



THIS PAGE INTENTIONALLY LEFT BLANK



DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 2/60 Intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

# Airport Master Plan Update Executive Summary

Project **4211479 Macau International Airport Master Plan Update**  
Discipline **Master Plan**

Date **JUNE 2015**  
Ref. **4211479 -MFM-ENG-RPT-01-A**  
Revision **A**  
Status **FINAL**



**CONFIDENTIAL CLIENT DOCUMENT**

Unless otherwise expressly stipulated in the contract applicable to the project in reference (the "Project"), intellectual property rights on ADPI's creation are granted to the Client for the purpose of the Project only. Any copy, modification, reproduction, or disclosure to third parties of the whole or part of the information herein, otherwise than for the Project, shall be subjected to ADPI's prior written authorization.

ADPI shall keep the right to utilize and publish material related to the Project, including but not limited to any picture, image, photographs, drawings of the Project design, for the purpose of its own commercial references.

Any such publication or distribution of the documents made by the Client shall explicitly bear ADPI's name and the documents shall be referred to as a creation of ADPI.

The working methods and know-how used by ADPI for the provision of the services shall always remain its exclusive intellectual property.

REVISION	DESCRIPTION	APPROVED BY	DATE
-	-	-	-
<b>A</b>	Initial submittal		JUNE 2015

	NAME	POSITION	DATE
<b>Prepared by</b>	L. Taurand	Program Expert	JUNE 2015
	K. Ho Nguyen	Master Plan Architect	
	P. Boucher	Master Plan Expert	
	F. Dormoy	Forecast Expert (DKMA)	
	C. Harmel Tourneur	Forecast Expert (DKMA)	
	E. Akkogiounoglou	Air Navigation Engineer	
	R. Abdellaoui	Air Navigation Engineer	
<b>Checked by</b>	T. Jaouad	Project Manager	JUNE 2015
<b>Approved by</b>	J. Couillandeu	Project Director	JUNE 2015

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 4/60 Intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



# Table of Contents

Table of Contents.....	5
Table of Figures and Tables .....	6
Introduction .....	7
→ Purpose and Need.....	8
• Demand/Capacity issues .....	8
• Continuous Planning.....	8
• Balanced Development.....	8
→ Planning Goals.....	9
• Safety and Security.....	9
• Capacity .....	9
• Development Flexibility .....	9
• Financial Viability .....	9
• Environmental Compatibility .....	9
• Convenience and Operational Efficiency .....	9
Fundamental Issues.....	11
1 Inventory of Existing Conditions .....	13
1.1 Runway.....	13
1.2 Taxiway System .....	13
1.3 Apron Area .....	13
1.4 Passenger Terminal Building.....	14
1.5 General Aviation .....	15
1.6 Summary .....	15

2 Traffic Forecasts.....	17
2.1 Annual Traffic Forecast .....	17
2.2 Design Day Traffic Forecast.....	17
3 Demand Capacity Analysis .....	19
3.1 Development Phases .....	19
• Phase 1: 7 Mpax.....	19
• Phase 2: 11 Mpax.....	19
• Phase 3: 15 Mpax.....	19
3.2 Facility Requirements.....	20
3.3 Demand Capacity Analysis .....	21
4 Airport Layout Plan.....	22
5 Aircraft Simulation .....	23
5.1 Inputs .....	23
5.2 Outputs.....	23
• Taxi Analysis .....	23
• Queue Analysis .....	23
• Delay Analysis.....	24
5.3 Conclusion .....	24
6 Airport Development Plan .....	25

6.1	Land Reclamation.....	25
6.2	Passenger Apron.....	27
	• Contact Stands Description .....	27
	• Remote Stands Description .....	27
6.3	Passenger Terminal Building.....	28
	• Phasing.....	28
	• PTB Improvements in Phases 1 (7Mpax) .....	28
6.4	General Aviation Facilities .....	29
7	Environmental Assessment .....	31
7.1	Noise Assessment.....	31
	• Noise Metric: Noise Exposure Forecast (NEF) .....	31
	• Land Use Compatibility .....	31
7.2	Water flow assessment .....	31
7.3	Wastewater treatment .....	32
7.4	Other Environmental Considerations.....	32
8	Economic Benefits.....	34
8.1	Contribution to Macao's Economy .....	34
8.2	Contributions to Government Revenue .....	34
8.3	Airport Construction Jobs Creation.....	34

## Table of Figures and Tables

Table 1: Summary Table of Contact Stands Characteristics.....	14
Table 2: Detail of the PTB capacity .....	14
Table 3: Summary of Main Facilities Annual Capacities .....	15
Table 4: Summary of Existing Conditions.....	16
Table 5: General Assumptions of the Development Phases .....	19
Table 6: Passenger Terminal Building Preliminary Facility Requirements.....	20
Table 7: Contact Stands Requirements.....	20
Table 8: Remote Stands Requirements.....	20
Table 9: Long-Stay Stands Requirements.....	20
Table 10: Business Aviation Preliminary Facility Requirements.....	20
Table 11: Demand/Capacity Analysis for Phase 7 Mpax .....	21
Table 12: Demand/Capacity Analysis for Phase 11 Mpax .....	21
Table 13: Demand/Capacity Analysis for Phase 15 Mpax .....	21
Table 14: Land Reclamation Summary .....	26
Table 15: Land Use Compatibility Matrix .....	31
Table 16: Overnight Visitors Spending (arriving via Macao Airport).....	34
Figure 1: A Typical Planning Process.....	9
Figure 2: MFM Annual Passenger Traffic Projection.....	17
Figure 3: Hourly Distribution of Total Arriving and Departing Commercial Flights .....	18
Figure 4: Planning Stages .....	19
Figure 5: Existing Airfield Layout .....	23
Figure 6: Preferred Alternative – Layout Visualisation in CAST .....	23
Figure 7: Land Reclamation Areas and Phasing .....	26
Figure 8: Contact Aircraft Stands.....	27
Figure 9: Remote Aircraft Stands .....	28
Figure 10: Passenger Terminal Building Development .....	28
Figure 11: General Aviation Facilities Locations .....	29
Figure 12: Three Alternatives of Land Reclamation of the Water Areas West of MFM Runway .....	32

### DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 6/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



## Introduction

The Civil Aviation Authority (AACM), of Macao Special Administrative Region of the People's Republic of China requested in early 2011 the Consultant Aéroports de Paris Ingénierie (ADPI) with its sub-consultant DKMA to elaborate the Airport Master Plan for the Macau International Airport (MFM). The Airport Master Plan aims at formulating a development strategy for future airport expansion.

In order to reflect the actual evolutions since the time of this study, the Civil Aviation Authority (AACM), of Macao Special Administrative Region of the People's Republic of China has asked in 2014 the Consultant Aéroports de Paris Ingénierie (ADPI) with its sub-consultant DKMA to update the Airport Master Plan for the Macau International Airport (MFM) realized in 2011.

The Airport Master Plan and its associated Executive Summary conclude the five stages of the project.

The present document is the Executive Summary which covers the following Work Packages of the Master Plan.

- Work Package WP 1: Inventory of Existing Conditions
- Work Package WP 2: Traffic Forecasts
- Work Package WP 3: Demand Capacity Analysis
- Work Package WP 4: Airport Development Alternatives
- Work Package WP 5: Aircraft Simulation
- Work Package WP 6: Vehicle Simulation
- Work Package WP 7: Airspace Analysis
- Work Package WP 8: Airport Development Plan
- Work Package WP 9: Land-Use Compatibility Plan
- Work Package WP 10: Implementation Plan

The Executive Summary organized with the following main sections:

- **Fundamental Issues:** this section describes the fundamental orientations serving as a base for the future airport development.
- **Inventory of Existing Conditions:** this section details the existing airport environment, the airport facilities with their main characteristics. It determines the capacity of the existing facilities.
- **Traffic Forecasts:** this section discusses the socio-economic background, air transport in the region and in MFM. It concludes by presenting the annual traffic forecasts and the busy day forecasts.
- **Demand Capacity Analysis:** this section confronts the future facility requirements with the existing capacities.
- **Aircraft Simulation:** this section discusses the findings of the aircraft simulation.
- **Airport Development Plan:** this section presents the preferred development, with the phasing of the airport facilities.
- **Environmental Assessment:** this section summarizes the key topics related to noise assessment for the aircraft noise and other environmental considerations.

The Executive Summary presents the essential findings that emanated from the Master Plan study. Detailed explanatory materials are contained in the Final Master Plan Report. For ease of reference, the report is illustrated by graphics at the end of this document in the Chapter "Master Plan Drawings".

→ **Purpose and Need**

The purpose and need for the Airport Master Plan can be summarized in 3 topics.

- **Demand/Capacity issues**

*The Federal Aviation Administration (FAA) states that “the airport sponsor usually identifies the need for a planning study, based on existing or potential shortcomings in the existing plan or airport. These deficiencies may be the result of demand exceeding capacity, the introduction of new aircraft types, or the emergence of a critical environmental problem.”<sup>1</sup>*

Planned and designed in the 1990’s, MFM has experienced solid growth in traffic volumes with a peak demand observed in 2007. The current trend for air traffic and the market conditions for MFM operating entities suggest that demand capacity should be studied. Some facilities appear currently saturated while others are below saturation levels. This strongly calls for a proper Airport Master Plan.

- **Continuous Planning**

*The International Air Transport Association (IATA) indicates that “master plans can be created for new or existing airport locations and should be considered as active, live documents which should be systematically reviewed at least every 5 years. This regular review and update process should address variations in market forces and the operational requirements of the facility’s airline clients. Existing master plans can be revised to accommodate unforeseen commercial variations to the airport’s or airline’s operations.”<sup>2</sup>*

The current Airport Master Plan was completed in 1994, and a 5-year development plan was formulated in 2006 under the authority of the airport concessionaire, Macau International Airport Co. Ltd. (CAM). It appears that the last comprehensive airport planning document was prepared more than 17 years now. Moreover, in 2008 there have been 2 major changes that have dramatically affected the way the airport operates: the opening of cross-strait flights between Taiwan and Mainland China, and the economic downturn. Those changing conditions occurred after the publication of the last 5-year development plan and therefore could not be foreseen at that time. Consequently there is an important need for an Airport Master Plan that refreshes the development assumptions.

- **Balanced Development**

*The International Civil Aviation Organisation (ICAO) says that “an airport master plan should be the most effective framework within which the individual facilities can operate their separate functions at the highest possible levels of efficiency. (...) It is not always possible for the best plans for individual facilities to be fitted together in a total plan for the airports without some modifications to make them compatible with each other.”<sup>3</sup>*

As stated above, some facilities appear currently saturated at MFM while others are below saturation levels. The recent growth observed in the Low Cost Carriers (LCC) and business aviation markets call for facilities more adapted to their specific needs. Once it is recognized that those users may have needs that are contradictory to other users, the need for a comprehensive Airport Master Plan becomes clear.

In light of those considerations, it has become crucial for the airport to update its long-term development framework by establishing a proper Airport Master Plan.

<sup>1</sup> FAA, Advisory Circular 150/5070-7b Airport Master Plans

<sup>2</sup> IATA, Airport Development Reference Manual C1.1

<sup>3</sup> ICAO Doc 9184 Airport Planning Manual

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 8/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



Figure 1: A Typical Planning Process



Source: ACRP Report20, Strategic Planning in the Airport Industry

The purpose of the Master Plan is to formulate the development guidelines for development of airport facilities over the next 20 years (2030), taking into account variation in market forces of the Macao Aviation Industry put within the general socio economic context of the PRD region, as well as the operational requirements of all the main airport users. The Master Plan provides a mean to ensure that the facilities required to meet the vision for the airport are identified and that space is reserved for the sitting of those facilities if needed.

As illustrated in Figure 1, the Master Plan has generally a central role in the typical planning process of an airport. It is a major input for the airport Business Plan as well as the airport Land-Use Plan.

→ **Planning Goals**

• **Safety and Security**

Safety and security are the first priorities when planning airport future developments. This goal is achieved through the application of the best standards and recommended practices provided by international bodies including ICAO, IATA, FAA and EU. Special attention will be exercised towards the prevention runway incursions, apron safety and protection against explosive devices.

• **Capacity**

The airport improvements will balance together the capacity of the various airport functions. Apron and runway capacity, airspace issues, terminal size, landside and seaside access must be carefully organized in order to achieve coordinated growth of the airport functions

• **Development Flexibility**

Changing market dynamics and unpredictable events may affect dramatically the initial plans. This calls for a planning philosophy where risks are duly recognized, allowing for the adoption of a flexible development strategy. This strategy will take into account the future decision points while securing some kind of protection against bad eventualities.

• **Financial Viability**

Financial aspects will be carefully studied with special focus exercised on maximizing the opportunities for revenue generation, while keeping costs to reasonable levels and optimizing capital expenditure. Developments should transform the airport from a public utility into an economic catalyst, creating business opportunities driving economic growth, on local, regional and national scales.

• **Environmental Compatibility**

The best internationally recognized practices in environmental planning will be considered in the study. This will be an opportunity to enhance the airport's image into a green facility where awareness will be exercised regarding noise impacts, water, waste and coastal management and air quality.

• **Convenience and Operational Efficiency**

The passenger experience will be pleasant with attractive and convenient facilities featuring short walking distances, and waiting times. Unconstrained operations to aircraft, short taxiing distances and optimized location of the airport functions will be key to the operational efficiency.



#### Update of Macau International Airport Master Plan

This update allows this planning document to be kept up to date and in line with the most recent development of the Air transport Industry and its implications in Macau International Airport.

The Master Plan Update is typically a lighter study than the elaboration of complete Airport Master Plan and reflects recent evolutions of the Airport without modifying the framework of its future development established by the latest Master Plan itself.

Therefore the Master Plan Update focuses only on updating the following Work Packages of the Master Plan established in 2011:

- Work Package WP 1: Inventory of Existing Conditions
- Work Package WP 2: Traffic Forecasts
- Work Package WP 3: Demand Capacity Analysis
- Work Package WP 8: Airport Development Plan
- Work Package WP 10: Implementation Plan
- Work Package WP 11: Financial Plan

#### DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copying, reproduction, retention or disclosure to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

10/60



## Fundamental Issues

---

Fundamental orientations were identified to serve as the base for the future airport development. The findings were resulted from stakeholder consultation, data collection and literature review efforts. Discussions with the airport concessionaire, operating entities, and tourism and cargo related associations enabled to identify the key considerations for the future airport facilities:

- Centralisation of Passenger Terminal Building (PTB) processing functions under one roof for the optimisation of staffing;
- Optimisation of walking distance to maximise exposure of commercial areas;
- Balanced accessibility for landside (sufficient space for taxi, buses waiting areas) and airside (fast access to runway for fast turnaround);
- Intermodality between air, sea and rail transportation;
- Accommodation of Low Cost Carriers (LCC) inside the same PTB with power-in power-out aircraft stands if possible;
- General Aviation would have convenient access and sufficient space for Fixed Base Operators (FBO) and hangars;
- Segregation between General Aviation (GA) facilities and commercial facilities;
- Cargo facilities would remain at the same place;
- Fuel farm and support facilities to be relocated;
- Provision of sufficient space for multi-user facilities;
- Adequately phased development with incremental expansion for financial considerations;
- Runway End Safety Area (RESA) extensions;
- Main Fire Station extension and relocation;
- Provision of occasional Code F operations;
- Question of the taxiway bridges; and
- Question of the ATC Tower.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 12/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

# 1 Inventory of Existing Conditions

---

The Inventory of the Existing Conditions detailed the existing airport environment, and the main characteristics of airport facilities. It concluded the data collection effort conducted collaboratively with AACM, further supplemented by field visits of the Consultants. It assessed the capacity of the existing facilities as follows.

The Existing Airport Layout is depicted in the Chapter “Master Plan Drawings”:

- Existing Layout
- Panoramic View - Existing Layout
- Sitting Plan - Existing Layout

## 1.1 Runway

---

The airport features one runway serving all flights all year long. Runway 16-34 is a 3,360 by 45 m rigid pavement runway designed for ICAO Code E aircraft (B747-400 or B777 family). Runway 16-34 is equipped with clearways and stopways at both runway ends. Runway End Safety Areas (RESAs) are planned to be extended at both ends in order to fulfill ICAO recommendation.

The runway capacity is highly constrained by ATC issues and by the coordination with the neighbouring centres of Hong Kong and Zhuhai.

## 1.2 Taxiway System

---

Runway 16-34 is linked by two taxiways H and C1 to the apron area. Taxiways H and C1 are 23 m wide rigid pavement taxiways (ICAO Code E) constructed on bridges. They connect to Runway 16-34 with 6 taxiways: C3, D, E, F, H and G all designed according to ICAO Code E standards.<sup>4</sup>

## 1.3 Apron Area

---

The apron area is shared between commercial passenger, cargo and maintenance operations. It features a concrete area with 24 stands (14 Code E and 10 Code D), of which 4 are contact stands with boarding bridges, and 2 used to be dedicate to cargo traffic (B09 and B11).

A detailed analysis of the aircraft stands usage statistics allowed for the evaluation of the existing capacity of the apron area. Compared to other airports in the world, MFM's Contact Stands handle a reasonable number of passengers per stand with 460,000 pax/year on average.

The vast majority of aircraft operating at MFM are narrow-body aircraft Code C with more than 90% on average. Those aircraft utilize stands that were designed for bigger wide-body Code E aircraft, thereby meaning that a geometrical reconfiguration of the apron may significantly improve the space utilization.

---

<sup>4</sup> Aeronautical Information Publications, AIP AD, 01 FEB 2007, AACM

**Table 1: Summary Table of Contact Stands Characteristics**

Stand Group	"Contact Stands"
PAX/Stand/Year (average)	460,000
Type of Traffic	Passenger Commercial Aviation
Type of Airline	"Regular Airlines" - Air Macau (48%), Transasia Airways (12%), Xiamen Airlines (11%)
Type of Stands	Code E Aircraft
Type of Aircraft visiting	96% C, 4% E
Type of Stay	Short (<3h) – Average turnaround time = 63min

Source: ADPI Analysis

The capacity of the Passenger Terminal Apron Area clearly copes with the actual demand on the 30<sup>th</sup> busiest day of the year. The analysis of the hourly usage of stands points out the fact that some General Aviation Flights must park on the Passenger Terminal Apron. The problem is being solved by increasing the General Aviation Apron capacity and proposing a new apron layout, and by clearly segregating the two activities which have very diverse operational needs.

## 1.4 Passenger Terminal Building

Field visits enabled to evaluate the capacity of the existing Passenger Terminal Building (PTB). As shown on Table 2, the PTB functions that should be prioritized for improvement are departure security checks, boarding lounges and check-in counters. It is estimated that the overall capacity of 6.1 to 6.4 million annual passengers (Mpax) for the PTB is sufficient to handle the traffic in the following years.

**Table 2: Detail of the PTB capacity**

Passenger Terminal Building Capacity			
Facility	Capacity per resources	Theoretical number of resources	Theoretical capacity
Check-in counters	31 pax/h	60 counters	1,860 pax/h
Departure Security Check	171 pax/h	10 X-rays	1,710 pax/h
Departure Passport Control	144 pax/h	18 desks	2,590 pax/h
Boarding Lounges		1,240 seats	1,900 pax
Arrival Passport Controls	109 pax/h	28 desks	3,050 pax/h
Baggage Reclaim	350 pax/h	6 belts	2,100 pax/h
One-way PTB Capacity			1,710 pax/h
Equivalent annual capacity			6.4 to 6.8 Mpax

Source: ADPI Analysis

**DISCLAIMER:**

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copying, reproduction, retention or disclosure to any unauthorized person, either wholly or in part without the prior written consent of ADPI.



## 1.5 General Aviation

The General Aviation Terminal Building (Macau Business Aviation Center, MBAC) is located in the southern portion of the apron area, adjacent to the South Car Park. It features a floor area of 1,500 m<sup>2</sup> on 1 level with a footprint of 1,500 m<sup>2</sup>.

A second general aviation maintenance hangar is under construction, on the south side of the first aircraft maintenance hangar. With an area of approximately 8,000 m<sup>2</sup>, it is intended to serve for storing GA aircrafts with minor maintenance functions.

The General Aviation Parking (GAP) is an aircraft parking area for business jets located in front of the General Aviation Terminal Building, and can accommodate 3 Code B stands. Larger aircraft can be accommodated in MFM on the Commercial Stands (Passenger stands and Cargo stands). Additionally, when the number of business jets exceeds the capacity of the GAP, business jets have to use Commercial Stands.

The study of the stands utilization statistics shows that General Aviation Apron Area is not adapted to the demand on that type of traffic. Too many General Aviation flights park on the Commercial Stands and there is a risk it might constraint Commercial Traffic. An increase of the General Aviation Apron Area is necessary, in order to avoid any capacity issue.

## 1.6 Summary

The capacity of the main airport components can be summarized as follows:

**Table 3: Summary of Main Facilities Annual Capacities**

Item	Capacity
Runway and Taxiway	24 ATM ( 13-15 Mpax) <sup>5</sup>
Passenger aircraft stands	8.5 Mpax
Passenger Terminal Building	6.4 to 6.8 Mpax

Source: ADPI Analysis

<sup>5</sup> Those figures were resulted from initial discussions with AACM and not subject to detailed runway capacity study. They should therefore be used with caution and interpreted in the context of the Master Plan.

Table 4: Summary of Existing Conditions

**Macau International Airport - Summary of Existing Conditions**

**Runway, Taxiways**

Length		3,360 m
Width		45 m
Surface		Rigid Pavement (groove surface)
Taxiways H and C1 (bridges)	Design Aircraft	ICAO Code E
	Width	23 m
	Max. Load	395,900 kg
Taxiways C3, D, E, F, G, H	Design Aircraft	ICAO Code E

**Passenger Terminal Building**

PTB Floor Area	45,800 sqm
PTB Number of Storeys	3
PTB Building Footprint	18,000 sqm
VIP Building Floor Area	1,700 sqm

PTB Capacity	Capacity per Resources	Theoretical Number of Resources	Theoretical Capacity
Check-in counters	31 pax/h	60 counters	1,860 pax/h
Departure Security Check	171 pax/h	10 X-rays	1,710 pax/h
Departure Passport Control	144 pax/h	18 desks	2,590 pax/h
Boarding Lounges		1,240 seats	1,900 pax
Arrival Passport Controls	109 pax/h	28 desks	3,050 pax/h
Baggage Reclaim	350 pax/h	6 belts	2,100 pax/h
<b>Departure Peak-Hour Capacity</b>			<b>1,710 pax/h</b>
<b>Arrival Peak-Hour Capacity</b>			<b>2,100 pax/h</b>
<b>Equivalent annual capacity</b>			<b>6,4 to 6,8 Mpax</b>

**Aircraft Stands**

	Number of Stands
Aircraft Code E (Contact)	4
Aircraft Code E (Remote)	10
Aircraft Code D (Remote)	10
<b>Total Aircraft Stands</b>	<b>24</b>

**Cargo Facilities**

Total Surface	18,500 sqm
Total Treatment Capacity	320,000 tons
Ratio Capacity / Surface	20 tons/sqm

**Aircraft Maintenance Hangar**

Hangar Area	6,660 sqm
Design Aircraft	Boeing 747 (Code E)

**Flight Catering Facilities**

Building Footprint	4,600 sqm
Total Land Area	8,000 sqm
Capacity	10,000 meals/day

**Fuel Farm**

Number of Tanks	4
Capacity per Tank	2,000 m <sup>3</sup>
Total Capacity	8,000 m <sup>3</sup>
	200 aircrafts/day
Emergency Fuel Depot	500 m <sup>3</sup>

**Business Aviation**

Floor Area	1,500 sqm
Number of Storeys	1
Building Footprint	1,500 sqm

General Aviation Parking (GAP)	3 Code B Aircraft
General Aviation Hangar	2 helicopters

Source: ADPI Analysis

## 2 Traffic Forecasts

The Traffic Forecasts studied the future evolution of aviation activities at MFM. They started by analyzing the socio-economic background. The study followed by building annual traffic forecasts upon which more precise busy day forecasts were developed. The details were explained in the Final Master Plan Report.

### 2.1 Annual Traffic Forecast

Within the dynamic region of the Pearl River Delta, it appears that economic and tourism prospects are positive and that it will fuel the air transport demand for the coming years. However the unique multi-airport configuration with MFM placed in close proximity to Hong Kong and Zhuhai airport, and the strong interactions with its neighbours renders the situation very complex.

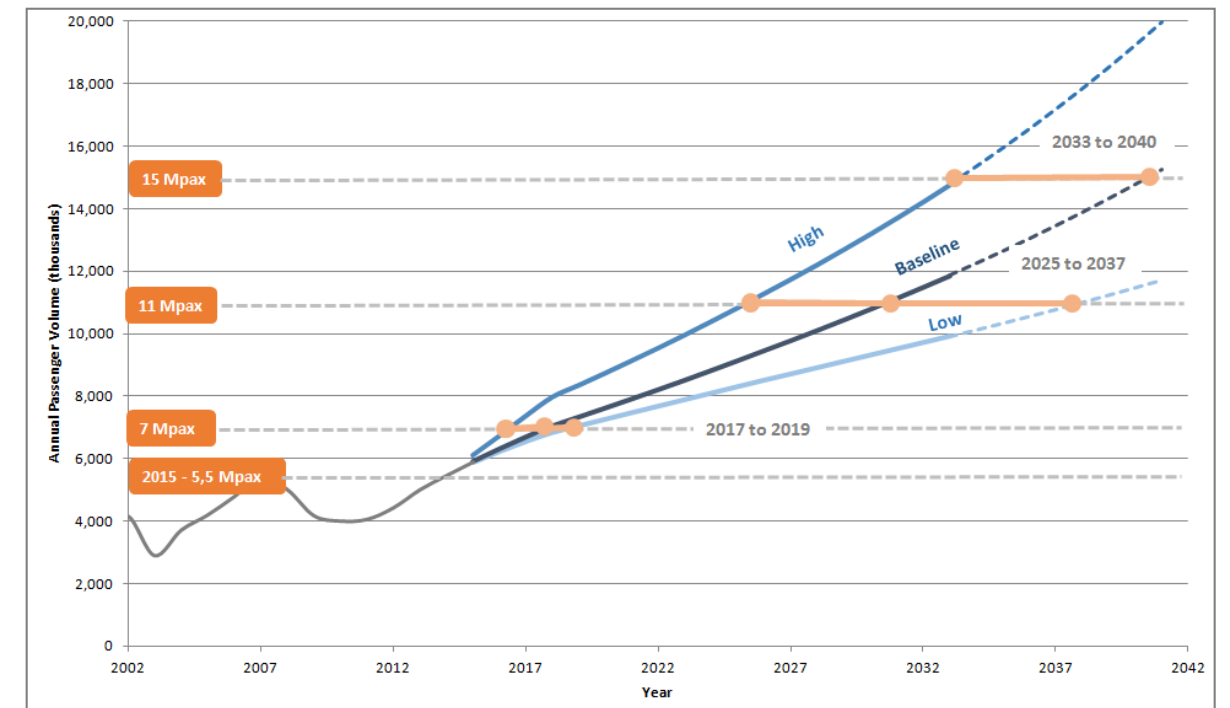
Moreover, the fast development of surface communication network with namely the Hong Kong-Zhuhai-Macao Bridge (HKZM), and the expected growing influence of LCC in the airline industry create even more uncertainties. Being the only international airport on the West bank of the PRD, MFM is expected to play the role of a multi-functional small to medium sized airport. The combination of all factors suggests a prudent reasonable approach.

For annual volumes, the highlights of the traffic study are:

- Passenger traffic will reach about
  - 7 Mpax between 2017 and 2019
  - 11 Mpax between 2025 and 2037
  - 15 Mpax between 2033 and 2040
- Passenger annual growth rate should achieve
  - Between 2.9% and 4.6% for 2018-2023
  - Between 2.5% and 4.2% for 2023-2028
  - Between 2.1% and 3.9% for 2028-2033
- Cargo traffic will grow moderately to 49,000 tons in 2033.

- The business aviation will strongly develop reaching about 9,400 annual movements in 2033 (more than 4.1% annual growth over 20 years).

Figure 2: MFM Annual Passenger Traffic Projection



Source: Research Team Analysis

### 2.2 Design Day Traffic Forecast

The computation of the design day is based on the 30th busiest hour methodology applied to baseline forecast. Existing traffic characteristics are as follows:

- The current peak hour for aircraft movement counts 15 movements.
- The current peak hour for passenger departure counts 1,158 pax.
- The current peak hour for passenger arrivals counts 1,408 pax.

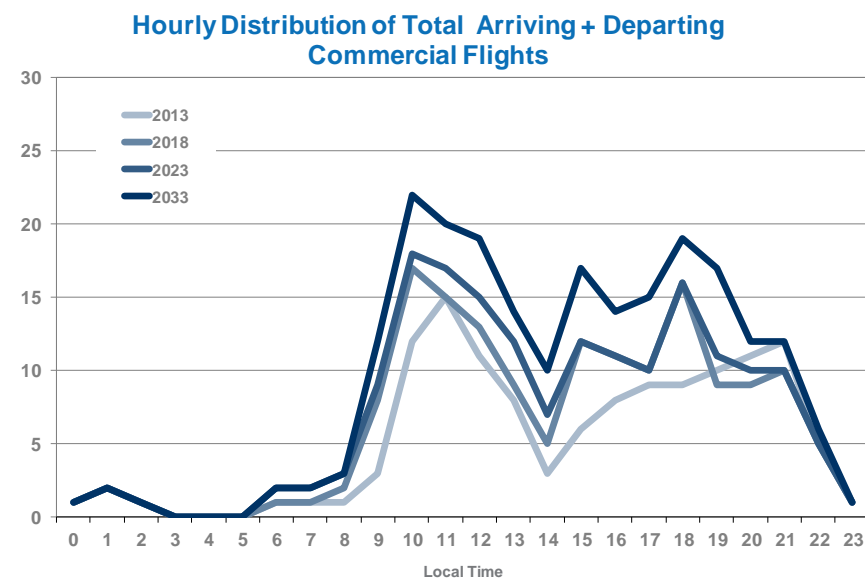
The air routes from MFM are broken down into 3 main markets based on common characteristics inside their routes.

For each route area, the additional flights added to cope with the growing demand were distributed throughout the Design Day, ensuring that the peaks remain at the same periods of the day. However, one needs to ensure that a good balance is reached between:

- Adding flights in the peak periods of the day;
- Increasing the number of flights during other periods of the day; and
- Determining the arrival/departure times for flights related to new routes by using as a benchmark the hourly profile of these flights on the same origin-destination to and from Hong Kong (for example new flights anticipated to and from India were given arrival/departure times which are the most current time found in Hong Kong for these markets).

The projected hourly profile of flights is illustrated in the following chart. An afternoon peak started to build up between 2013 and 2014 for both arrivals and departures and we expect this trend to continue in the future.

Figure 3: Hourly Distribution of Total Arriving and Departing Commercial Flights



Source: Research Team analysis

### 3 Demand Capacity Analysis

#### 3.1 Development Phases

The Demand Capacity Analysis evaluated the areas required for future airport development and compared them with the existing capacity of airport facilities. Development phases were defined as follows:

- **Phase 1: 7 Mpax**

The first development phase has been set to 7 Million passengers. This corresponds to an improvement of 10% of the existing capacity.

- **Phase 2: 11 Mpax**

The second phase is defined for an annual traffic of 11 Mpax. This corresponds to the baseline forecast traffic volume for around 2031.

- **Phase 3: 15 Mpax**

In addition to the 11 Mpax target, another phase has been defined. This phase corresponds to an increase of 35 to 40% of the baseline forecast. It also corresponds to the demand level projected in 2041 and 2034 for the baseline and high scenario respectively. This also corresponds to the usual capacity of a single runway system, when no airspace constraints apply.

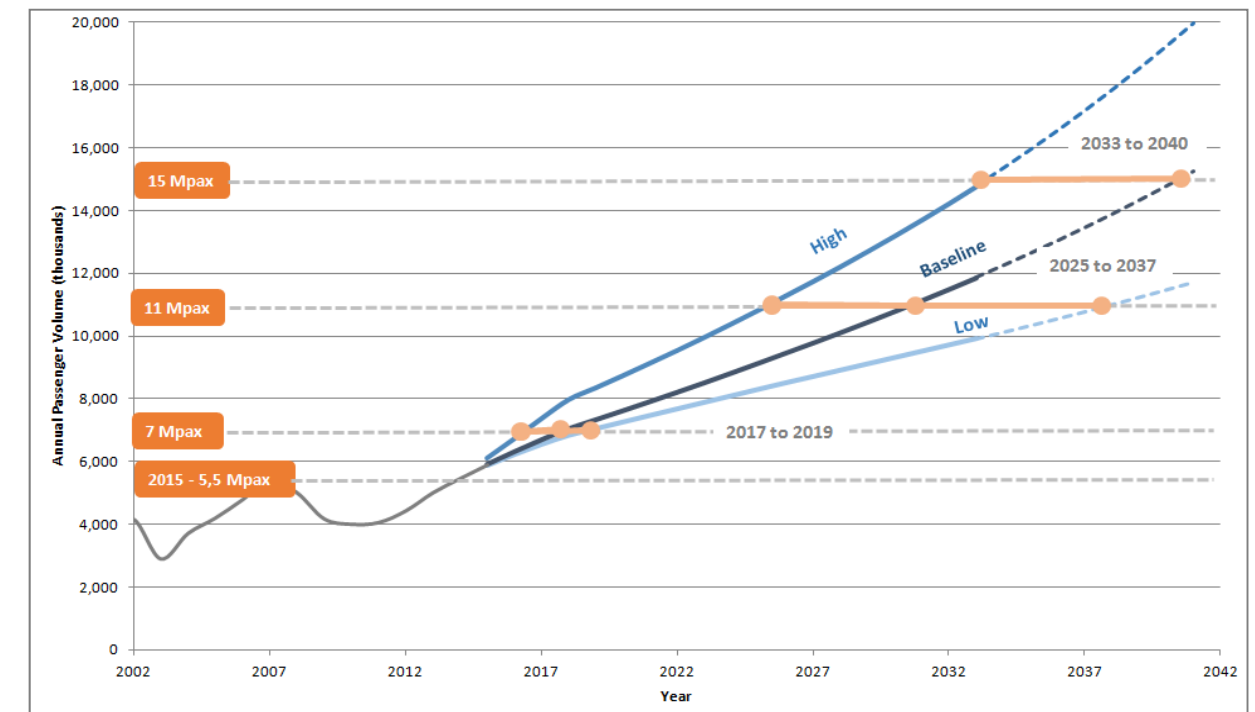
Table 5: General Assumptions of the Development Phases

	Phase		
	7 Mpax	11 Mpax	15 Mpax
Year when activity is reached	2017 (high)	2026 (high)	2034 (high)
	2018 (base)	2031 (base)	2041 (base)
	2019 (low)	2038 (low)	
Annual Passenger Traffic	7,000,000 pax	11,000,000 pax	15,000,000 pax
Annual Cargo Traffic	34,000 tons	47,000 tons	58,000 tons
Annual Movements	63,000 mvts	86,000 mvts	107,000 mvts
Annual Movements - Business Aviation	5,500 mvts	8,900 mvts	12,000 mvts
Busy Day Peak Hour Movements (passenger + cargo)	17 ATM	22 ATM	24 – 28 ATM
Busy Day Peak Hour Passenger (Departure)	1,400 pax / h	1,900 pax / h	2,200 pax / h
Busy Day Peak Hour Passenger (Arrival)	1,400 pax / h	1,700 pax / h	1,800 pax / h

Source: ADPI, DKMA Analysis

The following graph summarizes these three planning stages, as well as the date when the demand levels are likely to materialize.

Figure 4: Planning Stages



Source: ADPI, DKMA Analysis

## 3.2 Facility Requirements

The facility requirements for the main airport components are summarized below.

**Table 6: Passenger Terminal Building Preliminary Facility Requirements**

Passenger Terminal Building				
Scenario	Existing	7 Mpax	11 Mpax	15 Mpax
PTB Floor Area	45,000 m <sup>2</sup>	56,900 m <sup>2</sup>	89,800 m <sup>2</sup>	108,900 m <sup>2</sup>
PTB Footprint	20,000 m <sup>2</sup>	25,000 m <sup>2</sup>	39,100 m <sup>2</sup>	45,300 m <sup>2</sup>
<b>Total Land Area</b>	<b>30,000 m<sup>2</sup></b>	<b>38,000 m<sup>2</sup></b>	<b>59,000 m<sup>2</sup></b>	<b>68,000 m<sup>2</sup></b>

Source: ADPI Analysis

**Table 7: Contact Stands Requirements**

Contact Stands Required				
Aircraft Stands	Existing	7 Mpax	11 Mpax	15 Mpax
ICAO Code C - Contact	0	6	12	14
ICAO Code E	4	2	5	6
<b>Total</b>	<b>4</b>	<b>8</b>	<b>17</b>	<b>20</b>

Source: ADPI Analysis

**Table 8: Remote Stands Requirements**

Remote Stands Required				
Aircraft Stands	Existing	7 Mpax	11 Mpax	15 Mpax
ICAO Code C	2 (Code D)	14	11	17
ICAO Code E	8	0	0	0
<b>Total</b>	<b>10</b>	<b>14</b>	<b>11</b>	<b>17</b>

Source: ADPI Analysis

**Table 9: Long-Stay Stands Requirements**

Long Stay Stands Required				
Aircraft Stands	Existing	7 Mpax	11 Mpax	15 Mpax
ICAO Code C	8 (Code D)	5	6	7
ICAO Code E	2	1	2	3
<b>Total</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>10</b>

Source: ADPI Analysis

**Table 10: Business Aviation Preliminary Facility Requirements**

General Aviation Facilities				
Scenario	Existing	7 Mpax	11 Mpax	15 Mpax
Number of Code B Based Aircraft	3	8	15	15
Number of Code C Based Aircraft	0	8	10	12
Terminal area required	1,000 m <sup>2</sup>	4,000 m <sup>2</sup>	4,000 m <sup>2</sup>	4,000 m <sup>2</sup>
Storage Hangar area	1,500 m <sup>2</sup>	8,000 m <sup>2</sup>	10,000 m <sup>2</sup>	10,000 m <sup>2</sup>
Apron area	4,500 m <sup>2</sup>	44,000 m <sup>2</sup>	63,000 m <sup>2</sup>	70,000 m <sup>2</sup>
Maintenance Hangar area	-	8,000 m <sup>2</sup>	10,000 m <sup>2</sup>	10,000 m <sup>2</sup>
Landside Area required	4,500 m <sup>2</sup>	19,000 m <sup>2</sup>	19,000 m <sup>2</sup>	19,000 m <sup>2</sup>
<b>Total Land Area</b>	<b>12,000 m<sup>2</sup></b>	<b>82,000 m<sup>2</sup></b>	<b>101,000 m<sup>2</sup></b>	<b>108,000 m<sup>2</sup></b>

Source: ADPI Analysis

Remarks:

The followings are some typical aircraft according to ICAO categorization:

- Code B: CRJ, ERJ and Falcon
- Code C: A320 Family, B727 and B737
- Code D: A300, A310, B757 and B767
- Code E: A330, A340, A350, B747 and B777

### DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 20/60. Intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



### 3.3 Demand Capacity Analysis

The following tables compare each key airport facility requirement calculated against their existing capacity. The performance is measured with various metrics specific to each kind of facility. The metric can be a peak hour throughput, a building area, or a total area. The tables outline the expected deficiency or surplus in capacity for the three planning horizons: 7 Mpax, 11 Mpax and 15 Mpax. It is therefore possible to group facilities into 3 types:

Facilities adequately sized for Phase 15 Mpax:

- Cargo Facilities
- Aircraft Rescue and Fire Fighting Facilities (ARFF)
- Airport Maintenance Complex
- Airport Authority Facilities
- Flight Catering Facilities
- Aircraft Fueling Facilities

Facilities to be improved:

- The Passenger Terminal Building
- The Aircraft Stands
- The Airport Police and Customs Facilities
- The Aircraft Maintenance Hangar
- The Access and Landside Facilities
- The General and Business Aviation Facilities

Facilities to be added:

- Isolated Aircraft Position
- Dog Kennel
- Fire Training Facilities
- Medical Center
- Compass Calibration Pad
- Engine Run-up Pad
- GSE Maintenance Area

Table 11: Demand/Capacity Analysis for Phase 7 Mpax

Code	Facility	Metric	Existing Capacity	Requirement 7Mpax	Unit	Deficiency / Surplus
A-01	Runway	Peak Hour	24	17	a/c per hour	41 % (7)
B-01	Passenger Terminal Building	Building Floor Area	45,000	56,900	m2	-21 % (-11900)
		Departure Peak Hour	1,710	1,412	pax per hour	21 % (298)
		Arrival Peak Hour	2,100	1,410	pax per hour	49 % (690)
	Passenger Apron	Total Stands (Code E Equivalent)	19	16	Unit	19 % (3)
C-01	Cargo Terminal Building	Building Floor Area	18,500	3,400	m2	444 % (15100)
D	Airport Support Facilities	Total Land Area	3	5.0	Ha	-40 % (-2)
E	Airline Support Facilities	Total Land Area	3.0	9.2	Ha	-67 % (-6.2)
F-04	Departure Curbside	Departure Curbside Length	170	180	m	-6 % (-10)
		Arrival Curbside	170	180	m	-6 % (-10)
F-05	Passenger Car Parks	Car Park Lots	530	700	Lots	-24 % (-170)
H	General Aviation Facilities	Total Land Area	1.2	8.2	Ha	-85 % (-7)

Source: ADPI Analysis

Table 12: Demand/Capacity Analysis for Phase 11 Mpax

Code	Facility	Metric	Existing Capacity	Requirement 11 Mpax	Unit	Deficiency / Surplus
A-01	Runway	Peak Hour	24	22	a/c per hour	9 % (2)
B-01	Passenger Terminal Building	Building Floor Area	45,000	89,800	m2	-50 % (-44800)
		Departure Peak Hour	1,710	1,898	pax per hour	-10 % (-188)
		Arrival Peak Hour	2,100	1,672	pax per hour	26 % (428)
	Passenger Apron	Total Stands (Code E Equivalent)	19	19	Unit	0 % (0)
C-01	Cargo Terminal Building	Building Floor Area	18,500	4,900	m2	278 % (13600)
D	Airport Support Facilities	Total Land Area	3	5.8	Ha	-48 % (-2.8)
E	Airline Support Facilities	Total Land Area	3	11.2	Ha	-73 % (-8.2)
F-04	Departure Curbside	Departure Curbside Length	170	230	m	-26 % (-60)
		Arrival Curbside	170	230	m	-26 % (-60)
F-05	Passenger Car Parks	Car Park Lots	530	1,100	Lots	-52 % (-570)
H	General Aviation Facilities	Total Land Area	1.2	10.1	Ha	-88 % (-8.9)

Source: ADPI Analysis

Table 13: Demand/Capacity Analysis for Phase 15 Mpax

Code	Facility	Metric	Existing Capacity	Requirement 15 Mpax	Unit	Deficiency / Surplus
A-01	Runway	Peak Hour (estimate 24-28 ATM)	24	28	a/c per hour	-14 % (-4)
B-01	Passenger Terminal Building	Building Floor Area	45,000	108,900	m2	-59 % (-63900)
		Departure Peak Hour	1,710	2,100	pax per hour	-19 % (-390)
		Arrival Peak Hour	2,100	1,839	pax per hour	14 % (261)
	Passenger Apron	Total Stands (Code E Equivalent)	19	23	Unit	-17 % (-4)
C-01	Cargo Terminal Building	Building Floor Area	18,500	6,100	m2	203 % (12400)
D	Airport Support Facilities	Total Land Area	3	6.6	Ha	-55 % (-3.6)
E	Airline Support Facilities	Total Land Area	3	12.5	Ha	-76 % (-9.5)
F-04	Departure Curbside	Departure Curbside Length	170	270	m	-37 % (-100)
		Arrival Curbside	170	270	m	-37 % (-100)
F-05	Passenger Car Parks	Car Park Lots	530	1,500	Lots	-65 % (-970)
H	General Aviation Facilities	Total Land Area	1.2	10.8	Ha	-89 % (-9.6)

Source: ADPI Analysis

## 4 Airport Layout Plan

Good master planning practices encourage anticipating the future aviation demand, looking one step ahead of the future events. Therefore it was chosen to illustrate the Airport Development Alternatives with a capacity of 15 Mpax, higher than the baseline forecast of 11 Mpax in 2031.

Key considerations for the future airport facilities identified after discussion with AACM, CAM, operating entities, cargo and tourism related associations acted as inputs on planning the airport layout. Four Airport Development Alternatives were elaborated, based on traffic forecasts and facility requirements. All Alternatives studied various zoning possibilities for the airport and defined the followings:

- The airfield layout principles (runway and taxiway general positions)
- General organization of airport zones, sized based on preliminary facility requirements (e.g. land areas in hectares)
- Principles of access to the airport
- Relationship between the airport zones
- Airside / Landside frontage requirement

Multi-Criteria Analysis (MCA) was conducted to evaluate the four alternatives against a set of defined criteria with different weights which were chosen to reflect the specific constraints of MFM. Criteria were grouped into 3 categories and aimed at answering 3 main questions:

- General Master Plan: how are facilities located in relation to each other?
- Phasing and Construction: how easy or difficult is it to develop the planned facilities?
- Operations: how efficient the new facilities will operate?

In addition, an aircraft simulation was conducted to evaluate the relative performance of each alternative, as well as the existing airport layout, in terms of aircraft ground circulation efficiency. The results also provided the bases for the selection of the preferred alternatives.

Among the four alternatives, the preferred airport layout presented a good equilibrium among all areas being evaluated, including good flexibility on further landside access extension, good phasing and constructability, good performance on simulation results, etc.

It also demonstrated relative better linkage to the future Pac On Ferry Terminal and helped facilitating passengers travelling through various transportation mode.

The preferred airport layout plan with the capacity of 15Mpax is depicted in the Chapter "Master Plan Drawings":

- **Master Plan - Ultimate Phase**

### DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 22/60. Intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



## 5 Aircraft Simulation

The purposes of the aircraft simulation study undertaken at this stage of the project were to evaluate the relative performance of each alternative in terms of aircraft ground circulation efficiency and to identify areas where improvements should be prioritized. It consisted of the modeling, simulation and preliminary analysis of the four alternatives using the forecasted flight schedule for 2030. The existing layout of the airport had been included in order to compare the results between the preferred alternatives and the no-action option.

### 5.1 Inputs

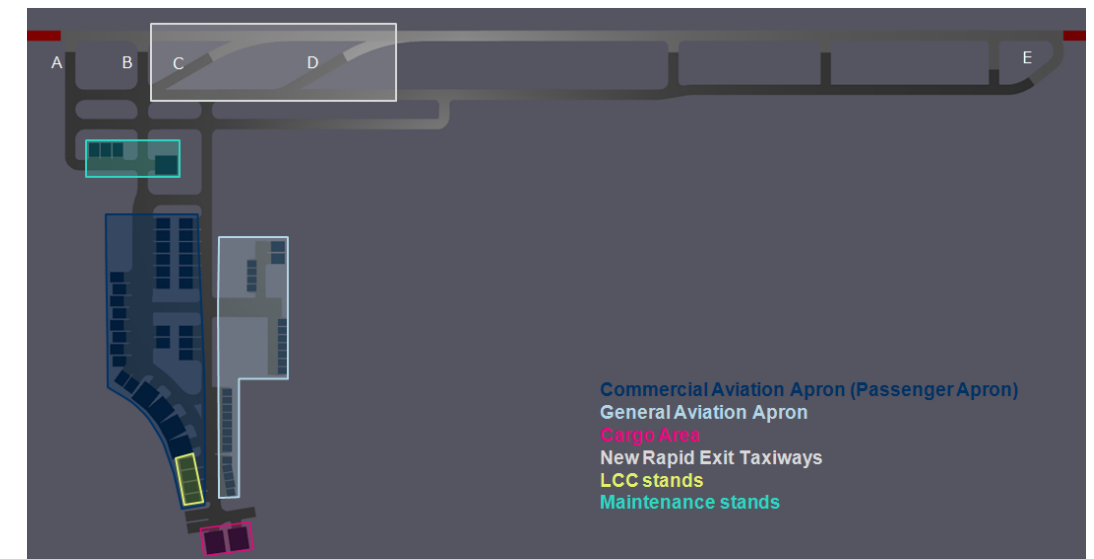
Below were the existing and the preferred alternative layouts modelled in CAST. The relevant areas were highlighted: new rapid exit taxiways, general aviation apron, commercial aviation apron (including existing and/or new areas) and cargo area.

Figure 5: Existing Airfield Layout



Source: ADPI Analysis, Cast Aircraft Tool

Figure 6: Preferred Alternative – Layout Visualisation in CAST



Source: ADPI Analysis, Cast Aircraft Tool

### 5.2 Outputs

- **Taxi Analysis**

The average travel times on the taxiway system of all four alternatives and existing layout measured for all the commercial aircraft of the schedule modeled ranged from 11min50s to 12min18s, while the travel distances ranged from 2,360 m to 2,972 m.

The preferred airport alternative performed the most efficient on taxi analysis with average travel times of 11min50s.

- **Queue Analysis**

According to the simulations there were no important queues generated in any apron area of the proposed alternatives. A maximum of one or two aircraft had been observed forced to wait for a few seconds in an intersection.

However, the departure holding position in Taxiway E represented an important aircraft queue generator due to the ATC constraints for takeoff sequencing. In all of them almost every aircraft of the schedule needed to wait for departure with the longest queue of 5 aircraft and maximum waiting time of 22min10s.

The preferred airport alternative performed relative well with maximum waiting time per aircraft of 20min50s.

- **Delay Analysis**

The average delay of every aircraft operation in all four alternatives and existing layout ranged from 8min41s to 9min4s, where the average departure and arrival delays were about 13min and 4min respectively. Departure operations appear more affected by delays than arrival operations, due to the ATC constraints.

In global, it can be observed that the four alternatives proposed perform similarly regarding the average operations delay.

## 5.3 Conclusion

---

The existing taxiway system has been constraining by its cul-de-sac that was observed to generate congestion if arriving and departing aircraft need to maneuver at the same time.

One of the main conclusions of this simulation study is that in general the results are very similar between the five layouts modeled. The reason is that the main constraint to MFM airfield capacity and performance is the ATC separation minima. That is, the delays observed are not only due to the apron design or taxiways layout, but to the ATC constraints, especially for departing flights. In other words, the delays will appear regardless of the layout design implemented.

### DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copying, reproduction, distribution, or disclosure of this document is prohibited without the prior written consent of ADPI.

24/60



## 6 Airport Development Plan

This chapter sets out the results of the analysis of the future airport layout development at Macau International Airport. It described land-uses and conceptual planning of the airport facilities, showing an overview of the recommended airport configuration.

The existing Passenger Terminal Building was constructed onshore and Runway 16-34 located on a distant reclaimed island. They are separated by an unoccupied water area, delineated by the two connecting taxiways. This layout characteristic showed a lack in expansion possibilities due to existing and future urban development at airport boundaries. The water area is identified as a major potential for future development zone.

Any airport development undertaking shall be considered in this area through taxiway system rearrangement. First, Taxiways Charlie and Hotel should be demolished once a new connecting taxiways are built. This new layout aims at redefining airside and landside boundaries to increase the available and buildable land area.

The new Passenger Terminal Building is located along the main access road and the Future Ferry Terminal. This proximity will create a dynamic which will end up with the construction of a new Passenger Terminal Building to further reach a 15MPax capacity. A bus station will arise between the existing and the future terminal as a connection with the future LRT Station. Together, the airport terminals, the Ferry Terminal, the bus and LRT station will create a multimodal transportation center, as existing in the world greatest international airports.

An area will be developed south, of the connecting taxiways, to accommodate General Aviation. As soon as Phase 2, a brand-new GA Terminal and its associated Code C Apron Area will be constructed in the newly available land. This location ideally offers space to accommodate the high service standards required by the activity. This area will provide for a dedicated Maintenance Hangar.

The General Aviation facilities will be implemented with new access road. The General Aviation will then benefit from a dedicated landside access, separated from commercial aviation network.

Each airport development phase will be the opportunity to relocate, modify, expand or implement new airport facilities and functions. The phased development plan was depicted on the following drawings in the Chapter “Master Plan Drawings”:

- Master Plan – Phase 1
- Master Plan – Phase 2
- Master Plan – Ultimate Phase

### 6.1 Land Reclamation

It is recognized that reclaiming the entire lagoon area would free some valuable land to the airport while the gains in developable areas must be carefully balanced with the costs associated with reclaiming lands. The land area requirements for Phase 15Mpax indicate that a major part of the lagoon area is needed for airport development.

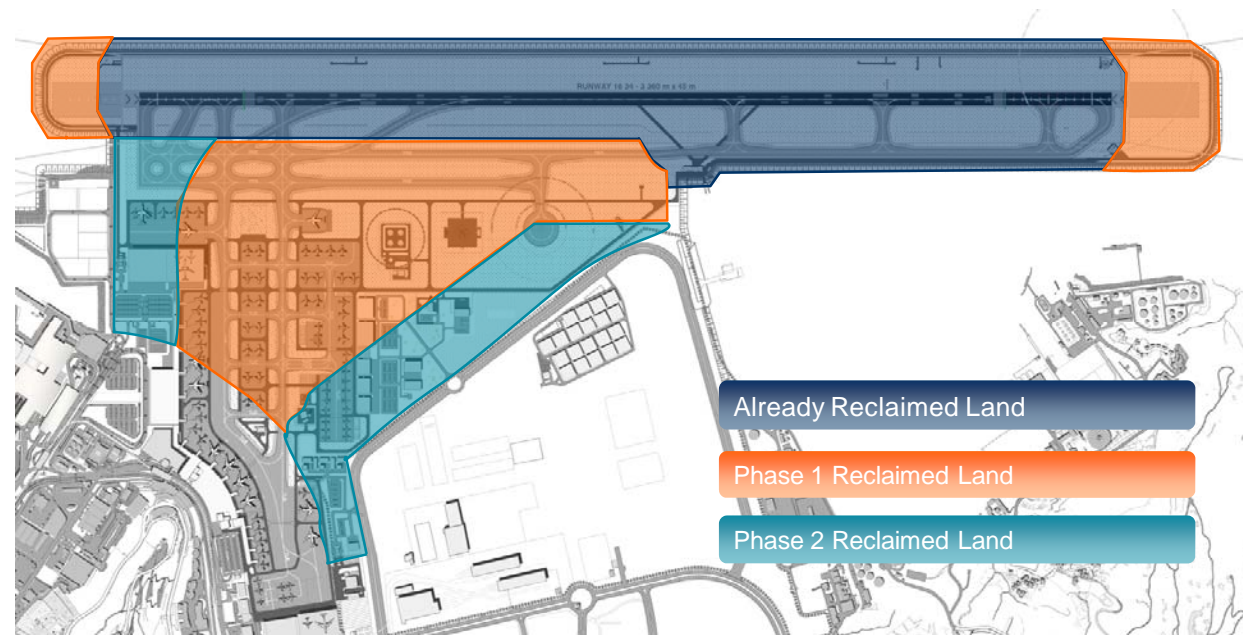
Several options regarding the reconfiguration of the lagoon area as described below were considered and evaluated against various factors such as cost, phasing and operations:

1. Keep taxiways H and C1 as bridges
2. Demolish taxiways H and C1 bridges
  - (a) Rebuild taxiways H and C1 at the same location on reclaimed land
  - (b) Build taxiways between the apron and the runway at other locations on reclaimed land (reconfigured)

After balancing all the comparison factors, it is proposed to demolish taxiways H and C1 bridges and to build taxiways between the apron and the runway at other locations than taxiways H and C1. This would bring more efficient utilization of land while allowing for a sound phasing.

Figure 7 illustrated the land reclamation area and its phasing.

Figure 7: Land Reclamation Areas and Phasing



Source: ADPI Analysis

To prepare Phase 7 Mpax, the unoccupied area in between Taxiway C1 and H will be partially reclaimed. This will permit to construct two new taxiways perpendicular to the runway, expand the apron area and relocate aircraft fueling facilities at Phase 1.

Furthermore, land will be reclaimed along the runway island. This will permit to develop a parallel taxiway with two Rapid Exit Taxiways (RET), and a partial second taxiway parallel to the runway.

Taxiways C1 and H will be demolished to permit further land reclamation.

To prepare phase 11 Mpax, land south west of the airport will be reclaimed in lieu of Taxiway C1. This will permit to develop mainly general aviation facilities with dedicated landside access. It is possible that some impacts on mud sediments will exist in the area between the GA facilities and the runway island. This matter should be further studied later during the engineering phase.

Land north of the airport (in lieu of Taxiway H) will be reclaimed in order to construct the new maintenance hangar and the new Passenger Terminal Buildings.

Table 14 differentiated the size of the new land reclamation and the total airport size by phase.

Table 14: Land Reclamation Summary

in Hectares	Existing	Phase 1 7Mpax	Phase 2 11Mpax	Phase Ultimate 15Mpax
Runway Island (existing)	119	119	119	119
Existing PTB Area	55	55	55	55
RESA Extension RWY 16 (Phase 1)	0	8	8	8
RESA Extension RWY 34 (Phase 1)	0	15	15	15
TWY C1 Bridge (demolition in phase 1)	7	0	0	0
TWY H Bridge (demolition in phase 1)	4	0	0	0
Land Reclamation (Phase 1)	0	95	95	95
Land Reclamation (Phase 2)	0	0	54	54
Land Reclamation (Phase 3)	0	0	0	0
<b>Total</b>	<b>185</b>	<b>292</b>	<b>346</b>	<b>346</b>

Source: ADPI Analysis, DSCC Basemap

DISCLAIMER:

ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 26/60. Intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



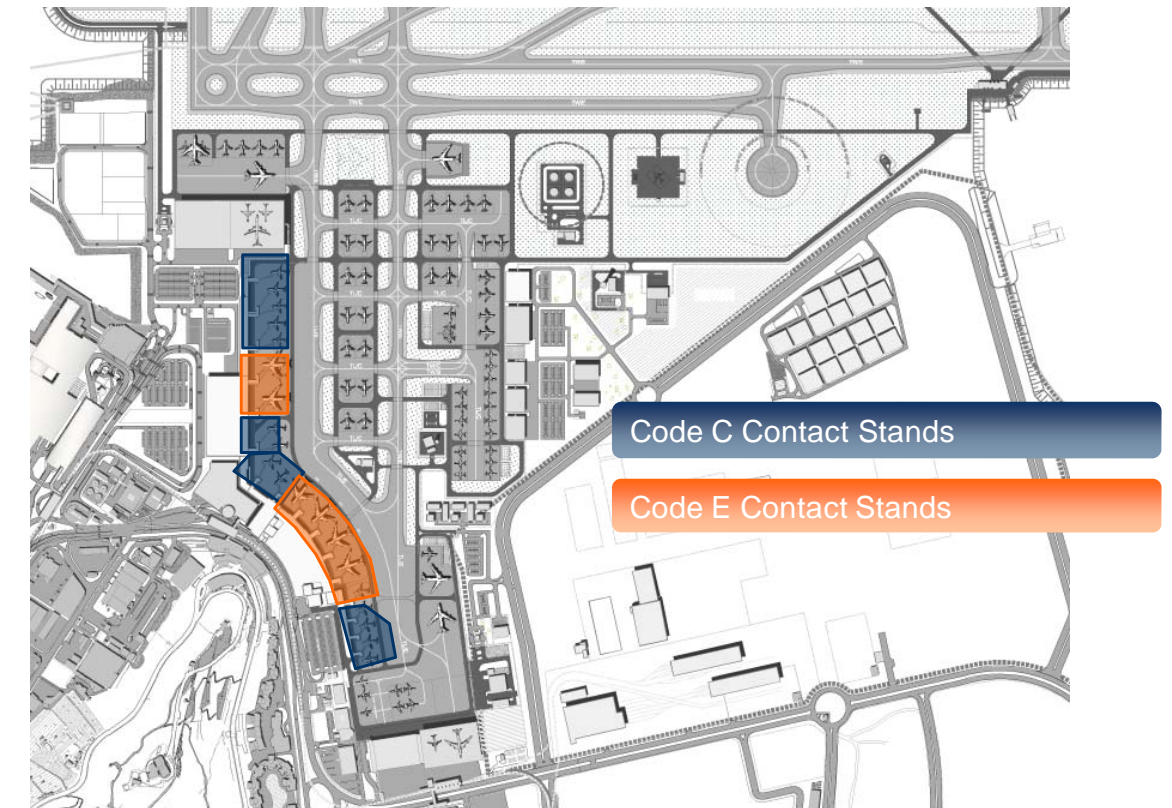
## 6.2 Passenger Apron

### • Contact Stands Description

- Phase 7 Mpax will add a southern concourse to the PTB adding 2 Code C contact stands, and a small extension of the PTB on the northern side for more boarding lounges adding 2 Code C contact stands and 1 Code C false contact stand. Thus, there can be 6 Code C and 2 Code E contact stands. In this configuration there are 3 Code C false contact stands along the PTB frontage. Indeed in this configuration, 2 Code E contact stands are used by 2 code C contact stands and 2 code C false contact stands.
- Phase 11 Mpax will add 8 Code C and 1 Code E aircraft contact stands and 1 Code C false contact stand. Thus, there can be 12 Code C, 5 Code E contact stands, and 1 Code C false contact stand.
- Phase 15 Mpax will add 1 Code C and 1 Code E aircraft contact stands. Thus, there can be 13 Code C, 6 Code E stands, and 1 Code C false contact stand.

Contact stands in the southern side of the PTB can be used as false contact stands for low cost carriers. The planning assumptions will need to be refreshed in the coming years to determine the best facility to plan in the northern side. Figure 8 describes contact stands locations at Phase 15 Mpax.

Figure 8: Contact Aircraft Stands



Source: ADPI Analysis

### • Remote Stands Description

Phase 7 Mpax will present 15 Code C and 3 Code E aircraft remote stands. Among these remote stands, 4 will be located on a new apron in the middle of the airfield, north of the existing ATCT.

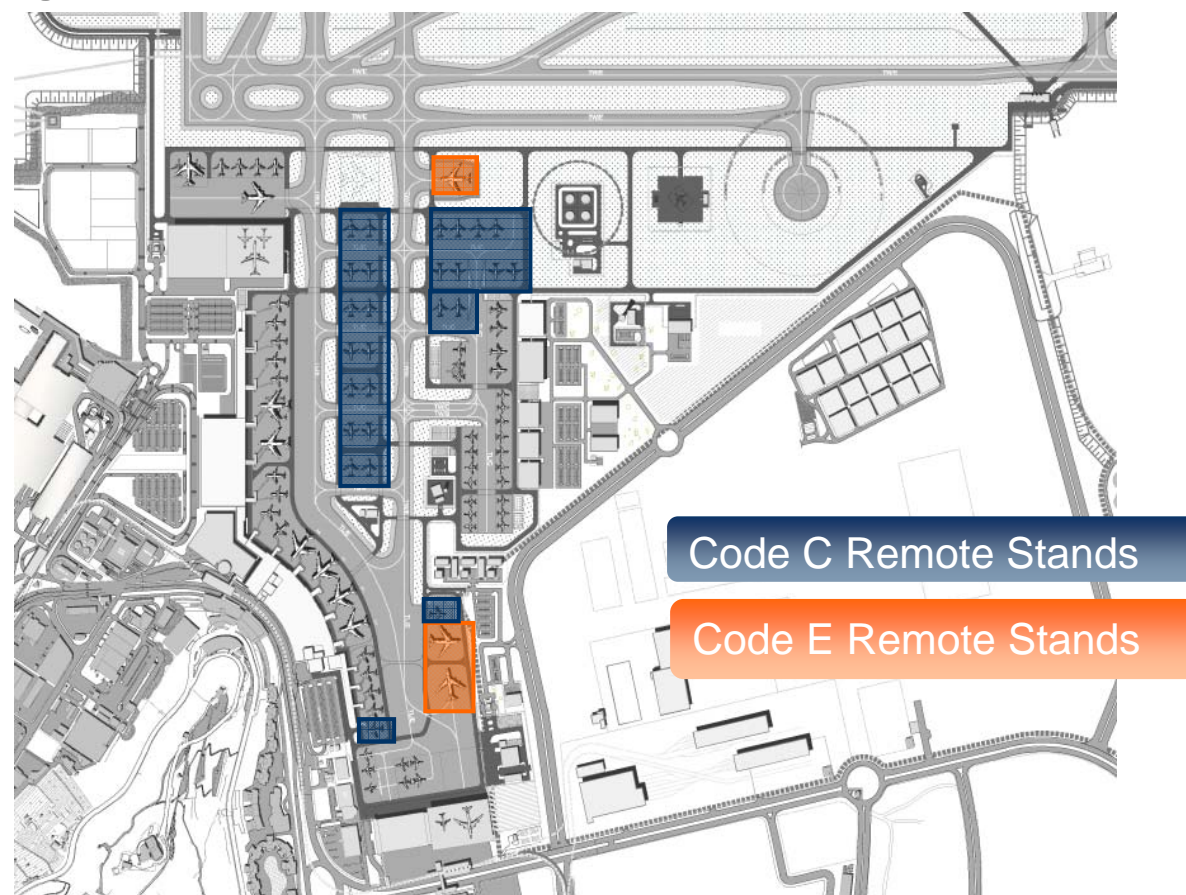
Phase 11 Mpax will present 17 Code C and 3 Code E aircraft remote stands.

Phase 15 Mpax will add 8 Code C aircraft remote stands.

Figure 9 describes remote stands at Phase 15 Mpax.



Figure 9: Remote Aircraft Stands



Source: ADPI Analysis

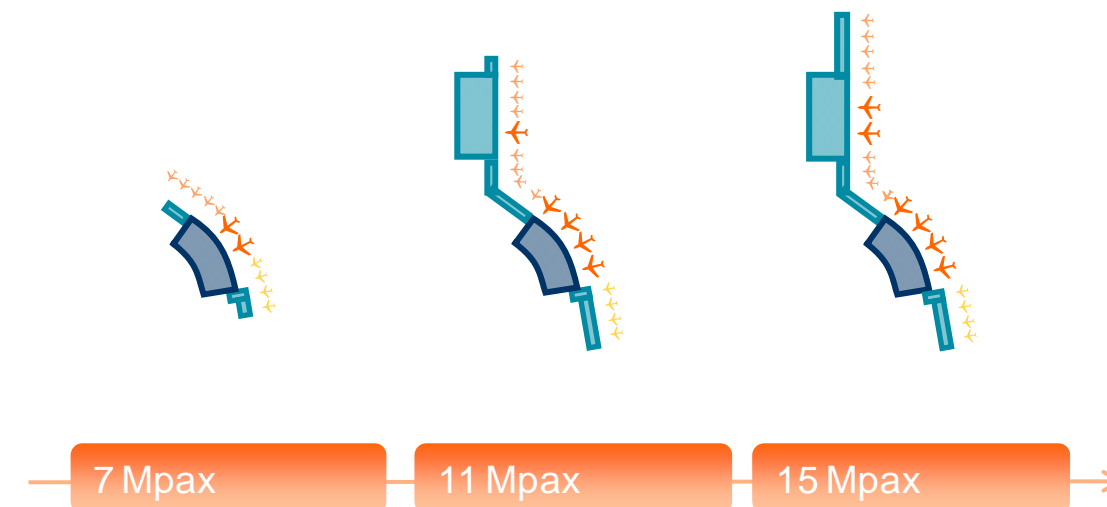
## 6.3 Passenger Terminal Building

- **Phasing**

Figure 10 presents the PTB development at each phase chosen for the Master Plan. The exact PTB configuration must be subject to further study when appropriate, and committing decision developments can be deferred until deemed really necessary (at least until Phase 7Mpax is completed).

- Phase 7 Mpax will add two concourses: At its southern side, a 80 m-long concourse will be built. At its northern side, a similar concourse will accommodate two additional boarding bridges.
- Phase 11 Mpax will add a new processor in a new terminal when needed, north east of the existing one. This one will be built at the extremity of a connecting concourse.
- Phase 15 Mpax will dispose a 200 m-long concourse at the new PTB eastern side.

Figure 10: Passenger Terminal Building Development



Source: ADPI Analysis

- **PTB Improvements in Phase 1 (7Mpax)**

According to the Demand Capacity Analysis, for the traffic volume of 7Mpax, there would need to be an additional 3,750 m<sup>2</sup> of boarding area, on top of the existing 7,500 m<sup>2</sup> (i.e. a 50% increase).

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
 This presentation is confidential to and the property of ADPI. Copying, reproduction, retention or disclosure to any unauthorized person, either wholly or in part without the prior written consent of ADPI.



The additional demand may be partially or fully accommodated in extensions of the PTB in the southern side and in the northern side. Such extension may be considered in conjunction with enhancements to the arrival passport facilities, airside bus maneuvering area, and car park reconfiguration in order to plan for a coherent extension.

Field observations, supplemented by discussions with stakeholders indicate that such extension should ideally be implemented as soon as possible, after appropriate design studies and upon availability of funds.

The exact design of such extension requires more in-depth analysis, which is beyond the scope of the current study.

## 6.4 General Aviation Facilities

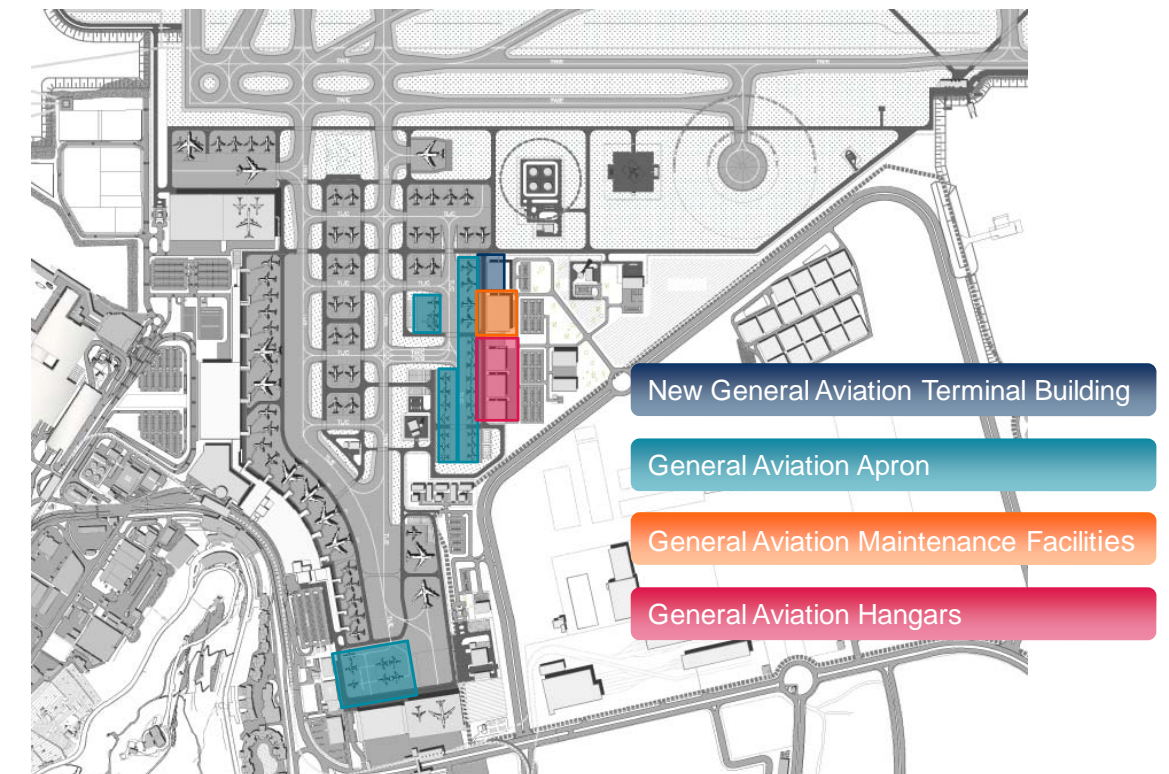
General aviation is an important part of MFM development strategy. The development of dedicated facilities is highly significant to serve the needs of High Net Worth Individuals.

Thus, brand-new general aviation facilities will be planned on the western and the southern sides of the apron area. The southern side is made available after the demolition of taxiway C1.

Furthermore, this location provides good provisions for later strategic expansion beyond the planning period or in case of unexpected growth of general aviation traffic at Macau International Airport.

Figure 11 presents the Phase 15 Mpax planned General Aviation facilities.

Figure 11: General Aviation Facilities Locations



Source: ADPI Analysis



It must be kept in mind that their development should be made following an as-needed basis. The commitment of developing one facility should be made if the demand materializes and it is likely that the operators will bear a significant portion of the required investments.

The proposed phasing should then be updated based on later general aviation development. This implies:

- At first, general aviation stands can reuse parts of the plot land occupied by cargo apron.
- Then, when the demand materializes, when land is reclaimed on former taxiway C1 and when the investment conditions are favorable, general aviation facilities can further expand around the existing ATCT and just south east of the cargo facilities.

Based on these remarks, the proposed phasing consists of the following developments.

In Phase 7 Mpax, general aviation stands can reuse parts of the plot land occupied by cargo apron.

In Phase 11Mpax, a new General Aviation terminal building will be located south of the airport on newly reclaimed land. The terminal will be served by a new access loop that will be dedicated to business passengers. This facility is sized according to Phase 15 Mpax requirements as its construction cannot be split regarding its size.

A new aircraft maintenance facility will be planned west of the new General Aviation building. This facility will be designed to house the specific needs of General Aviation aircraft. Car parks will also be planned to accommodate aircraft maintenance employees.

2 Code C aircraft stands will be located in front of the terminal, 2 Code C aircraft stands will be located in front of the maintenance hangar and Code B aircraft stands will be added.

In addition, three new hangars will be developed next to General Aviation terminal and maintenance hangar with associated car parks. Code B aircraft stands will be planned in front of these hangars. Some of these stands will be located on existing apron that will be reconfigured, thereby increasing the utilization of the current resources. This will allow for early improvements of the capacity of the General Aviation. The space reservation is flexible, such that those three land plots can be well used for maintenance hangar or as a general terminal operated by new FBOs.

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 30/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



## 7 Environmental Assessment

### 7.1 Noise Assessment

As populations and airports expand, airport noise has become an increasingly important issue for the airport surrounding communities. The perception of airport noise typically depends upon the airport activity level, the aircraft types in use, the prevalent wind directions, and the terrain configuration. Varying degrees of noise levels can be visualized by means of noise contours that delineate areas within which a certain level of noise is perceived on the ground.

The Noise Exposure Maps (NEM) are designed to identify an airport's present and future noise patterns as well as land uses which are not compatible with those noise patterns. Airport's NEM serves as a standard reference to the airport's existing and future noise exposure for anyone proposing sensitive development in the vicinity of the airport.

The noise assessment study was conducted in several steps:

- Summarizing the airport main characteristics (runway length and elevation, mean temperature, wind coverage, etc.);
  - Analyzing and forecasting the existing and future airport operations;
  - Defining the typical flight tracks for each runway for each time frame;
  - Using the fleet mix to assign flights per aircraft type to each flight track;
  - Computing the noise exposure contour.
- **Noise Metric: Noise Exposure Forecast (NEF)**

The Noise Exposure Forecast (NEF) expressed in dB provides a representation of the noise levels averaged over a 24-hour period (as opposed to a noise metric for instantaneous noise level). The NEF metric incorporates a weighting factor which effectively imposes a 12.2 dB penalty on sound occurring between 10 pm and 7 am. This corresponds to a nighttime event multiplier of 16.7 (i.e. one night operation is considered equivalent to 16.7 daytime operations).

Noise Exposure Maps (NEM) are depicted in the Chapter "Master Plan Drawings" on the following drawings:

- **Noise Exposure Forecast - 2010**
  - **Noise Exposure Forecast - 2020**
  - **Noise Exposure Forecast - 2030**
- **Land Use Compatibility**

According to the Hong Kong Planning Standards and Guidelines (HKPSG), all land uses are considered acceptable if they fall outside the 25 NEF contour.

Table 15: Land Use Compatibility Matrix

Acceptable Uses	Noise Exposure Forecast : NEF
All domestic premises including temporary housing accommodation	25
Hotels and hostels	25
Offices	30
Educational institutions including kindergartens, child care centres and all others where unaided voice communication is required	25
Places of public worship and courts of law	25
Hospitals, clinics, - diagnostic rooms - wards convalescences and residential care homes for the elderly	25
Amphitheatres, and auditoria, libraries, performing arts centres and Country Parks	depends on use, extent and construction

Source: Hong Kong Planning Standards and Guidelines, March 2011 Chapter 9.4

### 7.2 Water flow assessment

The Pearl River Hydraulics Research Institute, as requested by the Marine Administration, conducted a study for the resolution and planning on the water areas in the west of MFM

runway. The research involved studying various water hydraulic aspects, including the influence to the water environment due to the coast line change of the west water areas and accordingly suggested three alternatives for the land reclamation of the water areas west of MFM runway as shown in Figure 12.

**Figure 12: Three Alternatives of Land Reclamation of the Water Areas West of MFM Runway**



The report recommended the alternative 3 as it is comparatively more competitive regarding sources utilization, dredging of accumulated marine mud in the waterway, less polluted water areas and tidal effects, etc.

The reclamation suggested in this Master Plan aligns with this alternative 3.

### 7.3 Wastewater treatment

The wastewater discharged from the facilities of MFM is mainly treated by Taipa Wastewater Treatment Plant with design capacity of 70,000 m<sup>3</sup> per day. Minority is first treated by the wastewater treatment facility (design capacity of 685 m<sup>3</sup> per day) in MFM, and then delivered to the Taipa Wastewater Treatment Plant.

By extrapolation using the passenger number of 4.25 million and average daily amount of treated wastewater by MFM of 155 m<sup>3</sup> in 2009, the estimated demand in 2030 is about 547m<sup>3</sup>. The MFM wastewater treatment is capable to handle this demand. Meanwhile, this Master Plan reserves sufficient areas to build utilities facilities to accommodate the future demand required, such as wastewater treatment, generators and pumping stations, etc.

### 7.4 Other Environmental Considerations

This part highlighted issues that should be taken into account during the airport development process in order to reduce its environmental impacts. After a review of the airport context, it emphasized on the following topics:

- site preservation,
- energy,
- water,
- and waste.

As presented in the plans of airport concessionaire CAM, MFM airport pledges to address this topic by implementing a “Green Airport” strategy.

The Green Airport strategy consists in adopting “environmental protection concepts during the infrastructure construction, operation and maintenance, emphasizing environmental protection, energy saving and carbon reduction, to optimize the use of resources and asset management, simplify the working procedures and, as a sub product, also increase profitability”.

Objectives have been set to effectively apply a Green Airport strategy for a five-year plan:

- Reduction of energy usage per m<sup>2</sup> by 20% and emissions by 5,000 tons of greenhouse gas
- Supply of 3 to 5% of electrical power from clean renewable sources
- Adoption of policy to run 75% of vehicle fleet with alternative fuel
- Adoption of water recycling for irrigation
- Implementation of facility management with measurable standards for sustainable development
- Application of international certification system LEED - Leadership in Energy and Environmental Design, for new construction or extension of buildings.
- Cooperation with the newly created Government Department for Environmental Protection

The strategy focuses also on green purchasing policy, terminal air quality, and waste reduction and recycling.

The following lists the key recommendations that should be adopted in planning and pre-design phases, in accordance with the Green Airport Strategy:

<b>Site preservation</b>
Assess disturbances associated with construction of reclaimed land
Coordinate early with other governmental entities and communities for mitigation
Implement during operational phase adequate management plan
<b>Energy</b>
Measure airport performance through carbon footprint and air quality stations
Integrate energy into design considerations
Reduce energy usage with management procedures
Gain recognition by participating in carbon accreditation program
<b>Water</b>
Assess airport water needs
Recycle grey water and rain water
Ensure that discharged water have required quality
<b>Waste</b>
Implement waste management strategy
Implement selective waste collection
Select waste contractor on performance criteria



## 8 Economic Benefits

### 8.1 Contribution to Macao's Economy

The economic benefits of the project may come from the expenditure of foreign visitors, measured as the average expenditure per foreign visitor.

In order to estimate the contribution of overnight tourists to Macao's economy, the number of such tourist is multiplied by the average spending per capita based on historical DSEC statistics. The estimation of future spending of overnight tourists assumes a 4% annual increase of the average spending per capita based on the expected annual increase of world GDP per capita per IMF after 2017 (International Monetary Fund).

According to DSEC statistics, in 2014 spending per overnight visitors was 3,493 MOP.

Table 16 shows the airport revenues and visitor expenditures in the development phases.

Table 16: Overnight Visitors Spending (arriving via Macao Airport)

in thousands	2015	2020	2025	2030	2040
Hotel Guests coming from MFM (in thousands)	1,655	2,125	2,596	3,127	4,370
Annual Growth %	7.6%	4.4%	4.1%	3.8%	3.4%
Spending per overnight visitors (MOP)	3,633	4,420	5,377	6,542	9,684
Annual Growth %	4.0%	4.0%	4.0%	4.0%	4.0%
Overnight Visitors spending (thousand MOP)	6,010,943	9,391,318	13,960,612	20,456,991	42,344,790

### 8.2 Contributions to Government Revenue

As for any government, Macao Government revenue is generated through the levy of different taxes and mandatory contribution. At an aggregate level and in order to approximate annual government revenue generation a "macro" ratio representing the share of the country's GDP that is derived into government' revenues. This macro ratio directly indicates the expected additional revenues a government can collect for each additional unit of GDP. This indicator is typically used by the International Monetary Fund (IMF) to estimate future Government Revenues.

Based on DSEC statistics of GDP and annual government revenue, it is possible to estimate the share of GDP that represent the government revenues. As detailed in the following table, on the 2011-2013 period, government revenues represent on average 37.7% of Macao's GDP.

	billion MOP	2013	2012	2011	average
Macao GDP		413.471	348.2	295	
Government revenue		155.51	129.5	112.72	
% of GDP		37.6%	37.2%	38.2%	37.7%

Therefore considering this figure constant overtime, it is possible to estimate the contribution to government revenue of the Airport activity through its contribution to Macao's Economy and contribution from construction jobs. Based on results described in the previous section, the following table details the contribution to the government revenue. In addition to the previous item the corporate tax paid by CAM is directly accounted as government revenue.

	MOP million	2015	2020	2025	2030	2035	2040	Annual Average	Total
Contribution to Government Revenue		2,574	3,912	5,748	8,288	11,904	17,069	7,927	206,092
from CAM's Corporate tax		38	42	89	101	227	441	137	3,561
from Tourist Spending		2,264	3,536	5,253	7,694	11,083	15,909	7,325	190,455
from Employees Payroll		272	334	406	493	595	719	464	12,076

Over the 2015-2040 period, the airport development will contribute to more than 200 billion MOP (after inflation) to Government revenue through its contributions to Macao Economy. On average the contribution to Government revenues will be almost 8 billion MOP annually (after inflation). This assessment does not include governmental revenues that could be generated through airport construction.

Those figures need to be examined in regards to the land reclamation cost to be borne by Macao's Government and which is around 5.8 billion MOP (after inflation).

In conclusion the development of Macau International Airport will largely contribute to the local economy and its contribution will exceed the initial cost of land reclamation.

### 8.3 Airport Construction Jobs Creation

Based on cost estimates (in 2015 value) planned for Macau International Airport, a number of airport construction jobs opportunities can be derived. Those jobs opportunities cover

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copying, reproduction, retention or disclosure to any unauthorised person, either wholly or in part without the prior written consent of ADPI.





constructions that will be financed by CAM, by Macau Government and third party to develop the Airport.

Taking reference to the airport construction job statistics provided by the airport concessionaire and using the assumption of construction period of 36 months, it was estimated that approximately 5,500 jobs will be generated from the three development phases.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 36/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

## Master Plan Drawings

---

THIS PAGE INTENTIONALLY LEFT BLANK

1. Existing Layout
2. Existing Layout with Proposed Apron Configuration
3. Panoramic View - Existing Layout
4. Sitting Plan - Existing Layout
5. Master Plan - Phase 1
6. Master Plan - Phase 2
7. Master Plan - Ultimate Phase
8. Noise Exposure Forecast - 2010
9. Noise Exposure Forecast - 2020
- 10.Noise Exposure Forecast - 2030



THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 40/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

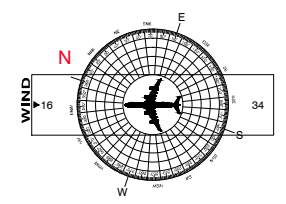
# Master Plan - Existing Layout

0 100 200 300 400 500m



A - AIRFIELD FACILITIES	
A-01	Runway
A-02	Taxiway
A-05	Airside Service Road
A-06	Airport Traffic Control Tower
A-09	Localizer
A-10	Glideslope
A-12	VOR
A-19	PAPI
A-22	Approach Lighting System
A-23	Windsock
B - PASSENGER FACILITIES	
B-01	Passenger Terminal Building
B-20	V.I.P. Hall
C - CARGO FACILITIES	
C-01	Cargo Terminal Building
C-08	Logistic Cargo
D - AIRPORT SUPPORT FACILITIES	
D-04	Security Fence
D-05	Security Checkpoint
D-09	Main Fire and Rescue Station
D-10	Sub Fire Station
D-12	Sea Rescue Facility
D-16	Engineering Building
D-31	Boat House
E - AIRLINE SUPPORT FACILITIES	
E-01	Aircraft Maintenance Hangar
E-06	GSE Storage Area
E-08	GSE Fuel Station
E-09	SERVAIR Flight Catering Facilities
E-10	NKCHEM Fuel Farm
E-17	Sanitation Building
F - AIRPORT ACCESS	
F-01	Main Access Road
F-04	Passenger Terminal Curbside
F-05	Passenger Car Park Contact
F-08	Employee Car Park
F-11	Bus Station
F-14	Train Station
F-17	Light Train Railway
F-23	Future Taipa Ferry Terminal
F-24	Temporary Pac-on Ferry Terminal
G - AIRPORT UTILITIES	
G-02	Electrical Substation
G-06	Water tank & Pump House
G-09	Water Reservoir
G-13	Wastewater Treatment Facilities
H - OTHER AVIATION RELATED	
H-01	General & Business Aviation Center
H-02	General Aviation Hangar
H-03	General Aviation Apron
I - AIRPORT CITY	
I-11	Future Land Reclamation

N:\PROJECTS\42114793 - PLANS\SHEET FILES\0-VPPM\FME0300\_2014.DWG



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.

DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 42/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE



THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 44/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

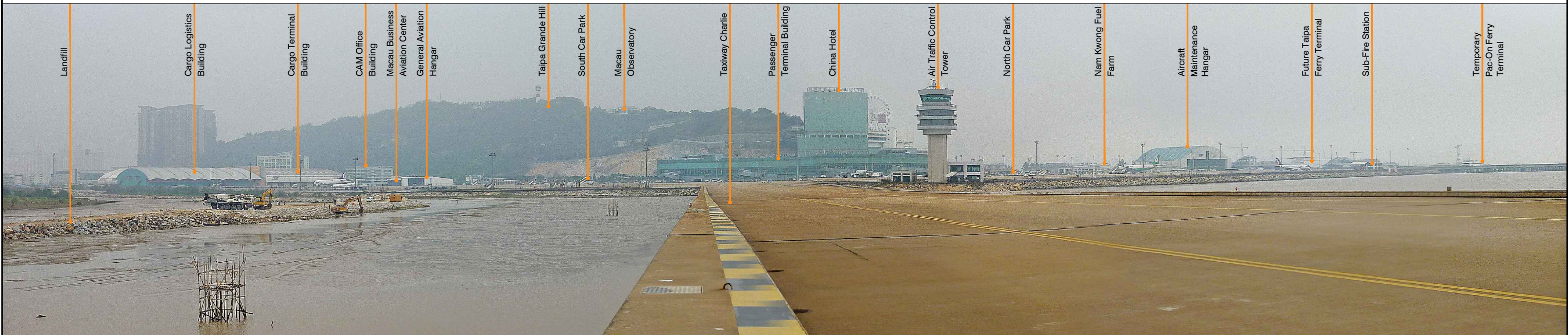


澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

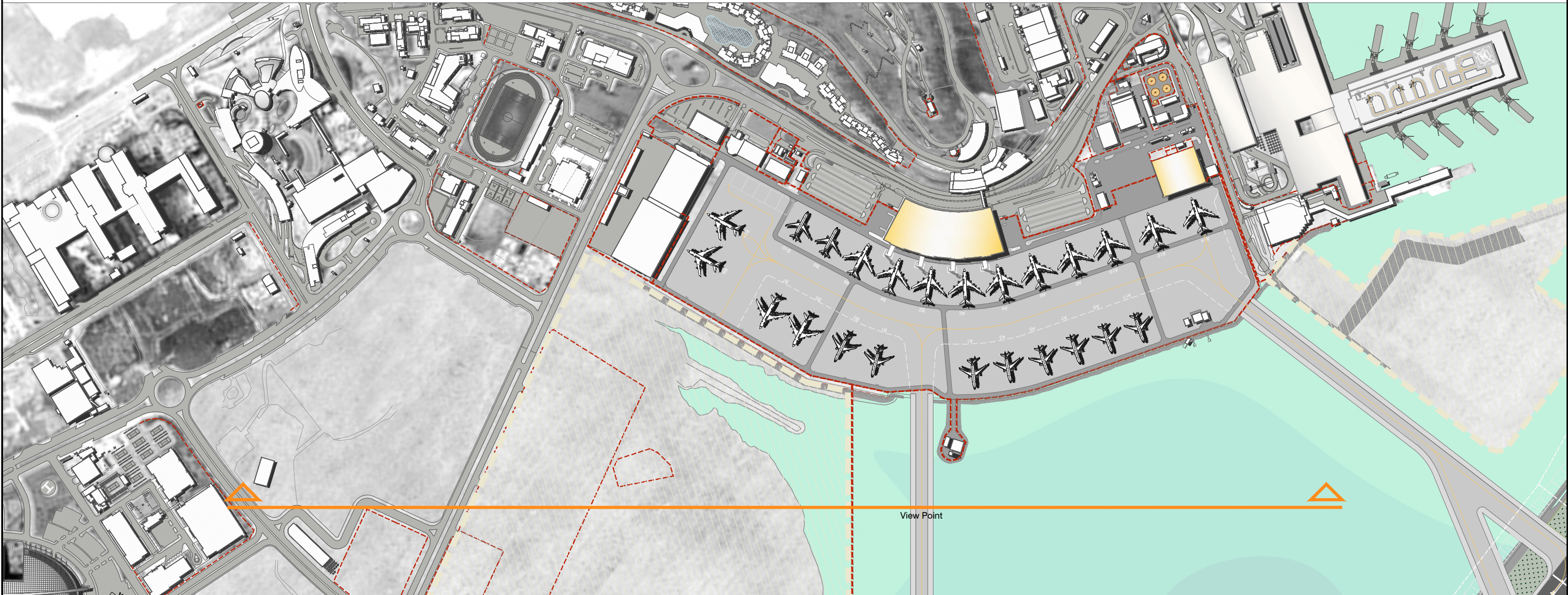
DKMA

adpi MORE VALUE

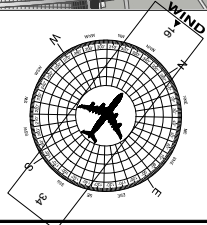
# Panoramic View - Existing Layout



PANORAMIC VIEW TAKEN AT THE CONNECTING TW VIEWING MACAO INTERNATIONAL PASSENGER TERMINAL BUILDING



N:\PROJECTS\4211479\3 - PLANS\VIEW SHEET FILES\0-VAPMFM0301.DWG



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 46/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

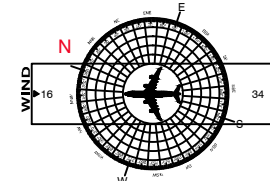
adpi MORE VALUE

# Siting Plan - Existing Layout 2014



N:\PROJECTS\4211479\3 - PLANS\SHEET FILES\0-VPAMFME0300.DWG

## Macau International Airport Master Plan



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 48/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

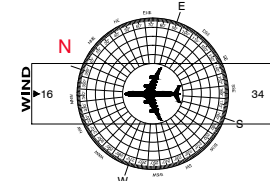
# Master Plan - Phase 1

7Mpax



A - AIRFIELD FACILITIES	
A-01	Runway
A-02	Taxiway
A-05	Airside Service Road
A-06	Airport Traffic Control Tower
A-12	VOR
A-19	PAPI
B - PASSENGER FACILITIES	
B-01	Passenger Terminal Building
B-05	Passenger Terminal Apron
B-06	Passenger Aircraft Stand Contact
B-07	Passenger Aircraft Stand Remote
B-08	Passenger Aircraft Stand Long-Stay
B-20	V.I.P Hall
C - CARGO FACILITIES	
C-01	Cargo Terminal Building
C-08	Logistic Cargo
D - AIRPORT SUPPORT FACILITIES	
D-01	Airport Police Facilities
D-04	Security Fence
D-05	Security Checkpoint
D-09	Main Fire and Rescue Station
D-10	Sub Fire Station
D-11	Fire Training Facilities
D-12	Sea Rescue Facility
D-16	Engineering Building
D-17	Landscape Maintenance
D-22	Meteorological Garden
D-24	Airport Authority Facilities
D-28	Medical Centre
E - AIRLINE SUPPORT FACILITIES	
E-01	Aircraft Maintenance Hangar
E-05	Engine Run-up Pad
E-06	GSE Storage Area
E-07	GSE Maintenance Area
E-09	Flight Catering Facilities
E-10	Aircraft Fueling Facilities
F - AIRPORT ACCESS	
F-01	Main Access Road
F-02	Secondary Access Road
F-04	Passenger Terminal Curbside
F-05	Passenger Car Park Contact
F-08	Employee Car Park
F-11	Bus Station
F-12	Rental Car Facilities
F-14	Train Station
F-17	Light Rail Transit Station
G - AIRPORT UTILITIES	
G-02	Electrical Substation
G-09	Water Reservoir
G-13	Wastewater Treatment Facilities
G-23	Miscellaneous Airport Utilities
H - OTHER AVIATION RELATED FACILITIES	
H-01	General Aviation Terminal Building
H-02	General Aviation Hangar
H-03	General Aviation Apron
H-13	Helicopter Maintenance Facilities
H-14	Helipad
I - AIRPORT CITY	
I-10	Stragic Land Reserve

N:\PROJECTS\4211479\3 - PLANS\W\SHEET FILES\0-VPPMFM10320.DWG



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

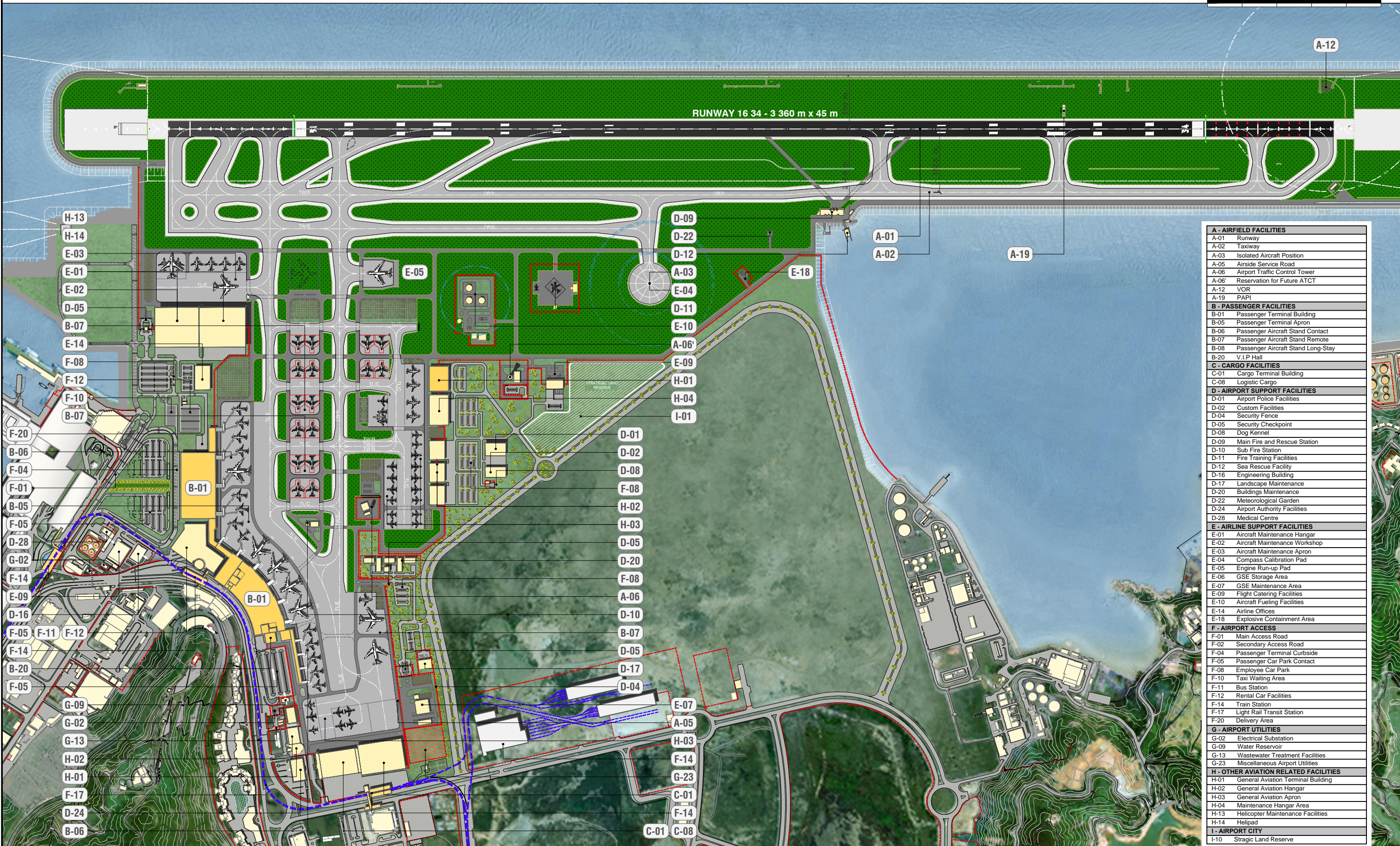
ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



# Master Plan - Phase 2

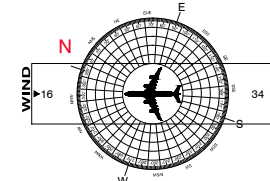
11Mpax

0 100 200 300 400 500m



A - AIRFIELD FACILITIES	
A-01	Runway
A-02	Taxiway
A-03	Isolated Aircraft Position
A-05	Airside Service Road
A-06	Airport Traffic Control Tower
A-06'	Reservation for Future ATCT
A-12	VOR
A-19	PAPI
B - PASSENGER FACILITIES	
B-01	Passenger Terminal Building
B-05	Passenger Terminal Apron
B-06	Passenger Aircraft Stand Contact
B-07	Passenger Aircraft Stand Remote
B-08	Passenger Aircraft Stand Long-Stay
B-20	V.I.P Hall
C - CARGO FACILITIES	
C-01	Cargo Terminal Building
C-08	Logistic Cargo
D - AIRPORT SUPPORT FACILITIES	
D-01	Airport Police Facilities
D-02	Custom Facilities
D-04	Security Fence
D-05	Security Checkpoint
D-08	Dog Kennel
D-09	Main Fire and Rescue Station
D-10	Sub Fire Station
D-11	Fire Training Facilities
D-12	Sea Rescue Facility
D-16	Engineering Building
D-17	Landscape Maintenance
D-20	Buildings Maintenance
D-22	Meteorological Garden
D-24	Airport Authority Facilities
D-28	Medical Centre
E - AIRLINE SUPPORT FACILITIES	
E-01	Aircraft Maintenance Hangar
E-02	Aircraft Maintenance Workshop
E-03	Aircraft Maintenance Apron
E-04	Compass Calibration Pad
E-05	Engine Run-up Pad
E-06	GSE Storage Area
E-07	GSE Maintenance Area
E-09	Flight Catering Facilities
E-10	Aircraft Fueling Facilities
E-14	Airline Offices
E-18	Explosive Containment Area
F - AIRPORT ACCESS	
F-01	Main Access Road
F-02	Secondary Access Road
F-04	Passenger Terminal Curbside
F-05	Passenger Car Park Contact
F-08	Employee Car Park
F-10	Taxi Waiting Area
F-11	Bus Station
F-12	Rental Car Facilities
F-14	Train Station
F-17	Light Rail Transit Station
F-20	Delivery Area
G - AIRPORT UTILITIES	
G-02	Electrical Substation
G-09	Water Reservoir
G-13	Wastewater Treatment Facilities
G-23	Miscellaneous Airport Utilities
H - OTHER AVIATION RELATED FACILITIES	
H-01	General Aviation Terminal Building
H-02	General Aviation Hangar
H-03	General Aviation Apron
H-04	Maintenance Hangar Area
H-13	Helicopter Maintenance Facilities
H-14	Helipad
I - AIRPORT CITY	
I-10	Stragic Land Reserve

## Macau International Airport Master Plan



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

N:\PROJECTS\4211479\3 - PLANS\MSHEET FILES\0-VPPMFM20320.DWG

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



# Master Plan - Ultimate Phase

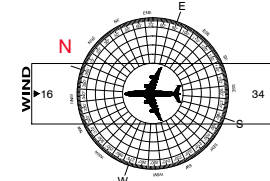
15Mpax

0 100 200 300 400 500m



A - AIRFIELD FACILITIES	
A-01	Runway
A-02	Taxiway
A-03	Isolated Aircraft Position
A-05	Airside Service Road
A-06	Airport Traffic Control Tower
A-06'	Reservation for Future ATCT
A-12	VOR
A-19	PAPI
B - PASSENGER FACILITIES	
B-01	Passenger Terminal Building
B-05	Passenger Terminal Apron
B-06	Passenger Aircraft Stand Contact
B-07	Passenger Aircraft Stand Remote
B-08	Passenger Aircraft Stand Long-Stay
B-20	V.I.P. Hall
C - CARGO FACILITIES	
C-01	Cargo Terminal Building
C-08	Logistic Cargo
D - AIRPORT SUPPORT FACILITIES	
D-01	Airport Police Facilities
D-02	Custom Facilities
D-04	Security Fence
D-05	Security Checkpoint
D-08	Dog Kennel
D-09	Main Fire and Rescue Station
D-10	Sub Fire Station
D-11	Fire Training Facilities
D-12	Sea Rescue Facility
D-16	Engineering Building
D-17	Landscape Maintenance
D-20	Buildings Maintenance
D-22	Meteorological Garden
D-24	Airport Authority Facilities
D-28	Medical Centre
E - AIRLINE SUPPORT FACILITIES	
E-01	Aircraft Maintenance Hangar
E-02	Aircraft Maintenance Workshop
E-03	Aircraft Maintenance Apron
E-04	Compass Calibration Pad
E-05	Engine Run-up Pad
E-06	GSE Storage Area
E-07	GSE Maintenance Area
E-09	Flight Catering Facilities
E-10	Aircraft Fueling Facilities
E-14	Airline Offices
E-18	Explosive Containment Area
F - AIRPORT ACCESS	
F-01	Main Access Road
F-02	Secondary Access Road
F-04	Passenger Terminal Curbside
F-05	Passenger Car Park Contact
F-08	Employee Car Park
F-10	Taxi Waiting Area
F-11	Bus Station
F-12	Rental Car Facilities
F-14	Train Station
F-17	Light Rail Transit Station
F-20	Delivery Area
G - AIRPORT UTILITIES	
G-02	Electrical Substation
G-09	Water Reservoir
G-13	Wastewater Treatment Facilities
G-23	Miscellaneous Airport Utilities
H - OTHER AVIATION RELATED FACILITIES	
H-01	General Aviation Terminal Building
H-02	General Aviation Hangar
H-03	General Aviation Apron
H-04	Maintenance Hangar Area
H-13	Helicopter Maintenance Facilities
H-14	Helipad
I - AIRPORT CITY	
I-10	Strategic Land Reserve

N:\PROJETS\42114793 - PLANS\MSHEET FILES\0-VPPMFMU0320.DWG



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.

DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

54/60

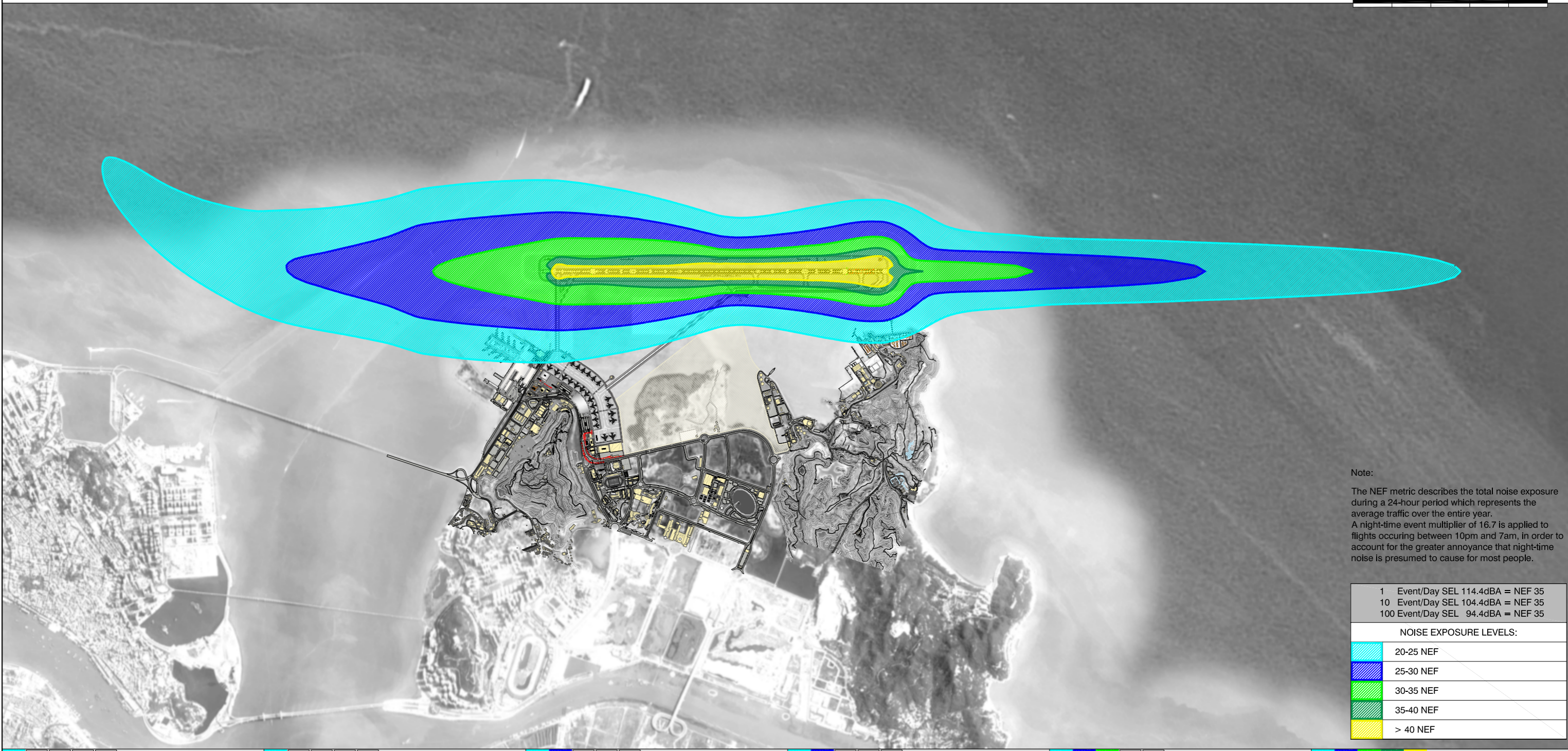
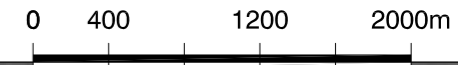


澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

# Noise Exposure Forecast - 2010



**Note:**

The NEF metric describes the total noise exposure during a 24-hour period which represents the average traffic over the entire year. A night-time event multiplier of 16.7 is applied to flights occurring between 10pm and 7am, in order to account for the greater annoyance that night-time noise is presumed to cause for most people.

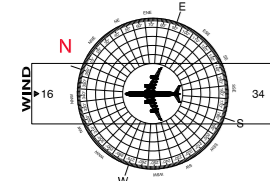
1	Event/Day SEL 114.4dBA = NEF 35
10	Event/Day SEL 104.4dBA = NEF 35
100	Event/Day SEL 94.4dBA = NEF 35
NOISE EXPOSURE LEVELS:	
	20-25 NEF
	25-30 NEF
	30-35 NEF
	35-40 NEF
	> 40 NEF

**RESIDENTIAL      INSTITUTIONAL      RECREATIONAL      COMMERCIAL      INDUSTRIAL      AGRICULTURAL**



LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	
1-2 Family	Y	N	N	N	Place of worship	Y	R	R	N	Outdoor sports arena and spectator sports	Y	Y	Y	N	Offices, business and professional	Y	Y	R	N	Manufacturing, general	Y	Y	Y	R	
Multi-Family	Y	N	N	N	Schools	Y	R	R	N	Golf courses, riding stables, water recreation	Y	Y	R	N	Wholesale and retail	Y	Y	Y	N	Photographic and optical	Y	Y	Y	R	
Mobile Homes	Y	N	N	N	Hospitals	Y	R	R	N	Nature exhibits and zoos	Y	Y	N	N	Utilities	Y	Y	Y	R	Resource production and extraction	Y	Y	Y	Y	
Dorms	Y	N	N	N	Nursing Homes	Y	R	R	N	Amusements, parks, resorts and camps	Y	Y	Y	N	Communication	Y	Y	R	N	Livestock farming and breeding	Y	Y	Y	N	
																				Agriculture and forestry	Y	Y	Y	Y	
																				Mining and fishing	Y	Y	Y	Y	
																					COMPATIBLE	N	INCOMPATIBLE	R	RESTRICTED

## Macau International Airport Master Plan



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

N:\PROJECTS\4211479\_3 - PLANS\3 SHEET FILES\DOSSIER 2015\SHEET FILES\0-VSNMFM10320\_(NOISE EXPOSURE 2010).DWG

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 56/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



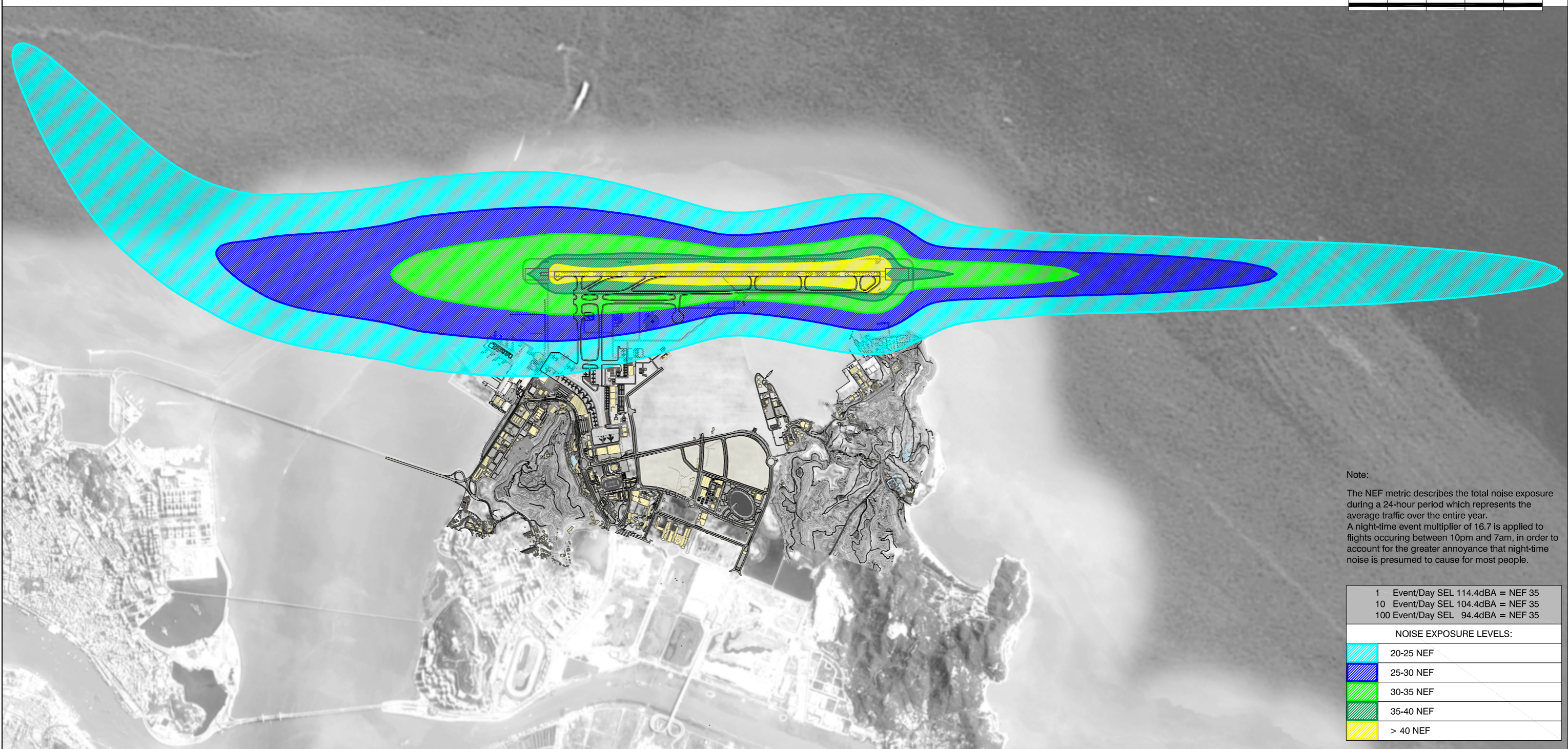
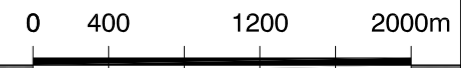
澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

# Noise Exposure Forecast - 2020

7Mpax



**Note:**

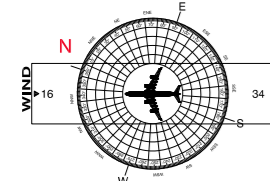
The NEF metric describes the total noise exposure during a 24-hour period which represents the average traffic over the entire year. A night-time event multiplier of 16.7 is applied to flights occurring between 10pm and 7am, in order to account for the greater annoyance that night-time noise is presumed to cause for most people.

1	Event/Day SEL 114.4dBA = NEF 35
10	Event/Day SEL 104.4dBA = NEF 35
100	Event/Day SEL 94.4dBA = NEF 35
NOISE EXPOSURE LEVELS:	
	20-25 NEF
	25-30 NEF
	30-35 NEF
	35-40 NEF
	> 40 NEF

**RESIDENTIAL      INSTITUTIONAL      RECREATIONAL      COMMERCIAL      INDUSTRIAL      AGRICULTURAL**



LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	
1-2 Family	Y	N	N	N	Place of worship	Y	R	R	N	Outdoor sports arena and spectator sports	Y	Y	Y	N	Offices, business and professional	Y	Y	R	N	Manufacturing, general	Y	Y	Y	R	
Multi-Family	Y	N	N	N	Schools	Y	R	R	N	Golf courses, riding stables, water recreation	Y	Y	R	N	Wholesale and retail	Y	Y	Y	N	Photographic and optical	Y	Y	Y	R	
Mobile Homes	Y	N	N	N	Hospitals	Y	R	R	N	Nature exhibits and zoos	Y	Y	N	N	Utilities	Y	Y	Y	R	Resource production and extraction	Y	Y	Y	Y	
Dorms	Y	N	N	N	Nursing Homes	Y	R	R	N	Amusements, parks, resorts and camps	Y	Y	Y	N	Communication	Y	Y	R	N	Livestock farming and breeding	Y	Y	Y	N	
																				Agriculture and forestry	Y	Y	Y	Y	
																				Mining and fishing	Y	Y	Y	Y	
																					COMPATIBLE	N	INCOMPATIBLE	R	RESTRICTED



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

N:\PROJECTS\4211479\_3 - PLANS\SHEET FILES\DOSSIER 2015\SHEET FILES\0-VSNMFM20320\_(NOISE EXPOSURE 2020).DWG

THIS PAGE INTENTIONALLY LEFT BLANK

DISCLAIMER:

ADPI's PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright 58/60 intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part without the prior written consent of ADPI.



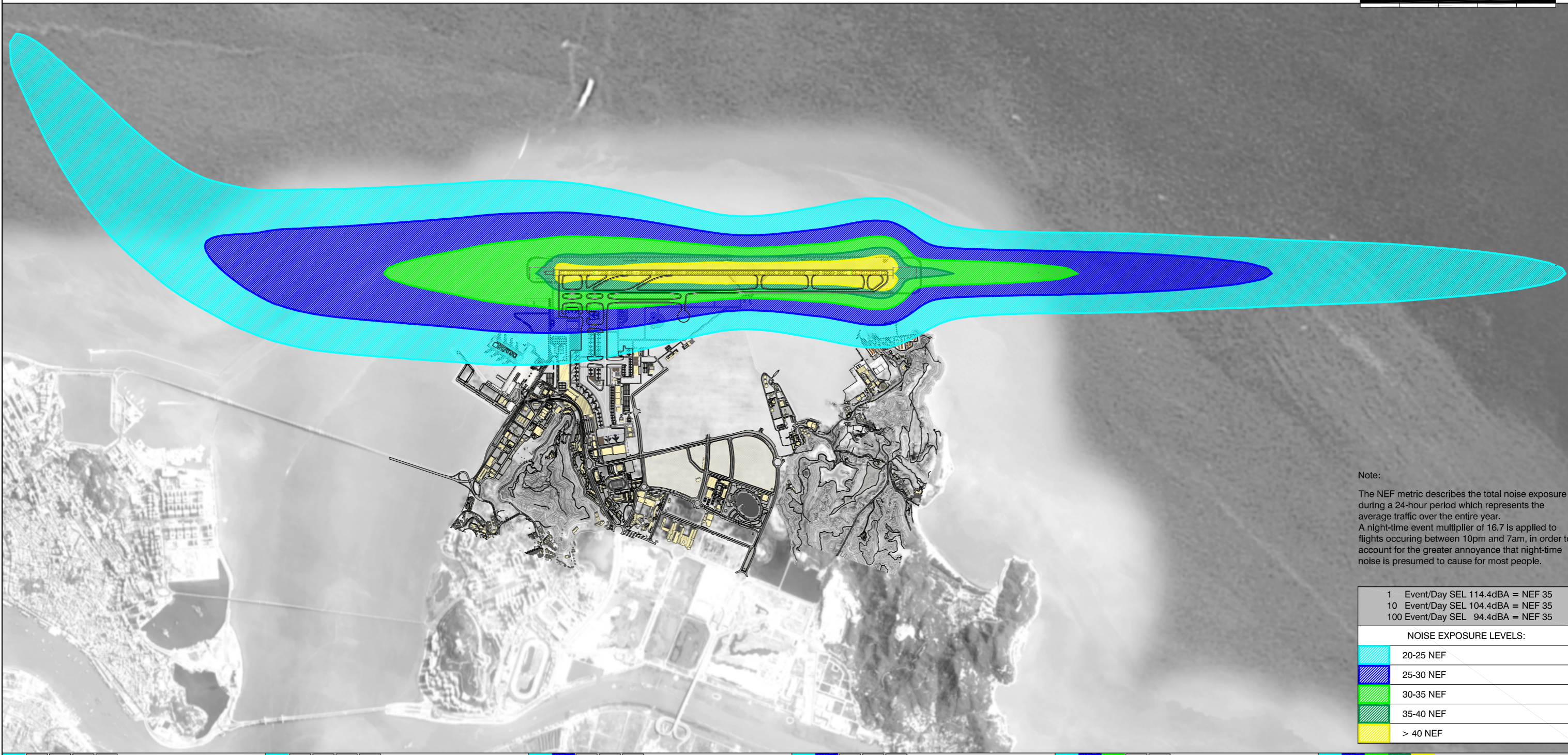
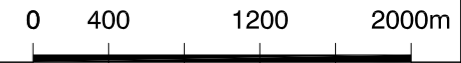
澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

DKMA

adpi MORE VALUE

# Noise Exposure Forecast - 2030

11 Mpax



**Note:**

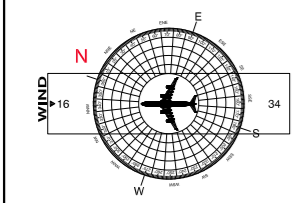
The NEF metric describes the total noise exposure during a 24-hour period which represents the average traffic over the entire year. A night-time event multiplier of 16.7 is applied to flights occurring between 10pm and 7am, in order to account for the greater annoyance that night-time noise is presumed to cause for most people.

1	Event/Day SEL 114.4dBA = NEF 35
10	Event/Day SEL 104.4dBA = NEF 35
100	Event/Day SEL 94.4dBA = NEF 35
NOISE EXPOSURE LEVELS:	
	20-25 NEF
	25-30 NEF
	30-35 NEF
	35-40 NEF
	> 40 NEF

**RESIDENTIAL      INSTITUTIONAL      RECREATIONAL      COMMERCIAL      INDUSTRIAL      AGRICULTURAL**



LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF	LAND USE NOISE SENSITIVITY MATRIX	< 25 NEF	25-30 NEF	30-35 NEF	> 35 NEF
1-2 Family	Y	N	N	N	Place of worship	Y	R	R	N	Outdoor sports arena and spectator sports	Y	Y	Y	N	Offices, business and professional	Y	Y	R	N	Manufacturing, general	Y	Y	Y	R
Multi-Family	Y	N	N	N	Schools	Y	R	R	N	Golf courses, riding stables, water recreation	Y	Y	R	N	Wholesale and retail	Y	Y	Y	N	Photographic and optical	Y	Y	Y	R
Mobile Homes	Y	N	N	N	Hospitals	Y	R	R	N	Nature exhibits and zoos	Y	Y	N	N	Utilities	Y	Y	Y	R	Resource production and extraction	Y	Y	Y	Y
Dorms	Y	N	N	N	Nursing Homes	Y	R	R	N	Amusements, parks, resorts and camps	Y	Y	Y	N	Communication	Y	Y	R	N	Mining and fishing	Y	Y	Y	Y



澳門特別行政區  
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU  
民航局  
AUTORIDADE DE AVIAÇÃO CIVIL  
CIVIL AVIATION AUTHORITY

## Macau International Airport Master Plan

DKMA adpi MORE VALUE



GENERAL NOTES:  
1. Do not scale drawings. Dimensions govern.  
2. All dimensions are in meters unless otherwise noted.  
DISCLAIMER:  
ADPI'S PROPRIETARY AND CONFIDENTIAL  
This presentation is confidential to and the property of ADPI. Copyright and all intellectual property right ownership is reserved by ADPI and the document is issued on the condition that it is not copied, reproduced, retained or disseminated to any unauthorised person, either wholly or in part without the prior written consent of ADPI.

N:\PROJECTS\4211479\_3 - PLANS\SHEET FILES\DOSSIER 2015\SHEET FILES\0-VSNMFM30320\_(NOISE EXPOSURE 2030).DWG

