Jabatan Perancangan Bandar dan Desa
Negeri Johor
(PLANMalaysia Johor)

JOHOR STATE DATA CENTRE DEVELOPMENT PLANNING GUIDELINES

APRIL 2024

These Guidelines have been presented and approved by
The State Planning Committee Meeting (SPC) No. 3/2023; and
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Jabatan Perancangan Bandar dan Desa Negeri Johor
(PLANMalaysia Johor)
Level 1 and 2, Bangunan Dato' Mohamad Salleh Perang
79646 Kota Iskandar, Iskandar Puteri, Johor

Website : https://jpbd.johor.gov.my/
Tel: 07-266 7200/7201 Fax: 07-266 1402/ 290 2112
Email : jpbd@johor.gov.my

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1.0 INTRODUCTION

The rise of data centres has become essential due to the increased use of technology and digital advancements stemming from the Fourth Industrial Revolution (IR 4.0). The significance of data in this era of revolution highlights big data analytics technology as a new digital business model that is becoming the standard in the business world and contributing to the growth of the country's economy.

The State Government has acknowledged, welcomed, and prioritised the challenges posed by the digital world in the context of the State of Johor, where the primary focus is on the planning, development, and implementation of data centres. Consequently, the State Planning Committee Meeting (SPC) No. 2/2023 dated 31 July 2023 has unanimously resolved to prepare the Johor State Data Centre Development Planning Guidelines.

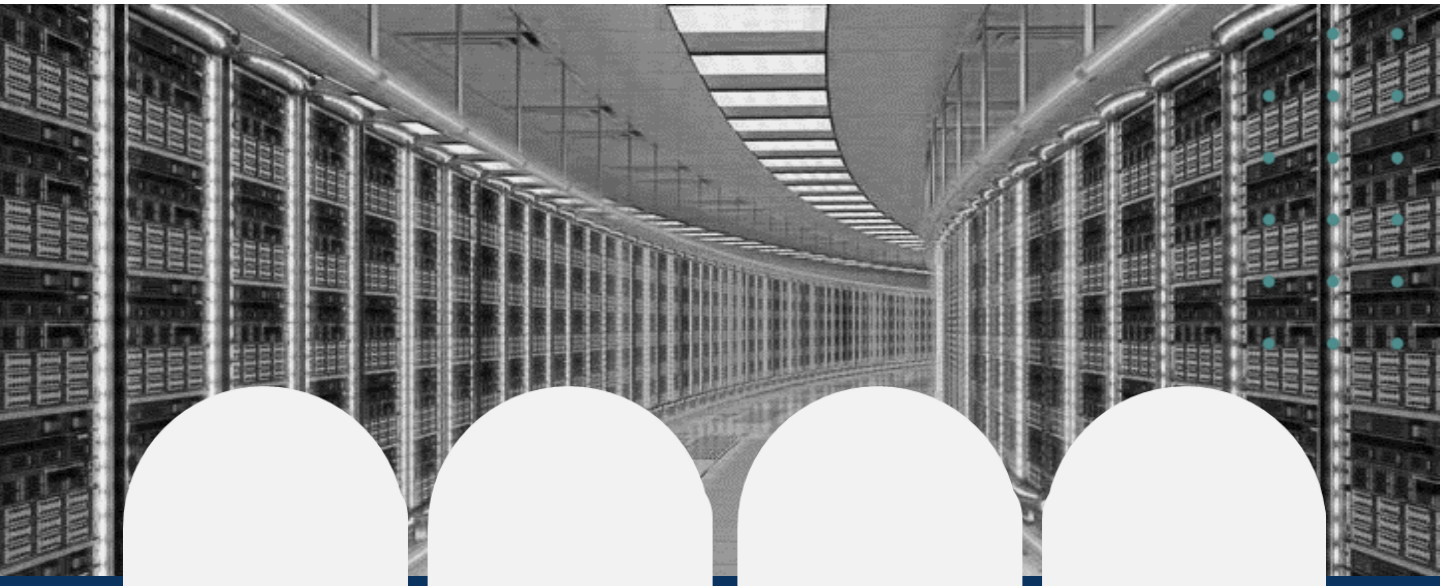
The establishment of these data centres can assist the State Government in achieving the goals outlined in the New Industrial Master Plan (NIMP2030). This includes attracting investors from both domestic and international markets, as well as creating more avenues for growth for small and medium enterprises (SMEs) and generating employment opportunities with better income prospects for the local population.

1.1 AIM

These guidelines serve as a uniform and comprehensive manual and reference for Local Authorities (PBT) and agencies involved in coordinating and monitoring data centre development planning.

1.2 OBJECTIVES

The four (4) objectives outlined in the Johor State Data Centre Development Planning Guidelines are:



01

To provide an understanding of matters related to the data centre

02

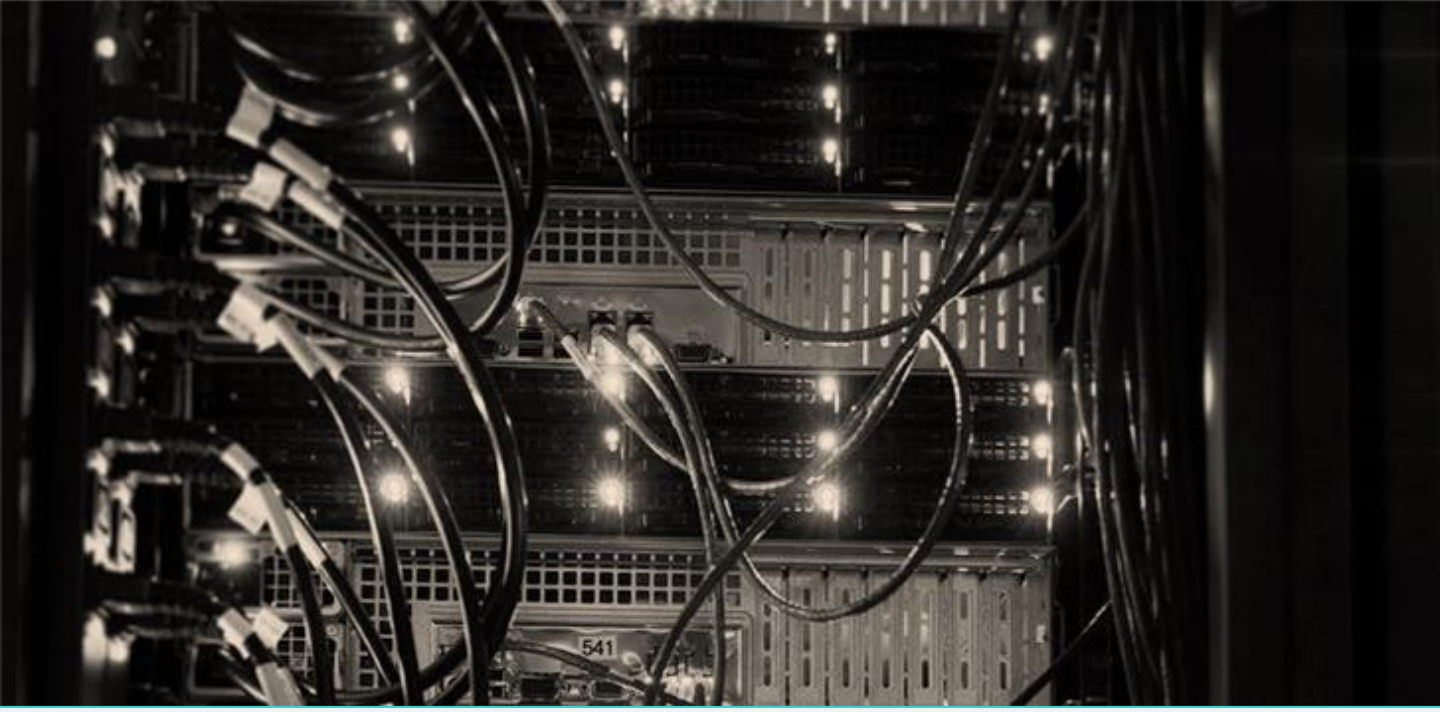
To serve as a guide for local authorities, relevant agencies, and industry stakeholders in advancing data centre development

03

To determine the direction of data centre planning and development in the State of Johor, ensuring the realisation of the Johor Smart City Blueprint 2030 aspirations

04

To facilitate local authorities, related agencies, and industry players in referencing technical requirements for data centre development



1.3 THE IMPORTANCE AND REQUIREMENTS OF JOHOR STATE DATA CENTRE

According to the 2020 World Bank report "Malaysia's Digital Economy: A New Driver of Development," Malaysia has 7,494 secure internet servers per 1 million population, in contrast to Singapore's 128,379. Additionally, for every RM 1 billion investment in data centres, the economic spillover is potentially significant in creating 400 to 600 job opportunities and contributing an estimated RM 400 million to RM 500 million to the Gross Domestic Product (GDP).

This makes data centres one of the most valuable forms of investment in Malaysia. Moreover, the State of Johor is a prime investment destination due to its proximity to Singapore and its potential as a Cable Landing Station (CLS) for the submarine cable telecommunications network.

1.4 GENERAL CHARACTERISTICS OF A DATA CENTRE

The general characteristics of a data centre include five (5) components, which are:

1.4.1 Security

Data centres are designed with robust security features to protect against both physical and cyber threats, including theft, fire, and cyber attacks. To ensure the security of the data centre, access is typically restricted to authorised personnel only, and security measures such as biometric authentication and surveillance cameras are implemented.

1.4.2 Infrastructure

Data centre infrastructure consists of a diverse set of components, such as servers, storage systems, networking systems, power systems, and cooling systems. These facilities demand substantial energy to function efficiently and must be adequately cooled to prevent overheating of IT components. To ensure continuous power and cooling, data centres frequently employ backup generators, Uninterruptible Power Supplies (UPS), and Dedicated Cooling Systems (DCS).

1.4.3 Services

The data centre provides an array of services encompassing data storage, management, backup, and recovery. It serves as a foundational pillar supporting various productivity applications, including email services, high-volume e-commerce transactions, and online gaming communities. Additionally, data centres are being increasingly leveraged to facilitate the adoption of Industry 4.0 technologies, such as big data analytics, machine learning algorithms, and artificial intelligence applications, among others.

1.4.4 Cloud Storage and Exchange

Cloud storage and exchange represent a paradigm-shifting online storage solution that enables users to securely store and manage their data in remote data centres. This system allows customers to access their information via a virtual server hosted on the cloud, facilitating seamless data storage and exchange processes. By leveraging cloud storage and exchange, users can benefit from enhanced data security measures, efficient data management practices, and streamlined connectivity to ensure the integrity and availability of their critical information assets.

1.4.5 Management

Data centre management necessitates specialised expertise, a deep understanding of the latest technologies, and a commitment to ensuring efficient and secure operations. This includes implementing best practices in operational management throughout the entire development of the data centre. In the context of data centre development, three existing management mechanisms are used to provide data centres, namely:

i. Operating Company (OpCo)

OpCo functions as an entity that oversees the operational management of data centres acquired through rental or lease agreements with property owners. Additionally, the company actively engages in tenant acquisition activities to attract prospective businesses seeking data centre services. It builds the tech product, owns the data and holds the IP. The OpCo is typically financed by venture capitalists.

ii. Property Company (PropCo)

PropCo is the building owner who constructs and owns the data centre facility, leasing out space to OpCo, which manages the operations and attracts tenants. PropCo also holds the more capital expenditure (capex) and duration-intensive parts of the business and is typically not financed by venture capital, especially after the company has secured product-market fit. Normally, these ownership companies do not engage in the daily operations of the data centres.

iii. Operating Company (OPCo) & Property Company (PropCo)

Operating Company (OpCo) and Property Company (PropCo) are entities that both develop and operate data centres. These companies handle the construction of the facilities and simultaneously manage the daily operations, ensuring seamless and efficient functionality.

2.0 INTERPRETATION

This section will provide a detailed overview of the definitions, concepts, and key players within the data centre industry.

2.1 DATA CENTRE DEFINITION

A data centre is a dedicated facility that houses critical information and communication technology (ICT) equipment and infrastructure. It is designed to manage data for an organisation or company, encompassing tasks such as data **storage, collection, processing, and distribution**.

2.2 CONCEPT OF DATA CENTRE

The concept of the data centre ecosystem is as shown in the following figure:

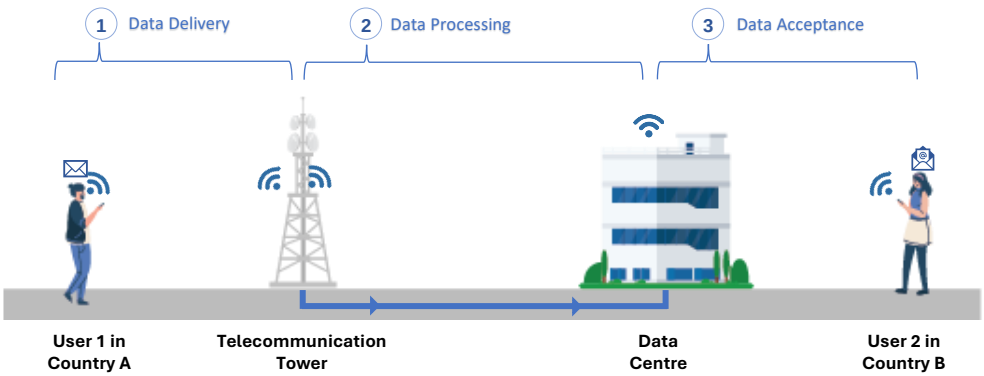
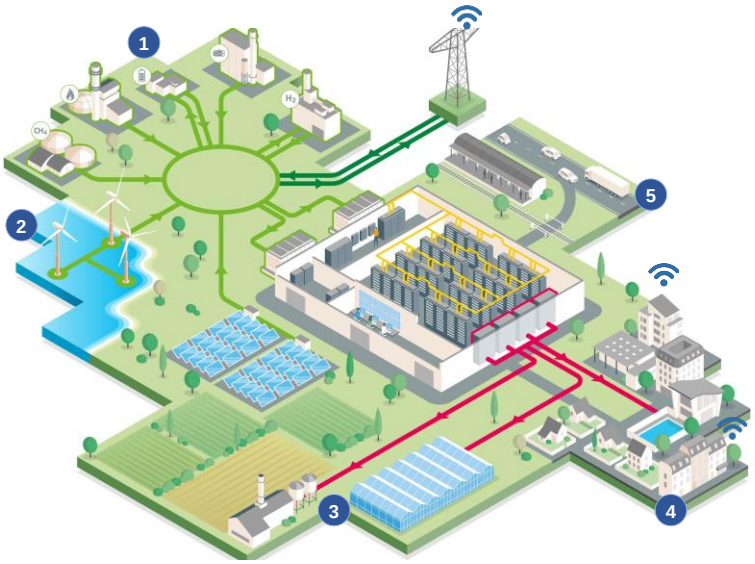


Figure 1 : Data Centre Ecosystem

1. **User 1 in Country A – Telecommunication Tower :** Transmitting data and information from a device to the data centre
2. **Telecommunication Tower – Data Centre :** Data and information will be transmitted to the data centre for storage, collection, processing, and distribution
3. **Data Centre – User 2 in Country B :** The processed data will then be transmitted to User B



1 **Industrial Revolution 4.0 (IR4)**
Accelerates production and increase efficiency

2 **Renewable Energy**
Ensures energy security and support the sustainability of resources and the environment

3 **Smart Agriculture**
Facilitates agricultural management and enhance high-quality production

4 **Smart City**
Creates a more effective and efficient smart city

5 **Efficient Logistics Management**
Enhances the quality of the supply chain through efficient and systematic logistics management

Source : https://www.datacentredynamics.com/

Figure 2 : The Role of Data Centres in Urban Areas

2.3 DATA CENTRE INDUSTRY PLAYERS

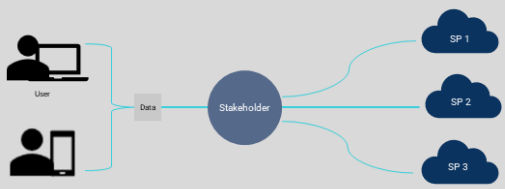
Key industry players in data centre development can be categorised into three (3) main groups:

Data Centre Provider (DCP)

Companies that provide and manage data centres

Cloud Service Provider (CSP)

Companies that provide cloud services and manage data centres



SP : Solution Provider

Digital Service Provider (DSP)

Companies that provide digital services

Examples : *Facebook, Google, Instagram,* etc.

Figure 3 : Data Centre Industry Players

2.4 TYPES OF DATA CENTRES

Based on the current landscape of data centre development in Malaysia, there are three primary types of data centre development :

01
Private
Data Centre

A data centre that is constructed and located either within the organisation's premises (on-premises) or at an external location (off-premises) for exclusive use, and is entirely managed by the organisation or company.

02
Colocation

A colocation data centre is a specialised physical facility that provides space, racks, and essential infrastructure, such as power supply, cooling systems, network systems, and security measures, for the development and hosting of data centres. These facilities enable organisations or companies to house their servers, storage devices, network equipment, and other IT infrastructure. Colocation data centre providers lease these spaces to clients in various configurations, including cabinets, cages, or private suites.

Examples : *Equinix, Bridge Data Centres, AIMS Data Centre,* etc.

03
Hyperscale

A hyperscale data centre is a data storage facility designed to accommodate vast amounts of data. These data centres are sought after by companies with extensive data processing and storage needs and are specifically tailored to meet those demands.

Examples : *Google, Amazon, Microsoft, Meta, Apple,* etc.

2.5 DATA CENTRE CLASSIFICATION

Based on the Telecommunications Industry Association Standards for Data Centers (TIA-942), there are four classifications of data centres, known as tiers. The following table provides a detailed description of each data centre tier:

Table 1 : Data Centre Tiers Classification

TIER	DESCRIPTION
Tier I Basic Site Infrastructure	• Utilises a single-capacity component for all data centre hardware equipment; • Relies on a network with a single path or non-redundant component (N) for power supply and cooling systems; • Experiences a downtime rate of 28.8 hours per year; • Maintains an uptime rate of **99.671%**.
Tier II Redundant Component Site Infrastructure	• Implements a single path for power supply and cooling systems with redundant components (N+1); • Features an Uninterruptible Power Supply (UPS), additional generator set, and a raised floor infrastructure; • Experiences a downtime rate of 22 hours per year; • Achieves an uptime rate of **99.741%**.
Tier III Concurrently Maintainable Site Infrastructure	• Recognised with international standard certifications for infrastructure, facilities, and security level; • Incorporates fully redundant components (N+1) in its design; • Deploys multiple power supplies, cooling systems, UPS units, additional generators, and a raised floor infrastructure; • Boasts an impressively low downtime rate of 1.6 hours per year; • Sustains an exceptional uptime rate of **99.982%**.
Tier IV Fault Tolerant Site Infrastructure	• Shares nearly identical hardware and development component requirements as Tier III; • Features fault-tolerant redundancy (2N or 2N +1) and the highest level of security; • Experiences a downtime rate of 0.4 hours or 24 minutes per year; • Maintains an uptime rate of **99.995%**.

Source : Telecommunication Industry Association (TIA)

Note

Downtime: Interruption period for the data centre.
Uptime: Optimal operation period for the data centre.
N: The minimum energy and cooling requirements necessary for a data centre.
N+1: Energy and additional requirements (backup) beyond the minimum needed by the data centre.

2.6 COMPONENTS IN A DATA CENTRE BUILDING

There are ten (10) types of development components in the main data centre building which comprise:

1. **Computing Requirements**

   Includes desktops, servers, racks, and other related hardware.

2. **Network Infrastructure**

   Includes routers, switches, modems, cables, and other components that connect data centres with storage servers to users.

3. **Uninterruptible Power Supply (UPS)**

   A UPS is a hardware device that functions as a preliminary backup power source, providing electricity to all electronic equipment in the event of a power outage.

4. **Cooling / Chiller System**

   This system is designed to maintain optimal temperature and humidity levels within the data centre. It comprises air conditioners, coolers, and Computer Room Air Handlers (CRAH).

5. **Power Distribution Unit (PDU)**

   PDU is equipment to control the flow of electricity supplied into the data centre.

6. **Emergency Power Generator (EPG)**

   EPG is equipment that includes a set of generators and diesel engines, serving as a backup power supply for the data centre.

7. **Security Requirements**

   The security requirements for a data centre include CCTV, biometric devices, mantraps, firewalls, detectors, and fire extinguishers. Additionally, security guards must be present, along with a guard post and control room.

8 Meet-Me-Room (MMR)

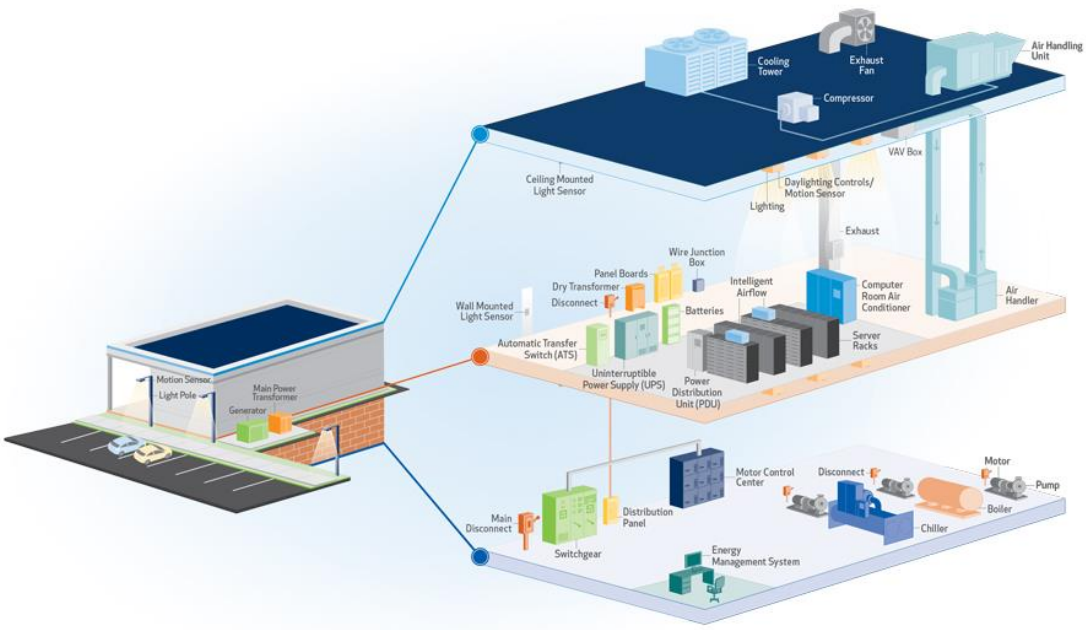
MMR is a designated area that consolidates all cables and fibres to facilitate data exchange between various users.

9 Main Distribution Frame (MDF) Room

The MDF Room is the area that connects network facility equipment to the cables and equipment within the data centre. Each cable providing services to users is routed through the MDF Room and subsequently distributed to the MMR for data processing.

10 Telco Room

The Telco Room is a designated area that houses all service providers operating within a data centre.

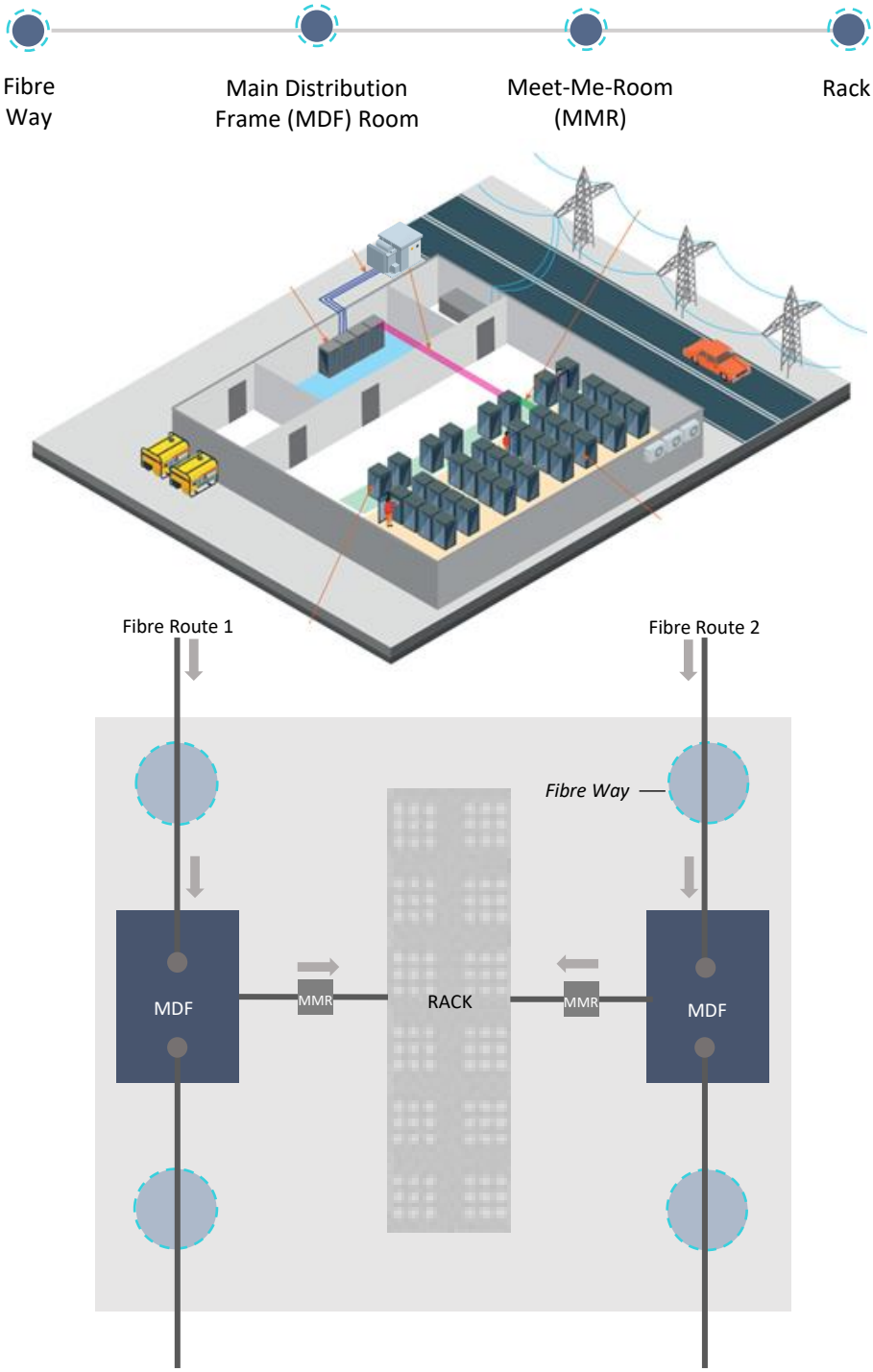


Source : Johor State Data Centre Development Planning Guidelines Study

Figure 4 : Illustration of Typical Components In a Data Centre

2.7 PROVISIONING OF DATA CENTRE FIBRE ROUTES

A well-designed data centre layout is the foundation of high-performance and efficient IT infrastructure, while effective cable management can create an efficient data centre environment. The following is an illustration of fibre routes for a data centre :



Source : Johor State Data Centre Development Planning Guidelines Study

Figure 5 : Illustration of Typical Fibre Routes in Data Centres

2.8 DATA CENTRE DEVELOPMENT SCALE

The following are the three (3) identified scales of data centre development :

Table 2 : Data Centre Development Scale

Classification	Small-scale Data Centre	Medium-scale Data Centre	Large-scale Data Centre
Floor Space Area (ft^2)	5,000 - 20,000	20,001 - 100,000	> 100,000
Estimated Number of Racks (unit)	714 – 2,857	2,857 – 14,286	14,286
Estimated Number of Server (unit)	500 - 2,000	2,001 - 10,000	10,001 - 100,000
Power Capacity (mW)	1 - 5	5 - 20	21 - 100

Source : Johor State Data Centre Development Planning Guidelines Study

Note

1 MW = 1000 kW

Estimated Calculation:
Standard Rack : 24” x 42 x 73.6”
Source : *https://blog.enconnex.com*

Formula :

Total Surface Area = Rack Size (length x width) / Gross Floor Space Area

3.0 GENERAL GUIDELINES

In general, the planning and development of data centres must comply with and take into account the following aspects :

3.1 DATA CENTRE LOCATION

Several factors must be considered when selecting a data centre location, including these areas to avoid :

i. Areas prone to natural disasters, such as regions frequently affected by floods, landslides, and other calamities;

ii. Environmentally sensitive areas (ESAs) such as coastal regions, water catchment areas, underground water sources, and hilly terrains;

iii. Peaty areas;

iv. Locations within the radius of important national targets as designated by the Office of the Chief Government Security Officer (CGSO).;

v. Proximity to high-risk industrial activities, such as chemical plants and petroleum facilities; and

vi. Proximity to major highways, railway lines, and locations within the altitude control radius established by the Civil Aviation Authority of Malaysia (CAAM).

3.2 ELECTRICAL ENERGY REQUIREMENTS

i. Ensuring the presence of an electrical substation with a capacity of 33 kV for small data centres and 132 kV to 275 kV for large-scale data centres;

ii. Data centre development is encouraged within a 100-metre radius of transmission lines or Main Intake Substations (PMU);

iii. All data centres under development must strictly adhere to industry best practices for Power Usage Effectiveness (PUE) to optimise energy efficiency and reduce operational costs;

iv. The provision of either a conventional generator set or green technology is essential and will be subject to the development capacity of the data centre being constructed.

v. Data centres should also incorporate the use of renewable and energy-saving technologies;

vi. Any requirements related to electricity supply must be reviewed and approved by Tenaga Nasional Berhad (TNB) before the data centre development proceeds.

3.3 WATER SUPPLY REQUIREMENTS

i. In principle, the functional storage tank capacity represents the maximal water volume that can be extracted for utilisation within a 24-hour timeframe. Consequently, it is imperative for a data centre development to meet the minimum **daily water supply** requirement, a parameter contingent upon the nature and scope of the data centre's development.

ii. The provision of water storage tanks is determined by the water consumption of the data centre;

iii. Data centres should also utilise renewable and energy-efficient technologies, such as direct expansion systems and eco-chiller water systems for cooling, as well as Rainwater Harvesting Systems (RWHS) [Sistem Pengumpulan dan Penggunaan Semula Air Hujan (SPAH)] and other similar technologies;

iv. The implementation of water supply management requirements necessitates a thorough review and approval by relevant authorities, including Ranhill SAJ Sdn. Bhd., the National Water Services Commission (SPAN), the Johor Water Regulatory Body (BAKAJ), and other pertinent agencies. Furthermore, data centre development must incorporate water conservation strategies that align with industry-recognised standards for water usage effectiveness, as prescribed by the prevailing norms and best practices.

3.4 INTERNET CONNECTIVITY REQUIREMENTS

i. Data centre connectivity requires the implementation of wireless or hybrid networking solutions, which offer a reliable and efficient means of transmitting internet traffic to and from the data centre. This approach can provide improved network resilience, scalability, and flexibility, as well as enhanced security and reduced latency;

ii. It is essential for data centre developments to ensure a minimum of dual service provider infrastructure, thereby ensuring redundancy and enhancing the reliability and resilience of the data centre's network infrastructure. This approach can mitigate the risk of service disruptions and provide a more robust and fault-tolerant environment for data centre operations; and

iii. The minimum requirement for internet speed access is 100 Mbps.

3.5 PERMITTED PLANNING ZONES

i. Data centre development is typically restricted to industrial or commercial planning zones as designated by the Local Plan (RT), with a focus on ensuring compatibility with the surrounding environment. In cases where data centres are proposed for commercial areas, it is crucial to conduct thorough research and analysis to ensure that the development aligns with the local character, zoning regulations, and community needs, thereby mitigating potential negative impacts and fostering a harmonious relationship between the data centre and its surroundings; and

ii. For this purpose, technical conditions such as buffer zones may be mandated beyond the requirements outlined in specific guidelines.

3.6 LAND USE CATEGORIES

i. For standardisation purposes, data centres should be classified as either buildings or industries, depending on the designated zone, to facilitate efficient planning, management, and regulation. This categorisation enables a more nuanced understanding of the data centre's role within the surrounding environment, allowing for more effective integration into local development; and

ii. Tax and premium rates will be determined by the State Authority (PBN).

4.0 SPECIFIC GUIDELINES

4.1 DATA CENTRES IN COMMERCIAL AREAS

Table 3 : Specific Guidelines for Data Centres in Commercial Areas

Site Requirements	• Land Use Planning Zone : Commercial/Business • Land Use Class : Commercial/ Business • Free Standing • Detached/Standalone
Lot Size (Minimum)	• 2 acres (8,094 m^2)
No. of Floors/Building Height (Maximum)	• Must comply with the stipulated plot ratio in the RTD, limited to a height not exceeding 6 floors or a total height not exceeding 27 metres.
Building Setbacks (Minimum) Front Adjacent to a Road Reserve Side Rear Between Buildings	 • 12 metres (40') • 12 metres (40') • 12 metres (40') • 12 metres (40') • 12 metres (40')
Road Reserves (Minimum) Local Road Collector Road Street Corner Cut	• 20 metres (66') • 24 metres (80') • 4.6 metres x 4.6 metres (15' x 15') In the event that the proposed site is situated within an existing commercial area, the road network should be harmoniously integrated with the surrounding infrastructure to ensure seamless connectivity and minimal disruptions to the local community. For greenfield developments, a supplementary utility reserve of 1.5 metres shall be provided on both sides of the road reserve, ensuring adequate space for future infrastructure upgrades and maintenance.
Parking Provision Car Parking Lot Car Parking Lot for the Disabled Motorcycle Parking	• 1 car parking lot/46.41m^2 (500ft^2) office gross floor space area (GFA) + 10% for visitors. • Minimum 1 unit, placed near the main entrance with ramp and railing facilities. • 20% of total car parking lots.
Supporting Facilities	• Office / Command Centre / Discussion Room. • Dining or Eating Area / Pantry. • Separate Prayer Rooms for men and women, each equipped with designated areas for ablution (wuduk). • Loading Area. • Garbage Disposal Facility. • Guard House. • Generator Set (a noise barrier shall be used to minimise sound transmission and mitigate disruptions if installed near residential or commercial areas). • Chiller Room, Mantrap, Battery Room, Meet-Me-Room, etc. • Other support facility requirements related to the data centre.

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Buffer Zones	• A minimum 50-metre buffer zone shall be maintained from the building line of the data centre, including all related support structures such as chillers, generators, and others, to ensure a safe and compliant distance from the residential lot boundary. The specific buffer zone requirements may vary depending on the local regulations, zoning ordinances, and surrounding development conditions. • The design of a buffer zone can incorporate various factors, including the width of the road, the displacement of adjacent buildings, perimeter planting, parking spaces, and other relevant features, as deemed necessary by the local authorities.
Building Design	• The exterior façade of the data centre building, located within a commercial building, shall be designed to harmonise with the surrounding development, incorporating aesthetically pleasing and contextually appropriate architectural features. • The façade shall be designed to incorporate soundproofing materials and construction methods that minimise the impact of data centre activities on the surrounding environment, thereby preventing any potential disruptions or disturbances.
Safety and Green Initiatives	• The placement of fire hydrants and other fire safety measures must conform to the standards and regulations set by the Malaysian Fire and Rescue Department. • Ensure responsible practices through the implementation of a comprehensive electronic waste (e-waste) and other related waste streams management plan to minimise environmental impact, and promote sustainable development. • Adhere to the standards set by the Green Building Index (GBI). • Implement green initiatives for each development through the following approaches: i. Encourage the installation of green roofs with a minimum coverage of 100m²; ii. Foster the adoption of renewable energy sources by promoting the use of solar energy in data centre design and operations; iii. Prioritise the creation of sustainable and aesthetically pleasing outdoor spaces by incorporating landscaped green areas; and iv. Integrate Water Sensitive Urban Design (WSUD) principles into data centre development to optimise the reuse of stormwater and grey water.

Note

Justification for Greenfield Data Centre Development : Height, Setback, and Buffer Zone Considerations :

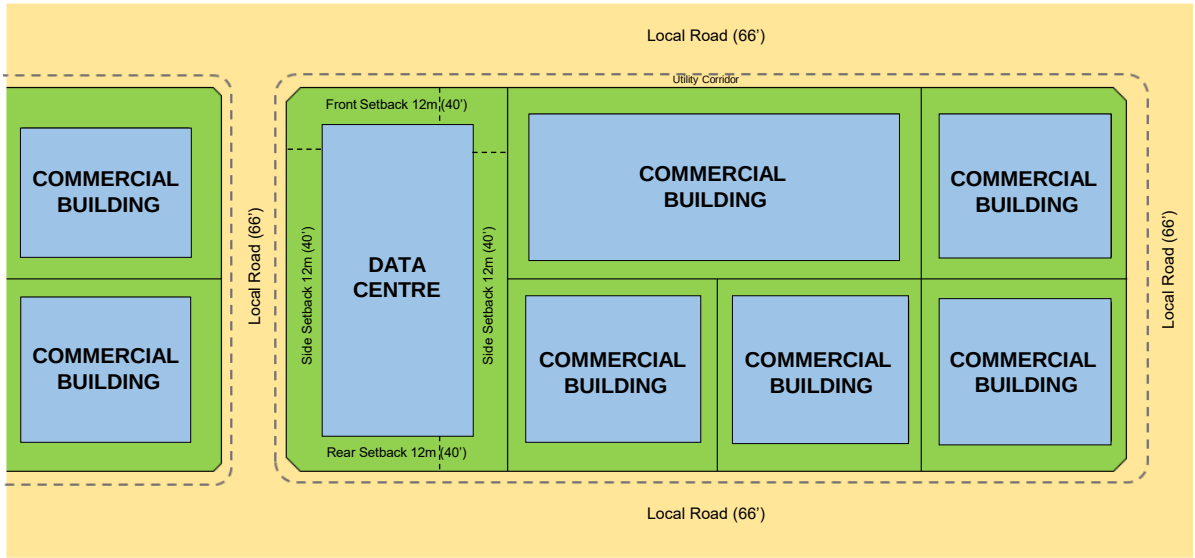
i. The set height is in reference to the Uniform Building By-Law (UBBL), 1984 amended 2022;
ii. A 40-foot setback and a 50-metre buffer zone are established to accommodate fibre optic routes or other utility needs, ensuring safety and maintaining harmony with the surrounding lots; and
iii. Setbacks may also be considered part of the buffer zone.

Examples of Data Centre Building Façades in Commercial Areas

Source : datacentredynamic.com Digital Reality Data Center, Jurong, Singapore

Figure 6 : Illustrated Example of Enhancing the Appearance of Commercial Buildings with the Installation of Metal Façades

Illustration



Source : Johor State Data Centre Development Planning Guidelines Study

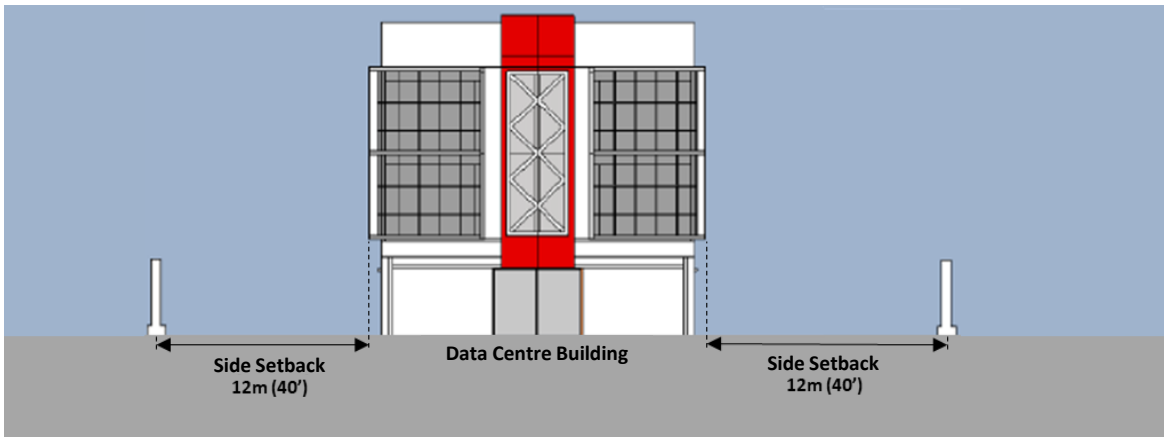
Figure 7 : Typical Setback Sketch for a Data Centre Building in a Commercial or Business Planning Zone

Note

i. The minimum site area for data centre development in a commercial or business planning zone is 2 acres (8,094 m^2).

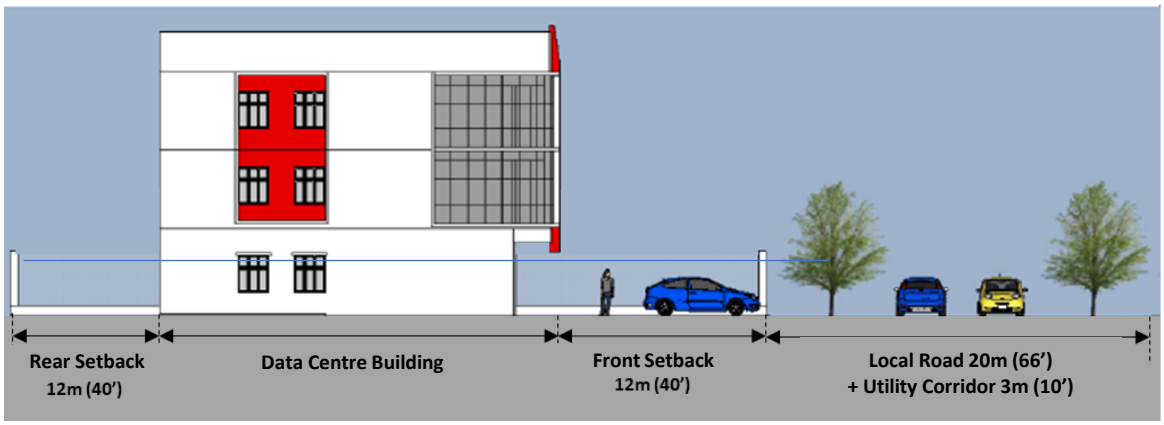
ii. The buffer zone is determined based on the minimum distance required by small industries, considering the energy capacity used and the operation of the data centre, which employs similar equipment and energy as other industries.

Cross-Section of a Data Centre



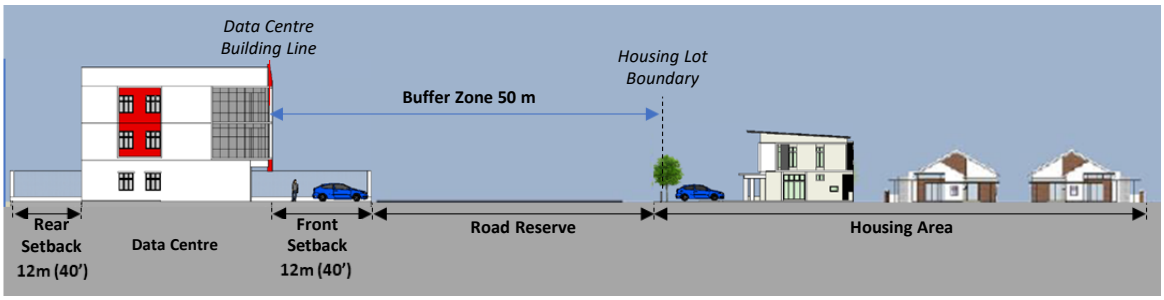
Source : Johor State Data Centre Development Planning Guidelines Study

Figure 8 : Typical Cross-Section of a Data Centre (Front View)



Source : Johor State Data Centre Development Planning Guidelines Study

Figure 9 : Typical Cross-Section of a Data Centre (Side View)



Source : Johor State Data Centre Development Planning Guidelines Study

Figure 10 : Illustration of Data Centre Development Buffer Zone in a Commercial Zone

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4.2 DATA CENTRE IN INDUSTRIAL AREAS

Table 4 : Specific Guidelines for Data Centres in Industrial Areas

Site Requirements	• Land Use Planning Zone : Industry • Land Use Class : Industry • Free Standing • Detached/Standalone
Lot Size (Minimum)	• 1 acres (4,047 m^2)
No. of Floors/Building Height (Maximum)	• Must comply with the stipulated plot ratio in the RTD, limited to a height not exceeding 4 floors or a total height not exceeding 27 metres.
Built-up Area (Maximum)	• 1.0 – 3.0 acres : 60% • > 3.0 acres : 70%
Building Setbacks (Minimum) Front Adjacent to a Road Reserve Side Rear Between Buildings	 • 12 metres (40') • 12 metres (40') • 6 metres (20') • 6 metres (20') • 12 metres (40')
Parking Provision Car Parking Lot Car Parking Lot for the Disabled Motorcycle Parking	 • 1 car parking lot/46.41m^2 (500ft^2) office gross floor space area (GFA) + 10% for visitors. • Minimum 1 unit, placed near the main entrance with ramp and railing facilities. • 20% of total car parking lots.
Road Reserves (Minimum) Local Road Collector Road Street Corner Cut	 • 20 metres (66') • 30 metres (100') • 9.14 metres x 9.14 metres (30' x 30') In the event that the proposed site is situated within an existing industrial area, the road network should be harmoniously integrated with the surrounding infrastructure to ensure seamless connectivity and minimal disruptions to the local community. For greenfield developments, a supplementary utility reserve of 1.5 metres shall be provided on both sides of the road reserve, ensuring adequate space for future infrastructure upgrades and maintenance.
Supporting Facilities	• Office / Command Centre / Discussion Room. • Dining or Eating Area / Pantry. • Separate Prayer Rooms for men and women, each equipped with designated areas for ablution (wuduk). • Loading Area. • Garbage Disposal Facility. • Guard House. • Generator Set (a noise barrier shall be used to minimise sound transmission and mitigate disruptions if installed near residential or commercial areas.). • Chiller Room, Mantrap, Battery Room, Meet-Me-Room, etc. • Other support facility requirements related to the data centre.

continued…

Buffer Zones	• A minimum 50-metre buffer zone shall be maintained from the building line of the data centre, including all related support structures such as chillers, generators, and others, to ensure a safe and compliant distance from the residential lot boundary. The specific buffer zone requirements may vary depending on the local regulations, zoning ordinances, and surrounding development conditions. • The design of a buffer zone can incorporate various factors, including the width of the road, the displacement of adjacent buildings, perimeter planting, parking spaces, and other relevant features, as deemed necessary by the local authorities.
Building Design	• The exterior façade of the data centre building, located within an industrial building, shall be designed to harmonise with the surrounding development, incorporating aesthetically pleasing and contextually appropriate architectural features. • The façade shall be designed to incorporate soundproofing materials and construction methods that minimise the impact of data centre activities on the surrounding environment, thereby preventing any potential disruptions or disturbances.
Safety and Green Initiatives	• The placement of fire hydrants and other fire safety measures must conform to the standards and regulations set by the Malaysian Fire and Rescue Department. • Ensure responsible practices through the implementation of a comprehensive electronic waste (e-waste) and other related waste streams management plan to minimise environmental impact, and promote sustainable development. • Adhere to the standards set by the Green Building Index (GBI). • Implement green initiatives for each development through the following approaches: i. Encourage the installation of green roofs with a minimum coverage of 100m²; ii. Foster the adoption of renewable energy sources by promoting the use of solar energy in data centre design and operations; iii. Prioritise the creation of sustainable and aesthetically pleasing outdoor spaces by incorporating landscaped green areas; and iv. Integrate Water Sensitive Urban Design (WSUD) principles into data centre development to optimise the reuse of stormwater and grey water.

Note

Justification for Greenfield Data Centre Development: Height, Setback, and Buffer Zone Considerations :

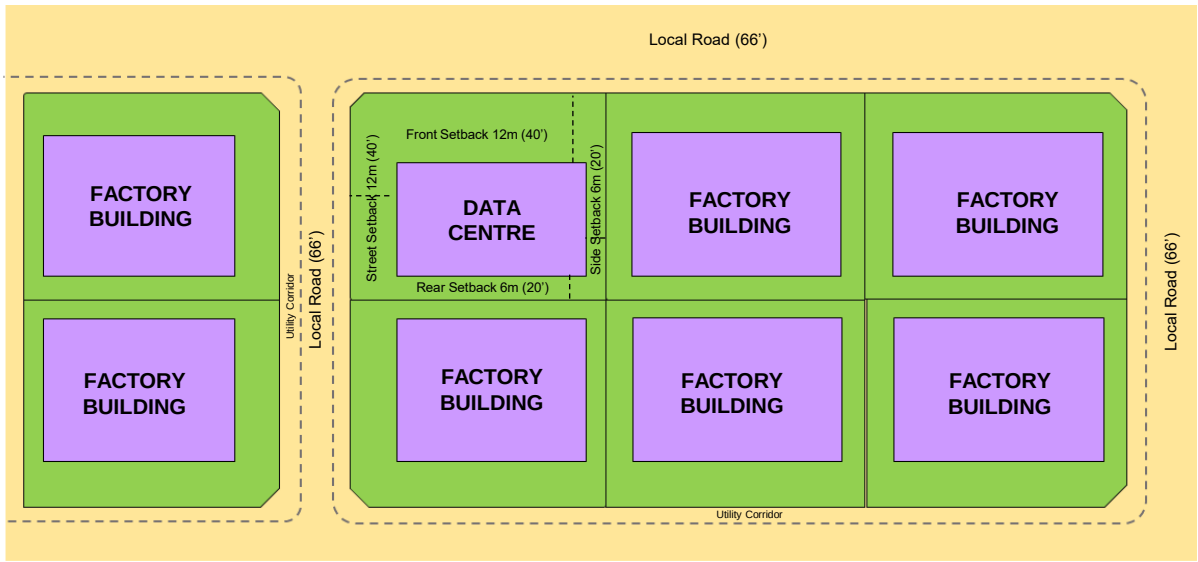
i. The set height is in reference to the Uniform Building By-Law (UBBL) amended 2022;
ii. A 40-foot setback and a 50-metre buffer zone are established to accommodate fibre optic routes or other utility needs, ensuring safety and maintaining harmony with the surrounding lots; and
iii. Setbacks may also be considered part of the buffer zone.

Examples of Data Centre Building Façades in Industrial Areas

Source : https://coulon-architecte.fr/

Figure 11 : Illustrated Example of Enhancing the Appearance of Modern Buildings with the Installation of Metal Façades

Illustration



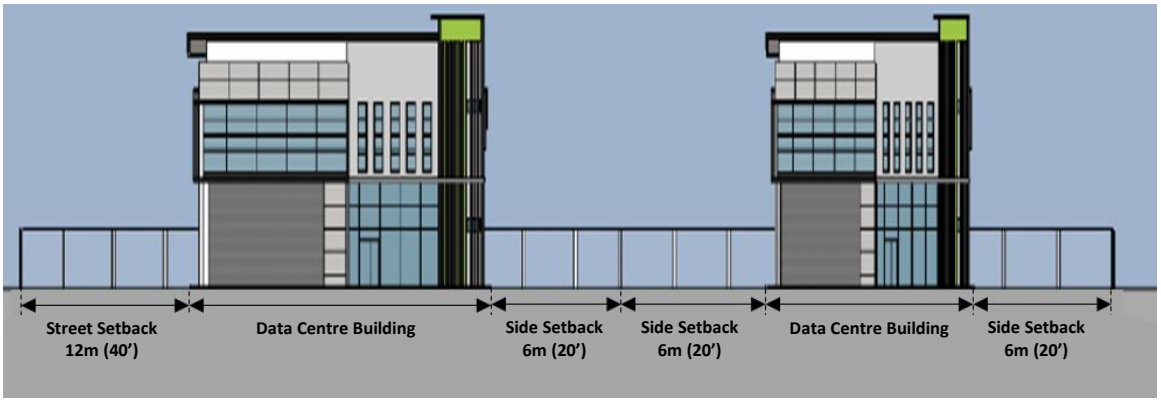
Source : Johor State Data Centre Development Planning Guidelines Study

Figure 12 : Typical Setback Sketch for a Data Centre Building in an Industrial Planning Zone

Note

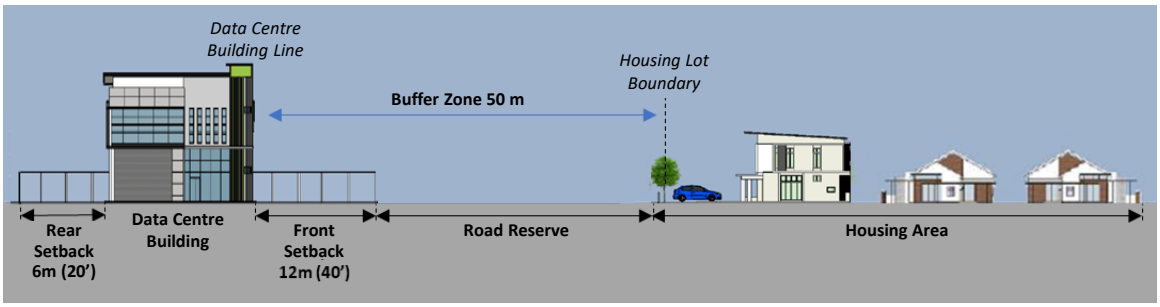
i. The minimum site area for data centre development in an industrial planning zone is 1 acre (4,047 m^2).

Cross-Section of a Data Centre (Industrial Area)



Source : Johor State Data Centre Development Planning Guidelines Study

Figure 13 : Typical Cross-Section of a Data Centre (Front View)



Source : Johor State Data Centre Development Planning Guidelines Study

Figure 14 : Illustration of Data Centre Development Buffer Zone in an Industrial Zone

4.3 DATA CENTRES IN EXISTING OR ABANDONED BUILDINGS

When considering the repurposing and adaptive reuse of existing or abandoned buildings for data centre development, several key factors must be carefully evaluated. These factors include :

i. The physical condition of the buildings must meet the structural and safety prerequisites to support data centre infrastructure;

ii. The buildings must be a part of the city's urban redevelopment plans;

iii. Buildings that have the potential can be repurposed and adaptively reused as data centres, to take advantage of the existing infrastructure;

iv. Data centre development requires sufficient support facilities, including access roads, buffer zones, and environmental compatibility, which are crucial for ensuring easy access, minimising environmental impact, and promoting sustainable development;

v. The proposed buildings must be located in commercial or industrial zoning compliant with the land use zoning specified in a gazetted Local Plan (RT);

vi. Buildings located outside commercial and industrial zones, including those in areas deemed unsuitable for data centre development, (e.g., adjacent to residential neighbourhoods), must seek guidance and secure approval from the Johor State Data Centre Development Coordination Committee (JPPPDNJ); and

vii. Expert input on building structure modification is essential in verifying that the modified buildings can withstand the increased loads and capacities required by data centre development, ensuring a safe and efficient infrastructure for the facility.

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Source : AIMS Data Centre

Figure 15 : Illustrated Example of a Data Centre in an Existing Building

5.0 IMPLEMENTATION MECHANISM

All data centre development applications must be submitted to the PBT for approval through either the OSC 3.0 Plus System or the Johor Fast Lane. Applicants are strongly recommended to conduct preliminary consultations with relevant technical agencies to ensure regulatory compliance and expedite the approval process.

In cases where complex issues arise during the development process, the PBT may refer the application to the Johor State Data Centre Development Coordinating Committee (JPPPDNJ) for its expert review and guidance.

5.1 FUNCTIONS OF THE JOHOR STATE DATA CENTRE DEVELOPMENT COORDINATION COMMITTEE

The Johor State Data Centre Development Coordination Committee (JPPPDNJ) plays a crucial role in facilitating the development of data centres within the State of Johor by :

i. Providing advisory services to the State Government and local authorities (PBT) on data centre development, ensuring that all applications are thoroughly reviewed and assessed;
ii. Offering expert advice on data centre development-related matters to the PBT prior to the review process, ensuring that all relevant considerations are taken into account;
iii. Conducting evaluations and making recommendations for the development of data centres in existing or abandoned buildings, helping to identify potential opportunities and challenges; and
iv. Submitting reports and information to the State Planning Committee as necessary, providing a comprehensive overview of data centre development in Johor.

The JPPPDNJ receives referrals for the following types of applications :

i. Data centre developments that require complex site planning, that necessitates expert guidance and coordination; and
ii. Applications for data centres located in non-industrial and non-commercial zones, which may require specialized knowledge and expertise to ensure compliance with relevant regulations and zoning requirements.

5.2 MEMBERSHIP OF THE DATA CENTRE DEVELOPMENT COORDINATION COMMITTEE (JPPPDNJ)

Table 5 : Committee Members of JPPPDNJ

Chairman	• **Chairman of the Johor Housing and Local Government Committee**
Deputy Chairman	• **Chairman of the Johor Investment, Trade and Consumer Affairs Committee**
Secretary	• **Director of PLANMalaysia Johor**
Members	1. Deputy Johor State Secretary (Development), Johor State Economic Planning Division (BPEN); 2. Director of the Johor Land and Mines Office (PTG); 3. Chief Executive of Iskandar Regional Development Authority (IRDA); 4. Secretary of the Johor Local Government Division (SUKT); 5. Secretary of ICT@Johor Division; 6. Chief Executive of Invest Johor; 7. Director of the Johor Department of Environment (JAS); 8. Director of the Malaysian Communications and Multimedia Commission (MCMC) Johor; 9. Director of the Office of the Chief Security Officer (CGSO) of Johor; 10. Director of the Johor Fire and Rescue Department; 11. Chief Executive Officer of Tenaga Nasional Berhad (TNB) Johor; 12. Chief Executive Officer of Ranhill SAJ Sdn. Bhd.; 13. Director of the Malaysian Digital Economy Corporation (MDEC); 14. Director of the Malaysian Investment Development Authority (MIDA); 15. Relevant Local Authorities; 16. Relevant District Land Offices; 17. Other Relevant Departments / Agencies as needed.
Secretariat	PLANMalaysia Johor

Note : Committee members may be represented by any officer from their respective departments.

5.3 PRELIMINARY CONSULTATIONS

The preliminary consultation and initial negotiation process is necessary to gather information and advisory services related to data and technical requirements, particularly regarding land and infrastructure availability. The following agencies are involved in this process:

1. Johor Land and Mines Office (PTG);
2. Relevant Local Authorities;
3. Invest Johor;
4. Ranhill SAJ Sdn. Bhd.; and
5. Tenaga Nasional Berhad.

5.4 DATA CENTRE DEVELOPMENT APPLICATION PROCESS THROUGH THE JPPPDNJ

The following flowchart outlines the application process for data centre development in the State of Johor, as facilitated by the JPPPDNJ.

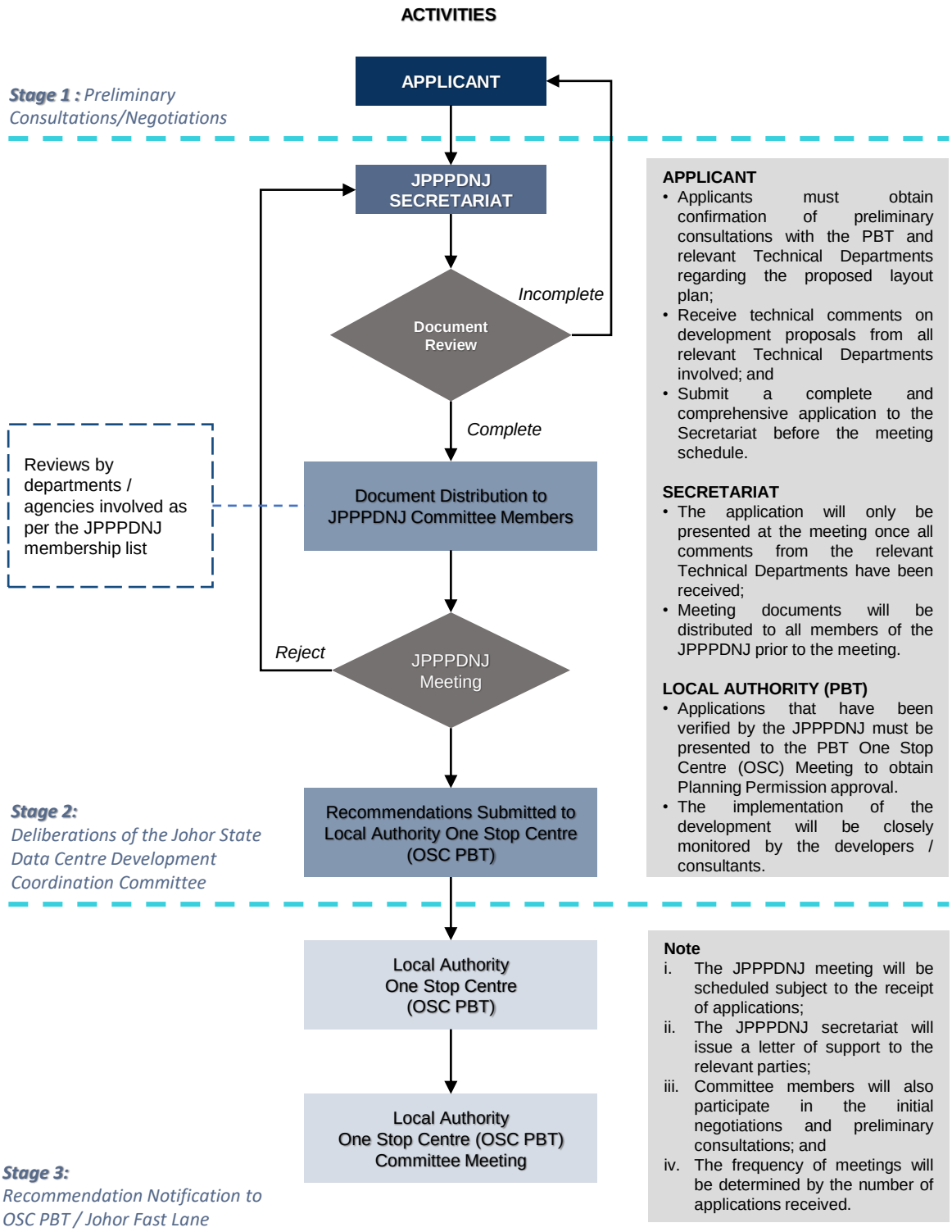


Figure 16 : Process Flowchart of Data Centre Development Application through the JPPPDNJ

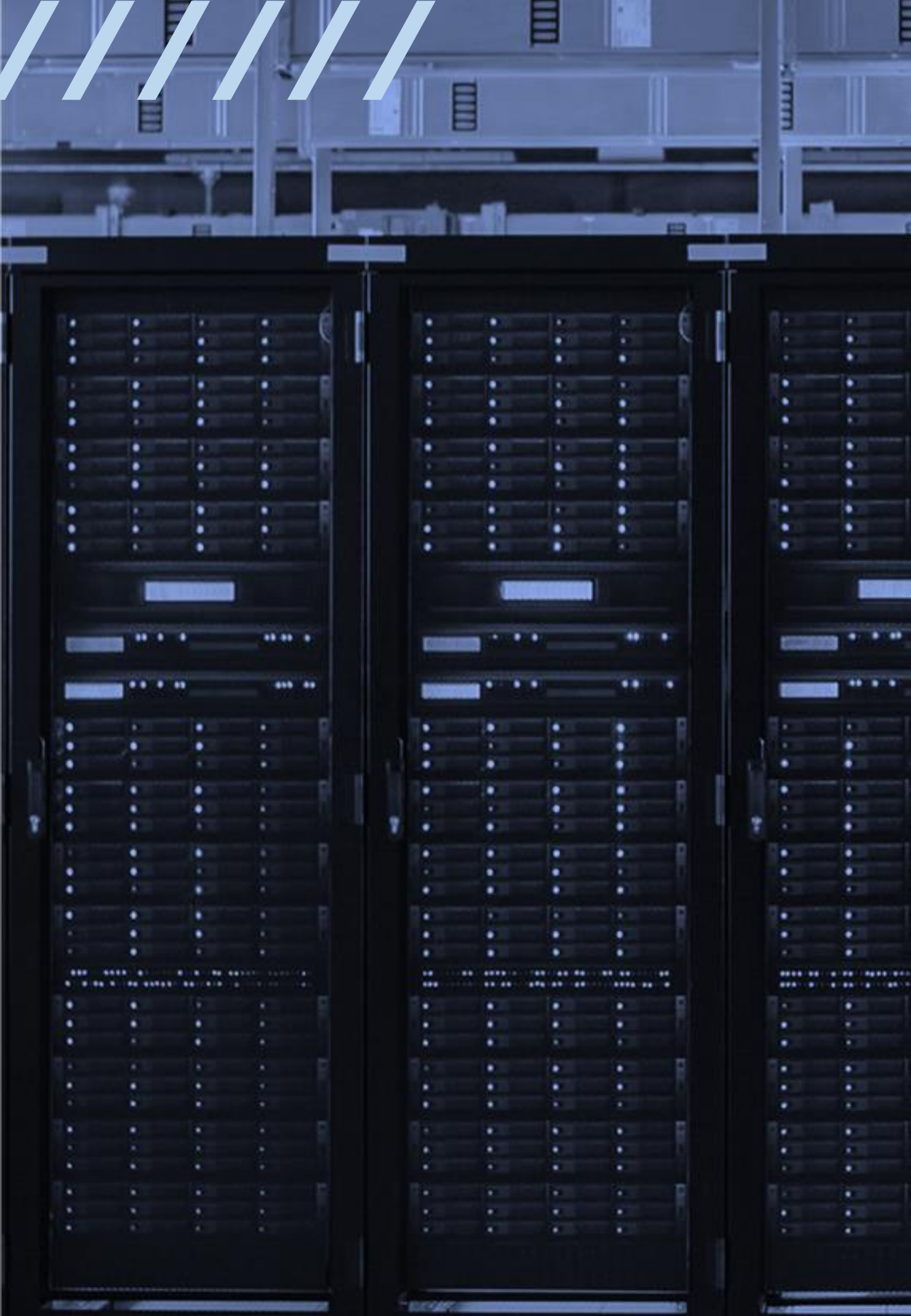
6.0 CONCLUSION

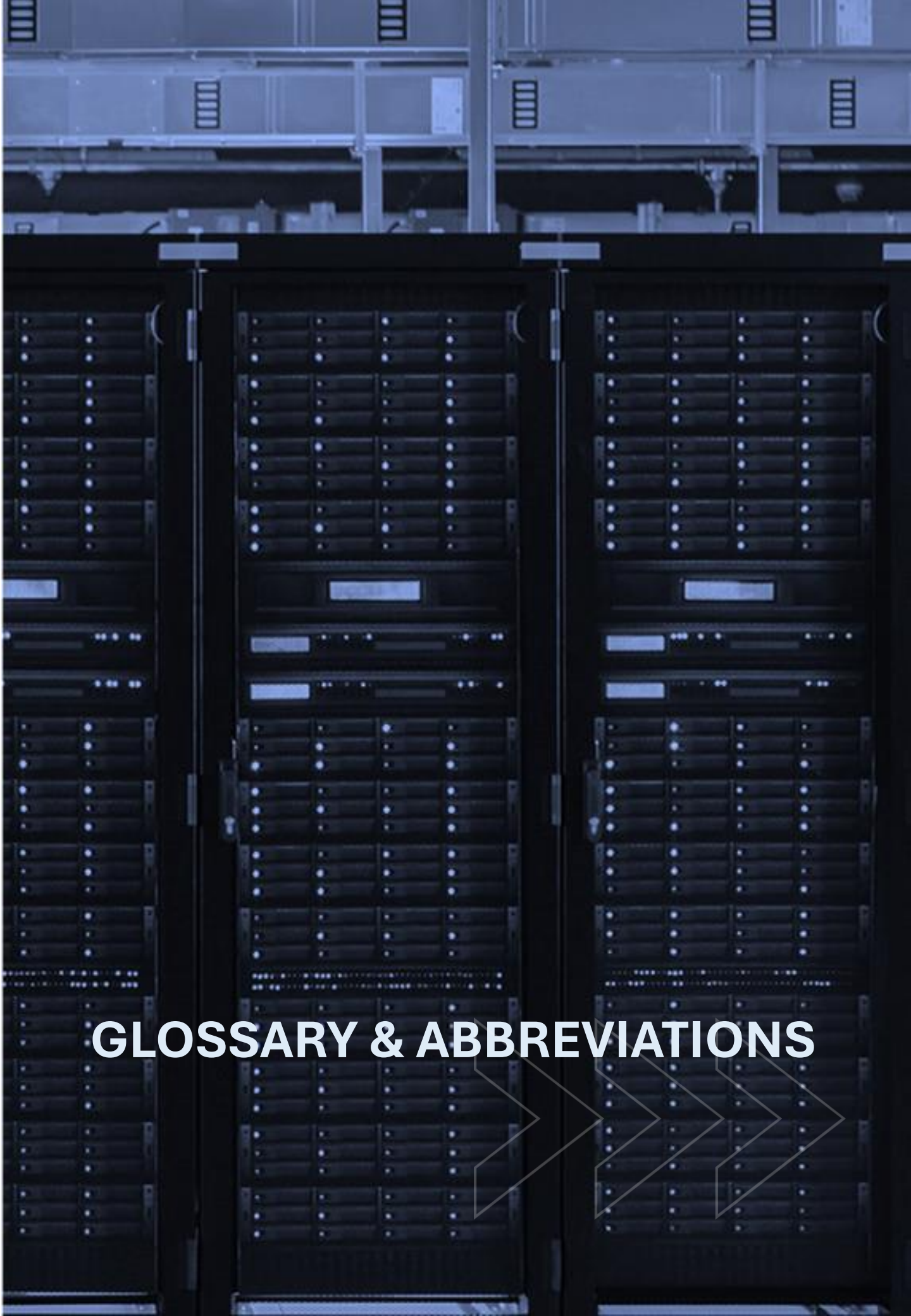
These Data Centre Planning Guidelines have outlined the fundamental concepts of data centres, set forth the minimum technical requirements for compliance, established zoning regulations, and defined the implementation mechanism and approval process for data centres in the State of Johor. It is essential to read these guidelines in conjunction with relevant legislation and regulations to ensure compliance with technical requirements and adapt to the surrounding environment. These guidelines also aim to facilitate the development and operation of data centres in the State of Johor by providing a comprehensive framework for all key industry players and stakeholders, including government agencies, investors, consultants, and relevant parties.

The Study Team would like to express its sincere appreciation and gratitude to all Technical Agencies, Local Authorities (PBT), stakeholders, and all parties who contributed valuable input and feedback to the preparation of the Johor State Data Centre Development Planning Guidelines. Specifically, we acknowledge the following organisations :

LOCAL AUTHORITIES

OTHER TECHNICAL AGENCIES





GLOSSARY & ABBREVIATIONS

ABBREVIATIONS

B

BAKAJ	Johor Water Regulatory Body *(Badan Kawalselia Air Johor)*
BPEN	State Economic Planning Division *(Bahagian Perancang Ekonomi Negeri)*

C

CAAM	Civil Aviation Authority of Malaysia *(Pihak Berkuasa Penerbangan Awam Malaysia)*
capex	capital expenditure
CCTV	closed-circuit television
CGSO	Malaysia Office of the Chief Government Security Officer *(Pejabat Ketua Pegawai Keselamatan Kerajaan Malaysia)*
CLS	Cable Landing Station
CRAH	Computer Room Air Handler
CSP	Cloud Service Provider

D

DCP	Data Centre Providers
DCS	Dedicated Cooling System
DSP	Digital Service Providers

E

Email/ E-mail	electronic mail
EPG	Emergency Power Generator
ESA	Environmentally Sensitive Area

F

ft²	square foot/feet

I

ICT	Information and Communication Technologies
IP	Internet Protocol
IR 4.0	Fourth Industrial Revolution
IRDA	Iskandar Regional Development Authority
IT	Information Technology

G

GBI	Green Building Index
GDP	Gross Domestic Product

J

JAS	Department of Environment *(Jabatan Alam Sekitar)*

K

kV	Kilovolt

M

m²	square metre/metres
Mbps	megabit per second
MCMC	Malaysian Communications and Multimedia Commission *(Suruhanjaya Komunikasi dan Multimedia Malaysia)*
MDEC	Malaysia Digital Economy Corporation *(Perbadanan Ekonomi Digital Malaysia)*
MDF	Main Distribution Frame
MIDA	Malaysian Investment Development Authority *(Lembaga Pembangunan Pelaburan Malaysia)*
MMR	Meet-Me-Room
MW	megawatt

N

NIMP2030	New Industrial Master Plan 2030

O

OpCo	Operating Company
OSC	One Stop Centre (*Unit Pusat Setempat*)

P

PBN	State Authority (*Pihak Berkuasa Negeri*)
PBT	Local Authority (*Pihak Berkuasa Tempatan*)
PDU	Power Distribution Unit
PMU	Main Intake Substation (*Pencawang Masuk Utama*)
PropCo	*Property Company*
PTG	Land and Mines Office (*Pejabat Tanah dan Galian*)
PUE	Power Usage Effectiveness

R

RT	Local Plan (*Rancangan Tempatan*)
RTD	District Local Plan (*Rancangan Tempatan Daerah*)
RWHS	Rainwater Harvesting System (*Sistem Penuaian Air Hujan*)

S

SME	Small and Medium Enterprises (*Perusahaan Kecil dan Sederhana*)
SPAH	Rainwater Collection and Utilisation System (*Sistem Pengumpulan dan Penggunaan Semula Air Hujan*)
SPAN	National Water Services Commission *(Suruhanjaya Perkhidmatan Air Negara)*
SPC	State Planning Committee *(Jawatankuasa Perancang Negeri)*
SUKT	Secretary of Local Government Division *(Setiausaha Bahagian Kerajaan Tempatan)*

T

TIA	Telecommunication Industry Association
TNB	Tenaga Nasional Berhad

U

UBBL	Uniform Building By-Laws, 1984 *(Undang-undang Kecil Bangunan Seragam, 1984)*

W

WSUD	Water Sensitive Urban Design

GLOSSARY

TERMS	DEFINITIONS
Artificial Intelligent (AI)	The development of a computing system capable of performing tasks that emulate or mimic human intelligence, including decision-making, problem-solving, and pattern recognition.
Backup generator	It is also known as a standby generator, that provides backup power to a building, home, or facility in the event of a power outage or grid failure to ensure critical systems, such as lighting, heating, cooling, and medical equipment, remain operational during such outages.
Big Data	A platform designed to provide a centralised data collection infrastructure that addresses the complexities of data in terms of volume, velocity, and variety, also known as the 3Vs. This platform enables the efficient and effective management of large-scale data sets, characterised by their enormous size, rapid generation, and diverse formats.
Cable Landing Station	A commonly used term to describe a critical onshore infrastructure point where submarine telecommunication cables emerge from the ocean and are used to transmit and receive data, voice, video signals, and electrical power. The CLS is equipped with specialised facilities to ensure reliable and secure operation.
Cloud Storage	It is a secure and scalable online data storage platform that enables users to store, access, and manage data or information on a virtual server, rather than on a physical device. With cloud storage, users can upload, share, and collaborate on files, as well as recover data in the event of a disaster or system failure. This flexible and on-demand storage solution allows users to access their data from anywhere, at any time, and on a variety of devices, making it an ideal solution for businesses and individuals alike.
Dedicated Cooling System	A critical infrastructure component that ensures the optimal operation of data centre cooling equipment, such as chillers and Computer Room Air Handlers (CRAHs). The goal of a DCS is to maintain a stable and controlled temperature within the data centre, while also ensuring redundancy, resilience, and energy efficiency. By leveraging real-time monitoring, predictive analytics, automated control, and integration with other systems, a DCS helps data centre operators maintain high availability, reliability, and energy efficiency while minimising downtime and costs.
Direct Expansion System	A Direct Expansion (DX) system is a type of air conditioning system that uses a refrigerant to cool the air in a data centre. It is a popular choice for data centres due to its reliability, efficiency, and scalability.
Downtime	Downtime refers to periods when a system, service, or facility is unavailable or non-operational, often due to maintenance, technical issues, or failures.
E-commerce	E-commerce refers to online electronic sales transactions managed through website applications often engaged to reach a wider customer base.
Fibre optic	Fibre optic technology uses light to transmit data and is installed to provide high-speed internet access, enabling efficient and reliable transmission of information.
Greenfield	A greenfield refers to an area or land that encompasses undeveloped habitats, forests, and productive agricultural land. This term also includes green spaces within urban areas.
Green Building Index (GBI)	It is a comprehensive rating system used to assess the sustainability of the design and performance of buildings, cities, and factories.
Generator Set	A generator set, often referred to as a genset, is a combination of an engine and an electrical generator used to produce electricity. It is commonly used as a backup power source in case of main power failures, ensuring a continuous supply of electricity for various applications, including in data centres, hospitals, and industrial facilities.

GLOSSARY (continued...)

TERMS	DEFINITIONS
Grey Water	Grey water is defined as wastewater without any input from toilets, typically produced from bathtubs, showers, handwashing basins, and washing machines in households, office buildings, schools, etc. Treated grey water can be used for various purposes such as toilet flushing, garden irrigation, and recreational irrigation.
Information and Communication Technology (ICT)	Information and Communication Technology (ICT) refers to the integration and application of various technologies for the collection, storage, processing, and transmission of information. ICT encompasses a wide range of tools and resources, including computers, internet services, telecommunications equipment, software applications, and multimedia systems, to facilitate communication and information management in various sectors.
Johor Fast Lane	The Johor Fast Lane is a streamlined process designed to expedite and simplify the application procedure for Planning Permission at the Local Authority (PBT) level. This initiative aims to reduce the time and effort required to obtain approval for development projects, making it a valuable resource for developers, architects, and other stakeholders.
Machine Learning	A technological advancement in computer science designed to revolutionize the way data and algorithms are processed that enhances efficiency and accuracy in data processing and algorithm execution.
OSC 3 Plus	This is an integrated development plan submission system, an online platform designed to facilitate the submission and management of development plans. This system enables the Principal Submitting Person (PSP) or Submitting Person (SP) to submit online applications, make secure payments, and engage with technical agencies seamlessly and efficiently through the system's real-time application status tracking and Command, Control, Communications, Computers, and Intelligence (C4i) functions.
Perimeter Planting	It refers to the strategic placement of plants around the development area, including building setbacks, to create a balance between the building structure and the environment.
Recovery	It is a process of retrieving lost, deleted, corrupted, or inaccessible data from storage devices such as hard drives, solid-state drives, USB drives, CDs, DVDs, or other electronic devices using specialized software or hardware tools.
Router	A router is a type of computer device that connects multiple computer networks and routes data packets between different networks and subnetworks and, is often used in conjunction with network switches.
Stormwater	Stormwater is surface water runoff resulting from rainfall.
Uninterruptible Power Supply (UPS)	A UPS (Uninterruptible Power Supply) is a device that maintains power to electronic equipment in the event of a power failure. It typically includes a battery that remains charged and ready to provide immediate power when the main power source is disrupted.
Uptime	Uptime refers to the duration during which a data centre operates optimally without any interruptions or downtime.
Virtual Server	A virtual server, also known as a virtual machine (VM), is a software-based emulation of a physical server that provides isolation, portability, scalability, and cost-effectiveness. e.g.: Microsoft's Azure cloud infrastructure.
Water Sensitive Urban Design	Land use planning incorporating an engineering design approach integrates the urban water cycle, comprising stormwater, groundwater, wastewater management, and water supply, into urban design. This approach aims to enhance aesthetic appeal and recreational opportunities while minimising adverse environmental impacts.