A Second Runway for Gatwick

Appendix

A5

Operational Efficiency - Master Plan

YOUR LONDON AIRPORT
Gatwick

Gatwick Airport Ltd.

Second Runway

Operational Efficiency - Master Plan

May 2014

Executive Summary

Key Drivers

Main Components of the Master Plan

ARUP

Gatwick is to be a world-class two runway airport, offering exceptional quality of service and connections to a wealth of international and domestic flight destinations.

Executive Summary

A comprehensive and integrated approach has been followed to develop the Master Plan in order to provide a detailed statement of the future land use requirements at the airport.

Gatwick Airport is to be a world-class airport offering exceptional quality of service and availability to a wide range of international and domestic destinations. Consistent with this vision, the goal is to create an asset which has long-term value for London and the UK as a whole and provides a financeable and sustainable business case for Gatwick Airport Ltd and its stakeholders. This will be achieved by;

- Planning, designing and constructing a new runway and its associated facilities to accommodate future growth in a flexible way which offers best passenger experience, is consistent with the regulatory framework governing its development and operation, is aligned to the needs of its different airline operating models and adopts a robust approach to minimising impacts and enhancing positive environmental and social effects.

- Providing a new runway option which, when combined with the capability of the other London Airports, best serves London and the UK to deliver additional capacity and connectivity in line with the Airports Commission's assessment of needs.

- Delivering a financially feasible scheme with affordable landing charges to ensure it is fundable and optimises the use of existing infrastructure to avoid waste and unnecessary investment.

- Engaging with and seeking feedback and input from business partners, public entities, the travelling public and the wider community, to ensure an equitable balance is achieved between the economic benefits of growth while managing the social and environmental impacts of such development..

Gatwick's Master Plan has been developed to provide London with a world-class two runway airport ensuring London continues to be the best connected world city in the foreseeable future. The developed airport will both complement and compete with Heathrow. Gatwick's Master Plan is designed with the flexibility to serve a broad range of airline markets; including low cost carriers, domestic regional carriers and full service international hub airlines and alliances, complementing Heathrow's focus on the full service scheduled airline sector.

Rail connectivity to Gatwick will allow direct access to the airport from 175 stations in London and around the country, and when considered in combination with a two runway Heathrow, it will allow more Londoners easier access to a major international airport, distributing the surface access demand over a wider area of the transport system rather than focusing it into one corridor.

With a dual two runway London airport system the benefits of airport competition, seen since the break-up of BAA and the start of new ownership of Gatwick, will be enhanced. Market and commercial competition will force both airports to be responsive to user and airline needs and to change and innovate accordingly. Gatwick's Master Plan allows the flexibility to do this.

Executive Summary

Key Drivers

There are a number of fundamental principles which have shaped the Gatwick Master Plan proposals. Details of how these have influenced the development of component parts of the airport Master Plan are:

Capacity and efficiency – The new runway, located 1,045m to the south of the existing runway and 3,400m in length, allows full mixed mode operations and can accommodate large Code F aircraft. The new runway can be operational by 2025, adding capacity to the London airport system sooner than the Airports Commission's assumed 2030 opening date hence bringing forward associated socioeconomic benefits. The new and existing runways are supported by a comprehensive but simple taxiway arrangement that allows rapid uncongested access between stands and runways. Airfield simulation modelling has confirmed that up to 98 scheduled movements in the peak hour can be supported, equivalent to 95 million passengers per annum (mppa) in 2050. A compact and efficient midfield apron layout provides capacity for up to 50 mppa and minimises landtake. With aircraft using the midfield apron assigned to the new southern runway and those using the northern apron to the existing runway, the resulting taxiing distances are short and with minimal conflicting aircraft ground movements. The overall compact airfield arrangement results in short taxiing times, rapid turnarounds and reduced fuel burn.

Minimising disruption – The Master Plan allows the new runway, taxiways, apron and New Terminal to be built on undeveloped land with little impact on the operating airport through construction. This allows for simpler, quicker and cheaper construction remote from passengers as they continue to use the existing terminal facilities. Subsequent expansion of the New Terminal and apron can be delivered incrementally, as demand requires, and since the facilities can be designed for expansion from the outset, minimal impacts will be experienced by airport users. Improvements to the roads, construction of the new transport interchange (the Gatwick Gateway) and extension of the automated people mover (APM) system between the Gatwick Gateway and New Terminal will need careful planning, but can all be achieved with little impact on airport and other users.

Passenger service – Delivering high quality passenger service is been central to the Gatwick Master Plan. All stages of the journey are underpinned by the objectives of; Intuitive Wayfinding, Avoid Queues and Seamless Processing. By 2030, the experience for passengers using the airport will be transformed. The re-developed Victoria Underground and London Bridge Stations along with new Gatwick Express and Thameslink rolling stock will deliver passengers in comfort to a new transport interchange, 'the Gatwick Gateway'. New check-in, smart bag tag and walk through security technologies will mean less time processing and more time relaxing, shopping and eating. Short travel distances with minimum level changes will make the process easy and accessible for all passengers including those encumbered by luggage or needing assistance. Service products will be tailored to the individual passenger, whether core, premium, business, leisure or family travellers.

Convenient and legible access – Achieving 60% access by public transport is a core objective of the Master Plan. The new Gatwick Gateway will be pivotal to achieving this, providing up to 20 train services per hour at peak times to a variety of London destinations as well as to the south coast and beyond London to the north. Wayfinding for passengers is easy with all train services arriving and departing from the extended seven platform airport station, avoiding the confusion for passengers if they were to have to alight at different stations for different terminals. From the Gatwick Gateway, a 2-3 minute landside APM journey provides access to the New and North Terminals allowing rapid landside connection between all three terminals.

The Gatwick Gateway acts as a central interchange location for rail, buses, coaches and car rentals, providing passengers with complete clarity of where to go to get each service. Local buses and courtesy services will serve each terminal providing passengers and staff high levels of convenience to local destinations.

Access by road will be equally simple and intuitive. The M23 J9 and J9a will be the route to the airport for road users allowing simple directional signage from the motorway, independent of which terminal is to be used. Upgrades to the motorway junctions and new grade separated junctions will allow quick and easy access to all three terminals and their adjacent short term car parking. All long term car parking is located centrally, on the eastern side of the airport campus adjacent to the motorway.

Flexibility – The ability to successfully adapt to changing aircraft types, mix of sizes, new technologies and trends in airline and retail products is critical to the case for provision of sustainable long term infrastructure capacity. The Gatwick Master Plan has been developed and future-proof tested to allow a range of aircraft mix and operating models to be accommodated. For example, a variety of midfield apron and pier configurations can be accommodated within the taxiway geometry which will allow different arrangements of gate sizes, loading bridges, walk-out gates and remote stands. These have been tested against the varying requirements of full-service hub, low cost carrier, long-haul point to point and domestic regional airline models. MARS and multi-choice stand arrangements will allow flexibility of stand use at different times of the day.

The New Terminal will adopt a 'loose fit' approach allowing ready re-configuration of internal space to accommodate changing check-in, security and immigration procedures and technologies. A modular building form will allow easy incremental expansion as growth in demand dictates. The on-going programme of upgrades to the North and South terminals will continue throughout their life cycles to ensure they are fit for purpose and tailored to suit the airline and passenger services needed in each.

Resilient – As one of five airports serving London and the South East, the overall system resilience would be significantly enhanced by having two major airports (two runway LHR and two runway LGW) rather than focusing capacity at one airport only (three runway LHR and one runway LGW).

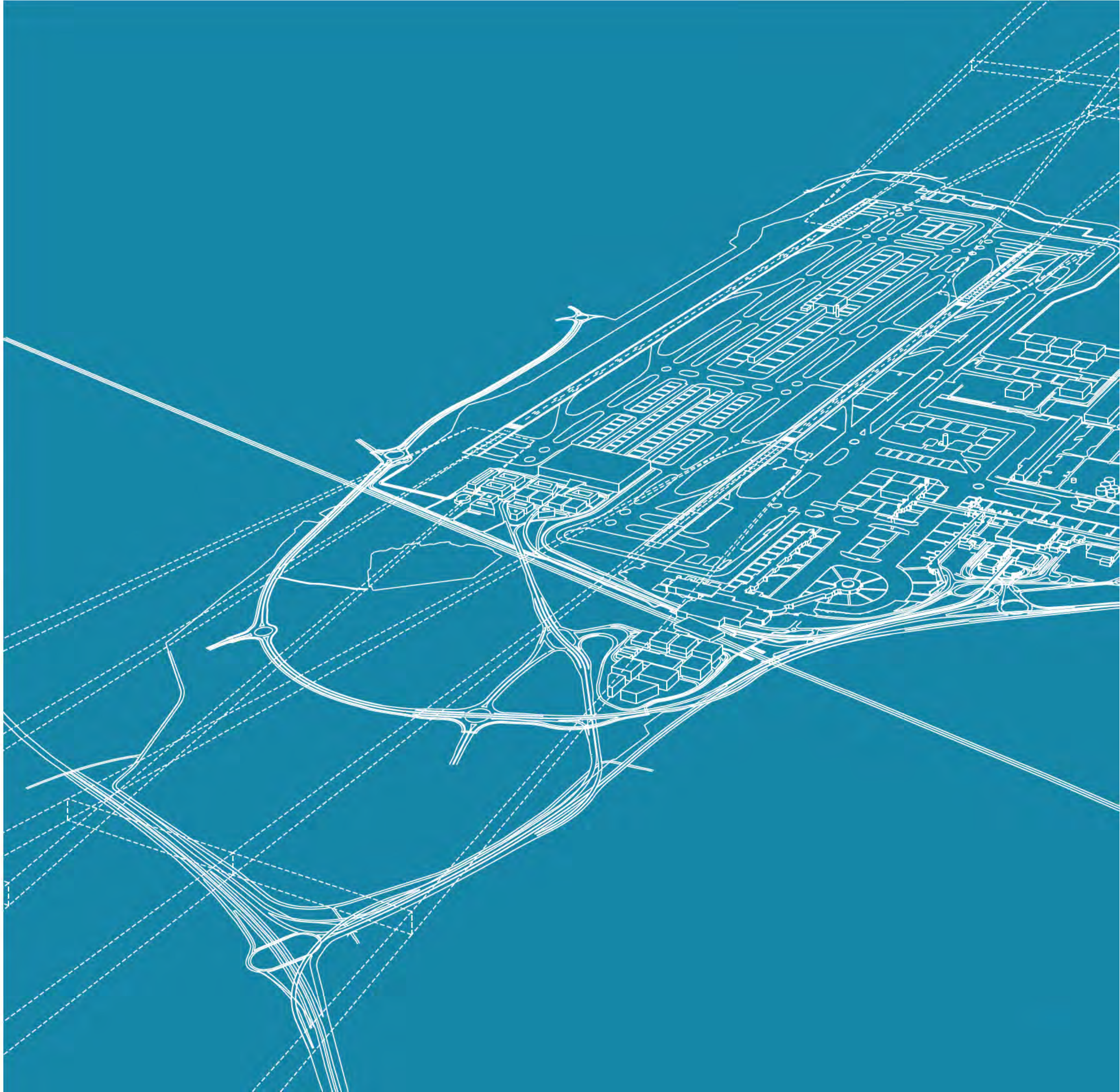
The Master Plan has been developed to enhance the airport's resilience. The addition of a second runway itself allows continued operation of the airport in the event of closure of one of the runways. The close proximately of the three terminals with rapid landside connectivity provided by the APM systems means that flights could be rescheduled if necessary to adjacent terminals with modest levels of disruption. The short distances between terminals and apron areas mean that airside passengers and baggage can also be moved with relative ease should it be necessary.

Minimising impacts – Gatwick's setting in a relatively unpopulated area means that it has relatively low impacts on neighbouring communities when compared to other London airports. In developing the Master Plan, a primary objective has been to retain this position. The runway location, 1,045m to the south of the existing runway, has been the result of extensive analysis which investigated a wide variety of options. The proposed location was found to have the optimum balance of:

- Supporting mixed mode capability and sufficient midfield capacity,
- Minimising airborne and ground noise exposure to surrounding properties, and
- Minimising land and properties needing to be acquired.

The resulting plan is substantially within the current safeguarded area, meaning that new blight concerns are significantly reduced. The airport boundary along the northern edge adjacent to Horley has not been further developed in the plan, and noise bunds and landscaping features have been extended along this boundary and included along the southern perimeter to minimise noise and visual impact.

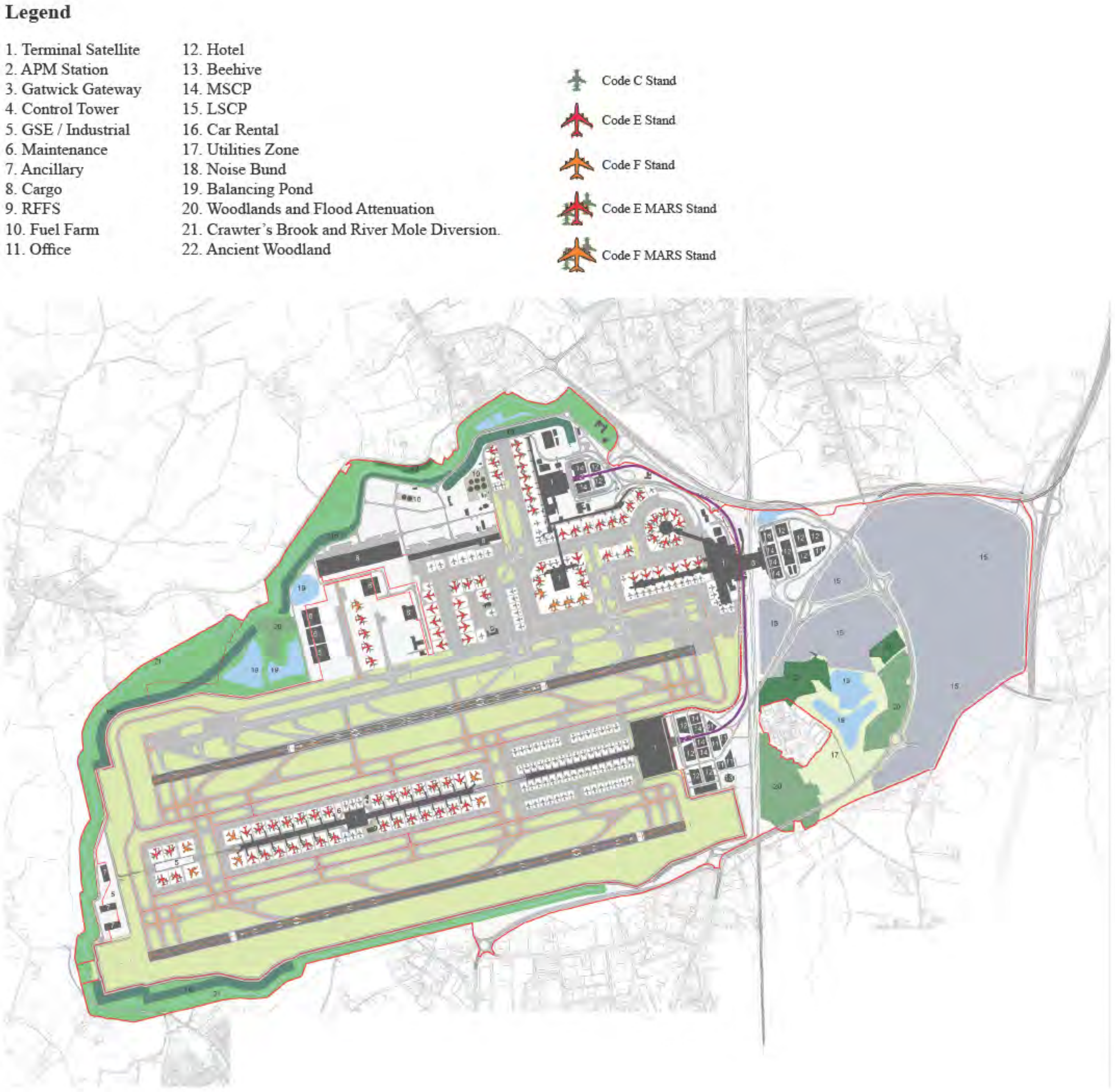
The Master Plan seeks, where possible, to enhance the environmental setting around the airport. Existing culverted areas of the River Mole are diverted and a natural river setting restored and enhanced to withstand the effects of climate change. A new green corridor along the river diversions is formed on the southern perimeter which, with new footpaths and cycleways, creates the opportunity for areas of enhanced biodiversity and new recreational space. The Master Plan allows for further flexibility and it is anticipated that additional enhancements will be made as a result of the outputs from the forthcoming community consultation process.



Main Components of the Master Plan

By 2050 the fully developed Master Plan will support a throughput of circa 95 mppa and 513,000 annual aircraft movements along with 1,070,000 tonnes of cargo. The main components of the Master Plan which will support this include:

- A new 3,400m long runway, 1,045m to the south of the existing runway, both operable in mixed mode with a combined capacity of 98 peak hour scheduled movements.
- A simple but comprehensive dual parallel taxiway system for both runways allows circulation of Code F aircraft and with minimal travel distances and congestion delays.
- A compact three terminal airport with rapid connectivity between each terminal with landside movement facilitated by the provision of a landside automated people moved (APM). Airside connections have been planned such that Minimum Connect Times (MCT) of 45 mins for transferring passengers between terminals can be achieved.
- A New Terminal and apron development designed to accommodate up to 50 mppa and a range of aircraft size and airline models, in a facility that delivers service and quality tailored to different passenger needs, incorporating new technologies and which can be incrementally delivered.
- The existing Northern Apron and North and South Terminals provide a combined 45 mppa, which will undergo cyclical refurbishments to ensure they incorporate new and emerging technologies and deliver high levels of passenger service, consistent with the New Terminal.
- An integrated transport interchange, the Gatwick Gateway, incorporating a seven platform mainline station, coach, bus and hire car facility which will deliver the 60% public transport mode share for access to the airport.
- Expanded cargo facilities in the Northern Apron with capacity of 1,070,000 tonnes and vehicle access directly to the M23 via airport access roads.
- Up to four new Code E maintenance hangers in the Northern Apron.
- Additional ancillary support facilities provided such as a new control tower, rescue and fire fighting facilities, workshops and fuel storage to a standard commensurate with a world class 95 mppa airport.
- The full 2050 long term and staff surface car parking demand on-airport and consolidated in an area to the east of the railway (eastern campus) with ready access to all three terminals.




NORTH
TERMINAL
Gatwick
Departures
Departures
easyJet
LOOK
LEFT

Part 1:
Description of the Masterplan

01_Introduction

ARUP

01_Introduction

1.1 Scope of this report

This report describes the Master Plan for Gatwick Airport with a second runway in response to the Airports Commission's Interim Report and appraisal framework. The Master Plan proposes the expansion of Gatwick Airport to include a new runway to be operated independent from the existing and with both runways operating in mixed mode, will delivering a throughput capacity of 95 mppa in 2050.

The purpose of the Master Plan Report is to demonstrate how the Master Plan meets the objectives of the Airports Commission's Operational Efficiency module by:

- Identifying the main components of the airport Master Plan and their spatial requirements.
- Define the basis for sizing these components and explain the operation of the main airport systems.
- Illustrate how the Master Plan can flexibly respond to changing aviation requirements.
- Describe how the airport will deliver excellent quality of service to passengers and other users.
- Demonstrate compliance against safety standards and regulatory requirements.

The key inputs into the development of the Master Plan are the traffic forecasts which are described in Part 2.

A comprehensive and integrated approach has been followed to develop the Master Plan in order to provide a detailed statement of the future land use requirements at the airport.

Gatwick Airport is to be a world-class airport offering exceptional quality of service and availability to a wide range of international and domestic destinations. Consistent with this vision, the goal is to create an asset which has long-term value for London and the UK as a whole and provides a financeable and sustainable business case for Gatwick Airport Ltd and its stakeholders without unacceptable environmental and social costs. This will be achieved by;

- Planning, designing and constructing a new runway and its associated facilities to accommodate future growth in a flexible way which offers best passenger experience, is consistent with the regulatory framework governing its development and operation and aligned to the needs of its different airline operating models.
- Providing a new runway option which, when combined with the capability of the other London Airports, best serves London and the UK to deliver additional capacity and connectivity in line with the Airports Commission's assessment of needs.
- Delivering a financially feasible scheme which requires affordable landing charges to ensure it is fundable and optimises the use of existing infrastructure to avoid waste and unnecessary investment.
- Engaging with and seeking feedback and input from business partners, public entities, the travelling public and the wider community, to ensure an equitable balance is achieved between the economic benefits of growth while managing the social and environmental impacts of such development.

A Master Plan is part of a dynamic process within the aviation industry. Master Plans provide a framework which allows the airport to evolve as markets and technology change, and airlines and businesses adapt to new operating environments. Therefore, an inherent flexibility has been a guiding philosophy underpinning this Master Plan.

The Master Plan report forms part of the Gatwick Airport submission and should be read in conjunction with the following reports (Appendices to the submission):

London Traffic Report	Ground Noise
Economic Impact Assessment	Air Quality
Local Economy Impacts	Place
Land Valuation	Biodiversity
Public Safety Zones	Community
Operational Risk	Quality of Life
Airspace	Construction Programme & Risk Profile
Planning Context	Programme Risk Management
Water and Flood Risk	Construction Delivery & Transition
Waste	Financial Case
Energy	Engagement Strategy
Fuel Strategy	Consultation Document
Geo-environmental	Capital Cost Forecast
Carbon	How Technology will drive Transformation of the Aviation Industry
Surface Access	Engagement Charter for Local Landowners and Occupiers
Air Noise	Commercial Facilities Requirements

The report is structured to first give a clear and simple overview of the Gatwick two runway mixed mode proposal. The second section of this report then outlines how this proposal responds to the Airports Commission's Appraisal Framework.

1.2 The baseline airport

The baseline airport is a two terminal airport with a single runway to the south of the apron. Gatwick is located within the administrative areas of Crawley Borough Council (CBC) and West Sussex County Council (WSCC) and lies on the boundary with Surrey County Council. Mole Valley, Reigate and Banstead and Tandridge District Councils are nearby, while Horsham and Mid Sussex District Councils are to the south.

The existing terminals have a capacity of circa 21 mppa each which can be increased to 45 mppa in total through internal reconfiguration, minor expansions and increased operational efficiencies (2012 Gatwick Single runway Master Plan). Under the Q6 regulatory period Gatwick Airport is currently exploring options for redeveloping North and South Terminals to provide a combined capacity of 45 mppa and support the consolidation of easyJet in the North Terminal.

Surface access to the terminals is provided by a combination of road (private vehicle, taxi and bus) and rail. A rail station and bus interchange is located adjacent to the South Terminal with a similar smaller bus interchange located at the North Terminal. Passengers from the rail station can travel from the South Terminal to North Terminal via a landside APM. Short stay car parking is located adjacent to each terminal with airport based long stay parking located primarily to the east of the airport. Additional long stay parking is also located off site.

For the purposes of the appraisal of the benefits and impacts of the second runway expansion it was necessary to identify a baseline against which the new runway development would be assessed. The baseline reference adopted has been the airport including all developments currently proposed within Q6 regulatory period.

The projects assumed to be complete are listed below.

- Pier 1 reconfiguration
- Pier 5 reconfiguration
- Pier 6 extension
- Internal reconfiguration and minor expansion of north and south terminals

Some of the projects are under construction whereas others are at an earlier stage and are still to be agreed with airlines and the Civil Aviation Authority (CAA).

The table opposite summarises the assumed baseline characteristics of the airport.

	Combined	North Terminal	South Terminal
Terminals			
Capacity (mppa)	45	21	21
Passenger Processing Area * (sqm)	220,500	97,500	123,000
Stands			
Code C	28	7	13
Code D	17	2	4
Code E	56	20	14
Code F	6	4	0
Total	**107**	**33**	**31**
Car parking			
Short term spaces	5,000		
Number of Multi-Storey Car Parks (MSCPs)	5		
Long term spaces**	46,300		
Staff spaces	10,000		

* Passenger Processing Area: includes all passenger departures and arrivals areas such as check-in, security, departures lounge, immigration, reclaim, customs and the arrivals hall. It excludes gate rooms, piers and APM stations.

** Long term and staff spaces include off site provision of ~26,280 spaces

Note: The stand provision identified in the combined column above includes remote stands while terminal columns summarises just pier-served stand provision.

Table 1.2_1 - Baseline airport facilities

Legend

- Airfield
- Aprons
- Runways
- Taxiways
- Cargo
- Maintenance
- Terminal Building
- Landscape Areas
- Ancient Woodland
- Ancillary and Surface Transport Facilities including parking
- Existing Airport Roads
- Train Station
- Balancing Pond
- Existing Airport Boundary
- Safeguarded Boundary

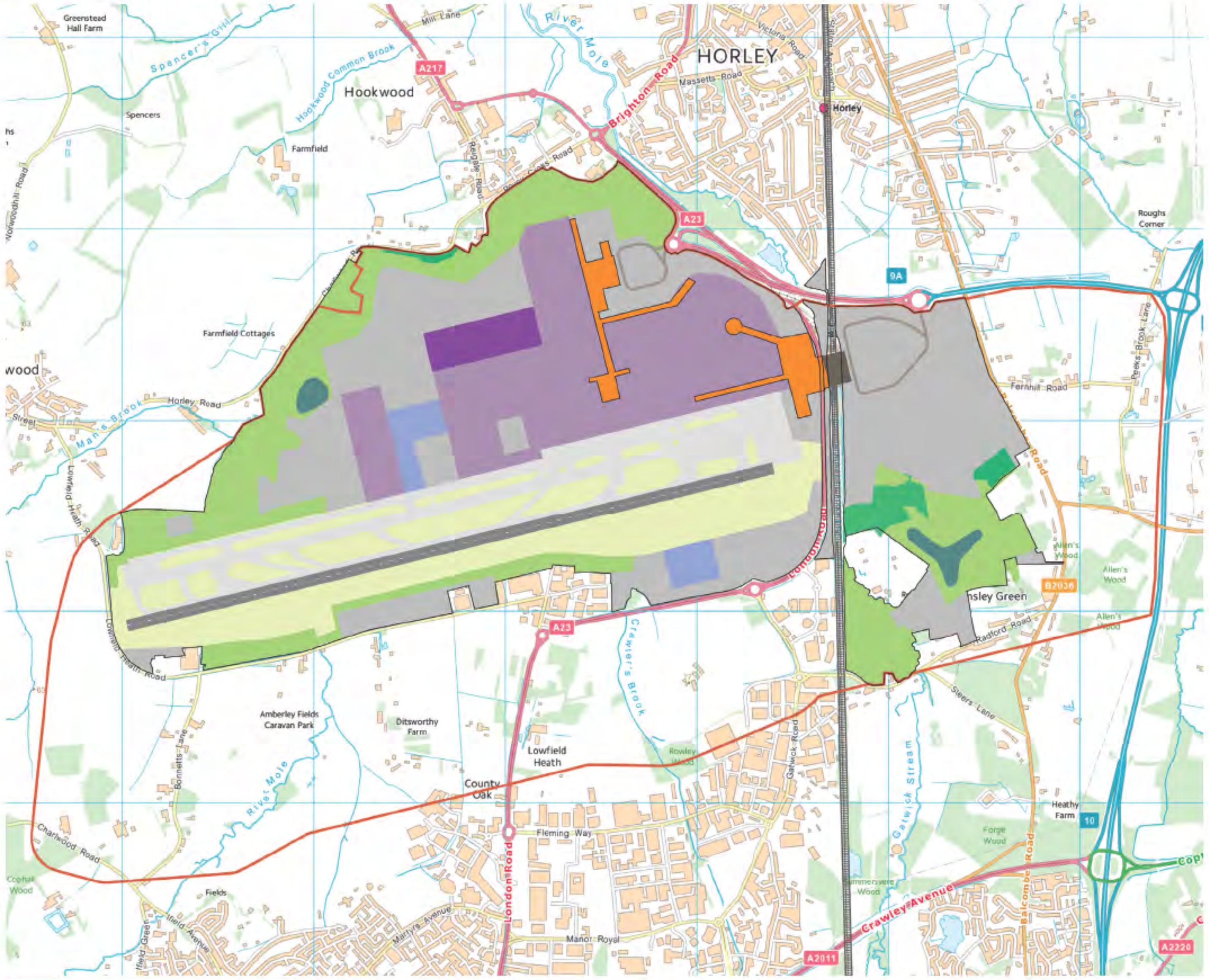


Figure 1.2_1 - Baseline Zonal Plan

Legend

- Contact Stands
- Remote Stands

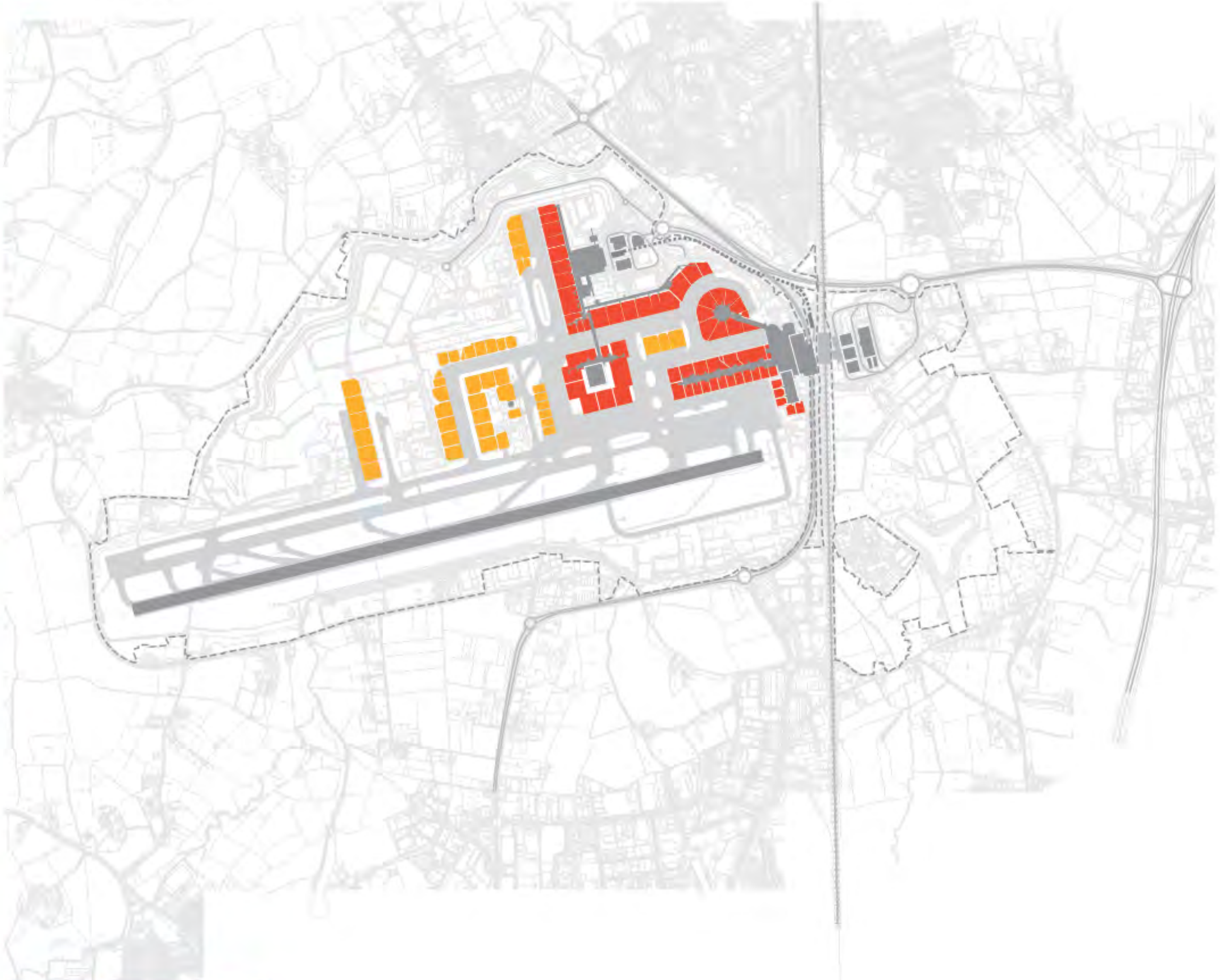


Figure 1.2_ 2 - Baseline airport

Part 1:
Description of Masterplan

02_The Master Plan

2.1 Key Drivers

Capacity, Efficiency, Flexibility, Resilience, Quality of Service, Easy Way Finding

ARUP

2.1 Key Drivers

Gatwick's Master Plan has been developed to provide London with a world-class two runway airport to ensure London continues to be the best connected world city in the foreseeable future. The developed airport will both complement and compete with Heathrow. Gatwick's Master Plan is designed with the flexibility to serve a broad range of airline markets; including low cost carriers, domestic regional carriers and full service international hub airlines and alliances, complementing Heathrow's focus on the full service scheduled airline sector.

Rail connectivity to Gatwick will allow direct access to the airport from 175 stations in London and around the country, and when considered in combination with a two runway Heathrow, it will allow more Londoners easier access to a major international airport, distributing the surface access demand over a wider area of the transport system rather than focusing it into one corridor.

With a dual-two runway London airport system the benefits of airport competition, seen since the break-up of BAA and the start of new ownership of Gatwick, will be enhanced. Market and commercial competition will force both airports to be responsive to user and airline needs and to change and innovate accordingly. Gatwick's Master Plan allows the flexibility to do this.

There are a number of fundamental principles which have shaped the Gatwick Master Plan proposals. Details of how these have influenced the development of component parts of the airport Master Plan are provided in Chapter 4 and are also summarised below.

Capacity and efficiency – A wide spaced runway system that maximises the mixed mode operational capability.

Minimising disruption – Development of new infrastructure on a green field site to allow new capacity to be delivered with little disruption to on-going airport operations.

Passenger service – Providing a high quality environment for passengers through all stages of their journey.

Convenient and legible access – Access by public transport via a multi-modal transport interchange and for road vehicles by the M23 J9 and J9a. The Master Plan provides a simple, legible and convenient approach to the airport and between terminals for all users.

Flexibility – A flexible New Terminal, pier and apron configuration that is adaptable to changing requirements, different airline models and new technologies.

Resilient – A resilient airport which supports a reliable overall London airport system.

Minimising impacts – Being good neighbours by minimising the development impacts while sharing the benefits locally.

2.1.1 Capacity and Efficiency

The new runway, located 1,045m to the south of the existing runway and 3,400m in length, allows full mixed mode operations and can accommodate large Code F aircraft. The new and existing runways are supported by a comprehensive but simple taxi arrangement that allows rapid uncongested access between stands and runways. Airfield simulation modelling has confirmed that up to 98 movements in the peak hour can be supported, equivalent to 95 mppa in 2050.

A compact and efficient midfield apron layout provides capacity for up to 50 mppa allowing the existing northern apron to be operated at a reduced throughput level of 45mppa based on the 2050 traffic forecasts. In 2050 the North Terminal (22.5mppa), South Terminal (22.5mppa) and a New Terminal (50 mppa) serves each apron area.

In the early years aircraft using the midfield apron will be assigned to the new southern runway and those using the northern apron to the existing runway. The resulting taxiing distances are short and with minimal conflicting aircraft ground movements. In later years when runways use increases, it may be necessary to allocate the departures runway according to the departure route being flown by that flight. This would avoid the flight paths of departing aircraft crossing (conflict free airspace routings) and the loss of capacity that would result from this.

Even considering this, the overall compact airfield arrangement results in short taxiing times, rapid turnarounds and reduced fuel burn.

2.1.2 Minimising Disruption

The Master Plan allows the new runway, taxiways, apron and New Terminal to be built largely outside the current airport boundary on undeveloped land with little impact on the operating airport through construction. This allows for simpler, quicker and cheaper construction remote from passengers as they continue to use the existing terminal facilities.

Subsequent expansion of the New Terminal and apron can be delivered incrementally, as demand requires, and as the facilities can be designed for expansion from the outset, minimal impacts will be experienced by airport users.

Improvements to the roads, construction of the new transport interchange (the Gatwick Gateway) and extension of the APM system between the Gatwick Gateway and New Terminal will need careful planning, but can all be achieved with little impact on airport and other users.

2.1.3 Passenger Service

Delivering high quality passenger service for all is central to the Gatwick Master Plan. All stages of the journey are underpinned by the objective of:

- Intuitive wayfinding
- Avoid queues
- Seamless processing

A typical journey for a passenger in 2030 could start at the newly redeveloped Victoria Underground station where they would transfer into the mainline station and board new Gatwick Express rolling stock before arriving 30 minute later at the Gatwick Gateway. Alighting at this impressive new station and public transport interchange, they either walk directly into the South Terminal or take a short journey on the APM to the North Terminal or to the New Terminal.

Once inside the terminal, as the conventional check-in process are likely to be a thing of the past, they will simply drop-off smart tagged luggage at an automated bag-drop point and moments later have exited the walk-through security process. They can then relax in the departures lounge, shop or eat, before travelling a short distance to the aircraft departure gates.

Throughout the journey passengers will pass through new or substantially refurbished facilities with minimum level changes and short walk distances, making the process easy for all passengers including those encumbered by luggage or needing assistance. Processes will be unintrusive but safe and secure. Service products will be tailored to the individual passenger, whether core, premium, business, leisure or family travellers. Real-time passenger information services through passenger devices will inform all stages of the journey.

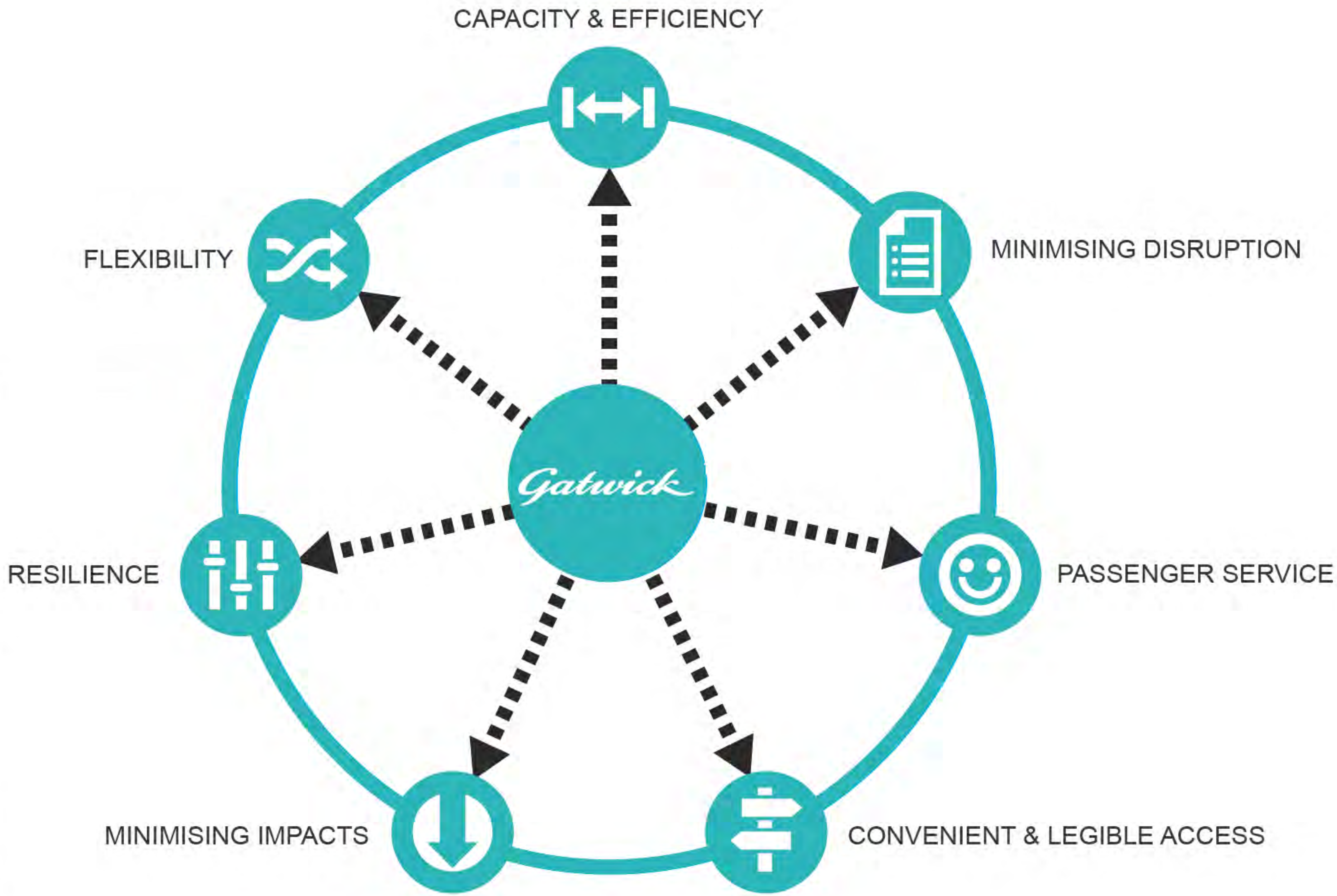


Figure 2.1_1 - Key Drivers

2.1.4 Convenient and legible access

Achieving 60% access by public transport is a core objective of the Master Plan. The new Gatwick Gateway will be pivotal to achieving this, providing 20 train services per hour to a variety of London destinations as well as to the south coast and beyond London to the north. Wayfinding for passengers is easy with all train services arriving and departing from the extended seven platform airport station, avoiding the confusion for passengers if they were to have to alight at different stations for different terminals.

From the Gatwick Gateway, wayfinding to any of the three terminals is simple, with a landside APM providing 2-3 minute travel times to the New and North Terminals and allowing rapid landside connection between all three terminals.

The Gatwick Gateway acts as a central interchange location for rail, buses, coaches and car rentals, providing passengers with complete clarity of where to go to get each services as well as enhancing the efficiency for service providers by not having them fragmented at different locations around the airport. Local buses and courtesy services will serve each terminal providing passengers and staff high levels of convenience to local destinations.

Access by road will be equally simple and intuitive. The M23 J9 and 9a will be the route to the airport for road users allowing simple directional signage from the motorway, independent of which terminal is to be used. Upgrades to the motorway junctions and new grade separated junctions will allow quick and easy access to all three terminals and their adjacent short term car parking. All long term car parking is located centrally, on the eastern side of the airport campus adjacent to the motorway.

2.1.5 Flexibility

The ability to successfully adapt to; changing aircraft types and mix of sizes, developments in passenger processing technologies and procedures, trends in airline and retail products and evolving surface access requirements is critical to the case for provision of sustainable long term infrastructure capacity. The Gatwick Master Plan has been developed and future-proof tested to allow a range of aircraft mix and operating models to be accommodated.

For example, a variety of midfield apron and pier configurations can be accommodated within the taxiway geometry which will allow different arrangements of gate sizes, loading bridges, walk-out gates and remote stands. These have been tested against the varying requirements of full-service hub, low cost carrier, long-haul point to point and domestic regional airline models. MARS and multi-choice stand arrangements will allow flexibility of stand use at different times of the day and space in the northern apron and the western end of the midfield can be redeveloped to provide additional capacity beyond the Gatwick 2050 forecasts.

The New Terminal will adopt a ‘loose fit’ approach where large column free spaces and carefully positioned vertical circulation and building services distribution systems allow ready re-configuration of internal spaced to accommodate changing check-in, security and immigration procedures and technologies. A modular building form will allow easy incremental expansion as growth in demand dictates. The on-going programme of upgrades to the North and South terminals will continue throughout their life cycles to ensure they are fit for purpose and tailored to suit the airline and passenger services needed in each.

2.1.6 Resilience

As a nationally important piece of transport infrastructure, the resilience of Gatwick to respond to unplanned events is of critical importance. Of course, Gatwick is one of several airports serving London and the Southeast and the overall system resilience would be significantly enhanced by having two major airports (two runway LHR and two runway LGW) rather than focusing capacity at one airport only (three runway LHR and one runway LGW).

The Master Plan has been developed to enhance the airport’s resilience. The addition of a second runway in itself allows continued operation of the airport in the event of closure of one of the runways. The existing northern runway along with the North and South terminals can operate essential independently from the southern runway and New Terminal minimising the potential for an incident in one area to impact all operations. That these runways support mixed mode operations further enhances resilience given this mode of operation allows the ability to flex runway usage and deal with disruption events and peaks in demand.

The close proximately of the three terminals with rapid landside connectivity provided by the APM systems means that flights could be rescheduled if necessary to adjacent terminals with modest levels of disruptions. The short distances between terminals and apron areas mean that airside passengers and baggage can also be moved with relative ease should it be necessary.

These physical characteristics along with appropriate system design and operational processes will ensure the expanded Gatwick will be able to attain high levels of reliability.

2.1.7 Minimising impacts

Gatwick’s setting in a relatively unpopulated area means that it has relatively low impacts on neighbouring communities when compared to other London airports. In developing the Master Plan, a primary objective has been to retain this position.

The runway location, 1,045m to the south of the existing runway, has been the result of extensive analysis which investigated a wide variety of options. The proposed location was found to have the optimum balance of:

- Supporting mixed mode capability and sufficient midfield capacity,
- Minimising airborne and ground noise exposure to surrounding properties, and
- Minimising land and properties needing to be acquired.

The resulting plan is substantially within the current safeguarded area, meaning that new blight concerns are significantly reduced. The airport boundary along the northern edge adjacent to Horley has not been further developed in the plan, and noise bunds and landscaping features have been extended along this boundary and included along the southern perimeter to minimise noise and visual impact.

The Master Plan seeks, where possible, to enhance the environmental setting around the airport. Existing culverted areas of the River Mole are diverted and a natural river setting restored bringing ecological improvements. A new green corridor along the river diversions is formed on the southern perimeter which, with new footpaths and cycleways, creates the opportunity for areas of enhanced biodiversity and new recreational space. This corridor will also be designed to manage flood risks. The Master Plan also seeks to minimise the impacts of noise, air quality and flood risks.

The Master Plan allows for further flexibility and it is anticipated that additional enhancements will be made as a result of the outputs from the forthcoming community consultation process.

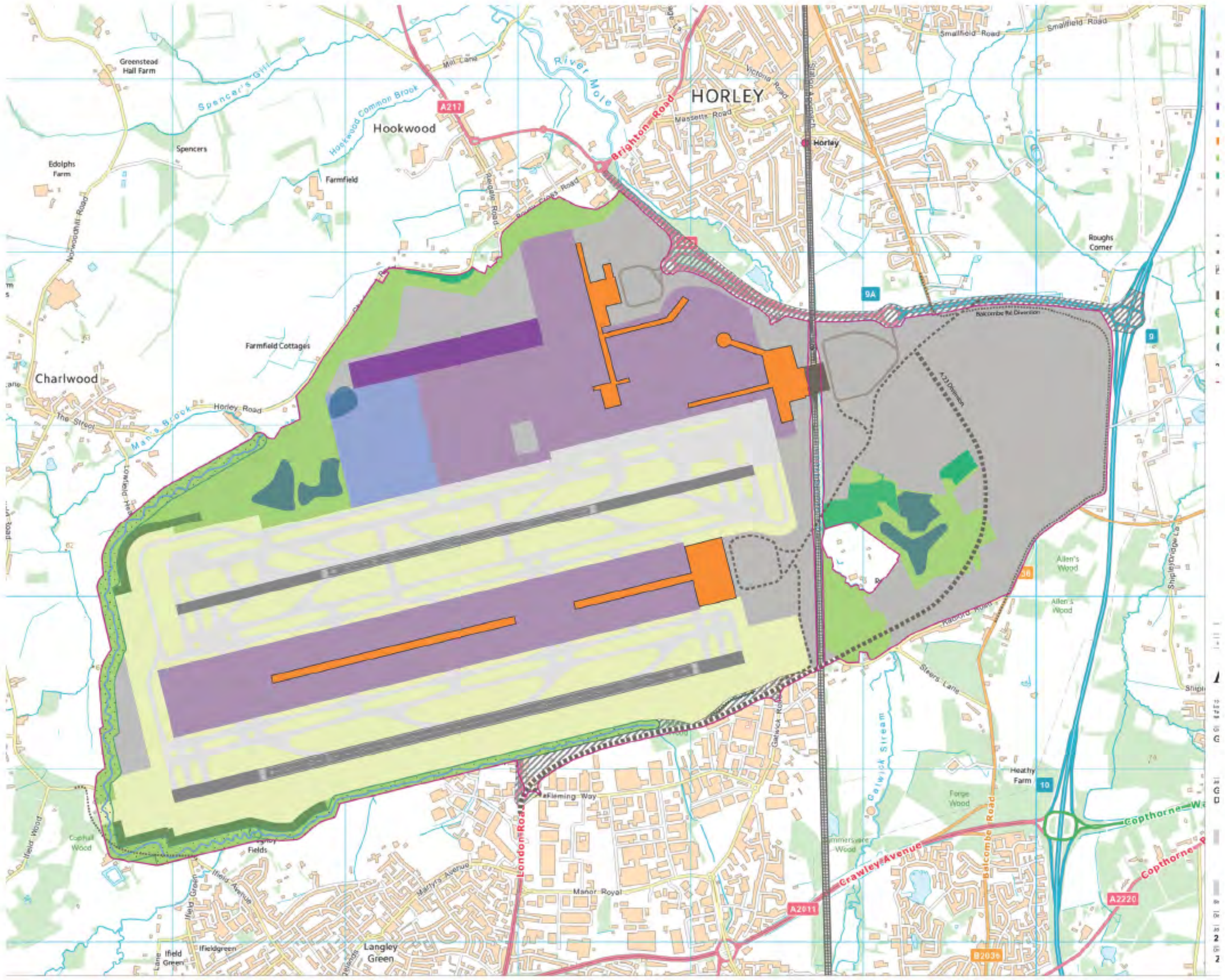


Figure 2.1_2 - Zonal Plan

Figure 2.1_3 - Detailed Master Plan

Part 1:
Description of Masterplan

03_Basis of Development Plans

ARUP

Planning for flexibility, efficiency and to provide the best passenger experience.

A world class airport

03_Basis of Development Plans

3.1 Summary of passenger and aircraft movement forecasts

This section outlines the basis of the Master Plan development setting out a collection of assumptions which allows plans, environmental appraisals, costs and the business case to be based on a consistent data set.

To determine the high-level planning requirements for the airport, a set of requirements was developed using the air traffic forecasts as inputs. The facility requirements for each functional element of the airport (airside, landside, terminal, utilities and other) have been calculated using several approaches and results have been benchmarked against relevant airports.

The planning assumptions, ratios and criteria used are those specified by International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), European Union (EU) and other national standards such as CAA, Gatwick's own Airfield Planning standards and Arup's own recommendations to allow the Master Planning team to easily compute airport facility requirements.

The ultimate planning horizon considered has been 2050 at which point the airport is forecast to be serving 95 mppa. The facility and the infrastructure requirements generated for 2050 have been used as the basis for the long range plan.

Detailed secondary forecasts were prepared for 2030, 2040 and 2050 and from these the requirements for other spot years have been interpolated as necessary to reflect construction phasing options. The annual passenger and aircraft movement forecasts are presented in Figure 3.1_1.

The secondary traffic forecasts include annual and busy hours for passengers and aircraft movements as well as planning day flight schedules for 2030 and 2040. Refer to Forecast Report for further detail.

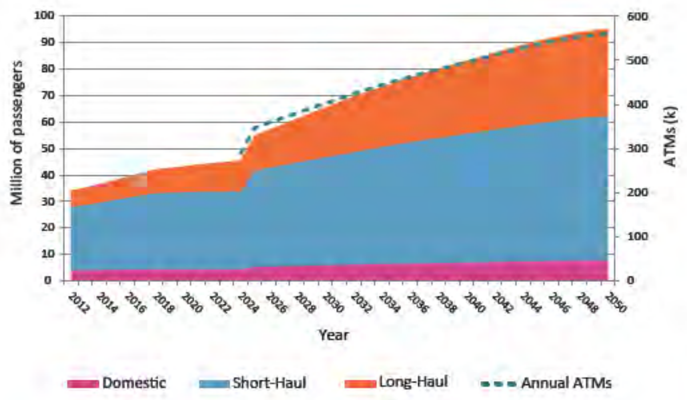


Figure 3.1_1 Forecast Annual passenger and aircraft movements

Airline assignment assumptions and scenarios

The flight schedules include characteristics per flight listed in Figure 3.1_2.

To calculate the programme of requirements for terminals stands and airfield an airline assignment strategy has been developed which assumes a mix of longhaul and shorthaul airlines would be accommodated in the midfield. This assignment is also representative of a mix of full service and low cost type of operations. Planning for a mix of airlines drives more efficient use of the infrastructure utilisation, particularly of the apron as long haul and short haul peak operations occur generally at different times across the day and hence through MARS-ing of stands there is a greater opportunity for the stands to be shared across the day. The mix also facilitates and supports transfer operations within the terminals rather than between the terminals with waves of inbound short haul flights feeding into the outbound long haul.

Alternative airline assignments have been tested to assess the flexibility of the infrastructure to adapt to changes in aircraft types and airline requirements.

The assignment scenarios have been used in the airfield simulation models developed, to calculate aircraft stand requirements and the terminal programme of requirements.

																				Transfer to/from		
Haul	ID	Time	Arr/Dep	Flight number	Registration	Airline	Alliance	Type	ICAO Code	Region	Seats	LF	Pax total	Pax terminal	Pax transit	Pax OandD	Pax transfer	Airline	Dom	SH	LH
SH	118	00:05	A	AT2	T2	LCC	None	319neo	C	E	156	84	131	131	0	125	6	Airline 1	1	1	4
Dom	2100	00:10	A	AT800	T800	FSC	All2	DH4 Enhanced	C	D	90	87	78	78	0	66	12	Airline 2	0	3	9
LH	1429	00:10	D	DN1	N1	FSC	None	77X	E	ME	280	87	244	244	0	206	38	Airline 3	12	19	7
SH	119	00:15	A	AT3	T3	LCC	None	321neo	C	E	215	95	204	204	0	196	8	Airline 4	1	1	6
LH	568	00:25	A	AT4	T4	FSC	All3	77X	E	AF	280	87	244	244	0	206	38	Airline 5	12	19	7
Dom	2101	00:30	A	AT801	T801	LCC	None	319neo	C	D	156	84	131	131	0	125	6	Airline 6	0	1	5
LH	1364	00:50	D	DN2	N2	Charter	None	787-10	E	CCE	400	95	380	380	0	380	0	Airline 7	0	0	0
SH	120	00:55	A	AT5	T5	LCC	None	319neo	C	E	156	92	144	144	0	138	6	Airline 8	1	1	4
SH	121	01:10	A	AT6	T6	Charter	None	320neo	C	E	180	92	166	166	0	166	0	Airline 9	0	0	0
SH	2102	01:15	A	AT802	T802	FSC	All1	AT7 Enhanced	C	E	72	89	64	64	0	54	10	Airline 10	1	1	8

Figure 3.1_1 Extract from planning day flight schedule

3.2 Levels of service and planning standards

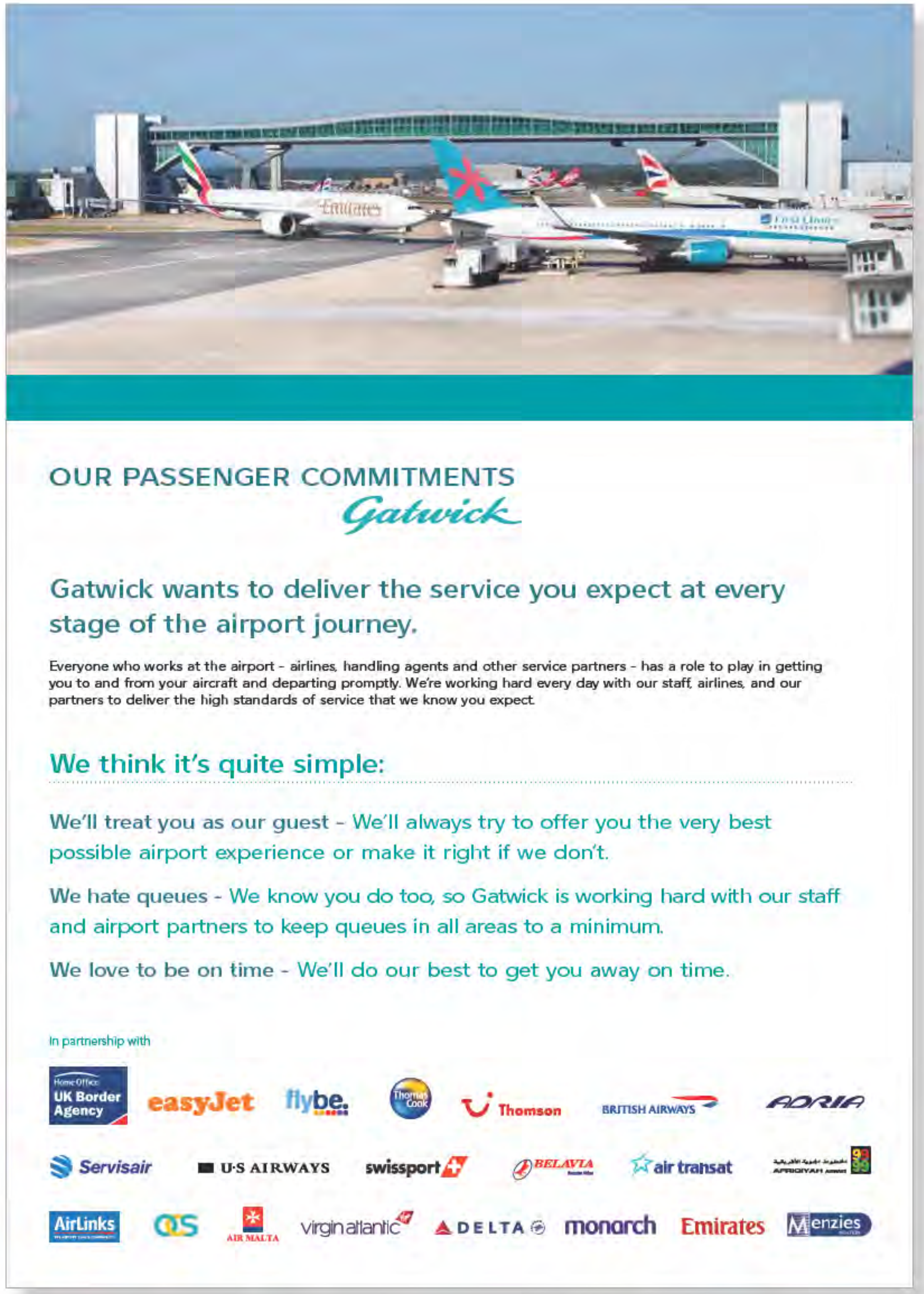
CAP 168 (tenth edition, February 2014) standards have been used for taxiway minimum separation distances for the airfield layout. ICAO Annex 14 recommendations and standards have been applied when appropriate as well as Gatwick's own Airfield Planning Standards.

For terminal planning the IATA Airport Development Reference Manual (ADRM) 9th Edition as well as Gatwick's own terminal planning standards have been used. Key standards have been to minimise queues in line with Gatwick's Passengers Commitment and provide 95% of passengers with pier service. In 2010, Gatwick became the first UK airport to publish passenger commitments, outlining the standards of service passengers can expect. These are:

- We'll treat you as our guest - We'll always try to offer you the very best possible airport experience or make it right if we don't.
- We hate queues - We know you do too, so Gatwick is working hard with our staff and airport partners to keep queues in all areas to a minimum.
- We love to be on time - We'll do our best to get you away on time.

Through collaborative discussions, these commitments were endorsed by the airlines operating at the airport, handling agents and the UK Border Force (UKBF). The commitments are central to Gatwick's service focus and are publicly displayed on the website and throughout the terminals. Gatwick has also embraced the regulated service standards, continuously improving performance and going beyond these standards, to develop an airport community approach across a broader range of services, such as check-in, arrivals baggage and border zones. Gatwick will continue to work corroboratively and openly with its users which is central to reliably deliver the service expected.

Gatwick's aspiration to continuously improve levels of service, enhance passenger experience for all and make use of latest technology available is embedded in the planning approach taken. The areas have been planned to provide flexibility to accommodate technology improvements over time whilst responding to current known process requirements with the aim of balancing planning for the future with today's operation.



3.3 Airfield programme of requirements

The runway and taxiway layout has been planned to provide efficient operations in line with acceptable delay criteria, maximise capacity and accommodate the forecast aircraft sizes including the A380. The key airfield planning assumptions are summarized below:

1. Minimum landing distance to be provided: 2500 m
2. Take-off distances for the existing runway remain as currently
3. Take-off distances for the new runway: 3400 m
4. Two new parallel taxiways are provided to the south of the existing runway and two more north of the new runway with apron areas between the two.
5. Taxilanes are provided either side of the midfield apron, avoiding push-backs onto taxiways and cul-de-sacs.
6. Two cross-field taxiways are provided at each end of the satellite building with clearances for Code F aircraft.
7. Two rapid exit taxiways are provided for each runway direction of the new runway, and for the south side of the existing runway. The first one will cater primarily for code C aircraft and the second one for code E aircraft, minimizing runway occupancy times and increasing runway capacity.
8. New holding areas (south of the existing runway and north of the new runway) has been designed with 3 Code F access taxiways, providing flexibility for ATC to optimally sequence aircraft for departure.
9. For the new runway, a Runway End Safety Area (RESA) length of 240 m has been provided for both landing overshoots and undershoots and take-off overruns.
10. Instrumented Landing System (ILS) CAT III capability for the new runway has been assumed. Critical and sensitive ILS areas have been considered to define the airfield boundary, ensuring that these areas are clear of objects during airport operations.

The airfield layout and operational assumptions have been validated using a dynamic simulation tool developed in CAST Aircraft software. Assumptions for the airfield set and operation have been validated through discussions with NATS and Gatwick Airfield Operations, including SID routing, runway allocation, runway crossings and ATC separations standards. Figure 3.3_1 shows a capture of the CAST Aircraft model.

Passenger aircraft stand requirements have been calculated using NAPA software tool which is an Arup proprietary software. The main inputs being the flight schedules and the gate definition of the baseline stand configuration assumed. The gate definition assumptions used have been discussed and agreed with Gatwick Airport and a calibration exercise was undertaken of the 2012 schedule in order to ascertain that any assumptions used when gating future schedules would be realistic and representative of Gatwick's operation, particularly of the existing stands.

The output includes Gantt charts from which the stand requirements can be calculated as well as gated flight schedule. Figure 3.3_2 shows a capture of this output.

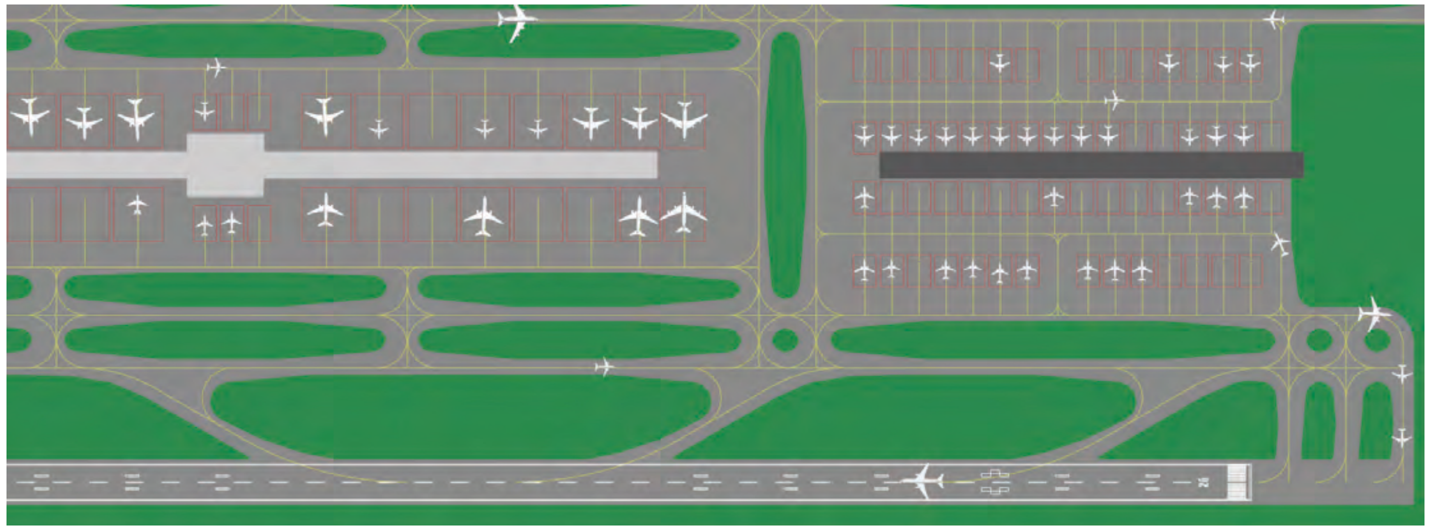


Figure 3.3_1 Airfield Simulation Image

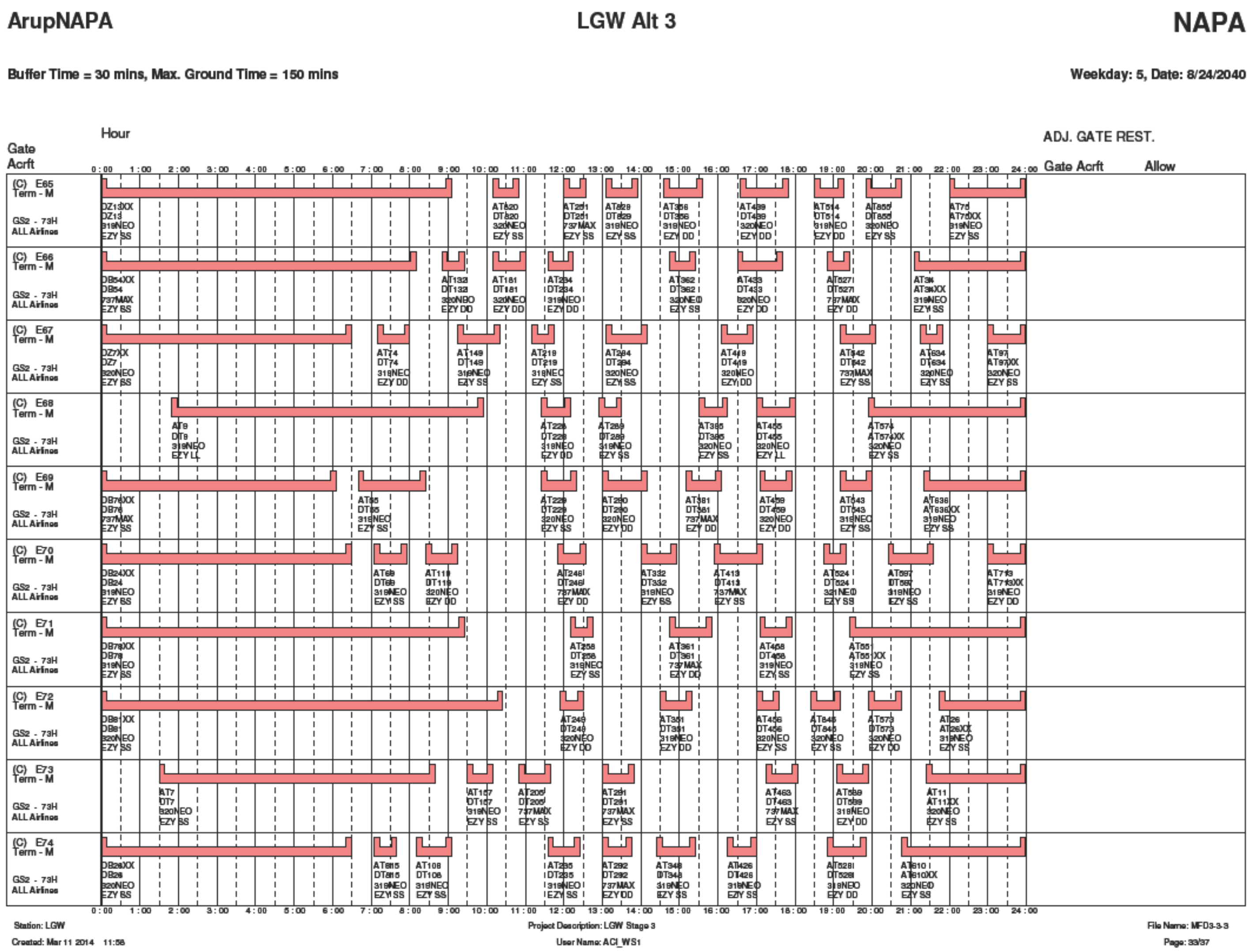


Figure 3.3_2 Example of Gantt Chart

Larger aircraft were given priority on existing and contact stands. Code E/F peak requirements, being the maximum number of Code E and F aircraft that need to be accommodated on the ground, were calculated as were the maximum number of aircraft on the ground. This gave a stand demand that combined both requirements. The combination of both to overall and Code E/F peak requirements in the busy day allows the consideration of the effect MARS-ing has on the mix of stands.

The resulting total stand requirements are shown in Table 3.3_1. The airport wide stand requirements were translated into midfield stands requirements by apportioning the equivalent mppa capacity. These splits are identified in Section 4.

The pier service level agreement at Gatwick is that 95% of annual passengers should be pier served. Pier service is provided by contact stands which are those served by air bridges or stands where passengers can walk to the aircraft from the gate room. This figure has been used to plan the number of stands that should be contact stands.

	2040					2050
Code	Max aircraft size	Peak E/F	Stands Required (Busy Day)	% Buffer	2040 Stands	Stands Required
C	156	79	110	15%	127	134
D	0	0	0	15%	0	0
E	0	0	0	15%	0	0
E MARS	25	54	52	15%	60	63
F MARS	4	2	4	15%	5	6
Total	**185**	**135**	**166**		**192**	**203**

Table 3.3_1 Total Stand Requirements

3.4 Terminal programme of requirements

The New Terminal size has been assessed using two different approaches. A bottom up approach using a planning model and a top down approach based on a benchmarking exercise of other terminals.

The planning model is a theoretical calculation using a spreadsheet that gives an order of magnitude for the terminal size and an estimate of processor numbers required. The model calculates the number of processing facilities needed and the associated space requirements. The sum of these elements becomes the net floor area. This area is then grossed up by applying factors to account for vertical/lateral circulation and back of house/MEP requirements. This approach for calculating theoretical gross floor area can result in a lower figure than the actual terminal size which is dictated by a number of factors including geometry, circulation, layouts etc.

The detailed assumptions behind the planning model outputs can be found in Appendix C. The assumptions are based on Gatwick's operational performance targets which reflect operational efficiencies of future processing models as well as the adoption of new technologies. These targets have been tested against current processing assumptions and factors applied to provide resilience and contingency and account for exceptions.

The baggage area has been calculated by considering the number of make up positions required, early bag store and reclaim feeds needed. The assumptions take into consideration development in technologies and are tailored to maximise the flexibility of use, while increasing the efficiency of the area used. The baggage area calculation is in accordance with latest industry rules and regulations.

	Passenger and facility counts	Area
	2050	
Annual Passengers (Millions) mppa	50	
International Arrival	5,103	
International Transfers	732	
Domestic Arrivals	1,392	
Domestic Transfers	149	
International Departures	4,856	
Domestic Departures	1,529	
ALL Departures	5,352	
FSC Departure	2,733	
LCC + CHARTER Departure	3,487	
2 WAY Combine	12,728	
Pax Departures Facilities		**11,489**
Check-In		
Check-In Desks LCC + Charter	41	
Check-In Area LCC + Charter (m2)		1,237
Check-In Desks FSC	38	
Check-In Area FSC (m2)		1,341
Boarding Pass Check		
Boarding Pass Check Counters	16	
Boarding Pass Check Area (m2)		661
Security Screening Direct		
Security Screening Direct Lanes	27	
Security Screening Direct Area (m2)		8,250
Pax Arrivals Facilities		**32,398**
Baggage Claim		
Baggage Claim International + Charter		
30 m Device	0	
50 m Device	7	
70 m Device	7	
90 m Device	2	
International+Charter Baggage Reclaim minimum length (m)		1,020
Baggage Claim International + Charter Area (m2)		17,546
Baggage Claim Domestic		
30 m Device	0	
50 m Device	3	
70 m Device	0	
Domestic Baggage Reclaim minimum length (m)	150	
Baggage Claim Domestic Area (m2)		2,830
Arrival Passport Control (International)		
EU Positions	17	
EU Area (m2)		1,703
Non-EU Positions	43	
Non-EU Area (m2)		2,374
Customs (International + Charter)		
Customs (International + Charter) Channels	6	
Customs (International + Charter) Area		261
Security Screening Transfers		
Transfers Boarding Pass Check Counters	4	
Transfers Boarding Pass Check Area (m2)		198
TRANSFERS Security screening Lanes	6	
TRANSFERS Security screening Area (m2)		991
Arrivals Hall		
Arrivals Area (m2)		32,398
Other Areas		**108,243**
Baggage Make-up		
Baggage Make-up Positions	187	
Baggage Make-up Area (m2)		12,184
Total Baggage Handling Area (m2)		23,516
Airport, Airline, Other offices + support accommodation		36,074
Total Concession Area Processor (m2)		45,306
Bus Hold room areas		3,348
Terminal Processor Net Area		**152,131**
MEP/Vertical/Lateral Circulation/ Washrooms/Structure	**50%**	**76,065**
Terminal Processor Gross Area		**228,800**

Table 3.4_1 New Terminal 2050 Programme of Requirements

Following on from this process the Gross Floor Area (GFA) calculated was benchmarked against a number of terminals which range from low cost operation (such as Stansted), mix use (Gatwick North and South terminals, Dublin Terminal 2) and a more hub type operation (Heathrow's Terminals 2 and 5). The areas benchmarked considered the passenger processing areas, basements and support areas including offices and plant but excluded gate rooms, piers, satellites and APM stations.

Figure 3.4_1 illustrates the benchmarked areas and identifies the new terminal as LGW NEW.

Passenger Processing Facilities

Passenger processing includes all passenger departures and arrivals areas such as check-in, security, departures lounge, immigration, reclaim, customs and the arrivals hall within the main processor building. It excludes gate rooms.

The area provided for passengers in the new terminal building is close to the average therefore indicating that a quality level of service is provided with space efficiencies gained through new technologies, minimum level changes and simple intuitive layouts. It also reflects the assumption that a mix of airlines, from low cost through to long haul full service carriers would be operating from the terminal.

Other

Areas measured under "other" are back of house, offices, baggage facilities and plant. They include basements where these accommodate the facilities described but exclude train/ APM stations and associated vertical circulation.

The range is much broader than in the Pax Processing benchmark. The Heathrow terminals provide greater amount of support facilities within the terminal footprint in contrast with Gatwick and the other airports benchmarked which allow for less support areas. The reasons being that the LHR terminals are built in more constrained sites and are multi level.

The new terminal "Other" area provision is aligned more closely with the Gatwick model.

Total

The resulting total area benchmarked puts the new terminal on the lower end of the scale as a space efficient building. The range also indicates that LHR T2 and T5 have greater area per mppa which is driven by the greater provision of support facilities.

The gross floor area allowed for in the master plan could be increased should a need for additional passenger or support areas be identified in future phases of design. There is flexibility within the footprint to accommodate a larger or smaller terminal building should it be required.

The capacity of North and South terminals is considered sufficient to accommodate the forecast demand. The terminals will need to undertake some internal re configurations to achieve capacity increments through operational efficiencies.

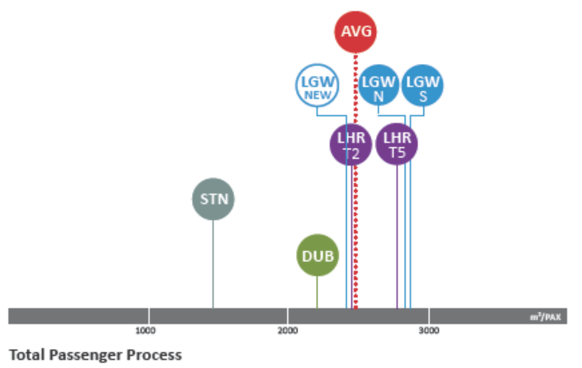


Figure 3.4_1: Top down Passenger Processing Area (m2/mppa)

(Source; GAL, Arup and publicly available information)

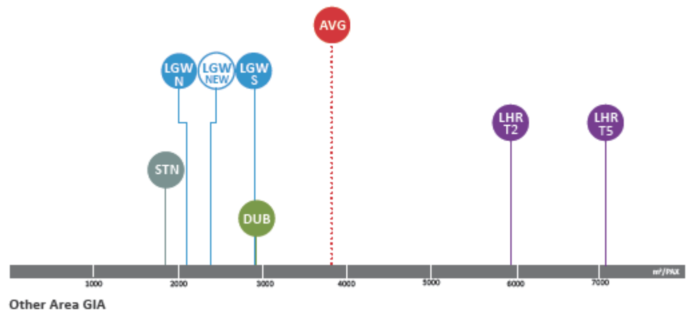


Figure 3.4_2: Top down Other Area (m2/mppa)

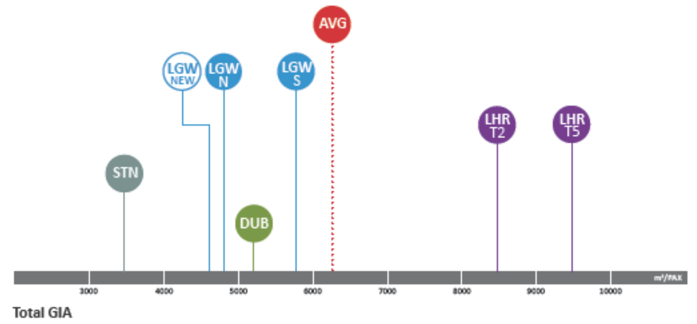


Figure 3.4_1: Top down Total Area (m2/mppa)

3.5 Summary of surface access forecasts and Gatwick Gateway

The information presented in this section of the Master Plan report has been referenced from the Gatwick Airport R2 Surface Access Assessment - Technical Report.

3.5.1 Surface Access Forecasts and Modelling

Capacity modelling has been undertaken on the rail and the highway network to understand and evaluate the implications of future demand growth in arrival and departure journeys at Gatwick, both with and without a second runway.

For all of modelling, the approach has been to testing the most conservative or "highest impact" case for each mode in order to provide a robust understanding of capacity on future surface access networks.

2040 busy day airport schedule data has been incorporated into matrices corresponding to demand on transport networks for a future 2040 busy day in September. The models have also been uplifted to reflect background demand growth in the South-East. For both the rail and highway networks, background growth is the primary driver for committed capacity enhancements and other elements of proposed mitigation i.e. modelling shows that capacity enhancements are required irrespective of a second runway at Gatwick.

For rail, modelling has been undertaken on the "highest impact" mode share, namely a 50% mode share for 2040, as part of an overall public transport mode share of 60% for passengers.

For road, modelling has been undertaken on the "highest impact" mode share, namely the current mode share of 60% of passengers accessing the airport by car maintained to 2040. This does not reflect the enhancements in rail and public transport capacity and connectivity which form part of the R2 ASAS and will drive a much higher mode share for public transport.

In addition, modelling has stress-tested surface access networks assuming another decade of growth to 2050 in order to demonstrate resilience in the networks for even more future growth.

Gatwick therefore has a high degree of confidence in the modelling analysis and the findings.

The modelling tools used are widely recognised in the industry and are as follows:

- Rail network capacity modelling – the Department for Transport's PLANET South model.
- Strategic Highway network – the Highways Agency's M25 Dartford Free Flow Crossing SATURN model.
- Local roads and access around Gatwick Airport – local VISSIM modelling.

The iterative modelling approach undertaken is shown in Figure 3.5.1_1 below. In essence, the approach has been as follows:

- Developing future year models using the forecasts developed for Gatwick Airport as well as background demand growth projections.
- Assigning Gatwick travel demand to the relevant rail and highway networks.
- Assessing the performance of the rail, public transport services and the highway network against growth scenarios to determine the effects, if any, of the proposed increase in travel demand to Gatwick.
- Identifying constraints and then testing whether committed future schemes can provide the necessary capacity. In addition, establishing whether any additional mitigation or enhancements are required and whether there are any residual impacts.
- Based on the above, assessing the performance of potential transport measures that could improve access by public transport and cycling and reduce the need to travel by car as well as understanding how proposals facilitate other users of transport.

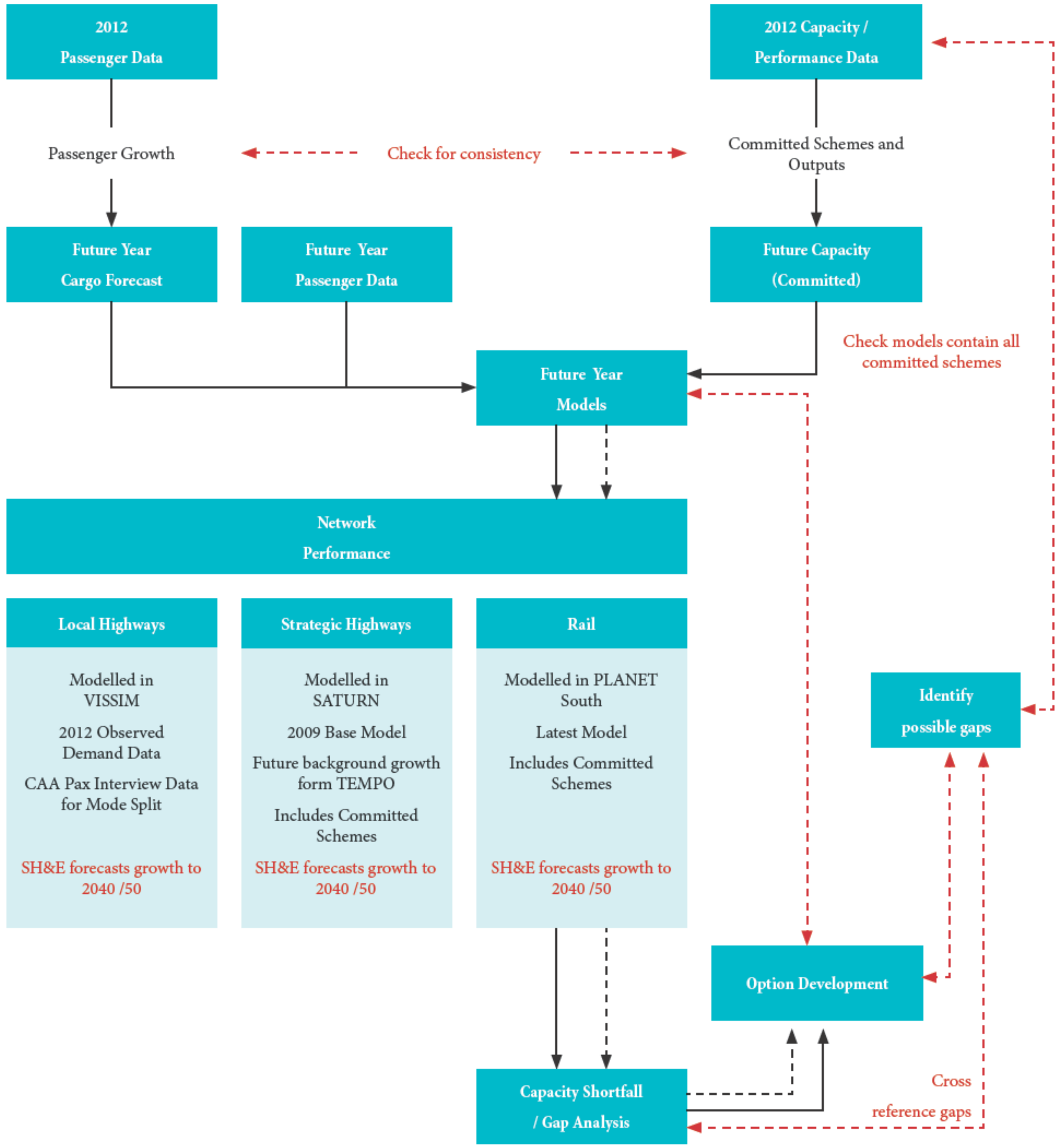


Figure 3.5.1_1: Modeling Approach

Figure 3.5.1_2a shows that with a second runway, the morning arrival peak at Gatwick will move to an earlier hour of 0600-0700 on the airside. Assuming a one hour lag to account for processing in the terminals, this means the demand will reach landside transport modes from 0700-0800 i.e. before the start of the commuter peak. This is a one hour time shift when compared to 2012 and is an important consideration when assessing how additional demand associated with a second runway relates to crowding on commuter rail services or traffic on the road network in the morning peak period.

For departures demand, as shown in Figure 3.5.1_2b, a peak is shown from 0900-1000, which assuming a two hour lead time, means more passengers travelling on transport networks from 0700-0800. This demand is generally in the counter-peak direction i.e. from London to Gatwick Airport.

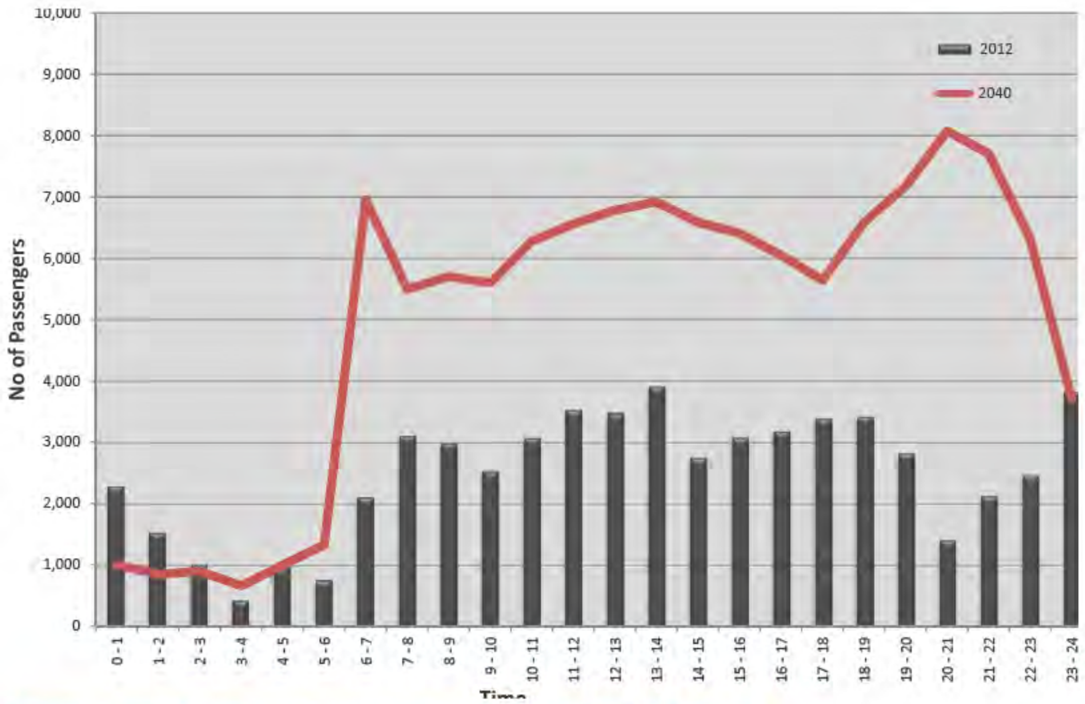


Figure 3.5.1_2a: Daily profile of arriving passengers - 2012 and 2040 forecast
Source: SH&E passenger forecasts

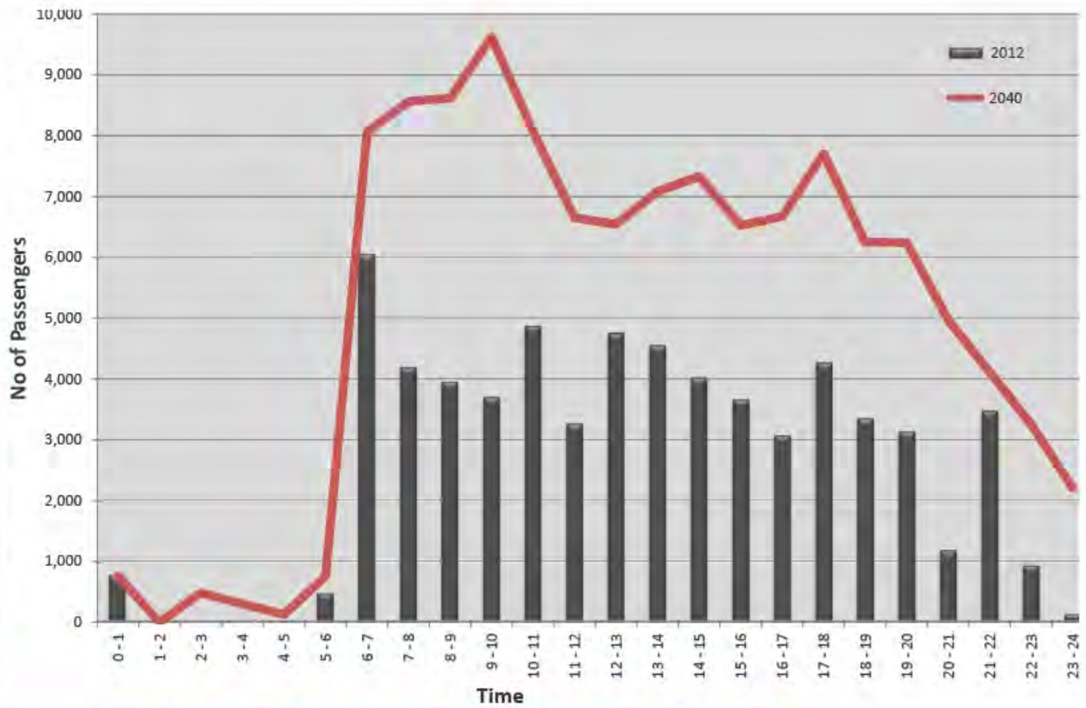


Figure 3.5.1_2b: Daily profile of departing passengers – 2012 and 2040 forecast
Source: SH&E passenger forecasts

3.5.1 Surface Access Enhancements

Capacity modelling of the strategic highway network and the rail network indicates that schemes committed by Government, such as M25 and M23 Smart Motorways and the Thameslink Programme will deliver sufficient capacity for growth in background commuter demand as well additional demand associated with a second runway at Gatwick to 2040 and even 2050.

Around Gatwick, the road network will need to be reconfigured to provide for access by road, including for bus and coach, cyclists and pedestrians.

Key features of the design of new road layout around the airport include:

- Providing more capacity at M23 Junction 9 and better links to the A23.
- Realigning the A23 to the east of the airport to separate out airport traffic from through traffic and thus safeguard journey times for both sets of users.
- Providing separate junctions for the airport terminals off the A23 as well as providing access to the Gatwick Gateway.
- Consolidating cargo and logistics deliveries in a single location to reduce transport impacts, minimising goods traffic travelling on the local road network in peak periods and giving direct access onto the A23 and M23.
- Delivering better access and benefitting local communities, including realigning Balcombe Road as a local road with connection to Antlands Lane. This will also help safeguard journey times for local trips.
- Providing 9km of new cycle routes and pedestrian rights of way.

3.5.1 Gatwick Gateway

Whilst the rail network can deliver the capacity required for future growth, the station will be reconfigured to accommodate future growth as part of the Gatwick Gateway project. Centred on the existing railway station, with an expanded concourse and improved circulation, the Gateway will provide simple and seamless interchange between a myriad of transport modes including rail, bus, coach, taxi, car rental, walking and cycling.

Bringing together enhanced rail connectivity as delivered by the Thameslink Programme and Crossrail, as well expanded bus and coach networks, the Gatwick Gateway will be the iconic arrival point at the airport for the majority of passengers by 2040. It is envisaged that the Gateway will provide benefits not only for air passengers and airport staff but also local residents and employees who will be able to take advantage of 24/7 public transport connectivity from the Gatwick region to the rest of the UK.

The Gatwick Gateway is integral to the Master Plan for a two runway Gatwick. It will make connections between modes of transport easier and create new journey opportunities. It will deliver quality passenger facilities as an interchange available to the whole region.

3.6 Cargo, maintenance and other support facility requirements

The following table summarises, for the planning horizon, the forecast traffic and facility requirements for cargo, maintenance, other support facilities and car parking.

These requirements were developed using the Gatwick Airport Davies Commission Submission Second Runway facility requirements, October 2013 technical report as a basis. The figures from this report were then refined to those presented through consultation with representatives of the GAL property team.

	2050
CARGO	
Annual Cargo Throughput (tonnes)	1,070,000
Cargo Terminal - standard automation (sqm)	92,500
MAINTENANCE	
Hangar Area (sqm)	55,000
No. of hangars	5
OTHER SUPPORT FACILITIES	
Industrial Supply (sqm)	42,200
Ground Services and Ancillary Airside (sqm)	63,900

Table 3.6_1 - Cargo, Maintenance and Support Facility Provision

3.7 Eastern area developments

The area to the east of the railway has been designated to accommodate a consolidated surface car parking zone which feeds all terminal buildings as well as providing a safeguard for commercial developments should these be required.

	2050
Car Parking	
Short Stay - Number of MSCP	9
Short Stay (spaces)	8,500
Long Stay (spaces)	59,750
Long Stay as Block parking (spaces)	23,900
Staff (spaces)	12,100

Table 3.7_1 Car Parking Provision for Eastern Zone

The area safeguarded for commercial developments, 35Ha, has been calculated on the assumption that some of the businesses impacted by the construction of the second runway, such as those in City Place, Manor Royal and Lowfield Heath, may need to be re-provided. These commercial developments would respond to their own business case which is separate from the second runway's business case. Should these be required there would be a need to deck some of the surface car parking shown in the table above to keep the developments within the extended airport boundary.

3.8 Safety and Security

The airport Master Plan has been configured in accordance with relevant standards and design criteria published by ICAO and CAA. Reference has also been made to EASA requirements where appropriate. These are not yet fully implemented in the UK and primarily adopt ICAO standards however in one or two key areas they align with CAA requirements. In some cases other criteria is used, where this is published by others e.g. Public Safety Zone Policy issued by the Department for Transport, or where it is recognised as best practice and no specific guidance exists in a comparable ICAO or CAA document. Where that is the case the source is specified. Appendix B outlines in detail the list of standards and sections of these standards that have been used as a reference.

Airport security requirements are subject to statutory regulation, which covers forecourt use, car parking, passenger search and techniques to be used, total segregation of departing and arriving air passengers in the airport's airside areas, airport boundary treatment and arrangements for staff. These requirements can lead to the need for infrastructure development, influencing the form and character of the airport facilities.

Part 1:
Description of Masterplan

04_Master Plan Components

Efficient and safe airfield operations

Three terminal buildings in close proximity

Consolidated cargo and aircraft maintenance facilities

Gatwick Gateway: a multimodal integrated transport interchange

ARUP

04_Master Plan Components

This section builds on the Section 2 summary and discusses each component of the airport assumed in the base Master Plan. It also provides a description of the operational principles assumed and the flexibility planned into each of the components.

4.1 Overview

The new runway, located 1,045m to the south of the existing runway and 3,400m in length, allows full mixed mode operations and can accommodate large Code F aircraft. The new and existing runways are supported by a comprehensive but simple taxi arrangement that allows rapid uncongested access between stands and runways. Airfield simulation modelling has confirmed that up to 98 movements in the peak hour can be supported, equivalent to 95 mppa in 2050.

A compact and efficient midfield apron layout provides capacity for up to 50 mppa, effectively accommodating all new apron and stand capacity needed to meet the 2050 forecast traffic whilst minimising landtake. Therefore, the existing northern apron would be operated at a throughput level of 45mppa. The North Terminal (22.5mppa), South Terminal (22.5mppa) and a New Terminal (50 mppa) serves each apron area.

The overall compact airfield arrangement results in short taxiing times, rapid turnarounds and reduced fuel burn.

The Master Plan identifies a series of development zones that are required to accommodate the various airport functions. The development zones identified in the Plan include airfield, terminal area, the landside area, the commercial areas, airport support areas which include aircraft maintenance, cargo and other support facilities. These zones are identified in Figure 4.1_1 and are described in more detail in the subsequent sections.

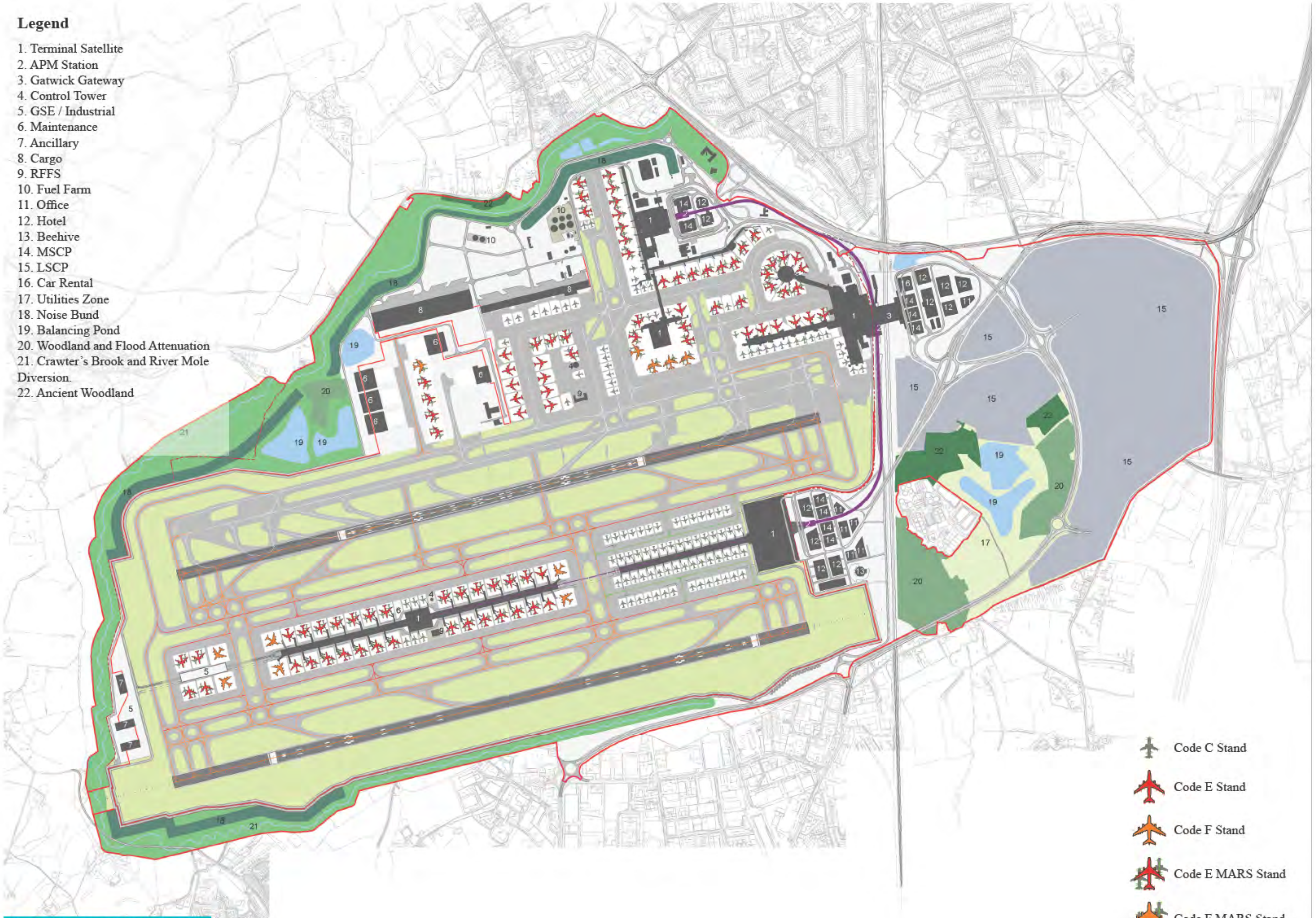


Figure 4.1_1 Detailed Master Plan

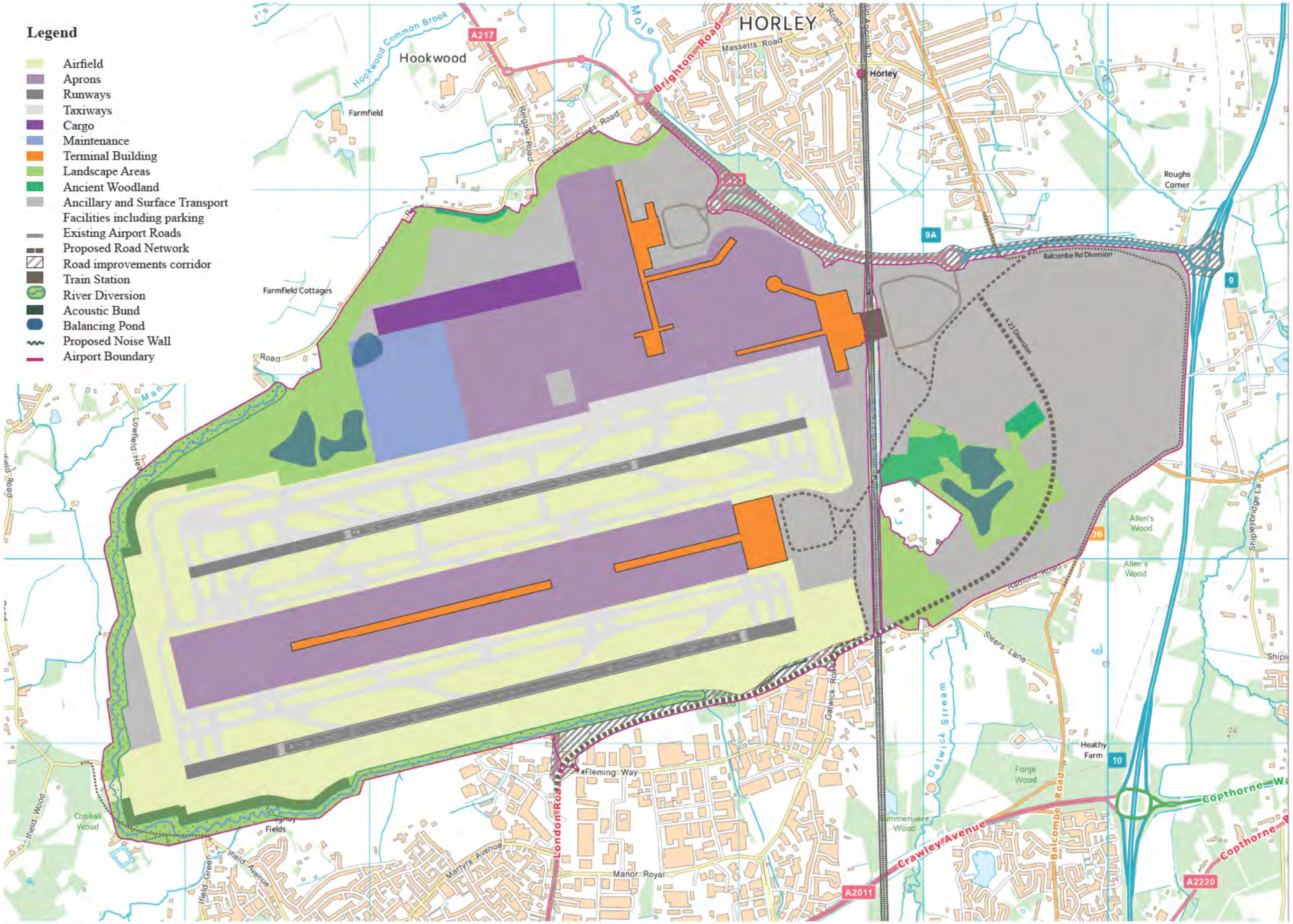


Figure 4.1_2 Zonal Land use Plan

From the detailed Master Plan, a zonal land use plan has been generated which illustrates the organisational framework (Figure 4.1_2). The zonal land use plan provides an organising framework to guide through the future phases of design given the size of the new development and the diversity of its component buildings. This framework will have the effect of providing continuity and cohesion in developments across the airport.

Note that the 'with EAT' Master Plan and zonal layouts have been used as the background for general diagrams in this report as this represents a slightly greater land take.

04_Master Plan Components

4.2 Runways and taxiways

4.2.1 Two Runway Mixed Mode Operation

This section describes the airfield layout, the modes of operation considered, the operational flexibility and resilience of the layout.

The base plan assumes no end-around taxiways (EATs) are provided. These would allow aircraft needing to cross the existing runway to taxi independently around the ends of the runway. Gatwick recognises EATs could be required in the future and a description of the proposed location and operation as well as some additional safeguarded options is included in this section. Gatwick is currently consulting with the public whether the EATs should form part of the base scheme.

With two runway independent mixed mode operation there would be approach and departure routes to and from both runways.

Apron and terminal capacity provision has been evenly split between the areas north of the existing runway (northern aprons) and the midfield. The midfield apron includes stands catering for all aircraft sizes. In this way, there is significant flexibility in the assignment of airlines to terminals so that a balanced use of the airfield can be achieved.

In the early years of operation, when the aircraft movement rates would be lower, the strategy would be to allocate as much of the northern apron traffic as possible to the existing runway (as today) and allocate traffic from the New Terminal in the mid-field to the new runway. This would reduce the number of aircraft needing to cross the existing runway.

In later years when runways use increases, it may be necessary to allocate the departures runway according to the departure route being flown by that flight. If the flight is heading south it would be allocated to the southern (new) runway and if it is heading north it would be allocated to the northern (existing) runway (this is referred to as Compass assignment). This would avoid the flight paths of departing aircraft crossing (conflict free airspace routings) and the loss of capacity that would result from this.

Where possible, to minimise the number of runway crossings, arriving flights would still be allocated to the runway best suited to their apron location (terminal assignment).

Both these modes of operation, compass assignment for departures and terminal assignment for arrivals, are feasible according to the ATC service provider from the point of view of airspace structure and routings. Refer to the Airspace Report for further information.

Airfield simulations of the arrivals runway assignment principles have demonstrated that their application does reduce to a minimum the need for runway crossings. In order for this assignment to be implemented, ATC will need to be informed of the destination gate (and therefore terminal) for each aircraft before final approach, so that the aircraft may be routed to the correct approach path and runway.

The runway allocation strategy for arrivals and departure described above is illustrated in Figure 4.2.1_1.

Guidance on runway crossings

While many thousands of runway crossings take place every day worldwide without incident, there has been a recent trend in airport design to reduce or eliminate crossings by providing End-Around Taxiways (EATs). One of the reasons for this is concern about runway incursions (where an aircraft enters an active runway without clearance).

Runway incursions are rare but industry working groups have been exploring ways to minimise the risks of them happening. This has resulted in written guidance acknowledging that runway crossings can contribute to the risk of incursions and recommending that crossings are avoided by, for example, providing EATs.

However this is an evolving field where technology is being developed that could offer other, robust means of managing the risk of incursions. Improved signage and lighting can alert pilots to the presence of an active runway and new technologies allow the automatic monitoring of aircraft on the ground, warning pilots and controllers before a runway incursion takes place.

If a second runway at Gatwick generates a need for runway crossings then Gatwick will review and select the appropriate technologies and procedures to provide a safe operation.

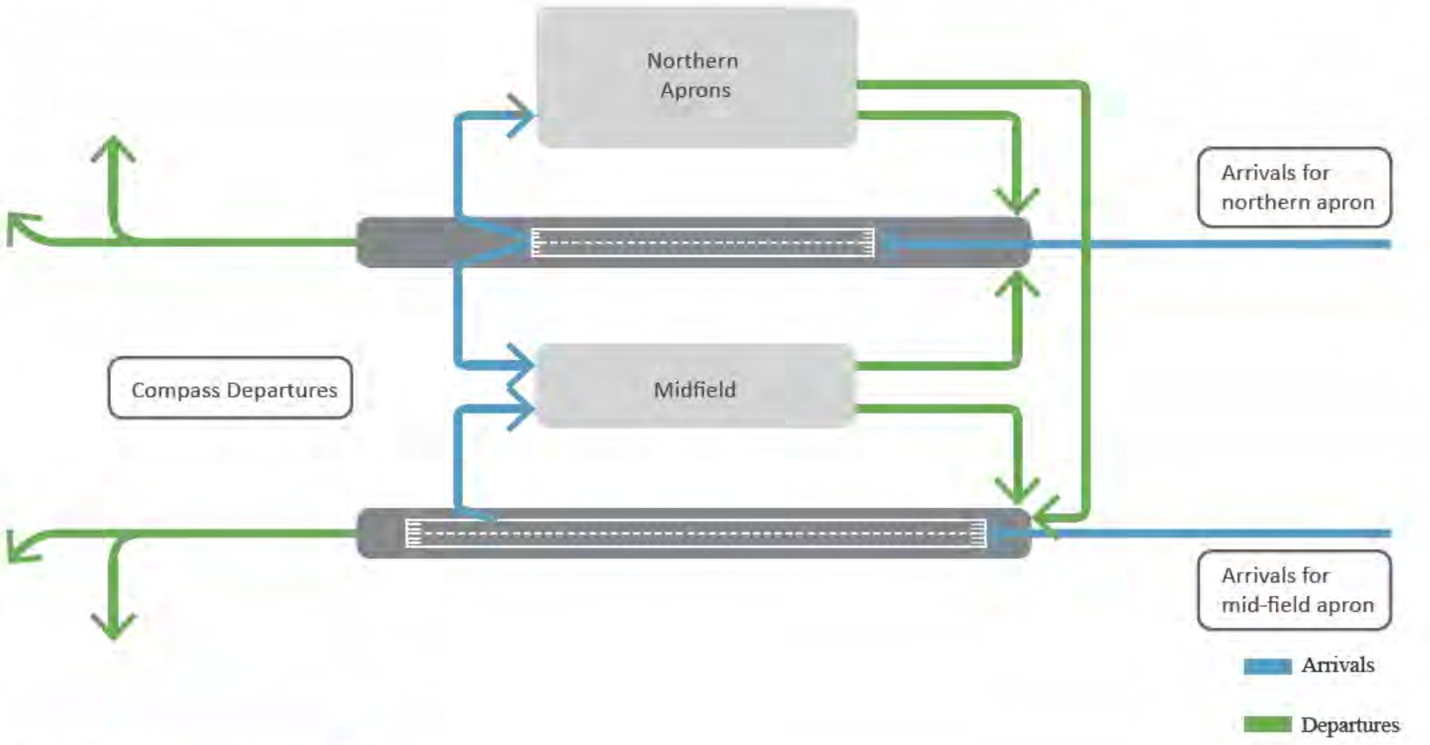


Figure 4.2.1_1 Runway assignment

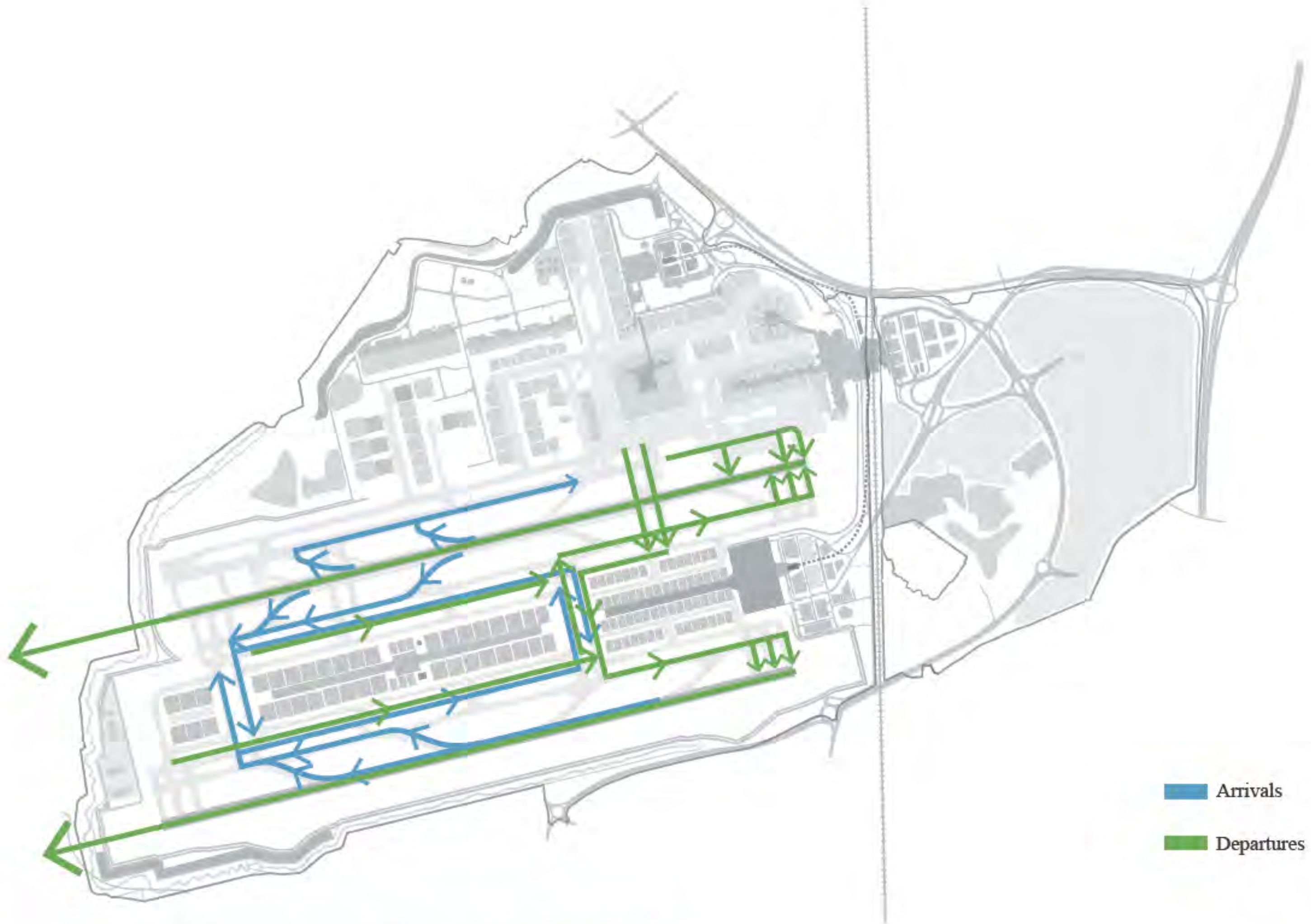


Figure 4.2.1_2 Airfield circulation patterns Westerlies (without EAT)

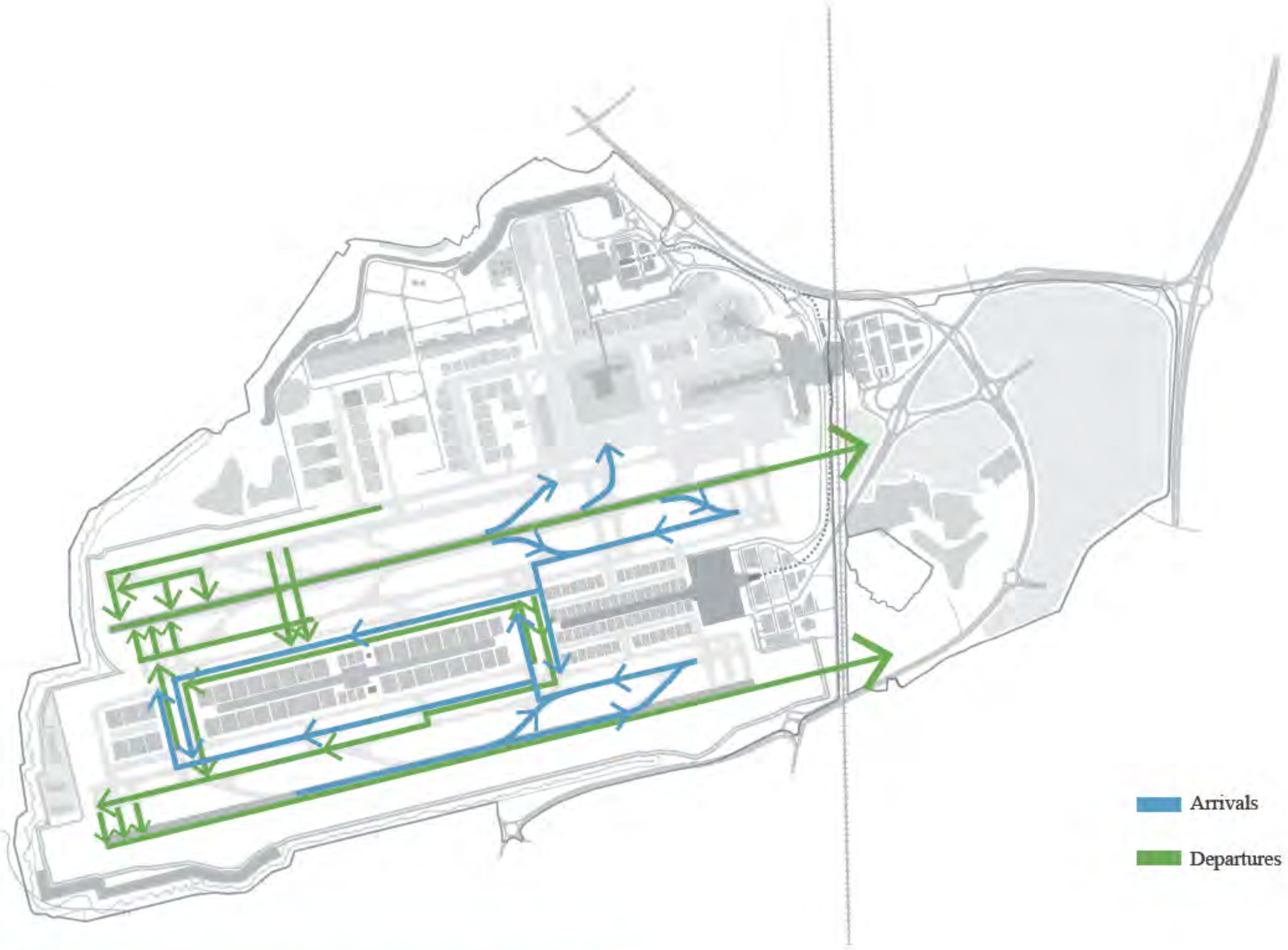


Figure 4.2.1_3 Airfield circulation patterns Easterlies (without EAT)

Airfield simulation summary

The masterplan layout and the operational strategies illustrated in Figures 4.2.1_2 and 4.2.1_3 have been simulated using CAST Aircraft™. The scenario was tested with the runways in westerly operations, an airline assignment which assumes that both aprons are operated by a mix of long haul and short haul aircraft (see section 4.3) and by providing twin parallel runway crossings positions at each end of the runways to be used primarily by departing aircraft.

The main objective of the simulation was to validate the capacity of runway system, airfield performance and operational efficiency of these layouts. The operational efficiency was measured in terms of taxi time and delay, whilst the runway capacity was measured in terms of the runway throughput achieved considering a maximum level of delay.

The results obtained indicate that the layout delivers the forecast flight schedule. The results show a maximum runway throughput of 98 atms/h being achieved, with the average hourly delay for departures being less than 10 min and the average hourly taxi time for departures not exceeding 15 min across the day. The average taxiing time excluding delays has been estimated at approximately 7 minutes for westerly operations.

With regards to arrivals, the simulation shows that delays and taxi times are significantly lower than for departures.

At the highest levels of capacity use, there is a greater risk that runway crossings for departing and arriving flights, taxiing between the northern apron and the new runway result in delays that exceed 10 min. This would translate into potential small losses of runway capacity at peak times in order to avoid excessive delays.

The assumptions considered for the simulation, a description of the model and further information about the outcomes are available in Appendix A of this report..

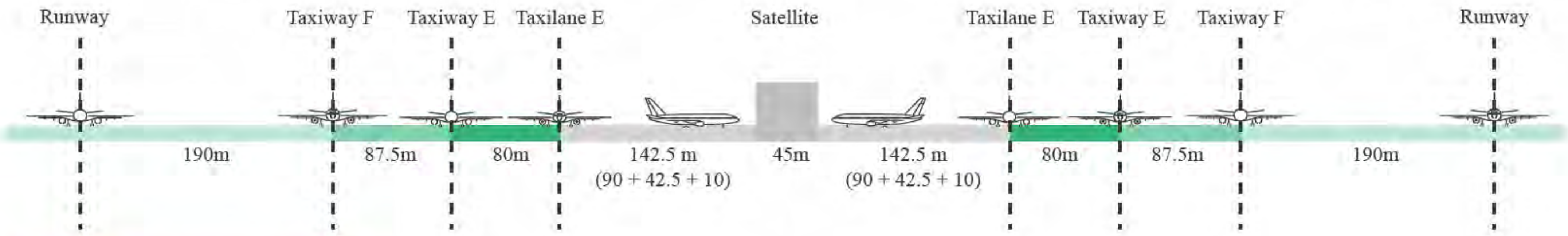


Figure 4.2.2_1 Runway Separation cross section

4.2.2 Runway separation

The runway separation safeguarded in the 2003 Air Transport White Paper was 1,035 m - which is the minimum distance required to operate two runways in mixed mode according to the ICAO Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways.

The separation provided is dependent on a number of factors, some directly linked to the operation of the airfield and others related to the impact the construction and operation of the runway may have on neighbouring communities and the environment. These two factors can be conflicting and at Gatwick greater runway separations are met with greater environmental impacts.

From an operational point of view, the most efficient aircraft flows can be achieved by maximising the capacity of the midfield which optimises the journey distances to/from the runways to the stands.

The land based impacts considered include air noise, air quality, land take and the impacts of the obstacle limitation surfaces as well as associated direct and indirect impacts on buildings, heritage and ecological receptors..

In recognition of the greater environmental impacts that result from increasing runway separations, the separation chosen, 1,045m, is the minimum that meets the operational requirements for the midfield airfield. These requirements are defined by the minimum spacing needed for the runway operational areas, taxiways, aprons and associated roads and the New Terminal pier, as shown in Figure 4.2.2_1. Most of these dimensions are specified by the CAA and ICAO and by GAL planning standards.

The 1,045m separation allows for two sets of twin parallel taxiways (inner Code F closest to the runway and Code E furthest from the runway) to be provided on the south side of the existing runway and the north side of the new runway. Code E taxilanes parallel to the twin taxiways provide access to two rows of Code E stands (90m long). These stands are served by a central satellite/pier which is parallel to the runway centreline of 45m wide with 10m wide head of stand roads either side. The airfield taxiway separations are driven by CAP 168 regulations whereas the stand depth, airside road and satellite width respond to Gatwick's own planning standards for a safe and efficient operation of the airfield.

This taxiway arrangement supports a range of different apron/ gate configurations which are described in more detail in section 4.3.

A 1,045m separation has similar land based impacts to those safeguarded for in the 2012 Master Plan.

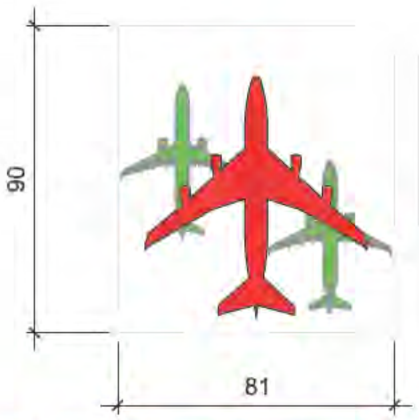


Figure 4.2.2_2 Dimensions of Code E MARS Stand

4.2.3 Declared lengths and supporting infrastructure

Analysis of runway length requirements for the current and future forecast aircraft operations at Gatwick indicates that a take-off distance of 3,400 m and a landing distance of 2,500m would be sufficient to accommodate all operations. The naming convention used in the Master Plan to describe the new runway is 08S for easterlies and 26S for westerlies. This means that the existing runway is referred to with its current naming convention (08R-26L).

On this basis, the take-off distances for the new runway is the 3,400m required and for the existing runway the current distances have been maintained (3,399 m on 26L and 3,311 m on 08R).

For the new runway, the threshold location for 08S has been set on the basis of the obstacle situation to the west of the airfield. The chosen threshold location is located as west as it can be without the approach surfaces affecting the ground, this allowed for a 3m clearance based on the quality of obstacle data available. The location may be refined in subsequent design stages once detailed topographical data of the area is available.

The threshold for 26S has been inset in order to accommodate the 26S Glide Path sensitive area within the airfield operational boundary site, leaving sufficient room for an airside and landside road west of the railway corridor.

For both runways the recommended RESA length of 240 m has been provided for both landing overshoots and undershoots and take-off overruns.

Rapid Exit Taxiways (RETs) are designed to allow landing aircraft to turn off the runway at higher speeds thereby minimising runway occupancy. The masterplan layout shows two RETs for each runway direction north of the new runway, with the same south of the reconfigured runway 08R-26L.

As they are currently drawn, the first RET will cater for Code C aircraft types with an optimum location likely to be in the range of 1300-1500m from landing threshold. The second RET will cater for large and wide-body aircraft and be located between 1900m and 2100m from the landing threshold. Final RET provision and locations will be revisited as a part of more detailed study however changes are likely to be minor and will have no impact on the airfield boundary.

All runway ends are to be equipped with ILS CAT III equipment.

	TORA	TODA	ASDA	LDA
08R	3,159	3,311	3,233	2,766
26L	3,255	3,399	3,316	2,831
08S	3,340	3,400	3,400	2,885
26S	3,340	3,400	3,400	3,132

Table 4.2.3_1 Runway Declared Distances

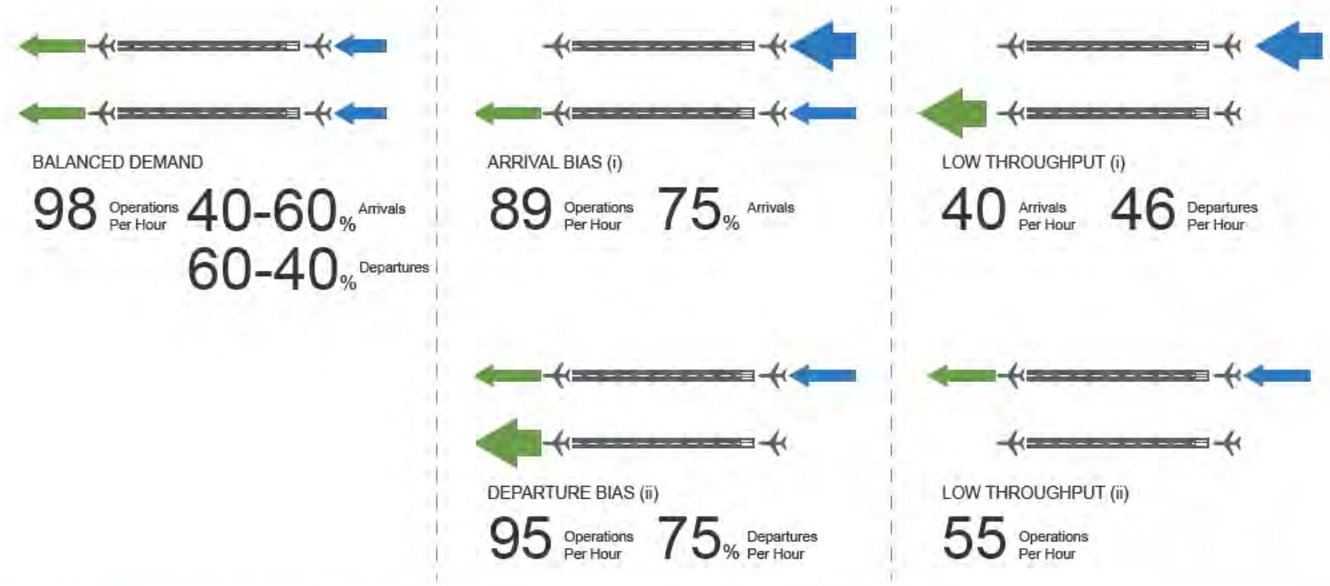


Figure 4.2.4_1 Runway Assignment Operational Flexibility, maximum hourly runway throughputs shown

4.2.4 Flexibility in mode of operations

The pair of mixed mode runways provides operational flexibility and resilience to deal with arrival or departure dominant flows and peaks (see Figure 4.2.4_1). Through simulation the maximum runway throughput during periods of balanced demand in the 2040 schedule has been established as 98 atms/hour. Furthermore, higher departure peaks periods can be accommodated to the point when combined with a low demand of arrivals the southern runway is operated as a departures only runway. The northern runway would operate in mixed mode (Departure Bias in Figure 4.2.4_1). Similarly, during high arrival peak periods, it would be possible to use the northern runway to accommodate a greater volume of arrivals up to becoming an arrivals only runway. In this case the southern runway would be operated in mixed mode (Arrival Bias in Figure 4.2.4_1).

During off-peak times, when the arrival and departure demand is below 40 and 46 movements one-way for arrivals and departures respectively, it would be theoretically possible to accommodate the traffic with the runways operating in segregated mode, with one runway serving departures and the other arrivals (Low throughput (i) in Figure 4.2.4_1). Segregated mode offers a relatively easier runway and airspace operation from an Air Traffic Control (ATC) point of view. In addition, it may offer respite from noise for communities living under the flight paths, since there will only be one arrivals stream, and one departure stream (rather than two streams for every flow in mixed mode). However, to operate in segregated mode consideration should be given to other factors such as the impact on taxi times and airlines assignments and operation; with arrivals on the northern runway and departures on the southern runway, all departures from the northern apron will need to taxi to the southern runway increasing average taxi distances and times for departures with respect to mixed mode operations.

During off-peak times and low volumes of traffic it may also be possible to revert to single runway operations -for example at night time. This operation would result in the ability to offer noise respite to surrounding communities if night time single runway operations are alternated between both runways.

The alternative modes of operation described above are inherent within the flexibility offered by mixed mode and could be adopted depending on how traffic materialises over time.

4.2.5 End-around taxiways (EATs)

As described in Section 4.2.1, to operate compass departures, there is a need for some aircraft departing from the northern apron to taxi to the new runway. This operation requires these aircraft to cross the existing runway. The provision of EATs would remove the need for departing aircraft to cross the runway.

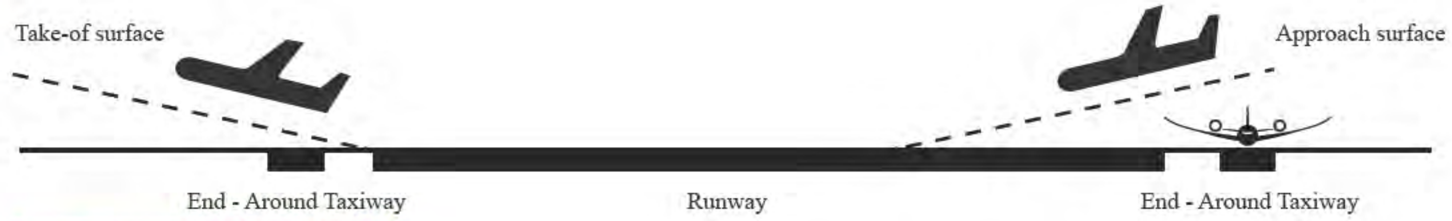


Figure 4.2.5_1 End-Around Taxiways

Having reviewed various concepts a preferred design has been settled on where the EATs are positioned so they can be used independently from runway operations only by aircraft taxiing beneath arriving aircraft. This principle, combined with an inset landing threshold, allows the EATs to be located close to the runway ends and keeps the airfield broadly within the safeguarded boundary.

The concept illustrated in Figure 4.2.5_1 shows EATs at both ends of the runway but, at any one time, only the EAT beneath the arriving flights would be in use. When the runway operation is reversed, owing to a change in wind direction, the other EAT would be brought into service.

To accommodate the EATs around the existing runway it is necessary to inset the landing thresholds of both operating directions (by 515 m for 26L and by 348 m for 08R). In order to maintain an adequate landing distance available in the 26 direction, the western end of the existing runway would need to be extended by around 100m.

The displacement of the thresholds is required so that aircraft taxiing on the EATs do not penetrate the approach surfaces – in this way, taxiing can take place independently of landing operations. The EATs have been located at an appropriate distance from the thresholds to allow for independent taxiing for aircraft up to Code E size. Figure 4.2.5_2 shows displacement of the thresholds of the existing runway and highlights in blue the location of EATs. Code F aircraft needing to cross would be able to use the EATs subject to permission from ATC or the runway crossings provided.

During westerly operations it is assumed that all departures parked on the northern apron departing from the new runway would taxi around the runway using the eastern EAT. When operating easterlies aircraft taxi around the runway using the western EAT. The airfield circulation patterns for the layouts with EATs are illustrated in Figures 4.2.5_3 and 4.2.5_4.

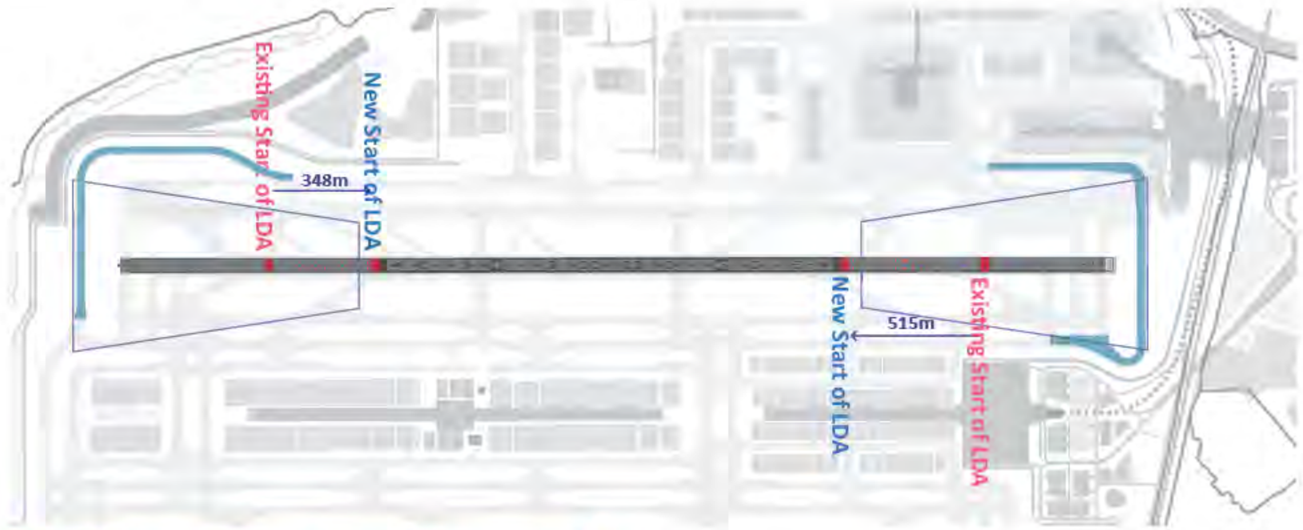


Figure 4.2.5_2 EAT Location and landing threshold displacements

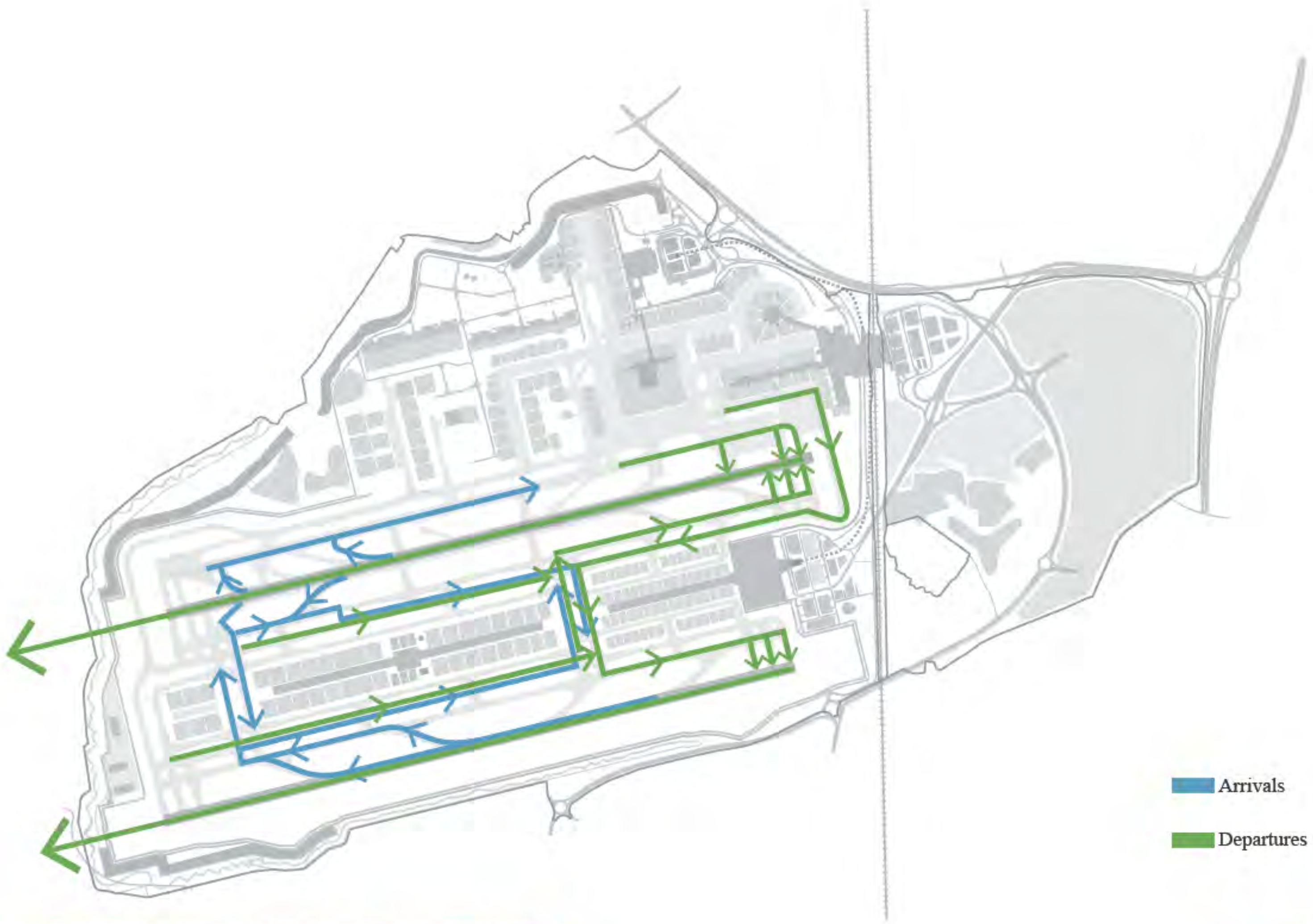


Figure 4.2.5_3 Airfield circulation patterns Westerlies (with EAT)

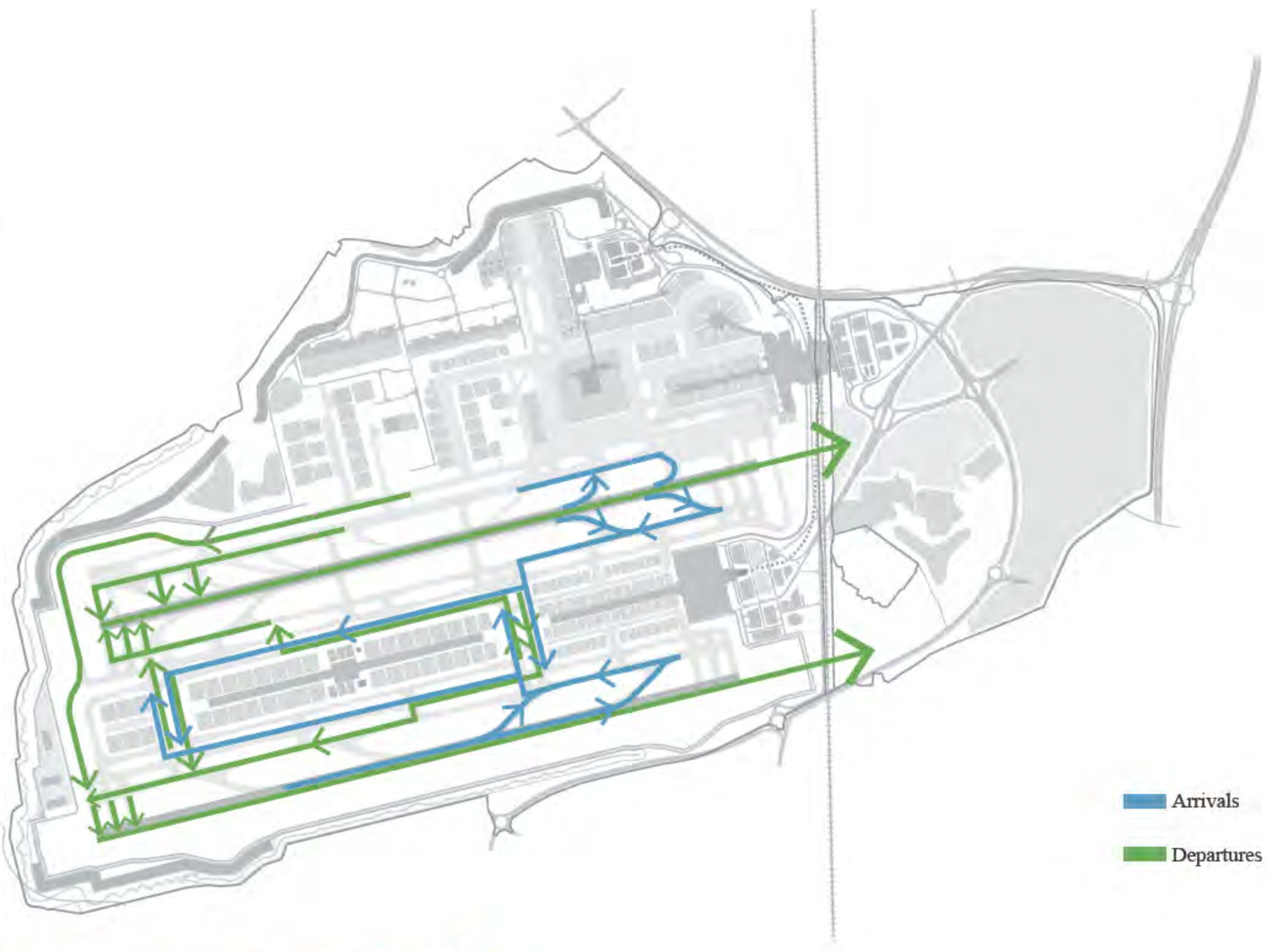


Figure 4.2.5_4 Airfield circulation patterns Easterlies (with EAT)

Airfield simulation summary (with EATs)

Similarly to the layout without EATs, CAST Aircraft™ simulations for the layout with EATs have been undertaken to validate runway system capacities, airfield performance and operational efficiency of these layouts. In this case, both operating modes (westerlies and easterlies) were tested. The airline assignment tested was the same assignment assumed in the without EAT scenario, e.g. a mix of long haul and shorthaul aircraft operating from each apron.

The results obtained show that the layout delivers the forecast flight schedule demand. The runway throughput achieved is a maximum of 98 atms/h, with an average hourly delay for departures less than 10 min and an average hourly taxi time for departures of less than 15 min throughout the day. With regards to arrivals, the simulation shows that delays and taxi times are significantly lower than in the case of departures.

By reducing the need for crossings, EATs have the following potential benefits which are supported by the results from the simulation;

- Reduce the risk of runway incursions;
- Reduce the risk of runway capacity reduction;
- Reduce aircraft holding delays;
- Provide more predictability and resilience to the operation.

These benefits need to be balanced with the additional land-take and potential environmental impacts of their operation. GAL is currently seeking feedback on these issues through the public consultation exercise.

Eastern Taxiway

Should an EAT be provided to the east of the existing runway, there would be an opportunity to further extend the taxiway to provide a direct route for aircraft needing to access the new runway from the northern aprons. This connection would reduce the journey for aircraft needing to access the new runway from the northern apron. This connection should preferably be extended across the east end of the New Terminal to serve the new runway 08R-26L and reduce aircraft taxi distances. The new taxiway would need to cross the terminal access road as well as the landside APM connecting the New Terminal with the Gateway.

While this taxiway configuration is not included on the base layout and simulation has not shown a need for it, two conceptual alternatives have been considered and are commented on below:

Option 1: assumes that the road access to the terminal will travel below the existing rail line as well as below the taxiway connection.

- The landside APM linking the new and south terminals runs parallel to the rail line, and will also need to be routed below the taxiway.
- The connecting taxiway is located parallel to the rail line, with a nominal 75m separation from its centreline, in order to minimise the impact on the landside facilities assumed to be provided adjacent to the terminal building.
- Its location also maximises the available length for the terminal access roads to ramp up from an assumed minus 8m elevation below the taxiway to the terminal forecourt.

Option 2: assumes a bridge over the rail line and a tunnel below the connecting taxiway.

- This would require an assumed 16m elevation change to the terminal access roads between the bridge over the rail line and taxiway tunnel, as well as a subsequent requirement to ramp up again to the terminal forecourt.
- In addition, this option could significantly reduce the landside area between the taxiway and the terminal. However, there would be an opportunity to maintain a similar provision of landside facilities by shifting the terminal and apron further west by sacrificing one of the western-most cross taxiways.

The airside simulation results don't indicate there is a need to provide this taxiway for operational reasons based on the current set of assumptions used. Nevertheless, should a need for this taxiway be identified in the future the Master Plan safeguards for the possibility to accommodate it. It is estimated that this taxiway could reduce taxi times for westerlies departing the new runway originating from the northern apron by approximately 4 minutes.

Figure 4.2.5_5 illustrates the first option described.

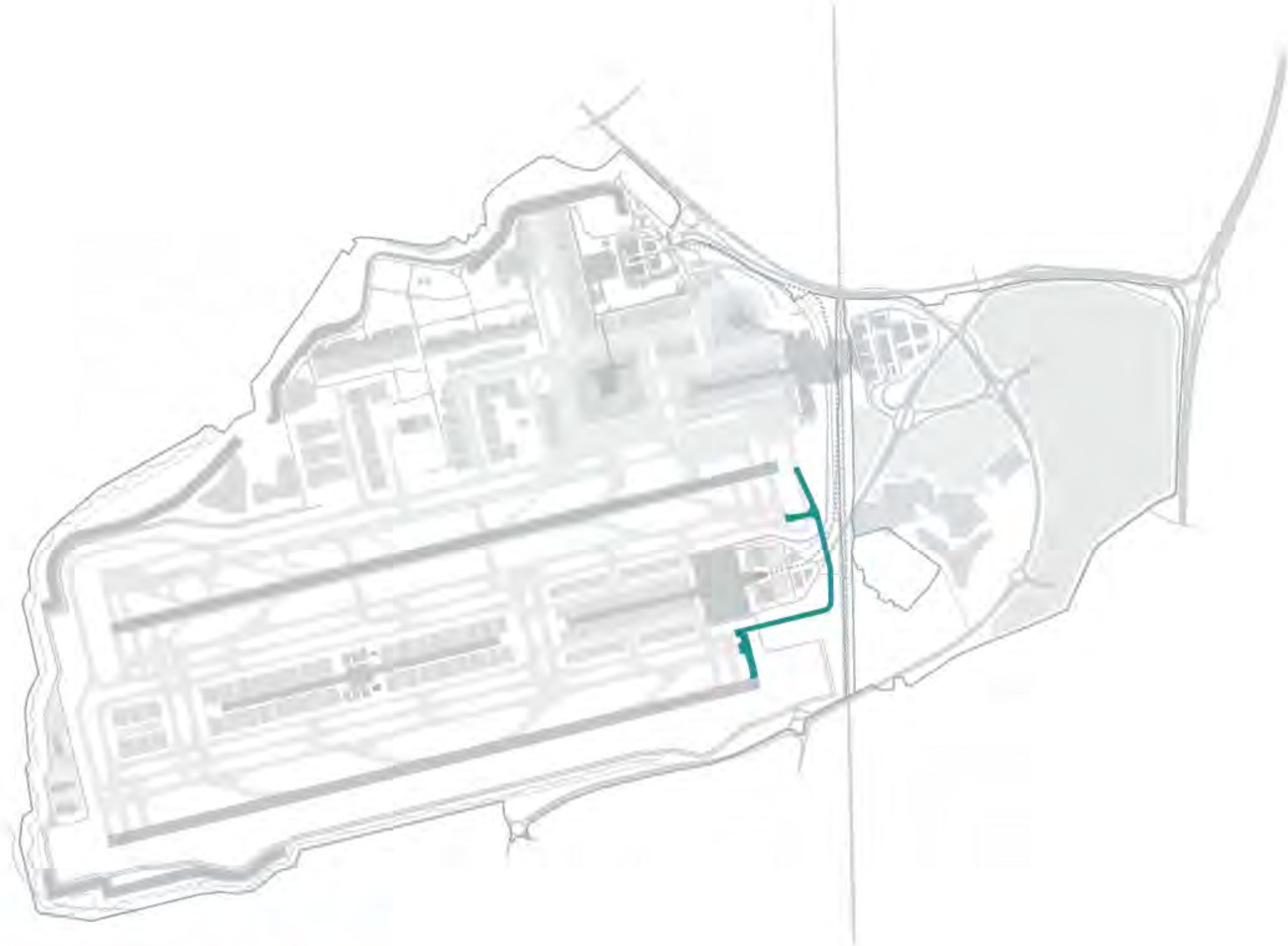


Figure 4.2.5_5 – Option 1: Eastern taxiway

4.2.6 Planned and unplanned runway closures

In the event of a planned or unplanned runway closure, the airfield has been designed to enable single runway (mixed mode) operation. The closure of a runway does not affect the ability to use other parts of the airfield infrastructure (terminals or aprons).

Should the new runway be out of service, all operations would take place on the existing runway, as per today's operation. The only different feature compared with current day operations would be that aircraft needing to get to the midfield apron would exit the runway using the new taxiways located south of the existing runway. Controllers and pilots would need to ensure that aircraft take the exit in the direction appropriate to the parking apron.

Should the existing runway become unavailable, all arrival and departure operations would take place on the new runway. Access to/from the runway would be via the two sets of twin runway crossings and via the two sets of EATs if they are provided, since there would be no overflying operations on the existing runway.

Furthermore, during off-peak times (e.g. at night) with lower scheduled demand, it would be possible to operate only from one of the runways. The ability to alternate between both runways could offer respite from noise for communities living under the flight paths.

4.2.7 Low visibility procedures

The Master Plan layout has been developed to enhance airport's resilience in the event of severe weather. It is known that Gatwick sometimes operates under low visibility conditions in the early morning, generally early spring and autumn. In order to mitigate the impacts of low visibility conditions, the following operational provisions have been considered:

- ILS CAT III capability for the new runway with CAT III runway holding positions as per CAP 168 requirements.
- Critical and sensitive ILS areas have been considered to define the airfield boundary, ensuring that these areas are clear of objects during airport operations.
- CAT II/III approach lighting systems for the new runway 08S-26S, with a full length (900 m) approach lighting system.
- The arrangement of the taxiways and the midfield apron provide simple taxiway routings. Simple taxiway routings are particularly important in low visibility operations in order to minimize aircraft mis-routing.
- Advanced Surface Movement Guidance Control Systems (A-SMGCS) and Surface Movement Radar (SMR) will be used to determine the position of aircraft and vehicles on the manoeuvring area to enhance controller situational awareness.
- If a second runway at Gatwick generates a need for runway crossings, new technologies will be used to provide a safety net for pilots and controllers before a runway incursion takes place, e.g. Runway Status Lights (RWSL).
- Mixed mode will allow for the most flexible use of runways in order to deal with short-term peaks in arrival or departure demand that may result during periods of severe weather.

When Low Visibility Procedures (LVP) are in force a much reduced landing rate can be expected due to the requirement for increased spacing between arriving aircraft. This arises from the need to protect ILS sensitive and critical areas. The following landing rates are currently provided in Gatwick's AIP:

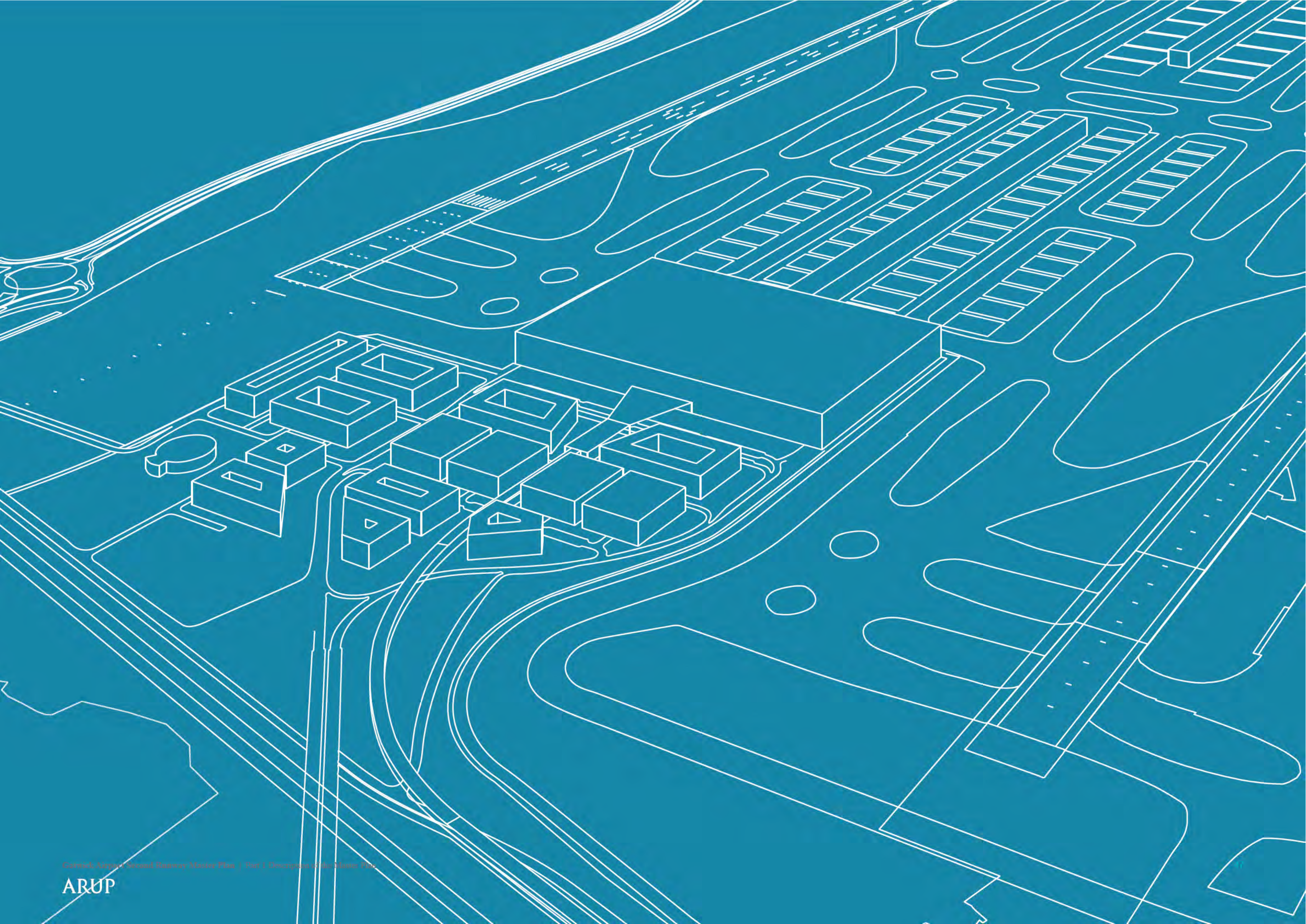
- 600 m < RVR < 1000 m: 20 arrivals/h
- 350 m < RVR < 550 m: 15 arrivals/h
- RVR < 300 m: 12 arrivals/h or less

The spacing between departures is not modified under low visibility operations, and therefore the departure rate might remain as per normal operations at 30 departures/h during departure peak periods and 24 departures/h during 2-way balanced peak periods. However, the achievement of this rate will be dependent on maintaining the required taxiway capacity. LVP may require an increase in aircraft longitudinal taxiway spacing, and additional time between aircraft crossing a common junction, since ground movement controllers will likely be relying on surface movement radar alone to provide separation between aircraft on the ground. Because of that, a drop on the departure rate is expected under low visibility conditions.

Assuming a balanced mixed mode operation and a constant Arrival-Departure-Arrival (ADA) sequence, on the basis of the landing rates stated above, the expected 2-way throughput for the two runways would be:

- 600 m < RVR < 1000 m: (20+20) x 2 = 80 atms/h
- 350 m < RVR < 550 m: (15+15) x 2 = 60 atms/h
- RVR < 300 m: (12+12) x 2 = 48 atms/h

It should be noted that during departure peak periods, when the arrival demand is low, the quoted mixed mode figures could be increased by fitting more than one departure in the LVP spacing between arrivals (ADDA sequence).



4.3 Aprons

The apron has been designed to facilitate flexible and resilient airport operations. The assessment presented has considered a range of scenarios which aim to provide:

- Flexibility – to support a range of airline and fleet mixes
- Quality of Service – with high levels of pier service and fully equipped stands
- Efficient – quick access to runways and fast turnaround times
- Safety – large and safe equipment areas/places to work

The approach used to plan the aprons has been to consider the existing apron capacity, future stand requirements and spatial constraints. Spatial planning has been complemented with robust analysis using proprietary gating software, NAPA, and forecast planning day flight schedules for 2040.

The results from the 2040 busy day have been translated into annual requirements for 2040 and 2050 to assess overall stand requirements. Following this, a number of airline assignment scenarios have been tested against the Master Plan apron layout to assess stand utilisation, capacity and efficiency. The base Master Plan stand layout is shown in Figure 4.3_1 with the total stand breakdown presented in Table 4.3_1.

Note that the total number of stands in this breakdown differs slightly compared to the baseline airport provision summarised in Section 1.2. This difference is due to the conversion of a remote Code F stand to a maintenance hanger leading to a reduction in stands to 106, compared with the baseline airport total of 107.

4.3.2 Midfield Apron

Master Plan Layout

The approach to plan the apron has been driven by two characteristics; the runway separation which defines the area available for the apron stands, and the mix of aircraft forecast to operate from the airport.

The runway separation as described in Section 4.2.2 allows for a range of stand configurations. The planned capacity of the midfield apron is 50 mppa and the configuration assumed includes two distinct types of arrangements. The first consists of two rows of Code E stands located either side of a central satellite with Code F stands provided at the end of the satellite. The second is four rows of Code C stands located near the New Terminal, the inner rows being contact and the outer close remotes. This layout therefore, contains a balanced mix of Code F, E, C stands with the additional flexibility in the use of stand being provided through having a high proportion of the larger stands being MARS stands. Remote Code E/F stands are also provided west of the satellite.

Access to the stands is provided via dedicated taxilanes to segregate through traffic on the Code E and F taxiways parallel to the runway.

The contact pier is serving a Code C apron with two rows of contact and remote stands either side. The remote Code C stands are drive through. From these stands, aircraft could power on to the Code C taxilane or be towed on to the contact stands on the pier. This configuration allows for an intensive use of the contact stands with fast turn-around times including overnighting aircraft on remote stands as these are located in close proximity to the terminal. Overall efficient, safe and fast Code C operations that support multiple rotations across the day.

The total number of contact stands provided in the midfield is 70 which accounts for almost 70% of stands and which will provide pier service levels of 95%. Stand provision in the midfield apron is summarised in Table 4.3.2_1.

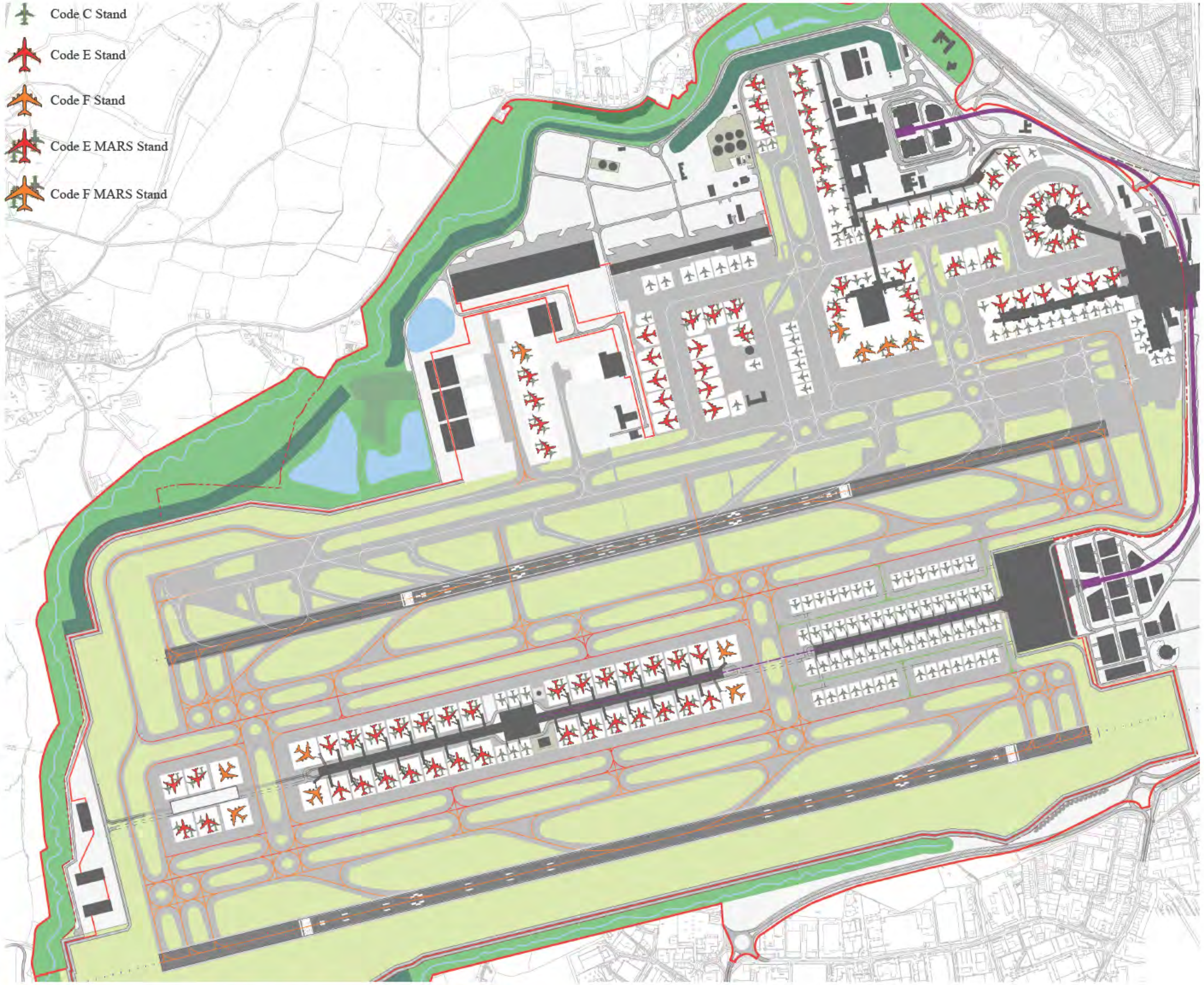


Table 4.3_1 Northern and midfield apron stand layout

Aircraft Code	North Terminal	South Terminal	Remote Stands
C	7	13	8
D	2	4	11
E	4	7	9
E MARS	16	7	13
F MARS	4	0	1
Total	106 (based on maximum aircraft size) 137 (based on maximum aircraft number)		

Table 4.3.1_1 Northern apron stand breakdown

Aircraft Code	Midfield Apron	Midfield Contact	Midfield Remote
C	66	38	28
E	4	4	0
E MARS	28	24	4
F	6	4	2
Total	104 (based on maximum aircraft size) 132 (based on maximum aircraft number)		

Table 4.3.2_1 – Midfield apron stand provision

Aircraft Code	Total Stands	Contact Stands	Remote Stands
C	94	58	36
D	17	6	11
E	24	15	9
E MARS	64	47	17
F MARS	11	8	3
Total	210 (based on maximum aircraft size) 269 (based on maximum aircraft number)		

Table 4.3.1 Total stand breakdown

Alternative arrangements to support different airline mix scenarios

Acknowledging that market requirements may change overtime to what is currently forecast, this section illustrates alternative apron arrangements to the one shown in the Master Plan. The following images illustrate the different apron configurations available should the traffic materialise with greater proportions of E/F aircraft and/or Code C aircraft in the mix than currently forecast. The stand provisions for alternatives are presented in Figure 4.3.2_2.

Aircraft Code	E MARS Configuration	High Proportion of Code C	Code F Stands
C	6	96	8
E	14	8	8
E MARS	40	22	34
F	0		10
Total	60	126	60

Table 4.3.2_2 Summary of alternative stand configurations

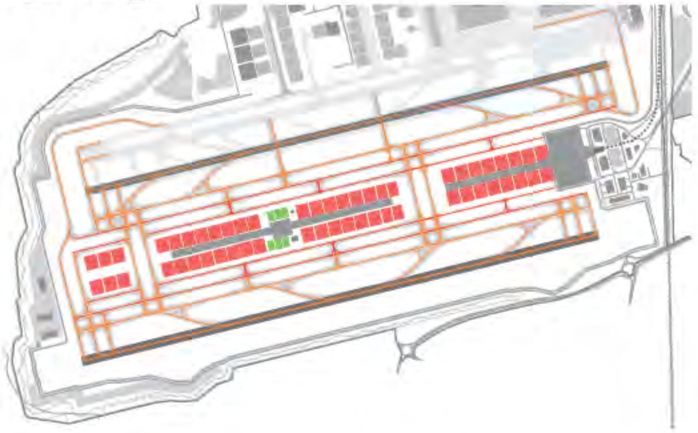


Figure 4.3.2_1 – Maximum E MARS configuration

Alternative 1: E MARS configuration

The E MARS configuration layout replaces the four rows of Code C stands near the terminal with 12 Code E MARS stands and 4 Code Es

Figure 4.3.2_2 – High proportion of Code C

Alternative 2: High Code C configuration

The Code C layout replaces 12 E MARS and 4 E stands on the satellite with Code Cs. Near the terminal the Code Cs have been replaced by 6 E MARS and 2 Es.

Figure 4.3.2_3 – Maximum Code F stands

Alternative 3: Code F and E configuration

The Code F configuration provides a maximum of 10 Code F. The Code F stands would be perpendicular to the other stands so that they can be pushed back onto the adjacent code F taxiways.

4.3.3 Airline Assignment Alternatives

A gating exercise has been carried out to investigate the range of airline assignments that could be supported by the configurations described previously and to test the flexibility of operation provided by both the northern and midfield aprons. This exercise used the 2040 forecast flight schedule and considered three airline assignments which represented a range of possible future scenarios:

- **Base Case:** Considered a balanced airline assignment apron wide with long haul and short haul airlines co-located in the midfield. Short haul/low cost flights given preferential access to the Code C stands located at the terminal pier and long haul/full service flights access to the satellite stands.
- **Alternative 1:** Co-located all airlines with the higher airside transfer percentages, including alliance members, and those which are long haul in the midfield to offer a consolidated transfer product. In this alternative the North Terminal is almost entirely dedicated to low cost airlines and South Terminal hosts a mix of charter, low cost and non-aligned full service carriers.
- **Alternative 2:** Placed emphasis on locating as many short haul and low cost airlines as possible in the midfield. Some low cost airlines were also assigned to the northern apron.

The resulting analysis indicated that all alternatives could be accommodated within the midfield. The results identify there is a surplus of stands. Given that the results are based on the 2040 busy day flight schedules, the surplus should be considered as the buffer needed to support growth to 2050.

ARUP

Base Case

The Master Plan layout with Code C stands located near the New Terminal was most appropriate for the base case assignment.

Figure 4.3.3_1 illustrates the utilisation of stands for the base case. The different colour coding reflects how each particular stand has been used across the busy day – e.g. if a Code E stand has been used only by Code C stands it will be colour coded green.

The Figure illustrates that there would be spare remote capacity of 21 Code C stands in the midfield which are not used at any point during the busy day. The remote stands to the western end of the Northern apron are also underutilised with one movement occurring either in the morning or in the evening due to overnighting aircraft. The analysis also indicates that stands in the midfield are utilised efficiently. The northern apron has spare capacity on the remote stands while the contact stands are used by a mix of Code Es and Cs.

A more detailed breakdown of the utilisation of the midfield stands across the day is shown in the stand utilisation graphs (Figure 4.3.3_2). The graph indicates that during the early morning and late evening stand requirements are at their highest, but in the middle of the day stand demand drops. There is additional spare capacity throughout the day.

Figure 4.3.3_3 illustrates how the Northern Apron is being utilised throughout the busy day. The stands are very busy in the early morning as some of the overnight aircraft are still departing and the first wave of arrivals have started to land. Through the remainder of the day the stands are not utilised heavily.

There is a surplus of stands as illustrated in Figures 4.3.3_2 and 4.3.3_3. This is due to the fact that the 2040 busy day flight schedule has been gated against the maximum 2050 capacity available. The surplus of stands will be needed to deal with the 2040 absolute annual peak stand requirements and to support growth to 2050.

Figure 4.3.3_1 Base Case 2040 stand utilisation

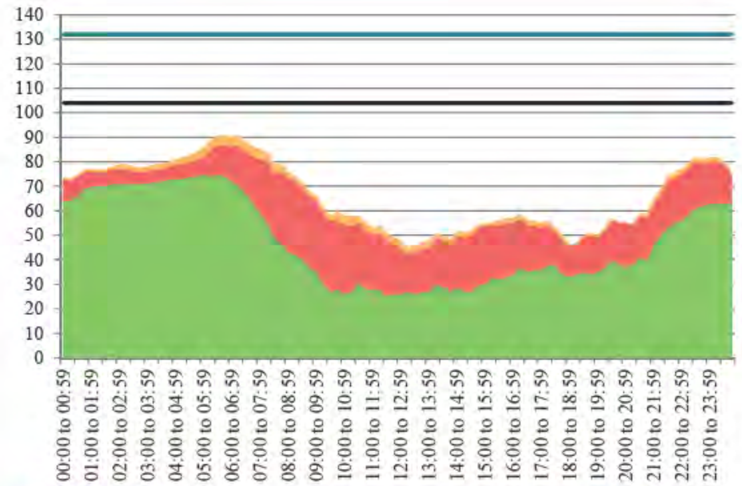


Figure 4.3.3_2
Base Case midfield apron stand utilisation across the busy day

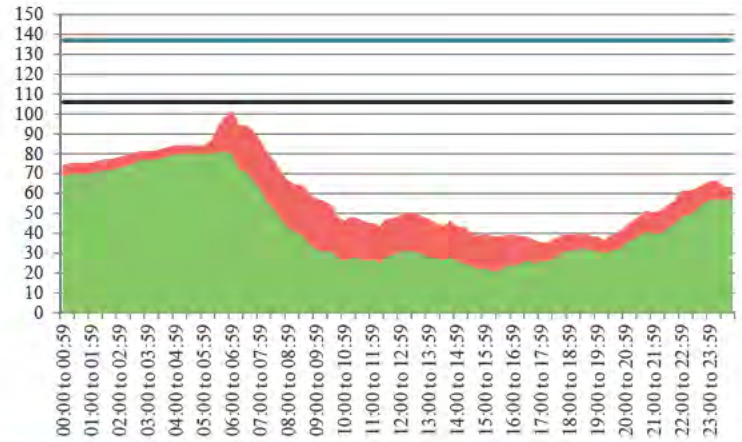


Figure 4.3.3_3
Base Case northern apron stand utilisation across the busy day

Alternative 1

The Alternative 1 E MARS configuration layout was used for the Alternative 1 gating exercise as a greater proportion of long haul flights requires a higher volume of Code E stands in the midfield. When gating this alternative larger aircraft were given preferential access to contact stands while the smaller Code C aircraft would be parked on remote stands west of the satellite.

Figure 4.3.4_4 illustrates the utilisation of stands for Alternative 1. It shows that there would be spare remote capacity of one Code E and one Code C stand in the midfield apron. The northern apron contact stands are heavily utilised by Code Cs, while larger Code E aircraft use the remote stands. This allows for a higher pier service level.

The midfield apron and the northern apron stand utilisation across the day can be seen in Figure 4.3.3_5 and Figure 4.3.3_6.

There are fewer overall aircraft movements in the midfield and a greater number of movements in the northern apron compared with the base case. This suggests that the northern apron stands are being used more intensively by Code C aircraft on stands that can actually accommodate larger aircraft. In the midfield the utilisation of stands is low, therefore suggesting that from an airfield operations perspective and to make best use of existing and new facilities a mix of short haul and long-haul aircraft sharing aprons results in a more efficient and balanced assignment strategy.

Figure 4.3.3_4 Alternative 1 2040 Busy Day Stand Utilisation

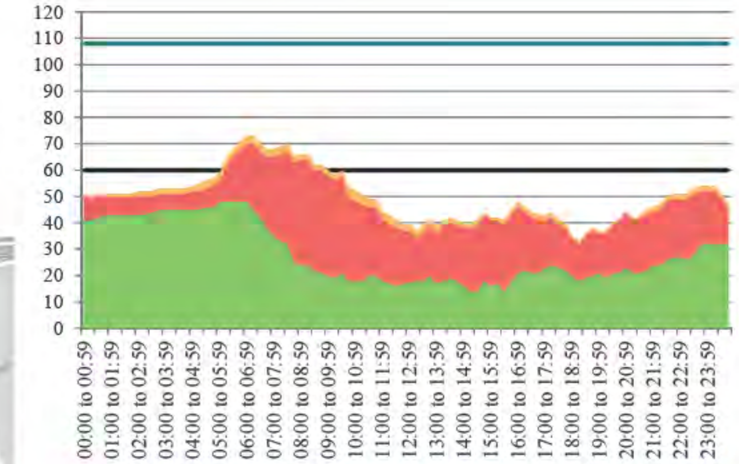


Figure 4.3.3_5-Alternative 1 midfield apron stand utilisation across the busy day

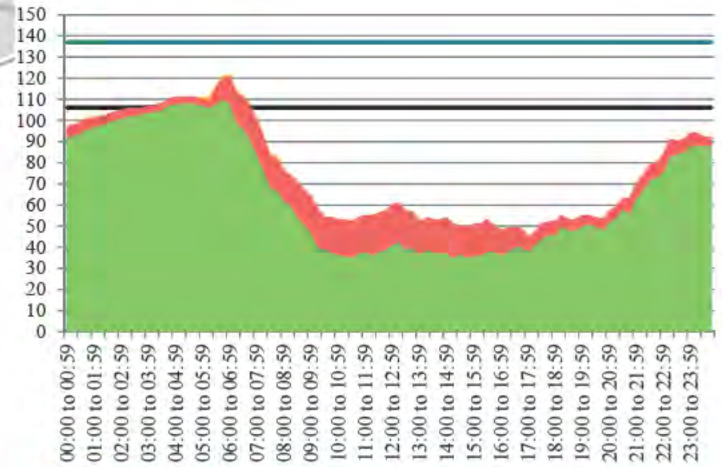


Figure 4.3.3_6- Alternative 1 northern apron stand utilisation across the busy day

Alternative 2

The Base Master Plan layout with Code C stands located near the terminal was most appropriate for the Alternative 2 assignment as short haul and low cost flights are typically flown by smaller aircraft creating demand for more Code C stands.

Figure 4.3.3_7 illustrates the 2040 Alternative 2 stand requirements. It shows that there would be spare remote capacity of 26 Code C stands in the midfield apron. The northern apron is heavily utilised by Code Es as well as Code Fs. There is spare capacity on some of the remote Code D stands.

The midfield and northern apron stand utilisation across the day is shown in Figures 4.3.3_8 and 4.3.3_9 respectively. There are fewer overall aircraft movements in the midfield compared with the Base Case and the northern apron is underutilised.

As per Alternative 1, these results suggest that a mix of short haul and long-haul aircraft sharing the same apron is a more efficient and balanced assignment strategy to make best use of existing and new facilities. The results also reflect the inherent flexibility within the apron configuration to accommodate alternative assignments if there are reasons to adopt these, e.g. airline location preference.

Legend

- Code F Stands
- Code E Stands
- Code C Stands
- 2050 Supply (max size a/c)
- 2050 Supply (max size no.)

Figure 4.3.3_7 Alternative 2 2040 Stand Utilisation in the Midfield

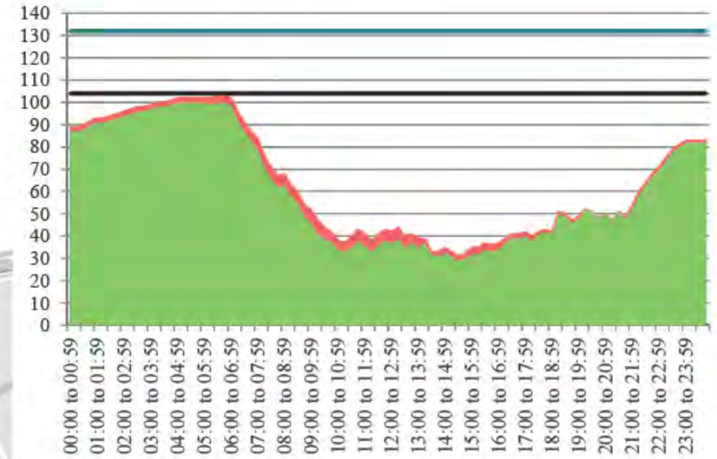


Figure 4.3.3_8 –Alternative 2 midfield apron stand utilisation across the busy day

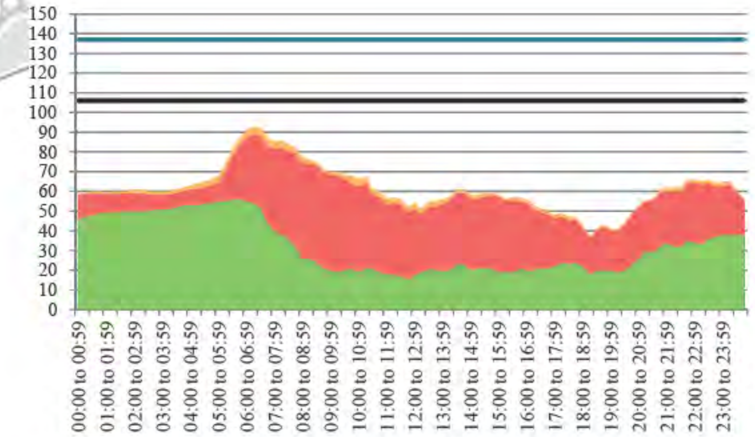


Figure 4.3.3_9- Alternative 2 northern apron stand utilisation across the busy day

4.4 Terminals, Piers and Satellites

4.4.1 Three Terminal Development Strategy

The terminal strategy is based on creating an effortless and legible layout that builds on the inherent simplicity of the current two terminal layout at Gatwick.

The key driver to creating an efficient and easy passenger journey for all is to locate the New Terminal facilities as close as possible to both surface access and to the expanded airfield. Therefore, the optimum location, as illustrated in the figures opposite, for the terminal building is in between the runways and to the west side of the railway line. Placing the New Terminal between runways allows direct connectivity between surface access and aircraft gates. This philosophy is demonstrated schematically in Figure 4.4.1_1.

Care has been taken, in responding to increasing passenger demand, to avoid the airport becoming more complex, less intuitive and an increasingly stressful environment. As the existing enhancements of passenger facilities at Gatwick have demonstrated, the passenger journey can be enhanced with considered and focussed investments.

The planned investments and on-going programmes to upgrade and modernise North and South Terminals will allow the combined capacity to increase to circa 45 mppa by better utilising the existing floor space in the terminals, with a similar capacity being available on the apron.

For the New Terminal, the separation between new and existing runways allows a building width of up to 360 metres. Plans have been developed for a three level terminal of this width which can accommodate 50 mppa in 2050, while providing high levels of passenger service.

Furthermore, the three terminal strategy allows the New Terminal building to be constructed independently from the existing in a green field site and incrementally. The close proximity of the terminal buildings, demonstrated in Figure 4.4.1_2, delivers fast airside and landside connections between the terminals for passengers and staff.

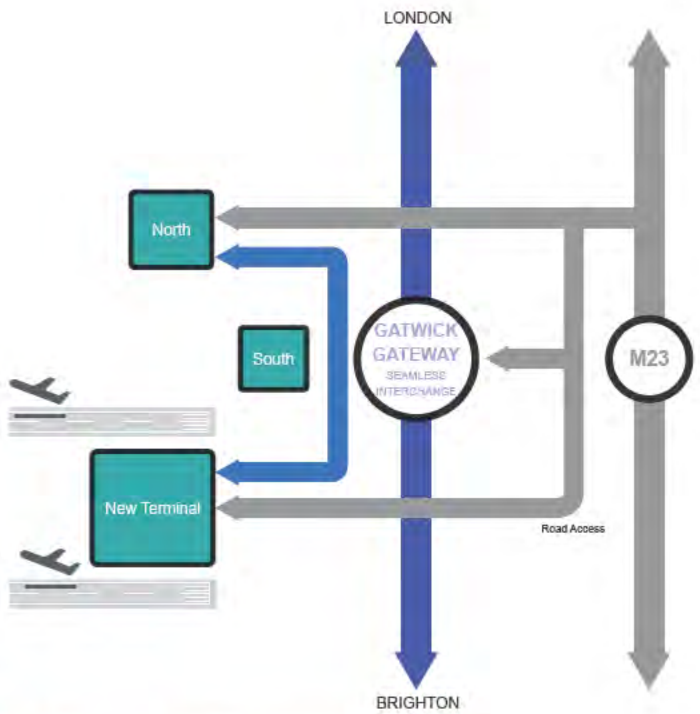


Figure 4.4.1_1 Terminal Connectivity Diagram

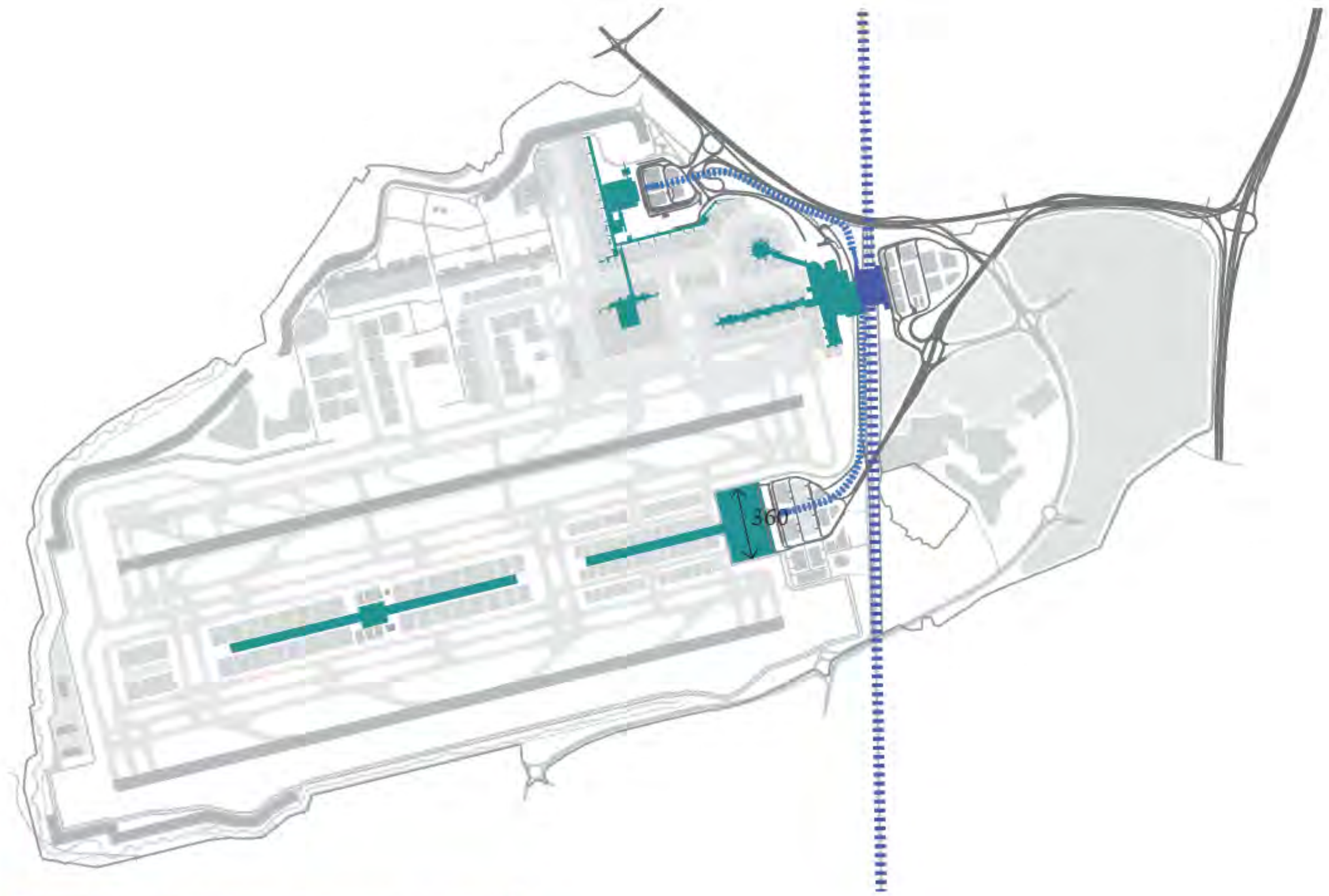


Figure 4.4.1_2 Three terminal airport in close proximity

4.4.2 New Terminal

The New Terminal (exploded view shown in Figure 4.4.2_1) has been developed with the following key planning philosophies central to the process:

- **Location:** New Terminal capacity should be provided in the best location with easy access to both runways, apron capacity and surface transport (Gatwick Gateway) and in close proximity to the existing terminals.

- **Passenger experience:** A simple iconic layout which focuses on providing the passenger with intuitive and easy way finding as well as fast connections between the terminals with minimum level changes throughout the whole passenger journey.

- **Operational efficiencies:** The terminal space has been planned considering current and future operational requirements. The terminal is planned to be flexible to take advantage of emerging technologies which drive more efficient utilisation of space as well as being able to accommodate the latest standards in energy efficiency.

- **Construction:** The terminal should be easy to construct with the ability to be built incrementally to allow for the expansion to be responsive to the growth requirements of the UK aviation sector.

The following sections present in detail the way in which these philosophies have been applied and the resulting terminal layout and size.

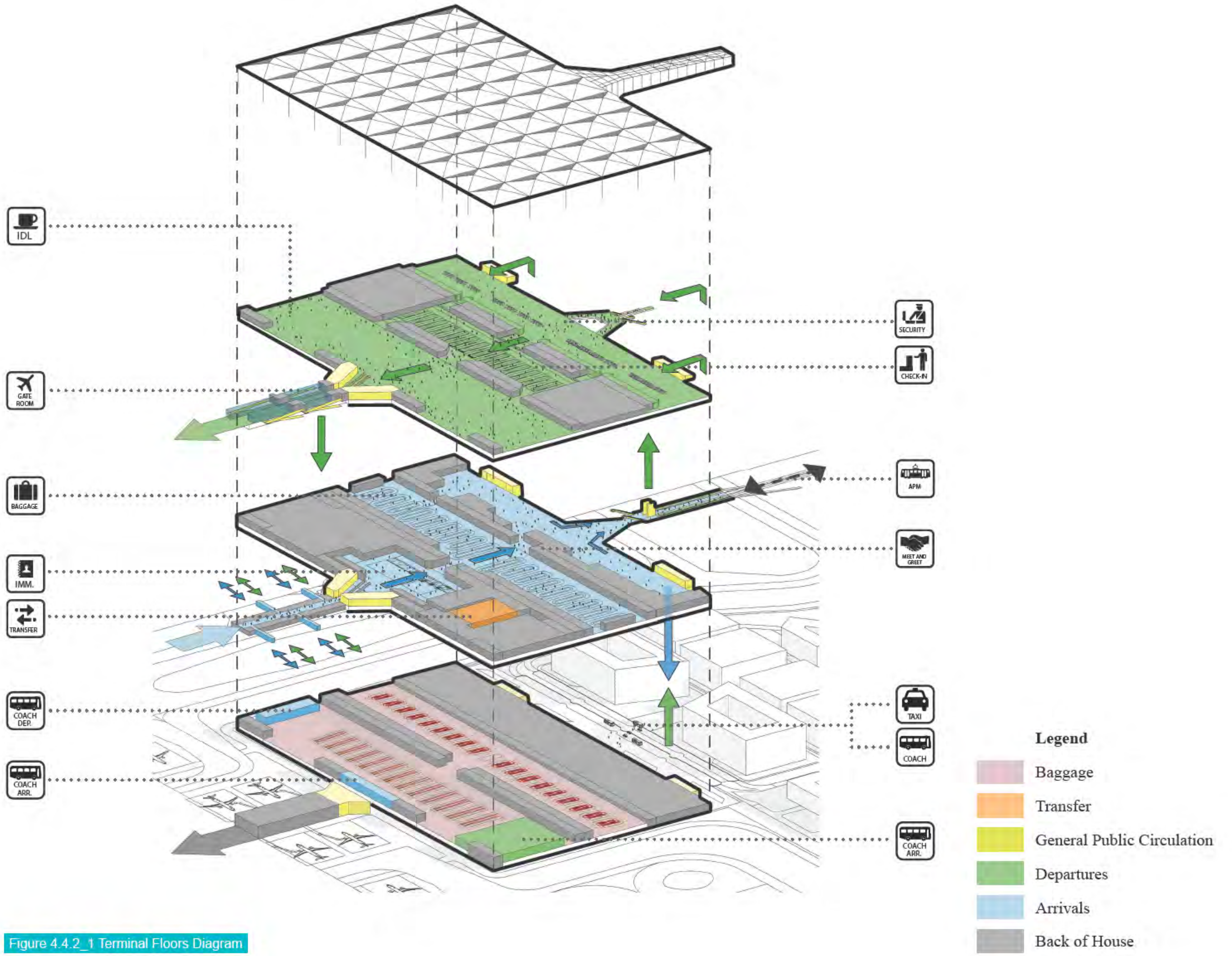


Figure 4.4.2_1 Terminal Floors Diagram

Terminal floor plan description

Substantial new terminal capacity is provided in the midfield with minimum disruption to current operations, as part of a fully integrated three terminal system. The New Terminal floor plans developed demonstrate a simple layout designed to maximise throughput capacity potential and efficiency of operation.

The configuration of the New Terminal and its stands is compact, yet flexible to adapt with resilience to changing airline, airport, and technological drivers and so that it is able to integrate within the context of the South East airport and runway systems.

The terminal itself will sit between the existing and new runways which have a separation of 1,045m. This achieves minimum mixed mode compliance requirements, and generates an elongated midfield apron area. The terminal footprint is defined by the maximum width available of 360m. A depth of 220m has been allowed for. The depth is variable whereas the width is fixed by airfield constraints.

The terminal serves a first phase Contact Pier with subsequent long haul growth allowed for in a satellite building which can be developed in incremental phases.

The simplicity of planning puts the passenger first, with the basic levels corresponding to, and effectively segregating, departure and arrival flows. This relationship is continued into the Contact Pier and into the Satellite to encourage intuitive way finding.

The estimated terminal area required is circa 228,000m2 which given the footprint available can be split over three floors. To minimise level changes, simplify way finding and provide intuitive and clear terminal spaces the terminal has been arranged over three floors, with departures at level +2, arrivals at level +1 and baggage and other support facilities at ground level, as shown in Figure 4.4.2_2.

The landside interface is also simple with the landside APM feeding the majority of passengers to Level +1. From the station, departing passengers continue up on comfortable inclined walkways into a generous Check-In/Bag Drop Concourse at Level +2, while arrivals walk out direct from the Arrivals Concourse at Level +1. This journey progression is shown diagrammatically in Figure 4.4.2_3.

The layout and sizing of the terminal facilities are based on the Programme of Requirements detailed in Section 3. This is based on an airline assignment for the New Terminal involving a balanced mix of different carrier profiles, including international longhaul and shorthaul as well as full service and low cost airlines. The terminal plans and associated floor areas have also been compared to terminals at a variety of other airports to accurately benchmark the planning assumptions used. It is recognised that the New Terminal demands maximum flexibility, rather than following particular carrier profiles and the space available for terminal development permits greater floor areas to be provided should there be a need.

The terminal has been sized based on the likely nature of terminal processes and services in the future. This includes increasingly streamlined bag-drop, security and border control processes and reduced passenger queuing to minimise interruptions to the journey through the building.

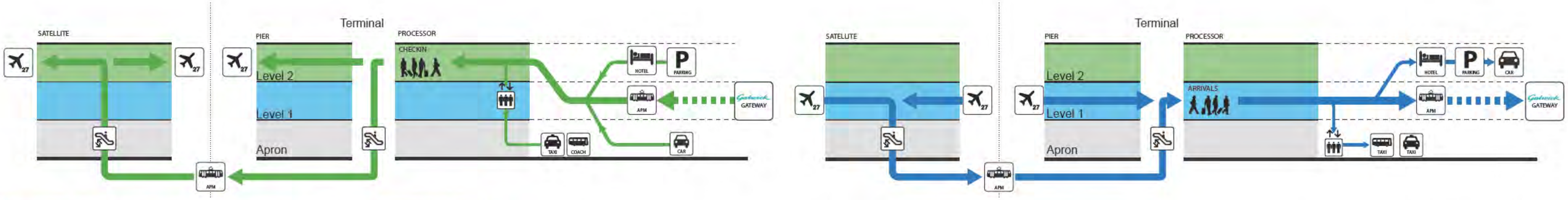


Figure 4.4.2_2 Arrival and Departure Passenger Floors - New Terminal, Pier and Satellite

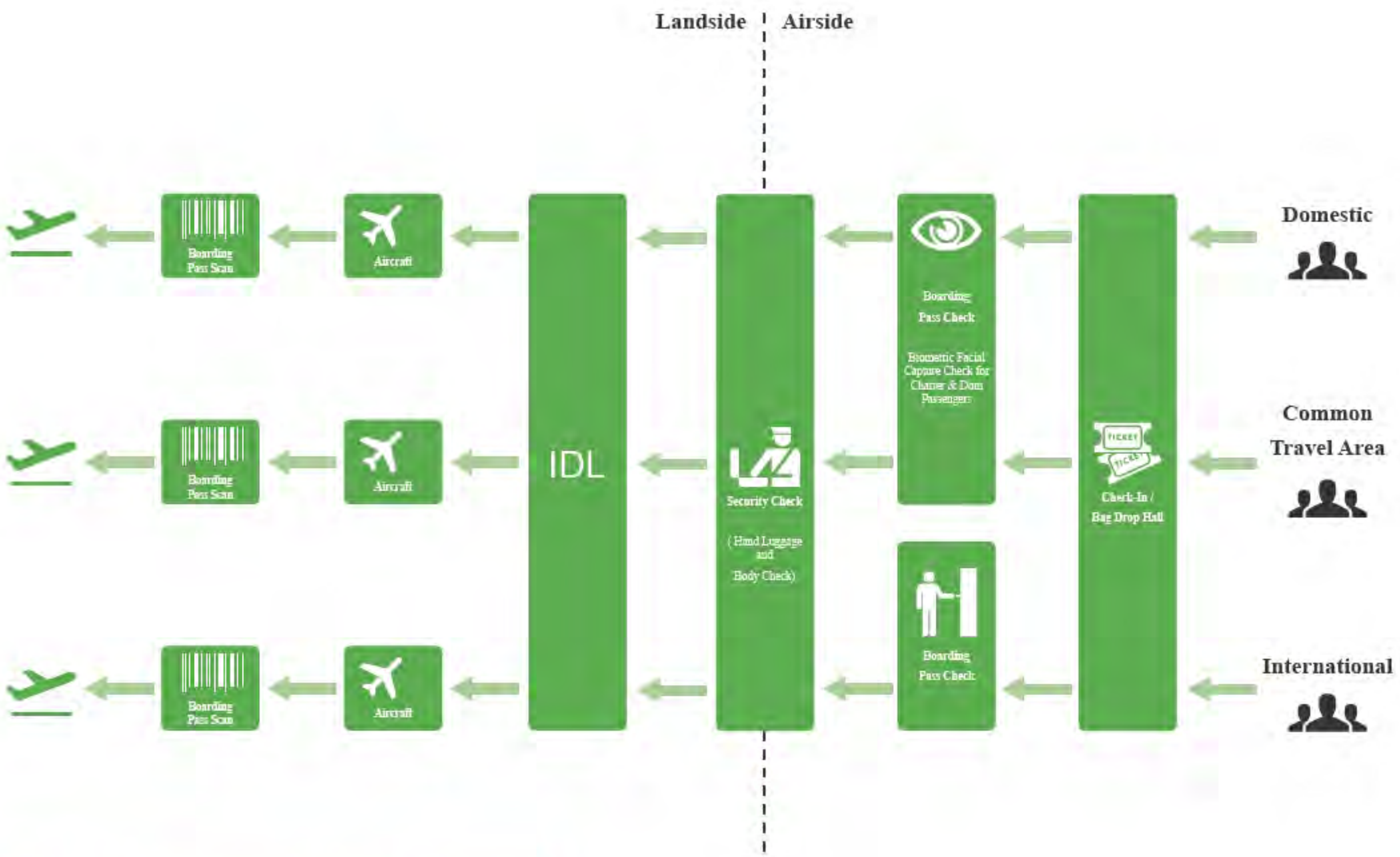


Figure 4.4.2_3 Passenger Flow Diagram - Departures

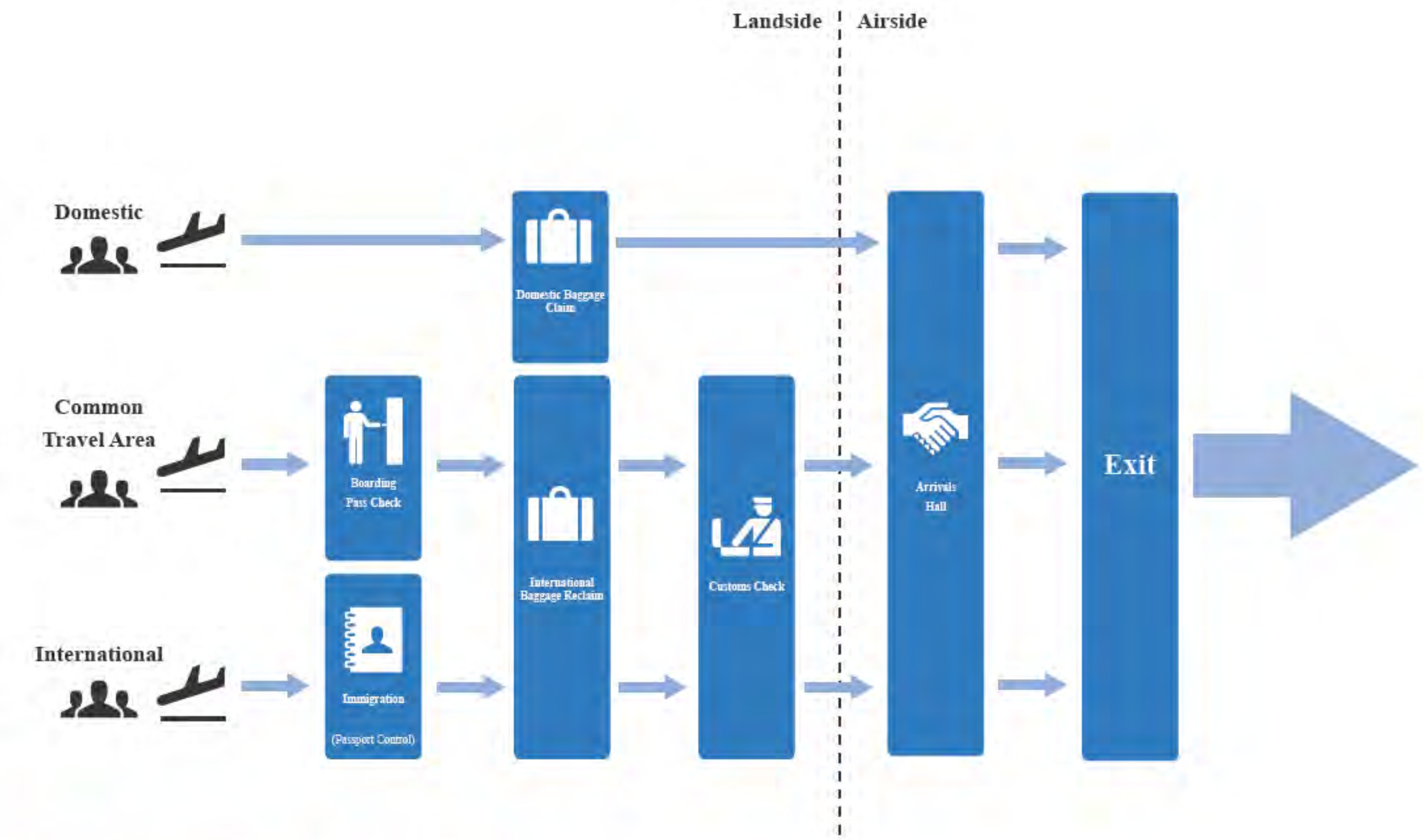


Figure 4.4.2_4 Passenger Flow Diagram - Arrivals

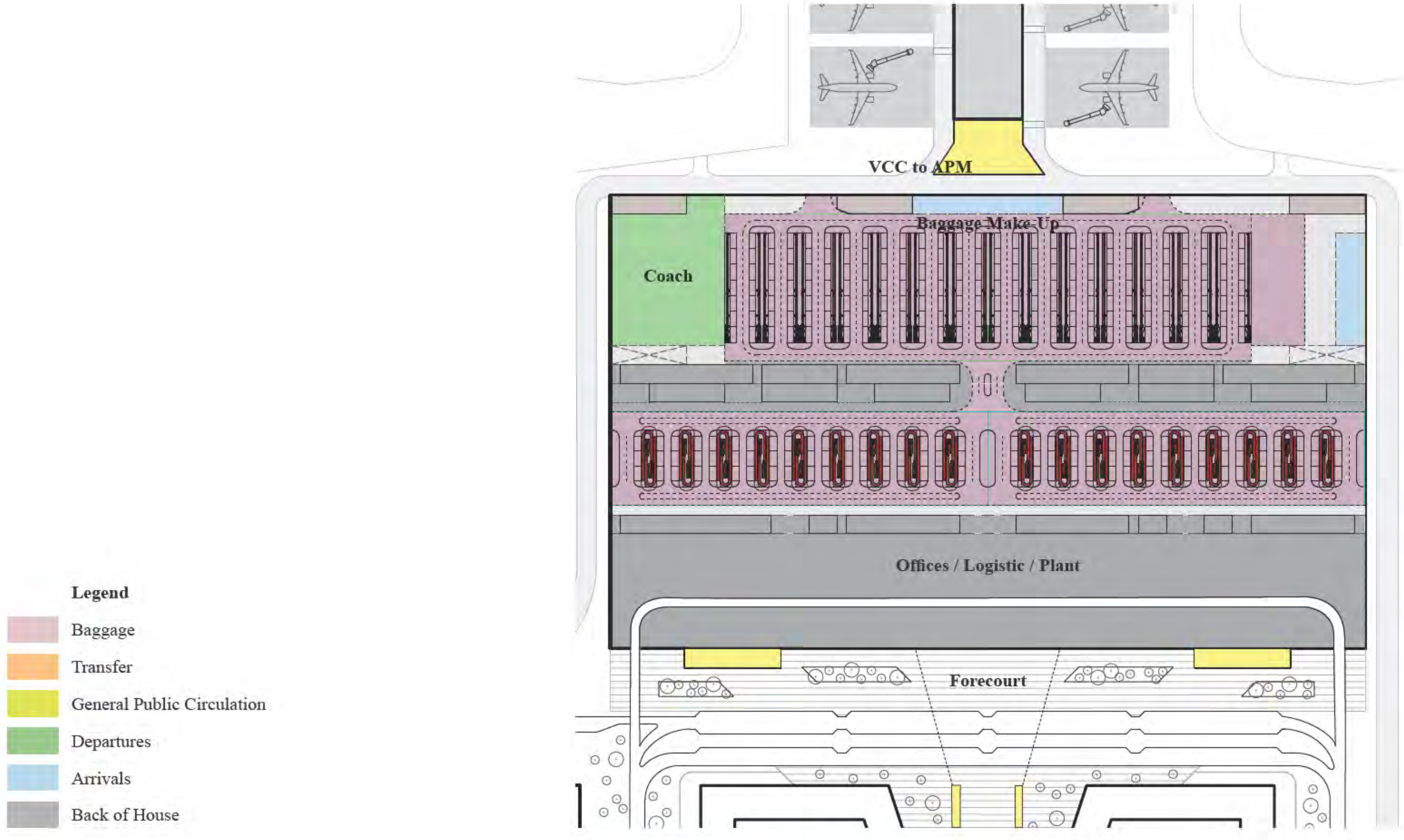


Figure 4.4.2_5 Terminal Processor Ground Level (Level 0)

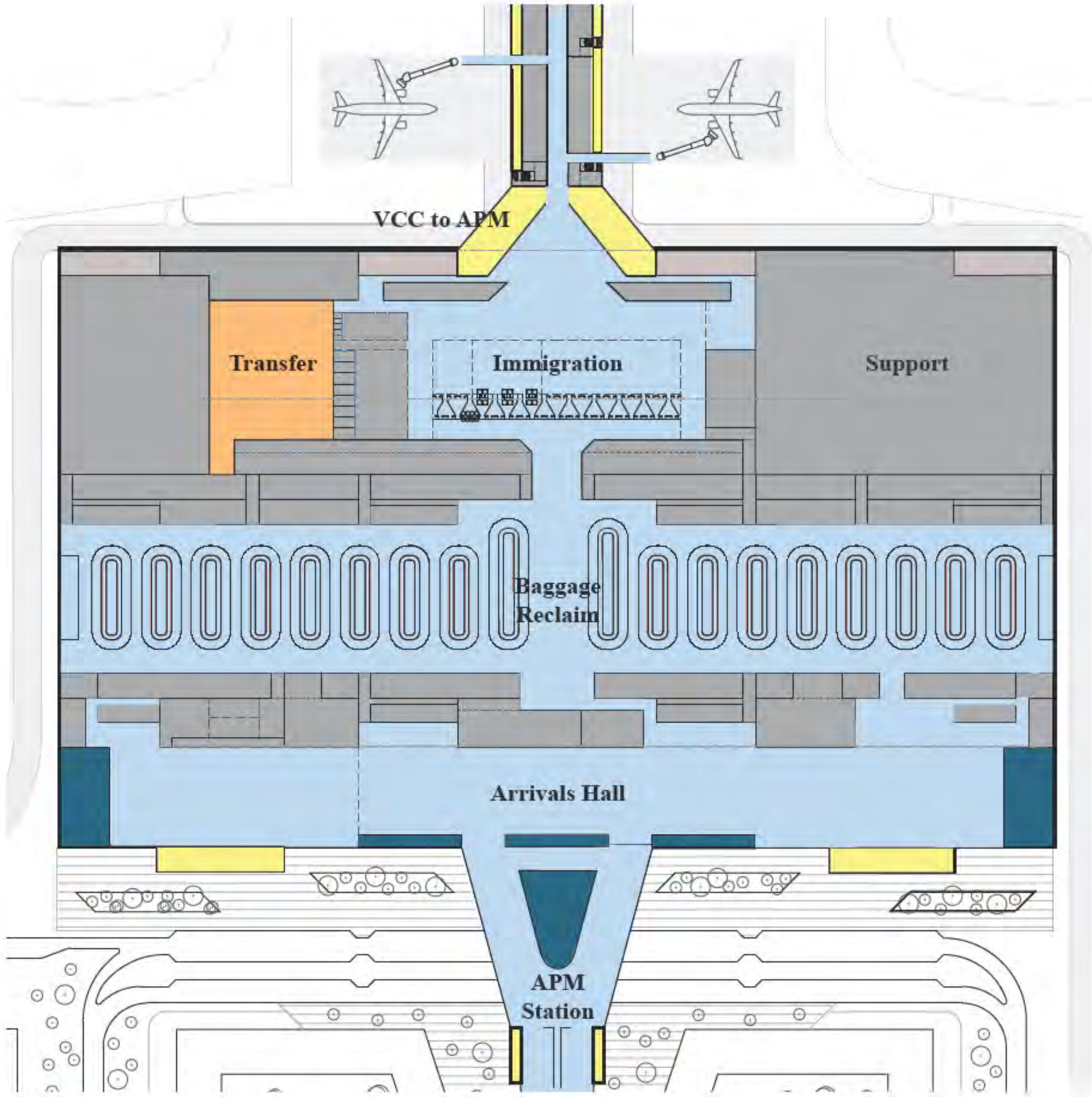


Figure 4.4.2_6 Terminal Processor Arrivals Level (Level 1)

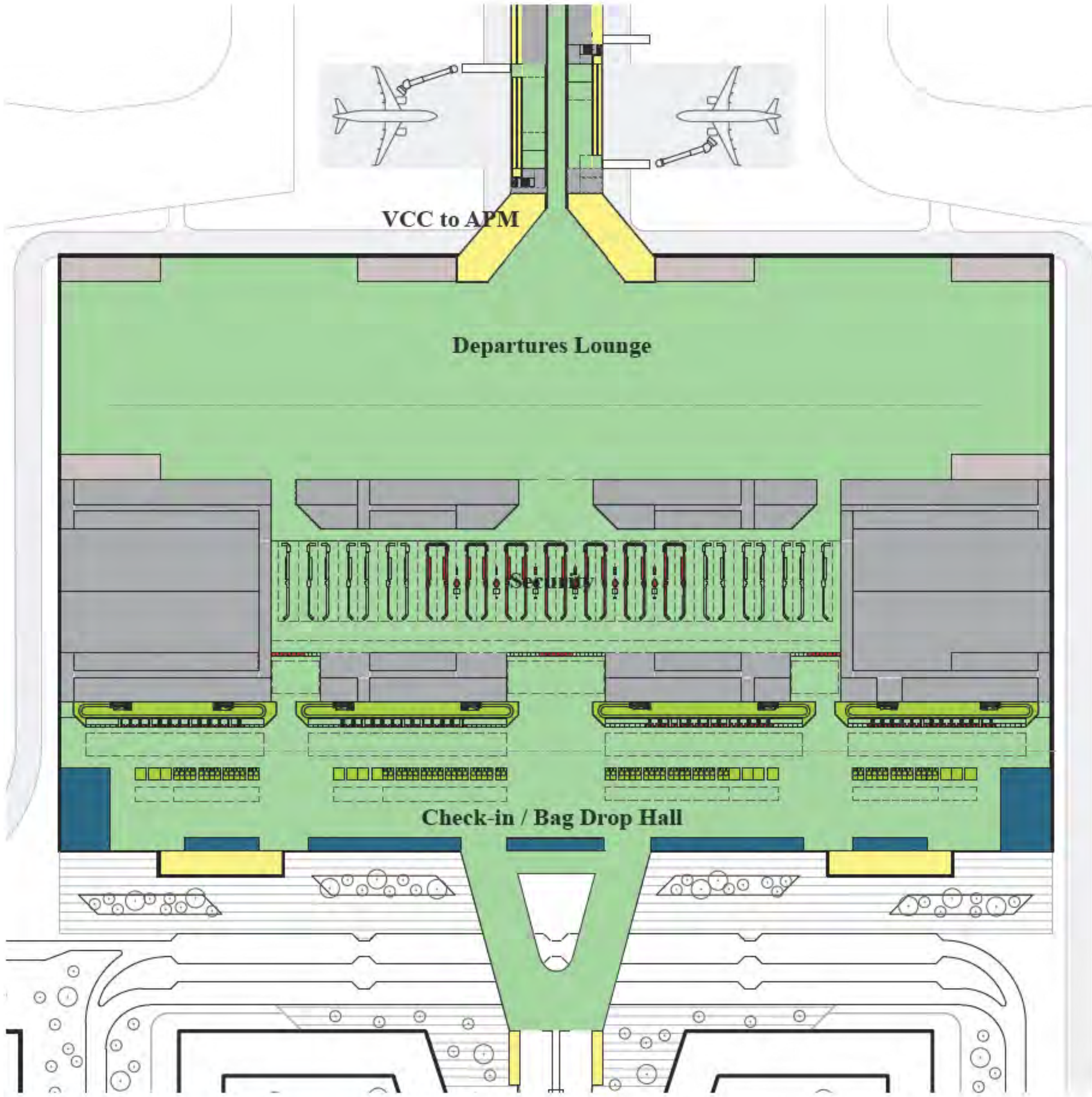
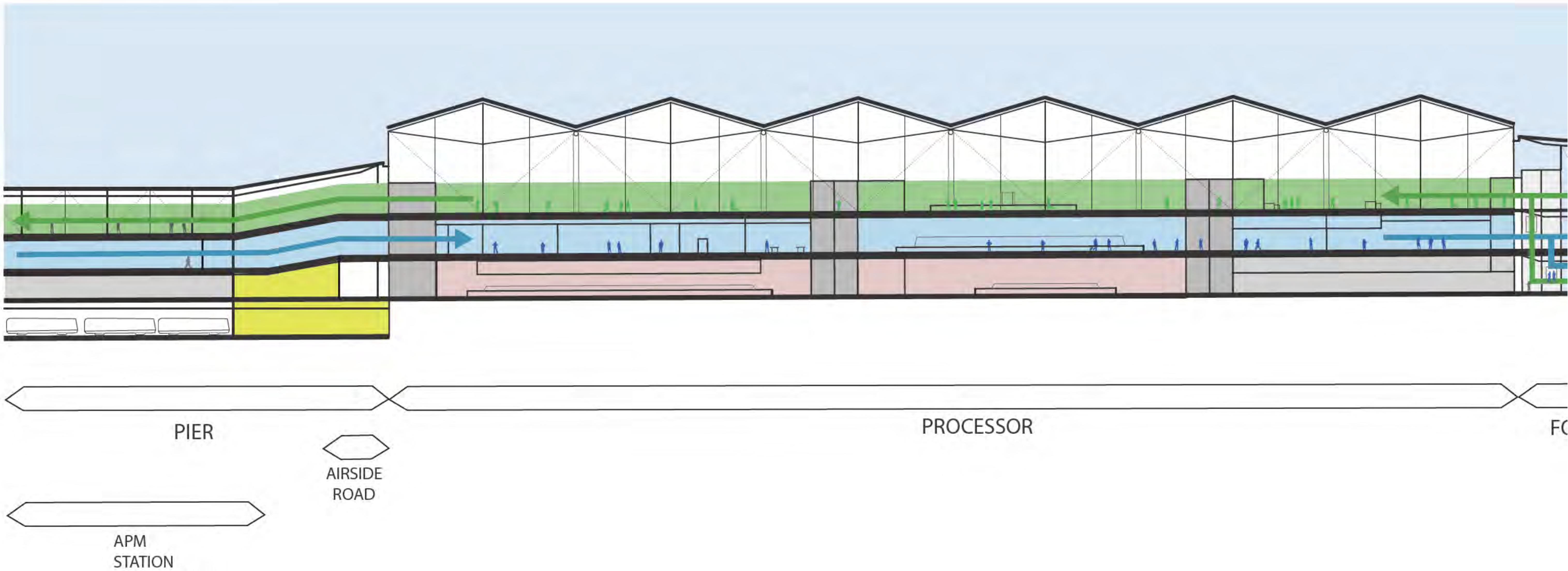


Figure 4.4.2_7 Terminal Processor Departures Level (Level 2)

04_Master Plan Components

Legend

- Baggage
- General Public Circulation
- Departures
- Arrivals
- Back of House
- Departing Passenger Flows
- Arriving Passenger Flows



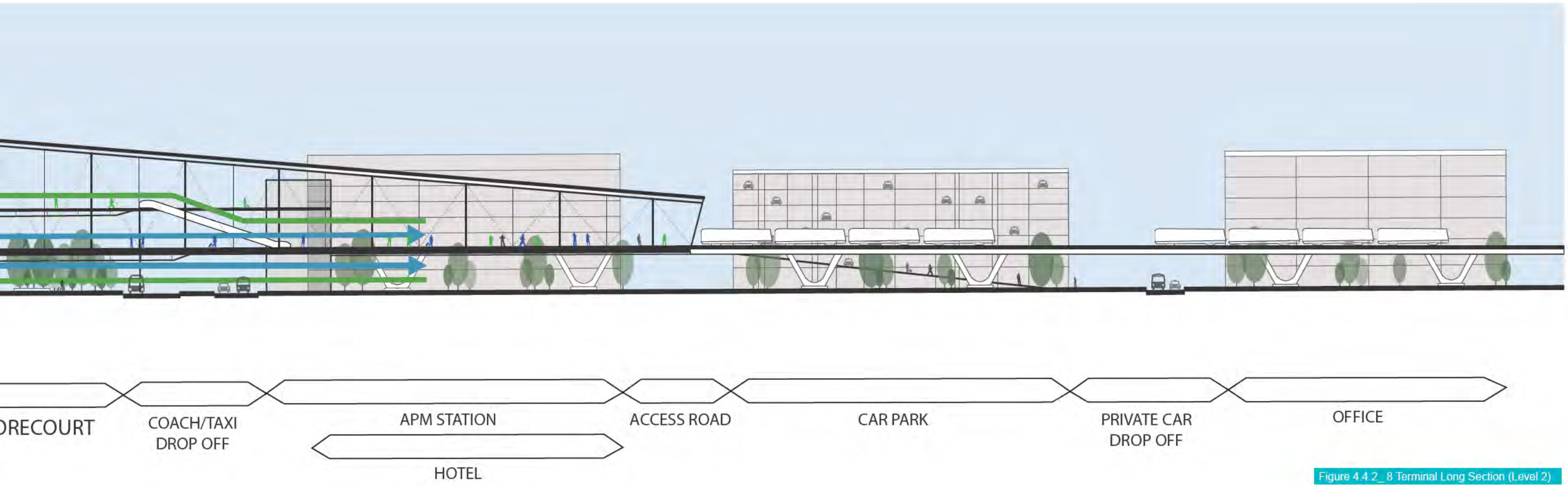


Figure 4.4.2_8 Terminal Long Section (Level 2)

The following sections contain a brief description of the main processing components of the New Terminal, in terms of the layout and its flexibility to different arrangements, including the potential to respond to technology or market changes.

Check-in

The departures flow is simple and intuitive – passengers who have not checked in by internet may use kiosks or go straight to security. Otherwise they proceed direct to walk-through self-service bag drops, or to 'assisted' desks in a shoreline configuration. All the bag drops and assisted desks will be common user and fully interchangeable, offering full flexibility for airlines to tailor services for business and leisure travellers with full service or low cost profiles.

Check-in has been designed around a common interchangeable product. The same footprint can accommodate:

- Walk-through, self-service bag drops
- Walk-through, assisted bag drops
- Linear self-service bag drops
- Linear, assisted bag drops
- Linear full service manned check-in desks.

Security

Security processes are constantly evolving. The terminal will provide the latest and best technologies which we envisage will feature walk though style screening with little or no queuing. However, to demonstrate the robustness of our planning the illustrative floor plans show a more conventional layout with lanes processing 200 passengers per hour. The area shown for security can accommodate systems, which Gatwick is currently trialling which may deliver up to 400 passengers per hour. The space should certainly allow for the walk-through concept.

Retail, Food and Beverage

Retail, food and beverage demands are anticipated to remain as a key income stream for airport operators, and these facilities may be provided in the main International Departure Lounge (IDL) at a level of provision to keep matching the annual throughput. Where the Satellite is developed at a later stage, associated with more long haul carriers, there is capacity to provide a significant range of products in a Satellite IDL.

The length of the Contact Pier and the 'arms' of the Satellite, will generate a demand for small 'pods' of retail and food and beverage services to be dotted along their length, so that no passenger has to walk more than the length of a 'gate'.

As today, domestic passengers will be able to share all these products through the technology associated with boarding cards.

Immigration

The Immigration Hall has three main access routes:

- A direct walk in from the Contact Pier
- A vertical circulation core up from the basement APM Station
- A vertical circulation core up from the ground floor coach drop off.

The Hall sits in front of all these access points, and recognises that a large number of positions are required to process the peak surges in arriving passengers. To accommodate the estimated number they are arranged in two lines, with a funnel arrangement allowing the Hall width to be condensed. Improvements in passenger processing will be achieved through self-service 'e-gates' encouraging passengers to use the biometric readers.

Transfers

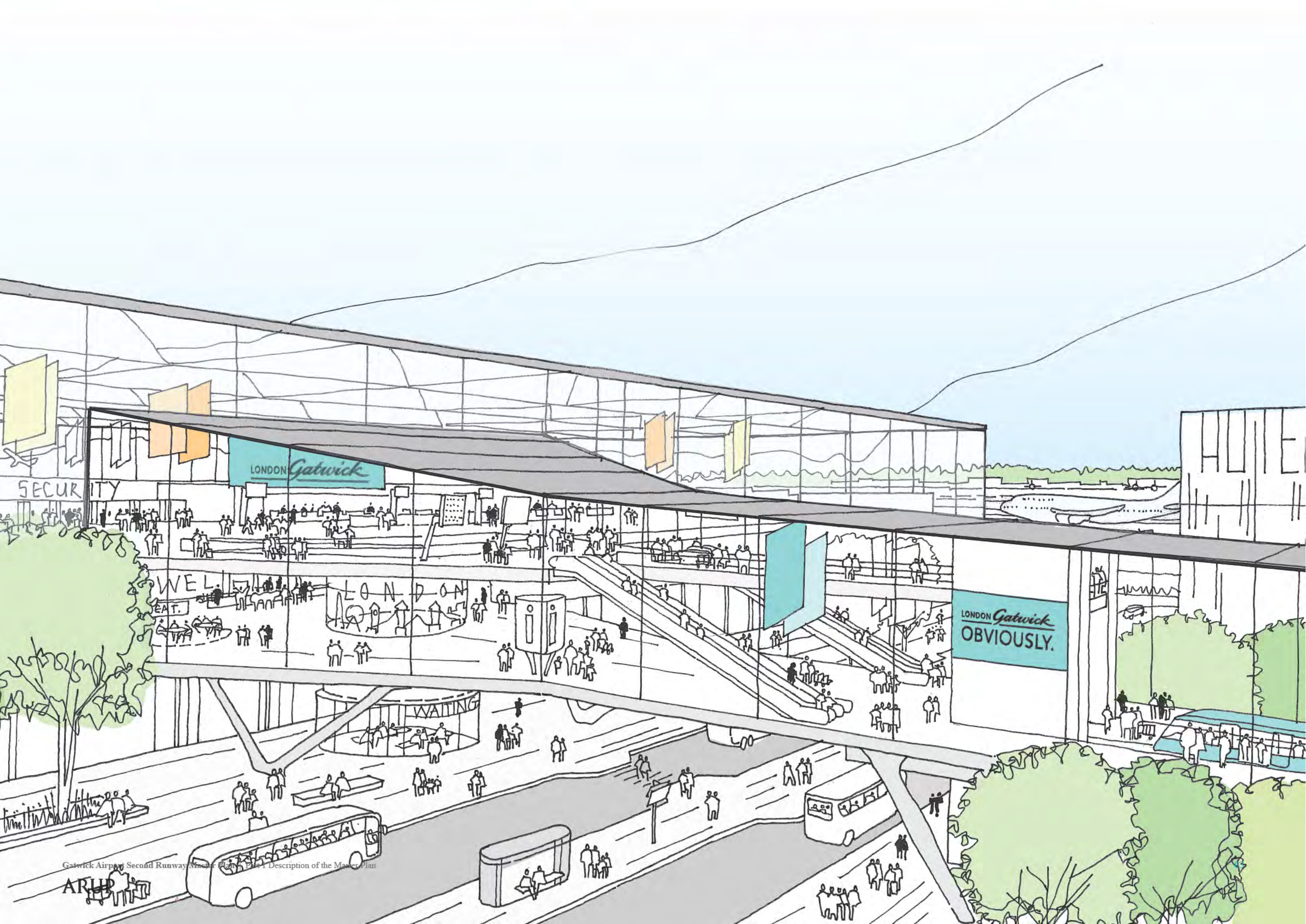
Transfers will comprise four streams:

- International to International
- International to Domestic
- Domestic to International
- Domestic to Domestic

Transfers involving International Arrivals require passengers to pass through a Boarding Card Check but only International to Domestic will have their passports inspected, while International to International do not need to. They will also pass through a security lane before gaining access to the common departures lounge. Further detail on transfers is provided in Section 4.4.5.

Baggage reclaim

Baggage reclaim belts sizes has been rationalised to provide a common Baggage Hall length and minimise the width. Most belts provided are 70m belts, which also allow for fluctuations in the ratio of International to Domestic passengers by allowing one 70m belt to flex – either during different peaks or seasonally. The Baggage Hall is on the same level as Immigration allowing a simple walk through. This is of especial benefit for quick access by passengers with only cabin baggage.


SECURITY
LONDON Gatwick
EAT.
LONDON
WAITING
LONDON Gatwick
OBVIOUSLY.

04_Master Plan Components

Arrivals Hall

The baggage system is planned with a centralised main baggage hall facility within the New Terminal for outbound and inbound baggage with an integrated Hold Baggage Screening (HBS) system.

The Master Plan safeguards for the ability to provide high speed baggage systems (ICS) between the main terminal and the satellite building should it be required.

Departures Baggage System

Check-In/Bag drop is located in the main terminal only. Bags will be transported from Check-In to the baggage hall via conveyors and hoists, where they will be screened by in-line HBS machines in accordance with the latest European legislation. In the subsequent sortation system, bags will be routed to their corresponding make-up position, from where they will be transported by road to the aircraft stands.

Early bag store:

An early bag store (EBS) has been provided to make the most efficient use of the departures make up area and to enhance the passenger service offering. EBS allow opening times of make-up positions to be minimised by routing bags that reach the sortation before make-up for the corresponding flight is open, to the EBS which has a high baggage storage capacity. Furthermore, EBS also permits passengers to check-in earlier, improving customer satisfaction.

The EBS also allows for greater flexibility within the baggage system; as flights can be built in a compressed time, allowing for increased efficiency and a reduced footprint.

The process flow for baggage is illustrated in Figure 4.4.2_8.

Arrivals

Arriving bags are offloaded from the aircraft and transported by road to the main arrivals Baggage Hall. In the main terminal building the arrivals baggage conveyors are located immediately below to the baggage reclaim belts.

Transfers

In the main terminal transfer bags are offloaded at dedicated transfer offload points. Bags departing from the New Terminal will be routed into the terminal's sortation system whereas bags bound for South and North terminals will be transported by road vehicles to the departures terminal, where they will be processed.

A dedicated Remote Transfer Facility (RTF) has been provided in the satellite to support intra-satellite fast connections. In this location, the baggage system automatically would identify and separate time-critical bags departing from the rest. These would be screened in the RTF and dispatched directly to the departing aircraft. Non-time critical bags would follow the standard arrivals process and be sorted in the dedicated transfer offload facility in the main terminal. Further information is provided in Appendix C.

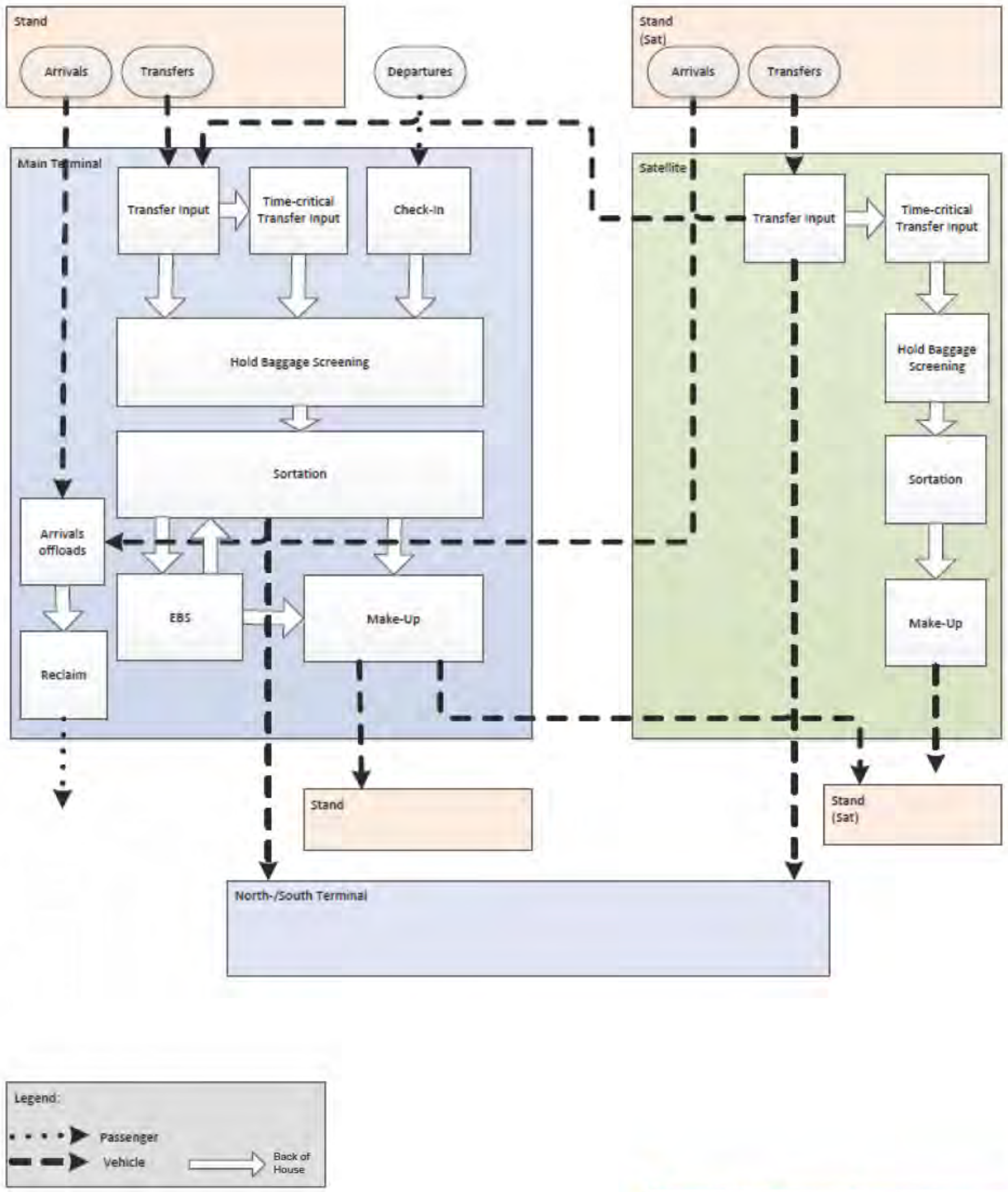


Figure 4.4.2_9 Baggage Handling Processes

4.4.3 Contact Pier and Remote Satellite

Contact Pier

The contact pier is anticipated to serve up to 60 Code C stands, 32 of which are contact, and most of which will demand fast turnaround times.

The pier follows the terminal configuration principles with minimum levels changes and intuitive and clear way finding by maintaining departures above arrivals level. The pier layout adopted illustrates an option of several available.

The Pier is connected directly to the main Terminal Processor allowing Departure passengers to walk freely out of the main Departure Lounge, and Arriving passengers to walk freely into Immigration or Transfers.

The contact pier is optimised for fast turnaround times, with enclosed gate rooms and fixed links allowing passengers to access the aircraft via air bridges or walking depending on the airline operational preferences. With a total width of 33m at departures level the pier will be an efficient world class facility tailored to the needs of its users.

The sizing of the pier has been carried out as follows;

The Departure Gate areas are sited directly facing the stands, which have a basic width of 45m, comprising a 38m wide Stand and 7m inter-stand spaces. The width of the Gate area is estimated at 9m, and this has been benchmarked against a number of airport piers. This width provides a reasonable envelope for an enclosed gate room format which is preferred by some airlines as it allows them to register and group passengers before boarding commences. The internal layout is based on IATA recommendations in the Airport Development Reference Manual Section F9.10.4 which results in a gate area of circa 340m2. The layout is based on an Airbus A321 of 220 seats of which 80% are accommodated. A further 20% has been allowed for entrance circulation and queuing, as an enclosed gate room may require this to avoid a build-up of passengers outside in the main pier through-route. The gate rooms include a family space and a quieter 'Touchdown Zone' for business users.

The remaining area available is used for support space which includes some combination of lift and stairs to the apron, toilets, cleaners stores, retail and food and beverages. These facilities can be grouped in pairs for efficiency, and for meeting regulations such as walking distances to accessible toilets.

This pairing also anticipates any future conversion of the Pier to serve Code E aircraft in MARS format. The typical number of seats on a Code E is around 440 – 450 double the assumed allocation for the Code C design aircraft.

Although the Gate Rooms have been sized for full enclosure, based on Gatwick's own planning standards, IATA "does not recommend enclosed Gate Rooms but open spaces allowing sharing. The 80% Load Factor capacity could be replaced by Peak Accumulation". Therefore, if this were applied in future phases, through the whole or parts of the Pier, it would release more space for retail developments and greater freedom of circulation.

The Gate Rooms are located each side of a central circulation zone 7.5m wide. Passenger moving walkways would be provided in the central circulation zone. On the outer face a

Legend

- General Public Circulation
- Departures
- Arrivals
- Back of House

'buffer zone' is provided. This is an energy-saving measure as ramps avoid the use of escalators, which allows Departure ramps to descend to a 'valved' lobby at Arrivals level. This is connected to the Fixed Link which gives access over the airside road to the Stand and allows for the connection of passenger boarding bridges. The total width of the Pier is therefore 33m which compares favourably with a number of other European examples that have been benchmarked.

The Arrivals level comprises a series of 'valved' lobbies giving access to a central Arrivals corridor leading back to the main Terminal. Various support functions can be added at this level, either as part of the initial build, or as later fit-out. The Apron level is free to accommodate ramp accommodation, airline offices and Ground Support Equipment.

The layout of each level of the Pier are presented in Figures 4.4.2_9 to 4.4.2_12.

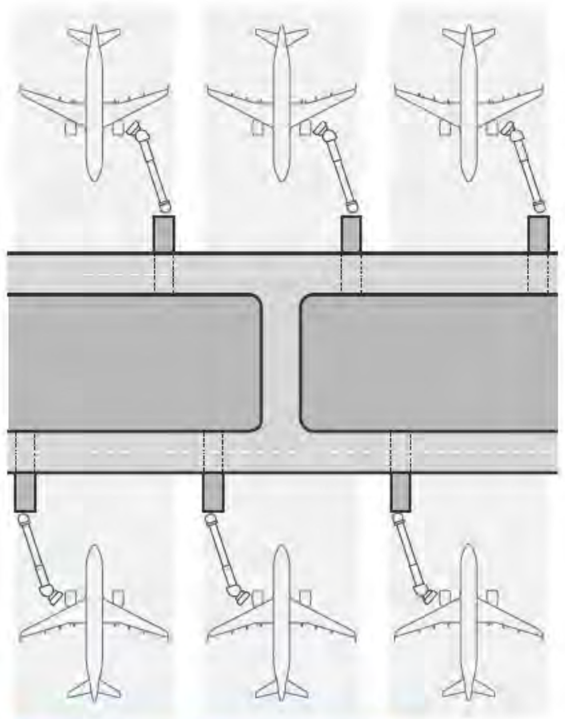


Figure 4.4.2_10 Pier Apron Level

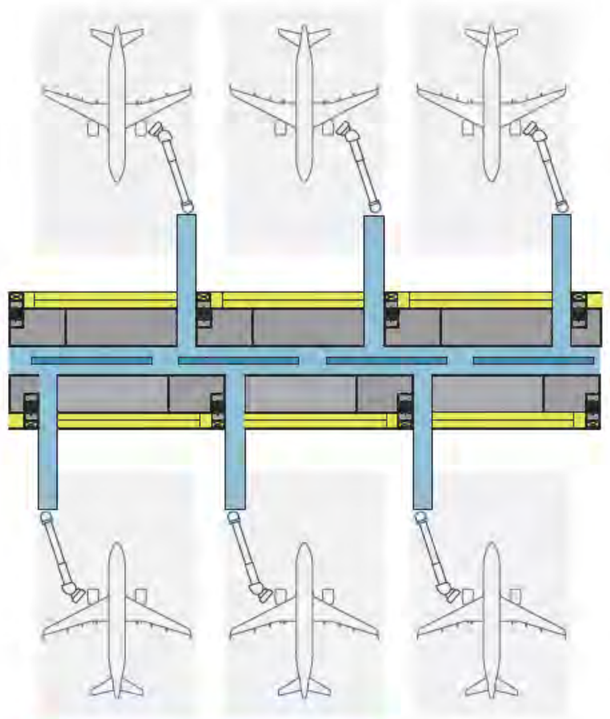


Figure 4.4.2_11 Pier Arrivals Level

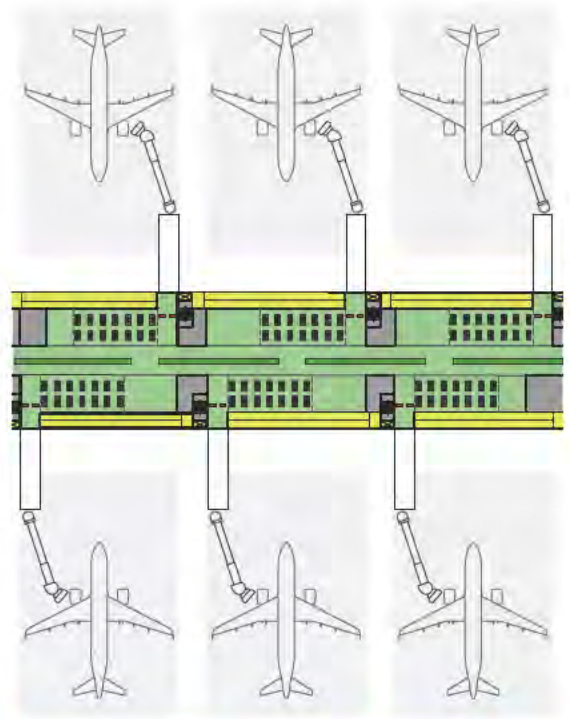


Figure 4.4.2_12 Pier Departures Level

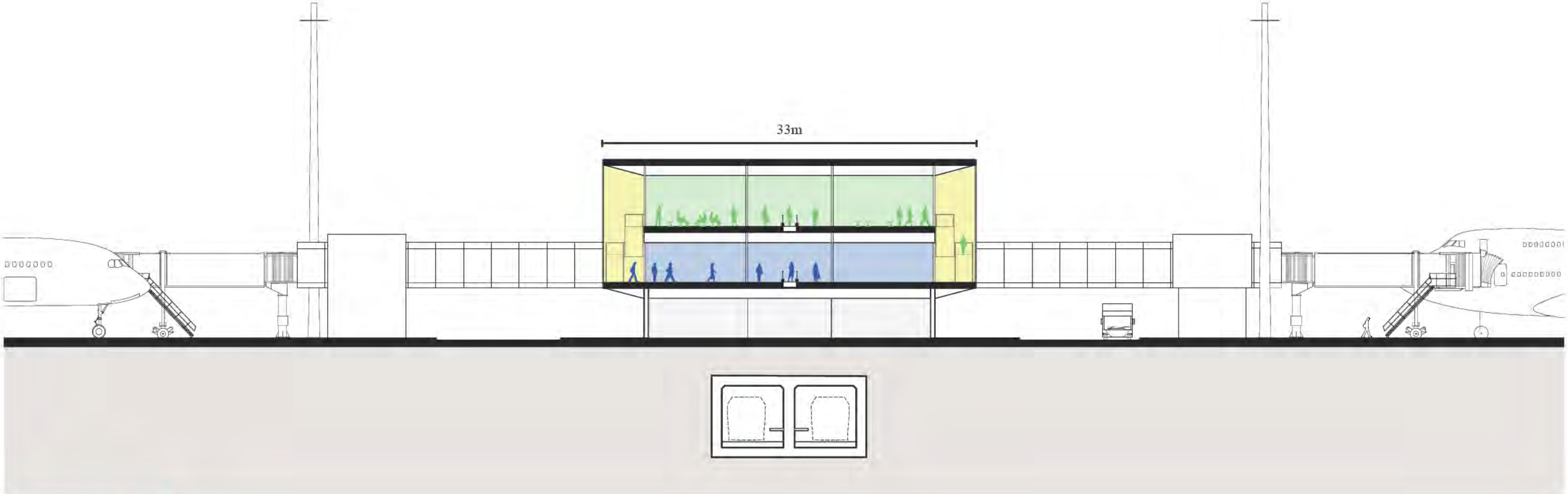


Figure 4.4.2_13 Pier Section

Satellite

The satellite serves 6 Code C stands, 4 Code F stands and 28 Code E stands some of which are in a MARS configuration. The satellite is therefore primarily serving long haul flights and will offer a quality experience to outbound passengers with comfortable seating and dwelling areas, food, beverage and retail zones and free flow circulation spaces. It is envisaged that the satellite could also become a transfer hub within the airport and therefore it will host fast and convenient transfer facilities for passengers on connecting flights

The Satellite would follow the same basic Gate Room configuration as the Contact Pier, but with the pairing of Gates fully converted into Code E Gate Rooms which through MARS-ing also allow for their use by two Code C aircraft simultaneously.

The Satellite width is variable from 36m on the satellite piers to 65m in the central zone. Given it would serve more long haul passengers, a more generous width of up to 45m has been safeguarded for on the satellite piers to recognise longer dwell times and give greater comfort to early check-in and transfer passengers.

The Satellite is not physically connected to the main Terminal, and will rely on a fast APM to convey passengers between the two, in a tunnel beneath the Pier. The track layout for the APM and connectivity with the New Terminal is shown in Figure 4.4.2_13

The APM stations will be designed to maintain segregation between Arriving and Departing passengers, with separate vertical circulation systems.

The APM station at the Satellite is located centrally, to balance and minimise walking distances. This central zone is designed to allow for Retail, food and beverage allocation with considerable potential for growth to capture any major increase in Intra-Terminal Transfer traffic or a decentralised IDL strategy if that is considered appropriate.

The Arrivals level of the centre part of the Satellite may be used for airline offices, retail storage, and transfer processing facilities such as re-ticketing and security.

The Apron level is to accommodate ramp accommodation, airline offices and Ground Support Equipment. Transfer baggage facilities are provided and there would also be an option to include departures Baggage Make-Up areas for the Satellite stands should these be required.

The layout of each level of the Satellite are presented in Figures 4.4.2_14 to 4.4.2_19.

Legend

- Transfer
- General Public Circulation
- Departures
- Arrivals
- Back of House

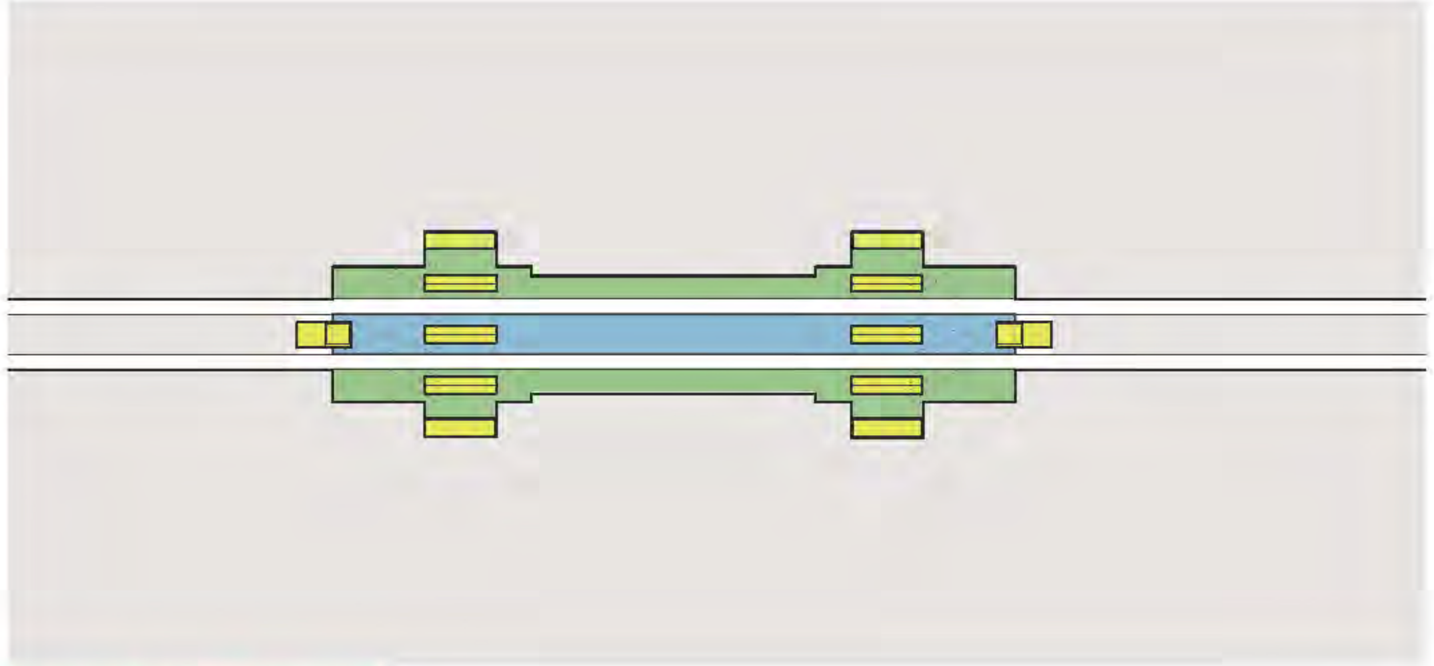


Figure 4.4.2_14 Satellite APM Station

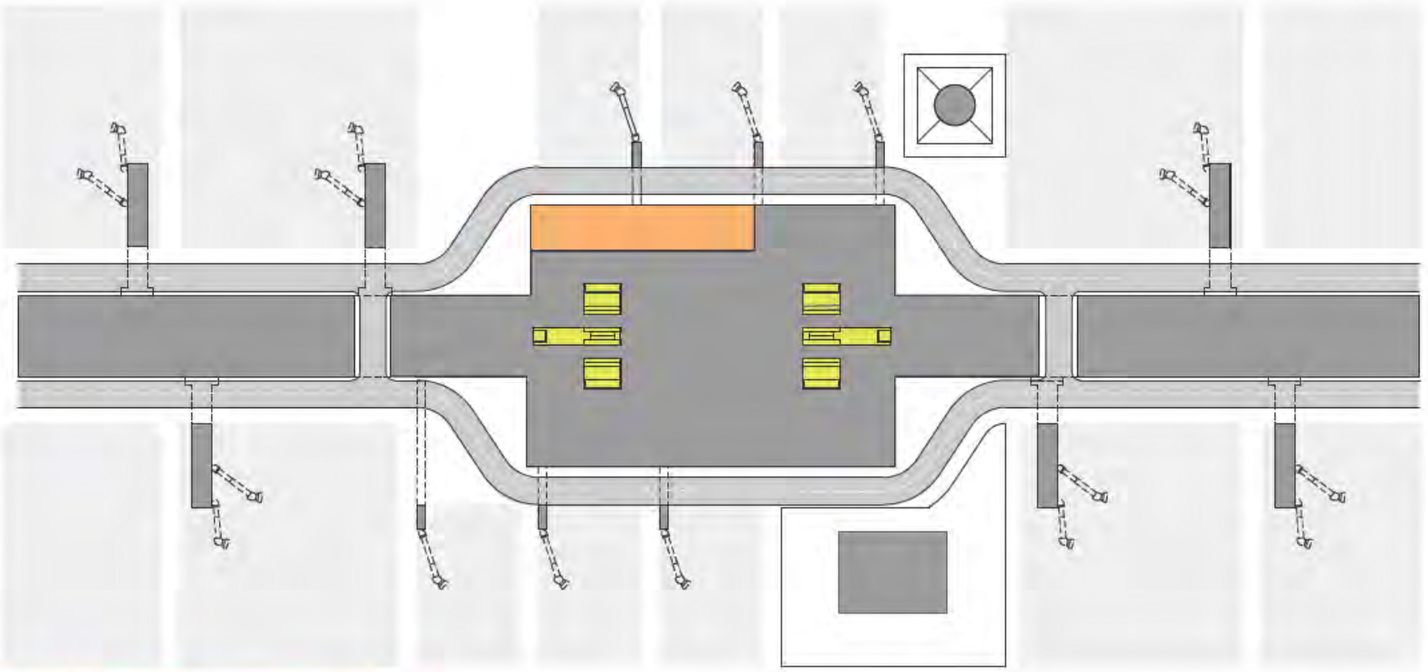


Figure 4.4.2_15 Satellite Apron Level

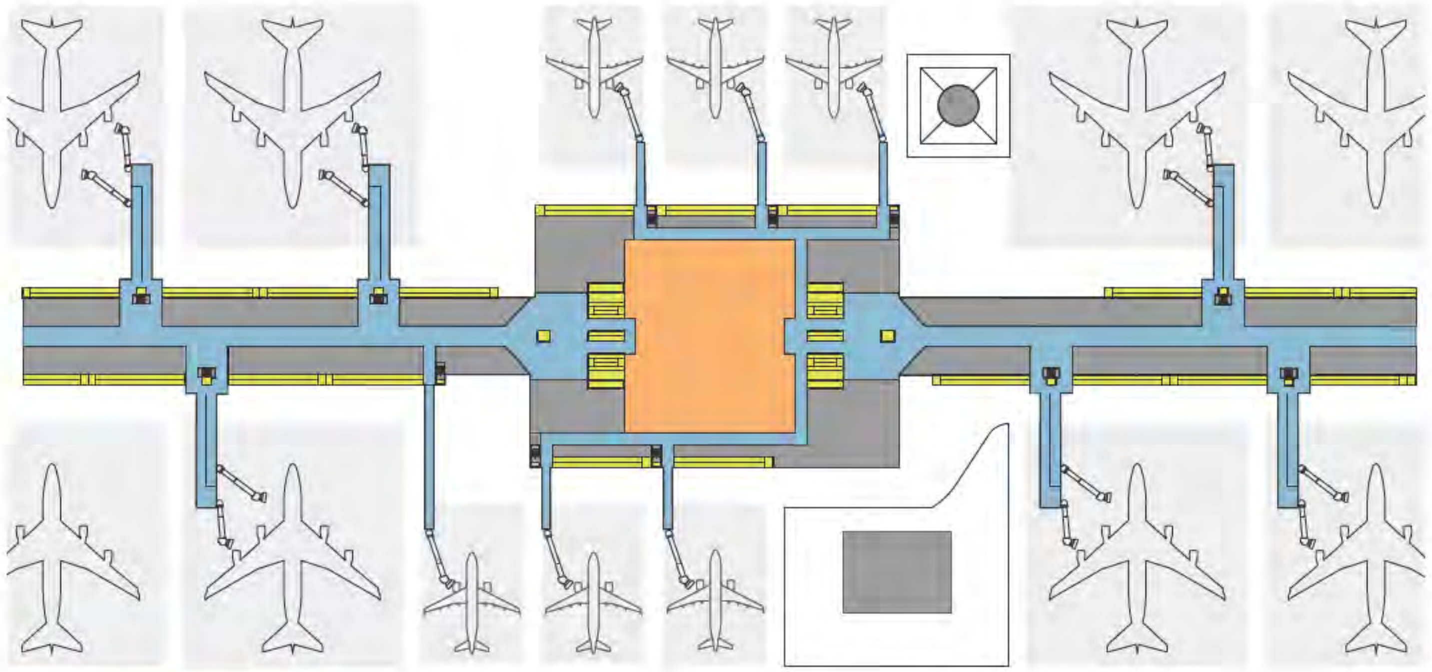


Figure 4.4.2_16 Arrivals Level

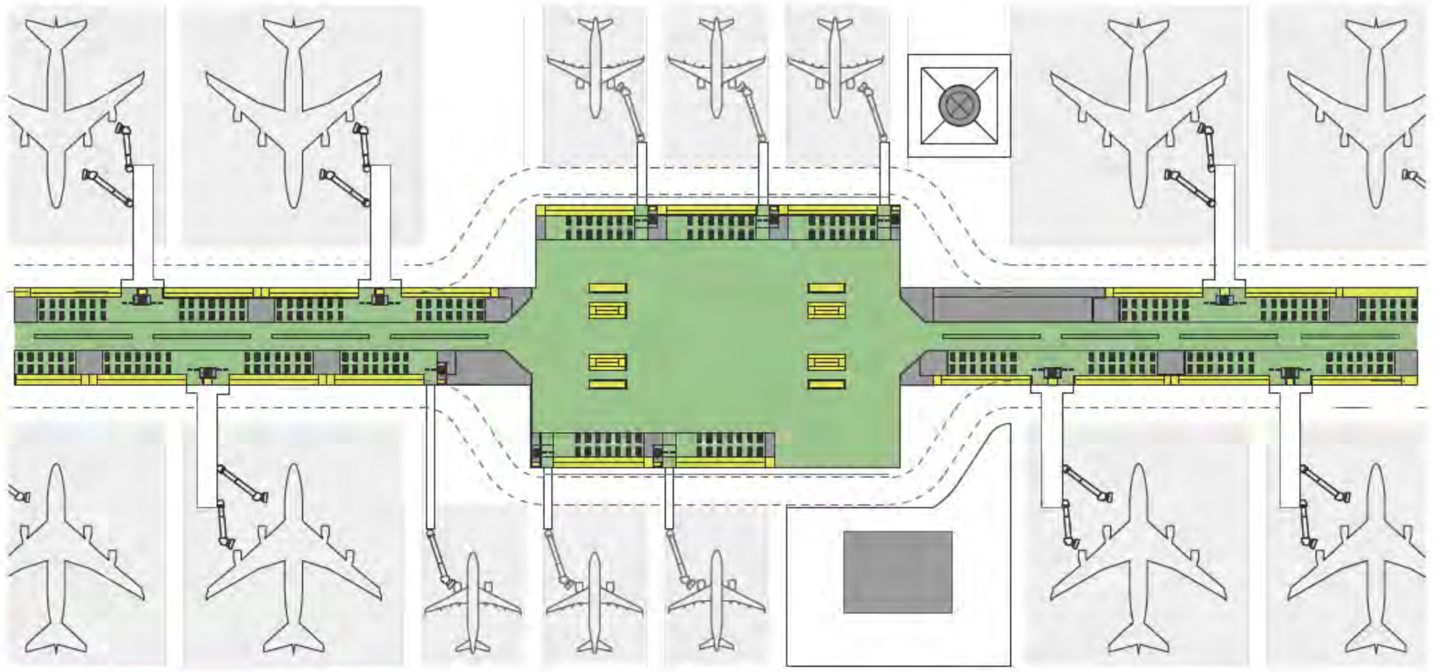


Figure 4.4.2_17 Departures Level

Legend

- Transfer
- General Public Circulation
- Departures
- Arrivals
- Back of House

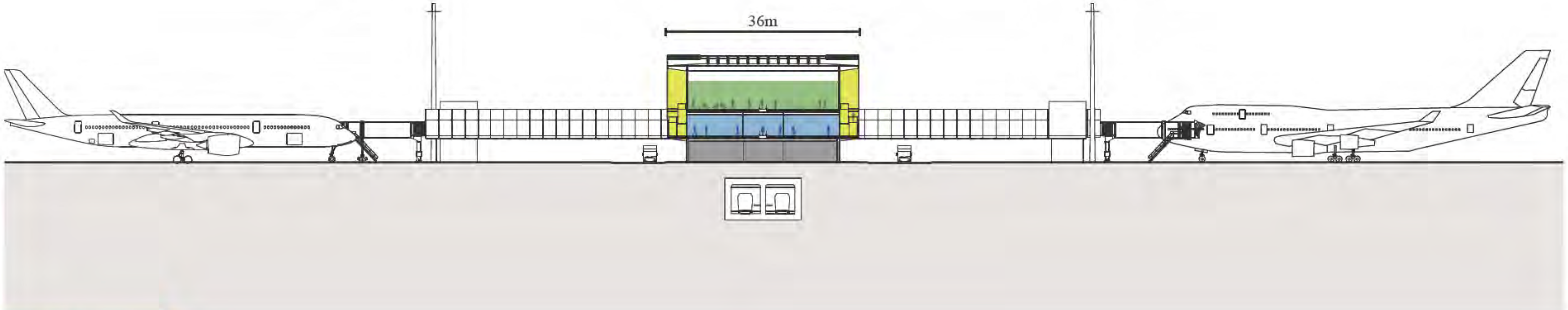


Figure 4.4.2_18 Satellite Section Through Central Area

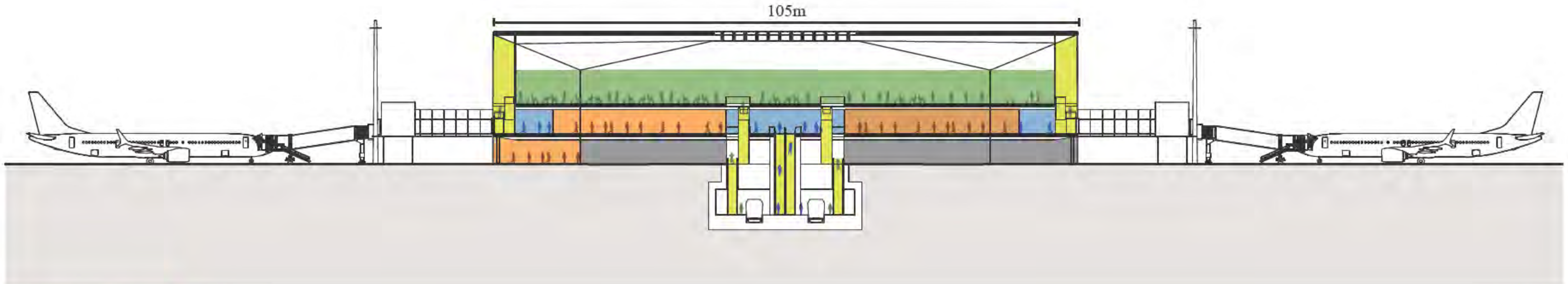


Figure 4.4.2_19 Satellite Section Through Central Area


COFFEE
GATES S22-S38
22a
22
LONDON Gatwick

04_Master Plan Components

4.4.4 Landside Terminal Area

The position of the New Terminal provides a significant opportunity to create a coherent landside terminal area that integrates hotels, parking and surface access into a unified Master Plan. Hotel accommodation has been placed immediately in front of the terminal to maximise the commercial opportunity and passenger accessibility. The APM station is placed between the hotels at arrivals level. The station leads onto a generous and welcoming covered orientation space which provides seamless passenger flows for both arriving and departing passengers. All authorised drop off and pickup is located at ground level. Together these components create a human-scaled but dramatic frontage to the terminal.

The landside APM runs above a central pedestrian access spine linking the terminal to the short stay car parking, private car drop off and accesses to the principal hotels. This spine is further extended to provide a direct pedestrian connection to the offices located at the eastern edge of the landside zone, optimising the commercial opportunity by reinforcing the connectivity of these sites both on a local, regional and international scale.

Further hotel accommodation is located to the east linked by pedestrian and vehicular avenues further strengthening the coherence of the land use plan. A key feature of the layout of the Master Plan is that it retains the Beehive, the original historic terminal building and a Grade II* listed building.

The land to the south east of the terminal building in designated as commercial. However, should there be a requirement to provide additional airside/airport support facilities some of this area could be converted to cater for this use. Its proximity to the terminal and the apron is very convenient for operational facilities.

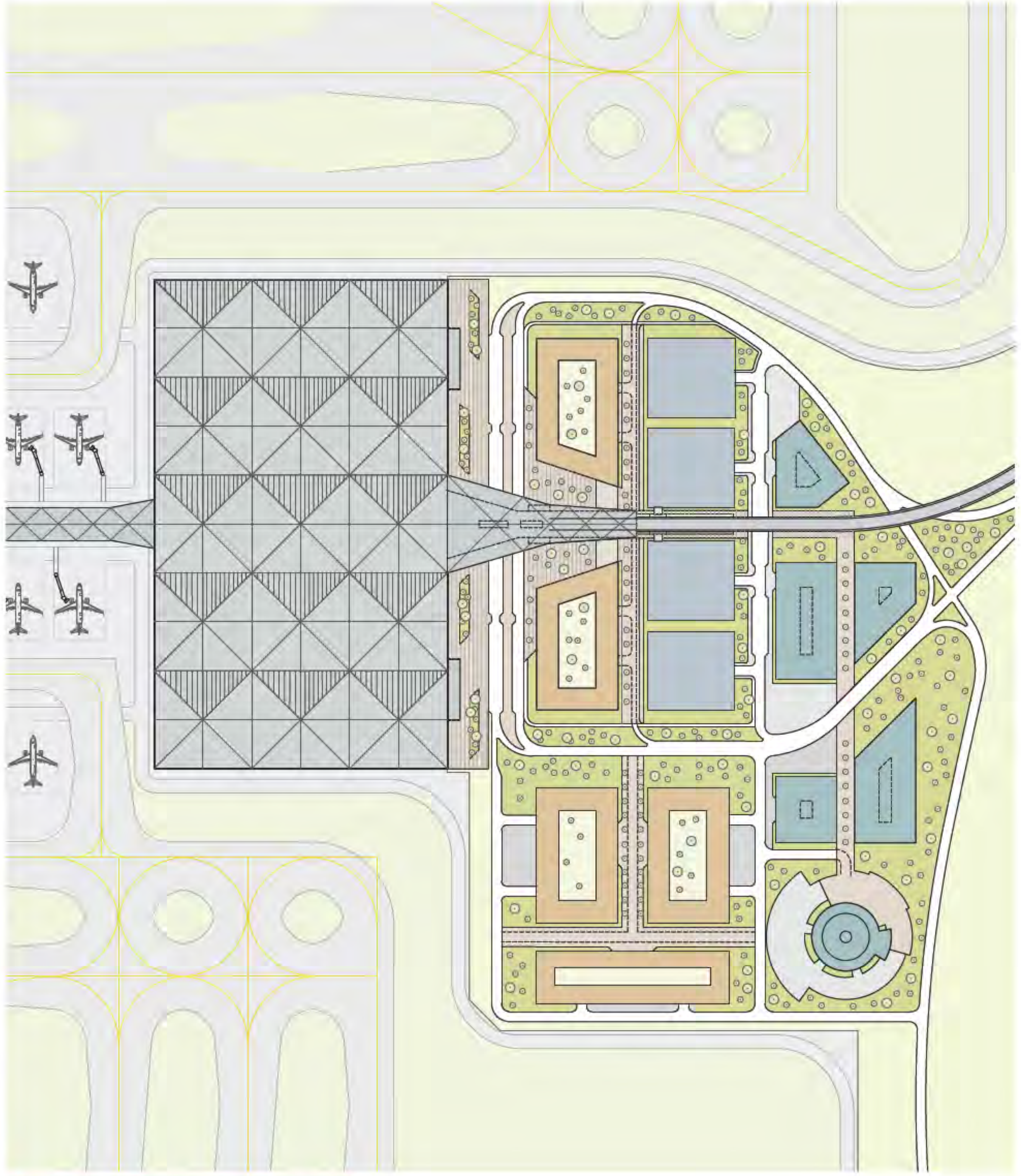


Figure 4.4.4_1 Gatwick landside landuse plan

Figure 4.4.5_1 Current Self Connect (Gatwick Connect) Transfer Process

Figure 4.4.5_2 - Airside Transfers / Interline and Future Self Connect Gatwick Connect) Transfer Process

4.4.5 Inter-terminal connections

While the majority of journeys to and from London and the South East are, and will continue to be, point-to-point journeys, Gatwick expects that at least up to 10% of passengers using a two runway Gatwick in 2050 will be making a connection between flights.

The two runway Master Plan has been planned to offer an excellent standard of service to all passengers including those making a connection at the airport.

As a part of the masterplan process a highly competitive target of delivering an inter-terminal MCT of 45 minutes and an intra-terminal MCT of 30 minutes has been set. Achieving these targets will be assisted by the compact nature of the airport, well-connected terminals and tailored Gatwick Connect service.

This section describes the connectivity requirements and solutions proposed focusing on the inter-terminal transfer operation at the airport.

Transfer operation considers both airside and landside connections. Airside connections are widely recognised as the most common method by which passengers connect through an airport and are preferable from a passenger service perspective.

The Master Plan supports two forms of passenger connections;

- Passengers transferring between flights with the same airline where a single ticket has been purchased for the entire journey and passengers transferring between different airlines but where a through-ticket has been purchased.
- Passengers transferring between two flights where separate tickets have been purchased and the airlines are not aware that a connection is being made ('self-connects').

The current process for these two types of transferring passengers is different (See Figures 1 & 2). The aspiration however, is that in the future both would follow the same process which would be the Airside transfer process.

Traditionally airlines relying heavily on transfer passengers have entered into interline agreements with other airlines allowing bags to be through checked and passengers to remain airside during the transfer process. With the emergence of Low Cost Carriers (LCCs) this pattern has changed. LCC airlines typically do not enter into these types of agreements and this has resulted in quite a high level of self-connects at Gatwick. With the nature of agreements continuing to change there is evidence of LCC airlines such as JetBlue forming partnerships with long haul carriers and airports like Gatwick are facilitating the transfer for self-connecting passengers by piloting a scheme, Gatwick Connect.

For self-connecting passengers, the masterplan has built on the current 'Gatwick Connect' service. This service aims to offer self-connecting passengers a smooth transfer between flights, resulting in a similar experience to the typical airside transfer process. Currently self-connect passengers are effectively carrying out a landside transfer and need to pick up their baggage at reclaim, exit the airside area via customs, check-in and enter the departures lounge via security. Gatwick Connect simplifies this process by streamlining the journey of the self-connecting passengers by providing the equivalent of an airside transfer process. The Gatwick connect process relies on passengers notifying Gatwick of the intention to do a self-transfer at the airport.

Ultimately, the goal is for all transferring passengers at Gatwick to benefit from the same high level of service. However, some of the self-connecting passengers may choose not to notify the airport. For these passengers the landside APM will be available to make an easy journey between terminals. These passengers are referred to as landside transfers and would make their own way in between terminals.

Transfer Process

Transfer processes (illustrated in figures 4.4.5_1 and 4.4.5_2) have been developed to allow a two runway Gatwick airport to deliver the highest standard of passenger experience. A target delivering an a 45 minute inter-terminal and 30 minute intra-terminal MCT has been set. Inter-terminal MCTs can be delivered through offering a dedicated transfer processes for passengers and baggage which are time critical. Effectively the journey for those passengers on a short-connect, where limited time is available, will be prioritised through the airport.

By co-locating airlines and flights with high transfer flows within the same terminal building Gatwick can ensure that most connecting passengers do not need to travel between terminals simplifying their journey. The midfield apron configuration and satellite arrangement is uniquely placed to accommodate airlines with high transfer requirements. The estimated capacity of the satellite is circa 28 mppa. Passenger and baggage transfer facilities are to be provided in the satellite to support intra-satellite connections. This facility would have re-ticketing and security facilities to avoid passengers having to travel back to the main terminal building to be processed and a decentralised baggage system to sort and identify transfer bags.

Even with coordination some passengers may need to connect between terminals and the Master Plan responds to their requirements. For passengers transferring between the satellite and the terminal building, the airside APM provides a reliable fast and high quality facility to transferring passengers.

Connections between the three terminal buildings will also be easy and speedy. The close proximity between the three terminal buildings, their relative location with respect to the airfield and aprons and the provision of a high speed airside road corridor connecting the three buildings supports these inter-terminal connections. The high speed airside corridor would run parallel to the landside APM corridor, along the existing A23 alignment, stressing the strategic importance of this artery in the proposed developments. The alignment of this high speed corridor avoids the need for transfer vehicles to circulate via the existing northern apron increasing the speeds at which vehicles can travel. This route would be used mainly by high priority movements including passenger and baggage transfer vehicles as well as security and maintenance service vehicles.

In addition to the inter-terminal transfer process described above, all transferring passengers would be able to make use of dedicated transfer facilities at security and immigration to ensure minimal queue times. Landside self-connecting passengers for inter-terminal connections would travel using the continuous landside APM.

Minimum Connect Time analysis

An assessment of the Minimum Connect Times (MCTs) has been undertaken for the New Terminal and satellite buildings considering inter-terminal connections. The analysis has been conducted using the 2050 planning horizon Master Plan layout. The calculation of transfer times incorporates a range of planning assumptions. Further detail on the process, assumptions and results of the assessment are provided in Appendix C.

The results of the assessment for each terminal are shown in Table 4.4.6_1. These MCTs were taken from the furthest gate in the arrival terminal to the furthest gate in the departures terminal.

Table 4.4.6_1 International-to-International and International-to-Domestic MCT for time critical transfers.

	South Terminal	North Terminal	New Terminal	Midfield Satellite
South Terminal		43	45	43
North Terminal	43		45	44
New Terminal	45	45		43
Midfield Satellite	43	44	43	

Table 4.4.5_1 International-to-International and International-to-Domestic MCT for time critical transfers


13
12
11
10
9
8
7

4.5 Access to the airport and ease of access within the airport

Gatwick has excellent connectivity to the strategic road and rail networks with onward connections across the South East and to all parts of the UK. The airport sits adjacent to the Brighton Main Line railway line and Gatwick Airport station is integrated with the airport's South Terminal. The airport is located at Junction 9a of the M23, with onward journey times to the M25 of between 7 and 8 minutes. From the M25, there is access to the wider UK strategic road network to the north, south, east and west.

Gatwick is London's best connected airport by rail. It currently has direct services to 129 rail stations, trains calling 24 hours a day, seven days a week and up to 15 trains an hour to a range of London destinations. Once the committed Thameslink Programme is completed in 2018, Gatwick will have direct services to 175 stations, over 1,000 railway and London Underground stations with just one change, and will be served by a train into London every 3 minutes in the peak.

All users of Gatwick Airport railway station will benefit from committed and planned capacity improvements for the Brighton Main Line, delivered by Government and Network Rail before 2025, including the Thameslink Programme. These network improvements include more frequent and longer trains, double the number of direct trains between Brighton and London Bridge and 50% more trains to St Pancras and beyond. There will also be more direct connections to Gatwick including new destinations north of London.

On average over 500 coaches arrive and depart from Gatwick each day along with eight different local bus services calling over 400 times a day, direct to our terminal forecourts. Service enhancements envisaged for these modes include new and better coach services to Kent, South and East London and the South Coast and development of local bus services. National Express is already committed to working with Gatwick to develop new routes.

Access to the forecourts at each terminal will still be available for buses and coaches but more capacity will be added to improve the passenger experience. Rail, coach and bus services will come together at a new passenger transport interchange, the Gatwick Gateway, an iconic transport hub at the airport that will represent the main arrival point for the majority of passengers by 2040.

The improvements to bus, coach and rail services will provide people travelling to or from the airport with more choice and better connections. Gatwick has a target of 60% of air passengers travelling by public transport and 50% of staff using sustainable modes by 2040 (40% by public transport).

Improvements will be made at the main Gatwick junction (M23 Junction 9) to double capacity and provide free flow access to the airport terminals and separate connectivity with the A23. The A23 will be realigned east of the railway to improve the through route for general traffic and provide reliable journey times.

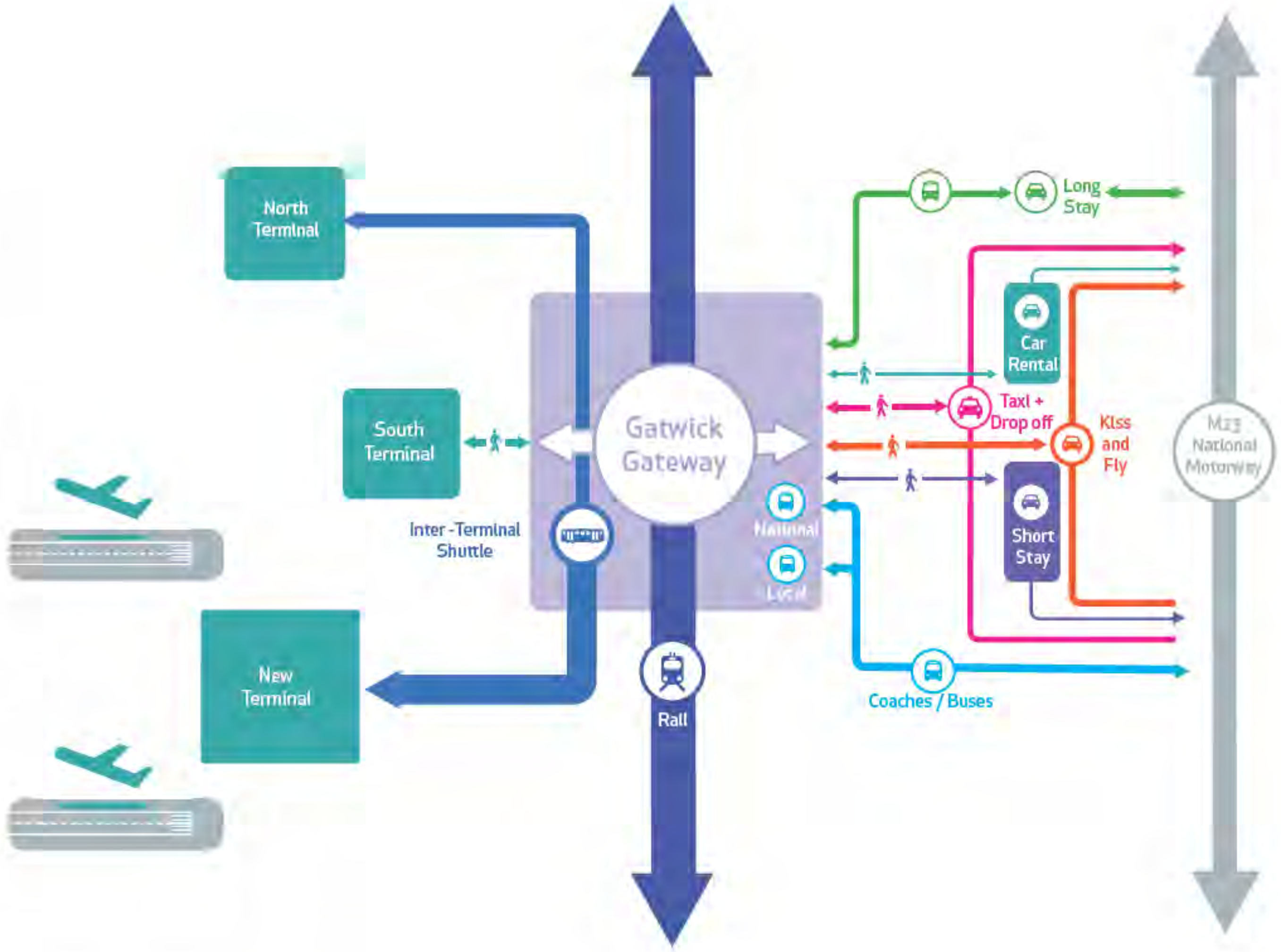
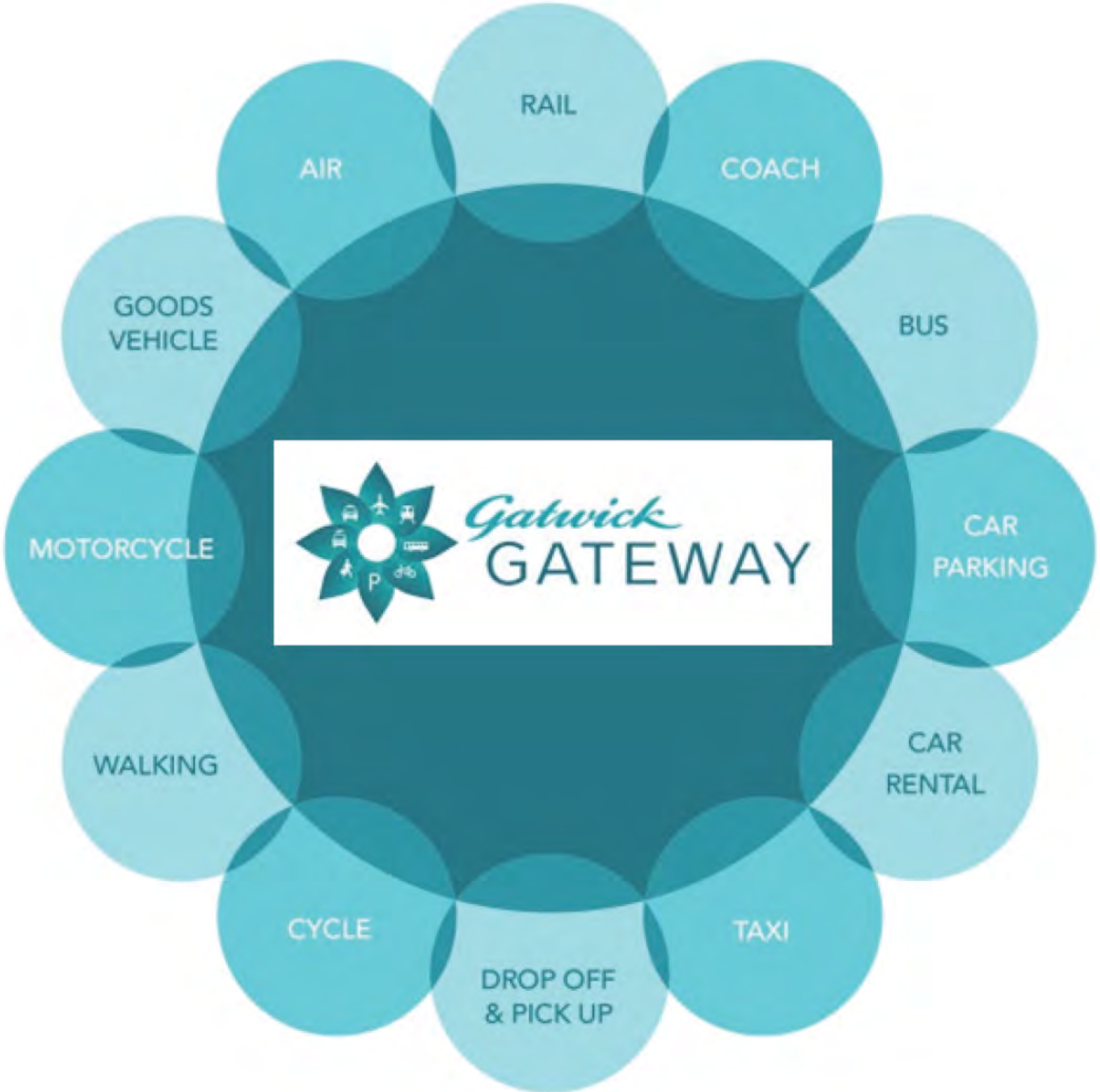


Figure 4.5_1 Gatwick Gateway concept – A Focal Point for Interchange


RAIL
COACH
BUS
CAR PARKING
CAR RENTAL
TAXI
DROP OFF & PICK UP
CYCLE
WALKING
MOTORCYCLE
GOODS VEHICLE
AIR
Gatwick GATEWAY

04_Master Plan Components

4.5.1 Gatwick Gateway

Gatwick's vision for the Gatwick Gateway is for an integrated passenger transport interchange, which serves both the airport and local users. It will offer a high quality facility to support sustainable travel opportunities and access to jobs across the region. The Gateway will be centred around the railway station at South Terminal with a new single concourse to replace the current railway station ticket hall and pedestrian bridge links to the South Terminal forecourt and car parks. This will create an attractive space that will deliver a world-class passenger experience and a true feeling of arrival at a global destination.

It is envisaged that a single passenger concourse will span the area between the existing pedestrian link bridges. This will integrate the railway concourse with pedestrian links across to the forecourt. A new waiting area for long-distance coach and local bus services will be integrated within the new concourse. The new bus and coach interchange will occupy the area of the current car rental facility. It will provide high quality, enclosed waiting areas at an upper level above bus and coach stands at ground level.

A new consolidated car rental facility at the Gateway, adjacent to the current short stay car parks, will bring all of the customer facilities together with office, preparation, fuelling and maintenance space. This will improve efficiency and offer a better customer experience.

A cycle parking hub and pedestrian access will also be key components of Gatwick Gateway. The cycle hub will be linked to cycle routes to north and south for staff use and public access via a new National Cycle Route 21, in effect a new cycle super highway, which will run parallel to the A23. This will be provided in a new corridor to the east of the airport to avoid conflict with other parts of the masterplan development.

The existing APM that transfers passengers between the North Terminal and South Terminal will be extended to provide a continuous route connecting all three terminals and will keep connection times to less than 5 minutes for terminal to terminal landside connections. This extended alignment will take the existing APM below south terminal allowing for the new APM station to be located below south terminal. Beyond the Gatwick Gateway the APM will travel along the alignment of the current A23, rising gradually up to the west towards the new Terminal and arriving at mezzanine level in the New Terminal forecourt. This allows the track to remain at grade for most of the alignment, rising to enter New Terminal building without compromising surface access.

These improvements mean that the Gateway will provide for a step-change in connectivity between rail, coach and bus services not just for air passengers, but also for employees, commuters (to London and other cities) and local users.

The Gatwick Gateway will become a focal point for journeys into and out of the airport. Planning work has concentrated airport access around this new interchange, including cycling and walking routes, car rental consolidation centre, airport taxis and forecourt access to South Terminal with APM access to other terminals.

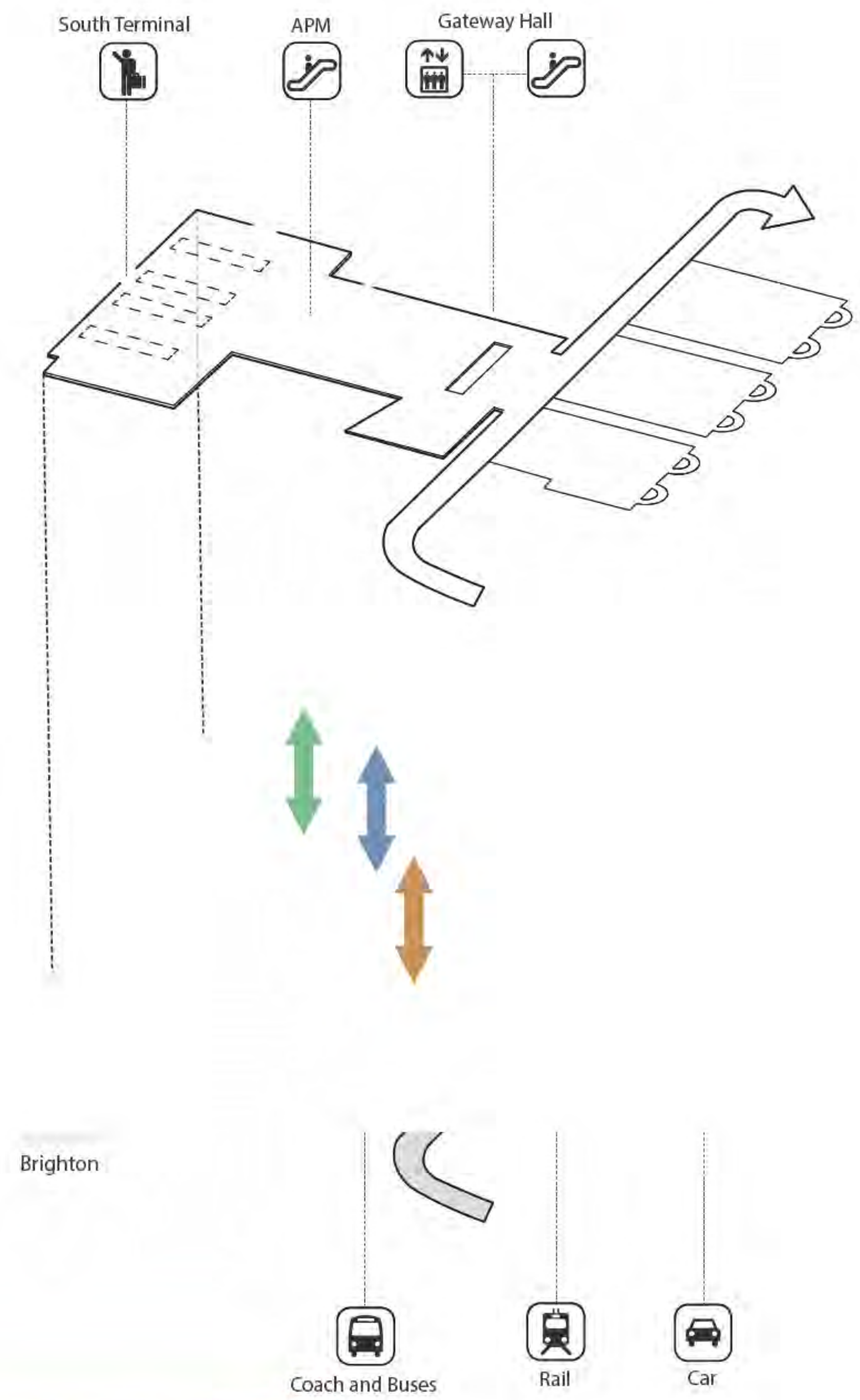
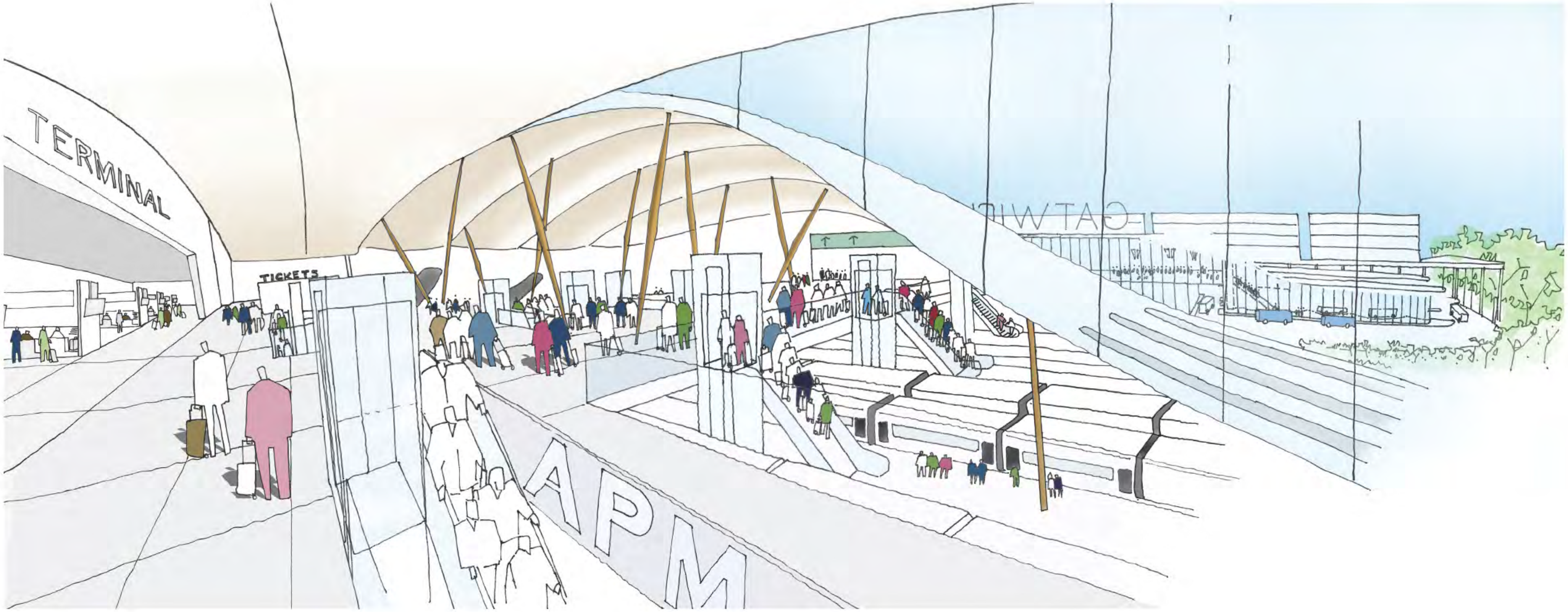


Figure 4.5.1_1: Gatwick Gateway Circulation Flows


TERMINAL
TICKETS
APM
GATWIC

4.5.2 Road access and car parking

Road access improvements focus on providing safe, reliable journeys and predictable journey times, and combine local highway improvements funded by Gatwick as a part of the second runway project with the committed investment by Government in the strategic highway network. The funded improvements in the Master Plan are as follows:

- Junction 9 of the M23 – enhanced to nearly double its capacity through grade separation.
- Additional capacity on the M23 J9 and J9a and better connections to the terminals and for general traffic to access the A23.
- A23 realignment – part of the new runway lies over the current A23. Realigning the A23 improves access for local traffic, by separating it from airport traffic, and guarantees journey times for both sets of users. The preferred route for the A23 is to move it east of the railway to go around the new operational area of the airport.
- Balcombe Road realignment – realigned between Radford Road and the M23 J9 and J9a road. It will still connect to Antlands Lane but stays a local road, wide enough for cyclists to use safely but not attracting traffic from the A23 or from the Airport.
- Internal road layouts will provide simple wayfinding and efficient access routes to the terminals. Terminal access from the A23 and M23 will be intuitive and fast.

In terms of terminal forecourts, the design takes into consideration the capacity of each terminal and appropriate sizing of the forecourt and access roads. The prioritisation of each mode favours public transport access and the introduction of the Gatwick Gateway.

Analysis of kerb and forecourt requirements at the New Terminal indicates that all the necessary capacity can be provided at-grade and therefore there is no requirement for an elevated kerb. The New Terminal's forecourt design is based on a hierarchy which prioritises public transport in order to meet GAL's sustainable surface transport targets along with targeting a reduction in the number of kiss-and-fly trips to the airport.

The routes for vehicles arriving along each of the main arterials planned are presented in Figure 4.5.2_1.

The kerb-space immediately adjacent to the terminal building will be designated for public buses, taxis and connections from the long-stay facilities. Crossings will be provided at appropriate intervals along the length of the forecourt kerb. Space for private vehicle drop-off is provided to the east of short-stay multi-storey car parks, with private pick-up in the car parks themselves.

For car parking, the Master Plan has been designed to deliver the best possible passenger experience and increase value and efficiency while meeting sustainability objectives. All additional airport-related car parking will be provided on-airport. Long stay car parking will be consolidated to a new area east of the railway. Increasing public transport mode share means that the requirement for additional car parking spaces will be reduced.

Road access and car parking components of the Master Plan described above are also highlighted in Figures 4.5.2_2 and 4.5.2_3 and Table 4.5.2_1.

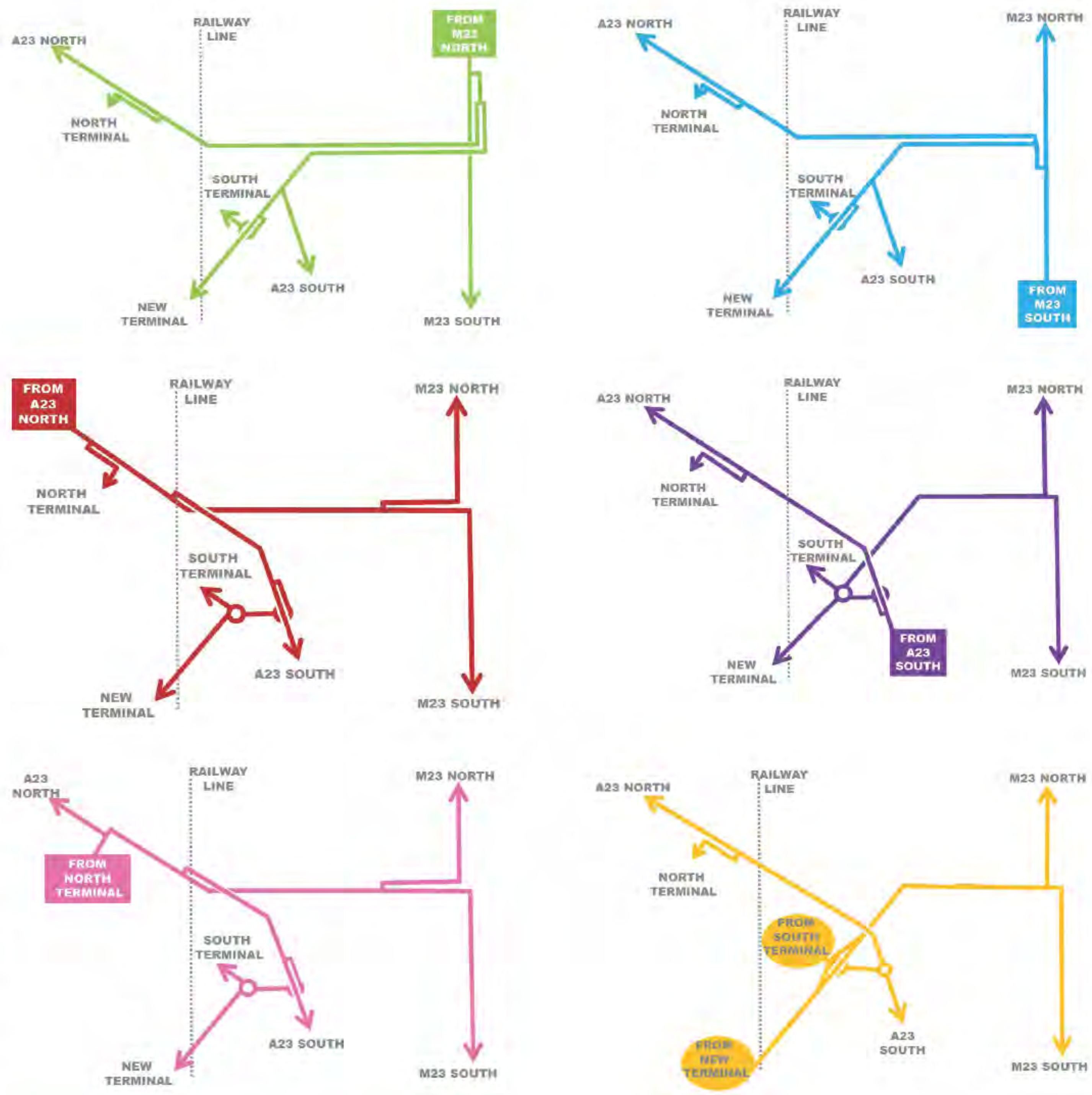


Figure 4.5.2_1: Road Network - Key Movements and Wayfinding

Scenario	Year	MPPA	No of Staff	Number of parking spaces		
				Short-stay	Long-stay	Staff
Existing	2012	35	21,000	5,000	46,300	10,000
Option 0	2025	45	24,000	5,700	52,700	10,100
Option 3	2040	79	33,700	8,500	78,700	12,100

Table 4.5.2_1 Future Car Parking Space Requirements

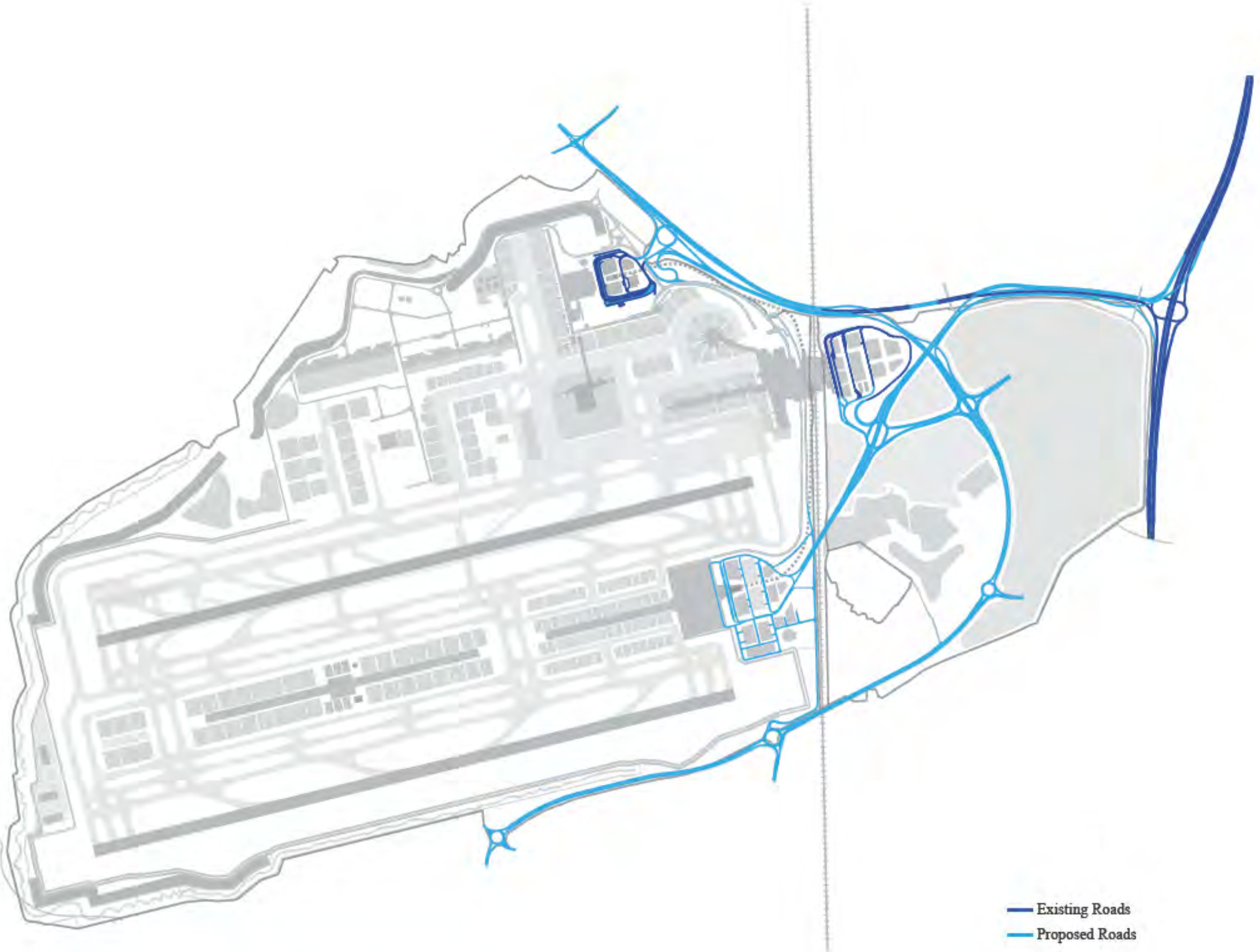


Figure 4.5.2_2 Principal Landside Road Access

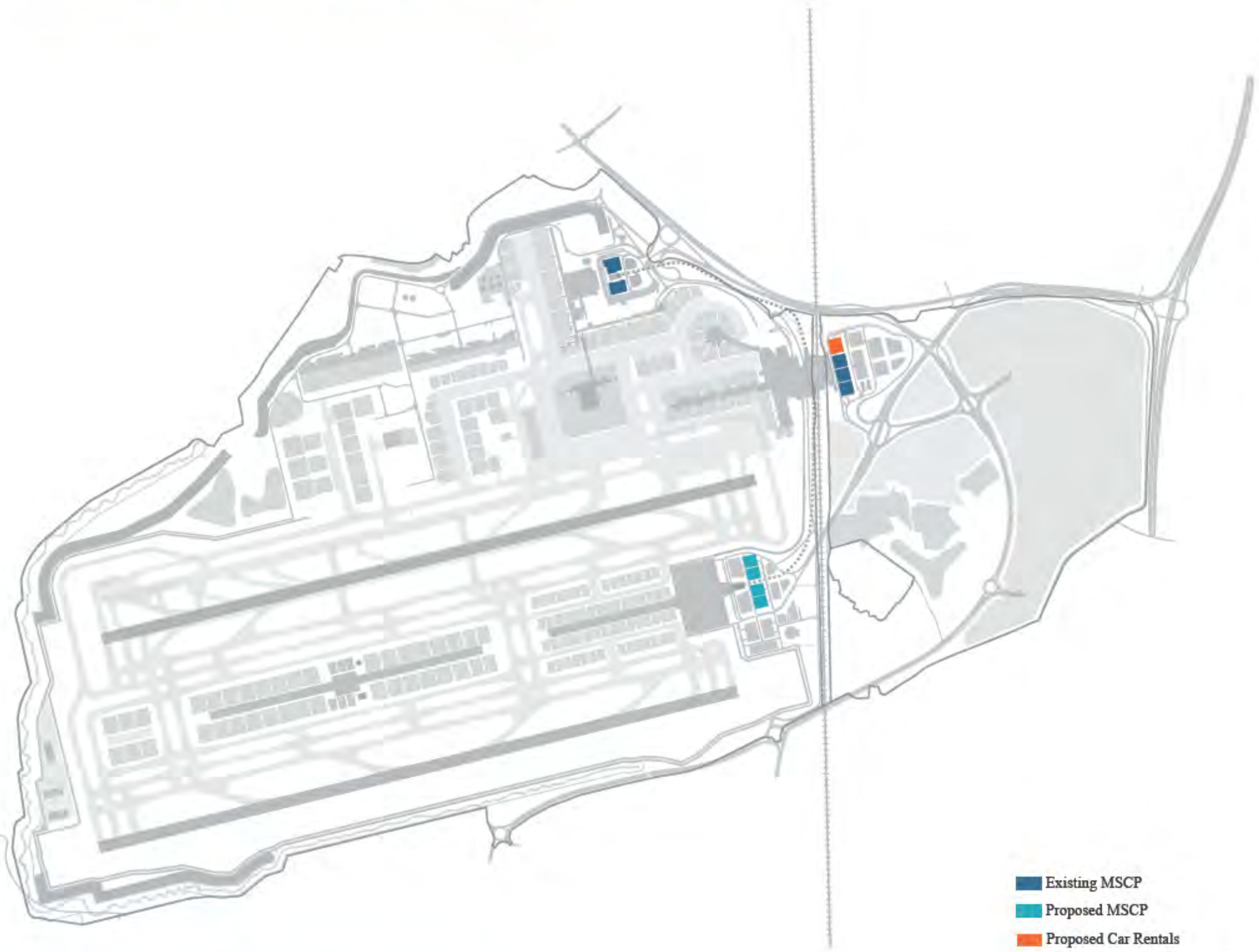


Figure 4.5.2_3 Short stay car parks and car hire

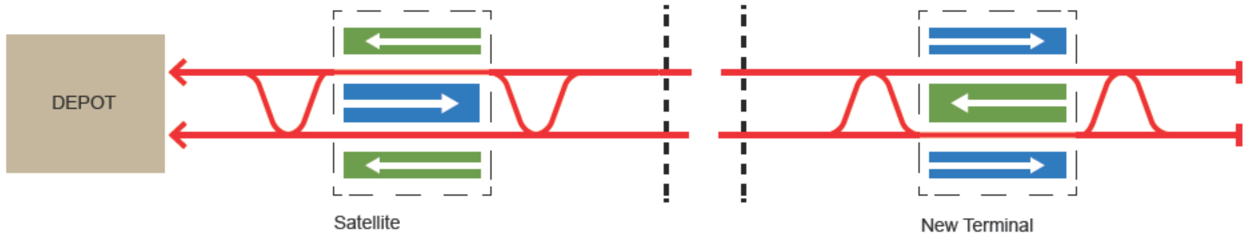


Figure 4.5.3_1 APM rail track alignment

4.5.3 Ease of access within the airport

A road and APM based distribution network has been planned to facilitate a high quality high speed strategic connections linking the terminals, aprons, cargo and maintenance areas. The airside and landside network aims to segregate airport main distributor corridors from apron specific head-of-stand roads thus minimising journey times for all vehicles as well as offering a safe and efficient circulation routes around the airport.

Airside and Landside Passenger APM

The Gateway and onward passenger landside APM connections will be the beginning of the journey of a high proportion of passengers and will be designed to facilitate a seamless and informed transition from passenger access mode to airport terminal and eventually onto a flight. The landside APM will be integrated with Gatwick Connect to provide the best possible passenger connectivity as a fundamental design consideration.

The landside APM will be a continuous system, running along the west side of the Brighton Main Line providing the best possible inter-terminal connectivity for passengers and staff.

Journey times between terminals with a continuous system will be as follows:

- North to South = travel time of 2 minutes.
- New Terminal to South = travel time of 2.5 minutes.
- New Terminal to North = travel time of 4.5 minutes.

The airside passenger APM connects the new New Terminal with the New satellite. As for the landside system this APM has been designed to facilitate the seamless and rapid movement of passengers between these two buildings. A pinched loop APM track layout has been safeguarded for in the Master Plan and is shown above in Figure 4.5.3_1.

Journey times between the terminal and the satellite with a continuous system will be as follows:

- Terminal to Satellite = travel time of 3 minutes.

Airside and landside APM alignments are shown in Figure 4.5.3_2.

North and midfield apron airside roads connectivity

An airside perimeter road is provided bordering the whole airport. This road connects the terminals on the east side and provides access to ancillary support facilities on the western end of the airport.

The section of road to the east connects the New Terminal with the north terminal either through the northern apron or through a more direct route under south terminal. The direct route, located within the existing A23 corridor, allows for faster speeds (high speed airside corridor) to be achieved than typically allowed for on an apron due to its separation from apron activities.

To connect this airside road system to the new satellite and remote stand area it will be necessary to provide some means of crossing the Code F cross field taxiways that link the two runways. The main connection between the terminal and the satellite is assumed to be via an airside road that passes below the taxiways. Taxiways will be supported on taxiway bridges. A similar underpass crossing will be provided between the Satellite and the remote stands west of the new satellite.

A further crossing is required from the remote stands to the western Ground Service Equipment (GSE) storage and ancillary support facilities. Due to the small area of the remote stands and thus an expected lower traffic requirement it is assumed connection to this area would be via an at grade connection. However, an underpass could be provided if required.

The airside road network described above is highlighted in Figure 4.5.3_3.

The airside road network described will support movement of passengers, cargo, GSE, maintenance, security activities and staff movements. These roads are planned to be a minimum of 10m wide. The head of stand roads around the satellite and the pier could accommodate additional through middle lanes to allow fast vehicles to overtake slow moving vehicles such as tugs and dollies.

Movement of goods to/from the cargo facility in the north and the GSE and ancillary support facility in the west are anticipated to flow via the western section of the airside road network segregated from the passenger related traffic. The movement of passengers will primarily occur via the road network to the east, including the high speed link under south terminal. As described in section 4.4.6 these roads to the east will support a high speed passenger vehicle based APM service which, as a part of the terminal transfer process, will support the MCT also described in that section.

Landside Roads

In addition to the road network described in section 4.5.2 and the Surface Access Report, a landside perimeter road is provided running parallel to the airside road. The landside road is safeguarded to border the whole airport. Like the airside road this perimeter road connects terminals, cargo, aircraft maintenance and the ancillary support facilities to the west. It is envisaged this road would not be for public use rather for airport related activities.

This perimeter road supports the airside road by separating movements that are related to airport operations but do not require direct access to the airside area. This landside road network is highlighted in Figure 4.5.3_3.

The landside perimeter road to the south will provide support during the incremental expansion of the midfield by providing direct landside access to the western end of the midfield thus segregating construction traffic from the operational areas of the airport.

The landside road network described above is highlighted in Figure 4.5.3_3.

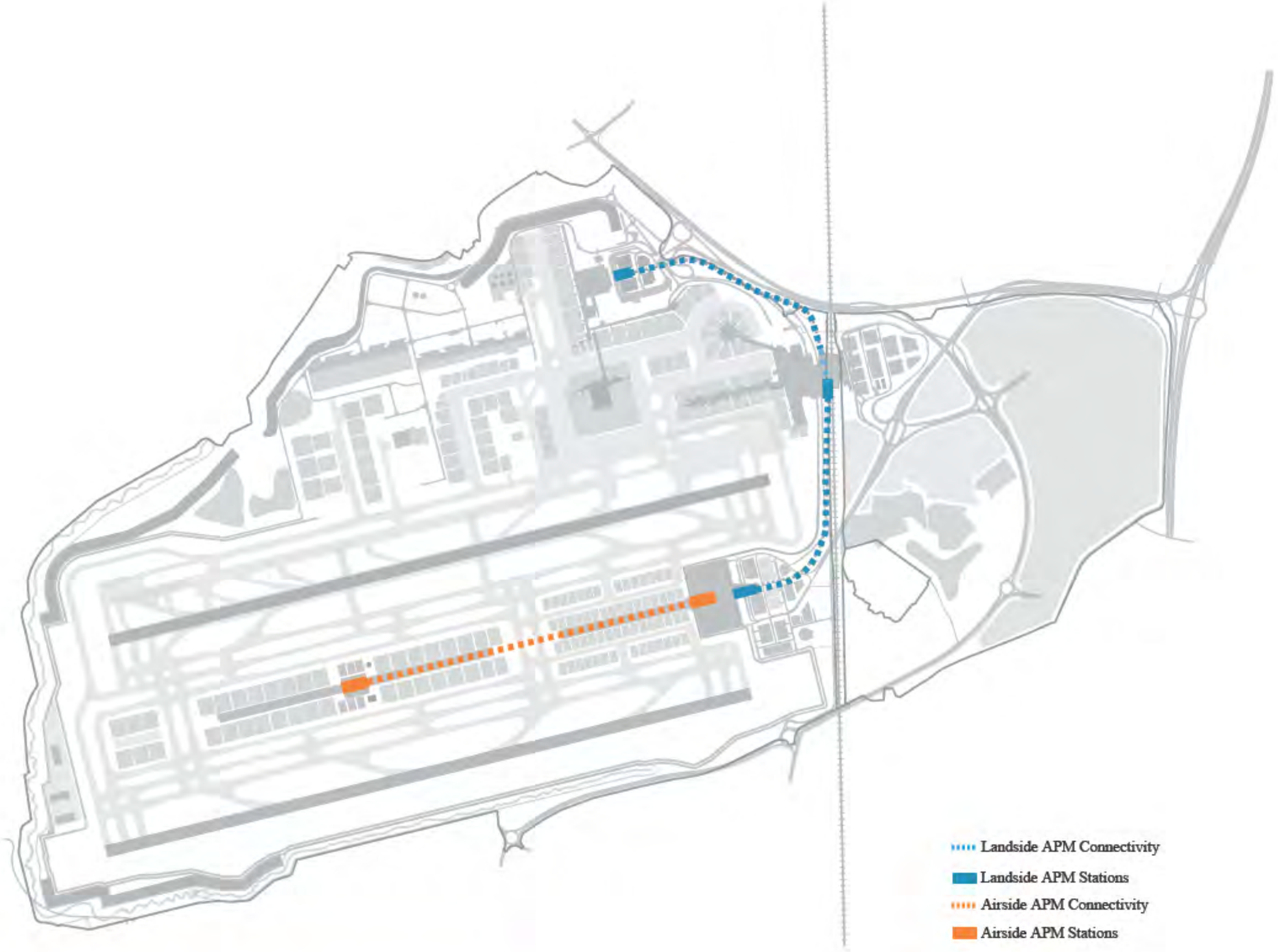


Figure 4.5.3_2 Airside and Landside APMs

Figure 4.5.3_3 Airside and Landside Roads

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4.6 Airport Support Facilities

4.6.1 Air Traffic Control Tower

The Air Traffic Control Tower (ATCT) is a key element of a safe and effective air traffic management service. The Visual Control Room (VCR) is located at the top of the ATCT and a clear and unobstructed view of the entire airport is required from the VCR to ensure the safety of all aircraft operating on runways, taxiways, aprons and in the airspace surrounding the airport.

The ATCT location and height need to be such that the appropriate visual surveillance is achieved without compromising airport operations or becoming an unacceptable hazard to flight. The optimum location to meet these requirements is close to the centre of the movement area of the airport. Where two runways are provided a central location between the runways that provides a broadly similar view to each of the respective landing thresholds is preferred. Given this and the fact that the existing ATCT is located too far from the new runway for controllers to see each end a location adjacent to the centre of the new satellite was adopted as a starting point for the new ATCT provided in the masterplan. The proposed location for the ATCT is shown in Figure 4.6.1_1.

An assessment identified that an ATCT height of 39m would allow the controllers to see the ends of all operational runways. An additional 3m has been added to the tower height to allow controllers to see the extent of the eastern zone of the airfield which may enhance safety.

Some areas of the existing airport may have restricted visibility from a new VCR, these include movement areas near the South and North Terminals which may be out of range or blocked by tall buildings. Unsighted areas such as these are common in large airports. Methods to mitigate these issues include using supporting systems such as CCTV or multilateration which uses the coverage from several surface movement radars.

A further option for addressing this issue is the retention of the existing control tower to provide the secondary control function for manoeuvring areas. With these interventions the new VCR would control runway operations and movements in the midfield area. Detailed procedures would be implemented to clearly identify the split in operational management of air and ground operations and airfield areas. Retaining the existing control tower as a secondary VCR has the added benefit of providing a back-up function for air traffic control operations generally.

Ground apron control could be incorporated into the new ATCT, or as mentioned above the existing ATCT could be maintained for this purpose as well.

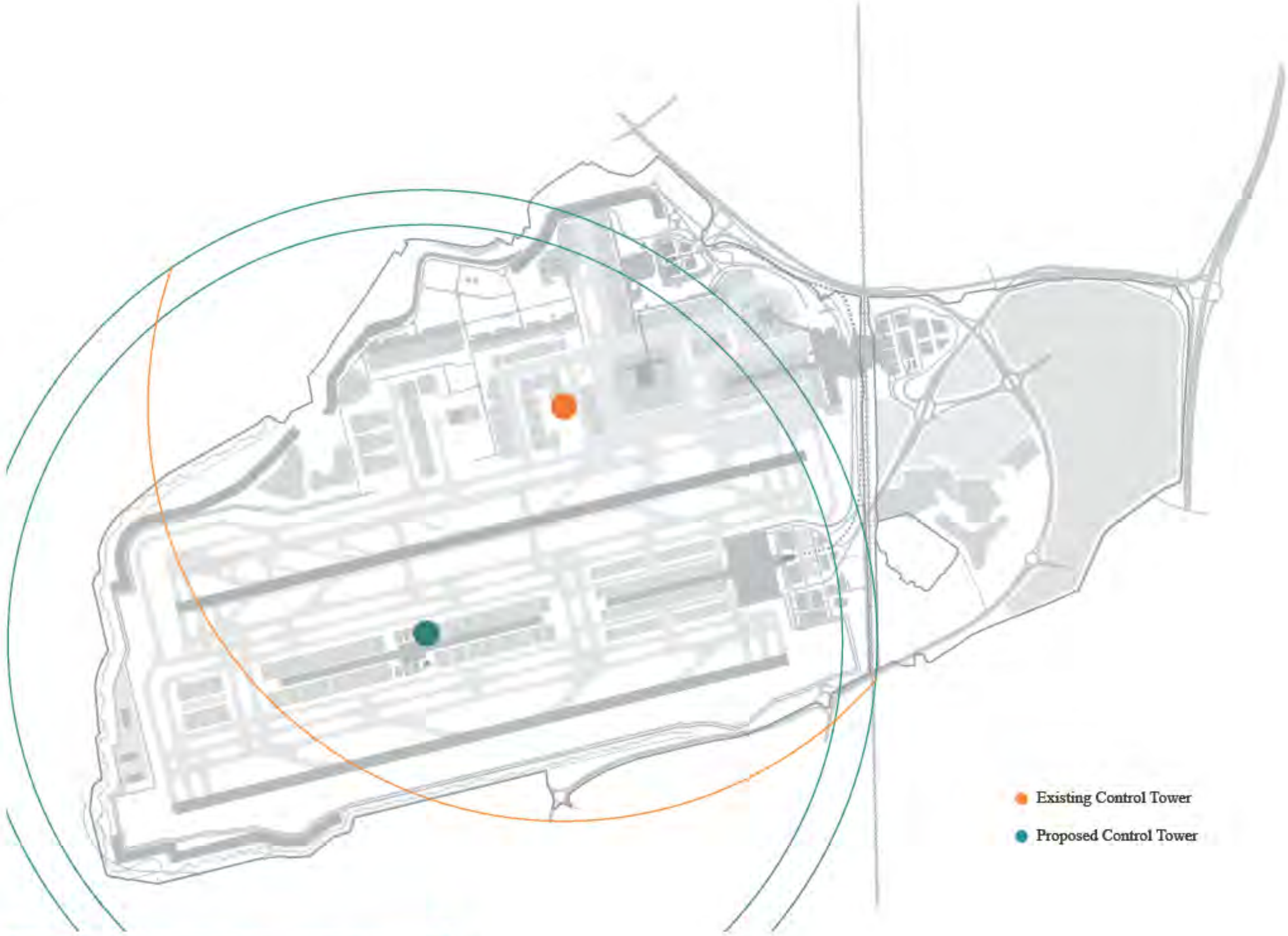


Figure 4.6.1_1 Proposed Control Tower Location

4.6.2 Rescue Fire Fighting Station

The location of a Rescue Fire Fighting Station (RFFS) is a primary factor in ensuring that recommended response times can be achieved. All fire stations should be located so that access to the manoeuvring area and runway is direct and incorporates the minimum number of turns for rescue and fire fighting vehicles.

The response time is considered to be the time between the initial call to the rescue and fire fighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam. Gatwick's Airside Planning Technical Standards specify the response objectives:

- To achieve a response time of 2 minutes 30 seconds to any part of the operational runway(s);
- To achieve a response time of 2 minutes, and not exceeding 3 minutes, to any part of the response area;
- To achieve a response time not exceeding 2 minutes where helicopter operations are concerned (Annex 14 Vol. II, para 6.1.9)

Based on these response time requirements we calculated the distances that could be covered with the proposed airfield layout in those times were calculated. Based on the assumptions set out in Table 6.6.2_1 a satellite fire station located in the midfield as well as the existing RFFS station would allow for a response time to all runway ends within 2 minutes 30 seconds as well as to all movement areas within 3 minutes.

Each airport fire station should house a self-contained rescue and fire fighting unit, with appropriate facilities for the protection of vehicles, crew members and such operational services as are necessary to ensure an effective and immediate response in an emergency. The proposed location for the second station is near the new satellite building, in between the two runways(see Figure 4.6.2_2).

Based on CAP 168, Gatwick will require a Category 10 service, this is the maximum level of protection and will provide coverage for aircraft up to 90m in length and with a fuselage width of up to 8m. This is sufficient for all Code F aircraft for which the airfield has been designed to support.

The minimum number of foam producing emergency vehicles required by CAP 168 for a Category 10 airport is four vehicles. The minimum footprint area required to house this number of vehicles as well as the facilities mentioned above was estimated based on the ICAO Airport Services Manual Part 1 sample fire station layout, which is about 650m2. The existing fire fighting station at Gatwick has a building footprint of around 1,700m2 and a total area of around 4,300m2, which is large enough to support category 10 services. It is recommended that the satellite be of a similar building footprint area, as well as having sufficient forecourt space to provide for vehicle manoeuvring. The suggested location would provide an area of around 3,400m2.

It should be noted that this figure excludes facilities for training. There is an existing fire training rig located on a fire training ground in the airport's North West zone and the Master Plan assumes the training facility will be retained in the same location.

Action	Time (sec)	Distance (m)
Alarm	10	
Start engine	20	
Accelerate from 0-80 km/h	30	333
Accelerate from 80-120 km/h	30	167
Drive to accident site at 120 km/h	45	1,500
Decelerate before accident site	15	250
Total distance in 2 minutes 30 seconds	150	2,250

Table 4.6.2_1 - Response Time and Distance

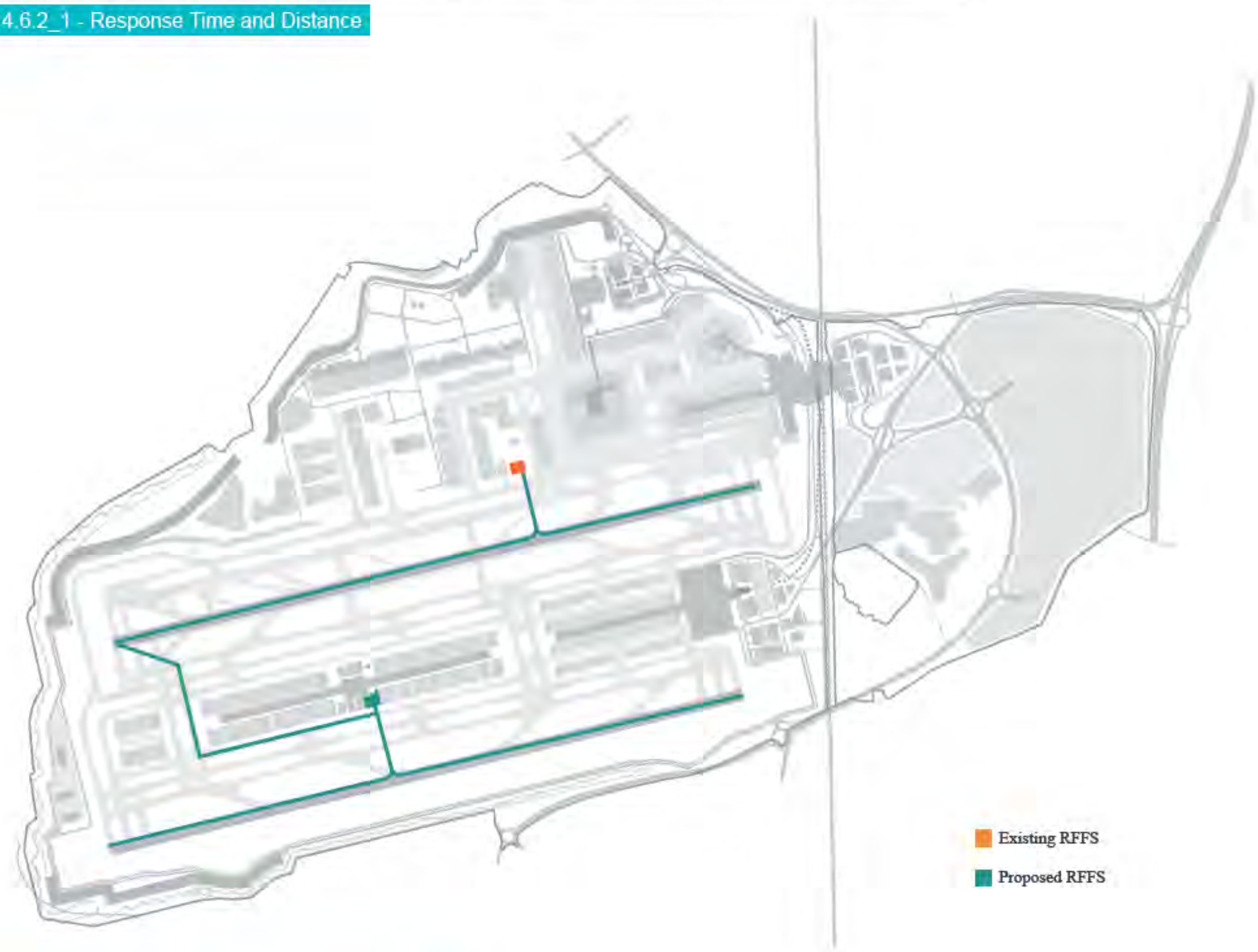


Figure 4.6.2_2 Location of Proposed and Existing RFFS

4.6.3 Cargo Facilities

The existing cargo building has an area of 27,085m2 , of which 16,169m2 (60%) is occupied, a typical width of 45m, and an overall length of 588m. The building processed 97,567 tonnes of cargo in 2012, resulting in an operational capacity of 6.03 annual tonnes per square metre (ATSM). This is a significant reduction from the 320,000 tonnes processed in 2000 when the airport had a greater proportion of long haul flights, as well as dedicated freighter operations.

Seven cargo aircraft stands are immediately adjacent to the building on its south side, with additional remote stands available as required.

The landside truck docking area (forecourt) has an overall depth which varies from 30m to 35m, including Cargo Forecourt Road. Diagonal remote parking is provided for trucks to the north of the forecourt, as well as car parking for visitors and employees.

The total site area of the existing cargo facilities is 7.74 hectares, excluding the airside apron and adjacent stands which account for an additional area of approximately 5 hectares.

Forecast Cargo Demand and Facilities Requirements:

The forecast cargo demand for Option 3 is 1,070,000 tonnes in 2050. This demand is calculated to generate a future total cargo building area requirement of 92,478m2 (which equates to an operational capacity of 10.4 ATSM, and to an additional building requirement of 65,394m2. The overall site requirement is calculated at 26.4 hectares, which includes an additional site area requirement of 18.7 hectares.

The layout described below is for the 2050 planning year, and will be developed in stages in response to demand:

- The existing cargo building and its landside and airside facilities remain unchanged.
- Timberham Farm Road is extended to the west, to establish the rear (north) of a 40m deep forecourt for a new cargo building.
- The new cargo building has a length of 520m and a width of 100m, providing a footprint of 52,000m2. A second level of 13,520m2 (26m x 520m) is located on the north side of the building (above the loading docks), providing a total building area of 65,520m2.
- The landside area to the north of the forecourt includes diagonal parking for cargo trucks, similar to the existing, and an area of 6.1 ha for visitor and employee parking, which equates to approximately 2,400 cars, assuming 25m2/car.
- An airside cargo apron/vehicle staging area with a depth of 45m is provided on the south side of the new cargo building. Additional cargo aircraft stands are not provided.
- Airside cargo vehicular flow is from the east end of the apron, where it connects to the existing cargo apron and airside roads to the terminals.
- The total area associated with new cargo development, including building and related landside and airside, is 19 hectares (see Figure 4.6.1_3).

It should be noted that Larkins Road is terminated where it intersects with Cargo Forecourt Road at the west end of the existing cargo building, in order to provide the continuous cargo airside noted above. A new east/west road is provided immediately south of the new cargo apron to maintain access to existing facilities on the southern part of Larkins Road.

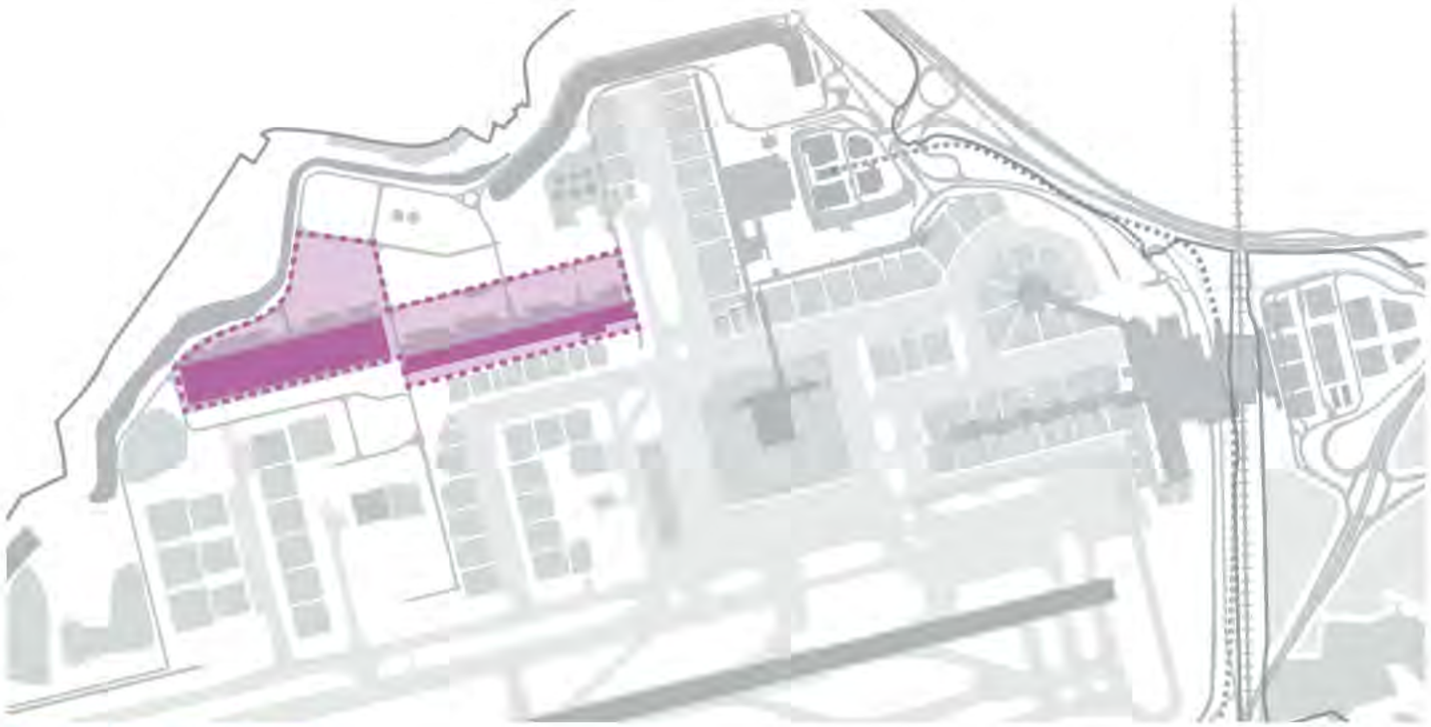


Figure 4.6.3_1 Cargo Facilities

4.6.4 Maintenance facilities

The existing aircraft maintenance hangars operated by British Airways (Hangar 6) on the south side of the existing runway, and by Virgin Atlantic on the north side, have a total building area of 16,493m2 and a site area of 8.13 ha.

Forecast Aircraft Hangar Demand and Facilities Requirements

The forecast aircraft maintenance hangar facilities for 2050 indicate a potential demand for the equivalent of 5 Code E hangars of 55,000m2 floor area. Current market activity suggests sufficient demand for the staged development of two hangars, increasing to a total of five hangars in the medium term. A total additional hangar area of 38,500m2 is provided in the master plan.

The layout described below is for the 2050 planning year, and will be developed in stages in response to demand:

- Four new Code E hangars, each with a nominal size of 100m by 100m, as indicated in Figure 4.6.4_1.
- The south wall of the most southerly new hangar is located 275m from the centreline of existing north runway 08L-26R, allowing a building height of up to 28.6m based on the 1:7 transitional slope from the runway. It should be noted that the runway 08L-26R is a visual runway thus the runway strip has a width of 150 m.
- An additional two future hangars of a similar size are shown in outline, bringing the total footprint area of the new facilities up to 55,000m2, when required.
- The south wall of the south future (as outlined in Figure 4.6.4_1) hangar is 360m from the centreline of existing runway 08R-26L, allowing for a building height of up to 30m assuming that runway 08L-26R will not be operational in 2050.
- The new hangars are each provided with aprons sized for Code E aircraft, which are accessed from the Code F taxilane that serves existing remote stands 230R to 235R.
- New landside access roads are located to the rear of the new hangars, providing a depth of 30m for receiving docks and parking.
- The total additional site area provided, including the new aprons, is 16.5 ha.

As noted at section 4.6.3, a new east/west road is provided immediately south of the new cargo apron to maintain access to existing facilities, including the Virgin Atlantic hangar, on the southern part of Larkins Road.

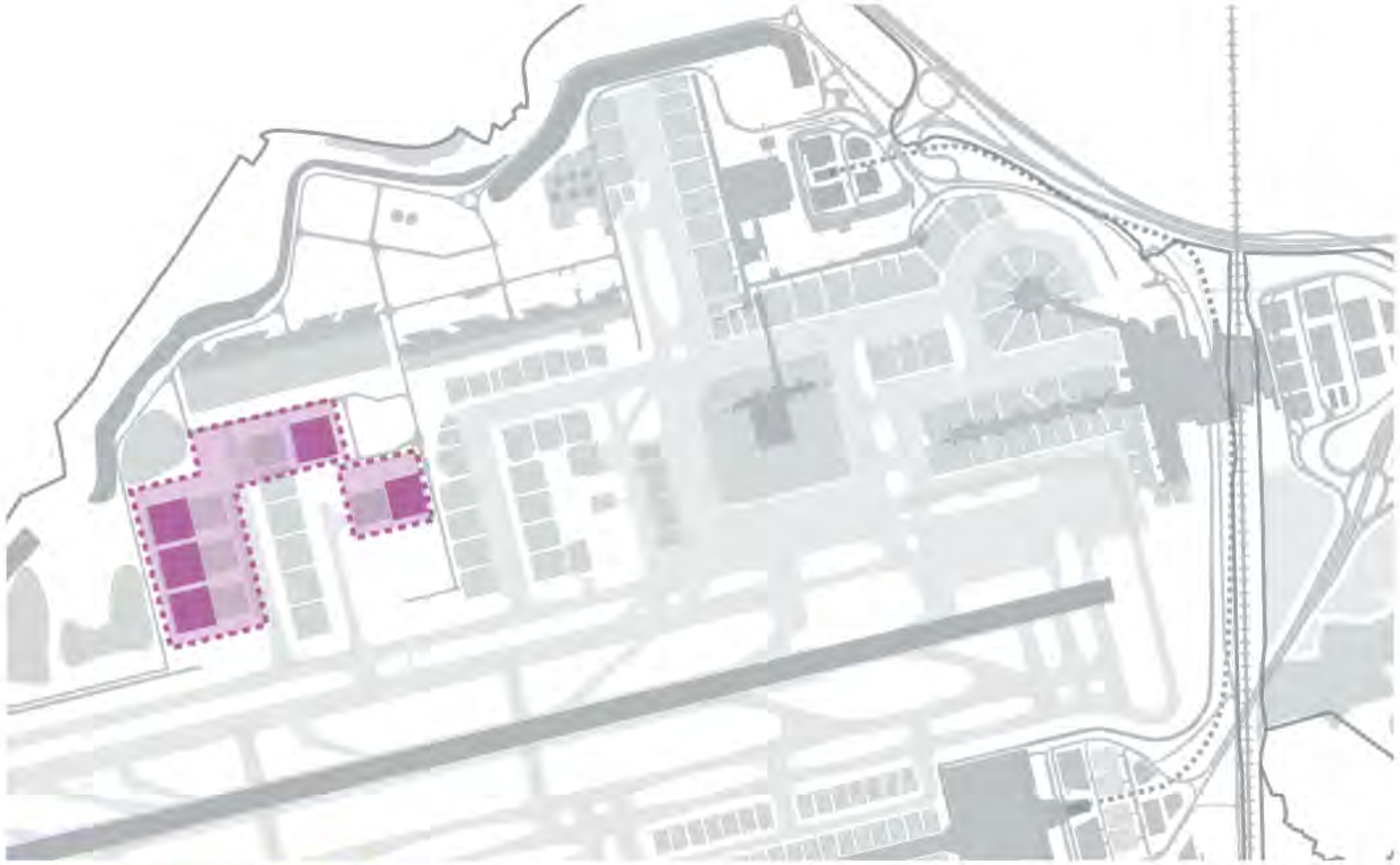


Figure 4.6.4_1 Maintenance facilities

04_Master Plan Components

4.6.5 Other airside and support facilities

Ancillary Facilities

Ancillary facilities, as defined in the airport Master Plan, include vehicle maintenance depots, flight catering facilities, offices and hotels, for which an existing site area of 9 ha is identified.

Forecast Ancillary Facilities Demand and Requirements

The Deloitte report identifies a future total site area requirement for 2050 of 6.39 ha for ground services and ancillary airside facilities and 4.18 ha for industrial requirements. These requirements are airport wide facility requirements.

The layout described below is for the 2050 planning year, and will be developed in stages in response to demand:

- A site area of approximately 7.5 ha is located at the west end of the New Terminal site, and designated for ancillary facilities development.
- Figure 4.6.5_1 includes three buildings, each with a footprint of 4,000m2, which could be used for airport maintenance, airline equipment maintenance, and aircraft deicing support in various combinations. Space is also provided for GSE parking.
- The site is accessed by a landside service road from the north. Direct airside road access is provided to the remote aircraft stands and the New Terminal, and to adjacent de-icing facilities (if provided).
- In addition, the space between the midfield remote stands to the west and some spaces around the centre of the new satellite have been designated for ground services and ancillary airside facilities.

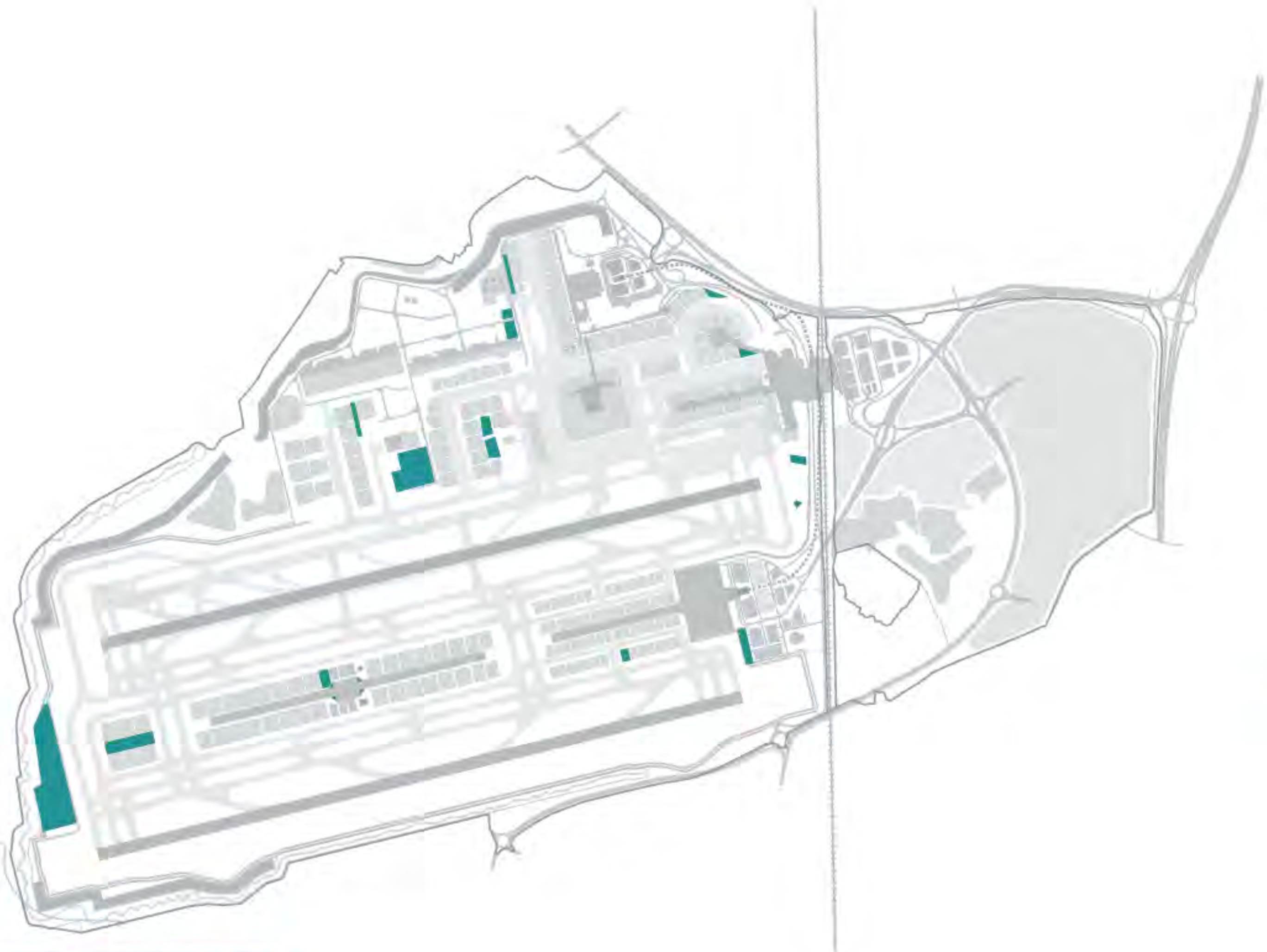


Figure 4.6.5_1 Ancillary facilities

Fuel Farm

In the period to 2050 additional storage would be needed. The additional capacity required has been estimated as 3 x 10,000 litre tanks. One of these tanks will be located in the existing fuel farm while the others will be provided in a remote compound with an exclusion area of 200m in all directions and off the centre line of the new runway. Further detail on the placement and provision of fuel services is detailed in the Fuel report.

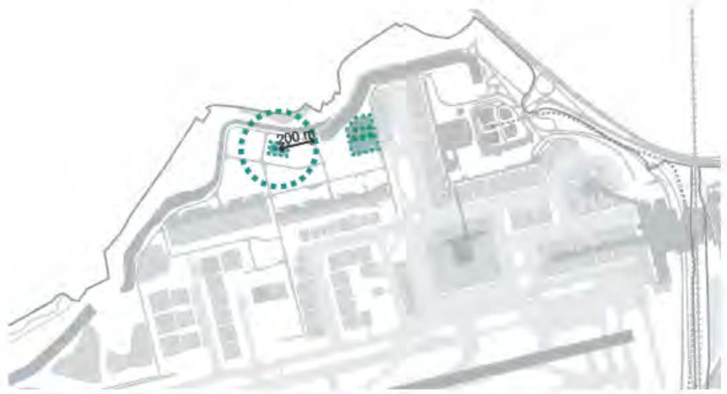


Figure 4.6.5_2 Fuel farm location

De-icing Facilities

These requirements are assumed to relate to the New Terminal development only. They will need to be based on a detailed de-icing study which will identify the recommended number and mix of de-icing positions and their preferred locations, based on a number of criteria, including the assumed weather conditions and number of bad-weather days, the type of de-icing fluid and equipment to be used, related hold-over times, etc.

For the purpose of this study it is assumed that the location of de-icing facilities should be based on a requirement for both eastbound and westbound departures from either runway during de-icing conditions. Three potential de-icing areas have been identified which could be used individually or in combination.

Area 1

- Located in the area between the remote stands at the west end of the terminal satellite and the ancillary support area to its west, and are well suited for departures from the 08 ends of the runways (see Figure 4.6.5_2).
- There is sufficient space to accommodate two typical large de-icing pads of 100m x 240m (e.g. Toronto Pearson) with intermediate road allowances for equipment movement and parking.
- Each pad will accommodate four Code C or two Code E/F aircraft in various combinations during de-icing operations, or as additional remote stands in good weather conditions.
- Support facilities, including glycol storage, equipment refilling/servicing, and staff accommodation can be accommodated in the adjacent ancillary support area.
- This facility could expand into the adjacent remote stand area if additional de-icing positions are required.

Area 2

- Located at the east end of the satellite in order to provide Code E/F deicing capability closer to the 26 ends of the runways (see Figure 4.6.5_2).
- The single pad indicated will accommodate two Code E/F aircraft or four Code C in various combinations.
- Its disadvantage is the impact that it will have on the satellite and its gates, which should be shifted to the west if feasible.
- Support facilities, including glycol storage, equipment refilling/servicing, and staff accommodation can be accommodated on the apron level of the satellite.

Area 3

- Located in the eastern part of the remote stand areas on either side of the terminal pier, and restricted to Code C aircraft assumed to be departing from the 26 ends of the runways (see Figure 4.6.5_2).
- Three de-icing pads, each approximately 95m x 60m and providing two Code C aircraft positions can be accommodated on both side of the terminal pier.
- Delays are anticipated during de-icing operations. Preferred aircraft flows through the deicing pads are from taxiway to taxilane in order to minimise delays to aircraft pushbacks from gates on the pier.
- These positions would revert to remote stand operations during good weather conditions, however the de-icing layout will reduce the number of Code C stands in each area from seven to six.
- Support facilities, including glycol storage, equipment refilling/servicing, and staff accommodation can be accommodated on the apron level of the terminal processor.

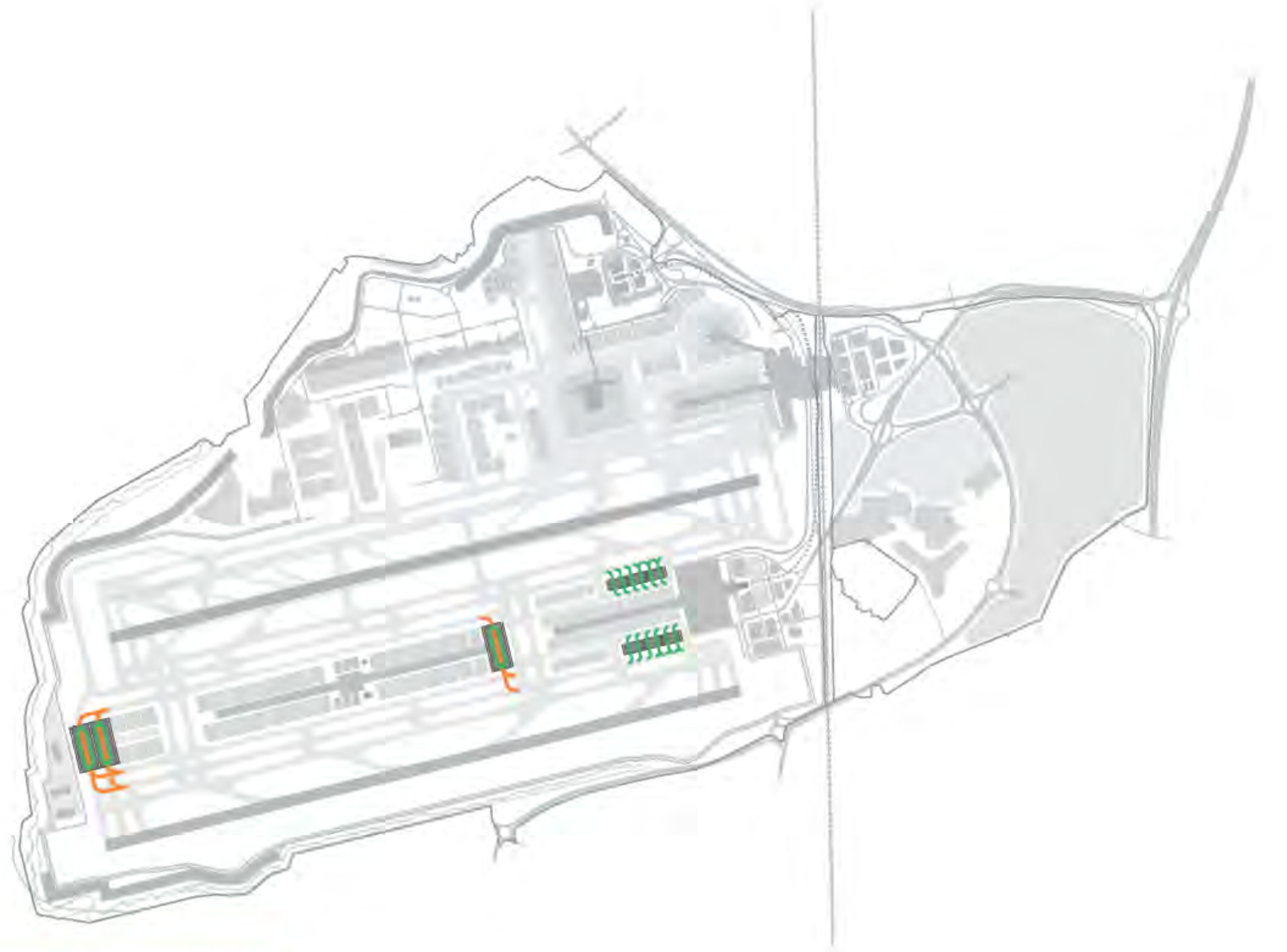


Figure 4.6.5_3 De-icing facilities

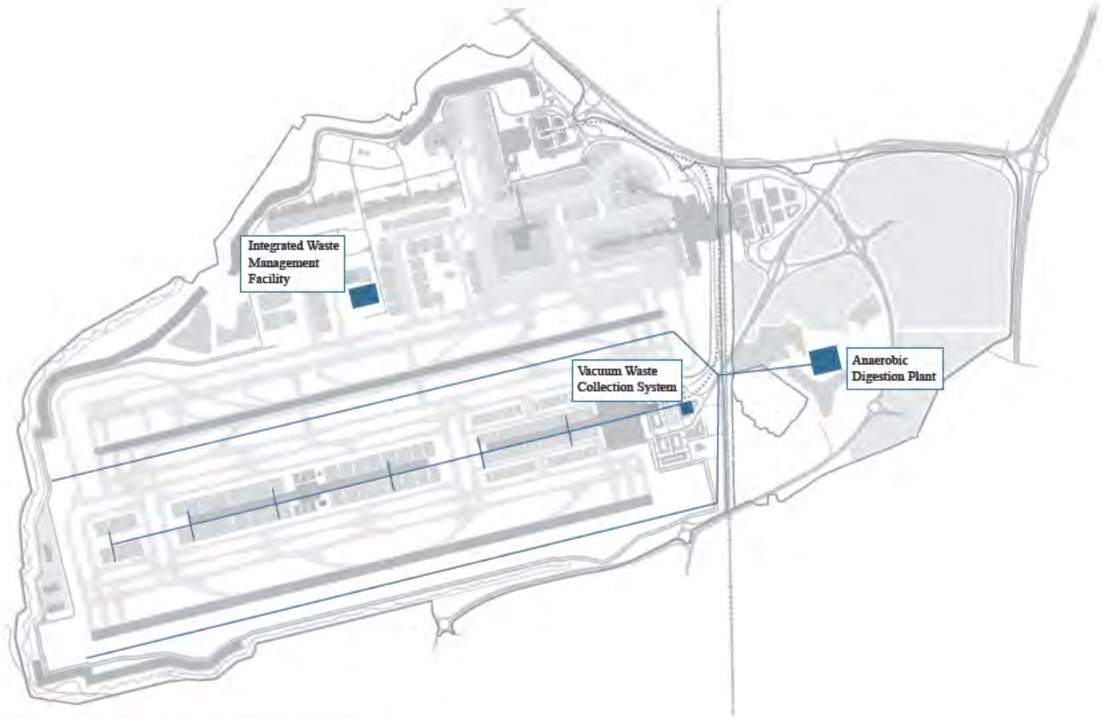


Figure 4.6.5_5 Waste Utilities Strategy

Utilities Strategy

The Master Plan has also considered the land use requirements of Energy, Water and Waste. A new energy centre, an enhanced waste handling facility, balancing ponds and treatment lagoons are to be provided east of the Crawley Sewage treatment plant and adjacent to the existing balancing ponds in the area. This zone is the most suitable as it is centrally located with respect to the runways and east of the railway line. This facilitates effective fuel combustion dispersal, provides logistical infrastructure connections for fuel deliveries and avoids interference with the runways flight paths and obstacle limitation surfaces. This new infrastructure will be connected to existing and new facilities and a utilities corridor will run along the spine of the midfield.

Further detail is provided in the respective Energy, Waste and Water and Flood Risk reports.

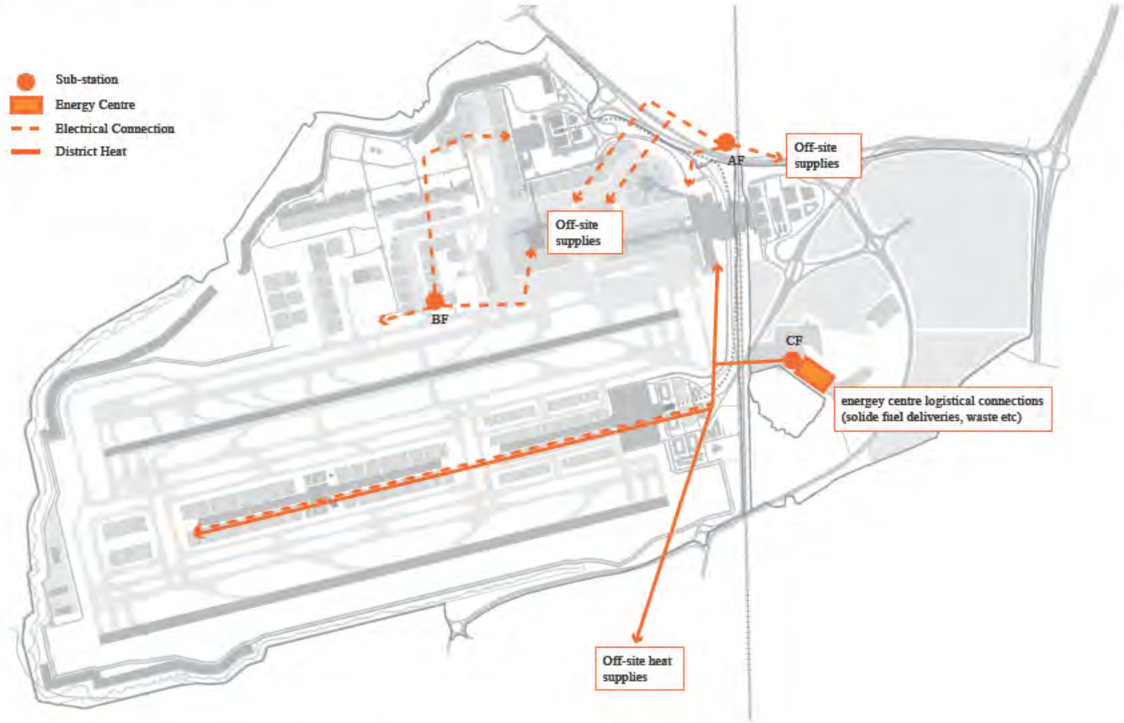


Figure 4.6.5_4 Energy Utilities Strategy

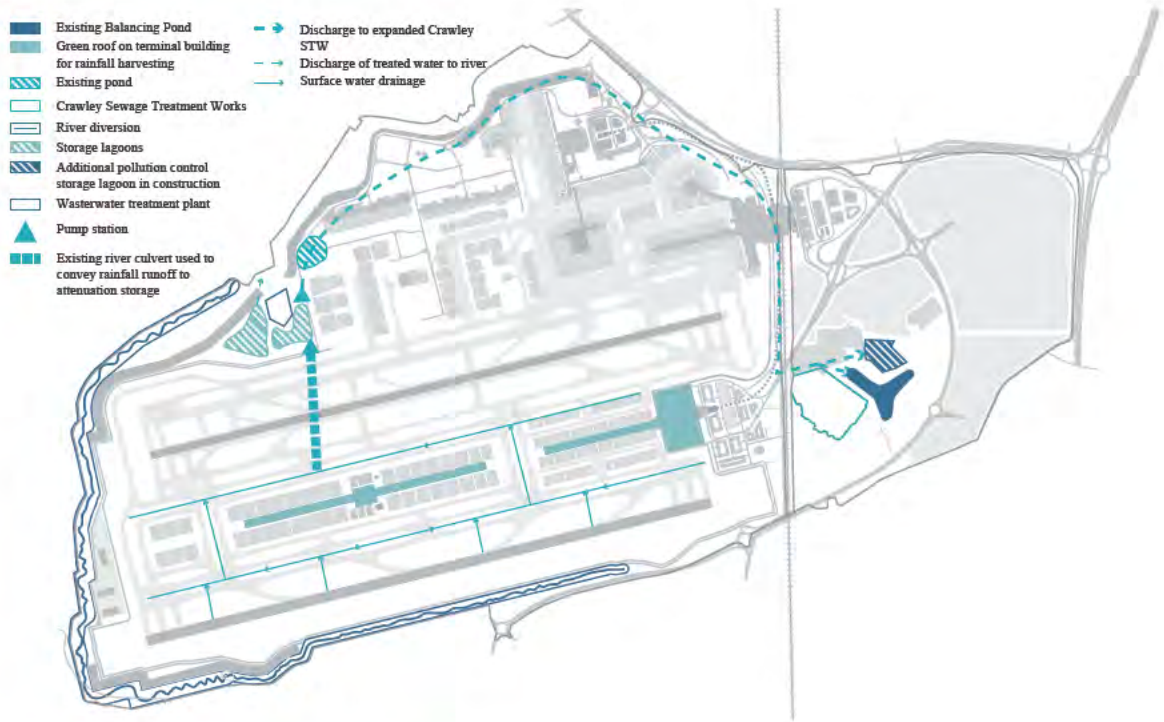


Figure 4.6.5_6 Water Utilities Strategy

4.6.6 Eastern campus

The area east of the railway line and within the airport boundary hosts a number of uses. This zone include areas of ancient woodland and storm attenuation zones, which fall within the airport boundary, but have been treated as not developable for other uses given their significance. The Crawley Sewage Treatment works is also located in the eastern zone and given the critical nature of its operation this has also been retained.

The Eastern zone also accommodates utility landuses including a new energy centre and an anaerobic digestion plant as described in the previous section.

The remaining land available will accommodate the A23 diversion, the Balcombe road diversion, cycle lanes and walking paths as well as surface car parking.

There are safeguards for some of the land designated as surface car parking to be used for commercial and industrial zones should there be a requirement in the future.

Legend

1. APM Station
2. Gatwick Gateway
3. Office
4. Hotel
5. MSCP
6. LSCP
7. Car Rental
8. Utilities Zone
9. Balancing Pond
10. Woodland and Flood Attenuation
11. Ancient Woodland

Figure 4.6.6_1 Eastern Campus Master Plan zoom in

4.7 Airport Boundary

The extended airport boundary has been established by firstly generating the operational boundary and secondly identifying those elements that are located outside of the operational boundary which should be included within the airport zone. Ways of modifying the airport and hence operational boundary to avoid environmentally and socially significant areas were also adopted were possible.

There is a difference in land take around the western boundary of the airport if EAT's are provided. The difference is approximately 20ha and the land affected is mostly agricultural in nature.

Figures 4.7_1 and 4.7_2 illustrate the two options, with and without EAT's.

Figure 4.7_1 - Airport Boundary (with EAT)

Figure 4.7_2 - Airport Boundary (without EAT)

4.7.1 Operational Boundary

The operational boundary is effectively determined through the ICAO/CAP 168 taxiway and runway clearance requirements. These clearances – such as the runway strip, transitional surfaces and the ILS sensitive zones determine the proximity of the airside road and airside security fence to the airfield. A landside road has been provided running parallel to the security fence. The operational boundary has been defined as the outer edge of the landside perimeter road. Examples of these clearances are presented in Figure 4.7.1_1. The runway centreline to boundary distances are variable depending on which is the most critical element in each location.

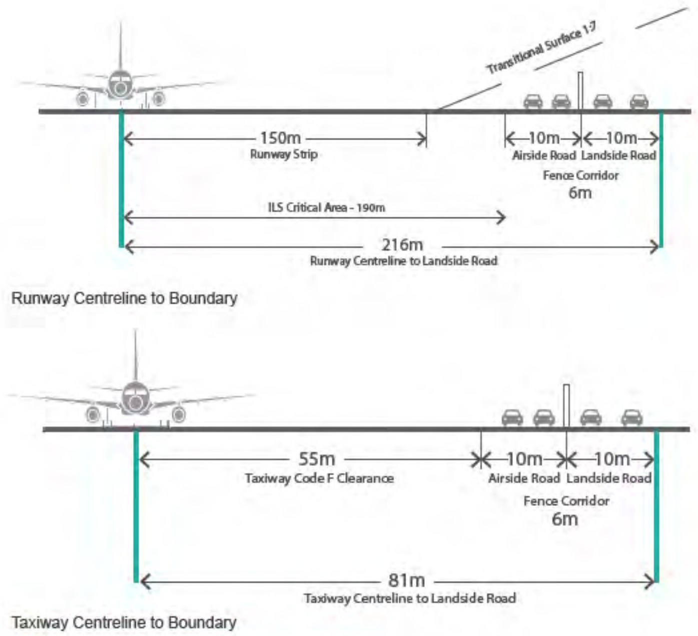


Figure 4.7.1_1 - Operational Boundary

4.7.2 A23 diversion

Landtake requirements beyond the operational boundary defined in Figure 4.7.1_1 were defined by considering a number of factors. Two key factors were the cross-section of the A23 road diversion and environmental mitigation measures. The extent of these are defined below.

The diversion of the A23 impacts the airport boundary on the area south of the new runway. The corridor allowed for in the Master Plan provides two lanes in each direction with adjacent bicycle and pedestrian paths. One metre hard strips have been included adjacent to each verge and central median making the total corridor width approximately 31m (see Figure 4.7.2_1).

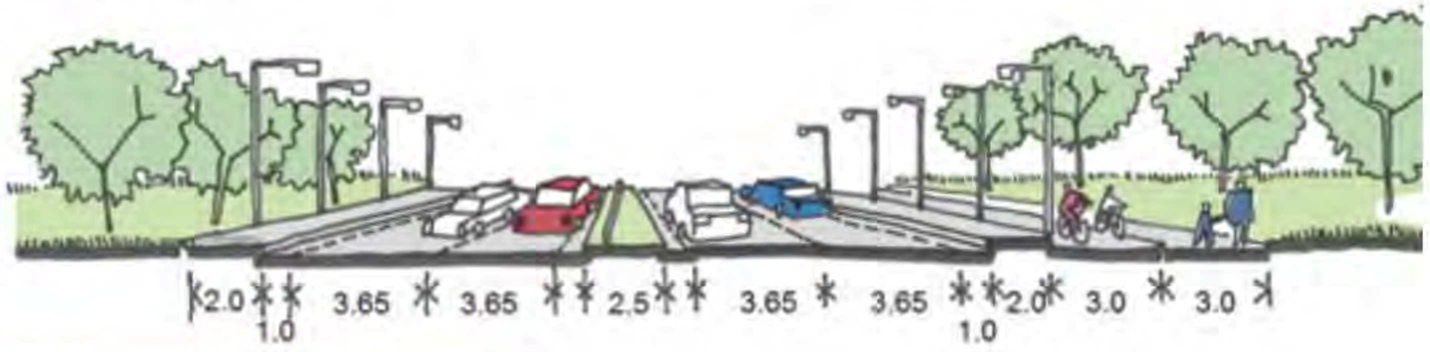


Figure 4.7.2_1: Proposed A23 cross-section

4.7.2 Environmental Mitigation

For environmental mitigation purposes, in particular ground noise mitigation, noise bunds have been provided around the new EAT's on the existing runway - in the with EAT option - and on the south west side of the new runway for all options. It has been assumed that the noise bunds would be 50m wide and 10m high (see Figure 4.7.2_2). On the south western corner of the new runway, due to space constraints and the more industrial nature of the site a wavy wall has been provided instead of a noise bund.

The new runway impacts some of the water streams in the area. To mitigate these impacts a new river diversion has been considered. This runs alongside most of the south and westerns perimeter of the airport (see Figure 4.7.2_3).

Figures 4.7.3_1 and 4.7.3_2 show examples airport boundary composition at several points in the airport. These cross-sections have been designed considering climate change and flood risk factors.

Further detail with regards environmental mitigation and landscaping can be found in the Ground Noise, Water and Flood Risk and Surface Access Reports.

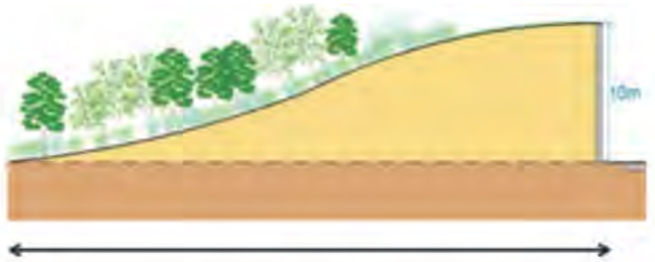


Figure 4.7.2_2: Proposed Noise Bund Cross-section

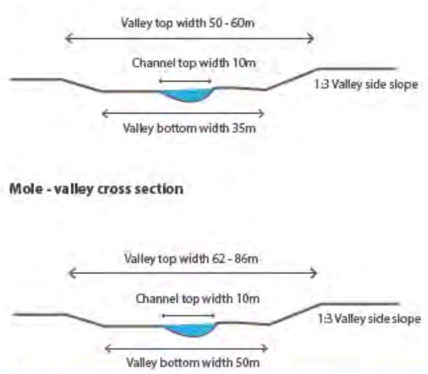
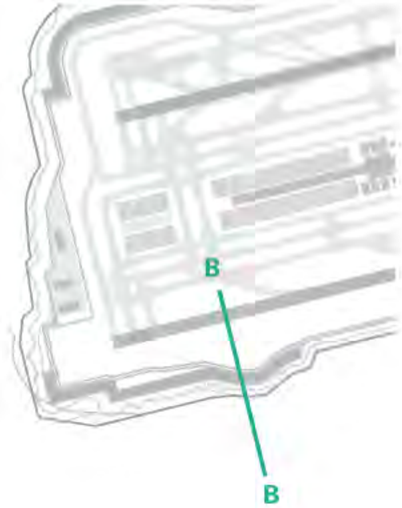
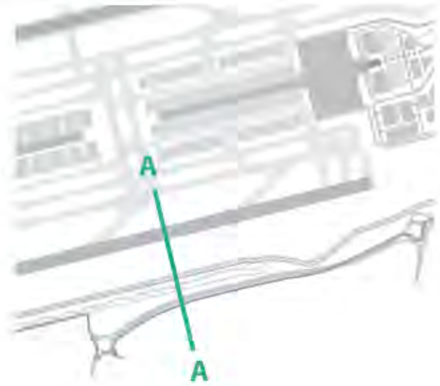


Figure 4.7.2_3: Proposed River Diversion Cross - Sections

4.7.3 Airport Boundary

The following are some examples of the final airport boundary composition at key locations around the airport.





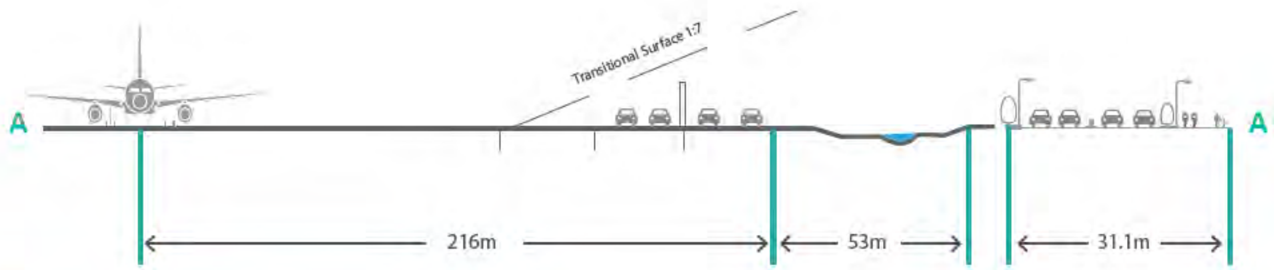


Figure 4.7.3_1: Section Through A23 and River Diversion

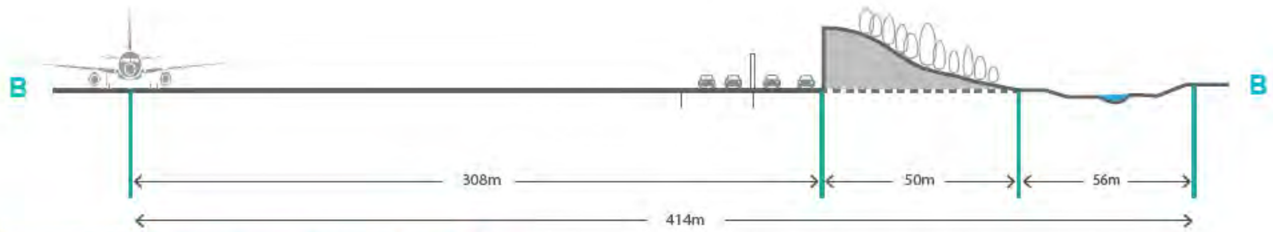


Figure 4.7.3_2: Section Through Acoustic Bund

Part 1:
Description of Masterplan

05_Phased Master Plan Development

Incremental, Flexible and Scalable Phasing

05_Phased Master Plan Development

The Master Plan for Gatwick Airport allows a wide variety of phasing strategies to be adopted depending on the rate at which forecast growth is realised and the choices made on the optimal balance between construction and capital efficiency. The ability to incrementally phase construction and provide flexibility in the design to accommodate change is therefore a vital feature of the Master Plan. This section summarises one of the many strategies which might be taken for the phasing and implementation of the airport facilities from opening day to end of the concession period in 2050. The phasing strategy outlined in this section has been used as the basis for the business case which is described in detail in the business case report.

5.1 Runway Opening Phase - 2025

The runway opening phase allows for the construction and entry into service of the new full length southern runway. The operating strategy would be for the new runway to be utilised by short haul narrow bodied aircraft with wide bodied aircraft continuing to operate from the existing runway. New pier capacity would be provided with a new remote pier in the midfield serving Code C stands. These stands would be accessed from the existing terminals via a bussing operation.

The construction of the new runway would require partial realignment of the A23. Construction of the New Terminal would have commenced and would be on-going during this phase. Fundamentally, this phase allows opening of the runway and consequential increase in capacity before completion of the New Terminal.

Forecast demand indicates that annual traffic at the airport be 63 mppa in 2029.

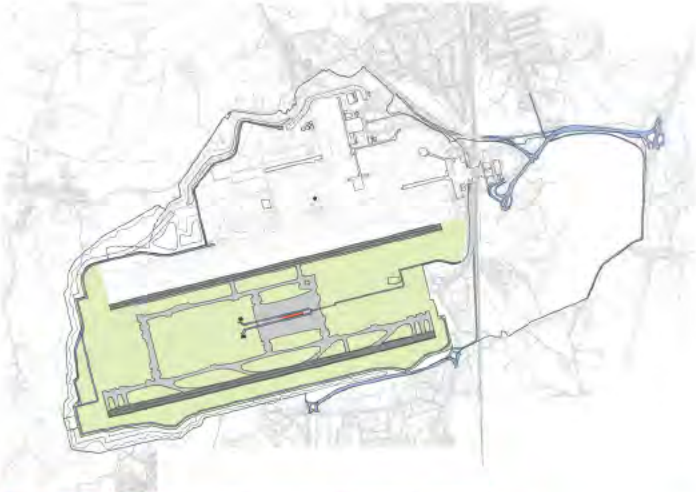


Figure 5.1_1 - Diagram of Runway Opening Phase

5.2 Phase 1 – Opening 2030

Phase 1 includes the opening of the New Terminal with a GFA of 125,960 m2 alongside with the contact pier and Code C apron, serving a total of 44 Code C stands in this phase. Only 78,660 m2 would be fitted out with the remaining 47,300m2 of terminal fitted out at later stages to allow for easier incremental expansion.

The landside APM would connect the New Terminal to the railway station, and the second section of A23 diversion works would be complete. The Runway Opening phase midfield apron and remote pier would continue to operate through Phase 1.

Demand at the airport is forecast to increase to approximately 73 mppa by 2034.

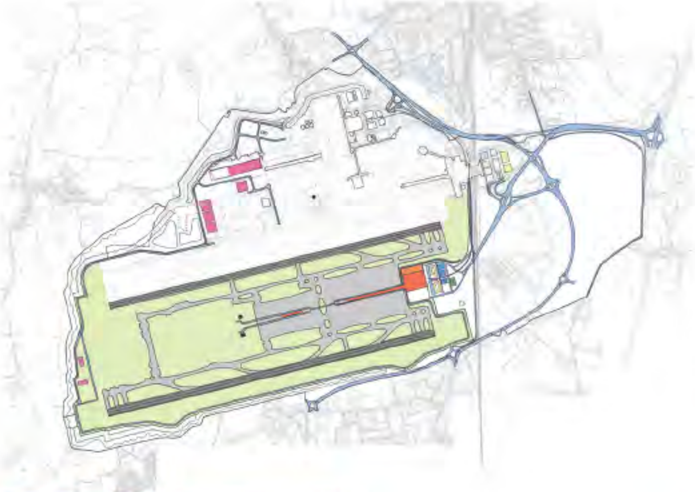


Figure 5.2_1 - Diagram of Phase 1

5.3 Phase 2 – Opening 2035

At this stage the New Terminal's remaining 47,300m2 built in Phase 1 would be fitted out. This stage would also include the extension of the contact pier to its full length and the corresponding expansion of the shorthaul aircraft apron, which would now accommodate 60 Code C aircraft. Initial construction of the new satellite would also begin at this stage, with a total of 50,000 m2 provided.

Demand at the airport is forecast to increase to approximately 82 mppa by 2039.

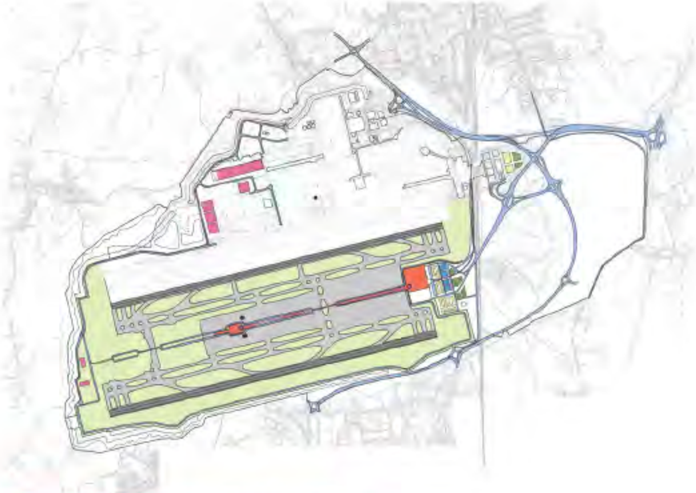


Figure 5.3_1 - Diagram of Phase 2

5.4 Phase 3 – Opening 2040

Phase 3 comprises the full build out of the midfield apron and terminal area with the New Terminal expanded to its full size of 228,000 m2 and the total floor area of the satellite being approximately 118,000 m2. The midfield satellite would be connected to the main terminal by an airside APM. This satellite would be served by 6 Code C and 32 Code E contact stands with a further 6 Code E remote stands provided west of the satellite.

By the end of the phase, in 2050 the airport is forecast to be serving 95 mppa.

The table below breaks down forecast demand and the provision of facilities allowed for in each phase.

	Runway Opening	Phase 1	Phase 2	Phase 3
Years	2025-2029	2030-2034	2035-2039	2040-2050
Midfield apron demand, at end of phase (mppa)	18	28	37	50
New Terminal GFA, built (m2)	-	126,000	126,000	228,000
New Terminal GFA, fitted out (m2)	-	78,660	126,000	228,000
New Terminal Pier GFA (m2)	-	37,600	51,400	51,400
New Satellite GFA (m2)	-	-	50,000	118,000
Remote facility GFA (m2)	15,000	15,000	15,000	-
Midfield stand capacity	30 Code C	66 Code C 4 Code E	66 Code C 17 Code E 2 Code F	66 Code C 32 Code E 6 Code F

Table 4.5.2_1 Future Car Parking Space Requirements

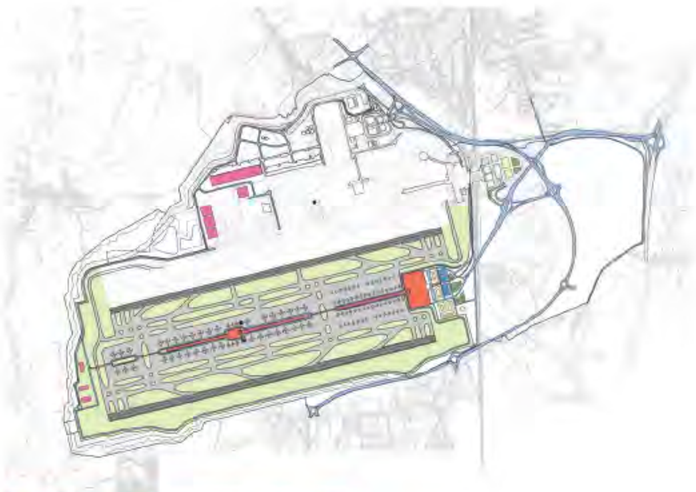


Figure 5.4_1 - Diagram of Phase 3

Part 2:
Evaluation Against Airports Commission Criteria

ARUP

ARUP

This section provides a tabulated 'appraisal summary table' analysis for the Airports Commission criteria relevant to the Master Plan. These tables indicate: the relevant Airports Commission criteria; how it has been met; where it is addressed in this report; and other consultant reports which include supporting information.

Airports Commission Criteria	Strategic Fit: Capacity
Commentary	The mixed mode operations which are supported by the layout described within this report enable the highest possible two runway throughput. This in turn enables the greatest hourly and annual passenger and cargo capacity for the two runway system.
Performance/Measures	The runway capacity provided, which has been validated through dynamic simulation, is the following: • 98 two-way atm/hour; • 60 departures atm/hour; • 53 arrivals atm/hour. This level of runway hourly capacity is forecast to deliver; • 95 mppa by 2050; • 1,070,000 tonnes of cargo. All new forecast capacity requirements to 2050 can be accommodated in the midfield hence minimising impacts on the existing airport operational facilities. The airport as a whole and the midfield in particular can accommodate a range of airlines through alternative stand configurations. Beyond 2050 further additional capacity requirements could be accommodated in the northern apron through the extension of north terminal.
Reference Section in this report	3.1 Summary of Passenger and Cargo Forecasts 4.2 Runways and Taxiways Appendix A - Airfield Simulation Report
Reference to other documents	Traffic Forecast Report Airspace Report

Airports Commission Criteria	Strategic Fit: Connectivity
Commentary	Central to good connectivity is high capacity. As identified for the Capacity criterion Gatwick's second runway delivers the highest possible increase in capacity for the London system. Coupled with a high capacity, this report also demonstrates the range of options for terminal and apron configuration. These are evidence that the Master Plan is able to adapt and serve a range of anticipated fleet configurations ranging from longhaul to shorthaul LCC traffic. The proximity of terminals allows for airside inter terminal connections of 45 minutes.
Performance/Measures	The airfield and apron design has been demonstrated to support a range of operations including: • domestic regional traffic; • longhaul schedule traffic; • fast turnaround for short haul aircraft; • transfers including international and domestic transfers, interline transfers and self-connectors. The MCTs achieved support efficient and fast hub operations to provide airlines with the maximum flexibility needed to schedule flights with a high percentage of transferring passengers: • 45 minutes for airside inter terminal connections; • 90 minutes for landside inter terminal connections.
Reference Section in this report	3.1 Summary of Passenger and Cargo Forecasts 3.3 Terminal Programme of Requirements 4.3 Aprons 4.4 Terminals 4.5 Surface Access Appendix A – Runway Capacity Report Appendix C – Inter-terminal Connectivity Analysis Report
Reference to other documents	Traffic Forecast Report

Airports Commission Criteria	Passenger Experience: Wayfinding and Legibility
Commentary	70% of all airport arrivals will enter Gatwick Airport via the Gatwick Gateway. Strong wayfinding in this area will facilitate a seamless journey for these passengers. This way finding is also supported by the landside terminal access strategy. A single landside APM that connects all terminals will mean that passengers arriving at the Gateway and movement to one of the other terminals will all head to the same centralised position. The design of the Gateway will also support segregation of arriving and departing passenger flows. Other passengers accessing the New Terminal and north terminal using private vehicle drop off or parking will also be supported by strong cohesive wayfinding. A single surface access entry point for access to the South and New Terminals, and maintaining the same point of access for the North Terminal will also support easy and intuitive terminal access. Inside the airport the New Terminal has been designed to be intuitive and minimise level changes from when a passenger enters until they arrive at their gate.
Performance/Measures	Key Passenger experience measures are the following; • Easy and familiar access to the airport with 60% public transport mode share and 70% of all arrivals and departures using Gatwick Gateway. • Single road entry point for South and New Terminals with the existing North Terminal entry route maintained. • Clear, intuitive and simple way finding provided through straightforward access from Gateway to the terminals and minimal level changes. Design is tailored to serve all airport users, from business passenger to families. • Efficient and reliable systems with short journey times through terminals and inbetween terminals for fast connections. High frequency airside and landside APM routes an average 60 second wait time.
Reference Section in this report	4.3 Terminals 4.4 Surface Access Appendix C – Inter-terminal Connectivity Analysis Report
Reference to other documents	Traffic Forecast Report

Airports Commission Criteria	Passenger Experience: Mobility and Travel Distances
Commentary	Terminal and surface access design has been developed with the aim of minimising journey times for arrivals, departures and connections. This philosophy is also supported by intuitive and legible terminal design.
Performance/Measures	The proximity between the three terminal buildings minimises travel distances for outbound and inbound passenger and for transferring passengers (MCTs of 45min for all inter terminal airside connections). Ease of movement for all passengers including mobility impaired passengers (minimal level changes and directness of routes). The New Terminal building is planned as a simple three level terminal with departures and arrivals primarily consolidated over two levels and minimal level changes to facilitate mobility and fully integrated with landside transport access (road and landside APM) and airside pier and airside APM.
Reference Section in this report	4.2 Runways and Taxiways 4.3 Aprons 4.4 Terminals 4.5 Surface Access Appendix A - Airfield Simulation Report Appendix C – Inter-terminal Connectivity Analysis Report
Reference to other documents	Surface Access Technical Report

Airports Commission Criteria	Operational Efficiency: Capacity
Commentary	The mixed mode operations described within this report provide the highest possible two runway throughput. This in turn enables the greatest hourly and annual capacity from the two runway system. Analysis of stands and midfield apron has identified that a range of operations can be supported and there is sufficient stand infrastructure to meet peak day and annual demands. Taxi times have also been minimised through preferential assignment of runways given the destination apron and by supplying all new capacity in the midfield area.
Performance/Measures	The runway capacity provided, which has been validated through dynamic simulation, is the following: • 98 two-way atm/hour; • 60 departures atm/hour; • 53 arrivals atm/hour. This level of runway hourly capacity is forecast to deliver; • 95 mppa by 2050; • 1,070,000 tonnes of cargo. All new forecast capacity requirements to 2050 can be accommodated in the midfield hence minimising impacts on the existing airport operational facilities. The airport as a whole and the midfield in particular can accommodate a range of airlines through alternative stand configurations. Beyond 2050 further additional capacity requirements could be accommodated in the northern apron through the extension of north terminal.
Reference Section in this report	3.1 Summary of Passenger and Cargo Forecasts 4.2 Runways and Taxiways 4.3 Aprons 4.4 Terminals Appendix A - Airfield Simulation Report
Reference to other documents	Traffic Forecast Report

Airports Commission Criteria	Operational Efficiency: Safety and Security
Commentary	The airport Master Plan has been configured in accordance with relevant standards and design criteria published by ICAO and CAA. Reference has also been made to EASA requirements where appropriate. These are not yet fully implemented in the UK and primarily adopt ICAO standards however in one or two key areas they align with CAA requirements. In some cases other criteria is used, where this is published by others e.g. Public Safety Zone Policy issued by the Department for Transport (DfT), or where it is recognised as best practice and no specific guidance exists in a comparable ICAO or CAA document e.g. Federal Aviation Administration (FAA) standards. Where that is the case the source is specified.
Performance/Measures	The airport has been planned to be compliant with all relevant safety and security standards. An objective audit has been carried out to ensure compliance. The impact of new Public Safety Zones (PSZs) on existing and proposed land uses has been considered. Any changes required to the airspace would support safe operations.
Reference Section in this report	3.7 Safety and Security Appendix B - Safety and Compliance Report
Reference to other documents	Public Safety Zone Report Airspace Report Operational Risk Report

Airports Commission Criteria	Operational Efficiency: Efficiency
Commentary	The two runway system operated in mixed mode provides the most efficient way of delivering the maximum capacity. This is further enhanced by the runway assignment strategy which assigns arriving aircraft to runway depending on the apron of destination thus reducing journey times and potential delays. The three terminal buildings are integrated through the continuous landside APM and the dedicated airside APM corridor which allows efficient operations particularly with regards to connections between the terminals for passengers and staff. Their proximity further supports to minimise passenger and staff journey times. The supporting landside infrastructure is consolidated and centralised in the form of the Gatwick Gateway and the surface car parking zones east of the railway line. Sharing of common facilities allows for a more optimum resource allocation and generates space efficient developments whilst simplifying the operational costs.
Performance/Measures	Efficiency refers to competency in performance and is measured through; • Ability of runway and airfield to accommodate forecast peak hour ATMs whilst minimising delays and taxiing distances. • Ability of the three terminal system to operate seamlessly. • Ability of supporting infrastructure (landside and airside) to support effectiveness.
Reference Section in this report	4.2 Runways and Taxiways 4.3 Aprons 4.4 Terminals
Reference to other documents	Airspace Report

Airports Commission Criteria	Operational Efficiency: Reliability and Resilience
Commentary	The solution proposed by Gatwick Airport is inherently reliable due to its simplicity and ease with uncomplicated and straightforward design from road and public transport access through to terminal intuitive navigation plan. The split apron capacity with a high proportion of Code E and F MARS stands in the mix offers greatest reliability to accommodate all aircraft types. Mixed mode runway operations are the most reliable and resilient by nature being able to accommodate high one way peaks, segregated mode of operation and single mixed mode operations should one of the runways be out of service. The landside and airside APMs connecting the terminals are supported by airside/ landside road corridors for resilience. Furthermore, an airside/landside perimeter is provided to provide access through the west and eastern areas of the airport. All terminal buildings have a secondary landside access should the primary access be down due to unforeseen reasons. Ancillary facilities, including de-icing facilities, have been provided to manage demand during severe cold weather. In addition to this, river cross-sections and flood attenuation areas have been designed to accommodate extreme flooding events.
Performance/Measures	Reliability is the ability to be dependable and predictable. This can be measured through; • Simplicity of end to end passenger journey • Terminal and Airfield efficient operations Resilience is the ability to recover and return to normal operations due to unfore-seen or irregular operations.
Reference Section in this report	4.3 Aprons 4.8 Airport Boundary Appendix A - Airfield Simulation Report
Reference to other documents	Water Report Operational Risk Report

Airports Commission Criteria	Operational Efficiency: Scalability
Commentary	The report has described that New Terminal and apron facilities are able to support a range of demand and aircraft mix alternatives. Assessment has considered a range of scenarios including, low cost, long haul, high and low transfer and identified that the proposed configuration can accommodate all the requirements of these alternatives. All the forecast growth to 2050 can be accommodated within the midfield and therefore planned to be provided incrementally over time. The phasing strategy will minimise impact on existing operational facilities and terminal, apron and supporting facilities can be easily built by building flexibility into the earlier phases of construction so that they are easily adaptable to growth and to changes.
Performance/Measures	The Master Plan demonstrates scalability given it's ability to support a range of future scenarios and the facilities needed to support these. This ability has been demonstrated by presenting the ability to accommodate the following: • Either a higher proportion of wide body aircraft, including Code F aircraft, or a higher proportion of narrow body aircraft. • Point to point or Hub operations. • Low cost carriers. • Growth incrementally and independently from operational areas.
Reference Section in this report	4.2 Runways and Taxiways 4.3 Aprons 4.4 Terminals
Reference to other documents	-

Airports Commission Criteria	Operational Efficiency: Surface Access
	The capacity of the proposed surface access for the Master Plan has been tested rigorously at both 2040 and 2050 demand horizons. On the rail network, the capacity boost provided by the new Thameslink franchise and the switch to 12 car trains from 8 car trains, will improve performance. Even at 2040, crowding ratios in peak periods are improved compared to today. On the strategic highway network, additional capacity on both the M23 and the M25, including enhancement of the junction of the two motorways, is required to support background growth. A combination of these and other committed strategic highway and local road improvements is capable of meeting 2050 demand. Planning has considered the scalability of infrastructure provision and phasing for road improvements has been understood and can be achieved. For rail, no physical infrastructure requirements are required with all the additional capacity delivered on committed schemes. The Gatwick Gateway is a priority investment for Gatwick. The Master Plan envisages the Gateway going beyond simple station improvement leading to the creation of a new integrated transport facility. In terms of resilience on the rail network, Network Rail operates a joint Regional Operations Centre at Three Bridges controlling all trains on the network with staff working alongside each other and taking joint operational decisions. Network Rail has reported that service reliability has improved dramatically in 2013 with the benefit of resilience works that have already taken place. The internal road network is designed to allow passengers, staff, operational and emergency vehicles to reach each terminal and all parts of the airport via alternative routes in the event of any one access route being blocked or unavailable (including events impacting the A23 and M23). Access to terminals will be provided by a continuous landside APM. This means that should the forecourt or access roads to specific terminals be disrupted, it will be possible for Gatwick to bring traffic into another terminal and distribute people on the APM system back to the affected terminal.
Performance/Measures	The Master Plan demonstrates efficiency of the surface access network given it's ability to respond to increases in private and public transport trips. The details on performance are outlined in the main body of this report and in the Arup Surface Access Technical Report. The following measures were used to measure performance • Peak hour capacity of surface access compared to airport demand. • Surface access congestion and delays. • Ease of access to/from airport. • Scalability of surface access systems. • Reliability and resilience of all surface access modes.
Reference Section in this report	4.4 Surface Access
Reference to other documents	Surface Access Technical Report

Appendix A
Airfield Simulation Report

ARUP

Contents

Tables

Figures

1 Introduction

The master plan mixed mode airfield operations have been simulated using CAST Aircraft™. CAST Aircraft™ is based on state-of the-art multi-agent technology that simulates aircraft traffic on and around the airport taking into account, infrastructure, rules, restrictions and operational strategies.

The main objective of the simulation was to validate runway system capacities, airfield performance and operational efficiency of the proposed airfield master plan. The operational efficiency has been measured in terms of taxi time and taxi delay, whilst the runway capacity has been measured in terms of the runway throughput achieved considering a maximum delay criterion. Additionally, different terminal and gate assignment strategies have been tested to identify their impact on taxi times and delays and to demonstrate the flexibility of the layouts proposed.

The nominal mode of operation for the two runways is independent mixed mode, with both runways used for arrival and departure operations. In order to enable conflict free airspace routings, departures are allocated to runways according to their initial flight direction – **compass assignment**.

Arrivals have been allocated to runways based on the location of their stands – **terminal assignment**.

The basis of the runway allocation strategy is illustrated in the Figure 1:

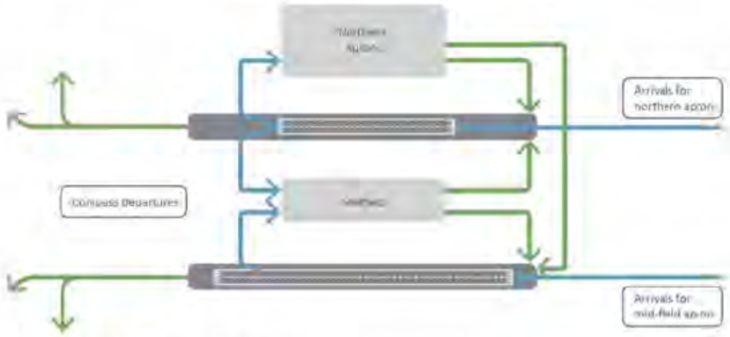


Figure 1. Runway assignment strategy

As shown in the previous figure, in applying compass departures, there is a need for aircraft parked on northern aprons to taxi to the southern runway for departure. For this purpose, there are two alternatives: crossing the runway or taxiing around it. This simulation study tests operational performance of both approaches.

The terminal assignment strategy for allocating arrivals depending on the destination stand eliminates the need for arrivals to cross the runway.

2 Assumptions and model description

The following assumptions have been considered on the airfield models.

2.1 General assumptions

The following assumptions regarding infrastructure, rules, restrictions and operational strategies have been considered to simulate the 2040 daily flight schedule:

2.1.1 Final approach speed

A final approach speed of 160 knots to 4 NM before the threshold is assumed for all aircraft. Between the threshold and 4 NM, all aircraft maintain a speed of 135 knots.

2.1.2 Runway assignment

For departures, the runways have been assigned on the basis of the SID routing. The following table presents the runway allocation for the applicable SIDs.

SID (08 and 26 directions)	Runway allocation
08 BOG	South (08S/26S)
08 CLN	South (08S/26S)
08 DVR	North (08R/26L)
08 KEN	North (08R/26L)
08 LAM	South (08S/26S)
08 SAM	North (08R/26L)
08 SFD	South (08S/26S)

Table 1. SID to runway allocation Source: SH&E

On the basis of this assignment, and on the basis of the SIDs assigned to destinations for operations in 2012, the following table presents the assumed distribution of runway use for each destination region. On advice from NATS SIDs for DVR departures are assumed to require departure from the northern runway in order to balance the daily departure demand on each runway.

Sector	South Runway (% of atms)	North Runway (% of atms)
Africa	19%	81%
Americas	13%	87%
Caribbean/Central America	13%	87%
Domestic	64%	36%
Europe	59%	41%
Far East	12%	88%
Indian Subcontinent	12%	88%
Middle East	12%	88%

Table 2. SID to runway allocation Source: Arup

Arrivals have been allocated considering the destination stand, as follows:

- Arrivals parked on northern aprons land on the northern runway
- Arrivals parked on the midfield land on the southern runway. For the end of the day during the arrival demand peak, some arrivals parked on the midfield have been allocated on the northern runway in order to balance the usage of both runways.

2.1.3 ATC separations

All arrival separations are set to 4 NM from threshold.

2.1.4 Arrival-arrival

Minimum arrival – arrival separations for aircraft arriving on the same runway are based on CAP 493 and ICAO Doc 4444 (with the former taking precedence). Wake turbulence separations are marked in red.

Leading aircraft	Following aircraft					
	Super Heavy	Heavy	Upper Medium	Lower Medium	Small	Light
Super Heavy	4 NM	6 NM	7 NM	7 NM	7 NM	8 NM
Heavy	4 NM	4 NM	5 NM	5 NM	6 NM	7 NM
Upper Medium	3 NM	3 NM	3 NM	4 NM	4 NM	6 NM
Lower Medium	3 NM	3 NM	3 NM	3 NM	3 NM	5 NM
Small	3 NM	3 NM	3 NM	3 NM	3 NM	4 NM
Light	3 NM	3 NM	3 NM	3 NM	3 NM	3 NM

Table 3. Arrival-arrival separations. Source: UK CAA CAP 493

2.1.4.1 Arrival-departure-arrival

In mixed mode operations, arrival stream spacings are increased to 6 NM in order to allow a departure to take-off in between two arrivals. If the required arrival – arrival separation is higher (e.g. Upper Medium following a Super Heavy), then the higher value is applied.

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2.1.4.2 Departure-arrival

In mixed mode operations, a minimum upstream distance from threshold of 4 NM is applied for a landing aircraft in order to give clearance to a departure to line-up on the same runway. A departing aircraft should start its take-off roll when the arrival is at least 2 NM from the threshold.

2.1.4.3 Arrival-departures

A departure is allowed to line-up as soon as the preceding arriving aircraft passes the threshold. Once the departure has lined up, it is allowed to commence the take-off roll as soon as the preceding arriving aircraft is clear of the runway.

2.1.4.4 Departure-departure

Minimum departure – departure separations for aircraft taking off from the same runway are based on ICAO Doc 4444. Wake turbulence separations are marked in red.

Leading aircraft	Following aircraft			
	Super Heavy	Heavy	Medium and Small	Light
Super Heavy	120 sec	120 sec	180 sec	180 sec
Heavy	60 sec	60 sec	120 sec	120 sec
Medium	60 sec	60 sec	60 sec	120 sec
Light	60 sec	60 sec	60 sec	60 sec

Separations of 60 seconds are only applicable to aircraft departing on SIDs diverging by more than 45 degrees. Otherwise, in order to assure the required radar separations, a minimum time separation of 120 seconds is applied between two consecutive departures, unless a larger separation due to wake turbulence separation is applicable.

It is assumed that 70% of departures can depart on a SID that diverges by 45 degrees or more relative to the SID flown by the preceding departure.

2.1.5 Apron modelling

One of the objectives of the simulation was to test the airfield performance of new developments and those in close proximity to departure holds. Accordingly, the midfield apron, Pier 1 stands and the stands on the South side of Pier 2 in the northern apron have been modelled as individual stands with defined push-back locations where applicable. For the rest of stands in the northern apron, these have been modelled as a simplified single big apron. A representation of the model is shown below:

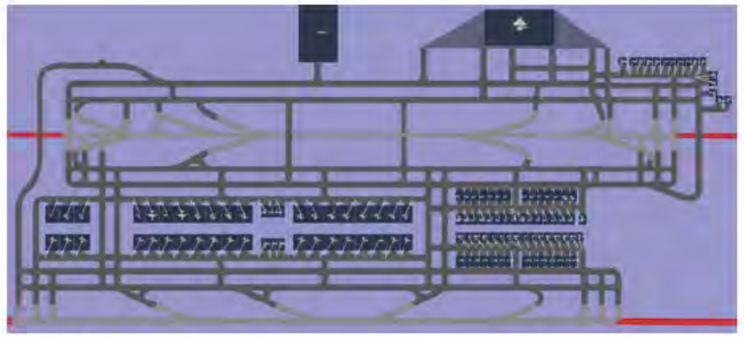

Figure 2. CAST Model

2.2 End-Around Taxiways scheme

During westerly operations it is assumed that all departures parked on northern aprons departing from the southern runway taxi around the runway using the eastern End-Around Taxiway (EAT). This EAT can be used by code C and E aircraft for taxiing independently of arrivals overhead, as the threshold has been displaced accordingly. With the gating and runway allocation strategies, there are no code F aircraft parked on northern aprons taking off from the southern runway.

Similarly, when operating easterlies, aircraft taxi around the runway using the western EAT. This taxiway also allows code C and E aircraft to taxi around the runway independently of arrivals overhead.

The main airfield circulation flows for westerly operations are illustrated in the Figure 3. The same patterns could be extrapolated to easterly operation.

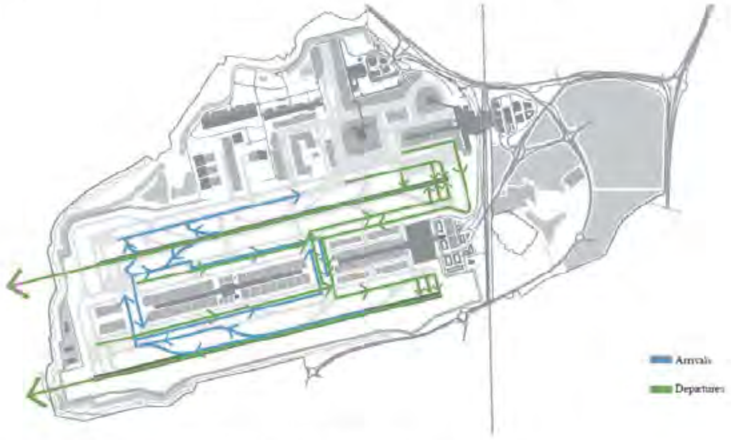

Figure 3. EATs scheme. Westerlies. Airfield circulation patterns

2.3 No End-Around Taxiways scheme

Without end-around taxiways, departures parked on northern aprons taking off from the new runway need to cross the existing runway. The behaviour and the rules for crossings are summarised below:

1. Two crossing points are used for departures heading towards the southern runway.
2. An Arrival-Departure-Arrival gap of 130 seconds enables the crossing of two aircraft per runway crossing, with the departure on the northern runway being held at the runway holding position until the next Arrival-Arrival pair.
3. In order to enable crossing when the runway is busy, a maximum queuing time for crossers of 5 minutes has been assumed. When this maximum time is exceeded, crossers have priority over departures.
4. The average crossing time of an aircraft is 45 seconds.
5. A crosser can enter the runway as long as the next arrival is at least 3 NM away from the threshold and there isn't any departure lined up for take-off.

The airfield circulation patterns with the scheme without End-Around Taxiways for westerly operations are illustrated in the Figure 4.

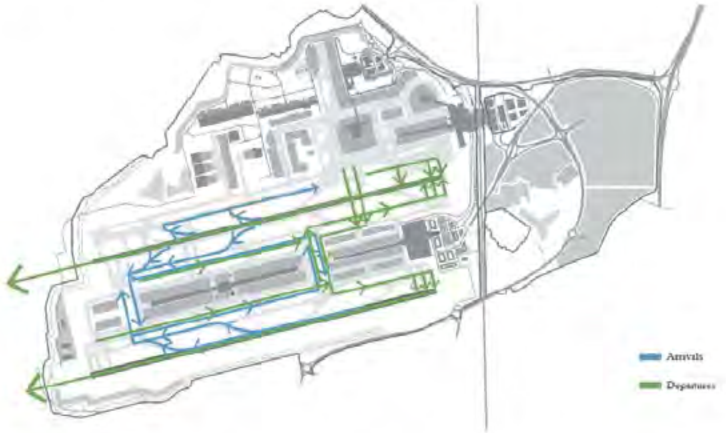

Figure 4. No-EATs scheme. Westerlies. Airfield circulation patterns

3 Flight schedules and demand

The traffic forecasts have been produced by SH&E and include annual and busy hours for passengers and aircraft movements as well as planning day flight schedules for 2030 and 2040. In this simulation, the planning day flight schedules for 2040 have been used. Please refer to the Forecast report of the GAL Submission for further detail.

In the following graphs, the 2-way, departure and arrival demand are represented, together with the breakdown by type of aircraft. The graphs show a rolling hour analysis with an interval of 15 min, a lead interval of 30 min and a gap interval of 30 min. For instance, the 6:00 point contains the movements occurring from 5:30 to 6:29. As shown, the daily profile is defined by a departure peak period in the morning followed by a constant 2-way demand, where the departure is decreasing whereas the arrival demand is growing. At the end of the day, there is an arrival peak period.

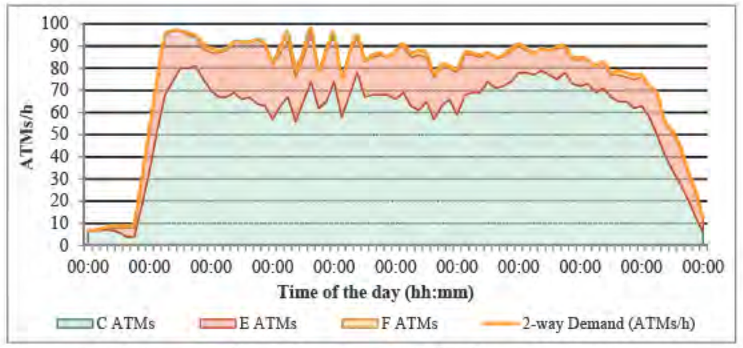

Figure 5. 2-way demand and breakdown by type of aircraft. Source: SH&E

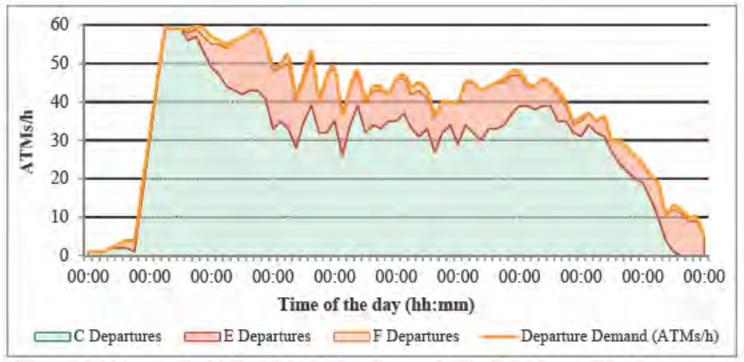

Figure 6. Departure demand and breakdown by type of aircraft. Source: SH&E

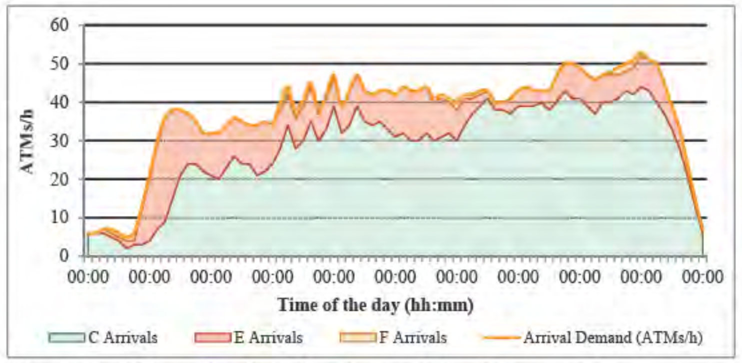

Figure 7. Arrival demand and breakdown by type of aircraft. Source: SH&E

The main parameters from the graph above are summarized below:

- 2-way maximum demand: 98 ATMs/h at 11:15 (from 10:45 to 11:44)
- Departure maximum demand: 60 ATMs/h at 07:30 (from 07:00 to 07:59)
- Arrival maximum demand: 53 ATMs/h at 22:00 (from 21:30 to 22:29)
- Total movements during the day: 1551
- Total departures during the day: 777
- Total arrivals during the day: 774
- Average breakdown by type of aircraft: 78% code C, 21% code E and 1% code F.

3.1 Airlines assignment and runway demand

The distribution of flights between both runways is driven by the runway allocation strategy and the airline assignment considered. In order to demonstrate the flexibility of the layouts proposed, two different airline assignment alternatives have been tested (for further information about the airline assignment alternatives considered and their implications refer to section 4.3 of the main report):

- Base Case: Considered a more balanced airline assignment apron wide. Long haul airlines as well as low cost are located in the midfield with low cost flights given preferential access to the Code C stands located at the terminal pier.
- Alternative 2: Placed emphasis on locating as many as possible short haul and low cost airlines in the midfield. Some low cost airlines were also assigned to the northern apron.

Given the planning day for 2040 and based on the runway allocation strategy described in the previous sections, the following demand for each runway has been simulated. As shown below, the two different gate assignment tested imply different runway allocations. In overall terms, it can be seen that there is a balanced two-way (arrivals and departures) demand between both runways.

3.1.1 Airline assignment base case

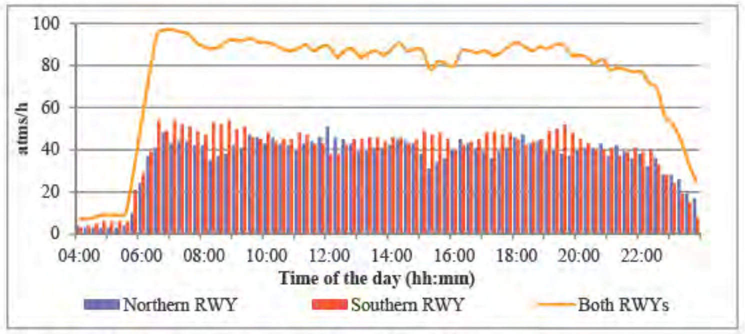

Figure 8. Airline assignment base case. 2-way demand by runway.

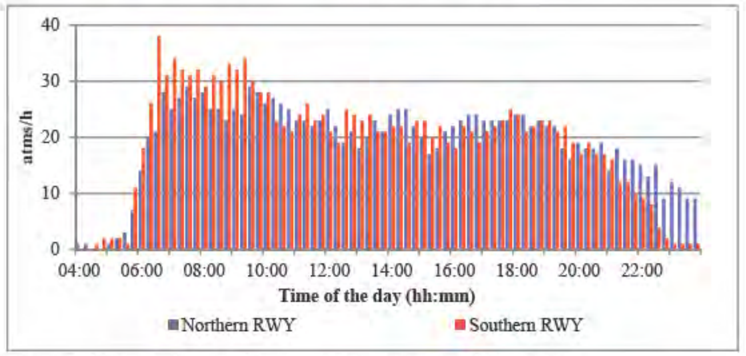

Figure 9. Airline assignment base case. Departure demand by runway

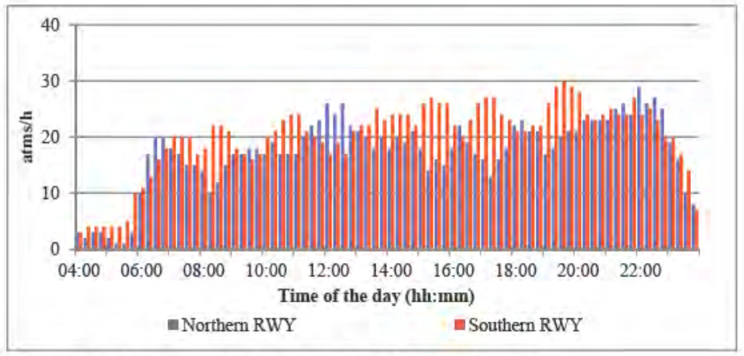

Figure 10. Airline assignment base case. Arrival demand by runway

3.1.2 Airline assignment alternative 2

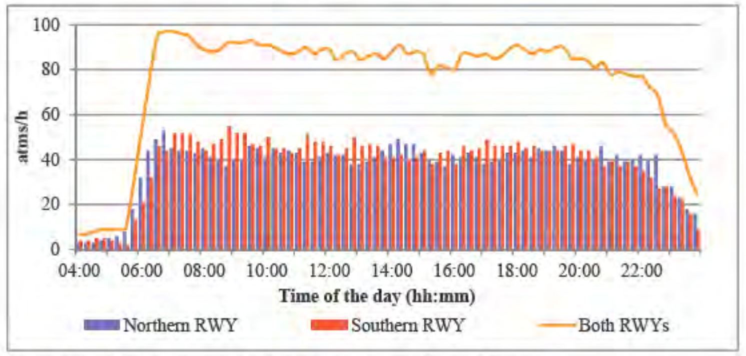

Figure 11. Airline assignment alternative 2. 2-way demand by runway.

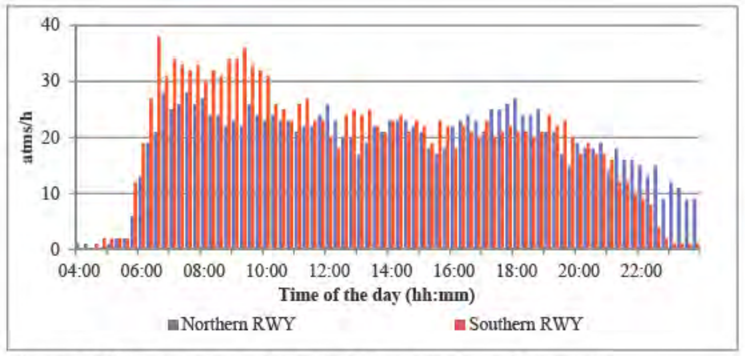

Figure 12. Airline assignment alternative 2. Departure demand by runway

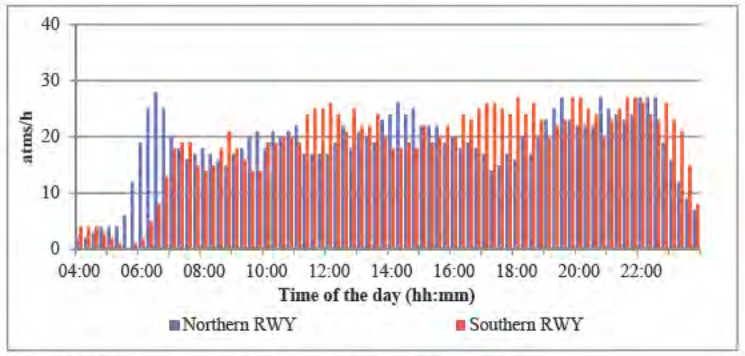

Figure 13. Airline assignment alternative 2. Arrival demand by runway

4 Results

In this section, the main results for both layouts –with and without EATs– are provided. These outcomes include:

- **Runway throughput**. The runway throughput is defined as the number of flights taking place in a period of time. In this analysis, a rolling hour analysis of the runway throughput has been considered, as per the runway demand described in the previous section. It should be noted that scheduled 2-way demand is based on at gate times and runway throughput is based on runway times.
- **Taxi time**. It is defined as the time taken by a departure between the off-block time and entering to the runway or the time taken by an arrival between clearing the runway and the on-block time. Therefore, the taxi time includes push-back times and all the delays experienced by an aircraft along the taxi journey, including holding delays at departure holding positions. As mentioned in the section 2.1.5, the northern stands have not been modelled in detail, so for these movements the taxi time does not include the push-back time and the taxi journey within the apron area.
- **Delay**. It's considered as excess travel time –the difference between *actual* operating times minus a nominal or optimal operating time, i.e. difference between the optimum time calculated by the software from gate to gate if there isn't any interruption and the real time achieved. The causes of delays are listed below:
    1. Delay in airspace to achieve required arrival separations
    2. Queuing time at departure holding positions
    3. Interference between push-backs and aircraft taxiing on taxilanes
    4. Waiting time at some junctions to avoid conflicts
    5. Queuing time at runway crossings (if applicable).

To estimate **runway capacity**, it is commonly industry defined as the number of movements that can take place without exceeding a specific level of delay. Having reviewed different definitions and standards for **maximum delay criteria**[1] for planning purposes, a **10 min of maximum average hourly delay** in the planning delay has been adopted. As shown in the results there is a differentiation between arrival delay and departure delay and both delays should perform under the criterion established.

[1] For further information refer to the following documents:
1. TRB's Airport Cooperative Research Program, 2014, *Defining and Measuring Aircraft Delay and Airport Capacity Thresholds*, Transportation Research Board, Washington, D.C.
2. Federal Aviation Administration, 2012, National Plan of Integrated Airport Systems (NPIAS) 2013-2017, Secretary of Transportation, Washington, D.C.
3. Federal Aviation Administration, 2007, *Advisory Circular: Airport Master Plans*, Reprint Incorporates Change 1, AC No: 150/5070-6B. Federal Aviation Administration, Washington, D.C.
4. Federal Aviation Administration, 1999, *FAA Airport Benefit Cost Analysis Guidance and Addendum* (2010), Office of Aviation Policy and Plans, Washington , D.C.
5. Federal Aviation Administration, 1983, *Advisory Circular: Airport Capacity And Delay*, Reprint Incorporates Changes 1 and 2, AC No: 150/5060-5. Federal Aviation Administration, Washington, D.C.

It should be noted that the aim of this document is not to establish the maximum runway capacity, but to verify that the layouts and operational strategies proposed can deliver the traffic forecasted with acceptable delays. The maximum runway capacity can be achieved only with a perfect mix of aircraft, arrivals/departures, and the minimum separation between aircraft.

4.1 EAT scheme

4.1.1 Runway throughput

The 2-way hourly runway throughput achieved for both runways and both operating directions is represented below. In the same graph, the results for the two different airlines assignments tested are superimposing. As shown, with both airline assignments, a maximum runway throughput of 96-98 atms/h can be delivered.

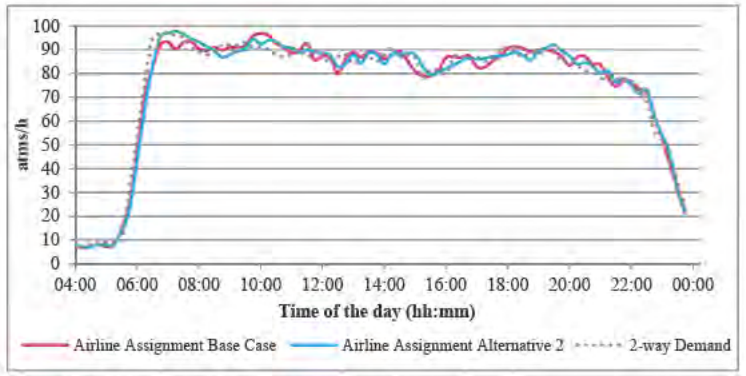

Figure 14. EAT scheme. Westerly operations. Runway throughput

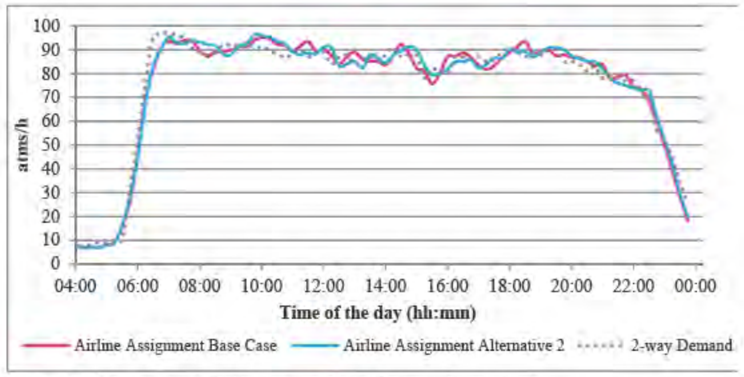

Figure 15. EAT scheme. Easterly operations. Runway throughput

4.1.2 Average hourly delay

The figures below show the average hourly delay for both airline assignments tested. It can be seen the traffic forecasted can be delivered with acceptable delays for both operating directions and airline assignments.

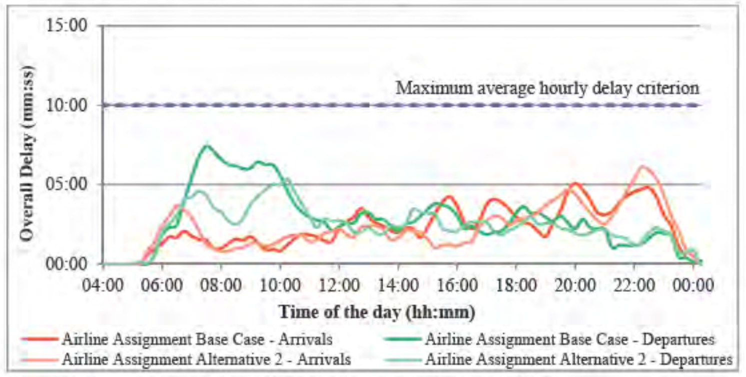

Figure 16. EAT scheme. Westerly operations. Average hourly delay

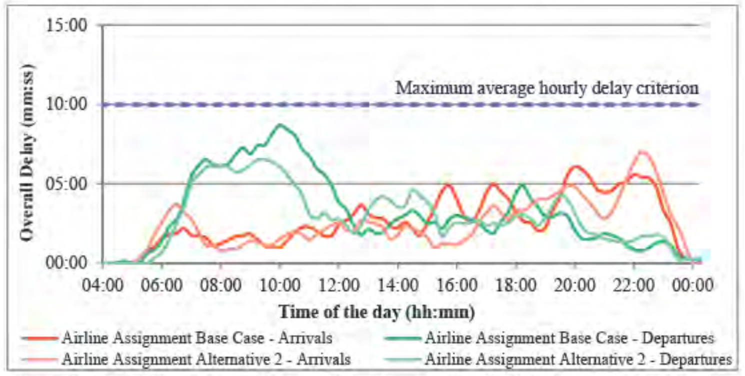

Figure 17. EAT scheme. Easterly operations. Average hourly delay

The majority of the departures delay is associated with the departure holding position queues whereas the arrivals delay is related to airspace delay.

4.1.3 Taxi time

For both airline assignments, the average hourly taxi time for departures remains less than 15 min when operating westerlies and 20 min when operating easterlies. With regards to hourly arrival taxi time, it can be seen in the following figures that it is nearly 5 min.

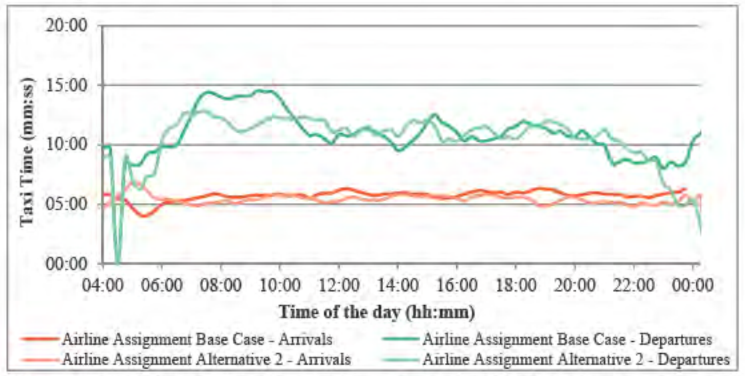

Figure 18. EAT scheme. Westerly operations. Average hourly taxi time

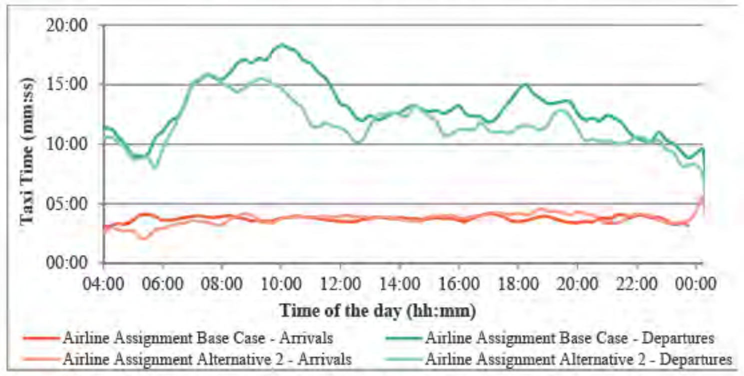

Figure 19. EAT scheme. Easterly operations. Average hourly taxi time

As mentioned previously, the taxi times calculated do not include the journey within the northern apron, thus average hourly taxi times calculated would slightly increase when considering the journeys through the northern apron.
A separate exercise has been carried out in order to calculate pure taxiing times excluding queuing time at departure holding positions and push-back times. For those flights parked on the northern apron (see Section 2.1.5), taxiing times obtained through simulation have been compared against actual observed times measured by Gatwick Airport Ltd and adjusted accordingly. It should be noted that this exercise has been undertaken as a sensitivity and only for the scheme

with EATs, the airline assignment base case and westerly operations. The results are provided below:

- Average westerly arrivals taxiing time: 6:32 min.
- Average westerly departures taxiing time: 7:25 min.

4.2 No EATs scheme

In this case, only westerly operations have been simulated. Nevertheless, as shown for the EAT scheme, conclusions obtained for the westerly model can be extrapolated to the easterly model.

Simulation considered two runway assignment scenarios for aircraft from the northern apron. The first (base case) was the same runway assignment as simulated for the EAT scenario. The second (sensitivity) included a preferential assignment of aircraft from the midfield apron to the southern (new) runway which had the effect of reducing demand on the northern runway and allowed more crossing opportunities, a practice that would not be uncommon for an operating airport.

The results of both simulations are shown below

4.2.1 Runway throughput

The 2-way hourly runway throughput achieved for both runways is represented below. In the same graph, the results for the two different airlines assignments tested are superimposing. As shown, with both airline assignments, a maximum runway throughput of 96-98 atms/h can be delivered.

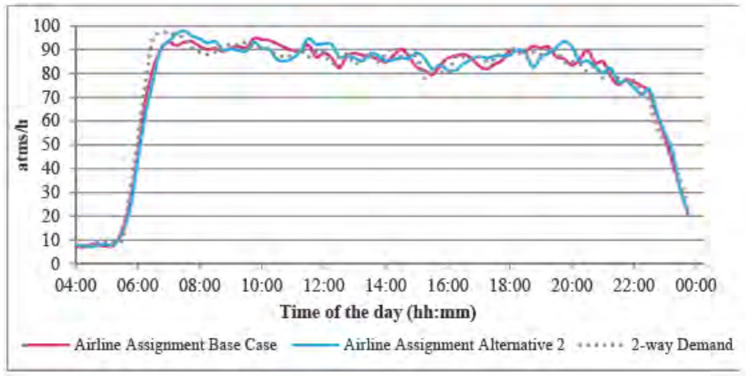

Figure 20. No EAT scheme. Westerly operations. Runway throughput, base

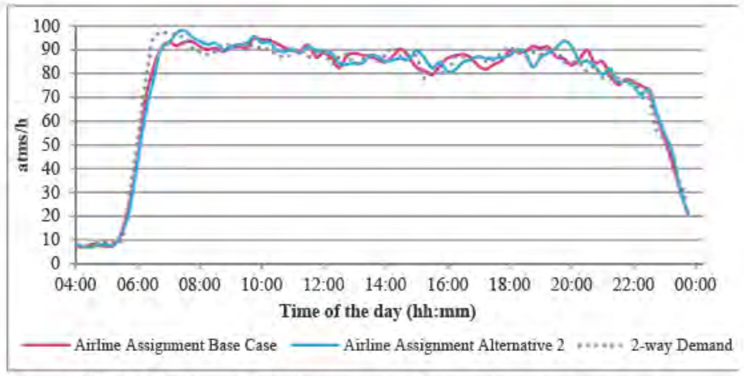

Figure 21. No EAT scheme. Westerly operations. Runway throughput, sensitivity

4.2.2 Average hourly delay

In the figures below, the average hourly delay for both airline assignments is shown. It can be seen that at the highest levels of capacity use, runway crossings for departing flights, taxiing between the northern apron and the new runway, could result in small losses of runway capacity at peak times in order to remain under the maximum delay criterion.

At those times, it would be possible to mitigate the higher delays induced by runway crossings by reallocating some departures originally departing from the northern runway to the southern runway.

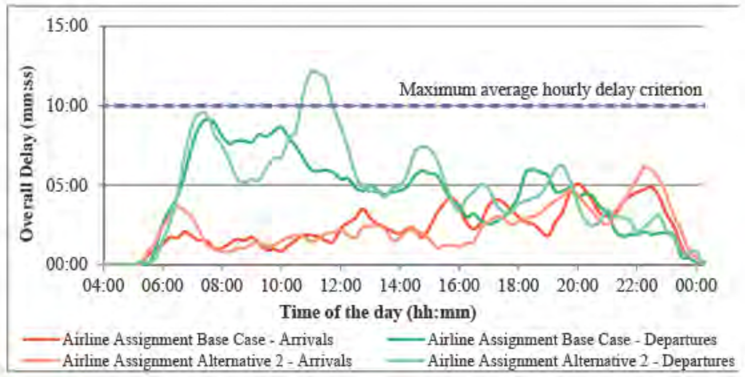

Figure 22. No EAT scheme. Westerly operations. Average hourly delay, base

A sensitivity has been carried out which indicates that a modification of the runway assignment would reduce delays below 15 minutes.

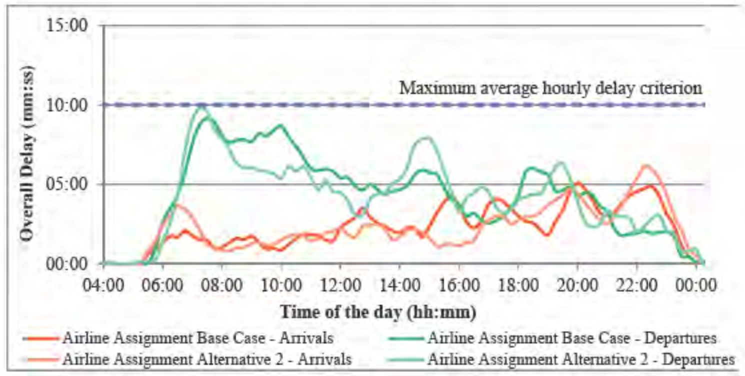

Figure 23. No EAT scheme. Westerly operations. Average hourly delay, sensitivity

The majority of the departures delay is associated with the departure holding position queues and the queues at runway crossing points whereas the arrivals delay is related to airspace delay.

4.2.3 Taxi time

For both airline assignments tested, the average hourly taxi time for departures remains less than 20 min when operating westerlies. With regards to the hourly arrival taxi time, it can be seen in the following figure that it is circa 6 min. As mentioned previously, the taxi times calculated do not include the journey within the northern apron, thus average hourly taxi times calculated would slightly increase when considering the detailed northern apron layout.

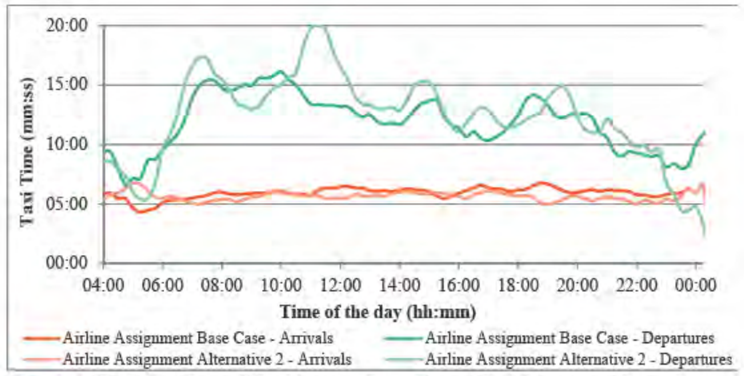

Figure 24. No EAT scheme. Westerly operations. Average hourly taxi time, base

Similarly to section 4.2.2, the following graphs provide the results for the runway assignment sensitivity carried out which results in reduced taxi-times.

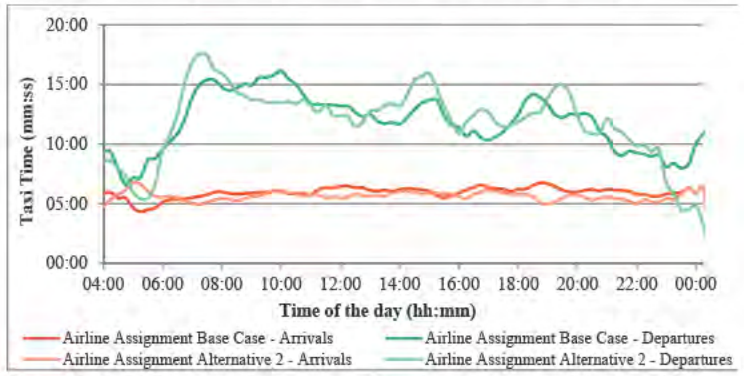

Figure 25. No EAT scheme. Westerly operations. Average hourly taxi time, sensitivity

5 Conclusions

The main conclusions obtained from the results presented for the EAT and no-EATs schemes and two different cases of airline apron assignments, are summarised below:

- The EAT scheme delivers the forecasted demand in all the cases without exceeding the acceptable level of delays criterion.
- For the no-EAT scheme, at the highest levels of capacity use, runway crossings for departing flights, taxiing between the northern apron and the new runway, could result in small losses of runway capacity at peak times in order to remain under the maximum delay criterion.
- Average hourly taxi times, including push-back times and holding time at departure holding positions, are less than 20 min in all the cases.
- Both schemes can deliver a maximum runway throughput of 98 atms/h, when both runways are considered.

Appendix B
Safety and Compliance Report

ARUP

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Gatwick Airport Ltd

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1 Introduction

The airport master plan has been configured in accordance with relevant standards and design criteria published by ICAO and UK CAA. Reference has also been made to EASA requirements where appropriate. These are not yet fully implemented in the UK and primarily adopt the ICAO requirement, however in one or two areas they do align with CAA requirements. In some cases other criteria is used, where this is published by others e.g. Public Safety Zone Policy issued by the Department for Transport, or where it is recognised as best practice and no specific guidance exists in a comparable ICAO or CAA document e.g. FAA standards. Where that is the case the source is specified. A table of adopted criteria is attached at Annex B1.

The compliance assessment has been undertaken on the master plan base case (without End Around Taxiways (EATs)) and with EATs. The core requirements are the same for both layouts but there are some key physical differences, for example, the provision of EATs necessitates the insetting of thresholds to ensure no infringement occurs to the obstacle limitation surfaces from aircraft taxiing on the EAT. This in turn shortens the landing distance available. Where physical differences occur as a result of EAT provision, these are identified.

Figure 1 – 2050 Master Plan with EATs

Figure 2 - 2050 Master Plan without EATs

Gatwick Airport Ltd

Gatwick R2 – Master Plan
Operational Efficiency
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2 Proposed Runway 08S 26S

The new runway will be a Code 4F runway and is 60m wide. Runway shoulders measuring 7.5m on each side provide an overall dimension of 75m. Declared distances for the new runway are shown in the table below. A clearway of 60m, being the strip end, is declared in both cases.

Runway	TORA	TODA	ASDA	LDA
08S	3340	3400	3400	2885
26S	3340	3400	3400	3132

The runway strip and Obstacle Free Zone (OFZ) runway strip protect the runway. The former extends 150m each side of the runway centreline and 60m beyond runway end/before threshold. The OFZ runway strip width is based on Code F requirements with a strip width of 155m is used (77.5m either side of the runway centreline.

Runway End Safety Area

A Runway End Safety Area (RESA) is defined for each runway direction for both landings and departures. The runway landing thresholds are displaced by ~514m on runway 08S and ~267m on runway 26S in which case the RESA for landing aircraft for each runway direction is contained wholly within the runway strip. For departures the RESA originates at the runway strip end, 60m beyond the runway end. The dimensions of each RESA are 240m long x 150m wide.

3 Reconfigured Runway 08R 26L

The existing runway 08R 26L is classified as Code E as the runway pavement is 45m wide with 7.5m shoulders giving an overall width of 60m. With its 80m wingspan the A380 is classified as a Code F aircraft. Both ICAO and CAA design standards specify 60m width for a Code F runway, however, as the A380 is certificated to operate from 45m wide runways and does so already at many airports worldwide the need to widen the runway is not anticipated. The requirement to widen the runway or increase the width of the shoulders will however be kept under review and implemented if necessary. At this stage the master plan shows the runway width unchanged from its current dimensions. The declared distances for departing aircraft are also unchanged where EATs are not provided. However, where EATs are provided, the landing distance is amended by insetting the threshold further. The amended distances are shown in the table below and are designed to ensure no infringement to the approach surface occurs due to aircraft transiting the proposed end around taxiways. Some further adjustments to the design of the amended runway may be necessary to achieve this depending on the finished elevations of the runway and the EAT. A clearway of 60m, being the strip end, is declared in both cases.

With EATs

Runway	TORA	TODA	ASDA	LDA
08R	3159	3311	3233	2500
26L	3255	3399	3316	2500

Without EATs

Runway	TORA	TODA	ASDA	LDA
08R	3159	3311	3233	2766
26L	3255	3399	3316	2831

Runway End Safety Area

A Runway End Safety Area (RESA) is defined for each runway direction for both landings and departures. The existing runway landing thresholds are unchanged in the base master plan where no EATs are included and are displaced by ~393m on 08R and ~424m on 26L. For the with EATs layout, the insetting is increased to ~741m on runway 08R and ~939m on runway 26L to avoid aircraft taxiing on the EAT infringe the Approach surfaces. In both cases the RESA for landing aircraft for each runway direction is contained wholly within the runway strip. For departures the RESA originates at the runway strip end, 60m beyond the runway end. The dimensions of each RESA are 240m long x 150m wide.

The proposed EATs are routed through the RESA to help reduce land-take. This is permissible since the EAT below the departing aircraft is not available for use and only the Approach Surface is protected for taxing movements under arrivals. This potentially introduces different materials within the RESA and a change in friction characteristics, moving from grass to paving. As a minimum the edge of the taxiway will need to be de-lethalised to reduce the likelihood of any overshooting aircraft entering the RESA and losing its wheels when it meets the

taxiway edge. Guidance published by CAA advises that provision of a paved RESA with known friction characteristics can be considered an improvement therefore paving the whole RESA would potentially mitigate any concerns. Alternatively it might be acceptable to pave from the runway end to the EAT given the minimum RESA requirement is 90m. Further consideration will need to be given to the design of the EAT as it passes through the RESA at detailed design with an appropriate safety case generated.

4 Runway Approach Lighting

Both the existing runway 08R 26L and the new runway 08S 26S will be precision instrument runways fitted with high intensity coded centreline lights and a 5 bar approach lighting system with supplementary lighting for Cat II/III operations. The approach lighting system is typically 900m before threshold +/- permitted tolerances. There are no significant issues anticipated with the approach lights for the new runway as lights for all thresholds will be contained within the extended airport boundary.

The approach lighting on runway 08R 26L will remain as per existing unless EATs are incorporated into the layout in which case the lighting system will be repositioned to align with the increased inset threshold.

While the lights for 26S will cross the railway this is no different from the existing runway 26L. With over 430m available from runway end to railway boundary there is ample room to enable the lights to be elevated above the railway and any trains operating on the line. A maximum rising gradient of 1/66 is permitted.

The approach lights will be protected by the 'plane of approach lights' which is a surface (or series of surfaces) that should not be penetrated by any obstacle. The plane follows the lighting profile and extends 60m either side of the extended centreline and 1.5 times the length of the approach lighting system.

The precision approach path indicator (PAPI) system is a visual landing aid that provides guidance to pilots during the approach and landing procedure such that the aircraft's position can be determined relative to the glidepath slope. The system consists of a row of 4 light units located 15m (±1m) from the runway edge with a 9m (±1m) spacing between units. For the purposes of the master plan design it is assumed the units would be located on the southern side of the runway for both the new runway and the reconfigured existing runway. For both runways there is no restriction on the siting of the PAPI units which can be located outside of the restricted areas associated with the glide path aerial. The specific siting of the PAPI lights will vary depending on several factors, many of which are not yet fixed. For example, the elevation of the PAPI lights in relation to the threshold elevation is relevant along with the MEHT (Mean Eye Height above Threshold).

The position of the PAPI units will need to be sited in conjunction with the runway crossing points to ensure there is no conflict. This is true whether or not EATs are provided and the threshold position on runway 08R is further inset. The final position of the runway crossing point will depend on the design assumptions adopted. For the purposes of this master plan it is assumed a distance to the PAPI installation of between 430m and 450m will be used. The final position of the runway crossing point can be adjusted accordingly to take account of the final design requirements for the PAPI units.

5 Taxiway System

Clearances published in CAP168 differ slightly from those published in ICAO Annex 14 with the latter aligning with criteria published by EASA in February 2014 in their certification specifications. Implementation of EASA requirements at airports in the UK, including Gatwick, will take place over the next few years. Alternative methods of compliance have yet to be agreed with CAA and at this stage the airfield has been set-out using clearances that are primarily based on CAP168 requirements as shown in the table below. Once all alternative methods of complying with EASA requirements have been formulated the setting out criteria for the master plan can be adjusted. Checks have already been carried out to confirm that this is possible.

	CAP168 Clearances (m)	ICAO Annex 14 Clearances (m)
Runway to Taxiway	190	190
Code F Taxiway to Code F Taxiway	95	97.5
Code F Taxiway to Code E Taxiway	87.5	90
Code F Taxiway to Object	55	57.5
Code E Taxiway to Object	47.5	47.5
Code E Taxilane to Object	42.5	42.5

Code F to Code E separation is not specifically stated in CAP168 and is calculated using the principles set-out in the ICAO Aerodrome Design Manual Part 2 with the half wingspan of the two aircraft added to the safety clearance for the critical aircraft (e.g. using the CAP168 safety margin equates to 40m + 32.5m + 15.0m = 87.5m). There is nevertheless sufficient flexibility in the master plan that ICAO requirements can be adopted if required. The available space and the clearances applied from north to south between the runways is more critical. To achieve ICAO Code F separation an additional 5m would be needed. This can be made available if required by reducing the width of the satellite from 45m to 40m.

The width of taxiways have been specified to ensure the minimum distance from the outer edge of the main wheels of the most demanding aeroplane and the edge of the pavement is no less than 4.5m. This correlates to a width of 26m for Code F aircraft, 23m for Code E and 18m for Code C with additional concrete provided as fillets on turns as required.

Parallel Taxi Routes

Two new parallel taxiways are provided to the south of the existing runway and two more north of the new runway with apron areas between the two. The 'inner' taxiway (nearest the runway) is designed to accommodate Code F aircraft while the 'outer' taxiway is a Code E route. A third parallel Code E taxi route is provided adjacent to the new satellite building and Code E remote stands. This additional stand taxilane will help ensure congestion on the parallel taxiways is minimised due to aircraft movements to and from the new satellite. The Code C remote stands adjacent to the new pier on the terminal building, are accessible from the outer parallel taxiway and will operated as drive-through stands to avoid aircraft pushing back on to the taxiways. . Initial modelling shows congestion will not be a problem in these areas. The apron areas adjacent to the new terminal building and pier incorporate Code C taxilanes.

Rapid Exit Taxiways

Rapid Exit Taxiways are designed to allow landing aircraft to turn off the runway at higher speeds thereby minimising runway occupancy. The master plan layout shows two Rapid Exit Taxiways (RETs) for each runway direction north of the new runway 08S 26S, with the same south of the reconfigured runway 08R 26L. In addition because the threshold positions on the existing runway are amended to accommodate EATs the existing RETs north of runway 08R 26L will need to be reviewed to ascertain the appropriateness of their location. An additional RET is likely to be needed for large aircraft landing on 26L and exiting to the north due to the insetting of the threshold.

The optimum distance to exits will depend on a number of factors including; available declared distances, supporting taxiway infrastructure, relative position of apron and terminal facilities and aircraft mix during peak periods. In addition variables such as aircraft performance, weight, weather and pilot technique can all influence the turn-off position. The primary goal is to reduce runway occupancy time (ROT) and as the busiest single runway airport in the world Gatwick Airport is well versed in minimising ROT. For the purposes of this master plan layout two RETs are shown. The first RET will cater for Code C aircraft types with an optimum location likely to be in the range of 1300-1500m from landing threshold. The second RET will cater for large and wide-body aircraft and be located between 1900m and 2100m from landing threshold. Given the variables, actual requirements will be assessed in more detail as the design develops with particular reference to the number and type of aircraft expected to use the runway.

Additional measures can be considered to enhance RET provision. These include installation of Runway Exit Taxiway Indicator Lights (RETILs) and widening of the entrance to the RET to aid pilot perception. In general engagement with the pilot community is also key to ensure they utilise the infrastructure to its best advantage.

Runway Access Taxiways

It is assumed Collaborative Decision Making (CDM) will limit the number of aircraft in the departures hold in the future (e.g. to say 5-6 aircraft maximum) but there still needs to be a certain "pool" of aircraft to feed the runway and maximise capacity. To ensure ATC have the flexibility to sequence aircraft for take-off in the optimum way and by-pass any aircraft should they develop a technical problem multiple access points are provided for departing aircraft. Each holding area south of the existing runway and north of the new runway has been designed with 3 Code F access taxiways. North of the existing runway already provides 3 entry points for 08R and 4 entry points for 26L.

Cross Taxiways

Two cross-field taxiways are provided at each end of the satellite building with clearances for Code F aircraft.

End Around Taxiways

To maximise the flexibility and efficiency of a two runway airport aircraft will need to move safely, quickly and efficiently between the two runways, the airport's terminal facilities and associated aircraft parking stands. Constructing the new runway south of the existing runway introduces the need for aircraft to cross from the existing airfield to access the new facilities in the midfield. Depending on the way aircraft are assigned to each runway, this could raises operational issues if high numbers of runway crossings put significant additional burden on air traffic control (ATC) and increases the risk of runway incursion.

For this reason, a master plan option has been developed with EATs which allows aircraft to taxi around the end of a live runway rather than cross it. This has not been included in the base master plan as additional land take is needed to accommodate the EAT. GAL are currently undertaking a consultation process which includes seeking views on if EATs should be include in the base master plan.

A key factor in determining the viability of introducing EATs in the master plan layout was understanding what method of operation could safely be adopted. Studies undertaken to date suggest the safest method of operation might be to utilise the EAT below arriving aircraft or behind a departing aircraft, subject to aerodrome safeguarding and jet blast considerations. This is the method which has been assumed for the master plan layout. This allows the potential implications for land-take to be kept to a minimum as the landing thresholds can be inset to meet aerodrome safeguarding requirements (Shorter landing distances are acceptable). This concept and safety case will need to be fully evaluated and progressed with CAA.

The master plan layout incorporates a single EAT taxiway at each runway end intended for use by Code E aircraft. The number of Code F aircraft operating to and from Gatwick will be modest so the additional landtake necessary to provide Code F capability is not considered to be justified. Code F aircraft would instead utilise the runway crossing points provided or the closest runway to the stand. Aerodrome Safeguarding requirements have been taken into consideration when positioning the EATs to ensure the tailfin of Code E aircraft operating on the taxiway would not infringe the Approach Surface.

When lined up on the runway, the rear of a departing aircraft to the wingtip of an aircraft transiting the EAT on 08R is a minimum of around 170m and appropriate procedures will be needed to protect the taxiing aircraft from jet blast. On 26L this distances is around 145m. In this configuration the EAT movements will need to be restricted where departing aircraft initiates full thrust at the outermost start of roll point. However, for most departing aircraft the start of roll point can be inset and free movements on the EAT allowed. Appropriate equipment (e.g. wig wags) coupled with operational procedures would be put in place to ensure no aircraft utilising the EAT would be adversely effected by jet blast. As an alternative, the TODA on 26L and 08R could be reduced to eliminate this dependency, which would mean approximately 1% of departing aircraft would then be restricted to using only the southern runway.

Runway Crossings

Two runway crossing points have been provided. For a departures runway, locating the crossing point close to the start of departure roll is be preferred by controllers as it is easier to cross but should avoid departures runway holding areas and points of congestion. The holding area for runway 26L adjacent to South Terminal is one of the busiest areas at Gatwick so the runway crossing points have been located away from this area.. When used as an arrivals runway the crossing points have been located as close to the threshold as possible in order to maximise crossing opportunities and reduce the risk of potential go-rounds.

In addition the crossing points are not aligned with the cross taxiways in order to reduce the risk of runway incursion and are located outside of glide path critical or sensitive areas.

6 Apron

Apron areas within the midfield area have been designed to accommodate a forecast mix of traffic comprising largely of Code C and Code E aircraft. There is however sufficient space and flexibility in the design to accommodate Code F aircraft. This is achieved by realigning the 'end stands' on the satellite so they can be accessed from the Code F capable cross taxiways. Should larger numbers ever be needed these could be accommodated by removing sections of the Code E taxilane in specific areas.

The dimensions adopted for planning the apron area are as follows:

Facility	Preliminary Dimensions	Comments
Code E Taxilane to Object	42.5m	
Code C Taxilane to Object	24.5m	
Code E Mars Stand	90m long x 81m wide	1 x Code E or 2 x Code C
Code C Stand	53-60m long x 38m wide	
Wingtip Clearance	9m	
Head of Stand Road	10m	

These are minimum distances and would be subject to review once airline occupancy and fleet mix are established.

Ground Service Equipment (GSE) provision will be an important item to consider when finalising the design of the apron. The amount of area required can vary considerably depending on the aircraft types, routes flown and the ground handling agent requirements. Studies at Gatwick indicate 15% of the overall stand area is a realistic rule of thumb. Some equipment area would be provided within the envelope of the overall stand dimensions shown above, either side of the head of stand tug zone, for ground service equipment and vehicle positioning prior to an aircraft's arrival. This would cater for around 7.5% of the equipment requirement in which case another 7.5% will need to be provided for additional equipment areas which may be needed for longer term fleet parking, cargo consolidation, container storage and areas for repair and maintenance of GSE. These requirements would need to be reviewed in more detail to determine specific requirements in consultation with handling agents.

7 Building Design

There are a number of safety related factors that will need to be considered in the detailed design of buildings associated with the master plan. Of primary interest are any buildings with a large footprint and mass such as the terminal building and satellite however all buildings will need to be developed with overall safety requirements as a primary consideration. An example is the energy centre which will be needed to service the new terminal building which is likely to incorporate a 25-35m tall chimney stack. Some penetration of the protected surfaces may be feasible subject to risk assessment and PANS-OPS procedures design.

Large buildings can introduce wind turbulence for aircraft on final approach. This was a known problem at Gatwick in the past due to the Maintenance hangars sited south of the existing 26L landing threshold. Therefore to ensure the problem is not re-introduced detailed assessment will be required for the new Terminal, Pier and Satellite Building so that appropriate mitigations can be built into the final building design.

The new Terminal, Pier and Satellite Building will be designed to take account of technical safeguarding issues such as potential interference to communication, navigation and surveillance equipment due to the large building mass. This might include buildings with cladding and/or concave profiles to absorb or reduce reflected signals. Modelling of the signals will need to be undertaken as the building form develops to ensure appropriate mitigation is built into the final building design.

A technical safeguarding assessment will also be included during the construction phase due to large number of cranes that are likely to be used.

The buildings will also be designed to avoid birds roosting or settling on them. In the UK pigeons and starlings are the most common birds to be found in and around buildings. Pigeons make use of ledges on buildings to roost whilst starlings may roost on and in buildings in large numbers. Gantries and other complex structures offer potential perching sites and swallows and swifts will happily nest in roof spaces or inside buildings they can gain access to e.g. hangars and cargo sheds. Gulls are also a growing concern in urban areas and will use flat roofs for roosting, nesting and loafing. Any buildings proposed as part of the expanded airport will need to be reviewed against bird hazard criteria and designed to minimise their attractiveness to birds.

8 Air Traffic Control Tower

The Air Traffic Control Tower (ATCT) is a key element in the provision of a safe and effective air traffic management service to the aircraft operating at an airport. The Visual Control Room (VCR) is located at the top of the ATCT and has a clear and unobstructed view of the entire airport to ensure the safety of all aircraft operating on runways, taxiways, aprons and in the airspace surrounding the airport. The ATCT location and height needs to be such that the appropriate visual surveillance is achieved without compromising airport operations or becoming an unacceptable hazard to flight. The location in the master plan is in the centre of the midfield, adjacent to the new satellite and close to the centre of the movement area of the airport. With two runways this central location between the runways provides a broadly similar view to each of the respective landing thresholds.

Ideally the height should not obstruct the PANS-OPS surfaces or infringe the Obstacle Limitation Surfaces (OLS) for the runways however in practice this is often difficult to achieve at large multiple runway airports where infringement of the OLS, and the Inner Horizontal Surface (IHS) in particular, or the PANS OPS surfaces may be warranted to ensure acceptable visibility to runway approaches, holds, taxiways and apron areas. The increased risk due to infringement is balanced against the increased safety benefits a VCR with optimised visibility can provide. Work at the detailed design stage will seek to evaluate the benefits and risks of any infringement and mitigation procedures put in place as part of the airports' procedures design.

At this master plan stage the location of the tower has been reviewed in relation to a number of factors as follows:

Distances from the ATCT to the farthest point on all runways and taxiways – these should be minimised with runway ends and landing thresholds considered to be key.

- Line of Sight (LOS) - the aim being unobstructed views to all areas. In order of criticality these are airborne traffic and landing thresholds, runways, taxiways, apron taxilanes and apron parking stands. For the purposes of this initial study LOS visibility down to ground level is assumed. While this would be desirable for all areas in practice this requirement can be relaxed in some areas with the agreement of the air navigation service provider e.g. apron taxilanes and parking stands. The minimum requirement is for the controller to see a sufficient portion of the aircraft and its markings in order that it can be recognised. NATS minimum requirement at Heathrow and Gatwick has historically been visibility to 51% of the tailfin of an agreed datum aircraft. This allows the airline logo on the tailfin to be identified. Typically an A320 has been used as the datum aircraft as was the case in the design of Terminal 5 and its Satellite Buildings.
- Angle of Incidence – A minimum of 0.8° is considered best practice as specified in FAA document 6480.4A. The FAA figure was derived from a study of sample ATCTs. This is the absolute minimum at the furthest point to be viewed, which is usually the runway end. Lower values are used in some other states e.g. the Australian Civil Aviation Safety Authority publishes a value of 0.6°.

- Consideration of controller eye height and potential infringements to the protected surfaces.
- Site access and security – From a security perspective an airside location is preferred although it is recognised this makes access for staff less straightforward.

From these initial studies it has been concluded that a new ATCT will be required in a location between the two runways, in the vicinity of the new satellite, where similar distances to each runway end can be achieved. Positioning the ATCT towards the eastern end of the satellite will ensure LOS is maintained to all runway ends and all areas of the midfield zone. Positioning the ATCT further west and closer to the terminal building has the potential to create some areas of shadow on taxiways and stands due to the Terminal Building, in which case more detailed studies would need to be carried out to assess visibility during detailed design of the building and its roof profile.

An angle of incidence of around 1° can be achieved for a tower in this location which is better than the best practice values published by FAA. It should be possible to keep the height of the new tower below the height of the inner horizontal surface (IHS) although a modest infringement to the surface of between 5 to 10m may be necessary in order to maximise visibility from the ATCT.

Un-sighted areas can be mitigated using supporting systems such as CCTV or multilateration which uses the coverage from several surface movement radars. The latter has been utilised successfully at Heathrow. These might be appropriate for some areas of the existing airport which may have restricted visibility from a new ATCT. Systems such as this can be an acceptable solution to provide coverage as an alternative to providing a secondary ground movement control tower.

The alternative would be to retain the existing control tower to provide the secondary control function for manoeuvring areas on the existing airport campus. The new ATCT would control runway operations and movements in the midfield area. This arrangement is not uncommon at multiple runway airports. Detailed procedures would be implemented to clearly identify the split in operational management of air and ground operations and airfield areas. Retaining the existing control tower as a secondary ATCT has the added benefit of providing a back-up function for air traffic control operations generally.

9 Navigational Aids

The master plan assumes an Instrument Landing System (ILS) and Glide Path (GP) will be required for both runways. The critical and sensitive areas associated with these installations have been applied in the design of the master plan. It has been assumed the same areas that apply to the existing runway should also be protected for the new runway.

Ideally vehicles or aircraft should not be permitted within the critical areas associated with the ILS localiser and Glide Path (GP) installations under any conditions but this is particularly true when the runway is being used in arrivals mode and landing aircraft are locked on to the ILS and GP signals. The sensitive area is generally considered to be less critical unless the airport is operating in low visibility conditions.

The parallel taxiway immediately south of the existing runway infringes the ILS sensitive areas for the Glide Path installations on runway 08R 26L. As a consequence it may not be possible to use all routes on the northernmost parallel taxiway while aircraft are using the runway as a landing runway with ILS. Operational procedures can be implemented to manage the situation. Alternatively new technologies such as Cat III GBAS may be available in the future to help mitigate any restrictions.

GBAS is more flexible than ILS with one GBAS installation capable of broadcasting multiple approaches covering all runways at an airport. However the ability to do so will depend on siting criteria and the local environment. The FAA has published requirements for Cat I GBAS equipment however the area required remains subjective at present and will to some extent be governed by whose equipment is selected and their individual siting criteria since the requirements vary between different manufacturers. As the technology becomes more common and is refined requirements may change further and system requirements will remain under review as and when the technology becomes more readily available.

A number of other navigational aids are likely to be required including Primary Surveillance Radar (PSR), Secondary Surveillance Radar (SSR), Surface Movement Radar (SMR), Multi-lateration systems, VHF Omni-directional range (VOR), Distance Measuring Equipment (DME) and VHF/UHF communications equipment. A technical safeguarding process will be followed in order to site this equipment. This will be undertaken in consultation with key stakeholders including NATS. None of the equipment mentioned above is considered to have a significant land-take requirement therefore no major issues are anticipated in siting the equipment. Appropriate studies will be undertaken at the time to identify specific requirements.

10 Rescue and Fire Fighting Service (RFFS)

The location of an airport fire station is a primary factor in ensuring that recommended response times can be achieved. All fire stations should be located so that access to the manoeuvring area and runway is direct and requires the minimum number of turns for rescue and fire fighting vehicles to negotiate. The response_time is considered to be the time between the initial call to the rescue and fire-fighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam.

Initial studies demonstrate one additional satellite fire station will be needed to meet the required response times which has been included in the master plan. This is the case regardless whether EATs are provided. The airport currently applies a response time of 2mins 30 seconds to any part of the operational runway and 2mins, not exceeding 3mins to any part of the response area. This is slightly greater than the recommended 2mins published in CAP168 and ICAO Annex 14. For the purpose of this masterplan it is assumed the currently adopted response times can remain.

From the existing fire station, the new runway end would not be close enough to reach in 2mins 30 seconds therefore the satellite fire station has been included. The existing station would remain as it has direct access to the northern runway and the existing apron areas as well as access to the helicopter aiming point on Uniform Taxiway. The new satellite station in the midfield area would have a clear view and direct access to the southern runway and movement areas in the midfield and is likely to be closer to 08R runway end.

Further studies will need to be undertaken at detailed design stage, in consultation with CAA, to finalise RFFS requirements and optimise the position of the two fire stations.

11 Fuel

The current Gatwick Airport Storage and Hydrant Co Ltd (GASHCo) fuel depot meets all current regulations concerning fire prevention. Any enhancements to the capacities at the fuel depot would however trigger a review of the facility and new facilities may be needed to mitigate the impact of smoke, heat and fluids.

In advancing the project to enhance the GASHCo facilities, further studies would be undertaken jointly with GASHCo and Gatwick Airport to prove that the development is safe and that adequate mitigation of heat, smoke and fluids has been addressed.

After 2040, higher pumping capacity on the two pipelines will be required, together with 2 x remote tanks located within the enlarged Gatwick Airport. The remote tanks would be fully automated, unmanned and controlled from the current facility. The site identified within the Master Plan for the location of the remote fuel tanks is within the curtilage of the existing North Terminal long stay car park. In the Master Plan this area is designated to support cargo and for ancillary support facilities. All passenger car parking is to be relocated east of the railway line. A 200m total exclusion zone free of any other activity and void of any members of the public has been allowed for. These protective zones around such a facility and the fire protection necessary would be designed to meet the standards applicable at the time following studies undertaken in conjunction with all relevant stakeholders.

12 Aerodrome Safeguarding

Aerodrome Safeguarding requirements have been assessed in the design of the new runway with a particular focus on the obstacle environment to the south, east and west of the expanded airport. To the west there is rising terrain and initial terrain modelling has shown no infringement of the approach surface (APPS). At this stage penetrations to the take-off climb surface (TOCS) are also not anticipated however as the terrain is much closer to the surface more detailed analysis with more detailed terrain data will be needed at a later stage as the runway design progresses. If small penetrations occur this would have little impact since it would be taken into account in the design of instrument departures. The terrain will not infringe the Obstacle identification Surface (OIS). This is the surface used by procedure designers to identify obstacles in the departures area for instrument departures. This surface is wider and higher than the TOCS. As no terrain infringes this surface then a standard procedure design gradient (PDG) of 3.3% can be used (subject to any obstacles on the high ground also being assessed). In fact PDGs higher than 3.3% are not uncommon, for example Heathrow has a published PDG of 4%, and Paris Charles De Gaulle airport a PDG of 5.5%.

Earthworks are therefore not anticipated in relation to terrain other than that required close in to the new runway end and within the expanded airport boundary.

It is assumed significant obstacles will need to be removed e.g. there is a mobile phone mast to the west of the airport on Russ Hill and some lopping and removal of trees in the same area will also be required as appropriate. The aim is to reduce the obstacle environment so that it is no worse than the existing runway 26L.

The objective is that infringements to the Approach Surface should be avoided but some infringements are likely to be permissible through the Take-off Climb Surface. This is accepted practice at Gatwick and many other airports where obstacles exist under departure routes. Safety is assured through the application of PANS-OPS surfaces and the design of instrument flight procedures that incorporate appropriate obstacle clearance heights for the obstacle environment.

In addition departing aircraft are protected by the Type A chart. Airlines will take account of obstacles for departing aircraft through reference to the Type A chart. This is generated through application of the 'take-off flight path area' (TOFP) surface, which is used to identify obstacles for inclusion on the chart. The TOFP area is shallower than the take-off climb surface.

Some modest infringements may be permissible to other surfaces e.g. infringement of the Transitional Surface by Astral Towers, an office building to the south of the new runway. As before safety would be assured through the application of PANS-OPS surfaces in the design of instrument flight procedures that incorporate appropriate obstacle clearance heights for the obstacle environment.

Certain features would be designed to fall below the surface. For example, the proposed embankment/noise bund around 08S runway end can be restricted in height to 6m in this area to ensure the Take-off Climb and Transitional Surface is not penetrated. The height of screen planting would also need to be similarly

restricted. At 26S runway end the proposed acoustic 'wavey' wall would likely be subject to a height restriction of around 8m in some areas.

Aircraft waiting at the runway holds will infringe the Approach surface however ICAO Annex 14 specifies that the inner transitional surface (OFZ) is intended as the controlling surface for navaids, aircraft and other vehicles. An assessment of risk would be undertaken during detailed design to confirm the safety of operations. No infringement will occur to the OFZ from aircraft.

Aerodrome Safeguarding requirements has been taken into consideration in the positioning of EATs to ensure the tailfin of Code E aircraft operating on the taxiway would not infringe the Approach Surface. This is achieved by insetting the existing runway thresholds.

The route of the road bridge for the A23 road diversion is one potential area of concern and the potential for a small infringement of the Approach Surface has been identified and possible mitigation options will be considered at detailed design stage.

13 Bird Hazard Management

The detailed design of the new runway and associated infrastructure, including any environmental offsetting will need to take cognisance of safeguarding requirements for bird hazard. This includes the location, species, density and height of tree planting; location and design of water courses and sustainable urban drainage schemes (SUDS); location and management regime for areas of grassland and careful design of buildings and roofs. The latter can offer attractive habitat for roosting nesting or loafing birds which is covered in more detail under Building Design. Where necessary appropriate mitigation will be introduced e.g. netting of water courses.

14 Public Safety Zones

The basis for restricting new development within Public Safety Zones is constrained cost–benefit analysis (CCBA). This is a risk appraisal principle under which individual risk is reduced to a tolerable level irrespective of cost (in this case 10-5 is tolerable for *most types of* development and 10-4 is considered intolerable) and then further reduced only if the benefits of doing so exceed the costs. The same principle can be applied to PSZ definition for new runways.

Where specific concerns are identified an assessment of risk through comparison of mitigation cost versus risk reduction benefits would need to be undertaken by application of CCBA principles. Experience suggests this is not necessary at this stage given the nature of infrastructure identified within the zone is no worse than for the existing airport.

The existing runway is reconfigured in order to inset the thresholds so there will be a positive impact on the PSZ's. Although departing aircraft are factored into PSZ definition landing aircraft have the biggest impact so the area affected by the PSZs on the existing runway will reduce in size to the extent that the few buildings currently affected by the PSZ will fall outside the amended zone.

There are no major concerns with the PSZ's for the new runway. To the west of the airport local distributor roads will pass through the zone however local and minor roads are generally permitted within PSZ's. To the east the realigned A23 will fall within the zone, as will the existing railway line but this is no different from the existing situation at Gatwick and many other airports.

As PSZ risk is based on 'individual annual fatality risk' the transient nature of individuals using major transport routes that are exposed to risk can be factored into any assessment. On that basis the inclusion of transport routes is thought likely to be permissible particularly where they are designed with features such as stations, traffic lights, roundabouts and junctions outside the zone which is the case here. Some properties also fall within the zone to the east however these properties have already been identified as being impacted by the airport expansion therefore dialogue with the owners will take place.

The provision of EATs in the masterplan layout will also result in aircraft routing through PSZs while aircraft are landing over them. The transient nature of individuals would also apply in this case with the annual fatality risk for individuals being very low.

15 Meteorological Systems

Airports operating with ILS need to determine the runway visual range (RVR). Several methods exist for determining RVR but the most common used in the UK is the use of equipment called transmissometers. These measure visibility using a beam of light taking ambient light conditions into account. RVR equipment will need to be allocated for the new runway. As a minimum three RVR sites would be provided for each located within the runway strip, one at each runway end, close to the runway thresholds and one near the midpoint of the runway.

For the purpose of this master plan it is assumed the existing runway RVR sites can remain as no proposed infrastructure changes will impact these sites. For the new runway the equipment would likely be sited south of the new runway outside of any glidepath critical or sensitive areas.

The same conclusion is reached in relation to the siting of anemometers. For the existing runway it is assumed the existing equipment can remain as no infrastructure changes will impact on the current sites. For the new runway anemometer equipment would be sited south of the new runway outside of any glidepath critical or sensitive areas. The final siting of meteorological equipment will have little significant impact on landtake or master plan design and can therefore be determined at a later date

Annex B1 - Planning Parameters and Design Criteria

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Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
Runway Proposed 08S 26S	Separation from RWY 08R 26L	Simultaneous Parallel Operations - 1045m	ICAO Annex 14 Ch 3; ICAO PANS-ATM; ICAO PANS-OPS; ICAO SOIR Doc 9643
	Code	4F	ICAO Annex 14, Ch 1; CAP168, Ch 3
	Width	60m	ICAO Annex 14, Ch 3; CAP168, Ch 3
	Shoulders	7.5m	ICAO Annex 14 Ch 3; CAP168 Ch 3
	Threshold Displacement	08S ~ 514m, 26S ~ 267m - balance between obstacles and LDA	ICAO Annex 14 Ch 3 and Attachment A
	Runway Strip	300m wide, 60m beyond runway end/before threshold	ICAO Annex 14 Ch 3; CAP168 Ch 3
	OFZ Strip Width	Code F - 155m wide	ICAO Annex 14 Ch 4; CAP168 Ch 4
	Declared Distances		
	TORA	08S & 26S 3340m	ICAO Annex 14 Attachment A
	Clearway	60m x 150m wide (increasing to 180m by end of TODA)	ICAO Annex 14 Ch 3; CAP168 Ch 3
	TODA	08S & 26S 3400m	ICAO Annex 14 Attachment A
	ASDA	08S & 26S 3400m	ICAO Annex 14 Attachment A
	LDA	08S - 2825.10m, 26S - 3072.23m	ICAO Annex 14 Attachment A
Runway End Safety Area	08S 26S RESA	240m x 150m	ICAO Annex 14 Ch 3; CAP168 Ch 3
Runway Amended 08R 26L	Code	4E	ICAO Annex 14, Ch 1; CAP168, Ch 3
	Width	Minimum 50m	ICAO Annex 14, Ch 3; CAP168, Ch 3
	Shoulders	Up to 15m	ICAO Annex 14 Ch 3; CAP168 Ch 3
	Threshold Displacement	08R ~ 864m, 26L ~ 939m - - balance between obstacles and LDA	ICAO Annex 14 Ch 3 and Attachment A
	Runway Strip	300m wide, 60m beyond runway end/before threshold	ICAO Annex 14 Ch 3; CAP168 Ch 3

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	OFZ Runway Strip	Code F requirements: Extends 77.5m each side of the runway from 60m before threshold to 1800m beyond.	ICAO Annex 14 Ch 4; CAP168 Ch 4
	Declared Distances		
	TORA	08R - 3159m, 26L - 3255m	ICAO Annex 14 Attachment A
	Clearway	08R - 152m, 26L - 144m	ICAO Annex 14 Ch 3; CAP168 Ch 3
	TODA	08R - 3311m, 26L - 3399m	ICAO Annex 14 Attachment A
	ASDA	08R - 3233m, 26L - 3316m	ICAO Annex 14 Attachment A
	LDA	08R - 2766m without EATs & 2500m with EATs, 26L - 2831m without EATs or 2500m with EATs	ICAO Annex 14 Attachment A
Runway End Safety Area	08R 26L RESA	240m x 150m	ICAO Annex 14 Ch 3; CAP168 Ch 3; CAA SN–2012/004
Runway Approach Lighting	High intensity coded centreline and 5 bar approach lighting system with supplementary lighting for Cat II/III operations	900m long +/- permitted tolerances	ICAO Annex 14 Ch 5 and Attachment A; CAP 168 Ch 6
	Approach Lighting Profile	Minimise changes in gradient and do not exceed 1/60; for any section of lights max rising gradient 1/66, max falling gradient 1/40	ICAO Annex 14 Ch 5 and Attachment A; CAP 168 Ch 6
	Plane of Approach Lights	120m wide; 1.5 x length of approach lighting system; For railway lines 5.4m above the rail should be used for obstacle assessment purposes	ICAO Annex 14 Ch 5 and Attachment A; CAP 168 Ch 6
	PAPI	Position of PAPI units south of existing and proposed runways. Precise position will depend on factors such as PAPI unit elevation and mean eye height above threshold.	

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
Taxiway System	Taxiway Width	Code F - 26m, Code E - 23m minimum	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2
	Parallel Taxiways	2 x parallel taxiways south of existing main runway, 2 x taxiways north of new runway; Code F Runway to Taxiway Separation = 190m; Code F Taxiway to Code F taxiway = 95m; Code F Taxiway to Code E Taxiway = 87.5m; Code F Taxiway to Object = 55m; Code E Taxiway to Object = 47.5m	CAP 168 Ch 3
	Cross-field Taxiways	4 x Code F cross taxiways routing to/from the parallel taxiways; Code F Taxiway to Code F taxiway = 95m; Code F Taxiway to Object = 55m	CAP 168 Ch 3
	Taxilanes	Code E taxilane serving the satellite building and Code E remote stands to the west, Taxilane to Object clearance = 42.5m	CAP 168 Ch 3
	End Around Taxiways	1 x EAT at each runway end serving Code E aircraft. Code F aircraft would require to cross the runway. EATs are safeguarded to protect arrivals over or departures away from the EAT.	CAP 168 Ch 3 & Ch 4; final requirements to be agreed in conjunction with CAA
	Runway Access Taxiways	3 x each runway end, Code F separation = 95m	CAP 168 Ch 3
	Runway Exit Taxiways	Intersection Angle 25-45°; 550m Radii	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2
		08R North: 2 x existing RETs with exit curve located at 1465m and 1965m from threshold	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2
		26L: 2 x existing RETs to North with exit curve located 1325m and 1625m from landing threshold; New third RET at 1900m.	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2
		08R 26L: 2 x RETs in each direction to South with exit curves located 1400m and 1900m from landing threshold	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
		08S 26S: 2 x RETs in each direction with exit curves located 1400m and 2100m from landing thresholds	CAP 168 Ch 3; ICAO Aerodrome Design Manual Part 2
		RET enhancements	CAP 168 Ch 6; ICAO Annex 14 Ch 5 and Attachment A;
	Link Taxiways / Runway Crossings	2 x additional crossing points; Located close to landing thresholds to maximise crossing opportunities and reduce risk of go-around	NATS best practice advice
Aerodrome Safeguarding - Protected Surfaces	Take-off Climb Surface	Origin 60m beyond end of TORA or at end of clearway, 180m inner edge, 12.5% divergence each side, final width 1200m. Remaining infringements would be subject to risk assessment and PANS-OPS procedures design.	ICAO Annex 14 Ch 4; CAP 168 Ch 4
	Approach Surface	Origin 60m before Threshold, 300m inner edge, 15% divergence each side; 1st 3000m at 2% (1/50), next 3600m at 2.5% (1/40), next 8400m Horizontal. To be kept clear of obstacles as far as practicably possible. To be kept clear of obstacles as far as practicably possible. Remaining infringements would be subject to risk assessment and PANS-OPS procedures design.	ICAO Annex 14 Ch 4; CAP 168 Ch 4
	Transitional Surface	Along the runway strip equal to the corresponding runway centreline elevation, along the side of the approach surface equal to the elevation of the approach surface at that point, outer limit intersects with the inner horizontal surface, slopes at 14.3% (1/7). To be kept clear of obstacles as far as practicably possible. Remaining infringements would be subject to risk assessment and PANS-OPS procedures design.	ICAO Annex 14 Ch 4; CAP 168 Ch 4

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	OFZ Approach Surface (Inner Approach)	Code F requirements: Origin 60m before Threshold, 155m wide, 900m long; slope 2% (1/50). No infringements permitted.	CAP 168 Ch 4; ICAO Annex 14 Ch 4
	OFZ Balked Landing Surface	Code F requirements: Origin 1800m beyond Threshold, 155m inner edge, 10% divergence each side; slope 3.33% (1/30). No infringements permitted.	CAP 168 Ch 4; ICAO Annex 14 Ch 4
	OFZ Side Surface (Inner Transitional)	Along the OFZ strip edge equal to the corresponding runway centreline elevation; along the side of the inner approach surface equal to the elevation of the inner approach surface at that point; along the side of the balked landing surface equal to the elevation of the balked landing surface at that point; the outer limit intersects with the inner horizontal surface; slopes at 33.3% (1/3). No infringements permitted. Controlling surface for navaids, aircraft and other vehicles that must be near the runway.	CAP 168 Ch 4; ICAO Annex 14 Ch 4
	Inner Horizontal Surface	Horizontal plane 45m above lowest threshold, existing runway 26R threshold is taken as lowest threshold (59.35m AOD), radii of 4000m centred on runway strip ends joined by common tangents to form racetrack pattern.	CAP 168 Ch 4; ICAO Annex 14 Ch 4
	Conical Surface	5% (1/20) slope from edge of inner horizontal surface up to outer horizontal surface at 105m above lowest threshold; existing runway 26R threshold is taken as lowest threshold (59.35m AOD).	CAP 168 Ch 4; ICAO Annex 14 Ch 4

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	Outer Horizontal Surface	Horizontal circular plane extends from the upper edge of the conical surface out to 15km from the ARP.	CAP 168 Ch 4; ICAO Airport Services Manual Part 6
Take-off Flight Path Area	Type A Surface	Origin at end of TODA, 180m inner edge, surface diverges to a width of 1800m at a distance of 6480m from origin, extends from this point at 1800m width out to 10km in length, slope is 1.2% (1/83.33)	ICAO Annex 4 Ch 3; CAP 232 Ch 2
PANS-OPS Procedures Design	Obstacle Identification Surface (OIS), Basic ILS surfaces, Obstacle Assessment Surfaces (OAS).	Surfaces used by procedures designers to calculate obstacle clearance height (OCH) and instrument flight procedures.	ICAO Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS, Doc: 8168), Volume II – Construction of Visual and Instrument Flight Procedures
Apron	Aircraft Stand Dimensions		CAP 168 Ch 3
	Code F	None	
	Code E Mars Stand (2x Code C)	32 x pier served Code E Mars Stands; 90m long x 81m wide; 2.5m longer than required which can be used for equipment	Gatwick Airside Planning Standards
	Code C	32 x Code C Stands; 53m x 38m wide	Gatwick Airside Planning Standards
	Interstand Clearway	7m (9m wingtip to wingtip clearance)	Gatwick Airside Planning Standards
	Remote Stands	6 x Code E, 28 x Code C; Dimensions as per pier served stands	Gatwick Airside Planning Standards
	Pushback	Maintain taxiway clearances	CAP 168 Ch 3
	% GSE of Total Stand Area	15% of stand area typically required; around 7.5% is provided in HOS areas either side of tug reservation	Best Practice; Gatwick Airside Planning Standards
	Airside Roads		
	Head-of-stand (HOS) road	10m wide (single lane each direction); Height clearance minimum of 4.5m	Best Practice; Gatwick Airside Planning Standards; ICAO Aerodrome Design Manual Part 2

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	Back-of-stand (BOS) road	None, HOS Road preferred from an apron safety perspective	Best Practice; Gatwick Airside Planning Standards; ICAO Aerodrome Design Manual Part 2
	Tug zone	7.5m Long (minimum provided)	Best Practice; Gatwick Airside Planning Standards
	Apron Markings	Safety lines to define areas for use by ground vehicles	CAP 168 Ch 7; ICAO Aerodrome Design Manual Part 4
	Airside Road Tunnels	Maximum gradient	TBC
De-Icing Facility		Clear paved area capable of accommodating most demanding aircraft with 3.8m clearance around for de-icing vehicle manoeuvring	ICAO Annex 4 Ch 3
Building Design	Terminal Building	Avoid OLS infringements, height constraint by TRANS is around 26.5m at northern edge	CAP 168 Ch 4; ICAO Annex 14 Ch 4; CAP 760
		Wind turbulence	ICAO Annex 14 Ch 4 Attachment A; CAP791 Ch 4
		Technical Safeguarding	CAP 670;
	Energy Centre with 25-35m Stack	Locate near to R2 Terminal Building with road and rail access. Avoid OLS infringements if practicable.	CAP 168 Ch 4; ICAO Annex 14 Ch 4; CAP 760
Bird Hazard Management	Environmental offsetting, landscaping, water courses and SUDS design, flat roofs, putrescible waste disposal, bird hazard management plan	Application of bird hazard mitigation techniques	CAP 772;
Perimeter Arrangements	Runway centreline to airside road	190m minimum (to accommodate 150m runway strip + 35.7m clearance to transitional for 5.7m vehicle)	Vehicle Height - Highways Agency Standards ?
	Airside Perimeter road	10m wide (single lane each direction)	Gatwick Airside Planning Standards
	Airside road to security fence	3m	Gatwick Security Standards TBC

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	Security fence to landside perimeter road	3m	Gatwick Security Standards TBC
	Landside Perimeter Road	10m wide (single lane each direction)	Source TBC ??
ATC and Navigational Systems	Air Traffic Control Tower	Line of sight angle of incidence 0.8°	FAA Doc 6480
		Uninterrupted line of sight where practicable; minimum 51% of tailfin of datum aircraft (A320) to areas of shadow	CAA CAP670 ATC01; NATS best practice
		Avoid OLS infringements if practicable	CAP 168 Ch 4; ICAO Annex 14 Ch 4; CAP 760
	ILS/GP	Generic ILS Critical and Sensitive applied;	CAP 670; Annex 10 Vol. 1
	GBAS	Cat III GBAS is not yet available; Preliminary guidance available on Cat I systems	FAA Doc 6884
	Other (VOR/DME, PSR, SSR, SMR, Multilateration, VHF/UHF Comms etc)	To be provided	CAP 670; Annex 10 Vol. 1
Meterological Systems	Anemometers	To be provided south of new runway; 120m from runway centreline outside of GP critical areas	CAP746 Ch 7; ICAO Annex 3; Australian MET Bureau Observation Specification
	RVR Systems	To be provided south of new runway outside of GP critical areas; 3 x installations approx. 350m from thresholds at each runway end and 1 x midway around 1300m from threshold	CAP746 Ch 7; ICAO Doc 9328 Ch 5
	Wind Direction Indicator	To be provided	CAP746 Ch 7
Support Facilities	Cargo Building	4 x Cargo Buildings	
	Cargo Stands	Code E taxilane Clearances, 4 X Code E Cargo (Overwide) Stands - 90m long x 78.5m wide with allocated area between stands for cargo handling	

Zone/System	Parameter/Facility	Criteria Used	Relevant Standards/Reference Documents
	Maintenance Hangars	Could be provided if demand requires	
	Maintenance Stands	Could be provided if demand requires	
	Engine Run-up Bay	Could be provided if required	
Fire and Rescue	Fire Station	Second Fire Station required in midfield area based on response times	Gatwick Airside Planning Standards - Response Times and Response Times Exemption TBC with LGW
	Fire Training Ground	Replacement facility required	
Ancillary Facilities	Fuel Farm	Add 1 x tank to current site circa 2030	Current Fire Prevention Regulations
		followed by 2 x tanks in remote facility, possibly in NT long stay car park	Regulations applicable at the time
Public Safety Zones	All Runway Ends	PSZ 10-5 and 10-4 Risk contours	DFT Circular 01-10

Appendix C
Connections and Terminal Planning Assumptions

Contents

1 Introduction

This appendix presents the approach, assumptions and results of the assessment carried out to calculate Minimum Connect Times (MCTs) for passengers on transferring flights (Section 2) and the key inputs/assumptions used to calculate the Terminal Programme of Requirements (Section 3).

2 Minimum Connect Times

While the majority of journeys to and from London and the south east are expected to continue being point-to-point journeys, we expect that at least 10% of passengers using a two-runway Gatwick in 2050 will be making a connection between flights. Therefore, understanding the passenger journeys through Gatwick, both for passengers on point to point flights and for those transferring between flights at the airport is important.

When tickets between connecting flights are sold, the airline or agent needs to ensure that there is enough time between arriving and departing flights for the passenger and their bag to make the connection. This is known as the 'Minimum Connection Time' or MCT. The shorter the MCT at the airport the more connecting opportunities exist. For multiple terminal airports the MCT can sometimes be as high as two hours.

As a part of the masterplan process a highly competitive target of delivering an inter-terminal MCT of 45 minutes and an intra-terminal MCT of 30 minutes has been set. Achieving these targets will be assisted by the compact nature of the airport, well-connected terminals and tailored Gatwick Connect service.

In the future, connecting passengers will have more freedom to choose the airline and route options that best meet their personal needs. Information technology and process improvements will then allow connecting passengers and their bags to be easily identified on arrival. Those on a minimum connection will be given priority treatment to take them directly to the departures gate by airside transfer vehicle.

In most cases, flights with the highest transfer volumes will be collocated in the same terminal. Each terminal will have its own transfer facility for bags and passengers, reducing journey distances and times to a minimum.

The Master Plan supports two key forms of passenger connections;

- Passengers transferring between flights with the same airline where a single ticket has been purchased for the entire journey and passengers transferring between different airlines but where a through-ticket has been purchased.
- Passengers transferring between two flights where separate tickets have been purchased and the airlines are not aware that a connection is being made ('self-connects').

The current process for these two types of transferring passengers is different (See Figures 1 & 2). The aspiration however, is that in the future both would follow the same process which would be the Airside transfer process.

Traditionally airlines relying heavily on transfer passengers have entered into interline agreements with other airlines allowing bags to be through checked and passengers to remain airside during the transfer process.

Figure 1 - Airside transfers / Future self-connect transfer process

With the emergence of Low Cost Carriers (LCCs) this pattern has changed. LCC airlines typically do not enter into these types of agreements and this has resulted in a quite high level of self-connects at Gatwick. With the nature of agreements continuing to change there is evidence of LCC airlines such as JetBlue forming partnerships with long haul carriers and airports like Gatwick are facilitating the transfer for self-connecting passengers by piloting a scheme, Gatwick Connect.

For self-connecting passengers, the masterplan has built on the current 'Gatwick Connect' service. This service aims to offer self-connecting passengers a smooth transfer between flights, resulting in a similar experience to the typical airside transfer process. Currently self-connect passengers are effectively carrying out a landside transfer and need to pick up their baggage at reclaim, exit the airside area via customs, check-in and enter the departures lounge via security. Gatwick Connect simplifies this process by streamlining the journey of the self-connecting passengers by providing the equivalent of an airside transfer process. It relies on passengers notifying Gatwick of the intention to do a self-transfer at the airport.

Ultimately, the goal is for all transferring passengers at Gatwick to benefit from the same high level of service. However, some of the self-connecting passengers may choose not to notify the airport. For these passengers the landside APM will be available to make an easy journey between the terminals. These passengers are referred to as landside transfers and would make their own way in between terminals.

Figure 2 — Current self-connect (Gatwick Connect) transfer process

2.1 Approach

Those passengers on a minimum connection will be given priority treatment to take them directly to the departures gate by airside transfer vehicle. The process followed by them is defined as Time-critical below. For the remaining passengers with more time in between flights, the process is described as standard.

Time Critical Connections

The journey for those passengers on a short-connect, where limited time is available, will be prioritised through the airport as outlined below.

Gatwick will know in advance that the passenger needs special assistance and they will be met at the arrival terminal where they will be processed and security checked. From here they will be taken to a priority transfer vehicle which will drive them directly to the appropriate pier for their departing flight where they will join the other departing passengers.

Their bags will be inserted into the transfer bag facility in the arrival terminal and, once identified as a priority bag will be screened and sent to a priority pick-up point where an agent will take the bag by vehicle straight to the appropriate departure gate.

In this way an inter-terminal MCT of 45 minutes can be provided. The table below illustrates a journey for a passenger arriving on the remote satellite in the mid-field and departing from a gate at the end of North Terminal Pier 6 (representing the longest gate-to-gate journey).

Baggage Process	Time
Arriving flight on stand to transfer bags unloaded	6 minutes
Transport bags from stand to satellite transfer facility	5 minutes
Container offload	4 minutes
Pre-Sortation, screening and van loading	11 minutes
Vehicle transfer from satellite to North Terminal departure gate	9 minutes
Load bag on aircraft and pre-departure buffer	10 minutes
TOTAL	**45 minutes**
Passenger Process	
Disembarkation	15 minutes
Walk to transfer facility (buggy assistance if required)	6 minutes
Transfer processing	5 minutes
Transfer vehicle from satellite to North Terminal departure gate	9 minutes
Arrival at departure gate pre-departure	10 minutes
TOTAL	**45 minutes**

A diagram showing a schematic breakdown of the processes and travel time for the transfer between the midfield satellite and the north terminal, for time critical transfers, is illustrated in Figure C.1.1.2_1.

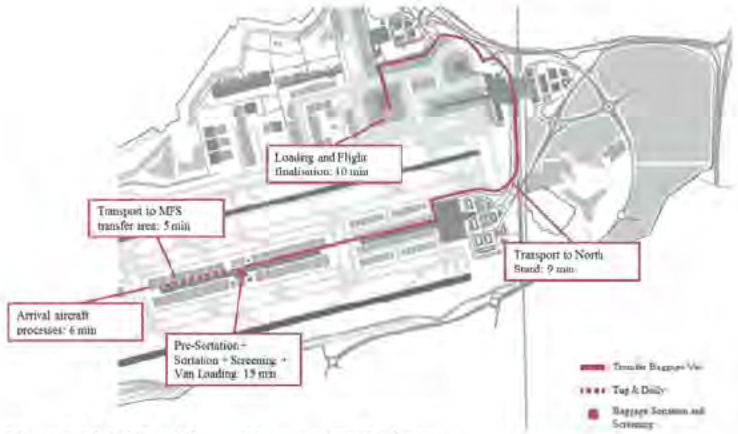

Figure C.1.1.2_1 Breakdown of baggage transfer journey

Standard Connections

Those passengers transferring between terminals will be directed to a transfer facility where they would use an airside transfer vehicle to take them to the departure terminal. In the departures terminals they will be processed. Much of the journey in between terminals will make use of the high-speed inter-terminal airside road system.

The bags will be driven on arrivals to the arrivals terminal, sorted and then taken to the departure terminal to be processed (security screened and sorted).

2.2 Assumptions

This section outlines the assumptions and approach taken in the MCT assessment. The main operational assumptions are listed below:

- Standard transfer passenger processing (including security) will take place in the terminal of departure except for those on short connect times which may be security screened in the terminal or arrival.
- The midfield remote pier will have its own transfer facility (passengers will not need to return to the terminal).
- Airside connections between the terminals will use an airside transfer shuttle bus. Dedicated high speed vehicles will also be provided to assist passengers on short connect times.
- Technology will allow arriving bags that are connecting to be identified
- Transfer bags are input into the terminal of arrival baggage system. Standard baggage would be security screened in the departing terminal
- Baggage on short connects would be screened on arrival and then sent to a priority pick-up point. A van is then available to take the security screened bag straight to the departure gate for loading.

- Self-connecting passengers (not through-ticketed) to notify Gatwick in advance (through Gatwick Connect website.)
- Gatwick informs inbound airline that their passenger is making a connection at Gatwick and checked-in luggage is marked accordingly at the origin airport.
- 45 minute inter-terminal MCTs only apply to through-checked bags or self-connect bags following the above process.
- Calculations have been based on journeys between contact stands.

Passenger Process Time Assumptions

The process time assumptions relating to passenger and baggage processes are presented in the following tables.

Table C.1.1_1 Time Critical Connection

Process (including queue times)	Self-connect	Airside Interline
Disembarkation	15.0 mins	15 mins
Passport check	5.0 mins	-
Wait at reclaim	15.0 mins	-
Connection desk	3.0 mins	0.3 mins
Customs	0.1 mins	-
Boarding Pass Check	0.2 mins	0.2 mins
Waiting time for bus	-	-
Security	0.3 mins	0.3 mins
Minimum arrival at gate pre closure	5.0 mins	5 mins

Table C.1.1_2 Standard Connection

Process (including queue times)	Self-connect	Airside Interline
Disembarkation	15.0 mins	15.0 mins
Passport check*	5.0 mins	-
Wait at reclaim	15.0 mins	-
Connection desk	3.0 mins	3.0 mins
Customs	0.1 mins	-
Boarding Pass Check	0.2 mins	0.2 mins
Waiting time for bus or APM	1.1 mins	5.0 mins
Security	5.3 mins	5.3 mins
Minimum arrival at gate pre closure	5.0 mins	5.0 mins

* Assuming e-gate passport checks

Baggage Process Time assumptions

Table C.1.1_3 Time Critical Connection

Process	Self-connect	Airside Interline
First bag process/ Flight offload	6 min	6 min
Container offload:	0.5 min	-
Transport to Reclaim	3 mins	-
Pre-Sortation + Screening + Sortation + Build (Container loading)	18.8 mins	10.8 mins
Flight finalisation	5 mins	5 mins

Table C.1.1_4 Standard Connection

Process	Self-connect	Airside Interline
First bag process/ Flight offload	6 min	6 min
Container offload:	0.5 min	-
Transport to Reclaim	3 mins	-
Pre-Sortation + Screening + Sortation + Build (Container loading)	18.8 mins	18.8 mins
Flight finalisation	5 mins	5 mins

Other assumptions

A series of general assumptions were also required to estimate the journey time for passengers between processes. These are presented in Table C.1.1_5.

Table C.1.1_5 Speed assumptions

Mode		Speed
Terminal		
Walk	*On Travellator*	1.5 m/s
	Security to gate	1.3 m/s
	Check-in to security	1.1 m/s
	Entry to check-in	0.9 m/s
Buggy		2.2 m/s
Inter and intra-terminal		
Bus/Baggage Van	*Reduced speed areas (apron)*	25 kph (15 mph)
	High speed areas (airside road)	50 kph (30 mph)
Tug	*Apron*	15 kph (9 mph)
	Bag hall	10 kph (6 mph)
ICS	*Tunnel*	8 m/s
	Bag hall	4 m/s

This table indicates that two speeds zones that have been assumed for vehicles making inter-terminal connections (i.e. baggage vans and terminal transfer busses). These two speed zones have been adopted given the two road environments that exist along the transfer routes. Reduced speed areas are those sections of the airside road which are located along the apron and the high speed roads are those located away from the apron including the section that travels under South terminal. These zones are highlighted in Figure C.1.1_1 with the corresponding distances and therefore journey times for transfer vehicles presented in Table C.1.1_6.

Table C.1.1_6 Distance Assumptions

Route	Total (m)	High speed areas (m)	Reduced speed areas (m)	Bus/Baggage Van Journey Time (min)
Midfield to South	2,340	1,760	585	3.8
Midfield to North	3,280	2,880	400	4.7
Satellite to South	4,100	1,760	2,345	8.0
Satellite to North	5,040	2,880	2,160	8.9
South to North	1,300	1,120	185	1.8
Satellite to Midfield	1,760	0	1,760	4.2

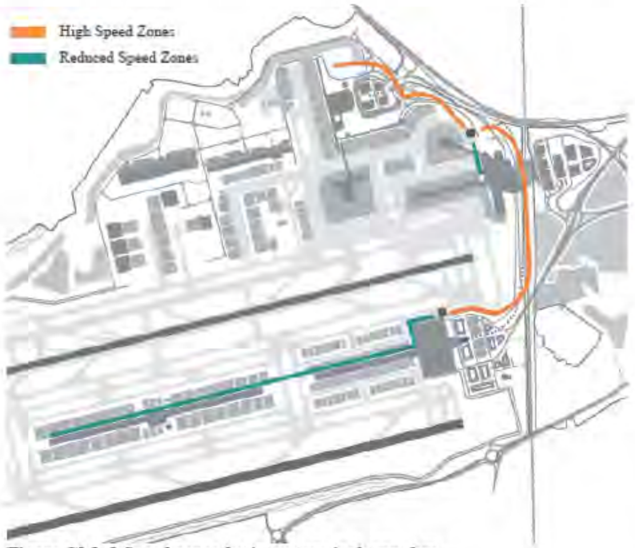

Figure C1.1_1 Speed zones for inter-terminal transfers

2.3 Results

This section outlines the results of the inter-terminal MCT assessment considering both passenger and baggage connection times for all the connectivity options within the three terminal system.

Passenger Connection Times

The tables summarising airside connection times show the time-critical inter-terminal MCT would be 45 minutes.

Table C 1.2.1_4 Inter terminal Airside transfers (Time Critical – International to International)

From/To	South Terminal	North Terminal	Mid-field Terminal	Mid-field Satellite
South Terminal		35.3	37.1	41.2
North Terminal	35.5		40.3	44.4
Mid-field Terminal	36.1	39.3		38.5
Mid-field Satellite	40.2	44.4	38.5	

Passengers with greater time in between flights (non-critical) would be able to complete the transfer journey between terminals within 60mins. Those passengers transferring landside and receiving no assistance from Gatwick would require up to 90minutes.

Baggage Connection Times

The initial assessment of baggage transfers has focussed in interline/pre-registered self-connection operations (i.e. airside transfers). The table presenting standard airside inter-terminal MCT would be around 65 minutes. The time critical inter-terminal MCT would be 45 minutes.

Table C 1.2.2_1 Airside (Time Critical)

From/To	South Terminal	North Terminal	Mid-field Terminal	Mid-field Satellite
South Terminal		43	45	43
North Terminal	43		45	44
Mid-field Terminal	45	45		43
Mid-field Satellite	43	44	43	

The baggage of passengers or non-critical connect times would be transferred between flights in circa 60minutes.

3 Terminal Programme Assumptions

The following table summarises the general assumptions that were used to develop the Programme of Requirements for the new terminal. These assumptions were developed in consultation with Gatwick and incorporate aspirations for common use facilities and increased efficiencies at check-in.

PoR Assumptions		
DEPARTURES	Process time (sec)	Queue time (min)
LCC+Charter		
Check-in Counters	120	10
Self-service Kiosks	90	2
Bag Drop Counters	60	5
FCC		
Check-in Counters	150	10
Self-service Kiosks	60	2
Bag Drop Counters	30	5
ALL		
All Boarding Pass Check	10	3
Security Screening	18	5
ARRIVALS	Process time (sec)	Queue time (min)
Arrivals Passport Control (Immigration) EU Passengers	20	10
Arrivals Passport Control (Immigration) Non-EU Passengers	90	20
Customs (International + CTA) Green/Blue channels	3	2
Customs (International + CTA) Red channels	300	2
TRANSFERS	Process time (sec)	Queue time (min)
Transfers Boarding Pass Check	15	3
Transfers Security screening	18	2
AIRSIDE BAGGAGE HANDLING		
Make Up Opening Times before STD Code C (Narrow Body)	1.5 hours	
Make Up Opening Times before STD Code E/F (Wide Body)	2 hours	
Make Up Positions (MUP): Code C	2 per flight	
Make Up Positions (MUP): Code E/F (Wide Body)	5 per flight	
Hold Baggage Screening (HBS)s		
Peak bag flow	0.8 Domestic Bag/pax	1.2 International Bag/pax
Peak bag flow Surge Factor	1.2	
In-Line HBS Level 1/2	800 bags	
In-Line HBS Level 3	120 bags	
OOG HBS	180 bags	
Early Baggage Storage (EBS)		
Early O/D	80%	
Early transfers	50%	

Appendix D
Glossary of Terms

ARUP

Acronyms

A-SMGCS - Advanced Surface Movement Guidance Control Systems

AC - Airports Commission

ADDA - Aircraft Sequence (Arrival, Departure, Departure, Arrival)

AIP - Aeronautical Information Publication

APM - Automated People Mover

ATM - Air Traffic Movement

ATC - Air Traffic Control

ATCT - Air Traffic Control Tower

ATSM - Annual Tonnes per Square Metre

BAA - British Airports Authority

CAA - Civil Aviation Authority

CAPEX - Capital Expenditure

CAT - Category (Relates to ILS systems)

CBC - Crawley Borough Council

CCTV - Closed Circuit Television

DfT - Department for transport

EAT - End Around Taxiway

EASA - European Aviation Safety Agency

EBS - Early Bag Store

EU - European Union

FAA - Federal Aviation Administration

FSC - Full Service Carrier

GSE - Ground Support Equipment

GAL - Gatwick Airport Limited

GFA - Gross Floor Area

Ha - Hectares

HBS - Hold Baggage Screening

IATA - International Air Transport Association

ICAO - International Civil Aviation Organization

ICS - Independent Carrier System

IDL - International Departure Lounge

ILS - Instrumented Landing System

kph - Kilometres per hour

LCC - Low Cost Carrier

LGW - London Gatwick Airport

LHR - London Heathrow Airport

LSCP - Long Stay Car park

LVP - Low Visibility Procedure

m - meters

MARS - Multiple Aircraft Ramp System

MCT - Minimum Connection Time

MEP - Mechanical, Electrical, Plumbing

mppa - Million passengers per annum

MSCP - Multi-Storey Car Park

NATS - National Air traffic Services

OPEX - Operating Expenditure

PoR - Programme of Requirements

PSZ - Public Safety Zone

RET - Rapid Exit Taxiway

RFFS - Rescue Fire Fighting Station

RTF - Remote Transfer Facility

RWSL - Runway Status Lights

RVR - Runway Visual Range

SID - Standard Instrument Departure

SMR - Surface Movement Radar

UKBF - UK Border Force

VCR. - Visual Control Room

WSCC - West Sussex County Council

Glossary

Airports Commission - The Airports Commission is an independent commission established in September 2012 by UK Government to examine the need for additional UK airport capacity and recommend to government how this can be met in the short, medium and long term.

Airside - Refers to the secure area of an airport, located beyond the security checkpoint.

Apron - A paved area where aircraft are parked, unloaded or loaded, refuelled or boarded.

Automated People Mover (APM) - Small automated transit systems utilised to move people quickly across relatively small areas.

Capacity - Refers to the number of passengers that an airport's facilities are designed to accommodate.

Culvert - A structure allowing water to travel beneath a road, railway or other piece of infrastructure. The River Mole currently runs under Gatwick in a culvert.

Dependant segregated mode - If runways are segregated then one runway is used exclusively for departures and another only for arrivals. If runways are also dependent the sequencing of the departures needs to take into account the arrivals flow, limiting the combined capacity. For example, a departing aircraft can only begin its take-off roll once the landing aircraft touches down on the parallel runway. This mode requires a separation of equal or greater than 385m between runways (in order to provide space for at least one parallel taxiway between the runways).

Easterlies/Westerlies - The direction of aircraft travel when arriving or departing e.g. an easterly arrival refers to an aircraft coming from the west of the runway, and an easterly departure refers to an aircraft taking off to the east.

Existing runway - Gatwick's main runway (called 08R/26L).

Independent segregated mode - If runways are segregated then one runway is used exclusively for departures and another only for arrivals. If the runways are independent, then the timing of departing aircraft can be independent of any aircraft landing movements. This mode achieves a higher capacity than a dependent system but requires a separation equal or greater than 760m between runways. Independent segregated operations can also be achieved with separations that are lower than 760m if the runways are staggered, in accordance with ICAO guidance.

Landside - All areas of an airport located before the security checkpoint, including all publicly accessible areas, car parks, check-in zones, arrivals hall and surface access facilities.

Midfield - The area between the existing runway and proposed runway.

Mixed mode - Where both runways can accommodate independent arrival and departure movements on the same runway and operate independently from each other. Theoretically this mode can achieve the maximum capacity from the two runways but requires a separation of equal or greater than 1,035m between runways.

Movement or Air traffic movement (ATM) - means a flight landing or taking-off at Gatwick.

million passengers per annum - A measure of throughput.

New terminal - is the term we use to describe the terminal which we may build in the mid-field as part of the second runway development.

Northern Apron - the term for Gatwick's existing apron serving the North and South Terminals.

North terminal and South terminal - The two existing terminals at Gatwick.

Operating mode - means the way runways are used at an airport. Runway operating modes are described as dependent or independent, and segregated or mixed.

Parking stand (also "stand") - means the area of an apron on which an aircraft is parked, refuelled, loaded and unloaded.

Passenger Terminal (also terminal) - a building designed to enable passengers to transfer between surface transport and aircraft. Amongst other things the terminal contains check-in areas, security checkpoint, baggage handling, departure lounges, an arrivals area and baggage reclaim.

Passenger throughput - The number of passengers forecast to pass through the airport in any given year

Pier - A building providing passenger access to the aircraft parked around it. Gatwick South Terminal's existing piers are numbered 1, 2 and 3. North Terminal's existing piers are 4, 5 and 6. Pier 1 is currently being replaced with an upgraded facility.

Planning capacity - A forecast number of passengers used as a basis for design and assessment purposes.

Respite - In this context means a period of relief from noise from aircraft flying overhead. Respite can be provided by runway alternation or by reducing the frequency of movements.

Remote pier - A pier not directly connected to the terminal, usually connected to the terminal by an APM.

Runway - A paved surface designed for the landing and take-off of aircraft.

Runway alternation - In segregated mode, means switching the arrival and departure runway for a period of time (for example half the day).

Runway capacity - Would be the theoretical maximum number of ATMs possible per annum for a given movement rate taking account of restrictions on night flights.

Runway separation - The distance between the two runway centre lines. Independent operation is possible with runway separation greater than 760m.

Resilience - means ability to recover quickly from an operational disruption.

Satellite - Remote set of stands physically separated from terminal buildings.

Sift Criteria - Criteria produced by the Airports Commission to help identify long term options for airport expansion. The criteria reflect an integrated approach, taking into account economic, social, environmental or operational issues.

Safeguarded Area - In 2003, the previous Government called for land for a second runway at Gatwick to be safeguarded. The safeguarding is reflected in local planning policies. Development in the safeguarded area has since been restricted in case a second runway is supported by future national policy.

Segregated mode - means one runway is used only for landings, and the other used only for take-offs.

Stand - The parking position for airplanes at airports, needed from the time of arrival to the time of departure.

Stand-by runway - Gatwick's secondary runway (called 08L/26R), used only when the main runway is not available for use. Gatwick's main and stand-by runways are too close together to be used at the same time, so the stand-by runway is usually used as a taxiway.

Surface access - Refers to all types of ground based transport used to reach an airport, including rail, public transport and road.

Taxiway - A paved surface used by aircraft to move between a runway and an apron.

Way finding - Refers to the ways in which people orient themselves in physical space and navigate from place to place.