CHAPTER 4 OPTION 1 : MAINTAINING THE TWO-RUNWAY SYSTEM

Constrained Air Traffic Demand Forecast under the Two-Runway System

4.1 HKIA's two-runway capacity is forecast to reach its limit in 2020, but passenger and cargo demand is expected to keep growing even thereafter, albeit at a slower rate. While airlines would be reluctant to mount additional flight frequencies thereafter, they may try other approaches to accommodate demand. For example, during the last few years of single-runway operation at Kai Tak, passenger airlines managed to gradually stretch their annual average number of passengers carried per movement to a record high of 214 (see Figure 4.1) by "up-gauging" aircraft size and maximising passenger seat factors in response to the constrained situation.

Figure 4.1 : Historical Passenger Numbers per Passenger Flight Movement

Year	Average Number of Passengers per Passenger Flight Movement	
1993	209	
1994	204	
1995	210	
1996	214	
1997	198	
1998	194	(New airport opened on 6th July, 1998)
1999	203	
2000	208	
2001	189	
2002	191	
2003	174	
2004	185	
2005	186	
2006	191	
2007	196	
2008	194	
2009	196	

Source: CAD (1993-1996), AAHK (1997-2009)

4.2 Assuming a similar reaction by airlines to deal with the constraints of a freeze in air traffic movement (ATM, also known as flight movement) levels, the annual average number of passengers carried per movement is expected to gradually stretch from the unconstrained forecast of 200 in Year 2021 to 212 in 2030. Cargo airlines could gradually stretch the annual average cargo tonnage carried per freighter movement from the unconstrained forecast of 51 in Year 2021 to 55 in 2030. The Constrained ATM demand forecast and the resulting constrained passenger and cargo demand forecasts beyond 2020 are depicted in Figure 4.2, Figure 4.3 and Figure 4.4. Further explanation of the calculation can be found in Appendix 2.

Figure 4.2 : Constrained Air Traffic Movement Demand Forecast due to Runway Capacity Limit

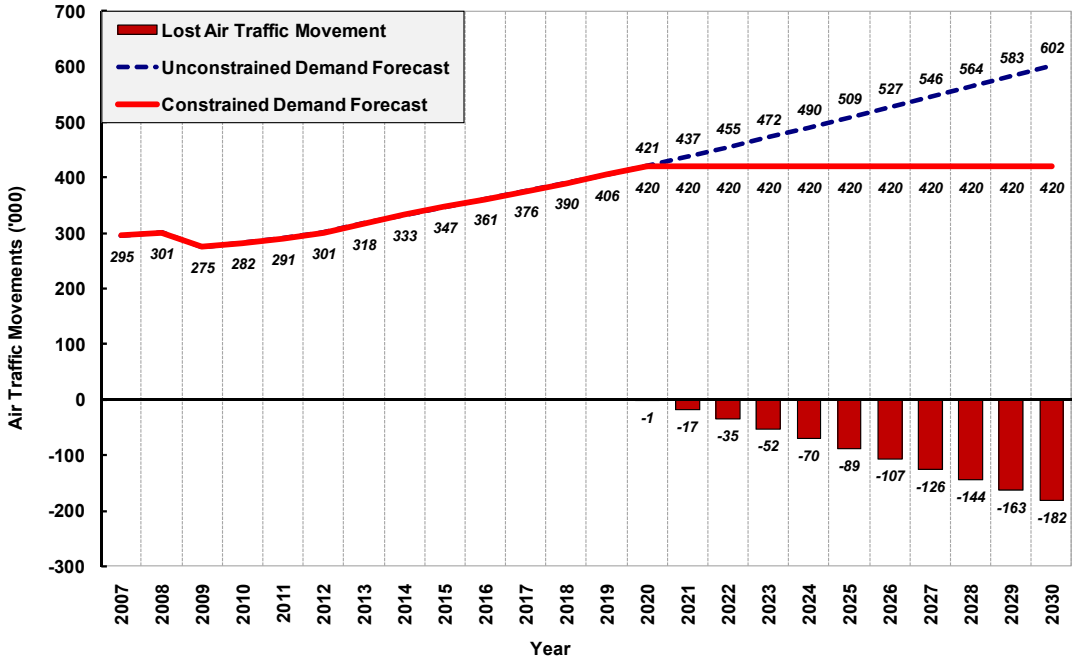


Figure 4.3 : Constrained Passenger Demand Forecast due to ATM Capacity Limit

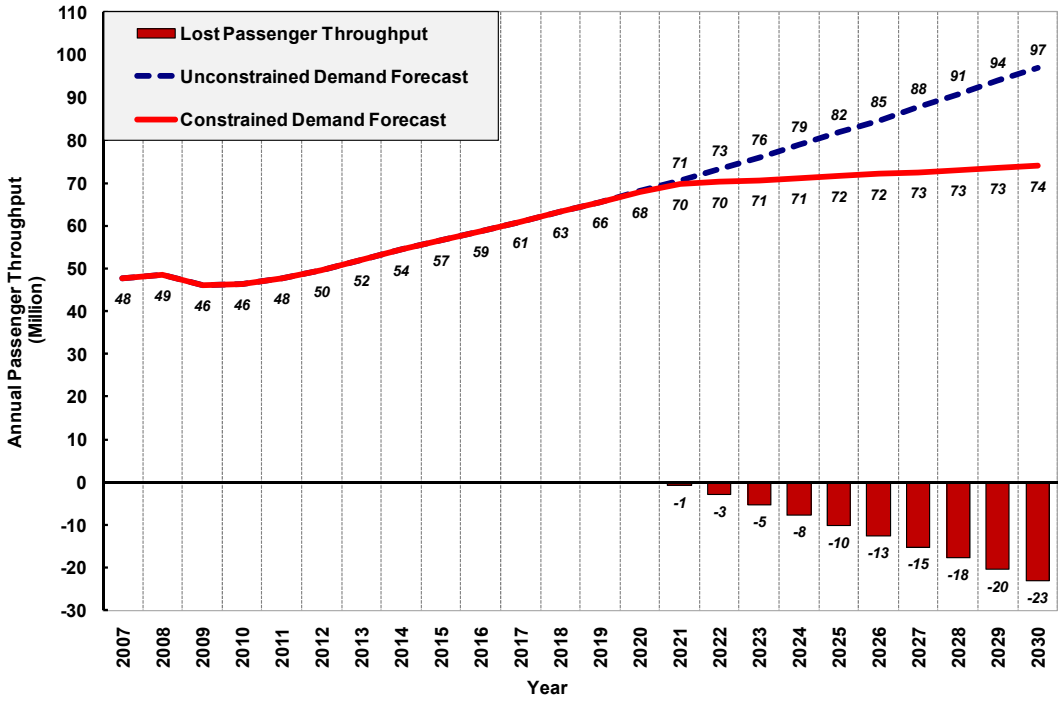
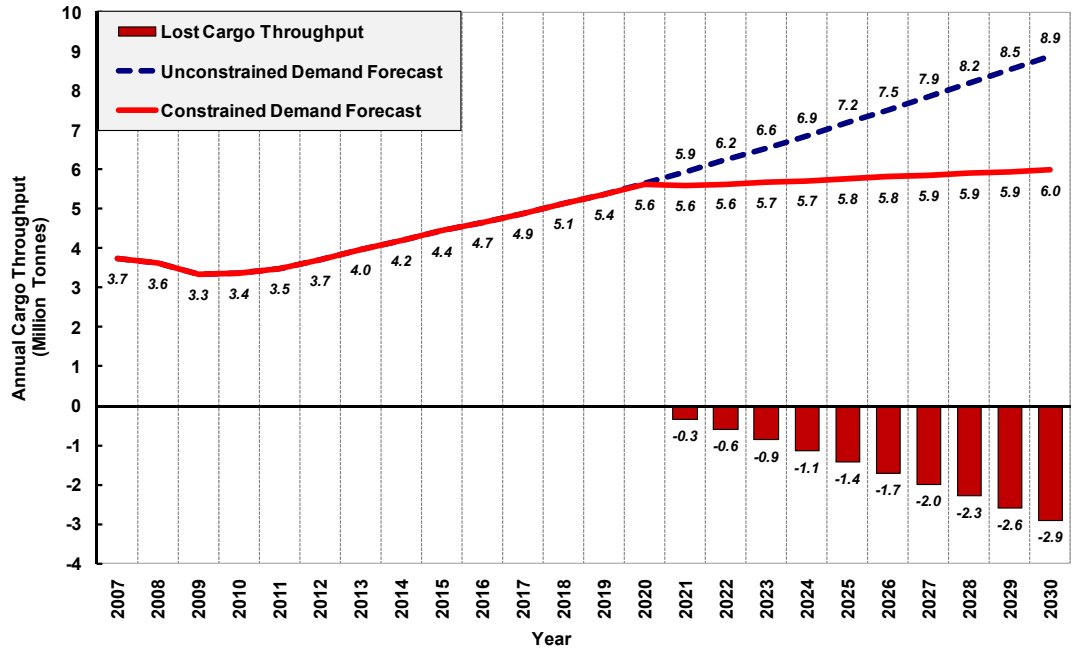


Figure 4.4 : Constrained Cargo Demand Forecast due to ATM Capacity Limit



Airport Infrastructure and Facilities Needed to Meet the Constrained Demand Forecast

Passenger Processing Terminal Requirements

4.3 Passenger processing Terminal 1 (T1), constructed as part of the original airport development in 1998, is currently one of the largest single airport terminal buildings in the world, with a total floor area of about 570,000 square metres. The passenger processing Terminal 2 (T2), with a floor area of 140,000 square metres, was built to the east of T1 in 2007. T2 is currently a departure-only terminal and is linked to the departure gates via an extension of the automated people mover (APM) system.

4.4 Airport facilities should be designed to ensure passenger safety and comfort and timely performance of airline operations even in busy periods. International Air Transport Association (IATA) defines a typical busy hour as the busiest 60-minute period on the second-busiest day in an average week during the peak month of the year (excluding special events such as religious events).

4.5 The original design capacity of T1 in the New Airport Master Plan published in 1992 was 45 million passengers per year, based on IATA's Level of Service "C" criteria. According to the IATA Airport Development Reference Manual (9th Edition 2004), the level of service can be considered as a range of values or assessments of the ability of supply to meet demand. A range of Level of Service measures from A through F may be used to allow comparison among the various systems and sub-systems of an airport. Figure 4.5 and Figure 4.6 show the Level of Service Framework and the level of service for passenger flow. Level of Service C is recommended by IATA as the minimum design objective.

Figure 4.5 : Level of Service (LOS) Framework

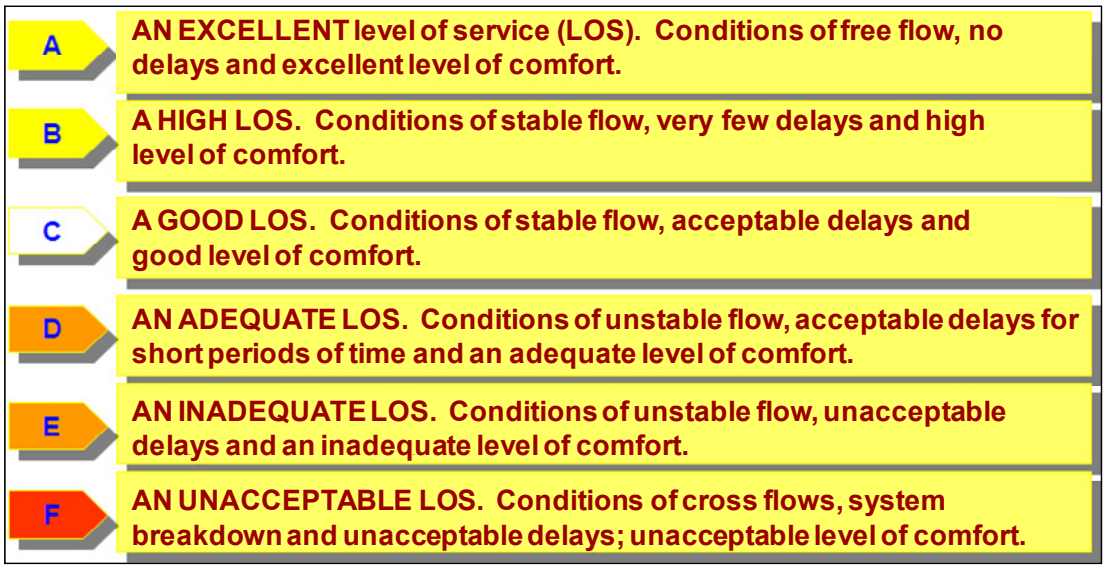
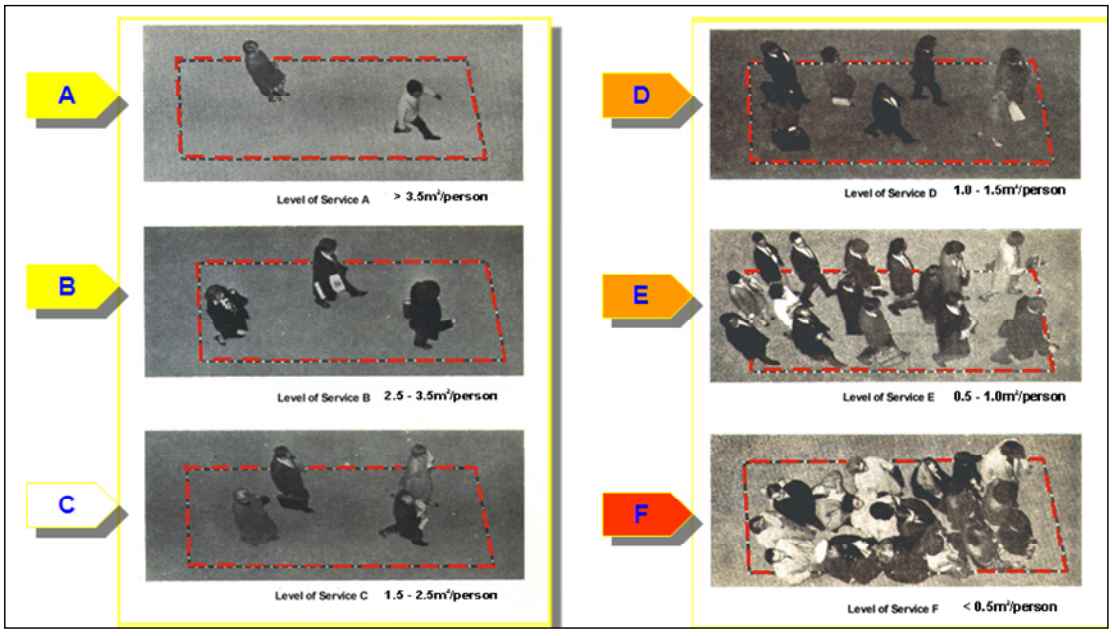


Figure 4.6 : Similar LOS Standard Used in Transportation Planning for Pedestrian Facilities



Source: John J. Fruin. 1987 Pedestrian Planning and Design, p.75

4.6 Several enhancement projects have been implemented at the airport to accommodate passenger traffic growth and maintain the facility at a high service level. Figure 4.7 shows the current handling capacity of the major passenger processing facilities at T1, after the HK$1.5 billion passenger terminal capacity enhancement work committed in 2006, and the busy hour demand for them, as forecast in the Master Plan for 2030.

Figure 4.7 : T1's Facility Capacity and Busy Hour Demand Forecast

T1 Facility	Current Capacity (including Enhancement Projects Underway)	Busy Hour Demand Forecast in 2030 (at 74 million Passengers Per Annum)
Departures		
Check-in Counters	324	342
Departures Security (Unit)	30	27
Immigration – Conventional Counters	56	52
Immigration – e-Channels	16	16
Departure Kerbside Space (Vehicle Bay)	58	66
Arrivals		
Immigration – Conventional Counters	116	110
Immigration – e-Channels	18	18
Baggage Carousels*	12	16

Note: *Excluding existing two OOG (out of gauge) baggage belts

4.7 **To meet the passenger demand forecast of 74 million passengers per annum by 2030 for the two-runway system, it will be necessary to enhance or expand the existing two passenger processing terminals**, (as illustrated in Figure 4.7 for the case of T1) to provide additional departure and arrival processing facilities for circulation, concessions and amenities to maintain the existing level of quality service for passengers.

4.8 In particular, expansion by two additional bays each to the north and south of the existing T1 building envelope (see Figure 4.8) is required to physically accommodate additional baggage reclaim carousels at the arrival level (see Figure 4.9) and create kerbside space at the departure level (see Figure 4.10). T2 will also require a fit out of the remaining space in its check-in hall to increase its check-in counters from 56 to 112.

Figure 4.8 : Proposed Expansion by Two Additional Bays Each to the North and South of the Existing Terminal 1 Building

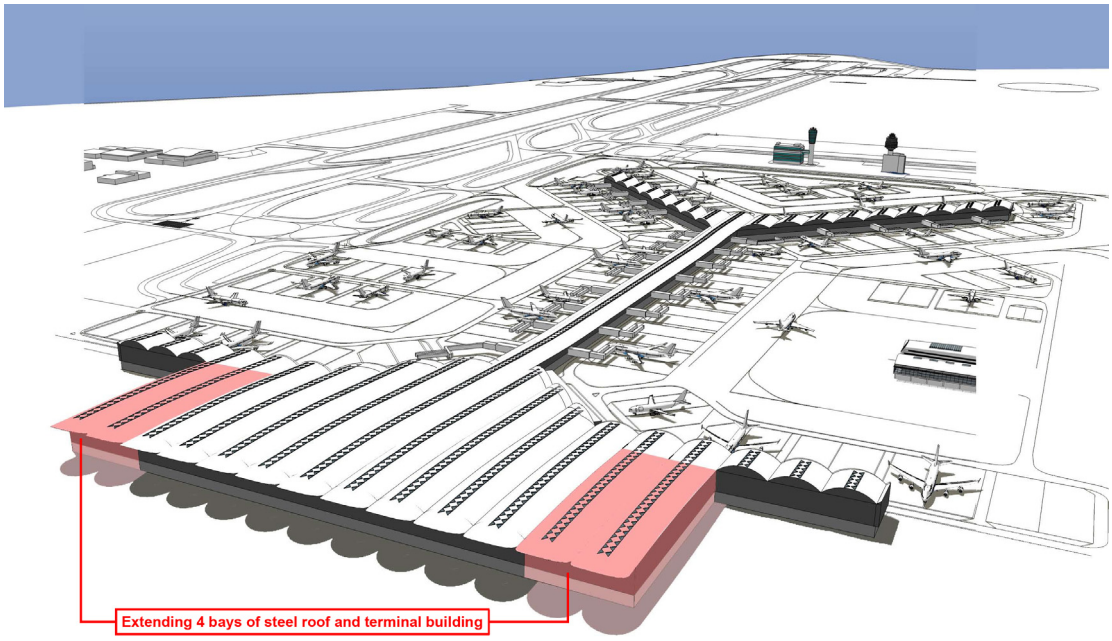


Figure 4.9 : Proposed Increase of T1 Baggage Reclaim Carousels from 12 to 16

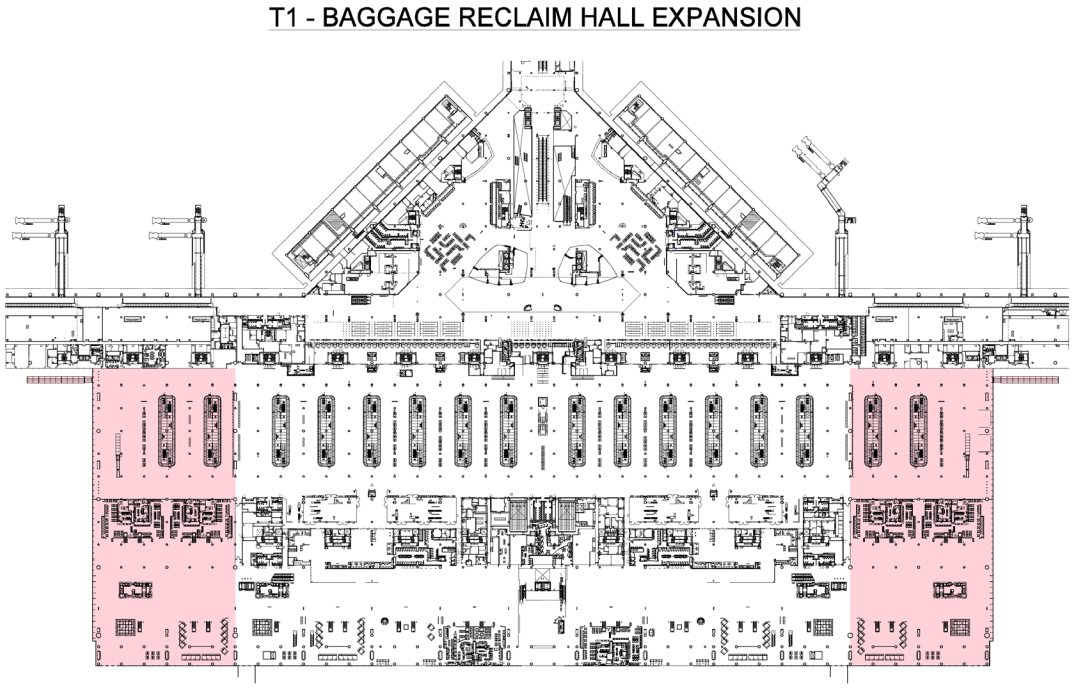
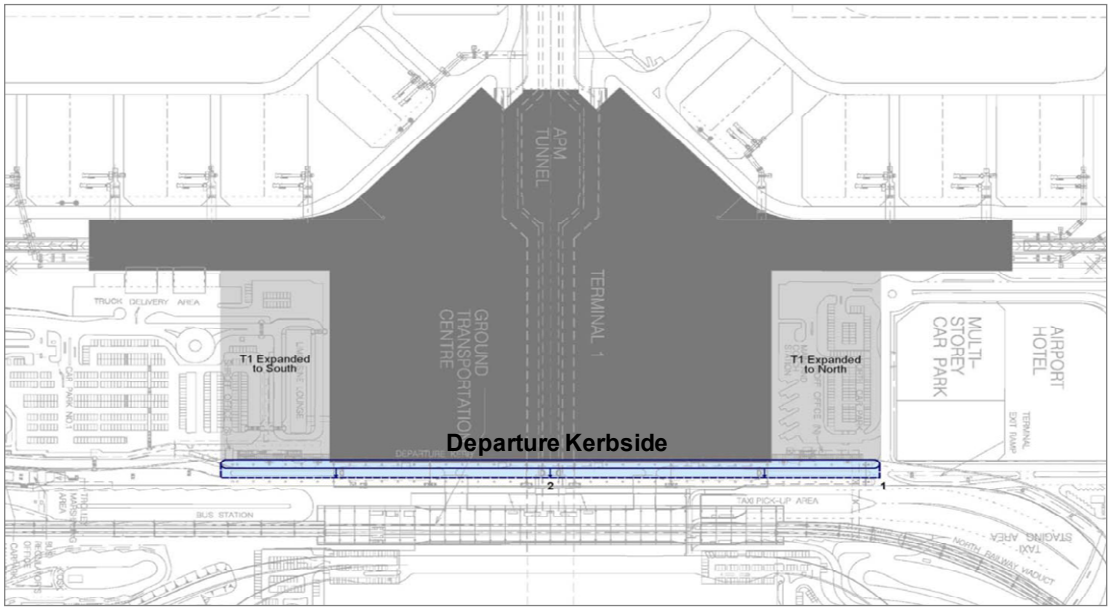


Figure 4.10 : Proposed T1 Kerbside Extension



Aircraft Apron and Passenger Concourse

4.9 Substantial progress has been made on the aircraft apron and passenger concourse development project as set out in MP2025. A significant portion of the HK$3 billion airfield facility enhancement programme announced by AAHK in 2006 has been spent on providing additional passenger and cargo aircraft parking stands capacity. These works are detailed below:

- 10 new cargo stands were opened in 2007, taking the existing Southern Cargo Apron handling capacity up to a maximum of 34 wide-bodied cargo stands; and
- A new 20,000 square-metre North Satellite Concourse (NSC) with 10 airbridge-served stands for narrow-bodied aircraft at was opened in 2010. This is in addition to T1's original passenger concourse ("Y-shaped" concourse) of 49 airbridge-served and 27 full-services remote stands, and the 11 temporary stands at the eastern end of the Midfield area.

4.10 To meet the constrained passenger demand forecast of up to 74 million passengers and 6 million tonnes of cargo per annum by 2030, a staged addition of 40 airbridge-served passenger aircraft stands and 20 cargo stands in the Midfield area will be required over the next twenty years. The first stage of development, already committed to by AAHK up to 2015, has been outlined in Chapter 3 (see paragraph 3.17). The remaining development plans for 2015 and beyond are summarised in the following section on development phasing.

4.11 AAHK's service pledge is that approximately 95% of passengers will be served via air-bridges for boarding or disembarking from the aircraft. Additionally, the distance between T1 and aircraft parked in the Midfield area makes it difficult to bus passengers between them. Passenger concourses will therefore be built in phases in the Midfield area so that all passenger aircraft stands there are eventually served by airbridges. The

existing automated people mover system (APM) will be extended to facilitate transportation of passengers from the Midfield concourses to T1 and vice versa.

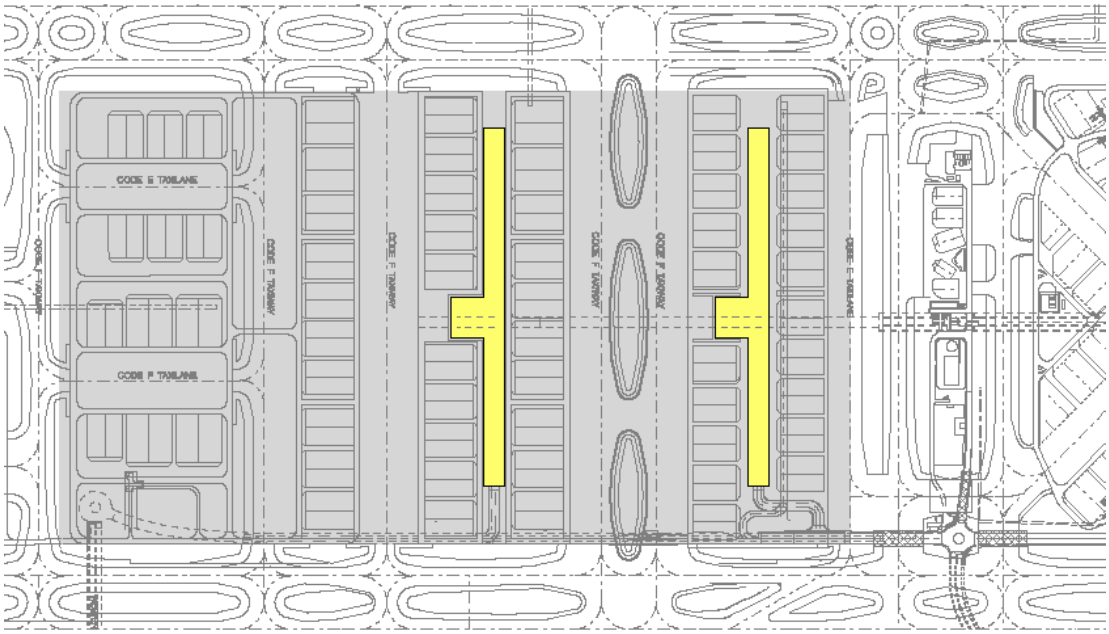
4.12 The Midfield Concept Design Study, conducted in 2008, identified how the Midfield area should be utilised for aircraft parking stands, concourses, taxiways, taxilanes, airside roads, baggage handling system, APM system and other related support facilities to meet the maximum capacity of the two-runway system. It served as an update to the previous Midfield development study namely "The Strategic Overview of Major Airport Development" (SOMAD) that was conducted in 2001.

4.13 After considering relevant performance criteria including the total number of stands provided (airbridge-served stands and remote stands for cargo), airfield operations efficiency, passenger convenience such as walking distance and way-finding within the concourse, baggage facility arrangement and location, retail performance etc., the Midfield Concept Design Study has developed a range of 14 Midfield layout options, together with preliminary construction cost estimates, for subsequent evaluation.

4.14 Amongst layout options for the **ultimate development** of the Midfield area, the "I" shaped layout (see Figure 4.11) will provide the maximum capacity in the two-runway system. The scheme includes:

- Two "I" shaped concourses providing a total of 40 airbridge-served stands; and
- 20 remote aircraft stands for freighter and aircraft base maintenance parking.

Figure 4.11 : A Possible Concept of Ultimate Midfield Development to Meet the Maximum Capacity of the Two-Runway System



Automated People Mover System

4.15 The Midfield Concept Design Study has recommended extending the existing automated people mover (APM) pinched loop system operating between T1's East Hall and West Hall to the Midfield concourse as the most efficient way to facilitate passenger flow (see Figure 4.12).

Figure 4.12 : Existing APM System Operating Between T1's East and West Halls

4.16 In parallel, the existing south tunnel will have to be extended from T1's West Hall to the Midfield area to accommodate an additional APM Shuttle System, which will provide route recovery in case passengers disembark at the wrong station and also serve as a backup in the event of a breakdown on the T1 line.

Baggage Handling System

4.17 HKIA's bag-passenger ratio is one bag per passenger and as passenger numbers increase, there will be a corresponding increase in baggage. Extensive works will be required to enhance the baggage handling system (BHS) to accommodate the higher volume and while maintaining the service standard of baggage delivery time from the Midfield concourse to T1 and vice versa. The 2008 Midfield Concept Design Study recommends the use of automated baggage transportation via a new high-speed baggage conveyance system known as Destination Coded Vehicle (DCV) (see Figure 4.13). This is to meet the following service level pledges of HKIA:

- **Arrival Bags**: Delivery of the 1st bag no later than 20 minutes, and delivery of the last bag no later than 40 minutes after the parking of the aircraft.
- **Departure Bags**: Delivery of a bag to the aircraft is within 40 minutes of closure of check-in services and before aircraft departure.

Figure 4.13 : High-speed Tray Baggage System or Destination Coded Vehicles

Source: Vanderlande Industries

4.18 Expansion of the existing baggage handling system at HKIA will comprise the following elements:

- Baggage Hall provision at the Midfield concourse to incorporate unloading docks, connections to the DCV and Midfield departure baggage handling systems, including baggage sortation system and make-up laterals;
- Extension of the existing north tunnel to link the Midfield concourse and T1 in order to install the DCV system to transport bags between the Midfield concourse and T1;
- Modifications to T1 to facilitate interface with the Midfield Concourse. An additional interface zone will need to be created for unloading bags from the DCV tunnel and transferring to conveyor feeds and reclaim carousels; and
- Additional baggage make-up laterals, which will be accommodated in the basement of the proposed four-bay expansion of T1.

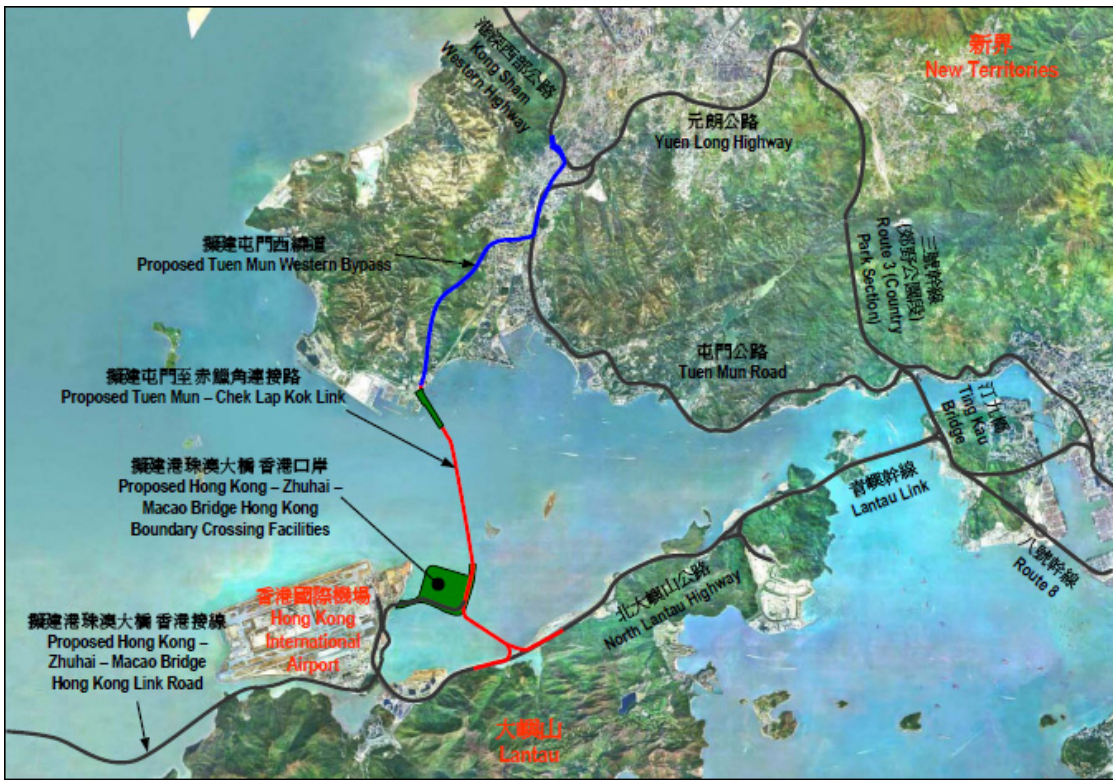
Surface Access and Transportation Facilities

4.19 Providing good surface access to and from HKIA and optimising traffic circulation within the airport island are essential for smooth airport operations. Surface access includes both land and sea transportation.

4.20 *Airport Access Road Network*

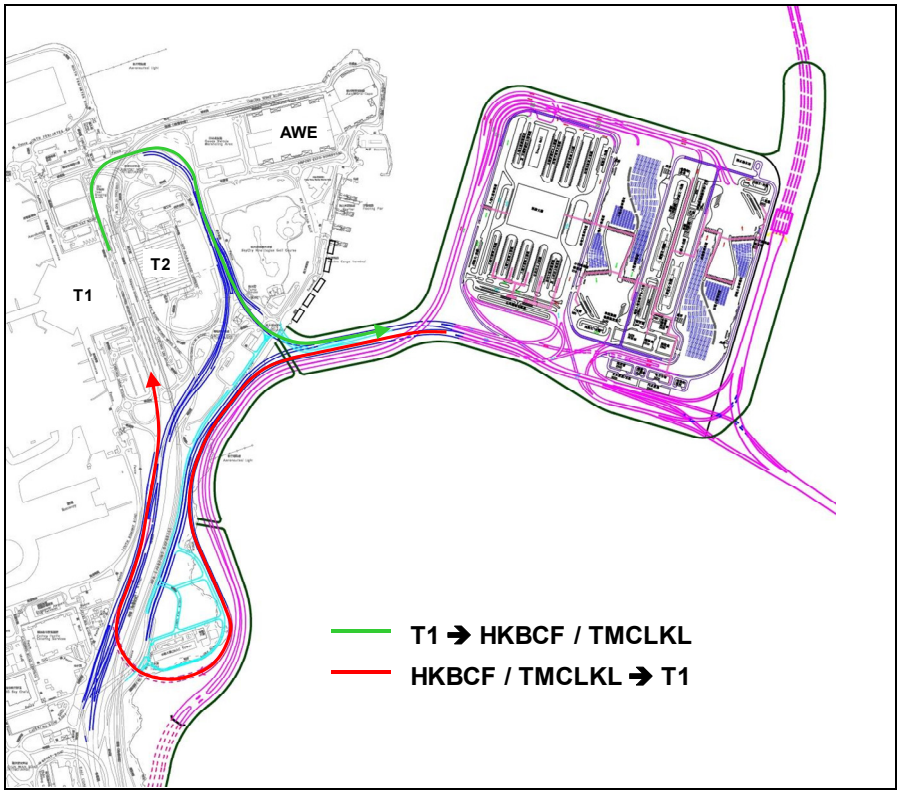
Based on the proposed road network and forecast traffic volumes, it is anticipated that the existing two access roads - Airport Road and Chek Lap Kok South Road, which connect to the North Lantau Highway - together with the planned third access road from Tuen Mun to the airport via the Tuen Mun-Chek Lap Kok Link (TMCLKL) and Hong Kong Boundary Crossing Facilities (HKBCF) – will provide sufficient road traffic capacity up to 2030. HKIA's accessibility from western PRD will be greatly enhanced when the Hong Kong-Zhuhai-Macao Bridge (HZMB) and HKBCF become operational around 2016. In addition, TMCLKL will provide a back-up route in case the Tsing Ma Bridge or North Lantau Highway is blocked (see Figure 4.14 and Figure 4.15).

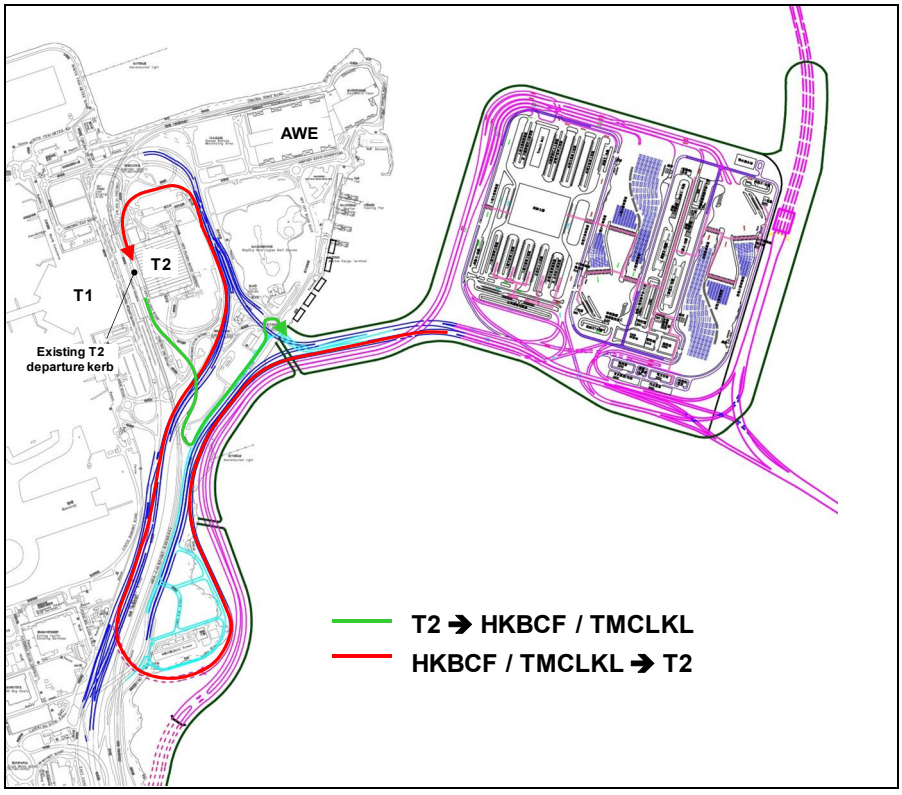
Figure 4.14 : Indicative Layout of HZMB and TMCLKL Transportation Network



Source: Highways Department (March, 2011)

Figure 4.15 : Road Connections to and from the Airport via HKBCF/TMCLKL for Two-Runway Option





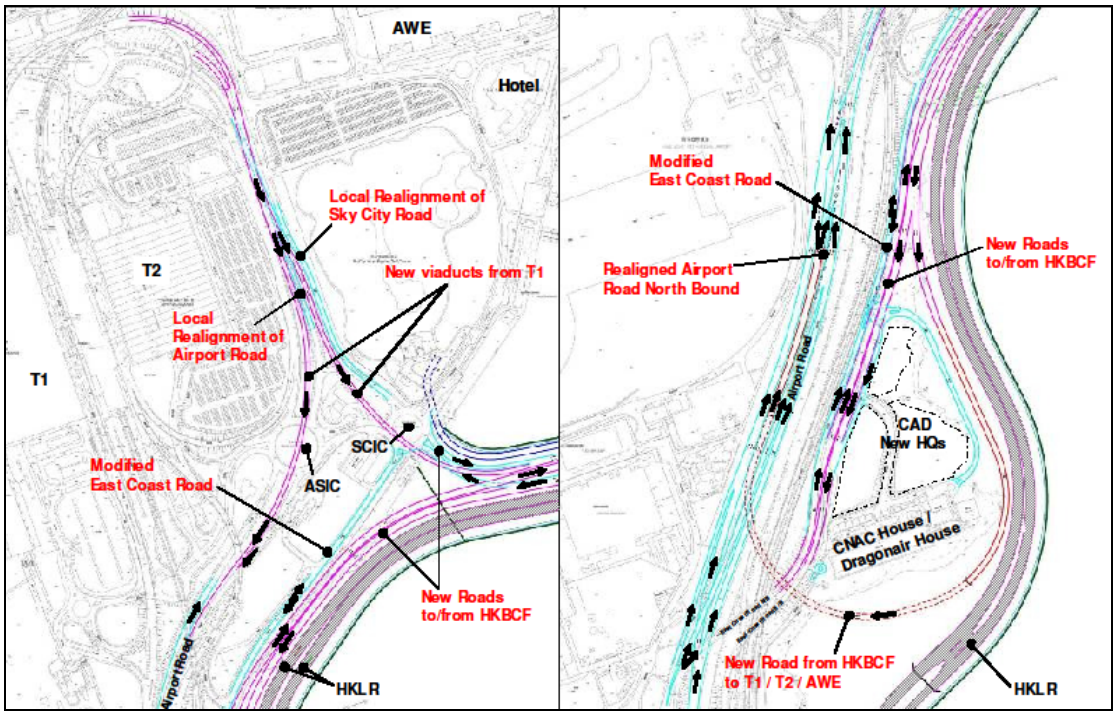
4.21 *Passenger Terminal Area Road Network*

The road system in the Passenger Terminal area will be modified in line with the expected increase in origin/destination passenger throughput. Elevated viaducts will be added to Airport Road to divert exit traffic from the passenger terminals from the current interchanges at grade, resulting in speedier access to either the North Lantau Highway or TMCLKL via HKBCF while simultaneously helping alleviate congestion along the Airport South Interchange (ASIC) and SkyCity Interchange (SCIC) (see Figure 4.16).

4.22 There will be new at-grade roads and tunnels for inbound traffic to passenger terminals, and existing roads on the airport island will be modified to increase the capacity of the passenger terminal access roads via the HKBCF (see Figure 4.16).

4.23 Other road improvement works that will be carried out in the passenger terminal area include the widening of Cheong Lin Road south of T1 to accommodate increased bus traffic and the widening of SkyCity Road East to serve additional airport and Asia World-Expo (AWE) traffic.

Figure 4.16 : Road System in the Vicinity of the Passenger Terminal Area



Transportation Facilities/Services

Figure 4.17 shows the proposed transportation facilities in the T1 and T2 area. The facilities include:

4.24 *Buses, Coaches, Limousines and Taxis*

The existing private car and hotel vehicle pick-up area south of T1 will be relocated and integrated into a multi-storey complex, built on the remainder of Car Park 1 that has not been taken up by the southward expansion of the T1 building's footprint (see Figure 4.17). The taxi pick-up area, taxi staging area and franchised bus terminus will remain at the same location, serving both T1 and T2. However, a project is underway to expand the existing franchised bus terminus which is expected to be completed in 2011.

4.25 *Car Parking*

The existing car parks are not fully utilised on a normal day. However, during holiday and seasonal peaks, significant surges in car parking demand have been experienced, almost reaching the total capacity of the existing car parks in the Passenger Terminal area (about 4,000 spaces in total). To cater for a 50% increase in passenger volume beyond 2020, it is estimated that 2,000 additional car parking spaces will be required. The development of two multi-storey car parks adjacent to T1 and T2 is expected to accommodate the additional car parking demand by 2020, including the re-provision of about 800 existing at-grade car parking spaces affected by the development of the multi-storey car parks (see Figure 4.17).

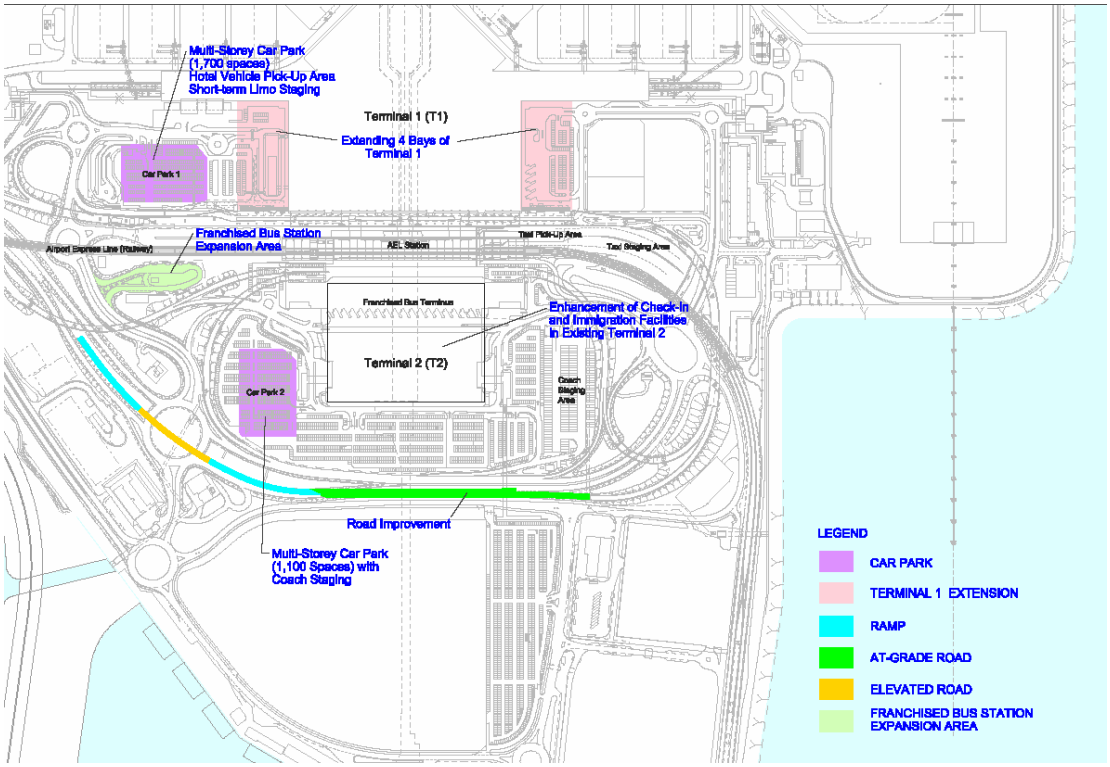
4.26 *Coach Staging*

The existing coach staging area north of T2 provides 150 spaces. This facility will be retained and designated for future use as a short-stay coach staging area. Further spaces will be provided on the lower levels of the new multi-storey car park complex to be built south of the existing T2 building, and will be allocated for longer stay and overflow coach staging. It will also be used as a taxi and limousine staging area, taxi/light goods vehicle parking area and pre-booked taxi pick-up area.

4.27 *Airport Express Line*

The Airport Express Line (AEL) has been designed to operate with up to nine passenger cars (giving each train a capacity of 572 seats) and a baggage car at a seven-minute headway, which is equivalent to 8.5 trains per hour running via Tsing Yi to the Airport section of the line. This gives a maximum AEL capacity of around 4,850 passengers per hour per direction. It is believed that AEL can expand its service levels to accommodate the anticipated increase in AEL passenger volume due to the broader expansion of the Hong Kong rail network.

Figure 4.17 : Proposed Transportation Facilities near T1 and T2



Cross-Boundary Multi-modal Transportation Services

4.28 *SkyPier Terminal*

The 16,500 square-metre SkyPier Terminal was opened in January 2010 to process the air-sea inter-modal transfer of HKIA passengers to and from cities in the PRD and Macao. It has an ultimate design handling capacity of 8 million passengers per annum, with an underground APM link to transfer passengers between the SkyPier Terminal and T1.

4.29 With more than 110 scheduled sailings a day, the SkyPier ferry services offer comprehensive coverage of the GPRD, including Macao (see Figure 4.18). Subject to traffic, SkyPier can operate eight berths (four at present) to support its maximum capacity of 8 million annual passengers.

Figure 4.18 : Ferry Network

4.30 *Airport Coach and Limousine Services*

Cross-boundary coach services cover about 115 destinations in major PRD cities and towns with 109 scheduled coach departures from T2 Coach Hall per day. Airport coach licensees have continuously run a hub-and-spoke connection with town coach operators at Mainland boundary-crossing points to increase coverage of and frequencies to PRD destinations.

4.31 The cross-boundary limousine service has also become increasingly popular, with the number of limousines serving the airport increasing to 290 vehicles, providing about 600 round-trip services between HKIA and PRD cities daily (see Figure 4.19).

Figure 4.19 : Coach and Limousine Services Network

4.32 *Hong Kong-Shenzhen Western Express Line*

The Hong Kong–Shenzhen Western Express Line (WEL), which is currently under feasibility study by the Government, includes a terminus at HKIA (either on the airport island or at the HKBCF). The potential alignment currently under evaluation is indicated in Figure 4.20.

4.33 The proposed WEL is intended to be a multi-function cross-boundary railway with the following objectives:

a) To provide convenient services for air passengers of the two locations, i.e. HKIA and Shenzhen Airport;

b) To provide cross-boundary travellers with environmentally friendly and efficient railway services between Hong Kong and Shenzhen; and

c) To facilitate the development of northwest New Territories in Hong Kong and Qianhai in Shenzhen.

Figure 4.20 : Potential Hong Kong-Shenzhen Western Express Line (WEL) Alignment

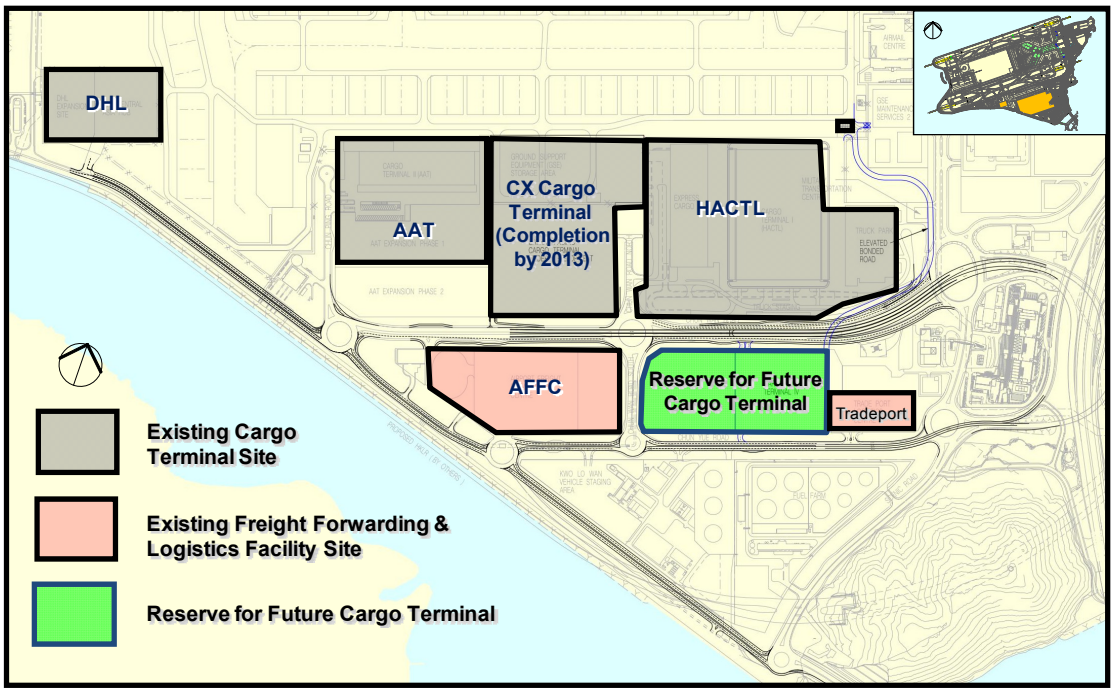
Aviation Support Facilities and Infrastructure

4.34 *Cargo Terminals*

The three existing cargo terminals (namely HACTL, AAT and DHL) and the upcoming Cathay Pacific Cargo Terminal will offer a total design capacity of around 7.4 million tonnes per annum. These four cargo terminals are expected to be able to handle the constrained forecast growth, capped at around 6 million tonnes per annum beyond 2020 due to aircraft movement limitations on the two runways. However, more flexibility may be needed in cargo terminal capacity planning to respond to market dynamics that might impact operating efficiency (e.g. 100% cargo screening may be required for all freighter operations on a piece-by-piece basis at the cargo terminal), create more competition, and/or create specialised services in the future.

4.35 Based on feedback from the cargo industry that cargo terminals should be located together for the operational efficiency of freight forwarders and truck drivers, it is prudent that some land be reserved in the Southern Cargo Precinct to construct an additional (fifth) cargo terminal with links to the airside as well as the cargo stands as illustrated in Figure 4.21 (shaded in green).

Figure 4.21 : Layout of the Southern Cargo Precinct

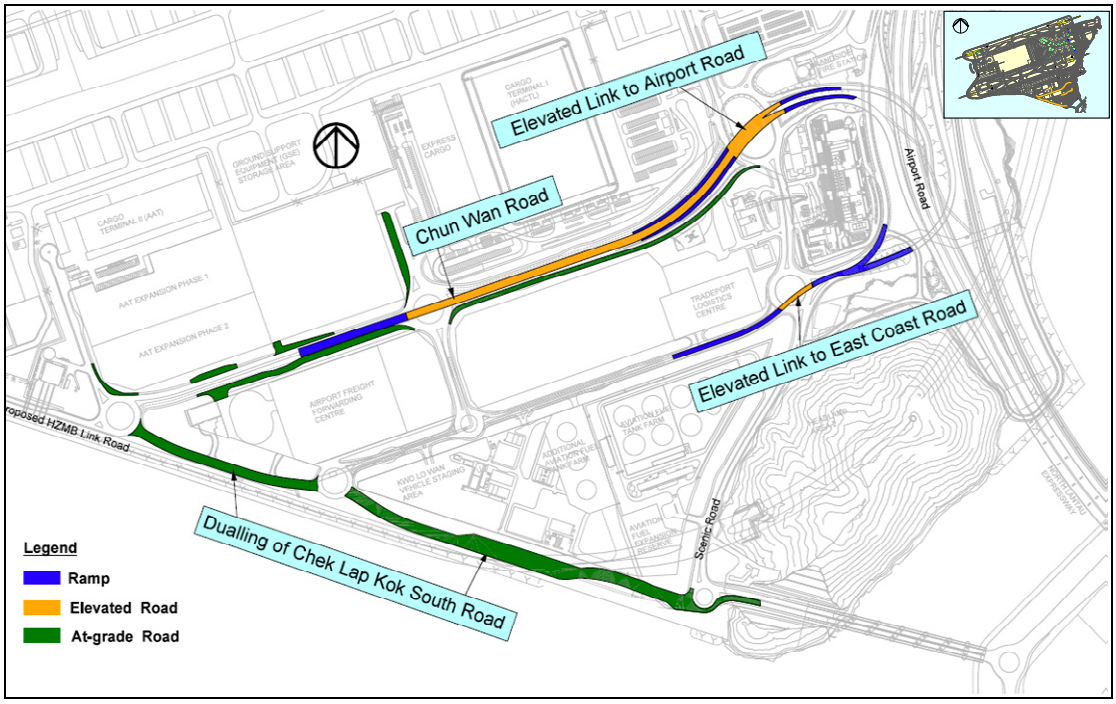


4.36 *Cargo Terminal Area Road Network*

The road system in the Southern Cargo Precinct will be modified in line with the expected increase in the cargo terminals' throughput by adding elevated road links to both Chun Wan and Chun Yue roads to divert through-traffic from the at-grade

interchanges; widening at-grade sections of Chun Wan and Chun Yue roads, and converting Chek Lap Kok South Road to a dual carriageway (see Figure 4.22).

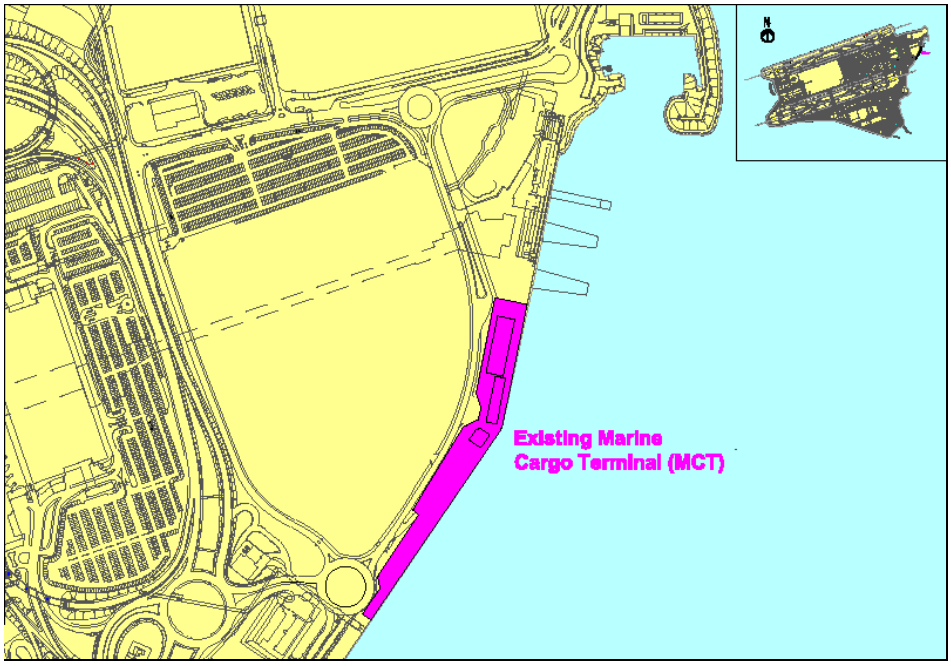
Figure 4.22 : Proposed Road Improvements in the Southern Cargo Precinct



4.37 *Marine Cargo Terminal*

The Marine Cargo Terminal (MCT) is a component of aviation logistics services at HKIA offering one-stop air-sea inter-modal transportation services connecting HKIA with 18 ports in the Pearl River Delta (PRD) region. The role of the MCT is to facilitate cargo distribution and provide an alternative mode of transportation between PRD and HKIA. The tonnage throughput of the MCT has been expanding at a CAGR of 24% since 2002 and was about 93,000 tonnes in 2010. The existing MCT site (see Figure 4.23 for its location) has the capability to handle marine cargo demand in the medium term. However, given the changes to HKIA landscape after the planned commissioning of HZMB and TMCLKL around 2016, the future development needs of the MCT and its most suitable location will be further reviewed in due course.

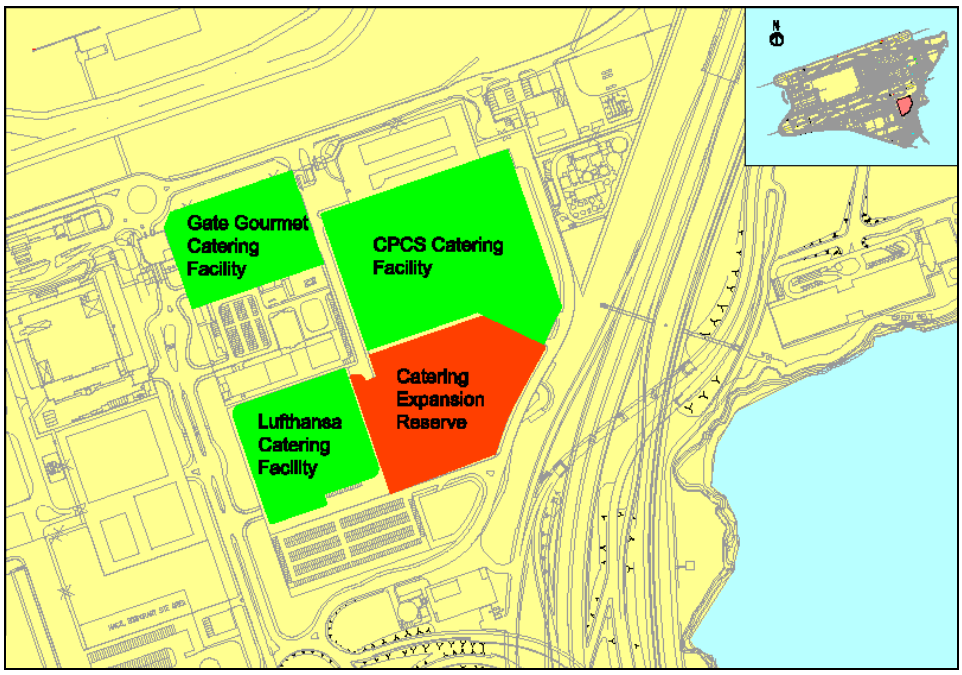
Figure 4.23 : Existing Location of Marine Cargo Terminal (MCT)



4.38 *Aircraft Catering*

The demand for space for aircraft catering facilities (to prepare airline meals) is declining due to the trend of supplying "pre-packed frozen food". While HKIA is not expected to require additional aircraft catering facilities, space is available in the existing aircraft catering precinct if needed. Figure 4.24 illustrates the land area reserved for the expansion of aircraft catering facilities.

Figure 4.24 : Land Reserved for Catering Facilities



4.39 *Aircraft Maintenance*

Currently, there are two aircraft base maintenance operators at HKIA: Hong Kong Aircraft Engineering Company Limited (HAECO) and China Aircraft Services Limited (CASL). With the second phase of HAECO's third hangar coming into operation by 2015, the capacity of aircraft base maintenance at HKIA will reach about 4.2 million man-hours per annum.

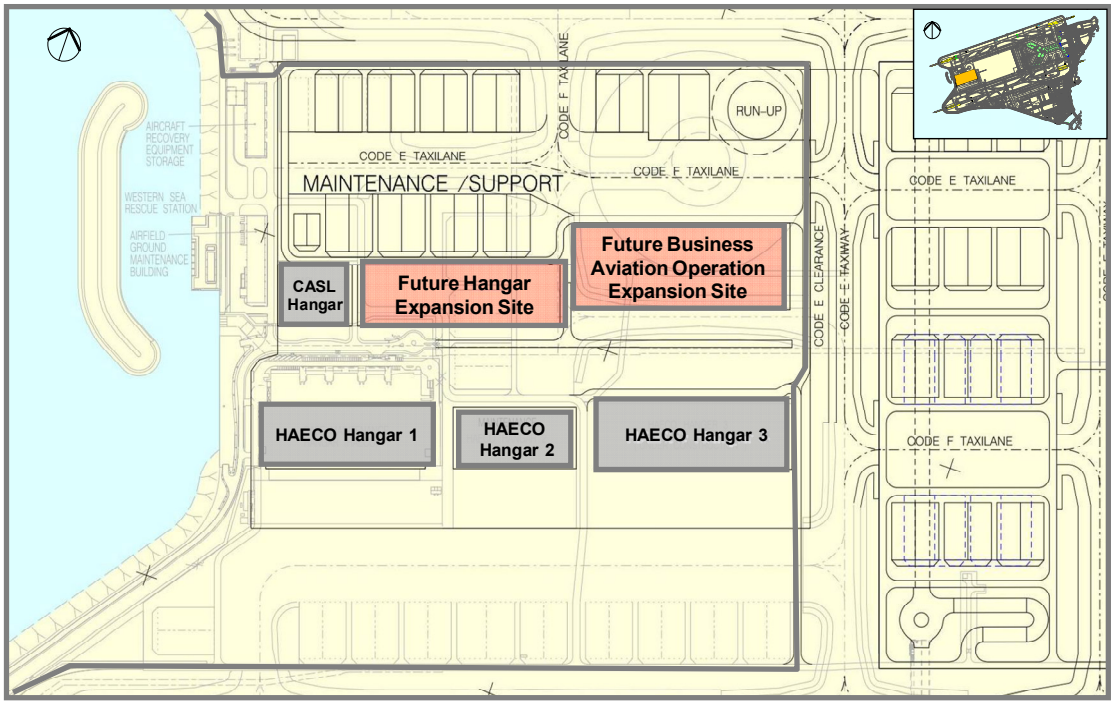
4.40 Demand for aircraft base maintenance is driven not just by projected aircraft movements at the airport, but also by airlines' commercial considerations, and competitiveness of aircraft base maintenance operators around the world. Some areas have been reserved for maintenance hangars (see Figure 4.25).

4.41 *Business Aviation Centre*

The Mainland's economic growth will fuel both business and leisure demand for business jet travel. Hong Kong is geographically well positioned to gain from the increase in business aviation. Business jet movements for 2009, recorded at over 4,000 movements, represented 1.5% of total aircraft movements. This is forecast to increase in line with total aircraft movement growth.

4.42 Subject to market demand, for possible development in future, an area for a second business aviation facility has been earmarked at the western end of the Midfield area, with convenient access to both the aircraft parking apron and the approach roads to and from the airport (see Figure 4.25).

Figure 4.25 : Reserved Area for Hangar, Maintenance Facilities and Business Aviation



4.43 *Ground Support Equipment Maintenance*

Ground support equipment (GSE) maintenance services are provided by two operators located adjacent to the flight catering complex, namely, Ground Support Engineering Ltd (GSEL) and Dah Chong Hong – Dragonair Airport Services. They provide maintenance and support to the following categories of equipment:

- Powered equipment such as tugs, pallet loaders, tractors, buses, catering trucks, etc.;
- Non-powered equipment such as dollies, trailers, generators and mobile stairs; and
- Baggage and cargo containers for use on aircraft, such as the Unit Load Device (ULD).

4.44 GSE maintenance activities are forecast to grow in line with the growth in the number of aircraft stands. These are undertaken for heavy specialised equipment and other equipment that cannot travel on public roads, and usually take place on-airport, with direct access to the airside. Some component parts of the GSE may be repaired/refurbished at specialised off-airport facilities if required.

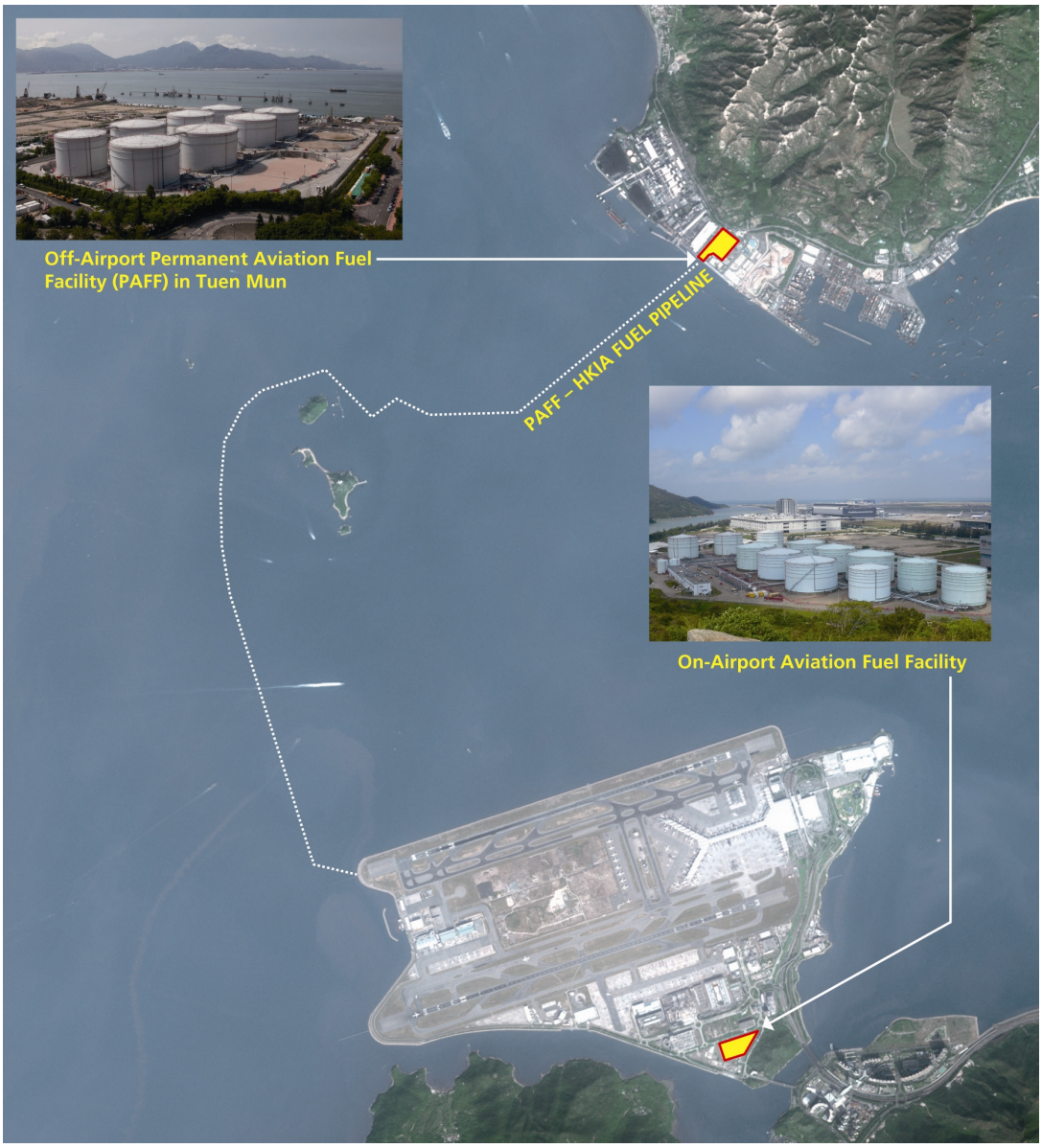
4.45 As demand for space at existing GSE facilities increases, more work could be outsourced by trucking equipment (e.g. ULDs and non-powered equipment) off-airport or by component removal and shipping to specialist repairers. This would significantly augment the capacity of existing GSE maintenance facilities to cope with the expected increase in repair-related services.

Aviation Fuel Facilities

4.46 There are currently 12 aviation fuel storage tanks on the airport island, with a total storage capacity of 223,000 cubic metres. This facility occupies an area of 71,000 square metres. Currently, the HKSAR Government requires a minimum of 11 days' supply of aviation fuel to be maintained as reserve.

4.47 To ensure that the minimum reserve requirement is met as traffic grows, the storage capacity for aviation fuel was expanded when the Permanent Aviation Fuel Facility (PAFF) at Tuen Mun Area 38 came into operation in 2010. It consists of eight aviation fuel storage tanks providing a storage capacity of 264,000 cubic metres. Together with the on-airport fuel storage tanks, these facilities provide a total capacity of 487,000 cubic metres, which is adequate to support the two-runway system operation at maximum capacity. PAFF has safeguarded space for four additional fuel storage tanks, which would be built subject to future aviation fuel demand.

Figure 4.26 : Aviation Fuel Facilities of HKIA



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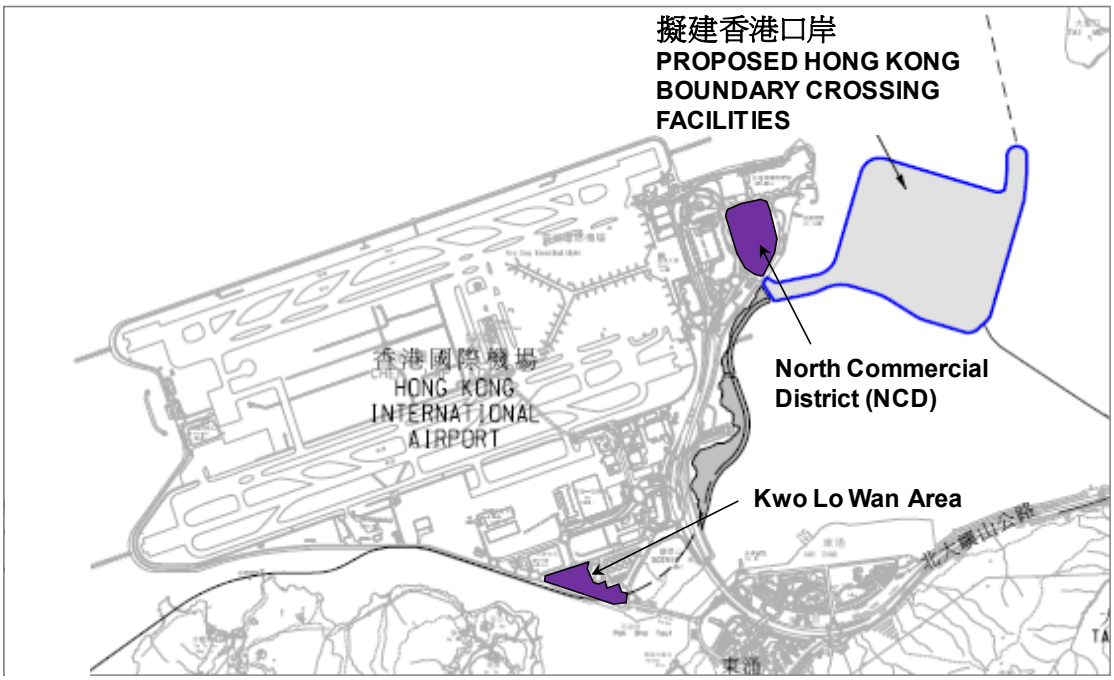
Airport Related Development

4.48 Given the scarcity of land on the existing airport island, airport related development planning will be subject to a detailed business case analysis, conducted in accordance with the Airport Authority Ordinance (Cap 483). This Ordinance stipulates that the Airport Authority must operate and develop HKIA with the objective of maintaining Hong Kong's status as a centre of international and regional aviation, conducting its business according to prudent commercial principles and paying particular regard to safety, security, economy and operational efficiency.

4.49 AAHK would like to explore opportunities arising from the enhanced connectivity between the airport and the Pearl River Delta (via the HZMB and TMCLKL). To this end, consultants have been appointed to evaluate the landside commercial opportunities associated with the airport city and the Hong Kong Boundary Crossing Facilities'

bridgehead economy. The scope covers land in both the North Commercial District of HKIA and its neighbourhood including Tung Chung, North Lantau and Northwest New Territories, (i.e. the wider airport region) and consultation with and incorporating input from relevant Government bureaux and departments. This would form the basis of developing an integrated development strategy for the North Commercial District (see Figure 4.27) on the airport island, which is being temporarily used as a golf course at the moment.

Figure 4.27 : Location of North Commercial District and Kwo Lo Wan on the airport island



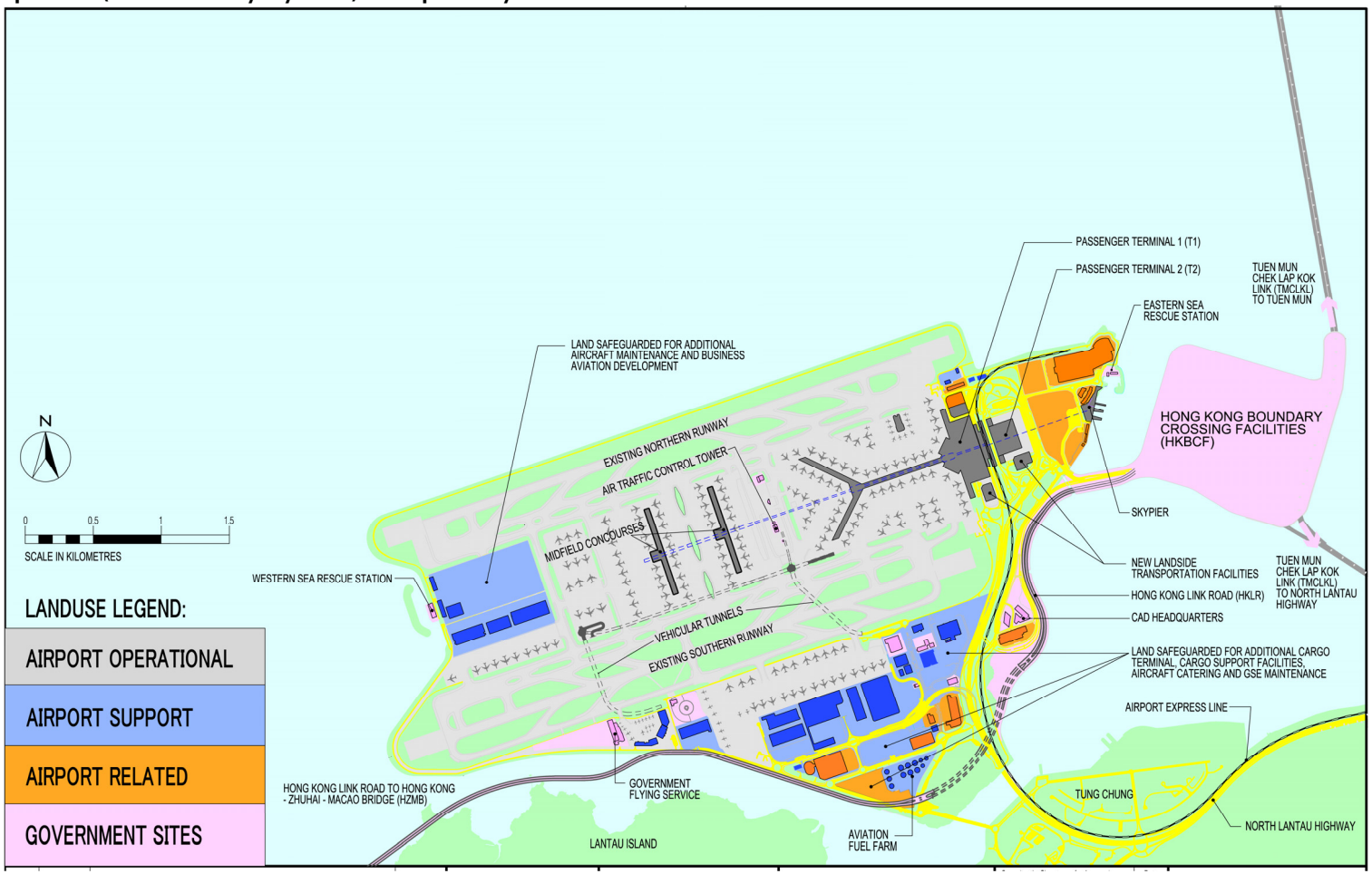
4.50 Apart from the North Commercial District, the existing Southern Cargo Precinct has reserved approximately five hectares of land at the Kwo Lo Wan site (see Figure 4.27) for airport related development to support air cargo operations. This may include facilities like:

- A centralised common-use cargo screening facility to facilitate the implementation of air cargo screening as mandated by civil aviation authorities (e.g. US Transport Security Authority's requirement to screen all air cargo going on board passenger aircraft to USA);
- A common-use truck parking facility to reduce road and cargo terminal congestion; and
- More freight forwarding facilities to undertake timely consolidation and breakdown, as well as collection and distribution of airfreight.

Government Sites

4.51 The current and planned government facilities on the existing airport island are considered adequate to support the eventual capacity of the two-runway system. Figure 4.28 shows the layout of HKIA under Option 1.

Figure 4.28 : Option 1 (Two-Runway System) – Airport Layout Plan in 2030



Definitions:

1) Airport Operational Development (AOD) refers to operational facilities such as the runways, taxiways, parking aprons, passenger processing terminals and passenger concourses, ground transportation centre and vehicle parking spaces, etc.

2) Airport Support Development (ASD) refers to support facilities such as cargo terminals, aircraft maintenance and engineering, aircraft catering, ground services equipment maintenance, aircraft fuelling, etc.

3) Airport Related Development (ARD) refers to commercial facilities such as freight forwarding, hotels, offices, retail and exhibition centre, etc.

4) Government Sites refer to Government facilities such as the Government Flying Service (GFS), the Headquarters Building of Civil Aviation Department and the Air Mail Centre, etc.

Preliminary Engineering Feasibility

4.52 To explore the two-runway system option, preliminary engineering feasibility was conducted which focused on reviewing and establishing the 'hardware' requirements for meeting the forecast traffic demand up to 2030. With input from the consultants, airport community, professionals and management experts, the requirements were translated into feasible engineering options and implementation plans. The technical challenge was achieving seamless integration between the existing and new facilities/systems, while factoring in elements like capacity optimisation, maintaining system robustness, compliance with safety and other statutory requirements, maintenance and product obsolescence, etc. Specific areas that have been examined under the two-runway option include passenger terminals/concourses, automated people mover (APM), baggage handling system (BHS) and access infrastructures. The following paragraphs summarise the developments required for each specific area.

Airfield and Apron Works

4.53 Preliminary designs have been prepared for the airfield and apron which cover pavement construction, drainage, utilities, firefighting systems, aviation fuel system, airfield ground lighting, apron systems, and airside roads. The grading of the new airfield and apron will meet CAD and ICAO requirements and can be matched with the existing airport. It is proposed to use flexible pavement construction for the taxiways and taxilanes and rigid pavement for the aircraft parking stands. The tributary stormwater drainage and oil separation systems should be similar to the existing system at the airport.

4.54 Since the Midfield is bounded on all four sides by operational taxiways the only regular means of access will be via the eastern and western vehicular tunnels. The vehicular ramp that currently provides access to the temporary stands (T-stands) from the eastern vehicular tunnel will be reprofiled and extended to give access to the Midfield concourses and its aprons. For the western vehicular tunnel, a new access ramp will be constructed at both ends of the existing tunnel structures underneath the South Runway. These preliminary designs have taken into account the requirements of the CAD and Hong Kong Observatory (HKO) facilities.

Passenger Processing Terminal and Concourse Development

4.55 *Expansion of Terminal 1 (T1)*

Under the two-runway option, the expansion requirements for T1 are driven by the increasing demand for baggage handling capacity. This breaks down into:

- Additional baggage make-up capacity; and
- Additional arrivals baggage reclaim capacity.

4.56 The expansion of the baggage hall provides a potential addition of 24 make-up locations. This incorporates the plan for an imminent expansion and reconfiguration of the central island of the baggage hall.

4.57 The demand analysis for the arrivals system suggests that eventually a total of 16 carousels will be needed. This number can be fitted into T1 if the building is extended by

six 12m grids to both the north and the south. This can be achieved with the relocation of the existing Out Of Gauge (OOG) reclaim conveyor lines (for oversize and odd-size baggage) and the inclusion of four carousels. The interim arrangement for carousel sharing will further increase the capacity of the baggage reclaim facility in the medium term, generating some extra time for long-term planning and expansion projects.

4.58 Expansion by means of two additional bays each to the north and the south of the existing T1 building envelope will be needed in order to physically accommodate four additional baggage reclaim carousels at arrivals level and to provide more kerbside space at departure level (see Figures 4.8 - 4.10).

4.59 *Expansion of Midfield Concourse*

A second "I"-shaped passenger concourse parallel to the Midfield concourse currently under design will be built. The "double I" concourse layout is one of the many options studied that have taken into consideration the alignment with the two runways and T1, cross field access to the two runways, and the flexibility and feasibility of phased construction over a long time span of 15 years to maintain a high level of services to satisfy the forecast demand. The second concourse will provide an additional 20 airbridge-served passenger aircraft stands. Together with 20 remote aircraft parking stands for freighters to be built at the extended apron, the expansion can meet the constrained demand of up to 74 million passengers and 6 million tonnes of cargo by 2030.

4.60 The planning of the second concourse as well as the facilities for interfacing with T1 not only have to address the main passenger arrival and departure flows but also various transfer, route recovery, and backup scenarios. Figure 4.31 shows the layout of the second "I" concourse.

Automated People Mover System

4.61 The key criteria to be considered in the concept design of the APM System are to:

- Maintain airport protocol for passenger segregation and security;
- Ensure a convenient means of route recovery between the Midfield Concourse and T1;
- Meet normal mode passenger flow requirements;
- Provide an acceptable level of service at degraded operation mode; and
- Take into full account the APM station platforms and vertical circulation elements for peak design flows in various design years.

4.62 The proposed APM system to the Midfield concourse from T1 will consist of two lines and a depot:-

T1 Line Extension

For the T1 line extension, an important design factor is the possible simultaneous arrival of large size aircraft at both the Midfield and West Hall. In this case, the configuration would result in peak-within-peak periods where the APM is filled up at Midfield and passengers are unable to board at the West Hall in T1. To resolve this, either the train

could be so configured that some doors do not open at the Midfield to make empty carriages available when the train arrives at the West Hall, or the number of passengers moving down to the platforms by escalators at the Midfield concourse and/or West Hall could be monitored. Provision for both is allowed in the design for providing future flexibility of operations.

Another important factor while determining fleet size and headway is the platform clearance time required at the East Hall arrival platform for alighting passengers. The chosen solution has to ensure that passengers alighting at the East Hall will be cleared before the next train arrives.

Route Recovery Line

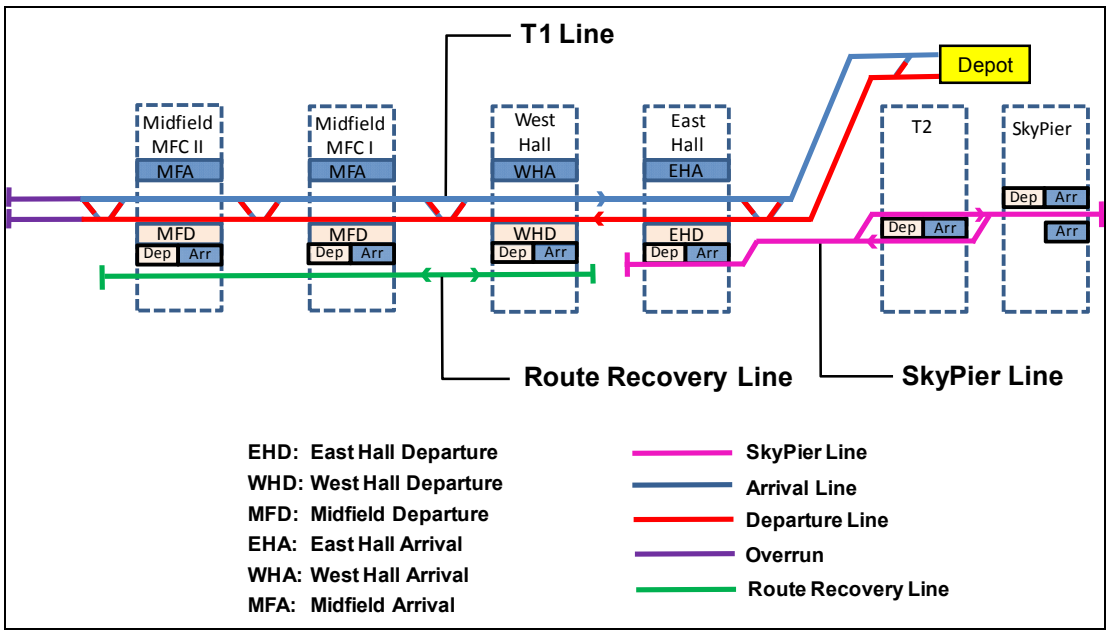
APM technology will also be deployed for the Route Recovery Line. The Route Recovery Line will be connected with the T1 system at the west of the Midfield concourse. As the expected demand for route recovery is not high, a two-car train would normally be sufficient. The Route Recovery Line running in a single shuttle configuration would also be used as a backup system to supplement the capacity of the T1 main line in the event of T1 line failure.

The proposed APM track schematics are presented in Figure 4.29.

APM Depot

With the completion of two passenger concourses in the Midfield area by 2030, HKIA would require an ultimate APM fleet size of approximately 68 cars to handle its maximum annual throughput of 74 million passengers. The existing underground APM depot beneath T2 will be relocated to the east of T2, and sized to accommodate the ultimate APM network capacity. Construction may however be completed in phases.

Figure 4.29 : APM Track Schematics



Baggage Handling System

4.63 The baggage handling process flows have been translated into technology concepts in co-ordination with wider terminal and airfield planning activities. Schematic layout concepts have been developed, drawing on previous work undertaken within the baggage handling system (BHS) master plan, the baggage handling system upgrade and enhancement project, as well as other reviews conducted by AAHK.

4.64 The development of the BHS concept is based on a number of key requirements/assumptions summarised below:

- The baggage system (T1/Tunnel/Midfield) will be capable of handling all bags that are currently handled by the T1 system;
- Out of gauge (OOG) and non conveyable bags will be handled by separate processes consistent with the current T1 system;
- All check-in counters within T1 and T2 will be able to service all airlines and flights departing from Terminal 1 and the Midfield Concourse – subject to the constraints within the current system;
- Other baggage input points (in-town check-in, transfer input docks, etc.) will be able to service all airlines and flights;
- All arrivals reclaim devices at T1 will be able to receive bags from flights arriving at both Midfield Concourse and T1;
- Make up positions will be based on single tier laterals which can accommodate up to a tug and six dollies;
- Transfer offload docks will be based on being able to accommodate up to a tug and six dollies;
- Transfer offload docks will be based on an assumed offload rate of 20 bags per minute;
- All transfer bags will be unloaded from containers at their point of flight arrival i.e. T1 or Midfield Concourse;
- The key customer service metrics are:

  - Check-in close out time (40 minutes)
  - Minimum connecting time (50 minutes)
  - First bag/last bag on arrivals reclaim (20 and 40 minutes)
- Early bag store (EBS) release will typically occur 2 hours 20 minutes before the Scheduled time of departure (STD) – based on make up positions being open at 2 hours 30 minutes before STD. Variations on this may occur to optimise the EBS/make up provision on a flight by flight basis;
- To allow optimisation of make up operations, the EBS will not be used as a "dynamic bag store" to selectively release bags based on a sub-sort (e.g. all first class bags for a flight);
- Make up positions remain allocated until 5 minutes prior to STD; and
- All bags on flights departing HKIA require security screening in line with current international practice and the particular requirements of the CAD. For the purpose of the concept design, and in line with current practice, it is assumed that transfer bags that have been screened at their previous port (or origin or transfer) require re-screening in Hong Kong.

All bags being transported between T1 or T2 and the Midfield Concourse or vice versa will either be screened or unscreened. This is to avoid the risk of cross contamination between "cleared" and "uncleared" bags or of tampering with "cleared" bags.

Airport Access and Infrastructure

4.65 The primary links currently serving the HKIA are the Airport Road and Chek Lap Kok South Road between Tung Chung and the airport island. Additional links in the form of the Hong Kong-Zhuhai-Macao Bridge (HZMB), HZMB Hong Kong Link Road, and the Tuen Mun-Chek Lap Kok Link (TMCLKL) are under implementation and the additional capacity provided by these links should be sufficient to cater for the forecast 2030 traffic demand.

4.66 The road system in the vicinity of the passenger terminal area has been studied in light of the increasing traffic load. Modification plans for the road system have been drawn up in line with the expected increase in origin/destination passenger throughput. More information is provided in paragraphs 4.21 to 4.23.

4.67 The plan for the provision of other transportation facilities to support T1 and T2 has also been studied. Information is provided in paragraphs 4.24 to 4.27.

Indicative Infrastructure/Facilities Development Phasing Plan

4.68 In keeping with the prudent commercial principles of AAHK, facilities development requirements envisaged at the master planning level are outlined with an indicative phased implementation programme, say at 5-year intervals as illustrated in Figure 4.30 and Figure 4.31. AAHK will keep close tabs on competition dynamics and demand growth trends and regularly review and make final decisions on the timing and scope of the facilities development projects closer to the time of implementation.

4.69 Under the two-runway option, developments proposed include the expansion of the aircraft parking apron, passenger terminal, and concourse facilities and systems to maintain good service levels as well as operational efficiency while taking HKIA's

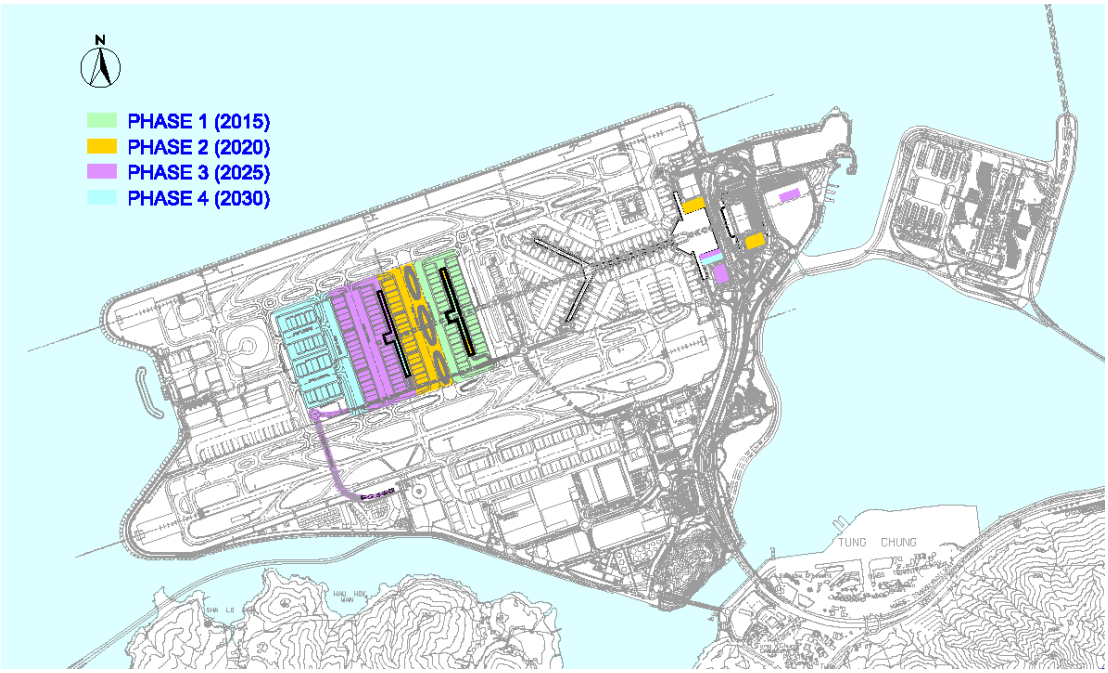
handling capacity to its limit of 74 million passengers and 6 million tonnes of cargo per annum.

Figure 4.30 : Indicative Infrastructure/Facility Development Phasing for the Two-Runway System

	Constrained Development				
	Phase 1 (2015)	**Phase 2 (2020)**	**Phase 3 (2025)**	**Phase 4 (2030)**	**Total**
Midfield Apron Development:					
Additional Number of Airbridge-served and Remote# Aircraft Parking Stands	20	10	20	10	60
Passenger Processing Terminal and Concourse Development:					
Terminal 1 (T1) Building Expansion	-	Addition of two bays to the north of T1 building envelope	Addition of one bay to the south of T1 building envelope	Addition of one more bay to the south of T1 building envelope	Four additional bays
New Passenger Concourse at Midfield	First phase of the first "I" shaped concourse completed	Second phase of the first "I" shaped concourse completed	First phase of the second "I" shaped concourse completed	Second phase of the second "I" shaped concourse completed	Two "I" shaped concourses

Note: # Remote aircraft parking stands can be used by both passenger aircraft and freighters.

Figure 4.31 : Indicative Infrastructure/Facility Development Phasing Plan for the Two-Runway System



Indicative Infrastructure/Facility Development Phase 1 (completion by 2015)

4.70 As explained in Chapter 3, HKIA has already committed to the development programme under Phase 1 to ensure that there would be sufficient facilities to serve the forecast demand by 2015. To recap, the Phase 1 programme includes:

- The construction of a Midfield concourse with 11 airbridge-served stands and 9 remote parking stands, the latter for common use by passenger and freighter aircraft;
- An additional cross-field taxiway to serve the stands on the west side of the Midfield concourse;
- An extension of the APM line and APM tunnel from T1 West Hall to connect with the Midfield concourse, with a back up system in case of APM breakdown or for route recovery;
- Minor BHS enhancement; and
- An additional ramp providing access to the Midfield concourse from the existing eastern tunnel roundabout, with a tunnel extending west under the new taxiway.

Indicative Infrastructure/Facility Development Phase 2 (completion by 2020)

4.71 Phase 2 of the development programme will include:

- Further expansion of the Midfield concourse with conversion of the 9 remote parking stands built in Phase 1 into airbridge-served stands;
- An additional 10 remote parking stands to the west of the Midfield concourse for common use by passenger and freighter aircraft;
- A second cross-field taxiway to serve the additional remote parking stands to the west of the Midfield concourse;
- Increasing APM capacity to six cars per train;
- T1 expansion by adding two bays on the northern side, with additional departure

and arrival facilities; and
- Addition of one multi-storey car park with 1,100 additional parking spaces.

Indicative Infrastructure/Facility Development Phase 3 (completion by 2025)

4.72 Phase 3 of the development programme will include:
- The construction of a second Midfield concourse further west and conversion of 5 remote parking stands built in Phase 2 into airbridge-served stands;
- An additional 20 aircraft stands to the west of the second Midfield concourse, including 5 airbridge-served stands and 15 remote parking stands for common use by passenger and freighter aircraft;
- An additional cross-field taxiway to serve the stands on the west side of the second Midfield concourse;
- Further extension of the APM line with back up system to the second Midfield concourse;
- Installation of a new high-speed BHS from T1 to the second Midfield concourse via the extended northern baggage tunnel;
- Opening of the western vehicular tunnel with new access ramps;
- T1 expansion by adding one bay on the southern side, with additional departure and arrival facilities;
- Relocation of hotel limousine pick-up to the southern side of T1;
- Addition of one more multi-storey car park with 1,700 additional parking spaces;
- Construction of a new APM depot under the existing North Commercial District; and
- Improvement of landside road networks at the eastern side of T2 and south cargo area.

Indicative Infrastructure/Facility Development Phase 4 (completion by 2030)

4.73 Phase 4 of the development programme will include:
- Further expansion of the second Midfield concourse with the conversion of 10 remote parking stands built in Phases 2 and 3 into airbridge-served stands;
- An additional 10 remote parking stands in the remaining area of the Midfield mainly for freighter aircraft use; and
- T1 expansion by adding one more bay on the southern side, with additional departure and arrival facilities.

Estimated Construction Costs

Estimated Costs

4.74 Figure 4.32 shows the preliminary estimated costs for the development programme described above.

Figure 4.32 : Preliminary Phased Development Cost Estimates for the Two-Runway System

Constrained Development Phases	Construction Cost HK$ Billion	Design and Project Management HK$ Billion	Contingency HK$ Billion	Total Cost Estimate HK$ Billion
Phase 1 (by 2015)	7.9	0.6	0.8	9.3
Phase 2 (by 2020)	5.4	0.5	1.0	6.9
Phase 3 (by 2025)	8.9	0.9	1.7	11.5
Phase 4 (by 2030)	3.8	0.4	0.8	5.0
Total (Phases 2 – 4)				**23.4**

Committed

Estimating Approach & Methodology

4.75 The rates used in computing the cost estimates are fixed-price competitive tender rates prevailing during the Fourth Quarter of 2010 subject to future inflation adjustment. The rates used in the cost estimates were compared whenever possible with the relevant government contract rates for similar types of civil works. The preliminary cost estimate was based on the best information available at the master planning stage. These estimates also include contingency, design fees and project management fees. Phase 1 development which is already committed, is at Money-of-the-day (MOD) prices. The two-runway option's development phases from 2016 up to 2030 are estimated to cost HK$23.4 billion in 2010 dollars or HK$42.5 billion at MOD prices.

4.76 Approximate quantities of works entailed have been measured, where practical, corresponding to the level of design detail available. Where appropriate, costs per unit of construction floor areas employed from other similar projects have been applied. For items of uncertain scope, lump sum budget allowances have been inserted accordingly. For airport specialist systems such as the baggage handling system and automated people mover system, quotations from specialist manufacturers have been obtained, supplemented by reference to existing airport project benchmarks.

Environmental Considerations

4.77 Care for the environment is at the heart of HKIA's long-term commitment to sustainable growth. In the 1992 published New Airport Master Plan, a pledge was made to "prepare a comprehensive and environmentally acceptable scheme ... for a new airport". A voluntary Environmental Impact Assessment (EIA) was conducted to provide a thorough evaluation of the potential environmental impacts associated with airport development

and operations, and the outcome was a range of commitments designed to ensure that environmental impacts would be effectively managed over the lifetime of the airport.

4.78 Under Section 15 (1)(f) of the EIA Ordinance, the Director of Environmental Protection established a register of EIAs approved by Government prior to the enactment of the Ordinance in February 1997. Included in this register is the New Airport Master Plan-EIA (NAMP-EIA), the NAMP-EIA supplement and the EIA of the Aviation Fuel Receiving Facility at Sha Chau. Section 9(2) (g) of the Ordinance exempts a project from obtaining an Environmental Permit if it has commenced construction or operation prior to enactment. As a result, the development of the New Airport did not require an environmental permit to complete its construction or for its operations, unless future airport development qualified as environmentally significant "material change" to the project.

4.79 The phased development plan up to 2030 under this Option entails some changes over that described in the NAMP. Should Option 1 be pursued, an assessment of the "environmental significance" of these changes will be undertaken based on evaluation guidelines as presented in Section 6 of the Technical Memorandum of the Environmental Impact Assessment Process. Based on the outcome of such assessment, the Director of Environment Protection would be able to confirm whether an environmental permit is required for Option 1 as a result of these changes.