WOOD & GRIEVE ENGINEERS

St Catherine's School Electrical and Hydraulic Services Brief

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Revision

REVISION	DATE	COMMENT	APPROVED BY
001	08.05.14	Preliminary	TMM
002	03.06.14	Revised	TMM
003	21.07.14	Revised	TMM
004	14.08.14	Revised	TMM
005	15.08.14	Revised	TMM

Contents

1. Introduction

WGE has been commissioned by St Catherine's School, Waverley, to assist with the preparation of an Environmental Impact Statement (EIS) to accompany a Development Application (DA) for the school which is located at 26 Albion St Waverley (the site)

The DA seeks concept approval for the School's campus Master Plan and detailed design approval of the proposed Stage 1 works which comprise of a new Research, Performing Arts and Aquatic Centre (RPAC).

This report has been prepared to address a number of key issues as stated in the Director General's Environmental Assessment Requirements (DGRs) issued on 29th January 2014 (SSD 6339). The issues addressed by this report includes:

> ***Item 12 – Utilities***
> *In consultation with relevant agencies, the EIS shall address the existing capacity and any augmentation requirements of the development for the provision of utilities including staging of infrastructure through the preparation of an Infrastructure Management Plan.*

This document has been prepared based on the following information:

- Architectural drawings received from PD Mayoh Pty Ltd including the following:
  - Plans
  - Elevations
- Site land survey, dated May 2012.
- Heritage report prepared by NBRS + Partners, dated December 2013.
- Geotechnical survey prepared by J&K, dated 8th November 2013.
- Block plans and associated site information as provided by St Catherine's Facilities Manager.

2. Critical Issues

2.1 Authority Connections

The following is a list of applications that will be required for the project in due course.

- Section 73
  - lodged by hydraulic consultant after DA
- Building Over Sewer Permit
  - TBC by Section 73 Application
- 188 FRNSW Exemption
  - lodged by hydraulic consultant pending outcomes of fire engineering analysis by Fire Safety Engineer
- Ausgrid Application for Connection
  - lodged by electrical consultant

The following information will be required to aid the electrical and hydraulic designs:

- BASIX Assessment — determination of rainwater re-use and hot water system requirements
- ESD report — determination of ESD initiatives to be incorporated into the project
- BCA Report — determination of DTS requirements
- Fire Engineering Report — determination of fire safety measures to be implemented during design phase

2.2 Works by Others

Please note the following works are not considered to fall under the Electrical or Hydraulic Contractors Scope of Works and may require a specialist contractor:

Specialist Theatre Consultant – required for the following works:

- Design and specification of theatre stage lighting and lighting control systems
- Design and specification of theatre AV systems (incl. music/PA, projection etc)

Specialist AV Consultant – required for the following works:

- Design and specification of specialist AV hardware (incl. PA systems) required for the school refurbishment

IT Consultant – required for the following works:

- Design and specification of all active IT equipment required for the new development
- Patching of patch panels into active equipment

3. Electrical Services Overview

3.1 Design Criteria

Electrical services will be designed to comply with:

- The Building Code of Australia 2014
- The requirements of Australian Communications Authority (ACA) and Austel.
- NSW Service and Installation Rules
- The following Australian Standards:

AS/NZS 3000	SAA Wiring Rules (2007)
AS 1680	Interior Lighting
AS 1670.1	Fire Detection, Warning, Control and Intercom Systems
AS 2293	Emergency Evacuation Lighting in Buildings
AS 3008.1	Electrical Installation - Selection of Cables
AS 3786	Smoke Alarms

3.2 Power Supply Authority Infrastructure

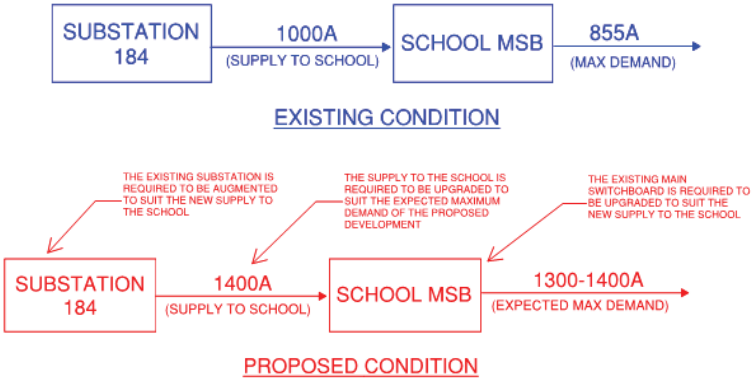
The local Supply Authority is Ausgrid.

The school is currently fed from a 1000A direct supply from substation 184 located in Leichhardt Lane towards the eastern boundary of the school.

Preliminary advice received from Ausgrid states that the maximum supply that is able to be delivered to the school is 1400A from the existing substation. This will require the existing substation to be augmented to have the existing feed upgraded.

Preliminary advice received from Ausgrid also states that the school currently has a maximum demand of 800A, which was confirmed on site with the maximum demand reading taken off the Main Switchboard power meter of 855A. Preliminary estimates of the maximum demand of the **proposed RPAC development** are in the order of 400-500A based on recommended allowances as determined by AS3000.

As such, the total maximum demand of the school (**including the proposed RPAC development**) is in the order of 1300-1400A. **This will mean that the supply to the school following the substation augmentation is likely to be at capacity.**



3.3 Generator Backup

Generator backup is not required on this project.

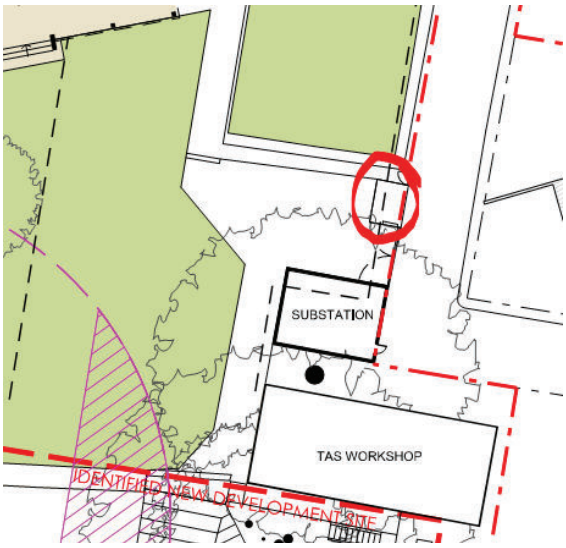
3.4 Communication Authority Infrastructure

The school has an existing communications connection. It is not anticipated that the proposed developments will require modification of the existing telecommunication infrastructure.

3.5 Power Distribution

3.5.1 School Main Switchboard and Associated Infrastructure

The school site main switchboard and associated Supply Authority metering equipment is located in the site main switchroom opposite the substation. The site MSB has a power factor correction unit located adjacent.



Based on our inspection of the existing site main switchroom we have determined that the room is non-compliant with current AS3000 requirements as there is no provision for an alternative exit path as required by c ii) below.

2.9.2.2 *Accessibility and emergency exit facilities*

Switchboards shall be—

(a) located so that the switchboard and access to it is not obstructed by the structure or contents of the building or by fittings and fixtures within the building; and

(b) be provided with adequate space around the switchboard on all sides where persons are to pass to enable all electrical equipment to be safely and effectively operated and adjusted; and

NOTE: These requirements apply with switchboard doors in the open position and switchgear in a racked-out position to enable work on the switchboard to be performed safely and emergency exit facilities to be readily available.

(c) be provided with sufficient exit facilities to enable a person to leave the vicinity of a switchboard under emergency conditions.

Sufficient access and exit facilities are considered to be the provision of the following:

(i) Unimpeded space of at least 0.6 m around switchboards with switchgear doors in any position and large circuit-breakers racked out (see Figures 2.15 to 2.19).

(ii) Adequate alternative emergency exit paths, where a switchboard—

(A) has a prospective short-circuit current of not less than 15 kA; or

(B) is supplied by a circuit with a nominal capacity of not less than 800 A per phase; or

(C) is more than three metres in length.

(iii) Openings or doorways that are at least 0.75 m wide by 1.98 m high to allow persons necessary access to the switchboard room or enclosure.

NOTE: Larger openings may be required to enable entry of prefabricated switchboards.

Furthermore, based on our inspection and subsequent drawings received from the switchboard manufacturer, we can confirm that site MSB currently does not have a main switch/service protection device installed. As such the MSB is also considered non-compliant with the NSW Service Installation Rules.

The customer must provide, install and maintain an approved service protection device located in accordance with the following sub clauses.

For installations with a maximum demand of up to 100A per phase, determined in accordance with the AS/NZS 3000 for consumers mains, unless otherwise approved by the electricity distributor the service protective device must be located at the meter position.

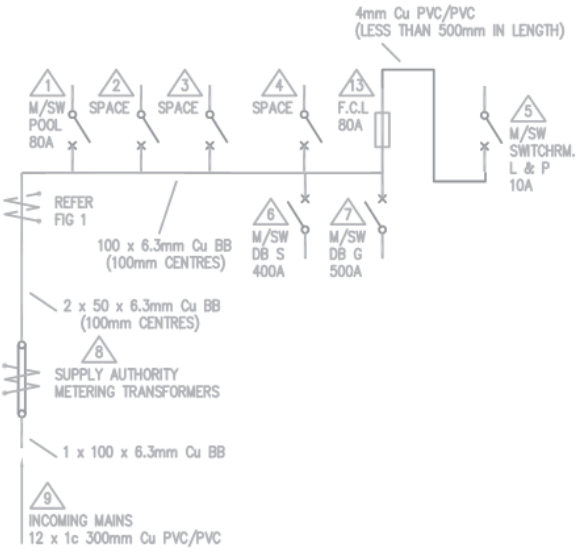
For installations with a maximum demand exceeding 100A per phase, determined in accordance with the AS/NZS 3000 for consumers mains, the service protective device must be located adjacent to or incorporated in the main switchboard. The service protective device must be installed on the line side of the current transformers.

The requirements of this clause apply to alterations and additions to existing installations except where the relocation of the service protective device would require upgrading of the service mains, consumers mains or main switchboard, then the existing service protective device location may be maintained.

Locate the service protective device no higher than 2.0m to the top of the device and no lower than 0.5m to the line side terminals of the device above the ground floor or platform.

For special situations check with the electricity distributor.

In our experience the need to modify the existing site MSB (as required for the new development) will trigger the requirement to upgrade the MSB to comply with the latest regulations which will require a service protection device to be installed.

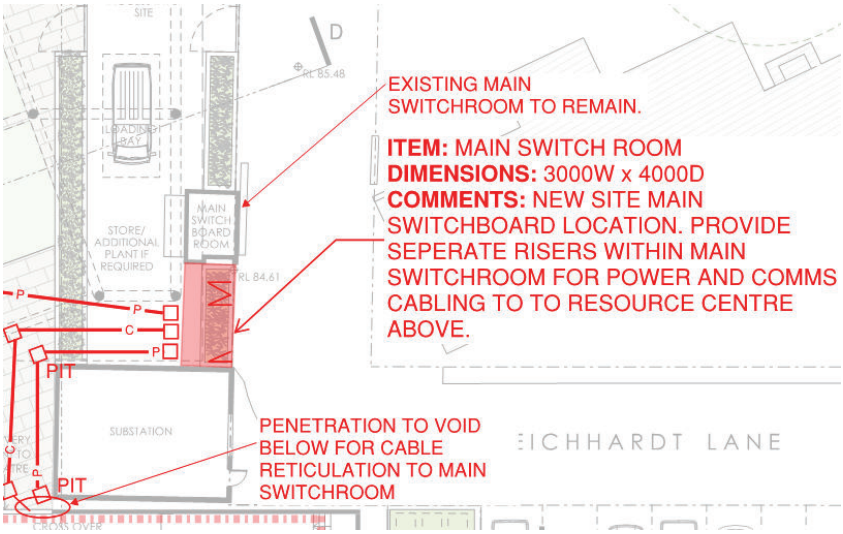


SINGLE LINE DIAGRAM

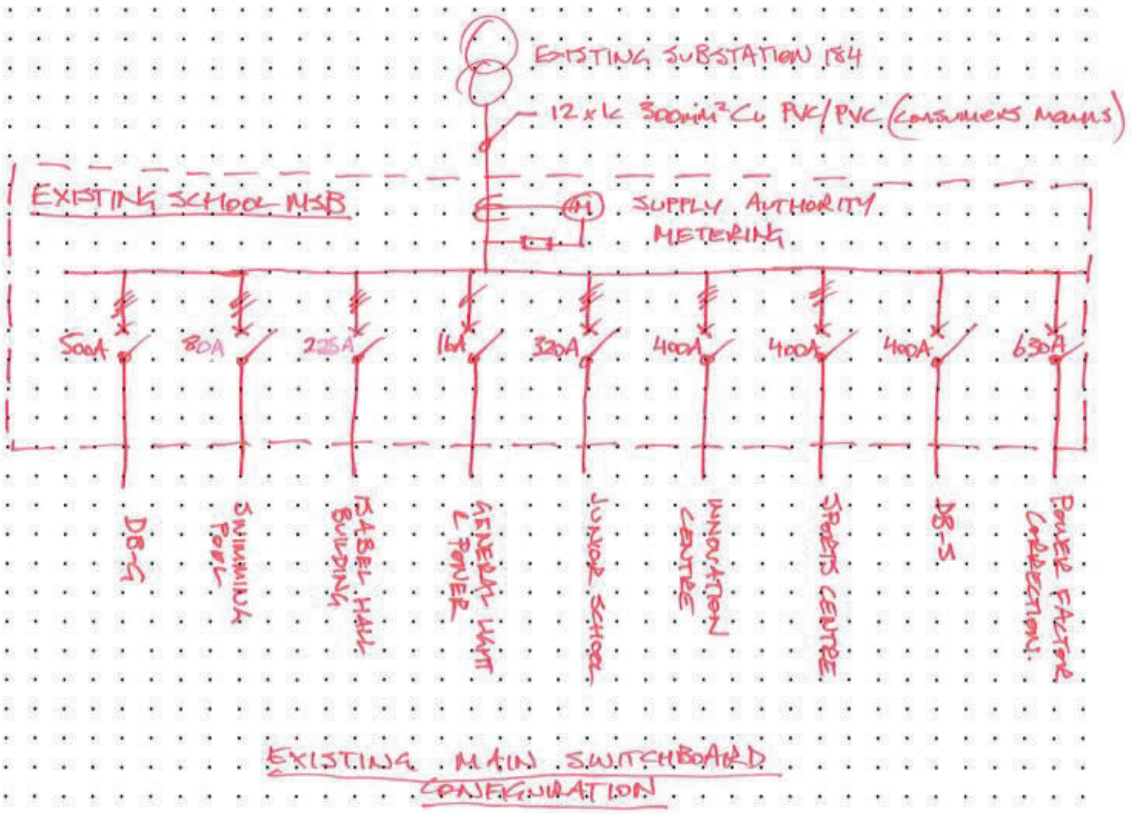
There are currently 12 x 1c 300mm2 Cu PVC/PVC consumers mains cabling feeding the MSB from the substation. Our calculations have determined that these cables are rated up to 1100A/ph. These consumers mains are required to be upgraded to in order to support the additional load of the new building. There is no information on the existing switchboard busbar ratings however we would assume that these are rated to the existing supply (ie in the order of 1000-1200A) which would require upgrading to suit the upgraded supply.

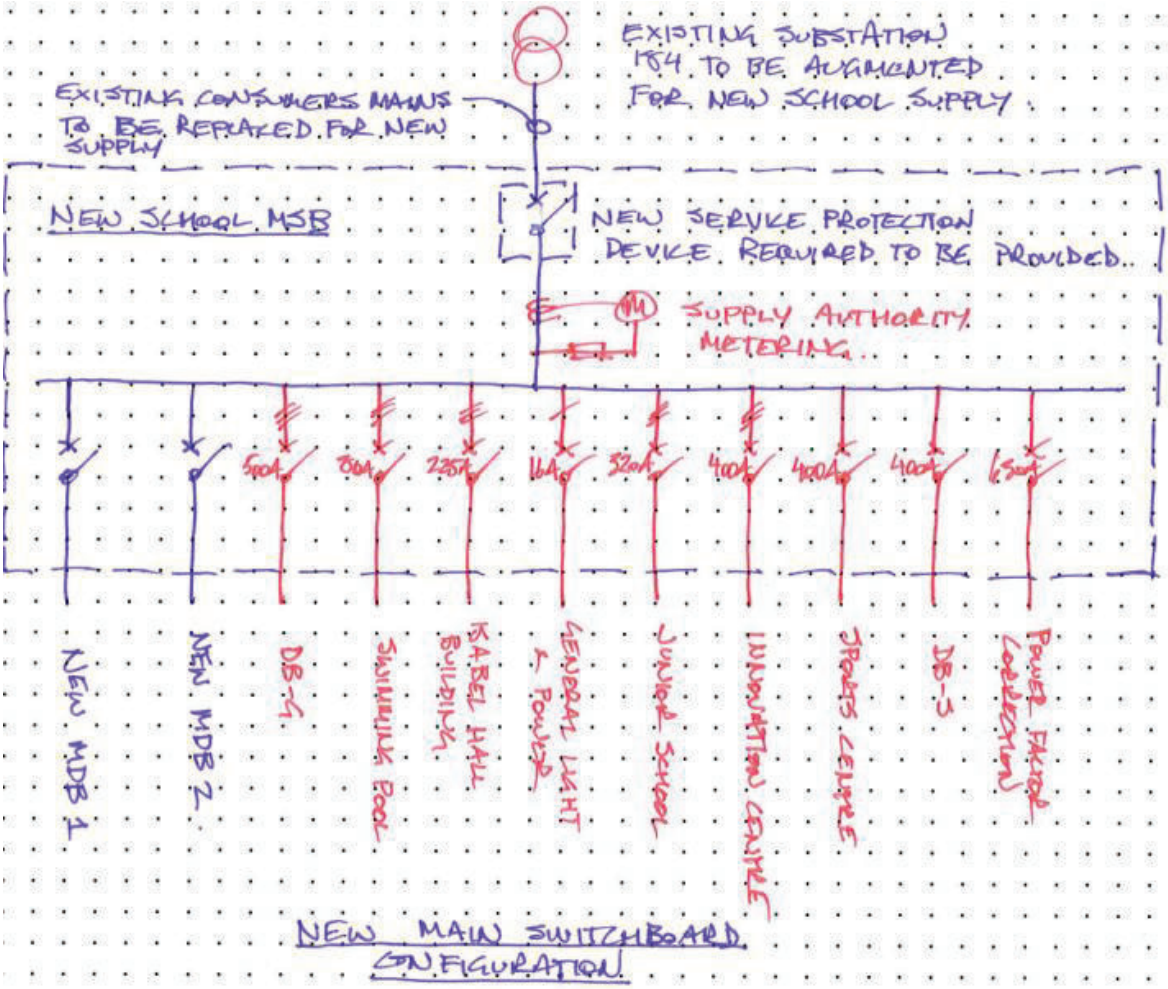
Due to the upgrades required to the site MSB to make it compliant, the replacement of the existing consumers mains cables and the uncertainty of the existing busbar ratings, and extended periods of shutdown, it is recommended that the existing site MSB replaced with a new MSB with adequate consumers mains for future capacity.

To prevent extended periods of shutdown required for the MSB upgrades above, and to prevent new submains cable runs from to each building to the new MSB location, it is recommended that a new switchroom be constructed as close as possible to the existing switchroom. The new switchroom shall be constructed complete with the new site MSB and consumers mains cables prior to site shutdown in order to reduce downtime when transferring to the new supply. Based on the plans provided, there is adequate space adjacent to the existing site main switchroom for a new switchroom to be located.



Existing submains cabling to school distribution boards shall be terminated within the new site MSB.


EXISTING SUBSTATION 184
12 x 1c 300mm² Cu PVC/PVC (CONSUMERS MAINS)
EXISTING SCHOOL MSB
SUPPLY AUTHORITY METERING
500A
80A
225A
160A
320A
400A
400A
400A
630A
DB-G
SWIMMING POOL
KABEL HALL BUILDING
GENERAL LIGHT & POWER
JUNIOR SCHOOL
INNOVATION CENTRE
SPORTS CENTRE
DB-S
POWER FACTOR CORRECTION
EXISTING MAIN SWITCHBOARD CONFIGURATION


EXISTING CONSUMERS MAINS TO BE REPLACED FOR NEW SUPPLY
EXISTING SUBSTATION 184 TO BE AUGMENTED FOR NEW SCHOOL SUPPLY
NEW SCHOOL MSB
NEW SERVICE PROTECTION DEVICE REQUIRED TO BE PROVIDED
SUPPLY AUTHORITY METERING
500A
80A
225A
160A
320A
400A
400A
400A
630A
NEW MDB 1
NEW MDB 2
DB-G
SWIMMING POOL
KABEL HALL BUILDING
GENERAL LIGHT & POWER
JUNIOR SCHOOL
INNOVATION CENTRE
SPORTS CENTRE
DB-S
POWER FACTOR CORRECTION
NEW MAIN SWITCHBOARD CONFIGURATION

3.5.2 Stage 1 (RPAC) Supply

New submains cabling will be provided to the proposed RPAC building from the site MSB through a series of underground cable pathways incorporating conduits and cable pits located along the cable route for access.

In order to facilitate new submains cabling and other installation requirements the proposed RPAC building shall be divided into three distribution zones each with its own switchroom/cupboard and Main Distribution Board. The MDBs shall be fed directly from the site MSB and supply power to other distribution boards within the distribution zone. Cabling in each distribution zone shall generally be reticulated via cabletray within the ceiling space. Cable risers and other penetrations are required to be provided in order to reticulate cabling as shown on the electrical sketches.

- Switchroom 1/MDB 1 shall be located within the new Level 1 basement and supply power to levels 1,2 and 3 (basement carpark and aquatic centre).

- Switchroom 2/MDB 2 shall be located within the new Level 4 performing arts auditorium void and supply power to levels 4 and 5 (performing arts auditorium, multi-purpose hall and boardroom).

- Switchroom 3/MDB 3 shall be located within the new site Main Switchroom and supply power to levels 6 and 7 (Research Centre).

- ***Positions of distribution boards and main cable runs have been indicated on the electrical sketches. These positions are indicative only and are subject to change following further coordination with project stakeholders.***

3.5.3 Campus Master Plan Supply

It is anticipated that existing supplies to distribution boards in areas where works have been proposed in later stages of the campus masterplan will generally be reused. Exact requirements will be investigated further in accordance with the project staging.

3.5.4 Existing School Distribution Boards

The school currently has a large network of electrical distribution boards located throughout the campus. From the location map provided by the Facilities Manager (refer appendix) there are approx. 58 existing DBs around the site. Due to time constraints and the nature of our inspection we were not able to determine the relationship between each switchboard. A comprehensive investigation will be undertaken in accordance with the project staging.

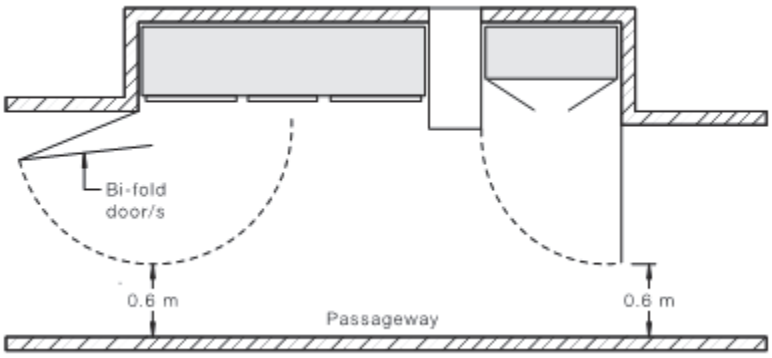
3.5.5 Stage 1 (RPAC) – Distribution Boards

New distribution boards will be provided throughout all areas of the proposed RPAC development areas as required.

New distribution boards will generally be smoke sealed (IP5x rated), have lockable doors and have segregated power and lighting chassis with sub-metering in accordance with the latest BCA requirements.

New circuits will be RCD protected in accordance with AS3000 requirements.

New distribution boards are required to be located in a dedicated electrical cupboard in order to prevent general access (eg by students). Where general access is limited (eg within storerooms) the distributions boards can be floor mounted without a cupboard. Cupboards are required to maintain 600mm clearance in front of the switchboard with the doors in the open position as per AS3000 requirements



- ***DB locations shall be confirmed as the design is developed pending anticipated circuiting requirements to each area.***

- ***It is recommended that new distribution boards be provided with Schneider Isobar/NHP Grizzbar type chassis to allow for circuits within the distribution boards to be worked on WITHOUT having to isolate the entire board. This will help prevent un-necessary shutdowns and facilitate minor works to local circuits.***

3.5.6 Campus Master Plan – Distribution Boards

Existing DBs and circuits in areas being refurbished will generally be reused as required. There are several instances where the existing DBs are non-compliant with BCA J8.3 (regarding the provision of segregated power and lighting chasses for sub-metering purposes) and may be required to be replaced. The requirement to replace these DBs will be investigated with a BCA consultant in accordance with the project staging.

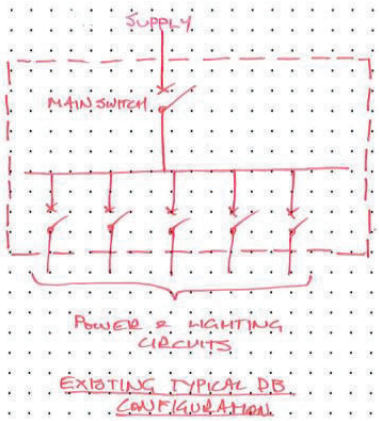
J8.3 Facilities for energy monitoring

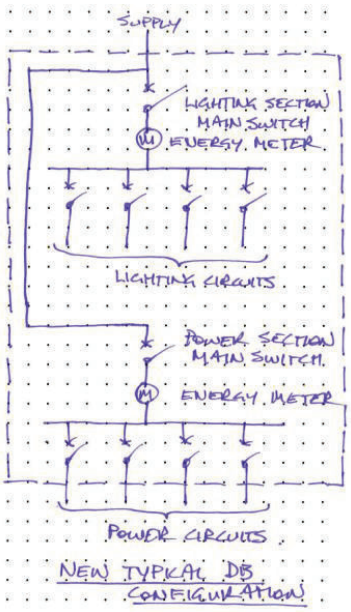
(a) A building or *sole-occupancy unit* with a *floor area* of more than 500 m^2 must have the facility to record the consumption of gas and electricity.

(b) A building with a *floor area* of more than 2,500 m^2 must have the facility to record individually the energy consumption of—

- (i) *air-conditioning* plant including, where appropriate, heating plant, cooling plant and air handling fans; and
- (ii) artificial lighting; and
- (iii) appliance power; and
- (iv) central hot water supply; and
- (v) internal transport devices including lifts, escalators and travelators where there is more than one serving the building; and
- (vi) other ancillary plant.

(c) The provisions of (b) do not apply to a Class 2 building with a *floor area* of more than 2,500 m^2 where the total area of the common areas is less than 500 m^2.





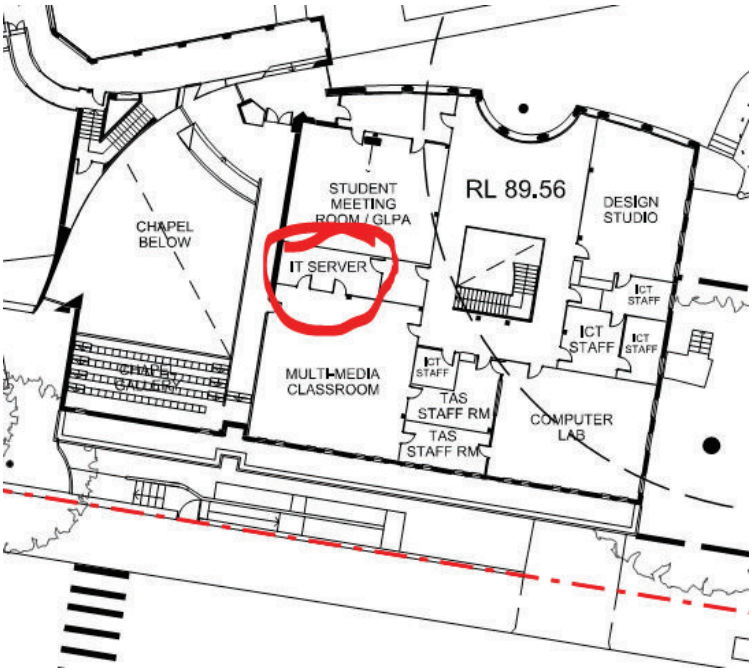
All new circuits will be RCD protected in accordance with AS3000 requirements.

- ***The BCA Consultant shall advise if existing DBs in the refurbished areas are required to be upgraded in accordance with the BCA requirements.***

3.6 Communications Distribution

3.6.1 School Campus Distributor and Associated Infrastructure

The school campus distributor (ie the main server rack) and associated communications equipment is located within the IT server room on level 5 of the Dame Joan Sutherland Centre.



3.6.2 Stage 1 (RPAC) – Communications Link

New fibre optic cabling will be provided to the proposed RPAC development from the campus distributor rack via a new cabletray reticulated within the ceiling space of level 5 of the Dame Joan Sutherland Centre to the cable riser proposed within the new performing arts auditorium control room. From here the fibre will distribute to the new building distributor racks as required.

Similar to the power distribution, the proposed RPAC development shall be divided into two separate distribution zones each with its own main distributor rack. These main distributor racks shall be linked directly to the campus distributor via fibre optic cabling and then link to other distributor racks within the distribution zone via a combination of cat.6 and fibre optic cabling as required. Cabling in each distribution zone shall generally be reticulated within the ceiling space.

- Comms Room 1/Main Distributor Rack 1 shall be located within the new Level 1 basement and link to distributor racks within levels 1, 2 and 3 (basement carpark and Aquatic Centre)

- Comms Room 2/Main Distributor Rack 2 shall be located within the new Level 4 Performing Arts Auditorium void and link to distributor racks within levels 4 and 5 (Performing Arts Auditorium levels) and levels 6 and 7 (Research Centre levels)

- ***Positions of distributor racks and main cable runs have been indicated on the electrical sketches. These positions are indicative only and are subject to change following further coordination with project stakeholders.***

3.6.3 Campus Master Plan – Communications Link

It is anticipated that existing data links to distributor racks in other areas where works have been proposed in later stages of the campus master plan will generally be reused. Exact requirements will be investigated further in accordance with project staging.

3.6.4 Existing School Distributor Racks

Similar to the electrical DBs, the school currently has a large network of distributor racks located throughout the campus. Due to time constraints and the nature of our inspection we were not able to determine the relationship between each distributor rack.

Requirements for the alterations to the existing school distributor racks or the associated data network will be investigated further in accordance with the project staging.

- ***It is recommended that an electrical/data contractor be engaged to conduct communications audit in order to determine the existing communication distribution network.***

3.6.5 Stage 1 (RPAC) – Distributor Racks

New distributor racks will be provided throughout all areas of the proposed RPAC development areas as shown on the electrical sketches.

New distributor racks will either be wall or floor mounted depending on the data and active IT requirements at the local area. All data cabling will be cabled back to patch panels mounted within the local distributor rack for patching into the active IT equipment.

New distributor racks are required to be located in a dedicated electrical cupboard in order to prevent general access (eg by students). Where general access is limited (eg within storerooms) the distributor racks can be floor/wall mounted without a cupboard.

- ***Data racks shall be confirmed as the design is developed pending anticipated data requirements to each area.***

3.6.6 Campus Master Plan – Distributor Racks

It is anticipated that existing distributor racks in areas where works have been proposed in later stages of the campus master plan will generally be reused as required. Exact requirements will be investigated further in accordance with the project staging.

Where practical, new data outlets will typically be terminated into new patch panels within existing distributor racks.

3.7 Dry Fire

Based on our inspection we note the school currently has smoke detectors and BOWS systems generally installed throughout most buildings. Further information received from the schools Facilities Manager has confirmed the following:

- The existing school PA and Occupant Warning System has been upgraded to a wireless system.
- A number of buildings are provided with a wireless smoke detector system which is connected (wirelessly) to the FIP currently in the Administration Building (near the building entrance)
- The existing Dame Joan Sutherland Centre uses a wireless detector system which is connected to its own standalone OWS panel
- The existing sports centre, uniform shop and ICT uses a standalone FIP with conventional smoke detectors and is provided with mechanical fire trip.
- Isabell Hall Wing uses a standalone FIP with conventional smoke detectors and mechanical fire trip connected to an OWS panel.
- The St Johns Building is linked to the Isabell Hall Wing FIP and is provided with conventional smoke detectors

- Nan Hind Centre uses a standalone FIP with addressable smoke detectors and a mechanical fire trip connected to an OWS panel.
- 317 Bronte Rd is linked to the Nan Hind Centre FIP and uses addressable smoke detectors.
- The Junior School uses an FIP with conventional smoke detectors with built in sounders.
- All FIPs listed above are linked at the main FIP currently located in the Administration Building

As a result of existing fire upgrade works occurring at the school, the main FIP currently within the Administration Building will be relocated into the Lenthall Building. All relevant proposed works will be coordinated with the existing upgrade works.

Due to time constraints we were not able to inspect all areas to determine compliance.

3.7.1 Stage 1 (RPAC) – Dry Fire

The proposed RPAC development will be provided with new smoke detectors and BOWS speakers in accordance with the BCA and Fire Engineering requirements. New FIP and BOWS panels and associated mimic panels will be provided for the new building as required. These panels will have a wireless link back to the Schools main FIP as per the existing arrangement.

3.7.2 Campus Master Plan – Dry Fire

New smoke detectors and BOWS speakers will be provided during future staging of the campus master plan in accordance with the BCA and Fire Engineering requirements. It is anticipated that this equipment will be connected into the existing panels serving these areas.

3.8 PA/BOWS

The school currently has a central PA system installed throughout the campus, with the master panel located in the Administration Building and further sub panels provided at each campus distributor location. This PA system provides the following functions:

- Public address
- Evacuation tone
- Lockdown tone
- School bells

3.8.1 Stage 1 (RPAC) – PA/BOWS

The proposed RPAC development will be provided with a new PA system located throughout all areas as required. This new system will be linked into the existing PA system such that the central PA system operation is maintained throughout the school.

3.8.2 Campus Master Plan – PA/BOWS

New speakers to the refurbished areas will be provided during future staging of the campus master plan as required. It is anticipated that the new speakers will be connected into the existing panels serving these areas.

3.9 Lighting and Lighting Control

3.9.1 Stage 1 (RPAC) - Lighting

Lighting concepts shall be developed with the Architect during the detailed design stage and controlled in accordance with the BCA requirements.

3.9.2 Campus Master Plan - Lighting

Lighting requirements for future stages of the campus master plan will be investigated during the detailed design of each project in accordance with the project staging

3.10 Access Control and CCTV

- ***Security concepts for the proposed development will be investigated with the Client and Architect during the design development stage in accordance with the project staging.***

3.11 Audio Visual Requirements

- ***Audio visual concepts for the proposed development will be investigated with the Client and Architect during the design development stage in accordance with the project staging.***

3.12 MATV

- ***MATV requirements for the proposed development will be investigates with the Client and Architect during the design development stage in accordance with the project staging.***

4. Hydraulic Services Overview

4.1 Design Standards and Criteria

4.1.1 Design Standards

- Hydraulic services to comply with the Building Code of Australia 2014.
- Hydraulic services to comply with all current statutory requirements and guidelines including Waverley Council, Sydney Water, Waters and Rivers Commission, Fire and Rescue New South Wales (FRNSW), New South Wales (NSW) Health Department and Department of Environmental Protection.
- Hydraulic Services to comply with current Australian Standards where applicable and particularly the following (unless alternative solutions are provided as a departure to the deemed to satisfy provisions of the BCA):

AS 3500	:	National Plumbing and Drainage Code incorporating:
Part 1	:	2003 Water Supply
Part 2	:	2003 Sanitary Plumbing and Drainage.
Part 3	:	2003 Stormwater Drainage.
Part 4	:	2003 Heated Water Services.
AS 2419.1	:	2005 Fire Hydrant Installations
AS 2441	:	2005 Fire Hose Reel Installations
AS 2118.1	:	1999 Fire Sprinkler Installations
AS 5601	:	2004 Gas Installations
National Construction Code – NCC/BCA		
Volume 1	:	Class 2 to 9 buildings.
Volume 2	:	Class 1 and 10 buildings.
Volume 3	:	Plumbing and drainage associated with all classes of buildings
E1.3	:	Fire Hydrants.
E1.4	:	Fire Hose Reels
E1.5	:	Fire Sprinklers
Section J	:	Specification J6.

4.1.2 Design Criteria

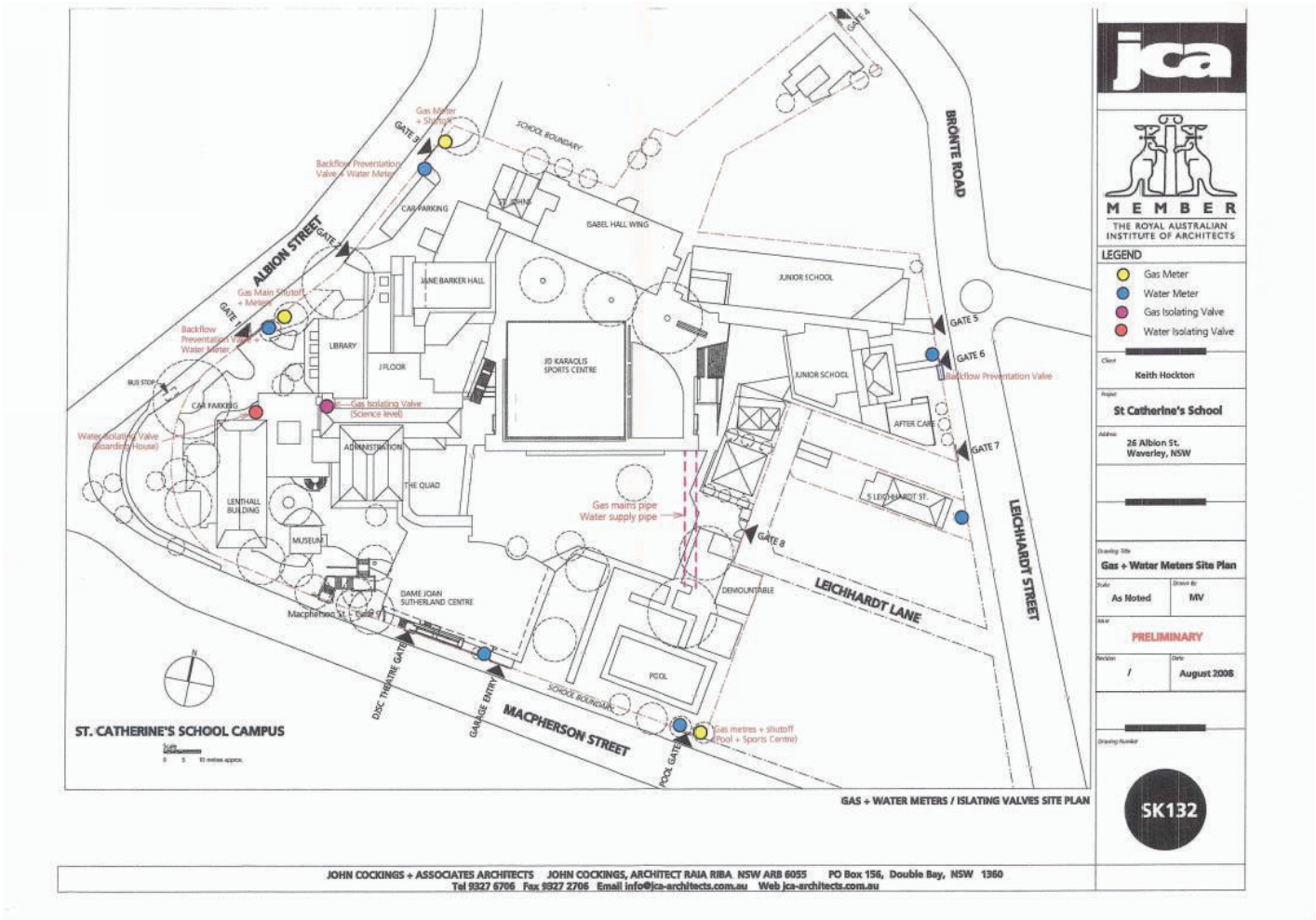
- Hot Water
  - : Supply Temperature (to all ablution fixtures) Maximum 50°C
  - : Supply Temperature to disabled facilities Maximum 42°C
- Provision of fixtures and tapware conforming to the WELS (Water Efficiency Labelling Standards) which identifies the following maximum flow rates.
  - Showers @ 9-12 ltrs/minute
  - Hand Basins @ 6 ltrs/minute
  - Sinks @ 6 ltrs/minute
  - Toilets @ Dual Flush 6/3 litres (4 1/2 litre available)

4.2 Cold Water

The following outlines the services currently connected to the site and proposed new connections and services required for the RPAC proposed development (Stage 1) and Master Plan (site wide) works. Refer to attached hydraulic block plan plans 1-3 provided within the appendices for further details coinciding with the section below.

4.2.1 Existing Cold Water Infrastructure

The existing school is being supplied by various water connections with associated meters and backflow devices to each building. Each connection appears to be extended from adjacent town's main infrastructure bordering the site including Albion St, Macpherson St and Leichhardt St. Some specific buildings do have pumping appliances while others are being fed by town's main pressure. All connections are of copper material and vary from 40mm-80mm in size. Locations of these connections are illustrated in the plan below prepared by JCA. Note: These plans are also provided in the appendices.



The following tables shows the water services currently serving each building:

Building(s)	Size	Location
Administration/Reception, Lenthall & Library	80mm	Adjacent to Albion St driveway
Pool, Jo Karaolis Sports Centre	50mm	Macpherson St boundary- adjacent to Pool
Dame Joan Sutherland Centre	40mm	Macpherson St, adjacent to building entrance
Junior School/Admin, Jo Karaolis Sports Centre	50mm	Bronte Road boundary
St Johns, Isabell Hall	40mm	Adjacent to Albion St driveway

The existing Dame Joan Sutherland Centre is being served by a 40mm service on the Macpherson St frontage and appears to be in good working order. The Dame Joan Sutherland Centre appears to be operating on town's main pressure. The existing Pool building is being served by a 50mm service on the Macpherson St frontage and appears to be in good working order.

4.2.2 Stage 1 (RPAC) – Cold Water

Given the scope of the Stage 1 works, we propose the removal of the existing pool meter and associated underground cold water routes, existing below ground services to the Jo Karaolis centre are to be maintained. Provisions are to be made for a new metering device for Stage 1 facilities. Final location and appropriate sizing to be determined during the design development phase of Stage 1.

4.2.3 Master Plan – Cold Water

Campus master plan works will generally consist of altering existing high level services to suit new proposed floor plan layouts.
Redundant services are to be disconnected, removed and terminated at high level. New services are to be extended to serve new outlet positions accordingly.
Cold water services to the Jane Barker Hall development are to be extended from existing site wide reticulations.
Pipework sizing and pumping capacity assessment of existing equipment will be investigated further in accordance with project staging.

4.3 Hot Water

4.3.1 Existing Hot Water Infrastructure

The existing hot water systems consist of localised plant to serve single or groups of buildings. Existing plant types include gas storage, electric storage and gas continuous heaters. The Dame Joan Sutherland Centre is currently being served by electric storage units located adjacent to wet areas, existing plant appears to be in good working order.

4.3.2 Stage 1 (RPAC) – Hot Water

In relation to Stage 1 works, further localised electric instantaneous/storage hot water systems maybe required to serve new proposed areas. Alternatively, the option of gas powered hot water heating systems are to be reviewed during detailed design phase.

4.3.3 Master Plan – Hot Water

Campus master plan works will generally consist of altering existing high level services to suit new proposed floor plan layouts.

Redundant services are to be disconnected, removed and terminated at high level. New services are to be extended to serve new outlet positions accordingly. Condition assessment of existing hot water systems shall be further investigated to determine if equipment is able to be re-used.

New heaters are proposed for the Jane Barker Hall development – options of gas and electric powered are to be considered.

Site wide systems are also to be reviewed to detect system performance and further additions made accordingly to adhere to new hot water loads and building fitouts in accordance with project staging.

4.4 Gas

4.4.1 Existing Gas Infrastructure

The School is currently being supplied by various gas connections with associated meters and regulators. Each connection appears to be extended from adjacent town's main infrastructure bordering the site. All connections are of copper material and vary from 20mm-50mm in size, locations are as per in block diagram provided in Section 4.2.1. Some examples have been provided below:

Existing Meter & Regulator – Nan Hind Centre

Existing Meter & Regulator – Pool

The following table shows a breakdown of the gas services currently serving each building:

Building(s)	Size	Location
Lenthall, Library	50mm (62 m3/hour)	Adjacent to Albion St driveway
Pool	25mm (7 m3/hour)	Macpherson St boundary- adjacent to Pool
Dame Joan Sutherland Centre	20mm (7 m3/hour)	Macpherson St, adjacent to building entrance
Junior School/Admin	20mm (7 m3/hour)	Bronte Road boundary
St Johns, Isabell Hall	20mm (7 m3/hour)	Adjacent to Albion St driveway

The existing Dame Joan Sutherland Centre is being served by a 20mm (7 m3/hour) service on the Macpherson St frontage and appears to be in good working order. The existing Pool building is being served by a 25mm (7 m3/hour) on the Macpherson St frontage and appears to be in good working order.

4.4.2 Stage 1 (RPAC) - Gas

Given the scope of the Stage 1 works, we propose the removal of the existing pool meter and associated underground gas routes to facilitate demolition works with provision of a new gas metering device for Stage 1 facilities. Gas services sizing and fixture outlet positions to be investigated further during detailed design phase of Stage 1.

4.4.3 Master Plan - Gas

Fitout works will consist of altering existing high level services to suit new proposed floor plan layouts.

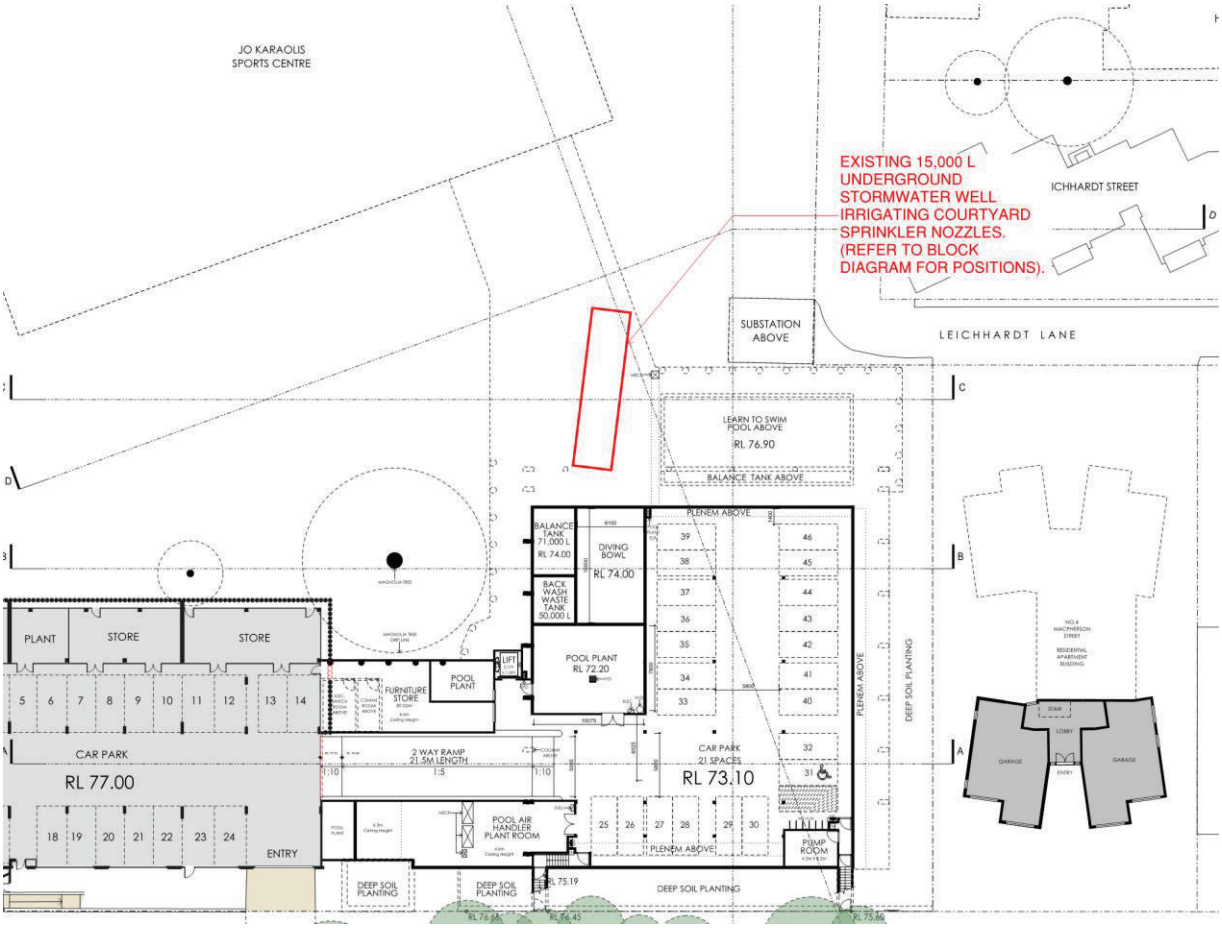
Redundant services are to be disconnected, removed and terminated at high level. New services are to be extended to serve new outlet positions i.e. hot water locations and cooking appliances.

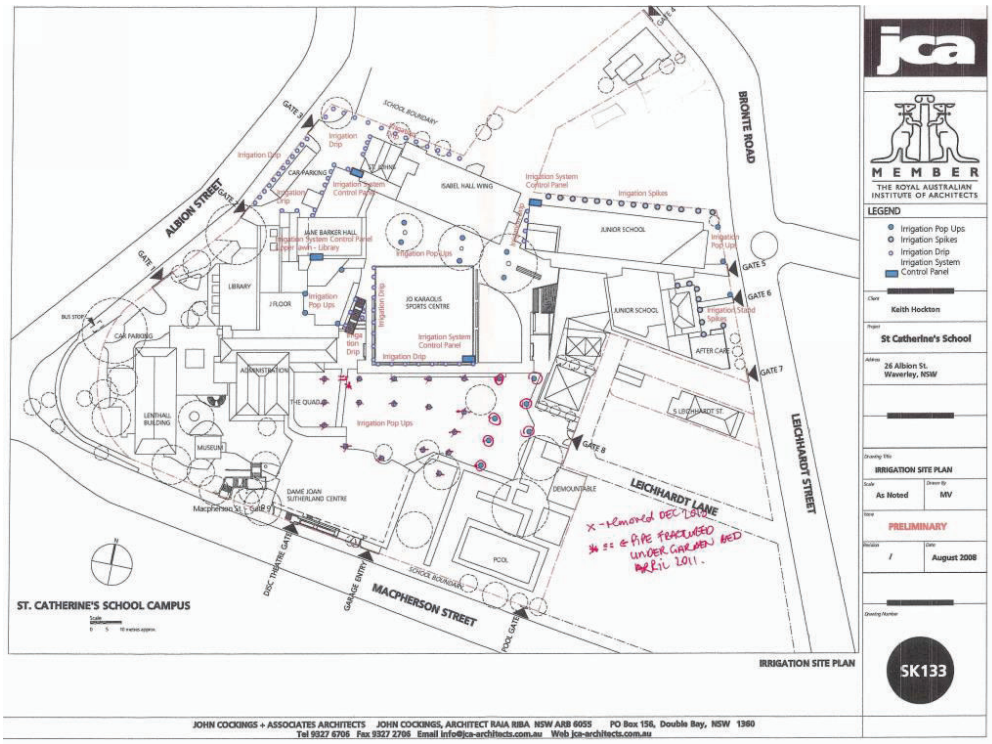
We anticipate the locations of the existing connections (other than pool connection) to remain however sizing may be altered as a result of new internal refurbishments posing new domestic loads – sizing to be confirmed during design development phase.

4.5 Rainwater Harvesting

4.5.1 Existing Rainwater Harvesting Infrastructure

On-site harvesting systems include a 15,000L in-ground stormwater collection system (no filtration provided) currently irrigating the central open courtyard and surrounding pool landscape. Please see below images for approximate locations.





The other system includes a 10,000L rainwater re-use system (see below) currently used for toilet flushing & landscape irrigation to the Nan Hind Centre only.

Existing Rainwater Harvesting Plant beside Nan Hind Centre

4.5.2 Stage 1 (RPAC) – Rainwater Harvesting

For the RPAC Stage 1 works, preliminary calculations have determined that an 8,000L rainwater storage tank with associated filtration (UV & Bag) and pump out service to feed new proposed toilets, basement wash down hose taps and surrounding landscape irrigation will be required. As the existing stormwater reuse system (15000L) is required to be demolished to facilitate the Stage 1 building footprint, WGE propose the existing capacity is integrated with the proposed 8000L tank. Final location and interfacing with civil engineering to be confirmed during detailed design. WGE recommend combining stormwater and rainwater collection with subsequent discharge criteria; filtration details to be confirmed during design development phase.

4.5.3 Master Plan - Rainwater Harvesting

Campus master plan works will generally consist of altering existing high level services to suit new proposed floor plan layouts.

Redundant services are to be disconnected, removed and terminated at high level. New services are to be extended to serve new water closet and laundry waste positions provided in the Nan Hind Centre building accordingly.

We do not anticipate the size of the existing rainwater collection or filtration systems changing as a result of the extension works.

Site wide services extending from the proposed stormwater harvesting system are to supply Jane Barker Hall development.

The requirement for rain water harvesting and pipe sizing for future master plan works to be investigated in accordance with project staging.

4.6 Fire Hydrant

4.6.1 Existing Fire Hydrant Infrastructure

The existing school is being supplied by various water connections with associated fire hydrant booster assemblies, backflow devices and pumping appliances serving separate building(s) site wide. Internal and external hydrant valves are in use. All connections are of copper and galvanized mild steel material and are 100mm in size, locations are as per attached fire block plan.

A breakdown of the existing fire hydrant services consists of the following:

Building(s)	Size	Pump	Location
Junior School, Jo Karaolis Sports Centre	100mm	Electric	Bronte Road frontage (Adjacent to Junior School entrance).
Junior School/Admin, Nan Hind Centre	100mm	Electric, Diesel	Bronte Road boundary.
St Johns, Isabell Hall	100mm	No	Adjacent to Isabell Hall entrance.

4.6.2 Stage 1 (RPAC) – Fire Hydrant

The Dame Joan Sutherland Centre is currently being served by internal fire hydrants. Additional landing valves are proposed to maintain coverage to Stage 1 with associated services extension from existing high level reticulations present in the Dame Joan Sutherland Centre. Refer to attached fire block plan prepared by WGE.

We anticipate the locations of the existing connections to remain the same but however system performance may be altered as a result of new internal refurbishments – hydrant coverage be confirmed during design development phase. In addition, system reviews will be required to ensure pumping appliance capacity is sufficient to meet RPAC floor plate layouts.

4.6.3 Master Plan – Fire Hydrant

Existing system is to be drained down and re-filled as required to facilitate alteration works.
Extension of 100mm high level services to serve additional landing valves to maintain coverage in conjunction with new floor layouts. Existing hydrants located within fire stairs are to remain unchanged. Subsequent relocations of general floor positioned valves may be required to suit fitout details and maintain coverage accordingly – to be confirmed in conjunction with project staging.
In addition, the Lenthall building requires installation of a new fire hydrant system as part of the existing fire safety upgrade works. It is anticipated that a hydrant pump room within the Lenthall building will service hydrant landing valves in the general area of the Lenthall building. All relevant future works will be coordinated with existing fire safety upgrade works.

4.7 Fire Sprinkler

4.7.1 Existing Fire Sprinkler Infrastructure

Existing sprinkler systems are present only to the Isabell Hall Wing. Existing infrastructure includes 100mm booster assembly, electric pumping appliance and control valve assemblies (see below). Equipment appears to be in good working order.

Existing Sprinkler Booster – Isabell Hall Wing

Existing Sprinkler Valvesets - Isabell Hall Wing

4.7.2 Stage 1 (RPAC) – Fire Sprinklers

It is currently anticipated that sprinkler protection may be required within the new auditorium. The extent of sprinkler protection for the remainder of stage 1 facilities will be confirmed by the fire engineer in coordination with the BCA consultant during the design development phase of the project.

4.7.3 Master Plan – Fire Sprinklers

Existing systems provided to the Isabell Hall building are to be drained down and re-filled as required to facilitate alteration works.
Existing services provided at ceiling level are to be removed and terminated at high level to allow for demolition works.
New droppers are to be extended from existing infrastructure to serve new proposed floor plan layouts.

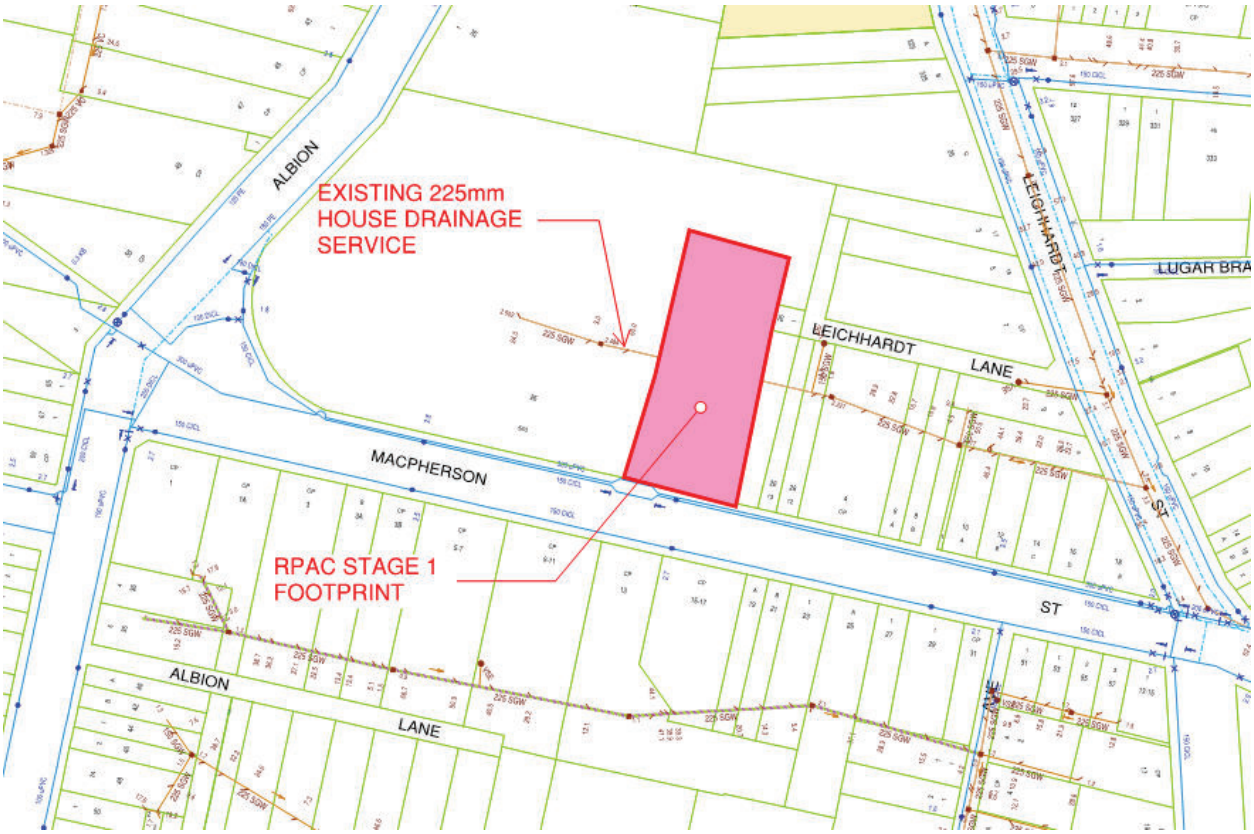
Pipework sizing and pumping capacity assessment of existing equipment will be investigated further in accordance with project staging.

We do not anticipate the rest of the site requiring sprinkler protection due to the nature of building refurbishments not altering the class of building and height of overall structure. Further clarifications are to be provided by accredited BCA consultant in accordance with project staging.

4.8 Sewer

4.8.1 Existing Sewer Infrastructure

The site is being drained by a 225mm house sewer service running through the open courtyard eventually discharging to Leichhardt St (see map below).



DBYD – Hydra Map Markup

From this house service, 100mm-150mm branches serve each building/groups of buildings as required. The footprint of the proposed Stage 1 development lies over the sewer line where diversion works will be required to facilitate new building structure and to maintain sewer serviceability.

4.8.2 Stage 1 (RPAC) - Sewer

It is proposed to privatise the sewer main for Stage 1 as it is only servicing the school (subject to Sydney Water approval). Refer to civil engineers DA report for further details.

4.8.3 Master Plan - Sewer

Internal works include disconnecting, removing and terminating redundant fittings and pipework during demolition works. New works shall include extension of drainage services underslab/in-ground to suit new fixture locations. Co-ordination with other building trades and structure is to be conducted in accordance with project staging. We do not anticipate the size of the existing sewer main branch extension from each building being altered as a result of the internal fitout works.

We do not anticipate any major external alterations to the rest of the site. Minor extension to proposed Jane Barker Hall development from existing in-ground infrastructure from J Block may be required. However, minor internal sewer works i.e. cap off and extension will be required to suit the fitout phase of works.

4.9 Rainwater (Roof) Drainage

4.9.1 Existing Rainwater (Roof) Drainage

The existing site is being drained by eaves gutter systems being picked up by on-site stormwater reticulations. Existing infrastructure appears to be in good working order.

4.9.2 Stage 1 (RPAC) – Rainwater (Roof) Drainage

The proposed new roof for the RPAC development will require additional eaves gutters and downpipe runs to facilitate new roof areas – pick up points in ground to be co-ordinated with civil engineering during detailed design phase. Note: Only a certain quantity of downpipes are to discharge to the rainwater re-use system.

5. Appendices

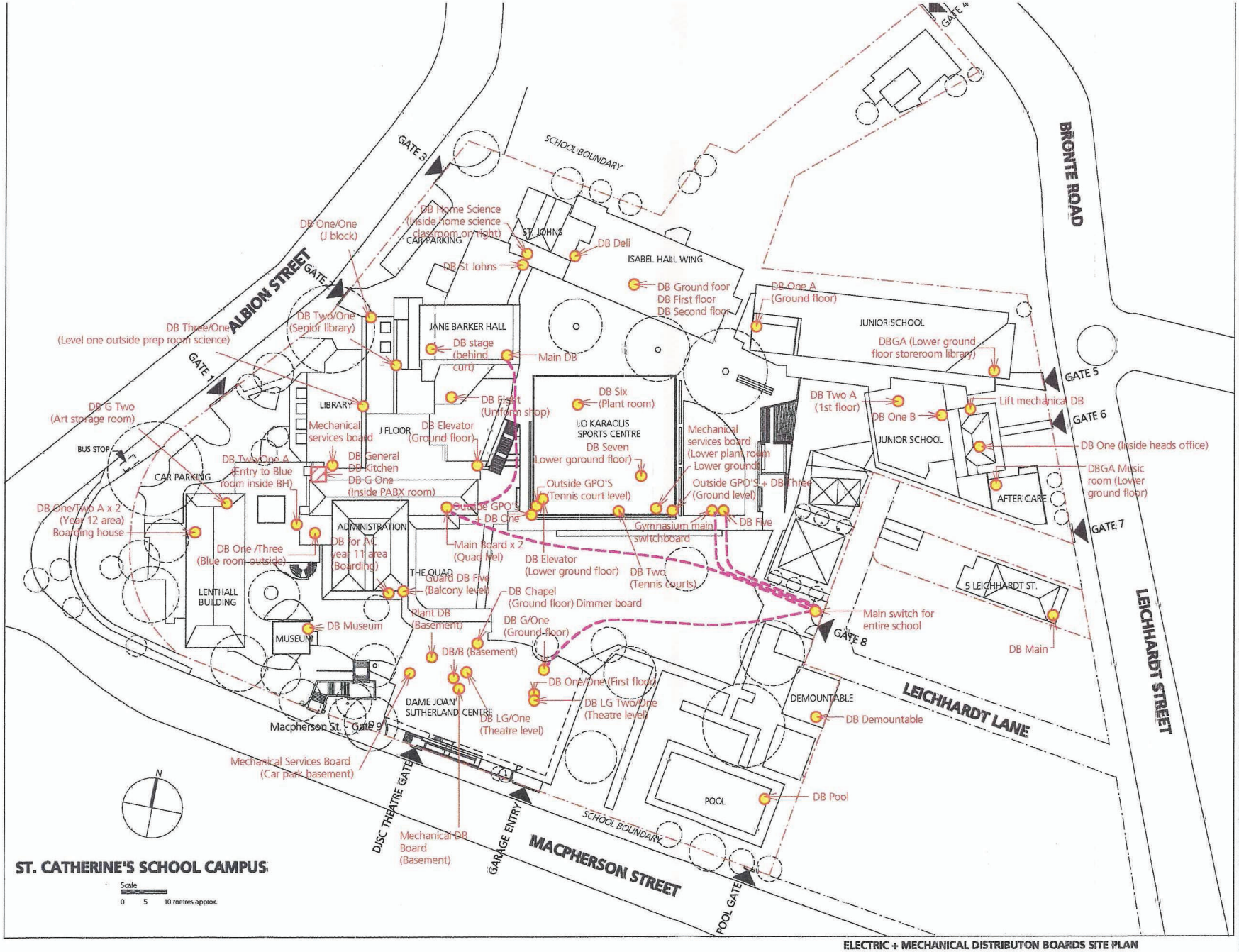
5.1 Electrical Services Spatials

5.1.1 Electrical and Communications Services (Preliminary)

SPACE OR ROOM	SIZE	FIRE INTEGRITY OF SPACE OR ROOM	DOORS	COMMENTS	CODE OR STANDARD REFERENCES
Main DB Cupboard	4000mm wide x 600mm deep with clear headroom of 3000mm	Walls, ceiling, floor 120/120/120 Doors --/120/30	Two sets of double equipment access doors 1800mm wide x 2400mm high.	Doors to open outwards. Doors to be self closing. Room to have positive mechanical ventilation. Room to be free of island or intruding columns. Be located adjacent to substation (with common wall) and riser. As consumers mains support emergency equipment they shall enclosed by construction of 120/120/120 and have classification of WS53W where subject to vehicle damage and WS52W elsewhere.	AS.3000, clauses 2.9.2 . BCA clause C2.13(b) & (c).
Electrical Risers and Comms risers	As indicated on sketches	None required if penetration between floors within cupboard are fire sealed (equal to slab rating).	One single door 900mm wide x 2700mm high	Door/s to open outwards. Doors to be solid core and full height. No ceiling required to cupboard. Where is located in a path of travel to a required exit, they are to fitted with smoke seals. Width will vary depending on size of floor and tenancy metering arrangements. Buildings cupboards to be vertically stacked where possible.	AS.3000,clauses 2.9.9 and 2.9.10. BCA clause D2.7(d).
Comms Room	Room, 2000mm wide x 3000mm deep with clear headroom of 3000mm	None required	One single door 900mm wide x 2700mm high	Where door is located in a path of travel to a required exit, they are to fitted with smoke seals. Doors to be solid core. Additional authority requirements may apply. Room requires ventilation, may need conditioning.	BCA clause D2.7(d).

Fire Indicator Panel (FIP)	Cupboard 2000mm wide x 600mm clear depth with clear headroom of 2400mm.	None required.	If obscured by door, door must be labeled 'FIRE PANEL' in minimum 50mm high letters of a contrasting colour to door colour. Clear work space of 1.0m shall be provided in front and to the side of panel..	Panel to prominently located in entry lobby.	AS.1670.1, clause 3.9.
EWIS Master Emergency Control Panel	Part of the FIP	None required		Panel to prominently located in entry lobby.	AS.2220.2, clause 2.1.1.2.

5.2 Electrical Services Block Diagrams



ELECTRIC + MECHANICAL DISTRIBUTON BOARDS SITE PLAN

jca

MEMBER
THE ROYAL AUSTRALIAN INSTITUTE OF ARCHITECTS

LEGEND

Submain Cable

Client: Keith Hockton

Project: St Catherine's School

Address: 26 Albion St. Waverley, NSW

Drawing Title: Electrical + Mechanical Distribution Boards Site Plan

Scale: As Noted

Drawn By: MV

Issue: PRELIMINARY

Revision: /

Date: August 2008

Drawing Number: SK131

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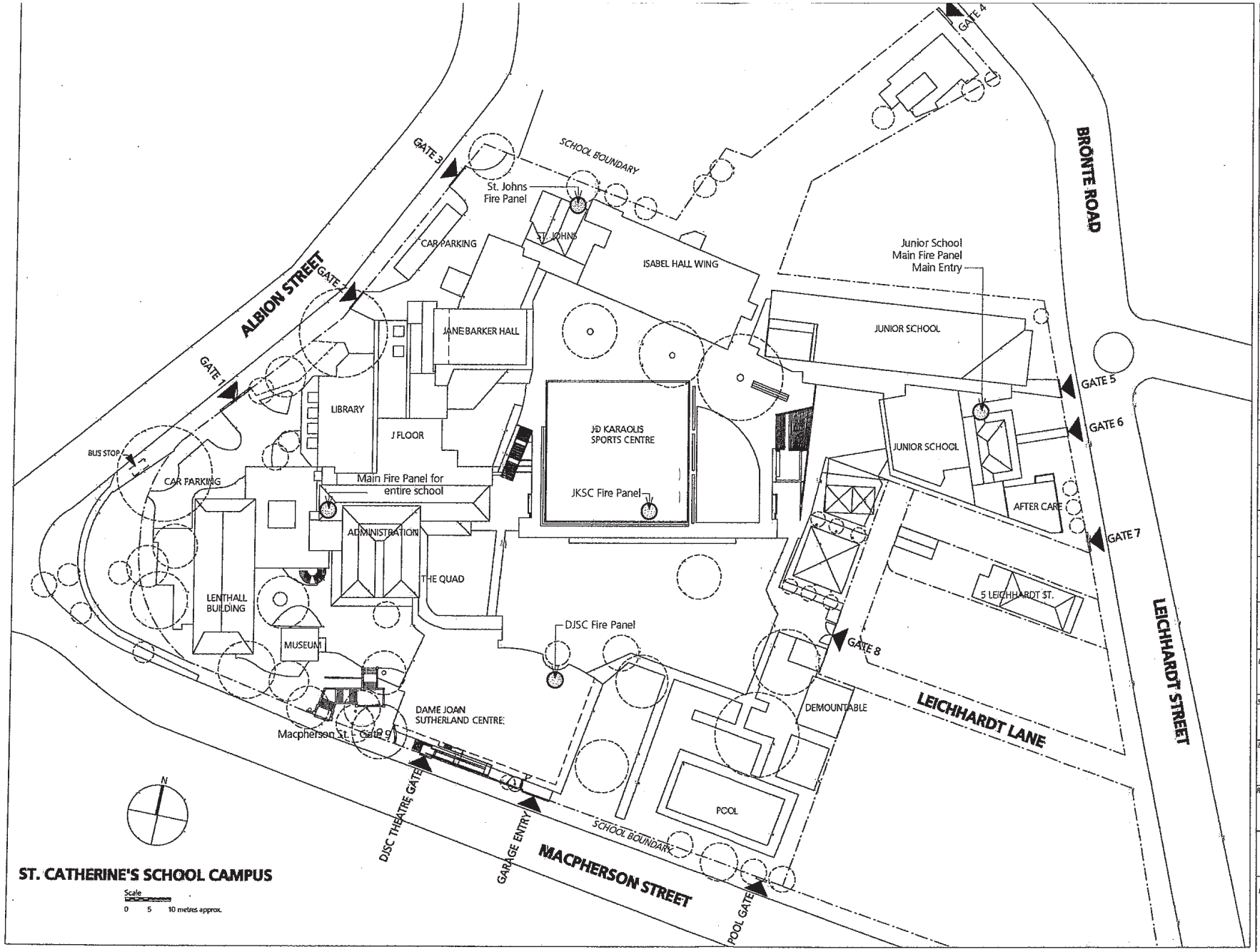

SCHOOL FIRE PANELS SITE PLAN

jca

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LEGEND

Fire Panel

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Drawing Title
SCHOOL FIRE PANELS SITE PLAN

Scale: As Noted
Drawn By: MV

Issue
PRELIMINARY

Revision: /
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Drawing Number
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