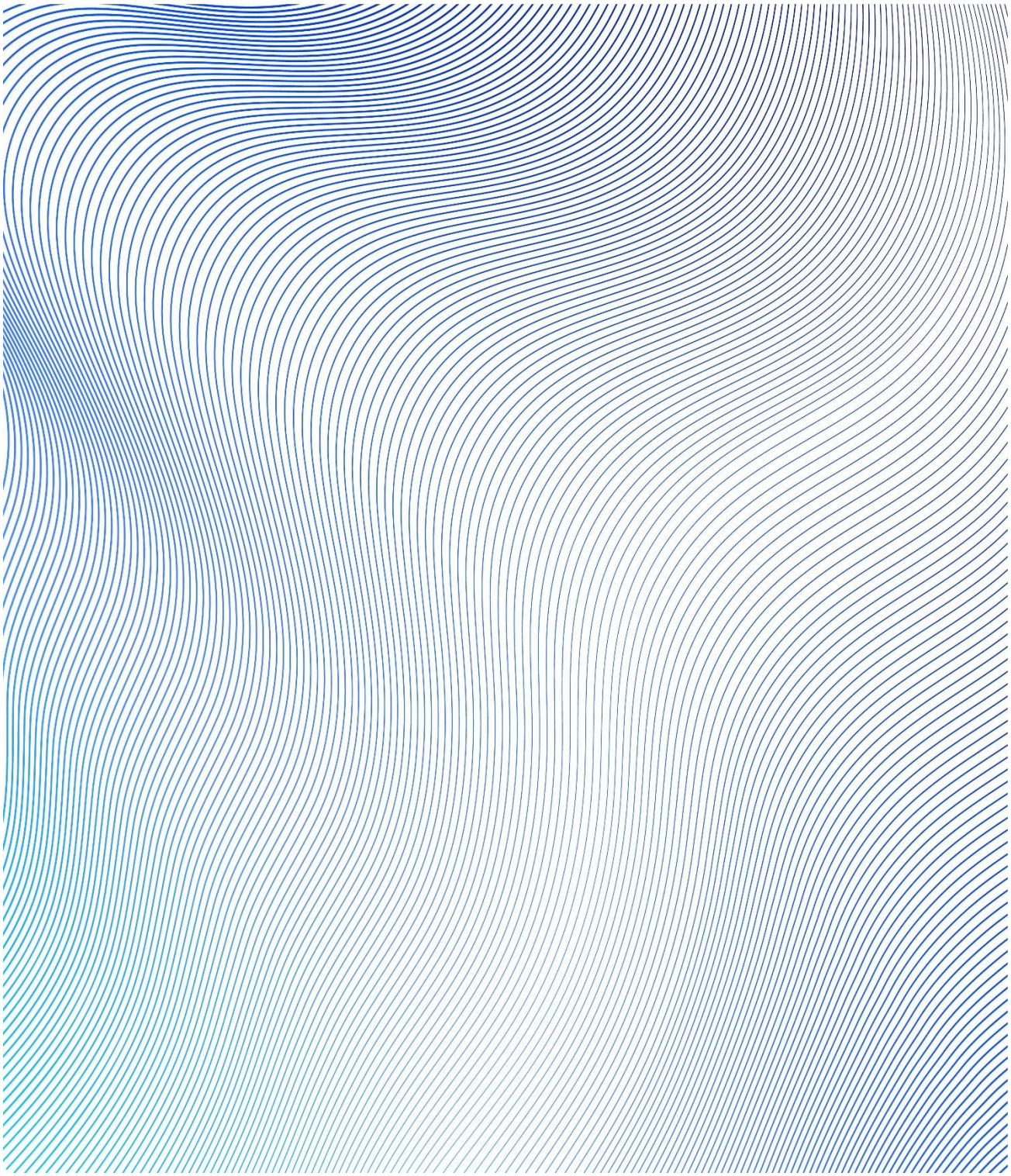
Tamworth Regional Aquatic Centre

CONCEPT DESIGN REPORT

MAY 2024



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Project Office

Introba Consulting Pty Ltd
Level 12, 77 Pacific Highway
North Sydney NSW 2065
+61 2 9431 9431

Project Contact:

Elie Damaset

elie.damaset@introba.com

Disclaimer

www.introba.com

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Executive Summary

The purpose of this design report is to capture broad-based discussions in relation to engineering services held to date, summarise the key design criteria, outline overarching design principles utilised in developing concept schemes, discuss various design options considered at this stage and provide recommendations on key design strategies to be adopted for each engineering discipline.

Based on the briefing information and further discussions with the Client, the following design principles were used for concept design development:

- All-electric building – minimal use of fossil fuels (gas for kitchen and diesel for fire pumps) are to be utilised in the project;
- Maximisation of renewable energy generation;
- Maximisation of rainwater harvesting for reuse within building and irrigation;
- Minimisation of energy use within building;
- Minimisation of water use within building.

A summary of scope, design criteria, design options considered (where applicable) is provided for each engineering discipline along with recommendations on key design strategies or options to be adopted moving forward.

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1 Introduction

1.1 General

The aim of this concept report is to capture broad-based discussions in relation to engineering services held to date, summarise the key design criteria, outline overarching design principles utilised in developing concept schemes, discuss various design options considered at this stage and provide recommendations on key design strategies to be adopted for each engineering discipline.

To date, the engineering services team has conducted a detailed review of briefing documentation, Dial Before You Dig information, participated in the discussions and workshops with the broader project team, provided advice for spatial planning of the building and contributed to the development of ESD strategy for the project.

The following information is provided for each engineering discipline in this report:

- General and background specific for the discipline;
- Description of systems included in the scope;
- Site and authority infrastructure considerations (where applicable);
- Design criteria used in development of concept design;
- Design options (if proposed);
- Recommendations on key design strategies or options to be adopted in this project.

1.2 Project Overview

This Design Report, prepared by Introba provides an outline of the Engineering Services Scope and Systems proposed to the Tamworth Regional Aquatic Centre located to the west of the Tamworth Regional Hockey Centre on Jack Smyth Drive, Tamworth, NSW 2340.

The proposed centre will include a new building comprising the below mentioned areas:

TRAC (Stage 1)

- 10 Lanes 50M Indoor pool with moveable swim wall and floor.
- Spectator stands Seating for up to 600 people.
- 25M Warm water/Program pool.
- Administration, offices and first aid.
- Foyer, reception, and café.
- Wet and dry lounge
- Gym, strength and cardio
- Allied health consulting rooms x4.
- Health and fitness rooms x2
- Crèche
- Services plant room and stores
- Off street parking (150 spaces, 6 accessible spaces, 30 staff spaces, and 4 bus spaces)

NICSH (Stage 1)

- Sports science testing lab.
- Administration/sports house.
- Teaching and meeting spaces.
- Reception and accessible amenities.

This report is covering only stage 1 and will not make allowances for the future stages 2 and 3 as confirmed by CO.OP and Tamworth Council.

This document has been prepared based on the architectural drawings received from CO.OP Studio, and the services workshops held with CO.OP Studio to date.

Figure 1 *Aerial photograph of the site*

2 Standards and Reference Documents

The Engineering Services design will reference the following key documents:

2.1 National Construction Code (NCC) Compliance

The design of all engineering services for the project will be designed in accordance with the requirement of the National Construction Code (NCC) 2022.

This will include Section J Energy Efficiency requirements for items such as lighting illumination power density, fan power, and insulation of new services.

2.2 Australian Standards

All designs will be completed in accordance with Australian Standards. For Australian Standards referenced in the NCC Volume 1; those versions of the standards will apply. Specific key Australian Standards are listed for each service in the following sections.

2.3 Client/Site Specific Standards and Guidelines

Subsequent discussions and correspondence with the Council and Lead Consultant (Co-Op Studio);

3 Electrical Services

3.1 Design Criteria

3.1.1 Standards

The Electrical Services for the project will be designed in accordance with NCC and Australian Standards, including the following:

Item	Australian Standard / Legislation	Design Criteria
All	NSW Service Rules AS/NZS 3000:2018 – Wiring Rules National Construction Code of Australia – 2022 Relevant State & Federal Occupational Health & Safety Legislation The Supply Authorities Codes & Regulations	- All Electrical Services Works
Radio Frequency Interference	AS/NZS CISPR 14.1:2010 – Electromagnetic Compatibility – Requirements for household appliances, electrical tools and similar apparatus - Emissions	- Suppression & Shielding as Required
Supply Conditions	Essential Energy Requirements	- Frequency = 50Hz - Voltage = 400V / 230V - Ground Level Substation - Power Factor Correction for Base Building Loads > 0.95
Power Reticulation	AS/NZS 3000:2018 – Wiring Rules	- Voltage Drop Allowance = 7% - Consumer Mains = <1 % - Submains approx = 3 % - Final Sub-circuits = 3 % - Generally Distribution Boards to be located at 30m radius maximum to longest outlet (horizontal distance) - Full Discriminated System
Main Switchboards	AS/NZS 61439 (All parts) – Low Voltage switchgear and control gear assemblies	- Spare Space Provision (Switchgear) = 25% - Spare Capacity Provision = 25% - Main Switchboard Room = Mechanical Ventilated - Moulded Case Circuit Breakers <1000A - Air Circuit Breakers > 1000A <u>Fault Level</u> - MSB =38kA for 1 Second - Form of Segregation = 3b - Front Connected / Bottom &Top Entry /Bottom & Top Exit - IP Rating = IP43

Item	Australian Standard / Legislation	Design Criteria
Distribution Switchboards & Tee-Off Boxes	AS/NZS 61439 (All parts) – Low Voltage switchgear and control gear assemblies	- Miniature Circuit Breakers = < 100A Din Mounted - Pole Capacity – Refer to Schematics - IP Rating = IP42 - Busbar Rating = 250A - Prospective Fault Level Rating = 20kA for 1 Sec - Form 1b for loads up to 160 A; - Form 2 for loads greater than 160 A; - Separate Lighting / Power Chassis - Digital Multifunction Metering/Chassis - Surge Diverters - Designed to incorporate spare capacity for hardware (25 %) and spatial (20 %) above the design loads and spatial requirements.
Electrical Maximum Demand	AS/NZS 3000:2018 – Wiring Rules	As per Standard
Electrical Consumer Mains	AS/NZS 3008.1.1:2009 – Selection of Cables AS/NZS 5000: 2005 – Electric Cables – Polymeric insulated for working voltages up to and including 0.6/1 kV	As Per Standard - Fire rated Consumer Mains sized on rating of incoming main air circuit breaker frame rating on Main Switchboards
Electrical Sub Mains	AS/NZS 3008.1.1:2009 – Selection of Cables AS/NZS 5000: 2005 – Electric Cables – Polymeric insulated for working voltages up to and including 0.6/1 kV	As Per Standard - Sub Mains (Fire rated where appropriate) sized on rating of outgoing moulded case circuit breakers frame rating on Main Switchboards
Final Power & Lighting Sub-Circuits	AS/NZS 3008.1.1:2009 – Selection of Cables AS/NZS 5000: 2005 – Electric Cables – Polymeric insulated for working voltages up to and including 0.6/1 kV	- Power 2.5mm^2 min. - Lighting 1.5mm^2 min. - Maximum of 75% load utilisation of AS/NZS 3000 calculated demand - Initial spare outlet capacity of 25% per power circuit
Lighting	AS/NZS 1680 – Interior and workplace lighting	As per Standard - >0.3 Uniformity (Circulation Spaces) - >0.5 Uniformity (Over NLA at 0.7m) - >0.7 Uniformity (Over Task Area) - Maximum Glare Index = 19 or above - Illuminance Ratio between spaces = 10:1 CRI > 90 (colour rendering Index) - DALI Dimmable Control Gear - Aesthetic / Architectural Empathy - Maintenance Factor – 0.8
External Lighting	AS/NZS 1158 – Exterior Lighting AS/NZS 4282 – Control of Obtrusive Effects of External Lighting	Relevant categories for pedestrian and vehicular movement to be confirmed during design.
Sports Lighting	AS 2560.2.5	Sports Lighting – Swimming Pools
Emergency / Exit Lighting System	AS/NZS 2293 (All Parts) Emergency escape lighting and exit signs for buildings	- Single Point Type Fittings (LED) - Centrally monitored & tested system

Item	Australian Standard / Legislation	Design Criteria
Lightning Protection	AS/NZS 1768: 2003 Lightning Protection	Complete AS1768 Assessment to determine if protection to new building is required for warehouse facility structure. If required, produce assessment and optional cost based on installation as per standard; - Use reinforcement in foundations for earth terminations - No finials if stainless steel strap used or building fabric for air terminations - Use structure for down conductors. Bond Floor slab reinforcing.
Communications Services	Building Code of Australia – 2022 AS/NZS 3000:2018 – Wiring Rules NBN Design Guidelines Australian Communications and Media Association (ACMA) - General Premises Cabling Manual. AS/ACIF S008:2006 - ACIF Australian Standard - Requirements for Authorised Cabling Products. AS/ACIF S009:2006 - ACIF Australian Standard - Installation Requirements for Customer Cabling (Wiring Rules). TIA/EIA TSB-36 - Additional Cable Specification for Unshielded Twisted Pair Cables. TIA/EIA TSB-40 - Additional Transmission Specification for Unshielded Twisted Pair Cable Connecting Hardware. AS/NZS 3080 - Telecommunications Installations – Integrated Telecommunications Cabling Systems for Commercial Premises. AS/NZS 3084 - Telecommunications Installations - Telecommunications Pathways and Spaces for Commercial Buildings.	- All Communications Services Works

3.2 Systems Descriptions

3.2.1 Overview

The site is under Essential Energy network coverage and the potential HV cable entry to the site would be via Longyard Drive or Jack Smyth Drive. There are existing underground HV cables routes present on the Jack Smyth Drive and east side of the site as shown in Figure 2. A feedback on our preliminary enquiry was received from Essential Energy about the possibility of getting the HV connection point to the north side of the site via Longyard Drive.

The preliminary maximum demand of the development has been calculated in the range of 1500-1800 kVA for lighting, power, mechanical, hydraulic and pool related plant.

Essential Energy have confirmed in their planning assessment response that no upstream 11kV distribution network augmentation is required to allow the new load to connect. They have confirmed that 2No. 1000kVA pad mount substations can be installed off street Longyard Drive on the North side of the site with Loop in loop out connection from existing cable between Subs 18-972088 and 18-21298. Also, the substations shall be designed in accordance with Essential Energy design criteria, during subsequent design development.

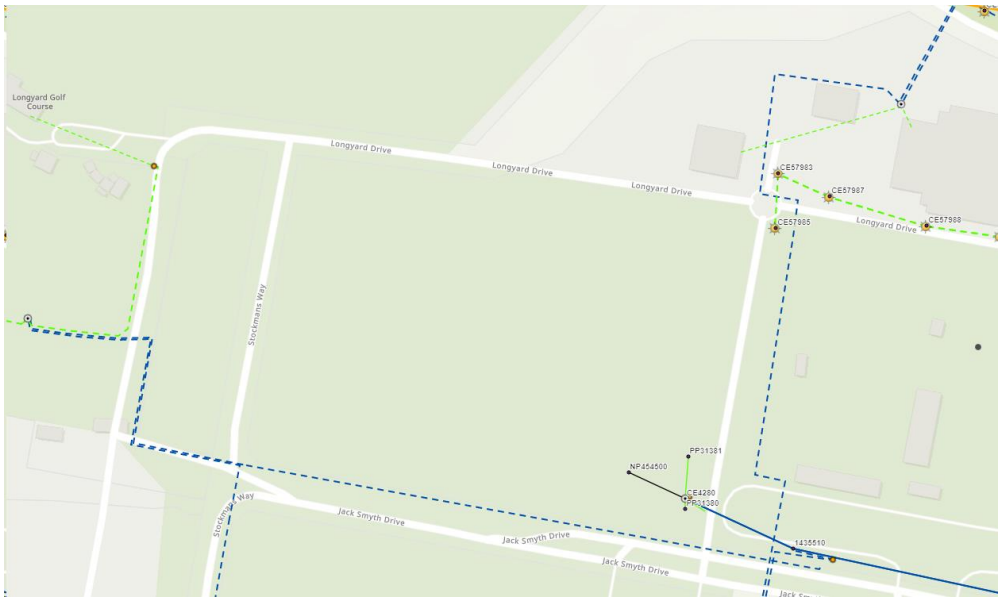

Figure 2 *Essential Energy site boundary map.*

The use of electrically powered systems (heat pumps) in place of fossil fuel powered systems such as pool water heating and domestic hot water heating will have an impact on the site's electrical demand. The electrical loads associated with the various building services shall be further developed to explore potential synergies and opportunities for energy/heat reclaim to reduce electrical power consumption.

The preliminary maximum demand of the development has been calculated in the range of 1500-1800 kVA for lighting, power, mechanical, hydraulic and pool related plant.

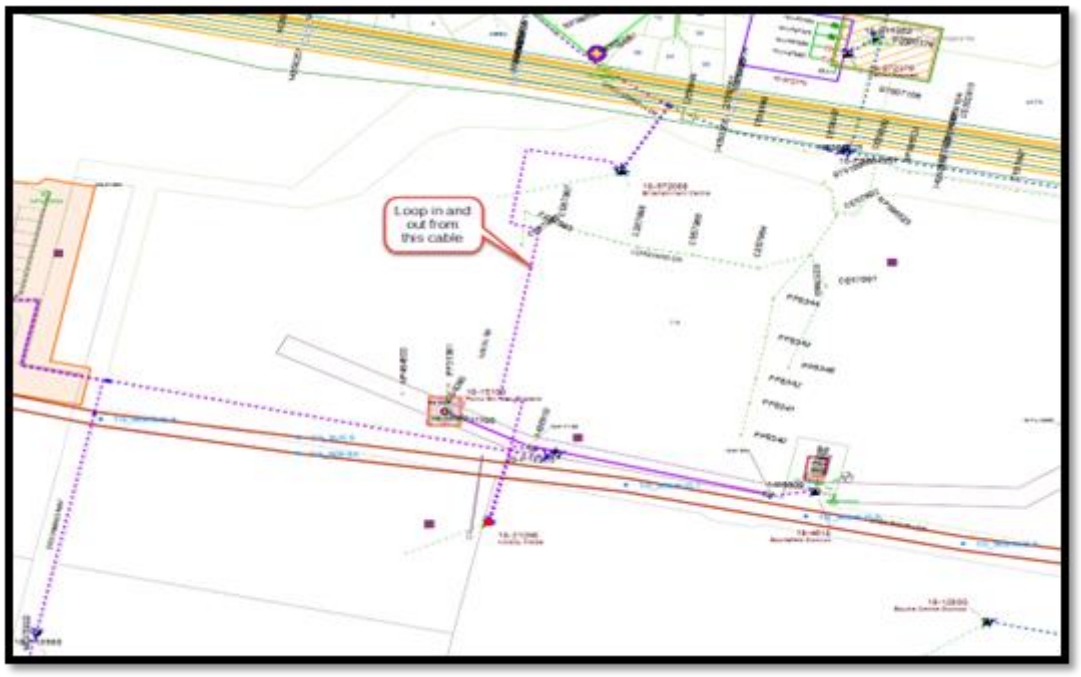

Figure 3 *Essential Energy Network GIS*

The proposed concept scheme allows for the provision of 2No. new pad mount substations which would provide separately metered electrical supplies to the 2No. new main switchboards – "MSB-1 & MSB-2". The

low voltage (LV) cables from the new substations to the switch room would be installed in ground via conduits and access pits.

The proposed Electrical Services for the development will include:

- New incoming HV Power Supply and authority substations to supply the project.
- New Main Switchboard, low voltage reticulation and distribution boards; along with main cable support systems (e.g. cable trays).
- Energy retailer metering.
- Sub-metering for tenancies, power, lighting, mechanical services, and as required in accordance with NCC 2022 and to meet the project ESD requirements.
- General power switched socket outlets and supplies, to suit the spatial usage and occupant requirements.
- Power supplies to special equipment and to serve other services and equipment, including mechanical supplies, hydraulic supplies, and fire protection supplies.
- Internal Lighting to meet AS1680 and NCC BCA J7 energy efficiency requirements.
- External lighting to building vicinity, pool area and carpark to AS1158 and AS2560; and to meet the architectural aspirations for the project.
- Lighting controls to allow flexible usage of spaces and for energy efficiency.
- Emergency lighting in accordance with the NCC 2022 BCA and AS2293 requirements.
- Electric Vehicle Charging infrastructure in accordance with NCC 2022 requirements
- Solar PV roof space and main switchboard connections as per NCC 2022 requirements.
- Battery Energy Storage System main switchboard connections as per NCC 2022 requirements.
- Security systems (intruder detection, access control and CCTV) – to client requirements which shall be refined during subsequent design stages.

3.2.2 Power Reticulation

Two main switchboards will be constructed within a two-hour fire rated dedicated room on the northern end of the building. The main switchboards will be rated to accommodate the full capacity of the nominated incoming authority supply arrangement.

Power Factor Correction equipment will be provided within the main switch room to improve the power factor (energy efficiency) of the connected electrical services to levels required by NSW Service and Installation Rules.

Lighting and power distribution boards will be installed at strategic locations throughout the building to provide safe electrical zoning and segregation of different area uses, as indicated on the electrical plan in Appendix A. Distribution boards will be split chassis type for NCC compliance, provided with 20% spare capacity and will be fitted with RCD safety protection to all lighting and power circuits.

Dedicated distribution boards will be provided in plant areas for air-conditioning plant, pool plant, pool heating equipment and domestic hot water. These boards will be powered from the site main switchboard via cable tray mounted submains through the building and underground submains for locations remote from the main building. Below layout shows the preliminary arrangement of new substation and main switch room.

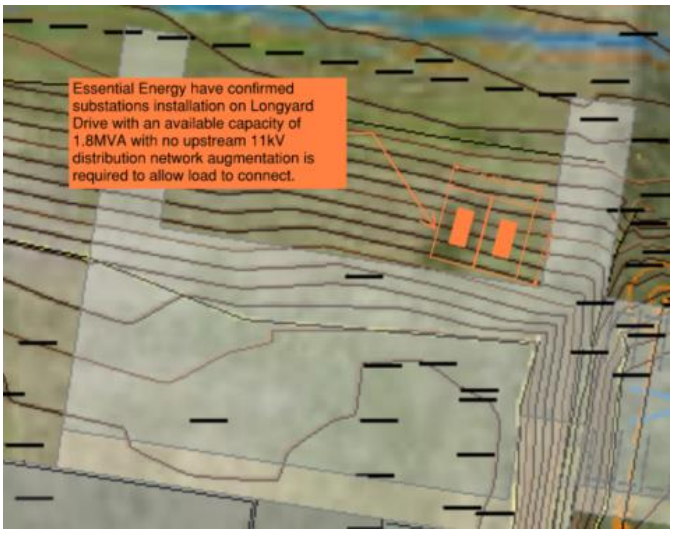

Figure 4 *Preliminary Pad-mount Station location.*

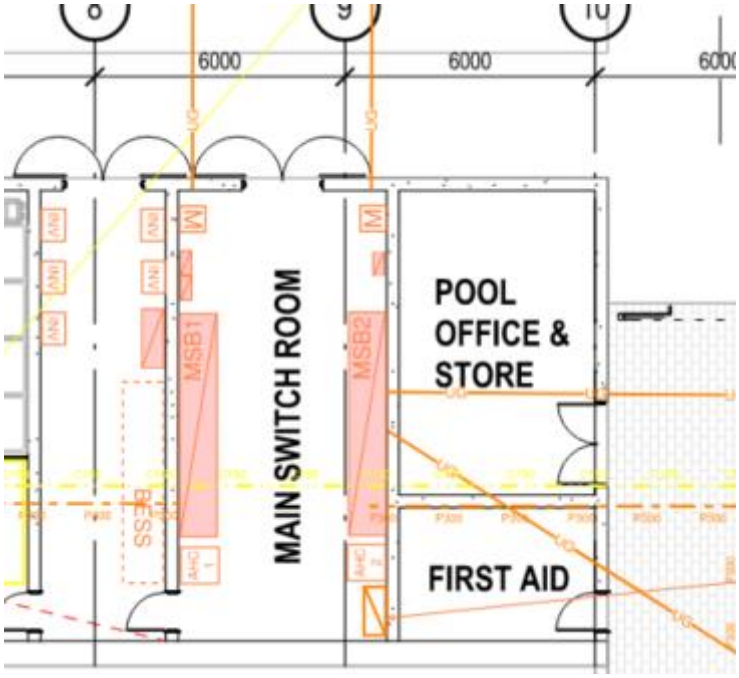

Figure 5 *Main Switch Room Spatial*

3.2.3 Metering

Authority Metering

Authority metering will be installed within the main switch room for the whole site along with separate Authority metering provisions for tenants, should this be required.

Client Metering

The provision of a comprehensive electrical metering system is proposed as per NCC 2022 Section J9D3.2, to facilitate the optimisation of the site's operations and assist in reduction of emissions.

The system shall comply with the NCC 2022 Section J9D3.3 requirement for meters to be interlinked by a communication system that collates the time of use energy consumption data to a single interface monitoring system where it can be stored, analysed, and reviewed.

Proposed Metering Coverage	
Artificial Lighting	Meters on Lighting Sections of DBs
Tenants	Meters on Switchboards supplying tenancies
Central Hot Water	Meters on Main Switchboard or relevant Control Panel(s)
Air Conditioning Systems	Meters on heating plant, cooling plant, air handling plant, pumps
Ancillary Plant	Meters on Main Switchboard, Mechanical Switchboards, or relevant Control Panel(s)
Pool Plant	Meters on Main Switchboard, Mechanical Switchboards, or relevant Control Panel(s)
EV charging	Meters on Main Switchboard & DB(s)
PV System	Meters on Main Switchboard or relevant Control Panel(s)

3.2.4 Renewable Energy Generation

NCC 2022 Section J9D5 requires that at least 20% of the roof area must be left clear for the installation with solar PV panels to reduce ongoing energy consumption.

It also requires that the main electrical switchboard must contain at least two empty three phase circuit breaker slots for the connection of Solar PV system and a battery energy storage system.

The main switchboard shall be designed to meet these criteria.

Overall Solar PV Capacity

Please refer below layout for space zoned for PV panel installation. Approx. 5000 sqm of roof area is suitable and available for PV panel installation.

Preliminary modelling has indicated that the pool hall roof could cater for an 231kWp DC rated system while the Eastern side roof could cater circa 271kWp DC rated system.

Preliminary assessments indicate that the site electrical demand is expected to provide sufficient local demand to utilise the PV installation of circa 500kWp DC.

It has been agreed with the client to design for plant and roof spaces for a system capacity of 300kWp with a potential for system rating increases to 500kWp DC.

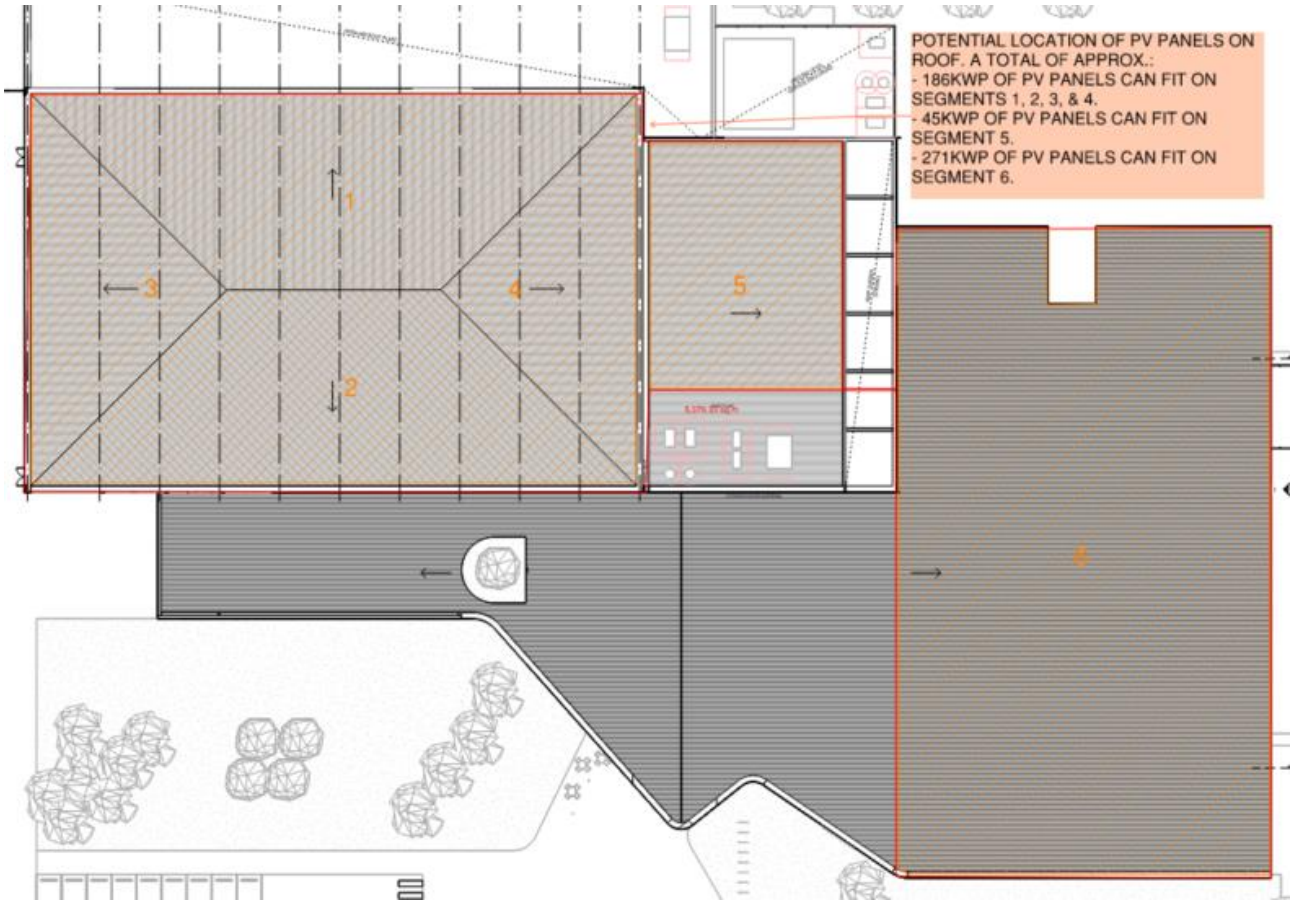

Figure 6 *Proposed Roof Area for PV Panel Installation*

3.2.5 Electrical Infrastructure Design

The electrical infrastructure capacity from the proposed new site substation shall be rated without considering the PV generation, as the PV generation is not a guaranteed source of supply (e.g., inclement weather).

The new main switchboard shall make allowances for the integration of the PV installation's electrical connections as per NCC 2022 Section J9D5 and spatial allowances shall be made in the primary electrical switch room and other strategic locations for PV inverters and similar equipment which need to be sited in proximity to the system they serve. Please refer appendix A for preliminary electrical spatial.

Main Switch Boards

Each of 2No. main electrical switchboards – "MSB-1 & MSB-2" shall be supplied by one of the two proposed Pad-mount substations. The site's various electrical loads shall be served from the two main switchboards based on the load centres' locations, demand load, operating conditions, and capacity. The proposed areas served by each MSB are explained below.

MSB-1 is proposed to serve the lighting and small power for the pool area, social, support spaces and tenancies as listed below:

- 50M Indoor pool area.
- Spectator stands seating.
- 25M Warm water/Program pool.
- Administration, offices and first aid.
- Foyer, reception, and café.

- Wet and dry lounge.
- Gym, strength and cardio.
- Allied health consulting rooms.
- Health and fitness rooms.
- Services plant room and stores.
- Car Parks.
- Sports science testing lab.
- Administration/sports house.
- Teaching and meeting spaces.
- Reception and accessible amenities.
- External lighting (Façade, Signage, Eastern cycle path lighting…)

MSB-2 is proposed to serve the power for the pool equipment, hydraulics equipment and EV charging system as listed below:

- Pool Heat pumps.
- Pool Equipment (50M & 25M).
- Hydraulics Equipment.
- Leisure pool Equipment.
- Program pool Equipment.
- EV Charging system.
- Sauna

3.2.6 Energy Storage System

Energy storage systems can provide several potential benefits, and these can be further explored and discussed with the client in subsequent design development to assess the extent to which these apply to the site's intended operations.

A battery energy storage system is not presently proposed for the site. The economic case for battery storage systems is significantly improved when a site can store excess energy generated by on site generation such as solar PV compared to charging the battery with grid purchased energy.

As the site's solar PV capacity estimated at circa 500 kWp is unlikely to generate excess power when the electric heat pumps serving pool water and general water heating are operational, opportunities to store excess generation will be limited and only in certain period of the year (Summer).

It is proposed that the below potential benefits be explored with the client in subsequent design stages as the cost of battery storage is decreasing over time.

a. Limitation of Solar Export

Supply authorities may limit or preclude grid export of on-site renewable generation into the grid to maintain their grid stability. During periods where PV generation exceeds the site's consumption, this energy could be stored for later use instead of disconnecting the PV installation and losing the energy generated by the on-site installation.

b. Demand Charge Reduction

Many facilities are subject to demand (kVA) charges on their energy bills. These charges are based on the 15-minute period in which the demand for energy is highest throughout the day and can account for a significant portion of the total energy bill. Building's typically have a baseline consumption with large plant start-up loads or short-term periodic loads, which effectively increase the maximum demand on which the charge is calculated.

While energy efficiency or solar PV can reduce total electricity consumption, these benefits do not always coincide with a building's peak use. Energy storage systems, especially those paired with intelligent software, can track a facility's load, and reduce demand charges by dispatching battery power during periods of peak demand, effectively "flattening" the load.

c. Participation in Demand Response Programs

Demand response for commercial facilities traditionally involves ratcheting down usage at times of peak demand. Energy storage can enable participation in demand response markets without impacting on-site energy use or operations. By responding to utility price signals, storage systems can increase financial return from participating in DR programs, while also benefiting the grid overall.

d. Maximising Time of Use Rates

Energy storage systems can shift consumption of electricity from expensive periods of high demand to periods of lower cost electricity during low demand. This reduces the risk of lowering the value of on-site solar if tariff structures change over time, and peak demand periods shift to the evening when the sun isn't shining. This also allows facilities to make the most of time-of-use pricing and reduce tariff structure change risk to electricity cost.

3.2.7 Electrical Vehicle Charging System

NCC 2022 Section J9D4 requires that a car park associated with Class 9 buildings must;

- Be provided with electrical distribution board(s) dedicated to electric vehicle charging.
- Be provided with a charging control system with the ability to manage and schedule charging of electric vehicles in response to total building demand.
- Have the capacity for each circuit to support an electric vehicle charger able to deliver a minimum of 12kWh from 9:00am to 5:00pm daily
- Be sized to support the future installation of a 7kW (32A), type-2 electric vehicle charger in 20% of car parking spaces.

As the proposed car park including future expansion indicates 156 No. off street parking spaces on Jack Smyth Drive side and 30 No. off street parking spaces on Longyard Drive side. 20% would equate to 32 Nos. and 8 Nos. respectively of EV charger provision to be provided.

NCC 2022 Section J9D4 notes a maximum of 24No. EV chargers per charging distribution board, which results in a requirement for 3No. EV Charging DBs, to avoid having long run cables from DB to EV Chargers. 2No. for the South side Car park and 1No. for the North side Car park.

The main switch board will be designed to accommodate the EV DBs with meter and labelled as per the NCC 2022 Section J9D3 requirement.

It is proposed to provide the electrical infrastructure up to an including the distribution boards, demand management system and in-ground conduits to proposed EV charge parking spaces as part of the initial works. The installation of EV Chargers can then be implemented as part of a phased roll out program co-ordinated with local EV uptake/usage.

The figures below illustrates the sample for EV charger installed in the outdoor car park, connector socket, cable and EMS system.

Figure 7 *EV charging system example.*

Maximum Power Output(kW)	7.4-22
Output Current(A)	32
Operational Temperature Range	-30°C to +50°C

Figure 8 *EV charging compatibility example.*

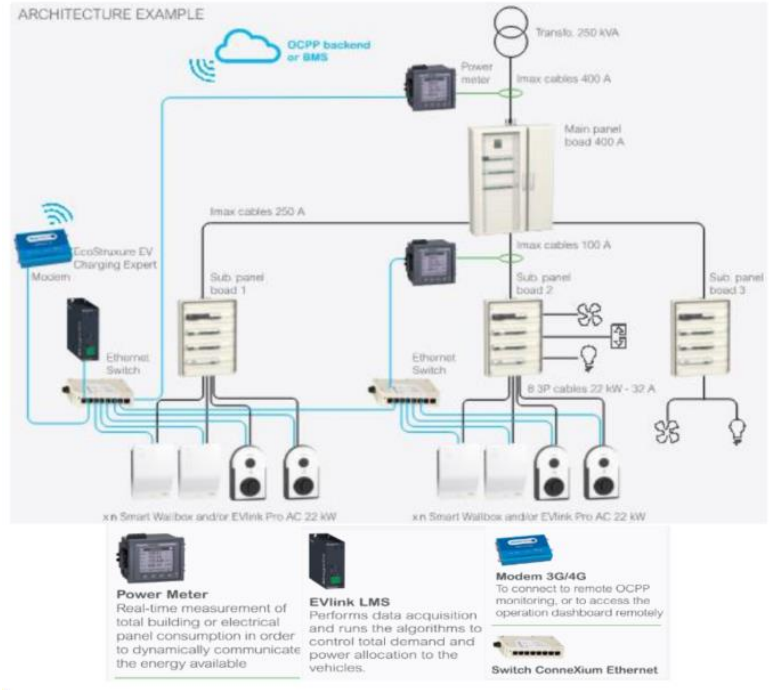

Figure 9 *Energy Management System Smart-eBox*

The system shall comprise 3No. EV Charging distribution board located near the Car Parks, from which suitably rated power circuits shall be reticulated to EV charge points located at agreed locations within the car park area, via in ground conduit reticulation. It is proposed that parking areas provided with EV charging facilities be located at the closest point of the EV-DBs to minimise the extent of cabling and associated in-ground services.

Figure 10 *EV Charging Proposed Area on south side.*

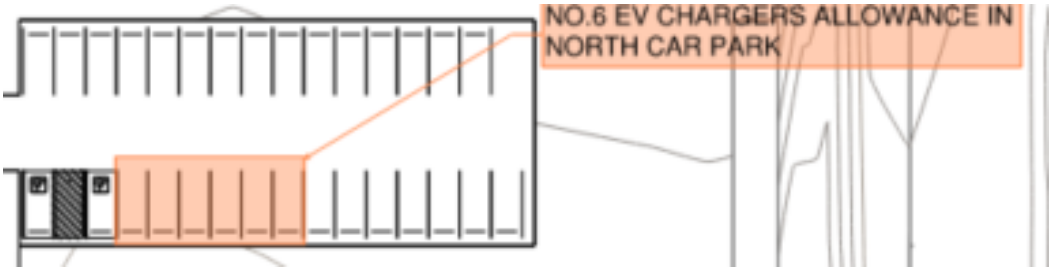

Figure 11 *EV Charging Proposed Area on North side.*

A portion of the site's calculated maximum demand shall be apportioned to EV charging and a demand management system shall be provided, which shall monitor the electrical demand of the EV chargers relative to the overall site electrical capacity and demand of the rest of the site. It shall manage the charge rates to ensure no impact on the site's operations, i.e. allowing maximum rated charge unless conditions are such that load management is required. The demand management system will also facilitate the installation of additional charge points in the future, as the electrical demand presented by the quantity of chargers and rate of charge requested can be automatically and intelligently adjusted to suit the site's electrical demand.

While a billing methodology has yet to be finalised, council may elect to use 3rd party operator.

3.2.8 General Power

The general power installation shall comprise general power outlets and direct connections for services including, but not limited to;

- General use
- Workstations
- Computers & visual display units
- Office equipment
- Gym equipment

- Amenities (kitchens, break rooms, etc.)
- Audio Visual
- Cleaning

3.2.9 Lighting

Lighting will be installed throughout the facility to comply with the lighting requirements specified by AS 1680 (internal), AS1158 (external) and AS2560 (Sports Lighting). All lighting will comprise commercial quality high efficiency, long life LED type fittings of high colour rendering quality. Lighting will be recessed into ceilings where possible.

Proposed Luminaire Types	
Foyer / Reception / Front of House Areas	Decorative lighting will be provided to public areas. Lighting to these areas will comprise recessed down lights, linear extrusions, and pendants.
Administrative areas	Recessed, diffused linear lighting shall be provided.
Amenities / Back of house areas	Suitably ingress protected, recessed LED downlighter type luminaires shall be provided
Plant areas	Sealed linear battens shall be provided
Pool Area	The indoor pool area will be provided with wall/suspended mounted direct / indirect of corrosion resistant construction. Lighting will not be installed above pools and will be positioned for maintenance access.
Gym Area	Recessed, diffused linear LED lighting shall be provided.
Indoor Grandstand	Suitably ingress protected, wall mounted LED luminaires shall be provided.
External areas, circulation spaces and car park areas	Low glare LED pole mounted lighting shall be provided.

Below are some proposed swimming pools lighting strategy:

According to AS 2560.2.5-2007-Choice of lighting system in swimming pools, several options are provided below to determine the suitable selection that goes with the architectural design.

Figure 12 *Indoor pool area lighting strategy options.*

Lighting Controls

Automatic lighting controls shall be provided in accordance with NCC 2022 requirements. While this can be achieved via localised automatic controls, a lighting control system is proposed to enhance the client's ability to optimise and fine tune the operation of the lighting installation post occupancy, to further enhance their energy efficiency and assist in the achievement of their climate policy guidelines.

Lighting control for areas such as the Pool Hall, Gym, etc. shall be developed with the client to provide suitable staff control over lighting in places of public access. Lighting control locations shall be located in staff areas, to avoid misuse and requirements for lockable enclosures when placed in public areas.

External lighting will be controlled by time clocks and photocells, with over-ride facilities at reception. All lighting controls and zoning will be provided in accordance with the requirements of the NCC 2022 Section J.

Pool area lighting controls shall be located in secured staff areas.

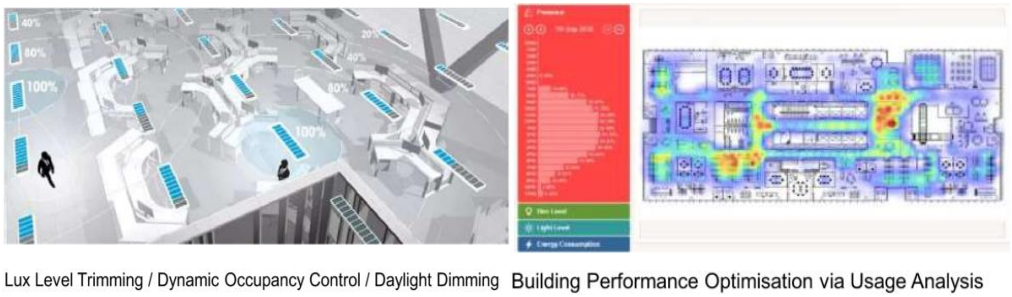

Figure 13 *Lighting Control System Features*

Exit and Emergency Lighting

Exit and emergency lighting will be provided throughout the facility in accordance with the requirements of the NCC 2022 and AS 2293. A centrally monitored system is proposed for the client's consideration to reduce ongoing maintenance and testing costs.

3.2.10 Communications

Incoming Services

Separate NBN compliant lead-in services shall be provided for landlord and tenant services respectively from the adjacent Sports Dome and the facility, via dedicated in ground conduits and shall be reticulated to the main comms room.

Conduits shall be provided for non NBN fibre services providers (e.g. Optus, Telstra) to provide commercial grade fibre services to the council's main comms room. The lead-in cabling connection will be organised by Council with their telecommunication provider. Provision shall be made for additional fibre break out boxes from the council ICT installation for other carriers depending on tenant arrangements.

No copper lead in service is proposed. Where communications are required for fire alarm, security services, lifts, etc. the use of 4G mobile SIMS or alternatively NBN Network Termination Devices (NTD's) shall be utilised.

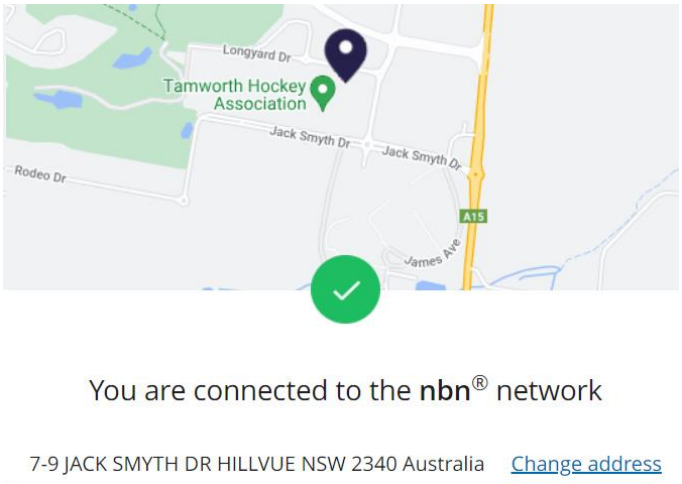

Figure 14 *NBN Coverage*

Telecommunications Services Equipment Rooms

The building shall be provided with a main telecommunications room, which is proposed on the ground level of the southern area of the centre. The room shall be sized to accommodate council communications racks, incoming NBN and non NBN fibre termination equipment, access control and security head end equipment in a secure location. A secondary data cabinet for data network switch shall be located inside the plant storeroom, such that all telecommunication outlets can be within 90m cable length of a communications rack. The below figure shows the preliminary spatial arrangements of the main comms room and is subject to design development with client.

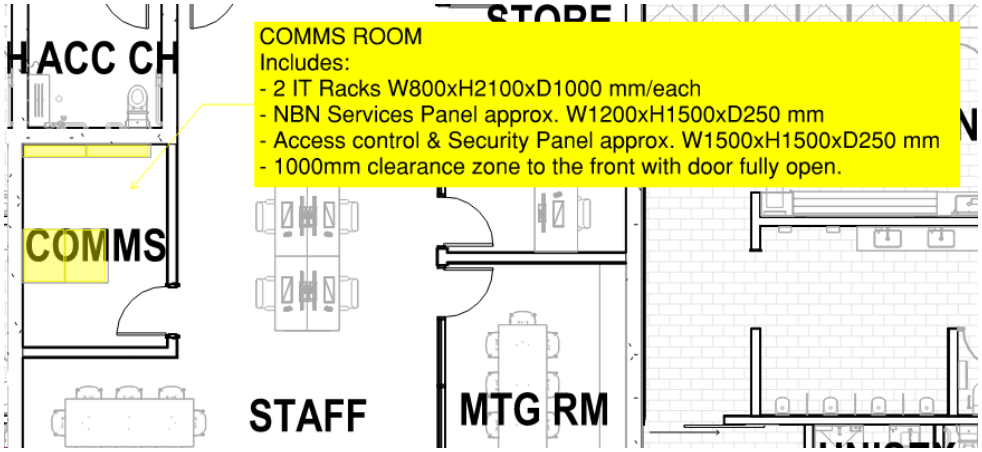

Figure 15 *Preliminary Comms Room Spatial*

Telecommunications Services

Communications will be distributed throughout the site by a Category 6A structured cabling system with RJ45 type outlets.

The communication cabinets will contain Cat 6A patching for distribution of voice and data cabling throughout the facility. Space will be provided within the cabinet for the Council's supplied active communication equipment which may include the telephone PABX, computer server, modem, network switches and Uninterruptable Power Supply (UPS) unit.

Category 6A RJ45 communications outlets will be provided at selected locations throughout the facility and can be patched to provided voice and data services. Triple outlets will be provided at each workstation location and POS location. Additional outlets will be provided for ancillary services and building services systems which utilise the building LAN.

Outlets will also be provided for Wireless Access Communications points to provide wireless data coverage throughout the site.

3.2.11 Security

Intruder Detection

An after-hours intruder detection alarm system is proposed to the building, which shall be refined during design development. The system will comprise arming / disarming keypad at the entry, movement detectors, door sensors, sirens, strobe and back-to-base remote monitoring facilities.

An access control swipe point shall be provided at the alarm panel to allow arming of the alarm prior to exit.

The alarm system brand/incumbents shall be co-ordinated with the Council to ensure consistency with existing precedents.

Access Control

Electronic access control to selected doors/gates/barriers is proposed and details of the Council's requirements will be obtained during design development.

Access control equipment shall be connected to Council owned network equipment to ensure that all equipment can be centrally managed. Emergency break glass units or emergency door open release buttons shall be provided in accordance with NCC requirements and shall be provided with audible alarms.

The access control system brand/incumbents shall be co-ordinated with the Council to ensure consistency with existing precedents.

CCTV

A CCTV system will be provided to monitor selected public areas. IP type cameras will be provided with weatherproof and vandal resistant housings. IP cameras shall be located at strategic locations to enhance safety and security within the building and around the site. Cameras shall be connected to either the main or secondary comms rooms and NVR & interface equipment shall be located in the main comms room.

Perimeter cameras shall cover all entry and exit points including fire exits and shall provide adequate performance in night conditions.

Intruder Detection

Perimeter reed switches and motion detectors shall be located strategically to provide a layered detection envelope with facilities for remote alarm signalling.

Duress points shall be provided in strategic locations for use by staff and users of accessible facilities.

4 Mechanical Services

4.1 General

This section discusses the proposed mechanical services design strategy for the redevelopment of Tamworth Aquatic Centre development and outlines project specific design criteria, and design conditions.

The mechanical services will include ventilation and air conditioning of the aquatic centre buildings, comprising a 50m competition pool, warm water pool, gym, program room, first aid administration areas, offices, storerooms, and kitchen.

It should be noted that the central heating hot water systems for heating of swimming pools will fall under the scope of the Pool Consultant and Pool Contractor therefore it is not included in this report. Please refer to the Pool Consultant's concept report for further information.

4.2 Mechanical Services Scope

Mechanical services will generally comprise:

- Air conditioning and ventilation of the Pool spaces.
- Ventilation of wet change rooms associated with the Pool spaces.
- Air conditioning and ventilation of the Gym and associated spaces.
- Air conditioning and ventilation of ancillary spaces (Program, Sports Science, First Aid, & Admin Space).
- Air conditioning, ventilation and kitchen exhaust system if required for Café.
- General exhaust and ventilation systems for Storerooms, Pool Plant Area, Toilets etc.
- Automatic controls and Building Management System (BMS).
- Electrical power supply for mechanical services.
- Comms Room HVAC systems.

Air Conditioning

The building features several spaces vastly different in nature and use, therefore, the proposed indoor environmental conditions also differ to reflect anticipated user requirements. Refer to Section 4.3 Design Criteria for the summary of proposed indoor conditions.

Ventilation

Mechanical ventilation systems will be designed to satisfy the requirements of BCA and AS1668.2 for general ventilation purposes. It is expected that outdoor air will be generally supplied via air conditioning systems.

The following ventilation systems will be provided where required by the code:

- General exhaust systems.
- Toilet exhaust systems.
- Commercial kitchen exhaust system.
- Aquatics plantroom exhaust system.
- Chemical storeroom exhaust system.
- Supply air systems, where not provided via air conditioning (e.g. non-conditioned spaces).

Air Conditioning and Ventilation in Pool Hall

Air conditioning and ventilation systems serving indoor pools are specialised by nature and, in addition to minimum code compliance, require performance-based design approach.

The following factors will be taken into the account during design development:

- Ventilation requirements for indoor air quality based on anticipated water evaporation rates, code requirements and occupancy.
- Humidity control for indoor air quality, thermal comfort of swimmers and minimisation of moisture impact on building envelope.
- Active pool hall pressure control for prevention of air cross contamination with adjacent non-aquatic spaces and minimisation of moisture impact on building envelope.
- Indoor air temperature control for minimisation of pool water evaporation.
- Air distribution system design for indoor air quality and minimisation of condensation on glazing.

Refer to the Design Criteria section for the proposed design conditions in Aquatics Area.

Building Management and Control Systems

Given the size and the scale of mechanical services systems required for the development, it is proposed to provide Building Management and Control System (BMCS) for control and monitoring of all mechanical systems, as well as monitoring of other engineering services within the building.

BMCS is also proposed to be utilised as a facility for data acquisition from various utility meters and sub-meters on site. Data can then be harvested by the cloud-based utility management system with machine learning capabilities for automatic fault detection and diagnostics.

Fire and Smoke Control Systems

Passive fire and smoke control systems (e.g. fire and smoke dampers) will be provided as required by BCA and AS 1668.1 in accordance with fire and smoke compartmentation of the building – to be determined during design development stage.

However, due to the nature of the building it is anticipated that the extent of fire and smoke compartmentation will be limited.

It is also expected that provision of active mechanical fire and smoke control systems (e.g. smoke exhaust, smoke and heat vents) will not be required – pending confirmation by BCA consultant.

4.3 Design Criteria

This section specifies the design criteria used for the development of concept design.

4.3.1 Standards

In addition to the NCC, the Mechanical Services for the project will be designed in accordance with Australian Standards, including the following:

AS/NZS 1668.1	The use of ventilation and air conditioning in buildings: Part 1 Fire and smoke control in buildings
AS 1668.2	The use of ventilation and air conditioning in buildings – Part 2 Mechanical ventilation to buildings
AS 1668.3	The use of ventilation and air conditioning in buildings – Part 3 Smoke control systems for large single compartments or smoke reservoirs
AS 1668.4	The use of ventilation and air conditioning in buildings – Part 4 Natural ventilation of buildings

AS 3666.1	Air Handling and water systems of buildings – microbial control
AS/NZS 5149	Refrigerating systems and heat pumps – Safety and environmental requirements
AS 2896	Medical gas systems – Installation and testing of non-flammable medical gas pipeline systems

4.3.2 Client / Site Specific Standards and Reference Documents

The systems shall operate to maintain the specified indoor design conditions within all areas serviced by the respective system when the ambient conditions are within the specified outdoor design conditions. Refer to Section 4.3.3 & 4.3.4 Design Criteria for the summary of proposed outdoor & indoor conditions.

4.3.3 Outdoor Design Conditions

Outdoor design conditions will be based on weather data from Tamworth Airport, as follows:

Outdoor Design Conditions – Non-critical (Comfort Cooling and Heating)		
Summer	31.0 °C db	25.1 °C wb
Winter	6.0 °C db	80% RH

Outdoor Design Conditions – Critical (Communications Equipment Rooms)		
Summer	33.3 °C db	26.1 °C wb
Winter	6.0C db	80% RH

Outdoor Design Conditions – Peak Wet Bulb and Coincident Dry Bulb Temperatures (For Pool Hall Heating & Ventilation)		
Summer	29.5 °C db	22.7 °C wb
Winter	6.0 °C db	80% RH

Mechanical system thermal performance will not consider contribution of internal blinds. The mechanical system will not consider the human discomfort issues associated with direct glare or direct radiation from the vision glazing when the façade is in direct sun. This will require blind control by the occupants.

4.3.4 Indoor Design Conditions

Proposed indoor environmental design conditions are nominated below. The mechanical systems will be designed to achieve these indoor conditions within the nominated outdoor design conditions.

50m Competition Pool		
Summer	28.0 ± 1°C db	60% RH nominal
Winter	28.0 ±1°C db	

Warm Water Pool		
Summer	33.0 ± 1°C db	60% RH nominal
Winter	33.0 ±1°C db	

*Based on AHRAE recommendations, air temperatures in pools areas are to be maintained 1 to 2 °C above the water temperature (but not above the comfort threshold of 30°C) for energy conservation through reduced evaporation and to avoid chill effects on swimmers.

Program, Sports Science, First Aid, & Admin Space		
Summer	23.0 ± 1°C db	60% RH nominal
Winter	21.0 ± 1°C db	
Gym / Programme Room		
Summer	20.0 ± 1°C db	60% RH nominal
Winter	18.0 ±1°C db	
*Based on recommendations of International Fitness Association for aerobics, cardio, weight training and Pilates areas.		

Communications Equipment Rooms		
Summer	26.0 ±1°C db	Up to 60% RH nominal
Winter	19.0 ±1°C db	
*Based on ASHRAE recommended temperature range of 18° to 27°C for data centres.		

4.3.5 Pool Water Temperatures

The following pool water temperatures, taken from the Pool Consultant's report, will be used as a design basis for air conditioning and ventilation systems serving the Pool Hall:

- Warm Water Pool: 32 °C;
- 50m Competition Pool: 27 °C;

The above water temperatures indicate the worst-case operational scenario from HVAC perspective (highest evaporation rate) and may be adjusted downwards by the end users.

4.3.6 Space Populations

Design occupancies play a vital role in air conditioning systems design and selection, especially in spaces with medium to high occupancy densities (< 5 m2/ person). At this stage, space populations used for design development are based on AS 1668.2 Table A1 and are subject to confirmation.

4.3.7 Ventilation Systems

Exhaust Ventilation	
General	Ventilation will comply with the requirements of AS1668.2-2012
Amenities	The exhaust rate will be the greater of:
	25 l/s per fixture, or 10 l/s/m^2
Change Rooms	20 l/s/m^2
Kitchen exhaust canopy	Approx. 700-1000l/s (dependent on size, hood type, and type of cooking)
Switch room	5 l/s/m^2
Plantrooms	5 l/s/m^2

Pool Plant	10 ACH

Outdoor Air Ventilation	
General	7.5 l/s/person if filtration is provided to achieve a minimum filtration efficiency in accordance with AS1668.2 Appendix D.
Gym, Dance Studio / Fitness	15 l/s/person

4.3.8 Mechanical Load Estimations

Heat load calculations utilising the ACADS-BSG load estimation software, CAMEL, will be undertaken during design to estimate mechanical system capacity sizing.

The following internal heat gains will generally be utilised:

- People Loads are dependent on the activity levels:
  - High Activity – East Court, Gym, Dance / Fitness
  - Low Activity – Generally, all other areas
- Lighting: 10 W/m^2
- Equipment: 15 W/m^2 (or based on actual equipment in room; in particular the Gym and Control Room)

4.3.9 Noise Criteria

The acoustic performance of the mechanical systems will be based on the recommendations of the Acoustic Engineer.

4.4 Mechanical Concept Strategy

This section gives an outline of the services expected for each area of buildings. Please refer to spatial strategy in the appendix for reference.

In general, it is proposed to use local DX/VRF throughout the site due to the small, concentrated loads throughout and given that there are heat pumps serving only the pool water heating. This is a simpler and more cost-effective solution, we do not propose any chilled water for centralised heating/cooling.

- Pool Plant, Switch room, Stores, Amenities
  - Local exhaust only ventilation for each space as required.
- Club Room Facilities (Program, Sports Science, First Aid, & Admin Space)
  - DX/VRF split system on rooftop to provide heating, cooling and ducted FCUs for supply air.
- Change Zones (Family, Male Female)
  - Exhaust air only to be provided to change areas.
  - Reception Area (Reception, Café Servery, Admin, Amenities, Store & Comms Room)
  - DX/VRF split system providing heating and cooling for Admin, Program, Sports Science, First Aid, combined with supply/exhaust air as required.
  - DX Split system for comms room cooling & cooling.
  - Exhaust ventilation for WCs and Store.
- Gym Area (Gym, Programme Room, Gym Expansion, Store

- Individual packaged unit serving Gym Providing heating, cooling and ventilation. Store ventilation incorporated.

- Pool Area (Pool Space, Amenities, Store, Plant, MDC, FDC)
  - Pool water heating by Pool Consultant/Contractor
  - Pool PAC units to serve Pool space. Providing heating, cooling, ventilation and humidity control.
  - Exhaust ventilation provided to Amenities and Plant spaces as required.

5 Fire Services

5.1 General

This Section discusses the proposed Fire Protection Services for the development. The Fire Protection Services required at this stage are as follows:

- Fire Hydrant System
- Fire Hose Reel System
- Automatic Fire Detection System
- Emergency Warning and intercommunication system (EWIS)
- Portable Fire Extinguishers
- Automatic Fire Sprinkler System

5.2 Design Standards

In addition to the NCC 2022 Section E and project BCA report, the fire protection services for the project will be designed in accordance with Australian Standards, including the following:

AS 1221:1997	Fire hose reels
AS 1670.1:2018	Fire detection, warning control and intercom systems - System design, installation and commissioning (Part 1: Fire).
AS 1670.4:2018	Fire detection, warning control and intercom systems - System design, installation and commissioning (Part 4: Emergency Warning).
AS 1851-2012	Routine service of fire protection systems and equipment.
AS 2419.1-2021	Fire Hydrant installations (Part 1: System design, installation and commissioning).
AS 2441-2005	Installation of fire hose reels.
AS2118.1-2017	Automatic Fire Sprinkler System
AS 2444-2001	Portable fire extinguishers and fire blankets – selection and location.
AS 2941-2013	Fixed fire protection– selection and location.
AS/NZS 3000-2018	Wiring Rules
AS/NZS 3500	Plumbing and Drainage (All Relevant Parts)

5.3 Fire Services Scope

5.3.1 Authority Services Connections

The water authority town's main is located on Jack Smyth Dr and is a 250mm PVC-O underground pipeline.

At this stage the proposal would be make a new fire tapping connection to the Ø250mm PVC-O town main to serve the fire hydrant system to the building.

The Statement of Available Pressure and Flow in the Ø250mm CICL town main indicates that maximum 20l/s is available to draw off for fire services. Refer to section 5.3.2 for impacts on the required fire hydrant system to serve the development.

- Details

Date :	**04/04/2024**	
Water main size:	**150mm Mm**	
Details	**Location (A)**	**Location (B)**
Static Pressure (KPa)	Litres/Sec	Kpa
Maximum Flow (Litres/sec)		
Residual Pressure		
No1	0	420
No2	5	410
No3	10	405
No4	15	380
No5	20	320

Figure 16 *Table from Tamworth Regional Council Statement of Available Pressure and Flow*

Figure 17 *Water Authority Towns Main*

5.3.2 Fire Hydrant System

Fire Hydrant Protection compliant with NCC 2022 Clause E1D2 and AS2419.1-2021 as applicable will be provided throughout and will utilise external and internal fire hydrants to provide coverage to all areas of the building.

Primary Fire Hydrant coverage will be provided through external fire hydrants ensuring all areas on ground level can be adequately reached with a 60m hose length and 10m nozzle spray from external fire hydrant outlets. These outlets will need pedestrian pathways to be provided from the outlet to the building as required under AS2419.1-2021.

Additional internal Fire hydrants may be provided where adequate coverage cannot be achieved from external Fire Hydrants. Fire Hydrant coverage will be achieved by ensuring all areas can be adequately reached by internal hydrants with a 30m hose length and 10m nozzle spray.

The system shall be capable of 3 hydrants operating simultaneously i.e 30l/s as the building meets the following criteria:

- is non sprinklered and fire compartmentation sizes are >5,000m2 but not >10,000m2

As such the town main supply will be able to provide 20l/s with the remaining 10l/s for 4 hours to be provided via on site water storage. The total capacity of the water storage tank will be 144,000L and will be required to be provided with a divisional wall for 50/50 maintenance as required under AS2419.1-2021. The storage tank will be provided with 20l/s infill from the towns main supply on Jack Smyth Dr.

Fire hydrant booster assembly will be provided adjacent to the water storage tank at the south west corner of the site at the boundary facing Jack Smyth Dr and will be addressed under a performance solution as it is not at the principal vehicular access to the site. The booster shall be provided with large bore tank suction points and quad boost points, to allow for the full flow requirements of the hydrant system.

Dual diesel fire hydrant booster pumps will be required to boost the pressure in the system from the tank to achieve the requirements as set out under AS2419.1-2021 (700kpa at remote fire hydrants). This can be housed in an external pumproom or prefabricated external acoustic enclosure in close proximity to the fire brigade booster assembly and tank and no more than 20m from fire brigade hardstand area (Jack Smyth Dr).

An external strobe light will be provided at the booster assembly as required under AS2419.1-2021.

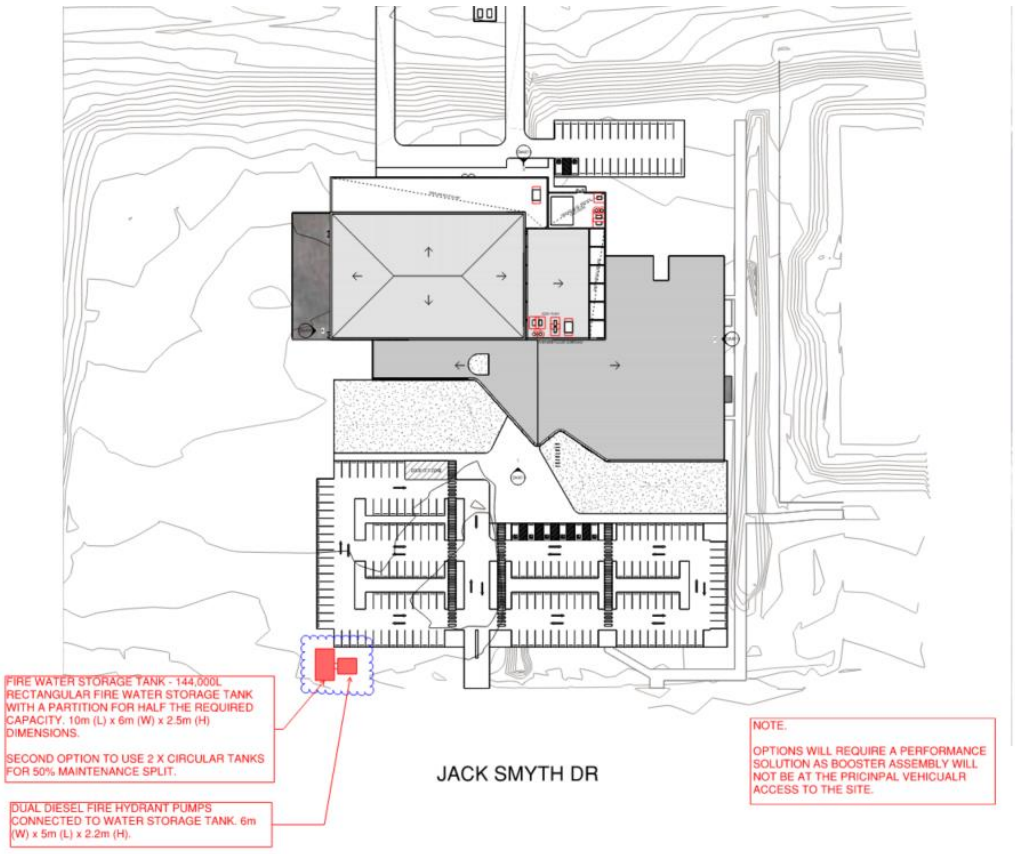

Figure 18 *Fire Hydrant Tank and Pump Location on Jack Smyth Dr*

5.3.3 Fire Hose Reel System

Fire Hose reel protection compliant with NCC 2022 Clause E1D3 and AS2441.1-2005 as applicable will be provided throughout and will utilise fire hose reels located within 4m of required exits to provide full coverage to the new building.

Coverage will be achieved using 36m Fire Hose Reels with a 4m spray at the end of the nozzle.

External fire hose reels may be proposed to provide coverage to pool hall areas due to humidity / corrosion concerns. They are to be located in weatherproof cabinets.

Fire Engineered solution will be required for Fire Hose Reels which are, for example, not located within 4m of exit, or where a hose stream coverage shortfall exists. This will be subject to further design development and input from the BCA consultant.

5.3.4 Fire Sprinkler System

An Automatic Fire Sprinkler System compliant with NCC and AS2118.1-2017 would be required to be provided to the building as it exceeds the volume limitations for Type A construction under the NCC.

The proposal is to address this via a performance solution to negate the requirement for an automatic fire sprinkler system to the building.

5.3.5 Fire Detection and Alarm System

The building at a minimum will be provided with a fire detection system in order to shutdown air handling systems as per the requirements of NCC 2022 NSW Clause E2D16.

Smoke detectors will be installed complying with NCC 2022 S20C6 or potentially NCC 2022 S20C4 to support fire engineering requirements.

A Main Fire Detection Control and Indicating Equipment Panel (FDCIE) with associated equipment will be provided within site of the main entrance of the building to serve the new facility.

It is noted a performance solution could be adopted to omit smoke detection above the pool areas.

Heat detectors to be provided in lieu of smoke detectors in aggressive environments at risk of spurious alarms due to dust, steam, condensation or corrosion, including kitchen, shower, pool and plant areas.

Interface with mechanical, security and AV system will be provided.

5.3.6 Emergency Warning and Intercommunication system (EWIS)

The NCC report prepared by Design Confidence notes the requirement to provide an emergency warning and intercommunication system to the building in accordance with NCC 2022 Clause E4D9. Given the set out of the building (single level with no fire compartmentation proposed) the proposal would be to utilise an Occupant warning system only with no warden intercom points and address via a fire engineered solution.

Occupant warning panel is to be located at the FIP location with loudspeakers provided throughout the building as required. Horn speakers to be provided in pool and plant areas due to the humidity and corrosive environment.

5.3.7 Portable fire extinguishers

Portable fire extinguishers and fire blankets including associated signage shall be installed in accordance with the NCC 2022 Clause E1D14 provisions and AS2444-2001.

Generally, AB(E) rated 4.5kg Dry Chemical Powder type extinguishers shall be utilised throughout and located within 2 to 10m of electrical switch rooms and switchboards and other selected hazards.

Extinguishers will be installed complete with associated hangers and signage.

Fire blankets shall be located at tea points, kitchens and break-out areas.

5.3.8 Clarification items

The following items require further discussion and clarification with project stakeholders as part of the next design stage:

Fire Services Clarifications	
BCA Consultant path of egress	Confirmation of the location of exit doors to complete fire hydrant and fire hose reel coverage check.
Performance solutions	Alternate solution report required to assist and rationalise overall project design. 1. Rationalise the building to Type A construction requirements in lieu of large isolated building given the volume exceeds Type A requirements; 2. Providing an occupant warning system to the building in lieu of an emergency warning and intercommunication system (EWIS); 3. Fire hydrant booster assembly proposal to be located not adjacent the principal vehicular access to the site; 4. Omission of fire detection within the internal pool hall area, sauna and the like. It is noted the above performance solutions are proposed as part of the fire services design only, further performance solutions may be required pending BCA consultants requirements.

6 Hydraulic Services

6.1 Standards and Design Criteria

The Hydraulic Services for the project will be designed, but not limited, in accordance with the following sections.

6.1.1 Design Standards

AS/NZ 3500.1	Water Services
AS/NZ 3500.2	Sanitary Plumbing and Drainage
AS/NZ 3500.3	Stormwater Drainage
AS/NZ 3500.4	Heated Water Services
Requirements of the NCC 2022 Part 1 & Part 3	
Requirements of the Building Surveyor	
Requirements of the relevant water authority	

6.1.2 Design Criteria

Design criteria associated with the Project are listed below:

Item	Design Criteria
Extreme ambient conditions under which all plant shall operate	46.0°C dry bulb maximum 24.0°C wet bulb maximum Full solar load. -2.0°C dry bulb minimum
Water supply Pipe Sizing Design Criteria	Australian Standard 2200 – Design charts for Water Supply and Sewerage and The Institute of Plumbing Australia – Selection and sizing of copper tubes for water piping systems.
Water supply – mains water	Mains water supplied from relevant Water Authority mains water network. Average supply temperature: 12°C
Water velocity within water pipework	Limit cold water velocity in pipework to 1.5 m/s to minimise water hammer, noise & wear. Limit hot water flow velocity to 1.2 m/s Limit hot water return velocity to 1.0 m/s
Water pressure to points of supply	350 – 500 kPa
Backflow Prevention Devices to Water Supply	To requirements of Australian/New Zealand Standard 3500 - Plumbing and Drainage Part 1.1 - Water Supply, Australian Standard 2845 - 1998 - Water Supply - Backflow prevention devices Part 1 - Materials, Design and Performance Requirements, Australian Standard 2845.2 -1998 - Water Supply - Backflow Prevention Devices - Part 2 - Air Gaps and Break Tanks, Australian Standard 2845.3 - 1998 - Water Supply -

	Backflow Prevention Devices, Part 3 - Field Testing and Maintenance NCC 2022 Part 3 Section B5
Domestic hot water Generation	Designed on the provision of 65°C water storage for a one hour recovery period. Via CO2 heat pumps.
Hot water supply	Maximum pipework operating velocity. • 3m/s Maximum pipework circulating velocity. • 1.2m/s Maximum pipework circulatory return line velocity. • 1.0m/s Operating pressures at fixture outlets. • 250kpa minimum pressure. • 500kpa maximum pressure. Hot Water Temperatures • Storage and outflow temperature 65°C Maximum operating temperatures at fixture outlets. • Ablution fixtures 43.5°C • Accessible fixtures 43.5°C • Other fixtures (kitchen sinks, cleaners sinks etc) 60°C Maximum pipework dead–legs 10 m between hot water circulating loop to fixtures.
Warm water temperature	In accessible toilets the delivery temperature to sanitary fixtures used for personal hygiene purposes must not exceed 43.5°C In other areas, the maximum temperature delivered to sanitary fixtures used for personal hygiene must not exceed 50°C For sensor taps with no manual temperature adjustment feature shall have tempered water supplied to the fixture at no more than 37°C
Sanitary Plumbing and Drainage	To requirements of Australian/New Zealand Standard 3500.2 - Plumbing and Drainage - Part 2.1 and Part 2.2 - Sanitary Plumbing and Drainage Drainage pipework will be installed at the following minimum gradient. 2.5% grade for pipes equivalent or < DN.65mm 1.65% grade for pipes equivalent or < DN.100mm 1.00 % grade for pipes equivalent or < DN.150mm
Stormwater and Roof Drainage	To requirements of Australian/New Zealand Standard3500.3 - Plumbing and Drainage - Stormwater Drainage. Rainfall Intensity for 5–minute duration. • 1 in 20yr = 161mm/hr. • 1 in 100yr = 214mm/hr. ARI stormwater components designed in accordance with • Overflow Provisions — 1 in 100 yr storm event • Box Gutters - 1 in 100 yr storm event

	• Eaves Gutters – 1 in 20 yr storm event
Water Conservation Measures	In accordance with the Water Efficiency Labelling Scheme (WELS). In accordance with the ESD consultant requirement.
Acoustic Treatment	In accordance with Acoustic consultant's requirements.

6.2 Extent of Works

The proposed Hydraulic Services for the development will include:

- Domestic Cold Water Service
- Domestic Hot Water Service
- Thermal Generation for Domestic Hot Water Service
- Sanitary Plumbing and Drainage
- Trade Waste drainage
- Rainwater harvesting
- Treated Rainwater Service
- Above-ground Stormwater drainage
- Roof drainage

6.3 Existing Hydraulic Services

6.3.1 Authority Infrastructure

Tamworth Council sewer and water infrastructure within proximity of the site includes:

- 1 No x 200mm Water mains located on Jack Smyth Drive;
- 1 No x 150mm authority sewer main running down the middle of site, and run across Jack Smyth Drive. (It is noted that diversions of the sewer main would be under the scope of the civil engineers and the proposed direction is to the east of the site area.)
- 1 No x 150mm Recycled Water mains located on Jack Smyth Drive;
- 1 No x 63mm Gas mains located on Jack Smyth Drive (for information only);

Figure 19 *Tamworth Council Existing Water mains*

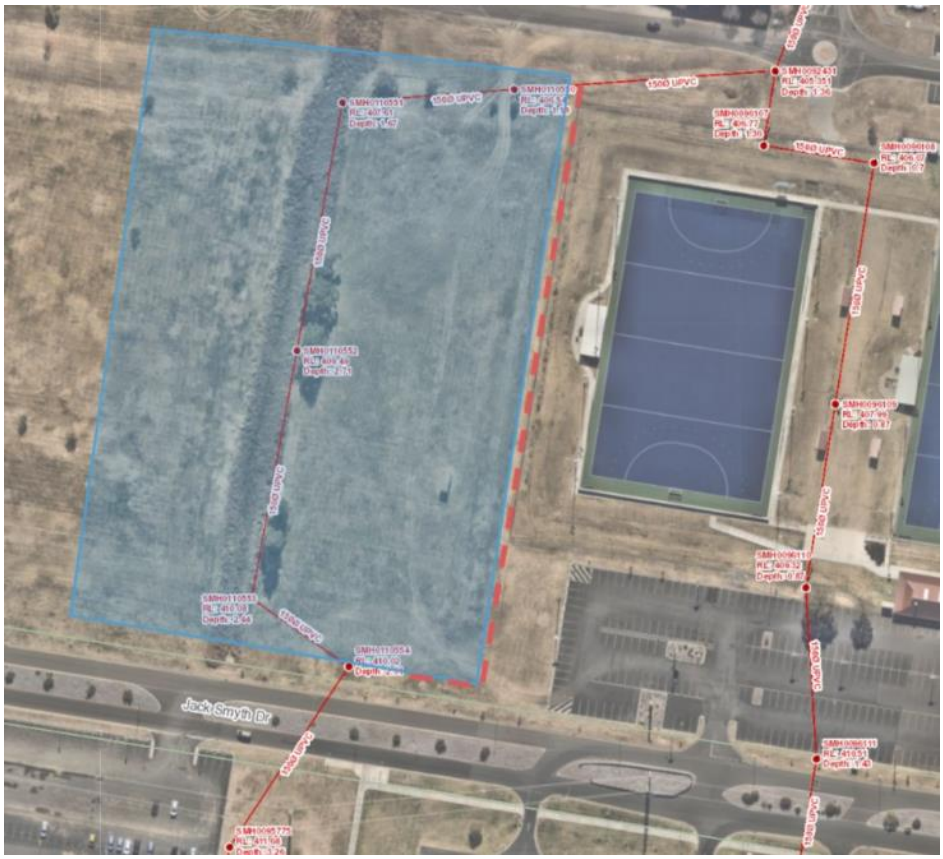

Figure 20 *Tamworth Council Existing Sewer Main*

Figure 21 *Tamworth Council Existing Recycled Water Main*

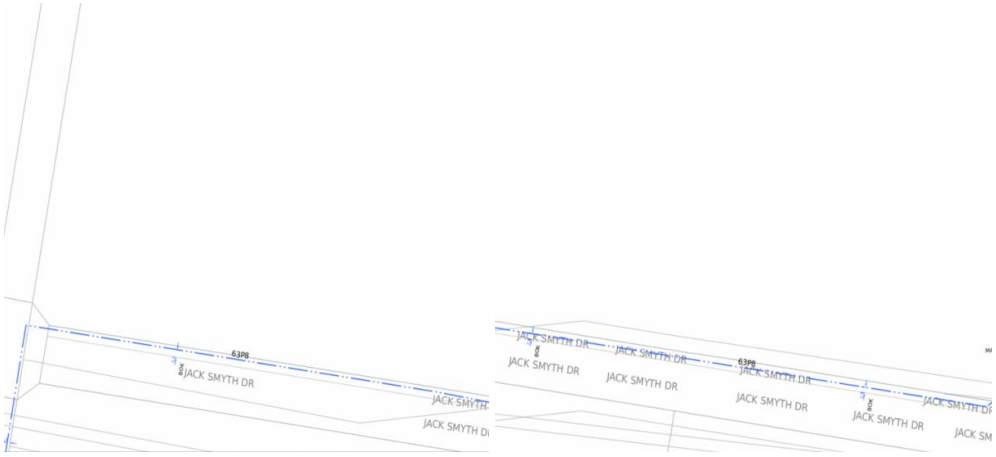

Figure 22 *Tamworth APA Existing Gas Main (Left) Stockmans Way and Jack Smyth Drive (Right)*

6.4 Proposed System Descriptions

6.4.1 Site services

A new water tapping will be required to serve the facilities, with fire and domestic water meters at the site boundary. The new tapping will be located at Jack Smyth Drive.

It is our understanding that the preferred incoming cold-water supply and associated Fire water meter assembly is to be located off at Jack Smyth Drive.

The sewer from the new building will be discharged to the following 2 options subject to detailed design.

1. The existing authority sewer that runs at Jack Smyth Drive via a gravity drainage system.
2. The diverted sewer main (by Civil) of the east of this site.

Final locations of drainage points and levels will need to be coordinated and confirm is required to verify the gravity drainage is achievable from the furthest fixture to the existing authority sewer branches or diverted sewer main.

Where site surface levels change council manholes and vertical inspection shaft lids shall be adjusted to suit the level changes.

Where new structures including carparks are proposed over existing council sewer drainage, the existing council sewer infrastructure may need replacement of realignment in accordance with Tamworth Council's adopted design and construction specifications.

Where existing council drainage is to be abandoned, the junctions are to be capped off at the council authority main. Council must be notified to carry out an inspection prior to backfilling.

A new recycled water tapping may be provided alongside the domestic cold water connection. The recycled water supply will be extended to the site as a backup supply for the treated rainwater supply for use in irrigation.

6.4.2 Sanitary Drainage and Plumbing

Sanitary drainage will be reticulated inground from each point of use and connect to the site discharge point via gravity complete with inspection openings, boundary trap and overflow relief gully trap.

Overflow relief gully trap should be positioned above the flood lines to prevent any stormwater from discharging into the sewer system during flood events.

Design Criteria

The Sanitary drainage service will be designed to the following minimum criteria:

- Drainage pipework will be installed at the following minimum gradients.
  - 2.5% grade for pipes equivalent or < DN.65mm
  - 1.65% grade for pipes equivalent or < DN.100mm
  - 1.00 % grade for pipes equivalent or < DN.150mm

6.4.3 Trade Waste

Trade waste drainage and treatment systems are to be provided for the facility to treat the waste discharges from the café/ kitchen. This will comprise inground drainage from the café/kitchen & bin enclosure with a grease arrestor provided to treat grease discharges from the kitchen equipment and fixtures to treat prior to connecting to the sewer system.

Grease interceptor traps will have sufficient anchoring to prevent flotation due to the water table.

The grease interceptor trap will be located based on the following:

- Close to the discharge from the fixtures
- Access requirement to be considered for maintenance purposes.

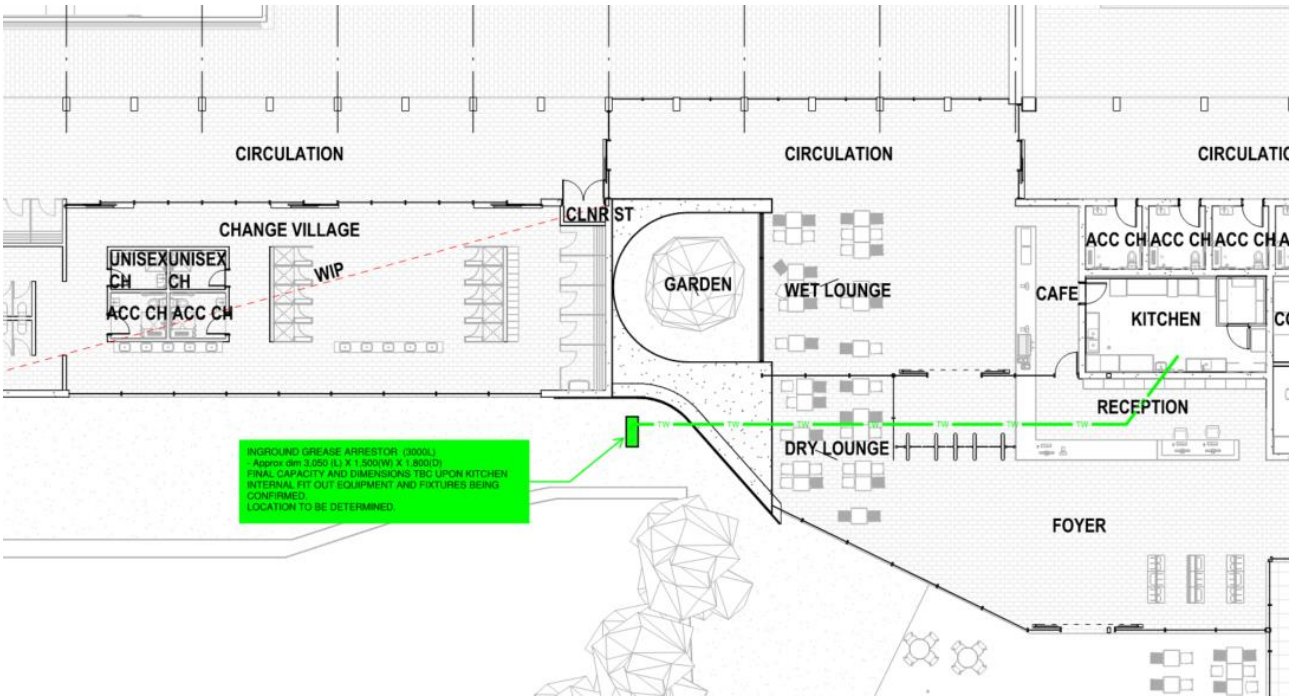

Figure 23 *Inground Grease Trap*

Design Criteria

The Sanitary drainage service will be designed to the following minimum criteria:

- The grease interceptor sizing will be as per the council guidelines.
- Trade waste drainage pipework will be installed at the following minimum gradients.
  - 2.5% grade for pipes equivalent or < DN.65mm
  - 1.65% grade for pipes equivalent or < DN.100mm

- 1.00 % grade for pipes equivalent or < DN.150mm

6.4.4 Water Supply and Reticulation

Potable water supply is to be extended from the water meter assembly to the proposed development with all required isolation valves, pressure control valves and backflow valves. Domestic Cold water booster pumps has been proposed as the water main may not meet the required pressure and flow for the site. Location of the pumps will be coordinated and finalize in the next design stage.

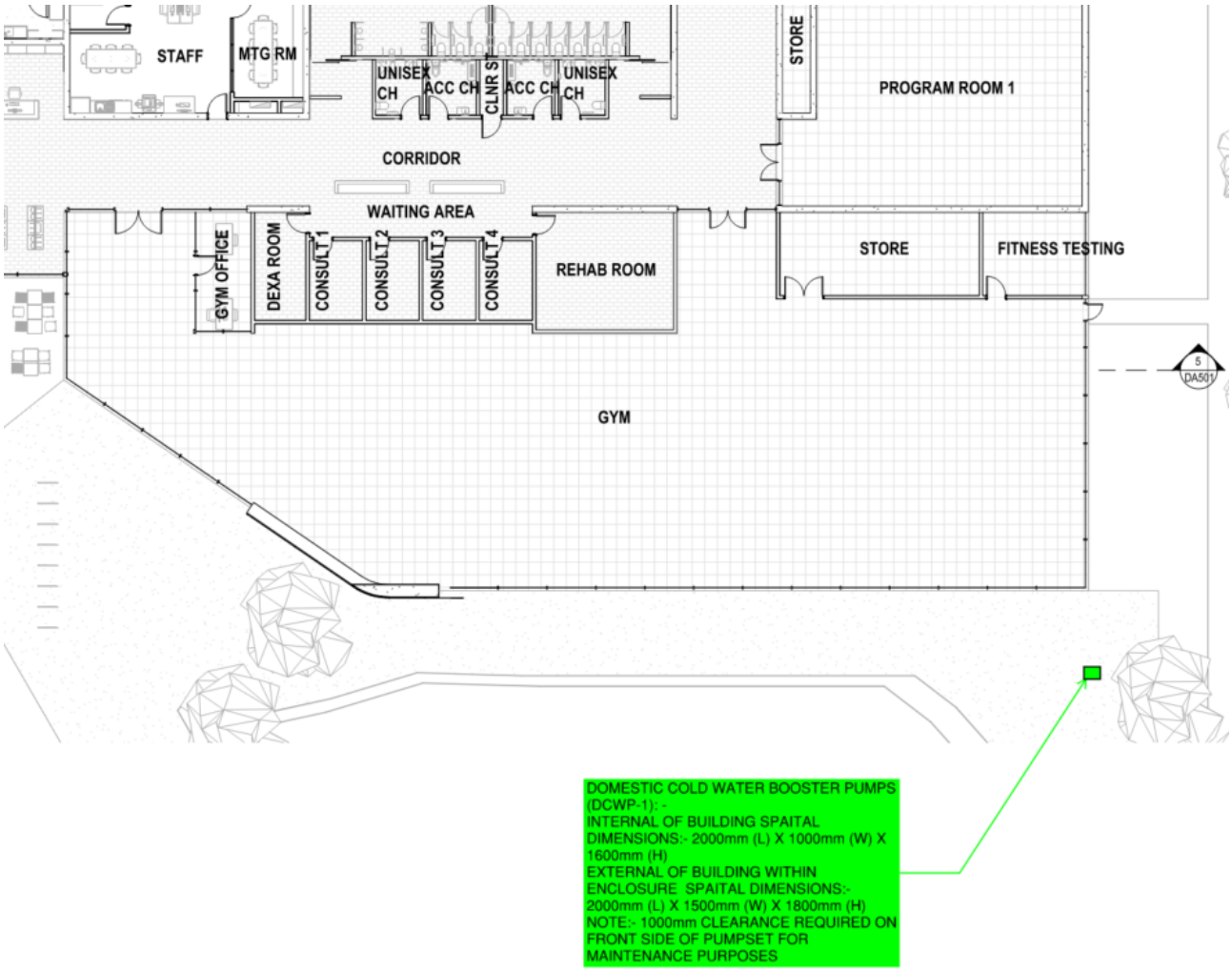

Figure 24 *Domestic Cold Water Booster Pumps Location*

The main water demands include:

- Showering facilities
- Café Kitchen
- Aquatic – pool plant connections
- Rainwater reuse backup

The site will have an external main water meter and sub water meters for major water uses. (Café, Hot water unit, rainwater harvesting plant & different pools), and where required to meet ESD initiatives.

Coordination will be undertaken with the pool and irrigation consultants to determine the water supply requirements.

Design Criteria

The Domestic Cold-Water service will be designed to the following criteria.

- Maximum pipework operating velocity.
  - 1.5 m/s
- Operating pressures at fixture outlets.
  - 350kpa minimum pressure.
  - 500kpa maximum pressure.

6.4.5 Hot Water Generation, Reticulation and Temperature Control

Hot water for the various fixtures will be via a CO2 hot water heat pump system coupled with storage tanks.

Total of 1 combined hot water heat pump systems have been proposed for the change village and gym changing room area. The hot water generation systems are currently proposed to be located on the roof floor above the warm water pool. The quantities, sizes and locations of these systems can be further coordinated upon fixtures and layout confirmed.

Figure 25 *CO2 Hot Water Heat Pumps & Storage Tanks Location*

Total of 1 electrical hot water storage system have been proposed for the group changing room area. The hot water systems are currently proposed to be located on the ground floor of the plant building. The quantities, sizes and locations of these systems can be further coordinated upon fixtures and layout confirmed.

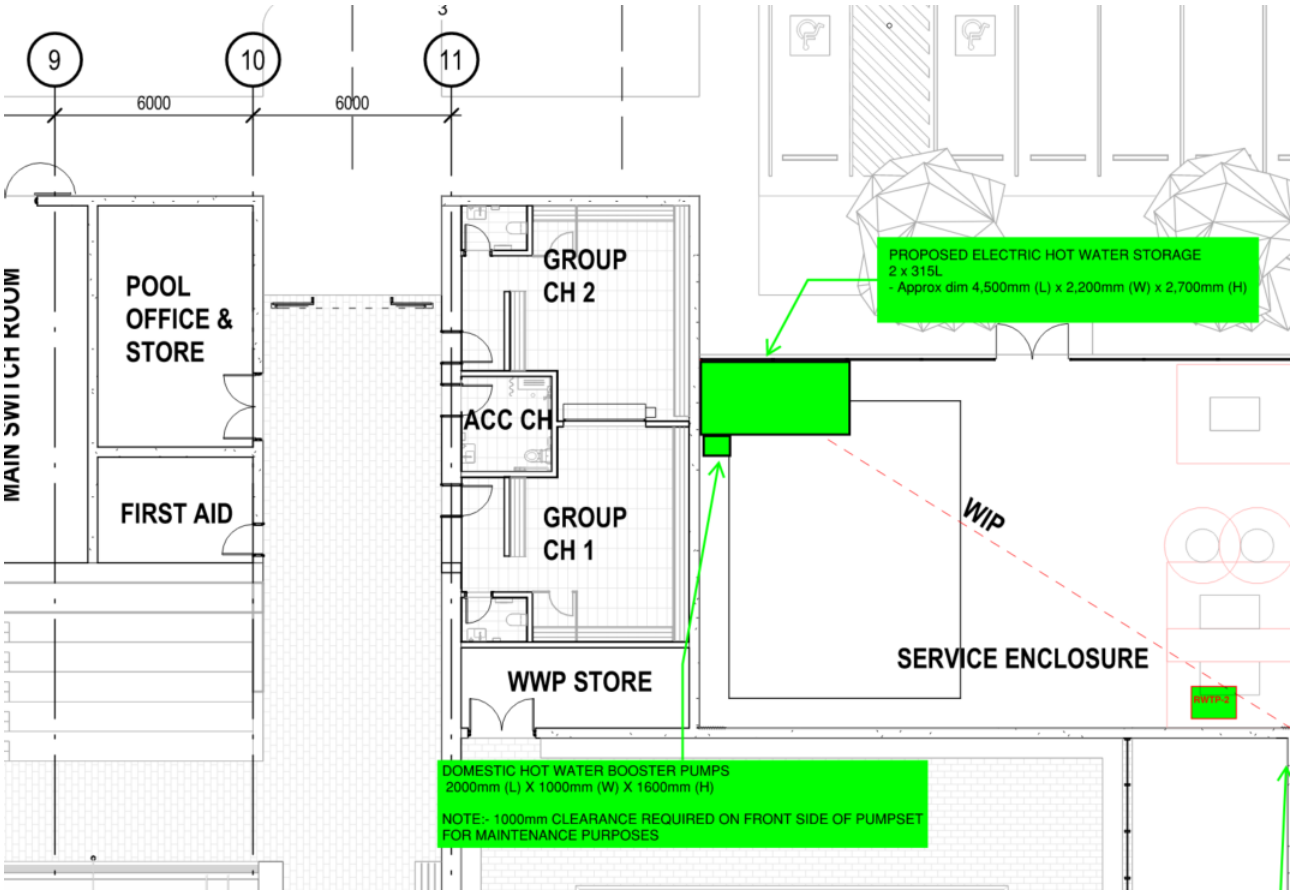

Figure 26 *Electric Hot Water Storage Unit Location*

The hot water installations will be sized to meet the expected demands of the building population and demand peaks. The size will be reviewed once we receive the facility usage.

Hot water will be reticulated from the generation system to the points of demand with insulated pipework complete with isolation valves, pipe supports, penetrations, expansion facilities and fittings.

The temperature at tap outlets used for hygienic purposes is controlled via thermostatic mixing valves and tempering valves to ensure water temperatures at outlets comply with the standards.

Design Criteria

The Domestic Hot Water service will be designed to the following criteria:

- Maximum dead leg pipework operating velocity.
  - 3m/s
- Maximum loop pipework operating velocity.
  - 1.2m/s
- Maximum pipework circulating velocity.
  - 1.0m/s
- Operating pressures at fixture outlets.
  - 350kpa minimum pressure.
  - 500kpa maximum pressure.
- Hot Water Temperatures
  - Storage and outflow temperature 65°C

- Hot Water Return Temperature 60°C
- Maximum operating temperatures at fixture outlets.
  - Ablution fixtures 43.5°C
  - Accessible fixtures 43.5°C
- Maximum pipework dead–legs
  - 10 m between hot water circulating loop to fixture.

6.4.6 Rainwater Harvesting and Reuse

Rainwater collection

A series of downpipes and gutter systems will convey roof rainwater catchment to above ground and below-ground rainwater collection tanks, with overflow from tanks to the stormwater drainage system.

The main roof over the main building will be captured via gravity drainage system, collecting the downpipes at high level running to the rainwater tank. The final captured area will be determined in detailed design.

The roof over the Stage 1 - 50m pools will be captured via siphonic drainage system, collecting the rainwater at high level running to the rainwater tank. The final captured area will be determined in detailed design.

Other Roof rainwater catchment areas that cannot reticulate to tanks will discharge directly into the civil drainage system.

The incoming rainwater piping systems will incorporate first flush filter treatment and diversion of supply to the site stormwater system prior to entry to storage tanks.

The capacity of the rainwater storage tanks system will be nominally 180,000 litres (4 No x 45,000L) subject to a full water balance and site usage assessment.

Rainwater tanks will have sufficient anchoring to prevent flotation due to the water table.

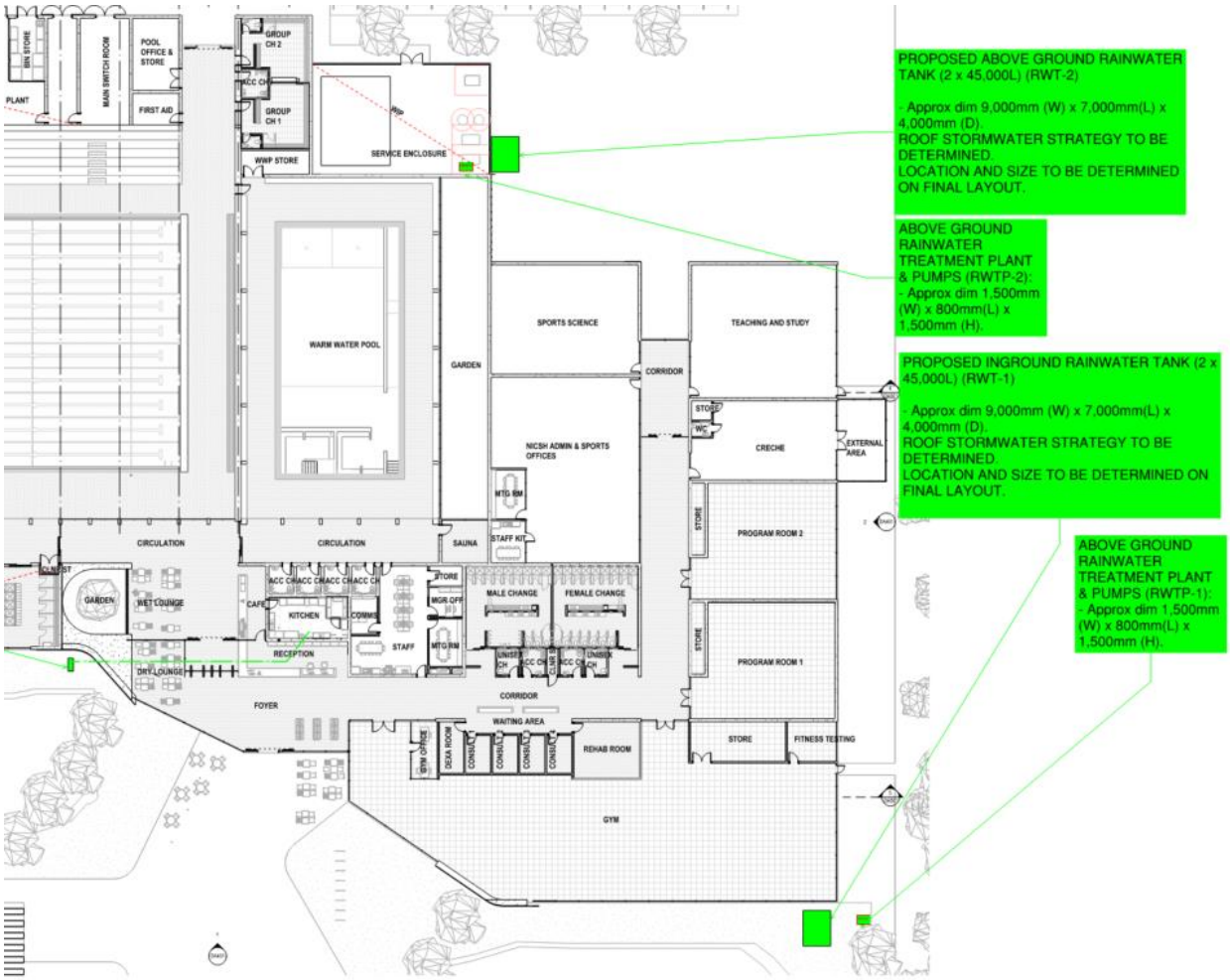

Figure 27 *Rainwater Tank Sketch*

Design Criteria

The Rainwater drainage will be designed to the following criteria:

- Rainfall Intensity for 5–minute duration.
  - 1 in 20yr = 161mm/hr.
  - 1 in 100yr = 214mm/hr.
- ARI stormwater components designed in accordance with
  - Box gutters - 1 in 100yr storm event
  - Eaves Gutters – 1 in 20yr storm event
  - All overflows (including eaves gutters) – 1 in 100yr storm event.

Rainwater Reuse

Harvested rainwater will be supplied to the building from the rainwater tank for irrigation purpose. Other purposes such as WC flushing, pool top-up and washdown are proposed subject to council's approval.

Dedicated pumps and filtration equipment will be provided for rainwater supply and treatment.

The Rainwater Re–use service will be designed to the following criteria:

- Maximum pipework operating velocity.
  - 1.5m/s
- Operating pressures at fixture outlets.
  - 250kpa minimum pressure.
  - 300kpa minimum pressure for flush valve fixtures.
  - 500kpa maximum pressure.

The backup supply to the rainwater treatment system will be provided via motorised isolation valves that will automatically change from the rainwater tank supply to a supply from the following two options:

1. Council recycled water system, to confirmed sufficient availability to the system.
2. Domestic cold water system.

6.4.7 Natural Gas Service

An existing natural gas authority supply is available from Jack Smyth Drive. We understand that currently the design for café/kitchen has not been finalised and therefore a natural gas connection to the new development has not been proposed. This can be provided after the design of the café/kitchen has been finalized and gas supply is required.

6.5 Clarification Items

The following items require further discussion and clarification with the Client as part of the next design stage:

Item	Clarification Required
Final café design	Confirm café layout to finalise the grease arrestor sizing.
Rainwater Tank sizing	Final sizing to be determined based on acceptable usage i.e. treated rainwater for toilet flushing and irrigation requirement.
Facility Usage	Peak patrons numbers, staffs and patterns (weekly/yearly).
Metering arrangements for operators	Café, Pool & Gym
Pool water requirements	Confirmation of expected water supply demands and discharge flow rates from pool consultant.
Irrigation requirements	Confirmation of expected water supply demands from the Irrigation consultant.
Fixtures	Water-efficient fixtures with user-activated timers
Sewer diversion design	Confirm diversion design to finalise sewer connections from building.
Stormwater design	Confirm stormwater design to finalise stormwater connections.