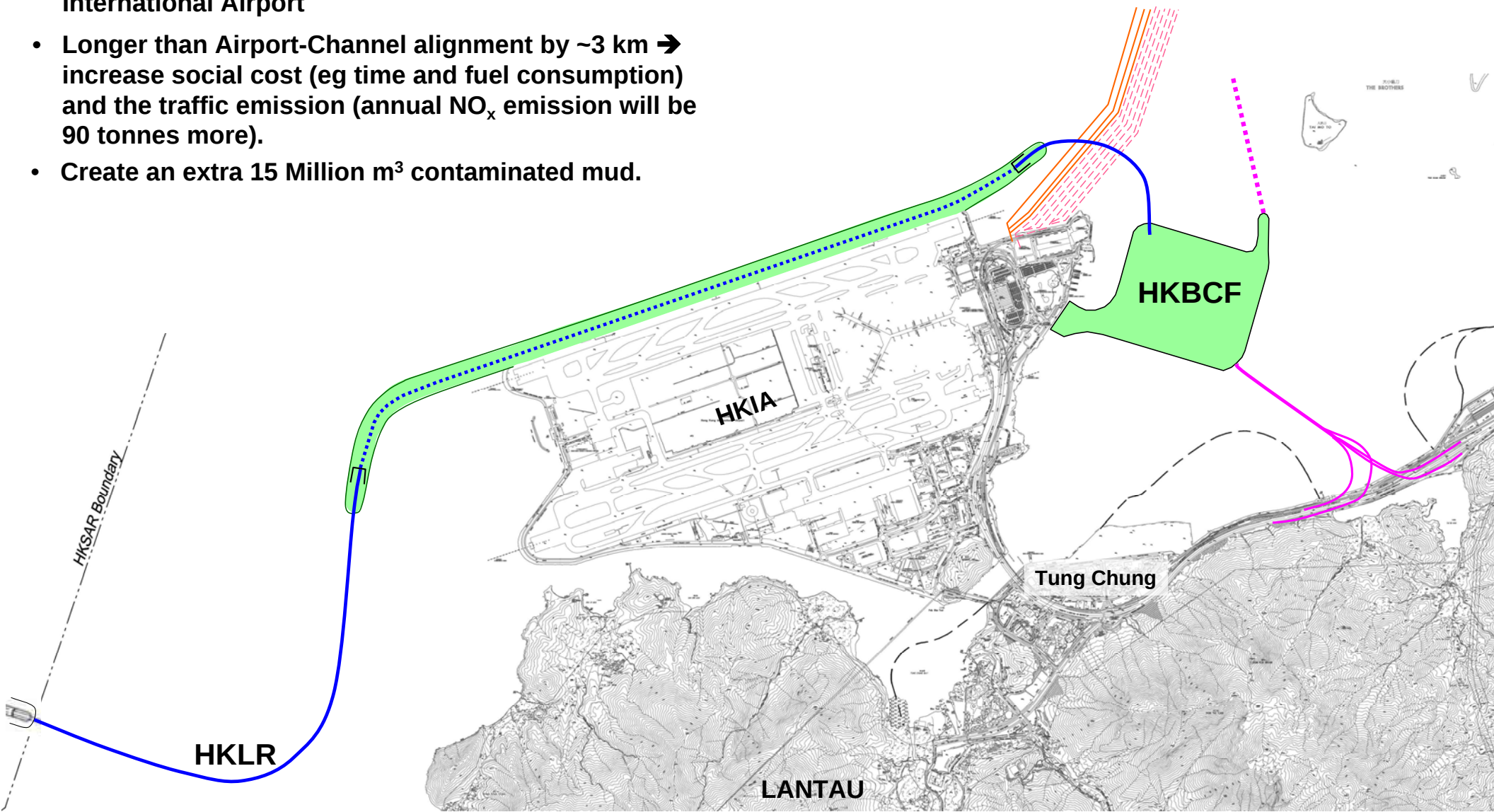
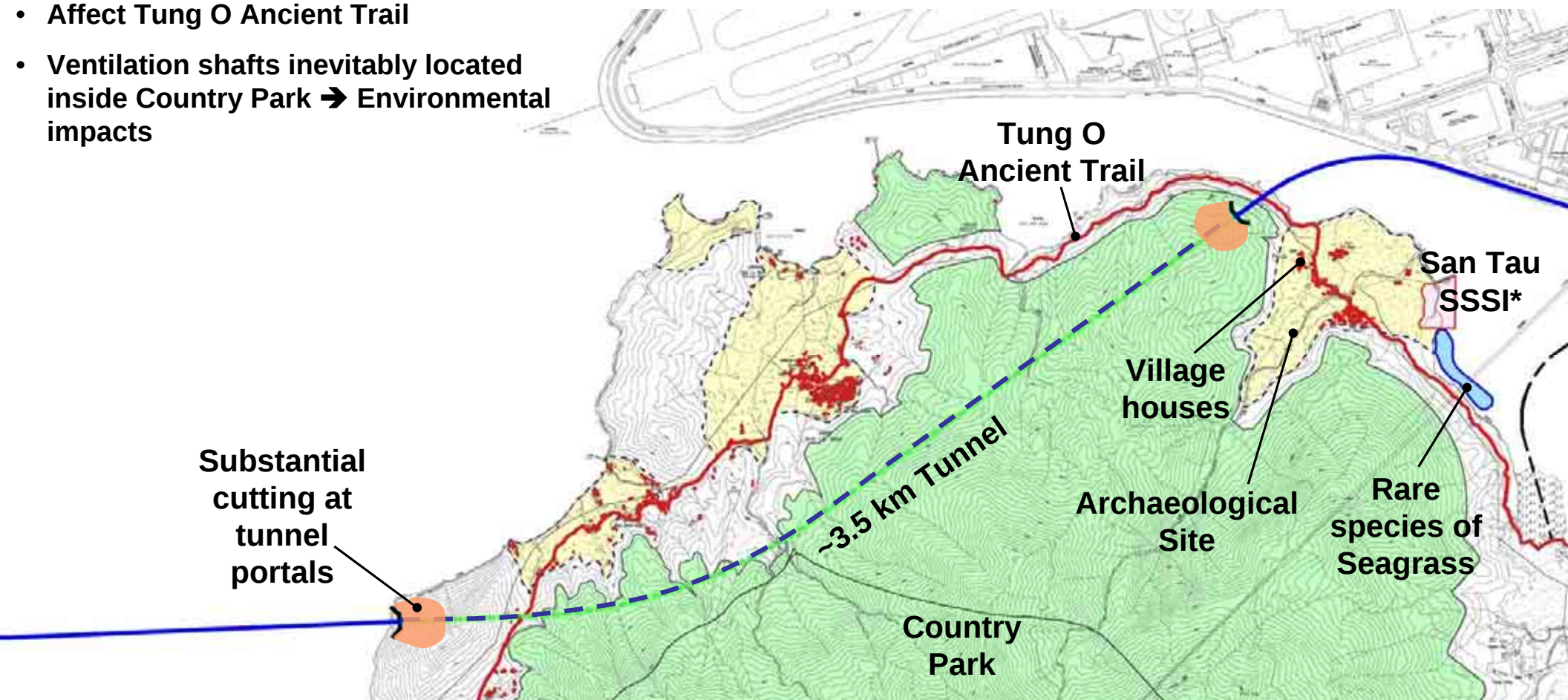


Figure 11 HKLR alignment option – Tunnel option along northern side of the Airport Island



ARUP

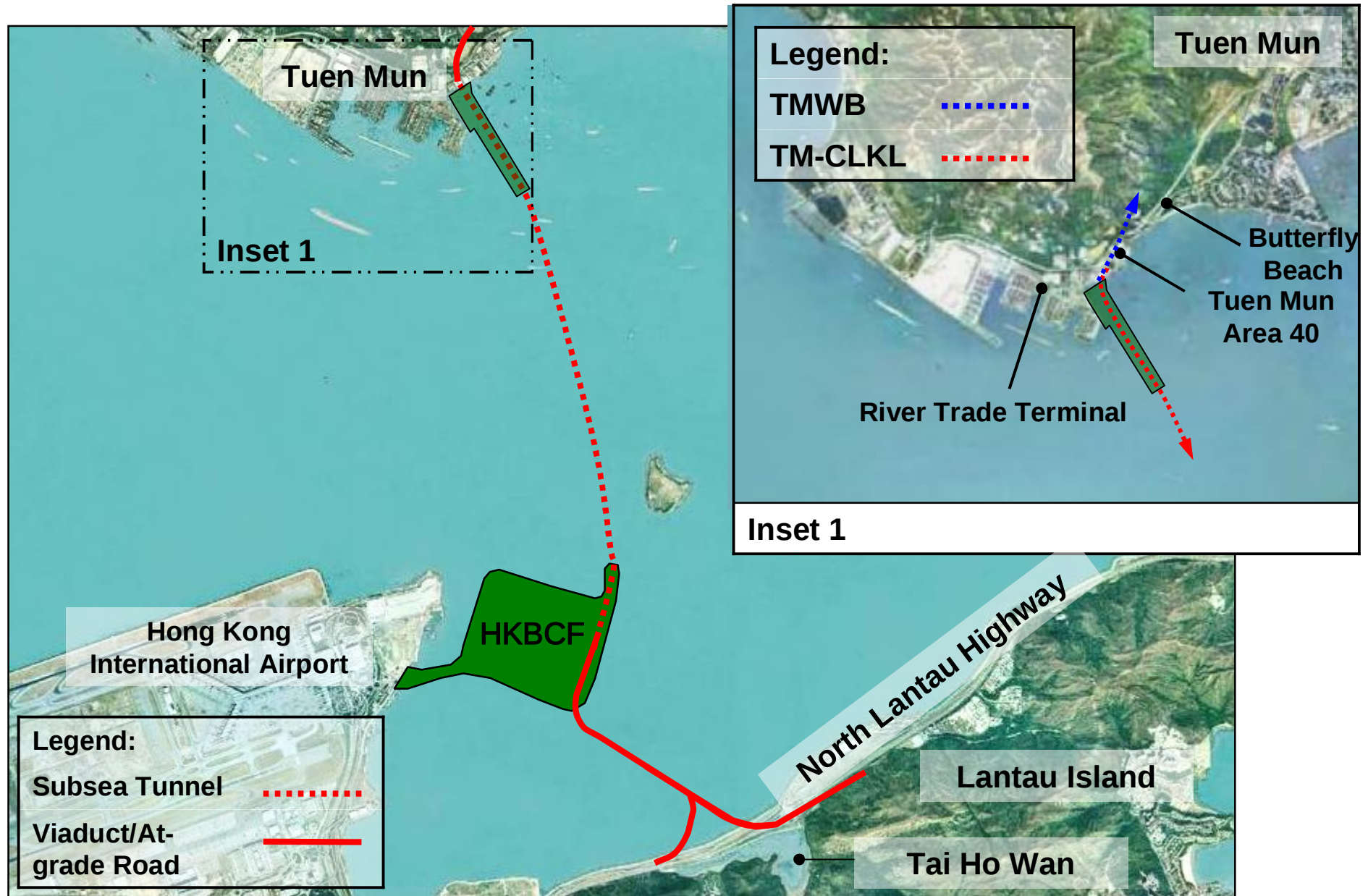
- Substantial cutting at tunnel portals
- Eastern tunnel portal encroach on Country Park
- Affect Tung O Ancient Trail
- Ventilation shafts inevitably located inside Country Park → Environmental impacts



*SSSI – Site of Special Scientific Interest

Figure 12 HKLR alignment option – Tunnel option through Lantau Island

Figure 13. Tuen Mun – Chek Lap Kok Link Layout



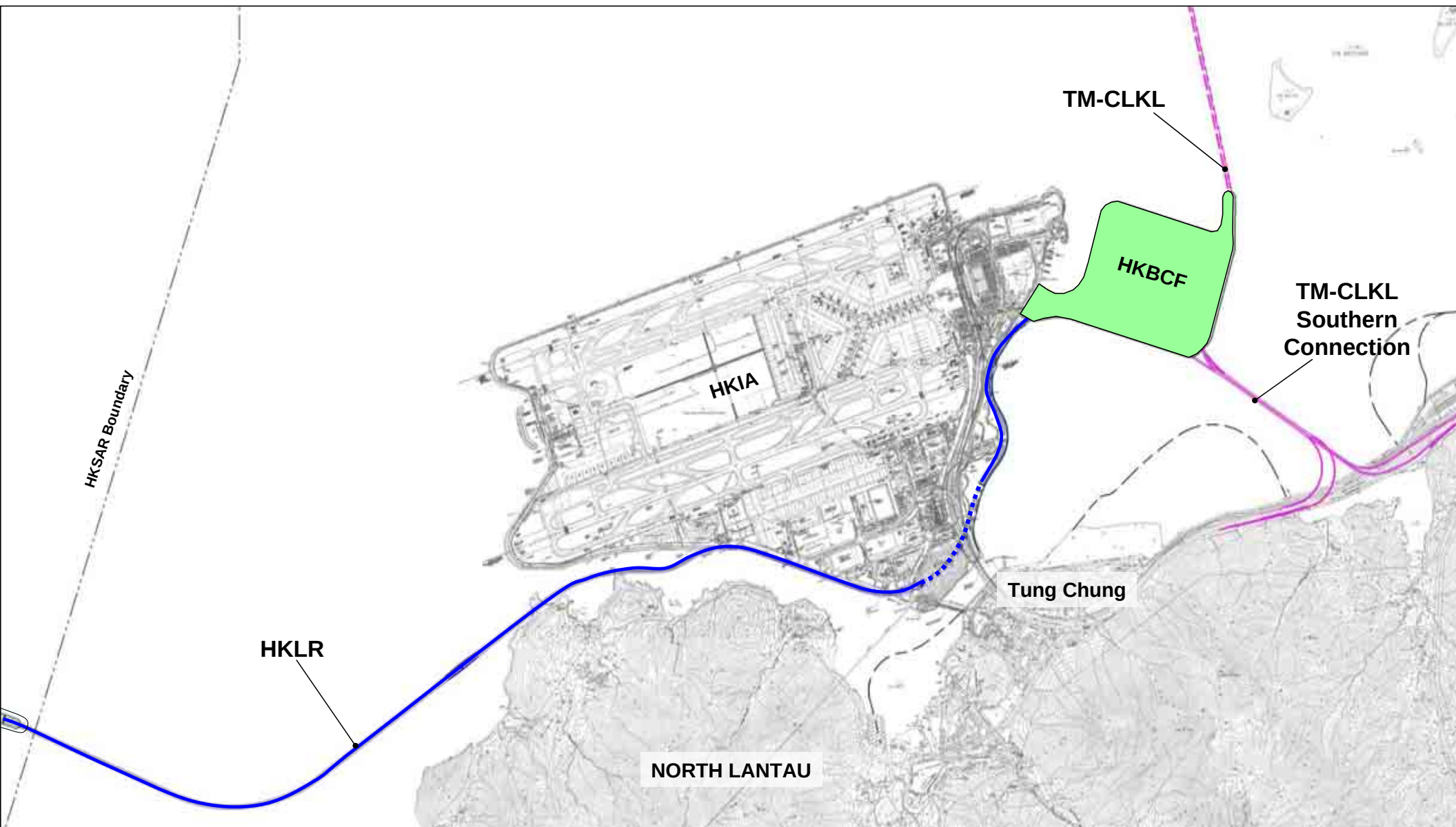


Figure 14 Overall Scheme