WOOD & GRIEVE ENGINEERS

Rouse Hill Anglican College

Electrical & Hydraulic Services Infrastructure Report

Prepared for:

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Revision

REVISION	DATE	COMMENT	APPROVED BY
01	28/07/2017	Preliminary	**TMM**
02	08/08/2017	Revised	**TMM**
03	15/08/2017	Final Consolidated	**TMM, ALM**

Contents

1. Introduction

This Infrastructure Management Plan has been prepared for Anglican Schools Corporation for the proposed Rouse Hill Anglican College (RHAC) at 7 & 37 Worcester Rd Rouse Hill NSW. This report is intended to provide an overview of the electrical & hydraulic services infrastructure requirements for the redevelopment of the site in response to the Secretary's Environmental Assessment Requirement per below:

> ***12. Utilities***
>
> ***Prepare an Infrastructure Management Plan in consultation with relevant agencies, detailing information on existing capacity and any augmentation requirements of the development for the provision of utilities including staging of infrastructure.***

This report aims to address the SEARs requirement by:

- Providing an estimate of the current and future max demand requirements for the site through the various phases in accordance with AS3000 recommendations.
- Providing an estimate of simultaneous water loads and fixture unit loadings for the site in accordance with AS3500 recommendations and industry practice.
- Identify the capacity of the existing infrastructure on the site
- Nominate potential changes to the site infrastructure as required to suit the requirements of each phase.

This document has been prepared based on the following information:

- Architectural drawings received from Terroir.
- Existing electrical & hydraulic services information received to date
- Site investigations to date
- Talks with relevant stakeholders.

Limitations of this report include the following:

- No detailed calculations were performed to check existing system capacities
- No taking or testing of the existing installation was performed
- All information provided by others, particularly verbal information, has been taken at face value

2. Critical Issues

2.1 Authority Approvals

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

- Endeavour Energy Application for connection
  - Lodged by the electrical consultant at each stage of design
- Sydney Water Application for Building Plan Approval (BPA)
  - lodged by hydraulic consultant at the time of design
- Pressure & Flow Enquiry of Sydney Water main in Rouse Road.
  - lodged by hydraulic consultant at the time of design

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

- ESD report — determination of ESD initiatives to be incorporated into the project
- Fire Engineering Report — determination of fire safety measures to be implemented during design phase
- BCA report — determination of BCA/code requirements to be incorporated within the design

3. Electrical Services Overview

3.1 Power Supply Authority Infrastructure

The local Supply Authority is Endeavour Energy.

The College is currently fed via a 1000kVA substation (asset #21595) located at the main entrance to the school. This supply is connected to an external Main Switchboard near the substation.

Note that there are two kiosk enclosures at the substation location. One of these enclosures (asset #26991) is a 22kV/11kV auto transformer and **cannot** be used for a second supply to the college.

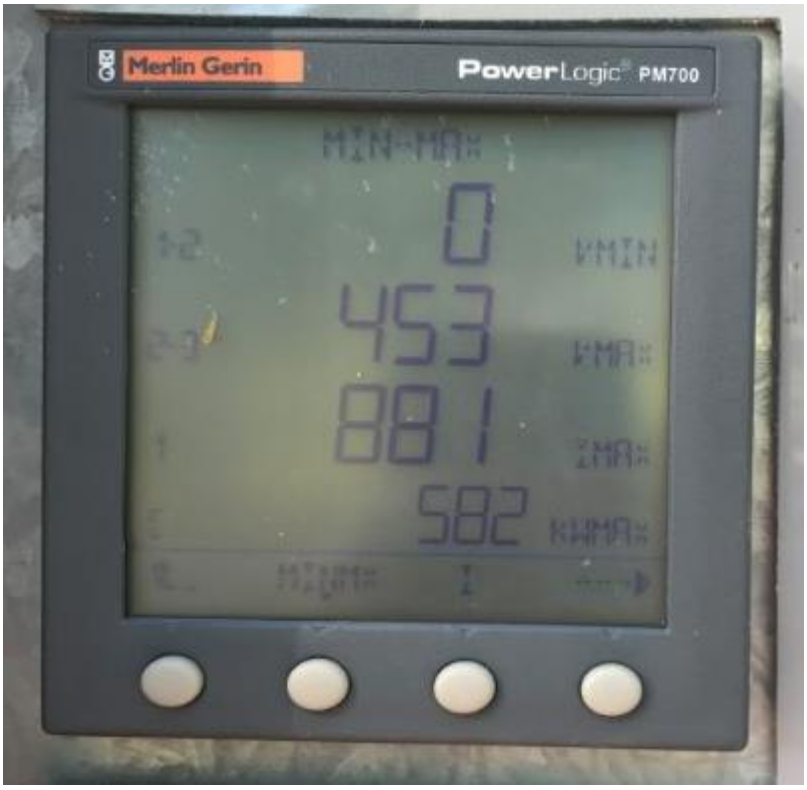
The existing site Main Switchboard is made up of an older section and a newer section which has been added to accommodate various building developments that have occurred over the years. Both sections of the MSB appear to be in good condition and are suitable to be reused for the new works.

3.1.1 Existing Substation Capacity

Preliminary advice received from Endeavour states that the existing substation is a 1000kVA substation (typically rated to approx. 1400A/ph). This existing supply to the College from the substation is through a LV configuration that

currently allows the supply from the substation to be dedicated to the site. The site Main Switchboard has a 1600A Service Protection Device which has been set at 1400A. The site therefore has 1400A supply available.

Load information we have received from Endeavour Energy (dating back to 2013) indicates that the existing substation is loaded to approx. 400kVA (580A/ph) however this information is outdated as the max demand reading on the sub-meter within the MSB reads 881A max. Based on the sub-meter reading there is approx. 520A capacity in the substation supply.



Sub-meter reading within the MSB

NOTE: We have previously asked for and received billing information to confirm the above however, information provided does not contain adequate max demand information. We are therefore relying on the sub-meter reading to be an accurate record of the existing site max demand.

3.1.2 Proposed Max Demand

Based on the classroom areas proposed within the masterplan drawings and recommendations in AS3000 (Table C3), we estimate that maximum demand of the site following the new building works to be as follows:

Phase	Location	Allowance
	Existing College	881 A/ph
Phase 1	Block K (1200m2 @ 80VA/m2)	140 A/ph
Phase 2	Block L (1700m2 @ 80VA/m2)	200 A/ph
	Carpark/Oval/Canteen	63A/ph
Phase 3	Senior School – Phase 1 (1900m2 @ 100VA/m2)	280 A/ph
Phase 4	Library – (2200m2 @ 100VA/m2)	320 A/ph
Phase 5	Senior School – Phase 2 (2500m2 @ 100 VA/m2)	360 A/ph
Phase 6	Multipurpose Hall (2000m2 @ 100 VA/m2)	290 A/ph
Phase 7	Block M (1400m2 @ 80VA/m2)	160 A/ph
	Plant/Canteen/Bike shed	63 A/ph
	Total expected demand	**2777 A/ph**

NOTE: the max demand figures above are approximate only for the purpose of this exercise and are required to be confirmed during the detailed design of each phase once the actual electrical load requirements are understood.

Based on the proposed max demand derived from building areas proposed in the masterplan drawings, a new substation is required to be installed in the future in addition to the existing substation. The existing substation does not have adequate capacity to supply all buildings nominated in the masterplan.

3.2 Site Power Distribution During Project Phases

The configuration of the existing site main switchboard indicates that there is a direct feed to the following electrical distribution boards throughout the site (refer to Appendix A – Single Line Diagram):

- DB 5/1 - 250/630A breaker supplied from the 'new' MSB busbar
- DB 6 - 450A breaker supplied from the 'new' MSB
- DB 1/1 - 125/160A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)
- DB 1/2 - 125/160A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)
- DB 2/1 - 200/250A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)
- Stage 2B - 175/250A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)
- DB 3/1 - 200/250A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)
- DB 4/1 – 160/400A breaker supplied from the 'old' MSB (note the old MSB has a 250/630A upstream breaker)

The distribution boards nominated above can be considered the main supply points to various other sub-DBs throughout the site and as such are considered the main supply points for the new distribution boards which will be provided within the new buildings.

The sequence of how all the new site buildings can be supplied at the various phase is indicated below and is nominated within Appendix 2 sketches. This phasing sequence aims to identify the existing infrastructure available, the associated capacity and necessary upgrades.

NOTE that the information below is derived from examining design drawings of previous stages and through visual inspection. The details nominated below are required to be verified prior to the commencement of each of the new phases to determine whether the proposed supply point is suitable.

3.2.1 Phase 1 – Block K

- Max demand: 140 A/ph (per above)
- Supply DB: DB 5/1 – this is the closest DB supplied directly off the site MSB
- Supply DB upstream breaker: 250/630A (existing setting)
  400/630A (proposed setting)
- Supply DB submain: 8 x 1c 150mm2 Cu XLPE/PVC
- Existing submain distance: 230m
- Existing submain capacity: 512A
- Comments: It may be possible to increase the circuit breaker setting supplying DB5/1 at the MSB to 400/630A for the increased supply for Block K. The existing submain has the capacity and may be reused.
- Max demand @ existing MSB: 1021A

3.2.2 Phase 2 – Block L/Carpark/Canteen

- Max demand: 200 A/ph (per above)
- Supply DB: DB 5/1 – this is the closest DB supplied directly off the site MSB
- Supply DB upstream breaker: 400/630A (existing) – this would have been upgraded for Phase 1 works
  600/630A (proposed)
- Supply DB submain: 8 x 1c 150mm2 Cu XLPE/PVC
- Existing submain distance: 230m
- Existing submain capacity: 512A
- Comments: The existing DB5/1 submains does not have the capacity to supply Block L, however may be able to support the carpark/oval/canteen buildings.

Rather than increase the submains and associated conduits to DB5/1, it may be easier and more economical to install a new substation closer to the Primary School and redirect DB5/1 to be fed from the associated new site main switchboard located in the vicinity of the substation. The supply for Block L will come directly off the new site Main Switchboard.

- Max demand @ new MSB: 200A/ph + DB5/1 load

3.2.3 Phase 3 – Senior School (Phase 1)

- Max demand: 280 A/ph (per above)
- Supply DB: Site Main Switchboard – DB5/1 breaker will be left over and can be reused
- Supply DB upstream breaker: 630/630A (proposed) – this allows for future Phase 5 (max demand = 360 A/ph to be fed from the same supply)
- Supply DB submain: new submain to be provided
- Submain distance: TBC at time of design
- Submain capacity: 630A
- Comments: DB3/1 does not have adequate capacity to supply new senior school. Phase 3 will need a new supply fed directly off the existing site main switchboard. A new DB will be provided in Phase 3 for the senior school to supply both phase 3 and phase 5 works.
- Max demand @ existing MSB: 1301A – DB5/1 load.

3.2.4 Phase 4 – Library

- Max demand: 320 A/ph (per above)
- Supply DB: DB 6 this is the closest DB supplied directly off the MSB.
- Supply DB upstream breaker: 450A (existing)

  800A (proposed)
- Supply DB submain: 8x1c 120mm2 Cu XLPE/PVC
- Existing submain distance: 170m
- Existing submain capacity: 450A
- Comments: Upgrading DB-6 for phase 4 is a cost prohibitive exercise due to the requirement to replace existing submains cables, replace existing conduits and replace DB 6 to larger capacity DB.

- Alternative supply DB: DB-2/1
- Supply DB upstream breaker: 200/250A (existing)

  630/630A (proposed)
- Supply DB submain: 4x1c 240mm2 Cu XLPE/PVC
- Existing submain distance: 130m
- Existing submain capacity: 420A
- Comments: Upgrading DB 2/1 for phase 4 is a cost prohibitive exercise due to the requirement to replace existing submains cables, replace existing conduits and replace DB2/1 to a larger capacity DB.

- Due to the constraints in the existing installation and limitations of existing infrastructure, Phase 4 will need a new supply from the new site MSB. Further details of the requirements will need to be confirmed at the time of design.
- Max demand @ new MSB: 520A + DB5/1 load

3.2.5 Phase 5 – Senior School (Phase 2)

- Max demand: 360 A/ph (per above)
- Supply DB: New DB provided as part of Phase 3
- Supply DB upstream breaker: 630/630A (existing)
- Supply DB submain: new submain to be provided as part of Phase 3 works
- Comments: Phase 5 will be supplied via the DB provided as part of the Phase 3 works
- Max demand @ existing MSB: 1661A – DB5/1 load.

3.2.6 Phase 6 – Multipurpose Hall

- Max demand: 290 A/ph (per above)
- Supply DB: New site MSB
- Supply DB upstream breaker: 300/300A (proposed setting)
- Supply DB submain: new submain to be provided
- Submain distance: TBC at time of design
- Existing submain capacity: 300A
- Comments: Phase 6 will be supplied from the new site MSB.
- Max demand @ existing MSB: 810A + DB5/1 load

3.2.7 Phase 7 – Block M/Plant/Canteen/Shed

- Max demand: 223 A/ph (per above)
- Supply DB: New site MSB
- Supply DB upstream breaker: 300/300A (proposed setting)
- Supply DB submain: new submain to be provided
- Submain distance: TBC at time of design
- Existing submain capacity: 300A
- Comments: Phase 7 will be supplied from the new site MSB.
- Max demand @ new MSB: 1033A + DB5/1 load

3.3 Communications Authority Infrastructure

The existing communications infrastructure on site consists of an incoming connection which terminates into a rack within the kinder primary buildings. From here communications links are extended to a second rack within the Admin Building. Further details on the communications infrastructure on site are not known.

Existing communications infrastructure on site will need to be amended in response to the new buildings however as links to new buildings will be fibre, there are no restrictions on distance, making the reticulation paths more flexible than those required for power.

Final reticulation paths for new communications links will be coordinated at each phase to suit the requirement of the building and site conditions.

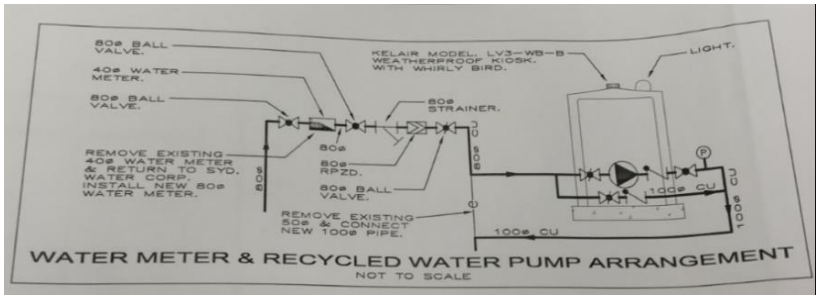
4. Hydraulic Services Overview

4.1 Authority Infrastructure

4.1.1 Existing Cold Water Supply

The site is currently provided with an 65mm site connection, 32mm master metering device and RPZD adjacent to the Worcester Road/Rouse Road corner of the property as per image below.

Master Cold Water Meter & RPZD Devices



Existing Water Services Diagrammatic

Below ground reticulations continue to an on-site booster pumpset then a 100mm potable services to subsequent buildings on the premises for potable usage in common areas. A 50mm non-potable supply is provided with separate backflow prevention devices and mains reticulation to serve science class rooms and laboratory spaces.

Following some calculations on diversified water usage for the school master plan a 100mm supply network is sufficient to cater for the proposed domestic cold water loadings. The master meter device and above ground pipework in the image above will be upsized to suit the main system diameters and relocated to allow for the new senior school development in phase 2. Refer to attached sketches for further detail.

As a result of ongoing developments in the local area we understand that Sydney Water (local Water Authority) are rolling out recycled water mains in the Rouse Hill municipal zone. Future connection to this network may be possible at a later stage.

4.1.2 Existing Gas (LPG) Supply

The site is currently provided with LPG storage cylinders provided adjacent to buildings with below ground reticulations to science class room areas.

As a result of ongoing developments in the local area we understand that Jemena (local Gas Authority) are rolling out natural gas mains in the Rouse Hill municipal zone. Future connection to this network may be possible at a later stage.

4.1.3 Existing Fire Hydrant Services Supply

The site is currently provided with a 150mm site connection, 4-point hydrant booster assembly adjacent to the Worcester Road main entrance as per image below.

150mm 4 Point Fire Hydrant Booster Assembly

Below ground reticulations continue to external dual head hydrant locations providing coverage to the buildings on the premises.

As apart of the site wide masterplan works a fire hydrant booster relocation upgrade will be required to adhere to current standards with the potential for an on-site pump will be considered to achieve system flow and pressure requirements.

4.1.4 Existing Sanitary (Sewer) Drainage Services

The site house drainage consists of private sewer man holes and 100mm & 150mm reticulations currently connecting to an existing authority sewer man hole on the Rouse Rd frontage.

Sewer Man Hole Site Connection

Following some calculations on fixture units for the school master plan a 150mm main drainage line is sufficient to cater for the proposed sanitary fixture unit loadings.

4.2 Potable Cold Water & Non-Potable Water Services

4.2.1 General Building Supplies

Potable & Non-Potable cold water supplies are to extend from capped provisions provided in a previous scope of works. Refer to attached sketches for approximate locations and routing. No disruptions are anticipated on the site wide main distribution services as localized isolation points are provided.

4.2.2 Proposed Gymnasium Services Diversion

Potable cold water line passing through proposed gymnasium is to be re-routed beside the proposed building footprint and re-connected to tail ends on either side as required. Refer to attached sketches for more information.

4.2.3 Cold Water Pump House Relocation – Seniors (Phase 2)

Potable cold water pump house accommodating pumpset, metering devices, boundary services currently passing through proposed senior building (phase 2) is to be re-routed to the Worcestor Rd frontage and re-connected to tail ends on either side as required. Incoming water supply from the water main in Rouse Road shall be diverted within the property boundary also to reticulate to the new pump house location.

The above works will require a site wide shut down of the cold water services with an associated outage time to perform the relocation works. Works are to be coordinated out of hours so as to minimize impacts during school hours.

New non-potable (recycled) site connection from Rouse Rd to be extended to this area as well subject to mains infrastructure works in the area to be confirmed at a later stage.

4.2.4 Existing Primary and Kindergarten Modules

The existing potable and non-potable supplies to the primary and kindergarten modules are to be demolished and capped beyond the proposed building footprint. Suitability of re-use for proposed senior's development to be assessed based on water load calculations.

4.3 Hot Water Services

4.3.1 General Building Supplies

The existing buildings are currently provided with localized hot water units serving common areas (typical). Below bench boiling/chilled water facilities are provided to staff kitchenette areas. The same design philosophy is proposed for the master plan works, sizing and reticulation dependent on domestic hot water loads posed by each building. Existing systems serving primary and kindergarten modules are to be demolished.

4.4 Gas (LPG) Services

4.4.1 General Building Supplies

LPG gas supplies are to extend from existing site wide below ground services. Refer to attached sketches for approximate locations and routing. Some disruptions are anticipated on the site wide main distribution services as to extend house services to new science laboratory areas.

Gas loadings are to be assessed subject to finalized layouts of science & laboratory spaces to confirm capacities of existing bulk storage cylinders and potential addition of supplementary cylinders if deemed required. Future connection to natural gas mains in the street may possible at a later stage – subject to further development.

4.5 Fire Hydrant & Hose Reel Services

4.5.1 General Building Fire Hydrant Coverage

Fire hydrant services serving buildings in stage 1 are to extend from existing ring main services provided around the site. Refer to attached sketches for approximate locations and routing. No disruptions are anticipated on the site wide main distribution services as localized isolation points are provided.

External dual head fire hydrants are proposed to be located 10m away from new building facades or adjacent to fire rated building elements as required to achieve full floor coverage.

4.5.2 Proposed Gymnasium Services Diversion

Fire hydrant services passing through proposed gymnasium is to be re-routed beside the proposed building footprint and re-connected to tail ends on either side as required. Refer to attached sketches for more information.

4.5.3 General Building Fire Hose Reel Coverage

The current building code – National Construction Code (NCC) stipulates fire hose reels are exempt from classrooms & corridors in primary and secondary schools. Fire hose reels will be provided to staff occupied and multi-purpose usage areas as required. Fire hose reels are to be connected to the metered potable cold water supply and generally provided along egress paths adjacent to exit doors.

4.6 Sanitary Drainage

4.6.1 General Building Drainage Provisions

Sanitary drainage services are to extend from existing site wide below ground services for proposed buildings/expansions adjacent to existing facilities. Refer to attached sketches for approximate locations and routing. No disruptions are anticipated on the site wide main distribution services as localized capped provisions are provided.

A new 150mm house drainage service is proposed to extend up to Block K, L & M as a capped off provision for future connection. Currently, this area is remote from any sanitary sewer services.

4.6.2 Proposed Gymnasium & Seniors (Phase 2) Building Services Diversion

Drainage services including sewer man holes passing through proposed gymnasium are to be re-routed beside the proposed building footprint and re-connected to tail ends on either side as required. Refer to attached sketches for more information.

5. Appendices

Appendix 1 – Existing Site MSB Single Line Diagram

Appendix 2 – Site Power Distribution Sketches

Appendix 3 – Existing Hydraulic Site Plan

Appendix 4 – Proposed Hydraulic Site Plan

Appendix 5 – Cold Water Pump House Relocation