goldfish&bay

Infrastructure Delivery, Management and Staging Plan Report

Project Details:	Mixed Use Development
Project Name:	UPG NEWCASTLE
Project Address:	10 Dangar street Wickham NSW 2293
Applicant Name:	UPG WICKHAM PTY. LTD.
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Date:	30-March-2026
Produced For:	UPG WICKHAM PTY. LTD.
Reference:	25200_SDIR_01

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Table of Contents

INTRODUCTION

1.1 General and Project Description

Goldfish and Bay Pty Ltd have been engaged by UPG WICKHAM PTY. LTD. to undertake the Hydraulic, Mechanical, Fire services and Electrical design for the mixed-use development located at 10 Dangar street Wickham.

The proposed development seeks approval for a 43-storey mixed-use building comprising 245 residential apartments, 99 co-living rooms, and a hotel with approximately 171 rooms. The development includes three basement levels accommodating approximately 215 car parking spaces, as well as ground floor retail tenancies, building lobbies, and publicly accessible open space. The lower levels of the tower incorporate the retail, hotel and associated ancillary uses, while Levels 7 to 11 provide co-living accommodation supported by communal facilities. The upper levels accommodate residential apartments, including a component of affordable housing across Levels 12 to 16. The development also includes dedicated communal open space and amenities for both residential and co-living occupants. The site is located adjacent to the Newcastle Interchange, providing direct access to heavy rail, light rail, and bus services, and is well positioned to utilise existing transport and urban infrastructure.

Goldfish and Bay aim to provide valuable input and expertise in the creation of the Detailed Design Report. Their objective is to offer practical solutions that balance cost-effectiveness, ease of construction, performance, maintenance, flexibility, and other project-specific requirements.

This Report is a comprehensive and flexible document that evaluates the relevant infrastructure allowing stakeholders to assess Goldfish and Bays' considerations and provide feedback for further discussion and resolution. This will support the development of design documentation.

The brief will be developed with the goal of providing value-added advice that provides cost-benefits and build-ability solutions.

The purpose of this brief is to provide a concise and well-organized written description of the service scope to be designed. However, it should not be mistaken as a Specification or Bill of Materials, nor does it provide detailed equipment selection. Instead, the document outlines the expected outcome services to be delivered within the proposed building development.

This document represents the client's approval of the Building services, which consist of Hydraulic, Mechanical, Fire and Electrical services to be provided for this project by Goldfish and Bay.

2 HYDRAULIC SERVICES

2.1 Standards, Regulations, And Guidelines

This report outlines the design proposals relating to the Hydraulic services proposed to be installed throughout the site. The proposed hydraulic services include:

- Sewer Drainage and Sanitary Plumbing
- Trade Waste
- Roof Drainage
- Potable Cold Water
- Potable Hot Water
- Subsoil Drainage
- Natural Gas Services

Referencing Document	Description
AS3500.1:2021	Plumbing and Drainage Part 1: Water Services
AS3500.2:2021	Plumbing and Drainage Part 2: Sanitary Plumbing and Drainage
AS3500.3:2021	Plumbing and Drainage Part 3: Stormwater Drainage
AS3500.4:2021	Plumbing and Drainage Part 4: Heated Water Services
AS5601:2022	Gas Installations
AS2441:2005	Installation of Fire Hose Reels
NCC 2022	National Construction Code
NCC 2022 - Volume 3	Plumbing Code of Australia
Hunter Water Regulations	
Jemena Network Operating Rules	
City of Newcastle	
Fire & Rescue NSW	

2.2 Sewer Drainage and Sanitary Plumbing

2.2.1 Connection Point

Currently there is an existing 150 UPVC sewer main traversing through the proposed development site. We recommend UPG WICKHAM PTY. LTD. obtain approval from Hunter Water for the sewer diversion via a Hunter Water accredited designer.

It is proposed for the site to be drained via two new sewer connections. one being a new 150mm connection on Charles Street and the other being a 150mm connection on Hannell Street.

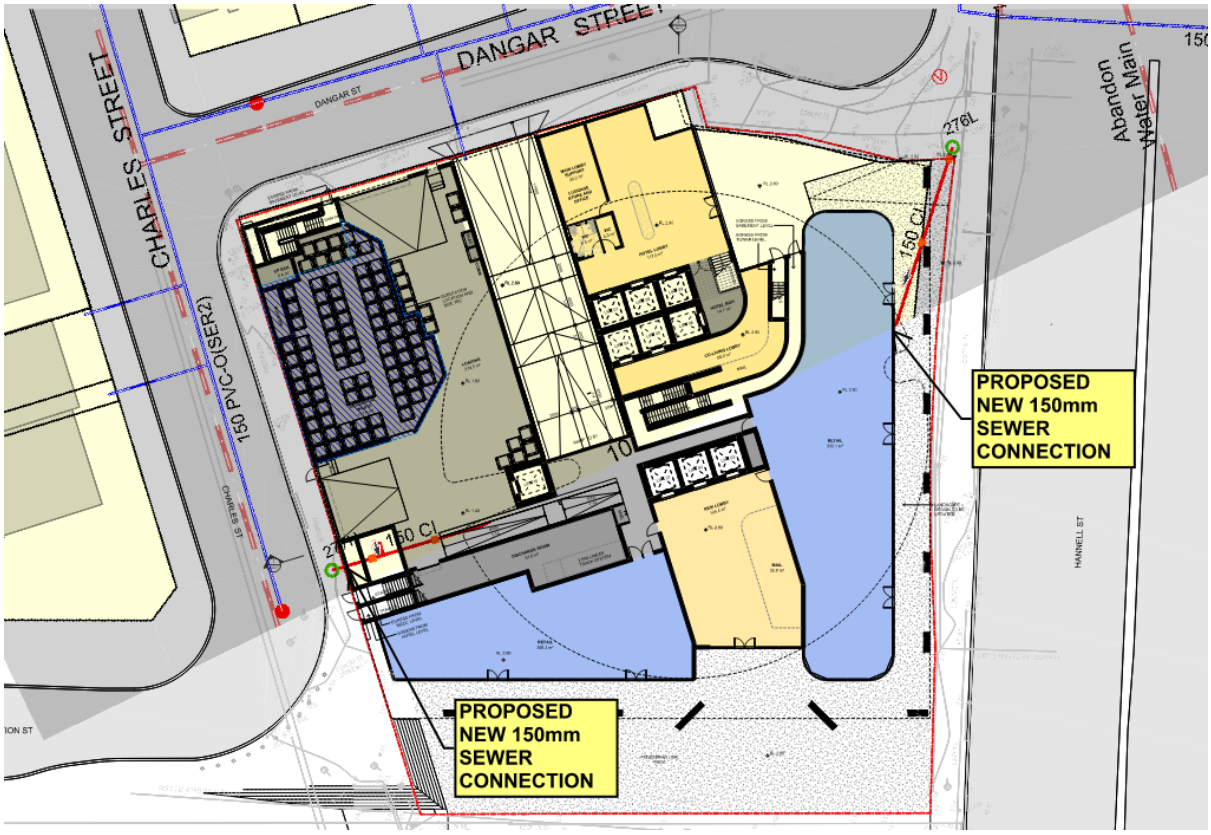

Figure 1: Hunter Water (BYDA)

During the detailed design phase, relocation, coordination, and design efforts will be required in collaboration with the Water Servicing Coordinator (WSC) to finalize the sewer diversion incoming sewer connection points.

2.2.2 DESIGN CRITERIAQ

2.2.2.1 Sewer Loading

The main reticulated sewer drainage line serving the development will be in accordance with AS/NZS 3500.2-2021 and preliminary proposed fixture unit calculations are as follows:

Area	Units	Fixture Units
Hotel	171 Units	1,026 FU
Co-living	99 Units	891 FU
Residential	244 Units	4,165 FU
Commercial/Retail	500 m^2	200 FU
Subtotal sewer connection		**6282 FU**
2 x 225mm @ 1.00% Capacity		**4,800 FU (each)** **9,600 FU (total)**

A network of sewer drainage systems will transfer sewerage waste from all levels of the proposed building to the nominated sewer connection.

2.2.2.2 Sewer Pump Stations

Areas within the building that are unable to be drained via gravity system to the property connection point and will be conveyed via localized sewer pump stations.

2.2.2.3 Retail Tenancies

Each retail tenancy is proposed have a 100mm sewer drainage provision for future extension during the tenancy fit-out stage, utilizing aerial drainage principles to the site's sewer infrastructure.

The drainage provision will be set at an invert level that ensures sufficient coverage of the tenancy floor plate.

2.2.2.4 Residential Apartments

The residential apartments are proposed to be conveyed utilising a Studor P.A.P.A. pressure attenuator stack system. This minimizes penetration and drainage riser sizes and limits the vents that needs to be taken through to atmosphere allowing extra amenity on rooftop and podiums.

2.2.3 MATERIALS

Piping System	Use / Location	Material	Nominal Pipe Size (mm)
Sewer Drainage	Below Ground	uPVC[1] Class DWV SCJ SN6 to SN8	100 - 225
Sewer Drainage	Above Ground	uPVC[1] Class DWV SCJ SN4 to SN6	100 - 150
Sanitary Plumbing	Above Ground	uPVC[1] Class DWV SCJ SN4 to SN6	100 - 150
Sewer Vent	Above Ground	uPVC[1] Class DWV SCJ SH - SN6	40 - 100
Sewer Drainage/Plumbing	High temperature	HDPE Electrofusion joints	40 - 100
Sewer Rising main	Below/Above Ground	Class 12 Pressure PVC	50-65
[1] uPVC to comply with 'Best Practice Guidelines for PVC in the Built Environment'			

2.2.4 PLANT & EQUIPMENT

System	Proposed Equipment
Sewer Pump Stations	Kwikflo polyethylene tank with submersible macerator pump set in duty/standby arrangement connected to BMS.

System	Proposed Equipment
Water Services Pump Set (Potable, Non Potable, Rainwater)	Grundfos pump set in Duty/Duty/Standby arrangement connected to BMS.

2.3 TRADE WASTE DRAINAGE

2.3.1 CONNECTION POINT

All trade waste shall gravity drain to associated pre-treatment equipment and be conveyed into the basement sewer pump station to the sewer drainage discharge point.

2.3.2 DESIGN CRITERIA

2.3.2.1 Retail Tenancies

Each retail tenancy is proposed have a 110mm Trade waste (grease) drainage provision for future extension during the tenancy fit-out stage, utilizing aerial drainage principles to the site's sewer infrastructure.

The drainage provision will be set at an invert level that ensures sufficient coverage of the tenancy floor plate.

2.3.2.2 Kitchen Grease Trade Waste

Hunter Water trade waste guidelines provide guidance of minimum pre-treatment requirements for various facilities and are summarised below:

A grease arrestor of at least 1000L capacity is required for the majority of food handling premises.

The required size increases with increasing scale of operations on the site.

Capacity allowance of 250L per dishwasher and 15L per seat is used to calculate grease arrestor sizes for

restaurants, function centres, hotels, motels, clubs, hospitals, nursing homes, cafeterias, and any other

premises serving meals. Table 12 below provides sizing based on these allowances.

Table 12: Minimum Sizing for Food Premises Grease Arrestors

No. of seats	Grease Arrestor size (L)
1-49	1000
50-79	1500
80-109	2000
110-169	3000
170-229	4000
≥230	5000

It is noted the commercial kitchen areas will have access to grease waste provision. We are proposing that only the nominated retail areas that have access to commercial mechanical kitchen exhausts be supplied with grease arrestor capacity.

Grease arrestors will be supplied with pump out lines with camlock couplings adjacent to the grease trap and in loading dock for ease of maintenance and cleaning if required.

Having an oversized grease arrestor can lead to longer detention rates and can result in faster deterioration due generation of hydrogen sulfide gas and sulfuric acid.

2.3.2.3 Car Wash Bay

Drainage located for a car wash bay (if any) will be conveyed into a collection tank and treated via an oil/water separator in accordance with Hunter Water trade waste requirements.

2.3.3 MATERIALS

Trade waste drainage pipework will be installed in the following materials.

Piping System	Use / Location	Material	Nominal Pipe Size (mm)
Grease Waste	Below Ground	HDPE Electrofusion joints or Rehau Raupiano plus	100
Grease Waste	Above Ground	HDPE Electrofusion joints or Rehau Raupiano plus	40-100
Trade Waste Vents	Above Ground	uPVC[1] Class DWV SCJ SN4	100
[1] uPVC to comply with 'Best Practice Guidelines for PVC in the Built Environment'.			

2.3.4 PLANT & EQUIPMENT

System	Proposed Equipment
Grease Arrestor	Halgan MGTA grease arrestor with access platform.

2.4 ROOF DRAINAGE

2.4.1 CONNECTION POINT

All site stormwater shall discharge into the on-site detention tank, except for those designated to bypass it, as specified in the civil engineer's documentation.

Non-trafficable roof areas to be discharged into a rainwater tank located on the roof. OSD will be located on mezzanine level.

2.4.2 DESIGN CRITERIA

Pipework will be adequately sized as outlined in AS 3500.3 to meet the required capacity for a 5min storm event of a 1 in 20-year ARI for all eaves gutters and 1 in 100-year for all box gutters and flat concrete roof areas.

The ARI figures from the Bureau of Meteorology are summarised below:

Description	AEP (mm/hr)
1 in 20 year	222
1 in 100 year	311

Flow in downpipes will be calculated utilizing the Colebrook White equation in accordance with AS 2200.

2.4.3 MATERIALS

Roof drainage pipework will be installed in the following materials.

Piping System	Use / Location	Material	Nominal Pipe Size (mm)
Conventional	Below Ground	PVC Stormwater SCJ SN4 to SN6	100 - 225
Conventional	Above Ground (internal)	PVC Stormwater SCJ SN4 to SN6	100 - 225
[1] uPVC to comply with 'Best Practice Guidelines for PVC in the Built Environment'			

2.5 SUBSOIL DRAINAGE

2.5.1 CONNECTION POINT

It is proposed the basement subsoil drainage collecting groundwater inflow will be discharged via the stormwater pump station and de-watering treatment plant to the discharge control pit at ground floor as nominated in the Dewatering Management Plan and Civil Stormwater Reports.

2.5.2 DESIGN CRITERIA

Pipework will be adequately sized as outlined in AS 3500.3 with stormwater pits provided throughout the floor plate with coordination of the architectural concrete profile plans.

The perimeter drainage detail is understood to be a trench in front of the shotcrete wall, perimeter rebate filled with 10mm aggregate. This will be collected via a perimeter subsoil drainage line connecting into stormwater pits on the floor plate.

Each stormwater pit will be fitted with a subsoil drainage pipe along the upstream side to adequately drain the trench and relieve hydrostatic pressure below the structural slab.

The de-watering treatment plan will be coordinated with the specialist consultant for system integration.

2.5.3 STORMWATER PUMPOUT WELL

The sizing of the stormwater pump out will be calculated based on seepage rate given by the geotechnical engineer, exposed areas draining to pit and ramp exposure as per the AS 3500 in conjunction with the site maximum discharge rate.

An insitu in ground stormwater pump out pit is proposed with the final volume to be determined following design development.

The pump out well is proposed to be located inground on the lowest basement level central to the building footprint.

2.5.4 MATERIALS

Stormwater drainage pipework will be installed in the following materials.

Piping System	Use / Location	Material	Nominal Pipe Size (mm)
Conventional	Below Ground	PVC Stormwater SCJ SN4 to SN6	100 - 300
Conventional	Above Ground (internal)	PVC Stormwater SCJ SN4 to SN6	100 - 150
Stormwater Pumpout	Above Ground (internal)	Class 12 Pressure PVC	100
[1] uPVC to comply with 'Best Practice Guidelines for PVC in the Built Environment'			

2.5.5 PLANT & EQUIPMENT

System	Proposed Equipment
Stormwater Pump out	Insitu concrete tank

System	Proposed Equipment
Stormwater Pump out	Grundfos Dual pump set Duty/Duty arrangement connected to BMS.

2.6 POTABLE COLD WATER

2.6.1 CONNECTION POINT

Currently there is an existing 150 PVC potable water main in Charles Street.

It is proposed for the site potable and fire water connection to be made via 2 x 150mm connections into the watermain in Charles Street.

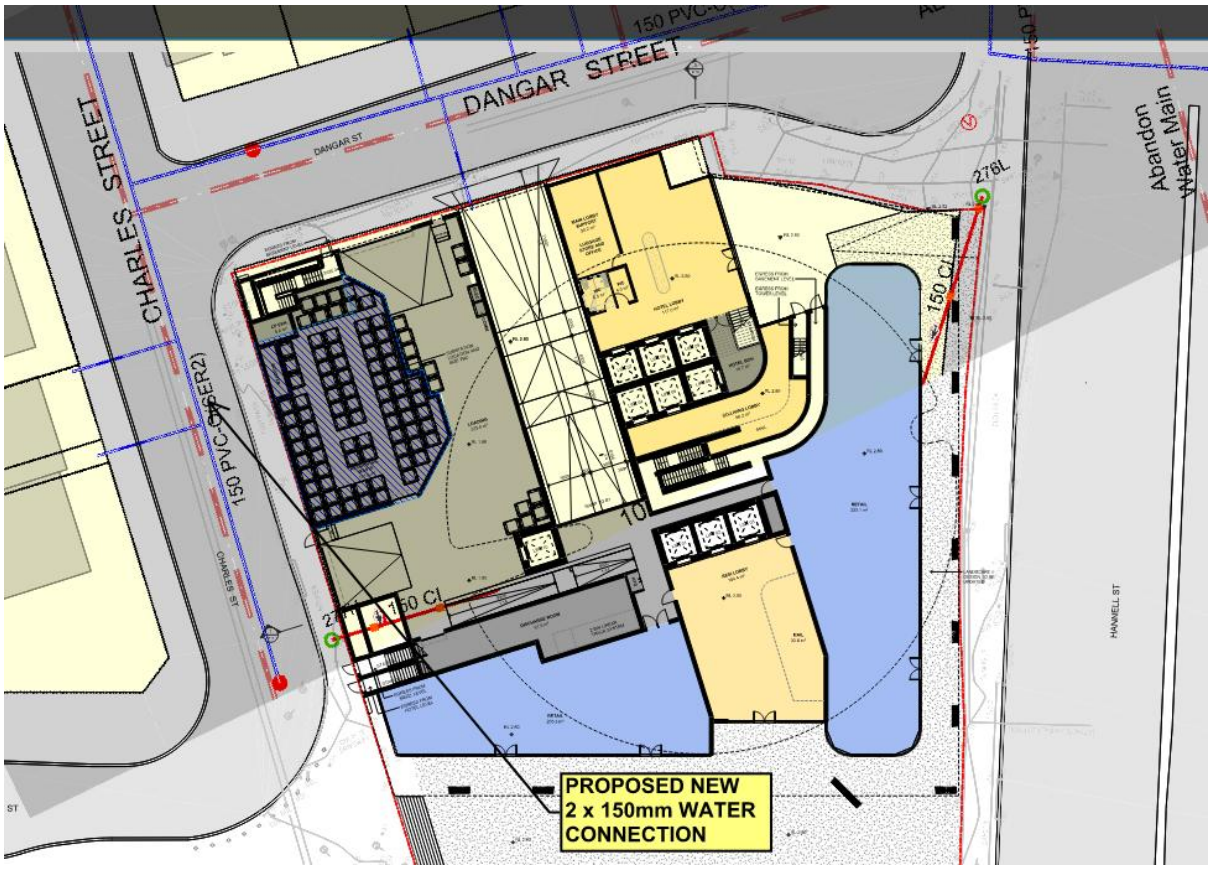

Figure 2: Hunter Water (BYDA)

2.6.2 DESIGN CRITERIA

2.6.3 SIZING

The parameters for sizing cold water services have been determined utilizing the following criteria:

Location	Design Velocity	Maximum Velocity	Minimum Pressure	Maximum Pressure
In ground	2.4 m/s	3.0 m/s	250kPa	500kPa
Internal in walls and ceilings	1.6 m/s	3.0 m/s		

Potable cold water services will be sized with adequate capacity to convey water supply to all fixtures and appliances. Typically, the loading unit method of calculated has been utilized from AS 3500.1-2021.

A preliminary assessment of the probable simultaneous flow rates have been calculated as follows:

Area	PFSR (L/s)	Pipe Size (mm)
Hotel	11.5L/s	100mm
Co-living	7.5L/s	80mm
Residential	14.5L/s	100mm
Commercial/Retail	2.35L/s	50mm
Subtotal Flow	**35.85L/s**	**150mm**

Due to the limited pressure available in the incoming water service, each service will be boosted by variable speed pump sets to ensure the minimum pressures in the brief are met to the commercial and residential stratums.

We note the retail tenancies will be supplied via variable speed pump sets.

Pressure reduction valves are to be provided to the lower levels to ensure 500 kPa is not exceeded at any fixture.

2.6.4 METERING

2.6.4.1 Authority

This building will incorporate four (4) stratums:

- Hotel
- Co-living
- Residential
- Commercial/Retail

Separate authority stratum meters will be provided to each. All individual apartments and all retail tenancies metered separately via sub-meters downstream of their respective stratum meters located in an accessible location.

Sub-metering will be provided to each retail/commercial/residential tenancy.

2.6.5 MATERIALS

Piping System	Use / Location	Material
Water Supply	Incoming Supply	MDPE Blue Stripe PN16.
Cold Water	Below Ground	MDPE Blue Stripe PN16.
Cold Water	Above Ground	Type A & B copper Tube. Grade 316 stainless steel.
Cold Water	Above Ground	Peroxide cross linked polyethylene with compression sleeve connections for rough in pipework.

2.6.6 PLANT & EQUIPMENT

System	Proposed Equipment
Hotel Pumpset	Variable speed pump set boosting mains supply.
Co-living Pumpset	Variable speed pump sets boosting mains supply.
Residential Pumpset	Variable speed pump sets boosting mains supply.
Commercial/Retail Pumpset	Variable speed pump sets boosting mains supply.

2.7 HOT WATER SERVICE

2.7.1 DESIGN CRITERIA

The parameters for sizing hot water services will be determined utilizing the following criteria:

Location	Design Velocity	Maximum Velocity	Minimum Pressure	Maximum Pressure
Hot water service	2 m/s	3.0 m/s	250 kPa	500 kPa
Circulating pipework	1.2 m/s	1.2 m/s		

Potable hot water services have been sized with adequate capacity to convey water supply to all fixtures and appliances. Typically, the loading unit method of calculated has been utilized from AS 3500.1-2021.

Dead legs will be minimized and the industry standard of maximum of 30 seconds will be targeted.

Pressure reduction valves will be supplied adjacent to ensure 500kPa is not exceeded at any fixture along with the cold water services.

2.7.2 METERING

Metering will be provided for each unit in the lobby areas via meter cupboards and supplied by the embedded network provider.

2.7.3 TEMPERATURES

Fixture outlet temperatures shall be provided in accordance with the following table:

Area	Fixture Outlet	Temperature Set
Accessible amenities	Wash basins, baths and showers.	45°C
BOH areas	Dirty utilities cleaner sink, dispensers.	60°C
Ablution fixtures	Wash basins, baths, showers, sink, laundry tub.	50°C

Temperature control for all fixtures at 45°C will be provided via thermostatic mixing valves located in recessed wall boxes located at 1500mm AFFL and tempering valves for all fixtures requiring tempering to 50°C.

2.7.4 MATERIALS

Piping System	Use / Location	Material
Hot Water	Above Ground	Type B copper Tube
Hot Water	Above Ground	Peroxide cross linked polyethylene with compression sleeve connections for rough in pipework

2.7.5 PLANT & EQUIPMENT

The following hot water plant options and reviewed for the proposed building:

2.7.5.1 Centralized Electric Storage

Typically, each plant consists of a manifolded bank of storage tanks heated by 3 phase electric heating elements. This option has been discounted due to high electrical load and high running costs vs Commercial Heat Pump. Also discounted due to potential difficulties with satisfying Basix requirements and Section J of the BCA.

2.7.5.2 Electric Boosted Solar

As above but with additional storage tanks heated by water solar collectors which reduce the load on the electric “Boost“ plant during sunny conditions. This option has been discounted due to the excessive roof space and cost required for enough solar collectors to achieve comparative running costs vs a Commercial Heat Pump plant. Note that the size of the electrical boost plant is not reduced compared with an electric only plant as the electric boost plant is required to meet 100% of the hot water load during periods of no or low solar gain.

2.7.5.3 Electric Commercial Heat Pump

Uses refrigeration technology to transfer energy very efficiently from the air to heat potable water. Approximately 4 x times the efficiency of electric water heaters and 4.5 times the efficiency of a gas hot water plant. Very low energy output vs gas necessitates large capacity storage tanks which require, combined with the heat pumps, require a comparatively large plant room space requirement, and much greater plant weight and equipment costs vs a centralized gas plant. However, the operating costs vs gas are comparable.

2.7.5.4 Individual Electric Instantaneous hot water units

Similar to the plant described in Section 2.7.5.6, this provides a great solution from a redundancy perspective and provides a premium finish as they are very small units that can be concealed in joinery. This option has been discounted as the power consumption for each unit is significant and due to the scale of the development, it will have a significant impact on the maximum demand.

System	Proposed Equipment
Garbage room hot water units	50L electric storage hot water unit
Commercial hot water plant	electric storage hot water unit
Residential hot water plant	Centralised electric heat pump instantaneous hot water plant with storage tanks

2.8 RAINWATER RE-USE SERVICES

2.8.1 CONNECTION POINT

The rainwater reuse services (if required) will be supplied from the rainwater tank. The location, capacity and reuse requirements will be subject to assessment from the BASIX consultant.

2.8.2 DESIGN CRITERIA

2.8.3 SIZING

The parameters for sizing cold water services have been determined utilizing the following criteria:

Location	Design Velocity	Maximum Velocity	Minimum Pressure	Maximum Pressure
In ground	2.4 m/s	3.0 m/s	250 kPa	500 kPa
Internal in walls and ceilings	1.6 m/s	3.0 m/s		

Rainwater reuse services will be sized with adequate capacity to convey water supply to all fixtures and appliances. Typically, the loading unit method of calculated has been utilized from AS3500.1-2021.

2.8.4 METERING

We note additional sub-meters will not be required; however the potable water top-up will be metered by the common meter.

2.8.5 MATERIALS

Piping System	Use / Location	Material
Reuse Water	Above Ground	Stainless steel pipework.
Reuse Water	Above Ground	Peroxide cross linked polyethylene with compression sleeve connections for rough in pipework.

2.8.6 PLANT & EQUIPMENT

System	Proposed Equipment
Rainwater Tank	Polyethylene tank or as per civil stormwater design
Supply Pumpset	Dual variable speed pump set fed from the tank
Filtration Plant	2 to 3 – Stage filtration consisting of automatic backwash filters and bag filters if used for irrigation

	only, ultraviolet filter (UV) will be required if need for wash down facility.

2.9 NATURAL GAS

2.9.1 CONNECTION POINT

Subjected to Jemena approval, it is understood the strategy for supplying gas to the development will be via either the 32 NY 210 kPa main located in Charles Street or the 32 NY 210 kPa main located in Dangar Street project require gas.

However, this is subject to approval and mains capacity.

This will be discussed with Jemena during the design concept stage and determined once embedded network completes the Jemena gas application.

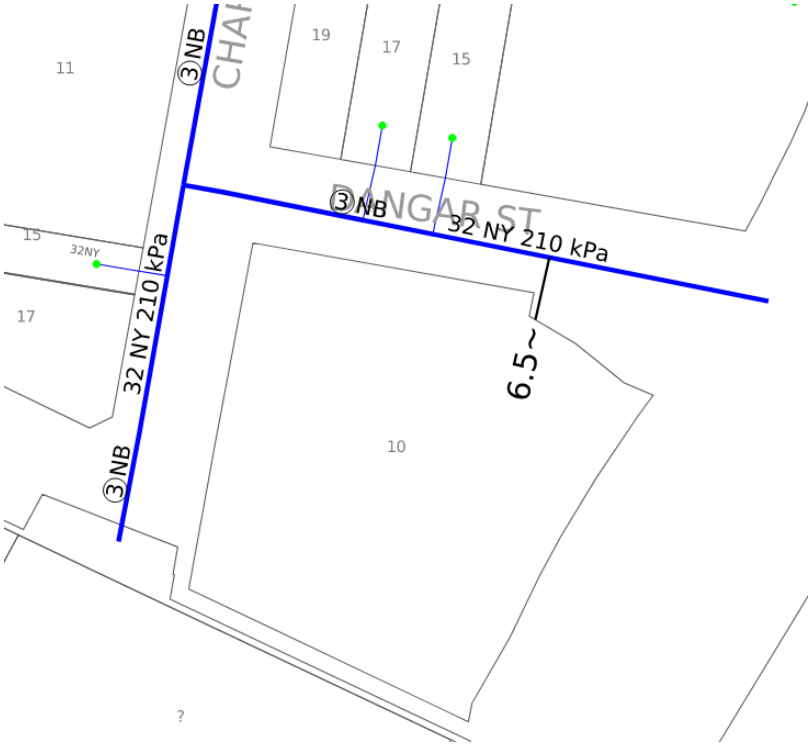

Figure 3: Gas Infrastructure Map (DBYD) https://www.byda.com.au/

2.9.2 SIZING

Gas services will be sized with adequate capacity to convey gas supply to all required gas appliances.
The pipe sizing methods from AS 5601 – 2022 will be used.
Gas service pipework will be sized using the following parameters:

Location	Value
Index Length	Variable depending on design layout
Pressure Drop	0.75 kPa (to suit 2.75 kPa reticulation pressure)
Gas Load	12,000 Mj/hr to 15,000 Mj/hr assumed

2.9.3 METERING

Below is the below proposed metering for the development

Stratum	Equipment	Description
All	Boundary Regulator	Incoming 7 kPa supply will be reduced down to 5 kPa through this device
Retail	Provision for meter assembly	Each retail tenancy will be provided with a capped provision from the outlet of boundary regulator for the meter to be installed during fitout contractor.

It is understood should we proceed with gas, the site will be established in an Embedded Network arrangement with a retailer. Therefore, each apartment will not be separately metered and be supplied with a dedicated feed from the meter cupboard on the respective level with a ball valve.

2.9.4 MATERIALS

The following schedule specifies the minimum requirement for gas pipework materials.

Location	Material
Reticulated pipework and fittings (above ground)	Type B Copper. Stainless Steel Press fitting (yellow ring).
Reticulated pipework and fittings (in ground)	Polyethylene PN20 pipe with electro fusion joints.

3 MECHANICAL SERVICES

Goldfish and Bay Pty Ltd has been engaged by UPG Wickham Pty. Ltd. Group to undertake the mechanical services design for this new mixed-use development located at 10 Dangar Street Wickham.

This report outlines the design proposals relating to the mechanical services proposed to be installed throughout the site. The proposed mechanical services include:

- Air conditioning systems for residential and co-living units
- Air conditioning systems for hotels
- Mechanical ventilation for residential and co-living units
- Mechanical ventilation for hotels
- Air conditioning systems for retail areas
- Miscellaneous mechanical ventilation for spaces in common areas
- Car park supply and exhaust ventilation
- Smoke hazard management

Goldfish and Bay aims to provide valuable input and expertise in the creation of the Detailed Design Report. Their objective is to offer practical solutions that balance cost-effectiveness, ease of construction, performance, maintenance, flexibility, and other project-specific requirements.

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The brief will be developed with the goal of providing value-added advice that provides cost-benefits and build-ability solutions.

The purpose of this brief is to provide a concise and well-organized written description of the service scope to be designed. However, it should not be mistaken as a Specification or Bill of Materials. Additionally, it does not aim to offer in-depth equipment selection details. Instead, the document outlines the expected outcome of services to be delivered within the building.

This document represents the client's approval of the mechanical services to be provided for this project by Goldfish and Bay.

Mechanical services to comply with current Australian Standards where applicable. Relevant Australian Standards include but are not limited to the following.

Referencing Document	Description
AS1668.1-2015	Fire and smoke control in multi-compartment buildings
AS1668.2-2012	Mechanical ventilation in buildings
AS4254.1-2012	Flexible ductwork
AS4254.2-2012	Rigid ductwork
AS3666.1-2002	Microbial control – Design, installation, and commissioning
AS3000-2007	Wiring rules
NCC 2022	National Construction Code

3.1 DESIGN CRITERIA

3.1.1 EXTERNAL AMBIENT AND INTERNAL ROOM CONDITIONS

The external ambient conditions and internal room conditions are as follows:

Summer Outdoor	35.0°C Dry Bulb, 23.5°C Wet Bulb (full solar load), "Comfort"
Winter Outdoor	5.0°C Dry Bulb (no solar load)
Summer Indoor	24.0°C Dry Bulb, 50% relative humidity – assumed maximum
Winter Indoor	21.0°C Dry Bulb, nil relative humidity control

Temperature shall be controlled within a tolerance of +/- 1.5^{0}C dry bulb at the point of control. Humidity control will not be provided.

3.1.2 OCCUPANCY RATES AND LOADS

Occupancy rates as per the requirements of AS1668.2 2012 Table A1

The internal people loads are listed as follows:

Area	Activity Level	Sensible Heat (W/person)	Latent Heat (W/person)
Hotel room	Seated at rest	70	33
Office & Admin	Seated standing	70	60
Dining	Sedentary Work	80	80

3.1.3 General Internal Lighting And Power Loads

SPACE	LIGHTING (W/m^2)	POWER (W/m^2)
Equipment	Apartments based on normal internal loads such as television, stereo, refrigerator, etc. Other areas based on 10W/m^2	
Lighting	Apartments based on non-concurrent peaks between daylight and artificial lighting Other areas based on actual installed lighting loads if the lighting specification is available or use 15W/m^2	

3.1.4 Ventilation Rate

SYSTEM	DESIGN CRITERIA
Carparks	AS1668.2-2012
Toilets and Amenities	AS1668.2-2012
Bin Rooms	5 l/s per m^2. Minimum of 100l/s
Grease Arrestor Room	5 l/s per m^2. Minimum of 100l/s
Store Rooms	5 l/s per m^2.
Laundry Cupboards	40 l/s (non-condensing dryer)
All other	AS1668.2-2012

3.1.5 Noise Criteria

The acoustic environment within the occupied areas of the buildings shall comply with the requirements of AS2107 and the Acoustic Engineers recommendations.

3.2 MECHANICAL SYSTEM DESCRIPTIONS

3.2.1 4.1 Air Conditioning System for Residential and Co-living Units

3.2.2 Air conditioning systems for residential and co-living units

VRV systems described in Section 4.1.2 below is proposed. The client needs to confirm and approve.

3.2.3 Air Cooled VRV (Variable Refrigeration Volume) Multi-Split System

Each unit is to be provided with an air-cooled reverse cycle multi-split system with a bulkhead type indoor unit that can be positioned in a drop ceiling or above the wardrobe. Refrigeration pipework

will be concealed in the ceiling space. The air-cooled outdoor unit would be positioned on the balcony of the respective apartment.

The occupant of each room in an apartment will be able to turn the air conditioning on and off in their room and adjust the room temperature to suit their requirements without affecting other rooms. The VRV system would be heat pump type with no simultaneous cooling and heating function available.

3.3 VENTILATION Systems for Residential and Co-living Units

3.3.1 Toilet and Laundry Ventilation

Mechanical ventilation will be provided to the bathroom and laundry in the apartment.

The system will be installed in the ceiling space and consist of an exhaust fan, ceiling grille, and associated ductwork. Each wet area will have its own exhaust air fan. Air discharge will be through an opening in the external wall with a weatherproof louvre.

Fan operation will be interlocked with a room light switch and be complete with 10-minute (adjustable) run-on timer. Make-up air will be through the undercut door.

It is recommended to have condensing dryer used for this project (client to confirm). Otherwise, a separate direct ducting from the dryer to outside would be required (for Class 2 units). Exhaust air fan needs to be controlled via a current switch as an interlock strategy with the dryer operation.

3.3.2 Kitchen Hood Ventilation

A kitchen exhaust hood will be provided above the cooktop. The builder will provide and install the hood with an integral fan. The mechanical contractor will connect the hood (and a boost fan if designed) exhaust to the outside via a weatherproof louvre opening in the external wall.

3.3.3 Make up Air and Natural Ventilation

All air-conditioned space inside the units will be naturally ventilated through operable windows (subject to acoustic report where mechanical ventilation might be required). Same concept applies to make-up air for WE and TE systems.

3.4 AIR Conditioning System for Hotel

3.4.1 Air conditioning systems for hotel rooms

Central VRV heat recovery systems described in Section 4.3.2 below is proposed . The client needs to confirm and approve.

3.4.2 Central Air Cooled VRV (heat recovery type)

For typical levels with hotel dwellings, a central air-cooled heat recovery VRV systems are proposed. It would be having 2-3 central condenser units (subject to refrigerant concentration) for each level and the condenser units are to be located inside the AC plant room on each level.

Each hotel unit is to be provided with a bulkhead type indoor unit that can be positioned in a drop ceiling or above the wardrobe. Refrigeration pipework will be concealed in the ceiling space.

The occupant of each room in an apartment will be able to turn the air conditioning on and off in their room and adjust the room temperature to suit their requirements without affecting other rooms. The VRV system would be heat recovery type with simultaneous cooling and heating function available for the hotel units. A multi-tenancy card system shall also be provided to the central VRV system to ensure systems to function as per design requirements. A master controller is also required.

3.4.3 AIR CONDITIONING SYSTEMS FOR HOTEL GENERAL AREAS

Central VRV heat recovery systems described in Section 4.3.4 below is proposed . The client needs to confirm and approve.

3.4.4 CENTRAL AIR COOLED VRV (EITHER HEAT PUMP OR HEAT RECOVERY TYPE, TBD)

It is proposed to have central VRV systems to serve other hotel areas (such as ball rooms, function rooms, kitchens, lobbies etc.). The system can be either heat pump or heat recovery type (subject to further design). Indoor units for these areas would be a combination of ducted, cassette, wall hung units (TBD). A master controller is also required.

3.5 VENTILATION Systems for Hotel Rooms

3.5.1 TOILET/BATHROOM VENTILATION

Mechanical ventilation will be provided to the bathroom and laundry in the hotel units.

The system will be installed in the ceiling space and consist of an exhaust fan, ceiling grille, and associated ductwork. Each wet area will have its own exhaust air fan. Air discharge will be through an opening in the external wall with a weatherproof louvre.

Fan operation will be interlocked with a room light switch and be complete with 10-minute (adjustable) run-on timer. Make-up air will be through the undercut door.

It is currently understood that there is no individual laundry room inside each hotel room.

3.5.2 KITCHEN HOOD VENTILATION

A kitchen exhaust hood will be provided above the cooktop. The builder will provide and install the hood with an integral fan. The mechanical contractor will connect the hood (and a boost fan if designed) exhaust to the outside via a weatherproof louvre opening in the external wall. (note that the use of rangehood inside each hotel unit is to be confirmed by the client).

3.5.3 MAKE UP AIR AND NATURAL VENTILATION

All air-conditioned space inside the units will be naturally ventilated through operable windows (subject to acoustic report where mechanical ventilation might be required). Same concept applies to make-up air for WE and TE systems.

3.5.4 CARPARK VENTILATION

There are 3 stories of basement car parks under the buildings. Mechanical supply and exhaust ventilation are required according to AS1668.2.

The ventilation systems include supply and exhaust fans, jet fans, ductwork, air grilles, and a control system. Supply air intake will be through horizontal louvres near ground floor and the exhaust air would be through a shaft to the roofs (details to be shown in the design drawings).

Supply and exhaust fans will be located in plant rooms in the car park. Supply and exhaust air ductwork will be arranged at a high level against the walls.

Jet fans in general will be mounted hard up to the soffit.

The system operation will be controlled via a carbon monoxide (CO) monitoring system.

3.6 Smoke Hazard Management

3.6.1 SMOKE EXHAUST SYSTEM

It is understood that no smoke exhaust systems are required for this project (subject to future Fire Engineering advice as we have not received the fire engineer report or any FEBQ yet.)

3.6.2 STAIR PRESSURIZATION SYSTEM

Fire egress stairways/corridors will be provided with an automatic stair pressurization system in accordance with AS1668.1. Fire Engineer is to nominate which fire stairs need to pressurized as per AS1668.1.

Stair pressurization is required to prevent smoke from entering the fire egress stair when building occupants are leaving the building in case of fire.

The system will consist of a pressurization fan, ductwork, fire ratings, duct mounted attenuators, and controls.

Provide relief air paths for the pressurized air from the fire-affected zone.

3.6.3 ZONE SMOKE CONTROL SYSTEM

It is expected that the required zone smoke control system as per NCC will be deleted under a fire engineering performance solution (subject to future Fire Engineering advice as we have not received the fire engineer report or any FEBQ yet.).

3.7 Air Conditioning for Retails

Besides the air conditioning systems described in Section 4.1, Section 4.3 sets out the proposed AC requirement for other specific areas.

All retail areas are proposed to have its own AC system and the proposed system would be air cooled VRV type system. At this point, the retail design hasn't been finalized yet. However, the below cooling loads provisions will be considered in future mechanical design (client to review and confirm).

Retail Loads:

The allocation to individual tenancies will be designed based on the following allowances and considerations:

250 W/m2 of Cooling (Retail)

300 W/m2 of Cooling (Food &Beverage)

100 W/m2 of Heating

3.7.1 PUBLIC TOILET VENTILATION

Mechanical ventilation systems are required for toilets in general public areas (such as the hotel common area toilets etc.).

Generally, the system consists of an exhaust fan, air grilles, and associated ductwork and is to be installed inside the ceiling space.

Exhaust air will be discharged at roof level or horizontally via louvres at the facade.

3.8 Kitchen Ventilation

Kitchen hood exhaust ventilations will be allowed and designed as per Services Matrix (not provided at current stage, TBD).

Generally, each system shall consist of a central exhaust air fan and ductwork. The system shall be provided and installed by the tenant. The duct route and discharge point shall meet the building owner's requirements.

Exhaust air will be discharged above the roofs.

3.9 Mechanical Ventilation Systems in Tenancies

Mechanical ventilation in each tenancy should be provided and installed by the tenant. It is proposed to have high level louvres around the tenancies above ground level.

3.10 Swimming Pool Ventilation

There are no swimming pool as a common community area for the residential parts of the building. Mechanical service requirement for Indoor swimming pool for the gym is described in Section 4.6.1.

3.11 Hotel Common Area Ventilation

Mechanical ventilation via louvres shall be provided generally consisting of louvres, ductwork, fan equipment etc.. It is proposed to have high level louvres around the common hotel rooms (including but not limited to kitchen areas, function rooms, ball rooms etc.).

3.12 Fire Pump Room Ventilation

The fire pump rooms (final locations and quantities are be confirmed) will require mechanical ventilation to ensure the satisfactory operation of the diesel engine system during a fire.

The room shall be mechanically ventilated through louvres to the outside. Air intake and exhaust air discharge shall comply with AS1668.1&2 in terms of distance separation and fire protection requirements.

At the current stage, the air flow required for each pump room has not been determined yet.

3.13 Plant Room Ventilation

General plant rooms (where required) will have a ventilation system to AS1668.2's requirement. Generally, the system consists of an exhaust fan, air grilles, and associated ductwork and is to be installed inside the ceiling space. Exhaust air discharge will be through a louvre or an exhaust air shaft.

3.14 Miscellaneous Ventilation System

There are miscellaneous minor ventilation systems for areas such as garbage room, switch room, comms room, gas meter room, fire control room, fire pump room, hot water room, etc.

Generally, those rooms will be either naturally ventilated as per AS1668.4 or mechanically ventilated as per AS1668.2. For typical mechanical ventilation system, each system consists of a fan, grilles, and associated duct. The system will be installed in ceiling space. Exhaust air will be discharged through the roof or external wall.

4 FIRE SERVICES

This report outlines the design proposals relating to the fire protection services proposed to be installed throughout the site. The proposed fire services include:

- Automatic Fire Sprinkler System
- Fire Hydrant System
- Smoke/Fire Detection
- Emergency Warning and Intercom Systems (EWIS)
- Portable Fire Extinguishers and Fire Blankets

4.1 STANDARDS AND REGULATIONS

Apart from adhering to the brief, the design solution must strictly comply with the relevant Codes and Standards listed below (note that some of these Standards may be superseded by specific State Government guidelines):

Referencing Document	Description
AS 2118.1-2017	Automatic Fire Sprinklers Systems – General systems incorporating amendment 1 and 2 (Ref. NCC E1D4)
AS 2419.1-2021	Fire Hydrant Installations – System design, installation, and commissioning (Ref. NCC E1D2)
AS 2118.6-2012	Automatic fire sprinkler systems – Combined sprinkler and hydrant systems (Ref. NCC: E1D2, E1D4 E1D16)
AS 2941 – 2013	Fixed Fire Protections – Pumpset Systems
AS 2444-2001	Portable Fire Extinguishers and Fire Blankets – Selection and location (Ref. NCC E1D14)
AS 1670.1-2024	Smoke Detection, Warning, Control, and Intercom Systems (Ref. NCC E2D5 & E2D6)
AS 1670.1-2024	Emergency Warning and Intercom Systems (Ref. NCC Clause E4D9)
NCC 2022 amdt 2	National Construction Code
NSW Service and Installation Rules	
Fire & Rescue NSW	
NSW Service and Installation Rules	
Local Council regulations having jurisdiction on this project	

4.1.1 Design Criteria

The project design will comply with the Australian Standards and the National Construction Code (NCC) mentioned above.

The fire services system requirements have been based on the building's classification as Class 2 (residential), Class 3 (hotel), Class 6 (retail), and Class 7a (carpark) according to the NCC Part A6. The final building classifications will be confirmed by the BCA Consultant and detailed in the BCA Report.

4.1.2 Wet Fire Services

4.1.3 Fire Water Infrastructure

The water supply requirements of the fire system can be split into two separate categories; one portion being the fire hydrant system requirements; and the other the fire sprinkler system requirements. The flow rates of these are as follows:

System Component	Water Flow Requirement	Explanation
Fire Hydrant Component	30L/s	The largest fire compartment on the project is the basement car park; with several carpark levels having a combined floor area of greater than 5000m^2. This floor area within a sprinkler-protected building requires 3 fire hydrants (at 10L/s each) to be considered as flowing simultaneously.
Fire Sprinkler Component	18L/s	The most onerous hazard classification within the site would be the retail portion of the building; the area will be classified as OH 3 – thus requiring 18 sprinklers to be considered as operating simultaneously (at 1L/s each) 12 sprinklers are required to operate simultaneously for car park area.

From the above, we can obtain the full fire services water flow requirement as being **45L/s for car park area**. This does not include provisions for internal wall-wetting sprinklers, total water flow is subject to change pending confirmation of fire engineering requirements for internal separation between fire compartments.

Due to the buildings effective height is greater than 135m the hydrant system will be designed in accordance with Appendix D of AS 2419.1-2021. 2-off water storage tanks will be required for the system in accordance with Appendix D. The 1st fire tank of approximately 133kL provided with an automatic infill of 45L/s. The effective capacity is based on 52kL for 30mins of hydrant supply and 1 hour supply for Ordinary Hazard 3 flow rate of sprinklers. The 2nd tank of 65kL will be provided on the roof and this capacity is based on 36kL for 30mins of hydrants and 1 hour of Ordinary Hazard 1 sprinkler flow rate. The tank to the lower level has been increased for the benefit of increasing the water supply to the Roof-level tank should the reticulated water supply fail, both tanks will also be

compartmented into 50/50 partitions, this is inline with an N+1 redundancy approach as stated in AS 2419.1 2021 Appendix D.

4.1.4 COMBINED HYDRANT AND SPRINKLER SYSTEM

It is proposed that a *Combined Fire Hydrant and Fire Sprinkler* system be installed to service the development. This system will be designed in accordance with the requirements of AS 2118.6-2012, AS 2118.1-2017 incorporating amendment 1 & 2, & AS 2419.1 2021.

A new combined system fire brigade booster assembly is proposed to be installed at the building fascade facing the hardstand of Dangar Street, a performance solution will be required as the building has multiple entrances, including 1x4 point feed hydrant and 2of 1x 4 booster inlets to the lowest 2 pressure zones of the system.

Fire mains, appropriate test facilities and an AS 2118.6 alarm valve set will be provided in the fire stairs, a landing depth of not less than 1.4 m should be provided. This depth would enable the minimum egress width to be maintained, while providing sufficient space for the installation of critical fire safety infrastructure.

A secondary water supply to the combined system is split into 2 areas and to be installed on Basement 1 and Level 43 with the pump rooms on basement 1 and Level 43. The tank is proposed to have an effective capacity of 133kL and 65kL respectively.

The fire pump rooms shall be directly accessed from fire-isolated stair via an air lock. Within plant room is proposed to be house the full duty diesel pumps (2-off required for the combined system), electric jockey pump, test pit discharging to storm water, and the pressure reduction stations if bottom-up system is to be adopted.

Typical Diesel Fire Pump and Concrete Water Storage Tank

4.1.5 FIRE SPRINKLER COMPONENT

The development will be equipped with an automatic fire sprinkler system in accordance with AS 2118.1-2017 and AS 2118.6-2012.

For the residential areas, the hazard classification will be Light Hazard, while plant rooms and storage areas will be classified as Ordinary Hazard 1. Carpark areas will be classified as Ordinary Hazard 2, commercial areas as Light Hazard, and retail areas as Ordinary Hazard 3.

The sprinkler system will have a demand of 20L/s and the primary water supply for this system is the onsite tank.

Each fire stair of the building will have a 150mm-diameter Fire Hydrant/Sprinkler main pipe. Each level of the building's fire stair will have a sprinkler alarm valve assembly connected to this main riser. Distribution pipes feeding sprinklers throughout the building will feed from the alarm valves. Testing or alterations will not disrupt service when isolation valves are incorporated to ensure minimal disruption. Sprinkler heads installed will be of the latest fast/quick response technology.

The fire sprinkler system will be interconnected with the FIP to monitor valves, flow and/or pressure switches.

4.1.6 DESIGN CRITERIA

For the Sprinkler system the following design criteria shall apply:

Occupancy	Hazard Class	Sprinkler Heads Flowing Simultaneously
Plant	OH1	6
Hotel	Light Hazard	4 (Residential Heads)
Residential	Light Hazard	4 (Residential Heads)
Car park	OH2	12
Retail	OH3	18

4.1.7 FIRE HYDRANT COMPONENT

The fire hydrant component provided through the development will be designed in accordance with AS2419-2021 and AS 2118.6 - 2012. The hydrant system will have a demand of 30L/s and the water supply for this system will be tank. The tank will hold 54kL of first response hydrant water, with an infill rate of 45L/s to provide an additional minimum of 4hrs.

From the pumps room 150mm diameter fire hydrant main pipework will reticulate throughout the basement to each stair core, and hydrant risers will reticulate up the building within each of the fire-isolated stairs. A landing depth of not less than 1.4 m should be provided. This depth would enable the minimum egress width to be maintained, while providing sufficient space for the installation of critical fire safety infrastructure.

The building will operate with multiple pressure zones; considering the building's height.

Fire hydrants will be generally located within the fire-isolated stairs. Where coverage from positions within the stairwell is insufficient to cover an area completely, additional fire hydrants will be installed in purpose-constructed fire services cupboards in readily accessible locations. Supplementary hydrants will be installed within 25m of a hydrant located in a fire stair.

4.1.8 DESIGN CRITERIA

Application	Criteria
Operating pressures at fixture outlets.	Minimum - 700kpa Maximum – 1200kpa
Operating Velocities through pipework.	Maximum – 4m/sec
Minimum number of Hydrants to operate simultaneously	3
Minimum operating flow rate	30L/s

4.2 DRY FIRE SERVICES

4.2.1 SMOKE DETECTION SYSTEM

The main Fire Detection & Control Indicating Equipment (FDCIE) is installed in the Fire Control Room. The FIP interface will allow for a full display and readout of fire event information on the display screen, irrespective of which zone has a fire event. Sub FDCIE will be located in the residential lobbies which will be interlinked to the main FDCIE providing a high level interface between panels.

Main-FIP, will be installed an Alarm Signaling Equipment (ASE). This ASE will facilitate the fire brigade call-out; and will provide the fire brigade with the building address to order the fire brigade directly to the location of the booster assembly.

A fully addressable fire detection system, designed and installed in compliance with AS1670.1-2024, is proposed to be installed throughout.

Smoke detectors will be provided throughout all of the non-residential portions of the building (such as the carpark, retail, commercial, plant spaces etc). With each sole occupancy unit will be a residential smoke alarm which is not connected to the dry fire system, but rather is an independent mains powered device. Smoke detection will be omitted from public corridors and public internal spaces within the sprinkler-protected class 2 portions of the building, as nominated in S20C5 of NCC 2022 amdt 2, unless engineered in for performance based solutions.

Smoke detection systems provide signals that activate mechanical, electrical, and security systems, e.g. equipment shutdown, building management systems, door security systems. AS 1668.1 requires that all necessary interfaces be provided to the FFCP to interface with the smoke hazard management system.

In accordance with respective Australian Standards, the fire alarm system will interface with components of the wet fire system to provide monitoring and notification functions.

4.2.2 EMERGENCY WARNING AND INTERCOM SYSTEM

The building will be equipped with an Emergency Warning and Intercom System (EWIS) installed in accordance with AS1670.4-2024, covering all areas to ensure effective communication during emergencies.

The EWIS system in accordance with AS1670.4-2024 to ensure compliance with safety regulations. This system will activate both audible and visual warnings throughout the building, with strategically placed speakers in each apartment to ensure appropriate sound pressure levels and speech intelligibility as required by the code.

Visual indicators will be installed in areas where speech intelligibility performance cannot be attained. These indicators will be available in the carpark area, commercial kitchen, and other plant and services rooms.

Evacuation diagrams will be located around the new building to comply with standard requirements and will highlight fire equipment locations as well as exits.

Figure 8: Typical EWIS Speakers and Horns

Standard EWIS speakers to be provided throughout building, and horn speakers will be provided only within the carpark and plant/services rooms.

4.3 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers and fire blankets to satisfy the requirements of the Building Code of Australia, Fire & Rescue NSW and the local authorities shall throughout the development in accordance with the requirements of the AS 2444-2001 standard and NCC Clause E1.6.

To ensure safety in the residential component, unlocked hydraulic water meter cupboards will house dry chemical powder extinguishers within a 10m travel distance from the entrance doorway of a sole-occupancy unit.

In the retail areas, portable fire extinguishers will be designated within fire hose reel cupboards, located within a 40m travel distance from any point on the floor. For the commercial kitchen portion of the retail areas, additional wet chemical extinguishers and fire blankets will be provided.

Fire Source	Equipment Type and Rating	Preferred Location
Essential Services Switch boards	4.5 kg Dry Chemical Powder (4A 60B:(E)) or Carbon Dioxide 5 kg (5B(E))	Between 2m and 20m from essential service switchboards.
Electric Switch Rooms	4.5 kg Dry Chemical Powder (4A 60B:(E)) or Carbon Dioxide 5 kg (5B(E))	Adjacent to and internal side of entry door between 2m and 5m maximum.
Plant Rooms	4.5 kg Dry Chemical Powder (4A 60B:(E)) or Carbon Dioxide 5 kg (5B(E))	Adjacent to and internal side of entry door between 2m and 5m maximum.
Commercial Kitchens (cooking oil and fats)	7Ltr Wet Chemical (2A:4F) including 1.8 m x 1.8 m Fire Blanket.	Adjacent to exit door and accessible from cooking area, between 2m and 20m maximum.
Residential Levels	2.5kg Dry Chemical Powder	Within 10m of all residential entry points
Throughout the entire site T	4.5kg Dry Chemical Powder (4A 60B:(E))	Within 2m of each Fire Hose Reel.

4.4 Interface With Other Systems

In fire mode, the building services need to interact with other systems. To ensure this, interfaces will be established between the fire detection system and the following building services:

- Mechanical ventilation used for smoke hazard management
- General air conditioning systems
- Building management systems
- Security and access control devices
- Automatic door operators

5 Electrical Infrastructure Assessment

The following report is an assessment of the electrical infrastructure requirements and impacts in relation to the located at 10 Dangar Street, Wickham.

- Development overview
- Existing electrical infrastructure
- Approximate maximum electrical demand of the proposed development
- Indicative electrical/Ausgrid requirements and indicative solutions

5.1 Standards

- AS3000 – Wiring Rules
- AS3008 – Selection of Cables
- AS2293 – Emergency Lighting and Exit Signs for Buildings

- AS 1768 – Lightning Protection
- AS1158 – Lighting for Roads and Public Spaces
- AS1680 – Interior and Workplace Lighting
- AS4282 – Control of Obtrusive Effects of Outdoor Lighting
- AS 61439 – Switchgear and Control gear Enclosures
- AS 62386 – Digital Addressable Lighting Interface
- Ausgrid NS109 for the location of the main switch rooms adjacent to the substations.
- NBN Design Guidelines

5.2 Design OVERVIEW

This document will outline key electrical infrastructure and systems proposed for the subject development and provide technical design characteristics forming GFB design intent while considering, cost optimization, performance, end-user satisfaction, safety and compliance to necessary local and national rules, regulations and standards listed above:

1. Site Main Electrical Low-Voltage Infrastructure
2. Site Wide LV Cabling and Distribution
3. General Indoor and External Lighting
4. Emergency and Exit Signage
5. Security, CCTV and Access Control
6. Lightning protection
7. Telecommunications
8. Retail/Commercial Tenancies Electrical Provisions
9. Residential Units Electrical Provisions

5.3 ELECTRICAL DESIGN CRITERIA

GFB have performed a maximum demand calculation with consideration of no gas provision to the development and utilization of electrical distribution system for the overall site services provisions including cooking and hot water generation. Summary of the maximum demand allowances are included in the table below following by a summary table indicating the overall demand across the two lots:

Area/ Equipment	Design Allowance	Calculation Method
Basement Carpark (Including Mechanical Ventilation)	15 VA/m2	Power Density
Communal Internal Areas	30 VA/m2	Power Density
Lobbies & Corridors	30 VA/m2	Power Density
BOH	30 VA/m2	Power Density
Office Tenancies	100 VA/m2	Power Density
Retail Tenancies	160 VA/m2	Power Density
Food & Beverage Tenancies	30 VA/m2	Power Density
Residential SOU's	60 VA/m2	Power Density
Lifts & Escalators	32A/each	125% rating of first lift + 75% rating of second lift + 50% rating of the remainder
Hot Water Generation – Residential Heat Pump	0.9A/per unit	Allowance
EV Charging	1.5kW/per bay	Allowance
Site Wide Diversity	85%	Utilisation Allowance

Based on the latest architectural Concept Plans maximum demands as per below: -

5.3.1 SITE MAIN ELECTRICAL LOW-VOLTAGE INFRASTRUCTURE

5.3.2 SITE MAIN SWITCHROOM

It is anticipated that each room will accommodate three (3) main switchboards accordingly dependant of final authority confirmation of substation LV arrangement. GFB will further assess the required load groups during the detail design and finalise each main switchboard accordingly with consideration of house, retail, safety services, base building services, hotel, co-living and residential load.

5.3.3 ELECTRICAL RISER ARRANGMENT

It is anticipated that each room will accommodate GFB strategy to provide dedicated residential and commercial/retail electrical riser for equipment installation vertical cable reticulation, tee-off boxes and access provisions. This strategy will provide segregation between different stratums and facilitate the need of restricting access by other entities if multiple strata management is proposed for this site in the future.

The preference is for the electrical riser to be located adjacent to lift cores and not immediately close to mechanical risers to minimise transition points and potential services clashes during detailed design. Access to be provided to all electrical risers at each rise in the floor including construction in accordance with NCC

section D3D8. Safe work zone of 600mm-1000mm is to be maintained to the front of each riser access door in accordance with AS3000 requirement.

5.3.4 ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

In accordance with latest NCC revision, EV charging infrastructure will be in designed and documented to ensure compliance is achieved inline with section J9. Considering the size if the basement level and quantity of carpark bays subject to receiving such infrastructure, it is anticipated that a busduct system will be designed and utilised to assist with potential voltage drop issues and required demand specifically for the carpark areas nominated for class 2 carpark bays. The supply to the future EV charging distribution boards will be from un-metered section of the main switchboards. This is to provide flexibility for the future development strata management to facilitate such infrastructure or have the capacity to hand over to EV charging management companies if necessary.

An EV dynamic load management system including utility management system will be documented to further assist with maximising charging capacity of the infrastructure to the benefit of the tenants and ensure electricity usage is captured accordingly for billing and financial purposes.

A local addressable network infrastructure compromising of distribution communications cabinets, patch panels, cable management and break out trays will be documented to assist with data reading and transferring information locally to necessary head-end units accordingly. these infrastructures are to be placed in necessary EV charging cupboards.

5.3.5 PHOTO-VOLTIC SOLAR SYSTEM

Each main switchboard will include a spare compartment reserved for a future PV system in accordance with NCC requirements.

The system size will be determined by the BASIX certificate, and GFB will design the PV system accordingly. Generated power will be fed back to the common house services section within the main switchboard to offset consumption in common areas.

The PV inverter location will be confirmed at design stage, either roof-mounted or within the riser at one level below.

5.3.6 SITE WIDE LV CABLING AND DISTRIBUTION

5.3.6.1 Maximum Demand

Based on the drawings provided, the overall development yield comprises the following:

- 171 hotel rooms;
- 99 co-living rooms;
- 245 residential apartments;
- Approximately 450 m² of retail/commercial floor area;

However, a clear breakdown of these quantities and associated NLAs on a per-building or per-lot basis has not been established, particularly where multiple buildings share common basement levels.

This information is also required to inform the ASP Level 3 design approach. GFB will review and refine the maximum demand calculations once the updated yield and NLA data is confirmed.

For the purpose of the maximum demand calculation, below clarifications, considerations and power demand allocations are indicated specific to the SOUs, retail and commercial spaces. These numbers will be rationalised and fine-tuned once the scheme is further developed.

Clarifications and Considerations

- We have considered electric cooking appliances to the residential units
- We have considered heat-pump for hot water generation – 1Amps per units
    - Studio 1.5A
    - 1-bedroom 1A
    - 2-bedroom 2A
    - 3-bedroom 2A
- Considered 150VA/m2 per commercial tenancy for lighting, power and mechanical systems
- Considered 250VA/m2 per retail tenancy for lighting, power and mechanical systems
- Considered 150VA/m2 for the supermarket
- Sole Occupancy Unit power allocation as per below excluding hot water generation –
    - Studio 3.5kVA
    - 1-bedroom 4.5kVA
    - 2-bedroom 5.5kVA
    - 3-bedroom 6.5kVA
- Sole Occupancy Carpark count as per below indication for EV chargers –
    - Studio – no carpark bay
    - 1-bedroom – 1off carpark bay
    - 2-bedroom – 2off carpark bay
    - 3-bedroom - 2off carpark bay
    - Visitors – 10% of total carpark bays
    - 100% future EV charging allowance as per NCC2022

MAXIMUM DEMAND CALCULATION - SUMMERY

Project:	10 DANGAR ST, WICHAM
Job Number	25200
Date:	30/03/2026
Author	MM
Reviewed by	GF
Revision	REV B

Residential	Comments	QTY	Gas Cook Top (Y/N)	Gas Hot Water (Y/N)	kVA/Unit	TOTAL kVA	TOTAL A
Studio Apartments	-	270	N	N	3	810	1169
1 Bedroom Apartments	-	46	N	N	3.5	161	232
2 Bedroom Apartments	-	155	N	N	4	620	895
3 Bedroom Apartments	-	38	N	N	4.5	171	247
4 Bedroom Apartments	-	2	N	N	5	10	14
Penthouse Apartments	-	4	N	N	10	40	58
	Total Apartments	515				1812	2615
	Loading Multiplier	1.08			Total Residential MD:	1950	2815

Retail / Commerical	Comments	m²		VA/m²	TOTAL kVA	TOTAL A
Ground Floor Retail Tenancy 1	RETAIL	192		200	38.4	55
Ground Floor Retail Tenancy 2	RETAIL	164		200	32.8	47
Ground Floor Retail Tenancy 3	RETAIL	114		200	22.8	33
Hotel Lobby & BAR	F&B	585		200	117	169
common area	Retail	1000		150	150	217
			Total Retail/Commercial MD:		71	103

Communal	Comments	QTY		Amps per Lift	TOTAL kVA	TOTAL A
Lifts	1 off passenger lift and 1 off car lift	10		63	262	378
	Total Area:	10	Total Retail/Commercial MD:		262	378

EV Charging	Qty	kW Each	Total kW	Total A	Diversity	TOTAL kVA	TOTAL A
Residential EV chargers with Load Control System	196	1.5	294	424	100%	294	424
Commercial EV Chargers with Load Control System	21	1.5	31.5	45	100%	31.50	45
					Total EV MD:	326	470
Note: Based on 400V.					BUILDING TOTAL MD:	2610 kVA	3766 A

5.3.6.2 House Services

General house services will be provided via rising main arrangement and tee-off boxes installed inside respective risers. Dedicated rising mains will be nominated per respective stratum.

Safety house services will be provided by dedicated supplies and from safety chassis of respective main switchboards.

Major submains will reticulate via suspended cable tray/ladder arrangement. Cable tray installation will extend within the risers for vertical reticulation for the full extend of the cable. Fire rated cabling and trays to NCC section C3D14 and AS3013 will be nominated for safety house services.

Sub-circuit cabling for lights and general power within basement levels will be via cast-in power conduits and junction boxes. Where ceiling void is available, GFB will document for

electrical cabling to run within the void accordingly for ease of access and maintenance in the future.

In-ground cable reticulation will be in accordance with AS3000 underground wiring systems requirement to nominate minimum dept of cover and further detailing the trench layout.

Considering the full electric nature of this development, riser space available and long cable runs, it is anticipated that low voltage busduct system with tap-off boxes maybe proposed to ensure necessary voltage drop is achieved.

This site is subject to overall 7% voltage drop from the point of supply to the final sub-circuit. All cabling will be sized to achieved VD below nominated number accordingly. all cabling will be sized to their respective maximum demand and circuit breaker size plus 25% spare capacity throughout the site. General supply cabling will be of XLPE/PVC type and Safety services will have 2hrs fire rating accordingly.

5.3.6.3 Un-metered Services

Residential units are to be supplied via riser meter panel arrangement. Residential rising mains and tee-off box arrangement is to be documented. Each riser meter panel can supply up to 16 units depending on final equipment provisions and hot-water generation strategy.

Retail tenancies to receive grouped meter panels or dedicated metering dependant on the final calculated maximum demand and/or future tenant supply rating requested for loads in excess of 100A/3ph. NMI rated kWh meters will be provided for billing purposes. Supplies above 100A/3ph are to receive CT metering and dedicated kWh enclosure within the vicinity of the tenancy accordingly and from communal spaces for authority and electricity retailer personnel access in the future.

Commercial and office type tenancies to receive dedicated supply via CT metering and separate kWh metering enclosure within electrical commercial riser accessible from the common corridor. Each tenancy will also receive a general distribution board having split chassis for light and power. It is anticipated that the mechanical is supplied via base building via dedicated essential/non-essential mechanical services switchboards.

5.3.6.4 Power Factor Correction Unit

Service and installation rules NSW indicates the necessity of power factor correction units if the site power quality is not achieved accordingly. since at design stage this can not be calculated accordingly. GFB will be documenting space provision for CT chamber and circuit breaker for future installation. It is landlord responsibility to test ad measure power factor across all main switchboards after 12 months of practical completion and if compliance is not achieved, engage a consultant to design a system accordingly.

5.3.6.5 General Indoor and External Lighting

The preliminary lighting services design shall be configured generally as follows.

- Internal lighting will be designed in accordance to Australian Standard AS1680 and Section J7 of the NCC. Consideration to people with disability lighting levels and glare will be emphasized and implemented.
- Intelligent lighting controls is proposed throughout the building.
- External lighting will be designed in accordance to Australian Standard AS1158 and AS4282 as well as Section J6 of the NCC. These standards focus on road lighting and consider public safety regarding:
    - better visibility during the night,
    - theft,
    - security and crimes within a given suburb and
    - preventing disturbances via glare emitting from the luminaires to the neighboring sites.
- Where security and CCTV coverage is of paramount importance, post-top lighting will be in place to provide vertical illumination accordingly.
- Lighting control strategy is to provide combination of motion sensors, timeclock, PE cells and local switches to comply with NCC Section J7 requirements.
- Lighting control to retail and commercial tenancies will also be via motion sensors and local override-off switch suitable for a cold-shell tenancy fit-out.
- Power to external lighting will be reticulated via flexible conduit pathways within soft-landscaped areas for ease of installation, access and maintenance.

Table below is provided to summarise the design criteria, require light levels and control accessories:

Area	Lighting Performance	Luminaires	Control System	Maximum Power Density
Carpark Entry	800 Lux for first 15m during daytime 160 Lux for first 15m during night-time 160 Lux for next 4m	LED	Time Clock Daylight Sensor Motion Sensor	NCC Section J7
Car Park Isles and Parking Spaces	100 Lux	LED	Time Clock Motion Sensor	NCC Section J7
Entrance Lobbies/ Foyers	240 Lux	LED	Time Clock Motion Sensor	NCC Section J7
Egress Corridors	160 Lux	LED	Time Clock Motion Sensor	NCC Section J7
Stairs/ Fire Stairs	120 Lux	LED	Motion Sensor	NCC Section J7
Offices/ Commercial	20 Lux – Cold shell	LED	Motion Sensor Light Switch	NCC Section J7
Retail	20 Lux – Cold shell	LED	Motion Sensor Light Switch	NCC Section J7
Services Plant Rooms	240 Lux	LED	Light Switch	NCC Section J7
Amenities/ Toilets	120 Lux	LED	Motion Sensor	NCC Section J7
Balconies	N/A	LED	Light Switch	NCC Section J7
External Security	50 Lux	LED	Time Clock Daylight Sensor	NCC Section J7
External Lighting	To AS1158 & AS4282	LED	Time Clock Daylight Sensor	NCC Section J7

Note that AS1680 does not provide guidance associated with lighting levels within SOUs, however, below table is included to ensure consistency is achieved across all units and the client is to receive a cost-effective and optimised solution within the residential section.

Area	Lighting Performance	Luminaires	Control System	Maximum Power Density
Bedrooms	160 Lux	LED	Light Switch	NCC Section J7
Bathrooms/ Ensuites	80 Lux	LED	Light Switch	NCC Section J7
Laundries	80 Lux	LED	Light Switch	NCC Section J7
Lounge/ Dining	160 Lux	LED	Light Switch	NCC Section J7
Studies	160 Lux	LED	Light Switch	NCC Section J7

5.3.7 EMERGENCY AND EXIT SIGNAGE

The preliminary lighting services design shall be configured generally as follows.

- Emergency luminaires and exit signs shall comply with AS2293 and be National Construction Code (NCC).
- Each emergency lighting unit will be of the self-contained single point type complete with LED light source, batteries, dual rate battery charger, inverter, test switch and light emitting diode to indicate that the charger is operating.

- Where emergency lighting units are contained within normal luminaires, the batteries and associated control equipment will be housed on a separate metal enclosure attached to the luminaire and located so that the batteries are not affected by the high temperatures generated within the luminaire during normal operation.
- Emergency exit luminaires will be of the 'Running Man' pictorial type complete with arrows as required and classified by an approved authority in accordance with AS/NZS2293.1, with the classification being clearly identified on the luminaire label.
- Central monitoring system will be fitted to this development in order to reduce the maintenance cost and allow for ease of installation using systems enhancing wireless technology. GFB will provide segregation of the monitoring system between retail/commercial and residential component to allow for multi strata management unless advised otherwise.
- Where exit signage is to be mounted above nominated height in AS2293, GFB will be documenting jumbo fittings with increased viewing distance (typically 40m).
- Where exit signage is has potential of obstruction via other services provisions, GFB will be documenting signage installation wall mounted at lower height below the services to ensure visibility is achieved accordingly.
- If suspension is deemed necessary, rod suspension is to be documented instead of wire suspension.

5.3.8 SECURITY, CCTV AND ACCESS CONTROL

Provision of security system is typically driven by client's direction and DA consent, having said that, GFB approach to design the system will be in accordance with below table unless advised otherwise.

System	System Type & Description
Access Control	Proximity card access control for; • Main entry doors residential • Main entry doors commercial/retail • Retail tenancies • Commercial and office tenancies • Carpark entry doors • Carpark entry boom gates • Lifts • Stair doors (only monitoring)
Intercom	Video intercom to; • Carpark entry doors • Loading docks • Receiver station with door release function to the building managers office
CCTV	Closed circuit television to; • Main entry points • Entry lobby

	• External surrounding and hiding spots • Car park entry • Car park circulation aisles • All common areas • Loading docks • All lifts • Building managers office

The overall system is a networked based (IP)solution with capabilities to have third-party system integration in the future. All head end units will be located within the main communications room and integrated via local addressable network. Inline with other services, the security, CCTV and access control system will also be segregated between retail/commercial and residential to allow for multi strata management capabilities in the future.

An un-interruptible power supply system will be proposed for 1hrs autonomy in case of power failure to maintain system integrity accordingly.

A fire trip signal will be provided to the system from the fire control room to ensure that access-controlled doors are released accordingly in fire mode to ensure safe evacuation of the buildings accordingly

5.3.9 LIGHTNING PROTECTION

Considering the height of proposed buildings, electrical infrastructure to be installed on site to provide electricity and extend of the site, it is very likely that this development will require lightning protection system. This is to be further confirmed by GFB through lightning risk assessment. Having said that, if such system is required. GFB will be designing a conventional system in accordance with AS1768. Conventional lightning protection system is designed to safeguard buildings and structures from lightning strikes by providing a controlled path for the electrical discharge to follow, thereby minimising damage and ensuring safety. The key components of a conventional lightning protection system include:

Air Terminals (Lightning Rods):

These are pointed metal rods placed at the highest points of the structure, such as rooftops, chimneys, and towers. They serve as the initial contact point for lightning strikes, capturing the electrical charge and directing it safely towards the ground.

Conductors:

These are thick, conductive wires or cables that connect the air terminals to the ground. They provide a low-resistance pathway for the electrical current to travel from the air terminals to the ground electrodes. Conductors are typically made of copper or aluminum.

Ground Electrodes (Grounding Rods):

These are metal rods or plates buried deep in the ground, often made of copper or galvanized steel. They dissipate the electrical charge into the earth, away from the protected structure. Ground electrodes are crucial for safely transferring the lightning current into the ground.

Bonding:

Bonding ensures that all metal parts of the structure are electrically connected, preventing potential differences that could lead to side flashes. This includes metal roofs, pipes, and other conductive materials within the building. Proper bonding reduces the risk of electrical hazards and ensures the system's effectiveness.

Surge Protection Devices (SPDs):

SPDs are installed at key points within the electrical system to protect against surges caused by lightning strikes. These devices help prevent damage to electronic equipment and electrical systems by diverting excess voltage and current away from sensitive components.

Inspection and Maintenance:

Regular inspection and maintenance of the lightning protection system are essential to ensure its ongoing effectiveness. This includes checking for corrosion, loose connections, and damage to components. Proper maintenance ensures that the system remains capable of handling lightning strikes.

Overall, a conventional lightning protection system provides a comprehensive approach to mitigating the risks associated with lightning strikes, protecting both the structure and its occupants.

5.4 TELECOMMUNICATIONS

5.4.1.1 Incoming Telecommunications Infrastructure (NBN/Opticomm)

NBN and Opticomm are widely used within Australia to provide FTTP (Fibre to the Premises) infrastructure. Both these services are readily available for this site. NBN Co has requirements to install their passive equipment on premises inside a secured and dedicated room. This service is reticulated from available street provisions into the development via in-ground conduits and further reticulate on cable tray to building fibre device (BFD). Topology of NBN distribution internally is via star distribution comprising of equipment installed in communications risers such as Fibre Distribution Terminals (FDT) and Splitter Distribution Terminals (SDT) with final fibre termination inside tenancies via Network Terminal Devices (NTD). NBN does not require dedicated NTDs for safety services such as emergency lifts and fire control rooms as a mobile sim coverage will provide connectivity to necessary emergency department and services. GFB will be documenting NTDs associated with security, house and retail/commercial base building services to maintain segregation between different stratums.

Additionally, Opticomm has provisions for communications rack installation to accommodate active equipment on site. Depending on Urban Preferenace preference, GFB can document spatial provisions accordingly.

Note that all necessary conduit reticulation to tenancies (retail, commercial and residential) from associated communications risers at each level is via in-slab 25mm communications conduit in coordination with structural engineer's approval. This is to minimise clashes with other services and provide a less Labour-intensive installation.

Our desktop assessment confirms that the NBN services are available within the vicinity of the site to serve this development.

5.4.1.2 Base Building Communications Equipment

In order to facilitate different network infrastructure and provide connectivity within the overall site, it is necessary to install passive communications infrastructure to provide such connection points. GFB will be documenting communications racks in main communications room to distribute fibre cabling throughout. Communications risers within basement, ground and level 1 will have small communications racks installed to provide connection link back to the base building head-end units in basement level. Each rack will receive fibre-breakout tray, patch panels, cable management and power rail including dedicated captive screw power outlet at high level connected to house services. Small, localised UPS system will be documented if a communications rack has connection link to CCTV, Access Control and Security system at that level/area.

Two separate networks will be documented to provide segregation between retail/commercial and residential sections of the development.

A wireless local addressable network will be documented to further enhance wireless connectivity within basement levels, ground and level 1 excluding residential portion. This is to further assist users with internet connectivity in locations well cellular internet coverage is limited or non-existent.

5.4.1.3 Fibre TV

Since NBN and Opticomm provide TV over fibre, GFB will be documenting a fibre TV system instead of traditional MATV/PayTV infrastructure. This approach will provide TV connections with no coaxial cabling and additional TV equipment inside risers. Media conversion will take place within tenancies through NTDs accordingly to achieve the same outcome as the traditional system.

This will also remove provisions of any roof top antenna and dish installations.

5.4.1.4 In-building Mobile Coverage/Distributed Antenna System (DAS) – Provision only

Space provision for future installation of distributed antenna system will be documented by GFB. Note that system design, equipment specification and reticulation pathway design is to be conducted by a qualified DAS system consultant. Our space provision will be in accordance with *MCF DESIGN SPECIFICATION FOR DISTRIBUTED ANDTENNA SYSTEM (DAS) EDITION 2023*.

Necessary backbone cabling associated with this system can reticulate via nominated communications risers.

5.4.2 RETAIL/COMMERCIAL TENANCIES ELECTRICAL PROVISIONS

Table below is summarising electrical, communications and lighting provisions to retail/commercial tenancies in accordance with cold shell fit out requirement

Services	Electrical	Communications	Lighting
Retail (including food and beverage)	1 x Tenant DB with split chassis (size TBC) 1 x DGPO for NTD	1 x NTD 1 x Intercom by the entrance door	LED batten including emergency and non-emergency. Exit signage as required. Motion sensor with override-off local switch by the entry door.
Commercial/ Office	1 x Tenant DB (size TBC) 1 x DGPO for NTD	1 x NTD 1 x Intercom by the entrance door	LED batten including emergency and non-emergency. Exit signage as required. Motion sensor with override-off local switch by the entry door.

Size of distribution boards to be confirmed during detail design stage.

5.4.3 RESIDENTIAL TENANCIES ELECTRICAL PROVISIONS

Table below is summarising electrical, communications and lighting provisions to residential tenancies.

APARTMENT ELECTRICAL PROVISIONS

Services	Power	Communications	Lighting
Living	2 x DGPOs for TV 2 x DGPO general use	1 x Double Data 1 x TV Outlet	downlights with local light switches
Dining	1 x DGPOs	1 x NTD 1 x Double Data	downlights with local light switches
Kitchen	2 x DGPOs above bench 1 x GPO for dishwasher in-joinery 1 x GPO for microwave in-joinery 1 x GPO for others in-joinery 1 x GPO for oven in-joinery 1 x GPO for cook-top in-joinery	1 x Double Data above bench	Downlights, pendant and in-joinery strip lighting with local light switches
Master Bedroom	1 x DGPOs for TV 2 x DGPO general use	1 x Double Data 1 x TV Outlet	downlights with local light switches
Bedroom 2	1 x DGPOs for TV 2 x DGPO general use	1 x Double Data 1 x TV Outlet	downlights with local light switches
Bedroom 3	1 x DGPOs for TV 2 x DGPO general use	1 x Double Data 1 x TV Outlet	downlights with local light switches
Study	1 x DGPOs for TV 1 x DGPO general use	1 x Double Data 1 x TV Outlet	downlights with local light switches
Bathrooms	1 Double GPO integrated in joinery	NA	Downlights and in-joinery strip lighting with local light switches
Laundry	1 x DGPOs for washer/ dryer 1 x DGPO general use	NA	Downlights and in-joinery strip lighting with local light switches
Hallway	NA	Intercom	downlights with local light switches