Prepared for
Department of Education, School Infrastructure NSW
ABN: 40 300 173 822

AECOM

Building Services Infrastructure Report

27-Sep-2021
SINSW01113-20 Glenwood High School
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Building Services Infrastructure Report

Client: Department of Education, School Infrastructure NSW

ABN: 40 300 173 822

Prepared by

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Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
P1	27-Sept-2021	Draft	Paul Angus Education Sector Lead	
P2	02-Nov-2021	Final	Paul Angus Education Sector Lead	
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1.0 Introduction

1.1 Background and Purpose

This AECOM Services Infrastructure Report accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) in support of a State Significant Development Application (SSD - 23512960).

The development is for upgrading works comprising alterations and additions to Glenwood High School at 85 Forman Avenue, Glenwood. The site is legally described as Lot 5227 DP 868693.

The site is roughly rectangular in shape, with a total area of 60,790m^2 and street frontages to Forman Avenue to the south and Glenwood Drive to the east. Glenwood Reserve adjoins the northern and western boundaries of the school.

This report addresses the relevant Secretary's Environmental Assessment Requirements (SEARs), specifically:

Utilities

- In consultation with relevant service providers:
    - assess the impacts of the development on existing utility infrastructure and service provider assets surrounding the site.
    - identify any infrastructure upgrades required off-site to facilitate the development and any arrangements to ensure that the upgrades will be implemented on time and be maintained.
    - provide an infrastructure delivery and staging plan, including a description of how infrastructure requirements would be co-ordinated, funded and delivered to facilitate the development.

The Proposal
The proposed development seeks to upgrade Glenwood High School. The upgrade consists of the following alterations and additions:

- Construction of a new three-storey building at the north-eastern portion of the site facing Glenwood Park Drive which will accommodate new learning spaces;
- Construction of one storey performance pavilion;
- Refurbishment of existing Building Block A (ground floor only) to provide one new support unit within the space of an existing general learning space;
- Refurbishment of Building Block D (ground floor only) to provide an additional office space and storeroom;
- Refurbishment of Building Block E to re-purpose it on the ground floor for computer learning spaces, staff and administration spaces as well as upgrades to the library on the first floor;
- Refurbishment of Building Block J to re-purpose it from visual arts and performing arts to learning spaces and workshops for food tech and woods/metal unit;
- Demolition of existing botany room and construction of a new single storey pavilion comprising of interview rooms and end-of trip facilities; and
- The proposed development will also involve ancillary works at the site associated with the proposed upgrades.

1.2 Purpose of this Document

This report aims to provide the following items to inform the strategy for servicing the proposed development:

- A summary of how the existing school is serviced:
  - Identification of any adverse effects on the supplies to the existing school which may be caused by the new building.
  - A summary of existing infrastructure services in the vicinity of the site.
  - A preliminary assessment of existing and proposed demand for each utility service.
  - An assessment of the indicative capacity of utility infrastructure currently servicing the site.
  - Potential external services infrastructure layouts to cater for the proposed development.

This report focuses on the following utility services infrastructure:

- Potable water infrastructure (Water)
- Wastewater infrastructure (Sewer)
- Natural gas infrastructure (Gas) and
- Electrical infrastructure (Elec)
- Data and telecommunications infrastructure (Telco)
- Fire Protection Services

Stormwater drainage and flood management infrastructure is described in a separate Stormwater Management Plan (SMP) and is not considered in this report.

1.2.1 Limitations

The recommendations included within this report are based on visual observations only (no measurements were recorded), information available at the time of writing, and are preliminary in nature.

The recommendations are subject to design development, coordination with advances in the proposed architectural and landscape architectural layouts, and consultation with approval authorities (i.e., for lead in utility works and Council requirements).

Please note that the utility infrastructure information provided in this report is detailed on record drawings provided by utility authorities through DBYD and technical enquiries made by AECOM and existing visual non-intrusive services surveys.

Assumptions included within this report, including existing site conditions, existing and proposed infrastructure capacity, and existing and proposed demand will need to be confirmed prior to detailed design and further consultation with the utility authorities.

1.3 Existing Site wide infrastructure

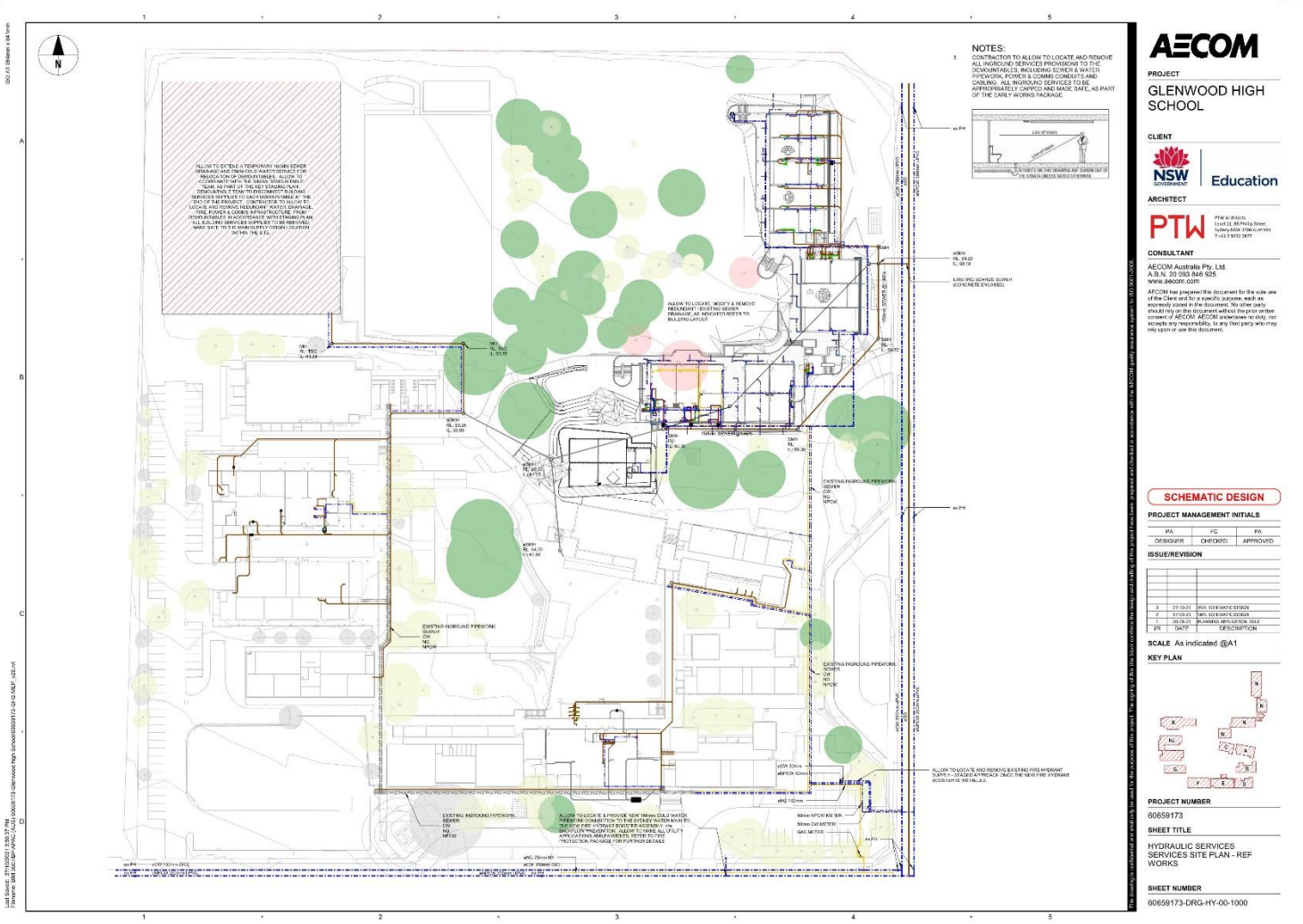

Figure 1 Existing Site Wide Hydraulic Services reticulation plan

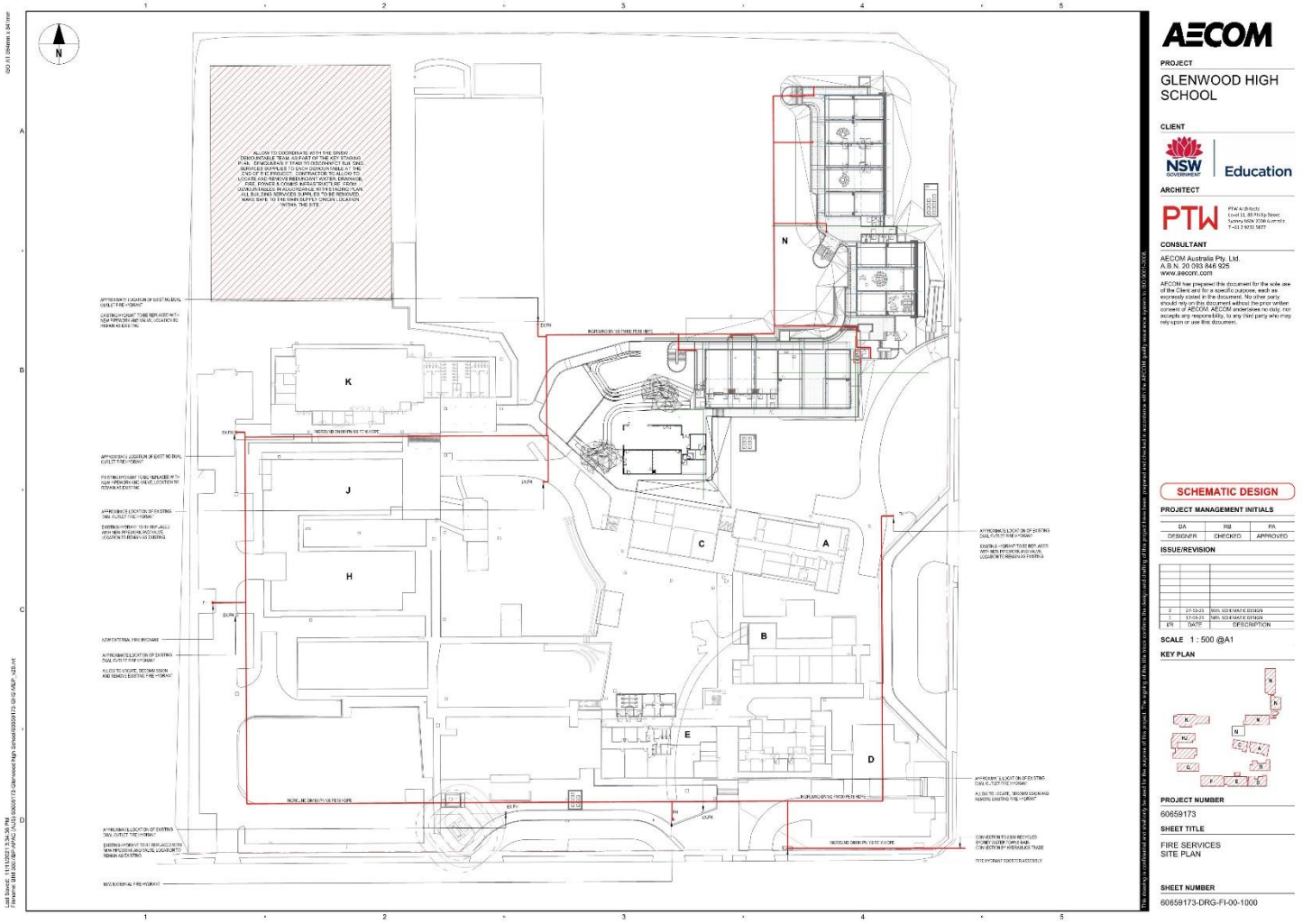

Figure 2 Existing Site Wide Fire Protection Services reticulation plan

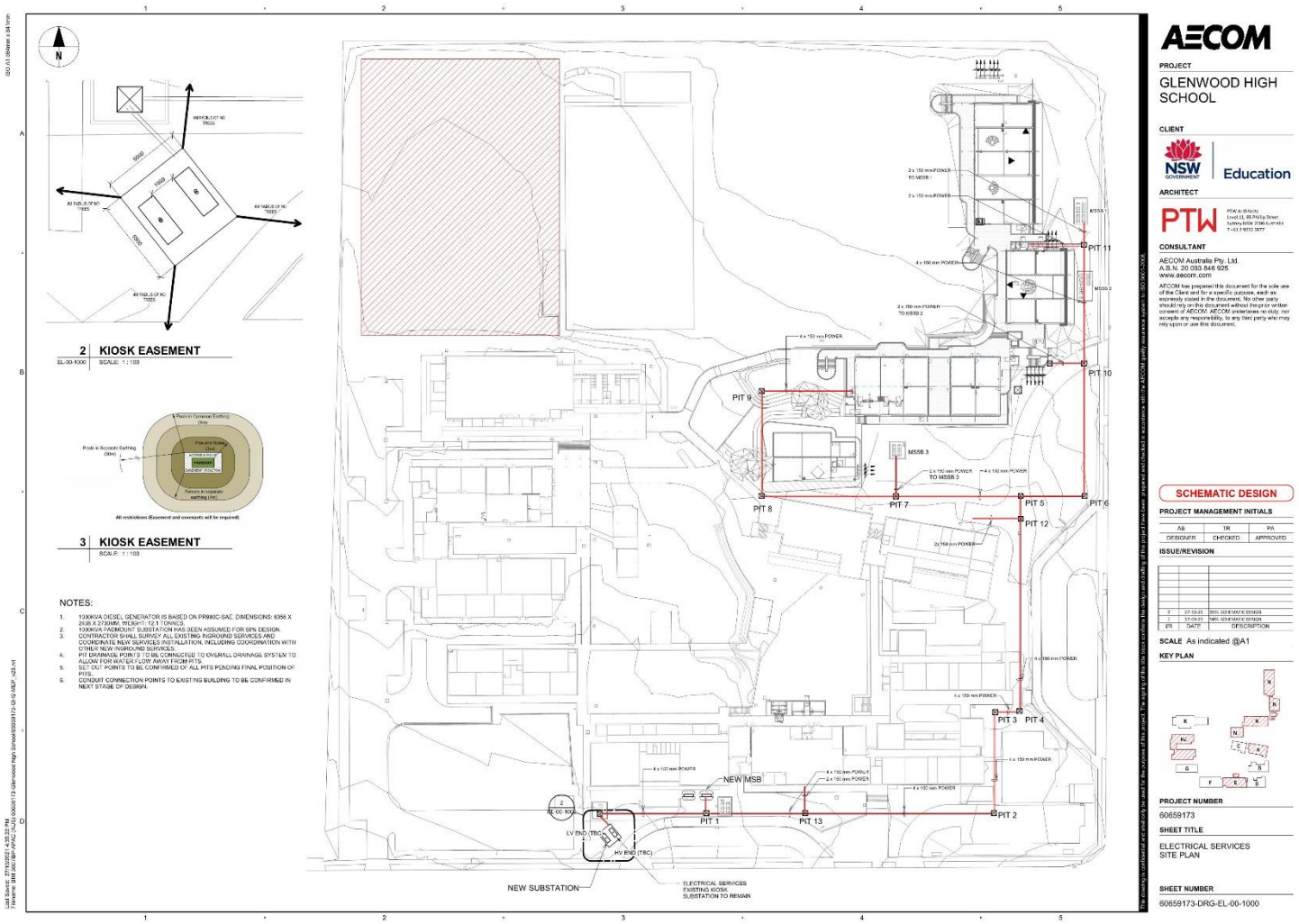

Figure 3 Existing Site Wide Electrical Services reticulation plan

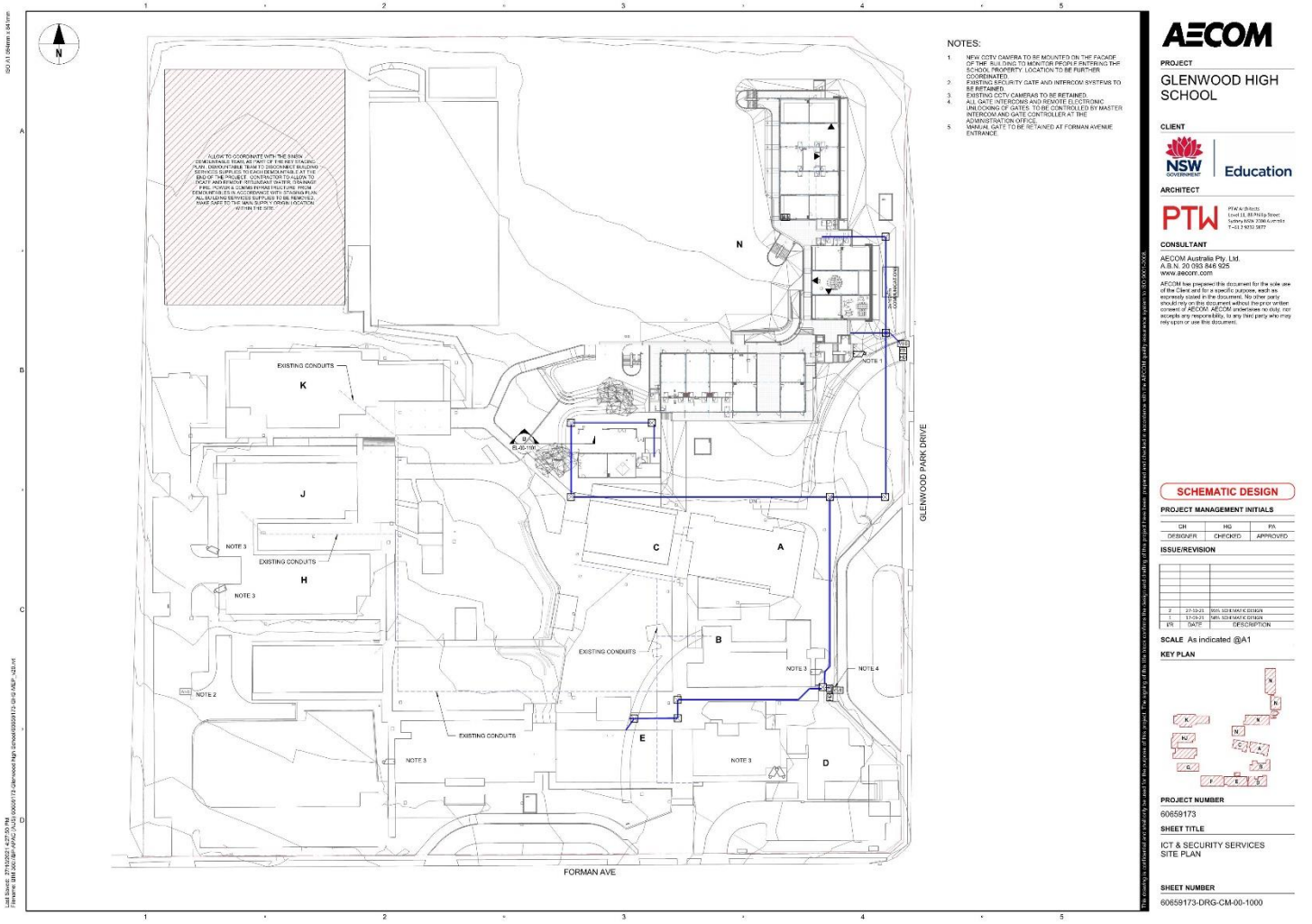

Figure 4 Existing Site Wide ICT Services reticulation plan

2.0 Hydraulic and Fire Protection Services

2.1 General

The hydraulic and fire protection services to the existing school campus comprise of the following:

- Utility water mains
- Utility sewer mains
- Utility gas mains
- Sanitary drainage systems
- Cold water services
- Gas services
- Fire Protection systems
    - Fire hydrant
    - Portable fire extinguishers
    - Fire Detection / Alarm system

2.2 Review of Existing Documentation

2.2.1 Standards and Guidelines

The hydraulic and fire protection services section has been prepared in accordance with the following standards and guidelines, as defined by the current Educational Facilities Standards and Guidelines (EFSG):

- DG51 – Hydraulics (General)
- DG52 – Drainage and Trade Waste
- PS Technical Data Summary - Drainage
- DG53 – Water
- PS Technical Data Summary - Water
- DG54 – Gas
- PS Technical Data Summary – Gas
- DG95 Stormwater
- PS Technical Data Summary - Fire Protection

2.3 Sewer and Sanitary Drainage

2.3.1 Network Utility Operators Sewer

2.3.1.1 Existing assets

A DBYD enquiry shows Sydney Water sewer mains around the site.

The following Sydney Water sewer drainage assets reticulate around the site:

Glenwood Park Drive (North East of the site)

- 1 x DN600 Reinforced Concrete pipeline
- 1 x DN300 PVC pipeline

Forman Drive (South of the site)

- 1 x DN150 PVC pipeline

The site 150mm diameter sewage pipework from the site discharges to the 300mm PVC main, located in the north-eastern corner of the site.

2.3.1.2 Capacity analysis

According to the below table from the Sewerage Code of Australia - Sydney Water Edition, WSA-02-2002, the existing sewer mains in close proximity to the site meet the minimum size limitations to cater for the site.

The existing catchment area and current EP loading on these sewer mains however is currently unknown. It is possible that these mains are currently at peak capacity and are unable to cater for additional loading without an increase in pipe size.

Final determination of any upgrade works required will be subject to Sydney Water assessment via a Water Services Coordinator and approval under a Section 73 Application. It is not anticipated that any sewer mains upgrade will however be required.

Table 1 Sewage Demand Estimates

Pipework Diameter (DN)	Maximum Allowable EP
150mm	600
225mm	1,600
300mm	3,200

2.3.1.3 Foreseeable amplification and diversions

Sydney Water design for an Ø150 sewer main accounts for a maximum estimated population of 600, which equals to a maximum of 3000 students (based on 0.2 EP / student).

It is not anticipated that any sewer mains upgrade will be required.

2.3.1.4 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 1 Existing Site Wide Hydraulic Services reticulation plan**.

2.3.2 Internal Sanitary Drainage Systems

2.3.2.1 Existing assets

The existing school campus conveys by gravity across the site from each of the various buildings to the 150mm sewer main to the 300mm Sydney Water sewer in the north-eastern corner of the site, refer to **Figure 1 Existing Site Wide Hydraulic Services reticulation plan.**

2.3.2.2 Capacity analysis

Refer section above.

2.3.2.3 Foreseeable amplification and diversions

Minor site diversions of the existing sewer drainage will be required around the vicinity of the existing hall, plus modifications to the private sewer will be necessary for the new buildings.

2.3.2.4 Bespoke features and compliance issues

The overflow relief gully (ORG) and induct pipe mica flap (IMPF) could not be located on the perimeter of the site towards the North East of the site and should be uncovered or reinstated, as part of the upgrade works to the site.

A CCTV survey will be required to establish the condition of the existing sewer drainage pipework.

2.4 Water Services

2.4.1 Network Utility Operators Water

2.4.1.1 Existing assets

A DBYD enquiry shows the site is being serviced by dual reticulated Sydney Water 200mm uPVC recycled water mains and 200mm DICL potable water mains, running along Glenwood Park Drive and Forman Drive (refer to **Error! Reference source not found.**). Recycled water is supplied by the Rouse Hill Water Recycling Plant, the largest residential water recycling scheme in Australia, and is likely being used for toilet flushing and lawn irrigation.

2.4.1.2 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 1 Existing Site Wide Hydraulic Services reticulation plan**

2.4.1.3 Capacity analysis

An initial assessment of the increase in potable water demand, generated from the redevelopment has been made to determine the necessary potable water infrastructure upgrades. Demand estimates for potable water have been calculated below in Table 2 using the *Water Supply Code of Australia WSA 03-2002-2.2 (Sydney Water Edition)*.

It is likely that some of this estimated water demand (e.g., for toilet flushing) can be met through recycled water. On average, users in the Rouse Hill recycled water scheme area consume up to 40% less drinking water than other users in greater Sydney. The Development Servicing Plan 2016 for Rouse Hill Recycled Water System indicates that forecasting recycled water consumption for special uses such as schools is based upon the relative design allowances for that development. As such, the potable water demand estimates below are conservative and subject to confirmation at a later stage when the demand split for dual reticulation is determined.

From Table 2.1 of the abovementioned Code, for primary schools, average and maximum day demand rate are assumed to be 45 kL/d/500 pupils and 90 kL/d/500 pupils respectively.

Table 2 Potable Water Demand Estimates

Yield	Average Day Demand (ADD) (kL/d)	Maximum Day Demand (MDD) (kL/d)
Current - 1410 students	127	254
Future - 1820 students	164	327

2.4.1.4 Foreseeable amplification and diversions

Based on the increase of 37 kL/d, amplification of the existing DN200mm main is not envisaged to be required – however this would depend on the extent of existing flows through the DN150mm / DN200mm outside of the school site.

The exact lead-in infrastructure upgrade requirements should be confirmed through a formal capacity assessment from Water Services Coordinator via a S73 application, depending on the complexity of the network flow modelling may be required to confirm exact capacities will be required.

Diversions within the site are expected to cater to the proposed redevelopment with new building locations.

2.4.2 Internal Cold-Water Services

2.4.2.1 Existing assets

The campus is serviced by an existing 50mm diameter cold water meter and existing 50mm diameter recycled / non-potable cold-water meter, both located in a fenced enclosure adjacent the existing Fire Hydrant Booster Assembly on the perimeter of the campus, adjacent to Glenwood Park Drive

The in-ground potable water supply reticulates throughout the campus to serve each of the existing buildings, temporary demountable classroom buildings and external hose taps serving the irrigation system.

The demountable classrooms are each provided with a 20mm cold water connection.

Figure 5 Existing Water Meter (Potable and Non-potable Water)

2.4.2.2 Capacity analysis

Refer section above.

Statement of Available Pressure and Flow

Sydney WATER

Paul Angus
420 George Street
Sydney, 2000

Attention: Paul Angus Date: 07/07/2021

Pressure & Flow Application Number: 1160303
Your Pressure Inquiry Dated: 2021-06-07
Property Address: 85 Forman Avenue, Glenwood 2768

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Glenwood Park Drive	Side of Street: East
Distance & Direction from Nearest Cross Street	15 metres North from Forman Avenue
Approximate Ground Level (AHD):	63 metres
Nominal Size of Water Main (DN):	200 mm - Recycled

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	67 metre head
Minimum Pressure	61 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	61
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	63
	10	63
	15	63
	20	63
	26	63
	30	62
	40	62
	50	62
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5	61
	10	61
	15	61
	20	61
	26	60
	30	60
	40	60
	50	59
Maximum Permissible Flow	118	54

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

swtapin@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

Figure 6 Sydney Water Pressure and Flow Statement (Recycled Non-Potable Water Supply)

Statement of Available Pressure and Flow

Sydney WATER

Paul Angus
420 George Street
Sydney, 2000

Attention: Paul Angus Date: 08/07/2021

Pressure & Flow Application Number: 1160302
Your Pressure Inquiry Dated: 2021-06-07
Property Address: 85 Forman Avenue, Glenwood 2768

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Glenwood Park Drive	Side of Street: West
Distance & Direction from Nearest Cross Street	15 metres North from Forman Avenue
Approximate Ground Level (AHD):	63 metres
Nominal Size of Water Main (DN):	200 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	52 metre head
Minimum Pressure	40 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	40
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 15 20 26 30 40 50	41 41 40 40 39 38 36 33
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 15 20 26 30 40 50	40 40 39 39 38 37 35 32
Maximum Permissible Flow	108	4

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

swtapin@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

Figure 7 Sydney Water Pressure and Flow Statement (Potable Water Supply)

2.4.2.3 Foreseeable amplification and diversions

Modification works to the incoming water main meters and existing in-ground distribution throughout the site will be necessary to accommodate the fire hose reels requirements, supplied from the potable cold-water pipework.

The in-ground water supply reticulates throughout the site to serve each of the existing buildings, temporary demountable classroom buildings and external hose taps serving the irrigation system.

It is anticipated that diversions and extension to existing water services pipework within the site are likely to be required.

The new buildings shall incorporate a rainwater harvesting tank to conserve and minimize the use of potable cold-water consumption. The recycled water shall be used for irrigation and WC flushing.

Water saving fixtures and fittings shall also be incorporated throughout the site.

It is recommended an in-ground survey be undertaken to confirm and identify the exact location of the in-ground water services pipework.

2.4.2.4 Performance requirements

All water systems will be designed in accordance with legislation and standards, with the following noted performance requirements:

- Working velocities in pipes shall be limited to a maximum of 1.8 m/s
- Maximum operational pressure 500 kPa
- Minimum operational pressure 200 kPa
- The following maximum flow rates shall be provided to fixtures:
    - WC cistern 3.5 l/min (4.5 / 3 litre dual flush)
    - Basins 4.5 l/min
    - Sinks 7.5 l/min
    - Hose taps 12.0 l/min
    - Showers 7.5 l/min
- Water sub-metering

Water sub-metering will be provided for each of the main buildings and irrigation to facilitate individual monitoring of water use.

2.4.2.5 Bespoke features and compliance issues

At the time of the inspection, there were no issues reported with water pressure or flow performance and no non-compliances were noted.

In the short term, the current water meter assembly is sagging and will require to be modified.

2.5 Gas Services

2.5.1 Network Utility Operators Gas

2.5.1.1 Existing assets

Available DBYD data indicates that gas is supplied to the neighbourhood by Jemena through a 210 kPa distribution main that runs along Forman Avenue.

Based upon the As Built information received, the depths and exact position of the existing reticulation mains within the school remain unknown. It is recommended that the contractor undertake further surveys to determine the exact layout, prior to excavation works around the existing buildings to be refurbished.

2.5.1.2 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 1 Existing Site Wide Hydraulic Services reticulation plan**

2.5.1.3 Foreseeable amplification and diversions

The existing gas supply within the site will need diversions and amplification to provide a central hot water plant for the proposed new building layouts. However, it is possible that the new gas demand will be offset by the discontinued use of existing gas heaters in classrooms.

2.5.2 Internal Gas Services

2.5.2.1 Existing assets

The gas meter and boundary regulator is located to the rear of fire hydrant booster assembly on the perimeter of the campus, on Forman Avenue.

Figure 8 Existing Gas Meter and Boundary Regulator - Forman Avenue Entrance

2.5.2.2 Capacity analysis

The incoming 20mm gas supply is assumed to have a maximum inlet pressure of 400kPa – the data badge is extremely weathered. The as-built / constructed drawings will be required to confirm.

The existing 50mm supply is regulated to an assumed outlet pressure of 2.75kPa, – the data badge is extremely weathered - the as built / constructed drawings will be required to confirm.

The gas conveys reticulates to gas heaters located within each classroom located in Blocks A - G only. The demountable classrooms have no gas supply.

Based on a metering pressure of 2.75kPa and 50mm diameter distribution pipework the maximum gas load achievable is 1,008 MJ/hr.

The gas supply is reticulated to each of the Bowin LB90 Flueless Convection Gas room heaters.

Based upon the buildings inspected and without the assistance of As-Built / constructed drawings it has been assumed that 2 gas heaters are located within each classroom. Each heater consumes 17MJ/hr, the total gas load for the site can be summarised within Table 3.

Table 3 Gas consumption summary

Location	Level	Number of heaters	Gas consumption (MJ/hr)	Gas load (MJ/hr)
Block A	Ground level	16 No.	17/9	256
Block B	Ground level	16 No	17	272
Block C	Ground level	11 No	9/28/17	165
Block D	Ground level	12 No	17	204
Block E	Ground level	7 No	17	119
Block F	Ground level	5 No	17	85
Block G	Ground level	0 No	0	0
Block H	Ground level	0 No	0	0
Block J	Ground level	8 No	17/9/28/22	149
Block K	Ground level	6 No	40	240
Block L	Ground level	0 No	0	0
		Total		1490

The index length of the gas pipework will also require to be taken into account during the design stage, however it has been established that the existing gas load has spare capacity.

It is understood that the future heating provisions to classroom will be undertaken via the reverse heating cycle on the air conditioning system and all gas heaters will become redundant.

This will allow any future provisions for gas fired hot water heaters; however it is envisaged that local point of use electric instantaneous / heat pump hot water heaters will be the preference, based on limited hot water usage.

2.5.2.3 Foreseeable amplification and diversions

The existing gas supply will require modifications to based upon the gas heaters being replaced in the refurbished and new buildings with air conditioning (reverse heating) for the proposed new building layouts.

As-built drawings were not available at the time of compiling this report. These drawings would indicate the in-ground gas services supply around the site. From our investigation on site and request for existing services drawings has established that there are very few hydraulic drawings specifically relating to water supply that are available.

It is appreciated that the building layouts and functions have changed over time with various fit outs and therefore we have no way of establishing the current layout.

It is recommended an in-ground survey be undertaken to confirm and identify the exact location of the in-ground gas services pipework.

It is anticipated that no increase in gas supply is required, based on offsetting. The plumbing contractor will require to submit a written application for additional gas loading will require to be lodged to the selected Gas Retailer, when final additional gas quantities are ascertained.

2.5.2.4 Bespoke features and compliance issues

There are no issues reported from the facilities team and no issues were uncovered during the time of the inspection.

A number of unflued gas heaters were noted to be installed throughout the school building. This model of gas heaters do not have a flue to the atmosphere and require specific cross ventilation requirements.

It is understood that the future heating provisions to each classroom will be undertaken via the reverse heating cycle on the air conditioning system and the existing gas heaters will become redundant and be disconnected. However, in the short term all obstructions located within 1m of the gas heaters should be assessed and moved accordingly.

2.6 Fire Protection Services

The fire protection services to the existing site comprise of the following:

- Fire Hydrant System,
- Fire Hose Reel System,
- Fire Detection and Alarm System and,
- Portable Fire Extinguishers.

2.6.1 Existing Wet Fire Services assets

2.6.1.1 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 2 Existing Site Wide Fire Protection Services reticulation plan**

2.6.1.2 Water Supply System

Fire hydrant coverage shall be provided to the new buildings and existing buildings as required by the NCC 2019 and AS 2419.1-2005.

Hydrants shall be provided externally and internally as required to satisfy hydrant coverage. External double outlets fire hydrants shall be provided adjacent to on-grade buildings entry points and within 50 metres of Hardstands. External fire hydrants shall not be within 10 metres of the buildings they are serving, nor sources of high voltage and gas.

Internal single outlet Fire Hydrants will be located within 4 metres of exits as required to achieve full compliant coverage. Horizontal fire hydrant pipe supports shall comply with AS2419.1:2005 Clause 8.7.4.

It is understood that there are seven (7) existing external fire hydrants present on site. The compliance and pipework integrity of the existing system is unknown. The existing fire hydrant system shall be stripped out and new fire hydrant outlets supplied from the new fire water infrastructure provided. New fire hydrants will be provided in compliant locations to protect existing buildings on the site.

The Fire hydrant service shall have adequate capacity to supply a minimum of 10 L/sec to each fire hydrant location and allow for two (2) hydrants to operate simultaneously. Based on the BCA Report, it is assumed that the largest fire compartment size is less than 5000 m^2. A fire compartment larger than 5000 m^2 will require additional operational hydrants that will require greater water supply capacity which is not allowed for in the proposed design.

2.6.1.3 Hydrant System

The existing fire hydrant infrastructure consists of the following:

- Sydney Water Recycled Town Main,
- Fire Hydrant Booster assembly.

The existing Fire Hydrant Booster Assembly will be removed and replaced in the South-Eastern corner of the site. A new Fire Hydrant Booster Assembly will be installed to serve the hydrant system on site.

A Sydney Water Pressure and Flow Statement has been acquired for the 200mm Recycled Sydney Water Towns main on Glenwood Park Drive. The pressure and flow available from this connection point will be sufficient to serve the Fire Hydrant system without the need for on-site fire tanks or pumps. A new 150mm connection to the 200mm Recycled Sydney Water Towns main is proposed to replace the existing 100mm connection.

For the Fire Hydrants, the following design criteria will apply:

Table 4 Fire Hydrant Service Performance Requirements

Design Items	Design Criteria
No. of hydrants to operate simultaneously:	2 (based on largest fire compartment area)
Minimum flow rate:	20 L/s total at the two (2) most hydraulically disadvantaged hydrants (10 L/s each) in simultaneous operation
Minimum outlet pressure at each hydrant outlet relying on the fire hydrant pump output:	700 kPa @ 5 L/s for each hydrant
Minimum outlet pressure when boosted by the fire brigade:	700 kPa @ 10 L/s for each hydrant
Minimum pressure at the booster assembly after the backflow prevention:	Min 150 kPa @ 20 L/s at the booster assembly
Maximum friction loss in the fire hydrant system:	Max 150 kPa @ 20 L/s
Coverage from internal fire hydrants:	40 m (30 m hose length + 10 m of hose stream)
Coverage from external fire hydrants:	70 m (60 m hose length + 10 m of hose stream)

2.6.1.4 Fire Hose Reels

A fire hose reel system shall be installed throughout the new buildings and refurbished areas of existing buildings in accordance with NCC 2019 Part E1.4 and AS 2441-2005 requirements.

Water supply to the fire hose reel system shall be taken from the on-site potable cold-water system with appropriate backflow prevention. Connection to the potable cold-water supply to be coordinated with the Hydraulic trade.

Fire hose reels shall be installed within four (4) metres of exits and adjacent to internal Fire Hydrants.

The Fire Hose Reel service shall be sized with adequate capacity to convey water supply to all connected fire hose reels, allowing for a minimum supply of 0.44 L/sec at each fire hose reel and for two (2) fire hose reels to operate simultaneously.

The Fire Hose Reel Service reticulation shall be constructed by either copper pipework and fittings or medium weight galvanised steel pipework. Should the pressures at the fire hose reel be equal to or greater than 1,000 kPa, pressure reduction valves shall be provided.

Note: The NCC 2019 exempts fire hose reel protection in classrooms and associated corridors in primary and secondary schools. Where fire hose reels are removed portable fire extinguishers shall be provided.

2.6.1.5 Fire Hose Reel Design Criteria

The Fire Hose Reel system is to adhere to the characteristics below:

Table 5 Fire Hose Reel Service Performance Requirements

Minimum Hose Reel Discharge Pressure	220 kPa
Minimum Hose Reel Flow Rate (19 mm Hose)	0.33 L/s
Minimum Hose Reel Flow Rate (25 mm Hose)	0.44 L/s

2.6.1.6 Portable Fire Extinguishers

Portable fire extinguishers and fire blankets shall be provided throughout the school in accordance with NCC 2019 clause E 1.6 and the EFSG. They shall be selected, located and distributed in accordance with Sections 1 to 4 of AS 2444-2001, refer to fire protection package for locations.

All extinguishers will be complete with appropriate mounting boards, mounting brackets/cabinets, nozzles, hoses, operation instructions and location signs.

Portable fire extinguishers will replace fire hose reels in Class 5 buildings/areas and in classrooms and classroom corridors (i.e., where fire hose reels are as exempted per the NCC), and they shall be located as per AS 2444-2001.

2.6.2 State of Repair

It is understood that there are seven (7) existing external fire hydrants present on site. The compliance and pipework integrity of the existing system is unknown.

The existing fire hydrant system shall be stripped out and new fire hydrant outlets supplied from the new fire water infrastructure provided.

New fire hydrants will be provided in compliant locations to protect existing buildings on the site, refer to fire protection package.

2.6.3 Foreseeable amplification and diversions

The existing Fire Hydrant Booster Assembly will be removed and replaced in the South-Eastern corner of the site.

A new Fire Hydrant Booster Assembly will be installed to serve the hydrant system on site. The proposed location shall be reviewed with the BCA consultant at the next design phase.

The existing fire hydrant system will require to be modified to provide adequate coverage to the proposed new buildings on the campus, in accordance with AS 2419 and National Construction Code requirements.

2.6.3.1 Bespoke features and compliance issues

In the immediate short term, it is a recommendation to undertake the following additional works:

- Provide external signage to the existing fire hydrant booster assembly, in accordance with AS 2419; and,
- Provide a permanent fire services block plan indicating all existing site hydrant features (including assumed pipe routes), available pressure and flow test performance characteristics and Australian Standard of installation, in accordance with AS 2419 requirements.
- Additional fire hydrants and fire hose reels will be required to provide coverage to all existing and new proposed buildings

It is best practice to retro fit FRNSW / RFS compatible Storz screw on couplings to the existing hydrant standpipes to enable quick connection and intervention in accordance with AS 2419 requirements.

It is recommended that the fire maintenance contracts be provided for further analysis for effectiveness and compliance with the essential services maintenance provisions of the National Construction Code (NCC); this should include a review of the following:

- Annual Fire Safety Statement (AFSS) of the facility;
- Fire and life safety assessment of existing facility;
- Performance assessment of existing fire system, assumed to be ordinance 70;
- Assessment of existing Occupation Certificates, Council Orders or Annual Fire Statements to determine the existing site compliance benchmarks;
- Review of maintenance records, operations and maintenance manuals; and,
- As built documentation was not available during the course of the desktop study or at the time of reporting.

Whilst the fire protection services design and installation appear to comply with the requirements of the Building Regulations and design standards at the time of installation, the Building Regulations and some of the referenced Australian standards have changed in the period since the original installation, refer to fire protection package.

2.6.4 Fire Detection / Alarm system

2.6.5 Existing assets

The existing fire detection system consists of smoke detectors.

It is unclear how these smoke detectors are monitored, as there is no existing Fire Detection Control and Indicating Equipment (FDCIE) serving classrooms on site.

It is understood there is an FDCIE in the hall, serving only fire alarm devices in the hall.

A new Fire Detection and Alarm System is proposed in accordance with NCC 2019 and AS1670.1:2018.

A networked addressable analogue FDCIE will be provided at the designated site entry point, in addition to the entry lobby of the staff room, workshop and new classroom building.

'NSW Table E2.2b Specific provisions' of the National Construction Code (NCC) requires all ducted fan coil units, in Class 9b buildings (schools), to be automatically shut down on receipt of a fire trip signal, generated by a smoke detection system installed in accordance with 'Specification E2.2a Clause 6' of the NCC.

The Fire Detection & Alarm System will provide interface between the hydrant system, smoke detectors and shutdown/control of the mechanical systems where required.

2.6.6 State of Repair

The existing detectors may be reaching the equipment's end of life. It is recommended to replace detectors that have been in service for 10 years or more. New and existing detectors are to be maintained throughout the school campus in accordance with AS1851 – Routine service of fire protection systems and equipment, refer to fire protection package for further details.

2.6.7 Capacity analysis

The fire panel could not be observed during the site inspection. As a result, the following could not be determined:

- Model/type of the panel;
- Available capacity to accommodate additional devices; and,
- Battery backup capacity.

2.6.8 Foreseeable amplification and diversions

In accordance with the Educational Facilities Standards and Guidelines (EFSG) Technical data Summary Fire Protection, a fire detection and alarm system will be required in line with the National Construction Code.

The proposed new Main Fire Detection Control and Indicating Equipment (FDCIE) location will be subject to the fire brigade approval.

2.6.9 Proposed site connection points

The fire detection and alarm system will be designed in accordance with AS1670.1-2015 and include, as a minimum, the following items:

- Main FDCIE,
- FDCIE (where required)
- External alarm strobe
- Smoke detectors
- Thermal detectors
- Break glass alarm
- Occupant Warning System.

2.6.10 Automatic Fire Detection and Alarm System

A new automatic fire detection and alarm system shall be provided to the following buildings, in accordance with the relevant Australian Standards, National Construction Code and EFSG Technical Data Summary:

New proposed buildings

- Buildings proposed to be refurbished or extended (existing detection to be upgraded in line with current standard)
- Existing buildings that are remaining with no scope of work involved, will maintain the existing fire detection system as installed in line with original standards.

The system shall be fully automatic addressable fire detection and alarm system that is controlled and monitored by a Main FDCIE located at the designated site entry point.

The FDCIE will consist of Alarm Signalling Equipment (ASE) for automatic notification of a fire alarm to the Fire Brigade via a third-party monitoring provider.

The existing fire detection systems serving the existing buildings which are remaining will be interfaced with the new FDCIE if the systems are compatible. However, the existing detection system components and configuration will need to be verified to ensure that the existing system is compatible with the new fire detection and alarm system.

The new automatic detection and alarm system shall incorporate an Occupant Warning System (OWS) to sound throughout the new and refurbished/extended buildings of the school campus during a fire condition. A Sound Systems and Intercom Systems for Emergency Purposes (SSISEP) is not required to the school campus as the proposed buildings do not have a rise in storey more than 3 and are also less than 25m in effective height.

The Occupant Warning System will be automatically initiated by the automatic detection and alarm system or activation of manual call point.

Occupant warning speakers will be provided throughout each of the new and refurbished/extended buildings to provide the required sound pressure levels to all occupied areas of the building. Speech intelligibility performance is not required provided that live speech facilities are not required for the OWS; however, this is subject to consideration by all relevant stake holders.

Visual Alarms (Strobes) will be provided in areas with high ambient noise level, and to any areas specified for use by hearing impaired occupants.

2.6.11 Bespoke features and compliance issues

The new buildings will have a new fire detection and alarm system and occupant warning system in accordance with the current NCC and Australian Standards. To maintain consistent fire protection system throughout the buildings where extensions/refurbishment works are taking place, it is recommended to perform the following:

Upgrade the existing detection system to the current BCA and Australian Standards.

Provide new fire detection and alarm system to the buildings being extended/refurbished in accordance with the current BCA and Australian Standards.

Provide new occupant warning system to the buildings being extended/refurbished in accordance with the current BCA and Australian Standards.

The fire protection services design and installation is understood to comply with the requirements of the Building Regulations and design standards at the time of installation. The Building Regulations and some of the referenced Australian standards have changed in the period since the original installation. As a result, the existing installation may not comply with the requirements of the current standards.

Certification of the fire protection services is assumed to have been obtained at the time of installation, deeming fit for purpose and therefore it would be deemed to meet the design intent.

The fire protection services appear in satisfactory condition and suitable for continued use in their present condition, provided the current level of maintenance and testing is continued.

This will need to be confirmed by the BCA/NCC consultant.

3.0 Electrical and Information & Communications Technology (ICT) Services

3.1 Electrical Services

3.1.1 Existing assets

3.1.1.1 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 3 Existing Site Wide Electrical Services reticulation plan**

3.1.1.2 Existing Incoming Supply and Substation

The school is currently supplied by one dedicated Endeavour Energy pad mount substation 23864, located adjacent to the school boundary. (refer to Figure 9)

Based on initial visual observations, the estimated substation size according to its physical size is of the order of 500k-750kVA.

Figure 9 Existing Padmount Substation

3.1.1.3 Existing Main Switchboard (MSB)

The main switchboard is located in Building F.

The age of the MSB could not be established at this stage.

The MSB is not compliant to current code requirements. A service protection device is not available at the main switchboard.

Figure 10 Existing MSB

3.2 Electrical Services – Proposed Works

3.2.1 Upgraded Kiosk Substation / Additional Kiosk Substation

At this stage we anticipate the existing kiosk substation will need to be upgraded or an additional substation will need to be installed to feed the new building loads. This will be developed after lodging a formal application to Endeavour Energy.

3.2.2 New Site Main Switchboard

The Existing Main Switchboard (MSB) is proposed to be retained.

A new main switchboard will be installed in a new main switchroom to serve all the new areas.

The new main switch room shall comply as follows:

- Minimum 2-hour (120/120/120) fire separation, including doors.
- Smoke seals on cupboard doors where cupboards are within path of egress where required by AS or NCC.

The new MSB shall be constructed as follows:

- Form 3b
- IP 65 complete with anti-condensation heaters
- Front connected
- Equipped with surge protection
- Minimum of 25% spare capacity (Busbar ratings & Spare MCCB spaces)
- The outgoing submains cables will be reticulated via underground conduits to all new building electrical distribution boards.
- The MSB will contain a life safety services section to accommodate any existing, new or future life safety services, i.e., Lifts, fire services etc.
- The MSB shall be sized to accommodate the required maximum demand, including non-essential and life safety services, and to have an allocation of 25% future spare capacity.

3.2.3 New Distribution Boards

All new distribution boards (DBs) shall be readily accessible and installed within dedicated electrical cupboards.

Cupboards for DBs shall comply as follows:

- Minimum clear width dimensions to suit the electrical distribution board (including spare capacity)
- Unimpeded access to the DB from the floor to door head height with cupboard doors open.
- Positioning major DBs within dedicated 1-hour fire rated electrical riser cupboards for ease of access.
- Smoke seals on cupboard doors where cupboards is within path of egress where required by AS or NCC.

Each separate building shall be served with one DB with one DB per level.

DBs shall will be constructed as follows:

- Form 2B type construction to AS/NZS 61439 complete with hinged lockable doors
- IP 42 rated
- Front connected
- Equipped with surge protection
- All outgoing sub-circuits complete with RCD protection as per AS/NZS 3000 requirements
- Minimum of 25% spare capacity (Busbar ratings & Spare MCB spaces)
- Separate chassis with energy monitoring metering per NCC J8.3 requirements

3.2.4 Thermal Scanning of Existing Distribution Boards

Thermal scanning is a process of viewing heat, generated from an electrical switchboard by utilising thermal imaging equipment. The more power a device draws from a switchboard, or if there is a malfunctioning component in a switchboard, the more heat is generated. If excess heat and stress on the switchboard are left undetected, they can lead to equipment failure, loss in electricity supply or even electrical fire.

Industry recommendation is to have such tests carried out every 12 months as part of the site's preventative maintenance.

As such, AECOM recommends that a thermal scan for all distribution boards is undertaken to confirm if there is any excess heat to prevent future faults and replace components prior to full switchboard failure. This work can be captured as part of the scope of works for the Detailed Design phase and executed during construction stage.

3.2.5 Foreseeable amplification and diversions

It is considered likely that new / upgraded supply substation and main switchboard will be required to support the proposed upgrade works.

The location and design of the new substation and the new MSB will be subject to further discussion with Endeavour Energy.

From initial discussions with Endeavour Energy - ULL3356 FW: Application for additional load for Glenwood High School the following has been ascertained:

Development Details & Applicant's Assessed Load:

Total load of 2002A is required on site, for School's AC upgrade, no AS3000 calculations submitted.

Endeavour Energy Assessed Load:

As per customers load AS3000 required for confirmation on submission of PMOS.

Development & Site Plans received/not received:

Plans not received and will be required on the MOS submission

HV/LV Connection Point & Connection Asset Requirements:

HV/LV connection point on site from substation 23864 load 276k A/1000Kva. HV feeder 41361 off Parklea ZS.

Network Constraints & Limitations

No capacity in the existing PM substation 23864 for the proposed load. Substation is only rated at 1000kVA. Uprate of substation 23864 is required.

Connection Options:

Department of Education is to engage a Level 3 ASP to investigate and submit a proposed Method of Supply (MOS) to Endeavour Energy for further assessment. If another PM substation is proposed on site than L3 ASP is to indicate on the MOS the substation location and access and outline any structures/encumbrance in the restriction zone, and ensure all works comply with EE PM Substation requirements and relevant standards

It is recommended that an ASP3 consultant is engaged to commence, as a priority at the next stage of study for the proposed upgrade works.

A new main switchboard will need to be installed within 50 metres of the substation. A new building to house the main switch board may be required. In ground works and excavation will be required.

Final verification will need to be made with Endeavour Energy to determine the overall peak demand of the school and substation capacities.

To accommodate the addition of the new proposed buildings, a new MSB will be required, and in-ground works to install all new supplies to the new development, refer to electrical package.

The existing MSB will be converted to a main distribution board (MDB) and supplied from the new MSB.

3.2.6 Bespoke features and compliance issues

All works to be in accordance the relevant Australian standards and NSW Department of Education EFSG guidelines.

Modification to the existing infrastructure will trigger the following compliance issues:

- All new subcircuit lighting and power will need to be on RCD circuit breakers (safety switches).
- In accordance with NSW Department of Education – EFSG – DG61 Electrical Services minimum service / consumer mains will need to be rated at 800amps for 1000 students (assume Primary school rated at 1000 Students will be of similar load to high school students

Grid connected solar PV system shall be provided to the new buildings to offset power consumption costs in accordance with NSW Department of Education – EFSG – DG66 Photovoltaic Solar Power Generator, refer to Electrical package for further details.

3.2.7 Opportunities and Constraints

As noted previously, formal technical enquiry application will need to be lodged with Endeavour Energy to confirm maximum peak demand for the site as a priority at the next stage of study for the proposed upgrade works.

The main site switchboard will require modifications or replacement. The site will require power shutdowns to facilitate the upgrades for a new main switchboard; this may have to be done during school holidays.

3.3 Data and Telecommunications

3.3.1 General

The communications services requirements for the Glenwood High School (GHS) refurbishment and new building have been assessed based upon EFSG, DoE and SSU requirements. As part of the EFSG requirements, a life cycle cost assessment is required for the preferred options, to demonstrate the most cost-effective solution, when taking owning, operating, and replacement costs.

3.3.2 Existing site infrastructure and proposed site wide reticulation

The existing site connection points are indicated on **Figure 4 Existing Site Wide ICT Services reticulation plan**

3.3.3 Staging and Early Works

Staging of communications services will be determined in accordance with the approved construction methodology. The proposed concept design allows for early enabling works prior to commencement of the first stage of construction works.

Prior to initiating any site work or shutdowns, communications contractors shall conduct a detailed site audit to inspect the existing site infrastructure, equipment conditions, validate the existing services and associated cable reticulation nominated in the existing as-built and project documentation where applicable, to ensure all communications services are maintained and operational throughout the construction phase.

It is anticipated that the existing main communications room (MCR) located within the existing library on the upper level of E Block will be upgraded to meet current EFSG design requirements. Staging will be required to ensure that the school network remains operational until the upgraded MCR has been commissioned.

3.3.4 Campus Backbone Cabling Infrastructure

In accordance with DoE requirements, the fundamental backbone design for GHS is to supply and install a 10pr copper connection and 1x 12 core OS2 single mode optical fibre connection from the upgraded MCR within the library to each new BCR. During temporary relocation, existing backbone cabling between BCRs and the existing MCR will be pulled back and retained during construction. Where possible the existing fibre backbone will be reused once the MCR is re-established.

3.3.5 Building Backbone Cabling Infrastructure

There shall be a new 12C OS2 fibre link between the MCR and each building BDR. For multi-storey blocks, the ground level BDR shall connect to Floor Distributor Rooms (FDRs) within the same building via a 12C OS2 fibre link in a star topology. FDRs shall be located within buildings to maintain horizontal cable length distances as per the EFSG standard requirements.

3.3.6 Structured Cabling System

All new buildings are to be provided with a complete structured cabling system to support current and future requirements. The design will be and be able to support at minimum the following parameters:

- The horizontal cabling system shall be Category 6A U/FTP and will be categorised into three (3) classifications:
  - Underground Use: Installed inside in-ground conduits and must be classified for external and underground use.
  - Indoor Use: Installed wholly within internal building spaces and must be classified for internal use and be LSZH.
  - Outdoor Use: Installed in conduits above ground outdoor and must be classified for external use and be LSZH.
- IEEE 802.3 (Ethernet) data networks (10/100/1000/10G Base-T);
- Wireless networks up to 802.11b/g/n/ac; and
- Voice over Internet Protocol (VoIP) services

3.3.7 Cable Pits

Cable pits shall be provisioned along the campus backbone pathways at the required intervals for cable hauling, or at points where there is a change in pathway direction. Pits shall be installed adjacent to the new buildings for cabling drawings purposes.

Heavy-duty draw wire shall be provisioned and installed within each conduit run for future works.

Cable pits shall be size and positioned appropriately and detailed during the schematic design stage.

Cable pits shall be constructed with heavy duty material incorporating a water proofing agent in the render or concrete and stamped with non-removeable label in accordance to EFSG standards.

3.3.8 In-ground Conduits

In-ground conduits will be minimum of 100mm diameter. Conduits shall be white and rated for external and underground use.

A number of conduits shall be provisioned to comply with spare capacity in accordance with EFSG and DoE communications standard.

3.3.9 Main Communications Room (MCR)

The existing MCR will be upgraded as part of the library works as per the EFSG guidelines. Staging shall consider the establishment of a temporary MCR during construction to limit network downtime/disruption.

3.3.10 Public Address and Period Bell System

The existing Public Address and Period Bells system shall be extended throughout the new development. Where buildings are upgraded, modified or extended, the system shall be relocated to accommodate the new design.

3.3.11 IP Receivers

IP Receivers will be provided for each amplifier zone. IP Receivers connect to the data network and output line-level audio. IP Receivers can also come with built-in amplifiers for smaller-scale systems not requiring a zone amplifier, for example, demountable classrooms.

3.3.12 Zone Amplifiers & Speakers

AECOM will work with the school to determine the required PA zones for the new building. Each zone will be provided with an amplifier connected to the IP Receiver and also fire trip to relay occupant warning system messages. The amplifier will output the 100V sound signal to its connected speakers. The system is specified to be configured for maximum speech intelligibility.

3.4 Security Services

3.4.1 Security Management System

A new Security Management System (SMS) will be provisioned for the upgrade of GHS and shall be coordinated and led by DoE School Security Unit (SSU).

It is proposed the new security system shall be backwards compatible with the current Inner Range Concept 400 security system assumed to be installed within the school. AECOM proposes that the SMS is to be Inner Range Integriti Series and be supplied, installed and commissioned by licensed and experienced security contractor. The new SMS head-end shall be located in the MCR room and shall have total control and monitoring of existing security head-end equipment. Where existing hardware requires an upgrade for backwards compatibility, the contractor is to provide written notice to the stakeholders for review and approval. This is to be investigated further during the schematic design stage. All existing end devices supporting by the existing Concept 4000 system shall only be transferred to the upgraded system once the Integriti solution has been tested.

The Inner Range Integriti system shall consist of a central processing server providing a centralised platform for the management, control, monitoring and interface of the following security subsystems:

- Electronic Access Control System (EACS);
- Intruder Alarm System (IAS); and
- IP Intercom System.

The EACS shall also provide low-level interface (LLI) to other critical systems and equipment as listed below.

- Interface to Fire Detection System; and
- Motorised auto-doors and roller shutter doors (if applicable).

The SMS head-end is to be provided with a dedicated back-to-base monitoring communications service operated over either a fixed-line or a mobile network (3G/4G) connection.

3.4.2 Backbone Infrastructure

Security services shall utilise the new and existing communications backbone infrastructure from the MCR for connectivity. Security services shall have their own dedicated cabling system within each building.

3.4.3 Electronic Access Control System (EACS)

The Electronic Access Control System shall be designed to protect buildings and restricted areas from unauthorised entry.

Egress from the building is unrestricted as per NCC fire safety requirements. Access controlled exit doors shall be installed with a ‘request-to-exit’ push button adjacent to the door.

The EACS shall consist of the following components but not limited to:

- Door Controllers;
- Card Readers and Access Cards;
- Electric Strikes;
- Emergency Break Glass Units;
- Request-to-Exit Button (REX); and
- Interface to Fire Indicator Panel (FIP).

3.4.4 Card Reader and Access Credentials

Access controlled doors shall be connected back to door controllers, which interfaces to RFID proximity reader with electric strike unlocking the door for a short period.

The security contractor is required to supply additional encrypted access cards or key fobs as needed or required basis (replacing lost cards, key fobs or client requesting additional cards).

The access cards shall be programmed to provide authorisations to access controlled doors and elevators.

3.4.5 Keypad System

The client will determine the scope of numeric or alpha-numeric key codes to allow access to certain areas. The provided system will consist of an analogue push-button panel at nominated doors.

Nominated doors will be fitted with door controllers, which interface local keypads with electric or magnetic locks, unlocking the door for a short period.

3.4.6 Intruder Alarm System (IAS)

The Intruder Alarm System (IAS) shall be provided by the licensed security contractor, as a function of the EACS, to monitor the status of various doors and enclosures.

In the event of an alarm, the IAS shall report this status to the SMS for logging, alarm notification and security operator action. Furthermore, alarms generated during after-hours shall trigger localised alarm and send the status to the back-to-base alarm monitoring service provider.

The IAS shall be an intelligent distributed system capable of maintaining local controller functions in the event of LAN, server or ISMS failure.

The IAS proposed shall consist of the following components but not limited to:

- 20mm Magnetic Reed Switches;
- Passive Infrared (PIR) Sensor;
- Remote Arming Station;
- Door Sounder/Screamer; and
- Duress Buttons (if applicable).

The IAS equipment shall reticulate back to the same Security/Access Control Panels as EACS.

Monitoring, control and administration of the IAS shall occur at the operator's workstations located in the nominated location.

As a minimum, the following configuration shall be deployed at the new multi-storey building.

- All doors leading to external areas including open verandas and courtyards shall be installed with a reed switch, which upon unauthorised interruption will trigger a localised alarm and send signals to the back-to-base monitoring provider;
- Door sounder/screamer shall be installed on main entry/exit door on each floor of a building;
- PIR sensors shall be installed in each room and shall be positioned at optimal height recommended by the manufacturer in the corner closest to main entry door. Large rooms shall be designed such that multiple PIR sensors are installed to provide complete coverage of the area.

Where there is a risk of damage to PIR sensors, an approved metal cage shall be installed around the PIR sensors for protection.

PIR sensors shall be installed in all movement areas such as internal corridors and stairways and shall be spaced such that any intrusion into the corridor shall be detected.

Remote Arming Station shall be installed in each building in staff accessible only areas closest to the main entry door. Additional arming terminal keypads may be installed in other areas

3.4.7 Video Surveillance System (VSS)

3.4.7.1 Existing VSS

It is assumed that there is no existing VSS at GHS, and that all cameras within the administration areas are monitored locally at staff PCs.

3.4.7.2 General

An Internet Protocol (IP) based integrated security monitoring system, including high-definition Closed Circuit Television System (CCTV), cameras and recording devices, will be designed as part of the security system package. Design development of CCTV camera locations and recording system operation shall be developed in coordination with SSU during schematic design stage. Refer to Security package for further details.

3.4.7.3 VSS Servers

VSS servers shall be located in the existing MCR. CCTV cameras shall be powered by local PoE network switch from the local communications room serving that floor. The horizontal CAT6A cabling system shall not exceed 90m.

3.4.7.4 Recording Server

The CCTV system shall be designed with spare capacity to retain footage from all cameras for a minimum of 42 days with the following parameters.

Live View Parameter:

- Live Viewing at 3MP resolution at 15 Frames Per Second (FPS).

Recording Parameter:

- Recording at 3MP resolution at 15FPS

3.4.7.5 CCTV Camera Coverage

CCTV cameras shall be provisioned and positioned in optimal position to provide coverage according to SSU requirements.

3.4.7.6 High-Level Interface

CCTV System shall be interfaced to access control system via High-Level Interface (HLI) for control and monitoring purposes. Refer to Security package for further details.

4.0 Summary and Recommendations

4.1 General

Details of desktop study, site visit and preliminary engineering appraisal activities have been presented in the previous sections of this report for the following technical disciplines:

Hydraulic and Fire Services; and
Electrical and ICT Services;

Summary of key risks, constraints and issues identified as outcomes of these activities are presented in the following subsections in concise tabular format.

At this early stage and in the absence of detailed site investigation and extended data collection period, it is difficult to be definitive in providing recommendations for each of the identified risks, constraints and issues.

Accordingly, a likelihood descriptor has been assigned against each, consistent with a typical risk management approach. The likelihood descriptors that have been adopted are defined in Table 6.

Table 6 Adopted Likelihood Descriptors

Almost Certain	Very likely. The event is expected to occur in most circumstances as there is a history of regular occurrence at similar institutions
Likely	There is a strong possibility the event will occur as there is a history of frequent occurrence at similar institutions.
Possible	The event might occur at some time as there is a history of casual occurrence at similar institutions
Unlikely	Not expected, but there's a slight possibility it may occur at some time.
Rare	Highly unlikely, but it may occur in exceptional circumstances. It could happen, but probably never will.

Recommendations on the associated planning and infrastructure implications are provided for each item consistent with the assigned likelihood descriptor.

It is recommended that this report and the following summary tables are provided to the parties responsible for ongoing master planning, design and initial budget costing works associated with the proposed upgrade works.

4.2 Hydraulic & Fire Services

Table 7 Summary and Recommendations – Hydraulic and Fire Services

Item		Risk / Constraint / Issue	Likelihood	Summary and Recommendations
6.3.1	Network Utility Operators sewer	Existing external sewer infrastructure servicing site not able to support proposed development	Likely	• Upgrade to external sewer infrastructure may be required to support proposed development at this site. To be confirmed by a Sydney Water Coordinator (S73 process)
6.3.2	Sanitary drainage systems	Relocation and/or upgrading of internal sanitary drainage infrastructure required to support proposed development	Almost Certain	• Significant new works required to connect new sanitary drainage provisions at new / back-converted building to existing sanitary drainage infrastructure. • Minor diversions to existing pipework within the site are likely to be required. • Other unaffected existing internal sanitary drainage infrastructure is not likely to require upgrading.
6.3.3	Network Utility Operators water	Existing external potable water supply infrastructure servicing site not able to support proposed development	Likely	• Upgrade to external water supply infrastructure may be required to support proposed development at this site. To be confirmed by a Sydney Water Coordinator (S73 process)
6.3.4	Cold water services	Relocation and/or upgrading of internal potable water reticulation infrastructure required to support proposed development	Almost Certain	• The proposed works will require the existing 32mm water supply will require to be amplified to a 50mm water connection, meter and backflow prevention device. • In the short term, the current water meter assembly is sagging and will require to be modified.
6.3.5	Network Utility Operators gas	Existing external gas supply infrastructure servicing site not able to support proposed development	Possible	• Upgrade to external gas supply infrastructure possibly required to support proposed development at this site.
6.3.6	Gas services	Relocation and/or upgrading of internal gas reticulation infrastructure required to support proposed development	Almost Certain	• The existing gas supply conveys to numerous gas heaters located within classrooms around the campus. It is understood that the future heating provisions to classroom will be undertaken via the reverse heating cycle on the air conditioning system. • The existing gas supply will require to be amplified to provide a central hot water plant for the proposed new building layouts.
6.3.7	Wet fire services	Compliance / capacity issues associated with existing wet fire services affected by proposed development	Almost Certain	• The existing hydrant pipework will require to be extended and provide a minimum of two additional hydrants. • External signage to the existing fire hydrant booster assembly, in accordance with AS 2419 is not currently displayed and non-compliant with AS 2419. • No permanent Fire Hydrant block plan was displayed, which is non-compliant. A laminated block plan was located at the bottom of the booster assembly enclosure; this was incomplete and did not display the flow and pressure testing data. • The location of the existing fire hydrants on campus is non-compliant - being located less than 10m to the building(s). • The hydrant opposite Block B is non-compliant being less that 750mm above FFL and will require to be raised in height. • Should minimum hydrant requirements not be met by the available mains pressures, a fixed on-site fire pump is required to boost pressures. Should the authority water main flow rates not be met, an on-site storage tank will be required.

Item		Risk / Constraint / Issue	Likelihood	Summary and Recommendations

6.3.8	Dry fire services	Compliance / capacity issues associated with existing dry fire services affected by proposed development	Almost Certain	• Existing assets include smoke detectors, which appear to be in good condition.
				• The following items were identified as not currently installed:
				  ○ Fire Indicator Panel,
				  ○ Break glass alarm,
				  ○ Fire bells,
				  ○ Occupant Warning System.
				• Allow for new provision of all dry fire services required to support proposed development.

4.3 Electrical & ICT Services

Table 8 Summary and Recommendations – Electrical and ICT Services

Item		Risk / Constraint / Issue	Likelihood	Summary and Recommendations
6.4.1	Availability of power requirements from the local supply authority and the electrical reticulation within the school	Existing external electrical supply to site not able to support proposed development	Almost Certain	• Upgrade to Endeavour Energy external electrical supply likely to be required to support proposed development at this site • Allow for provision of new supply substation servicing the site
6.4.2	Existing site electrical infrastructure services, including location, routes and any notable non-compliances	Compliance issues associated with existing internal site electrical infrastructure affected by proposed development	Almost Certain	• In accordance with NSW Department of Education – EFSG – DG61 Electrical Services minimum service / consumer mains will need to be rated at 800amps for 1000 students.
6.4.3	System site electrical infrastructure configuration and capacity/spare capacities or expansion capabilities	Configuration / capacity issues associated with existing internal site electrical infrastructure affected by proposed development	Almost Certain	• A new main switchboard will be required for compliance with the NSW service and installation rules if a new supply is installed. • The main switchboard will need to be within 50m of the Endeavour Energy point of connection. • A new building to house the main switch board may be required. Modifications will be needed to the main site switchboard. In ground works and excavation will be required • Significant works required to reticulate new electrical power to proposed new / back-converted buildings.
6.4.4	Availability of Telecommunications provisions from the local telco providers	Existing external communications service to site not able to support proposed development	Unlikely	• The school's main server and communication racks are located in the school library • The incoming supply is NBN fibre and will likely have sufficient capacity to cater for the replacement of the demountable classrooms to new permanent classrooms • Upgrade to external communications service not likely to be required to support proposed development at this site
6.4.5	Existing site communication infrastructure services, including location, routes and any notable non-compliances	Compliance issues associated with existing internal site communications infrastructure affected by proposed development	Almost Certain	• Existing communications room infrastructure not compliant with requirements of DG63 • Proposed development likely to trigger requirement to upgrade existing communications room to comply with DG63 – subject to further decision making by Department of Education

Item		Risk / Constraint / Issue	Likelihood	Summary and Recommendations
6.4.6	System site communication infrastructure configuration and capacity/spare capacities or expansion capabilities	Configuration / capacity issues associated with existing internal site communications infrastructure affected by proposed development	Almost Certain	• During the construction stage power supply and communication system within the main comms room to be un-interrupted and dedicated access to the comms room required. • A new rack may be provided in the main server room if the existing main server rack is fully occupied, this is to be determined in detail designed stage • Significant works required to reticulate new communications connections to proposed new building.